An exploratory study of road rage, aggressive driving and other hazardous driving behaviour among a representative sample of motorists in Durban, South Africa

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KEYWORDS

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ABSTRACT

An exploratory study of road rage, aggressive driving and other hazardous driving behaviour among a representative sample of motorists in Durban, South Africa

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Road rage, aggressive driving and other hazardous driving appear to be of increasing concern in South Africa as evidenced by its increasing publicity in the media and discussion in society. Considering the high international prevalence and our staggering road traffic injury statistics, it was pertinent to initiate this exploratory study to determine the nature and extent of these behaviours. Furthermore, profiles of victims and perpetrators of these and 'other high-risk driving behaviours' were generated by studying associated predictor variables.

A total of 1006 participants were included in the study. The target population was urban motorists in Durban and the sample was acquired from randomly selected petrol stations in the Durban Metropolitan Area. The study was a cross-sectional descriptive survey and an interviewer-administered semi-structured questionnaire was used for this purpose.

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Driver aggression was categorised into four sub-scales: 1) mild, verbal but non-threatening expression of annoyance, 2) verbal or other expression of anger directed at the offending motorist, 3) threatening or intimidating behaviour, 4) experience of rage and 'loss of control', direct confrontation and pre-meditated behaviour. Sub-scales 1-2 provided a measure of aggressive driving behaviour while sub-scales 3-4 provided a measure of road rage. A modified semantic differential on a scale of 1-10 was used to measure aggressive driving and 'other high-risk driving behaviours'.

Motorists were fairly experienced, as indicated by the relatively large proportions of those that drove almost everyday and by the relatively high averages for the distance driven per day and number of years of driving experience. The general concern of driver aggression was found to be justified. Prevalence of at least one aggressive driving behaviour that was experienced as a victim per aggression group ranged from 24% (group 4) to 95% (group 2 and 3) while the *frequency* of experiencing these behaviours was the highest for group 3 behaviours followed by similar values for group 2 and group 4. As perpetrators, the prevalence ranged from 10% in group 4 to 87% in group1.

'Other high-risk driving behaviours' were also prevalent – just more than half the motorists reported driving above the posted speed limits half the time that they would get an opportunity to and about one-tenth acknowledged driving under the influence of alcohol.

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Motorists were requested to provide their views on several issues around driver aggression. Motorists rated taxi drivers and their associated driving behaviour as factors that agitated them most often. Also, common perception was that driver aggression was more prominent during peak hours and during festive periods.

Many predictor variables were identified for driver aggression and 'other high-risk driving behaviours' based on demographics (gender, age, education and race), with general driving characteristics (driving experience and type of vehicle driven) and with fines, collisions and the carrying of weapons.

Based on these results, the broader relevance of the study as well as implications for intervention are discussed under the 4 universal public health strategies for intervention - Education, Enforcement, Environmental modification and Engineering.

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DECLARATION

I declare that *An exploratory study of road rage, aggressive driving and other hazardous driving behaviour among a representative sample of motorists in Durban, South Africa* is my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Anesh Sukhai **July 2003**

Signed: .....

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CONTENTS

Page

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UNIVERSITY of the WESTERN CAPE

http://etd.uwc.ac.za

UNIVERSITY of the
WESTERN CAPE

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CHAPTER 1:

Introduction

Increasing reports of the phenomena of road rage and aggressive driving over the past few years (IOL, 2003) give the impression that aggression on our roads is escalating and consequently, this has become a major traffic concern among communities and professionals involved in traffic safety.

1. Legitimacy of the term 'road rage'

'Road rage' is often exaggerated by the media in an attempt to sensationalise the phenomenon and attract a larger audience.

Elliot (1999) contends that this is a criminal matter and not a road safety issue. Some have also questioned whether 'road rage' actually exists as a distinctive phenomenon, and believe that the term should be replaced or incorporated into something less emotive e.g. driver aggression (Ward et al., 1998). However, this behaviour may be seen as a symptom of a traffic problem and furthermore, these physical acts definitely exist and definitely contribute to morbidity and mortality in the traffic arena. The magnitude of driver aggression may also be understated since there are possibly thousands of less violent acts of aggression in the traffic environment that contribute to collisions but never show up in newspaper or police reports. There is also concern that although this concept is receiving increasing attention internationally, South African motorists may be ill-informed about the factors that lead to driver aggression or how to diffuse these potentially volatile traffic situations.

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2. Definitions

Various definitions of aggressive driving have been postulated, many of which are vague and conflicting. However, Shinar (1998) proposed a comprehensive and useful definition based on the psychological theory of aggression and the frustration-aggression model. Here, aggression is defined as behaviour that is directed at a person with the intention of inflicting psychological or physical harm. Furthermore, he identifies two broad categories of aggressive behaviour – instrumental and hostile. Instrumental behaviours characterise aggressive driving and are manifested as either inconsiderateness towards or annoyance with other drivers; or deliberate dangerous driving to save time at the expense of other road users e.g. weaving in traffic or flashing of headlights. These behaviours are directed at drivers in general and are regarded as traffic offences. Hostile aggression is associated with strong and uncontrolled emotion and is generally directed at a particular driver with little or no consideration of possible consequences. Such behaviour typifies road rage and is often an overt reaction by one driver to another's aggressive driving behaviour. Road rage usually involves verbal threats or physical assault and is generally regarded as criminal behaviour (see Chapter 2 for operationalised definitions).

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3. International prevalence

Internationally, road rage and aggressive driving is seen as a huge problem. In a survey undertaken by the Automobile Association in Britain, 90% of motorists reported that they experienced at least one 'road rage' encounter over a one year period and 60% admitted to "losing my temper" while driving (Joint, 1995). The National Highway Traffic Safety Administration (NHTSA) in the USA attributes 66% of all annual traffic fatalities to aggressive driving actions (Martinez, 1997).

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4. South African literature

To date, there is a lack of scientifically based data in the South African context on the prevalence and characteristics of these phenomena. This was confirmed by searches on the international Medline database as well as the Index of South African Periodicals (ISAP) and African Health Anthology local databases. However, what we do know is that our traffic injury statistics are alarming. In South Africa, the National Injury Mortality Surveillance System (NIMSS) revealed that in 2001, approximately one-quarter (27%) of all injury-related deaths were as a result of road traffic collisions (Sukhai, 2002). Compared globally, South Africa's road traffic death rate of 11.7 per 100 million kilometres travelled is the 5th highest in the world (IRF, 1991). In 2001, the National Department of Transport (NDoT) indicated that approximately 512 000 crashes occurred on South African roads and the cost of this carnage to the South African economy was estimated at approximately R13.8 billion (NDoT, 2002). For the same year, these collisions resulted in 7 900 road traffic deaths and 150 000 injuries (NDoT, 2003). Considering these disproportionately high traffic statistics together with the high prevalence of road rage and aggressive driving found internationally, it would be extremely worthwhile to research the contribution of these phenomena to morbidity and mortality in the traffic arena.

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5. Conceptual refinement

Road traffic crashes are caused by a combination of driver, vehicle and environmental factors and generally, driving behaviour in itself plays the largest role. In the South African context, the National Department of Transport suggested that between 80-90% of all collisions are related to driver factors (NDoT, 2002). Furthermore, risk-taking behaviour, which is related to lifestyle factors, may predispose some to a greater frequency of crashes as commented by Boyce and Geller (2002, p51) that "some people go their entire lives

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without experiencing a vehicle crash, while others are involved in multiple crashes throughout the course of their driving lives." Driver aggression is a major component of all possible driver behaviours that cause or have the potential to cause morbidity and mortality in the traffic environment.

In our quest to assess this 'problem', we first need to establish whether road rage and aggressive driving (or the features thereof) actually exist and what the magnitude of this perceived problem is. A search was conducted on the www.iol.co.za website, which covers the country's major newspapers, for all reports on road rage for 2002. Results revealed that 16 cases were reported, 14 of which occurred during 2002. All cases involved injuries (total of 24 injuries) of which one-quarter was fatal and a further one-quarter resulted in critical or life-threatening injuries (IOL, 2003). This compares disproportionately with an international study in Oregon that used a similar method. Marion County in Oregon is about one-third the size of the Durban Metropolitan Area and although other contextual differences exist between these two areas, a prevalence study showed only five cases of fatal road rage over a 36-year period from 1963 to 1998 (Batten, 2000).

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However, the extent of this perceived problem needs to be qualified by rigid scientific methods in order that interventions are based on data that is empirically driven. Further to quantifying road rage and aggressive driving as a problem, it would also be useful to identify and assess the contribution of those factors that provoke motorists to feel anger, which may result in aggression. Anger is defined as an emotional state varying from mild irritation to intense fury or rage (Spielberger et al., 1983). Shinar (1998) suggested that the resulting level of frustration is dependent on three factors: the level and threshold for

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frustration, the perceived negative consequences of expressing aggression and the extent to which a driving behaviour is seen as unfair/inappropriate.

But the question is whether this anger experienced by motorists is any different to that experienced under other circumstances. In a study conducted by Parkinson (2001) among postgraduate students, participants reported on two recent experiences of anger, of which one had occurred while they were driving and the other in a non-driving situation. More than three-quarters reported that they experienced anger relatively more frequently during driving than during other everyday activities. Furthermore, pre-existing stress that was unrelated to driving was rated as less influential in causing anger in the driving situation.

Internationally, various other interesting relationships with driver aggression have been studied such as whether aggression while driving is an index of general aggression in society or the link between aggression and psychiatric disturbances. However, in light of the paucity of data on the subject in the South African context, the logical first step was to conduct this exploratory and descriptive investigation. The geographical scope is limited to a single South African city (Durban), which could also serve as a pilot towards a larger national initiative. Durban was selected as a result of convenience to the investigator.

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6. Research framework

The *aim* of the study was to describe the nature and the extent of road rage and aggressive driving among motorists in the Durban Metropolitan Area (DMA) and to establish a general profile of motorists and profiles of victims and perpetrators of road rage and aggressive driving.

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Being in a position to collect information on demographics, general driving characteristics, high-risk behaviour and levels of anger experienced, this information served the basis for establishing profiles and basic inter-relationships with road rage and aggressive driving behaviours.

In this regard, the specific *objectives* were:

- To establish a general profile of *motorists* in the Durban Metropolitan Area (DMA) using data on their demography, general driving characteristics and habitual high-risk driving behaviours
- To describe the magnitude and frequency (using a likert scale) of motorists experiencing and perpetrating road rage and aggressive driving behaviours in the DMA
- To describe the magnitude and levels of anger (using a likert scale) experienced by victims of road rage and aggressive driving behaviour
- To establish a profile of *victims and perpetrators* of road rage and aggressive driving in the DMA based on their demography, motoring characteristics, habitual high-risk driving behaviour and levels of anger experienced by victims; and
- To describe motorist's views on road rage and aggressive driving in the DMA.

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To obtain this data, a cross sectional descriptive survey was conducted using an interviewer-administered questionnaire among a representative probability sample of motorists in the DMA. Randomly selected petrol stations in the DMA were used to obtain this sample. Being an explorative investigation, a specific 'research problem', which would be more typical of analytic studies, was not explicitly defined. However, some relationships were explored, the results of which could inform further research initiatives.

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7. Anticipated outcomes

It is anticipated that these results will inform a multi-disciplinary strategy to address driver aggression in the Durban Metropolitan Area (initially) and the specific outcomes that are anticipated are to:

- Workshop the results and make recommendations to the key parties involved in traffic safety in an attempt to impact on policy and intervention initiatives. These stakeholders include the National and Provincial Departments of Transport and Education, the Provincial Road Traffic Inspectorate, the National Arrive Alive Campaign, the Provincial 'Asiphephe' initiative and UNIARC; and
- Provide awareness and education on the problem via the general media and peer reviewed publications.

A more *long-term goal* would be to develop a strategy to incorporate the psychological and emotional aspects of driving into the driver licensing system to equip drivers with the necessary skills to manage anger and diffuse potentially volatile encounters in the traffic environment.

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Importantly, this study serves as an explorative investigation and hence does not provide a comprehensive research strategy to deal with this perceived problem. The various limitations to the study are discussed in Chapter 5.

Chapter 2 provides a review of relevant literature to support this exploratory investigation into road rage and aggressive driving. However, some other useful research that is not directly related to the scope of the study will be briefly presented to provide an understanding of the key issues revolving around this phenomenon. The research design

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and methodology is presented in *Chapter 3*, where key concepts are operationalised together with information motivating the use of the research instruments, the sampling and data collection strategies and data analysis techniques. Descriptive summary results and information on the various relationships that were explored are presented and discussed in *Chapter 4*. Finally, *Chapter 5* concludes the thesis with a summary and discussion focussing on the key findings and the overall burden posed by driver aggression is also emphasised. The larger relevance of the study is discussed together with important implications for policy and practice.

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CHAPTER 2:

Literature review

Chapter 1 described the results of two studies in Britain and the USA, both suggesting that road rage and aggressive driving is a problem internationally (or at least in these two countries). The absence of this data in the South African context was also described. Generally, the bulk of international research reported on results based on analytic designs, which looked into relationships with various factors that were related to road rage and aggressive driving. Thus, a larger focus was on theory development with fewer studies that looked at the prevalence and nature of these cases.

In refining the international literature, greater attention was given to information on the nature and extent of road rage, aggressive driving and other high-risk driving behaviours. Methodologies, measurement tools and strategies for intervention in other contexts were also explored.

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However, the next three sections looks at literature that falls beyond the scope of this study and is presented with the intention of providing background information on the subject, which would help contextualise the findings of this study and make appropriate recommendations for intervention. These first four sub-sections examine theories of aggression, the precursors of anger on the roads, personality and behavioural factors and instances when anger may not be the main precipitating factor for driver aggression. Following this is an examination of the characteristics of aggressive drivers, the link between driver aggression, road rage and violence in society, and a focus on behavioural

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intervention strategies. Methodologies used to measure road rage and aggressive driving in other contexts is also reviewed.

1. Theories of aggression

Various theories have been used to understand aggression, including psychoanalytic, biological and social learning. Psychoanalytic approaches suggest that aggression is a result of external factors or a combination of frustrating experiences. The original frustration-aggression hypothesis of Dollard et al. (1939) indicated that aggressive behaviour was always the consequence of frustration and that a one-to-one relationship existed between frustration and aggression. However, Miller (1941) revised this assumption and postulated that frustration produces an instigation to aggression and this instigation may or may not be strong enough to provoke aggressive behaviour. Furthermore, he suggests that when aggression has been elicited, the organism will be instigated to attack an opponent. Bekowitz (1962) also proposed a number of modifications to the original hypothesis and one of his major arguments was that frustration produced anger rather than aggression. Biological and genetic theories emphasise that aggression is innate (Edmunds and Kendrick, 1980) but this can be modified by evolutionary processes and experience while social learning approaches argue that aggression is a learned response through observation and imitation of others (Barchas, 1981).

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2. Precursors of anger

Factors that precipitate or increase anger in the traffic arena have most often been attributed to environmental/situational factors and general societal issues.

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Shinar (1998) reported a series of studies that related congestion with aggressive behaviour. Furthermore, Parkinson (2001) studied the relationship between anger on and off the road among undergraduate psychology students and concluded that road rage incidents could most often be attributed to frustration caused by congested traffic conditions. Situational factors such as congestion were also related with personality traits. A study was conducted among motorists that experienced peak hour congestion in Ontario (Hennessy and Wisenthal, 1997). Each driver's trait stress (the driver's predisposition to stress) and state stress (the driver's exposure to traffic congestion) were measured to determine how these variables affected a driver's behaviour. Findings indicated that observed stress levels were highest among drivers with high trait stress who also experienced higher levels of roadway congestion.

The traffic environment has also been blamed in that "unfamiliarity may make it more difficult to co-ordinate perspectives on the situation and easier to project blame onto the other person" (Parkinson, 2001, p508). A British survey investigated the effects of anger and the ensuing aggression on driving performance and ability, conducted among 100 drivers using the Driving Anger Scale, Driving Behaviour Questionnaire and the Social Motivation Scales (Lajunen et al., 1998). A tape recorder was also provided to participants for a two-week period to record information on various aspects of their driving behaviour. It was found that drivers who routinely drove in heavy traffic were less likely to report anger episodes compared to those who were not familiar with a traffic route and it's traffic patterns, and did not expect congested conditions.

On a societal level, a social psychologist Leon James (1997), attributes aggressive driving, in part, to cultural norms of disrespect that condone hostility and suggests that "road rage is

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a habit acquired in childhood" where "children are reared in a car culture that condones irate expressions as part of the normal wear and tear of driving". However, no mention is made of the extent of this behaviour being condoned and what cultural mechanisms promoted this behaviour.

3. Personality and behaviour

Given that motorists will experience some form of anger, what are the factors that result in these emotions being translated into aggressive behaviour or simply why do some act while others don't? Aggression is a result of a combination of the intensity of anger experienced and the means used to express this anger (Deffenbacher et al., 2002). Anger is also related to personality factors suggesting that some motorists may be more predisposed to expressing aggression than others may. Commonly associated personality traits and behaviours relate to sensation-seeking (Jonah et al., 2001), anxiety (Spielberger, 1972; Spielberger, 1983), impulsiveness (Novaco, 1991) and the inability to deal effectively with anger (Selzer et al., 1968).

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Sensation-seeking is one driver personality trait that has received considerable attention and is defined as a trait that involves the "seeking of varied, novel, complex, and intense sensations and experiences and the willingness to take physical, social, legal and financial risks for the sake of such experiences (Zuckerman, 1994). Jonah et al. (2001) showed that high sensation seekers were significantly more likely to be involved with high-risk driving behaviours (e.g. $p<0.001$ for driving above the 120km/hr speed limit and $p<0.04$ for driving above the legal blood alcohol limit) and were also more likely to report aggressive driving behaviours than low sensation seekers. This was also confirmed by a review of this

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topic by Jonah (1997) who found 36 of 40 cases to display a positive relationship between sensation seeking and some form of high-risk driving behaviour.

Spielberger (1972; 1983) categorise anxiety into state-anxiety and trait-anxiety. State anxiety denotes an individual's reaction to a perceived threat with consciously perceived feelings of inadequacy and tension. Trait anxiety is the tendency to perceive certain situations as threatening and to respond to these situations with varying levels of state-anxiety. Hence, individuals with high trait-anxiety would be more likely to perceive situations as threatening and to respond with a more intense reaction. This may also lead to the development of specific psychological defence mechanisms, which may cause anxiety-prone persons to be inattentive and slower to recognise possible risks or hazards on the road. Furthermore, the anxiety prone driver may be more likely to mis-interpret the perceived intent of other drivers and respond in an exaggerated manner.

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Another trait that was shown to be of importance was impulsiveness. Novaco (1991) suggested that impulsive persons may be more easily provoked by other drivers' behaviour and also showed that poor control of hostile impulses were positively related to those that were frequently involved in collisions.

Furthermore, the inability to deal effectively with anger was shown to be an important factor contributing to road traffic collisions and death. Selzer et al. (1968) looked at fatal traffic collisions and found that 20% of his sample involved drivers who had been in aggressive altercations within a six-hour period before their deaths. Hence, it was suggested that exposure to very recent aggression in one's personal life substantially increases the risk of involvement in a fatal collision.

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4. Other causes of driver aggression

Baron et al. (1994) suggested that anger may not always precede aggressive driving behaviour but may be used as a social problem-solving strategy or as an instrument for reaching one's goals. Another postulation is based on the territorial association with one's vehicle where, upon being threatened, one responds in a territorial and sometimes aggressive manner (Whitlock, 1971). The choice and the various characteristics of one's vehicle are often symbolic of characteristics of the owner and hence the personal offence together with territorial defences.

Previous research has also demonstrated that driver aggression is more likely in situations that confer more anonymity. Ellison et al. (1995) conducted a field study and compared the aggressiveness of drivers in an anonymous condition (i.e. drivers of convertibles and 4x4's with the tops up) with that of drivers in an identifiable condition (i.e. drivers of convertibles and 4x4's with the tops down). Statistically significant differences were found between the two groups with the anonymous group honking sooner, more frequently and for a longer duration. Furthermore, Wiesenthal and Janovjak (1992) found that tinted windows and increased traffic volume, both of which are perceived to increase the anonymity of the driver, were also related to an increased likelihood of adverse driving behaviour.

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5. General characteristics of aggressive drivers

Gender and age were commonly shown to predict driver aggression. For example, a Canadian study was conducted using the 'Driving Vengeance Questionnaire' to assess the use of vengeance in common driving situations (Wiesenthal et. al., 2000). Vengeance is defined as pain, injury, humiliation or annoyance that is inflicted on an offending motorist

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(Stein, 1973). The scale was administered to three sub-samples – two in a university setting and one among inmates at a correctional institute. Results indicated that younger drivers (18-23 years) reported significantly higher levels of vengeance than 24-66 year olds and male drivers responded with significantly more vengeance than females (although females were generally over-represented).

The international literature indicated that the role of driving experience in driver aggression is not consistent. Lajunen and Parker (2001) in their review of the driver aggression literature, suggested that older motorists would be more experienced and less likely to engage in aggressive driving behaviours. However, a British cross-sectional study of attendees at general practice clinics that examined the relationship between self-reported road rage and psychiatric morbidity found that perpetrators had significantly less driving experience (Fong, Frost and Stansfield, 2001).

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Literature on the characteristics of aggressive drivers are scarce but based on his experience with 'treating' thousands of aggressive drivers since 1963, Larson (1997) found aggressive drivers to have the following five identifying characteristics and beliefs:

- They place top priority in getting to their destination in the fastest possible time
- Aggressive drivers believe in competing with other fast cars
- Aggressive drivers respond to other aggressive drivers who wish to pass or cut in front of them by becoming unyielding and refusing to give the other vehicle the right of way
- Aggressive drivers feel contempt for anyone who doesn't look, act or drive the way they want to look, act or drive; and

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- Aggressive drivers believe it is their right to punish or hit back at drivers whose driving behaviour threatens them or others.

Furthermore, in a survey undertaken by Rathbone and Huckabee (1999) among law enforcement and transportation organisations in 50 Metropolitan areas in the USA, they found that the incidence of road rage was higher during Friday afternoon peak hours and in urban areas. Furthermore, moderate levels of congestion and fair weather were the conditions during which this phenomenon was most prominent.

6. Link between driver aggression, road rage and general violence in society

From Shinar's (1998) definition of aggression (see Chapter 1, 2), aggressive driving is characterised by instrumental aggression and is regarded as a traffic offence compared with road rage that is characterised by hostile aggression and is generally regarded as a criminal behaviour. Violence may be seen as physical aggression at the extremely high end of the aggression continuum.

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The relationship between driver aggression and violence was explored by Whitlock (1971). Whitlock correlated the number of road deaths with the number of violent deaths (murder and suicide) in numerous countries and found that those societies with the greatest amount of violence and aggression tended to externalise this violence in the form of dangerous and aggressive driving. This is also consistent with the South African setting. Together with the country's staggering traffic statistics, the homicide death rate was estimated in 1998 to be 60 per 100 000 population, which was 10 times that of the USA and only second to Columbia that had the highest rate (Peden & Butchart, 1999).

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Various tensions in society interplay at different levels and enable violent behaviour. These may include racial, ethnic, cultural and gender-based conflicts. Different cultural norms about violence (Nisbett and Cohen, 1996) and widespread exposure to violent entertainment media (Anderson and Bushman, 2001; Anderson and Bushman, 2002) has also been shown to contribute to violence.

7. Behavioural intervention strategies

In addition to passive environmental changes, it is compulsory to integrate active behavioural strategies in addressing driver aggression and other high-risk behaviours. However, the literature indicates that behavioural theories and models pertaining specifically to injury control and prevention are relatively lacking. Although this study is essentially descriptive and exploratory in nature, a review of this literature was necessary in order to recommend appropriate intervention strategies.

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The use of an ecological model allows for the determinants of disease (and injury) to be addressed on various levels. Glanz and Rimer (1995) describe individual and community factors at three levels:

- *intrapersonal level*, which refers to an individual's knowledge, attitudes and beliefs on one's own behaviour
- *interpersonal level*, which refers to how people in one's surrounding such as family members, friends, and co-workers influence an individual's behaviour; and
- *community level*, which relates to organisational settings and their influences such as the workplace, health policies as well as socio-economic issues such as poverty.

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In light of the paucity of behavioural models for injuries, it would be useful to examine the universal constituents of the different models that could be applied to injury prevention. With the HIV/AIDS epidemic, interventionists were faced with a similar paucity of related behavioural models and this led to a theorists workshop in 1991 to address this (Fishbein et al., 1991). Five models were selected that encompassed most of the key concepts that had been used to understand and address a wide variety of human behaviours. These models were the health belief model, the social cognitive theory, the theory of reasoned action, the theory of self-regulation and self control and the theory of subjective culture and interpersonal relations. From these models, eight factors were selected to account for most of the variation in health-related behaviours. These factors are summarised as the factors that would be essential to affect positive behaviour change:

a. a commitment to change
b. an absence of environmental barriers
c. having the necessary skills
d. the outcome should be viewed to have a greater advantages than its disadvantages
e. social norms that encourage positive behaviour change
f. positive self-standards, self-image or values
g. positive rather than negative emotional reactions; and
h. self-efficacy, where the individual feels that he or she has the capability to change behaviour

Some of these universal factors will be applied to addressing driver aggression in the South African context and are discussed in Chapter 5, B2 (Implications for intervention).

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8. Data collection methods and tools

Most international studies that set out to obtain prevalence data on driver aggression also used self-report measures. Methods included postal/faxed surveys (Rathbone and Huckabee, 1999; Kontogiannis et al., 2002; Parker et al., 2002), telephonic surveys (Schulman, 1998; Wells-Parker et al., 2002), literature searches using the Internet, newspapers, police records, etc (Batten et al., 2000; Willis, 1997), internal polls (Porter & Berry, 2001; James & Nahl, 2000) and studies that used a diary for motorists to document their experiences (Underwood et al., 1999). However, besides methods relying on self-report, other innovative tools were used in analytic studies to physically identify high-risk behaviour and included the use of an instrumental smart car (Boyce & Geller, 2002) or use of inductance loops and cameras to detect speeding and red light running (Fakhry, 2002).

The methods above are evaluated against the choice of research instruments and methods that were used in this study in Chapter 3 (Methods). Furthermore, various studies reported on the prevalence and relationships of driver aggression, demographic and driving characteristics and 'other high-risk driving behaviours'. These findings will be illustrated and discussed together with findings from this study in Chapter 5.

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CHAPTER 3:

Research Design and Methodology

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1. Key concepts and variables

Clearly, road rage and aggressive driving are not synonymous and the following definitions that were modified from Shinar (1998) and Wells-Parker et al. (2002) were used:

Road rage: Uncontrolled anger displayed by a motorist in the form of threatening/intimidating behaviour or assault on the road. This may be directed at another driver, vehicle or object and is considered to be criminal behaviour. This adds to Shinar's definition to include anger directed at another vehicle or object e.g. road signage.

Aggressive driving: A milder, verbal or gestural expression of anger on the road, which is considered a traffic offence but does not rise to the level of criminal behaviour. These behaviours are intentionally directed at another driver to cause harm (from Shinar's definitions of 'aggression' and first component of 'instrumental aggression'). This excludes the second part of the definition of 'instrumental aggression' i.e. "deliberate dangerous driving to save time at the expense of other road users" (see Chapter 1-2 and below).

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'Other high-risk driving behaviour' or 'other hazardous driving behaviour': A distinction is made with 'other' behaviours that do not involve an intentional aggressive interaction with other motorists such as in driving above the speed limit or driving above

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the legal blood alcohol limit and are referred to as *'other high-risk driving behaviour'* or *'other hazardous driving behaviour'*.

With the above categories, some behaviours may not be unique to a specific category, the intention may not always be clear or the circumstances may differ. For example, tailgating (or following too closely) may refer to a driver who habitually ignores following distances (aggressive driving) or to someone who is displaying intimidating behaviour to force someone to change their lane (road rage behaviour). An important point is that road rage is often the result of the perceived intent of another driver.

Driver aggression: When referring to a combination of road rage and aggressive driving behaviours, the term *driver aggression* is used.

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2. Study design

The study was a cross-sectional descriptive survey that aimed to collect both quantitative and qualitative data using an interviewer-administered semi-structured questionnaire. Although the study explored some relationships, it does not attempt to attribute causation, for which, stronger study designs such as a case-control or cohort study design would be more appropriate.

Chapter 2 illustrated many other studies that used *self-reporting* to collect descriptive data. This method is preferable since extreme forms of aggressive behaviour on the roads is relatively rare and would be difficult to detect by observation. Furthermore, self-report allowed the researcher to explore other contextual or motivating factors that may not have been possible using direct observation.

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Self-reporting, however, is subject to *non-response bias*, which impacts on the validity of findings. Of the different methods used to collect self-report data (see Chapter 2), interviewer-administered questionnaires may have the least response bias and therefore be the most reliable instrument. Generally, postal surveys have low response rates, with telephonic surveys obtaining compliance is problematic and internet surveys are biased and inaccurate. Furthermore, additional efforts were made to secure an adequate response rate by the use of incentives and by sensitising the driver population via the media.

3. Research instruments

3a) *Questionnaire*

The design of the questionnaire (Appendix 1) included the following sections:

- Section A – reference and demography
- Section B – general motoring characteristics
- Section C – specific aggressive behaviours

  A modified *semantic differential* ranging from 0 (never) to 10 (very often) was used to measure the extent of these behaviours that were experienced by both victims and perpetrators. The semantic differential was also used to measure the level of anger that was experienced by victims for each of these driving behaviours. The driving behaviours were divided into *four sub-scales of aggression*: 1) mild, verbal but non-threatening expression of annoyance, 2) verbal or other expression of anger directed at the offending motorist, 3) threatening or intimidating behaviour, and 4) experience of rage and 'loss of control', direct confrontation and pre-meditated behaviour. Sub-scales 1-2 provided a measure of aggressive driving behaviour while sub-scales 3-4 provided a measure of road rage.

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- Section D – 'other high-risk driving behaviours' (measured with a semantic differential as above)
- Section E – motorists' views on road rage and aggressive driving; and
- Section F – at the end of the questionnaire, a section was included for fieldworkers to document general *comments* from motorists and also to document instances where motorists displayed a general hostile tendency prior to the administration of the questionnaire. The latter was important to provide some insight into these cases in an attempt to control for possible exaggerated responses. Furthermore, fieldworkers were also required to document instances where participants were trying to fulfil 'demand characteristics' by deliberately responding in certain ways to reflect positively on them or deliberately trying to frustrate the researchers.

Zulu is the dominant African language in the Durban Metropolitan Area and for ethical reasons, a *Zulu version* of the questionnaire was also developed (Appendix 2).

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Various scales/questionnaires have been developed to measure driver aggression, more popular being the 'Driving Anger Scale' (Deffenbacher et al., 1994), the 'Driver's Stress Profile' (Blanchard et al., 2000) and the 'Driving Vengeance Questionnaire' (Hennessy & Wiesenthal, 2001). The 'Driving Anger Scale' is a 33-item self-report test that measures the extent to which driving situations provoke anger while the 'Driver's Stress Profile' measures the extent of anger as well as the frequency of individual aggressive driving measures. The 'Driving Vengeance Questionnaire' presents hypothetical driving scenarios in which another driver acts in a manner that could potentially irritate, frustrate or anger participants. Since none of them differentiated between victims, perpetrators and 'other high-risk driving behaviours', a customised questionnaire was developed for this study.

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Behaviours proposed by other studies to constitute road rage and/or aggressive driving are varied and generally inconsistent. Furthermore, these lists of behaviours vary substantially in length and precision. Although examples of behaviours were sought from various sources, most were obtained from James and Nahl (2000) and modified so that they would be easily understandable among the sample.

The 10 point Likert scale that was used to measure the frequency or levels of the different behaviours could also be interpreted in a categorical manner as per the following description provided by Kontogiannis et al. (2002, p383):

> Imagine that you get 10 chances to show each of the following driving habits in a certain time period. In this context, 'never' implies that you never engage in this behaviour, 'seldom' implies one or 2 times, 'rather seldom' implies 3-4 times, sometimes implies half of the times you get a chance, often implies 6 or 7 times and very often implies more than 8 times in this time interval.

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3b) Other instruments

A 'refusal sheet' (Appendix 3) was provided for fieldworkers to document the number of motorists that refused participation in the study in order to provide some indication of non-response. Furthermore, copies of a letter (Appendix 4) were provided to the fieldworkers in order to explain and authenticate the study with owners of petrol stations and motorists (when required).

4. Study population

The study focuses only on the Durban Metropolitan Area (DMA) and the target population includes all urban motorists in the DMA. Consequently, motorists that resided outside the

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DMA were excluded from the study. Besides logistical barriers in including rural motorists, the choice of urban motorists is motivated by international findings, which suggests that driver aggression is more prominent in urban areas or areas of high congestion (Rathbone and Huckabee, 1999; Shinar, 1998; Parkinson, 2001).

The sample of motorists was obtained from petrol stations in the DMA. Although petrol stations were not used as a setting in international studies, the petrol station was considered to be practical and almost all drivers were expected to visit a petrol station. Furthermore, the population validity of the study is enhanced by ensuring that all motorists had a possibility of being included in the sampling frame.

A listing of all suburbs in the DMA was obtained from the Durban Metropolitan Council. This listing constituted the clusters for the cluster sampling strategy that was used. All petrol stations were in these clusters were identified using information from the Durban Traffic and Transportation Department. Individual petrol stations were selected using simple random sampling, which was adjusted to provide a representative vehicle distribution pattern that was similar to that of the DMA.

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5. Sampling

5a) Sample size

The population for the Durban Metropolitan Area was estimated at 2.8 million in 2001 (Sukhai and Matzopoulos, 2002) of which approximately 500 000 were drivers (W. Watson, KZN DoT, personal communication, 2002). For the purposes of calculating the sample size, it was estimated that approximately 85% of motorists in the DMA experience some form of driver aggression (based on Joint, 1995 and Martinez, 1997). The Epi-Info

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sample size calculator showed that 196 participants were required to measure the true prevalence with a 95% confidence interval and a 10-unit width. However, besides measuring the prevalence of road rage and aggressive driving, the study also aimed to determine the prevalence of 'other high-risk driving behaviour'. With an estimated prevalence of 75%, a sample size of 288 participants were required to measure the true prevalence with a 95% confidence interval and a 10-unit width. Consequently, the initial proposed sample size was 300 motorists. However, on request from the funding organisation and key stakeholders, the sample size was increased to over 1000 cases.

5b) Sampling distribution

With a listing of 60 suburb clusters, and a desired 84 subjects per cluster, 12 clusters were randomly selected from the cluster listing to yield a total of 1008 participants. Thereafter, three petrol stations were randomly selected in each cluster. At each petrol station, 28 subjects were randomly selected as follows: ten cases were chosen during the day on a weekday (to accommodate workers whose work involves driving, and the non-worker), ten in the evening on a weekday (to accommodate the worker that works normal office hours and at a time when one would be relatively more inclined to participate) and a further eight cases were selected over the weekend (four during the day and four in the evening). See Appendix 5 that illustrates this distribution.

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According to the above scheme, the fieldworker approached sequential drivers from the time of arrival at each petrol station (convenience sample) until the desired number for that visit was obtained. Three fieldworkers were used to complete the data collection over a period of 11 days. As the aim of the study was not to physically identify acts of aggression but rather self-reporting thereof, possible environmental conditions that could possibly

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contribute to driver aggression (e.g. congestion) were not addressed in the sampling procedure.

6. Data collection process

6a) Piloting of questionnaire

The principal investigator pilot tested the questionnaire on ten cases prior to the study to test the content for clarity, to determine if the duration of the questionnaire would be problematic and to identify any sensitive issues or other potential problems that could arise. These findings were also applied to the training of the fieldworkers.

6b) Recruitment

Three experienced and suitably qualified fieldworkers were employed for the study (two on recommendation from the University of Natal's Interdisciplinary Accident Research Centre and one that conducted fieldwork for the Medical Research Council on other occasions). These fieldworkers were all fluent in English and Zulu, which controlled for any possible language/cultural bias, especially among African motorists.

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6c) Training

Training was provided one week before the study for approximately six hours. A background to the study was provided and each measuring instrument was discussed in detail. It was also ensured that the fieldworkers had adequate knowledge of the petrol stations and had reliable transport to travel to them. *Appendix 5* lists the petrol stations and suburbs that were randomly selected for the study. The fieldworkers were provided with copies of all necessary documentation in order to become thoroughly familiar with the study and the requirements. A follow-up meeting was held one day before the

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commencement of the study to address all additional queries and to set up the fieldworkers for the start of the study. *Appendix 6* shows the fieldwork schedule.

Fieldworkers were given strict instructions to ensure that motorists resided in Durban and that they had not participated in the study previously at another petrol station in order to avoid duplication. They were also expected to explain the concepts of road rage and aggressive driving to the motorists.

6d) Permission from owners of petrol stations

The petrol station owners granted permission for the research team to use their premises to collect the data. They were assured that the research would not affect the functioning of their petrol attendants or their business activities in any way. They were informed that motorists would be approached while their petrol tanks were being filled and if the motorist agreed to participate, a suitable and convenient area away from the petrol filler pumps would be used to conduct the interview. Patrons using the 'quick shop' or car wash that were on certain premises were also eligible for selection.

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6e) Incentives and the media

To help control for non-response bias, participants were offered an incentive to encourage participation. This consisted of a car air-freshener that depicted an anti-road rage message. Prior to the study, the MRC media liaison department also issued a press release on this study, which resulted in widespread media coverage in the Durban Metropolitan Area. This proved to be very valuable to sensitise motorists to the study. Fieldworkers claimed that many motorists reported hearing about the study over the radio and were generally enthusiastic to participate.

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6f) Supervision

Throughout the fieldwork, the Principal Investigator (PI) either provided direct supervision or was available at all times to deal with queries and problems that arose. Direct supervision was important to ensure that the questionnaire was administered in a standardised and unbiased manner to enhance the reliability of the different measures. Briefing sessions were conducted with the team to discuss difficulties and to create a forum for the fieldworkers to share their experiences. This proved valuable in keeping the fieldworkers motivated and focussed.

Overall, the fieldwork was carried out without any major difficulties. There were, however, the occasional glitches that included transportation difficulty, running out of questionnaires or incentives and one fieldworker had to be replaced since he obtained permanent formal employment elsewhere.

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7. Data analysis

A data puncher was employed to capture the records using *Microsoft Excel*. The Principal Investigator (PI) provided on-going supervision and cross-checked entry at regular intervals to ensure accuracy. On completion, the PI selected a 5% random sample of the questionnaires and verified the captured data again. The data was cleaned and coded by the PI. In addition to pre-existing codes in the questionnaire, common values in the 'other' categories were also re-coded. The advantage of using *Microsoft Excel (2000)* was that it was compatible with other analysis software and consequently, *Epi-Info (Version 6.02)* and the *Statistical Package for Social and Health Sciences (SPSS, Version 10.0)* were used to analyse the data. Advice on statistical measures was also obtained from an MRC in-house statistician.

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The prevalence of the various measures of driving behaviour was expressed as percentages. Chi–squared analysis together with the corresponding P-values were calculated to test for statistical significance among most categorical variables. Certain continuous variables (or groups such as the individual groups of aggressive behaviours) were converted to dichotomous variables where chi-square tests were also applied. For numerical variables, the mean and standard deviations were computed and the t-test was used to compare the means. Correlation between numerical variables was also explored using Pearson's correlation coefficient. The level of significance was set at alpha=0.05.

The following relationships were explored for possible associations (see Appendix 1 for questionnaire):

- The demographic and general motoring characteristics in sections A and B were compared to the different sub-scales of aggression in section C
- Sections A and B were also compared with 'other high-risk driving behaviours' in section D; and
- Section C was compared with section D to associate driver aggression and 'other high-risk driving behaviour'.

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Motorists' views on the various aspects of road rage and aggressive driving in section E were coded using a content-theme approach and the frequencies of the most common responses would be presented.

8. Ethics

Ethical approval for this study was obtained from the University of Western Cape Senate and Higher Degrees Committees. Permission was obtained from the owners and/or

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managers of all petrol stations and informed consent was obtained from all participants. Respondents were assured of anonymity (no names or other personal identifying information was captured) and confidentiality.

9. Data limitations

The inherent methodological challenges with this study that were already discussed include issues around self-report, non-response bias and that the study was limited to urban drivers in the Durban Metropolitan Area. One further data limitation was that the study does not incorporate the contextual or environmental factors associated with driver aggression such as traffic congestion. However, section E of the questionnaire provides an informal appraisal of some of these issues where motorists were requested to provide their views on general aspects of driver aggression. These findings are presented in Chapter 4 and discussed in Chapter 5. Other general limitations to the study are discussed in Chapter 5, Section B, 1b.

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CHAPTER 4:

Results

1. Nature of Sample

1a) Overview

Overall, 1081 motorists were approached in order to yield the final sample size of 1006 respondents, suggesting approximately one refusal for every 14 participants. This level of response was considered to be extremely good since self-report measuring instruments generally yield high levels of non-response. Reasons for the good response may have included experience and commitment from the fieldworkers, the use of incentives and the fact that many motorists were sensitised to the study via the media. Fieldworkers also expressed their shared view that 'it appeared as though motorists found the study topical, identified with the subject as an area of concern and felt that they were contributing meaningfully in this regard'. The distribution of the sample by suburb and petrol station is shown in Appendix 5.

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1b) Demography

Although demographic profiles of motorists in the Durban Metropolitan Area were not available from any of the relevant authorities that were consulted, the gender, age and racial[i] distributions appeared plausible. Part A of Appendix 7 shows the demographic characteristics of the sample. Males constituted the bulk of the sample (83%), the mean age was around 40 years and subjects had a mean education level of 12 years (counting all years from grade 1). Both Asians and Blacks contributed to a similar proportion of just more than one-third. White cases accounted for about one-fifth while Coloured cases accounted for about one-tenth of the sample. Most participants were married (66%) while

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being single (having never been married) accounted for 30% of cases. The majority of participants were employed (60% were in formal employment and 27% were either self-employed or worked in the informal economic sector) while about seven percent were unemployed.

1c) General motoring characteristics

The general motoring characteristics of the sample is presented in part B of Appendix 7. Most motorists drove a vehicle 'almost every day' and the median distance driven per day was 70 kilometres (median measure used due to large variability with this variable).

The mean years of driving experience was relatively high at 16 years. The type of vehicle should be interpreted with caution since vehicle types were adjusted to be proportionally representative of the vehicle distribution in the Durban Metropolitan Area. Also, the model of vehicle is not strictly a numerical variable but in order to provide some indication of the 'social class of vehicles', the median measure is reported (1996). Self-owned vehicles were driven most often (73%) followed by company-owned vehicles (17%). Nearly one-tenth of motorists reported that the vehicle they drove most often belonged to a family or friend and this was most evident among taxi drivers.

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Gender was compared with frequency of driving (almost everyday vs. less frequently) and with years of driving experience (<5 years and >=5 years) and no statistically significant difference was found among males and females (Chisq=2.18, p=0.14 for driving frequency and Chisq=0.20, p=0.65 for driving experience). A significant positive correlation was found between age and driving distance (Pearson's correlation coefficient=0.09, p=0.01).

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1d) Driver aggression

Appendix 8 shows the prevalence of each aggressive driving behaviour (expressed as percentages of all valid or non-missing cases). The totals for each group reflects on at least one behaviour being positive/>=5 per group. Appendix 9 shows the mean rating for the frequency of each of these behaviours that was rated on a likert scale from 0 to 10. Groups 1 and 2 comprise aggressive driving behaviours while groups 3 and 4 comprise road rage behaviours.

In *group 1* ('mild, verbal but non-threatening expression of annoyance'), overall, 87% of motorists expressed that they engaged in at least one of these behaviours and the mean score was 5 (half the time when the opportunity arose).

In *group 2*, ('verbal or other expression of anger directed at the offending motorist'), the group prevalence for *experiencing* at least one of these behaviours as a victim was 95% (mean frequency score=4.9) and 84% experienced anger in these situations (mean level=5.2). Two-thirds of motorists acknowledged engaging in at least one of these behaviours at a mean frequency rating of 4.2. The single most prevalent behaviour that victims experienced and that was perpetrated in this group was 'hooting or yelling at another driver' (84% and 54%, respectively) but the behaviour that generated the most anger was 'making obscene gestures at another driver' (mean level=5.8).

In *group 3* ('threatening or intimidating behaviour') and overall among victims, the group prevalence for experiencing at least one of these behaviours was 95% (mean frequency=5.2) and 88% experienced anger in these situations (mean level=5.9). Less than half (45%) of motorists acknowledged engaging in at least one of these behaviours at a

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mean frequency rating of 3.7. Preventing one from entering a lane, preventing one from passing and being 'tailgated' were equally prevalent for victims (about three quarter) and perpetrators (about one-tenth). As expected, these behaviours were much more prevalent than the other more dangerous behaviours in this group, which were 'following/chasing another driver' and 'cutting off another driver'. The latter generated the highest level of anger in this group (mean level=6.8).

In *group 4* ('experience of rage and loss of control, direct confrontation and pre-meditated behaviour'), about one-quarter experienced at least one of these extreme aggressive behaviours over the past year as a victim (mean frequency score=4.9) but only one-fifth of motorists reported being angered by any of these behaviours (mean level=7.1). One-tenth of motorists engaged in at least one of these behaviours over the past year (mean frequency score=4.1). The single most prevalent behaviour that was experienced by victims was 'getting out of the car and arguing with another driver' (18%) and this behaviour also generated the highest level of anger (mean level=7.6).

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Besides the high prevalence from the above, comparing the totals for each of the groups shows the following striking observations:

– Group 2 and group 3 behaviours were equally as prevalent as a victim but the frequency of experiencing group 3 behaviours was higher than group 2 (mean=5.2 and 4.9, respectively) and this difference was statistically significant (t=2.11, p=0.03)

– Anger was most prevalent for group 3 behaviours (88%) and surprisingly, the prevalence was very low with the extreme behaviours in group 4 (19%) and this difference was statistically significant (Chisq=85.62, p<0.001); and

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– The frequency of engaging in group 4 behaviours as a perpetrator was rated higher than that for group 3 behaviours (mean=4.1 and 3.7, respectively) but was not statistically significant (t=1.29, p=0.20).

1e) 'Other high-risk driving behaviours'

The prevalence of engaging in 'other high-risk driving behaviours' that motorists engaged in, together with the frequency is shown in Appendix 10.

Of the listed hazardous driving behaviours, the most prevalent was *driving above the posted speed limit* (53%) and motorists also engaged with this behaviour most often (mean frequency=4.8 or half the time that an opportunity arose). About half (48%) of motorists also claim to speed up to a yellow *robot* (rather than prepare to stop) or intentionally drive through red robots and the mean frequency was 3.5 (of ten times when the opportunity arose). *Weaving* in traffic (unnecessary changing of lanes with infrequent use of signalling) had a prevalence of 21% but was the second most frequent behaviour engaged with, with a mean frequency of 4.1.

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About one-tenth of motorists acknowledged *driving under the influence of alcohol* and most drove above the legal alcohol limit. Furthermore, about half of them reported becoming aggressive when they consumed alcohol and drove a vehicle.

More than one-third (39%) of motorists received at least one *traffic fine* (for a moving traffic violation) in the past year and the average number of fines received was 2. Nearly one tenth of the motorists reported that they *carried a weapon* whilst driving and a firearm was most frequently the weapon of choice.

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1f) Motorists' views

Overall, 85% of motorists felt that road rage and aggressive driving was a serious problem in their community. Furthermore, motorists were requested to comment on the following:

– Driving behaviours that agitated them the most

– Drivers that have poor driving skills

– Places and times when driver aggression was more prominent

– Techniques that they used to calm themselves after being angered

– Measures that they thought would help in addressing this problem; and

– General comments.

Motorists were asked not to provide more than three responses. The percentages below are of the total combined responses. These should also be viewed with caution in light of the different distributions of the motorist sample.

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Driving behaviours that agitated motorists

The behaviour that was most frequently reported to agitate motorists was cutting in front of them without signalling or cutting in front and then driving slowly (16%). This was most often reported of taxi and bus drivers and 6% of motorists were agitated when they did not use designated stopping areas. Driving slowly (in general, on freeways, on the fast lane or by taxis 'looking for' passengers) contributed to 15% of responses and tailgating to 8%.

Views on people with poor driving skills

Motorists implicated taxi drivers most often (42%) followed by female drivers (17%). One-tenth of motorists felt that young adults had poor driving skills and only 3% felt that

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males in general had poor driving skills. One-tenth of the motorists did not differentiate between any groups of motorists and felt that *all* had poor driving skills.

Views on places and times when driver aggression was more prominent

Motorists found driver aggression to be more prominent during peak hours (42%) followed by festive periods (14%), weekends (8%) and mornings (6.4%). Furthermore, 8.8% reported that this behaviour was prominent throughout the year, 6% reported 'throughout the week' and 2% reported 'all places'. A large proportion did not differentiate with any of the above and claimed that this behaviour prevailed 'all the time'.

Calming techniques used when angered

Most motorists (58%) reported that they simply ignore or control their emotions when they encountered these behaviours. More specific measures include smoking (5%), using deep breaths [including sighing] (3%) and prayer (2%). Of concern was that 5% of motorists reported that they swear or yell at the offending motorist to vent their frustration.

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Views on measures to address the problem

Most motorists recommended enforcement measures – increased enforcement (16%), harsher penalties (14%) and increased police visibility (13%). One-tenth felt that some form of road engineering measure (e.g. cameras, speed humps or designated stopping areas) was required to improve the road network. A further one-tenth also felt that stricter laws/penalties were needed with regard to using a cell phone while driving. Nearly one-fifth of the motorists felt that training was required for motorists on stress/anger management, 9% felt that motorists need education on this topic in the form of workshops/courses and 7% felt that media awareness was needed on the problem.

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General comments

Interestingly, no cases of general predisposed hostility were recorded for any of the motorists that participated in the study and therefore exaggerated responses may be less likely. Motorists were generally very co-operative and provided favourable comments consistent with the study being a worthwhile initiative.

2. Driver aggression vs. demography and general driving characteristics

2a) Demography

The frequency of aggressive behaviours that were *perpetrated* in each of the four driving behaviour groups was dichotomised into >=5 (half or more times when the opportunity arose) and <5. These groups were then compared with all demographic variables and the following statistically significant associations were found:

– **Group 1**: significantly more whites than non-whites reported an aggression frequency of >=5 (Chisq= 21.90, p<0.001).

– **Group 1**:significantly more motorists with an education level of >=10 years compared with <10 years education reported an aggression frequency of >=5 (Chisq=11.97, p=0.001).

– **Groups 2 & 3**: significantly more motorists that were single (never married) than those that were not single reported an aggression frequency of >=5 (Chisq=4.28, p=0.04 and Chisq=5.51, p=0.02, respectively) while **group 1** had an inverse relationship with marital status (Chisq= 4.43, p=0.04).

– **Group 3**: significantly more motorists aged 18-25 than >25 reported an aggression frequency of >=5 (Chisq=7.59, p=0.01).

– **Group 4**: significantly more males than females reported an aggression frequency of >=5 (Chisq=5.54, p=0.02).

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2b) Driving characteristics

As above, the same dichotomised aggression variables for each group were compared with all variables relating to driving characteristics, which yielded the following statistically significant associations:

– **Group 1**: significantly more motorists that had >=5 years driving experience compared to those that had <5 years driving experience reported an aggression frequency of >=5 (Chisq=4.14, p=0.04).

– **Group 1**: significantly more 'non-taxi drivers' than taxi drivers reported an aggression frequency of >=5 (Chisq=6.61, p=0.01).

– **Group 1**: significantly more 'non-sport utility drivers' than sport utility drivers reported an aggression frequency of >=5 (Chisq=4.04, p=0.04).

3. Driver aggression vs. 'other high-risk driving behaviour'

Similar to the sub-section above, the frequency that driver aggression was perpetrated in each of the four groups was dichotomised into >=5 (half or more times when the opportunity arose) and <5. These groups were compared with a combined high-risk driving group (at least one high-risk driving behaviour that was >=5 and at least one high-risk driving behaviour that was <5). Overall, the frequency of high-risk driving behaviour was positively related to the frequency of aggression in **each of the 4 groups of aggressive behaviour** (Chisq=34.70, p<0.001; Chisq=22.85, p<0.001; Chisq=30.94, p<0.001 and Chisq=13.22, p<0.001, respectively).

With individual high-risk behaviours, the following statistically significant associations were found:

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– The frequency of driving above the speed limit was positively related to the frequency of aggression in **each of the 4 groups of aggressive behaviour** (Chisq=30.46, p<0.001; Chisq=6.23, p=0.01; Chisq=4.58, p=0.03 and Chisq=10.61, p=0.001, respectively).

– The frequency of driving above the legal blood alcohol limit was only positively related to the frequency of aggression in **group 1** (Chisq=21.72, p<0.001).

– In **group 3**: significantly more motorists who received at least one fine compared to those that did not receive any fines reported an aggression frequency of >=5 (Chisq=7.80, p=0.01).

– In **groups 2, 3 & 4**: significantly more motorists that carried a weapon (mostly firearm) than those who did not carry a weapon reported an aggression frequency of >=5 (Chisq=6.15, p=0.01; Chisq=12.80, p<0.001 and Chisq=20.18, p<0.001 [Fisher's Exact], respectively).

– In **groups 2, 3 & 4**: significantly more motorists that were involved in collisions than those that were not involved in collisions reported an aggression frequency of >=5 (Chisq=6.28, p=0.01; Chisq=7.26, p=0.01 and Chisq=4.74, p=0.03, respectively).

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4. 'Other high-risk driving behaviour' vs. demography and general driving characteristics

The frequency of 'other high-risk driving behaviour' was dichotomised into >=5 and <5 and was positively related in the following instances:

– The frequency of 'other high-risk driving behaviour' was significantly higher among motorists who had 10 or more years of education compared to those who had <10 years of education (Chisq=4.84, p=0.03).

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– The frequency of 'other high-risk driving behaviour' was significantly higher among motorists who received at least one traffic fine over the last year compared to those who did not receive any fines (Chisq=9.65, p=0.002). Furthermore, a significant negative correlation was found between the number of fines received over the past year and age (Pearson's correlation coefficient= -0.12, p=0.02).

– The frequency of 'other high-risk driving behaviour' was significantly higher among motorists who were involved in at least one road traffic collision in the last year compared to those who were not involved in any collisions (Chisq=4.36, p=0.04).

Chapter 4 has shown interesting but also disturbing results. The various predictor variables relating to road rage, aggressive driving and 'other high-risk driving behaviour' are summarised in Appendix 11 and will be discussed in the following section together with reference to international findings.

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CHAPTER 5:

Conclusions and Recommendations

SECTION A: SUMMARY OF FINDINGS

This chapter first highlights and discusses some of the general results that were found, which includes an overview of demographic and motoring characteristics, prevalence data of driver aggression and 'other high-risk driving behaviours' and motorists' views on the problem. Thereafter, various predictors of driver aggression that were identified in the previous chapter will be summarised and discussed in order to generate a more composite profile of driver aggression. These predictor variables look at statistically significant associations between both aggressive and 'other high-risk driving behaviour' compared with firstly, demographic predictors and then predictors based on general driving characteristics. The inter-relationship between aggressive and 'other high-risk driving behaviour' is also explored. The burden posed by this problem is then discussed. Finally, the larger relevance of this study is emphasised together with important implications for policy and practice.

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1. Demographic and motoring characteristics

Males constituted the bulk of the sample. Asians and Blacks dominated, which is consistent with the overall profile for the Durban Metropolitan Area. Furthermore, two-thirds were married, only 7% were unemployed and the average level of education was a matriculation.

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Motorists were fairly 'experienced', which was indicated by the relatively large proportions of those that drove almost everyday and by the relatively high averages for the distance driven per day and number of years of driving experience. Age was also positively related with driving distance i.e. older drivers drove a larger distance per day.

2. Prevalence of driver aggression and 'other high-risk driving behaviour'

2a) Prevalence of aggressive driving and road rage

With regard to the different groups of behaviours, two striking results were found. Firstly, highly aggressive behaviours (in group 3) were *experienced more frequently* than any other group (mean *per motorist*=5.2). Secondly, it was shown that the *prevalence* of experiencing anger was lowest in group 4, which consisted of the most extreme forms of aggressive behaviours. This implies that the most aggressive behaviours were generally more condoned by motorists, which does not seem plausible. Reasons for this anomaly are unknown.

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Due to inconsistent definitions used for aggressive driving and road rage internationally, it is difficult to compare composite scores with that of international findings. However, comparisons are made for the prevalence of individual behaviours and the following findings show reason for concern. In a survey conducted by the Automobile Association in the United Kingdom (Joint, 1995), motorists reported their experience of obscene gestures (group 2) and tailgating (group 3) over a one-year period as 48% and 62%, respectively. Results from this study show the prevalence of experiencing these behaviours to be much higher (64% and 79%, respectively). In another random digit dial survey of motorists in Arizona (Miller et al., 2002), these behaviours were reported from the perspective of a perpetrator and 34% reported using obscene gestures and 28% tailgated another motorist.

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The use of obscene gestures was lower in this sample (20%) while the prevalence for tailgating was similar (29%). In summary, compared with these two studies and for these behaviours only, this study shows a much higher prevalence for experiencing aggressive behaviours and a lower prevalence for perpetrating these behaviours. Considering the representative nature of the sample and the relatively large sample size used for this study, it is unlikely that motorists who experienced these behaviours were over-represented.

Importantly though, the concepts of 'victim' and 'perpetrator' should be viewed with caution. Victims may not always be innocent of contributing to the eventual outcome and in fact, they frequently precipitate these situations that cause anger and retaliation among perpetrators. But, this does not mean that perpetrators are justified in retaliating and therefore, disentangling cause and effect is difficult. Furthermore, drivers would be more likely to attribute these behaviours to others than themselves.

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2b) Prevalence of 'other high-risk driving behaviours'

Just more than half the motorists reported driving above the posted speed limits half the time that they had the opportunity to do so. About one-tenth of motorists acknowledged driving under the influence of alcohol and on average they did so four out of ten times when the opportunity arose - half of them also reported becoming more aggressive when they drove under the influence of alcohol. Jonah et al. (2001) showed a strong relationship between 'risky driving' and sensation-seeking and therefore it will be important to take cognisance of this and other similar personality traits in addressing behavioural modification.

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The 'Road to Safety 2001-2005' is a current and promising strategy by the South African Department of Transport aimed at addressing the carnage on our roads. The strategic objective is to reduce crashes, deaths and injuries on South Africa's roads by 5% year-on-year until the year 2005. (NDoT, 2002). This report emphasised that excessive speed for prevailing circumstances and driving under the influence of alcohol were the two largest contributors to the burden of traffic collisions in South Africa. However, the report does not take into account their association with driver aggression as has been highlighted in the current study. This association is discussed further in sub-section 3d.

With alcohol-relatedness of road traffic fatalities, the NIMSS indicated that in 2001, more than half (51.8%) of all drivers that were tested, were positive for alcohol and most consumed alcohol excessively at a mean BAC=0.17 g/100ml - more than three times the legal driving limit of 0.05 g/100ml (Sukhai, 2002). Driving whilst impaired with alcohol is strongly associated with the risk of injury and death. Internationally, a study in the U.S showed that the relative risk of fatal crash involvement among adult drivers was 5-6 at 0.05g/100ml (the legal driving limit) and more than 80 at 0.15 g/100ml, which was the approximate mean of the NIMSS driver sample (Zador et al., 2000).

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Excessive speed for prevailing circumstances plays a role in approximately 30% of all crashes and about 50% in the case of heavy commercial and public passenger vehicles (NDoT, 2002). Besides increasing the probability of a collision occurring, vulnerable road users are at greater risk and resultant injuries are generally more severe.

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Furthermore, driving under the influence of alcohol and speeding often occur concurrently. Considering the high individual risk of injury that each of these factors pose, the combined risk would surely be potentiated.

3. Predictors of road rage, aggressive driving and 'other high-risk driving behaviours'

3a) Demography

Findings from the previous chapter indicate that significantly more whites and motorists with 10 or more years of education reported being involved with aggressive driving behaviours (in groups 1 and 2) while more males and more motorists aged 18-25 reported engaging in aggressive driving behaviours that constituted road rage (in groups 3 and 4). Furthermore, it was shown that motorists who had 10 or more years of education were also more likely to be involved in 'other high-risk driving behaviours'. Generally, the international literature concurs with the gender and age associations and one such study was described in the review of the literature (Wiesenthal et al., 2000). However, social desirability bias may play a role with these associations since males and the younger population may be more willing to admit to their adverse driving behaviours.

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3b) General driving characteristics

The previous chapter also indicated that experienced drivers (in terms of frequency of driving and years of experience) in this sample perpetrate more aggressive driving behaviours (group 1 and 2 behaviours). This was also consistent with the study by Fong et al. (2001), which was described in the literature review. The findings from this study suggest that in this South African setting, increased experience may result in lesser caution and decreased tolerance for other 'inexperienced' drivers.

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Popular conception is that drivers of taxis and sport utility vehicles are more aggressive than other drivers but this was not the case in this sample. However, it could also be possible that drivers of these vehicles are less forthcoming about their negative driving behaviours. Furthermore, issues around anonymity (or the lack of) may also play a role. Taxi drivers as a group, may be more conscious that they are easily identifiable and that they are criticised often by the general public and media. This may result in them being less likely to acknowledge their adverse driving behaviours. Other drivers, however, who may enjoy more anonymity, being less identifiable, may have been more willing to share their behaviours in this study. Alternatively, they may in fact more often be perpetrators of aggressive driving than is recognised by the general public. Two studies were described in the literature review (Chapter 2) that support this association with anonymity.

3c) Fines, collisions and carrying of a weapon

Driver aggression (for group 3) and 'other high-risk driving behaviour' were both positively related to the receipt of traffic fines. This was a commonly found association in the international literature (such as Deffenbacher et al., 2001 and Hemmenway & Solnick, 1993).

Driver aggression (for groups 2,3 & 4) and 'other high-risk driving behaviours' were both positively related to being involved in a traffic collision. Blanchard et al. (2000) together with many other studies also showed this relationship.

Finally, driver aggression (for groups 2,3 & 4) was positively related to carrying a weapon, which was most often a firearm. This significant positive association was also demonstrated in a telephone survey in Arizona that aimed specifically to assess this

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relationship (Miller et al., 2002). However, since firearms are likely to be carried in other environments, this may suggest that these motorists are predisposed to hostile behaviours and violence in general and not only in the traffic environment. This may also be an additional thread to the link between driver aggression and aggression in society.

3d) Relationship between driver aggression and 'other high-risk driving behaviour'

Driver aggression was positively related to the frequency of driving above the speed limit (in all groups) and the frequency of driving above the legal blood alcohol limit (in group 1). The latter implies that motorists become mildly aggressive (group 1 behaviours) when driving under the influence of alcohol. However, this is not to say that alcohol-impaired driving does not result in more aggressive behaviours but only that a statistical association was not evident. Hence, the role of speed and alcohol in traffic crashes (as mentioned earlier) is further emphasised.

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4. Burden of driver aggression and 'other high-risk driving behaviour'

A recent newspaper article reported on a collision in the Kwa-Zulu Natal province titled "Rushing Roulette". The following description of the circumstances around the collision highlight the extent and consequences that a single incident involving aggressive/high-risk driving behaviour can have:

> "Two minibus taxis crashed and burst into flames on the P197 road in Sezela on the South Coast yesterday, killing 13 of their 36 passengers … Many of the survivors were critically injured … Witnesses and transport authorities said one of the minibus taxis had been overloaded with passengers and had been speeding … The two drivers were playing a game

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where one of the drivers drives into the oncoming lane and then drives as if to crash into the other …One of them lost control and the unthinkable happened".

(*The Daily News*, May 1, 2003, p1)

The high prevalence and relationships between 'other high-risk driving behaviours' and driver aggression (like in the example above) were emphasised in the previous sections. Many of these factors also occur concurrently, which potentiates their individual effects. As mentioned previously, driver behaviour plays the largest role in road traffic collisions (80-90%, NDoT, 2002). Both driver aggression and 'other high-risk driving behaviour' interplay to account for this extremely high percentage.

The staggering number of road traffic collisions and its economic burden to South Africa was emphasised in Chapter 1. According to a crash calculation model developed by the Council for Scientific and Industrial Research (CSIR), the cost to the economy is approximately R368 000 per fatal collision, R101 000 per serious injury and R29 000 per slight injury (NDoT, 2002). The economic burden also extends to communities and society at large since this poses a drain on scarce resources, hampers economic development and further perpetuates poverty.

The costing does not take into account the physical disability, which also results in a massive burden to the many victims and their families who suffer lifelong psychosocial trauma and other health consequences such as alcohol and other drug abuse as well as eating and sleeping disorders.

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The Medical Research Council recently released the 'Initial Burden of Disease Estimates for South Africa, 2000' report (Bradshaw et al., 2003). This report showed that road traffic collisions was ranked the 4th highest cause of premature mortality accounting for 489 979 years of life lost (YLL) in 2000. This huge burden further emphasises the urgency that's required to curb this growing and serious problem.

The potential cost effectiveness of preventing these collisions was also illustrated by the National Department of Transport predicting that if they achieve their aim of a 5% reduction of collisions, deaths and injuries, year-on-year, the saving to the economy would be R770 million per annum.


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SECTION B: RELEVANCE AND IMPLICATIONS FOR INTERVENTION

1. Relevance of study, general limitations and future research

1a) Relevance

This exploratory study has been an important first step in providing a scientifically based baseline for measures of road rage, aggressive driving and 'other high-risk driving behaviours'. Furthermore, the general consistency of the results with findings of many other studies lends support to the high level of construct validity of this study. These results have the potential to make a 'significant' impact on the behaviour of motorists. Generally, motorists will be in a position to establish if they are at risk as perpetrators and be able to identify those behaviours that contribute to other motorists experiencing and reacting to anger. What remains then is to provide viable options in order to effect positive behaviour change. It is also envisaged that this data will contribute 'significantly' to injury

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prevention and control efforts across various disciplines and agendas but most importantly, that of public health.

1b) General limitations

The limitations posed by self-report and the use of descriptive cross-sectional designs was discussed under 'Research Design and methodology' (Chapter 3). However, two further general limitations are social desirability bias and socio-cultural bias. With the former, some motorists who do not display hostile tendencies may be more sensitive about the social implications of expressing this emotion in public and may have reported greater anger than others to the interviewers. Furthermore, a significant positive association was found between ambivalence over emotional expression and driver aggression in a study that examined anger on and off the road among a student population (Parkinson, 2001). Socio-cultural bias refers to instances when the intent of one's action is perceived differently by both drivers e.g. tailgating or flashing of lights, which frequently annoys/angers motorists may merely be one driver wanting to acknowledge one's presence.

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1c) Future research

Given the above, similar research in the future will be enhanced by introducing controls for the above factors. Analytical designs such as case control or cohort studies will be useful to verify some of the predictor variables that were identified in this study or add to our understanding of the complex relationships that exist. A retrospective cohort may also be useful to identify and better understand the pre-event, event and post-event factors relating to traffic collisions and thereby establish the role of human behaviour, particularly that of driver aggression.

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2. Implications for intervention

Historically in South Africa and as in many countries of the world, road traffic injuries have been viewed as 'accidents', which conferred a large degree of inevitability to these incidents. Injury control (or containment of injuries after they occur) was prioritised and much lesser attention was afforded to primary prevention (or pre-event action) and the upstream or root causes of these incidents. Consequently, these cases were not of priority on public health agendas and injury prevention efforts suffered. It follows then that adverse driving behaviour has also been seriously neglected.

A literature review, titled "Controlling road rage" was conducted by Tasca (n.d.) after being commissioned by the American Automobile Association and the findings that are presented below are based on this report. Driver aggression began receiving attention internationally many years back. The initial focus in many states was to enhance legislation based on driver aggression. However, it was found that definitional conflicts and conflicts with existing laws often posed as barriers. In 1998, nine US states introduced 26 driver aggression bills where driver aggression was a separate charge from other driving offences and included mandatory re-education for offenders and harsher penalties such as the suspension or revocation of drivers' licences.

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Internationally, various programmes have been set up to target driver aggression together with 'other high-risk driving behaviours', popular being the "Smooth Operator Campaign" (California) and the "3D" / "Drunk, Drugged and Dangerous" (Massachusetts). Some programmes focussed specifically at aggressive behaviour such as "TRIAD" / "Targeting Reckless and Intimidatory Aggressive Drivers". Driver aggression was often targeted in 'waves' in order to be ongoing and was generally 'well-packaged' and aimed to be 'hard-

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hitting'. Measures included intensive media efforts (awareness, educational materials and self-tests) together with enhanced enforcement (increased police visibility, cameras and a toll free number for reporting these behaviours). Although various factors interact and make evaluating these programmes difficult, with the well-publicised programmes, there was about one-fifth declines in fatalities. For example, Maryland achieved a 22% reduction in fatalities since 1995 and New Jersey, an 18% reduction in a nine-month period.

In South Africa, the magnitude of the problem has not been assessed previously and it makes sense that such programmes are lacking. In strategising intervention programmes, measures undertaken in the American context could be explored in our setting. Furthermore, a health promotion approach is advocated to address driver aggression and 'other high-risk driving behaviours' since it facilitates both the broader environmental factors and behavioural intervention strategies. The discussion that follows encompasses this comprehensive and co-ordinated approach. Specific intervention strategies are discussed under the four universal public health approaches for interventions (commonly referred to as the 4 'E's'):

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- Education (including behavioural modification)
- Enforcement
- Environmental modification
- Engineering

Common to all these categories, an important concept that should be borne in mind is the 'response generalisation theory' (Deffenbacher et al., 2001). Here it is described that in general, if motorists exhibit certain high-risk driving behaviours, they would be more likely to exhibit others. Furthermore, this implies that if interventions are targeted on one

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component of a class of behaviours, it will have positive effects on all behaviours in that class (example safe vehicle speed will have a positive effect on safe following distance).

2a) Education, awareness and training

High proportions of the sample of motorists expressed that education on this topic in the form of workshops/courses was required, that training was required for motorists on stress/anger management and that media awareness was needed on the problem. These responses may also pay tribute to the general neglect of the problem of driver aggression in the past.

Behavioural intervention

Biological and genetic approaches to aggression suggest that this behaviour is an instinct or drive. Social learning approaches are advocated where aggression is deemed to be responsive to learned inhibition and the fear of retaliation (Miller, 1941) or norms, rewards and punishment (Bandura, 1983). The use of behavioural approaches will be essential to address the determinant factors to driver aggression and 'other high-risk driving behaviours' rather than just targeting the symptoms e.g. by use of law enforcement. Many drivers may break speed limits because they are afraid or intimidated by close driving. Furthermore, some behaviours such as sensation-seeking may be resistant to change by enforcement. For example, sensation-seeking may be seen as a mutually re-inforcing activity that provides a 'high' to the perpetrator and is therefore likely to be repeated. Therefore, attendance of behaviour modification courses may achieve more favourable outcomes compared to the receipt of fines.

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The ecological model that addresses behavioural interventions at three different levels (intrapersonal, interpersonal and community level) and eight important factors that were derived from the various behavioural theories and models were described in the literature review (Chapter 2) and are discussed below.

On the broader community level, coalitions and task forces together with media advocacy and general social marketing is required to raise awareness and support for appropriate policies among civil society and relevant decision-makers. In addition to the media, various community and religious-based organisations could be instrumental in influencing social norms and in encouraging positive behaviour change. The use of credible sources will also be instrumental in enhancing self-efficacy and positive-self standards and thus facilitate a commitment to behaviour change. Besides encouraging confidence-building, those at risk need to be encouraged and supported with the notion that he or she has the capability to change behaviour. An appeal to motorists' moral values and a demonstration of greater advantages than disadvantages for behaviour change will be required for those that are more resistant to change. Furthermore, salient messages that need to be instilled among drivers are that driving is a privilege that demands respect on the roadways and that it is a co-operative venture and not a competitive sport. Communities should be mobilised and encouraged to be involved at all levels including their needs assessment, program design and its implementation.

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The media could also play a valuable role on an individual level by highlighting the magnitude and risk factors associated with driver aggression and 'other high-risk driving behaviours'. Motorists should not only be made aware but to 'realise' the burden posed by this problem and issues around susceptibility needs to be addressed. A variety of

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educational, counselling and skill development programmes should be made available for motorists that perceive themselves to be at risk. As far as possible, environmental barriers to the accessibility of these programmes (including financial) should be addressed. For example, these could be subsidised by relevant sectors such as transport or traffic safety departments. On a voluntary basis, larger industries such as the vehicle insurance industry should investigate the possibility of providing incentives for motorists to participate in these programmes. As a punitive or rehabilitative measure, those prosecuted for serious driver aggression should be compelled to attend such programmes.

Sarkar et al (2002) demonstrated that an increase in awareness resulted in a significant positive change in attitudes in an evaluation of a seminar targeting aggressive driving. Furthermore, the high returns on education and training is emphasised by results from a survey undertaken by James (1997) where it was reported that over 85% of 'road ragers' expressed that they would not have responded in an aggressive manner if the other driver simply apologised. On this note, a universal hand signal/gesture to apologise in the traffic environment will go a long way in equipping motorists to apologise and also prevent misinterpretation of drivers' intent.

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Generally, effecting positive behaviour change generally takes time and also, educational efforts in isolation will probably be much less effective unless combined with other measures.

2b) Legislation and Enforcement

Laws relating to driver aggression may need to be reviewed such that these transgressions are unmistakable to the police officer on scene and to ensure appropriate prosecution.

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Furthermore, this study indicates that the motoring public is generally in favour of increased law enforcement and harsher penalties. The driving behaviour of taxi drivers was most often criticised and this may indicate that good driver conduct may need to be enforced. The Minibus Taxi Recapitalisation Project is a current initiative (initiated in 1996) to formalise the South African minibus taxi industry. However, the process is criticised as being lengthy and slow and this needs to proceed with greater urgency. There are plans to use the current revised card licensing system to implement a points system to assess frequency of transgressions on which penalties are based. This will enhance prosecutions but together with this, the concept of a graduated licensing system should also be explored. This requires young drivers to demonstrate responsible driving behaviour usually in three phases before obtaining a final unrestricted licence. Such a system will provide for inexperienced drivers to be more cautious and will create an opportunity to provide the necessary skills to deal with stress or anger in the traffic environment.

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Strong positive associations were shown with aggressive behaviour, excessive speed and driving under the influence of alcohol and increased enforcement in these areas may be required. Generally however, South Africa is reputed to implement first class legislation but with inadequate enforcement thereof. For example, enforcement of our new DUI (driving under the influence) laws has been less than adequate. Roadside testing for alcohol is generally concentrated only during the popular holiday seasons and besides, testing is conducted only on drivers showing more overt signs of intoxication. This was also confirmed by a UNIARC survey on drinking and driving habits. The study was conducted among 600 participants at bars, clubs and shebeens in the Durban Metropolitan Area and results indicated that 61% of respondents had not seen a roadblock for the entire year of 2000 (Watson, 2000). International experience such as in Australia has shown that alcohol

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screening among motorists should be frequent, routine and random in order to be effective (Homel, 1990).

However, given that law enforcement often has other competing demands, this may not always be the most practical approach. Hence, this challenge may require a greater attention to automatic enforcement systems (e.g. advanced measures for the use of cameras in capturing high-risk driving behaviours) or alternatively, greater attention to engineering measures.

2c) Environmental modification

South Africa's context to traffic trauma also influences the disproportionately high traffic statistics. Rapid urbanisation, together with informal developments results in environments with high population densities and congestion. Furthermore, increasing levels of motorisation and long travelling distances contribute to this challenge. Hence, it is imperative that injury prevention initiatives include general socio-economic and environmental upliftment, particularly among the low-income sector.

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As mentioned before, peak hours and festive periods were perceived by motorists in this sample to be the times when driver aggression was most prominent and is consistent with other international studies that support this association (Shinar, 1998; Parkinson, 2001). This has implications for addressing traffic density and the long commutes that people generally undertake.

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2d) Engineering

With road engineering, intelligent traffic systems offer promise to ease congestion, which was identified in this and international studies as a contributing factor to driver aggression. With vehicle design, promise lies in stress detection sensors that would be capable of detecting high-risk driving behaviours and respond by adjusting vehicle speed and/or following distance, or by initiating an appropriate calming measure. Other technological promise lies in data recorders that provide behavioural feedback or a 'black box' to record for example, vehicle speed, acceleration and braking before a crash. The principle is similar to enforcement where knowing that one is being 'watched', one would modify one's behaviour in a positive manner.

3. Conclusion

This study has provided evidence showing a high prevalence of driver aggression and 'other high-risk driving behaviours'. Furthermore, important predictor variables have been identified. In addressing these driver behaviours, it would be vital to adopt a health promotion approach that engages with culturally-specific behaviour modification together with broader environmental interventions. An important policy challenge would be to provide passive training relating to these behavioural issues and one opportunity would be during the driver licensing process. A graduated driver licensing system is advocated since it will provide the necessary time frame to address these psychological and emotional aspects of driving. Various other strategies for intervention have been suggested and a co-ordinated and integrated response to this challenge is required in order to pool together the relevant expertise and resources. The Department of Transport cannot address the problem in isolation. Hence, a multidisciplinary and multi-sectoral response is required and possible role players together with the Department of Transport should include the Departments of

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Education, Health and Safety and Security. Within the transport sector, inter-agency co-operation is required between the various stakeholders involved in traffic safety such as the various research institutions, Arrive Alive, CSIR and the 'Asiphephe' initiative. In light of the relationship between driver aggression and general interpersonal violence in society, a multifaceted approach is needed to address its foundational determinants. Furthermore the important role of religious and other community-based organisations as well as civil society was emphasised. Finally, these hazardous driving behaviours pose a significant challenge to public health and urgency is required to firstly 'realise' its magnitude and then to initiate appropriate strategies for intervention.

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APPENDICES

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APPENDIX 1

Questionnaire for Road Rage & Aggressive Driving Study, 2003

MRC-UNIARC ROAD RAGE & AGGRESSIVE DRIVING STUDY, 2003

SECTION A

1. PS code & time (1 or 2)
2. Interviewer (initials)
3. Date / / 2003

4. Gender [M] [F]
5. Age (yrs)
6. Education (yrs)

7. Race [A] [B] [C] [W] [OTHER]

8. Marital Status

SINGLE	1
MARRIED	2
DIVORCED/ SEPAR.	3
WIDOWED	4
LIVING WITH ANOTH.	5

9. Employment

FORMAL	1
INFORMAL/ SELF EMPL.	2
UNEMPLOYED	3
OTHER (SPECIFY)	4

SECTION B

1. How often do you usually drive a vehicle?

1. ALMOST EVERY DAY		
2. FEW TIMES A WEEK	3. FEW DAYS A MONTH	4. FEW TIMES A YEAR

2. How many years have you been driving? (continuously)
3. What is the approximate distance that you travel per day? kms

4. What type of vehicle do you drive most often?

1. CAR		
2. SPORT UTILITY	3. BAKKIE	4. TRUCK
5. BICYCLE/ MOTORCYCLE	6. OTHER (SPECIFY) :	

5. What is the make _____, series _____ and model _____ of vehicle that you drive most often?

6. Who owns the car that you drive most often?

1. SELF		
2. COMPANY	3. FAMILY/ FRIEND	4. OTHER

SECTION C

On a scale of 0-10, please rate how often you have experienced these acts as a **victim** or as a **perpetrator**. As a victim, also indicate on a scale of 0-10 how angry this act makes you.

NEVER 0 _____ 10 VERY OFTEN	VICTIM		PERPETRATOR
	Experience	*Anger*	
1.1 Say bad things to yourself or passenger about another driver			
1.2 Yell to yourself or passenger about another driver			
2.1 Give another driver 'dirty' looks			
2.2 Hoot/yell at someone through window			
2.3 Make obscene gestures at another driver			
3.1 Prevent someone from entering lane from anger			
3.2 Deliberately prevent another driver from passing			
3.3 Tailgate others to force them to move over			
3.4 Try to cut another car off the road			
3.5 Follow/chase another driver in anger			
4.1 Get out of car to argue with another driver			
4.2 Think about physically hurting another driver			
4.3 Get out of car to hurt another driver			
4.4 Deliberately collide with or damage another car			
4.5 Point a gun or shoot at another car			

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SECTION D

During the last one-month, please indicate how often you have engaged in the following?

	NEVER 0 _____ 10 VERY OFTEN
1.1 Speed up to a yellow robot or drive through red	
1.2 Follow too closely	
1.3 Weave in traffic and change lanes without signaling	
1.4 Drive above the legal speed limit	
1.5 Drink and drive	
1.6 Drive above the legal blood alcohol limit	
1.7 Do you become aggressive when drinking and driving (if applicable)?	

2. Over the past year, have you received any fines for a moving traffic violation? [Y] [N] How many? [ ]
3. Do you carry a weapon for possible road rage encounters? [Y] [N]

SECTION E

1. Is there any particular driving behaviour that really agitates you?
2. Do you find any particular groups or types of people to have poor driving skills?
3. From your experience, do you think that road rage and aggressive driving is more prominent at specific places, during a certain time of day, day of week or time of year?
4. If you become angry on the road, what techniques do you use to calm yourself?
5. Do you think that road rage and aggressive driving is a serious problem in your community? [Y] [N]
6. What measures do you think would help in reducing road rage and aggressive driving?

COMMENTS:

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APPENDIX 2

Zulu version of questionnaire for Road Rage & Aggressive Driving Study, 2003

MRC-UNIARC ROAD RAGE & AGGRESSIVE DRIVING STUDY, 2003

SECTION A

1. PS code & time (1 or 2)
2. Interviewer (initials)
3. Date / / 2003

4. Gender M F
5. Age (yrs)
6. Education (yrs)

7. Race: A B C W OTHER

8. Marital Status

SINGLE	1
MARRIED	2
DIVORCED/ SEPAR.	3
WIDOWED	4
LIVING WITH ANOTH.	5

9. Employment

FORMAL	1
INFORMAL/ SELF EMPL.	2
UNEMPLOYED	3
OTHER (SPECIFY)	4

SECTION B

1. Ujwayele kangakanani ukushayela imoto? 1. Cishe zonke izinsuku | 2. Izikhathi ezimbalwa ngesonto | 3. Izinsuku ezimbalwa ngenyanga | 4. Izikhathi ezimbalwa onyakeni
2. Usuneminyaka emingaki ushayela?
3. Cishe uhemba amakhilomitha amanaki ngosuku? ____ kms

4. Uhlobo lunilwemoto ojwayele ukuyishayela? 1. Imoto encane | 2. I-veni | 3. i-truck | 4. Imoto yemidlalo | 5. isithuthuthu | 6. Olunye uhlobo (chaza):

5. Uhlobo nonyaka lwemoto ojwayele ukuyishayela? _____

6. Ngubani umnikazi wemoto? 1. SELF | 2. COMPANY | 3. FAMILY/ FRIEND | 4. OTHER

SECTION C

Ezingeni lika 1kuya ku 10, chaza ukuthi sewahlangabezana kanganani nalezigameko **njengomhlukunyezwa** noma **mhlukumezi.** Njengomhlukunyezwa chaza futhi ngezinga kusuka ku 1kuya 10 ukuthi lezigameko zikuthukuthelisa kangakanani.

AKUKAZE 1_____10 KUJWAYELEKILE	UMHLUKUNYEZWA *Isigameko*	UMHLUKUNYEZWA *Ukuthukuthela*	UMHLUKUMEZI
1.1 Ukhulume kabi wedwa noma kumgibeli ngomunye umshayeli.			
1.2 Ubalise wedwa noma kumgibeli ngomunye umshayeli.			
2.1Ubuke kabi omunye umshayeli.			
2.2 Uthethise omunye umuntu uvele ngefasitele.			
2.3 Wenze izimpawu eziyinhlamba komunye umshayeli.			
3.1 Uvimbele omunye ukuba angangeni kumzila ngenxa yokuthukuthela.			
3.2 Udlule enye imoto ngesivinini ukhombisa ukuthukuthela.			
3.3 Uhlale emsileni wabanye ukubaphoqa ukuba bagudluke.			
3.4 Uzame ukusika enye imoto ukuba iphume emgwaqeni.			
3.5 Ulandele/Ujahe omunye umshayeli ngenxa yentukuthelo.			
4.1 Uphume emotweni uyoqophisana nomunye umshayeli.			
4.2 Ucabange ukulimaza omunye umshayeli.			
4.3 Uphume emotweni uyolimaza omunye umshayeli.			
4.4 Ushayise enye imoto ngamabomu.			
4.5 Ukhombe ngesibhamu noma udubule enye imoto.			

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SECTION D

Kulemibuzo elandelayo 1 no 2, kulenyanga edlule , khombisa ukuthi ukwenze kangakanani lokhu okulandelayo.

	AKUKAZE 1_____10 KUJWAYELEKILE
1.1 Udlule ngesivinini erobhothini eliphuzi noma weqe libomvu	
1.2 Ulandele eduzane kakhulu	
1.3 Uthubeleze phakathi kwethilafiki ushintshe imizila ngaphandle kokwexwayisa	
1.4 Ushayele weqe umgomo wokugijima osemthethweni	
1.5 Ushayele uphuzile	
1.6 Ushayele weqe umgomo wotshwala ovumelekile egazini?	
1.7 Kungabe uba nesihluku uma ushayela uphuzile (uma ukwenza lokhu)	

2. Kulonyaka odlulile uke wahlawuliselwa ukwephula umthetho womgwaqo wezimoto ezihambayo? Y N Izikhathi ezingaki?
3. Ingabe uyasiphatha isikhali emotweni sokuzivikela kubashayeli ababudedengu? Y N

SECTION E

1. Ngabe kukhona uhlobo lokuziphatha kwabashayeli olukuthukuthelisayo?

2. Ngabe lukhona uhlobo oluthize lwabantu obathola bengakwazi ukushayela kahle?

3. Ngokwazi lwakho wena ucabanga ukuthi ukuhlukumezana emgwaqeni nokushayela ngesihluku kuvame kakhulu ezindaweni ezithize, ngezikhathi esithize sosuku, ngosuku oluthize lwesonto kumbe isikhathi esithize sonyaka?

4. Uma uthukuthela emgwaqweni, usebenzisa ziphi izindlela zokuzipholisa?

5. Ngabe ucabanga ukuthi ukuhlukumezana emgwaqeni nokushayela ngesihluku kuyinkinga enkulu emphakathini wakho? Y N
6. Yiziphi izinyathelo ocabanga ukuthi zingasiza ekunciphiseni ukuhlukumezana emgwaqeni nokushayela ngesihluku ?

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APPENDIX 3

Form for refusal cases, Road Rage & Aggressive Driving Study, 2003

At each site, please indicate the date, the petrol station reference code and time (cross morning=1 and evening=2) and mark a cross for each refusal

																				FW	
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
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/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.
/04	PS code	1	2																		TOT.

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APPENDIX 4

Letter to owners of petrol stations, Road Rage & Aggressive Driving Study, 2003

15 April 2003

To Whom It May Concern:

RE: MRC-UNIARC Road Rage and Aggressive Driving Study, 2003

Please be advised that the Crime, Violence & Injury Lead Programme of the Medical Research Council together with the University of Natal Interdisciplinary Accident Research Centre will jointly be undertaking the above study from the 16th to the 25th April 2003.

With this study, we aim to assess the magnitude of the problem, establish profiles of victims and perpetrators and identify related driving behaviour deemed to be high-risk. This information is absent in the South African context and once obtained; this will provide a basis to inform prevention and policy interventions.

A sample of petrol stations has been selected in the Durban Metropolitan Area and from these, a sample of motorists will be approached whilst using the service station. On consent, these participants will as far as possible be interviewed at an area away from the petrol pumps.

Once again, we appreciate and value your co-operation in this priority initiative. If you require further information or have any enquiries, please do not hesitate to contact me.

Kind regards,

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Anesh Sukhai

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APPENDIX 5

Description of Petrol Stations by Suburb, Road Rage & Aggressive Driving Study, 2003

Ref.	Brand	Name	Location
	1. CHATSWORTH		
1A	ENGEN	BAYVIEW MOTORS	248 PELICAN DRIVE, CHATSWORTH
1B	BP	CHATSWORTH CENTRE BP	4 JOYHURST ROAD, CHATSWORTH
1C	SHELL	CROFTDENE SERVICE STATION	ROAD 501, CHATSWORTH
	2. SHALLCROSS		
2A	SHELL	JAMAICA	GRANADA STREET, SHALLCROSS
2B	BP	SUNPARK MOTORS	LINK ROAD, SHALLCROSS
	3. MALVERN/HILLARY		
3A	TOTAL	MALVERN PIC 'N PAY CENTRE	OLD MAIN ROAD, PINETOWN
3B	SHELL	ROLLERCOASTER MOTORS	SARNIA/OLD MAIN ROAD, HILLARY
3C	CALTEX	BELLAIR CALTEX	OLD MAIN ROAD, BELLAIR
	4. PINETOWN		
4A	SHELL	SAFARI MOTORS	ST JOHNS/OLD MAIN RD, PINETOWN
4B	BP	RICHMOND BP	8 RICHMOND ROAD, PINETOWN
4C	SHELL	ST JOHNS SHELL	CHECKERS CENTRE, PINETOWN
4D	TOTAL	WESTMEAD TOTAL	WESTMEAD ROAD, PINETOWN
4E	ENGEN	MARIANHILL TRUCK STOP	1 WESTMEAD ROAD, PINETOWN
	5. BLUFF/ROSSBURGH		
5A	CALTEX	SOUTHWAY CONVENIENCE	EDWIN SWALES DRIVE, BLUFF
5B	SHELL	BLUFF SHELL	BLUFF RD, BLUFF
5C	BP	BLUFF T/S, SOUTHWAY	EDWIN SWALES DRIVE
	6. MEREBANK/WENTWORTH		
6A	ENGEN	PENTAGON ENGEN	AUSTERVILLE DRIVE, WENTWORTH
6B	BP	SKY	RAJMAHAL, MEREWENT
	7. KWA-MASHU/NTUZUMA		
7A	ENGEN	NTUZUMA SERVICE STATION	NOZAZA, NTUZUMA
7B	BP	KWA MASHU BP	KWA MASHU K-SECTION
7C	TOTAL	MANJOE SERVICE STATION	KWA MASHU, E-SECTION
	8. PHOENIX/MT. EDGECOMBE		
8A	SHELL	GOOLAM'S GARAGE	MT. EDGECOMBE, PHOENIX
8B	SHELL	PLAZA SHELL	PHOENIX PLAZA, PHOENIX
8C	ENGEN	ENGEN	PHOENIX HIGHWAY, PHOENIX
	9. NEWLANDS		
9A	ENGEN	COW LAKE MOTORS	JOYCE AND HIPPO ROAD, NEWLANDS
9B	SHELL	AZMUTH MOTORS	NEWLANDS WEST DRIVE
9C	ENGEN	KFC ENGEN	INANDA ROAD
	10. WESTVILLE		
10A	SHELL	BLAIR ATHOLL SHELL	BLAIR ATHOLL ROAD, WESTVILLE
10B	CALTEX	BLAIR ATHOLL CALTEX	BLAIR ATHOLL ROAD, WESTVILLE
10C	TOTAL	WESTVILLE TOTAL	WESTVILLE ROAD, PICK 'N PAY CENTRE
	11. UMLAZI		
11A	CALTEX	W-SECTION CALTEX	UMLAZI W-SECTION
11B	BP	V-SECTION BP	UMLAZI V-CENTRE
11C	TOTAL	BALENTINE SERVICE STATION	UMLAZI W-SECTION
	12. ISIPINGO/FOLWENI		
12A	CALTEX	ISIPINGO BEACH CALTEX	ISIPINGO BEACH, ISIPINGO
12B	SHELL	ISIPINGO HILL SHELL	HILLVIEW/OLD MAIN ROAD, ISIPINGO
12C	BP	UMBUMBULU BP	UMBUMBULU RANK, ISIPINGO

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APPENDIX 6

Schedule for fieldwork and cases obtained, Road Rage & Aggressive Driving Study, 2003

Date	Description	Sites†	Scheduled cases	Cases obtained
16 APR 2003, WED	Weekday 1	SUB 1 & 2	2 PS and 40 cases per FW	59
17 APR 2003, THU	Weekday 2	SUB 4 & 10	2 PS and 40 cases per FW	83
18 APR 2003, FRI	Weekend day 1 (PH)	SUB 1, 2 & 4	3 PS and 24 cases per FW	78
19 APR 2003, SAT	Weekend day 2	SUB 3, 5, 6 & 10	3 PS and 24 cases per FW	95
20 APR 2003, SUN	Weekend day 3	SUB 11 & 12	3 PS and 24 cases per FW	49
21 APR 2003, MON	Weekend day 4 (PH)	SUB 7, 8 & 9	3 PS and 24 cases per FW	72
22 APR 2003, TUE	Weekday 3	SUB 7 & 8	2 PS and 40 cases per FW	120
23 APR 2003, WED	Weekday 4	SUB 5 & 6	2 PS and 40 cases per FW	119
24 APR 2003, THU	Weekday 5	SUB 3 & 9	2 PS and 40 cases per FW	123
25 APR 2003, FRI	Weekday 6	SUB 11 & 12	2 PS and 40 cases per FW	108
26 APR 2003, SAT††	M/buses & Trucks	SUB 4	*not scheduled*	100
		TOTAL CASES OBTAINED		**1006**

Notes:

Key: SUB=suburb, PS=petrol stations, FW=fieldworker & PH=public holiday

† see suburb and petrol station descriptions (Appendix 5)

†† last day of study used to adjust the distribution of vehicle populations in the sample in order to be consistent with that of the Durban Metropolitan Area and to collect shortfall of scheduled cases

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APPENDIX 7

Table 1: Demographics and driving characteristics, Road Rage & Aggressive Driving Study, 2003, n=1006

		Categorical (%)	Numerical mean (S.D) [unless otherwise spec]
(A) DEMOGRAPHICS			
1. Gender (males)		788 (83.1)	
2. Age			40.3 (± 12.0)
3. Education (years from grade 1)			12.2 (± 2.8)
4. Race	*A*	375 (37.7)	
	B	351 (35.3)	
	C	78 (7.8)	
	W	191 (19.2)	
5. Marital Status	*Single*	292 (29.7)	
	Married	647 (65.8)	
	Divorced/separated	27 (2.8)	
	Widowed	14 (1.4)	
	Living with another	3 (0.3)	
6. Employment	*Formal*	600 (60.2)	
	Informal/Self employed	266 (26.7)	
	Unemployed	65 (6.5)	
	Retired	39 (3.9)	
	Pensioner	16 (1.6)	
	Student	10 (1.0)	

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(B) DRIVING CHARACTERISTICS			
7. Driving frequency	*Almost every day*	928 (93.8)	
	Few times a week	56 (5.7)	
	Few days a month	4 (0.4)	
	Few time a year	1 (0.1)	
8. Driving experience (years)			16.4 (± 10.9)
9. Distance driven per day (kilometres, median [IQR]) [1]			[1] 70 (70.0)
10. Type of vehicle driven most often	*Car* [2]	732 (72.8)	
	Sport utility [3]	22 (2.2)	
	Bakkie [4]	159 (15.8)	
	Truck	43 (4.3)	
	Bicycle/motorcycle	3 (0.3)	
	Taxi [5]	42 (4.2)	
	Bus	5 (0.5)	
11. Model of vehicle driven most often (median, IQR) [6]			[5] 1996 (9.0)
12. Vehicle ownership	*Self*	707 (73.3)	
	Company	163 (16.9)	
	Family/Friend	86 (8.9)	
	Other	9 (0.9)	

Notes:

[1] due to the large variability with this variable, the median measure is used

[2] included 'kombis' used for personal and non-taxi purposes

[3 included 'venture', jeeps and double-cab vehicles

[4]) included 'mini-trucks'

[5] included a 'venture' used for taxi purposes

[6] vehicle model is not strictly a numerical variable and therefore the median value is provided

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APPENDIX 8

Table 2: Prevalence of experience, anger and perpetration of driver aggression, Road Rage & Aggressive Driving Study, 2003

	VICTIM				PERPETRATOR	
	Experience		*Anger*			
	n (%)	≥ 5 (%)	n (%)	≥ 5 (%)	n (%)	≥ 5 (%)
1.1 Say bad things to one's self or passenger					812 (84.9)	462 (48.3)
1.2 Yell to one's self or passenger					780 (81.9)	422 (44.3)
Group 1 TOTAL					832 (86.9)	506 (52.9)
2.1 Give another driver 'dirty looks'	749 (74.8)	359 (35.9)	522 (55.6)	276 (29.4)	462 (46.9)	227 (22.7)
2.2 Hoot/yell at another driver	818 (83.8)	346 (35.5)	706 (76.8)	351 (38.2)	519 (53.6)	169 (17.5)
2.3 Make obscene gestures at another driver	630 (64.3)	298 (30.4)	485 (51.7)	303 (32.3)	196 (20.0)	58 (5.9)
Group 2 TOTAL	951 (94.6)	484 (48.2)	834 (84.1)	549 (55.3)	668 (66.7)	302 (30.1)
3.1 Prevent another driver from entering lane	789 (80.1)	388 (39.4)	683 (71.9)	411 (43.3)	261 (26.4)	100 (10.1)
3.2 Prevent another driver from passing	687 (69.5)	374 (37.8)	610 (63.6)	397 (41.4)	241 (24.5)	69 (7.0)
3.3 Tailgate another driver	777 (78.6)	417 (42.2)	676 (71.7)	456 (48.4)	280 (28.5)	76 (7.7)
3.4 Try to cut another driver off the road	330 (34.3)	170 (17.7)	270 (29.0)	212 (22.8)	47 (4.9)	15 (1.6)
3.5 Follow/chase another driver	89 (9.5)	49 (5.2)	71 (7.6)	45 (4.8)	35 (3.6)	9 (0.9)
Group 3 TOTAL	954 (95.1)	626 (62.4)	880 (88.4)	729 (73.2)	453 (45.2)	181 (18.1)
4.1 Get out of car and argue with another driver	174 (17.8)	76 (7.8)	148 (15.5)	121 (12.7)	71 (7.2)	33 (3.4)
4.2 Think about physically hurting another driver					171 (17.3)	68 (6.9)
4.3 Get out of car to hurt another driver	49 (5.1)	23 (2.4)	33 (3.4)	10 (1.0)	29 (2.9)	14 (1.4)
4.4 Deliberately collide with or damage another car	90 (9.2)	50 (5.1)	60 (6.3)	34 (3.5)	18 (1.8)	3 (0.3)
4.5 Point a gun or shoot at another car	57 (5.9)	31 (3.2)	34 (3.5)	15 (1.6)	3 (0.3)	1 (0.1)
Group 4 TOTAL	238 (24.1)	124 (12.6)	187 (18.9)	153 (15.5)	97 (9.8)	44 (4.4)

Notes:

1. Group totals reflect AT LEAST ONE behaviour in the group being positive
2. Percentages were calculated of all valid (non-missing cases)

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APPENDIX 9

Table 3: Frequency of experience and perpetration of driver aggression and level of anger experienced on a likert scale of 1-10), Road Rage & Aggressive Driving Study, 2003

	Victim						Perpetrator		
	Experience			*Anger*					
	Mean	**S.D**	**n>0**	**Mean**	**S.D**	**n>0**	**Mean**	**S.D**	**n>0**
1.1 Say bad things to one's self or passenger							5.1	2.3	812
1.2 Yell to one's self or passenger							4.9	2.4	780
Group 1 TOTAL							5.0	2.4	832
2.1 Give another driver 'dirty looks'	5.0	3.2	749	4.9	2.9	522	4.7	2.6	468
2.2 Hoot/yell at another driver	4.8	3.0	818	5.0	2.7	666	4.0	2.6	519
2.3 Make obscene gestures at another driver	4.9	3.2	630	5.8	2.9	485	3.7	2.8	196
Group 2 TOTAL	4.9	3.1	951	5.2	2.8	834	4.2	2.6	668
3.1 Prevent another driver from entering lane	5.2	2.9	789	5.6	2.8	683	4.0	2.9	261
3.2 Prevent another driver from passing	5.3	2.8	687	5.8	2.7	610	3.5	2.6	241
3.3 Tailgate another driver	5.3	2.8	777	6.1	2.6	676	3.6	2.6	280
3.4 Try to cut another driver off the road	5.0	3.4	330	6.8	2.5	270	3.6	3.2	47
3.5 Follow/chase another driver	5.2	3.4	89	5.5	3.0	71	3.1	2.6	35
Group 3 TOTAL	5.2	3.1	954	5.9	2.7	880	3.7	2.7	453
4.1 Get out of car and argue with another driver	4.4	3.3	174	7.6	3.1	148	4.4	3.3	71
4.2 Think about physically hurting another driver							4.0	2.9	171
4.3 Get out of car to hurt another driver	4.9	3.2	42	4.2	3.8	33	4.7	3.7	29
4.4 Deliberately collide with or damage another car	5.5	3.7	90	6.3	3.8	60	2.8	2.6	18
4.5 Point a gun or shoot at another car	5.4	3.5	57	5.2	4.1	34	4.0	5.2	3
Group 4 TOTAL	4.9	3.4	238	7.1	4.2	187	4.1	3.1	97

Notes:

1. Group totals reflect AT LEAST ONE behaviour in the group being positive
2. Weighted means and standard deviations were used for group totals

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APPENDIX 10

TABLE 4: Prevalence and frequency of engaging in 'other high-risk driving behaviour', Road Rage & Aggressive Driving Study, 2003

High-risk driving behaviours	Behaviour prevalence (n, %)		Behaviour level positive mean (S.D)	
	Positive n	%	Mean	S.D
1. Speed up to yellow or drive through red	475	47.6	3.5	2.2
2. Follow too closely	299	30.1	3.4	2.4
3. Weave in traffic	205	20.6	4.1	2.8
4. Drive above speed limit	524	52.6	4.8	2.9
5. Drink and drive	113	11.4	3.9	2.6
6. Drive above legal blood alcohol limit	81	8.2	4.0	2.8
a] Become aggressive when drinking and driving	45	4.6		
b] Received at least one traffic fine in the past year	384	38.5		
c] Number of fines received			2.0	1.6
d] Carry a weapon while driving	68	7.0		

NOTES

1. All variables are continuous but are treated as dichotomous variables to express prevalence
2. Measures of the means and standard deviations are of all positive cases

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APPENDIX 11

TABLE 5: Summary of predictor variables by group of driving behaviour and 'other high-risk driving behaviour' (H/R), Road Rage & Aggressive Driving Study, 2003

	GROUP 1	GROUP 2	GROUP 3	GROUP 4	H/R[1]
WHITES	X				
EDUC>=10 YEARS	X				X
NOT SINGLE	X				
SINGLE		X	X		
18-25 YEARS			X		
MALES				X	
>=5YRS DRIVING EXPERIENCE	X				
NON-TAXI DRIVERS	X				
NON-SPORT UTILITY DRIVERS	X				
HIGH RISK BEHAVIOUR (COMBINED)[1]	X	X	X	X	
DRIVE ABOVE SPEED LIMIT	X	X	X	X	
DRIVE ABOVE ALCOHOL LIMIT	X				
RECEIVED AT LEAST 1 FINE			X		X
CARRY A WEAPON IN VEHICLE		X	X	X	
INVOLVED IN A COLLISION		X	X	X	X

NOTES:

1. 'Other high-risk driving behaviour' (combined or at least one behaviour being positive)

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END NOTES

[i] The concept of 'race' and its constituents i.e. 'Asian', 'Black', 'Coloured' and 'White' are social constructs and are not meant to signify any inherent genetic or biological differences between these groups. Instead, they are used as demographic markers where such profiling allows for identifying vulnerable populations in order to plan and implement effective prevention and intervention programmes.

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