

UNIVERSITY OF CAPE TOWN

**The Effect of the Violence Prevention through Urban Upgrading
(VPUU) Intervention on Violence-related Injuries Presenting to Health
Facilities in Khayelitsha and Nyanga**

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TRPLYD001

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PREAMBLE

DECLARATION

I, *Lydia Trupe*, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, or is being, or is to be submitted for another degree in this or any other university.

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ABSTRACT

Background: Violence is one of the leading causes of morbidity and mortality in South Africa's Western Cape province. Recent efforts, both globally and locally, have focused on using emergency room surveillance systems to collect data on violent injuries and to use these data to inform comprehensive, sustainable interventions such as urban upgrading. Drawing on insights from criminology, these urban upgrading interventions have sought to use environmental design to ameliorate socio-ecological factors related to violence.

Objective: To use injury surveillance data in order to describe the pattern of violent injuries presenting to health facilities in the communities of Khayelitsha and Nyanga and to assess the effect of the Violence Prevention through Urban Upgrading programme (VPUU) on risk of violent non-fatal injury in these two areas.

Methods: We conducted a case-control study using data from a series of semi-annual rapid assessments to compare violent and non-violent injuries in adults presenting to five health facilities in Khayelitsha and Nyanga between September 2013 and October 2015. Multivariable logistic regression was used to assess the risk of violent injury with respect to demographic and behavioural characteristics and exposure to the VPUU intervention.

Results: Multivariable analysis of 1,753 complete cases revealed that living in a VPUU intervention area was protective against presentation for violent injury when controlling for other risk factors (OR=0.75, $p=0.022$). Age, gender, race, and alcohol consumption were also found to be significantly associated with presentation for violent injury. There was a statistically significant interaction effect between alcohol and gender; the association between alcohol consumption and violent injury was stronger in women than in men.

Conclusion: This study highlights the demographic and behavioural factors associated with violent injury and provides preliminary evidence of the reduction of violent injury risk in VPUU intervention areas.

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LIST OF ABBREVIATIONS

BoD	Burden of Disease
CHC	Community Health Centre
CI	Confidence Interval
CoCT	City of Cape Town
DfID	Department for International Development (UK)
HST	Health Systems Trust
IDRC	International Development Research Centre
IPV	Intimate Partner Violence
IRR	Incidence Rate Ratio
GBV	Gender Based Violence
LMIC	Lower- and Middle-Income Countries
OR	Odds Ratio
PIMSS	Provincial Injury Mortality Surveillance System
RA	Rapid Assessment
SD	Standard Deviation
UCT	University of Cape Town
UK	United Kingdom
US	United States
VPUU	Violence Prevention through Urban Upgrading
WC	Western Cape
YLL	Years of Life Lost

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SECTION A: RESEARCH PROTOCOL

The Effect of the Violence Prevention through Urban Upgrading (VPUU) Intervention on Violence-related Injuries Presenting to Health Facilities in Khayelitsha and Nyanga

Background

Injuries are one of the leading causes of premature death and disability around the world, accounting for 10% of global mortality (WHO, 2008). Violence (including homicide, suicide, and war) accounts for nearly one third of these injuries, claiming an estimated 1.2 lives annually (Haagsma et al., 2016). The vast majority (approximately 90%) of these deaths occur in low- and middle-income countries (WHO, 2014). In South Africa, prevalence is particularly high, with violence being the fifth highest cause of years of life lost (YLL) in 2013 (Naghavi et al., 2015). Following global patterns, the burden of violence-related mortality in South Africa is highest among males and young adults (Msemburi et al., 2015; Norman et al, 2007). Interpersonal violence is the second highest single-cause of death among males, and among those aged 15-29 and 20-44, the rate of interpersonal violence in South Africa is 9.3 and 9.4 times that of the global average, respectively (Msemburi et al., 2015; Norman et al., 2007).

Prioritization of local prevention efforts is critical to addressing the high rates of violence in South African communities, and research has indicated that detailed sub-national data are necessary for implementing and assessing these neighbourhood interventions (Matzopoulos & Corrigan, 2013). The second Western Cape Burden of Disease BoD Reduction Study, conducted in 2010, indicated that 10.4% of premature mortality in the province was due to interpersonal violence (Groenewald et al., 2013). For males in the Western Cape, interpersonal violence was the leading cause of YLL, accounting for 12.8% of deaths and topping HIV/AIDS, TB, and cardiovascular causes (Groenewald et al, 2013). The Provincial Injury Mortality Surveillance System (PIMSS) was implemented in 2009 as a response to the need for local level mortality data (Groenewald et al., 2013). Data from PIMSS revealed that nearly two-thirds of deaths in the Western Cape occurred in the Cape Town metro district, with interpersonal violence accounting for 8.9% of these deaths, second to only HIV/AIDS (Groenewald et al., 2013).

Risk factors for experiencing violence occur at both the individual and societal level. The primary biological risk factors are age and sex, with young males at higher risk of both experiencing and perpetrating violence (Matzopoulos et al., 2008). Behavioural risk factors include individual personality characteristics (such as aggression) that may be caused by childhood trauma, diet, or exposure to lead, as well as alcohol or substance abuse (Matzopoulos et al., 2008). In a study of injuries reporting to trauma centres in three large South African cities (Cape Town, Durban, and Port Elizabeth) from 1999-2001, more than 50% of injuries were associated with alcohol use (Pluddemann et al., 2004). In addition to individual risk factors, certain group characteristics are also associated with an increased risk of violence, and high-violence neighbourhoods often share common characteristics. Societal risk factors, including reduced social cohesion, association with violent friend groups or gangs, social norms of violence, and ineffective policing are all associated with increased levels of violence, as are structural risk factors including poverty and inequality (Matzopoulos et al., 2008). A cross-country comparison indicated that high levels of inequality are significantly associated with increased crime rates (Fajnzylber, Lederman, & Loayza, 2000). Inequality appears to be a more important contributor than poverty with respect to increased rates of violence; as neighbourhoods with high levels of poverty but low levels of inequality experience lower violent crime rates than societies with high levels of inequality (Kawachi et al., 1997). Research has suggested that the association between inequality and violence may be mediated by a reduction in social capital (Kawachi et al., 1997; Sampson, Raudenbush, & Earls, 1997). There is some evidence that reduced social capital is also associated with increased alcohol use and increased risk of mental disorders (Ausen & Nillson, 2013; Weitzman & Chen, 2005; De Silva et al., 2005). Levels of both poverty and inequality are remarkably high in South Africa. In 2014, the World Bank ranked South Africa as the most unequal country in the world, with a GINI coefficient—one measure of income inequality—of 0.65 (World Bank, 2014). The City of Cape Town also experiences an extraordinarily high level of inequality, with a reported GINI coefficient of 0.67 in 2011 (United Nations Human Settlements Program [UN-HABITAT], 2011). More than one-third (35.7%) of the city's population lives below the poverty line, and 23.9% of residents are unemployed (Statistics South Africa [StatsSA], 2011). High levels of inequality and

reduced levels of social capital, widespread alcohol and substance abuse, and a high prevalence of mental disorders may all contribute individually or jointly to high levels of violence experienced in Cape Town communities.

In 2001, in response to the need for violence prevention interventions to address upstream causes of violence, the South African government in partnership with the German government began to develop a programme that focused on urban development and reduction of violence. The Violence Prevention through Urban Upgrading programme (VPUU) was implemented in 2005, and has been rolled out in three phases: (1) arranging and planning for implementation, including identification of key target areas, definitions of community boundaries, and baseline surveys; (2) implementation of the programme in Khayelitsha; (3) further rollout and scaling in Khayelitsha and replication of the methodology in other informal settlements including Nyanga/Gugulethu (City of Cape Town [CoCT], 2015). Drawing on the UN Habitat Model for Safer Cities, VPUU emphasizes a holistic society approach that recognizes the complexity of addressing violence and utilizes both upstream and downstream approaches to address the wide range of drivers (Cassidy et al., 2015). VPUU encompasses five major components: (1) *situational crime prevention* through the use of infrastructure development and urban planning to develop safe and accessible communities; (2) *social crime prevention* by building community identity and instituting social and cultural programmes targeting the root causes of violence (such as youth education and victim support); (3) *community operation, maintenance, and management* including improvement of service delivery and community functionality; (4) *community participation* through engagement of community members and stakeholders in planning, implementation, and management of the programme; and (5) *knowledge management* through the dissemination of research and lessons learnt (CoCT, 2015). As part of this knowledge management strategy, extensive data collection and research are being conducted to determine the efficacy of community-based upstream interventions such as VPUU. The International Development Research Centre (IDRC) and the UK's Department for International Development (DfID), in partnership with community stakeholders and the University of Cape Town (UCT), are conducting annual household surveys in both Khayelitsha

and Nyanga/Gugulethu, which include information on household demographics, attitudes towards urban upgrading and alcohol policy, experience of violence, mental health, and alcohol behaviours. Simultaneously, the non-profit organization Health Systems Trust (HST) is conducting semi-annual rapid assessments (RA) on acute injury incidence in the targeted communities. Additional data collection includes mapping of liquor outlets and records of robberies obtained from police databases. In order to integrate these diverse sources, all data is geographically linked. Despite the significance of upstream factors on violence, there is limited literature available on the efficacy of upstream, intersectoral interventions to address root causes of violence, particularly in low- to middle-income countries (LMIC) (Matzopoulos, 2010). Thus, there is significant need to evaluate the efficacy of programmes such as VPUU in order to determine whether they can be used as a model for violence prevention in low- to middle-income contexts.

Aim

Aim: This study aims to assess the effect of the VPUU intervention on prevalence of non-fatal violent injury in adults in the communities of Khayelitsha and Nyanga.

Objectives

Objective 1: To describe the pattern of injuries, and specifically violent injuries, presenting to health facilities in Khayelitsha, Gugulethu, and Nyanga.

Objective 2: To determine whether the prevalence of non-fatal violent injury in Khayelitsha, Gugulethu, and Nyanga is associated with key risk factors including age, sex, and concurrent alcohol use in order to determine what individual risk factors may be associated with receiving a violence-related injury.

Objective 3: To determine whether the prevalence of non-fatal violent injury in Khayelitsha, Gugulethu, and Nyanga is associated with the presence of an urban upgrading intervention (VPUU), controlling for known confounders, in order to determine the effect of this intervention on prevalence of violence related injury.

Methods

Study Design

This study will be a case-control study analysed using quantitative methods. Secondary data analysis will be conducted using an existing dataset from the study *“Injury Morbidity Surveillance in Nyanga and Khayelitsha in the Western Cape.”*

Data Source

Data on prevalence of violent injuries as well as potential confounders will be obtained from the study *“Injury Morbidity Surveillance in Nyanga and Khayelitsha in the Western Cape,”* a repeated rapid analysis (RA), conducted by Health Systems Trust (HST) from 2012-2015. Rapid Assessments (RA) were conducted for one-week periods semi-annually in three communities: Khayelitsha, Nyanga (including Gugulethu), and Elsies River. The areas of Khayelitsha, Nyanga, and Elsies River were selected because they were among those identified by the Western Cape Provincial Cabinet as having a high risk of alcohol-related-violence. This study will use data from only Khayelitsha and Nyanga, as data collection in Elsies River did not continue after 2012. From these areas, 5 health facilities were sampled:

- In Khayelitsha: (i) Khayelitsha District Hospital (KDH), (ii) Khayelitsha Site B CHC, and (iii) Michael Mapongwana CHC
- In Nyanga: (i) Gugulethu CHC, and (ii) Nyanga CHC

Five weeks of trauma data were collected at the above facilities from September 2012-September 2015. For each RA, all individuals presenting to the Emergency Centre (EC) at each of these facilities who were identified by clinic staff as having an injury or who had an injury described and recorded in the EC register were approached for inclusion. All participants who gave informed consent were interviewed by the data collectors. Detailed information on location of injury, the perpetrator (in the case of violent injuries) and alcohol or drug involvement, in addition to basic demographic information, was obtained on a data tool (Appendix A) loaded on a mobile device. The reason for injury was self-classified as ‘violence’, ‘transport’, ‘unintentional’, or ‘self-harm.’ Non-injury cases, and cases who did not want to

provide details about their injury, were asked sign a waiver of informed consent and had basic demographic data collected. For this study we will aggregate from all five phases of RA's.

Case and Control Selection

Cases will be all those identified in the dataset who presented to a health facility with an acute non-fatal injury caused by violence. We will include all subjects who presented within 24 hours of the injury, where the victim was at least 18 years old, and for which the stated reason for the injury (as self-classified by the victim) was 'violence.' Those who refused informed consent or who do not meet the above criteria will be excluded.

Table A-1: Intervention and comparison areas in Khayelitsha and Gugulethu/Nyanga

	VPUU Intervention	Non-Intervention
Khayelitsha	Harare Kuyasa Monwabisi Park	Driftsands/Enkanini Ilitha Park/Phakamisa Khaya Makaya Makhaza Site B [subareas of Greenpoint, K, K2, L, LP, M, Masikhule, N, P, PJS, Q, QQ, R, RR, S, SB, T, TT, U, UT, V, VE, VT, W, WB, X, Y, YA, YAB, YB, and Z] Site C [subareas of Bongweni and Ikwezi Park] Tafelsig Town 2
Gugulethu/Nyanga	Nyanga [Old Crossroads] Phillipi Crossroads	Gugulethu Nyanga [excluding Old Crossroads]

Controls will be all adults (at least 18 years of age) identified in the dataset who presented to a health facility for a non-fatal injury not due to violence, including those for which the stated cause was 'transport' or 'unintentional.' We believe that these subjects will be a reasonable set of controls, as they are likely to share a similar risk profile to cases (including demographics, SES, and previous exposure to violence). We will exclude injuries for which the stated reason was 'self-harm.'

Exposure Variables

The exposure of interest for this study will be the presence or absence of VPUU exposure. Subjects will be considered to have received the intervention if they report that they reside in an intervention area. A total of 5 areas in Khayelitsha will serve as intervention areas, and 9 areas will serve as non-intervention areas. In Nyanga, 2 areas will serve as intervention areas, and 3 areas will serve as non-intervention areas. Intervention areas will be defined as those who have had any level of VPUU intervention since 2005. Non-intervention areas will be defined as those who have no VPUU intervention since 2005.

Known confounders that will be included in our analysis are age, sex, race, and concurrent use of alcohol and drugs.

Age will be measured in years and will be included in the analysis as a continuous variable. Sex will be binary (male or female) as reported by the subject. Race will be categorical (Asian, Black, Coloured, or White) as reported by the subject. Concurrent alcohol use and concurrent drug use will be recorded by the fieldworker as either 'yes/suspected,' 'no,' or 'unknown' and will be included in the analysis as a categorical (binary) variable.

Data Analysis

Data Analysis will be conducted using Stata version 13.1 (Stata Corporation, USA). We will conduct a multivariable analysis using logistic regression, due to the binary nature of our outcome variable (presence vs. absence of violence related injury). Potential confounders or effect modifiers that we will include in our model are age, sex, race, concurrent use of alcohol, and concurrent use of drugs. Prior to regression analysis, descriptive analysis will be conducted using means and standard deviations for normally distributed data and medians and inter-quartile ranges for non-normally distributed variables. Associations between the outcome of violent injury and categorical predictor variables will be determined using chi-square tests.

Table A-2: Dummy table—association between violent injury and presence of VPUU intervention

	Violent Injury Present (Case)	Violent Injury Absent (Control)	Total
VPUU Present			
VPUU Absent			
Total			

Table A-3: Dummy table—association between violent injury and binary confounding variables

	Violent Injury Present (Case)	Violent Injury Absent (Control)	Total
Confounder+ (Male, Alcohol Present, Drugs Present)			
Confounder- (Female, Alcohol Absent, Drugs Absent)			
Total			

Table A-4: Dummy table—association between violent injury and continuous confounding variables

Variable	Event (Violent Injury)	N	Mean	SD	Range	IQR	Min	LB	Median	UB	Max
Age	0										
	1										

Ethical Considerations

All data analysis for this study will be secondary, and no primary data collection on individuals will be undertaken. Ethical approval for the collection of these data has already been obtained from UCT Health Research Ethics Committee through September 2016 (HREC 399/2013), which has also been approved by the Department of Health’s Provincial Health

Research Committee. We will request an expedited review from the UCT HREC for this new use of the data.

Risks and Benefits: There are no direct benefits to participants in the study, nor are there any significant risks. This study may be used to inform policy on violence prevention within South Africa, and specifically within urban areas in the Western Cape. Thus, society (and research participants) may indirectly benefit from completion of the study.

Informed Consent: During data collection, informed consent documents were provided to each participant in their language of choice (English, Afrikaans, or isiXhosa). Participation in the study was voluntary, and individuals were permitted to at any time for any reason. For our analysis, only subjects from whom informed consent was obtained will be included. See Appendices for Informed Consent documents.

Privacy and Confidentiality: All data will be kept entirely confidential. Demographic information will be linked to a unique identifier, and no data will be linked to names. Rosters containing participant names and birthdates, as well as informed consent forms will be kept in separate locked file cabinets at UCT. Electronic records will be kept in a password-protected database and will be shared only over secured Internet connections. All field workers and research team personnel will be required to complete comprehensive training in confidentiality and working with human research subjects.

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SECTION B: LITERATURE REVIEW

Objectives

The primary objective of our study was to describe the pattern of violent and non-violent injuries, presenting to health facilities in Khayelitsha, Gugulethu, and Nyanga - located in Cape Town, South Africa. Our secondary objectives were to determine whether the prevalence of non-fatal, violent injury in Khayelitsha, Gugulethu, and Nyanga is associated with key risk factors including age, sex, and concurrent alcohol use and, when controlling for these potential confounders, whether the prevalence of non-fatal, violent injury in these areas is associated with the presence or absence of an urban upgrading intervention implemented by the Violence Prevention Through Urban Upgrading (VPUU) programme. Thus our review of the literature had two primary objectives:

1. To describe the literature on individual-level risk factors for violent injury globally, and in South Africa in particular
2. To describe the literature on the effectiveness of community-level interventions to prevent violence-related injury in adults

Search Strategy

We searched the databases GoogleScholar, PubMed, and Medline using a combination of the following search words for objective 1: violence, violent, violent crime, injuries, interpersonal, intentional, risk factor, emergency room, South Africa, and Africa. For objective 2, we used a combination of the following search words: violence, violent, injury, intentional, interpersonal, community, prevention, intervention, evaluation, urban upgrading, VPUU, South Africa, and Africa.

We included studies published from January 1, 1970-March 1, 2016 that used a rigorous study method (RCT, cohort, case-control, cross-sectional, or ecological) to either identify risk factors for interpersonal injury among adults or to evaluate violence prevention strategies within a community or larger geographical area.

We excluded studies that were limited to a particular type of violence (including sexual violence or domestic partner violence), those that were limited to children or adolescents, or those that evaluated interventions limited to a particular setting (such as schools or workplaces).

Summary of the Literature

Risk Factors for Experiencing Violence

One important potential risk factor for experiencing violence is the consumption of alcohol. Of the 12 studies we identified that examined risk factors for experiencing violence-related injury, 11 included some form of alcohol use as a variable of interest. The majority of studies used drinking at time-of-event as a predictor of violence and all studies found a significant association with elevated blood alcohol concentration (BAC) or self-reported drinking and experience of violence-related injury (Cherpitel and Yu, 2010; Macdonald et al., 2005; Taibo et al., 2016; Schuurman et al., 2015; Pluddemann et al., 2004; Borges et al., 2006). This finding has been replicated across multiple countries. Macdonald et al. (2005) pooled studies across six countries (USA, Mexico, South Africa, Canada, Australia, and Spain), identifying an independent relationship between elevated BAC and violence-related injury in each country. A pooled calculation of odds ratios in these six studies demonstrated a dose-response effect, with the likelihood of intentional injury (compared to accidental injury) increasing as BAC increased. Similar findings have been produced in the African context, with emergency room studies in both Mozambique and South Africa demonstrating a significant association between drinking at time-of-event and violence-related injury (Taibo et al., 2016; Pluddemann et al., 2004, Schuurman et al., 2015).

While the association with alcohol use and violence-related injury appears to be well established, some authors have posited that the causal relationship between alcohol and violence has not been shown and that the association may be explained by a third variable (Pernanen et al., 1991). Due to the observational nature of the aforementioned studies, as well

as the vast majority of the studies we identified, it is not possible to determine whether the relationship between alcohol and violence is in fact causal. Both the Macdonald (2005) and Schuurman (2015) studies included multivariate regression models in their analyses, and in both cases the association between BAC and intentional injury remained significant when controlling for age and sex as well as education, employment, socioeconomic status (SES), and location (in the Macdonald et al. (2005) study) and day of the week (in the Schuurman et al. (2015) study). While these findings do not provide conclusive evidence of causality, they do demonstrate a relationship between alcohol and intentional injury that is independent of potential confounders such as age and sex. This statistical association as well as the dose-response relationship between BAC and violence-related injury strongly suggest but do not prove the causal effect of alcohol. There remains the possibility that the relationship between alcohol use and intentional injury may be explained by a third variable unmeasured by the aforementioned studies or that the relationship is partially mediated by a measured or unmeasured variable.

Pernanen (1991) proposed that the relationship between alcohol use and violence might be explained by aggressive personality and thus a tendency towards heavy drinking. However, this hypothesis appears to be largely untested. We were not able to identify any studies that explored the association between independent personality traits or personality disorders and experiencing violence-related injury.

Another hypothesis is that context or the environment affects the relationship between alcohol and injury. Location could be a partial mediator between alcohol use and the experience of intentional injury, as alcohol consumption leads one to be present in places such as a bar or tavern where perpetrators are likely to be under the influence of alcohol (Cherpitel & Yu, 2010). Macdonald et al. (2005) included both BAC and location of injury in their country-specific and combined models. In their combined model, both location and time-of-event BAC remained significant, with location having a stronger association with violent injury (Macdonald et al., 2005). However, as these authors did not include the crude odds ratios from the combined

dataset, we were unable to determine if location of injury was acting as a partial mediator in this model (Macdonald et al., 2005). In their country-specific models, the relationship between BAC and violent injury became non-significant for two countries (Argentina and Spain) upon adding location of injury to the model (Macdonald et al., 2005). This finding suggests that in some countries the location where injury occurs may mediate the relationship between alcohol and violent injury (Macdonald et al., 2005).

Cherpitel et al. (2012) calculated the Alcohol Attributable Fraction (AAF) for violence-related injuries taking into account both the self-reported alcohol consumption of the victim as well as the perceived alcohol consumption of the perpetrator. They reported that, across 15 countries including South Africa, the AAF for violence-related injury was 23.9% when taking into account only the alcohol consumption of the victim. The AAF increased by 62% to 38.8% when both victim's and perpetrator's perceived alcohol consumption were considered. The AAF varied greatly by country, with South Africa having one of the highest. Nearly 42% of South Africans reported that both they and the perpetrator had been drinking at the time of injury, while 16.4% reported that only they had been drinking and 13.5% reported that only the perpetrator had been drinking. While this was the only study that directly measured the drinking of the perpetrator, other variables might be considered as proxies for increased likelihood of perpetrators' drinking, such as day of presentation. Schuurman et al. (2012) found a significantly increased odds of violent injury on weekends (OR 1.292; $p=0.001$) independent of the victim's alcohol consumption. The increased presentation on weekends could be due to a number of factors including increased alcohol consumption in the population, increased likelihood of attending taverns or other social gatherings, or insufficient policing relative to demands, and each of these possibilities should be further explored.

The effect of alcohol on violent injury also appears to vary by country. Cherpitel and Yu (2010) reported increased relative risks of violence from alcohol consumption that ranged from 4.68 in Spain to 942 in Canada. Similarly, Cherpitel et al. (2012) found that AAF varied widely by country. The authors analysed countries' AAF by their level of detrimental drinking pattern

(DDP), as determined by the World Health Organization (WHO). DDP, which ranges from 1-4, is an indicator of detrimental health effects on a population at a given level of alcohol consumption. Countries with a DDP of 3 (Brazil, India, Ireland, Korea, Mozambique, South Africa, and Sweden) had the highest aggregate AAF when considering the alcohol consumption of both the victim and perpetrator (AAF=48.7).

Borges et al. (2004) explored whether the relationship between alcohol consumption and violent injury could be explained by alcohol dependence (as measured by the validated Rapid Alcohol Problems Screen [RAPS4]) and found that the relative risk estimates were the same for those with and without alcohol dependence. This study, which was conducted in emergency rooms in Mexico City, found a dose-response relationship between number of drinks consumed and risk of violent injury; the effect of alcohol was, somewhat counterintuitively, stronger in patients who did not have alcohol dependence (Borges et al., 2004). The authors hypothesized that the acute effects of alcohol consumption may be greater among those who do not frequently consume alcohol, such as adolescents. In contrast, Vinson et al. (2003) found a significant association between violent injury and both alcohol consumption and alcohol dependence (based on DSM-IV criteria), suggesting roles for both current alcohol consumption and alcohol dependence.

Few studies have examined whether demographic variables modify the effect of alcohol on violent injury, although one study conducted in 30 hospital emergency rooms found that gender acted as an effect modifier, explaining the association between concurrent alcohol use (drinking-in-event) and violence for women but not for men (Wells et al., 2007). However, this study also found that heavy episodic drinking was a stronger predictor of violence in women, suggesting that while acute alcohol use may not have as strong an effect on women's risk of violence, regular alcohol use may be associated with increased risk of violent injury. Several studies have found that alcohol dependence is associated with gender-based violence (GBV) or intimate partner violence (IPV); we would suggest that this may explain some of the

discrepancy between acute and chronic effects of alcohol in women and men, but this hypothesis has not been fully explored (Cunradi, Caetano, & Schafer, 2002; Dunkle et al., 2004).

Although the bulk of the literature we identified examined alcohol use as the main variable of interest, demographic characteristics have also been found to have an effect on risk of experiencing violence, independent of alcohol use. Multivariable analyses in several studies have demonstrated that patients who are young and male are more likely to be victims of violent injury than women or older men, even when controlling for possible confounders (Macdonald et al., 1999; Schuurman et al., 2015; Taibo et al., 2016; Doolan et al., 2007). Macdonald et al. (1999) found that patients in two Canadian emergency rooms who experienced violence-related injury were more likely to be male than those who experienced unintentional injury ($p < 0.001$) as well as more likely to be in the age group 18-29 years old ($p < 0.01$). More recently, Schuurman et al. (2015) observed a similar pattern in a Cape Town trauma department, with both sex (being male OR: 1.96; 95% CI: 1.64, 2.30) and age (OR: 0.979; 95% CI: 0.974, 0.984) significantly associated with experiencing intentional injury in a multivariable model. In a countrywide study of violence in South Africa, Doolan et al. (2007) found that those who experienced violence were significantly more likely to be male.

Contrary to previous evidence, in separate bivariate analyses this study found that patients experiencing violence were significantly older, more educated, and more likely to be employed (Doolan et al., 2007). However, in the multivariable analysis, the association between experience of violence and being male remained significant, while the association with both education and employment became non-significant, suggesting that these associations may have been partially explained by gender (Doolan et al., 2007).

In both individual-level and household-level analyses, being in the wealthiest quartile as opposed to the poorest quartile was protective against violence, though there was no significant difference between the poorest quartile and other quartiles. In household analysis, those experiencing violence were significantly more likely to belong to a Black household

compared to a Coloured or White household, while individual analyses showed that experiencing violence was significantly associated with being Coloured. The authors hypothesized that this association may have been due to the disproportionately high levels of violence in the Western and Northern Cape provinces, in which there are large populations of Coloured residents. Both the small sample size and cross-sectional nature of this study preclude determination of the causal relationship between socio-demographic factors such as SES, education, and race and experience of violence. Further research is needed to explore these relationships.

The vast majority of the publications we identified reported either cross-sectional or case-control studies. While observational research is subject to biases, the nature of the risk factors of interest (including alcohol consumption and demographic characteristics) means that they do not lend themselves well to experimental design. Demographic characteristics cannot be randomized nor can alcohol consumption be ethically randomized, and prospective studies are not appropriate for studying drinking at the time of event.

Patients with accidental or non-violence related injuries may not be ideal controls, as alcohol has been shown to increase risk of accidental injuries (Ringson & Howland, 1987). However, non-injury (or medical) patients presenting to emergency rooms tend to be much older and likely to have a different demographic makeup than injury patients, and thus associations

between both demographic factors and alcohol use with violent injury would potentially be overestimated (Oteng et al., 2015). Therefore, the use of accidental injuries as controls, despite the aforementioned limitations, is seen as a conservative choice (Cherpitel et al. 2012). There is always a possibility of recall bias in case-control studies, and measures of alcohol use may have been affected by recall bias in cases where drinking was self-reported.

Evaluation of Violence Prevention Interventions

The literature on the effectiveness of violence prevention efforts in lower and middle-income countries (LMICs) is woefully limited. We were unable to identify any studies that assessed the

effect of violence prevention in an African context and were able to identify only one study that took place in a developing country (in Medellin, Colombia) (Cerda et al., 2012). The effectiveness of this intervention in addition to six interventions evaluated in higher income countries are described below, categorized by the type of intervention.

Anonymized data sharing and 'Hot Spot' Policing

In the past few decades, efforts have been made in several countries, including South Africa, to create comprehensive injury surveillance systems and to use this data to inform policing in high crime areas (Villaveces et al., 2000; WHO, 2004; Mercy et al., 2006). Florence et al. (2011) investigated the effect of an anonymized data sharing programme between hospital emergency rooms and police departments on violent crime in the UK. The Cardiff Violence Prevention Programme (CVPP) gathered information from patients presenting to emergency rooms on the type, location, and time of violent incidents and, where relevant, the type of weapon used (Florence et al., 2011). This information was combined with police data to generate a database of violence 'hot spots' where comprehensive efforts to reduce violent crime were implemented, including increased policing and visibility, targeted enforcement of alcohol licensing, increased traffic flow, availability of public transit services, and mandatory plastic glassware laws in bars and taverns. The intervention took place in a single UK city and was compared to 'control' cities deemed to be similar in socio-demographic and geographic variables of interest. The authors conducted both a time-series analysis and multiple regression to investigate both pre- and post-intervention trends in violence as well as to compare Cardiff to control cities. The study revealed a decrease in violent injuries over time after the intervention was implemented compared to other cities (excluding an initial spike in violence during the year the programme was implemented). The study also showed an association between implementation of CVPP and decreased hospital admissions for violence (adjusted incidence rate ratio, 0.58; 95% CI, 0.49-0.69).

While the results suggest that trauma surveillance systems and subsequent data-based 'hot spot' policing may reduce violent crime, it is difficult to determine which component of the

programme had a causal effect on decreased violence. Because the programme included a variety of strategies implemented simultaneously, it is not possible to isolate the effects of each strategy. Although investigators made an effort to ensure that potential confounding factors were similar between the intervention and comparison cities, the intervention was not randomly assigned and thus may have been subject to selection bias. Additionally, comparison cities may have been subject to implementation of their own violence prevention strategies, which the investigators did not measure, thereby underestimating the effect of the CVPP intervention.

Community Mobilisation

Social science research has emphasized the importance of voluntary, community-based organizations in the promotion of so-called 'social cohesion' (Putnam, 1995; Heuser, 2005). There is some evidence to suggest that diminished levels of social cohesion are associated with both an increase in violence as well as increased alcohol use and risk of mental disorders (Kawachi et al., 1997; Sampson, Raudenbush, & Earls, 1997; Matzopoulos et al., 2008; Ausen & Nillson, 2013; Weitzman & Chen, 2005).

Donnelly (2006) evaluated the implementation of a strategic plan created by a local neighbourhood association, which was based on the idea of 'defensible space' and involved the creation of mini-neighbourhoods, gated streets, moderated traffic flow, and increased 'neighbourliness' in Dayton, Ohio. Although their article is titled 'An Evaluation of the Effects of Neighbourhood Mobilization on Community Problems,' the study ultimately evaluated the effects of urban upgrading rather than social cohesion and neighbourhood mobilisation on violent crime. The authors found that the creation of a 'defensible spaces' street plan reversed an upward trend in violence in the neighbourhood and that perceptions of safety in the community had improved even five years after implementation of the plan. The study did not find any significant change in measures of social cohesion or 'neighbourly relations' after the study was implemented, suggesting that the neighbourhood associations may provide an important vehicle for improving neighbourhood violence independent of their association with

social cohesion. Because the study did not seek to evaluate effects of creation of neighbourhood associations on either social cohesion or violent crime and because the study took place in a city with a long history of prevalent neighbourhood associations, we cannot draw any conclusions about the effect that neighbourhood associations might have on violence outside of their ability to mobilize urban upgrading.

CeaseFire, billed as a 'public health approach to violence', attempted to reduce violence in the United States city of Chicago using a comprehensive programme of community mobilisation, public education, counselling services, and 'violence interpreters'—community members (usually ex-gang members) who attempted to mediate potentially violent situations and offer non-violent solutions to disagreements (Ritter, 2006). An evaluation of the programme compared trends in violence between intervention areas and matched comparison areas (Skogan et al., 2009). The study found that while shootings decreased in both intervention and comparison areas, the decreases in shootings in several CeaseFire areas were statistically significant while those in the comparison areas were not (Auburn Gresham: -3.6%, $p < 0.01$ vs. -1.4%, n.s.; East Garfield Park: -2.5%, $p < 0.05$ vs. +4.5%, n.s.; West Garfield Park: -4.5%, $p < 0.01$ vs. -4.1%, $p < 0.01$). The effect of CeaseFire on murder rates was inconclusive as some intervention areas performed better than their counterparts, while other performed worse. Geostatistical analysis indicated that violence 'hot spots' in intervention areas were reduced, and median number of shootings per square mile decreased more in intervention areas than in the comparison areas.

The evaluation of the CeaseFire programme demonstrates both the great potential for comprehensive community mobilisation programmes in reducing violence and the difficulty of evaluating such expansive programmes. In addition to an ill-understood decline in violent crime rates city-wide starting in 1992, the implementation of simultaneous interventions may have also contributed to declining violent crime rates in both intervention and non-intervention areas. Thus, it is difficult to conclusively show that CeaseFire was a causal factor in the decrease of violence (Skogan et al., 2009). Secondly, intervention and comparison sites were not

randomly assigned. As in the CVPP study, efforts were made to match comparison areas to intervention areas based on socio-demographic characteristics (including SES, racial composition, and home ownership). However, selection bias may have played a role if intervention areas were selected by (or if they over- or under-represented) any unmeasured confounders. Similarly, while investigators attempted to avoid comparison sites where simultaneous interventions were being undertaken, they could not control this variable. The avoidance of these areas may also have presented a selection bias. Finally, the need to produce data in a timely and easily digestible way meant that the analysis was limited to sites with sufficient post-intervention data and that both pre- and post-intervention times and intervention and non-intervention areas were dichotomized, ignoring the relative strength and varied rollout timeline of the intervention in individual areas (Skogan et al., 2009).

Infrastructure Upgrading

The ‘broken windows theory,’ proposed in 1982 by James Wilson and George Kelling and popularized in criminology literature, is premised on the idea that broken windows and other signs of disrepair portend crime and violence, as they signal to criminals a low police presence and sense of low neighbourhood cohesion (Wilson & Kelling, 1982). Efforts have been made, particularly in North American and European countries, to apply this theory in designing interventions to prevent violence. Both Ray Jeffery’s ‘Crime Prevention through Environmental Design (CPTED)’ and Newman and Rand’s ‘Defensible Space—Crime Prevention through Urban Design’ precede Wilson & Kelling’s theory (published in 1971 and 1972 respectively), but both theories are based on similar premises—that the built environment can impact the level of crime in a neighbourhood (Jeffery, 1971; Newman & Rand, 1972). The ‘defensible spaces’ model was a narrow interpretation of Jeffery’s theory that the physical environment could encourage or discourage crime. The theory of defensible spaces primarily promoted the ideas of increased visibility and community ownership of the neighbourhood (Newman & Rand, 1972). Modern theories of violence prevention take ideas from all of the above theories, generally falling under the umbrella of ‘urban upgrading’—defined as “physical, social, economic, organizational, and economic improvements undertaken cooperatively among

citizens, community groups, businesses, and local authorities to ensure sustained improvements in the quality of life for individuals” (Cities Alliance, 2003).

In a less ambitious attempt at violence prevention, focused solely on the improvement of the built environment, Kuo & Sullivan (2001) evaluated the effect of vegetation and ‘green spaces’ on levels of violent crime in particular buildings in Chicago. Although the study was cross-sectional, residents were randomly assigned by the city to live in particular apartment blocks and residents were homogenous across buildings, thus allowing meaningful comparison across buildings. The authors identified a significant association between levels of vegetation outside a building and reduced levels of violent crime reported, even after controlling for the number of units in a building (coef.=-0.81, $p<0.05$).

Another example of situational crime prevention is improved street lighting to reduce crime. A 2008 systematic review identified 13 studies (eight in the United States and five in the UK) that evaluated the effect of improved street lighting on crime (Welsh & Farrington, 2008). While the review demonstrated that improved street lighting had a significant effect on total crime prevention, particularly in the UK, studies that looked specifically at violent crime had mixed results. Two studies demonstrated significantly reduced violent crime, one study showed increased violent crime compared to the control area, and one showed no effect of improved lighting on violent crime. A meta-analysis of included studies did not demonstrate a significant effect of improved street lighting on violent crime (IRR=1.10, 95% CI, 0.91-1.34). The authors of the review hypothesized that, at least in some studies, simultaneous policing interventions may have confounded the effect of street lighting.

The only study we identified that took place in a developing country was an evaluation of the effect of large-scale infrastructure development on rates of violence in Medellin, Colombia (Cerdeira et al., 2012). The rate of violence in Medellin in 2002 during the pre-intervention phase of the study was significantly higher than the current rate of violence in Cape Town, with a homicide rate of 185 per 100,000 population compared to Cape Town’s rate of 65.5 per

100,000 in 2015 (Cerda et al., 2012; Institute for Security Studies, 2016). However, both countries' rates of violence are vastly higher than those of the US and UK cities in which the aforementioned evaluations took place, meaning that the Colombian study is the most relevant in terms of its applicability to our own research.

Cerda et al. (2012) conducted a natural experiment after a large-scale public works project (the Metrocable mass transit system) was implemented in Medellin, affecting only select neighbourhoods that the transit system would service. In addition to increased access between impoverished and wealthy areas, those sites serviced by the transit system received additional infrastructure upgrades including increased lighting in public areas, improved pedestrian access, a heightened police presence, and improved recreational and business centres (Cerda et al., 2012). The study used household survey data collected prior to the implementation of the intervention to compare rates of violence in areas serviced by the transit system to matched controls. The authors identified a 66% greater decrease in rates of violence in the intervention areas as compared to their matched controls (Cerda et al., 2012). Although, as in the previous studies discussed, the intervention was not randomized, the authors used propensity scores to match control areas to intervention areas achieving the same level of heterogeneity that would be expected under randomisation (Cerda et al., 2012).

This study again highlights both the promise of the urban upgrading strategy but the challenges in evaluating such interventions. Randomisation of interventions at the neighbourhood-level require considerable resources such as monetary support, time, political will, and political capital. In the absence of randomisation, researchers are able to take advantage of 'natural experiments,' such as the cases discussed above including random assignment of residents to apartment blocks or government roll-out of a service to selected neighbourhoods before others (Kuo & Sullivan, 2001; Cerda et al., 2012).

In the latter example, selection bias cannot be ruled out, as the neighbourhoods selected to receive infrastructure development were likely not chosen completely at random, although the

authors in the Medellin study made every effort to ensure that the control neighbourhoods chosen were comparable in terms of all known confounders (Cerdeña et al., 2012). It is possible that intervention neighbourhoods are already less violent prior to receiving the intervention; when neighbourhoods are chosen to receive interventions, they may be the beneficiaries of community efficacy that either allows their neighbourhood to be chosen to receive the intervention or to succeed upon introduction of the intervention. Alternatively, governments may target particularly violent or inefficient neighbourhoods as a priority to receive interventions. Unmeasured factors that vary between intervention and control areas may also confound the results. For both practical and ethical reasons, total randomisation at the neighbourhood-level is challenging, as it would require denying both the intervention of interest as well as all other interventions to randomly selected neighbourhoods.

In addition to the lack of randomisation, several factors make it difficult to establish causality in such evaluations. In comprehensive interventions, such as the CeaseFire programme in Chicago and the Metrocable study in Medellin, investigators are unable to pinpoint whether a particular component of the intervention is driving changes in outcome measures.

Additionally, the mechanisms through which these interventions may have an effect on violence are poorly understood and difficult to measure. Urban upgrading interventions are often implemented in order to address upstream, societal risk factors for violence that are complex and difficult to measure, such as inequality, low social cohesion, education, or employment (Cassidy et al., 2015; Matzopoulos et al., 2010). These interventions may demonstrate success or failure independent of their ability to address these risk factors. For example, Donnelly (2006) utilized the principles of 'defensible spaces' theory, intended to increase a sense of community ownership and neighbourliness. While the intervention did have a significant effect on violence, there was no change in social cohesion following the intervention (Donnelly, 2006).

Gaps in the Literature

The most striking gap in the literature on violence prevention is the paucity of evidence from LMICs, particularly in sub-Saharan Africa. Despite the high burden of disease related to violence in South Africa, we were unable to identify any evaluations that examined the effect of interventions on violence-related injury. Among the evaluations we identified, there was limited evidence on whether upstream interventions have an effect on an individual-level risk of experiencing violence, while controlling for other factors that may affect risk of violent injury. Similarly, there is no evidence on how the effect of violence prevention interventions may vary for different categories of individuals (such as difference age groups or races). While the increasing prevalence of injury surveillance systems around the world has led to ample evidence on risk factors for violence-related injury, studies on violence interventions primarily use robbery or homicide as the outcome measure. Thus, further research is needed to determine whether these interventions have an effect on non-fatal violent injury in the risk groups identified by injury surveillance systems.

Conclusion

The literature on risk factors for violent injury demonstrates that young males and both males and females under the influence of alcohol are at the greatest risk of experiencing violent injury. Data suggest that this risk may increase on weekends and at particular locations including bars or taverns. These risk factors have been shown to be significantly associated with violent injury even within multivariable analyses. Therefore, these factors should be both independently and jointly considered when designing interventions to prevent violent injury. There is a large body of evidence demonstrating that alcohol use is associated with experiencing violent injury. There is some evidence that the effect of alcohol on violent injury is stronger in countries with high rates of alcohol dependence or when victims of violence are present in locations where others are likely to be drinking. Concurrent alcohol consumption has been shown to have a stronger effect on risk of violent injury in men than for women, but alcohol dependence may be as or more important for risk of violent injury in women. Although some authors have posited that the relationship between alcohol use and violent injury may be

partially explained by a third variable, several studies have utilized multivariable analysis to control for possible confounding variables and have demonstrated a dose-response relationship between alcohol use and increased risk of injury, indicating that there is likely a causal effect. Comprehensive, community-based interventions to address high risk groups including infrastructure upgrading, community mobilisation, and hot-spot policing have been effective in reducing levels of violence in high income settings. There is limited evidence, and thus the need for further research, on the effectiveness of such interventions in LMICs.

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SECTION C: MANUSCRIPT

Full Title:

The Effect of the Violence Prevention through Urban Upgrading (VPUU) Intervention on Violence-related Injuries Presenting to Health Facilities in Khayelitsha and Nyanga

Short Title:

The effect of the VPUU intervention on violence-related injuries in Khayelitsha and Nyanga

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¹ Lydia Trupe is the sole author of this dissertation; however, Kimberly Bloch, Linda Mureithi, and Richard Matzopoulos will be included as authors for publication.

Abstract

Background: Violence is one of the leading causes of morbidity and mortality in South Africa's Western Cape province. Recent efforts, both globally and locally, have focused on using emergency room surveillance systems to collect data on violent injuries and to use these data to inform comprehensive, sustainable interventions such as urban upgrading. Drawing on insights from criminology, these urban upgrading interventions have sought to use environmental design to ameliorate socio-ecological factors related to violence.

Objective: To use injury surveillance data in order to describe the pattern of violent injuries presenting to health facilities in the communities of Khayelitsha and Nyanga and to assess the effect of the Violence Prevention through Urban Upgrading programme (VPUU) on risk of violent non-fatal injury in these two areas.

Methods: We conducted a case-control study using data from a series of semi-annual rapid assessments to compare violent and non-violent injuries in adults presenting to five health facilities in Khayelitsha and Nyanga between September 2013 and October 2015. Multivariable logistic regression was used to assess the risk of violent injury with respect to demographic and behavioural characteristics and exposure to the VPUU intervention.

Results: Multivariable analysis of 1,753 complete cases revealed that living in a VPUU intervention area was protective against presentation for violent injury when controlling for other risk factors (OR=0.75, $p=0.022$). Age, gender, race, and alcohol consumption were also found to be significantly associated with presentation for violent injury. There was a statistically significant interaction effect between alcohol and gender; the association between alcohol consumption and violent injury was stronger in women than in men.

Conclusion: This study highlights the demographic and behavioural factors associated with violent injury and provides preliminary evidence of the reduction of violent injury risk in VPUU intervention areas.

Introduction

Violence is a highly significant contributor to the burden of injuries and premature death around the world, accounting for more than 1.2 million deaths each year (Haagsma et al., 2016). For every person killed by violence, many more are injured and are forced to confront high economic costs and lower quality of life (WHO, 2014; Murray, 2006). The vast majority of violence related morbidity and mortality occurs in lower- and middle-income countries (LMICs), and the economic cost of violence to these countries is huge, accounting for billions of US dollars in health expenditures annually (Krug et al., 2002). This is compounded by the fact that those at a highly productive working age are most likely to be affected, with violence among the leading causes of death for those aged 15-44 years old (WHO, 2002).

Risk factors for experiencing violence occur at multiple levels, from individual, including both biological and behavioural factors, to societal. Both age and sex have been found to be strongly correlated with violence, with males and those aged 18-29 years old experiencing the highest risk of intentional injury (Matzopoulos et al., 2008; Macdonald et al., 1999; Schuurman et al., 2015). Behavioural factors including alcohol and drug consumption are also strongly associated with experiencing violence, and some studies have demonstrated a dose-response effect between blood alcohol concentration (BAC) and risk of violence-related injury (Schuurman et al., 2015; Cherpitel et al., 2014; Macdonald et al., 2005). While alcohol use has been found to be independently associated with risk of violent injury even in multivariable analysis, other contextual factors may also contribute to an individual's risk of experiencing violence. Risk of violence has been shown to increase on weekends, which may be due to an increased likelihood of an individual being around a perpetrator who is under the influence of alcohol, independent of the victim's own alcohol consumption (Schuurman et al., 2015).

Structural factors, such as poverty, inequality, and low levels of social capital are associated with increased rates of violence at the neighbourhood-level (Fajnzyblber, Lederman, & Loayza, 2002; Matzopoulos et al., 2008). Research has also suggested that reduced social capital at the neighbourhood level may be associated with increased alcohol use and increased risk of mental

disorders, further increasing the risk of violence for individuals (Ausen & Nillson, 2013; Weitzman & Chen, 2005; De Silva et al. 2005). Demographic characteristics, behavioural factors, and the neighbourhood or context in which a person lives each contribute individually and jointly to the risk of experiencing violence; and there is evidence that interventions to both comprehensively address upstream factors for violence and to target high risk groups should be prioritized (Matzopoulos et al., 2008).

In South Africa, violence-related injuries contribute to the country's unique quadruple burden of disease, which, in addition to injuries, includes high rates of both chronic and infectious disease as well as HIV/AIDS. Injuries account for an estimated 52,000 deaths countrywide each year, and violence is responsible for nearly half of those deaths (Msemburi et al., 2014; Matzopoulos et al., 2015). Violence is the second highest cause of years of life lost (YLL) among South African males and the fifth highest cause of YLL overall (Naghavi et al., 2015; Msemburi et al., 2014). The rate of interpersonal violence in high risk groups, including males and young adults, is disproportionately high in South Africa, with males in the 15-29 and 30-44-year-old age groups suffering rates 9.3 and 9.4 times higher than the global average, respectively (Msemburi et al., 2014; Norman et al., 2007).

Rates of interpersonal violence are particularly high in the Western Cape province. In 2010, violence was the leading cause of YLL for males in the Western Cape (Groenewald et al., 2013). Nearly two-thirds of violence-related deaths in the province occurred in the Cape Town metro area, and homicide rates are highest in the impoverished sub-districts of Khayelitsha (120 per 100,000 population) and Nyanga (132 per 100,000 population) (Cassidy et al., 2015; Groenewald et al., 2010).

In response to high rates of violence in the province, the Western Cape government produced the *Integrated Provincial Violence Prevention Policy Framework* (Western Cape Government, 2013). In addition to the collection of injury surveillance data in high violence areas, the *Policy Framework* recommends using these data to inform a comprehensive, inter-sectoral approach

to violence prevention that incorporates both short-term interventions and large-scale changes to the societal and structural factors that promote violence (Western Cape Government, 2013). The *Policy Framework* also advocates for a ‘whole-of-society’ approach in which the government, civil society, and the private sector would all be involved in the prevention of violence.

There is some evidence that such approaches are effective for preventing violent crime. Interventions incorporating community mobilisation, infrastructure upgrading, and ‘hot spot’ policing have been associated with decreased violent crime and reporting of violent injuries (Cassidy et al., 2014; Ritter, 2006). However, these effects have been primarily demonstrated in high income countries, and there is a paucity of evidence on the effectiveness of urban upgrading and other comprehensive violence prevention interventions in LMICs. The single exception to this is an urban upgrading intervention in Medellin, Colombia that was associated with a reduction in the rate of violence 66% greater than comparison areas (Cerdeña et al., 2012). However, despite limited evidence in the LMIC context, the urban upgrading approach has gained traction in South Africa as a potential method for reducing high levels of violence. (Civilian Secretariat for Police, 2016)

The Violence Prevention through Urban Upgrading programme (VPUU), implemented in Cape Town in 2005, draws on theories of situational crime prevention and community mobilisation that have proven successful in preventing violence in other countries (Ritter, 2006; Cerdeña et al., 2012). VPUU encompasses five major components: (1) *situational crime prevention* through the use of infrastructure development and urban planning to develop safe and accessible public spaces; (2) *social crime prevention* by building community identity and instituting social and cultural programmes targeting the root causes of violence (such as Early Childhood Development, youth programmes, neighbourhood watch, and victim support); (3) *institutional crime prevention* including community involvement with operations, maintenance and management of local facilities, improvement of service delivery, local economic development and community functionality; (4) *community participation* through engagement of community

members and stakeholders in planning, implementation, and management of the programme; and (5) *knowledge management* through monitoring and evaluation, the dissemination of research and lessons learnt, and mainstreaming (CoCT, 2015).

There are significant challenges to evaluating such interventions. Randomisation of interventions to specific neighbourhoods is not always feasible, either for ethical or practical reasons, making comparisons to non-intervention areas difficult. Additionally, these interventions seek to address upstream factors related to violence, such as levels of social capital, that are not easily measurable or quantifiable. Our study uses injury surveillance data from high violence areas to assess whether an individual's risk of experiencing a violence-related injury is associated with living in a VPUU-intervention area, while taking into account known risk factors such as age, sex, and alcohol or drug consumption. We examined the association between exposure to the VPUU intervention and receipt of treatment for a violent injury (as compared to those who were treated for an unintentional or traffic-related injury) and hypothesized that exposure to the intervention would be associated with a decreased risk of violent injury after controlling for other individual risk factors.

Methods

Study design

We conducted a retrospective case control study in two high violence communities in the Cape Town metro area - Khayelitsha and Gugulethu/Nyanga - using data from cross-sectional surveys of all cases presenting to Emergency Centres (EC) in the study areas. Surveys were completed at the ECs over a one-week period for 24 hours per day every six months from September 2013 to October 2015. The areas of Khayelitsha and Gugulethu/Nyanga were selected because they were identified by the Western Cape Provincial Cabinet as having a high risk of alcohol-related violence. From these areas, five health facilities were sampled: Khayelitsha District Hospital (KDH), Khayelitsha Site B Community Health Centre (CHC), Michael Mapongwana CHC, Gugulethu CHC, and Nyanga CHC. HST collected these data in collaboration with the Western Cape Department of Health (WCDOH), the University of Cape Town (UCT), and the South

African Medical Research Council (SAMRC) for the study *'Injury morbidity surveillance in Nyanga and Khayelitsha in the Western Cape: An ongoing assessment of the injury morbidity burden at health facilities in two high-violence communities.'*

Each person presenting to the EC for acute injury was approached for inclusion. Trained data collectors obtained informed consent and administered a two-page questionnaire to consenting participants, collecting information on demographics as well as the cause, location, and circumstances of the injury, including whether drugs or alcohol had been consumed prior to the event (subjectively assessed by the data collector in consultation with the individual, care giver or family member, and healthcare worker using visual cues or self-report).

Case and Control Selection

Cases and controls were defined subsequent to data collection; thus no efforts were made to match controls based on demographic characteristics. Cause of injury was self-reported and was classified as 'violence', 'transport', 'unintentional', or 'self-harm.' Cases were defined as those who presented to a health facility with an acute non-fatal injury and who reported their cause of injury to be 'violence' (n=1,286). Controls were defined as those who presented to a health facility for a non-fatal injury for which they reported the cause to be 'unintentional' (n=311) or 'transport' (n=156) because they were likely to share a similar risk profile to cases (including demographics, SES, and previous exposure to violence). We excluded patients who presented more than 24 hours after the injury event, patients under the age of 18 years old, those who presented to the EC for a reason other than injury, those who reported an injury caused by 'self-harm,' and those who refused informed consent. We also excluded patients who were injured outside their areas of residence (n=459) due to uncertainty around whether these individuals had been exposed to the intervention.

Exposure to Intervention

The primary exposure of interest in our study was exposure to the VPUU intervention. Areas in the Cape Town Municipality where the multipronged VPUU strategy (as outlined in the

Introduction) has been implemented, regardless of the scale of the intervention, were considered intervention areas (Table 1). Each of these areas had received all five arms of the intervention, though with varying degrees of investment. Assignment of individuals to intervention and comparison groups for our analysis was done in consultation with VPUU. We considered subjects to have been exposed to the intervention if they reported that they lived in one of the sub-areas that received the intervention. Several areas were excluded from our analysis including Site C (the subareas of A, AT, B, BT, C, Chris Hani, CL, CT, D, DT, Taiwan and Thembani) and Site B (the subareas of BM, France and TR). These areas were scoped to receive the intervention, but at the time of our analysis no investment had begun. Due to the uncertainty surrounding whether these areas should be considered intervention or comparison areas, we decided to exclude them from the analysis.

Table C-1: Intervention and comparison areas in Khayelitsha and Gugulethu/Nyanga

	VPUU Intervention	Non-Intervention
Khayelitsha	Harare Kuyasa Monwabisi Park	Driftsands/Enkanini Ilitha Park/Phakamisa Khaya Makaya Makhaza Site B [subareas of Greenpoint, K, K2, L, LP, M, Masikhule, N, P, PJS, Q, QQ, R, RR, S, SB, T, TT, U, UT, V, VE, VT, W, WB, X, Y, YA, YAB, YB, and Z] Site C [subareas of Bongweni and Ikwezi Park] Tafelsig Town 2
Gugulethu/Nyanga	Nyanga [Old Crossroads] Phillipi Crossroads	Gugulethu Nyanga [excluding Old Crossroads]

Statistical Analysis

Data extraction and analysis were conducted using Stata version 13.1 (Stata Corporation, USA). In addition to VPUU exposure, we considered age, sex, race, and concurrent alcohol or drug use

as potential risk factors, confounders or effect modifiers. Relationships between categorical predictor variables were explored using Pearson's chi-square test. A non-parametric two-sample test of medians was used to compare median age for cases and controls. Prior to regression analysis, age was log transformed in order to approximate a normal distribution. We first used stratified analyses in order to identify potential confounders and effect modifiers, and subsequently fitted multivariable logistic regression models using complete cases (n=1753) to explore the relationship between violent injury and predictor variables as well as relevant interaction effects. A step-wise forward selection process was used to select the best fitting model, and the Hosmer-Lemeshow goodness-of-fit test was used to confirm the fit of the model to our data. Odds ratios and 95% confidence intervals were computed, and the Wald test was used to evaluate the significance of each predictor variable.

Results

We analysed 1753 complete cases. We had a small number of controls compared to cases (n=467 vs. n=1286). This is largely due to the high percentage of children among those presenting to the EC for unintentional injuries. We excluded 455 potential controls (49.35%) and 164 potential cases (11.31%) who were under the age of 18 years old.

Bivariate analysis

As shown in Table 2, the bivariate analysis indicated that each of the predictor variables, when considered individually, was significantly associated with the receipt of treatment for a violent injury. The distribution of ages was right-skewed for both cases and controls, but cases had a significantly lower median age than controls (28.82 years old vs. 33.40 years old, $p<0.001$). Approximately 70% of violent injury cases were males, as compared to 53.96% of controls (OR: 1.989, $p<0.001$). Cases were also less likely to be Coloured than Black (OR:0.472, $p<0.001$) as well as to have reported alcohol or drug use at the time of presentation relative to controls (Alcohol OR: 4.917, $p=0.250$; Drugs OR: 2.534, $p<0.001$).

Table C-2: Characteristics of Cases and Controls				
Variable	Control n (%)	Case n (%)	Crude OR (95% CI)	P (Wald)
N	467	1286	--	
Age (median years)	33.40	28.82		<0.001
Sex				
Female	215 (46.04)	386 (30.02)	--	
Male	252 (53.96)	900 (69.98)	1.989 (1.600, 2.473)	<0.001
Race				
Black	401 (85.87)	1,190 (92.53)	---	--
Coloured	65 (13.92)	91 (7.08)	0.472 (0.337, 0.661)	<0.001
Asian	1 (0.21)	5 (0.39)	1.685 (0.196, 14.465)	0.634
Alcohol Use				
No	295 (63.17)	390 (30.33)	---	--
Yes	122 (26.12)	793 (61.66)	4.917 (3.855, 6.271)	<0.001
Unknown	50 (10.71)	103 (8.01)	1.558 (1.076, 2.256)	0.019
Drug Use				
No	373 (79.87)	875 (68.04)	---	--
Yes	36 (7.71)	214 (16.64)	2.534 (1.745, 3.681)	<0.001
Unknown	58 (12.42)	197 (15.32)	1.448 (1.055, 1.988)	0.022

The intervention and non-intervention groups had nearly identical distributions of sex (approximately 65% male for both groups). Those in the intervention groups were older than the non-intervention group (median age=30.77 vs. 29.07, $p<0.001$) and less likely to have consumed drugs (OR: 0.72 $p=0.028$) than the non-intervention group. However, those in the intervention group were also more likely to have consumed alcohol (OR: 1.21 $p=0.068$) and significantly less likely to be Coloured than Black (OR: 0.13, $p<0.001$).

<i>Table C-3: Characteristics of Intervention and Non-intervention Areas</i>				
Variable	Non-Intervention (n=1,091) <i>mean</i> n (%)	Intervention (n=662) <i>mean</i> n (%)	Crude OR (95% CI)	<i>p</i> (Wald)
Age <i>Median</i> <i>(years)</i>	29.07	30.77		<0.001
Sex Female Male	378 (34.65) 713 (65.35)	223 (33.69) 439 (65.44)	1.044	0.681
Race Black Coloured Asian	943 (86.43) 143 (13.11) 5 (0.46)	648 (97.89) 13 (1.96) 1 (0.15)	-- 0.132 (0.074, 0.235) 0.291 (0.034, 2.497)	-- <0.001 0.26
Alcohol Use No Yes Unknown	441 (40.42) 548 (50.23) 102 (9.35)	244 (36.86) 367 (55.44) 51 (7.70)	-- 1.210 (0.986, 1.485) 0.592 (0.624, 1.309)	-- 0.068 0.592
Drug Use No Yes Unknown	751 (68.84) 169 (15.49) 171 (15.67)	497 (75.08) 81 (12.24) 84 (12.69)	-- 0.72 (0.543, 0.966) 0.74 (0.558, 0.987)	-- 0.028 0.040

Multivariable analysis

In the multivariable logistic regression each predictor variable except for drug use was associated with a significantly elevated odds of presentation for violent injury (Table 3). After controlling for all other variables, exposure to the VPUU intervention was associated with a significantly decreased odds of presentation for violent injury (OR=0.75, p=0.022). The association between VPUU exposure and receipt of violent injury only became statistically significant upon controlling for race. The model also included a significant interaction effect between alcohol use and sex (p=0.01). While both men and women had a significantly elevated

odds of violent injury when reporting alcohol use, the effect was stronger for women than for men (women: OR=7.55, $p<0.001$; men: OR=3.50, $p<0.001$) (See Appendix E). The persistent significance of age, sex, race, and alcohol use in our multivariable model is indicative of the strength of their association with violence-related injury. The overall fit of the model to our data was strong, with a 74.88% predictive power. The Hosmer-Lemeshow goodness-of-fit test was non-significant ($p=0.827$), indicating a good fit of our model to the observed data.

Table C-4: Multivariable binary logistic regression model for violent injury, using cases with complete information for model variables (n=1753)

	Beta coefficient	Std. error	p (Wald)	Odds ratio	95% CI (OR)
VPUU Intervention	-0.285	0.125	0.022	0.752	(0.589, 0.960)
Age (log)	-1.297	0.186	<0.001	0.273	(0.190, 0.393)
Sex					
Female	--	--	--	--	--
Male	0.555	0.162	0.001	1.743	(1.269, 2.393)
Alcohol					
Absent	--	--	--	--	--
Present	2.052	0.230	<0.001	7.787	(4.963, 12.217)
Unknown	-0.163	0.363	0.654	0.849	(0.417, 1.732)
Alcohol*Sex (interaction effect)					
Absent	--	--	--	--	--
Present	-0.769	0.280	0.006	0.463	(0.267, 0.803)
Unknown	0.668	0.438	0.127	1.951	(0.827, 4.605)
Race					
Black	--	--	--	--	--
Coloured	-0.699	0.194	<0.001	0.497	(0.340, 0.727)
Asian	0.692	1.120	0.537	1.997	(0.223, 17.927)
Intercept	4.651	0.657	<0.001	104.710	(28.885, 379.587)

Discussion

The associations between demographic and behavioural characteristics, such as age, sex, race, and alcohol and drug consumption, and the risk of violent injury are well documented across diverse contexts. However, there is limited evidence in the LMIC context on the efficacy of

interventions that seek to target these high risk groups. Our study supports previous research on risk factors associated with violent injury, in addition to providing novel evidence that comprehensive, urban upgrading interventions may be effective in preventing violence.

Our findings echo those of other studies that have found an increased risk of violence related injury in younger males and those under the influence of alcohol (Matzopoulos et al., 2008; Macdonald et al., 1999; Schuurman et al., 2015). While we did not find a significant association between drug use and violence related injury, the subjective assessment of drug use, and thus likely underreporting, may have led to an underestimate of the true association. The interaction effect between alcohol and sex in our study, which showed a stronger association between alcohol use and experiences of violence among women as compared to men, appears to contradict previous findings that either pointed to a stronger contribution of alcohol to men's risk of experiencing violence or to no gender differences (Steen and Hunskaar, 2004; Cherpitel et al., 2005; Cherpitel et al., 2014; Macdonald et al., 2005). This discrepancy may be explained by methodological differences between studies. Steen and Hunskaar (2004) found that male victims of violence were more likely than females to be under the influence of alcohol and Cherpitel et al. (2005) found that the attributable risk of alcohol consumption in violent injuries was greater in men than in women. However, these measures of association fail to take into account the significantly higher baseline prevalence of alcohol use in men. In our study population, the vast majority of participants reporting alcohol use at the time of presentation to a health centre were male (73%). However, while men were more likely to present to the EC for violence-related injury compared to non-violent injury regardless of alcohol use (Alcohol use: 86.3% violent injury; No alcohol use: 64.3% violent injury), women were far more likely to present for violent injury when they reported alcohol use. Of women who did report alcohol consumption, 87.7% presented to the EC for a violence-related injury, compared to 48.6% of women who did not report alcohol consumption. Some of this discrepancy may be due to the underreporting of violence, including intimate partner violence, by women; however, it is not clear that this underreporting would vary with alcohol use (Palermo et al., 2013). Another study of EC patients did not find a significant gender-by-alcohol interaction effect in South Africa,

although the authors did find that heavy episodic drinking was significantly associated with violent injury among women but not men in the United States (Wells et al, 2007). Further research is needed to explore the role that gender plays in alcohol-related risk of violence; however, these results point to the need to target women at least as much as men in alcohol reduction interventions.

The results of our study support our primary hypothesis that, when controlling for other potential risk factors including alcohol, race, age, and sex, exposure to the VPUU intervention is associated with a lower risk of presenting to the EC for violent injury in the communities of Khayelitsha and Nyanga. In our data, race confounded the association between VPUU exposure and violent injury, and the protective effect of the VPUU intervention only became statistically significant after controlling for race. The racial history of South Africa is extensive and complex. The apartheid era *Groups Areas Act of 1950* relocated Black and Coloured South Africans to separate non-White areas, and the country remains largely, though informally, racially segregated today (Christopher, 1991; Leggett, 2004). The different racial compositions of VPUU intervention and non-intervention areas may also be indicative of other, non-race-related factors including socioeconomic and geographic factors that could affect risk of violent injury independent of VPUU exposure.

Limitations

This study has several limitations. While the primary objective of our research was to assess the efficacy of the Violence Prevention through Urban Upgrading intervention in Khayelitsha and Nyanga, the case control design of the study makes it impossible to assess temporality and thus determine if the intervention had a causal effect on risk of violent injury in these areas. While we were able to control for known and potential confounders, including age, sex, race, and alcohol and substance use, the dataset we utilized did not include information on other potential confounding variables including socioeconomic status (SES). Furthermore, the intervention was not randomly assigned by the implementing agency due to practical constraints. These included time, funding, partnerships with local government and donors,

community buy-in, and organisational resources. The VPUU programme is composed of five intervention arms, and at the time of our study, these treatment arms had all been operationalised to at least some extent in each intervention area, though to varying degrees of intensity. For the purposes of our study, all areas that had received investment from VPUU were considered to be treated, regardless of the scale of intervention. Further research should consider the effect of each programme arm separately, as well as investigate whether there is a dose-response relationship between intervention investment and violence reduction. Given our use of individual level data that did not measure exposure to the intervention outside of area of residence, we were not able to account for potential spillover effects. Future studies should use network analyses to determine an individual's secondary exposure to the intervention. The use of transport and unintentional injuries was selected as a conservative control group; as alcohol is a potential risk factor for both transport and unintentional injuries, our results may underestimate the effect of alcohol on violent injury (WHO, 2007).

Intervention and non-intervention areas may also differ in other ways including geography, population density, levels of social cohesion, and SES such that we are not able to determine definitively whether the significant difference in levels of reported violent injury in intervention and non-intervention areas was caused by the presence of the intervention or rather differences between areas. Furthermore, our outcome variable was defined as the presentation to an EC for either a violent or non-violent injury. While this is likely to be representative of the total number of violent and non-violent injuries that occur in a community, an individual's ability to present to a health facility may be limited by the severity of their injury, their socio-economic position, and geographic proximity to a health centre. These factors may lead to underreporting of injuries. Moreover, the cause of injury was self-reported by victims. Women tend to underreport violence, particularly intimate partner violence, and thus the association between sex and violent injury may have been overestimated (Palermo et al., 2013). Alcohol and drug use were also assessed subjectively, though we think that it is unlikely that underreporting would vary systematically by either injury type or intervention group. Though it was not possible in our study due to funding and human resources constraints, further research

should consider more objective measures of classifying alcohol use (including BAC). Data were not collected consecutively, but rather over one-week long snapshots. Temporal variations in violence patterns may have biased our results if isolated spikes in violence occurred in specific areas during the time of data collection.

Conclusion

The findings of this study provide valuable information on the demographic, behavioural, and geographic factors associated with violence-related injury in the communities of Khayelitsha and Nyanga. These data substantiate the need for violence prevention interventions aimed at younger males as well the prevention of alcohol abuse in both men and women. Moreover, this preliminary evidence suggests that individuals living in VPUU intervention areas have a lower risk of violence than those in comparison areas when controlling for other known risk factors. Further research is needed to confirm the efficacy of this intervention in preventing violence-related injury. Future work would ideally follow intervention areas prospectively in order to determine whether intervention investment precedes reduction in violent crime as well as consider the scale of the intervention in order to assess whether there is a dose-response relationship.

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SECTION D: APPENDICES

Appendix A: Data Collection Tool

Appendix B: Consent Form

Appendix C: UCT Ethics Committee Approval Letter—Data Collection

Appendix D: UCT Ethics Committee Approval Letter—Dissertation

Appendix E: Stratified Analyses for Alcohol and Violent Injury by Gender

Appendix E: Journal Submission Criteria

APPENDIX A: DATA COLLECTION TOOL

APPENDIX A: INJURY SURVEILLANCE DATA COLLECTION FORM

FACILITY CODE		HOSP FOLDER NO		STUDY NO					
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GENDER	M	F	RACE	A	B	C	W
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DATE OF BIRTH	d	d	m	m	y	y	y	y	IF DOB UNKNOWN CAPTURE AGE→	AGE		
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Is this an interview?	Yes	No	IF YES CAPTURE DATE OF INTERVIEW OR FOLDER REVIEW →	d	d	m	m	y	y	y	y
Is this a folder review?	Yes	No									

Reason for visit to emergency centre: _____
Capture reason for seeking treatment at health facility

FIRST PRESENTATION TO A FACILITY FOR THIS INJURY?	Yes					
	No	Was patient referred?	Yes	No	if yes capture referral facility: _____	
		Is this a follow-up for a previous injury?	Yes	No		

TRIAGE CODE	1	Red	2	Orange	3	Yellow	4	Green	5	Blue	99	Unknown
-------------	---	-----	---	--------	---	--------	---	-------	---	------	----	---------

Date of injury	d	d	m	m	y	y	y	y	Time of injury	h	h	m	m	if exact time not known choose approximate time	7am-1pm	1pm-7pm
Date of treatment	d	d	m	m	y	y	y	y	Triage time	h	h	m	m		if exact time not known choose approximate time	7am-1pm

WAS ALCOHOL USED BY THE PATIENT PRIOR TO INJURY		
Yes/suspected	No	Unknown

WERE DRUGS USED BY THE PATIENT PRIOR TO INJURY		
Yes/suspected	No	Unknown

CAUSE OF INJURY	Violence	Transport	Unintentional/ other accident	Self-harm
	↓ 1	↓ 2	↓ 3	↓ 4

Please complete the section appropriate for the cause of injury

(1) VIOLENCE (person-on-person intentional)									
Specific cause			Type of violence			Perpetrator-victim relationship			
1	Sharp object (e.g. cut/stab)	7	Choking/strangulation	1	Rape/sexual	1	Spouse/partner	7	Neighbour
2	Blunt object	8	Fire burn	2	Child abuse	2	Ex-intimate partner	8	Community member
3	Firearm	9	Other burn	3	Gang-related	3	Parent	9	Acquaintance
4	Push/kick/punch	10	Poisoning	4	Crime-related (e.g. robbery, mugging)	4	Other relative	10	Police
5	Human bite	89	Other	5	Interpersonal (other than those above)	5	Unrelated caregiver	89	Other
6	Explosion	99	Unknown	89	Other Specify: _____	6	Friend	99	Unknown
				99	Unknown				

Gender of main perpetrator	M	F	U		
Number of perpetrators	1	2	3	4 or more	Unknown

APPENDIX A: INJURY SURVEILLANCE DATA COLLECTION FORM

(2) TRANSPORT			
Specific cause			
Traffic user			
1	Driver/ rider/ cyclist		
2	Passenger	89	Other
3	Pedestrian	99	Unknown
Vehicle involved			
1	Car/bakkie	6	Bicycle
2	Minibus taxi	7	Train
3	Bus	8	Aircraft
4	Truck	89	Other
5	Motorcycle	99	Unknown

(3) UNINTENTIONAL/ OTHER ACCIDENT OR (4) SELF-HARM			
Specific cause/ method			
If cause of injury is unintentional or other accident or self-harm choose specific cause or method below			
1	Sharp object	12	Caught between/ struck against
2	Blunt object	13	Near drowning
3	Firearm	14	Hanging
4	Hot liquid burn	15	Paraffin poisoning
5	Chemical burn	16	Other poisoning
6	Electrical burn	17	Inhaled gas
7	Fire burn	18	Dog bite
8	Fall on level	19	Other bite/sting
9	Fall on stairs	20	Machinery
10	Fall from height	89	Other
11	Jump	99	Unknown

Where does patient normally reside/ live? Choose from list							
Khayelitsha	Nyanga	Gugulethu	Phillipi	Crossroads	Other: _____	Elsies River	Unknown
Main area: _____							
Sub-area: _____							

Where did the injury occur? Choose from list							
Khayelitsha	Nyanga	Gugulethu	Phillipi	Crossroads	Other: _____	Elsies River	Unknown
Main area: _____							
Sub-area: _____							

PLACE OR SCENE WHERE INJURY OCCURRED			
Please choose ONLY ONE from the list below			
1	Home (including outbuilding, yard & garden)		
2	School/ educational area (e.g. crèche, high school, college)		
3	Shebeen/ bar/ night club		
4	Highway/ street/ road:	(a) Main road (e.g. N2, Mew Way, Spine Road, Klipfontein Road)	(b) Smaller road in area
5	Public transport area (taxi rank, bus stop, train station)		
6	Open field (not a sports field)		
7	Commercial area (shopping mall)		
8	Construction/ industrial area		
9	Sports area (e.g. soccer field)		
89	Other: _____		
99	Unknown		

ACTIVITY AT THE TIME INJURY OCCURRED	
Please choose ONLY ONE from the list below	
1	Work
2	Education
3	Travelling
4	Leisure (relaxing, eating, sleeping, socialising)
5	Playing a sport
89	Other: _____
99	Unknown

APPENDIX A: INJURY SURVEILLANCE DATA COLLECTION FORM

PLACEMENT AFTER INITIAL ASSESSMENT	
1	Discharged
2	Admitted to ward
3	Admitted to ICU
4	Died
5	Absconded
6	Referred to: _____
7	Transferred to: _____
8	Information not available at time of interview
99	Unknown

FORM COMPLETED BY	
Name:	_____
Signature:	_____
Date:	_____

APPENDIX B: CONSENT FORM

APPENDIX B: INFORMED CONSENT FORM

TO BE COMPLETED BY DATA COLLECTOR IN CONSULTATION WITH PATIENT

You are being invited to take part in a research study titled “**Injury Morbidity Surveillance in Nyanga and Khayelitsha in the Western Cape**”

Who is conducting the research?

The Health Systems Trust is collaborating with the Western Cape Department of Health and the Medical Research Council to conduct this study.

The Principal Investigator is Dr René English 021 762 0700/ rene.english@hst.org.za.

What is the study about?

- The study aims to assess the injury burden (how many injuries and what type of injuries take place during a certain time period) at health facilities in 2 communities in the Cape Town Metropole, namely Khayelitsha and Nyanga.
- The researchers will establish in which areas in these 2 communities the most injuries are occurring.
- The researchers plan to use this information to understand trauma patterns in your community. This will not necessary benefit you immediately but could help create a safer environment.

What will be required of you if you agree to participate?

- You will need to understand and sign this consent form.
- You may look at the questionnaire prior to deciding if you would like to take part.
- We will record routinely collected information such as the date, your folder number, age and gender. Your name will not be recorded on the data form. Your folder number is recorded so that we can make sure that we have seen all the patients attended to in the casualty by comparing our forms to the casualty register.
- You will then be asked a few questions by the data collector such as the type of injury you had, where and when it occurred. We will also confirm your date of birth.
- It will take approximately 5 minutes to complete.
- Some of the questions may be of a sensitive nature.
- Your participation is entirely voluntary and you do not have to provide any information that you don't want to share (you may withdraw your answers, refuse to participate or leave out details if you wish). You may withdraw at any time. If you choose not to participate this will not affect the care you receive in the health facility in anyway.
- In the event that information given to the study team suggests you may benefit from referral to health care staff/ services within the facility for an injury you have sustained, the referral options will be made available to you.

Are there risks involved in taking part in this study?

- The researchers do not intend to cause you any mental stress or discomfort. We will not be asking about the identity of individuals who may have injured you or the exact address where the injury occurred. We will not be examining you or taking blood from you.
- Your identity will not be revealed at any point during or after the study has been conducted or when the study is published. The consent form that you have signed will be kept separately from your questionnaire and filed in a locked cabinet in the HST offices. All information collected in the questionnaire will be stored in a password protected database. The questionnaires will be destroyed after the study. Only the researchers from Health Systems Trust and Medical Research Council will have access to these forms.

INFORMED CONSENT:

I agree to voluntarily consent to participate in this study and acknowledge that:

- I have been informed about the study; the nature, conduct, benefits and risks of study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and inputs will be anonymously processed into a study report. In view of the requirements of research, I agree that the data collected during this study can be processed by the researcher.
- I may, at any stage, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- If I have questions about my participation in this study, I know that I can contact the University of Cape Town Faculty of Health Sciences Human Research Ethics committee , 021 406 6492 and the Principal investigator Dr René English at rene.english@hst.org.za or on 021 7620700.

Signature or thumbprint of participant

Participant's name

Date

Study number

If informed consent is denied or cannot be obtained, please indicate reasons:

Patient declined	Dead on arrival	Unconscious	Intoxicated	Unable to speak	Other
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Data Collector's name

Data Collector's Signature

APPENDIX C: UCT ETHICS COMMITTEE APPROVAL LETTER—DATA COLLECTION

UNIVERSITY OF CAPE TOWN



Faculty of Health Sciences
Faculty of Health Sciences Human Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: sumayah.ariefdien@uct.ac.za
www.health.uct.ac.za/research/humanethics/forms

16 July 2013

HREC REF: 399/2013

Dr R English
Public Health & Family Medicine
Falmouth Building

Dear Dr English

PROJECT TITLE: INJURY MORBIDITY SURVEILLANCE IN NYANGA AND KHAYELITSHA IN THE WESTERN CAPE

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above mentioned study.

Approval is granted for one year till the 28 July 2014.

Please submit a progress form, using the standardised Annual Report Form, if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

Please note that the on-going ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, HSF HUMAN ETHICS

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

sAriefdien

APPENDIX D: UCT ETHICS COMMITTEE APPROVAL LETTER—DISSERTATION



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925

Telephone [021] 406 6338 • Facsimile [021] 406 6411

Email: shuretta.thomas@uct.ac.za

Website: www.health.uct.ac.za/fhs/research/humanethics/forms

15 January 2016

HREC REF: 014/2016

Dr R Matzopoulos
Public Health & Family Medicine
Falmouth Building

Dear Dr Matzopoulos

PROJECT TITLE: THE EFFECT OF THE VIOLENCE PREVENTION THROUGH URBAN UPGRADING (VPUU) INTERVENTION ON VIOLENCE-RELATED INJURIES PRESENTING TO HEALTH FACILITIES IN KHAYELITSHA AND NYANGA (MPH Candidate - Ms L Trupe) Sub-study linked to 399/2013

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30th January 2017.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Ms Lydia Trupe will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on

2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines.
The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

APPENDIX E: STRATIFIED ANALYSES FOR ALCOHOL AND VIOLENT INJURY BY GENDER

Table D-1 Alcohol and Violent Injury Crude OR: Combined

	Alcohol +	Alcohol -
Violent Inj +	793	390
Violent Inj -	122	295
	915	685

Odds Ratio: 4.91

Table D-2 Alcohol and Violent Injury Crude OR: Men

	Alcohol +	Alcohol -
Violent Inj +	579	234
Violent Inj -	92	130

Odds Ratio: 3.50

Table D-3 Alcohol and Violent Injury Crude OR: Women

	Alcohol +	Alcohol -
Violent Inj +	214	156
Violent Inj -	30	165
	244	321

Odds Ratio: 7.55

APPENDIX F: JOURNAL OF INTERPERSONAL VIOLENCE—SUBMISSION CRITERIA

Journal of Interpersonal Violence—Instructions for Authors

<http://jiv.sagepub.com>

Manuscripts should be submitted electronically to <http://mc.manuscriptcentral.com/jiv> where authors will be required to set up an online account on the SageTrack system powered by ScholarOne. Manuscripts should not exceed 30 typed double-spaced pages, including references, tables, and figures (Brief Notes should not exceed 12 pages, inclusive). References must conform to the *Publication Manual of the American Psychological Association* (Sixth Edition). All artwork must be camera-ready. Authors should include their name, affiliation, mailing address, email address, telephone number, and a brief biographical statement on a separate title page. Each manuscript should include an abstract and 3-5 keywords. Submission of a manuscript implies commitment to publish in the journal. Authors submitting manuscripts to the journal should not simultaneously submit them to another journal, nor should manuscripts have been published elsewhere in substantially similar form or with substantially similar content. Authors in doubt about what constitutes prior publication should consult the editor.

Journal Policy on Addressing Diversity in Manuscripts Effective January 2016

Effective January 2016 JIV will require that every manuscript include a discussion about the implications of the study questions, underlying research literature, methodology, and analysis or results in terms of diversity. Diversity concerns are not a criteria for publication but must be addressed. The nature of the discussion and amount of space devoted to the discussion is the responsibility of the author(s).

JIV understands diversity to include all aspects of human differences such as socioeconomic status, race, ethnicity, language, nationality, sex, gender identity, sexual orientation, religion, geography, ability, and age.

Diversity as a core value embodies inclusiveness, mutual respect, and multiple perspectives and serves as a catalyst for expanding knowledge and practice with all human beings. While science seeks knowledge that can be generalized, it must appreciate that specific findings, while important in understanding the unique experiences of individuals or groups, are not necessarily applicable to all.

Manuscript Preparation

The manuscript should include four major sections (in this order): Title Page, Abstract, Main Body, and References.

Sections in a manuscript may include the following (in this order): (1) Title page, (2) Abstract, (3) Keywords, (4) Text, (5) Notes, (6) References, (7) Tables, (8) Figures, (9) Appendices, and (10) Author Biography

1. Title page. Please include the following:

- Full article title
- Acknowledgments and credits
- Each author's complete name and institutional affiliation(s)
- Grant numbers and/or funding information
- Corresponding author (name, address, phone/fax, e-mail)

2. Abstract. Print the abstract on a separate page headed by the full article title. Omit author(s)'s names.

***JIV will not review or publish any manuscript without an abstract of 250-300 words that includes a concise summary of the study questions, subjects, methods, findings and major implications.**

3. Text. Manuscripts should be Word files (.docx or .doc). The main document must be blinded for peer review, with all author names and other identifying information removed. Upload text, headed by the full article title, as "Main Document."

a. Headings and subheadings. Subheadings should indicate the organization of the content of the manuscript. Generally, three heading levels are sufficient to organize text. Level 1 heading should be Centered, Boldface, Upper & Lowercase, Level 2 heading should be Flush Left, Boldface, Upper & Lowercase, Level 3 heading should be Indented, boldface, lowercase paragraph heading that ends with a period, Level 4 heading should be *Indented, boldface, italicized, lowercase paragraph heading that ends with a period*, and Level 5 heading should be *Indented, italicized, lowercase paragraph heading that ends with a period*.

b. Citations. For each text citation there must be a corresponding citation in the reference list and for each reference list citation there must be a corresponding text citation. Each corresponding citation must have identical spelling and year. Each text citation must include at least two pieces of information, author(s) and year of publication. Following are some examples of text citations:

(i) Unknown Author: To cite works that do not have an author, cite the source by its title in the signal phrase or use the first word or two in the parentheses. Eg. The findings are based on the study was done of students learning to format research papers ("Using XXX," 2001)

(ii) Authors with the Same Last Name: use first initials with the last names to prevent confusion. Eg. (L. Hughes, 2001; P. Hughes, 1998)

(iii) Two or More Works by the Same Author in the Same Year: For two sources by the same author in the same year, use lower-case letters (a, b, c) with the year to order the entries in the reference list. The lower-case letters should follow the year in the in-text citation. Eg. Research by Freud (1981a) illustrated that...

(iv) Personal Communication: For letters, e-mails, interviews, and other person-to-person communication, citation should include the communicator's name, the fact that it was personal communication, and the date of the communication. Do not include personal communication in the reference list. Eg. (E. Clark, personal communication, January 4, 2009).

(v) Unknown Author and Unknown Date: For citations with no author or date, use the title in the signal phrase or the first word or two of the title in the parentheses and use the abbreviation "n.d." (for "no date"). Eg. The study conducted by of students and research division discovered that students succeeded with tutoring ("Tutoring and APA," n.d.).

5. Notes. If explanatory notes are required for your manuscript, insert a number formatted in superscript following almost any punctuation mark. Footnote numbers should not follow dashes (—), and if they appear in a sentence in parentheses, the footnote number should be inserted within the parentheses. The Footnotes should be added at the bottom of the page after the references. The word "Footnotes" should be centered at the top of the page.

6. References. Basic rules for the reference list:-

∅ The reference list should be arranged in alphabetical order according to the authors' last names.

∅ If there is more than one work by the same author, order them according to their publication date – oldest to newest (therefore a 2008 publication would appear before a 2009 publication).

∅ When listing multiple authors of a source use "&" instead of "and".

∅ Capitalize only the first word of the title and of the subtitle, if there are one, and any proper names – i. e. only those words that are normally capitalized.

∅ Italicize the title of the book, the title of the journal/serial and the title of the web document.

∅ Manuscripts submitted to *Journal of Interpersonal Violence (JIV)* should strictly follow the APA manual (6th edition).

∅ Every citation in text must have the detailed reference in the Reference section.

∅ Every reference listed in the Reference section must be cited in text.

∅ Do not use "et al." in the Reference list at the end; names of all authors of a publication should be listed there.

