Risk factors for female and male homicidal strangulation in Johannesburg, South Africa

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Background. There is a paucity of research on homicidal strangulation by gender.
Objectives. A sex-disaggregated and comparative research approach was used to investigate individual-level risk factors for female and male homicidal strangulation in Johannesburg, South Africa (2001 - 2010).
Methods. Data were drawn from the National Injury Mortality Surveillance System. Logistic regressions were used to examine associations between each of the independent variables and homicidal strangulation in females and males relative to all other female and male homicides, respectively.
Results. The risk of fatal strangulation was high for both females and males aged ≥60 years, but markedly high only for male children and adolescents. Temporal risk for females was undifferentiated for day of the week, and the risk for males was high during weekdays. Females were more likely to be strangled in public places, and males in private locations.
Conclusions. The study underlines the importance of disaggregating homicide by external cause and gender.

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Gender-focused research is integral to homicide research that disaggregates fatal events into finer conceptual categories to explain the individual, situational and structural factors that present as unique across homicide causes and types. The gendering of homicide research is specifically supported by the argument that the inclusion of gender in analyses on lethal violence strengthens theoretical explanations through rejecting erroneous assumptions about similarities between females and males.[1] The inclusion of a gender focus in homicide analyses also develops the potential depth and rigour associated with conducting comparative research, especially as it helps to uncover factors assumed to be universal in explaining female and male homicide occurrence,[2] and to inform the development of gender-sensitive prevention interventions. Sex-specific homicide analyses therefore highlight the distinguishing nature of gender and gender experiences, and the ways in which this distinctiveness contextualises and explains, as well as informs, lethal violence.

Sex-specific homicide studies have focused on female and male homicide individual-level victimisation patterns of occurrence within and between cities and countries,[3-5] as well as the association of female and male homicide with a range of sociostructural factors.[6-9] However, disaggregated studies on strangulation homicide risk and gender are rare. The small body of research on homicidal strangulation has provided descriptive and forensic accounts, including the identification of lethal strangulation risk profiles[10] and non-fatal strangulation as a risk factor for attempted and completed homicide of women.[11-13]

Objectives

Building on the authors' descriptive analysis[10] and the assessment of sociodemographic and spatiotemporal predictors of homicidal strangulation for females and males combined,[3] this study employed a sex-disaggregated and comparative research approach to investigate the individual-level risk factors for female and male homicidal strangulation in Johannesburg, South Africa (SA) (2001 - 2010). The study focused on individual-level risk factors that differentiate female homicidal strangulation from other female homicides, and the individual-level risk factors that differentiate male homicidal strangulation from other male homicides.

Methods

Data

Data on all the valid homicidal strangulation cases recorded for Johannesburg (2001 - 2010) were drawn from the National Injury Mortality Surveillance System (NIMSS). The NIMSS, a mortuary surveillance system and a source of secondary data, provides information about deaths from external causes, collated from investigative procedures at forensic pathology and chemistry laboratories. Data included information on mechanism of homicide; sociodemographic profile of each strangulation victim (age, race and sex); and spatial and temporal descriptions of each case (time, day and month of the victim's death, and scene of homicidal injury). Information on the victim's blood alcohol concentration (BAC) was not included in the current analyses owing to the high proportion of missing data.

Dependent variable

Female and male homicidal strangulation were coded separately as the dependent variable for the two analyses undertaken in this study. All other homicides recorded for Johannesburg for the specified period served as the reference category. Of the total of 9 920 cases recorded, homicidal strangulation accounted for 2.2% (*n*=218) of all deaths, representing the smallest proportion of all deaths relative to firearm discharge, sharp-object homicide and blunt-object homicide.[3] Males represented a disproportionately high percentage of victims for all homicides combined (86.5%; *n*=8 580), with 1% of deaths (n=88) occurring from strangulation, and females constituted 13.5% (n=1 340) of all victims, with 9.7% of deaths (n=130) attributed to strangulation. The strangulation homicide dataset excluded 116 cases (34.7%) with missing data.

Independent variables

The independent variables comprised sociodemographic and spatiotemporal predictors. These predictors account for variations in homicide risk across different contexts and groups.[3] The sociodemographic predictors included two independent variables: (*i*) age group: 0 - 14, 15 - 29, 30 - 44, 45 - 59 and ≥60 years of age, with the latter coded as the reference category; and (*ii*) race: Indian, coloured, white and black, with the latter coded as the reference category. The authors note that in SA, the terms Indian, black, coloured (referring to mixed heritage) and white are an artefact of the apartheid period. Their use is contentious and does not imply acceptance of the racist assumptions on which these labels were founded. The spatiotemporal predictors incorporated four variables: (*i*) time of day: day (05h00 - 18h59) and night (19h00 - 04h49), with night coded as the reference category; (*ii*) day of the week: weekdays and weekend (commencing on Friday at 16h00), with the latter representing the reference category; (*iii*) month of death by seasonal cycle, with spring coded as the reference category; and (*iv*) scene of death: private and public places, with the latter serving as the reference group.

Cases with missing values were excluded. Given the smaller number of cases for which BAC data were available (40.9%) and the substantially reduced sample size that the inclusion of BAC data would have implied, BAC was not included as an independent variable. The analysis of missing values indicated that BAC was 'missing not at random', signifying a non-representative sample and biased estimates, while all the other variables were 'missing at random'.

Table 1 presents the frequency distribution of all the variables included in the analyses, aggregated for female and male homicide, respectively. The majority of female victims were distributed across the 15 - 29-year (37.8%; n=507) and 30 - 44-year (37.5%; n=503) age ranges. A preponderance of male deaths was recorded in these same age categories, 42.2% (n=3 621) and 41.2% (n=3 537), respectively. Black male (88.3%; n=7 578) and female (81.5%; n=1 092) deaths accounted for the largest proportion of all deaths in females and males alike. Whereas fewer males were murdered during the day than at night time (43.2%; n=3 709), more female homicides occurred during the day (56.3%; n=755). There were fewer male fatalities during the week (48.4%; n=4 153) than over the weekend, compared with female victims, for whom the inverse was noted (56.3%; n= 55). Homicides were almost equally distributed across the seasons of the year, with a slightly greater clustering around winter and spring for both females and males. Private places were the scene of injury for the majority of female and male deaths, and there was a larger proportion of deaths of women in private places (73.1%; n = 980) compared with public places (26.9%; n=360).

Table 1. Characteristics of female and male homicide victims, Johannesburg, 2001 - 2010 (N=9 920)

	Females (N=1 340), n (%)	Males (N=8 580), n (%)
Homicide mechanism		
Strangulation	130 (9.7)	88 (1)
Other	1 210 (90.3)	8 492 (99)
Age (years)		
0 - 14	65 (4.9)	108 (1.3)
15 - 29	507 (37.8)	3 621 (42.2)
30 - 44	503 (37.5)	3 537 (41.2)
45 - 59	182 (13.6)	1 016 (11.8)
≥60	83 (6.2)	298 (3.5)
Race		
Indian	25 (1.9)	163 (1.9)
Coloured	62 (4.6)	303 (3.5)
White	161 (12)	536 (6.2)
Black	1 092 (81.5)	7 578 (88.3)
Time of day		
Day	736 (54.9)	3 709 (43.2)
Night	604 (45.1)	4 871 (56.8)
Day of week		
Weekday	755 (56.3)	4 153 (48.4)
Weekend	585 (43.7)	4 427 (51.6)
Season of year		
Summer	316 (23.6)	2 086 (24.3)
Autumn	326 (24.3)	2 000 (23.3)
Winter	368 (27.5)	2 256 (26.3)
Spring	330 (24.6)	2 238 (26.1)
Scene of injury		
Private	980 (73.1)	4 431 (51.6)
Public	360 (26.9)	4 149 (48.4)

Logistic regression analyses

Logistic regressions were conducted separately, examining the independent associations between each of the predictor variables and homicidal strangulation in females and males in relation to all other female and male homicides, respectively. All other female homicides combined and all other male homicides combined were coded as the reference categories. Theoretically similar predictor variables were added sequentially to the analyses. The logistic regression analyses assessed the risks associated with female and male homicidal strangulation, respectively, each analysis examining a different model. The first model examined sociodemographic factors only, and the second model included spatial and temporal variables. Model coefficients were exponentiated so that they could be translated into adjusted odds ratios (ORs), and 95% confidence intervals (CIs) were calculated to measure the magnitude and significance of adjusted multivariate associations. A p-value <0.05 was considered significant. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 22 (IBM, USA).

Ethical considerations

Ethical approval for the study was granted by the University of South Africa's Department of Psychology Human Research Ethics Committee (ref. no. 12-11-2014).

Results

Female strangulation homicide v. all other female homicides

Model 1

The overall model when compared with the constant-only model tested significant at the p<0.05 level (χ^2=39.485, p=0.000 with degrees of freedom (df)=7). At the multivariate level, age was a significant predictor of female homicidal strangulation. When compared with the ≥60-year age group, females in the 15 - 29, 30 - 44 and 45 - 49-year age categories were respectively 2.62 (OR 0.381; 95% CI 0.193 - 0.751; p<0.05), 3.55 (OR 0.282; 95% CI 0.143 - 0.554; p<0.05) and 3.88

Table 2. Logistic regression analyses for female and male strangulation homicide v. all other female and male homicides, Johannesburg, 2001 - 2010

	Females†				Males‡			
	Model 1		Model 2		Model 1		Model 2	
Independent variable	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Sociodemographic								
Age (years)								
0 - 14	1.051	0.457 - 2.420	0.999	0.426 - 2.342	4.130*	1.855 - 9.194	4.376*	1.914 - 10.006
15 - 29	0.381*	0.193 - 0.751	0.375*	0.187 - 0.750	0.138*	0.066 - 0.287	0.194*	0.092 - 0.411
30 - 44	0.282*	0.143 - 0.554	0.274*	0.137 - 0.549	0.143*	0.070 - 0.290	0.186*	0.090 - 0.384
45 - 59	0.258*	0.118 - 0.563	0.264*	0.120 - 0.579	0.192*	0.086 - 0.429	0.222*	0.098 - 0.501
≥60	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Race								
Indian	2.654	0.943 - 7.469	2.575	0.903 - 7.342	2.990*	1.042 - 8.582	2.807	0.979 - 8.052
Coloured	2.527*	1.255 - 5.089	2.559*	1.254 - 5.222	1.424	0.500 - 4.055	1.346	0.459 - 3.947
White	1.496	0.850 - 2.665	1.457	0.809 - 2.621	2.422*	1.275 - 4.601	2.191*	1.138 - 4.219
Black	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Spatiotemporal								
Time of day								
Day	-	-	1.715*	1.141 - 2.576	-	-	3.133*	1.902 - 5.159
Night	-	-	Ref.	Ref.	-	-	Ref.	Ref.
Day of week								
Weekday	-	-	1.113	0.752 - 1.645	-	-	1.942*	1.199 - 3.148
Weekend	-	-	Ref.	Ref.	-	-	Ref.	Ref.
Season of year								
Summer	-	-	2.336*	1.297 - 4.206	-	-	1.723	0.874 - 3.400
Autumn	-	-	2.087*	1.152 - 3.780	-	-	2.040*	1.047 - 3.973
Winter	-	-	1.846*	1.023 - 3.332	-	-	1.565	0.791 - 3.098
Spring	-	-	Ref.	Ref.	-	-	Ref.	Ref.
Scene of injury								
Private	-	-	0.593*	0.399 - 0.881	-	-	2.066*	1.292 - 3.305
Public	-	-	Ref.	Ref.	-	-	Ref.	Ref.
Likelihood ratio tests	Model χ^2=39.485 *p*=0.000		Model χ^2=65.989 *p*=0.000		Model χ^2=120.250 *p*=0.000		Model χ^2=167.485 *p*=0.000	
Pseudo R-square (females *n*=1 340, males *n*=8 580)	Nagelkerke = 0.062		Nagelkerke = 0.102		Nagelkerke = 0.129		Nagelkerke = 0.179	

OR = odds ratio; CI = confidence interval; Ref. = reference category.
*$p<0.05$.
†The reference category for the dependent variable is 'All other female homicides'.
‡The reference category for the dependent variable is 'All other male homicides'.
The blank cells reflect the modelling.

(OR 0.258; 95% CI 0.118 - 0.563; $p<0.05$) times less likely to be murdered by strangulation relative to all other female homicides. Although the aggregate effect for age was found to be significant, the decomposed effects demonstrated a non-significant result for the youngest age group (0 - 14 years). Compared with black females, coloured females were 2.5 times more likely to die from strangulation (OR 2.527; 95% CI 1.244 - 5.089; $p<0.05$) as opposed to all other female homicides. The decomposed effects were not significant for Indians and whites when compared with blacks.

Model 2

The overall model was significant (χ^2=65.989, p=0.000 with df=13) at the $p<0.05$ level. After controlling for all the variables in the analysis, age and race were significant predictors of female fatal strangulation. The direction of the relationship between each of these two independent variables and the dependent variable, as well as their decomposed effects, were identical to the results observed for model 1. Women aged ≥60 years and coloured females, compared with black females, were most at risk of fatal strangulation relative to all other female homicides. Time of day significantly predicted female homicidal strangulation in relation to all other female homicides. Compared with night-time strangulations, the risk of being strangled to death during the day was almost 2 times higher (OR 1.715; 95% CI 1.141 - 2.576; $p<0.05$). Compared with spring, females were ~2.5 times more likely to be strangled in summer (OR 2.336; 95% CI 1.297 - 4.206; $p<0.05$), slightly less than in autumn (OR 2.087; 95% CI 1.152 - 3.780; $p<0.05$) and winter (OR 1.846; 95% CI 1.023 - 3.332; $p<0.05$). Scene of death was found to predict female strangulation homicide: females were 1.67 times less likely to die in private places (OR 0.593; 95% CI 0.399 - 0.881; $p<0.05$) than in public locations relative to all other female homicides.

Male strangulation homicide v. all other male homicides

Model 1

Results indicated the overall logistic regression model to be statistically significant at the $p<0.05$ level (χ^2=120.250, p=0.000 with df=7). The estimated effects for age were similar to those reported for females. When compared with the ≥60-year age group, males aged 15 - 29, 30 - 44 and 45 - 49 years were respectively 7.25 (OR 0.138; 95% CI 0.066 - 0.287; p<0.05), 7 (OR 0.143; 95% CI 0.070 - 0.290; p<0.05) and 5.2 (OR 0.192; 95% CI 0.086 - 0.429; p<0.05) times less likely to be fatally strangled relative to all other male homicides. Risk estimates were lower than those reported for females in the same age categories relative to all other female homicides. Unlike the non-significant effect reported for child and adolescent females, males aged 0 - 14 were ~4 times (OR 4.130; 95% CI 1.855 - 9.194; p<0.05) more likely to be strangled to death compared with the ≥60-year group relative to all other male homicides. The decomposed effects for race indicate that in comparison with blacks, Indian males were almost 3 times more at risk for fatal strangulation (OR 2.990; 95% CI 1.042 - 8.582; p<0.05) and whites 2.5 times more at risk (OR 2.422; 95% CI 1.275 - 4.601; p<0.05) in relation to all other male homicides. The effect for coloured males was non-significant, in contrast to female strangulation homicides.

Model 2

The overall logistic regression model was statistically significant at the p<0.05 level (χ^2= 167.485, p=0.000 with df=13). The nature and direction of the relationships between age and the dependent variable were almost identical to model 1. Relative to all other male homicides, the effect estimates indicated a pronounced increase in risk for the 0 - 14-year age group (OR 4.376; 95% CI 1.914 - 10.006; p<0.05) in comparison with the ≥60-year age category. Although the aggregate effect of race was non-significant, the decomposed effects indicated that compared with blacks, white males were at ~2 times higher risk (OR 2.191; 95% CI 1.138 - 4.219; p<0.05) of fatal strangulation in relation to all other male homicides. The effect for Indians approached significance (p=0.055). The localised effects were non-significant for coloured males. The probability of being fatally strangled during the day, as opposed to at night, was >3 times higher (OR 3.133; 95% CI 1.902 - 5.159; p<0.05) relative to all other male homicides. Disaggregated by sex and relative to all other male and female homicides, respectively, the risk of daytime strangulation was higher in males than in females. The predictive effects for day of week were also significant, with males almost 2 times as likely (OR 1.942; 95% CI 1.199 - 3.148; p<0.05) to be strangled during the week than over the weekend in relation to all other male homicides. While the overall effect of seasonality was non-significant, the decomposed results showed autumn to be a significant predictor of male strangulations. In comparison with spring, the risk of strangulation death in autumn was 2 times higher (OR 2.040; 95% CI 1.047 - 3.973; p<0.05) in relation to all other male homicides. In contrast to the female strangulation risk patterns, the B coefficient's positive direction indicated that males were 2 times more likely (OR 2.066; 95% CI 1.292 - 3.305; p<0.05) to be strangled to death in private locations than in public places.

Discussion

The results indicate differential fatal strangulation risks for females and males. The risk of fatal strangulation was distinctly higher for both females and males aged ≥60 years, contrary to indications showing overall homicide risk to be concentrated among younger males.[14] Referencing studies indicating that older victims of violent crime are likely to be assaulted by strangers and victimised in their own homes,[15,16] it is speculated that the elderly are being strangled in the commission of other serious crimes, such as house robbery.

Disaggregated by sex, the risk for male child and adolescent fatal strangulation is high, corresponding with estimates that register the overall male child homicide rate to be nearly twice the female rate (6.9/100 000).[17] While younger children are very physically vulnerable to strangulation attack, the incongruent risk effects for boys and girls suggest the need to consider the higher vulnerability among adolescent males alongside their excess mortality (27.1/100 000).[17] It is likely that males in this age group are beginning to be involved in contests for power, domination and influence, and in inter-gender conflicts, yet remain vulnerable to the violence associated with hegemonic masculinities. This explanation finds support in the typology for adolescent homicide victimisation in urban SA, which reports the majority of adolescent homicides to be all-male victim-offender encounters.[18]

Coloured females were at significantly higher risk of being strangled to death in the within-sex analyses, and white males when the stronger within-sex model (model 2) is considered, mirroring race-specific rates reported elsewhere.[10] Previous research shows coloured women to have the highest rates of female strangulation homicide[19] and intimate femicide.[20] Despite the absence of data on victim-perpetrator relationships, it is suggested that coloured women may be the target of expressive strangulation homicide perpetrated by males in social and relationship contexts of heightened aggression and hostility.[21] With regard to the effects for Indian and white males, the finding may be revealing of the lower risk of strangulation for males from the other two race groups. Alternatively, in the case of white men, the higher probability of strangulation death may be linked to the observed age effects. This group of males may be represented largely by elderly white men being strangled in the context of instrumental homicide, or homicide motivated by gain.

Whereas daytime is shown to be a period of higher risk in the sex-disaggregated analyses, the effects for day of the week emerge as non-significant for females, diverging from research revealing risk to be higher at night and over weekends.[4,22,23] The inverse time of day and day of week pattern noted here may be reflective of the opportunistic or predatory nature of strangulation homicide. The day-of-week effects for females suggest that the risk of strangulation violence is even across the days of the week. Although statistically significant, the predictive effects for seasonality did not exhibit a conceptually coherent risk profile. Seasonal patterns in interpersonal violence usually account minimally for variances in crime rates and risks.[24]

Although relatively marginal in effect, females were less likely to be strangled in private locations, with the direction of predictive effects being the opposite for males. Prior research[10,18,25] shows the reverse pattern. The current findings support the argument that females may be vulnerable away from home because they are more accessible targets to strangers.[26] The findings for males may be reflective of interaction with age and temporal effects, pointing to fatal strangulation risk in the commission of instrumental crime. In the aggregate, female homicide is explained as resulting from violence by male intimate partners perpetrated within the home, whereas for men fatal violence is considered to be largely concentrated in public spaces.[27] However, it is likely that homicide risk profiles have become more diverse over time, revealing unique and emergent risk characteristics, which increasingly appears to be the case for homicide by strangulation.

Study limitations

Owing to missing and incomplete data, a high percentage of cases and BAC data were excluded from the analyses, with disaggregation contributing to a smaller number of observations for the logistic regressions. Although the most inclusive source of homicide data for the Johannesburg area, the NIMSS does not register perpetrator information, thereby restricting analysis of risks associated with the victim-perpetrator relationship. The exclusion of sociostructural variables did not permit examinations of potential interacting influences of the individual and the social on strangulation. The multivariate analyses were employed principally to determine probabilities rather than causation; the brief explanations of fatal strangulation risk by gender are therefore to be read as speculative.

Conclusions

Notwithstanding the limitations, the study provides evidence on the gender gradient in homicidal strangulation risk and underlines the importance of undertaking a sex-disaggregated and comparative approach to homicide research. Follow-up studies using current data and larger case samples will clarify the patterns suggested in the current study, and raise the public policy and research salience of analyses of fatal strangulation. Prevention programmes that are sensitive to gender and age, and include the strengthening of social protection systems, are critical for reducing strangulation risk and homicide. Furthermore, screening for the physical and psychological manifestations of strangulation in healthcare settings is indicated for the recognition, management and prevention of fatal strangulation risk. Such screening requires the training of health professionals and the development of lethality risk assessment tools to identify fatal strangulation risk.

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