Perspective

Taking safety promotion and injury prevention “beyond interventionism”: Aligning activity theory with community based participatory research

Louis Botha
Violence, Injury and Peace Research Unit, MRC-UNISA

INTRODUCTION

In the year 2000 about five million people around the world died as a result of injuries due to violence or unintentional causes, while the numbers for those hospitalized or treated and discharged were, respectively, 30 times and 300 times as high (Suffla, van Niekerk, Bowman & Matzopolous, 2008). South Africa, is one of a number of countries for which very high rates on injury and violence have been recorded. The impact of these have been far reaching, e.g. the Centre for the Study of Violence and Reconciliation (CSVR, 2001) reported that the medical costs for violent injuries alone was estimated at R4,7 billion at the time. Despite the high incidence of violence and injuries in South Africa, and the negative effects they have on social and economic development "there remains a scarcity of effective, replicable and contextually congruent injury interventions” in this and other lower income contexts (Eksteen, Bulbulia, van Niekerk, Ismail & Lekoba, 2012, p. 499). It is no wonder that the South African Department of Health and its partners have called for ‘an integrated strategic framework for the prevention of injury and violence’ as well as the ‘prioritisation of evidence-based intervention, investment in surveillance systems, and improved human resources and management capacity’ (Mayosi et al., 2012, p. 12).

While an evidence-based response to violence and injury prevention is certainly desirable, there is still the danger that initiatives in countries such as South Africa may be compromised by inappropriate Eurocentric models that are not fully cognisant of the significance of cultural, financial and infrastructural factors (Seedat, 2002). The development of a ‘safe communities approach’ in an African context, may offer an instructive model for constructing contextually relevant research-based interventions for safety, peace and health promotion. Seedat, McClure, Suffla and van Niekerk (2012) explain the safe communities approach as

1 Please direct all correspondence to: Dr Louis Botha; Email: louis.botha2@wits.ac.za or louisinchile@gmail.com
one which “recognises the psychological, social, economic and criminological dimensions of violence and injuries and involves the promotion of ecological actions to address risk and protective factors at multiple levels (individual, school, peers, family, community and society) using interventions aimed at universal, selected and indicated groups’ (2012, p. 4). Such an inclusive and socioeconomically grounded approach is echoed by others in the safety promotion sector, e.g. Eksteen, et al. (2012) report that ‘injury prevention and safety must be studied in a social context’ (2012, p. 499) so as to ensure that communities’ participation, knowledge, interests and ownership is maximized. Lazarus, Bulbulia, Taliep, and Naidoo (2015) add that, for marginalised communities, especially, these issues of agency, knowledge and power should be historicised and engaged in a decolonizing agenda. In light of this need for a socio-historical contextualization of violence and injury, and so too for the research and interventions in this area, the above South African researchers have advocated for a community based participatory approach that is transformational and ‘reflects two-way processes, characterized by joint-learning, co-management, and shared control of projects’ (Lazarus et al., 2015, p.88). This is consistent with the relational approach to participatory research interventions that Seedat and colleagues insist should entail “the fostering and supporting of strong, protected, socially cohesive communities, which prioritise social connections and community life” (Seedat et al., 2012, p. 9).

Through the use of the language of Cultural Historical Activity Theory (CHAT), in anticipation of the discussion below, one could say that the above researchers employ community based participatory research (CBPR) as a worldview through which the community forms the basis for the nature and outcomes of the research process (Lazarus, Duran, Caldwell, & Bulbulia, 2012). The implication is that theoretical, symbolic and material tools for the research or intervention are collaboratively developed through co-learning activities that are cognisant of the rules, participants and roles of the activity, and the power relations that these entail. Practitioners of CBPR point out that poorly resourced communities are usually characterized by an abundance of urgent health and safety issues coupled with a shortage of researchers, infrastructure and resources. Furthermore, Lazarus, Taliep, Bulbulia, Phillips and Seedat (2012), add that it is a complex, time consuming and resource demanding matter to bring together a diverse group of actors and experiences within a CBPR engagement. Some of the challenges include those arising when researchers attempt to follow the ethical ideals of loosening control over the research design while simultaneously attending to the scientific demands of validity that are based upon that control. The unequal access to resources that structure power imbalances within and between the community and the researchers also give rise to fundamental contradictions around establishing empowering relationships, as well as around the appreciation and appropriation of the participants’ various forms of knowledge and resources.

In terms of a reflective engagement with these challenges, as well with developing
appropriately contextualised research interventions, as mentioned earlier, the Ukuphepha initiative is edifying. Developed from the work of the Centre for Peace Action (CPA), a Johannesburg-based NGO established in 1990 to focus on injury prevention programmes, Ukuphepha “aims to initiate, implement, evaluate and maintain safety promotion demonstration programmes in low-income communities in South Africa” (Eksteen et al., 2012, p. 501). The programme includes projects such as the Child Safety, Peace and Health Promotion study, the Elder Photo Documentary project, and the Spiritual Capacity and Religious Assets for Transforming Community Health by Mobilising Males for Peace and Safety (SCRATCHMAPS) project, all of which apply and innovate CBPR principles to maximize the transformative potential of community engagement.

This paper, therefore, confines itself to literature from the Ukuphepha researchers and projects to discuss the possibility that research interventions in the fields of violence and injury could benefit from an alignment with Cultural Historical Activity Theory (CHAT). Thus, having pointed to the necessity for effective research interventions in this field and indicated how progressive forms of CBPR are conceptualised in response to this need, the paper will now put forward CHAT as a useful framework for operationalising some of the key principles and practices of CBPR. It will briefly indicate some of CHAT’s principles which are congruent to those of CBPR and indicate how CHAT can contribute to CBPR with its analytical tools. The paper suggests that CHAT can, in turn, take its methodologies “beyond intervention” by learning from the innovative praxis of CBPR initiatives such as the Ukuphepha.

**ACTIVITY THEORY, DEVELOPMENT WORK RESEARCH (DWR) AND THE CHANGE LABORATORY**

The scope of CHAT is so vast that this discussion has sought only to reference some of its key contributors as clues for those wishing to follow up on it. However, like CPBR, CHAT is an approach which theorises learning and change within a particular community or activity system. Both of their concerns with transformative social relations have been historically developed from politically motivated, action-oriented research traditions. As Sannino explains: ‘Activity theory has an activist and interventionist history…Throughout this history, activity theory stands as an activist theory of development of practices, which may be traced back to Marx’s idea of revolutionary practice, emphasizing that theory is not only meant to analyse and explain the world but also to generate new practices and promote change’ (2011, p. 580). CHAT has developed from Lev Vygotsky’s attempts to account for social mediated learning, and offers an analytical framework that investigates human activity as a system of individual, communal and societal relationships which are historically developing and mediated by tools, rules and the division of labour (Daniels, Edwards, Engeström, Gallagher & Ludvigsen, 2013).
As can be seen from Figure 1, activity theory emphasizes ‘interdependencies between the acting subject and different levels in the activity system’ (Mørch, Nygård, & Ludvigsen, 2010, p.187). It is therefore, like CBPR, ‘a framework for analysing a multitude of relations’ (Mørch et al., 2010). However, it distinguishes itself from this, and other approaches by virtue of its focus on object oriented activity, where both the concepts of activity and object are deeply theorised as systemic and historical phenomena (Sannino, Daniels, & Gutiérrez, 2009). Activity is therefore more than actions, and the object, or objective of the activity is that focus which gives it direction.

![Figure 1: An activity system](image)

**Figure 1: An activity system**

Source: Derived from Engeström (1987, p.78)

The Ukuphepha programme, for example, may be analysed in terms of its historically developed object of implementing and studying safety, peace and health promotion initiatives across a number of low-income communities (Eksteen et al., 2012; Seedat, McClure, Suffla, & van Niekerk, 2012). For the SCRATCHMAPS project within this programme, the
main object is to mobilize community assets and spiritual capacities in particular, so as to promote safety and peace in the selected communities (Lazarus et al., 2012). Objects, though, are complex and dynamic, since they are subject to the various interpretations of the multiple subjects of the activity, and to the historically evolving construction by the activity itself (Kallio, 2010). This alludes to two other principles of CHAT, namely, multi-voicedness and historicity. According to the former, the effects of multiple points of view, traditions and interests of the activity of a project have to be considered, while the latter demands that activity systems be understood in terms of how they were produced over time (Engeström, 2001). CHAT therefore analyses the activity system in its entirety in much the same way as CBPR engages with the socio-historically contextualised community as the unit of analysis.

Yet, while CHAT aligns itself to the historical, relational and developmental aspects of CBPR, I believe its elaborate theorisation of human activity as a mediated, object-oriented process contributes a complex, systemic framework to the analyses of these aspects. Furthermore, the principles of contradictions as a source of change, and of expansive learning (Engeström, 2001) means that CHAT can offer deeply theorised concepts and models that analyse and harnesses the conflicts and disturbances arising from systemic tensions such as those mentioned earlier.

These analytical tools would be made available to CBPR through the Development Work Research (DWR) methodology as theorized and practiced by Yrjo Engeström and the Finish branch of cultural-historical activity theorists at the Center for Activity Theory and Developmental Work Research of the University of Helsinki (Engeström & Glăveanu, 2012). As Daniels and Edwards (2010) explain, DWR is based on the Vygotskian principle of dual stimulation and is used to resolve the kinds of tensions faced by participants seeking to expand beyond the constraints of their current situations, as is being suggested by the safe communities approach to violence and injury research and intervention development and implementation. This principle allows for the incorporation of an auxiliary means to resolve a problem situation so that both the person and the circumstances are transformed by such a use of external resources (Sannino, 2011). Intertwined with this is the principle of ascending from the abstract to the concrete which explains the dialectical manner in which theoretical generalizations are derived from change and experimentation (Sannino, 2011). Taken together these principles lead to research interventions which are “more than just innovative research methods which aim at achieving practical change in work and educational settings, they can be seen as instantiations of dialectical materialism and implementations of activity-theoretical interventionist epistemology” (Sannino, 2011, p. 594).

The Change Laboratory is exemplary as a research intervention that embodies this transformative methodology. Designed as a means of fast-tracking DWR, it essentially
comprises a specifically arranged space in which participants of an activity gather and set up “a rich set of instruments for analysing disturbances and for constructing new models for the work practice” (Engeström, Virkkunen, Helle, Pihlaja & Poikela, 1996, p. 10). This entails setting up three surfaces (blackboards or flipcharts) on which to elaborate (i) theoretical models for analysing information; (ii) new ideas and tools that the participants come up with; and (iii) ethnographic information about the activity system. Thus, the dual stimuli of empirically based problems and theoretically elaborated models are used simultaneously by the participants to trace past, present and future situations and ideas, and come up with more effective tools and practices for the activity in which they are engaged. Basically, then, the Change Laboratory offers CBPR a comprehensive tool for structuring a research intervention so that the participants can collaboratively collect, analyse, develop and represent data, theories and practical and theoretical resources with which to engage the project which they have identified.

That is not to say that the CPBR-CHAT exchange is a one-way process. For example, while Sutter (2011) suggests that the CHAT framework could go “beyond interventionism”, this is already being done by CPBR projects like SCRATCHMAPS. Sutter advocates for research activity that engages the diverse knowledges and resources of the participants in developing both the development activity as well as the research activity (Sannino & Sutter, 2011). Achieving this would entail that the joint activity of researching and developing be undertaken as a coalition in which notions of research, the role of researchers, and the tools for research, are redefined so that they are more receptive to utilising the resources held by all of the project’s participants (Sutter, 2011). While he admits that the details of how to go about this still need to be figured out, he proposes a two-step process, one of which would be to analyse the developmental project itself. The other step involves directing the resources of the participants in the project at the research activity.

Such an inclusive model for interventionist research in the area of safety, peace and health is evident in e.g. the Ukuphepha programme’s commitment to a proactive engagement which prioritises community participation and empowerment (Eksteen et al., 2012). At a practical level the SCRATCHMAPS project, in particular, encompasses an approach that goes “beyond interventionism”. The structures and processes it has put in place reflect Sutter’s (2011) call for radically restructured research relationships and tools. These range from advisory committees through which academics and community members negotiate the research process, to community asset mapping that identifies capacities which could enhance the effectiveness of the intervention as well as the research process, as well as openness to all forms of exchange that may positively capacitate individuals and the community, longer time-frames for the project (Lazarus et al., 2012), and mentoring engagements for building appropriate collaborative relationships (Lazarus et al., 2014).

Thus, while researchers and others using CBPR could develop their theoretical repertoire by drawing from the Change Laboratory methodology to model the analysis of projects,
CHAT can expand its praxis by examining how some of the above-mentioned projects draw from the community’s resources to theoretically and practically develop their research activity.

CONCLUDING REMARKS

The aim of this paper has been to encourage collaboration between CHAT and CBPR practitioners. Thus, while the complexity of CBPR and CHAT precludes even a superficial explanation of their principles, it should at least be evident that they demonstrate great potential for exchange through their community-oriented and relational approaches to investigating and instigating change.

In summary, then, I am suggesting that CBPR and CHAT analyses that are willing to push the boundaries of research interventions could benefit from a methodological alignment. This is because, while they have much in common, their respective primary foci or purpose differ somewhat. CBPR is essentially concerned with empowering, collaborative community based research, while CHAT’s main focus is understanding human activity (including research) as a system of mediated social relations. Thus, complementing a CBPR engagement with a CHAT-based approach like the Change Laboratory affords it a systematically elaborated set of theoretical and practical tools which have been developed from similar principles but within the scope of differing purposes and applications. For example, CHAT offers CBPR conceptual tools such as the cycle of expansive learning, knotworking, runaway objects (Engeström, 2001) and so forth with which to enhance the analytical ability and capacity to embrace the challenges and contradictions that inevitably arise from ambitious community based initiatives. CBPR projects like SCRATCHMAPS, in turn, have painstakingly developed their praxis beyond the conventions of interventionist research. By practically adapting their various roles, mediating structures and notions of engagement within the project, researchers and community participants here have reconfigured the interventionist methodology. CBPR’s priorities have therefore expanded research activity in ways which activity theorists may find instructive.

It is therefore not difficult to envisage a multitude of analytical and practical possibilities arising for a safety, peace and health promotion paradigm should researchers in this area choose to explore exchanges between the CHAT and CBPR frameworks.

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REFERENCES


Original Contributions

Urban density, deprivation and road safety: A small area study in the eThekwini metropolitan area, South Africa

Anesh Sukhai
Violence, Injury and Peace Research Unit, MRC-UNISA, Cape Town; School of Environmental Sciences, University of East Anglia, Norwich, Norfolk

Andrew P. Jones
School of Environmental Sciences, University of East Anglia, Norwich, Norfolk

ABSTRACT

Following a general paucity of small area research on road traffic injuries (RTIs), this study examined small area variations in RTIs for the eThekwini Metropolitan Area (comprising predominantly the City of Durban) in South Africa. Population density was used as an organising framework to examine variations in RTI outcomes, and correspondence with a range of measures relating to characteristics of the crashes and to socio-economic deprivation. Analyses were undertaken at the suburb level, using data from 2005–2009 and employing a cross-sectional geographical design. Analyses were also undertaken for disaggregated injury, crash severity, and road user groups. The distribution of the injury outcome measures corresponded with several measures that proxied risks relating to excessive driving speeds, excessive travel exposure, and general social as well as area level deprivation. Negative binomial models, fitted for the injury outcome measures, showed population density to be a significant predictor of all injury outcomes but also that its effects was only partially explained by the explanatory measures considered. The findings on deprivation provide new insights to rural-urban variations in RTIs, at least in the South African setting. The findings also have implications for informing integrated developmental policies and strategies across a range of disciplines and departments, especially at the city level.

1 Please direct all correspondence to: Dr Anesh Sukhai, Violence Injury and Peace Research Unit, Medical Research Council, PO Box 19070, Tygerberg, Cape Town, 7505; Email: Anesh.Sukhai@mrc.ac.za
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INTRODUCTION
The occurrence of road traffic crashes and injuries are particularly sensitive to the effects of population density (Noland & Quddus, 2004; Scheiner & Holz-Rau, 2011; Spoerri, Egger & von Elm, 2011). This may be especially apparent for cities and other urban centres subject to disparate and changing levels of population density through urbanisation and other related processes of suburbanisation, urban sprawl and fragmented forms of development. Whilst cities tend to hold promise of prosperity, with rapid rates of urbanisation, municipalities struggle to cope with the provision of essential services and infrastructure such that opportunities are unevenly distributed and are often accompanied by a multitude of deprivations that pose major challenges to the health and safety of vulnerable populations. Given that the majority of the world’s population are now living in cities and other urban centres, and that urban populations in developing countries are forecast to double between 2000 and 2030 (World Health Organization, WHO & United Nations HABITAT, UN-HABITAT, 2010), the health and safety of urban populations is a major concern.

Levels of urbanity or rurality have been shown to be an important discriminator of the geographical distribution of risk exposure and the occurrence of RTIs, along with contributory influences of the social and physical environments. For instance, evidence focussed on various geographical areas has shown a consistent inverse association between death from road traffic crashes and population density, which is commonly used to proxy the effects of rurality or urbanity in coarse-scaled geographical analyses (Noland & Quddus, 2004; Scheiner & Holz-Rau, 2011; Spoerri et al., 2011). Noland and Quddus (2004) in a study of 8,414 wards in England, showed urbanised areas with higher densities had fewer casualties, especially fatalities, but also areas of higher employment density tended to have more casualties. The authors used negative binomial count models to control for a range of area level factors including land use types such as population density, road characteristics such as the number of roundabouts and junctions, demographic characteristics such as deprivation, and proxies for traffic flow such as measures of employment. Spoerri et al. (2011) in a geographical study of road traffic fatalities (RTFs) at the municipality level in Switzerland, found road traffic mortality to increase with decreasing population density, but only for the motor vehicle occupant road user group. Inverse relationships between population density and death from RTIs has been shown for the South African setting in a coarse-scaled geographical analysis of RTFs that examined a large range of social and environmental influences (Sukhai & Jones, 2013). In this study, population density was the strongest predictor of the geographical variations in RTFs. The reasons for these effects have however not been investigated for the South African context.
The potential causal mechanisms that link population density to road traffic accident risk are numerous. The high burden of road traffic deaths in low density rural areas, and predominantly in high income countries, is often attributed to poorer injury outcomes due to inadequate access to quality pre-hospital and advanced in-hospital trauma care (Baker, Whitfield & O’Neill, 1987; Van Beeck, Mackenbach, Looman & Kunst, 1991) and relatively higher levels of risky driving behaviours such as drinking and driving, excessive driving speeds and non-wearing of seatbelts (Besag & Newell, 1991; Dumbaugh & Rae, 2009; Strine, Beck, Bolen, Okoro, Dhingra & Balluz, 2010). Van Beeck et al. (1991) showed that in the Netherlands, advanced trauma care along with traffic density were key predictors of regional variations in traffic mortality, showing an inverse relationship with case fatalities. Strine et al. (2010) examined self-reported seat belt use across the United States by adjusting for seat belt law and several other factors such as socio-demographic characteristics. They found respondents in the most densely populated metropolitan areas were significantly more likely to report wearing seatbelts compared to their most rural counterparts (adjusted odds ratio = 2.9).

We suggest that the effects of population density on health and safety, and in particular its influences on different road traffic outcomes, may be more apparent for small areas within cities and other urban centres, and these thus provide a useful context for understanding geographical influences on road safety. Small areas generally comprise geographical classifications below the level of health or local authority district. They often display greater social homogeneity as compared to census-level administrative units, and thus are regarded as more suitable units of analysis in epidemiology (Carstairs, 1981; Haining, Wise & Blake, 1994; Haynes, Lovett, Reading, Langford & Gale, 1999). For example, Haynes et al. (1999) compared a range of social and demographic predictors of crash rates in pre-school children using census enumeration districts, wards and specially constructed social areas, and found specially constructed small areas to yield the best fitting models.

Consistent with a paucity of small area studies on RTFs internationally, to the best of our knowledge, small area studies of RTIs have not been conducted in South Africa. Such studies are important for the South African traffic context. Geographical variations in health and safety conditions are largely related to socio-spatial patterns arising from historical urban planning policies under the apartheid regime that dictated where people could and could not live (see Coovadia, Jewkes, Barron, Sanders & McIntyre, 2009; Seedat, Van Niekerk, Jewkes, Suffla, & Ratele, 2009). Further, large-scale migration of deprived populations to urban and urban fringe areas has allowed for an “urbanisation of poverty” (Ravallion, Chen & Sangraula, 2007), commonly associated with informal settlements and other housing deprivation. Finally, South African cities typically show large variability in population densities arising from the combined processes of urbanisation with pockets of informal settlements close to the city, urban sprawl, and historical forced removals with
high population density township developments in the outskirts of the city. The effects of such disparate population densities on the health and safety of affected populations are however generally unknown.

This study seeks to contribute to our understanding of the geography of RTIs in South Africa by examining small area variations in RTIs and its influences for the eThekwini Metropolitan Area (EMA, incorporating the city of Durban). The EMA is particularly illustrative of the socio-political history of the country, characterised by high levels of socio-economic and spatial disparities and injuries (eThekwini Municipality, 2011; South African Medical Research Council-University of South Africa Crime Violence and Injury Lead Programme, SAMRC-UNISA CVILP, 2005), providing a relevant test bed to explore small area variations in RTIs. Following the significant influences of population density on road traffic crashes and injuries, found especially in coarse scaled studies, population density is used as an organising framework in this research to explore the influences on RTIs, and help elucidate some of the possible drivers to these relationships at a small area level. In particular, the role of social and area deprivation as well as the characteristics of crashes in explaining the injury outcomes by population density is examined.

METHODS

The study was based on a cross-sectional geographical design at the suburb level for the EMA. Suburbs, contained within cities and other urban centres, are not part of the census geographical hierarchy but rather represent city planning and service delivery units. In displaying greater social homogeneity as compared to census areas, suburbs may thus be regarded as relatively more appropriate entities for research on injury prevention and safety promotion. In order to reduce the effects of random year-to-year variation, aggregated data for the five-year period from 2005-2009 were used.

STUDY SETTING

The study setting is the EMA, which is one of eight metropolitan areas in South Africa and is located in the province of KwaZulu Natal (KZN). The EMA is the largest city within KZN and has a land area of approximately 2,300 km² and a population of approximately 3.5 million people (eThekwini Municipality, 2011). The EMA shows a fragmented urban form that reflects the diverse physical topography of the metropolitan area as well as remnants of distorted urban planning arising from historical apartheid-related policies and practices. The resultant highly uneven distribution of the population manifests in large clusters of residential development together with relatively low density urban sprawl as well as a peripheral location with much of its deprived populations (Breetzke, 2009). In addition, high
levels of associated crime and violence have also resulted in large scale decentralisation of retail and commercial activities as well as the upmarket development of numerous gated communities.

In addition, the EMA also contains large tracts of rural areas. Based on census classification, only 35% of the land area is considered as predominantly urban, with more than 80% of the population living in these areas (eThekwini Municipality, 2011). The Statistics South Africa census definition of urban and rural areas is based on the dominant settlement type and land use within Enumerator Areas (EAs), which is the lowest geographical level used for non-population based census dissemination (Statistics South Africa, StatsSA, 2003; StatsSA, 2004). Typical urban settlements are cities, towns, townships, and suburbs whilst rural areas typically tend to contain tribal areas, commercial farms and rural informal settlements (StatsSA, 2004).

The EMA is also characterised by large economic diversity. With an annual average economic growth of 3.7% from 2004-2009, compared to 3.4% for the province and 3.3% for the country (eThekwini Municipality, 2011), the economy of the EMA may be regarded as relatively progressive. However, the EMA is also characterised by increasing levels of poverty and inequality as well as by having the highest rate of unemployment of all metropolitan areas in the country. In 2004, estimates indicated that 31% of the population were living in poverty, 34% were unemployed, and the Gini coefficient, a measure of inequality ranging from 0 (perfect equality) to 1 (perfect inequality), was at 0.60 (Dray, McGill, Muller, Muller & Skinner, 2006). The Inanda/ Ntuzuma/ KwaMashu complex (INK) in the Metro is also one of 7 urban and 22 total presidential poverty nodes that represent the largest concentrations of poverty in SA and that are earmarked for accelerated development (Department of Provincial and Local Government, DPLG & Business Trust, 2007).

DATA FOR ROAD TRAFFIC INJURY AND EXPLANATORY VARIABLES

Table 1 details the measures relating to injury outcomes, crash characteristics, and socio-economic deprivation considered for this study. Aggregated suburb-level data on RTIs and crashes were provided by the eThekwini Transport Authority (ETA) for 2005-2009. Data from the ETA were based on accident report forms completed by police personnel, plus reports made to the police by members of the public involved in road traffic crashes. In terms of fatal injuries, cases with death occurring up to six days after a collision are considered by the ETA. Injuries requiring hospitalisation were considered to be serious injuries. Population-based fatal and serious injury rates were considered for analysis. Following the particular area-level risks for pedestrian injuries such as inadequate infrastructure for crossing or separation from motorised traffic, analyses are also undertaken separately for the pedestrian road user group. Population density for our study was based on population counts from the 2001 census, which was the latest census data available.
Table 1: Summary of explanatory measures

<table>
<thead>
<tr>
<th>Crash characteristics</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day of week</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Saturday</td>
<td>0.00</td>
<td>100.00</td>
<td>17.94</td>
</tr>
<tr>
<td>% Sunday</td>
<td>0.00</td>
<td>28.95</td>
<td>12.83</td>
</tr>
<tr>
<td><strong>Time of day</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Night</td>
<td>0.00</td>
<td>37.84</td>
<td>24.40</td>
</tr>
<tr>
<td>% Twilight</td>
<td>0.00</td>
<td>25.00</td>
<td>10.19</td>
</tr>
<tr>
<td>% Morning peak (6-8am)</td>
<td>0.00</td>
<td>25.00</td>
<td>12.62</td>
</tr>
<tr>
<td>% Evening peak (4-6pm)</td>
<td>6.25</td>
<td>100.00</td>
<td>17.08</td>
</tr>
<tr>
<td><strong>Road condition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Wet road surface</td>
<td>0.00</td>
<td>25.00</td>
<td>12.36</td>
</tr>
<tr>
<td><strong>Crash type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Head on</td>
<td>0.00</td>
<td>4.11</td>
<td>0.94</td>
</tr>
<tr>
<td>% Single vehicles overturned</td>
<td>0.00</td>
<td>100.00</td>
<td>6.08</td>
</tr>
<tr>
<td>% Vehicle- animal</td>
<td>0.00</td>
<td>20.00</td>
<td>2.56</td>
</tr>
<tr>
<td>% Vehicle- fixed object</td>
<td>0.00</td>
<td>50.00</td>
<td>10.24</td>
</tr>
<tr>
<td>% Turning</td>
<td>0.00</td>
<td>18.98</td>
<td>10.84</td>
</tr>
<tr>
<td><strong>Vehicle type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Car</td>
<td>0.00</td>
<td>73.99</td>
<td>55.03</td>
</tr>
<tr>
<td>% LDV</td>
<td>0.00</td>
<td>38.46</td>
<td>18.95</td>
</tr>
<tr>
<td>% Minibus taxi</td>
<td>0.00</td>
<td>100.00</td>
<td>13.64</td>
</tr>
<tr>
<td>% Bus</td>
<td>0.00</td>
<td>7.69</td>
<td>1.81</td>
</tr>
<tr>
<td>% Medium/ heavy commercial</td>
<td>0.00</td>
<td>27.27</td>
<td>3.29</td>
</tr>
<tr>
<td>% Articulated</td>
<td>0.00</td>
<td>36.54</td>
<td>3.15</td>
</tr>
<tr>
<td><strong>Socio-economic deprivation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Population living in a shack</td>
<td>0.00</td>
<td>31.61</td>
<td>3.73</td>
</tr>
<tr>
<td>% Population with less than secondary level education</td>
<td>0.00</td>
<td>37.65</td>
<td>16.55</td>
</tr>
<tr>
<td>% Population who are unemployed</td>
<td>0.00</td>
<td>33.42</td>
<td>15.86</td>
</tr>
<tr>
<td>% Population with monthly income of R400 or less</td>
<td>0.00</td>
<td>88.59</td>
<td>65.00</td>
</tr>
</tbody>
</table>

Table 2 summarises the hypothesised associations and relevant literature pertaining to the explanatory measures considered for analysis. A range of indicators covering the domains
of time variant risks, weather, driver behaviour, crash and vehicle types, population socio-demographic status, and road user types were considered.

Table 2: Summary of literature on selected explanatory measures

<table>
<thead>
<tr>
<th>Explanatory effects</th>
<th>Associations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporal patterns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evenings hours and weekends</td>
<td>Higher fatal injuries</td>
<td>Sukhai et al., 2009; Peden et al., 2004</td>
</tr>
<tr>
<td>Weather</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainfall</td>
<td>Higher risk of injury crashes in rainy conditions</td>
<td>Brodsky &amp; Hakkert, 1988</td>
</tr>
<tr>
<td>High risk driving behaviours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DUI, speeding, non-wearing of seatbelts</td>
<td>Higher injury rates in low density rural areas</td>
<td>Strine et al., 2010; Dumbaugh &amp; Rae, 2009; Besag &amp; Newell, 1991</td>
</tr>
<tr>
<td>Crash and vehicle types</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed-related single vehicle crashes</td>
<td>Higher crashes</td>
<td>Chen et al., 2009</td>
</tr>
<tr>
<td>among young drivers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian injuries involving sport utility vehicles and pickup trucks</td>
<td>Higher injury severity scores</td>
<td>Ballesteros, Dischinger &amp; Langenberg, 2004</td>
</tr>
<tr>
<td>Involvement of large trucks in rural crashes</td>
<td>Higher crash risk</td>
<td>Muelleman &amp; Mueller, 1996; Lyles, Campbell, Blower &amp; Stamatiadis, 1991</td>
</tr>
<tr>
<td>Socio-economic status and deprivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status</td>
<td>Higher crashes and RTIs with lower socio-economic status</td>
<td>Sukhai and Jones, 2013; Spoerri et al., 2011; Rivas-Ruiz, Perea-Milla &amp; Jimenez-Puente, 2007; Borrell et al., 2005; Christie, 1995</td>
</tr>
<tr>
<td>Deprived communities</td>
<td>Higher traffic-related risk exposure in deprived communities</td>
<td>Babio &amp; Daponte-Codina, 2006; Sonkin, Edwards, Roberts &amp; Green, 2006; Macpherson, Roberts &amp; Pless, 1998</td>
</tr>
<tr>
<td>Population and road user groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle occupants</td>
<td>Higher fatal injuries in rural areas</td>
<td>Spoerri et al., 2011; Muelleman &amp; Mueller, 1996; Chen, Maio, Green &amp; Burney, 1995</td>
</tr>
<tr>
<td>Pedestrians</td>
<td>Higher risk and injury in urban areas</td>
<td>Scheiner &amp; Holz-Rau, 2011; Petch &amp; Henson, 2000</td>
</tr>
<tr>
<td>Child pedestrians</td>
<td>Higher risk of injury in urban areas</td>
<td>Scheiner &amp; Holz-Rau, 2011; Petch &amp; Henson, 2000</td>
</tr>
</tbody>
</table>
ASSIGNING ROAD TRAFFIC INJURY AND EXPLANATORY DATA TO SUBURBS

Boundary data for the suburbs were obtained for planning units that are utilised by the municipality for management and service delivery. The planning unit areas matched that of the suburbs closely, and they comprised census Sub-places and Main Places or combinations of them. Sub-places and Main Places represent the second and third lowest census levels, after EAs (StatsSA, 2004). Sub-places generally include suburbs, sections of a township, smallholdings, villages, sub-villages, wards or informal settlements, while Main Places generally include cities, towns, townships, tribal authorities and administrative areas (StatsSA, 2004). Hence, areas from the non-census suburb classification may straddle both Main place and Sub-place census levels, especially in the case of towns, townships and informal settlements. The municipal boundary data were then adapted (mostly through renaming and merging some areas) and integrated with the suburb-level traffic data from the ETA within a Geographical Information System (GIS) (ArcGIS 9.3). Five of the suburb areas, which were demarcated to an expanded area of the EMA in 2001 (eThekwini Municipality, 2002), did not have data available. A total of 68 remaining suburbs were considered for analyses. The suburbs differed markedly by size; the mean area was 30.0 km², ranging from 2.2 km² for Canelands in the North to 160.6 km² for the Adams/ Folweni/ Sobonakhona cluster in the South.

The Small Area Layer, created by combining all EAs with a population smaller than 500 with adjacent EAs within a Sub-place, is the lowest geographical level for which population data are available (StatsSA, 2005). Since the boundaries for census areas are only partially coincident with that of the suburbs, the ArcGIS package was used to allocate the Small Areas (and their population counts) to the suburbs using their geographical centre-points. Likewise, socio-economic deprivation measures at the census Sub-place level were also allocated to the suburbs. The ArcGIS package was also used to integrate the road line data for the major roads within the GIS.

CALCULATION AND EXPRESSION OF OUTCOME AND EXPLANATORY MEASURES

Injury severity was considered using population-based fatality rates, calculated by dividing the number of cases for the suburbs by the respective population exposed and expressed as the number of deaths per 100,000 population. Crash severity, expressed as the quotient of the combined fatal and serious injuries to the total number of collisions, and measures relating to characteristics of the crashes were also expressed as percentages. Both crude and person-weighted population density measures were calculated within the GIS and considered for the analyses. Weighted population density was considered to accommodate possible effects of population clustering. The crude measure was the quotient of the total population and land area in square kilometres, which was then weighted using the Small Area Layer to produce the person-weighted measure. However, the measures showed
similar geographical distributions to each other and were also highly correlated (0.81, p<0.001), and consequently, only the crude population density measure that showed a general stronger correlation with the injury outcomes was considered for the analyses.

Following the lack of a clear linear relationship between population density and RTIs, evidenced at the coarse-scaled DC census level across the country using several exposure-based indicators (Sukhai, Jones & Haynes, 2009), relationships with population density in this study were explored using quartiles. Population-based rates for the injury outcomes and population percentages for the explanatory measures were calculated separately for each of the population density quartiles.

STATISTICAL ANALYSIS

Using the IBM SPSS Statistics version 19 software, univariate analyses was used to summarise the distribution of the outcome and risk-related variables listed in Table 1. The Pearson’s correlation coefficient and associated P-value were calculated to test the strength in the relationship between variables.

The software was also used to undertake linear regression analyses to test for linear trend across quartiles for the different measures, and to model the predictors of the road traffic outcomes for the EMA. To identify the presence of linear trend across the population density quartiles, the slope lines for the rates and proportions for the injury outcomes and explanatory measures were examined, and tested if the fitted lines were significantly different from zero. For the predictive modelling, negative binomial regression models were fitted for the 4 outcome measures, using the natural logarithmic transformation of the population size variable as an offset. The negative binomial count model was used to accommodate overdispersion in the dependant variable. Only variables showing a statistically significant association with the respective outcome measures were included in the models. For similar measures within the day, time and social deprivation groups, only that which contributed best to model fit was selected from each group. The regression models were fitted using a backward elimination process whereby non-significant variables were removed sequentially starting with the least statistically significant and continuing until only the statistically significant predictors remained.

RESULTS

A total of 3,199 fatal and 20,509 serious injuries were recorded for the 68 suburb areas included in the study over the five year period from 2005-2009. The overall average annual rate per 100,000 population for the EMA, based on the 68 suburbs, was 21.2 for fatal
injuries and 135.9 for serious injuries. On average, 3.5% of road crash victims sustained fatal injuries and 15.8% sustained serious injuries. On average, there were also 0.1 fatal or serious injuries per road traffic collision.

Table 1 shows the leading day for crashes to be Saturdays, accounting for nearly one-fifth of all crashes. Nearly one-quarter occurred at night and nearly one-fifth during the evening peak hour period from 4-6pm. About one-tenth occurred when the road surface was wet. Crashes occurring whilst turning and with a fixed roadside object were the most common type, accounting for about 10% each of all events. More than half the vehicles involved in the crashes were cars, followed by roughly one-fifth light delivery vehicles. In terms of the socio-economic deprivation, on average for the suburbs, little under one-fifth of the population have less than a secondary level of education, and the same proportion are unemployed. Of those that are employed, about two-thirds of them earn a monthly income of R400 or less.

Figure 1: Population density of EMA suburbs
The average population density across the suburbs was 2,053.7 persons per square kilometre (S.D. 2 284.2), ranging from 18.5 to 10,225.8. Figure 1 shows the geographical distribution of the population density measure. The distribution shows three clusters of suburbs with very high population densities: the city centre and surrounding suburbs (central East coast of city); the northern township areas, including much of the INK complex and Phoenix; and township areas in the south, including Umlazi and Chatsworth.

Table 3 shows the relationship between the RTI outcome measures, and the measures of crash characteristics and of socio-economic deprivation, by quartiles of population density. Only the measures of percentage articulated vehicles and the percentage of vehicle-animal crashes showed a statistically significant linear trend across the quartiles of population density, with both decreasing with increasing population density. Other patterns in the measures by quartiles of population density are however evident. In terms of fatal injuries, Table 3 shows the lower density quartiles (quartiles 1 and 2) to have higher rates per 100 000 population as compared to the higher density quartiles (quartiles 3 and 4) for both the overall and pedestrian injury groups. The above pattern is also evident for serious injuries in the overall injury group. Following the general inverse patterns above, statistically significant negative correlations were found between population density and the rates for overall fatalities (r=-0.32, p=0.01), pedestrian fatalities (r=-0.29, p=0.02), and overall serious injuries (r=-0.27, p=0.03).

In terms of crash characteristics, the higher injury rates in relatively low density areas, specifically in quartiles from 1-3, are also shown to be accompanied by higher percentages of collisions involving single vehicles that overturned, animals, and fixed objects, that occurred on a wet road surface, and that involved medium/heavy and articulated commercial vehicles. The highest levels of crash severity in quartile 4 are accompanied by higher percentages of cases occurring over weekends (on Saturday and Sunday) and with vehicles involving buses and minibus taxis.

In terms of socio-economic deprivation, the relatively higher injury rates in low density areas, specifically in quartile 1, are shown to be accompanied by higher percentages of the population that have less than a secondary level of education, and by the percentage of income earners that receive a monthly income of R400 or less.

In order to explicate some of the effects arising from population density, and based on the data available, Table 4 compares the coefficients for population density from an unadjusted and an adjusted model that adjusts for other statistically significant coefficients, for the four count-related outcome measures considered for this study. The adjustment covariates were the percentage of crashes involving fixed objects (for all injury outcomes); percentage articulated vehicles (for all injury outcomes except pedestrian serious injury); percentage
Table 3: Injury outcome by quartiles of crude population density

<table>
<thead>
<tr>
<th></th>
<th>Quartile 1 (18.5-367.7)</th>
<th>Quartile 2 (367.8-1191.6)</th>
<th>Quartile 3 (1191.7-2856.4)</th>
<th>Quartile 4 (28656.5-10225.8)</th>
<th>P-value for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injuries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of fatal injury per 100K population*</td>
<td>274.25</td>
<td>237.69</td>
<td>71.52</td>
<td>80.79</td>
<td>0.08</td>
</tr>
<tr>
<td>Rate of pedestrian fatal injury per 100K population*</td>
<td>109.44</td>
<td>144.06</td>
<td>45.80</td>
<td>53.53</td>
<td>0.27</td>
</tr>
<tr>
<td>Rate of serious injury per 100K population*</td>
<td>1250.22</td>
<td>1116.15</td>
<td>334.27</td>
<td>727.91</td>
<td>0.27</td>
</tr>
<tr>
<td>Rate of pedestrian serious injury per 100K population*</td>
<td>243.99</td>
<td>448.30</td>
<td>145.10</td>
<td>415.38</td>
<td>0.81</td>
</tr>
<tr>
<td>Crash severity index</td>
<td>0.068</td>
<td>0.062</td>
<td>0.066</td>
<td>0.078</td>
<td>0.36</td>
</tr>
<tr>
<td>Crash characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day of week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Saturday</td>
<td>13.38</td>
<td>12.21</td>
<td>15.03</td>
<td>16.22</td>
<td>0.17</td>
</tr>
<tr>
<td>% Sunday</td>
<td>9.67</td>
<td>8.24</td>
<td>10.38</td>
<td>11.65</td>
<td>0.27</td>
</tr>
<tr>
<td>Time of day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Night</td>
<td>20.54</td>
<td>18.21</td>
<td>21.06</td>
<td>20.68</td>
<td>0.67</td>
</tr>
<tr>
<td>% Twilight</td>
<td>8.64</td>
<td>8.66</td>
<td>10.03</td>
<td>9.49</td>
<td>0.25</td>
</tr>
<tr>
<td>% Morning peak (6–8am)</td>
<td>11.57</td>
<td>13.08</td>
<td>14.56</td>
<td>12.30</td>
<td>0.63</td>
</tr>
<tr>
<td>% Evening peak (4–6pm)</td>
<td>16.70</td>
<td>16.74</td>
<td>16.83</td>
<td>16.12</td>
<td>0.34</td>
</tr>
<tr>
<td>Road condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Wet road surface</td>
<td>12.86</td>
<td>13.28</td>
<td>12.66</td>
<td>10.06</td>
<td>0.20</td>
</tr>
<tr>
<td>Crash type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Head on</td>
<td>0.45</td>
<td>0.40</td>
<td>0.61</td>
<td>0.50</td>
<td>0.48</td>
</tr>
<tr>
<td>% Single vehicles overturned</td>
<td>2.75</td>
<td>2.29</td>
<td>2.39</td>
<td>0.68</td>
<td>0.14</td>
</tr>
<tr>
<td>% Vehicle- animal</td>
<td>1.12</td>
<td>0.81</td>
<td>0.77</td>
<td>0.29</td>
<td>0.047</td>
</tr>
<tr>
<td>% Vehicle- fixed object</td>
<td>7.56</td>
<td>8.09</td>
<td>8.90</td>
<td>5.49</td>
<td>0.52</td>
</tr>
<tr>
<td>% Turning</td>
<td>11.66</td>
<td>14.49</td>
<td>14.92</td>
<td>14.13</td>
<td>0.31</td>
</tr>
<tr>
<td>Vehicle type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Car</td>
<td>58.95</td>
<td>58.75</td>
<td>61.91</td>
<td>60.42</td>
<td>0.34</td>
</tr>
<tr>
<td>% LDV</td>
<td>17.19</td>
<td>17.53</td>
<td>18.45</td>
<td>14.86</td>
<td>0.49</td>
</tr>
<tr>
<td>% Minibus taxi</td>
<td>5.59</td>
<td>8.02</td>
<td>7.44</td>
<td>14.03</td>
<td>0.13</td>
</tr>
<tr>
<td>% Bus</td>
<td>1.30</td>
<td>1.48</td>
<td>1.59</td>
<td>2.64</td>
<td>0.12</td>
</tr>
<tr>
<td>% Medium/ heavy commercial</td>
<td>3.91</td>
<td>3.99</td>
<td>3.10</td>
<td>2.49</td>
<td>0.07</td>
</tr>
<tr>
<td>% Articulated</td>
<td>9.51</td>
<td>7.08</td>
<td>3.53</td>
<td>1.80</td>
<td>0.01</td>
</tr>
<tr>
<td>Socio-economic deprivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Population living in a shack</td>
<td>2.10</td>
<td>1.55</td>
<td>4.49</td>
<td>6.17</td>
<td>0.09</td>
</tr>
<tr>
<td>% Population with less than secondary level education</td>
<td>22.47</td>
<td>17.37</td>
<td>17.32</td>
<td>15.21</td>
<td>0.09</td>
</tr>
<tr>
<td>% Population who are unemployed</td>
<td>18.45</td>
<td>16.90</td>
<td>19.48</td>
<td>19.52</td>
<td>0.39</td>
</tr>
<tr>
<td>% Population with monthly income of R400 or less</td>
<td>77.21</td>
<td>68.29</td>
<td>71.18</td>
<td>68.63</td>
<td>0.29</td>
</tr>
</tbody>
</table>

* 5-year rate (2005–2009)
of minibus taxis (for overall and pedestrian fatal injuries); percentage of crashes occurring during afternoon peak hours, and percentage unemployed population (both for overall serious injuries); and lastly the income deprivation measure of percentage population earning less than R400 (for serious pedestrian injury). Of note is that although the effect of population density is attenuated in the adjusted models due to the effects of other explanatory variables that explain the outcomes, it remains still statistically significant along with these effects.

Table 4: Population density effect from unadjusted and adjusted models for injury outcomes

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted model</th>
<th></th>
<th>Adjusted model</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Standardised</td>
<td>S.E</td>
<td>P-value</td>
</tr>
<tr>
<td>Fatal injury</td>
<td>-3.19</td>
<td>-129.31</td>
<td>0.44</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fatal pedestrian</td>
<td>-2.46</td>
<td>-134.84</td>
<td>0.46</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>injury</td>
<td>-2.59</td>
<td>-12.80</td>
<td>0.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Serious injury</td>
<td>-1.51</td>
<td>-10.02</td>
<td>0.47</td>
<td>0.001</td>
</tr>
<tr>
<td>Serious pedestrian</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

POPULATION DENSITY AND RTIs

An inverse relationship between population density and road traffic injuries was found for the overall fatal and serious injury rates, and for fatal injuries in the disaggregated pedestrian injury group. Given the challenges and processes within cities arising from urbanisation, this confirms the general negative association between population density and RTIs, commonly found for large geographical areas (Noland & Quddus, 2004; Scheiner & Holz-Rau, 2011; Spoerri et al., 2011) to also manifest at the small area level. The consistency in findings for the different injury severity and road user groups also points to the influential role of area level effects on road traffic crashes and injuries. In contrast to the population findings from this research, crude population density was not shown to be a reliable measure of rurality as in previous rural-urban analyses at the DC census level (Sukhai et al., 2009). This may be due to the DC geographical units being more likely to contain clusters of populations that are relatively heterogeneous in nature and bigger than the suburb small areas used in this study.

Exceptions to the inverse association were for serious injuries in the pedestrian injury group, and for the crash severity index. For serious injuries in the pedestrian group, high rates were found in areas with relatively low population density (quartile 2) as well as in
areas with high population density (quartile 4). The presence of higher pedestrian injury rates in urban areas has been documented previously, although mostly for fatalities (Petch & Henson, 2000; Spoerri et al., 2011). The relationship with serious injury may relate to a combination of relatively higher pedestrian-related activities with relatively lower speeds for high density urban areas. For crash severity, the highest level was also found for the quartile of suburbs with the highest population density. This is expected given the greater levels of public transportation serving high density urban areas.

CRASH CHARACTERISTICS AND RTIs

In terms of population-based rates, many of the characteristics of the crashes showing higher percentages in the relatively lower population density suburbs (quartiles 1-3), such as those involving single vehicles that overturned, animals and fixed objects, and occurring on wet roads, may be suggestive of the involvement of excessive driving speeds as evidenced elsewhere (Brodsky & Hakkert, 1988; Chen et al., 2009; Peden et al., 2004). Excessive speed is also commonly cited as one of the reasons for relatively higher injury rates in low density rural settings, along with other high risk behaviours such as drinking and driving and non-wearing of seatbelts (Besag & Newell, 1991; Dumbaugh & Rae, 2009; Strine et al., 2010). The measure for the percentage of crashes involving articulated vehicles also showed a positive association with the population-based rates. Whilst the relatively higher involvement of large trucks in rural crashes has previously been described in settings such as the United States (Lyles, Campbell, Blower & Stamatiadis, 1991; Muelleman & Mueller, 1996), the data on crash characteristics in our study are restricted to prevalence rather than crash risk.

In terms of the crash severity measure, as expected, higher crash severity was shown to be associated with a relatively higher involvement of high passenger occupancy vehicles such as buses, minibuses and LDVs. Higher crash severities were also accompanied by higher percentages of cases occurring over weekends and at night. These may relate to high risk driving behaviours, the weekend cases involving high occupancy public transport vehicles may also relate to higher levels of mobility and travel exposure due to relatively higher recreational travel, and the need to travel longer distances to services, or homesteads in the case of migrant workers.

SOCIO-ECONOMIC DEPRIVATION AND RTIS

In terms of population-based rates, higher fatality rates in the relatively lower population density quartiles corresponded with higher percentages for the education and income deprivation measures. The high rate of serious injury for pedestrians and high crash severity index in the highest density and typically urban quartile corresponded with the highest percentage for the measure of the percentage population living in a shack.
The association of higher crash and injury probability with lower socio-economic status is well documented (Borrell et al., 2005; Rivas-Ruiz, Perea-Milla & Jimenez-Puente, 2007; Spoerri et al., 2011). Further to the general social stresses from deprivation and inequality, and high risk behaviours and practices by deprived populations (Babio & Daponte-Codina, 2006), area level deprivation is an important consideration in the context of road safety. Deprived populations tend to incur greater traffic-related risk exposure from greater mobility (Sonkin, Edwards, Roberts & Green, 2006) or from needing to cross roads more often (Macpherson, Roberts & Pless, 1998). However, consistent with our findings, pedestrians and especially children have been shown to be particularly vulnerable to road traffic injuries in high density urban settings (Petch & Henson, 2000; Spoerri et al., 2011). Inferior traffic infrastructure such as unsafe road crossings and transportation systems that do not accommodate the mobility of pedestrians, as well as road user and traffic conflicts arising from the diverse environments and land uses, may be important considerations.

**IMPLICATIONS FOR PREVENTION**

The findings have implications for addressing high-risk driving speeds, especially in low density settings, and for strengthening relevant policies to secure targeted investments in priority areas, especially informal settlement areas. In light of competing pressures for municipal resources, there is merit for the use of resource-efficient strategies such as automated enforcement systems including optimal speed camera technology (Organisation for Economic Co-operation and Development, OECD, 2003), to deter high-risk driving behaviours. However, these behaviours may also be symptomatic of large scale spatial disparities resulting in long journeys with excessive times spent travelling, together with being exposed to unsafe transportation infrastructure. Hence, long-term planning strategies need to prioritise the reduction of travel-related exposure, especially to disadvantaged populations.

Following the general correspondence between deprivation and RTIs found here, as well as the strong predictive link shown between general deprivation and road traffic mortality (Sukhai & Jones, 2013), it will be important to address the range of “interlinked deprivations” (Vearey, Palmary, Thomas, Nunez & Drimie, 2010) arising from the complexity of the urban context, with priority afforded to the pockets of deprivation including informal settlements that are often concealed within large cities and suburbs. Measures of social and area deprivation may also serve as important indicators of traffic-related risk within broad spatially targeted developmental policies, or within narrower policies focussed on traffic safety and transportation. Whilst some national attention is provided to small area deprivation through the “Presidential Poverty Nodes” (DPLG & Business Trust, 2007), it is important that systematic and relative small area prioritisation be used across the EMA.

The policy and practice implications from this study may also align with current city-related initiatives that were detailed by the Minister of Finance in his 2012 annual budget speech.
(Gordhan, 2012). These include a “Cities Support Programme”, focussed on improved spatial planning, public transport systems, and management of infrastructure utilities as well as a “Municipal Infrastructure Support Agency” targeting rural municipalities that lack planning capacity is also proposed. The findings may also be applicable to other metropolitan areas and large cities in the country as socio-spatial disparities and other negative effects from historical policies are not expected to be restricted to the current study setting.

With the backdrop of widespread failure of urban planning to address the needs of the majority of residents in urban areas, the United Nations-HABITAT Global Report on Human Settlements (UN-HABITAT, 2009) has stressed the importance that countries develop overall national urban strategies to deal with urbanisation as a positive phenomenon. Such strategies would be important to accommodate the dynamic nature of cities and their changing population densities as well as to provide opportunity for developing more coordinated and integrated policies and strategies across a range of disciplines and departments, including urban planning, transport, health, and social services. Spatial development frameworks provide the spatial component of integrated development plans for cities, but the focus has been criticised as being too broad and conceptual (Breetzke, 2009). The Global Report on Human Settlements has also emphasised the importance for such frameworks to be more closely linked with infrastructure development and to have transport-land use links prioritised. In addition, innovative and more sustainable spatial forms such as “compact cities” and “new urbanism” that argues for medium to high built densities for cities, and at the level of the local neighbourhood, would be useful to consider for addressing some of the shortfalls of historical urban planning (UN-HABITAT, 2009).

STRENGTHS, LIMITATIONS AND FUTURE RESEARCH

Our study has revealed various findings for understanding the geography of RTIs at the small area level in South Africa. We used exploratory quartile analyses that showed to be a simple yet useful technique for examining the correspondence between our outcome and explanatory measures. Further, in the absence of a theoretical underpinning to support a dose-response linear relationship between population density and RTIs, analyses using quartiles or other quantiles may generally be more reliable for assessing RTI risk than correlation analyses. Different injury severities and road user groups were considered, as well as a measure of crash severity that has rarely been used in other research but has shown to be an important discriminator to the geographical disparities shown for this study setting. Findings from the negative binomial regression models also showed the significant predictor effects of population density on a range of road traffic injury outcomes. The effects of population density however, could only partially be explained by the crash and socio-economic measures included in this study.
Our study suffers from three particular limitations. First, typical of small area analyses, our findings are affected by the problem of small sample sizes. Whilst the use of quartile analyses would have helped minimise the small number problem, this potential bias particularly applies to interpretation of findings on the population-based rates. Second, we were restricted to only having data at the group level comprising 68 spatial units, and in the absence of individual level data, we were not able to appraise differences in crash characteristics between the different road user groups. Third, as is often the case with data on crashes and RTIs, under-reporting is a serious challenge. In addition, there may also be an element of geographical bias in the analyses, since under-reporting tends to be a bigger problem in rural than in urban areas (Aptel et al., 1999), and may also be more particular in the case of non-fatal injuries that are less likely to be registered.

Whilst data on pre-hospital and advanced in-hospital trauma care was not available for this study, it would be useful to incorporate such measures in future research, particularly in the South African setting, given the evidence for such effects in other country settings (Baker, et al., 1987; Van Beeck et al., 1991), as well as with our analyses pointing to possible effects that have not been considered. In addition, other GIS-based small area measures such as measures of accessibility or of relative deprivation would be useful, especially towards further understanding the influences of population density on crashes and RTIs. It would also be useful for future predictive-type modelling to build on findings from this research by employing more advanced methodologies including Bayesian approaches to account for small sample sizes (Jia, Muennig & Borawski, 2004; MacNab, 2004).

**CONCLUSION**

This research has yielded novel insights on the nature, extent and distribution of injuries for the EMA. In addition, the presence of geographical disparities for disaggregated injury severity and road user groups, with relatively worse injury outcomes for low density areas, was confirmed at the small area level. The variations in RTIs, using a population density framework correspond to several measures relating to the characteristics of crashes and measures of socio-economic deprivation. Whilst findings on the characteristics of crashes proxy many of the previously described risks, the findings on deprivation provide additional perspectives to rural-urban variations in RTIs, at least in a South African setting. We suggest that spatial and developmental policies especially at the city level recognise these influences on road safety.

**ACKNOWLEDGEMENTS**

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REFERENCES


‘A stitch in time…may save nine’: A systematic synthesis of the evidence for domestic violence management and prevention in Emergency Care

Navindhra Naidoo
Department of Emergency Medical Sciences, Faculty of Health and Wellness Sciences, Cape Peninsula University of Technology, Cape Town, South Africa

Lillian Artz
Gender, Health and Justice Research Unit, University of Cape Town, Cape Town, South Africa

Lorna J Martin
Division of Forensic Medicine, Department of Clinical Laboratory Sciences, University of Cape Town, Cape Town, South Africa

Mustafa Zalgaonker
Department of Emergency Medical Sciences, Faculty of Health and Wellness Sciences, Cape Peninsula University of Technology, Cape Town, South Africa

ABSTRACT

The aim of this policy brief is to provide an evidence-informed answer to the question: ‘What is the role and scope of pre-hospital emergency care providers to domestic violence (DV) intervention as a form of gender-based violence prevention?’ The answer is intended to determine the theoretical and clinical best practice to inform the emergency care community and policy development by critically appraising the evidence that considers the responsiveness of Emergency Medical Services to the health needs of DV victims. Evidence-informed Decision Making methods are employed. The evidence appraised was based on electronic searches using the Cape Peninsula University of Technology database. Research and non-research publications were considered with publication dates mostly from 1999 to 2011. Upon screening 164 articles for content relevance, 53 were critically appraised against predetermined criteria for relevance of the evidence, robust nature of the evidence and presence of bias. A thematic/
narrative analysis ensued in terms of strength of evidence and frequency of findings. Early recognition and intervention is seen as one of the most effective methods of DV prevention. This finding is nuanced if it is male caregivers doing so. There is an ethical obligation to implement a comprehensive health approach to manage domestic violence victims. The strong, majority findings are that educational intervention/s increases the health care provider’s understanding of DV and improves screening for DV. The research supports the development and use of screening tools/guidelines/procedures for DV as they are found to improve DV intervention. The evidence supports an integrated effort of the health system in achieving its goal of DV prevention by promoting the participation of pre-hospital emergency care providers as critical stakeholders.

**Key words:** Domestic Violence (DV) management and prevention, Emergency Care Providers (ECP’s), Gender-based violence (GBV) prevention, Evidence-informed Decision Making (EiDM), Emergency Medical Service

**INTRODUCTION**

A narrow reading of the emergency care (EC) role in domestic violence (DV) management and prevention leans toward biomedical intervention and a ‘rescue’ demeanour. In cases where no medical intervention is needed, and where no rescue situation is imminent, facilitation and referral is critical for bio-psycho-social support. ‘Time-to-care’ is a mainstay measure in acute care settings. A solitary focus on acute and EC settings is problematic in the context of domestic violence, where victims of abuse present with a myriad of chief complaints directly and indirectly related to the experience of chronic abuse both after and between battering or other abusive incidents. Phrased differently, stopping the bleeding does not stop the abuse (Naidoo, Knight, & Martin, 2013), and the absence of ‘bleeding’ does not imply the absence of violence nor should it presume EC intervention is not required.

The aim of this paper is to provide an evidence-informed answer to the question: *What is the role and scope of pre-hospital emergency care providers to domestic violence intervention as a form of gender-based violence prevention?* The response should not only underscore theoretical and clinical best practice(s) to inform the EC community, but can also promote the development of an appropriate policy. The rationale for policy development is to contribute to the reduction of mortality, morbidity and the health-economic burden of domestic violence by critically appraising the evidence that considers the responsiveness of the EC discipline to the health needs of domestic violence victims. It recognises the health-promotion potential and enhancement of EC utility that the EC profession (mostly men of some 71 000 practitioners; Table 1) has in gender-based violence intervention. As the largest professional board at the Health Professions Council of South Africa (HPCSA),
approximately 13,000 of these providers are located in the public Emergency Medical Service (EMS). Sadly, EMS’s, as public health organisations, have been complicit (Naidoo et al., 2013) in contributing to the widely criticised poor social and state responses to domestic violence (Gevers, Jama-Shai, & Sikweyiya, 2013; Shefer, 2013).

Table 1: Total No. of Providers Registered with the Professional Board for Emergency Care (PBEC), HPCSA [As at 25 July 2014] (Health Professions Council of South Africa, 2014)

<table>
<thead>
<tr>
<th>Level of Skill</th>
<th>Professional Autonomy</th>
<th>Qualification</th>
<th>Professional Category of Registration</th>
<th>Number Registered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Life Support</td>
<td>Supervised Practice</td>
<td>Short course (4 weeks)</td>
<td>Basic Ambulance Assistant</td>
<td>57,838</td>
</tr>
<tr>
<td>'Intermediate' Life Support</td>
<td>Independent Practice</td>
<td>Short course (12 weeks)</td>
<td>Ambulance Emergency Assistant</td>
<td>8,703</td>
</tr>
<tr>
<td>'Intermediate’ Life Support</td>
<td>Independent Practice</td>
<td>Military Short course</td>
<td>Operational Emergency Care Orderly</td>
<td>554</td>
</tr>
<tr>
<td>Advanced Life Support</td>
<td>Independent Practice</td>
<td>Short course (9 months) or 3-year Diploma</td>
<td>Student Paramedic</td>
<td>572</td>
</tr>
<tr>
<td>Advanced Life Support</td>
<td>Independent Practice</td>
<td>4-year Bachelor’s Degree</td>
<td>Student Emergency Care Practitioner</td>
<td>520</td>
</tr>
<tr>
<td>Advanced Life Support</td>
<td>Independent Practice</td>
<td>2-year Certificate</td>
<td>Student Emergency Care Technician</td>
<td>799</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>751</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>71,635</td>
</tr>
</tbody>
</table>

METHODS

An Evidence-informed decision making (EiDM) approach was employed (Figure 1). This method, coherent with a post-positivist paradigm, involves integrating the best available research evidence into the decision making process in health practice and policy development. It resonates with the purpose of this study as it enables the most effective and cost-efficient interventions, considers the use of scarce resources, and takes into account customer satisfaction and improved health outcomes for individuals and communities (National Collaborating Centre for Methods and Tools, 2011).

The research to policy gap can have critical implications in patient response and treatment. In fact, Antman, Lau, Kupelnick, Mosteller, and Chalmers (1992) found that historically, it took an estimated 15 years to get research into recommended policy and for practitioners
to achieve implementation 40% of appropriate times in practice (Antman et al., 1992). Due to a research-practice gap, 30–40 % of patients do not get treatments that have been proven to be effective (Straus, Richardson, Glasziou, & Haynes, 2008). EiDM, as a bona fide but nuanced EBM strategy, seeks to bridge the gap between research and practice as well as between research and policy. It departs from traditional EBM in that it values theoretical, experiential, empirical and contextual research and non–research evidence equally or hierarchically to answer a broader range of questions for which there is no definitive evidence (National Collaborating Centre for Methods and Tools, 2011). It is also ‘systematic’, methodologically reproducible, transparent and efficient with high quality outputs to guide practice and policy on an inclusive rather than exclusive evidentiary basis. The complete practice of EBM comprises five steps. Straus et al. (2008, pp. 3–4) set these out as: 1) converting the need for information into an answerable question, 2) tracking down the best evidence with which to answer that question, 3) critically appraising that evidence for its validity, impact and applicability, 4) integrating the critical appraisal with our clinical expertise, patient biology, values and circumstances, 5) evaluating our effectiveness and efficiency in executing steps 1–4 and seeking ways to improve them. The approach to access information is determined by how research evidence is organised and what access is available: Original published articles in journals (Studies), Cochrane reviews (Syntheses), Evidence-based journal abstracts (Synopses) and computerised decision support (Systems) (Straus et al., 2008).

The evidence appraised for this systematic synthesis of literature was gathered based on electronic searches using the following Cape Peninsula University of Technology (CPUT) electronic databases: (a) EBSCO Host (Health Source Consumer Edition, Health Source Nursing/Academic Edition and Medline), (b) PubMed, (c) Science Direct, (d) Google Scholar, (e) Google, (f) iol.co.za, (g) news24.com, (h) Sage Publications, (i) Cochrane Library, and (j) Medical Research Council. Keywords included: “Domestic Violence, Domestic violence health care, Domestic violence pre-hospital, Domestic violence prevention, violence women, gender based violence, paramedic/ pre-hospital role/ duty” and “domestic violence South Africa”. Research and non-research evidence (in English) was considered with publication dates from 1999 to 2011, although studies from 1996 (3) and 1998 (3) were included. Upon screening 164 articles for content relevance, 53 were critically appraised against predetermined criteria for relevance of the evidence, robust nature of the evidence and presence of bias. A thematic analysis ensued in terms of strength of evidence (either strong or weak evidence) and frequency of finding (either majority or minority findings). A criterion-referenced hierarchy of evidence attained the best evidence- relative to the question in chief.

Upon screening of title, abstract and/or content, 111 articles were excluded due to irrelevance, duplication and poor/inadequate information relative to the question. The
Appraisal criteria are made up of three major sections (Relevance, Robustness and Bias). The individual criteria within each section was scored. High scores were given when evidence was clear, relevant, reliable, consistent, unbiased and had minimal conflict of interest. Relevance criteria included the research question being asked; the topic/field in which the question was asked and the degree of applicability of the evidence (context) in relation to South Africa and emergency health care. Robustness or reliability criteria included the sample size of the study, ‘Measures’ indicating the appropriateness and consistency of the tools/processes used to document and locate findings and ‘Analysis’ criteria referred to the process of analysis used. Bias criteria included the integrity and motive of the author and the institution. Scores were then ranked with the median score delineating strong evidence from weak evidence.

Figure 1: Evidence Informed Decision Making Process
Table 2: Hierarchy of Evidence

**Primary Research (Quantitative and/or Qualitative)**

i. **Quantitative:** Experimental and/or descriptive studies comparing screening tools and its efficacy for domestic violence/ gender based in the pre-hospital or emergency department environment. Experimental and/or descriptive studies comparing domestic violence training/ educational interventions for health care providers for screening/ victim identification.

ii. **Qualitative:** interviews or focus groups exploring the experiences of victims after interventional measures specific to domestic/ gender based violence prevention.

**Secondary Research (Quantitative and Qualitative)**

iii. **Quantitative:** Systematic reviews and/or meta-analysis of trials and/or studies revolving around domestic violence screening tools and/or interventional/ prevention strategies.

iv. **Qualitative:** Reviews of interviews and or focus groups exploring the benefits of interventions by health care providers regarding incidences of domestic/ gender based violence prevention.

**Non-Research (Particularly South African Context)**

v. **Experiential:** The views by health care providers and health care receivers regarding the interventions for gender based violence/ domestic violence prevention.

vi. **Contextual:**
   - **Qualitative:** Reports/ reflections/ experiences on the interventions/ prevention measures for gender based/ domestic violence
   - **Quantitative:** Reports/ audits comparing interventions or policies for gender based/ domestic violence prevention.
   - **Theoretical:** Political, Economic, Environmental, Social, and Technological barriers in the acceptability of domestic/ gender based violence prevention

**RESULTS**

**STRONG MAJORITY EVIDENCE/FINDINGS**

Educational intervention/s increases health care providers understanding of and improves screening for DV

Increased training and competence in assisting victims of violence in the out-of-hospital setting may allow earlier intervention, before the violence escalates and the patient is seriously harmed (McCoy, 1996). These findings were seen in 876 cases in the Boston EMS population (Husni, Linden, & Tibbles, 2000). EMS providers are in a unique position to help of domestic violence by treating the injuries, providing support, resources and
information or when that is not possible, by alerting the hospital emergency department (Mason, Schwarts, Burgess, & Irwin, 2010). Basic knowledge-building exercises such as general knowledge surveys on domestic violence and post instruction tests have shown marked improvement about domestic violence, which may have some influence in increased levels of screening for domestic violence in emergency care contexts (Weiss, Ernst, Blanton, Sewell, & Nick, 2000). There is also evidence that additional strategies such as specific screening questions were associated with an increase in intimate partner identification rates (Waalen, Goodwin, Spitz, Peterson, & Saltzman, 2000). In addition to knowledge-building surrounding domestic violence identification and intervention, the literature also promotes reliable methods for assessing service provider characteristics and their requirements for additional training (Maiuro et al., 2000).

The development and use of a screening tool/ guidelines/ procedures for DV improves intervention and is acceptable to EC providers

EC personnel thought that disease and injury prevention should take place during emergency calls (Lerner, Fernandez, & Shah, 2009). The development of an intimate partner violence screening tool and clear organisational implementation measures could potentially see early intervention increase due to pre-hospital identification and reporting (Datner, Shofer, Parmele, Stahmer, & Mechen, 1999; Edlin, Williams, & Williams, 2010). There are a number of dimensions to these policies that should be considered. These include: (a) Wadman and Mulleman (1999) show that the use of screening tools may provide optimal treatment, identification and screening procedures are critical to timely interventions in DV cases; (b) referrals to DV support services as the primary outcome measure is an intermediate outcome to reduce violence and improve quality of life and mental health for DV victims who are referred (Gregory, et al., 2010); (c) physical assessment and interviewing by healthcare providers including emergency personnel and (d) screening of pregnant patients who include the presence of certain clinical features. Other policy developments have also been recommended; for instance, addressing the fears of health care workers when dealing with DV cases and encouraging “team approaches” when managing patients of DV (Kilonzo et al., 2009).

When considering evidence-based policy development, data quality is paramount. Barriers to data quality are cited throughout the literature and include the following: lack of organizational support; characteristics of the violence-related data elements; design of the ambulance run report form; and paramedic knowledge, attitudes, and behaviours regarding data collection (Boergerhoff, Gerberich, Anderson, Kochevar, & Waller, 1999). Finally, health sector screening is a priority (Martin & Jacobs, 2003) as it facilitates access to care. A computerised system for screening emergency room (ER) patients for intimate-partner violence did not endanger victims either in the hospital or after they went home. More than one third of abuse victims said they had sought help based on the information they had
received. There are high rates of unrecognised abuse among emergency department (ED) patients, and centres should consider screening for it (Norton, 2008).

**STRONG MINORITY EVIDENCE/FINDINGS**

**Victims perceive DV screening to be acceptable**

There are two major findings regarding screening: disclosure opportunities and support. For instance women believed that being asked about intimate partner violence could be an opportunity for women in abusive relationships to access services and help (Christofides & Jewkes, 2010). They also found discussion of sexual violence by their health care providers to be nonintrusive and helpful (Littleton, Berenson, & Breitkopf, 2007). A majority of women reported favourable reactions after being asked questions around DV (Magen, Conroy, & Del Tufo, 2000).

**The barriers to DV protocol adherence include educational, linguistic, cultural, institutional and personal factors:**

Educational, linguistic, and cultural factors appear to affect the likelihood that health care providers discuss particularly sexual violence with their patients (Littleton et al., 2007). There are many obstacles in the DV screening and referral protocol. A long-term approach to protocol adherence in the ED is needed (Waller, Hohenhaus, Shah, & Stern, 1996). Providers received little training in DV. Nurses (Davies & Edwards, 1999), physicians and social workers in trauma centres were seen to rarely screen for DV. There are institutional and personal barriers impeding intervention for victims of DV (McGrath et al., 1997).

**HIV testing and prophylactic care for DV and rape victims are prerequisites for comprehensive care**

HIV testing and DV inquiry are important steps in identifying victims and referring them for appropriate care. There needs to be a linkage in the form of cross-referrals using standardised referral pathways and guidelines, protocols and medico-legal procedures in order to achieve comprehensive care for post-rape victims (El-Bassel et al., 2006).

**WEAK MAJORITY EVIDENCE/FINDINGS**

**Educational intervention/s increases understanding of DV and its early detection and treatment in the emergency setting**

Environmental enabling factors are relatively easy to initiate and are proven to increase inquiries about DV, as well as a small increase in case findings (Littleton et al., 2007; Thompson et al., 2000). Endeavours such as the DNA Project highlights the forensic role
EC providers can play (DNA Project, 2011). A voiced desire of the participants in a study about women’s perspectives of the emergency department of a hospital was for sincere interaction with a professional helper, and recognition of the victim’s lack of knowledge regarding shelters or protective services. When healthcare providers understand the context of DV and victims perceived needs, the ED will better serve female victims (Mayer, 2003). Improving the levels of knowledge about DV is important in detecting and treating the DV victim (Weiss et al., 2000). Results improved from 59 % to 70% correct after 3 hours of instruction but an understanding of DV was seen for only 4 out of 11 questions. These results indicate the need for more instruction on DV for EC providers (Weiss, Ernst, Blanton, Sewell, & Nick, 1999).

**Routine, universal screening for DV is supported in the emergency setting**

A simple direct questionnaire significantly improves the detection rate of DV in the ED. Direct questioning requires minimal time and should be incorporated into the patient assessment (Morrison, Allan, & Grunfeld, 2000). Routine screening for abuse is an essential element of history taking. Awareness of the patient’s experiences with DV is required to keep appropriate adjustments in patient management (te Kolstee, Miller, & Knaap, 2004). Both high and low risk patients should be screened for DV (Datner, Wiebe, Brensinger, & Nelson, 2007). Patients seen in an ED must be identified as a population at risk for DV and these situations can be identified only by a systematic assessment using a standardized questionnaire (Witting, et al., 2006). The Domestic Violence Act 116 provides case definitions for DV (Republic of South Africa, 1998; Warby, 1999). Pregnant women presenting to the ED may be at greatest risk of current DV and preterm birth (“Abused women at risk of preterm birth”, 2008) if they are young, have less than a high school education, have a prior diagnosis of trichomonas, and report current marijuana or alcohol use (Lejoyeux et al., 2002).

**WEAK MINORITY EVIDENCE/FINDINGS**

**Barriers to DV Screening include practitioner factors, institutional factors and lack of research on intervention outcomes**

Providers rarely screen for DV. There are institutional and personal barriers impeding intervention in victims of DV (McGrath et al., 1997). It is unknown whether screening for DV in EDs, followed by counselling, referrals, and support, can change the risk of future DV-related injuries to those patients (Houry et al., 2004). Practitioners should familiarise themselves with these barriers (Gremillion & Kanof, 1996) and the socio-political challenges of DV intervention (Vetten, 2005).
Regulatory and other social agencies should/can develop tools to screen

Violence is frequently used to resolve a crisis of male identity, at times caused by poverty or an inability to control women (Jewkes, 2002). As such, health care workers, police officers, paramedics, social workers, and public health officials should work together to develop screening protocols for systems that will be the most effective for victims (Datner et al., 1999).

**DV screening is effective for DV detection in the emergency setting**

A simple direct questionnaire significantly improves the detection rate of DV in the ED (Morrison et al., 2000). A three-question DV screen identifies a subset of women in the ED who are at high risk for subsequent physical violence and verbal aggression (Houry et al., 2004). No significant differences were found between different methods of screening for DV on any measurement, including refusals (Furbee, Sikora, Williams, & Derek, 1998). The out-of-hospital use of a DV screen for assessing patient risk is probable (Weiss et al., 2000).

**DV awareness by health care providers is a clinical and epidemiological imperative (Rickard, 2011)**

Awareness of the patient’s experiences with DV is required to make appropriate clinical adjustments in the management of the patient (Jewkes, Levin, & Penn-Kekana, 2002). Violence is a widespread and serious public health problem in South Africa, affecting both women and men in their intimate partnerships (Gass, Stein, Williams, & Seedat, 2011; “SA domestic violence as grim as HIV”, 1999). A history of alcohol abuse by the male partner, as reported by the female partner, was the strongest predictor for acute injury from DV (Kyriacou, McCabe, Anglin, Lapesarde, & Winer, 1998).

**DISCUSSION**

To globalise and contextualise the EC policy discourse, a brief presentation of World Health Assembly (WHA) Resolutions is followed by World Health Organization (WHO) Africa Regional Committee considerations and prevention implications. Study limitations are also critically presented.

**HEALTH SYSTEMS: EMERGENCY-CARE SYSTEMS**

The WHA Resolution 60.22 (World Health Assembly, 2007) in considering the report on Health systems: Emergency-care systems (World Health Organization, 2007), recalled resolutions WHA56.24 (World Health Assembly, 2003) on implementing the recommendations of the
World report on violence and health and WHA57.10 (World Health Assembly, 2004) on road safety and health, which respectively noted “that violence was a leading worldwide public health problem and that road-traffic injuries caused extensive and serious public-health problems” (World Health Assembly, 2007, p. 1). These two previous resolutions are linked inextricably with the resolution on emergency-care systems development (WHA 60.22; World Health Assembly, 2007), and calls on the WHO, ministries of health and civil society to advocate for and strengthen EC systems to respond to the burden of trauma and emergencies (that interpersonal violence invariably perpetuates). EC personnel also function in disaster and humanitarian settings in Africa where despite sexual violence in armed conflict is a crime against humanity, it “is being used as a method of war to brutalise and instil fear in the civilian population, especially women and girls” (Inter-Agency Standing Committee, 2005, p. iii). There are parallels and shared foundations between DV and global terrorism. DV is “everyday terrorism” (Pain, 2014).

PREVENTION IMPLICATIONS FOR EC PROVIDERS

A 2001 to 2010 review of the implementation of the Health Promotion Strategy for the African Region identified that there was “limited involvement of players such as community-based groups, civil society, academia and development partners in advocacy actions and regulation and legislation for good health governance” (WHO Regional Committee for Africa, 2012, p. 6). It also noted “a paucity of human resources to carry out health promotion activities at community level and a lack of sustainable financing mechanisms for health promotion” (WHO Regional Committee for Africa, 2012, p. 6).

Pre-hospital care providers are potentially the first point of contact for victims of DV. This places this group of health care practitioners in a unique position to identify these victims in the acute and non-acute setting, soonest (Naidoo et al., 2013), and at no additional operational cost (except for training costs). Early recognition and early intervention is seen as one of the most effective methods of DV prevention. There is an ethical obligation to implement a comprehensive health approach to manage DV victims. DV needs to be recognised as a health priority by all levels of the health sector and the development of policies and guidelines for all levels is essential to comprehensively address DV. This should include an examination protocol for the management of women who have experienced abuse (Martin & Jacobs, 2003). In response, the HPCSA has approved screening guidelines in EC.

Early identification and recognition of these victims may play a role in decreasing the burden of DV cases in South Africa. Valid screening tools must be adapted to the EC environment to achieve this goal. The mandatory screening for DV by EC providers should be implemented in the pre-hospital setting. Although recent WHO (2013) recommendations, in their idealism (Joyner, 2013) do not support universal screening, this is unlikely to be
directed at pre-hospital providers, who could screen routinely, create awareness of DV prevalence and implement clinical case-finding (Naidoo et al., 2013). “It is the everyday conditions that make violence possible and probable. As a social practice, violence is made permissible through normalised, everyday discriminations…These discourses of prejudice…make material acts of violence imaginable and explicable.” (Shefer, 2013, p. 4). Not immune, EC providers, in their everyday practice of health care, participate in failed resuscitations and are exposed to extremes of trauma, that serve to not only normalise its occurrence, but also to undermine their EC response. Despite an EC response to both cases, there was no outcry or any reflective discourse by the EC community for the late Anene Booysen or Reeva Steenkamp- not at the level of EC, forensic practice or violence prevention, presenting yet another lost opportunity. Such violence, albeit extreme, may be considered ‘normal’ (Judge, 2013) for emergency care.

Limitations of the ‘Health Promotion Strategy for the African Region’ can be mitigated for DV by enhancing the EC clinical and systems response, on the premise that the more than 71 000 strong South African EC profession (Table 1) are all latent health promoters with a current disproportionate focus on ‘tertiary care modalities’ and with sustainable alternative funding. The recent pilot of the DV call centre by the Department of Social Development highlights the lack of inter-sectoral collaboration. After-all, EMS has established communications centres in every Province that could facilitate early detection and referral nationally, given an ideological shift. The case for the ‘health promotion value proposition’ of EC involvement in DV prevention and management in South Africa is made (Naidoo, Knight, & Martin, 2013). The potential for this value proposition that intersects EC and health promotion to extend into the rest of Africa has promise as southern African countries embark on EC implementation strategies (Christopher et al., 2014).

**STUDY LIMITATIONS**

There were no random or systematic errors to declare. In particular, measurement error was prevented by using critical appraisal tools that have been tested (Naidoo, 2007) and expert validated (Naidoo & Christopher, 2009). The obvious limitation is the selection/sampling bias brought about by the availability and accessibility of databases. This may be compounded further by inherent publication biases. This consideration is mitigated by the evidence period and the inclusion of multiple databases. A University of Technology may have limited access to evidence from the humanities but EjIDM is intended to enable decision-making, despite the researcher’s context. The findings validate the claim of internal validity as we now have a highly specific hierarchy of evidence upon which to base policy and practice.

So, what of external validity? A case in point is the international finding that barriers to DV protocol adherence are multifactorial is also documented in the South African context.
This evidence, with direct reference to South Africa, did not emerge in the review. The non-sampling of this article and others could be due to the specificity of the search criteria, as this study was not in the pre-hospital environment. The alignment of these review findings to the Joyner article and others not sampled (and published after 2011) does however support a claim to stability and external validity. There is methodological coherence (Naidoo, 2011) with the post-positivist paradigm and for this reason; positivist critique would be epistemologically incongruent and consequently unfair and invalid. The critical appraisal tool satisfies criteria for construct, content, face and criterion-related validity. Findings have local relevance with international comparability.

The critique of EBM includes a limited focus on ‘effectiveness’ and RCTs, that it is simplistic (what works best for simple interventions), exclusionary (ignores other questions/evidence), difficult (requires dedicated expertise), expensive (time consuming), wasteful (excludes poorly reported evidence) and paralyzing when no decisions are made without evidence (Ellison, 2007). The former editor of the SAMJ agrees (Ncayiyana, 2007, p. 7):

What is new is EBM’s exclusive identification with systemic reviews and RCTs that has led to perceptions that diagnostic approaches and interventions not validated by RCTs have little or no validity. Furthermore, EBM zealots have tended to understare its limitations, such as the fact that RCT evidence relevant to many clinical situations simply doesn’t exist; that many clinical questions do not lend themselves to evaluation by RCT; that RCT evidence is population-based, and ‘does not answer the primary clinical question of what is best for the patient at hand’; that patient management choices are governed as much by evidence as by the limitations of time, space and resources; and that the EBM approach itself is not evidence based, there being no RCT evidence showing that it improves patient care.

Stoic implementation of the EBM-aligned method (Straus et al., 2008) assured a valid review process (Glasziou, Del Mar, & Salisbury, 2003). Aguinaldo argues that in positivist approaches, it is acceptable to be asking about research: “Is this valid?” In non-postivist designs however, he suggests a social constructivist move toward: “What is this research valid for?” (Aguinaldo, 2004). The authors argue that this review method is both internally and externally valid and that the research is valid for supporting methodological growth in EC and in providing evidence-informed answers to the study question.

CONCLUSION

The strong, majority findings are that educational intervention/s increases the health care providers understanding of DV and improves screening for DV. DV related CPD activities
and medical curricula, are therefore crucial to build agency amongst EC providers for implementing screening and overcoming its barriers. Routine, ‘universal’ screening for DV is supported in the emergency setting (Naidoo et al., 2013). DV awareness by health care providers is a diagnostic, clinical and epidemiological imperative. The health sector must work collaboratively to combat DV. Further research is needed about the role of first responders in DV prevention and their effectiveness. An EC response knowledge base is needed in order to assist system implementation and evaluation. Strategies “informed by research evidence during development are most likely to be effective in preventing gender-based violence on a large scale” (Gevers et al., 2013, p.14).

The emergency medical services (EMS) are a structure within the health sector, and–according to the evidence, can be utilised to further the health and human rights prerogative of DV prevention. Utilization of a resource such as the EMS for DV prevention can provide the Department of Health with an additional tool for primary prevention and intervention. The paucity of evidence in the pre-hospital environment is of interest as the abuse is located and perpetrated here. More research is needed in the evolving epidemiology of DV, the health needs of perpetrators and victims and the role of pre-hospital systems in promoting health and preventing the morbidity and mortality associated with DV.

This study also validates the use of EiDM in DV intervention by both EC practitioners and researchers as the approach is enabling of both policy development and ethical practice. “Emergency medicine is the only discipline with ‘universality’ and ‘responsivity’ at the point of need. This implies the potential for the simultaneous widespread facilitation of access to (emergency) health care” (Christopher, et al., 2014, p. 157) and indeed, health promotion. “To ensure that our responses to the brutal and demeaning legacy of sexual and other gender violences are not deployed in reproducing the very brutalities they seek to challenge, we need to unpack and interrogate carefully the things we say and do” (Shefer, 2013, p. 3). This review supports the aim that EC research is not complicit in reproducing the past- in EC policy or practice.

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CONFLICT OF INTEREST
None.

REFERENCES


Between March 27-29th in 2014, the American Men’s Studies Association (AMSA) held its 22nd annual interdisciplinary conference at the University of Washington campus in Tacoma, Washington State, U.S.A, which is located about an hour from Seattle. The American Men’s Studies Association was formally established in 1991, although the roots of the organisation stem into the early 1980s. The U.S. is the site of many of the pioneers in studies on men and masculinities, several of whom were part of AMSA’s formation (e.g. Harry Brod and Michael Messner). From AMSA’s origins it has been an anti-sexist organisation. Although the organisation is open to approaches to men and masculinity that are not explicitly driven by feminist principles (e.g. the mythopoetic movement), the organisers indicated that there were nonetheless limits to this openness (e.g. certain Men’s Rights Activist groups were no longer welcomed), and it was suggested that links to feminism informed an important aspect of the organisation’s values.

The focus of the conference was explicitly on masculinities in international and regional cultures, and whilst the conference did focus largely on issues affecting American males, there was also clearly an effort to consider and include speakers from other countries and also those representing minorities within the U.S. This is reflected in the selection of the keynote speaker and the scholar-in-residence address. The keynote speaker was Professor Shahin Gerami, originally from Iran but having emigrated to the U.S., who discussed her personal academic journey as an Iranian women in the U.S., as well as some of the intricacies of Islamic masculinity and its relationship to Western fear and racism. The scholar-in-residence address was by Ty Kāwika Tengan, who discussed his experiences and analysis of a cultural organization in Hawaii which aims to revitalise indigenous warrior practices and philosophies with native Hawaiian men. These speakers broached notions
of national and cultural identity, colonization, racism and Western imperialism, setting the
tone of the conference through the acknowledgment of the multiple factors other than
gender which shape men’s lives and their experiences of masculinity.

Accordingly, issues around how masculinity in different contexts is linked to and affected by
race and colonialism were present in many of the presentations. Although the presentations
were from a range of countries, as a South African I found it incredibly interesting and
illuminating to see the commonalities in the discourses surrounding race, racism and
masculinity across contexts, even in such vastly different countries such as the U.S and
South Africa.

The mission statement of AMSA includes that it “advances the critical study of men and
masculinities by encouraging the development of teaching, research, and clinical practice
in the field of men’s studies.” Accordingly, scholars, academics and practitioners alike were
represented as presenters at this conference, and the interests of each of these groups
appears to have been well catered for. Additionally, as the conference was interdisciplinary,
it showcased a wide variety of distinct fields, demonstrating differences in approaches to
masculinity studies from disciplines such as psychology, philosophy, anthropology, literary
studies and public health, to name a few.

The fact that the conference consisted of both practitioners and academics and was also
interdisciplinary provided a welcome balance in terms of content and approach. To give
an idea, there was a panel which focused on masculinity within clinical practice, and other
presentations which ranged from an historical analysis of media representations of white
masculinity during the economic depression (Michael Goebel – *Beached White Male:
Imperiled Masculinity in the Great Recession*); to a researcher’s regrets and concerns
about a participant relationship that ended badly (Zachary Morrisson – *Thanks for Using
Me: A Researcher’s Failure to Negotiate Closure*); to the perceived effect of gender-
progressive legislation on males in Rwanda (Sarah Tlapek–*Men’s Perceptions Of Threats
To Masculinity From Women’s Empowerment In Rwanda*), to a critical literary analysis of
how masculinity and heterosexual romantic relationships are portrayed in some popular
contemporary fiction (Elizabeth Mansley and Dana Hysock Witham–*Stalking As The New
Courtship: Exploring The Portrayal Of Stalking Behaviors In The “Twilight” Saga And
The “50 Shades Of Grey” Trilogy*). These examples demonstrate some of the diversity in
terms of disciplinary approach to masculinity at the conference. (As there were multiple
concurrent sessions, the use of these examples is clearly biased by the presentations I
chose to attend, and for those interested in a more complete picture the AMSA website has
a comprehensive listing of the conference presentations and abstracts).

Getting participants to actively engage with one another was another clear aim of the
conference organisers. In one of the sessions, the conference was split into six roundtable
groups: Thinking on Men in Therapeutic, Educational, Social Justice, Cultural, Mediated and Community Contexts. This format was intended for delegates to be able to engage with others interested or working in similar contexts, and in a subsequent session the significant points that came up were presented to the rest of the conference. Whilst it seems like the experiences differed quite significantly from group to group, this did seem to have been a useful format for sparking discussion and for networking amongst delegates. There were also two ‘cocktail hours’ and dinners, and extensive breaks between sessions, which enabled more informal networking and socialising amongst delegates.

A significant theme of this conference was of not only providing academic presentations, but also of thinking practically about how theory and research on men and masculinities might inform working with men in a variety of different settings. Indicative of this theme, another presentation which stands out was by Andrew Smiler, Lisa Hickley and Bob Minor, *Reaching Men Where They Live: Getting Guys to Talk About Masculinity*. This presentation contained practical information from three experts who work with men in a variety of different ways, ranging from virtual forums, to books, to men’s groups. The pre-conference workshop I attended on the *Men’s Stories Project*, run by Josie Lehrer, was another example of a practical intervention and how others might apply it in their own contexts.

In terms of organisation and administration, this conference was run very smoothly. The organiser, Jeff Cohen, was very friendly and, helpful and responsive to emails and attentive to requests. The conference also had a downloadable cellphone app to assist with the conference programme and presentation venues. Following the conference, presenters were also invited to submit their work for a special issue of the *Journal of Men’s Studies*, on some of the conference proceedings.