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Patterns of adverse childhood experiences and their associations with mental distress, substance use and sexual risk behaviors in Sub-Saharan Africa

Stephanie Spaid Miedema^{a,*}, Caroline Stamatakis^b, Allison Tracy^c, Jennifer Hegle^d, Maman Fathim Kamagate^e, Jordan McOwen^f, Angelo Augusto^g, Pedro Manuel^f, Rachel Coomer^h, Caroline Kambonaⁱ, Puleng Ramphalla^j, Phyllis Niolon^a, Pragna Patel^{d,1}, Francis B. Annor^{a,1}

^aDivision of Violence Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, GA, USA

^bDivision of Global HIV/TB, Center for Global Health, Centers for Disease Control and Prevention, Rwanda

^cTJFACT Inc., Atlanta, GA, USA

^dDivision of Global HIV/TB, Center for Global Health, Centers for Disease Control and Prevention, Atlanta, GA, USA

^eCenters for Disease Control and Prevention, Abidjan, Cote d'Ivoire

^fCenters for Disease Control and Prevention, Maputo, Mozambique

^gInstituto Nacional de Saúde, Maputo, Mozambique

^hCenters for Disease Control and Prevention, Windhoek, Namibia

ⁱCenters for Disease Control and Prevention, Nairobi, Kenya

^jCenters for Disease Control and Prevention, Maseru, Lesotho

Abstract

Background: Multiple adverse childhood experiences (ACEs) are associated with poor sexual and mental health outcomes in low- and middle-income countries (LMICs). Less well understood is how discrete and gendered clustering of ACEs may influence health.

Objective: To assess how multiple ACEs co-occur and how dominant patterns of co-occurrence are associated with mental distress, substance use, and sexual risk behaviors among young women and men in Sub-Saharan Africa.

*Corresponding author at: Division of Violence Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Highway NE, Atlanta, GA, USA., smiedema@cdc.gov (S.S. Miedema).

¹Denotes senior co-authors

Declaration of competing interest

The authors declare no conflict of interest.

Participants and setting: We used pooled data of young men and women aged 19–24 from comparable, nationally representative Violence Against Children and Youth Surveys (VACS) conducted in Cote d’Ivoire, Kenya, Lesotho, Mozambique, and Namibia ($n_f = 7183$; $n_m = 2207$).

Methods: We estimated sex-disaggregated latent classes of six ACEs among young women and men. We ran Bolck–Croon–Hagenaars (BCH) distal outcome analysis to test the sex-stratified relationships between ACEs latent classes and health outcomes.

Results: A six class solution best fit the female data. Classes included witnessing violence and experiencing physical violence (PV); experiencing PV; high ACEs; witnessing community violence; orphanhood; and low ACEs exposure. Among males, the best-fitting three-class solution included experiencing PV and witnessing community violence; high ACEs; and low ACEs exposure. Membership in the high ACEs class was associated with mental distress among females and males, and substance use among males. No differences in sexual risk behavior were identified by class membership among either females or males.

Conclusions: Discrete clusters of co-occurring ACEs are associated with elevated odds of mental distress among females, and mental distress and substance use among males. Preventing ACEs may improve mental health among young women and men in LMICs in Sub-Saharan Africa.

Keywords

Adverse childhood experiences; Sub-Saharan Africa; Low-and-middle-income countries; Mental health; Sexual risk behaviors

1. Introduction

Adverse childhood experiences (ACEs) are potentially traumatic events that occur before age 18, including but not limited to experiencing violence or neglect, witnessing violence in the home or community, or parental death or separation (Centers for Disease Control and Prevention, 2019). ACEs have significant adverse impact on health and well-being across the life course (Hughes et al., 2017). Exposure to multiple ACEs often results in graded relationships with poor health and behavioral outcomes. The more ACEs a child is exposed to, the greater the risk of later health and behavioral adversity (Basto-Pereira et al., 2022; Hughes et al., 2017). ACEs are common among children and adolescents in low- and middle-income countries (LMICs) across Africa. For example, one in two children in Africa experienced violence in the past year (Hillis, Mercy, Amobi, & Kress, 2016). Although research on ACEs in Africa is limited, studies find that high proportions of children and adolescents experience more than one ACE (Brittain et al., 2021; Kidman, Nachman, Dietrich, Liberty, & Violari, 2018).

In African LMICs, poor mental health and HIV are among the leading causes of adolescent morbidity and mortality (Ferrari, 2022; Risher et al., 2021; Ward et al., 2021). Multiple ACEs are associated with a greater risk of poor mental health and sexual risk behaviors that can increase HIV transmission (El Mhamdi et al., 2017). Evidence shows graded relationships between exposure to multiple ACEs and sexual risk behaviors, such as low condom use (Kidman et al., 2018; VanderEnde et al., 2018) and multiple or concurrent

partnerships (Kidman et al., 2018). Research also indicates graded associations between multiple ACEs and mental health outcomes such as depression (Brittain et al., 2021; El Mhamdi et al., 2017; Hatcher et al., 2019) and substance misuse (Brittain et al., 2021; El Mhamdi et al., 2017; Goodman, Grouls, Chen, Keiser, & Gitari, 2017). The relationships between multiple ACEs, poor mental health, and sexual risk behaviors can vary by gender. Women and men experience differential mental and sexual health outcomes of multiple ACEs (El Mhamdi et al., 2017).

Research on multiple ACEs and health sequelae frequently relies on cumulative risk measures of childhood adversity (Reidy et al., 2021). Less well understood is how ACEs cluster together, and how discrete clustering of ACEs may influence health and adversity, particularly among young adults in LMICs in Africa. ACEs often cluster in a population, such that groups of youth have varying probabilities of experiencing discrete patterns of co-occurring ACEs compared to others (Lian, Kiely, & Anstey, 2022; Miedema, Chiang, Annor, & Achia, 2023). These discrete patterns can have important effects on programming priorities. Efforts to prevent and respond to ACEs benefit from tailored intervention based on the type of ACE or grouping of ACEs to which a child is exposed. That is, appropriate interventions for a young person who has experienced child sexual abuse may differ from those designed to address household dysfunction. Furthermore, as noted above, many youth experience more than one ACE, and the specific grouping of ACEs also influences the type of programming deemed appropriate and beneficial. There could be multiple combination of unique patterns of ACEs, and intervention design would be overwhelmed to address all possible combinations. Gender differences in ACEs profiles could further complicate targeted intervention. Insight into the most common patterning of ACEs among male and female youth can help to identify sex-disaggregated groups with specific ACEs profiles, to support efficient and targeted prevention and intervention efforts.

Latent class analysis (LCA) is a useful statistical tool to evaluate how experiences, such as ACEs, cluster together in a population. LCA is a person-based statistical approach that identifies distinct groups of individuals who share common experiences or characteristics and, thereby, can be considered members of the same group or “latent class” for the issue under consideration (Collins & Lanza, 2010). LCA identifies the best-fitting class structure to maximize item-level probability differences between and similarities within classes (Lanza, Bray, & Collins, 2013). In other words, LCA helps to identify the most prevalent and salient groups of youth who experience discrete patterning or co-occurrence of ACEs. LCA is a complementary approach to measuring co-occurrence of ACEs, alongside cumulative risk approaches (Lian et al., 2022). The approach is less often used in LMICs in Africa, although there are several studies to date, for example in Kenya (Miedema et al., 2023), Tanzania (Zietz et al., 2020), and Uganda (Clarke et al., 2016) that have used LCA to identify latent clustering of childhood adversity. For example, using nationally representative data from the 2019 Kenya Violence against Children and Youth Survey (VACS), one study found that girls and young women experienced three distinct clusters of ACEs: 19 % experienced household and community physical violence only, 16 % experienced sexual violence only, and 65 % experienced low probability of any ACEs (Miedema et al., 2023). In Uganda, violence experiences among boys and girls were characterized by three distinct latent classes: emotional, physical, and sexual violence by adults and intimate partners;

physical, emotional, and sexual violence by peers; and physical violence by school staff but low probability of other forms of violence such as physical, sexual or emotional violence by adults, intimate partners or peers (Clarke et al., 2016). Beyond understanding how ACEs co-occur among certain groups, LCA is frequently used to examine how later life health outcomes may vary based on class membership (Lanier, Maguire-Jack, Lombardi, Frey, & Rose, 2018; Miedema et al., 2023; Zietz et al., 2020). For example, do some groups of youth who experience a certain pattern of ACEs co-occurrence have different health outcomes compared to another group of youth experiencing a different pattern of ACEs? Distinct clusters of ACEs may be associated with higher odds of experiencing later adversity (Zietz et al., 2020). Like with cumulative ACEs measurement approaches, these patterns may show differential associations with health outcomes among male versus female youth (El Mhamdi et al., 2017).

To date, there is minimal evidence of how clustering of ACEs is associated with adverse mental health and sexual risk-taking behaviors, and how these relationships may vary by gender among young adults living in LMICs across Africa. Assessment of the clustered nature of multiple ACEs – and their relationships with mental and sexual health – can inform targeted and layered ACEs prevention, HIV prevention and mental health programming. This study seeks to fill this gap by using a pooled data set of comparable, nationally representative VACS data from 2018 Cote d'Ivoire, 2019 Kenya, 2018 Lesotho, 2019 Mozambique, and 2019 Namibia to (1) estimate latent classes of ACEs among young men and women aged 19–24 years old and (2) assess the gender-specific relationships between latent ACEs, mental distress, substance use and sexual risk-taking behaviors.

2. Methods

2.1. Data and participants

VACS are nationally-representative, cross-sectional household surveys of children and youth aged 13–24-years-old, conducted in over 20 LMICs worldwide (Nguyen, Kress, Villaveces, & Massetti, 2019). VACS provide evidence on the prevalence, typology, and consequences of sexual, physical, and emotional violence against children and youth (Chiang et al., 2016). Data collection for VACS included in this analysis were funded by the US President's Emergency Plan for AIDS Relief (PEPFAR). Surveys were led by national governments and implementing agencies with technical assistance from the US Centers for Disease Control and Prevention. The standardized VACS protocol includes a household survey conducted with an adult household member in an eligible household, and an individual survey conducted with one eligible youth aged 13–24-years old in the household. VACS use a multi-stage randomized cluster gender-stratified sampling design with females and males sampled from different primary sampling units (PSUs). This gender-stratification ensures that male and female surveys are conducted in separate PSUs to minimize the risk that victims and perpetrators of violence from opposite sex relationships will be interviewed in the same community. Youth and their guardians participate in consent procedures, and interviews are conducted in the appropriate local languages (Nguyen et al., 2019). Face-to-face interviews are administered by trained interviewers of the same sex as participants (Centers for Disease Control and Prevention, 2017).

Interview responses are recorded electronically on tables or netbooks by interviewers. Complex skips are built into questionnaire programming to ensure complete data collection and minimize skip errors. Youth are provided with tiered referral services based on response plans developed in collaboration with local partners and service providers (Centers for Disease Control and Prevention, 2017; Nguyen et al., 2019). VACS protocols are reviewed and approved by the CDC Institutional Review Board, and one or more national ethics review committees.

For the present analysis, data from the 2018 Cote d'Ivoire VACS, 2019 Kenya VACS, 2018 Lesotho VACS, 2019 Mozambique VACS, and 2019 Namibia VACS were merged, and pooled estimates were generated from the combined dataset. Specific information on VACS survey design and implementation in Cote d'Ivoire, Kenya, Lesotho, Mozambique, and Namibia is provided in country specific final reports (Instituto Nacional de Saúde (INS) et al., 2022; Ministry of Gender Equality Poverty Eradication and Social Welfare et al., 2020; Ministry of Labour and Social Protection of Kenya, 2019; Ministry of Social Development of Lesotho et al., 2020; Ministry of Women Family and Children et al., 2019). To ensure appropriate temporality between exposure to ACEs and study outcomes in mixture models, only youth 19–24 years old were retained for the present analysis. Sample sizes for females (n_f) and males (n_m) aged 19–24-years-old in each country were as follows: Cote d'Ivoire $n_f = 572$, $n_m = 486$; Kenya $n_f = 541$, $n_m = 307$; Lesotho $n_f = 2983$, $n_m = 590$; Mozambique $n_f = 1052$, $n_m = 357$; Namibia $n_f = 2046$, $n_m = 467$. Eleven observations in the female data set were missing on all ACEs indicators and were omitted from analysis. The total pooled sample sizes were $n_f = 7183$ and $n_m = 2207$ for females and males, respectively. Sample weights for each country ensure that samples are representative of each country within the pooled data set.

2.2. Measurement

Psychometrically validated ACEs measures in the VACS were selected from the Juvenile Victimization Questionnaire (Finkelhor, Hamby, Ormrod, & Turner, 2005) and the ISPCAN Child Abuse Screening Tool-Retrospective (Dunne et al., 2009). Further details on validation and measurement approaches to ACEs using VACS data can be found elsewhere within this special issue (Amene et al., 2023). Multi-item ACEs indicators included the following experiences before age 18: sexual violence (including experiencing non-consensual sexual touching, unwanted attempted sexual intercourse, pressured sexual intercourse, or physically forced sexual intercourse by any perpetrator), physical violence (behavioral measurement varied slightly across countries, but included ever being slapped, pushed, shoved, shaken or intentionally had something thrown at them; punched, kicked, whipped or beaten with an object; choked, smothered, attempted to drown or burnt; or used or threatened with a knife, gun or other weapons, by a parent/adult caregiver/adult relative, intimate partner, peer, or adult in the community), emotional violence (behavioral measurement varied slightly across countries, but included a parent/adult caregiver/adult relative ever telling them that they were not loved, or did not deserve to be loved; saying they wished they had never been born or were dead, or ever ridiculed or put them down), death of one or more parents, witnessing violence in the community, and witnessing interparental violence.

We examined four outcomes: infrequent condom use, multiple sexual partners, mental distress, and drug use and/or binge drinking. Infrequent condom use was coded 1 if participants had never or sometimes used a condom in the past 12 months among unmarried individuals or married individuals with more than one sexual partner. Multiple sexual partners, coded as a dichotomous variable, was coded 1 if participants had >1 sexual partner in the past 12 months. We used the K6 scale to capture moderate or severe mental distress using a validated cut point (Kessler et al., 2002; Prochaska, Sung, Max, Shi, & Ong, 2012). The scale was dichotomized and coded 0 if participants' K6 scale score was <5, and 1 if their score was greater or equal to 5. From here forth, mental distress will be used to describe moderate to severe mental distress as characterized by the K6. Substance use was coded 1 if participants used drugs and/or binge drinking in the past 30 days. Binge-drinking was defined as 4 or more drinks of alcohol in a day.

Three potentially confounding demographic characteristics were considered for inclusion in the models. A dichotomous variable for educational attainment captured completed primary or less or completed secondary or higher. Material insecurity measured whether a household had enough money for clothing, school fees or medical care. In Kenya, the question only asked about having enough money for medical care/medicine. Among females, a dichotomous variable captured whether they had ever been pregnant or not.

2.3. Data analysis

We first estimated the weighted prevalence of all demographic characteristics, ACEs, mental distress, substance use, and sexual risk behaviors using the multi-country data set, stratified by gender and accounting for the complex survey design of the VACS. Descriptive analysis was conducted in Stata/SE 17. Data were transferred to Mplus 8.8 for latent class analyses.

We estimated sex-stratified unadjusted latent class measurement models to identify the best-fitting latent class structure of ACEs for female and male youth separately. Latent class models accounted for the VACS complex survey design by specifying that model estimates be corrected for sample weights, clustering, and stratified sampling. Full information maximum likelihood estimation was used to treat missing data. The team collectively reviewed sequential models to identify the best-fitting structure based on the evaluation of model fit, classification certainty, and class structure. Model fit was evaluated using Akaike's information criterion (AIC) and sample-adjusted Bayesian information criteria (BIC), whereby lower values indicated improved fit over prior models. We also evaluated model entropy, which is an indicator of classification certainty and refers to the level of classification error in the model, with higher values of entropy (bounded by 1.00) indicating less classification error (Collins & Lanza, 2010). We reviewed classification probabilities (specifically, the pooled probability of membership associated with the most likely latent class). We assessed the homogeneity of item response probabilities (high homogeneity indicates that the response pattern is highly characteristic of the specific latent class, i.e., the probability of experiencing a given response is relatively close to 0 or 1 for those in the class) and latent class separation (good separation indicates that the response pattern is characteristic of that latent class only, i.e., the response pattern is different from those in

other groups) (Lanza et al., 2013). Finally, we discussed interpretability of classes in the context of what is known about ACEs in African LMICs.

We used the three-step Bolck–Croon–Hagenaars (BCH) approach to estimate associations between latent classes and all four outcomes. The BCH approach is currently the preferred method for distal outcome latent class analysis as it uses posterior probabilities to assign observations to latent classes and generates weights to estimate classification error within the model (Asparouhov & Muthén, 2021). This three-step approach also avoids shifts in latent class structure as the result of adding auxiliary variables to the model, and thereby retains the integrity of the initial measurement structure (Asparouhov & Muthén, 2021). When estimates are near a boundary value (in this case, probabilities near 0 or 1), saddle points or other estimation issues might occur. Following the strategy used in the Mplus estimation algorithm, for such cases, we fixed class-specific item thresholds to the minimum (−15) or maximum (15) if they exceeded |15| to alleviate convergence issues in all BCH distal outcome models (Muthén & Muthén, 1998–2017).

3. Results

3.1. Descriptives

ACEs were prevalent among female and male youth in this multi-country sample (Table 1). Witnessing violence in the community was the most prevalent ACE for both female (37 %; 95 % Confidence Interval (CI): 34 %, 40 %) and male (55 %; 95 % CI: 50 %, 59 %) youth, followed by physical violence (females: 35 %; 95 % CI: 32 %, 38 %; males: 47 %; 95 % CI: 42 %, 52 %). Emotional violence was the least prevalent ACE: 9 % of females (95 % CI: 7 %, 11 %) and 7 % of males (95 % CI: 5 %, 9 %) experienced emotional violence before age 18. Over one in ten (14 %; 95 % CI: 12 %, 17 %) females and 8 % of males (95 % CI: 6 %, 11 %) experienced sexual violence. For both males and females, more than one in five (23 %) witnessed interparental violence (females 95 % CI: 21 %, 26 %; males 95 % CI: 19 %, 27 %). Over one in four (27 %; 95 % CI: 24 %, 30 %) females and one in five (23 %; 95 % CI: 20 %, 26 %) males experienced the death of one or both of their parents.

Over half of females (53 %; 95 % CI: 49 %, 57 %) and males (65 %; 95 % CI: 62 %, 69 %) attended secondary school or higher (Table 1). Both males and females had a similar prevalence of material insecurity (females: 42 %; 95 % CI: 38 %, 45 %; males: 42 %; 95 % CI: 37 %, 46 %). Two in three (62 %, 95 % CI: 58 %, 65 %) females had ever being pregnant.

Low or no condom use was common among both females (30 %; 95 % CI: 27 %, 33 %) and males (28 %; 95 % CI: 24 %, 33 %). One in four males (22 %; 95 % CI: 19 %, 25 %) had multiple sexual partners. Only 6 % of females had multiple sexual partners (6 %; 95 % CI: 4 %, 7 %) (Table 1). A substantial proportion of both females (42 %; 95 % CI: 39 %, 46 %) and males (39 %; 95 % CI: 34 %, 43 %) experienced mental distress. One in four males (23 %; 95 % CI: 20 %, 27 %) and one in ten females (11 %; 95 % CI: 9 %, 13 %) used substances in the past 30 days. For both males and females, past-30-day substance use was largely driven by binge drinking, rather than drug use.

3.2. Latent class solutions

Among females, a six-class latent structure was identified as the best-fitting model, based on assessment of model fit statistics, interpretability, and stability of latent classes (Table 2). Latent class descriptions were developed based on item response probabilities (Table 3). We considered high probabilities as those >0.5 (Lanza et al., 2013). Among females (Table 3), the six classes included (1) high probability of witnessing violence in the community (Probability (P) = 0.53) and between parents (P = 0.88) and experiencing physical violence (P = 1.00) [Witness Violence + Physical Violence (PV)]; (2) high probability of experiencing physical violence only (P = 0.75) [PV]; (3) high probability of experiencing most ACEs (probabilities ranged from 0.45 to 1.00) [High Adversity]; (4) high probability of witnessing violence in the community only (P = 0.78) [Community Violence (CV)]; (5) high probability of being an orphan only (P = 1.00) [Orphan]; and (6) low probability of any ACE exposure (probabilities range from 0.00 to 0.09) [Low Adversity].

Among males, applying an identical approach to model selection as with females, we selected the three-class latent structure as the best-fitting model (Table 2). The three classes included (1) high probability of experiencing physical violence (P = 0.63) and witnessing community violence (P = 0.84) [PV + CV]; (2) high probability of experiencing physical (P = 1.00), sexual (P = 0.79), and emotional violence (P = 1.00), and witnessing interparental violence (P = 0.96) [High Adversity]; and low probability of experiencing any ACE (probabilities ranged from 0.02 to 0.28) [Low Adversity] (Table 4). However, even in the Low Adversity class, probability of exposure was 0.28 for physical violence, 0.25 for witnessing community violence and 0.20 for orphanhood. The High Adversity class was consistent across sequential models, indicating its salience to the patterning of ACEs among males across the five countries. However, the low sample size of this class precluded further analysis of associations between class membership, demographics, mental distress, substance use, and sexual risk behaviors, and is not included in Table 6.

3.3. Mental health and sexual behaviors

Among females, those in the Low Adversity class had a predicted probability of 0.15 (baseline odds = 0.18) of experiencing mental distress after adjusting for three covariates: schooling, material insecurity, and whether the participant had ever been pregnant (Table 5). By comparison, females in the Witness Violence + PV class were estimated to have four times these baseline odds (adjusted odds ratio [aOR] 3.95, 95 % CI 1.69, 9.23), those in the PV class were estimated to have over five times the baseline odds (aOR 5.35; 95 % CI 2.99, 9.59), those in the High Adversity class had nearly 25 times the baseline odds (aOR: 24.83, 95 % CI 7.34, 84.10), and those in the CV class had over three times the baseline odds (aOR: 3.14; 95 % CI 1.83, 5.37) of experiencing mental distress, after adjusting for covariates. We observed no significant associations between the Orphan class and mental distress. We observed no significant associations between class membership and no/infrequent condom use, multiple sex partners or substance use among females.

Among males, the predicted probability of experiencing mental distress after adjusting for schooling was 0.29 (baseline odds = 0.41) (Table 6). Males assigned to the PV + CV class were estimated to have nearly three times the baseline odds (aOR: 2.64; 95 % CI 1.61, 4.31),

after adjusting for schooling. While there were too few males assigned to the High Adversity class to conduct robust significance tests, the point estimate suggests elevated risk as well (results not shown; available upon request). Males in the Low Adversity class were predicted to have a probability of 0.31 of substance use (baseline odds = 0.46) after adjusting for schooling. Males assigned to the PV + CV class were estimated to have over three and a half times these baseline odds of substance use in the past 30 days (aOR: 3.54, 95 % CI 1.58, 7.93), after adjusting for schooling. No significant associations were observed between class membership and sexual risk behaviors among males.

4. Discussion

The primary aim of this study was to assess whether co-occurrence patterns of ACEs among female and male youth in Sub-Saharan Africa puts some youth at greater odds of experiencing mental distress, substance use, or sexual risk-taking behaviors compared to others. To our knowledge, this is the first study using nationally representative samples to examine sex-stratified latent classes of ACEs, and their consequences on mental and sexual health, across multiple Sub-Saharan African countries.

We found that latent patterning of childhood adversity differs between young women and men. Using a consistent approach to identifying best-fitting models, we observed substantive differences in class characteristics by sex: females, but not males, grouped into classes characterized by orphanhood only [Orphan], community violence only [CV] and physical violence only [PV]. For males, the specific co-occurrence of experiencing physical violence and witnessing community violence was salient to latent patterning of ACEs among this group [PV + CV class]. We did not observe a parallel group among the female sample. Rather, among females, experiences of physical violence and witnessing community violence also co-occurred with witnessing interparental violence in the household [Witness Violence + PV class]. Further, while the probability of exposure to childhood adversity was generally low among females in the Low Adversity class, males in the Low Adversity class still faced a one in four probability of experiencing physical violence and community violence. Although the relatively lower sample size for males may have resulted in fewer and less distinct classes, taken as they are, these results hint at the gendered nature of childhood adversity in this region. For example, the relatively high probability of physical violence exposure among males – even in the Low Adversity class – may be related to greater use of physical violence to discipline boys, compared to girls (Lansford et al., 2010; Wang & Liu, 2014). Greater freedom of movement among boys and young men, compared to girls and young women, may increase chance of exposure to (for example witnessing) violence in community spaces (Hallman, Kenworthy, Diers, Swan, & Devnarain, 2015; Ramaiya et al., 2021; Zimmerman, Li, Moreau, Wilopo, & Blum, 2019). These gender differences can inform the development and implementation of sex-targeted intervention efforts: for example, increasing support to interventions that work with boys and young men to prevent and respond to physical and community violence exposure, for example through improvements in the built environment to reduce threats or crime, or through interventions that promote pro-social behavior among adolescent boys (World Health Organization, 2016).

Overall, national child protection services, schools, healthcare providers and all relevant stakeholders should be attuned to sex-specific variation in co-occurrence of ACEs between male and female youth. Gender sensitive and gender-specific programming can provide targeted interventions that take into account this variation and can in turn be more responsive to the unique experiences, challenges and needs of young women and men who experience childhood adversity (World Health Organization, 2016). That is, it is important to ensure that respective prevention and response activities are tailored for both males and females.

ACEs classes characterized by exposure to violence (e.g., experiencing or witnessing violence) were significantly associated with increased odds of mental distress for both females and males, and with substance use for males. These results are consistent with global research on the harmful effects of ACEs on later adulthood mental health and substance use (Hughes et al., 2017). Further, the observed associations between membership in classes characterized by violence and substance use among males may in part be due to higher prevalence of substance use among males compared to females (Kabiru, Beguy, Crichton, & Ezech, 2010; Magidson et al., 2017). Even among males in the Low Adversity class, we observed a predicted probability of 0.31, suggesting that one-third of young men in this low-risk class engaged in drug or binge drinking in the past 30 days. Female youth with a high probability of experiencing multiple forms of ACEs [High Adversity] had the greatest odds of experiencing mental distress, even compared to other adversity classes, which complements existing research on the graded effect of ACEs on mental health: the more ACEs one experiences, the greater the toll on mental health (Hatcher et al., 2019; Hughes et al., 2017). We also observed that females in the Witness + PV and CV classes had similar odds of experiencing mental distress (predicted probabilities of 0.42 and 0.37 respectively). This suggests that simply witnessing violence in the community could have a similar impact on females' mental distress as more proximal experiences with violence (exposure to parental violence, victim of physical violence, etc.). The results are in line with a growing evidence base on the adverse effects of community violence on mental health and wellbeing (Lee, Kim, & Terry, 2020). A recent study among male and female adolescents in peri-urban South Africa found that witnessing community violence was associated with higher levels of self-reported alcohol use in the past six months (Magidson et al., 2017). Expanding interventions to support and foster healthy communities, such as through economic supports to families, access to health and educational services, and family-friendly policies and programs (World Health Organization, 2016), may prevent violence and mitigate future consequences of childhood adversity.

While prior research finds robust associations between multiple ACEs and sexual risk-taking behaviors (Hughes et al., 2017; VanderEnde et al., 2018), we found no significant associations between ACEs classes and sexual behaviors for either males or females. Particularly in light of significant results between ACEs classes and mental health, the lack of association between ACEs classes and sexual risk behaviors may be due to the cascading effects of ACEs on adverse health outcomes. That is, mental health disorders, such as anxiety or depression, may contribute to less self-protective and more risk-taking behaviors, such as low condom use or multiple concurrent partners (Hill, Maman, Kilonzo, & Kajula, 2017). These sexual risk behaviors, in turn, render youth at greater risk of HIV. In a recent structural equation analysis of ACEs, mental health and HIV risk behaviors

using longitudinal data among adolescent girls in South Africa, Meinck and colleagues observed no direct effect of ACEs on HIV risk behaviors (infrequent condom use, lifetime sex while drunk or on drugs, and two or more sexual partners in the past year). Rather, the relationship between ACEs and HIV risk behaviors was fully mediated by internalizing and externalizing mental health consequences of childhood adversity (Meinck, Orkin, & Cluver, 2019). Alternatively, ACEs patterning based on class membership may not be associated with sexual risk behaviors. It may be the case that sexual risk behaviors are associated with specific ACEs, but not overall patterns of ACEs. Further research could examine the causal pathways of individual and multiple ACEs, mental health, and HIV risk behaviors among diverse populations of adolescents in LMICs across Africa. Finally, this lack of significant results may be due the measurement approach (e.g., latent classes versus cumulative/summed measure), limited measures of sexual risk behaviors, or use of a pooled sample that obscures country-specific associations. While we observed large adjusted odds ratios, the wide confidence intervals indicated lack of statistical significance, which also may be due to limited sample size, particularly among young men.

Overall, these results underscore the important connection between ACEs patterning, mental health and substance use among youth in African LMICs. In general, programming related to addressing mental health and substance use, especially alcohol misuse, is limited in the study countries. Greater investment in strategies for the successful primary prevention of ACEs among children would likely reduce the prevalence of mental health problems and substance use during adolescence and adulthood (Centers for Disease Control and Prevention, 2019; Merrick et al., 2019). Further, investing more in mental health and substance use prevention programming, particularly among boys and young men who have greater odds of engaging in risky substance use behaviors, may help to mitigate the long-term consequences of childhood adversity, including risk of HIV acquisition. Mental health counseling of persons who experience ACEs, especially those who witness or experience violence and those who experience multiple ACEs, including cognitive behavioral therapy and trauma-informed care, may be vital for mitigating the effects of ACEs on mental health and alcohol use. Expanding opportunities to train lay workers to provide mental health support may help address the shortage of psychiatrists and other mental health professionals in African LMICs. For example, the Common Elements Treatment Approach (CETA) trains lay providers to treat a range of common mental and behavioral health problems associated with poor HIV prevention and treatment outcomes and has demonstrated effectiveness in reducing HIV risk behaviors in African LMIC contexts (Murray et al., 2020). Further research on exposure to ACEs after HIV diagnosis, and the compounded adverse effects of living with HIV and ACEs on mental health, is also an important avenue for future inquiry, with implications for targeted and layered HIV prevention and mental health programming.

4.1. Limitations

The study has several limitations. First, the pooled multi-country sample does not allow for assessment of country-specific patterning of ACEs and associations with mental and sexual health. Each included country has their own unique socio-economic, political, and cultural context. By pooling data together, we generate adequate sample size to run complex models, but lose national-level contextual analysis. We recommend replication of this approach

in country-specific data sets where sample size allows. Second, sample size limitations precluded us from assessing associations between the High Adversity class among young men, and their mental and sexual health. There are some indications that the relatively small sample size of males in this study may have resulted in a less homogenous Low Adversity class. While the Low Adversity class was associated with the lowest behavioral and mental health risk profile among females, baseline risk estimates among males was somewhat higher than might be expected for the reference class. Third, although the measure used to assess mental distress (the K6 scale) demonstrated adequate reliability in this sample, it has not been validated in all study contexts and as such, the proposed cut-off may be misestimated for the specific local settings of this analysis. Future measurement research could use VACS data, and other country-level data sources, to conduct robust validation of this scale. Finally, there are some limitations to the ACEs items. Participants self-report ACEs that occurred during childhood, and so may underreport experiences due to recall bias or stigma around disclosure of childhood adversity. Further, the VACS include a limited number of ACEs. Future analysis with an expanded set of ACEs indicators would be warranted to delineate between relative influence of violence, household dysfunction, and other forms of adversity.

4.2. Conclusion

Young women and men in LMICs across Africa experience discrete patterning of childhood adversity. Latent classes of ACEs characterized by violence victimization and/or exposure are associated with elevated odds of mental distress among females, and mental distress and substance use among males. Preventing ACEs may improve mental health among young women and men in LMICs in Africa.

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Data availability

The Violence Against Children and Youth data are publicly available at <https://www.togetherforgirls.org/en>

References

- Amene EW, Annor FB, Gilbert LK, McOwen J, Augusto A, Manuel P, N'gouanma Nobah MTV, & Massetti GM (2023). Prevalence of adverse childhood experiences in sub-Saharan Africa: A multicountry analysis of the Violence Against Children and Youth Surveys (VACS). *Child Abuse & Neglect*.
- Asparouhov T, & Muthén BO (2021). Auxiliary variables in mixture modeling: using the BCH method in Mplus to estimate a distal outcome model and an arbitrary secondary model (Mplus Web Notes: No. 21, Issue).

- Basto-Pereira M, Gouveia-Pereira M, Pereira CR, Barrett EL, Lawler S, Newton N, ... Sakulku J (2022). The global impact of adverse childhood experiences on criminal behavior: A cross-continental study. *Child Abuse & Neglect*, 124, 105459. 10.1016/j.chiabu.2021.105459 [PubMed: 35007971]
- Brittain K, Zerbe A, Phillips TK, Gomba Y, Mellins CA, Myer L, & Abrams EJ (2021). Impact of adverse childhood experiences on women's psychosocial and HIV-related outcomes and early child development in their offspring. *Glob Public Health*, 1–13. 10.1080/17441692.2021.1986735
- Centers for Disease Control and Prevention. (2017). Critical elements of interviewer training for engaging children and adolescents in global violence research: Best practices and lessons learned from the Violence Against Children Survey.
- Centers for Disease Control and Prevention. (2019). Preventing adverse childhood experiences: Leveraging the best available evidence. In National Center for Injury Prevention and Control. Centers for Disease Control and Prevention.
- Chiang LF, Kress H, Sumner SA, Gleckel J, Kawemama P, & Gordon RN (2016). Violence against children surveys (VACS): Towards a global surveillance system. *Inj Prev*, 22 Suppl, 1(Suppl. 1), i17–i22. 10.1136/injuryprev-2015-041820 [PubMed: 27044493]
- Clarke K, Patalay P, Allen E, Knight L, Naker D, & Devries K (2016). Patterns and predictors of violence against children in Uganda: A latent class analysis. *BMJ Open*, 6(5), Article e010443. 10.1136/bmjopen-2015-010443
- Collins LM, & Lanza ST (2010). Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences. Inc: John Wiley & Sons.
- Dunne MP, Zolotor AJ, Runyan DK, Andrevia-Miller I, Choo WY, Dunne SK, ... Youssef R (2009). ISPCAN Child Abuse Screening Tools Retrospective version (ICAST-R): Delphi study and field testing in seven countries. *Child Abuse & Neglect*, 33(11), 815–825. 10.1016/j.chiabu.2009.09.005 [PubMed: 19853301]
- El Mhamdi S, Lemieux A, Bouanene I, Ben Salah A, Nakajima M, Ben Salem K, & al'Absi M. (2017). Gender differences in adverse childhood experiences, collective violence, and the risk for addictive behaviors among university students in Tunisia. *Preventive Medicine*, 99, 99–104. 10.1016/j.ypmed.2017.02.011 [PubMed: 28216378]
- Ferrari A (2022). Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Psychiatry*, 9(2), 137–150. 10.1016/S2215-0366(21)00395-3 [PubMed: 35026139]
- Finkelhor D, Hamby SL, Ormrod R, & Turner H (2005). The juvenile victimization questionnaire: Reliability, validity, and national norms. *Child Abuse & Neglect*, 29(4), 383–412. 10.1016/j.chiabu.2004.11.001 [PubMed: 15917079]
- Goodman ML, Grouls A, Chen CX, Keiser PH, & Gitari S (2017). Adverse childhood experiences predict alcohol consumption patterns among Kenyan mothers. *Substance Use & Misuse*, 52(5), 632–638. 10.1080/10826084.2016.1245748 [PubMed: 28026977]
- Hallman KK, Kenworthy NJ, Diers J, Swan N, & Devnarain B (2015). The shrinking world of girls at puberty: Violence and gender-divergent access to the public sphere among adolescents in South Africa. *Global Public Health*, 10(3), 279–295. 10.1080/17441692.2014.964746 [PubMed: 25303092]
- Hatcher AM, Gibbs A, Jewkes R, McBride RS, Peacock D, & Christofides N (2019). Effect of childhood poverty and trauma on adult depressive symptoms among young men in Peri-urban south African settlements. *The Journal of Adolescent Health*, 64(1), 79–85. 10.1016/j.jadohealth.2018.07.026 [PubMed: 30327276]
- Hill LM, Maman S, Kilonzo MN, & Kajula LJ (2017). Anxiety and depression strongly associated with sexual risk behaviors among networks of young men in Dar es Salaam, Tanzania. *AIDS Care*, 29(2), 252–258. 10.1080/09540121.2016.1210075 [PubMed: 27469516]
- Hillis S, Mercy J, Amobi A, & Kress H (2016). Global prevalence of past-year violence against children: A systematic review and minimum estimates. *Pediatrics*, 137(3), Article e20154079. 10.1542/peds.2015-4079 [PubMed: 26810785]
- Hughes K, Bellis MA, Hardcastle KA, Sethi D, Butchart A, Mikton C, ... Dunne MP (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-

- analysis. *The Lancet Public Health*, 2(8), e356–e366. 10.1016/s2468-2667(17)30118-4 [PubMed: 29253477]
- Instituto Nacional de Saúde (INS), Ministry of Health (MISAU), Ministry of Gender Child and Social Action (MGCAS), I. N. d. E. I, & U.S. Centers for Disease Control and Prevention (CDC). (2022). Violence against children and youth survey in Mozambique (VACS 2019).
- Kabiru CW, Beguy D, Crichton J, & Ezech AC (2010). Self-reported drunkenness among adolescents in four sub-Saharan African countries: Associations with adverse childhood experiences. *Child and Adolescent Psychiatry and Mental Health*, 4, 17. 10.1186/1753-2000-4-17 [PubMed: 20569490]
- Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, ... Zaslavsky AM (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, 32(6), 959–976. 10.1017/s0033291702006074 [PubMed: 12214795]
- Kidman R, Nachman S, Dietrich J, Liberty A, & Violari A (2018). Childhood adversity increases the risk of onward transmission from perinatal HIV-infected adolescents and youth in South Africa. *Child Abuse & Neglect*, 79, 98–106. 10.1016/j.chiabu.2018.01.028 [PubMed: 29428881]
- Lanier P, Maguire-Jack K, Lombardi B, Frey J, & Rose RA (2018). Adverse childhood experiences and child health outcomes: Comparing cumulative risk and latent class approaches. *Maternal and Child Health Journal*, 22(3), 288–297. 10.1007/s10995-017-2365-1 [PubMed: 28929420]
- Lansford JE, Alampay LP, Al-Hassan S, Bacchini D, Bombi AS, Bornstein MH, ... Zelli A (2010). Corporal punishment of children in nine countries as a function of child gender and parent gender. *International Journal Of Pediatrics*, 2010, 672780. 10.1155/2010/672780 [PubMed: 20976255]
- Lanza ST, Bray BC, & Collins LM (2013). An introduction to latent class and latent transition analysis. In Schinka JA, Velicer WF, & Weiner IB(Eds.), *Handbook of psychology*, 2nd edition (pp. 691–716). Wiley.
- Lee H, Kim Y, & Terry J (2020). Adverse childhood experiences (ACEs) on mental disorders in young adulthood: Latent classes and community violence exposure. *Preventive Medicine*, 134, 106039. 10.1016/j.ypmed.2020.106039 [PubMed: 32097756]
- Lian J, Kiely KM, & Anstey KJ (2022). Cumulative risk, factor analysis, and latent class analysis of childhood adversity data in a nationally representative sample. *Child Abuse & Neglect*, 125, 105486. 10.1016/j.chiabu.2022.105486 [PubMed: 35026439]
- Magidson JF, Dietrich J, Otworld KN, Sikkema KJ, Katz IT, & Gray GE (2017). Psychosocial correlates of alcohol and other substance use among low-income adolescents in peri-urban Johannesburg, South Africa: A focus on gender differences. *Journal of Health Psychology*, 22(11), 1415–1425. 10.1177/1359105316628739 [PubMed: 26936502]
- Meinck F, Orkin FM, & Cluver L (2019). Does free schooling affect pathways from adverse childhood experiences via mental health distress to HIV risk among adolescent girls in South Africa: A longitudinal moderated pathway model. *Journal of the International AIDS Society*, 22(3), Article e25262. 10.1002/jia2.25262 [PubMed: 30869202]
- Merrick MT, Ford DC, Ports KA, Guinn AS, Chen J, Klevens J, ... Mercy JA (2019). Vital signs: Estimated proportion of adult health problems attributable to adverse childhood experiences and implications for prevention - 25 states, 2015–2017. *MMWR Morb Mortal Wkly Rep*, 68(44), 999–1005. 10.15585/mmwr.mm6844e1 [PubMed: 31697656]
- Miedema SS, Chiang L, Annor FB, & Achia T (2023). Cross-time comparison of adverse childhood experience patterns among Kenyan youth: Violence Against Children and Youth Surveys, 2010 and 2019. *Child Abuse & Neglect*, 141.
- Ministry of Gender Equality Poverty Eradication and Social Welfare, Namibia Statistics Agency, & International Training and Education Center for Health at the University of Washington. (2020). Violence against children and youth in Namibia: Findings from the violence against children and youth survey, 2019 (full report). Government of the Republic of Namibia.
- Ministry of Labour and Social Protection of Kenya, D. o. C. s. S. (2019). Violence against Children in Kenya: Findings from a National Survey, 2019.
- Ministry of Social Development of Lesotho, ICAP, & Centers for Disease Control and Prevention. (2020). Violence against children and youth survey, 2018 (Ministry of Social Development of Lesotho).

- Ministry of Women Family and Children, National Program for the Care of Orphans and Other Children Made Vulnerable by HIV, National Institute of Statistics, & Centers for Disease Control and Prevention (CDC). (2019). Violence against children and youth in Cote d'Ivoire: Findings from a National Survey, 2018 (F. a. C. Ministry of Women).
- Murray LK, Kane JC, Glass N, Skavenski van Wyk S, Melendez F, Paul R, ... Bolton P (2020). Effectiveness of the common elements treatment approach (CETA) in reducing intimate partner violence and hazardous alcohol use in Zambia (VATU): A randomized controlled trial. *PLoS Medicine*, 17(4), Article e1003056. 10.1371/journal.pmed.1003056 [PubMed: 32302308]
- Muthén LK, & Muthén BO (1998–2017). *Mplus user's guide*. Muthén & Muthén: Eighth Edition.
- Nguyen KH, Kress H, Villaveces A, & Massetti GM (2019). Sampling design and methodology of the violence against children and youth surveys. *Injury Prevention*, 25(4), 321–327. 10.1136/injuryprev-2018-042916 [PubMed: 30472679]
- Prochaska JJ, Sung HY, Max W, Shi Y, & Ong M (2012). Validity study of the K6 scale as a measure of moderate mental distress based on mental health treatment need and utilization. *International Journal of Methods in Psychiatric Research*, 21(2), 88–97. 10.1002/mpr.1349 [PubMed: 22351472]
- Ramaiya A, Zimmerman L, Mafuta E, Lulebo A, Chipeta E, Stones W, & Moreau C (2021). Assessing the relationship between agency and peer violence among adolescents aged 10 to 14 years in Kinshasa, Democratic Republic of Congo and Blantyre, Malawi: A cross-sectional study. *PLoS Medicine*, 18(12), Article e1003552. 10.1371/journal.pmed.1003552 [PubMed: 34898599]
- Reidy DE, Niolon PH, Estefan LF, Kearns MC, D'Inverno AS, Marker CD, & Merrick MT (2021). Measurement of adverse childhood experiences: It matters. *American Journal of Preventive Medicine*, 61(6), 821–830. 10.1016/j.amepre.2021.05.043 [PubMed: 34489139]
- Risher KA, Cori A, Reniers G, Marston M, Calvert C, Crampin A, ... Eaton JW (2021). Age patterns of HIV incidence in eastern and southern Africa: A modelling analysis of observational population-based cohort studies. *The Lancet HIV*, 8(7), e429–e439. 10.1016/S2352-3018(21)00069-2 [PubMed: 34197773]
- VanderEnde K, Chiang L, Mercy J, Shawa M, Hamela J, Maksud N, ... Hillis S (2018). Adverse childhood experiences and HIV sexual risk-taking behaviors among young adults in Malawi. *Journal of Interpersonal Violence*, 33(11), 1710–1730. 10.1177/0886260517752153 [PubMed: 29739289]
- Wang M, & Liu L (2014). Parental harsh discipline in mainland China: Prevalence, frequency, and coexistence. *Child Abuse & Neglect*, 38(6), 1128–1137. 10.1016/j.chiabu.2014.02.016 [PubMed: 24661692]
- Ward JL, Azzopardi PS, Francis KL, Santelli JS, Skirbekk V, Sawyer SM, ... Viner RM (2021). Global, regional, and national mortality among young people aged 10–24 years, 1950–2019: A systematic analysis for the global burden of disease study 2019. *The Lancet*, 398(10311), 1593–1618. 10.1016/S0140-6736(21)01546-4
- World Health Organization. (2016). *INSPIRE: Seven strategies for ending violence against children*.
- Zietz S, Kajula L, McNaughton Reyes HL, Moracco B, Shanahan M, Martin S, & Maman S (2020). Patterns of adverse childhood experiences and subsequent risk of interpersonal violence perpetration among men in Dar es Salaam, Tanzania. *Child Abuse & Neglect*, 99, 104256. 10.1016/j.chiabu.2019.104256 [PubMed: 31835233]
- Zimmerman LA, Li M, Moreau C, Wilopo S, & Blum R (2019). Measuring agency as a dimension of empowerment among young adolescents globally; findings from the Global Early Adolescent Study. *SSM Popul Health*, 8, 100454. 10.1016/j.ssmph.2019.100454 [PubMed: 31372490]

Table 1

Weighted estimates of adverse childhood experiences (ACEs), demographic characteristics and mental distress, substance use and sexual risk behaviors among male and female youth aged 19–24, Cote d'Ivoire, Kenya, Lesotho, Mozambique and Namibia Violence Against Children and Youth Surveys.

	Female (n = 7183)			Male (n = 2207)		
	Wghtd %	95 % CI	Wghtd %	95 % CI		
ACEs						
Sexual violence	14.35	12.25	16.73	7.83	5.74	10.59
Physical violence	34.70	31.85	37.83	47.01	42.39	51.68
Emotional violence	8.80	7.05	10.96	6.87	5.05	9.29
Orphanhood	26.60	23.88	29.51	22.96	20.21	25.96
Witnessed violence in the community	37.16	34.08	40.34	54.62	50.44	58.74
Witnessed interparental violence	23.38	20.95	26.01	22.55	18.91	26.65
Demographic characteristics						
Education status						
Completed primary school or less	47.17	43.40	50.97	34.51	31.44	37.70
Attended secondary school or higher	52.83	49.03	56.60	65.49	62.30	68.56
Material insecurity	41.61	38.34	44.96	41.58	37.13	46.18
Ever pregnant	61.82	58.31	65.21	–	–	–
Sexual and mental health						
No/infrequent condom use	30.05	27.21	33.06	28.09	24.01	32.56
Multiple sex partners	5.53	4.18	7.28	21.72	18.63	25.15
Mental distress	42.35	39.20	45.58	38.76	34.27	43.46
Substance use past 30 days	10.70	8.72	13.07	23.10	20.15	26.54
Binge drinking	10.25	8.34	12.53	23.30	20.37	26.52
Drug use	0.73	0.37	1.46	5.79	3.91	8.50

Table 2

Summary information for selection of latent class models of adverse childhood experiences (ACEs) among male and female youth aged 19–24, Cote d'Ivoire, Kenya, Lesotho, Mozambique and Namibia Violence Against Children and Youth Surveys.

Classes	Likelihood ratio chi-square (<i>p</i> -value)	Df	AIC	BIC	Sample-adjusted BIC	Entropy
Female (n = 7183)						
2	105.45 (<0.001)	50	42,770.61	42,860.04	42,818.73	0.49
3	71.61 (0.004)	43	42,598.75	42,736.34	42,672.78	0.67
4	53.51 (0.030)	36	42,496.86	42,682.60	42,596.80	0.58
5	35.12 (0.201)	29	42,419.78	42,653.69	42,545.64	0.62
6	21.08 (0.516)	22	42,367.28	42,649.34	42,519.05	0.66
7	12.78 (0.619)	15	42,347.23	42,677.44	42,524.91	0.69
Males (n = 2207)						
2	74.46 (0.014)	50	12,791.88	12,865.97	12,824.67	0.38
3	49.65 (0.226)	43	12,724.29	12,838.27	12,774.73	0.62
4	35.12 (0.510)	36	12,694.59	12,848.48	12,762.69	0.70
5	25.69 (0.642)	29	12,683.67	12,877.45	12,769.43	0.70
6	18.29 (0.689)	22	12,680.22	12,913.89	12,783.63	0.75
7	12.45 (0.645)	15	12,682.54	12,956.11	12,803.61	0.77

Notes. Bold indicates selected class.

Table 3

Prevalence and latent class item probabilities for a six-class model of adverse childhood experiences (ACEs) among youth, aged 19–24, Cote d'Ivoire, Kenya, Lesotho, Mozambique and Namibia Violence Against Children and Youth Surveys - Female (n = 7183).

	Witness violence + PV	PV	High adversity	CV	Orphan	Low adversity
Prevalence % (n)	7.15 (514)	16.97 (1219)	3.56 (255)	28.14 (2021)	11.82 (849)	32.37 (2325)
Item-level probabilities						
'Sexual violence	0.01	0.26	0.61	0.17	0.07	0.02
'Physical violence	1.00	0.75	1.00	0.29	0.12	0.01
'Emotional violence	0.17	0.23	0.45	0.03	0.04	0.01
'Witnessed violence in the community	0.53	0.29	0.73	0.78	0.00	0.09
'Witnessed interparental violence	0.88	0.00	0.90	0.33	0.22	0.08
'Orphanhood	0.00	0.24	0.48	0.29	1.00	0.00

Notes. PV = physical violence; CV = community violence; bold indicates probabilities >0.50.

Table 4

Prevalence and latent class item probabilities for a three-class model of adverse childhood experiences (ACEs) among youth, aged 19–24, Cote d'Ivoire, Kenya, Lesotho, Mozambique and Namibia Violence Against Children and Youth Surveys - Male (n = 2207).

	PV + CV	High adversity	Low adversity
Prevalence (n)	59.71 (1318)	1.13 (25)	39.17 (864)
Item-level probabilities			
'Sexual violence	0.12	0.79	0.02
'Physical violence	0.63	1.00	0.28
'Emotional violence	0.10	1.00	0.02
'Witnessed violence in the community	0.84	0.00	0.25
'Witnessed interparental violence	0.34	0.96	0.10
'Orphanhood	0.28	0.00	0.20

Notes. PV = physical violence; CV = community violence; bold indicates probabilities >0.50.

Table 5

Adjusted odds and predicted probabilities of mental distress, substance use and sexual risk behaviors by class membership among youth aged 19–24, Cote d'Ivoire, Kenya, Lesotho, Mozambique and Namibia Violence Against Children and Youth Surveys - Female ($n = 7033$).

	No/infrequent condom use			Multiple sex partners			Mental distress			Substance use		
	Pred Prob	Baseline Odds	95 % CI	Pred Prob	Baseline Odds	95 % CI	Pred Prob	Baseline Odds	95 % CI	Pred Prob	Baseline Odds	95 % CI
Low Adversity	0.10	0.11	0.04, 0.27	0.01	0.01	0.00, 0.11	0.15	0.18	0.09, 0.36	0.02	0.02	0.01, 0.07
	Pred Prob	aOR	95 % CI	Pred Prob	aOR	95 % CI	Pred Prob	aOR	95 % CI	Pred Prob	aOR	95 % CI
Witness Violence + PV	0.19	2.14	0.87, 5.29	0.01	0.01	0.02, 68.58	0.42	3.95	1.69, 9.23**	0.04	1.66	0.50, 5.48
PV	0.15	1.56	0.79, 3.08	0.03	3.91	0.51, 30.20	0.50	5.35	2.99, 9.59***	0.04	1.96	0.79, 4.84
High Adversity	0.13	1.34	0.53, 3.37	0.05	6.48	0.80, 52.25	0.82	24.83	7.34, 84.10***	0.05	2.41	0.57, 10.23
CV	0.10	1.04	0.51, 2.11	0.02	2.51	0.34, 18.27	0.37	3.14	1.83, 5.37***	0.03	1.25	0.45, 3.45
Orphanhood	0.11	1.10	0.46, 2.62	0.02	2.33	0.24, 22.74	0.24	1.69	0.81, 3.50	0.04	1.70	0.60, 4.83

Notes.

* $p = 0.05$;

** $p = 0.01$

*** $p = 0.001$;

all models adjusted for schooling, ever pregnant and material insecurity. All adjusted Odds Ratios (aOR) are calculated relative to the reference class (Low Adversity). Pred Prob = Predicted probability.

Table 6

Adjusted odds and predicted probabilities of mental distress, substance use and sexual risk behaviors on class membership among youth aged 19–24, Cote d'Ivoire, Kenya, Lesotho, Mozambique and Namibia Violence Against Children and Youth Surveys - Male (n = 2207).

	No/infrequent condom use			Multiple sex partners			Mental distress			Substance use		
	Pred Prob	Baseline Odds	95 % CI	Pred Prob	Baseline Odds	95 % CI	Pred Prob	Baseline Odds	95 % CI	Pred Prob	Baseline Odds	95 % CI
Low Adversity	0.52	1.11	0.49, 2.48	0.35	0.53	0.24, 1.18	0.29	0.41	0.25, 0.67	0.31	0.46	0.22, 0.95
	Pred Prob	aOR	95 % CI	Pred Prob	aOR	95 % CI	Pred Prob	aOR	95 % CI	Pred Prob	aOR	95 % CI
PV + CV	0.44	0.71	0.34, 1.49	0.38	1.17	0.57, 2.42	0.52	2.64	1.61, 4.31 ^{***}	0.62	3.54	1.58, 7.93 ^{**}

Notes.

* $p = 0.05$;

** $p = 0.01$

*** $p = 0.001$;

all models adjusted for schooling; low sample size of the High Adversity class precludes statistical comparisons, so results are not shown. All adjusted Odds Ratios (aOR) are calculated relative to the reference class (Low Adversity). Pred Prob = Predicted probability.