Association of Sexual Violence and Human Rights Violations With Physical and Mental Health in Territories of the Eastern Democratic Republic of the Congo

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Context Studies from the Eastern Region of the Democratic Republic of the Congo (DRC) have provided anecdotal reports of sexual violence. This study offers a population-based assessment of the prevalence of sexual violence and human rights abuses in specific territories within Eastern DRC.

Objective To assess the prevalence of and correlations with sexual violence and human rights violations on residents of specific territories of Eastern DRC including information on basic needs, health care access, and physical and mental health.

Design, Setting, and Participants A cross-sectional, population-based, cluster survey of 998 adults aged 18 years or older using structured interviews and questionnaires, conducted over a 4-week period in March 2010.

Main Outcome Measures Sexual violence prevalence and characteristics, symptoms of major depressive disorder (MDD) and posttraumatic stress disorder (PTSD), human rights abuses, and physical and mental health needs among Congolese adults in specific territories of Eastern DRC.

Results Of the 1005 households surveyed 998 households participated, yielding a response rate of 98.9%. Rates of reported sexual violence were 39.7% (95% confidence interval [CI], 32.2%-47.2%; n=224/586) among women and 23.6% (95% CI, 17.3%-29.9%; n=107/399) among men. Women reported to have perpetrated conflict-related sexual violence in 41.1% (95% CI, 25.6%-56.6%; n=54/148) of female cases and 10.0% (95% CI, 1.5%-18.4%; n=8/66) of male cases. Sixty-seven percent (95% CI, 59.0%-74.5%; n=615/998) of households reported incidents of conflict-related human rights abuses. Forty-one percent (95% CI, 35.3%-45.8%; n=374/991) of the represented adult population met symptom criteria for MDD and 50.1% (95% CI, 43.8%-56.3%; n=470/989) for PTSD.

Conclusion Self-reported sexual violence and other human rights violations were prevalent in specific territories of Eastern DRC and were associated with physical and mental health outcomes.

JAMA. 2010;304(5):553-562 www.jama.com

The Democratic Republic of the Congo (DRC, formerly Zaire) has experienced continued violence and civil conflict for more than a decade and is routinely listed as the site of one of the world's worst humanitarian crises.[1]

Of the studies that evaluate sexual violence in the DRC, the majority do not include all forms of sexual violence,[2,3] are largely qualitative,[4-6] or evaluate patients presenting to medical care,[7] which comprise a biased, nonrandomized sample. In many settings, sexual violence survivors resist speaking out for fear of social stigmatization.[8,9] Consequently, rates of nonreport of the event at the time of seeking medical care are as high as 75% and may be higher in conflict settings.[8-11]

Of the few population-based studies assessing violence in Eastern DRC, estimates of reported sexual violence were between 16% and 20%.[2,3] Both studies limited inquiries about sexual violence to narrow definitions and did not ask about perpetrators, circumstances, mental and physical health consequences of the violence, or establish if the violence was community based, conflict-related, or violence against men.

This population-based study assessed the prevalence of all forms of interpersonal violence—including intimate partner violence (IPV), conflict-related sexual violence, and other human rights abuses—circumstances,

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characteristics of perpetrators, and physical and mental health effects of sexual violence, including the effect on individuals, families, and communities. In this article, the term *interpersonal violence* is used in place of *gender-based violence* to include all types of violence between men and women.[12]

METHODS

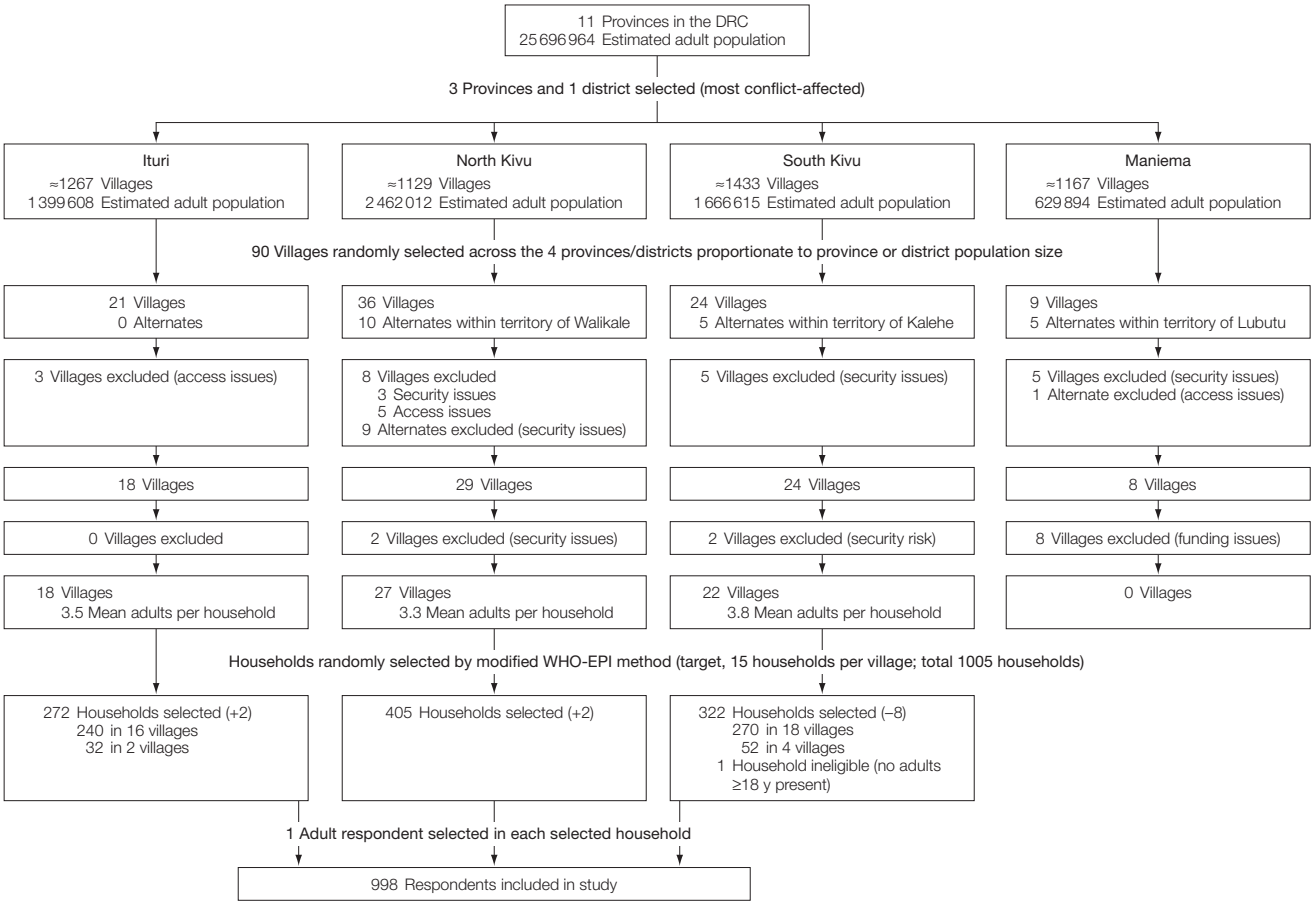
Survey Sites and Sample Selection

This research is based on a cross-sectional study conducted in the territories (26 provinces are subdivided into 192 territories) of North and South Kivu provinces and Ituri district in the DRC in March 2010. Initially, the study was to use a 90 × 10 (90 villages × 10 households) systematic sampling strategy; however, due to ongoing conflict, difficult terrain, and funding issues, the final sample was composed of 67 villages (10-15 households per village) and 1005 households, representing 5.2 million adults living in 19 territories in North and South Kivu provinces and Ituri district (FIGURE). Details of the sampling frame, including the selection of clusters/villages, selection of households, and selection of participants within households, are described in the online supplemental eMethods at http://www.jama.com.

For this study, systematic selection of villages was by geographic location (north to south). To allow an approximate probability-proportional-to-size sampling strategy, existing information on the village sizes—as provided by the DRC Office for the Coordination of Humanitarian Affairs—was used to create relative weights: "other villages" were assigned a weight of 1; "important villages" a weight of 2; "group capitals" a weight of 4; "territory capitals" a weight of 6; and province capitals a weight of 8. Probability of selection was then proportional to the relative weights in that a list was created containing all villages in north-to-south order, but each village was put in the list as many times as its weight (eg, a province capital was listed 8 times). Then, every *k*th village was chosen, where *k* equals the total size of the list, divided by the number of clusters to be selected from that province/area.

Study researchers had originally selected 90 clusters (ie, villages) for inclusion in the sample. However, the study was to take place during the rainy season, which meant that several roads would be washed out/inaccessible, making some clusters/villages prohibitively expensive

Figure. Flow of the Study Sample



DRC indicates Democratic Republic of the Congo; WHO-EPI, World Health Organization Expanded Program on Immunization.

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to access. In addition, the ongoing lack of security in the region meant that clusters/villages might have to be dropped suddenly in the field if it was no longer safe to travel to them. Therefore, the study researchers also prepared an "auxiliary" sample of 20 clusters to use as replacements for those of the 90 initially selected clusters. The purpose of the auxiliary sample was 2-fold: to allow better extrapolation at the territory level, which administratively is lower than the district level, and to provide a sufficient sample size for the study.

Due to several of the initial sample clusters being inaccessible as expected, the survey results are not generalizable to the entire adult household-based population of Eastern DRC (eTable 1). However, the sample is complete for many of the territories contained within Eastern DRC and is therefore generalizable for those areas. In 3 territories, a subset of the initially selected sample clusters was reached, and the weighting for those clusters within those territories was adjusted to account for the clusters missed. The resulting estimates are generalizable to the subset of Eastern DRC shown by the eFigure, and details of the weighting procedure are provided in the eMethods.

Sample size was determined by the prevalence of major depression of 0.5.[13-16] The sample size required to estimate that prevalence via a simple random sample, to within 0.05 with 95% confidence, is 770 households assuming a design effect of 2 to account for sample design.[17,18] To account for refusals the targeted sample size was 1000 households. The populations of North Kivu, South Kivu, and Ituri were obtained using voter registration records from 2006.[19,20] The sampling plan included stratification by province according to population size.[21,22]

Interviewers began in the geographic center of the village.[23] The interviewer chose which direction to go by tossing a pen into the air. The number of houses to pass to reach the first sampling unit (and the sampling interval) was chosen by selecting a number from 1 through 10 from a hat. A Congolese interviewer interviewed 1 adult (≥18 years) per household in the sample. At each house, the interviewer requested to speak with a male or female adult household member, randomly chosen by coin toss before entering the household. If that person was unavailable then the next adult in the household was approached. If only 1 adult or only 1 male or female was present at the time a household was visited, that person was interviewed regardless of sex. Records were kept of refusals, ineligible households, and lack of availability after 2 attempts.

One-on-one interviews were conducted anonymously in a setting that offered privacy and confidentiality, typically inside the housing unit. Referrals to appropriate local psychological services were given if requested by the participant or if the participant was perceived as a threat to himself or herself assessed by answers of yes to any red flag questions in the survey.

Instrument

The survey contained 144 questions on current respondent demographics, basic needs, education, physical and self-reported mental health, and health care access; mortality of household members during the previous 3 months; morbidity (lifetime head trauma exposure; current perceptions of general health before, during, and after the war), past and current substance abuse, current reproductive health, and lifetime exposure to sexual violence; lifetime combatant experience; and opinions on women's roles in society and justice for sexual violence.

A household was defined as the group of people eating from the same pot. Substance abuse was noted if the participant reported using drugs or alcohol on a regular basis; more than 2 times per week or in excess each time.[24] Untreated water source was defined as any water source other than a communal tap, home tap, or protected well. Inadequate shelter was defined as housing other than a brick or cement dwelling, or housing that either lacks a roof or has a paper roof. Inadequate general health care was defined as a lack of hospital or clinic within a 4-hour walking distance. Sexual violence was determined as any physical or psychological violence carried out through sexual means or by targeting sexuality and included rape and attempted rape, molestation, sexual slavery, being forced to undress or being stripped of clothing, forced marriage, and insertion of foreign objects into the genital opening or anus, forcing individuals to perform sexual acts on one another or harm one another in a sexual manner, or mutilating a person's genitals.[25] Gang rape was defined as rape by 2 or more individuals. Respondents were asked if they were ever subjected to beatings by a spouse or partner to identify lifetime IPV. A combatant was defined as any person who reported being part of any kind of regular or irregular armed force in any capacity, including but not limited to participation in combat, laying mines or explosives, serving as a cook/domestic laborer, decoy, courier, guide, guard, porter, or spy, trained or drilled as a combatant, or serving as a sexual servant or slave.[26] With regard to sexual servitude, respondents were asked if in their lifetime they were forced to be a sexual servant or sexual slave to a government or nongovernment military or militia group and followed with who the perpetrator may have been if known. A perpetrator was defined as any person who directly inflicted violence or a reported abuse.[25]

The PTSD Symptom Scale Interview (PSS-I) was used to assess symptoms of posttraumatic stress disorder (PTSD), which has an 86% sensitivity and 78% specificity for PTSD using a 1-month recall period.[27] Symptoms of major depressive disorder (MDD) were assessed using a 1-year recall period with the Patient Health Questionnaire–9, a well-validated, highly sensitive instrument for identifying individuals with depression.[28] The PTSD and MDD scales have been used reliably in several African communities affected by conflict.[13-16] Details of the scoring used for each scale are in the eMethods. The PTSD symptoms variable was set to 1 if the respondent met the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) (*DSM-IV*) criteria based on their answers to the PSS-I por-

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tion of the interview.[24,27] The MDD variable was set to 1 if the respondent met the *DSM-IV* criteria based on their answers to the Patient Health Questionnaire–9 portion of the interview.[24] Questions about suicidal ideation[29] during the previous year and lifetime suicide attempts[30] were reported as yes or no responses.

Respondents were asked whether they or their household members had been beaten, shot, seriously injured, sexually assaulted, raped, abducted, had violent amputations, or been subjected to forced labor by combatants during the past 16 years. For each human rights abuse, participants were asked the sex of the abused, type of abuse, and who they thought committed the violation.[31] Although a 10-year recall of events is generally considered reliable,[32] we asked about events since 1994 because the first civil war in the DRC was a major traumatic event in Congolese history and can therefore be reliably recalled.[33] Finally, respondents were asked about lifetime exposure to sexual violence, the sexual abuse type, the identity of the perpetrator, the number of attackers, the consequences of the sexual assault, and opinions regarding the punishment of perpetrators.

The survey was written in English and translated into Kiswahili by a certified translation service (World Lingo) and back-translated to account for culturally sensitive wording. Fluent in English, French, and Kiswahili, 4 Congolese supervisors from South Kivu and Ituri learned to verbally administer the amended survey in Kiswahili. The survey was pilot-tested to establish clarity of questions and for cultural appropriateness among public health experts in Eastern DRC.

Interviewers

Researchers trained Congolese supervisors and interviewers from each province to conduct the survey in that province. Interviewer training by 1 expatriate researcher and 1 Congolese supervisor involved 3 days of a combination of classroom teaching and experimental role-play focused on the quantitative surveys, sampling, and confidentiality. The 24 interviewers (15 male and 9 female) were from all 5 Eastern provinces and had prior experience administering surveys. Interviewers were not matched by sex with survey participants. Several days of field observation followed training.[34] Each survey interview took approximately 25 to 45 minutes to verbally administer.

Survey groups were sent out in teams of 2 with a supervisor and/or researcher whenever possible. Researchers worked closely with supervisors and interviewers on a daily basis to answer questions and give feedback about each survey completed; interviewers in remote villages had daily, if not frequent, mobile phone contact with supervisors and/or interviewers. Each interviewer completed an average of 8 surveys per day.

Ethical Approval

Permission to conduct the study was obtained from the Ministry of Health in Kinshasa and in each province and from the provincial health director for each health zone. Due to local legalities, supervisors and interviewers had to be hired by an organization with a work permit for Eastern DRC. The International Medical Corps served as the partnering organization. Ethics approval was obtained from the Uniformed Services University of the Health Sciences, McGill University, and Kinshasa School of Public Health institutional review boards. Verbal informed consent was obtained from all participants. Every effort was made to ensure protection and confidentiality and to reduce any potential adverse consequence to the participants.[35,36] Data were kept anonymous at all times. Survey participants did not receive any material compensation. They were informed that participation or lack thereof would not affect their access to or the quality of the care they receive and were explicitly given the right to refuse participation.

Statistical Analysis

Data analysis was performed using the survey module within the statistical software package R.[37,38] Analysis involved the estimation of weighted population and subpopulation means and percentages. Confidence intervals (95% CIs) were calculated using jackknife variance estimation to account for the complex sample design, and *P* values for bivariate comparisons were calculated using the adjusted Wald test of association. $P < .05$ was considered significant. Data were weighted to account for the sampling scheme, response rates, and excluded villages (see eMethods for details).

RESULTS

Demographics

Ongoing conflict, difficult terrain, and funding issues resulted in 21 of the 90 initial sample clusters/villages (5 for South Kivu, 8 for North Kivu, 3 for Ituri, and 5 for Maniema) and 10 of the alternate sample clusters/villages (9 for North Kivu and 1 for Maniema) being excluded. The result was an "accessible" sample of 79 clusters/villages: 24 for South Kivu, 29 for North Kivu, 18 for Ituri, and 8 for Maniema. As the study progressed, armed group movements caused another 4 clusters/villages to be dropped from the study. Finally, all of the clusters/villages in Maniema were excluded due to funding issues, resulting in a final count of 67 clusters/villages for the study (Figure).

Of the 1005 households surveyed, respondents from 998 households completed the survey, yielding a response rate of 98.9%. Of the 11 nonrespondents (1.1%), 4 refused to participate, 1 was ineligible due to age (<18 years), and 6 were interviewed but could not complete the survey. A total of 593 respondents were female and 405 were male (eTable 2). Mean age of the represented population was 40.1 years (95% CI, 38.2-42.0 years), and the majority were reported to be married, Christian, and working as farmers/herders. Sixty-one percent of the represented population were reported to be literate (61.3% [95% CI, 56.3%-66.2%]) and 80.0% (95% CI, 75.0%-85.0%) were reported to be landowners. The most common self-identified ethnic group was Nande, but the ethnic groups were diverse and vary according to the province sampled.

Combatant Status

Twenty percent of the adult population in the survey area were reported to have served as combatants at some

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Table 1. Weighted Sexual Violence Means and Rates, by Sex, Reported by 998 Respondents[a]

Characteristic	Female (n = 593)		Male (n = 405)		
	No./Total Respondents	Weighted % (95% CI)[b]	No./Total Respondents	Weighted % (95% CI)[b]	*P* Value[c]
Overall interpersonal violence	242/586	41.6 (33.8-49.5)	129/399	30.7 (24.2-37.2)	.004
Reported IPV	169/559	30.5 (24.1-36.9)	68/362	16.6 (11.4-21.9)	<.001
Reported physical IPV	160/168	96.0 (92.5-100.0)	66/68	98.1 (95.8-100.0)	.27
Reported sexual IPV	19/169	8.5 (3.9-13.1)	7/68	7.7 (2.5-13.0)	.82
Reported sexual violence	224/586	39.7 (32.2-47.2)	107/399	23.6 (17.3-29.9)	<.001
Reported conflict-related sexual violence	175/224	74.3 (66.2-82.5)	88/107	64.5 (52.9-76.1)	.19
Perpetrated by men only	94/148	58.9 (43.4-74.5)	59/66	91.4 (82.4-100.0)	.008
Perpetrated by women only	54/148	41.1 (25.6-56.6)	8/66	10.0 (1.5-18.4)	.01
Perpetrated by both	1/148	0.2 (0.0-0.5)	1/66	1.1 (0.0-3.2)	.41
Reported community-based sexual violence	25/224	13.5 (5.0-22.0)	10/107	6.5 (0.7-12.3)	.11
Perpetrated by men only	18/22	89.8 (75.4-100.0)	9/9	100.0	NA
Perpetrated by women only	4/22	10.2 (0.0-24.6)	2/9	26.9 (0.0-72.1)	.50
Reported sexual violence type					
Molestation	61/202	28.2 (18.2-38.3)	14/88	15.2 (6.5-24.0)	.04
Forced to undress	58/202	25.6 (17.7-33.5)	15/88	15.3 (5.6-25.0)	.06
Stripped of clothing	59/202	28.6 (19.6-37.6)	17/88	18.1 (7.6-28.7)	.12
Rape	105/202	51.1 (39.6-62.5)	18/88	20.8 (8.2-33.4)	<.001
Gang rape	67/202	33.4 (22.9-44.0)	6/88	7.5 (1.8-13.2)	<.001
Forced marriage	6/202	3.4 (0.0-0.1)	0/88	NA	NA
Abduction	11/202	4.5 (0.0-9.0)	22/88	32.0 (18.8-45.1)	.002
Sexual slavery	52/222	21.1 (13.6-28.5)	24/103	19.6 (10.4-28.8)	.80
Forced to perform act with another civilian	3/202	1.7 (0.0-3.9)	6/88	5.0 (0.0-11.2)	.34
Characteristics of male sexual violence perpetrators	(n = 123)		(n = 72)		
Immediate family member	14/123	10.0 (4.2-15.7)	7/72	8.0 (1.7-14.4)	.66
Extended family member/community member	9/123	7.7 (0.0-15.5)	7/72	6.4 (0.6-12.1)	.68
Noncombatant stranger	8/123	10.5 (2.0-19.0)	3/72	2.0 (0.0-4.6)	.09
Combatant	94/123	71.9 (60.4-83.5)	60/72	85.9 (76.7-95.1)	.06
Most frequent perpetrators					
Mai-Mai	15/93	13.8 (3.7-23.9)	7/59	12.3 (0.5-24.1)	.85
FDLR	10/93	11.7 (5.5-17.8)	9/59	12.9 (1.6-24.2)	.86
UPC	7/93	6.8 (1.1-12.6)	9/59	21.2 (0.5-42.0)	.19
Interahamwe	14/93	21.7 (8.8-34.5)	1/59	0.8 (0.0-2.3)	.008
Characteristics of female sexual violence perpetrators	(n = 66)		(n = 11)		
Immediate family member	5/66	2.1 (0.0-4.3)	5/11	40.6 (7.4-73.8)	.03
Extended family member/community member	3/66	2.9 (0.0-7.5)	1/11	12.7 (0.0-35.4)	.43
Noncombatant stranger	0/66	NA	1/11	6.4 (0.0-17.7)	NA
Combatant	54/66	88.4 (79.7-97.0)	8/11	79.3 (53.4-100.0)	.52
Most frequent perpetrators					
Mai-Mai	15/54	38.5 (18.2-58.7)	1/8	5.5 (0.0-16.9)	.11
FDLR	10/54	14.3 (5.1-23.5)	0/8	NA	NA
UPC	6/54	9.5 (0.0-19.3)	3/8	53.4 (6.2-100.0)	.21
Interahamwe	4/54	5.6 (0.0-13.0)	0/8	NA	NA
Reported consequences of sexual violence					
Bleeding	67/202	31.6 (22.6-40.6)	11/87	12.1 (1.6-22.6)	.002
Torn	58/202	21.7 (12.2-31.2)	11/87	12.4 (2.7-22.2)	.10
Bruised	48/202	17.6 (10.2-25.0)	3/87	3.8 (0.0-9.0)	.001
Beaten	45/202	18.7 (9.7-27.6)	30/87	32.2 (20.8-43.5)	.04
Pregnancy[d]	31/202	17.0 (9.3-24.7)	3/87	3.7 (0.0-8.4)	.008
Sexually transmitted infection	35/202	20.9 (11.3-30.6)	4/87	4.7 (0.0-10.8)	.01
Fear of AIDS/AIDS	21/202	15.6 (7.4-23.7)	4/87	5.9 (0.0-12.9)	.09
Stigmatized by family/community	14/202	8.4 (2.1-14.6)	3/87	2.8 (0.0-6.2)	.13
Anxiety	14/202	5.6 (1.9-9.3)	12/87	9.5 (3.2-15.8)	.25
Miscarriage[e]	12/202	8.7 (2.5-14.9)	1/87	0.7 (0.0-2.0)	.02
Depression	5/202	1.2 (0.04-2.3)	17/87	13.8 (4.9-22.7)	.005
Other	20/202	7.9 (2.8-13.1)	18/87	18.8 (10.1-27.4)	.03

Abbreviations: CI, confidence interval; FDLR, Democratic Forces for the Liberation of Rwanda; IPV, intimate partner violence; NA, not applicable; UPC, Patriotic Union of Congolese.
[a] Survey results are representative of the adult household-based population in Eastern DRC, defined in eTable 1.
[b] All statistics are weighted percentages unless otherwise noted. Denominators are the sum of the survey weights for the respondents in the subpopulation. Because denominators refer to the number of respondents that reported having experienced the abuse type, not the number of abuses, percentages in the table may sum to greater than 100%.
[c] *P* values based on the adjusted Wald test of association.
[d] Three pregnancies were reported by male survivors of sexual violence forced into sexual servitude by a female combatant who became pregnant.
[e] One miscarriage reported by male survivor of sexual violence by female combatant who experienced the miscarriage.

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point during their lifetime (eTable 3). Most reported being conscripted (abduction/kidnapping) into the armed groups. Both women and men carried out the same roles within the armed groups with the exception of sexual slavery (51.1% [95% CI, 37.6%-64.6%]; n=50/98 among women vs 20.3% [95% CI, 10.0%-30.6%]; n=24/105 among men). The most common reason given for staying with the armed group was because of threats to person or family.

Sexual Violence

Among the household-based population in the survey area, 39.7% (95% CI, 32.2%-47.2%; n=224/586) of women and 23.6% (95% CI, 17.3%-29.9%; n=107/399) of men were reported to have been exposed to sexual violence during their lifetime (TABLE 1). Thirty-one percent (95% CI, 24.1%-36.9%, n=169/559) of women were reported to have been exposed to IPV compared with 16.6% (95% CI, 11.4%-21.9%; n=68/362) of men. Of those who were exposed to sexual violence, 74.3% (95% CI, 66.2%-82.5%; n=175/224) of women and 64.5% (95% CI, 52.9%-76.1%; n=88/107) of men were exposed to conflict-associated sexual violence. Perpetrators of conflict-associated sexual violence were reported to include 41.1% women as perpetrators (95% CI, 25.6%-56.6%, n=54/148) among female survivors vs 10.0% (95% CI, 1.5%-18.4%, n=8/66) among male survivors. The most common type of sexual violence reported by both women and men was rape (women, 51.1% [95% CI, 39.6%-62.5%]; n=105/202; men, 20.8% [95% CI, 8.2%-33.4%]; n=18/88). Among the many consequences reported, less than 10% of men and women for whom sexual violence was reported also reported being stigmatized by family or community.

Human Rights Violations

Respondents were asked to report on human rights violations experienced by any member of their family since the start of the DRC civil war. Sixty-seven percent (66.7% [95% CI, 59.0%-74.5%]; n=615/998) of households in the survey area were reported to experience conflict-related human rights abuses against family members, including property, physical, and sexual violations (TABLE 2). The

Table 2. Weighted Human Rights Violation Means and Rates, by Sex, for Household Members of 998 Respondents[a]

	Households in Which Women Experienced Violation		Households in Which Men Experienced Violation		Total Households That Experienced Violation	
	No. of Respondents (n = 615)	Weighted % (95% CI)[b]	No. of Respondents (n = 615)	Weighted % (95% CI)[b]	No. of Respondents (n = 615)	Weighted % (95% CI)[b]
Physical violations	117	17.2 (13.2-21.3)	223	34.5 (28.2-40.9)	315	50.0 (42.5-57.6)
Beaten	87	12.1 (9.0-15.3)	181	28.9 (23.0-34.8)	246	37.0 (28.3-45.7)
Shot	25	2.9 (1.2-4.6)	55	7.7 (4.0-11.3)	75	11.6 (8.1-15.1)
Stabbed	15	1.9 (0.7-3.1)	10	1.2 (0.3-2.0)	23	3.3 (1.5-5.2)
Amputation	8	0.7 (0.1-1.2)	14	1.8 (0.7-3.0)	20	3.9 (1.1-6.7)
Other physical assault	27	3.8 (1.8-5.8)	25	4.8 (2.0-7.6)	52	8.1 (5.3-11.0)
Movement violations	55	7.8 (5.7-9.9)	71	12.0 (7.5-16.5)	122	20.8 (15.1-26.6)
Capture	44	6.1 (3.8-8.3)	64	10.6 (6.1-15.1)	107	18.1 (12.5-23.7)
Abduction	5	1.1 (0.0-2.2)	4	0.7 (0.0-1.5)	8	1.4 (0.2-2.6)
Forced displacement	8	0.8 (0.1-1.5)	7	1.7 (0.1-3.2)	15	2.6 (0.8-4.3)
Property violations	135	23.6 (16.7-30.4)	172	30.7 (24.9-36.5)	302	50.8 (43.2-58.4)
Property theft	107	20.5 (13.4-27.5)	141	25.7 (20.0-31.4)	245	41.9 (35.0-48.9)
Property destruction	50	12.5 (4.4-20.7)	67	15.2 (9.0-21.3)	118	19.3 (13.7-25.0)
Destruction of home	59	12.0 (5.1-19.0)	44	8.4 (4.7-12.0)	103	16.7 (11.0-22.4)
Forced work	3	0.4 (0.0-0.9)	11	1.2 (0.3-2.2)	14	1.7 (0.6-2.7)
Sexual violations	185	30.2 (23.5-36.8)	85	14.1 (9.4-18.8)	262	42.9 (35.6-50.1)
Forced to participate in sexually violent act against nonfamily	20	2.2 (0.8-3.5)	4	0.4 (0.0-0.9)	26	4.9 (2.8-7.1)
Forced to participate in sexually violent act against family	18	2.2 (0.8-3.7)	1	0.1 (0.0-0.3)	19	3.8 (0.6-6.9)
Other sexual violation	164	27.4 (21.1-33.8)	81	13.7 (9.0-18.5)	242	39.2 (31.9-46.5)
Other violations	28	3.4 (1.5-5.4)	26	5.5 (1.0-10.0)	49	7.1 (3.4-10.8)
Prevalence of most active perpetrators of abuse						
Mai-Mai	54	8.2 (4.3-12.0)	51	6.4 (3.5-9.2)	99	18.4 (10.4-26.3)
FDLR	49	8.0 (5.0-11.1)	36	5.1 (3.0-7.3)	76	11.3 (7.3-15.3)
FNI	32	8.7 (2.2-15.2)	50	12.3 (4.2-20.5)	71	10.3 (5.3-15.3)
MLC	20	1.3 (0.0-2.5)	29	1.4 (0.0-3.0)	35	7.8 (0.1-15.4)
Interahamwe	23	4.5 (0.8-8.1)	21	4.6 (0.2-8.9)	39	5.7 (1.9-9.4)
UPC	29	4.9 (2.3-7.5)	46	9.0 (3.2-14.8)	67	13.5 (4.6-22.4)

Abbreviations: CI, confidence interval; FDLR, Democratic Forces for the Liberation of Rwanda; FNI, Nationalist and Integrationist Front; ML, Movement for the Liberation of Congo; UPC, Patriotic Union of Congolese.
[a] Survey results are representative of the adult household-based population in Eastern DRC, defined in eTable 1.
[b] All statistics are weighted percentages unless otherwise noted. Denominators are the sum of the survey weights for the respondents in the subpopulation.

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most commonly reported abuses were property violations (50.8% [95% CI, 43.2%-58.4%]; n=302/615) and physical violations (50.0% [95% CI, 42.5%-57.6%]; n=315/615). Households in the survey area experiencing at least 1 abuse against a child constituted 6.8% (95% CI, 5.2%-8.5%). There were a reported mean 1.7 (95% CI, 1.5-18.) violations per household for those that experienced abuse, and mean 1.2 (95% CI, 1.0-1.4) violations per household over all households (whether they experienced abuse or not).

Morbidity and Mortality Indicators

The crude mortality rate for the population represented by the survey and based on reported mortality for the previous 3-month period, was 1.8/10 000 per day (TABLE 3). At the time of this study, basic needs were lacking; more than half of the population represented did not have adequate water, fuel for cooking and boiling water, shelter, and clothing. Few respondents reported use of mental health counseling (eTable 4). Rehabilitation centers (centers with psychosocial support including programs to address mental health, justice, and livelihoods) were listed as the most common need followed by education, income generation, and religious counseling/support.

Mental Health

More than twice as many men (46.3% [95% CI, 37.5%-55.0%]; n=177/398) than women (21.8% [95% CI, 16.7%-26.8%]; n=110/579) of the represented population were reported to be current substance abusers (TABLE 4). Among the represented population, 40.5% (95% CI, 35.3%-45.8%; n=374/991) met symptom criteria for MDD based on a 1-year recall period; 50.1% (95% CI, 43.8%-56.3%; n=470/989) met symptom criteria for PTSD based on a 1-month recall period; 25.9% (95% CI, 19.5%-32.4%; n=264/972) have had suicidal ideation during the past year; and 16.0% (95% CI, 10.8%-21.2%; n=162/965) have been reported to have attempted suicide at some point during their lives (Table 4). Extrapolated to the sampling frame population, 3.25 million (95% CI, 2.84 million-3.66 million) adults meet criteria for symptoms of PTSD, 2.63 million (95% CI, 2.29 million-2.97 million) adults meet criteria for symptoms of MDD, 1.68 million (95% CI, 1.27 million-2.10 million) adults have suicidal ideation, and approximately 1.04 million (95% CI, 0.70 million-1.38 million) adults have attempted suicide.

Table 3. Weighted Household Mortality and Morbidity and Mortality Predictors and Rates Reported by 998 Respondents[a]

Characteristic	No./Total Respondents to Question	Mean or Rate (95% CI)
Mortality		
Mean No. of household member deaths in last 3 mo	159/933	0.15 (0.10-0.19)
Mean No. of household member deaths in last 3 mo in those <5 y	95/937	0.11 (0.07-0.15)
Projected crude mortality/10 000 per day	159/933	1.8 (1.3-2.4)
Morbidity and mortality predictors		Weighted % (95% CI)
Untreated water source	533/988	54.7 (42.2-67.1)
Do not boil water and untreated water source	513/986	52.7 (40.5-64.8)
Inadequate cooking fuel	622/937	67.1 (57.6-76.5)
Inadequate shelter[b]	486/946	55.9 (46.5-65.2)
Inadequate clothing	745/930	77.2 (72.3-82.2)
Inadequate access to general health care[c]	632/989	67.1 (59.3-75.0)
Inadequate access to mental health care	876/931	94.6 (92.3-96.9)

Abbreviations: CI, confidence interval.
[a] Survey results are representative of the adult household-based population in Eastern DRC, defined in eTable 1. Denominators are the sum of the survey weights for the respondents in the subpopulation.
[b] Defined as housing other than a brick or cement dwelling, or housing that either lacks a roof or has a paper roof.
[c] Defined as a lack of hospital or clinic within a 4-hour walking distance.

COMMENT

The findings of this study indicate widespread sexual violence and human rights abuses in North and South Kivu and Ituri since the start of the conflict. The prevalence of sexual violence is significantly higher than previously reported in other conflict and postconflict settings[2,3,15] with associated poor mental health outcomes as seen in other studies.[4,13-15] Previous studies have been hampered methodologically but do indicate that limited numbers of women and men report sexual violence cases through the avenues provided by medical and judicial organizations/systems.[5-7]

This study is unique in that it evaluates the prevalence of sexual violence among men in the study area. There is a need for inclusion of men in sexual violence definitions and policies in addition to targeted programs to address their needs. The protections of men and boys should be considered by the United Nations as it has with women and children.[39,40]

The majority of sexual violence reported in this study is conflict-related. Institution-based studies have suggested that the number of cases of sexual violence perpetrated by civilians is on the rise[6]; however, these data do not support such claims. Hospital/clinic-based studies are not population-based and reflect a minority of individuals who may have severe physical outcomes, actually come to care, or are in the more remote, conflict-heavy regions. Furthermore, these results cannot be generalized to populations at large. Using such data to inform policy is problematic in that they can misalign resources with true need.

Our data reveal important perpetrator patterns for conflict-related sexual violence. In other conflicts, men and women have been reported to experience and perpetrate sexual violence.[41,42] This finding challenges the myth that women do not have the capacity to commit atrocities despite recent prosecutions for such crimes.[40] Policy makers and donors need to adjust societal paradigms of sexual violence and direct attention to female per-

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petrators and male survivors in regard to rehabilitation and justice.

Varying rebel groups were listed as perpetrators of sexual violence and other human rights abuses that are recognized as war crimes and can be prosecuted as such.[14,31,40] Given the territory assessed, it is possible that other rebel groups are involved in atrocities in areas that are not covered by this survey. The DRC government and the International Criminal Court should es-

Table 4. Weighted Mental Health Prevalences Reported by 998 Respondents[a]

Characteristic Reported	No. With Characteristic	Weighted % (95% CI) Substance Abuse (n = 977)	MDD (n = 991)	PTSD (n = 989)	Suicidal Ideation (n = 972)	Suicide Attempt (n = 965)
Total response						
Adults	998	31.8 (26.6-37.1)	40.5 (35.3-45.8)	50.1 (43.8-56.3)	25.9 (19.5-32.4)	16.0 (10.8-21.2)
Male	405	46.3 (37.5-55.0)	38.6 (31.2-46.0)	44.4 (35.4-53.4)	23.9 (17.1-30.7)	14.8 (8.4-21.3)
Female	593	21.4 (16.7-26.8)	41.9 (35.7-48.1)	54.0 (46.6-61.5)	27.3 (19.6-35.0)	16.8 (11.5-22.2)
P value		<.001	.45	.08	.35	.45
Sexual violence	331	27.9 (21.1-34.7)	60.4 (51.5-69.2)	70.2 (62.4-77.9)	37.6 (28.3-46.9)	29.1 (20.6-37.6)
No sexual violence	654	33.6 (26.9-40.3)	30.7 (24.3-37.2)	40.3 (31.4-49.3)	20.2 (13.2-27.2)	9.5 (3.6-15.5)
P value		.23	<.001	<.001	<.001	<.001
Combatants	205	32.9 (22.0-43.9)	57.7 (47.6-67.8)	62.3 (53.6-70.9)	31.5 (21.1-41.9)	29.3 (19.5-39.0)
Noncombatants	785	31.5 (26.5-36.6)	36.5 (31.0-41.9)	47.2 (40.0-54.4)	24.5 (17.2-31.7)	12.8 (8.1-17.6)
P value		.79	.003	.01	.25	<.001
Head trauma	427	39.8 (33.3-46.3)	55.7 (49.2-62.3)	68.3 (62.0-74.6)	33.8 (25.9-41.7)	20.6 (13.0-28.2)
No head trauma	522	25.2 (19.6-30.9)	28.7 (21.2-36.2)	36.1 (27.5-44.6)	19.8 (12.6-27.0)	12.3 (6.6-17.9)
P value		.007	<.001	<.001	.03	.26
Female	593					
Conflict-related sexual violence	174	18.1 (11.6-24.6)	67.7 (56.8-78.5)	75.9 (64.6-87.1)	37.0 (25.7-48.3)	32.8 (23.2-42.4)
No conflict-related sexual violence	412	23.4 (16.6-30.2)	30.3 (23.0-37.7)	44.4 (34.9-53.8)	23.0 (14.6-31.3)	9.6 (4.8-14.5)
P value		.31	<.001	<.001	.02	<.001
Community-based sexual violence	25	23.1 (0.0-51.6)	72.9 (50.7-95.2)	83.6 (63.2-100.0)	64.0 (37.9-90.2)	35.8 (0.0-71.7)
No community-based sexual violence	560	21.7 (16.7-26.8)	40.1 (34.1-46.1)	52.4 (44.7-60.0)	25.1 (17.6-32.7)	15.7 (10.7-20.8)
P value		.92	.07	.06	.08	.35
IPV	169	20.5 (12.0-29.0)	64.9 (52.3-77.5)	77.2 (66.8-87.7)	42.4 (28.9-56.0)	33.1 (22.9-43.4)
No IPV	390	22.7 (15.7-29.7)	31.0 (24.1-37.9)	43.9 (34.7-53.0)	20.5 (13.0-28.1)	9.7 (5.2-14.3)
P value		.72	.001	<.001	.001	<.001
Male	405					
Conflict-related sexual violence	87	50.1 (35.9-64.4)	47.5 (34.0-61.2)	56.0 (42.2-69.7)	39.3 (23.6-55.1)	22.8 (12.0-33.6)
No conflict-related sexual violence	312	45.3 (34.9-55.8)	36.3 (27.9-44.7)	41.7 (30.1-53.3)	20.2 (13.3-27.1)	12.9 (4.9-20.8)
P value		.61	.18	.17	.03	.16
Community-based sexual violence	10	83.4 (59.7-100.0)	50.7 (27.2-74.2)	61.5 (31.2-91.7)	42.2 (28.3-56.1)	72.0 (43.7-100.0)
No community-based sexual violence	389	45.7 (36.8-54.6)	38.4 (31.1-45.8)	44.1 (35.1-53.1)	23.6 (16.8-30.5)	13.9 (7.5-20.3)
P value		.08	.38	.34	.15	.07
IPV	68	44.4 (28.3-60.4)	53.9 (34.7-73.1)	55.5 (37.1-73.9)	34.6 (16.1-53.2)	38.3 (19.7-56.8)
No IPV	294	44.9 (35.2-54.7)	33.3 (23.7-43.0)	41.2 (31.1-51.4)	22.7 (15.5-30.0)	11.7 (6.3-17.0)
P value		.94	.12	.14	.20	.008
Former female combatants	98					
Sexual violence	75	17.2 (5.1-29.3)	74.6 (61.3-87.9)	80.4 (67.5-93.2)	33.8 (16.1-51.6)	32.2 (14.5-49.9)
No sexual violence	23	26.1 (0.0-59.3)	50.4 (22.0-78.8)	81.8 (68.3-95.2)	47.5 (13.4-81.5)	43.1 (10.0-76.8)
P value		.58	.23	.87	.49	.53
Former male combatants	106					
Sexual violence	52	53.9 (36.8-71.1)	36.1 (20.1-52.2)	53.9 (36.4-71.4)	44.4 (27.0-61.8)	37.9 (21.0-54.8)
No sexual violence	54	41.8 (23.7-59.9)	53.3 (34.2-72.4)	36.1 (17.3-55.0)	11.6 (0.0-26.6)	12.5 (0.0-27.5)
P value		.32	.21	.23	.02	.04
Former combatants	205					
Head trauma	100	33.1 (19.5-46.7)	69.0 (56.9-81.1)	76.2 (66.3-86.1)	34.4 (20.1-48.7)	33.1 (17.8-48.3)
No head trauma	105	32.7 (19.0-46.3)	44.0 (28.3-59.7)	45.4 (30.0-60.7)	27.8 (15.3-40.3)	24.8 (13.1-36.4)
P value		.95	.01	.006	.46	.40

Abbreviations: CI, confidence interval; IPV, intimate partner violence.
[a] Survey results are representative of the adult household-based population in Eastern DRC, defined in eTable 1. Denominators are the sum of the survey weights for the respondents with the characteristic. *P* values based on adjusted Wald test of association.

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tablish grounds for further investigation and prosecution of any members of these groups who currently have impunity and the protection of civilians in the areas known to be inundated by armed groups. Sexual violence survivor programs and medical services should be prioritized in these areas.

Sexual violence can have serious physical, social, and psychological consequences on the well-being of survivors, families, and communities.[15,16,31] Based on current population estimates in our sample area, 1.31 million (95% CI, 1.06 million-1.55 million) women and 0.76 million (95% CI, 0.55 million-0.96 million) men are survivors of sexual violence and might need health services specific to sexual violence–related care. A successful health care delivery strategy will also need to address men who have experienced sexual violence in addition to mental health services as necessary components of recovery and rehabilitation.

Limitations

The findings of the study represent the adult household-based population of most of the territories contained within Ituri, North Kivu, and South Kivu. Several of the sampled clusters in 3 territories were dropped; however, adjustments were made to the weights for the sampled units within those territories to account for the excluded clusters. Therefore, the study results cannot be generalized to the entire population of Ituri, North Kivu, and South Kivu, or to the entire Eastern region of DRC. In addition, the sample weights rely on voter registration records from 2006, which might introduce bias into the estimates due to both imperfections in the administrative system as well as changes in the underlying population since the records were created. Despite these limitations, it is unlikely the dropped/replaced villages or respondents would have yielded different results than were obtained, and the findings may be interpreted with caution to represent the more than 5 million persons in the 3 areas studied.

Although interviewers were careful to explain that there would be no material or other gain by participation in the study, respondents may have exaggerated or underestimated responses if they believed it would be in their interest to do so. Furthermore, it is possible that ethnicity, sex, and unfamiliarity of the interviewers as well as other unidentified characteristics may have limited truthfulness of respondents to sensitive questions such as sexual violence and thus we may have underestimated sexual violence. However, the rates reported in this study support findings in other postconflict settings.[13,29] Respondents were asked to serve as proxies for household members and report on abuses that occurred over a long period of time; as such, some events may have been forgotten or suppressed.

The instruments used to measure symptoms of PTSD and MDD, although validated for use in studies such as this, do not substitute for clinician-determined diagnoses, and thus rates of symptoms of PTSD and MDD should be interpreted with caution.

Finally, the nature of this study (a multistage clustered random sample survey) allows for the determination of association of population characteristics but not causality. None of the population characteristics discussed here are sufficiently rare to cause concern for overreporting- or underreporting.

CONCLUSION

Many women and men in the area of Eastern DRC included in this study are survivors and perpetrators of sexual violence and other human rights violations. The finding of male survivors and female perpetrators challenges the national and international community to develop and expand programs, policies, and protection strategies including United Nations Security Council resolutions. Improved access to basic health care with a focus on sexual violence– and mental health–specific programs is needed in the Eastern DRC.

Author Contributions: Drs Johnson and Lawry and Ms Asher had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
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Analysis and interpretation of data: Johnson, Scott, Kisielewski, Asher, Ong, Lawry.
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Obtained funding: Johnson, Ong, Lawry.
Administrative, technical, or material support: Johnson, Rughita, Kisielewski, Lawry.
Study supervision: Johnson, Rughita, Asher, Lawry.
Financial Disclosures: None reported.
Funding/Support: This document has been produced with and could not have been completed without the generous support of United States Africa Command, the International Medical Corps (IMC), and McGill University.
Role of the Sponsors: The funding organizations played no role in the design and conduct of the study; in the collection, management, analysis, and interpretation of the data; or in the presentation, review, or approval of the manuscript.
Disclaimer: The views expressed herein are those of the authors and should not, in any way whatsoever, be construed to reflect the official opinion of the US Department of Defense, IMC, IMC's donors, or McGill University.
Online-Only Materials: The eMethods, the eFigure, and 4 eTables are available at http://www.jama.com.
Additional Contributions: We are grateful to the following for their assistance with this project: Mukungo Munyanga, MD, PhD, Director of the Bukavu School of Public Health; Ann C. Macaulay, CM, MD, FCFP, McGill University Department of Family Medicine; and Maysaa Mahmoud, PhD, the International Health Division, Office of the Assistant Secretary of Defense for Health Affairs. We also thank Olivier Angbongo, Yann Machida, Cris Baguma, MD, Irene Kaindi, Lidija Zovko, Giorgio Trombatore, and Miel Hendrickson of IMC; without their logistical support and assistance in the field this project would not have been possible. We also thank the Center for Disaster and Humanitarian Assistance Medicine for their financial administration of this study, the Division of Women's Health at Brigham and Women's Hospital for its support of Dr Scott's travel expenses, and Juan Carlos Rosa for his technical support. We thank the paid Congolese supervisors and interviewers who assisted in data collection in very challenging and austere areas. Finally, we thank the volunteers from StatAid who assisted with data entry.

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