

Intimate partner violence against HIV-positive Cameroonian women: Prevalence, associated factors and relationship with antiretroviral therapy discontinuity-results from the ANRS-12288 EVOLCam survey.

Marion Fiorentino, Luis Sagaon-Teyssier, Khadim Ndiaye, Marie Suzan-Monti, Marie-Thérèse Mengue, Laurent Vidal, Christopher Kuaban, Laura March, Christian Laurent, Bruno Spire, et al.

▶ **To cite this version:**

Marion Fiorentino, Luis Sagaon-Teyssier, Khadim Ndiaye, Marie Suzan-Monti, Marie-Thérèse Mengue, et al.. Intimate partner violence against HIV-positive Cameroonian women: Prevalence, associated factors and relationship with antiretroviral therapy discontinuity-results from the ANRS-12288 EVOLCam survey.. Women's Health, 2019, 15, pp.1-12. 10.1177/1745506519848546 . hal-02473199

HAL Id: hal-02473199
https://hal.science/hal-02473199

Submitted on 10 Feb 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

WOMEN'S HEALTH

Women's Health
Volume 15: 1–12
© The Author(s) 2019
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1745506519848546
journals.sagepub.com/home/whe
SAGE

Intimate partner violence against HIV-positive Cameroonian women: Prevalence, associated factors and relationship with antiretroviral therapy discontinuity—results from the ANRS-12288 EVOLCam survey

Marion Fiorentino[1,2], Luis Sagaon-Teyssier[1,2], Khadim Ndiaye[1,2], Marie Suzan-Monti[1,2], Marie-Thérèse Mengue[3], Laurent Vidal[1,2], Christopher Kuaban[4], Laura March[5], Christian Laurent[5], Bruno Spire[1,2] and Sylvie Boyer[1,2] for the EVOLCam Study Group*

Abstract

Background: Intimate partner violence in its various forms increases HIV exposure in female victims and potentially jeopardizes the HIV treatment cascade, for instance, by impeding engagement in and adherence to care. Elevated rates of HIV and intimate partner violence are reported in Central Africa. Evidence on the effect of intimate partner violence on antiviral therapy interruption is lacking in Cameroon, where only 330,000 women live with HIV and only 19% of HIV-positive people are virally suppressed. This study aimed to assess the prevalence and factors of intimate partner violence against HIV-positive women and its relationship with antiretroviral therapy interruption ⩾1 month.

Methods: The EVOLCam cross-sectional survey was conducted in 19 hospitals in the Center and Littoral regions. The study sample comprised antiviral therapy–treated women declaring at least one sexual partner in the previous year. Scores of recent emotional, physical, extreme physical and sexual intimate partner violence were built using principal component analysis and categorized under no, occasional or frequent intimate partner violence. Multivariate logistic analyses were performed to investigate the relationship between intimate partner violence and recent antiretroviral therapy interruption ⩾1 month, and associated factors.

Results: Among the 894 analyzed women, the prevalence of intimate partner violence was 29% (emotional), 22% (physical), 13% (extreme physical) and 18% (sexual). Frequent physical intimate partner violence was a significant risk factor of antiretroviral therapy interruption ⩾1 month (adjusted odds ratio = 2.42 (95% confidence interval = 1.00; 5.87)). It was also associated with HIV-related stigma (2.53 (1.58; 4.02)), living with a main partner (2.03 (1.20; 3.44) and non-defensive violence against this partner (5.75 (3.53; 9.36)).

Conclusion: Intimate partner violence is a potential barrier to antiviral therapy continuity and aggravates vulnerability of Cameroonian HIV-positive women. The prevention and detection of intimate partner violence by HIV services might help to reach the last "90" of the 90-90-90 targets.

[1]INSERM, IRD, Aix Marseille Université, SESSTIM, Sciences Economiques & Sociales de la Santé & Traitement de l'Information Médicale, Marseille, France.
[2]ORS PACA (Observatoire Régional de la Santé Provence-Alpes-Côte d'Azur), Marseille, France
[3]Université Catholique d'Afrique Centrale, Yaoundé, Cameroun
[4]Department of Internal Medicine and Subspecialties, Faculty of Medicine and Biomedical Sciences, University of Yaoundé 1, Yaoundé, Cameroon
[5]IRD UMI 233-INSERM U1175, Montpellier University, Montpellier, France

*Members of the EVOLCam study group are listed in the "Acknowledgements" section.

Corresponding author:
Marion Fiorentino, INSERM, IRD, Aix Marseille Université, SESSTIM, Sciences Economiques & Sociales de la Santé & Traitement de l'Information Médicale, Faculté de Médecine, 27 Bd Jean Moulin, 13005 Marseille, France.
Email: marion.fiorentino@inserm.fr

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (http://www.creativecommons.org/licenses/by-nc/4.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Keywords
antiretroviral therapy interruption, Cameroon, HIV, intimate partner violence, women

Date received: 26 November 2018; revised: 18 March 2019; accepted: 8 April 2019

Introduction

Violence toward women is a worldwide public health issue and affects one woman in three. Perpetrators are mostly their intimate partners. Indeed, the latter are responsible for one-third of murders of women. Women physically or sexually abused by their partners have poorer physical, reproductive and mental health. Aside from mortality and injuries resulting from physical violence, they are also more likely to experience depression, to acquire sexually transmitted diseases and to have induced abortions or babies with low birth weight.[1,2] Intimate partner violence (IPV) also has an intergenerational effect on IPV itself[3] and on poor health outcomes.

IPV increases the risk of HIV acquisition, may delay or prevent HIV testing and HIV status disclosure to partners[4,5] and exacerbates the vulnerability of women living with HIV (WLHIV). WLHIV are at greater risk for domestic and family exclusion than other women.[4] IPV among people living with HIV (PLHIV) is associated with decreased access or use of healthcare services,[6–9] poorer engagement in HIV care, sub-optimal antiviral therapy (ART) adherence[10,11] and lower health-related quality of life, which is a strong predictor of death in PLHIV.[11,12] Suicidal ideation and attempts, depression, anxiety or post-traumatic disorders are more frequent in HIV-positive persons suffering from IPV than in other PLHIV, all of which affect ART adherence, immune functions and viral suppression.[12,13] To summarize, IPV is greatly interconnected with HIV and health outcomes of PLHIV and may jeopardize the implementation and success of various elements of the HIV treatment cascade.

IPV and HIV are both endemic in Central Africa.[4,14] In 2014, Cameroon was the 15th country most affected by HIV worldwide. Only 37% of PLHIV there received ART and only 19% were virally suppressed.[14] The lack of real progress toward achieving the UNAIDS 90-90-90 targets is a concern for the control of the epidemic in the country. In 2016, of the 32,000 new HIV infections, 4000 were due to mother-to-child transmission.[14] The 330,000 WLHIV in Cameroon account for 65% of all PLHIV in the country, a prevalence of 5.1% in women compared with 2.5% in men. In addition, Cameroon has the fifth highest prevalence of IPV among Sub-Saharan African countries. According to the 2011 Demographic Health Survey, nearly half of all Cameroonian women had recently suffered emotional, physical and/or sexual IPV.[15] In this setting, where the prevalence of both HIV infection and IPV is particularly high, no study has yet investigated the relationship between IPV and ART discontinuity in women. Antiretroviral therapy interruption (ATI) compromises the control of the HIV epidemic[16] and is a stronger risk factor than sub-optimal ART adherence for virological failure and HIV drug resistance[17,18] which are both very prevalent in Cameroon.[19]

The ANRS-12288 EVOLCam cross-sectional survey was conducted in 2014 in Cameroon to study the living conditions of PLWH followed up in 19 HIV services in the Center and Littoral regions, established as part of the national ART program. A previously published analysis from that survey reported that 21% of PLWH reported ATI.[20] The two objectives of this study were first to investigate whether IPV was associated with ATI among WLHIV participating in this survey and second to describe the prevalence of the different forms of IPV in this subpopulation and identify associated risk factors.

Methods

Study design, participants and data collection

The ANRS-12288 EVOLCam study was a cross-sectional survey conducted in the Center and Littoral regions of Cameroon between April and December 2014 which recruited 2357 eligible PLHIV (⩾21 years old, HIV-diagnosed >3 months) attending one of the study's 19 participating HIV services. Details about recruitment can be found elsewhere.[20] Demographic, socioeconomic, domestic and psychosocial data were collected during face-to-face interviews performed by independent, trained interviewers. The questionnaire included a section dealing with IPV previously developed by the World Health Organization (WHO) for a multi-country study on women's health and domestic violence against women.[21] Participating women were asked 12 behavior-specific questions about acts of violence (physical and mental) they might have had suffered from their most recent intimate partner in the 12 months prior to the survey and the frequency of these acts (never occurred, occurred occasionally or occurred frequently). Clinical data were obtained from medical files. A blood sample was collected from patients treated >6 months to measure HIV viral load (VL) and was analyzed by a reference HIV laboratory in Yaounde accredited by the WHO (quantification threshold 100 copies/mL). All participants provided written informed consent. ANRS-12288 EVOLCam was approved by the Ministry of Public Health in Cameroon and the Cameroonian National Ethics Committee. The study population of the present analysis included women declaring at least one intimate partner in the 12 months prior to the survey and having no missing data in the IPV section of the questionnaire.

IPV scores

We performed a principal component analysis (PCA) on the 12 items of the IPV questionnaire section to build IPV scores which, by construction, were standardized and computed using values ranging from 0 (no violence) to 1 (high level of violence). The Promax rotation technique, which enables correlation between factors, was implemented to improve the fit of the data.[22] IPV was broken down into four factors allowing the construction of the following scores (Appendix 1): emotional IPV (based on three items, eigenvalue = 2.55, Cronbach's $\alpha = 0.871$), physical IPV (five items, eigenvalue = 3.72, Cronbach's $\alpha = 0.929$), extreme physical IPV (two items, eigenvalue = 1.67, Cronbach's $\alpha = 0.685$) and sexual IPV (two items, eigenvalue = 1.62, Cronbach's $\alpha = 0.582$). The previous scores were considered highly reliable when Cronbach's α value was $\geqslant 0.7$ and moderately reliable when the value was $[0.5; 0.7[$.[23,24] The IPV scores explained cumulatively 80% of the total variance. A three-class IPV variable (no, occasional and frequent violence) was built using the following IPV score cut-offs: score = 0 (no IPV), score < median among non-zero values (occasional IPV) and score ⩾ median among non-zero values (frequent IPV).

Outcomes

ATI was an intermediary outcome in order to verify whether it was associated with one or more IPV scores. ATI ⩾ 1 month (ATI ⩾ 1m) was classified into three types: recent, that is, ATI ⩾ 1m in the 6 months prior to the survey; former, that is, ATI ⩾ 1m older than 6 months; and none, that is, no ATI > 1m since the beginning of ART.

IPV scores were defined as binary variables (frequent vs occasional or none). Those associated with recent ATI ⩾ 1m were then used as the main outcomes of this study in order to investigate related factors.

Explanatory variables

The following variables were common to both the intermediary and main analyses: age (in four categories defined using quartiles), living setting (rural, urban), educational level (primary, secondary, post-secondary), professionally active (yes, no), monthly household income (in four categories defined using quartiles), having children (yes, no), relationship with the household head (being the household head, spouse or ascending line, descending line or other family relationship or no family relationship), having a main partner (yes, no), experiencing ART stock-outs in the previous 3 months (yes, no), HIV clinical stage at ART initiation (stages 1–4).[25]

In addition, the following factors were used in the analysis investigating factors associated with ATI-related IPV: duration of relationship with the main partner (in four categories defined using quartiles), living together (living with the main partner, not living together, no main partner), marital status (legal or customary marriage, common-law couple, no main partner), kind of union (polygamous, monogamous, no main partner), educational level of the main partner (primary, secondary, post-secondary, unknown, no main partner), decision making about how to spend the respondent's income (the main partner alone, other responses), decision making about the respondent's health care (the main partner alone, other responses), HIV status disclosure to the most recent intimate partner (yes, no), HIV status of the most recent intimate partner (positive, negative, unknown), age difference between the respondent and her most recent intimate partner (>5 years, ⩽5 years, unknown), having perpetrated non-self-defensive violence against her intimate partner (yes, no) and having experienced stigma (stigma score >0, stigma score = 0 as measured by the HIV Stigma Scale).[26]

Statistical analysis

Relationship between IPV and ATI ⩾ 1m. Univariate logistic regressions were performed to evaluate the relationships between ATI ⩾ 1m and (a) the binary variables of emotional, physical, extreme physical and sexual IPV; (b) all the previously listed possible explanatory variables.

Multivariate logistic regression was performed including the binary variables of emotional, physical, extreme physical and sexual IPV, age and variables with a p value of <0.2 in the univariate analysis. Causal mediational analysis was further performed to investigate the influence of mental and physical quality of life (scores calculated by using the SF-12 scale)[27] on the association between recent ATI ⩾ 1m and IPV.

Factors associated with ATI-related IPV. Univariate logistic regression was then performed to investigate the associations of IPV scores previously identified as related to recent ATI ⩾ 1m and the previously cited explanatory variables. Multivariate logistic regression was performed including variables with a p value of <0.2 in the univariate analysis, using the backward stepwise technique. All the statistical analyses were performed using R 3.5.0.[28]

Results

Characteristics of participants

Of the 2138 participants in the ANRS-12288 EVOLCam survey, 1387 (65%) were female. Among them, 934 women declared at least one intimate partner in the previous 12 months. Of the latter, 894 (64% of all women included in the survey) had no missing values in the IPV questionnaire section and were therefore included in this

Table 1. Characteristics of HIV-positive ART-treated Cameroonian women who declared at least one intimate partner in the previous 12 months[a] (ANRS-122988 EVOLCam survey, n = 894).

	N (%) or median (IQR)
Demographic and socioeconomic characteristics	
Age (years)	37 (32–42)
Residential setting	
Urban area	79.9%
Rural area	15.3%
Educational level	
Primary level	33.1%
Secondary and post-secondary level	66.9%
Professionally active	
No	37.4%
Yes	62.6%
Monthly household income per consumption unit (FCFA) (USD)	8095 (4167–14,535) 14.9 (7.7–26.8)
Psychosocial characteristics	
HIV-related stigma	
Experienced	26.2%
Not experienced	73.8%
Physical quality of life (index)	51.9 (42.2–55.5)
Mental quality of life (index)	44.5 (38.1–51.7)
Alcohol consumption[b]	
No consumption	42.1%
Moderate consumption	54.5%
Elevated consumption	2.6%
Number of intimate partners in the previous 12 months	
1	86.2%
⩾2	13.8%
Domestic characteristics	
Number of children	
None	13.5%
1 child	21.9%
⩾2 children	64.2%
Relationship with the household head	
Herself	38.7%
Spouse/partner or ascending line	44.2%
Descending line, or other/no family relationship	17.1%
Having a main partner	
Yes	84.3%
No	15.7%
Duration of relationship with main partner (years)	5 (2–12)
Living together with the main partner	
No	36.5%
Yes	46.5%
Type of union	
Monogamous union	69.1%
Polygamous union	13.3%
Educational level of main partner	
⩽Primary level	14.8%
Secondary level or post-secondary level	67.2%
Unknown	16.1%
The main partner of the respondent alone makes decisions about	
How to spend the respondent's income	5.8%
The respondent's health care	11.7%
Characteristics of the most recent intimate partner[c]	
Type of partner at the most recent sexual encounter	
Main partner	94.4%
Occasional partner	5.4%
HIV status disclosure to the most recent intimate partner	
No	27.5%
Yes	70.2%
HIV status of the most recent intimate partner	
Negative	37.1%
Positive	23.6%
Unknown	38.7%
Age difference between respondent and most recent intimate partner	
⩽5 years	21.9%
>5 years	76.8%
Unknown	0.9%
Clinical characteristics	
ATI ⩾1 month since ART initiation[d]	
No	86.9%
Yes, recent ATI	5.1%
Yes, former ATI	8.0%
Viral load (VL)[e]	
Undetectable	71.6%
Detectable	28.4%
Experiencing ART stock-out(s) in the previous 3 months	
Yes	16.3%
No	75.0%

ART: antiviral therapy; ATI: antiretroviral therapy interruption; IQR: interquartile range; IPV: intimate partner violence.
[a]With no missing data in the IPV questionnaire.
[b]Alcohol consumption: moderate, ⩽3 big or 6 small bottles of beer (i.e. ⩽195 cL); elevated, ⩾4 big or 7 small bottles of beer (i.e. ⩾230 cL).
[c]In the 12+months prior to the survey.
[d]ATI⩾1 month: recent, ATI⩾1m = in the 6 months prior to the survey and former, ATI⩾1m = more than 6 months prior to the survey.
[e]Data on women with ART ⩾6 months (n = 852); undetectable VL ⩽100 copies/mL.

study. Median (interquartile range (IQR)) age was 37 (32–42) years (Table 1). A large proportion of women were living in urban areas (80%), were professionally active (63%), and had a secondary educational level (60%). Seventy three percent of participants had experienced HIV-related stigma. Sixteen percent of those included experienced ART stock-out(s) in the 3 months prior to the survey and 28% percent had a detectable VL.

A large proportion of women had disclosed their HIV status to their most recent intimate partner (70%), but 39%

Table 2. Description of intimate partner violence in HIV-positive ART-treated Cameroonian women who declared at least one intimate partner in the previous 12 months[a] (ANRS-122988 EVOLCam survey, n = 894).

	N (%)	Median IPV score (IQR)[b]
Emotional IPV		0.297 (0.141–0.372)
Present[c]	261(29.2%°)	
Occasional[d]	122 (13.7%)	
Frequent[e]	139 (15.5%)	
Absent[f]	633 (70.8%)	
Physical IPV		0.288 (0.062–0.462)
Present[c]	193 (21.6%)	
Occasional[d]	96 (10.7%)	
Frequent[e]	97 (10.9%)	
Absent[f]	701 (78.4%)	
Extreme physical IPV		0.013 (0.007–0.047)
Present[c]	115 (12.9%)	
Occasional[d]	57 (6.4%)	
Frequent[e]	58 (6.5%)	
Absent[f]	779 (87.1%)	
Sexual IPV		0.026 (0.007–0.152)
Present[c]	163 (18.3%)	
Occasional[d]	81 (9.1%)	
Frequent[e]	82 (9.2%)	
Absent[f]	731 (81.7%)	
Non-self-defensive violence perpetrated against most recent intimate partner[g]		
No	777 (86.9%)	
Yes	113 (12.6%)	

ART: antiviral therapy; IPV: intimate partner violence; IQR: interquartile range.
[a]With no missing data in the IPV questionnaire.
[b]Median score and IQR calculated for all non-zero scores.
[c]IPV score >0.
[d]IPV score < median IPV score[b].
[e]IPV score ⩾median IPV score[b].
[f]IPV score equal to zero.
[g]"Have you ever beaten up, slapped, hit, kicked or physically assaulted your (most recent) intimate partner when he was not assaulting you?"

did not know this partner's HIV status, while 37% and 24%, respectively, declared that their most recent intimate partner was HIV-negative and HIV-positive.

Description of IPV

The proportions of women reporting occasional or frequent IPV was 29% for emotional IPV, 22% for physical IPV, 13% for extreme physical IPV and 18% for sexual IPV (Table 2). Median scores of emotional IPV, physical IPV, extreme physical IPV and sexual IPV were, respectively, 0.297, 0.288, 0.013 and 0.026 among women who declared IPV. Thirteen percent of participants declared they had perpetrated non-self-defensive physical violence against their most recent intimate partner.

Association of IPV with recent ATI ⩾ 1m

For this study, we focused only on IPV association with recent ATI ⩾ 1m, due to the cross-sectional design of the survey. Accordingly, results for previous ATI ⩾ 1m are not shown. The analysis of IPV association with ATI ⩾ 1m was performed on 815 of the 894 WLHIV included in this study, as 5 had missing data on treatment interruption and 74 women were not receiving ART at the time of the study. In the final model, the risk of recent ATI ⩾ 1m was higher in women suffering from frequent physical IPV than in those reporting no or occasional IPV (Table 3; adjusted odds ratio (aOR) = 2.42 (95% confidence interval (CI) = 1.00; 5.87), p = 0.051). Recent ATI ⩾ 1m was reported, by 8%, 6% and 5% of women who reported, respectively, frequent, occasional or no physical violence. Other IPV scores were not associated with recent ATI ⩾ 1m. The other factors also independently associated with recent ATI ⩾ 1m as follows: experience of ART stock-outs in the previous 3 months (2.14 (1.04; 4.41), p = 0.039), women aged 32–37 years (0.19 (0.04; 0.87), p = 0.032), monthly household income per consumption unit >75th percentile, that is, ⩾US$26.8 (4.67 (1.64; 13.29) p = 0.004) and]50th–75th] percentile, that is,]US$14.9–US$26.8] (2.77 (0.95; 8.15), p = 0.063). In the causal mediational analysis, no mediation effect of mental and physical quality of life scores was found in the association between frequent physical IPV and recent ATI ⩾ 1m (average causal mediation effects: mental life quality index, coefficient = –0.00175, p = 0.616; physical life quality index, coefficient = –0.000581, p = 0.870; data not shown).

Factors associated with frequent physical IPV

Eight hundred and nighty-four women were included in the analysis of factors associated with frequent physical IPV. In multivariate analysis (Table 4), women living with their main partner (2.03 (1.20; 3.44), p = 0.009), those who experienced HIV-related stigma (2.53 (1.58; 4.02), p < 0.001) and those who reported non-self-defensive violence against their most recent intimate partner (5.75 (3.53; 9.36), p < 0.001) were all significantly more likely to experience frequent physical IPV.

Discussion

High IPV prevalence in Cameroonian WLHIV

IPV is an important concern in HIV-positive women in Cameroon, with one-third of our participants suffering emotional IPV, one-fifth suffering sexual and/or physical IPV, and one-eighth suffering extreme physical IPV. These findings are consistent with results which reported higher exposure to IPV in PLWH than in other related HIV-negative sub-populations, in Sub-Saharan Africa,[29,65] and in various settings.[5] However, the prevalence of IPV, especially sexual and emotional IPV,

Table 3. Factors associated with recent ATI ⩾1 month[a] in ART-treated HIV-positive Cameroonian women (ANRS-122988 EVOLCam survey, n = 815[b]).

	Univariate analysis[c]		Multivariate analysis[d]	
	OR (95% CI)	p	aOR (95% CI)	p
Age (ref.: ⩽32 years[e])				
]32; 37] years[f]	0.19 (0.04; 0.87)	0.033	0.19 (0.04; 0.87)	0.032
]37; 42] years[g]	1.24 (0.56; 2.72)	0.596		
>42 years[h]	1.28 (0.57; 2.88)	0.554		
Socioeconomic characteristics				
Monthly household income (ref.: <7.7 USD/cu[e])				
]7.7–14.9] USD/cu[f]	1.80 (0.58; 5.62)	0.311		
]14.9–26.8] USD/cu[g]	2.45 (0.85; 7.11)	0.099	2.77 (0.95; 8.15)	0.063
⩾26.8 USD/cu[h]	3.87 (1.40; 10.74)	0.009	4.67 (1.64; 13.29)	0.004
Domestic characteristics				
Relationship with the household head (ref. being the household head)				
Spouse or ascending line	0.54 (0.26; 1.13)	0.103		
Descending line, other/no family relationship	1.47 (0.68; 3.19)	0.334		
Having a main partner (ref. no)	2.39 (0.73; 7.89)	0.152		
Intimate partner violence				
Frequent[i] emotional IPV (ref. absent[j] or occasional[k])	0.91 (0.37; 2.21)	0.828		
Frequent[i] physical IPV (ref. absent[j] or occasional[k])	1.95 (0.83; 4.56)	0.125	2.42 (1.00; 5.87)	0.051
Frequent[i] extreme physical IPV (ref. absent[j] or occasional[k])	1.32 (0.39; 4.47)	0.656		
Frequent[i] sexual IPV (ref. absent[j] or occasional[k])	0.5 (0.12; 2.14)	0.351		
Living with HIV				
Experiencing ART stock-outs in the previous 3 months (ref. no)	2.11 (1.05; 4.25)	0.037	2.14 (1.04; 4.41)	0.039

ART: antiviral therapy; ATI: antiretroviral therapy interruption; CI: confidence interval; cu: consumption unit; OR: odds-ratio; aOR: adjusted odds ratio; IPV: intimate partner violence

[a]Recent ATI ⩾ 1 month = ATI ⩾ 1 month in the 6 months prior the survey

[b]Due to five missing values on ATI ⩾1 month and 74 women not receiving ART

[c]Except IPV variables, only associations with p value of <0.2 are presented (variables included in the multivariate analysis)

[d]Only associations with p value of <0.1 are presented

[e]<25th percentile

[f]]25th–50th] percentile

[g]]50th–75th] percentile percentile' is correct as given in the footnote of Table 3.]

[h]⩾75th percentile

[i]Frequent IPV score above median score (calculated for all non-zero scores)

[j]Frequent IPV score equal to zero

[k]Frequent IPV score below median score (calculated for all non-zero scores)

observed in this study, was particularly high compared with other research conducted among WLHIV in Sub-Saharan Africa.[29–31] The higher prevalence of recent IPV might reflect the higher prevalence of IPV in the Cameroonian general population than in other countries.[14]

In our study population, the prevalence of emotional IPV was similar to that of women in the general population of Cameroon. However, sexual IPV was higher and physical IPV was lower, as indicated by the 2010 demographic and health national survey (respectively, 29%, 22% and 18% in the general population vs 33%, 29% and 11% in our study population (15)). The higher exposure of HIV-positive women to sexual IPV than in the general population of women in Cameroonian might partly explain their HIV acquisition. Indeed, there is growing evidence that IPV, especially sexual IPV, increases HIV exposure and incidence in women.[4,32–35] Moreover, abusive partners are more likely to have HIV risky behaviors and sexually transmitted infections (STIs) than non-violent partners, which increases women's risk of exposure to HIV.[1] However, it is also possible that HIV diagnosis and status disclosure to their intimate partner in our population may have increased their exposure to physical violence.[4,12] In this study, two-thirds of women had disclosed their HIV status to their most recent intimate partner, which was their main partner in most cases. However, no statistical association was found between serodisclosure and frequent physical IPV, perhaps because IPV might occur as a result of disclosure,[6] or indeed prevent disclosure,[36] due to a fear of violence.

IPV and ATI

This study highlights an association between frequent physical IPV and prolonged ATI. One study among

Table 4. Factors associated with frequent physical IPV[a] experience in HIV-positive Cameroonian women (ANRS-122988 EVOLCam survey, n = 894).

	Univariate analysis[b]		Multivariate analysis[c]	
	OR (95% CI)	p	aOR (95% CI)	p
Sociodemographic characteristics				
Living in a rural area (ref. urban)	1.57 (0.92; 2.68)	0.097		
Age (ref.: ⩽32 years[d])				
]32; 37] years[e]	0.85 (0.49; 1.49)	0.580		
]37; 42] years[f]	0.62 (0.35; 1.10)	0.101		
>42 years[g]	0.64 (0.35; 1.17)	0.144		
Domestic characteristics				
Relationship with the household head (ref. being the household head)				
Spouse or ascending line	1.42 (0.88; 2.31)	0.152		
Descending line, other/no family relationship	1.58 (0.87; 2.89)	0.134		
Duration of couple relationship (ref.: <3 years)				
[3–7[years[e]	0.58 (0.28; 1.22)	0.152		
[7–14[years[f]	1.29 (0.56; 2.95)	0.545		
⩾14 years[g]	0.93 (0.42; 2.06)	0.861		
Did not have a main partner	0.84 (0.38; 1.90)	0.682		
Living together (ref. not living together)				
Living together with main partner	2.00 (1.21; 3.30)	0.007	2.03 (1.20; 3.44)	0.009
Did not have a main partner	1.62 (0.83; 3.16)	0.154	1.42 (0.70; 2.88)	0.332
Educational level of main partner (ref. ⩽primary level)				
Secondary level	0.73 (0.40; 1.31)	0.290		
Post-secondary level	0.80 (0.40; 1.59)	0.524		
Unknown	0.25 (0.10; 0.62)	0.003		
Did not have a main partner	0.72 (0.36; 1.46)	0.367		
The main partner alone makes all the decisions about how to spend the respondent's income (ref. other decision-maker[h])	1.78 (0.84; 3.77)	0.133		
Characteristics of the most recent intimate partner[i]				
Age difference between respondent and the most recent intimate partner (ref.: ⩽5 years)				
>5 years	1.48 (0.85; 2.60)	0.170		
Unknown	1.61 (0.19; 13.89)	0.666		
Non-self-defensive violence perpetrated against the most recent intimate partner[j] (ref. no violence)	6.28 (3.91; 10.08)	<0.001	5.75 (3.53; 9.36)	<0.001
Psychosocial characteristics				
Stigma (ref. no stigma)	2.41 (1.56; 3.71)	<0.001	2.53 (1.58; 4.02)	<0.001
Alcohol consumption (ref. no consumption)[k]				
Moderate consumption	1.56 (0.99; 2.47)	0.055		
Elevated consumption	1.67 (0.47; 5.93)	0.428		

CI: confidence interval; OR: odds-ratio; aOR: adjusted odds ratio; IPV: intimate partner violence.
[a]IPV score above median score (calculated for all non-zero scores), reference: no physical IPV (IPV score equal to zero) or occasional physical IPV (IPV score below median score).
[b]Only associations with p value of <0.2 are presented (variables included in the multivariate analysis).
[c]Only associations with p value of <0.1 are presented.
[d]<25th percentile.
[e][25th–50th] percentile.
[f][50th–75th] percentile.
[g]⩾75th percentile.
[h]The respondent herself, the respondent together with her main partner, someone else or someone else together with the respondent.
[i]In the 12 months prior to the survey.
[j]"Have you ever beaten up, slapped, hit, kicked or physically assaulted your most recent intimate partner when he was not assaulting you?"
[k]Alcohol consumption: moderate ⩽3 big or 6 small bottles of beer (i.e. ⩽195 cL) and elevated ⩾4 big or 7 small bottles of beer (i.e. ⩾260 cL), when the respondent drinks alcohol.

American WLHIV showed more frequent prolonged healthcare interruptions leading to viral rebound among victims of IPV.[37] Unstructured prolonged ATI has been found to compromise immunological recovery and viral suppression and increase comorbidity, mortality and resistance to antiretroviral treatment.[38–40] Increased VL in

HIV-positive people who interrupt their ART is a major predictor of the risk of vertical[41] and horizontal transmission of HIV.[42] Because women who are victims of IPV are more likely to interrupt ART for a long period, both their new-born children and HIV-negative intimate partners are at greater risk of HIV infection, as are their abusive partners' concurrent partners. IPV jeopardizes HIV control at both the individual and collective levels.

Furthermore, the experience of emotional, physical or sexual violence is associated with poor psychosocial outcomes in HIV-positive women,[37,43] which are known to be predictors for sub-optimal ART continuity or adherence.[44] Therefore, the effect of violence on linkage to and retention in health care is either direct, because of freedom deprivation, or indirect, by degrading the quality of life or mental health,[45] which in turn affects healthcare use. However, in this study, quality of life was shown to have no mediation effect on the association between frequent physical IPV and recent ATI ⩾ 1m. As suggested in a previous national survey conducted in Cameroon, ATI is more related to exogenous events than to individual decisions.[46] Therefore, in this specific setting, violent partners might directly affect women's use of health care by controlling them or by limiting how much money they have and how they use it, or by limiting their use of transportation rather than by degrading their mental quality of life.

Factors associated with physical IPV among Cameroonian WLVIH

Stigma was associated with frequent physical IPV in HIV-positive women in this study. Women who suffer HIV-related stigma are more likely to be socially isolated and helpless toward their partners' violence. Non-defensive violence perpetrated by the women on their partners, as well as cohabitation with their partners, were identified as risk factors for frequent physical IPV in this study, which is consistent with findings of a multi-country study conducted by the WHO.[47] Qualitative research investigated how cohabitation with partners is linked to IPV and poor-related health outcomes among HIV-positive women, through sexual slavery, confinement and healthcare access control and dissuasion.[45] Aside from these factors, no educational or socioeconomic characteristic of the women or their partners was associated with recent physical IPV in this study, which is consistent with observations made in the general population in Cameroon.[15]

Further research in Cameroon should investigate the health effect of domestic violence in HIV-positive women and men in greater detail. Domestic violence is not limited to violence perpetrated on women by their partners, but includes emotional and physical violence inflicted by co-wives in polygamous unions (which accounted for 13% of our study sample), or by in-laws.[48] Violence perpetrated by women on their partners, reported by 13% of our study sample, is related to violence they suffer and may also have an adverse impact on their male partner's health and HIV-related outcomes.[48]

Addressing IPV in HIV-positive women

When we consider the large proportion of women who are victims of IPV, the absence of demographic or socioeconomic criteria to identify those at risk of IPV, and the fact that in Cameroon, most physical and sexual IPV starts in the early years of a relationship,[15,16] we see that a major proportion of women followed up in HIV services are at risk of IPV. This fact justifies the need for systematic screening for IPV in these patients.

The most promising interventions to concomitantly address HIV and IPV in low-income countries are those which combine economic strengthening and gender-transformative interventions[49] and involve men.[50] However, these are mostly designed to prevent HIV acquisition by women in contexts where IPV is widespread[51–53] as opposed to help women already infected. Data on interventions to reduce IPV endured by HIV-positive African women and related poor outcomes are scarce. Skills and practices of workers in HIV services, as well as their regular contact and lifelong relationship with patients should be used to address IPV-related effects. Peers strongly recommend integrating universal screening for IPV in mother-to-child HIV transmission prevention programs, and in outreach for testing and ART programs, in order to achieve viral suppression in WLHIV.[54] IPV appears to be less spontaneously discussed by women in health services than other intimate issues such as condom and contraceptive use.[31] This suggests that healthcare providers need to raise the IPV subject instead of waiting for their patient to do so, and to screen for IPV by searching for identifying features (e.g. wounds and traces of punches).[12] A previous study investigated how acceptable it was to women to be asked about their experiences of IPV in counseling and testing services.[55] A few interventions to facilitate safe HIV serostatus disclosure options and sex negotiation in HIV-positive women who experience or fear IPV have been implemented, but with limited evidence for their success.[56]

Consequently, we recommend implementing universal counseling and screening for IPV (endured or mutual) and other forms of domestic violence, in both male and female patients, in healthcare services dedicated to testing, post-testing and ART provision, in accordance with the guidelines from the WHO 2006 report[57] and 2013 programming tool.[58] We also recommend that same-gender counselors be used where possible.[59] Implementing and evaluating the efficiency of such healthcare provider-led care interventions to improve ART continuity, viral suppression, HIV

transmission and other health outcomes in the context of IPV is a currently unexplored opportunity for research.[60]

Strengths and limitations of the study

The study did not include women attending HIV services in areas other than Center and Littoral regions, and more importantly, it did not include HIV-positive women not attending HIV services, a sub-population believed to be at greater vulnerability. Accordingly, our results are not representative of the overall situation of WLHIV in Cameroon. However, the study is representative of HIV-positive women receiving ART within the Cameroonian ART program in the two regions cited. Furthermore, the study's cross-sectional design did not allow us to establish causal mechanisms. In addition, our study relied on self-reported IPV, which is a sensitive issue, possibly inducing declarative bias. However, the WHO questionnaire used to collect IPV data has been validated and is considered highly reliable in discriminating different forms of violence in different social contexts.[59] PCA has already been used by other researchers to construct scores of IPV using a large number of items reporting IPV in face-to-face questionnaires.[60] To our knowledge, this is the first study to investigate IPV suffered by ART-treated HIV-positive Cameroonian women and its associated factors, as well as the association between IPV and prolonged ATIs among HIV-positive women in Cameroon.

Conclusion

The high proportion of women attending HIV services in the Center and Littoral regions of Cameroon who suffer from various forms of IPV is a great cause for concern. While sexual IPV may have contributed to their HIV acquisition, physical IPV increases the risk of prolonged ATIs, which may degrade health outcomes, increase vulnerability and negatively affect both the control of HIV and the HIV treatment cascade. In the context of the interconnection between the IPV and HIV epidemics in Cameroon, screening for IPV and providing counseling in HIV services offer the opportunity to identify patients at risk of poor health outcomes and to mitigate the effects of IPV not only on themselves but on their partners, their children and on public health. Combined with measures to address supply-related barriers to ART continuity, identified in the ANRS-12288 EVOLCam survey,[20] these efforts could both consolidate the important progress which Cameroon has already made in engagement in HIV care since the adoption in 2007 of a national policy of free access to ART[63,64] and improve the treatment cascade.

Acknowledgements

We thank all the female participants and all the staff from the participating HIV centers who agreed to take part in the survey. We also thank Jude Sweeney for revising and editing the English version of the manuscript. The members of the EVOLCam study group are as follows: C. Kuaban, L. Vidal (principal investigators); G. Maradan, A. Ambani, O. Ndalle, P. Momo, C. Tong (field coordination team); S. Boyer, V. Boyer, L. March, M. Mora, L. Sagaon-Teyssier, M. de Sèze, B. Spire, M. Suzan-Monti (UMR912—SESTIM); C. Laurent, F. Liégeois, E. Delaporte, V. Boyer, S. Eymard Duvernay (TransVIHMI); F. Chabrol, E. Kouakam, O. Ossanga, H. Essama Owona, C. Biloa, M.T. Mengue (UCAC); E. MpoudiNgolé (CREMER); P.J. Fouda, C. Kouanfack, H. Abessolo, N. Noumssi, M. Defo, H. Meli (Hôpital Central, Yaoundé); Z. Nanga, Y. Perfura, M. Ngo Tonye, O. Kouambo, U. Olinga, E Soh (Hôpital Jamot, Yaoundé); C. Ejangue, E. Njom Nlend, A. Simo Ndongo (Hôpital de la Caisse, Yaoundé); E Abeng Mbozo'o, M. Mpoudi Ngole, N. Manga, C. Danwe, L. Ayangma, B. Taman (Hôpital Militaire, Yaoundé); E.C. Njitoyap Ndam, B. Fangam Molu, J. Meli, H. Hadja, J. Lindou (Hôpital Général, Yaoundé); J.M. Bob Oyono, S. Beke (Hôpital Djoungolo, Yaoundé); D. Eloundou, G. Touko, (District Hospital, Sa'a); J.J. Ze, M. Fokoua, L. Ngum, C. Ewolo, C. Bondze (District Hospital, Obala); J.D. Ngan Bilong, D. S. Maninzou, A. Nono Toche (Hôpital St Luc, Mbalmayo); M. Tsoungi Akoa, P. Ateba, S. Abia (District Hospital, Mbalmayo); A. Guterrez, R. Garcia, P. Thumerel (Catholic Health Center, Bikop); E. Belley Priso, Y Mapoure, A. Malongue, A.P. Meledie Ndjong, B. Mbatchou, J. Hachu, S. Ngwane (Hôpital Général, Douala); J. Dissongo, M. Mbangue, Ida Penda, H. Mossi, G. Tchatchoua, Yoyo Ngongang, C. Nouboue, I. Wandji, L. Ndalle, J. Djene (Hôpital Laquintinie, Douala); M.J. Gomez, A. Mafuta, M. Mgantcha (Catholic Hospital St Albert Legrand, Douala); E.H. Moby, M.C. Kuitcheu, A.L. Mawe, Ngam Engonwei (District Hospital, Bonassama); L.J. Bitang, M. Ndam, R.B. Pallawo, Issiakou Adamou, G. Temgoua (District Hospital, Deido); C. Ndjie Essaga, C. Tchimou, A. Yeffou, I. Ngo, H. Fokam, H. Nyemb (District Hospital, Nylon); L.R. Njock, S. Omgnesseck, E. Kamto, B. Takou (District Hospital, Edea); L.JG Buffeteau, F. Ndoumbe, JD Noah, I. Seyep (Hôpital St Jean de Malte, Njombe).

Author contributions

M.S.-M., M.-T.M., L.V., C.K., L.M., C.L., B.S., S.B. and M.F. contributed to the concept and design of the work and acquisition of data. K.N., M.F. and L.S.-T. performed the analysis of data. M.F. drafted the paper. M.S.-M., B.S., S.B. and L.S.-T. contributed to revision of the paper.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by the French National Agency for Research on AIDS and viral hepatitis (ANRS).

ORCID iDs

Marion Fiorentino https://orcid.org/0000-0002-1615-4579
Bruno Spire https://orcid.org/0000-0002-3546-8020

References

1. World Health Organization. *Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence*. Geneva: World Health Organization, 2013.
2. Miller E and McCaw B. Intimate partner violence. *N Engl J Med* 2019; 380(9): 850–857.
3. Jewkes R. Intimate partner violence: causes and prevention. *Lancet* 2002; 359(9315): 1423–1429.
4. Karanja L. Uganda: just die quietly: domestic violence and women's vulnerability to HIV in Uganda. 2003, http://www.hrw.org/reports/2003/uganda0803 (accessed 9 March 2018).
5. Kouyoumdjian FG, Findlay N, Schwandt M, et al. A systematic review of the relationships between intimate partner violence and HIV/AIDS. *PLoS ONE* 2013; 8(11): e81044.
6. Aranda-Naranjo B. Quality of life in the HIV-positive patient: implications and consequences. *J Assoc Nurses AIDS Care* 2004; 15(5): 20S–27S.
7. Schafer KR, Brant J, Gupta S, et al. Intimate partner violence: a predictor of worse HIV outcomes and engagement in care. *AIDS Patient Care STDS* 2012; 26(6): 356–365.
8. Illangasekare S, Tello M, Hutton H, et al. Clinical and mental health correlates and risk factors for intimate partner violence among HIV-positive women in an inner-city HIV clinic. *Womens Health Issues* 2012; 22(6): e563–e569.
9. Cejtin HE, Komaroff E, Massad LS, et al. Adherence to colposcopy among women with HIV infection. *J Acquir Immune Defic Syndr* 1999; 22(3): 247–252.
10. Cohen MH, Cook JA, Grey D, et al. Medically eligible women who do not use HAART: the importance of abuse, drug use, and race. *Am J Public Health* 2004; 94(7): 1147–1151.
11. Hatcher AM, Smout EM, Turan JM, et al. Intimate partner violence and engagement in HIV care and treatment among women: a systematic review and meta-analysis. *AIDS* 2015; 29(16): 2183–2194.
12. Siemieniuk RA, Krentz HB and Gill MJ. Intimate partner violence and HIV: a review. *Curr HIV/AIDS Rep* 2013; 10(4): 380–389.
13. LeGrand S, Reif S, Sullivan K, et al. A review of recent literature on trauma among individuals living with HIV. *Curr HIV/AIDS Rep* 2015; 12(4): 397–405.
14. AIDSinfo and UNAIDS, http://aidsinfo.unaids.org/ (accessed15 February 2018).
15. Institut National de la Statistique (INS) II. *Enquête Démographique et de Santé et à Indicateurs Multiples du Cameroun 2011*. Calverton, MD: Institut National de la Statistique (INS) II, 2012.
16. Novitsky V and Essex M. Using HIV viral load to guide treatment-for-prevention interventions. *Curr Opin HIV AIDS* 2012; 7(2): 117–124.
17. Meresse M, March L, Kouanfack C, et al. Patterns of adherence to antiretroviral therapy and HIV drug resistance over time in the Stratall ANRS 12110/ESTHER trial in Cameroon. *HIV Med* 2014; 15(8): 478–487.
18. Meresse M, Carrieri MP, Laurent C, et al. Time patterns of adherence and long-term virological response to non-nucleoside reverse transcriptase inhibitor regimens in the Stratall ANRS 12110/ESTHER trial in Cameroon. *Antivir Ther* 2013; 18(1): 29–37.
19. Global Fund World Health Organization. *HIV drug resistance report 2017*. Geneva: Global Fund, World Health Organization, 2017.
20. Tong C, Suzan-Monti M, Sagaon-Teyssier L, et al. Treatment interruption in HIV-positive patients followed up in Cameroon's antiretroviral treatment programme: individual and health care supply-related factors (ANRS-12288 EVOLCam survey). *Trop Med Int Health* 2018; 23(3): 315–326.
21. García-Moreno C, Jansen HAFM, Ellsberg M, et al. *WHO multi-country study on women's health and domestic violence against women: initial results on prevalence, health outcomes and women's responses*. Geneva: World Health Organization, 2005.
22. Jackson JE. Promax rotation. *Encycl Biostat* 2005; 6: b2a13074.
23. Hinton PR, McMurray I and Brownlow C. *SPSS explained*. East Sussex: Routledge, 2004.
24. Thorndike RM. Book review: psychometric theory (3rd ed.) by Jum Nunnally and Ira Bernstein, New York: McGraw-Hill, 1994, pp. xxiv + 752. *Appl Psychol Meas* 1995; 19(3): 303–305.
25. World Health Organization. WHO case definitions of HIV for surveillance and revised clinical staging and immunological classification of HIV-related disease in adults and children. 2007, http://apps.who.int/iris/bitstream/handle/10665/43699/9789241595629_eng.pdf?sequence=1&isAllowed=y (accessed 21 April 2018).
26. Berger BE, Ferrans CE and Lashley FR. Measuring stigma in people with HIV: psychometric assessment of the HIV stigma scale. *Res Nurs Health* 2001; 24(6): 518–529.
27. Gandek B, Ware JE, Aaronson NK, et al. Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: results from the IQOLA project. *J Clin Epidemiol* 1998; 51(11): 1171–1178.
28. Team RC. *R: a language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing, 2013, http://www.R-project.org/ (2014, accessed 28 March 2018).
29. Were E, Curran K, Delany-Moretlwe S, et al. A prospective study of frequency and correlates of intimate partner violence among African heterosexual HIV serodiscordant couples. *AIDS* 2011; 25(16): 2009–2018.
30. Osinde MO, Kaye DK and Kakaire O. Intimate partner violence among women with HIV infection in rural Uganda: critical implications for policy and practice. *BMC Womens Health* 2011; 11(1): 50.
31. Myer L, Rebe K and Morroni C. Missed opportunities to address reproductive health care needs among HIV-infected women in antiretroviral therapy programmes. *Trop Med Int Health* 2007; 12(12): 1484–1489.
32. 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.
33. Li Y, Marshall CM, Rees HC, et al. Intimate partner violence and HIV infection among women: a systematic review and meta-analysis. *J Int AIDS Soc* 2014; 17(1): 18845.

34. Stockman JK, Lucea MB and Campbell JC. Forced sexual initiation, sexual intimate partner violence and HIV risk in women: a global review of the literature. *AIDS Behav* 2013; 17(3): 832–847.
35. Dunkle KL, Jewkes RK, Brown HC, et al. Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa. *Lancet* 2004; 363(9419): 1415–1421.
36. Mepham S, Zondi Z, Mbuyazi A, et al. Challenges in PMTCT antiretroviral adherence in northern KwaZulu-Natal, South Africa. *AIDS Care* 2011; 23(6): 741–747.
37. Siemieniuk RA, Krentz HB, Miller P, et al. The clinical implications of high rates of intimate partner violence against HIV-positive women. *J Acquir Immune Defic Syndr* 2013; 64(1): 32–38.
38. Kranzer K and Ford N. Unstructured treatment interruption of antiretroviral therapy in clinical practice: a systematic review. *Trop Med Int Health* 2011; 16(10): 1297–1313.
39. Silverberg MJ, Neuhaus J, Bower M, et al. Risk of cancers during interrupted antiretroviral therapy in the SMART study. *AIDS* 2007; 21(14): 1957–1963.
40. The Strategies for Management of Antiretroviral Therapy (SMART) Study Group. CD4+ count–guided interruption of antiretroviral treatment. *N Engl J Med* 2006; 355(22): 2283–2296.
41. Galli L, Puliti D, Chiappini E, et al. Is the interruption of antiretroviral treatment during pregnancy an additional major risk factor for mother-to-child transmission of HIV type 1? *Clin Infect Dis* 2009; 48(9): 1310–1317.
42. Quinn TC, Wawer MJ, Sewankambo N, et al. Rakai Project Study Group. Viral load and heterosexual transmission of human immunodeficiency virus type 1. *N Engl J Med* 2000; 342(13): 921–929.
43. Sowell R, Seals B, Moneyham L, et al. Experiences of violence in HIV seropositive women in the south-eastern United States of America. *J Adv Nurs* 1999; 30(3): 606–615.
44. Langebeek N, Gisolf EH, Reiss P, et al. Predictors and correlates of adherence to combination antiretroviral therapy (ART) for chronic HIV infection: a meta-analysis. *BMC Med* 2014; 12(1): 142.
45. Lichtenstein B. Domestic violence in barriers to health care for HIV-positive women. *AIDS Patient Care STDS* 2006; 20(2): 122–132.
46. Boyer S, Clerc I, Bonono C-R, et al. Non-adherence to antiretroviral treatment and unplanned treatment interruption among people living with HIV/AIDS in Cameroon: individual and healthcare supply-related factors. *Soc Sci Med* 2011; 72(8): 1383–1392.
47. Abramsky T, Watts CH, Garcia-Moreno C, et al. What factors are associated with recent intimate partner violence? Findings from the WHO multi-country study on women's health and domestic violence. *BMC Public Health* 2011; 11(1): 109.
48. Chouala YA. La «belle famille» et «la famille élargie»: Acteurs des violences conjugales et domestiques dans les foyers Camerounais. *Bull APAD* 2008; 3063: 27–28.
49. Gibbs A, Jacobson J and Kerr Wilson A. A global comprehensive review of economic interventions to prevent intimate partner violence and HIV risk behaviours. *Glob Health Action* 2017; 10(suppl. 2): 1290427.
50. Dworkin SL, Treves-Kagan S and Lippman SA. Gender-transformative interventions to reduce HIV risks and violence with heterosexually-active men: a review of the global evidence. *AIDS Behav* 2013; 17(9): 2845–2863.
51. Gilbert L, Raj A, Hien D, et al. Targeting the SAVA (substance abuse, violence and AIDS) syndemic among women and girls: a global review of epidemiology and integrated interventions. *J Acquir Immune Defic Syndr* 2015; 69(Suppl. 2): S118–S127.
52. Marshall KJ, Fowler DN, Walters ML, et al. Interventions that address intimate partner violence and HIV among women: a systematic review. *AIDS Behav* 2018; 22(10): 3244–3263.
53. Pronyk PM, Hargreaves JR, Kim JC, et al. Effect of a structural intervention for the prevention of intimate-partner violence and HIV in rural South Africa: a cluster randomised trial. *Lancet* 2006; 368(9551): 1973–1983.
54. Nachega JB, Sam-Agudu NA, Mofenson LM, et al. Achieving viral suppression in 90% of people living with HIV on antiretroviral therapy in low- and middle-income countries: progress, challenges, and opportunities. *Clin Infect Dis* 2018; 66(10): 1487–1491.
55. Christofides N and Jewkes R. Acceptability of universal screening for intimate partner violence in voluntary HIV testing and counseling services in South Africa and service implications. *AIDS Care* 2010; 22(3): 279–285.
56. Kennedy CE, Haberlen S, Amin A, et al. Safer disclosure of HIV serostatus for women living with HIV who experience or fear violence: a systematic review. *J Int AIDS Soc* 2015; 18(6 Suppl. 5): 20292.
57. World Health Organization. Addressing violence against women in HIV testing and counselling: A meeting report 2006.
58. World Health Organization. 16 ideas for addressing violence against women in the context of HIV epidemic: a programming tool 2013.
59. Schraiber LB, Latorre MRDO, França I Jr, et al. Validity of the WHO VAW study instrument for estimating gender-based violence against women. *Rev Saude Publica* 2010; 44(4): 658–666.
60. Coker AL, Davis KE, Arias I, et al. Physical and mental health effects of intimate partner violence for men and women. *Am J Prev Med* 2002; 23(4): 260–268.
61. Belich M, Bathnna M, Nwanne G, et al. Mentor mothers' willingness to engage male partners and screen for domestic violence among HIV-positive women in rural Nigeria. *Interpretation* 2017; 6(9): 25–30.
62. Anderson JC, Campbell JC and Farley JE. Interventions to address HIV and intimate partner violence in sub-Saharan Africa: a review of the literature. *J Assoc Nurses AIDS Care* 2013; 24(4): 383–390.
63. IRIN. Free ARV drugs for all. 2007, http://www.irinnews.org/report/72485/cameroon-free-arv-drugs-all (accessed 26 April 2018).
64. Mbuagbaw L, Thabane L, Ongolo-Zogo P, et al. Trends and determining factors associated with adherence to antiretroviral therapy (ART) in Cameroon: a systematic review and analysis of the CAMPS trial. *AIDS Res Ther* 2012; 9(1): 37.
65. Shamu S, Abrahams N, Temmerman M, et al. A systematic review of African studies on intimate partner violence against pregnant women: prevalence and risk factors. *PLoS ONE* 2011; 6(3): e17591.

Appendix 1. Frequency of IPV items and detailed results of principal components analysis used to construct IPV scores from IPV items.

IPV items							IPV indicators			
In the past 12 months, has your most recent partner ever …	Never		Sometimes		Often		Emotional IPV score	Physical IPV score	Extreme physical IPV score	Sexual IPV score
	n	%	n	%	n	%	Ranking of IPV items in constructing IPV indicators according to weighting from PCA			
said or done something to humiliate you in front of other people?	752	84.1	80	8.9	62	6.9	**0.92**	0.02	−0.02	−0.03
insulted or belittled you?	718	80.3	102	11.4	74	8.3	**0.90**	0.04	−0.05	−0.05
threatened to hurt you or someone you care about?	773	86.5	64	7.2	57	6.4	**0.84**	−0.04	0.12	0.06
hit you with his fist or with something else that could hurt you?	820	91.7	45	5	29	3.2	−0.03	**0.93**	0.04	−0.08
twisted your arm or pulled your hair?	820	91.7	40	4.5	34	3.8	−0.09	**0.93**	−0.05	0.18
slapped you?	770	86.1	77	8.6	47	5.3	0.14	**0.86**	−0.13	0.01
kicked you, dragged you or beaten you up?	834	93.3	34	3.8	26	2.9	−0.07	**0.86**	0.22	−0.16
pushed you or shoved you or thrown something at you?	790	88.4	60	6.7	44	4.9	0.18	**0.74**	−0.07	0.14
threatened to use or did in fact use a gun, knife, or other weapon against you?	883	98.8	5	0.6	6	0.7	0.02	−0.14	**0.93**	0.13
tried to or did in fact choke you or burn you on purpose?	869	97.2	10	1.1	15	1.7	0.02	0.24	**0.75**	−0.09
physically forced you to have sexual intercourse even when you did not want to?	838	93.7	32	3.6	24	2.7	0.07	0.03	0.09	**0.74**
forced you to practice any other sexual act that you did not want to?	877	98.1	8	0.9	9	1	−0.07	0.01	0	**0.92**
				Eigen values			2.55	3.72	1.67	1.62
				Explained variance			21.3%	31.0%	13.9%	13.5%
	Cumulative variance									79.6%
				Cronbach's α			0.871	0.929	0.685	0.582
	Correlation with other IPV score									
	Emotional IPV score						–	0.610	0.382	0.396
	Physical IPV score						–	–	0.540	0.360
	Extreme physical IPV score						–	–	–	0.286

IPV: intimate partner violence; PCA: principal component analysis.
Bold values indicate that the IPV item highly contributes to the construction of the IPV score (weighting >0.7)