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Prevalence of stressful life events and associations with symptoms of depression, anxiety, and post-traumatic stress disorder among people entering care for HIV in Cameroon

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Conflict of interest

The authors have no conflicts of interest to report.

Credit authorship contribution statement

LF: Conceptualization; Writing – original draft; Analysis; PVE: Project administration; Writing – review & editing; AD: Project administration; Supervision; Writing – review & editing; RA: Writing – review & editing; MW: Conceptualization; Writing – review & editing; BP: Conceptualization; Writing – review & editing; EP: Project administration; Writing – review & editing; MY: Writing – Review & editing; DNsame: Writing – Review & editing; KA: Writing – review & editing; DNash: Conceptualization; Writing – review & editing; AP: Conceptualization, funding, analysis, Writing – review & editing.

Abstract

Background: Exposure to stressors increases the risk of mental health disorders. People living with HIV (PLWH) are particularly affected by poor mental health which can contribute to adverse HIV treatment outcomes.

Methods: We estimated the prevalence of recent stressful life events (modified Life Events Survey) among a cohort of PLWH entering HIV care at three public health care facilities in Cameroon and quantified the association of seven types of stressful life events with symptoms of depression (Patient Health Questionnaire-9 scores>9), anxiety (General Anxiety Disorder-7 scores>9), and PTSD (PTSD Checklist for DSM-5 scores>30) using separate log-binomial regression models.

Results: Of 426 PLWH enrolling in care, a majority were women (59%), in relationships (58%), and aged 21 to 39 years (58%). Recent death of a family member (39%) and severe illness of a family member (34%) were the most commonly reported stressful life events. In multivariable analyses, more stressful life event types, a negative relationship change, death or illness of a friend/family member, experience of violence, work-related difficulties, and feeling unsafe in one's neighborhood were independently associated with at least one of the mental health outcomes assessed. The greatest magnitude of association was observed between work-related difficulties and PTSD (adjusted prevalence ratio: 3.1; 95% confidence interval: 2.0–4.8).

Limitations: Given the design of our study, findings are subject to recall and social desirability bias.

Conclusions: Stressful life events were common among this population of PLWH entering care in Cameroon. Evidence-based interventions that improve coping, stress management, and mental health are needed.

Keywords

Stressful life events; Depression; Anxiety; PTSD; HIV; Cameroon

1. Introduction

Mental health disorders were the second leading cause of years lived with disability globally in 2019, at nearly 15% (Institute for Health Metrics and Evaluation (IHME), 2019). These disorders contribute to an array of health issues, including social isolation (Brown et al., 2011; Elmer and Stadtfeld, 2020), increased substance use and substance use disorders (Conner et al., 2009; Worley et al., 2012), decreased quality of life (Penner-Goeke et al., 2015) and physical functioning (Penninx et al., 2000), cognitive decline (Paterniti et al., 2002), and increased risk of mortality (Walker et al., 2015). People living with HIV (PLWH) are particularly vulnerable to poor mental health outcomes (Ciesla and Roberts, 2001; Nanni et al., 2015; Remien et al., 2019; Too et al., 2021). A 2017 study of 270 adult Cameroonians estimated that nearly 34% of study participants with HIV (n = 169) had symptoms of moderate to severe depression compared to just 20% of participants who were HIV negative (n = 101) (Kanmogne et al., 2017). Similar trends have been observed across a range of settings, including South Africa, India, China, Canada, Uganda, and the United States

(Bhatia and Munjal, 2014; Gaynes et al., 2008; Institute for Health Metrics and Evaluation (IHME), 2019; Jonsson et al., 2013; Kendall et al., 2014; Kinyanda et al., 2011a; Niu et al., 2016; Remien et al., 2019).

Among PLWH, evidence suggests symptoms of common mental disorders (i.e., anxiety, depression, post-traumatic stress disorder [PTSD]) may contribute to sub-optimal treatment outcomes at each stage in the HIV care continuum (e.g., delayed linkage to care, delayed antiretroviral treatment [ART] initiation, suboptimal ART adherence, and viral non-suppression) (Nguyen et al., 2021; Regan et al., 2021; Uthman et al., 2014). In a study of 3996 adults newly initiating ART in Tanzania, the risk of viral non-suppression among women with depression at both ART initiation and 6 months after ART initiation was 1.94 times that in women who did not have depression at either time point (Regan et al., 2021). Similarly, the risk of viral non-suppression among men in the top tertile for depressive symptoms was 1.58 times the risk among those with symptoms in the bottom tertile (Regan et al., 2021). In settings such as sub-Saharan Africa, which bears a disproportionate burden of the HIV epidemic and has limited capacity for formal mental healthcare, these relationships are of particular concern (Abas et al., 2014; Remien et al., 2019).

Biopsychosocial stressors directly linked to HIV infection (e.g., HIV-associated stigma, discrimination, and shame, treatment side effects, symptoms of HIV infection, HIV disclosure) are consistently associated with suboptimal mental health outcomes among PLWH, including PLWH in sub-Saharan Africa (Abas et al., 2014; Ayano et al., 2018; Bennett et al., 2016; Duko et al., 2018; Feuillet et al., 2017; Gibbie et al., 2006; Huang et al., 2020; Nanni et al., 2015; Rong et al., 2017; Too et al., 2021). In a systematic review and meta-analysis of depression among PLWH in east Africa, opportunistic infections and perceived stigma were each noted as correlates of depression (Ayano et al., 2018).

Exposure to stress has been shown to induce an adaptive biological response in which allostatic mechanisms (i.e., fight-or-flight) are activated in the short term (Korte et al., 2005; McEwen, 2004, 2003, 1998). However, when an individual experiences prolonged exposure to stress, these biological mechanisms often “over-compensate” and ultimately collapse, placing an individual at increased risk of stress- and mood-related disorders (Juster et al., 2010; Korte et al., 2005; McEwen, 2004, 2003, 1998). As such, stressful life events have been shown to contribute to poor mental health, including increased risk for, or prevalence of, depression (Assari and Lankarani, 2015; Burger et al., 2017; Hadley et al., 2008; Hassanzadeh et al., 2017; Holmes and Rahe, 1967; Mazure, 1998; Paykel, 2003; Seok et al., 2020; Tennant, 2002), anxiety (Blazer et al., 1987; Hadley et al., 2008; Hassanzadeh et al., 2017; McLaughlin and Hatzenbuehler, 2009; Seok et al., 2020), PTSD (El-Khodary and Samara, 2018; Hadley et al., 2008), self-harm (Kinyanda et al., 2005), and heightened distress (Hadley et al., 2008; Tesfaye and Bune, 2014). Existing evidence spans a range of settings, including low- and middle-income countries (LMIC) (El-Khodary and Samara, 2018; Hassanzadeh et al., 2017), and sub-Saharan Africa specifically (Burger et al., 2017; Hadley et al., 2008; Kinyanda et al., 2005; Tesfaye and Bune, 2014).

The bulk of the existing research on stressful life events among PLWH centers on identifying the negative HIV-related effects (e.g., ART non-adherence, symptoms of HIV,

low quality of life, etc.) of these events (Corless et al., 2013; Koopman et al., 2002; J. Leserman et al., 2008; Jane Leserman et al., 2008). Few studies have explored the association between stressful life events that may or may not be directly linked to HIV infection (e.g., the death of a friend or family member, job and relationship changes, and experiences of physical and sexual violence), and sub-optimal mental health outcomes among PLWH (Elliott-Desorbo et al., 2009; Jiang et al., 2019). Evidence is especially limited in sub-Saharan Africa (Burger et al., 2017; Kemppainen et al., 2017; Pence et al., 2012b).

Characterizing the prevalence of stressful life events and their mental health implications among PLWH is important to inform the adaptation, implementation, and scale up of evidence-based stress management interventions and mental health care for PLWH. This is particularly relevant in LMIC and humanitarian settings where individuals are often exposed to multiple stressors (Tol et al., 2014). The World Health Organization Mental Health Gap Action Program (mhGAP) has prioritized identification and provision of evidence-based stress management and mental health care, highlighting a specific need for stress management research and capacity building in LMIC (Barbui et al., 2020; Murray and Jordans, 2016). Substantial work remains in improving stress management in these settings, especially for populations at increased risk of sub-optimal mental health outcomes such as PLWH. In this analysis, we estimate the prevalence of specific stressful life events among PLWH newly entering HIV care in Cameroon and quantify the association between specific types of stressful life events and symptoms of depression, anxiety, and PTSD, separately.

2. Methods

2.1. Setting

This study, previously described (Filiatreau et al., 2021; Parcesepe et al., 2021), was conducted in three public sector health care facilities located in the North-West, South-West, and Central (Yaoundé) regions of Cameroon. These areas have an estimated HIV prevalence of 5.1%, 3.6%, and 4.4%, respectively (Cameroon Population-based HIV Impact Assessment Project, 2018). In 2019, the estimated prevalence of mental health disorders in the total population in Cameroon was nearly 11% (Institute for Health Metrics and Evaluation (IHME), 2019). Each study site serves as part of the Central Africa (CA) International epidemiology Databases to Evaluate AIDS (IeDEA) (ca-iedea.org) (Chammartin et al., 2020) and provides HIV care services free of charge as is the national standard. Access to formal mental health care services and provision of psychiatric medications is highly variable in Cameroon over time and by clinic.

2.2. Study population

We collected data from a cohort of people newly entering care for HIV in the three public sector health facilities described above between June 2019 and March 2020. To be eligible for participation individuals had to be 21 years of age or older (as required by the local ethical review board), newly entering HIV care at one of the study sites, and provide written informed consent. Individuals previously enrolled in HIV care were ineligible.

2.3. Data collection

Research assistants fluent in French and English administered a structured quantitative interview to eligible and consenting individuals. Interviews were conducted in the participant's language of choice (French or English) in a private setting within the health care facility. Questions captured data on participants' socio-demographic and economic backgrounds, symptoms of mental health and substance use disorders, and exposure to stressful life events in the prior three months. Ethical approval for this study was obtained from the University of North Carolina's Institutional Review Board and the National Ethical Committee of Research for Human Health at Yaoundé.

2.4. Measures

2.4.1. Stressful life events—We used a modified version of the Life Events Survey to measure exposure to 12 specific stressful life events in the three months prior to study enrollment (Jane Leserman et al., 2008; Reif et al., 2011; Sarason et al., 1978). Events of interest included negative relationship changes (e.g., getting divorced or separated, estrangement from a family member, an increase in arguments with a partner), death or severe illness of a family member or close friend, work-related difficulties (e.g., unable to find work, losing job or income), motor vehicle accidents, physical attacks or threats on one's life, robberies, hospitalizations, major new illnesses, and safety concerns in one's neighborhood. These events were selected from the original Life Events Survey as each was considered moderately to severely stressful (Reif et al., 2011) and relevant to the study setting. For analytic purposes, similar events were further combined such that seven distinct event types were considered: death of a family member or close friend, illness of a family member or close friend, experiences of violence, negative relationship changes, work-related difficulties, vehicle accidents, and feeling unsafe in one's neighborhood. Major new illnesses and hospitalizations were not included in the current analysis as the study population was comprised of PLWH newly initiating HIV care, many of whom may have been recently diagnosed with HIV. We also created a dichotomous variable to represent individuals who were and were not in the top tertile of number of different types of stressful life events reported. Those in the top, middle, and bottom tertiles reported three or more event types, two event types, and no or one event type, respectively.

2.4.2. Depressive symptoms—The Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001), which has been validated and used among PLWH in sub-Saharan Africa, including in Cameroon (Chibanda et al., 2016; Cholera et al., 2014; Monahan et al., 2009; Pence et al., 2012a), was used to assess depressive symptoms. Scores range from 0 to 27 with scores greater than 9 considered indicative of symptoms of moderate to severe depression (Manea et al., 2012). Cronbach's alpha from the current study was 0.81.

2.4.3. Anxiety symptoms—Anxiety symptoms were assessed using the 7-item General Anxiety Disorder-7 (GAD-7) scale (Spitzer et al., 2006), which has been validated in a high HIV prevalence population in sub-Saharan Africa (Chibanda et al., 2016), and used among PLWH in Cameroon (Pefura-Yone et al., 2013). Scores range from 0 to 21 with scores greater than 9 considered indicative of moderate to severe anxiety symptoms (Chibanda et al., 2016; Spitzer et al., 2006). Cronbach's alpha from the current study was 0.82.

2.4.4. Post-traumatic stress disorder—PTSD symptoms were assessed using the PTSD Checklist for DSM-5 (PCL-5) (Blevins et al., 2015; Weathers et al., 2013) which has been validated and used in high HIV prevalence populations in sub-Saharan Africa (Duko et al., 2020; Verhey et al., 2018). Scores range from 0 to 80 with scores greater than 30 considered indicative of probable PTSD (Weathers et al., 2013). Cronbach's alpha from the current study was 0.92.

2.4.5. Composite outcomes of interest—We created dichotomous outcomes to represent individuals with and without symptoms of any measured mental health disorder and those with and without symptoms of two or more mental health disorders (i.e., those with symptoms of one or no mental health disorder(s) = referent).

2.5. Missing data

A small number of individuals were missing data on individual mental health scale items (n = 13 for PCL-5; n = 6 for PHQ-9; n = 12 for GAD-7). For individuals missing data on less than 10% of items for any given scale (n = 13 for PCL-5; n = 6 for PHQ-9; n = 10 for GAD-7), the mean of the individual's non-missing scale responses was imputed for the missing item(s) (Shrive et al., 2006).

2.6. Statistical analyses

We used counts, proportions, medians, and interquartile ranges (IQR) to describe the study population overall and the occurrence of stressful life events among study participants by presence of mental health symptoms. Log binominal regression was used to estimate the association between each type of stressful life event and symptoms of each mental health disorder, separately, and our composite outcomes. Adjusted analyses controlled for gender and clinic, the a priori covariates of interest. Clinic was included as a fixed effect variable given the small number of clinics (n = 3) included in the study.

3. Results

A total of 426 PLWH were included in this analysis. A majority of participants were women (n = 250; 58.7%), aged 21-39 (n=249; 58.5%), in relationships (n = 249; 58.5%), and had at least one child (n = 345; 81.4%) (Table 1). Over 40% of participants had completed secondary school or higher (n = 177; 41.5%) (Table 1). Most were working for pay at the time of interview (n = 275; 64.6%) (Table 1).

Recent death of a family member (n = 166; 39.0%), severe illness of a family member (n = 144; 33.8%), inability to find work despite looking for employment (n = 96; 22.5%), and an increase in arguments with a romantic partner (n = 92; 21.6%) were the most commonly reported stressful life events (Table 2). Median number of recent stressful life event types in the study population overall was 2 (Range: 0–7), with over one-third of participants (N = 147; 34.7%) reporting three or more stressful life event types (Table 3).

Nearly 30% of participants (n = 123) reported symptoms of at least one mental health disorder, with 62 (14.6%) reporting symptoms of two or more mental health disorders (Table 3). Approximately 20% (n = 87) reported moderate to severe depressive symptoms, 16% (n

= 67) reported symptoms of probable PTSD, and 13% (n = 54) reported moderate to severe anxiety symptoms (Table 3).

In bivariable analyses, reporting symptoms of any mental health disorder was associated with reporting: serious illness of a friend or family member, a violent experience, a negative relationship change, a work-related difficulty, and feeling unsafe in one's neighborhood (Table 4). Reporting symptoms of two or more mental health disorders was associated with reporting: serious illness of a friend or family member, a negative relationship change, a work-related difficulty, and feeling unsafe in one's neighborhood (Table 4). Specifically, probable PTSD and moderate to severe depressive symptoms were each associated with reporting: death of a friend or family member, severe illness of a friend or family member, a violent experience, a negative relationship change, a work-related difficulty, and feeling unsafe in one's neighborhood (Table 4). Moderate to severe anxiety symptoms was associated with reporting: serious illness of a friend or family member, a negative relationship change, a work-related difficulty, and feeling unsafe in one's neighborhood (Table 4). Each of the mental health outcomes explored was associated with reporting experiences of three or more stressful life event types.

In multivariable analyses, the prevalence of any mental health disorder symptoms, and symptoms of two or more mental health disorders was higher among those reporting a serious illness of a friend or family member, negative relationship change, work-related difficulty, and three or more stressful life events as compared to those who did not (Table 4). The prevalence of any mental health disorder symptoms was also associated with reporting a violent stressful life event as compared to those who did not (Table 4). More specifically, the prevalence of probable PTSD and moderate to severe depressive symptoms was significantly higher among individuals who reported three or more stressful life event types compared to those reporting up to two event types (Table 4). The prevalence of probable PTSD and moderate to severe depressive symptoms was also higher among those reporting a recent violent stressful life event (PTSD adjusted prevalence ratio [aPR]: 2.1 [95% CI: 1.4, 3.2]; depressive symptoms aPR: 1.7 [95% CI: 1.1, 2.4]), those reporting a work-related difficulty (PTSD aPR: 3.1 [95% CI: 2.0, 4.8]; depressive symptoms aPR: 1.7 [95% CI: 1.2, 2.4]), those reporting a recent negative relationship change (PTSD aPR: 1.8 [95% CI: 1.2, 2.8]; depressive symptoms aPR: 1.8 [95% CI: 1.2, 2.5]), those reporting a recent death of a friend or framily member (PTSD aPR: 1.6 [95% CI: 1.0, 2.4]; depressive symptoms aPR: 1.4 [95% CI: 1.0, 2.0]), and those reporting serious illness of a friend or family member (PTSD aPR: 2.1 [95% CI: 1.3, 3.1]; depressive symptoms aPR: 1.4 [95% CI: 1.0, 1.9]), compared to those who did not report exposure to each (Table 4). The prevalence of moderate to severe anxiety symptoms among those who reported feeling unsafe in their neighborhood was 1.8 (95% CI: 1.1, 3.0) times that of those who did not report feeling unsafe in their neighborhood and the prevalence among those reporting a negative relationship change was 2.5 times (95% CI: 1.5, 4.2) the prevalence among those who did not (Table 4).

4. Discussion

This study quantifies the occurrence of stressful life events and the association of specific types of stressful life events with symptoms of common mental disorders among PLWH

newly entering HIV care in Cameroon. Overall, recent stressful life events were common among PLWH entering care in this setting with participants reporting a median of two types of stressful events in past three months. The total number of stressful life event types, as well as unique event types were associated with unique mental health disorder symptoms, though some event types were associated with symptoms of multiple mental health disorders. Individuals who reported three or more stressful life event types (i.e., those in the top tertile for reported number of event types) were more likely to report symptoms of any mental health disorder, symptoms of two or more mental health disorders, probable PTSD, and moderate to severe depressive symptoms.

These findings are consistent with studies that have assessed the association between stressful life events and sub-optimal mental health outcomes in other settings, including parts of sub-Saharan Africa (Ayano et al., 2018; Duko et al., 2020; Kemppainen et al., 2017; Kinyanda et al., 2011a; Nyongesa et al., 2021; Olley et al., 2006, 2004; Tesfaw et al., 2016). For example, in a study of 205 PLWH in Southern Ethiopia, reports of negative life events were significantly associated with probable PTSD (adjusted odds ratio = 1.76, 95% CI [1.41, 6.98]). In another study from Ethiopia, the odds of major depressive disorder among PLWH who had experienced 6–10 negative life events or 11 or more negative life events were significantly higher than that among those who had experienced 1–5 negative life events (odds ratios of 3.66 [95% CI: 1.51, 8.86] and 8.27 [95% CI: 3.18, 21.46], respectively) (Kinyanda et al., 2011a).

Additional resources are needed to improve stress management and coping among PLWH newly entering HIV care in Cameroon to minimize the negative mental health effects of stressful life events. Some existing evidence-based interventions have been shown to significantly improve coping skills and mental health outcomes among PLWH in LMIC and sub-Saharan Africa, specifically (Aweto et al., 2016; Nakimuli-Mpungu et al., 2020; Nakimuli-Mpungu et al., 2021; Sikkema et al., 2015). For example, in a study of 361 pregnant women newly diagnosed with HIV in South Africa, active coping was significantly higher and avoidant coping was significantly lower among individuals enrolled in a 10-session psychosocial support group intervention compared to those in the control group (Mundell et al., 2011). In a cluster randomized trial conducted among 1140 PLWH in Uganda, the odds of major depression was significantly lower among those receiving group support therapy compared to those receiving group HIV education only (adjusted odds ratio: 0.01; 95% CI: 0.003–0.012) (Nakimuli-Mpungu et al., 2020). Such interventions, particularly those which can be implemented by lay health workers and place minimal strain on health care infrastructure, could be implemented in Cameroon to improve the mental health of PLWH with comorbid mental disorders.

Death of a friend or family member and serious illness of a friend or family member were among the most commonly reported types of stressful life events in this population of PLWH at 49% and 38%, respectively. Though higher than the estimated proportion of individuals in a cross-national survey of 21 countries (including 11 LMIC and two countries in sub-Saharan Africa) who had experienced the death of a loved one (30.5%) (Stein et al., 2010), these results were expected given the high rates of mortality and morbidity attributable to infectious diseases within Cameroon (Einterz and Bates, 2011; Institute for

Health Metrics and Evaluation (IHME), 2019) and because PLWH may be more likely to have family or friends living with HIV and at increased risk of mortality (Perry et al., 1992; Sikkema et al., 2003, 2000). Reports of both the death and the serious illness of a close friend/family member were associated with probable PTSD and depression, but not with moderate to severe symptoms of anxiety.

Bereavement and the grief that often accompanies such loss are normal emotional, behavioral, and cognitive responses to the death of a loved one. However, bereavement and complicated grief have been shown to increase the risk of sub-optimal mental health outcomes in high-income settings (Kristensen et al., 2012; Moriarty et al., 2015). In an analysis using data from the Northern Ireland Longitudinal Study, the odds of mental health problems among bereaved caregivers was between 1.2 and 1.6 times that among non-bereaved non-caregivers (Moriarty et al., 2015). Coping with death can be particularly difficult among PLWH. These individuals may experience elevated grief reactions and psychological distress (including depressive symptoms, anxiety and stress) following the death of a loved one, particularly if the death was HIV-related (Sikkema et al., 2003, 2000; Wood et al., 2006). Yet, bereavement and grief are under-studied across sub-Saharan Africa broadly (Mutedzi et al., 2019; Thurman et al., 2017; Tol et al., 2014). While several cognitive behavioral therapy-based interventions for orphaned children have shown promise for improving adverse grief and mental health outcomes among participants (Kumakech et al., 2009; Thurman et al., 2017), additional research may be needed to identify culturally competent interventions that minimize lasting stress, grief, and PTSD symptoms associated with bereavement and grief among adult PLWH in Cameroon.

Experiences of violence and work-related difficulties were reported by 18% and 33% of participants, respectively. Both of these stressors were associated with probable PTSD and moderate to severe depressive symptoms. It is well known that physical violence contributes to poor mental health outcomes, including PTSD and depression, globally (Filiatreau et al., 2020; Mahenge et al., 2013; Pengpid and Peltzer, 2020; Tsai et al., 2016). In a population of youth living with HIV in South Africa, 24% of respondents reported a history of physical violence, and the prevalence of heightened depressive symptoms among those with a history of physical violence was 2.04 times (95% CI: 1.46, 2.85) the prevalence among those with no history of physical violence (Filiatreau et al., 2020). Similarly, unemployment, loss of income, and lower socioeconomic status, have been found to be associated with both PTSD and depression, globally (Kiernan, 2019; Lund et al., 2013; Posel et al., 2021; Rueda et al., 2012b, 2012a; Saraceno et al., 2005). The relationship between each of these stressors and adverse mental health outcomes is often cyclical (i.e., experiences of violence or unstable income often lead to poor mental health outcomes, which in turn can increase future risk of violence or loss of income) (Olesen et al., 2013; Prince et al., 2011). Interventions are critically needed to minimize violent crime (e.g., robbery, physical attacks) and improve economic stability in resource-limited settings such as Cameroon.

Across sub-Saharan Africa, economic empowerment interventions-some of which have been conducted among PLWH specifically- have yielded substantial improvements in mental health outcomes among participants (Cavazos-Rehg et al., 2021; Eyal and Burns, 2016; Kilburn et al., 2016; Ohrnberger et al., 2020; Zimmerman et al., 2021). In a 6-year

randomized controlled trial of 702 adolescents living with HIV in Uganda, a subgroup of depressed participants randomized to an economic empowerment intervention arm had significantly lower scores on the Children's Depression Inventory at 36 months following enrollment when compared to the subgroup of depressed participants randomized to a control group (Cavazos-Rehg et al., 2021). While a handful of interventions have been shown reduce the occurrence of intimate partner violence (Kim et al., 2007; Kumakech et al., 2009; Pronyk et al., 2006; Wagman et al., 2015), little effort has been made to minimize interpersonal violence or violent crime more broadly in these settings (Hove et al., 2013). Furthermore, there is limited evidence to suggest effective intimate partner violence interventions yield improvements in participant mental health outcomes (Greene et al., 2019; Leight et al., 2020). As such, neighborhood strengthening and violent crime mitigation interventions should be explored.

Approximately 40% of our participants reported a negative relationship change in the prior three months. This was the only unique event type explored that was associated with all mental health outcomes assessed after adjustment and suggests maintenance of positive relationships may be of particular relevance to the mental health of PLWH newly entering HIV care in Cameroon. Alternatively, poor mental health may create challenges in maintaining positive relationships for PLWH (Segrin, 2013). Associations between poor family relationships or negative relationship changes and poor mental health outcomes have been observed in other settings in sub-Saharan Africa (Kinyanda et al., 2011b; Shenderovich et al., 2021; Tesfawet al., 2016). Similarly, higher levels of social support have been shown to improve the mental health of PLWH in sub-Saharan Africa (Cavazos-Rehg et al., 2020; Filiatreau et al., 2020; Seffren et al., 2018; Too et al., 2021). Evidenced-based interventions that incorporate psychosocial support groups or family or relationship-strengthening components (Betancourt et al., 2017, 2014; Nakimuli-Mpungu et al., 2020; Nakimuli-Mpungu et al., 2021; Thurman et al., 2018) may be particularly useful for improving the mental health of PLWH newly entering HIV care in this setting.

Feeling unsafe in one's neighborhood was reported by 17% of study participants and was significantly associated with symptoms of anxiety after adjustment. Evidence from high income settings, namely the United States, also suggests low perceived neighborhood safety is associated with symptoms of anxiety (Kreski et al., 2018; Slopen et al., 2012). Evidence from high income settings also suggests low perceived neighborhood safety is associated with depressive symptoms (Roh et al., 2011; Wilson-Genderson and Pruchno, 2013). While this is consistent with the point estimate from our study, our estimate did not reach statistical significance. The authors know of no other studies assessing the relationship between perceptions of neighborhood safety and mental health outcomes in sub-Saharan Africa. Instead, the bulk of the literature around neighborhood safety from this region assesses the effect of perceived neighborhood safety on physical activity or obesity (He et al., 2020; Malambo et al., 2018; Oyeyemi et al., 2012). While the observed relationship may be due to ongoing civil unrest throughout Cameroon (Chothia, 2018), more research is needed on the negative mental health effects of the built environment in Cameroon and other LMICs. Specifically, qualitative research illuminating what causes individuals to feel unsafe in their neighborhood could inform programs to improve both neighborhood safety (e.g., improved street lighting, traffic calming measures, etc.) (Haans and de Kort,

2012; Morrison and Thomson, 2004), and perceptions of neighborhood safety (e.g., social cohesion interventions, neighborhood associations) (De Jesus et al., 2010). Importantly, existing evidence-based interventions for improving neighborhood safety may be insufficient in settings such as Cameroon with ongoing political unrest. Thus, additional strategies may also be warranted.

Among study participants, no significant association was observed between reporting a motor vehicle accident in the prior three months and probable PTSD and moderate to severe depression or anxiety symptoms after adjustment. Significant associations between motor vehicle accidents and sub-optimal mental health outcomes, including depression and PTSD, have been observed in other settings in sub- Saharan Africa (Asuquo et al., 2017; Iteke et al., 2011). For example, in Nigeria, the prevalence of PTSD and depression was significantly higher among hospital patients involved in road traffic accidents than in controls (Asuquo et al., 2017). While participants were prompted to omit minor accidents with no resultant injury or significant damage, it is possible reported accidents resulted in no serious injury or that other stressful life events play a more significant role in influencing mental health outcomes in this setting because of the unique challenges faced among PLWH in Cameroon.

5. Limitations

This study has limitations worth noting. First, our findings are subject to recall bias, as is typical of studies of this nature with self-reported exposures or outcomes. To minimize this concern, we asked participants about exposure to stressful life events that occurred within the prior three months only as opposed to the prior year or throughout one's entire lifetime, as has been done in other studies (Duko et al., 2020; Nyongesa et al., 2021). In addition, because we asked individuals to respond to questions about potentially sensitive issues (e.g., symptoms of mental health disorders), social desirability bias may be of concern. To mitigate this concern, particularly sensitive questions were asked later in the study interview to allow time for participants to build rapport with the study interviewer. Next, small sample sizes limited our capacity to control for other potential confounders of interest (e.g., socio-economic status). As a result, we cannot make causal claims about the relationship between each of the explored events and mental disorders. Third, sub-optimal mental health can create tension in relations or lead to impulsive behaviors that put one at risk of heightened stress. Because of the cross-sectional nature of our study, we cannot make claims of direction of the observed association. Finally, we cannot draw conclusions about which events were or were not directly related to HIV (e.g., death of a family member/friend, severe illness of a family member/friend). This information is pertinent to ascertaining excess stress experienced among PLWH and to refining coping and mental health interventions specifically for PLWH.

6. Conclusions

Recent stressful life events were common among our study population of PLWH newly entering HIV care in Cameroon. Exposure to a high number of stressful life event types was associated with sub-optimal mental health outcomes, including probable PTSD and moderate to severe depressive symptoms. Negative relationship changes, death or illness of a

close friend or family member, experiences of violence, work-related difficulties, and feeling unsafe in one's neighborhood were particularly associated with sub-optimal mental health.

Evidence-based interventions that identify those with recent stressful life events and work to improve coping and stress management are needed. Given the existing limitations of formal mental health care throughout the sub-Saharan Africa region, interventions that may be administered by lay health workers are particularly important.

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Table 1

Sociodemographic characteristics of 426 people living with HIV newly entering HIV care at three health care facilities in Cameroon, overall and stratified by mental health symptom status.[a]

	Total (*n* = 426) N (col %)	**No mental health disorder symptoms (*n* = 301) N (col %)**	**Symptoms of any mental health disorder (*n* = 123) N (col %)**
Gender			
Male	176 (41.3)	133 (44.2)	43 (35.0)
Female	250 (58.7)	168 (55.8)	80 (65.0)
Age			
21–39	249 (58.5)	171 (56.8)	78 (63.4)
40+	177 (41.5)	130 (43.2)	45 (36.6)
Education			
None	31 (7.3)	15 (5.0)	15 (12.2)
Primary	218 (51.2)	152 (50.5)	66 (53.7)
≥Secondary	177 (41.5)	134 (44.5)	42 (34.1)
Relationship status			
Single	177 (41.5)	116 (38.5)	60 (48.8)
Partnered	249 (58.5)	185 (61.5)	63 (51.2)
Number of children[b]			
0	79 (18.6)	54 (17.9)	25 (20.7)
≥1	345 (81.4)	247 (82.1)	96 (79.3)
Employment status			
Not working for pay	151 (35.4)	103 (34.2)	48 (39.0)
Working for pay	275 (64.6)	198 (65.8)	75 (61.0)

Abbreviations: HIV- human immunodeficiency virus; PTSD- post-traumatic stress disorder.

[a]Individuals with symptoms of depression, anxiety, or post-traumatic stress disorder were considered to have symptoms of any mental health disorder while those without symptoms of depression, anxiety and post-traumatic stress disorder were considered to have no mental health disorder symptoms. Two individuals were missing data on mental health disorder symptoms status.

[b]Number of children n = 2.

Table 2

Prevalence of reported stressful life events in prior 3 months among 426 adults newly entering HIV care in Cameroon.

Event	Total population (n = 426)	
	No N (row %)	Yes N (row %)
Death		
Death of family member	260 (61.0)	166 (39.0)
Death of close friend[a]	353 (83.3)	71 (16.7)
Illness		
Serious illness of family member	282 (66.2)	144 (33.8)
Serious illness of close friend[a]	395 (92.9)	30 (7.1)
Violence		
Physically attacked	376 (88.3)	50 (11.7)
Robbed[a]	386 (90.8)	39 (9.2)
Negative relationship change		
Increase in serious arguments with partner	334 (78.4)	92 (21.6)
Divorced/separated	366 (85.9)	60 (14.1)
Major change in closeness to family member	346 (81.2)	80 (18.8)
Work-related difficulty		
Unable to find work even though looking	330 (77.5)	96 (22.5)
Losing work or source of income[a]	351 (82.6)	74 (17.4)
Trouble with employer (suspended/demoted/discriminated against)	400 (93.9)	26 (6.1)
Other stressful life events		
Vehicle accident	395 (92.7)	31 (7.3)
Felt unsafe in neighborhood	353 (82.9)	73 (17.1)

[a]Missing: death of close friend n = 2; serious illness of close friend n = 1; robbed n = 1; losing work or source of income *n* = 1.

Table 3

Prevalence of reported stressful life event type exposures in prior 3 months among 426 adults newly entering HIV care in Cameroon, stratified by current mental health (MH) disorder symptoms.

	Total	PTSD		Depression		Anxiety[a]		Any MH disorder symptoms		Symptoms of 2+ MH disorders	
	Overall (n = 426) N (col %)	Yes (n = 67) N (row %)	No (*n* = 359) N (row %)	Yes (n = 87) N (row %)	No (*n* = 339) N (row %)	Yes (n = 54) N (row %)	No (*n* = 370) N (row %)	Yes (n = 123) N (row %)	No (n = 301) N (row %)	Yes (*n* = 62) N (row %)	No (*n* = 362) N (row %)
Death of close friend/family[a]											
Yes	210 (49.4)	41 (19.5)	169 (80.5)	52 (24.8)	158 (75.2)	22 (10.6)	186 (89.4)	66 (31.7)	142 (68.3)	35 (16.8)	173 (83.2)
No	215 (50.6)	26 (12.1)	189 (87.9)	34 (15.8)	181 (84.2)	32 (14.9)	183 (85.1)	56 (26.0)	159 (74.0)	27 (12.6)	188 (87.4)
Serious illness of close friend/family											
Yes	160 (37.6)	40 (25.0)	120 (75.0)	44 (27.5)	116 (72.5)	27 (17.0)	132 (83.0)	59 (37.1)	100 (62.9)	38 (23.9)	121 (76.1)
No	266 (62.4)	27 (10.2)	239 (89.8)	43 (16.2)	223 (83.8)	27 (10.2)	238 (89.8)	64 (24.2)	201 (75.8)	24 (9.1)	241 (90.9)
Violent stressful life event[a]											
Yes	77 (18.1)	20 (26.0)	57 (74.0)	22 (28.6)	55 (71.4)	8 (10.5)	68 (89.5)	30 (39.5)	46 (60.5)	14 (18.4)	62 (81.6)
No	348 (81.9)	47 (13.5)	301 (86.5)	65 (18.7)	283 (81.3)	46 (13.3)	301 (86.7)	93 (26.8)	254 (73.2)	48 (13.8)	299 (86.2)
Negative relationship change											
Yes	171 (40.1)	40 (23.4)	131 (76.6)	52 (30.4)	119 (69.6)	36 (21.3)	133 (78.7)	70 (41.4)	99 (58.6)	41 (24.3)	128 (75.7)
No	255 (59.9)	27 (10.6)	228 (89.4)	35 (13.7)	220 (86.3)	18 (7.1)	237 (92.9)	53 (20.8)	202 (79.2)	21 (8.2)	234 (91.8)
Work-related difficulty[a]											
Yes	140 (32.9)	42 (30.0)	98 (70.0)	44 (31.4)	96 (68.6)	24 (17.1)	116 (82.9)	62 (44.3)	78 (55.7)	36 (25.7)	104 (74.3)
No	285 (67.1)	24 (8.4)	261 (91.6)	42 (14.7)	243 (85.3)	29 (10.2)	254 (89.8)	60 (21.2)	223 (78.8)	25 (8.8)	258 (91.2)
Vehicle accident											
Yes	31 (7.3)	4 (12.9)	27 (87.1)	4 (12.9)	27 (87.1)	5 (16.1)	26 (83.9)	8 (25.8)	23 (74.2)	4 (12.9)	27 (87.1)
No	395 (92.7)	63 (15.9)	332 (84.1)	83 (21.0)	312 (79.0)	49 (12.5)	344 (87.5)	115 (29.3)	278 (70.7)	58 (14.8)	335 (85.2)
Felt unsafe in neighborhood											
Yes	73 (17.1)	21 (28.8)	52 (71.2)	24 (32.9)	49 (67.1)	18 (25.0)	54 (75.0)	32 (44.4)	40 (55.6)	20 (27.8)	52 (72.2)
No	353 (82.9)	46 (13.0)	307 (87.0)	63 (17.8)	290 (82.2)	36 (10.2)	316 (89.8)	91 (25.9)	261 (74.1)	42 (11.9)	310 (88.1)
Stressful life event type count											
Upper tertile (3+ event types)	147 (34.7)	44 (29.9)	103 (70.1)	52 (35.4)	95 (64.6)	27 (18.6)	118 (81.4)	66 (45.5)	79 (54.5)	41 (28.3)	104 (71.7)

	Total	PTSD		Depression		Anxiety[a]		Any MH disorder symptoms		Symptoms of 2+ MH disorders	
	Overall (n = 426) N (col %)	Yes (n = 67) N (row %)	No (*n* = 359) N (row %)	Yes (n = 87) N (row %)	No (*n* = 339) N (row %)	Yes (n = 54) N (row %)	No (*n* = 370) N (row %)	Yes (n = 123) N (row %)	No (n = 301) N (row %)	Yes (*n* = 62) N (row %)	No (*n* = 362) N (row %)
Middle tertile (2 event types)	112 (26.4)	16 (14.3)	96 (85.7)	18 (16.1)	94 (83.9)	14 (12.5)	98 (87.5)	29 (25.9)	83 (74.1)	13 (11.6)	99 (88.4)
Lower tertile (0–1 event types)	165 (38.9)	7 (4.2)	158 (95.8)	16 (9.7)	149 (90.3)	13 (7.9)	152 (92.1)	27 (16.4)	138 (83.6)	8 (4.8)	157 (95.2)

Abbreviations: PTSD-post-traumatic stress disorder; MH- mental health.

[a]Missing: anxiety n = 2; death of close friend/family member n = 1; violent stressful life event *n* = 1; work-related difficulty *n* = 1; stressful life event tertile *n* = 2.

Table 4

Crude and adjusted associations between reported stressful life events in prior 3 months and current symptoms of mental health (MH) disorders among 426 adults newly entering HIV care in Cameroon.

	PTSD		Depression		Anxiety[a]		Any MH symptoms		Symptoms of 2+ MH disorders	
	uPR (95% CI)	aPR (95% CI)[b]	uPR (95% CI)	aPR (95% CI)[b]	uPR (95% CI)	aPR (95% CI)[b]	uPR (95% CI)	aPR (95% CI)[b]	uPR (95% CI)	aPR (95% CI)[b]
Death of close friend/family[a,c]	1.6 (1.0, 2.5)	1.6 (1.0, 2.4)	1.6 (1.1, 2.3)	1.4 (1.0, 2.0)	0.7 (0.4, 1.2)	0.7 (0.4, 1.1)	1.2 (0.9, 1.6)	1.2 (0.9, 1.5)	1.3 (0.8, 2.1)	1.2 (0.8, 19)
Serious illness of close friend/family[c]	2.5 (1.6, 3.9)	2.1 (1.3, 3.1)	1.7 (1.2, 2.5)	1.4 (1.0, 19)	1.7 (1.0, 2.7)	1.4 (0.9, 2.3)	1.5 (1.1, 2.1)	1.3 (1.0, 17)	2.6 (1.6, 4.2)	2.0 (1.3, 3.1)
Violent stressful life event[a,c]	1.9 (1.2, 3.1)	2.1 (1.4, 3.2)	1.5 (1.0, 2.3)	1.7 (1.1, 2.4)	0.8 (0.4, 1.6)	0.8 (0.4, 1.6)	1.5 (1.1, 2.0)	1.7 (1.3, 2.4)	1.3 (0.8, 2.3)	1.5 (0.9, 2.4)
Negative relationship change[c]	2.2 (1.4, 3.5)	1.8 (1.2, 2.8)	2.2 (1.5, 3.2)	1.8 (1.2, 2.5)	3.0 (1.8, 5.1)	2.5 (1.5, 4.2)	2.0 (1.5, 2.7)	1.6 (1.2, 2.2)	2.9 (1.8, 4.8)	2.2 (1.4, 3.6)
Work-related difficulty[a,c]	3.6 (2.3, 5.6)	3.1 (2.0, 4.8)	2.1 (1.5, 3.1)	1.7 (1.2, 2.4)	1.7 (1.0, 2.8)	1.4 (0.8, 2.3)	2.1 (1.6, 2.8)	1.8 (1.4, 2.3)	2.9 (1.8, 4.6)	2.3 (1.5, 3.5)
Vehicle accident[c]	0.8 (0.3, 2.1)	1.3 (0.5, 3.4)	0.6 (0.2, 1.6)	0.8 (0.3, 2.2)	1.3 (0.6, 3.0)	1.8 (0.7, 4.2)	0.9 (0.5, 1.6)	1.1 (0.6, 2.1)	0.9 (0.3, 2.2)	1.3 (0.5, 3.4)
Felt unsafe in neighborhood[c]	2.2 (1.4, 3.5)	1.4 (0.9, 2.2)	1.8 (1.2, 2.7)	1.2 (0.8, 17)	2.4 (1.5, 4.1)	1.8 (1.1, 3.0)	1.7 (1.3, 2.4)	1.2 (0.9, 17)	2.3 (1.5, 3.7)	1.4 (0.9, 2.2)
Upper tertile of event types (i.e.,3+ event types)[a,d]	3.6 (2.3, 5.7)	2.8 (1.8, 4.4)	2.9 (2.0, 4.2)	2.0 (1.4, 2.8)	1.9 (1.2, 3.1)	1.4 (0.9, 2.3)	2.3 (1.7, 3.0)	1.7 (1.3, 2.3)	3.7 (2.3, 6.1)	2.5 (1.6, 3.9)

Abbreviations: MH - mental health; PTSD - post-traumatic stress disorder; uPR - unadjusted prevalence ratio; aPR - adjusted prevalence ratio; CI - confidence interval.

[a] Missing: anxiety *n* = 2, death of close friend/family member *n* = 1; violent stressful life event *n* = 1; work-related difficulty n = 1; stressful life event tertile *n* = 2.

[b] Adjusted models include the specific event type of interest but no other event types, gender, and clinic.

[c] Referent group is those who did not report exposure to the specific event listed.

[d] Referent group is those in the lower two tertiles of event types.