


# Estimating the changing burden of disease attributable to interpersonal violence in South Africa for 2000, 2006 and 2012

M Prinsloo,<sup>1,2</sup> MPH, PhD ; M Machisa,<sup>3,4</sup> PhD; R Kassanjee,<sup>5</sup> PhD; C L Ward,<sup>6,7</sup> PhD; I Neethling,<sup>1,2</sup> PhD; L Artz,<sup>8,9</sup> PhD; R Jewkes,<sup>3,4,10</sup> MSc, MD; N Abrahams,<sup>3,11</sup> PhD; V Pillay-van Wyk,<sup>1</sup> MPH, PhD; R Matzopoulos,<sup>1,11</sup> MPhil, PhD; D Bradshaw,<sup>1,11</sup> DPhil; R Pacella,<sup>2</sup> PhD

<sup>1</sup> Burden of Disease Research Unit, South African Medical Research Council, Cape Town, South Africa

<sup>2</sup> Institute for Lifecourse Development, Faculty of Education, Health and Human Sciences, University of Greenwich, London, UK

<sup>3</sup> Gender and Health Research Unit, South African Medical Research Council, Cape Town, South Africa

<sup>4</sup> School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

<sup>5</sup> Centre for Infectious Disease Epidemiology and Research, University of Cape Town, South Africa

<sup>6</sup> Department of Psychology, Faculty of Humanities, University of Cape Town, South Africa

<sup>7</sup> Safety and Violence Initiative, University of Cape Town, South Africa

<sup>8</sup> Gender, Health and Justice Research Unit, University of Cape Town, South Africa

<sup>9</sup> Department of Pathology, Division of Forensic Medicine, Faculty of Health Sciences, University of Cape Town, South Africa

<sup>10</sup> Office of the Executive Scientist, South African Medical Research Council, Pretoria, South Africa

<sup>11</sup> School of Public Health and Family Medicine, Faculty of Health Sciences, University of Cape Town, South Africa

**Corresponding author:** M Prinsloo ([megan.prinsloo@mrc.ac.za](mailto:megan.prinsloo@mrc.ac.za))

**Background.** South Africa's (SA)'s high rate of interpersonal violence persists as a leading public health problem for the country. The first South African Comparative Risk Assessment Study (SACRA1) in 2000 quantified the long-term mental and physical health burden attributable to interpersonal violence by supplementing the direct injury burden of disease attributable to interpersonal violence injuries with the substantial contribution of mental health, behavioural and reproductive health consequences accruing from exposure to intimate partner violence (IPV) and child sexual abuse.

**Objectives.** To revise and improve these estimates by including the additional burden from other forms of child maltreatment, community violence, sexual violence by non-partners, and bullying victimisation in SA for 2000, 2006 and 2012, and trends over time.

**Methods.** We used comparative risk assessment methods to calculate population attributable fractions (PAFs) for interpersonal violence. This method requires inputs on the prevalence of exposure to the interpersonal violence risk factor subtypes, namely child maltreatment, bullying, IPV, sexual violence by non-partners and other community violence; the burden of related health outcomes (mortality and morbidity); and relative risks of health outcomes in individuals exposed to the risk factor v. those unexposed. We estimated the PAF for the combinations of all interpersonal violence subtypes together to estimate the burden attributable to interpersonal violence overall for 2000, 2006 and 2012.

**Results.** Between 2000 and 2012, there was a decrease in interpersonal violence age-standardised attributable death rates from 100 to 71 per 100 000. In the second South African Comparative Risk Assessment Study (SACRA2), estimates of the attributable disability-adjusted life years (DALYs) for interpersonal violence for the year 2000 were revised, from 1.7 million to 2 million DALYs, taking into account attributable mortality and disability from additional forms of violence. There was a decrease in DALYs attributable to interpersonal violence from 2 million in 2000 to 1.75 million in 2012, accounting for 8.5% of the total burden for SA, ranking second highest, after unsafe sex, among 18 risk factors evaluated in 2012.

**Conclusion.** Overall, interpersonal violence-attributable DALYs decreased substantially but remain high. The reduction in age-standardised attributable death rates indicates that some policy and social intervention aspects are effective. Further strengthening of existing laws pertaining to interpersonal violence, and other prevention measures, are needed to intensify the prevention of violence, particularly gender-based violence. Additional forms of violence included in this analysis have improved our understanding of the interpersonal violence burden, but the attributable burden in males, although exceedingly high, remains an underestimate. There is a need to improve the epidemiological data on prevalence and risks for the different types of interpersonal violence, particularly for males.

*S Afr Med J* 2022;112(8b):693-704. <https://doi.org/10.7196/SAMJ.2022.v112i8b.16512>

## The article in context

**Evidence before this study.** Interpersonal violence is a leading public health problem for South Africa (SA). In addition to the direct physical injury burden, non-fatal violence has well-documented long-term physical and mental health consequences. The first South African Comparative Risk Assessment Study (SACRA1) in 2000 estimated that 1.7 million disability-adjusted life years (DALYs) were attributable to interpersonal violence as a risk factor, and ranked second among 17 risk factors, after unsafe sex. This was done by supplementing the direct physical injury burden of violence with health outcomes attributable to exposure to intimate partner violence (IPV) and child sexual abuse.

**Added value of this study.** Comparative risk assessment methods were applied for the three time points for which estimates from the second South African National Burden of Disease Study (SANBD2) were available. We expanded the interpersonal violence categories to include IPV (physical and sexual violence against women), all forms of child maltreatment (physical, sexual and emotional abuse, neglect, and witnessing family violence), as well as community violence in children and adults, such as sexual violence by non-partners, bullying victimisation, and experiencing other forms of community violence, such as being attacked with or without an object or weapon. This allowed for more complete quantification of the interpersonal violence-attributable burden, with DALYs for interpersonal violence for the year 2000 being revised from 1.7 million in SACRA1 to 2 million in SACRA2. A key finding of SACRA2 was the decrease in interpersonal violence age-standardised attributable death rates between 2000 and 2012, from 100 to 71 per 100 000 population, and a decrease in attributable DALYs, from 2 million in 2000 to 1.75 million in 2012. Interpersonal violence is ranked as the second leading risk factor, after unsafe sex, for attributable DALYs in SA in 2000, 2006 and 2012, when the additional burden from mental health, behavioural and reproductive health consequences, HIV/AIDS and the direct physical injury burden are taken into account.

**Implications of the available evidence.** Despite a decline from 2000 to 2012, the exceedingly high burden indicates that SA requires further reinforcement and strengthening of existing laws on gender-based violence (GBV), child protection and firearm use, and other prevention programmes to address the burden of violence.

Fatal interpersonal violence (homicide) persists as one of SA's leading public health problems.<sup>[1,2]</sup> There has been a decline in national homicide rates in the early part of the past two decades, from 64.8 per 100 000 population in 2000<sup>[3]</sup> to 40.3 and 30.9 per 100 000 in 2004 and 2011, respectively.<sup>[4]</sup> Thereafter, South African Police Service (SAPS) reports indicate that homicide rates increased<sup>[5]</sup> and remained constant in recent years, at about 36/100 000 population.<sup>[6]</sup> Despite this apparent overall decrease, the homicide rate continues to be more than five times the global rate.<sup>[7]</sup>

More than 85% of homicide victims are male,<sup>[8]</sup> yet rates of homicide are also very high among SA women compared with global averages.<sup>[9]</sup> While there was a statistically significant reduction in female homicide between 1999 and 2009, the reduction in intimate femicide (killing of women by intimate partners) was more modest than that for non-intimate femicide, and not statistically significant, and there was no difference in the rate for suspected rape-related homicides over that decade.<sup>[10]</sup>

Exposure to violence can be fatal or non-fatal; in SA in 2012, interpersonal violence as a cause of injury accounted for 662 286 DALYs. In addition to the direct physical injuries, non-fatal violence has well-documented long-term physical and mental health consequences.<sup>[11,12]</sup> Women experience high rates of non-fatal GBV, in particular sexual violence<sup>[13,14]</sup> and IPV, which have a substantial impact on their health and increase the risk of HIV infection in young women.<sup>[13,15]</sup> The physical and mental health impact of IPV for male victims, however, is not as well documented.<sup>[16,17]</sup>

Children in SA also experience high rates of sexual violence and other forms of child maltreatment, including abuse in their homes, schools and communities, often resulting in fatalities or long-term consequences across the life course.<sup>[18-23]</sup> Only a small proportion of child abuse is reported to the police, and social services and child protection system data cannot be used as an accurate source for national prevalence.<sup>[24]</sup> Issues around availability of reliable data tend to make interpersonal violence risk factors challenging to assess and quantify, so these are often not included in comparative risk assessments.

There is limited global evidence of the burden of disease associated with experiences of interpersonal violence. Mental disorders are a leading cause of disability worldwide, and yet few risk factors for mental disorders are included in the Global Burden of Diseases, Injuries, and Risk Factors (GBD) studies. Currently, global risk estimates of child maltreatment are limited, as the GBD considers childhood sexual abuse only and a few related health outcomes.<sup>[25]</sup> The GBD also includes IPV as a risk to health and, since 2017, an

additional psychosocial risk factor, namely bullying victimisation,<sup>[25]</sup> as the first-ever risk factor for anxiety disorders in GBD. However, non-sexual child maltreatment and other forms of community violence are omitted.

Levels of violence are modifiable and preventable,<sup>[7]</sup> and given the exceedingly high levels of interpersonal violence in SA, SACRA1 quantified, for one time point, the burden attributable to interpersonal violence as a risk factor for loss of health for the first time. This included direct physical injuries (fatal and non-fatal) as well as the long-term mental and physical health consequences of exposure to non-fatal IPV and childhood sexual abuse.<sup>[1,2]</sup> Owing to data limitations, other types of interpersonal violence, including non-sexual child maltreatment and community violence, were omitted. Despite these omissions in 2000, between 1.4 and 1.7 million DALYs were attributable to interpersonal violence as a risk factor in SA, and it was the second leading risk factor after unsafe sex.<sup>[1,2]</sup>

The objective of this study was to estimate the burden of disease (deaths, years of life lost due to premature mortality (YLLs), years lived with disability (YLDs) and DALYs) attributable to exposure to interpersonal violence, including the contribution of IPV, all forms of child maltreatment, sexual violence by non-partners, bullying victimisation and other forms of community violence as risk factors for disease and injury in SA. Burden metrics in SA are available from three South African National Burden of Disease (SANBD) studies carried out for 2000, 2006 (the peak of the HIV/AIDS epidemic) and 2012, and we were therefore able to estimate the attributable burden for these three time points and trends over time. The results presented here supersede the previously published SACRA1 estimates. We incorporate improved methods, with additional interpersonal violence categories and related health outcomes, updated information on levels of exposure, and revised relative risks (RRs).

## Methods

Categories of violence include interpersonal, self-directed and collective violence.<sup>[26]</sup> This study focuses specifically on interpersonal violence as a risk factor for loss of health, and we expand on this to include family violence such as female IPV (physical and sexual) and all forms of child maltreatment (physical, sexual and emotional abuse, neglect, and witnessing family violence) (see exposure definitions in Table 1), as well as community violence, which occurs among individuals who are not connected as family members but who may be acquaintances or strangers. Community violence includes sexual violence by non-partners,

**Table 1. Exposure definitions, theoretical minimum risk exposure level, and data sources for interpersonal violence prevalence estimates\* by age group in South Africa for 2000, 2006 and 2012**

Interpersonal violence type	Exposure definition <sup>†</sup>	TMREL	Prevalence by age group (years), %												Data source
			15 - 19 (year <sup>‡</sup> )	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59 <sup>§</sup>				
1.1 All forms of child maltreatment, ever (boys)	Proportion of the population ever having had the experience of child physical abuse, <sup>a</sup> sexual abuse, <sup>b</sup> emotional abuse, <sup>c</sup> neglect <sup>d</sup> or witnessing family violence <sup>e</sup> when aged <18 years	No child maltreatment	40.1 <sup>†</sup>	-	-	-	-	-	-	-	-	-	-	-	Optimus SA <sup>[21]</sup>
1.2 All forms of child maltreatment, ever (girls)	As above	As above	51.6 <sup>†</sup>	-	-	-	-	-	-	-	-	-	-	-	Optimus SA <sup>[21]</sup>
1.3 Bullying victimisation (includes traditional and cyberbullying), in the past 12 months (boys)	Proportion of population attending school who have been exposed to bullying <sup>f</sup> victimisation within the past year	No bullying victimisation	4.5 <sup>  </sup> (2000) 13.0 (2006) 14.0 (2012)	-	-	-	-	-	-	-	-	-	-	-	Optimus SA, <sup>[21]</sup> Census 2001, <sup>[32]</sup> Community Survey 2007 <sup>[31]</sup> and Census 2011 <sup>[30]</sup> for proportion in school.
1.4 Bullying victimisation (includes traditional and cyberbullying), in the past 12 months (girls)	As above	As above	5.7 <sup>  </sup> (2000) 16.6 (2006) 18.3 (2012)	-	-	-	-	-	-	-	-	-	-	-	Optimus SA, <sup>[21]</sup> Census 2001, <sup>[32]</sup> Community Survey 2007 <sup>[31]</sup> and Census 2011 <sup>[30]</sup> for proportion in school.
1.5 Intimate partner <sup>§</sup> violence (physical or sexual), ever (females)	Proportion of the population who have ever experienced one or more acts of physical <sup>h</sup> or sexual violence <sup>i</sup> by a present or former intimate partner since the age of 15 years	No intimate partner violence	24	35	42	37	44	38	44	36	27	-	-	-	Gauteng GBV study <sup>[14]</sup>
1.6 Intimate partner violence (physical or sexual), in the past 12 months (females)	Proportion of the population who have experienced one or more acts of physical or sexual violence by a present or former intimate partner in the past 12 months	As above	12	18	18	15	19	13	8	17	1	-	-	-	Gauteng GBV study <sup>[14]</sup>
1.7 Sexual violence by non-partners, ever (females)	Proportion of the population who have ever experienced one or more acts of sexual violence by a non-partner since the age of 15 years	No sexual violence by non-partners	8	21	17	3	14	11	17	13	6	-	-	-	Gauteng GBV study <sup>[14]</sup>
1.8 Community violence victimisation, ever (boys)	Proportion of the population who have ever experienced having been hit or attacked with or without an object or weapon by perpetrators in their community when aged <18 years	No community violence victimisation	24	-	-	-	-	-	-	-	-	-	-	-	Optimus SA <sup>[21]</sup>

Continued ...

**Table 1. (continued) Exposure definitions, theoretical minimum risk exposure level, and data sources for interpersonal violence prevalence estimates\* by age group in South Africa for 2000, 2006 and 2012**

Interpersonal violence type	Exposure definition†	TMREL	Prevalence by age group (years), %											Data source		
			15 - 19 (year‡)	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59§	-	-			
1.9 Community violence victimisation, ever (girls)	As above	As above	19	-	-	-	-	-	-	-	-	-	-	-	-	Optimus SA <sup>[21]</sup>
1.10 Other community violence: witnessed murder of a stranger, ever (males)	Proportion of the adult population who have ever witnessed murder of a stranger by perpetrators in their community	No community violence victimisation	-	27	56	33	31	43	31	24	30					Gauteng GBV study <sup>[14]</sup>
1.11 Other community violence: witnessed murder of a stranger, ever (females)	As above	As above	-	7	10	6	14	7	15	10	12					Gauteng GBV study <sup>[14]</sup>
1.12 Other community violence: witnessed murder of family/friend, ever (males)	Proportion of the adult population who have ever witnessed murder of a family member/friend by perpetrators in their community	No community violence victimisation	-	27	32	31	31	20	22	24	26					Gauteng GBV study <sup>[14]</sup>
1.13 Other community violence: witnessed murder of family/friend, ever (females)	As above	As above	-	18	13	17	15	7	28	23	13					Gauteng GBV study <sup>[14]</sup>
1.14 Other community violence: carjacked/kidnapped/robbed, ever (males)	Proportion of the adult population who have ever experienced having been carjacked, kidnapped or robbed by perpetrators in their community	No community violence victimisation	-	42	48	65	51	47	47	59	48					Gauteng GBV study <sup>[14]</sup>
1.15 Other community violence: carjacked/kidnapped/robbed, ever (females)	As above	As above	-	33	25	14	20	20	13	18	13					Gauteng GBV study <sup>[14]</sup>

TMREL = theoretical minimum risk exposure level; Optimus SA = Optimus Study South Africa; GBV = gender-based violence.

\*See 'Methods' section for details on adjustment of prevalence estimates.

†Exposure definitions used in this study (a - i below) refer to conceptual understandings and definitions listed below which were mostly congruent with those used in data sources (see 'Discussion').

‡Physical abuse: an intentional act of physical force by a parent/caregiver that is intended to and does cause injury, harm, pain, or breach of dignity, or has a high likelihood of doing so (excludes lawful corporal punishment in relevant countries).<sup>[36,37]</sup>

§Sexual abuse: contact and non-contact sexual acts by any adult or child in a position of power over the victim, to obtain sexual gratification for the person or another person, whether immediately or deferred in time and space, when the child either does not have capacity to provide consent or has capacity but does not provide consent.<sup>[38]</sup>

¶Emotional abuse: parental behaviour, typically repeated, that conveys to the child they are worthless, unloved, unwanted, or only of value in meeting another's needs. Exemplified by acts of hostility, terrorising, rejection, isolation, corruption, and denying emotional responsiveness.<sup>[39,40]</sup>

¶Neglect: parental failure to provide the basic necessities of life as suited to the child's developmental stage and as recognised by the child's cultural context; includes physical, emotional, medical, supervisory and educational neglect.<sup>[41]</sup>

¶Witnessing family violence: witnessing a parent/family member subjected to assaults, threats, or property damage by another adult/teenager who lives in the household; includes other forms of interparental coercion.<sup>[42,43]</sup>

¶Bullying/victimisation is defined as unwanted aggressive behaviour that is repeated over time and involves an imbalance of power or strength.<sup>[44]</sup> Traditional bullying may be verbal (name calling, threats), physical (hitting, kicking, damaging a victim's property) or relational/social (social exclusion, rumour spreading), and cyberbullying refers to online bullying through the use of electronic communication, mobile phones and the internet, including online games and social media.<sup>[33]</sup> While bullying can be experienced as either a victim or perpetrator, bullying perpetration (i.e. bullies who bully others) was not included in this definition, although some victims will also be perpetrators (bully-victims).

¶Intimate partner is defined as 'a partner to whom you are married or with whom you cohabit; or with whom you have an intimate (sexual) relationship with but are not married to or cohabiting'.<sup>[45]</sup>

¶Intimate partner violence (physical) is defined as 'being slapped or having something thrown at you that could hurt you, being pushed or shoved, being hit with a fist or something else that could hurt, being kicked, dragged, or beaten up, being choked or burnt on purpose, and/or being threatened with or actually having a gun, knife, or other weapon used on you'.<sup>[46]</sup>

¶Intimate partner violence (sexual) is defined as 'being physically forced to have intercourse when you did not want to, having sexual intercourse because you were afraid of what your partner might do, and/or being forced to do something that you found humiliating or degrading' (the definition of humiliating and degrading may vary across studies, depending on the regional and cultural setting).<sup>[45]</sup>

¶Where 'year' is not specified, the same prevalence was assumed for 2000, 2006 and 2012.

¶The prevalence for 55 - 59-year-olds was assumed for those aged ≥60 years.

¶This estimate is for all child maltreatment combined, and prevalence estimates for different combinations of child maltreatment types are available from the authors upon request.

¶Estimates for 2006 and 2012 are for all bullying/victimisation combined, while estimates for 2000 are for traditional bullying only assuming no exposure to cyberbullying before 2006. Prevalence estimates for exposure to traditional bullying only, cyberbullying only and both traditional and cyberbullying are available from the authors upon request.

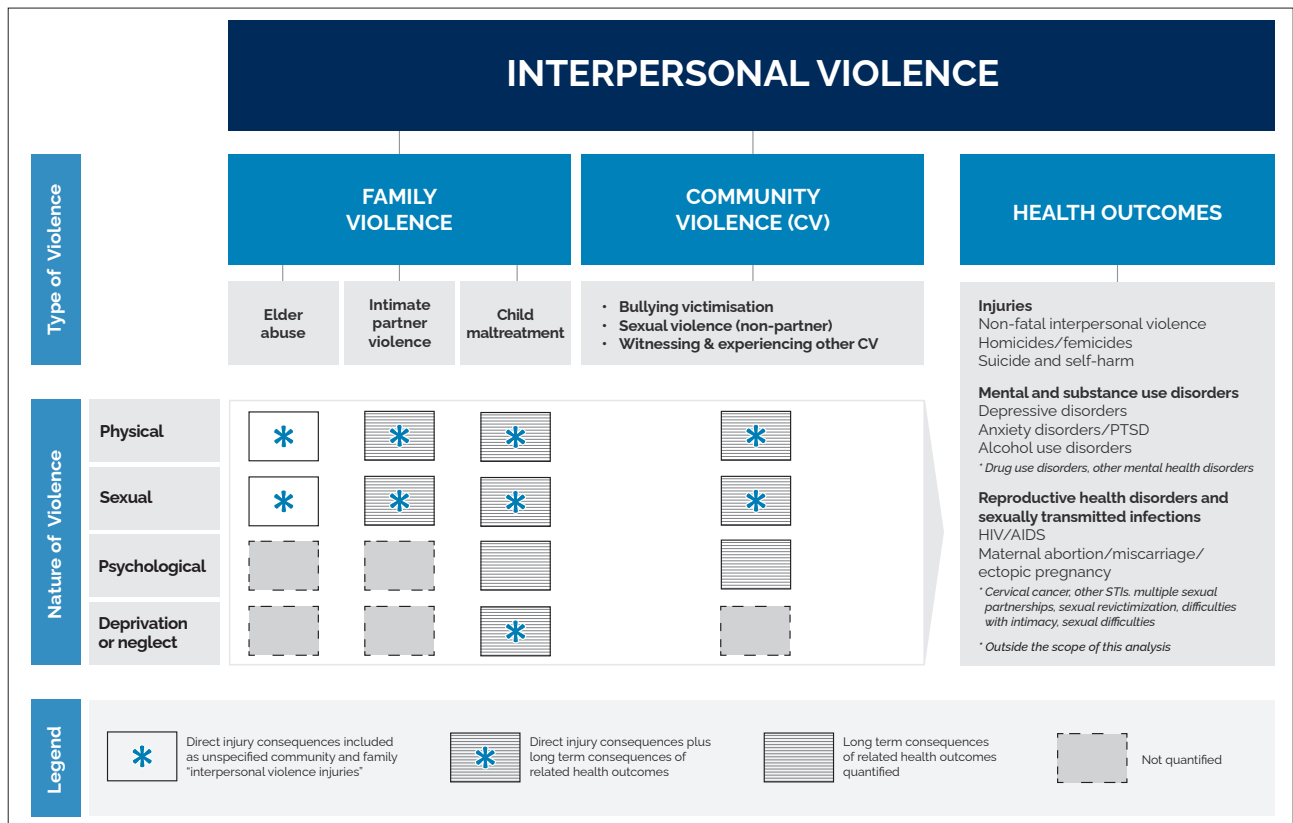


Fig. 1. Interpersonal violence risk factor framework and related health outcomes, South African Comparative Risk Assessment Study 2012 (adapted from Krug et al., 2002.<sup>[11]</sup>). (PTSD = post-traumatic stress disorder; STIs = sexually transmitted infections.)

bullying victimisation in school-aged children, and children and adults witnessing and experiencing other forms of community violence (Fig. 1). These types of family and community violence are included as subcategories of exposure to interpersonal violence. Self-directed violence, specifically fatal (suicide) and non-fatal self-harm injuries, are also included as health outcomes of exposure to interpersonal violence (Fig. 1).

We adapted the World Health Organization framework of interpersonal violence<sup>[11]</sup> and related health outcomes, based on available data sources, to estimate the total burden of disease and injury attributable to interpersonal violence, using categorical and counterfactual approaches.<sup>[27]</sup> We used comparative risk assessment methods to calculate the population attributable fraction (PAF) for interpersonal violence. This method requires inputs on the prevalence of exposure of the subcategories of risk factors for interpersonal violence, the burden of related health outcomes (mortality and morbidity) (Fig. 1), relevant RRs of disease outcomes in individuals exposed to the risk factor v. those unexposed, and the theoretical minimum risk exposure level (TMREL).

**Categorical attribution of injury mortality and burden**

Interpersonal violence itself appears as one of the mutually exclusive, categorically assigned disease and injury categories in the SANBD studies. Apart from IPV where the victim is female (intimate femicide estimation described below), data on victim-perpetrator relationships were not available, and we were therefore unable to distinguish the majority of fatal and non-fatal injuries due to other family violence from community violence. These injuries were included in the unspecified fatal (homicide/femicide) and non-fatal 'interpersonal violence injury' category (Fig. 1), and categorically attributed to interpersonal violence as a risk factor.

**Prevalence of exposure**

Child maltreatment prevalence data were sourced from the Optimus Study South Africa (Optimus SA), a 2015 national household survey that estimated lifetime prevalence of child physical, sexual and emotional abuse, neglect, and witnessing family violence among 15 - 17-year-old children (1.1 - 1.2 in Table 1).<sup>[18,21,22]</sup> We adapted the methods used in an Australian study by Moore *et al.*<sup>[28]</sup> to adjust for co-occurrence of multiple forms of maltreatment in childhood and derive prevalence estimates for the specific combinations of maltreatment types.

Bullying victimisation prevalence for children of schoolgoing age was sourced from Optimus SA, and we estimated a combined prevalence for traditional (in-person) bullying and cyber bullying for 15 - 17-year-old children, which was initially applied to children aged 15 - 19 years (1.3 - 1.4 in Table 1). To derive estimates for younger age groups, we applied the age pattern from an Australian study by Thomas *et al.*<sup>[29]</sup> to calculate prevalence for 5 - 9- and 10 - 14-year-old children and adjusted all prevalence estimates for the proportion of young people attending school using 2001 and 2011 census data and the 2007 Community Survey.<sup>[30-32]</sup> We estimated exposure to cyberbullying in younger age groups based on a study by Monks *et al.*,<sup>[33]</sup> which reported exposure to cyberbullying in young children 7 - 11 years of age. We assumed no prevalence of bullying victimisation in children aged <5 years.

In the absence of reliable national estimates, the prevalence of exposure to IPV (female victims only) was sourced from the Gauteng Gender Based Violence Indicators Project (Gauteng GBV study) of ever-partnered women aged 18 - 59 years,<sup>[14]</sup> and applied to women aged ≥15 years (for women aged ≥60 years, we assumed the same prevalence as for the 55 - 59-year age group) (1.5 - 1.6 in Table 1). Intimate femicides were categorically attributed to IPV

exposure in adult females, by applying the proportion of femicides committed by an intimate partner to the total number of femicides in SA from the 1999 femicide study for the 2000 estimates,<sup>[10,34]</sup> and the 2009 femicide study for the 2006 and 2012 estimates.<sup>[10,35]</sup> For IPV female victims, we only included physical and sexual violence (Fig. 1 and Table 1) owing to limited data on the long-term consequences of psychological abuse or economic abuse by intimate partners. We used the Gauteng GBV study<sup>[14]</sup> to derive a prevalence of sexual violence by non-partners where the victim is female and applied this to women aged  $\geq 15$  years, again assuming the same prevalence as for the 55 - 59-year age group in women aged  $\geq 60$  (1.7 in Table 1). Owing to data limitations, we did not quantify the burden of IPV for male victims and sexual violence by non-partners where the victim is male.

Community violence included bullying victimisation at school (children aged 5 - 19 years) as outlined above, but owing to data limitations, workplace bullying in adults and bullying by siblings were not included. In addition, we included other forms of community violence such as ever having been hit or attacked with or without an object or weapon (1.8 - 1.9 in Table 1) by perpetrators within their community (in children), and exposure to other forms of community violence including witnessing the murder of a stranger, witnessing the murder of a family member or a friend, and being robbed/carjacked/kidnapped (in adults) (Fig. 1 and Table 1). The prevalence of community violence among children was sourced from the Optimus SA study of children aged 15 - 17 years<sup>[18,21,22]</sup> and applied to children 15 - 19 years of age (Table 1). Owing to data limitations, we did not quantify exposure to other community violence in children aged  $< 15$  years. Exposure to community violence in adults was sourced from the Gauteng GBV study<sup>[14]</sup> of participants aged 18 - 59 years (male and female victims) and applied to adults aged  $\geq 20$  years (1.10 - 1.15 in Table 1). Although childhood is defined as age  $< 18$  years, the use of GBD age groupings meant that children were included up to the age group 15 - 19 years and then adult age groups were defined as  $\geq 20$  years. For men and women aged  $\geq 60$  years, we assumed the same prevalence as for the 55 - 59-year age group.

No change in prevalence over time was assumed for IPV, child maltreatment, bullying victimisation (although the proportion of children attending school varies over time) and other community violence, and we utilised the same prevalence estimates for all three time points, 2000, 2006 and 2012, except for cyberbullying, where we assumed no exposure before 2006.

### Theoretical minimum risk exposure level

We estimated the disease burden attributable to exposure to non-fatal interpersonal violence, specifically IPV, child maltreatment, bullying, sexual violence by non-partners and other forms of community violence, by comparing the exposure levels of these risks in the SA population with the TMREL counterfactual (defined as the level of risk exposure that minimises disease risk at the population level). The TMREL was defined as no exposure to these interpersonal violence risk factors in the population (Table 1).

### Relative risks

RRs for anxiety, self-harm and depressive disorders with exposure to 1, 2 and  $\geq 3$  types of child maltreatment, bullying victimisation (traditional bullying and cyberbullying), and exposure to childhood community violence for both sexes were calculated from a re-analysis of Optimus SA data. RRs used for child maltreatment, bullying victimisation and exposure to childhood community violence in this study were adjusted for confounders: housing, sanitation, scale of hunger, biological parents in the home, parental mental health

treatment, parental substance abuse and parental incarceration. However, we did not control for exposure to other forms of interpersonal violence (for example, exposure to child maltreatment was not adjusted for exposure to bullying victimisation or other community violence).

For IPV (female victims), we utilised RRs from the GBD study<sup>[25]</sup> for major depressive disorder and abortion. For IPV-abortion we applied the RR for abortion to the current prevalence of IPV (in the previous 12 months), rather than lifetime prevalence, because the case definition for the RR component studies as used in GBD was 'physical or sexual IPV in the past year'. For HIV/AIDS related to IPV exposure, we used data from the Stepping Stones trial (incidence rate ratio (IRR) 1.51; 95% confidence interval (CI) 1.04 - 2.21) after adjusting for herpes simplex virus type 2 infection at baseline, age, treatment, stratum, and person years of exposure<sup>[13]</sup> as an approximation of the RR and again applied the RR for HIV/AIDS to the current prevalence of IPV.<sup>[2]</sup> For sexual violence by a non-partner (female victims only, owing to data limitations), we calculated RRs for self-harm, alcohol use disorders, anxiety and depressive disorders, adjusted for age, for women who were exposed to non-partner rape from a reanalysis of Gauteng GBV study data.<sup>[14]</sup> We utilised the same source to calculate RRs for male and female adults who were exposed to community violence for post-traumatic stress disorder (PTSD) and applied this to the anxiety burden, as well as RRs for depressive disorders, alcohol use disorders and self-harm as health outcomes. For child sexual abuse and HIV/AIDS in female victims, we used RRs from Jewkes *et al.*<sup>[46]</sup> (IRR 1.66; 95% CI 1.04 - 2.63). For sexual violence by non-partners and HIV/AIDS, we used data from the Rape Impact Cohort Evaluation study,<sup>[15]</sup> which reported that women exposed to rape had an increased risk of acquiring HIV (adjusted hazard ratio 1.59; 95% CI 1.01 - 2.48) compared with those not exposed, and this was used as an approximation of the RR.

### Population attributable fractions

For a given risk-outcome pair, we estimated attributable burden by multiplying the burden metric (deaths and YLLs) sourced from SANBD studies,<sup>[47]</sup> and YLDs calculated by applying the ratio between non-fatal and fatal burden from the GBD study to the SA YLLs to extrapolate DALYs, by the PAF for the risk-outcome pair for each age, sex, and year 2000, 2006 and 2012. The PAF is the proportion by which the outcome would be reduced in the SA population and in a given year, if past exposure to the interpersonal violence risk factor were reduced to the counterfactual level of the TMREL. For child maltreatment, reanalysis of Optimus SA data enabled an adjustment for the co-occurrence of the five maltreatment types, and prevalence estimates for the specific child maltreatment combinations were paired with the corresponding RRs to calculate the PAF. For child maltreatment and bullying victimisation, we calculated PAFs in children aged  $< 19$  years and applied the age pattern from the GBD 2017 study<sup>[45]</sup> to estimate PAFs in adult age groups ( $> 20$  years); for bullying this included a waning effect over time. For IPV-abortion, the PAF was applied to the 'maternal abortion, miscarriage and ectopic pregnancy' burden of disease category.

The PAF for each individual risk-outcome pair was estimated independently and incorporated the entire burden for the outcome that was attributable to the risk factor, whether directly or indirectly. Child maltreatment, IPV, bullying victimisation, sexual violence by non-partners and other community violence were then aggregated to estimate the total effect of interpersonal violence overall on health outcomes.

To avoid overestimating the attributable burden, where these multiple interpersonal violence risk factors affected the same

outcome (namely depressive disorders, anxiety, self-harm, alcohol use disorders, HIV/AIDS), a multiplicative aggregation of the PAFs of the individual risk factors was used to estimate the joint effect of the  $n$  risk factors:

$$PAF_{1..n} = 1 - \prod_{i=1}^n (1 - PAF_i)$$

where  $PAF_i$  is the population attributable fraction for each individual risk factor (for example, child maltreatment, bullying victimisation, IPV, sexual violence by non-partners and other community violence). We then aggregated the burden by multiplying these joint PAFs with burden metrics to estimate the burden for interpersonal violence overall for the three time points.

### Uncertainty analysis

Monte Carlo simulation-modelling techniques were used to present uncertainty ranges around point estimates reflecting the main sources of sampling uncertainty in the calculations, using Ersatz software version 1.35<sup>[48]</sup> as an add-in to Excel version 2016 (Microsoft, USA). Beta distributions were specified for community violence, IPV and sexual violence by non-partner prevalence estimates based on number of cases and non-cases from reanalyses of Optimus SA and Gauteng GBV study data. For the child maltreatment and bullying victimisation multiple exposure categories, a Dirichlet distribution (a conjugate of the multinomial distribution) was specified that ensures that the returned random deviates (with binomial distributions) always sum to 1. For the RR input variables, we used the Ersatz random function *ErRelativeRisk*.<sup>[49]</sup> For each of the output variables (namely attributable burden as a percentage of total burden in SA in 2000, 2006 and 2012), 95% uncertainty intervals (UIs) were calculated bounded by the 2.5th and 97.5th percentiles of 2 000 iteration values generated.

### Results

Overall interpersonal violence-attributable DALYs increased from ~2 million in 2000 to ~2.5 million in 2006 at the peak of the HIV/AIDS epidemic and then decreased to ~1.75 million in 2012 as the HIV/AIDS burden decreased with antiretroviral treatment (Fig. 2). There was a corresponding increase in the proportion of the total attributable burden due to HIV/AIDS between 2000 and 2006, from 33.8% to 47.9%, followed by a decrease, to account for one-third of the total interpersonal violence-attributable DALYs in 2012. Between 2000 and 2006, there was a decrease in the proportion of attributable DALYs for interpersonal violence injuries (mostly for males), from 43.2% to 30.6% of total attributable DALYs (Fig. 2). Total interpersonal violence-attributable DALYs decreased from 2006 to 2012, largely because of the reduction in female deaths related to HIV/AIDS. A slight increase in the number of attributable DALYs for depressive disorders from 2006 to 2012 (Table 2) therefore appears as a marked proportional increase from 9.9% in 2006 to 16.1% in 2012 (due to the reduction in total attributable DALYs). There was no change for intimate femicide between 2000 and 2012, and the attributable DALYs accounted for ~3% of the total attributable burden (Fig. 2).

In 2000, interpersonal violence (including the direct injury burden from interpersonal violence, as well as the mental, behavioural and reproductive health, HIV/AIDS and self-harm injury consequences) accounted for an estimated 43 807 deaths (95% UI 35 189 - 51 284) or 8.7% of all deaths in SA (Table 2). For 2006, this increased to 56 610 deaths (95% UI 38 955 - 73 528) and decreased thereafter to 36 703 deaths (95% UI 27 741 - 44 221) by 2012, or 6.9% (95% UI 5.2 - 8.4) of all deaths in SA. Of all risk factors included in

SACRA2, interpersonal violence was the second leading cause of DALYs lost in 2000, 2006 and 2012, after unsafe sex, and accounted for >1.75 million DALYs in 2012 (Fig. 2 and Table 2), or 8.5% (95% UI 6.8 - 10.1) of all DALYs in SA.

Interpersonal violence injuries in males (directly attributable to interpersonal violence as a risk factor) were exceedingly high and ~10 times higher than in females in 2012. The self-harm injury burden attributable to interpersonal violence in males was 2.1 - 2.7 times higher than in females between 2000 and 2012 (Table 2). Interpersonal violence-attributable DALYs for depressive disorders and anxiety disorders were respectively 2.7 and 1.7 times higher for females across the three time periods. In addition, attributable DALYs for alcohol use disorders were higher for females and double those of males for 2000 and 2012. The burden by individual risk factors is shown in Table S1 in the appendix (<https://www.samedical.org/file/1886>).

For males, there was a decrease in the age-standardised overall interpersonal violence-attributable death rate from 113 to 69 per 100 000 population between 2000 and 2012 (Fig. 3). The age-standardised attributable death rate for females peaked in 2006 at 145 per 100 000, after which it halved to 73 per 100 000 population by 2012. Overall, the age-standardised interpersonal violence-attributable death rate for all persons decreased from 100 to 71 per 100 000 population between 2000 and 2012.

### Discussion

This study improved on SACRA1 estimates, which only included interpersonal violence injuries, IPV and child sexual abuse, by applying improved methods through the utilisation of current and available data sources. Building on the Australian study by Moore *et al.*,<sup>[28]</sup> key strengths of the present study are the inclusion of all forms of child maltreatment, and having adjusted for the co-occurrence of the various forms of child maltreatment (physical, sexual and emotional abuse, neglect, and witnessing family violence). In addition, the inclusion of sexual violence by non-partners (female victims), bullying victimisation (traditional bullying and cyberbullying) and other community violence have addressed some of the limitations of SACRA1,<sup>[1,2]</sup> and allowed for more complete quantification of the interpersonal violence-attributable burden. This has strengthened the findings of SACRA2 and highlighted important new factors contributing to the high burden of interpersonal violence as a risk factor in SA.

The present study shows that in addition to the exceedingly high direct injury consequences, a significant proportion of depressive and anxiety disorders, alcohol use disorders, intentional self-harm, and reproductive health disorders, including HIV/AIDS, in SA is attributable to exposure to interpersonal violence. As these findings are novel, there are no studies available for a direct comparison of attributable burden.

Estimates of the attributable DALYs for interpersonal violence from SACRA1<sup>[2]</sup> were revised for the year 2000 from 1.7 million to 2 million DALYs, taking into account mortality and disability from additional interpersonal violence risk factors and related health outcomes, particularly due to including the HIV/AIDS burden related to exposure to sexual violence by non-partners and child sexual abuse in females. An interesting finding of SACRA2 was the substantial decrease in attributable DALYs over time, from ~2 million DALYs attributable to interpersonal violence in 2000 to 1.75 million in 2012, or 8.5% of the total burden for SA, ranking second highest, after unsafe sex, of 18 risk factors. Age-standardised interpersonal violence-attributable death rates decreased from 100 to 71 per 100 000 between 2000 and 2012.

Table 2. Burden of disease attributable to interpersonal violence by sex and year in South Africa for 2000, 2006 and 2012

Health outcomes	Males			Females			Persons		
	AE, %	Deaths, n	DALYs, n	AE, %	Deaths, n	DALYs, n	AE, %	Deaths, n	DALYs, n
<b>2000</b>									
Interpersonal violence injuries*	100	22 475	792 369	100	2 240	83 920	100	24 715	876 289
Self-harm injuries	33	1 365	43 512	53	644	21 407	37	2 009	64 920
Intimate femicides	n/a	n/a	n/a	47	1 833	65 261	47	1 833	65 261
Depressive disorders	50	0	57 410	63	0	155 004	59	0	212 414
Anxiety disorders	64	0	45 063	64	0	74 505	64	0	119 568
HIV/AIDS	n/q	n/q	n/q	20	15 148	685 726	20	15 148	685 726
Maternal abortion, miscarriage and ectopic pregnancy	n/a	n/a	n/a	14	25	906	14	25	906
Alcohol use disorders	6	30	1 274	34	48	2 663	14	78	3 937
<b>Total attributable burden</b>	-	<b>23 870</b>	<b>939 628</b>	-	<b>19 936</b>	<b>1 089 392</b>	-	<b>43 807</b>	<b>2 029 020</b>
(95% UI)		(23 115 - 24 436)	(901 092 - 990 308)		(11 343 - 27 568)	(677 793 - 1 466 997)		(35 189 - 51 284)	(1 613 936 - 2 401 521)
<b>% of total burden</b>	-	<b>9.0</b>	<b>9.7</b>	-	<b>8.4</b>	<b>11.6</b>	-	<b>8.7</b>	<b>10.6</b>
(95% UI)		(8.7 - 9.2)	(9.3 - 10.2)		(4.8 - 11.6)	(7.2 - 15.6)		(7.0 - 10.2)	(8.5 - 12.6)
<b>2006</b>									
Interpersonal violence injuries*	100	19 730	701 043	100	1 657	64 001	100	21 387	765 045
Self-harm injuries	34	1 773	58 292	56	683	24 185	38	2 456	82 477
Intimate femicides	n/a	n/a	n/a	55	1 889	66 259	55	1 889	66 259
Depressive disorders	52	0	66 883	65	0	179 876	61	0	246 759
Anxiety disorders	68	0	52 094	69	0	84 820	68	0	136 914
HIV/AIDS	n/q	n/q	n/q	20	30 798	1 198 690	20	30 798	1 198 690
Maternal abortion, miscarriage and ectopic pregnancy	n/a	n/a	n/a	14	34	1 246	14	34	1 246
Alcohol use disorders	5	16	1 072	34	31	1 439	10	47	2 510
<b>Total attributable burden</b>	-	<b>21 519</b>	<b>879 384</b>	-	<b>35 091</b>	<b>1 620 517</b>	-	<b>56 610</b>	<b>2 499 901</b>
(95% UI)		(20 549 - 22 157)	(833 592 - 929 985)		(17 632 - 52 110)	(950 644 - 2 290 628)		(38 955 - 73 528)	(1 805 617 - 3 180 262)
<b>% of total burden</b>	-	<b>6.3</b>	<b>7.2</b>	-	<b>10.5</b>	<b>12.5</b>	-	<b>8.4</b>	<b>9.9</b>
(95% UI)		(6.0 - 6.5)	(6.8 - 7.6)		(5.3 - 15.6)	(7.3 - 17.7)		(5.8 - 10.9)	(7.2 - 12.6)
<b>2012</b>									
Interpersonal violence injuries*	100	15 854	556 802	100	1 416	54 445	100	17 269	611 248
Self-harm injuries	34	1 719	56 656	57	590	21 194	39	2 309	77 850
Intimate femicides	n/a	n/a	n/a	54	1 472	51 039	54	1 472	51 039
Depressive disorders	53	0	79 067	65	0	204 345	61	0	283 412
Anxiety disorders	70	0	56 794	71	0	93 899	70	0	150 693
HIV/AIDS	n/q	n/q	n/q	21	15 585	578 734	21	15 585	578 734
Maternal abortion, miscarriage and ectopic pregnancy	n/a	n/a	n/a	14	16	602	14	16	602
Alcohol use disorders	5	16	984	33	35	2 308	13	51	3 292
<b>Total attributable burden</b>	-	<b>17 590</b>	<b>750 302</b>	-	<b>19 113</b>	<b>1 006 567</b>	-	<b>36 703</b>	<b>1 756 869</b>
(95% UI)		(16 617 - 18 254)	(699 121 - 804 316)		(10 492 - 26 761)	(674 083 - 1 318 340)		(27 741 - 44 221)	(1 406 063 - 2 069 447)
<b>% of total burden</b>	-	<b>6.4</b>	<b>7.4</b>	-	<b>7.6</b>	<b>9.6</b>	-	<b>6.9</b>	<b>8.5</b>
(95% UI)		(6.0 - 6.6)	(6.9 - 7.9)		(4.2 - 10.6)	(6.4 - 12.6)		(5.2 - 8.4)	(6.8 - 10.1)

AE = attributable fraction based on the numbers of attributable deaths; DALY = disability-adjusted life year; n/a = not applicable; n/q = not quantified. \*Interpersonal violence injuries are unspecified community and family interpersonal violence injuries categorically attributable to interpersonal violence as a risk factor. Please note that in this table the interpersonal violence injuries plus intimate femicides need to be added to match the total interpersonal violence injury category estimate in the South African National Burden of Disease studies for 2000, 2006 and 2012.



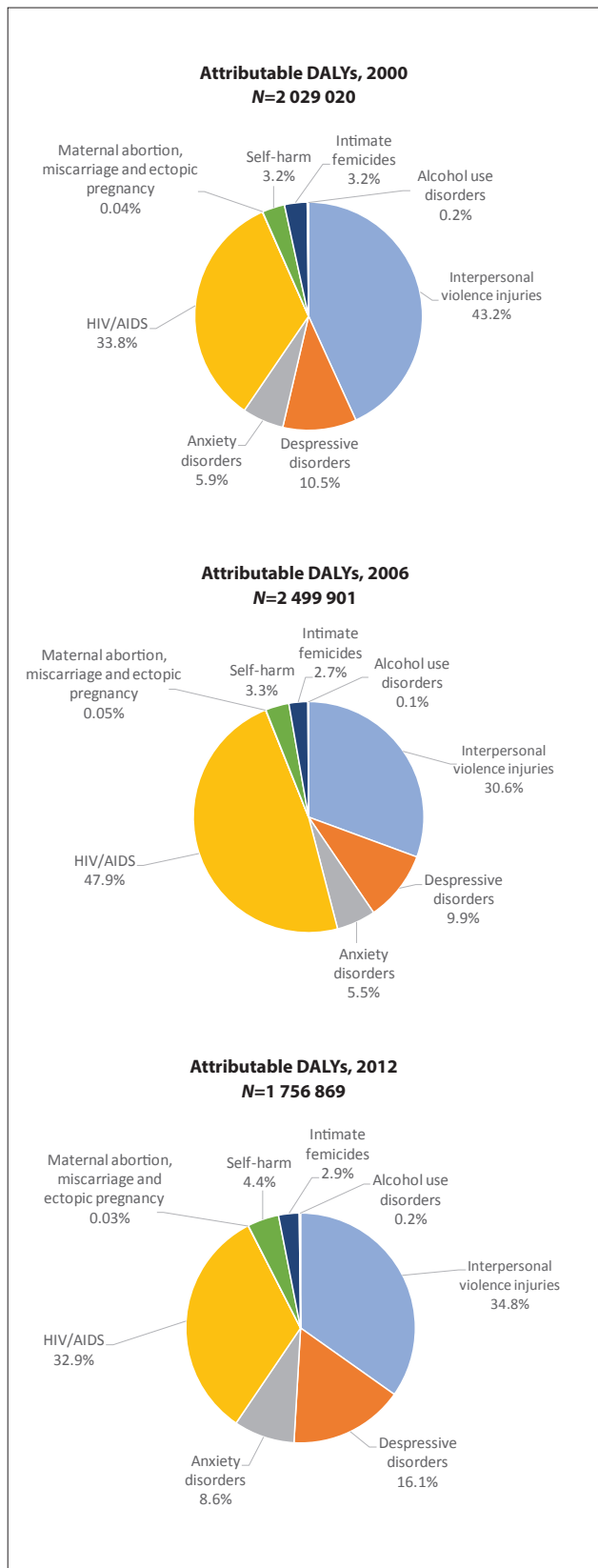


Fig. 2. Interpersonal violence-attributable DALYs and related health outcomes for persons in South Africa for 2000, 2006 and 2012. (DALYs = disability-adjusted life years.)

The decrease in the age-standardised attributable death rate for overall interpersonal violence since 2000 is partly due to a reduction

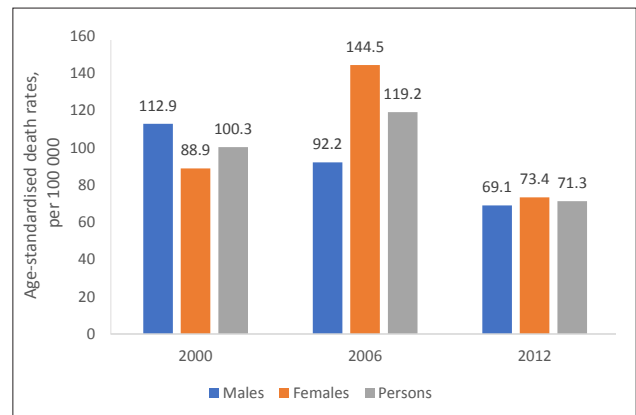


Fig. 3. Age-standardised interpersonal violence-attributable death rates in South Africa for 2000, 2006 and 2012.

in the direct interpersonal violence injury burden (mostly for males). Nevertheless, this burden remains exceedingly high and substantially higher than in females, with male attributable DALYs for interpersonal violence injuries ~10 times higher. The overall downward trend can be ascribed to a reduction in fatal firearm violence, attributable to the successful implementation and enforcement of firearm legislation prior to 2006.<sup>[50]</sup> In 2012, the direct interpersonal violence injury burden continues to account for more than a third of attributable DALYs in SA. In addition, the peak in attributable burden in 2006 is largely due to the peak of the HIV/AIDS epidemic, and the decrease in the death rate since 2006 can probably be attributed to the reduction in female deaths related to HIV/AIDS brought about by the implementation of antiretroviral therapy.<sup>[51]</sup> The high national mortality rates for interpersonal violence are mostly driven by male victims,<sup>[8]</sup> yet there is a lack of attempted interventions to reduce violence against males.

The under-recognised burden of violence in males is reflected in self-harm-attributable DALYs for overall interpersonal violence, which were nearly three times higher in males than in females in 2012. From 2000 to 2012, an estimated 34% of the self-harm burden in males was attributable to interpersonal violence through the joint effect of exposure to child maltreatment, bullying and other community violence. A systematic review found limited male studies on IPV, incident depressive symptoms and suicide attempts to assess, and reported no clear evidence of an association between IPV and suicide attempts for male victims.<sup>[52]</sup> However, the systematic review by De Vries *et al.*<sup>[52]</sup> found evidence of an association between IPV and female suicide attempts, as well as an increased risk and bidirectional relationship between IPV and depressive disorders for females. In the present study, we used RRs from GBD 2017 systematic reviews and meta-analyses for IPV and health outcomes, and although the IPV-depressive disorders burden was included, self-harm was not included as an outcome of IPV in GBD owing to insufficient evidence for fatal self-harm (suicides rather than suicide attempts). In the SACRA2 for 2012, 53% of the depressive disorders burden in males and 65% in females was attributable to interpersonal violence, which in males included the joint effect of exposure to child maltreatment, bullying and other community violence but in females also included the additional contribution of IPV and sexual violence by non-partners. The number of deaths and DALYs attributable to interpersonal violence is a function of both the attributable fractions and the amount of burden of disease accounted for by the related health outcomes for each time point. As a result, females had nearly three times higher attributable DALYs for depressive disorders related to interpersonal violence than males. The higher burden of attributable DALYs for alcohol use in adult females compared with males is supported by global evidence mostly

available for females, which indicates a clear association between female IPV and alcohol consumption.<sup>[53]</sup> The DALYs for depressive and anxiety disorders and self-harm can also be attributed to the increasing prevalence of bullying victimisation between 2000 and 2012, the very high prevalence of child maltreatment, where 40.1% of boys and 51.6% of girls reported ever having experienced some form of child maltreatment, as well as the exceedingly high proportion of the population who had witnessed a murder or experienced having been carjacked, kidnapped or robbed in their community.

Although these findings are relatively consistent and robust, they should be interpreted in the light of a number of limitations of our analysis. Recall bias and unreliability in self-reporting of violence exposures may have affected the results. Biases are more likely towards under-reporting rather than over-reporting, particularly for child maltreatment,<sup>[54]</sup> and hence our estimates of prevalence for SA may underestimate the true prevalence. This study underestimates attributable burden in males, particularly as a result of not having quantified HIV/AIDS, as the long-term consequences of rape by non-partners and IPV in male victims are not included. The inclusion of HIV/AIDS as a health outcome for female interpersonal violence only (child sexual abuse, IPV and sexual violence by non-partners) led to higher total attributable DALYs for females compared with males and should not be misinterpreted, particularly in view of the exceedingly high interpersonal violence injury burden in males. While we would not expect heterosexual men to have the same level of HIV risk driven by IPV as women, the risk for non-heterosexual men needs further consideration in future analysis. For SA, we have some insight into this based on a population-based household survey of adult men in two SA provinces, which found that HIV prevalence was significantly higher among men who reported a lifetime history of consensual sex with men, and among young men who had acted as perpetrators of violence, compared with men in the general population.<sup>[55,56]</sup>

For IPV, RR estimates from GBD 2017 were used to increase international comparability, although differences in risk are likely to exist across subpopulations. The Optimus SA and Gauteng GBV studies examining the relationship between exposure to family and community violence and disease outcomes are cross-sectional analyses that, by definition, cannot identify a temporal relationship between exposure to violence and the onset of health outcomes. Nevertheless, a causal relationship between all forms of child maltreatment, IPV, bullying victimisation and mental health disorders is well established.<sup>[25,57,58]</sup> The evidence for community violence, although suggestive, is not as robust. However, non-partner sexual violence has well-described health consequences<sup>[14]</sup> and a higher risk of depressive disorders and PTSD than other forms of violence. In this analysis, the relationship between the variables was plausible and coherent, and research from several settings has shown consistency and supports the strength of association.

The definition and measurement of health outcomes also varied across studies used to derive RR estimates. In the Optimus SA and Gauteng GBV studies, mental health outcomes were assessed using symptom scales rather than diagnostic instruments, and self-harm was based on self-reported suicidal behaviour. In this analysis, PAFs calculated using these RRs were then applied to burden of disease estimates for SA for selected health outcomes meeting ICD-10 diagnostic criteria. For IPV-abortion, PAFs were applied to the 'maternal abortion, miscarriage and ectopic pregnancy' burden of disease estimates. It was not possible to separate ectopic pregnancy from this combined category, but the numbers are likely to be small. The analyses also contain inconsistencies in how violence, particularly community violence, is defined and measured across the Optimus

SA and Gauteng GBV studies, with questions in these surveys not always congruent with conceptual understandings and definitions of these exposures, which may have influenced the results. The Optimus SA<sup>[18,21]</sup> definition of bullying, for example, may not have been all-inclusive of the Olweus definition.<sup>[44]</sup> There are in general complex challenges in measuring exposure to violence, and prevalence estimates are influenced by methodological aspects of the reporting of these experiences. Disclosure of violence is influenced by definition, measures, study design and interview context.<sup>[59-61]</sup> Owing to data limitations for the prevalence of IPV and community violence, the Gauteng GBV study was assumed to apply nationally, and this may have overestimated the burden, as levels of exposure to violence for these categories in Gauteng (an estimated lifetime prevalence for female GBV of 51.3%)<sup>[14]</sup> are likely to be somewhat higher than those gleaned from national SAPS reported cases for violence and other types of assault in other SA provinces.<sup>[4]</sup> At present, the validity of our assumption is unknown, but the South African Demographic and Health Survey (SADHS) for 2016 could not be used as a source for national GBV prevalence data, as the 26% national estimate for lifetime prevalence of GBV<sup>[62]</sup> was deemed too low in relation to other focused studies such as the Gauteng GBV study, and no related mental health outcomes were measured. In the absence of available trend data, we assumed no trend in exposure to these violence risk factors over time, and changes in attributable burden are due to changes in burden metrics at those time points. Although the present study focuses on interpersonal violence as a risk factor for loss of health and excludes exposure to collective violence, some gang violence and organised crime may have been included under community violence.

The relationship between exposure to violence and consequent health effects is multifaceted. Interpersonal violence does result in adverse health outcomes, but these outcomes are determined by socioeconomic contexts. We have attempted to adjust for some of these possible confounders in the models (housing, sanitation, scale of hunger, biological parents in the home, parental mental health treatment, parental substance abuse and parental incarceration). RRs used in this study were not adjusted for exposure to other forms of interpersonal violence. It is known that the various forms of violence are closely interconnected, both with individual experiences and across generations, and future analysis can benefit from adjusting for other forms of violence exposures in the models. To avoid overestimating the overall interpersonal violence-attributable burden, where these multiple interpersonal violence risk factors (bullying, IPV, child maltreatment, rape, other community violence) affected the same outcome (namely depressive disorders, anxiety, self-harm/suicide, alcohol use disorders, HIV/AIDS), a multiplicative aggregation of the PAFs of the individual risk factors was used.

However, the attributable burden for interpersonal violence overall presented in this study is the independent contribution of interpersonal violence to the overall disease burden in SA compared with the contribution of 17 other risk factors, including behavioural, dietary and environmental risks. Attributable burdens cannot be added together for different risk factors that share common causal pathways. For the estimation of each of the 18 risk factors included in SACRA2, the counterfactual distribution of exposure is the TMREL for that specific risk with no change in other risk factors. Therefore, the sum of these risk-specific estimates of attributable burden can exceed 100% for some causes, such as interpersonal violence, alcohol use and unsafe sex, as these three risk factors included in SACRA2 all include HIV/AIDS as outcomes. Self-harm, interpersonal violence injuries and alcohol use disorders are

also outcomes of interpersonal violence and alcohol use as risks to health. In future SACRA studies, it will be important to disentangle and better understand these complex causal pathways and calculate PAFs and attributable burden for combinations of risk factors such as unsafe sex, interpersonal violence and alcohol use, taking into account synergistic effects and mediation of different risk factors through other risk factors to estimate the joint effect of these multiple risks.

There are various pathways through which GBV and gender and relationship power inequity can place women at risk of HIV infection.<sup>[13]</sup> These may include having more risky male partners with controlling and violent masculinities, and more sexual risk taking, which could lead to anxiety, depressive disorders, PTSD and substance use disorders. A result could be female partners engaging in multiple and concurrent sexual relationships and prostitution, placing them at increased risk of HIV infection. These associations have been identified in developing and developed countries,<sup>[13,63,64]</sup> and this complex causal pathway should be addressed in society to reduce GBV. SA's high levels of violence are particularly rooted in the effects of apartheid, and how forced removals and the migrant labour system impacted on families and the socialisation of young men<sup>[65]</sup> and their engagement in criminal gang activity.<sup>[66]</sup> An intervention study on transforming gender attitudes and practices, and livelihood strengthening among young men in urban informal settlements with high levels of violence, poverty and poor health in an SA municipal area found that intensive group-based interventions led to significant reductions of physical, emotional and economic IPV among those who were classed as the most violent men in their communities.<sup>[67]</sup>

The present study's key strength was the inclusion of associated long-term disability of additional types of interpersonal violence, which led to enhanced estimates for interpersonal violence-attributable DALYs. It can, however, be further enhanced by quantifying the long-term mental, behavioural, and physical health consequences (including sexually transmitted infections) of sexual assault by acquaintances and strangers where the victim is male. Amid the growing commitment to gender equality globally,<sup>[16]</sup> the disparity in gender-relevant indicators for males, children and younger adolescents for various aspects of health, in comparison with females, has come to the fore. Such limitations hinder fair comparisons of outcomes and trends between males and females,<sup>[17]</sup> as we have found in our study, and we suggest that males be included in national-level research on child sexual abuse and IPV victims with HIV/AIDS as well as mental disorders and self-harm as related health outcomes to overcome this limitation. There is also a need to improve the epidemiological data on the prevalence and risks of the different forms of interpersonal violence to complete the picture, particularly for males.

## Conclusion

The inclusion of additional forms of violence has improved our understanding of the true extent of the interpersonal violence burden, which will assist in motivating the preventive response. Overall DALYs for interpersonal violence decreased between 2000 and 2012, but have remained high. There has been a substantial reduction in age-standardised attributable death rates, which indicates that some aspects of public policy and social interventions are being effective in reducing interpersonal violence. However, much is still to be done. Our findings show that policy implementation, and programmes and measures to prevent interpersonal violence, are still limited and inadequate for addressing the overall preventable burden of violence.

**Declaration.** None.

**Acknowledgements.** The National Burden of Disease team, led by Victoria Pillay-van Wyk, was responsible for mapping the NBD and GBD causes generating YLD and DALY estimates for national, province and population groups for SANBD2. The following individuals are acknowledged for their contribution: William Msemburi, Oluwatoyin Awotiwoon, Annibale Cois, Ian Neethling, Tracy Glass, Pam Groenewald and Debbie Bradshaw.

**Author contributions.** RP, DB and MP conceived and designed the study, and were responsible for the organisation and choice of methods, and selection of data sources. MP, RP, MM and RK prepared the data for analysis. MP and RP conducted the data analysis and drafted the manuscript. All authors contributed to the interpretation of findings, critiqued the manuscript for important intellectual content, and approved the final version of the manuscript.

**Funding.** This research and its publication were funded by the South African Medical Research Council's Flagships Awards Project (SAMRC-RFA-IFSP-01-2013/SA CRA 2). DB was principal investigator (PI) together with VPvW and Jané Joubert as co-PIs.

**Conflicts of interest.** None.

- Norman R, Bradshaw D, Schneider M, et al. Estimating the burden of disease attributable to interpersonal violence in South Africa in 2000. *S Afr Med J* 2007;97(8):653-656.
- Norman R, Schneider M, Bradshaw D, et al. Interpersonal violence: An important risk factor for disease and injury in South Africa. *Popul Health Metr* 2010;8:32. <https://doi.org/10.1186/1478-7954-8-32>
- Norman R, Matzopoulos R, Groenewald P, et al. The high burden of injuries in South Africa. *Bull World Health Organ* 2007;85(9):695-702. <https://doi.org/10.2471/blt.06.037184>
- South African Police Service. RSA: April to March 2004 - 2014: Crime categories figures and ratios 2014. [https://www.saps.gov.za/resource\\_centre/publications/statistics/crimstats/2014/download/final\\_tables\\_2014.xlsx](https://www.saps.gov.za/resource_centre/publications/statistics/crimstats/2014/download/final_tables_2014.xlsx) (accessed 31 May 2017).
- South African Police Service. Annual Crime Report 2015/2016: Addendum to the SAPS Annual Report. Pretoria, 2016. ISBN No. 978-0-621-44671-5.
- Nicolson G. Crime stats: Murder rate remains 'stable' at around 58 deaths a day. *Daily Maverick*, 31 July 2020. <https://www.dailymaverick.co.za/article/2020-07-31-crime-stats-murder-rate-remains-stable-at-around-58-deaths-a-day/> (accessed 28 January 2021).
- World Health Organization. Global status report on violence prevention, 2014. Geneva: WHO, 2014. [www.who.int/violence\\_injury\\_prevention/violence/status\\_report/2014](http://www.who.int/violence_injury_prevention/violence/status_report/2014) (accessed 10 July 2018).
- Matzopoulos R, Prinsloo M, Pillay-van Wyk V, et al. Injury-related mortality in South Africa: A retrospective descriptive study of post-mortem investigations. *Bull World Health Organ* 2015;93(5):303-313. <https://doi.org/10.2471/BLT.14.145771>
- United Nations Office on Drugs and Crime. Global Study of Homicide 2018: Gender-related killing of women and girls. Vienna: UNODC, 2018. [https://www.unodc.org/documents/data-and-analysis/GSH2018/GSH18\\_Gender-related\\_killing\\_of\\_women\\_and\\_girls.pdf](https://www.unodc.org/documents/data-and-analysis/GSH2018/GSH18_Gender-related_killing_of_women_and_girls.pdf) (accessed 2 August 2021).
- Abrahams N, Mathews S, Martin LJ, et al. Intimate partner femicide in South Africa in 1999 and 2009. *PLoS Med* 2013;10(4):e1001412. <https://doi.org/10.1371/journal.pmed.1001412>
- Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. World report on violence and health. Geneva: World Health Organization, 2002. [https://apps.who.int/iris/bitstream/handle/10665/42495/9241545615\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/42495/9241545615_eng.pdf) (accessed 12 April 2018).
- World Health Organization. Understanding and addressing violence against women: Health consequences. Geneva: WHO, 2012. [https://apps.who.int/iris/bitstream/handle/10665/77431/WHO\\_RHR\\_12\\_43\\_eng.pdf?sessionid=D6145444E19D2C3B89815EB35B9F37C?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/77431/WHO_RHR_12_43_eng.pdf?sessionid=D6145444E19D2C3B89815EB35B9F37C?sequence=1) (accessed 13 April 2021).
- Jewkes RK, Dunkle K, Nduna M, et al. Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: A cohort study. *Lancet* 2010;376(9734):41-48. [https://doi.org/10.1016/S0140-6736\(10\)60548-X](https://doi.org/10.1016/S0140-6736(10)60548-X)
- Machisa M, Jewkes R, Lowe-Morna C, et al. The war at home: Gender Based Violence Indicators Project, Gauteng Research Report, South Africa. Johannesburg: GenderLinks and South African Medical Research Council, 2011. [https://www.saferspaces.org.za/uploads/files/GenderLinks-13452\\_begin\\_war\\_at\\_home.pdf](https://www.saferspaces.org.za/uploads/files/GenderLinks-13452_begin_war_at_home.pdf) (accessed 16 February 2019).
- Abrahams N, Mhlongo S, Dunkle K, et al. Increase in HIV incidence in women exposed to rape. *AIDS* 2021;35(4):633-642. <https://doi.org/10.1097/QAD.0000000000002779>
- Lancet Global Health. No man left behind. *Lancet Glob Health* 2020;8(12):e1444. [https://doi.org/10.1016/S2214-109X\(20\)30490-3](https://doi.org/10.1016/S2214-109X(20)30490-3)
- Levy JK, Greene ME. Pushing the boundaries of data to ensure gender equality across the life span. *Lancet Glob Health* 2020;8(12):e1445-e1446. [https://doi.org/10.1016/S2214-109X\(20\)30487-3](https://doi.org/10.1016/S2214-109X(20)30487-3)
- Ward CL, Artz L, Leoschut L, et al. Sexual violence against children in South Africa: A nationally representative cross-sectional study of prevalence and correlates. *Lancet Glob Health* 2018;6(4):e460-e468. [https://doi.org/10.1016/S2214-109X\(18\)30060-3](https://doi.org/10.1016/S2214-109X(18)30060-3)
- Abrahams N, Mathews S, Martin LJ, et al. Gender differences in homicide of neonates, infants, and children under 5 y in South Africa: Results from the Cross-Sectional 2009 National Child Homicide Study. *PLoS Med* 2016;13(4):e1002003. <https://doi.org/10.1371/journal.pmed.1002003>
- Mathews S, Abrahams N, Jewkes R, et al. Child homicide patterns in South Africa: Is there a link to child abuse? Cape Town: South African Medical Research Council, 2012. <http://www.mrc.ac.za/policybriefs/childhomicide.pdf> (accessed 9 March 2016).
- Artz L, Burton P, Ward CL, et al. Optimus Study South Africa: Technical report. Sexual victimisation of children in South Africa: Final report of the Optimus Foundation Study. Zurich: UBS Optimus Foundation, 2016. [https://www.saferspaces.org.za/uploads/files/08\\_cjcp\\_report\\_2016\\_d.pdf](https://www.saferspaces.org.za/uploads/files/08_cjcp_report_2016_d.pdf) (accessed 2 May 2018).
- Artz L, Ward CL, Leoschut L, et al. The prevalence of child sexual abuse in South Africa: The Optimus Study South Africa. *S Afr Med J* 2018;108(10):791-792. <https://doi.org/10.7196/SAMJ.2018.v108i10.13533>

23. Mathews S, Martin LJ, Coetzee D, et al. The South African child death review pilot: A multiagency approach to strengthen healthcare and protection for children. *S Afr Med J* 2016;106(9):895-899. <https://doi.org/10.7196/SAMJ2016.v106i9.11234>
24. Jamieson L, Sambu W, Mathews S. Out of harm's way? Tracking child abuse cases through the child protection system in five selected sites in South Africa. Cape Town: Children's Institute, University of Cape Town, 2017. <http://www.ci.uct.ac.za/overview-violence/reports/out-of-harms-way-tracking-child-abuse-cases-through-the-child-protection-system> (accessed 4 June 2021).
25. GBD 2017 Risk Factor Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990 - 2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018;392(10159):1923-1924. [https://doi.org/10.1016/S0140-6736\(18\)32225-6](https://doi.org/10.1016/S0140-6736(18)32225-6)
26. Dahlberg LL, Krug EG. Violence - a global public health problem. In: *World Report on Violence and Health*. Geneva: World Health Organization, 2002:1-56. [http://apps.who.int/iris/bitstream/handle/10665/42495/9241545615\\_eng.pdf?jsessionid=64F72CE602719FAE07FBBCEE2D8B3A8D?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/42495/9241545615_eng.pdf?jsessionid=64F72CE602719FAE07FBBCEE2D8B3A8D?sequence=1) (accessed 11 November 2017).
27. Mathers CD, Ezzati M, Lopez AD, et al. Causal decomposition of summary measures of population health. In: Murray CJL, Salomon J, Mathers CD, Lopez AD, eds. *Summary Measures of Population Health*. Geneva: World Health Organization, 2002. [http://apps.who.int/iris/bitstream/handle/10665/42439/9241545518\\_eng.pdf?jsessionid=5B415800D5035D01A36713D1F0895536?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/42439/9241545518_eng.pdf?jsessionid=5B415800D5035D01A36713D1F0895536?sequence=1) (accessed 5 February 2018).
28. Moore SE, Scott JG, Ferrari AJ, et al. Burden attributable to child maltreatment in Australia. *Child Abuse Negl* 2015;48:208-220. <https://doi.org/10.1016/j.chiabu.2015.05.006>
29. Thomas HJ, Connor JB, Lawrence DM, et al. Prevalence and correlates of bullying victimisation and perpetration in a nationally representative sample of Australian youth. *Aust N Z J Psychiatry* 2017;51(9):909-920. <https://doi.org/10.1177/0004867417707819>
30. Statistics South Africa. Census 2011/2012. [https://www.statssa.gov.za/?page\\_id=3839&gclid=CjwKCAjw9-KTBBcEiwAr19ig66T8PT4l9owrKms3VqNeWLuuaeZTqkKCrMpeMy6\\_YqfK1\\_BcuoYhCXugQAvD\\_BwE](https://www.statssa.gov.za/?page_id=3839&gclid=CjwKCAjw9-KTBBcEiwAr19ig66T8PT4l9owrKms3VqNeWLuuaeZTqkKCrMpeMy6_YqfK1_BcuoYhCXugQAvD_BwE) (accessed 8 November 2012).
31. Statistics South Africa. Community Survey 2007: Key municipal data. Statistical release P03-01-22. Pretoria: Stats SA, 2007. <https://www.statssa.gov.za/publications/Report-03-01-21/Report-03-01-212007.pdf> (accessed 6 June 2018).
32. Statistics South Africa. Census 2001: Census in brief. Pretoria: Stats SA, 2003. [http://www.statssa.gov.za/census/census\\_2001/census\\_in\\_brief/CIB2001.pdf](http://www.statssa.gov.za/census/census_2001/census_in_brief/CIB2001.pdf) (accessed 15 April 2021).
33. Monks CP, Robinson S, Worlidge P. The emergence of cyberbullying: A survey of primary school pupils' perceptions and experiences. *School Psych Int* 2012;33(5):477-491. <https://doi.org/10.1177/0143034312445242>
34. Abrahams N, Jewkes R, Martin LJ, et al. Mortality of women from intimate partner violence in South Africa: A national epidemiological study. *Violence Vict* 2009;24(4):546-556.
35. Abrahams N, Mathews S, Jewkes R, et al. Every eight hours: Intimate femicide in South Africa, 10 years later! Cape Town: South African Medical Research Council, 2012. <http://www.mrc.ac.za/policybriefs/everyeighthours.pdf> (accessed 9 March 2016).
36. Mathews B, Pacella R, Dunne MP, et al. Improving measurement of child abuse and neglect: A systematic review and analysis of national prevalence studies. *PLoS ONE* 2020;15(1):e0227884. <https://doi.org/10.1371/journal.pone.0227884>
37. World Health Organization and International Society for Prevention of Child Abuse and Neglect. *Preventing child maltreatment: A guide to taking action and generating evidence*. Geneva: WHO, 2006. <https://apps.who.int/iris/handle/10665/43499> (accessed 4 May 2022).
38. Mathews B, Collin-Vézina D. Child sexual abuse: Toward a conceptual model and definition. *Trauma Violence Abuse* 2019;20(2):131-148. <https://doi.org/10.1177/1524838017738726>
39. Glaser D. How to deal with emotional abuse and neglect: Further development of a conceptual framework (FRAMEA). *Child Abuse Negl* 2011;35(10):866-875. <https://doi.org/10.1016/j.chiabu.2011.08.002>
40. Kairys SW, Johnson CF. The psychological maltreatment of children - technical report. *Pediatrics* 2002;109(4):e68. <https://doi.org/10.1542/peds.109.4.e68>
41. Dubowitz H, Newton RR, Litrownik AJ, et al. Examination of a conceptual model of child neglect. *Child Maltreat* 2005;10(2):173-189. <https://doi.org/10.1177/1077559505275014>
42. Hamby S, Finkelhor D, Turner H, et al. The overlap of witnessing partner violence with child maltreatment and other victimisations in a nationally representative survey of youth. *Child Abuse Negl* 2010;34(10):734-741. <https://doi.org/10.1016/j.chiabu.2010.03.001>
43. Ford-Gilboe M, Wathen CN, Varcoe C, et al. Development of a brief measure of intimate partner violence experiences: The Composite Abuse Scale (Revised) - Short Form (CAS<sub>s</sub>-SF). *BMJ Open* 2016;6(12):e012824. <https://doi.org/10.1136/bmjopen-2016-012824>
44. Olweus D. *Bullying at School: What We Know and What We Can Do*. Oxford: Blackwell, 1993.
45. GBD 2017 Risk Factor Collaborators. Supplementary appendix 1: Methods appendix to Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990 - 2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018;392:S1-375. <https://ars.els-cdn.com/content/image/1-s2.0-S0140673618322256-mmcl.pdf> (accessed 9 May 2022).
46. Jewkes RK, Dunkle K, Nduna M, et al. Associations between childhood adversity and depression, substance abuse and HIV and HSV2 incident infections in rural South African youth. *Child Abuse Negl* 2010;34(11):833-841. <https://doi.org/10.1016/j.chiabu.2010.05.002>
47. Pillay-van Wyk V, Msemburi W, Laubscher R, et al. Mortality trends and differentials in South Africa from 1997 to 2012: Second National Burden of Disease Study. *Lancet Glob Health* 2016;4(9):e642-e653. [https://doi.org/10.1016/S2214-109X\(16\)30113-9](https://doi.org/10.1016/S2214-109X(16)30113-9)
48. Barendregt JJ. Ersatz version 1.35. 2017. <http://www.epigear.com> (accessed 2 June 2021).
49. Barendregt JJ. The effect size in uncertainty analysis. *Value Health* 2010;13(4):388-391. <https://doi.org/10.1111/j.1524-4733.2009.00686.x>
50. South Africa. Firearms Control Act No. 60 of 2000 and Regulations 2004. [https://www.saps.gov.za/services/flash/firearms/legislation/gov\\_notice\\_english.pdf](https://www.saps.gov.za/services/flash/firearms/legislation/gov_notice_english.pdf) (accessed 31 May 2018).
51. Abdool Karim SS, Churchyard GJ, Abdool Karim Q, et al. HIV infection and tuberculosis in South Africa: An urgent need to escalate the public health response. *Lancet* 2009;374(9693):921-933. [https://doi.org/10.1016/S0140-6736\(09\)60916-8](https://doi.org/10.1016/S0140-6736(09)60916-8)
52. De Vries KM, Mak J, Bacchus LJ, et al. Intimate partner violence and incident depressive symptoms and suicide attempts: A systematic review of longitudinal studies. *PLoS Med* 2013;10(5):e1001439. <https://doi.org/10.1371/journal.pmed.1001439>
53. De Vries KM, Child JC, Bacchus LJ, et al. Intimate partner violence victimisation and alcohol consumption in women: A systematic review and meta-analysis. *Addiction* 2013;109(3):379-391. <https://doi.org/10.1111/add.12393>
54. Fergusson DM, Horwood LJ, Woodward LJ. The stability of child abuse reports: A longitudinal study of the reporting behaviour of young adults. *Psychol Med* 2000;30(3):529-544. <https://doi.org/10.1017/S0033291799002111>
55. Dunkle KL, Jewkes RK, Murdock DW, et al. Prevalence of consensual male-male sex and sexual violence, and associations with HIV in South Africa: A population-based cross-sectional study. *PLoS Med* 2013;10(6):e1001472. <https://doi.org/10.1371/journal.pmed.1001472>
56. Jewkes R, Sikweyiya Y, Morrell R, et al. The relationship between intimate partner violence, rape and HIV amongst South African men: A cross-sectional study. *PLoS ONE* 2011;6(9):e24256. <https://doi.org/10.1371/journal.pone.0024256>
57. Norman RE, Byambaa M, De R, et al. The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. *PLoS Med* 2012;9(11):e1001349. <https://doi.org/10.1371/journal.pmed.1001349>
58. Moore SE, Norman RE, Suetani S, et al. Consequences of bullying victimisation in childhood and adolescence: A systematic review and meta-analysis. *World J Psychiatry* 2017;7(1):60-76. <https://doi.org/10.5498/wjpv.7.1.60>
59. Garcia-Moreno C, Jansen HA, Ellsberg M, et al. Prevalence of intimate partner violence: Findings from the WHO multi-country study on women's health and domestic violence. *Lancet* 2006;368(9543):1260-1269. [https://doi.org/10.1016/S0140-6736\(06\)69523-8](https://doi.org/10.1016/S0140-6736(06)69523-8)
60. Ellsberg M, Heise L, Peña R, et al. Researching domestic violence against women: Methodological and ethical considerations. *Stud Fam Plann* 2001;32(1):1-16. <https://doi.org/10.1111/j.1728-4465.2001.00001.x>
61. Jewkes R, Watts C, Abrahams N, et al. Ethical and methodological issues in conducting research on gender-based violence in southern Africa. *Reprod Health Matters* 2000;8(15):93-103. [https://doi.org/10.1016/S0968-8080\(00\)90010-7](https://doi.org/10.1016/S0968-8080(00)90010-7)
62. National Department of Health (NDoH), Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC), and ICF. *South Africa Demographic and Health Survey 2016*. Pretoria, South Africa, and Rockville, Md, USA: NDoH, Stats SA, SAMRC, and ICF, 2017. [www.statssa.gov.za/publications/Report%2003-00-09/Report%2003-00-092016.pdf](http://www.statssa.gov.za/publications/Report%2003-00-09/Report%2003-00-092016.pdf) (accessed 5 July 2021).
63. Johnson SD, Cunningham-Williams RM, Cottler LB. A tripartite of HIV-risk for African American women: The intersection of drug use, violence, and depression. *Drug Alcohol Depend* 2003;70(2):169-175. [https://doi.org/10.1016/S0376-8716\(02\)00345-9](https://doi.org/10.1016/S0376-8716(02)00345-9)
64. Wingood GM, DiClemente RJ. Rape among African American women: Sexual, psychological, and social correlates predisposing survivors to risk of STD/HIV. *J Womens Health* 1998;7(1):77-84. <https://doi.org/10.1089/jwh.1998.7.77>
65. Coovadia H, Jewkes R, Barron P, et al. The health and health system of South Africa: Historical roots of current public health challenges. *Lancet* 2009;374(9692):817-834. [https://doi.org/10.1016/S0140-6736\(09\)60951-x](https://doi.org/10.1016/S0140-6736(09)60951-x)
66. Delius P, Glaser C. Sexual socialisation in South Africa: A historical perspective. *African Studies* 2002;61(1):27-54.
67. Gibbs A, Abdelatif N, Washington L, et al. Differential impact on men in an IPV prevention intervention: A post hoc analysis using latent class analysis of the Stepping Stones and Creating Futures intervention in South Africa. *Soc Sci Med* 2020;265:113538. <https://doi.org/10.1016/j.socscimed.2020.113538>

Accepted 18 March 2022.