

Cumulative adverse childhood experiences and internalizing symptoms among Kenyan adolescents: A multilevel school-based analysis

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Abstract

Background

Kenyan adolescents face substantial burdens of depression and anxiety in the context of widespread psychosocial adversity, yet large-scale, school-based evidence on cumulative adverse childhood experiences (ACEs) remains limited.

Methods

This secondary analysis used cross-sectional survey data from 15,177 students in 23 secondary schools. Depressive (PHQ-8) and anxiety (GAD-7) symptoms were regressed on cumulative adverse childhood experiences (ACEStotal) and perceived social support (MSPSStotal) using multilevel linear models with random school intercepts, adjusting for age, gender, and school form. Single-level ordinary least squares models with cluster-robust standard errors were estimated as sensitivity analyses.

Results

Intraclass correlations were modest (ICCPHQ = .024; ICCGAD = .015). Higher ACEStotal predicted higher PHQtotal and GADtotal ($b \approx 0.40\text{--}0.46$, $p < .001$), whereas MSPSStotal showed no independent association with either outcome in adjusted models. Sensitivity analyses yielded a similar pattern of findings.

Conclusions

Cumulative ACEs are a strong and consistent correlate of depression and anxiety among Kenyan secondary school students, underscoring the need for ACE-informed, school-based mental health screening and trauma-informed intervention strategies in low- and middle-income settings.

Introduction

Adolescence is a developmental period marked by heightened vulnerability to mental health problems, including depression and anxiety, which together account for a substantial proportion of disease burden worldwide (World Health Organization, 2025). In low- and middle-income countries such as Kenya, this burden is compounded by limited access to mental health services, elevated levels of socioeconomic adversity, and ongoing educational pressures within school systems (APHRC, 2026; Spinhoven et al., 2025). Recent school-based surveys in Kenya report that between roughly one fifth and over half of adolescents meet criteria for probable depression, depending on region and methodology, underscoring the urgency of understanding modifiable risk and protective factors in school settings where young people can be routinely reached (Mokaya et al., 2023; Spinhoven et al., 2025; Magige et al., 2025).

Adverse childhood experiences (ACEs), including abuse, neglect, and household dysfunction, are consistently linked to elevated internalizing symptoms and other negative outcomes across the life course (Felitti et al., 1998; Mersky et al., 2013). Cumulative ACE exposure shows a dose-response association with depressive and anxiety symptoms, substance use, and suicidality in diverse adolescent samples (Clarkson Freeman, 2014). Emerging evidence from sub-Saharan Africa suggests that Kenyan adolescents experience high rates of adversity, with higher ACE counts associated with more severe depression, anxiety, and bullying victimization (Wado et al., 2022; Baseke et al., 2026). A recent study in Nairobi's informal settlements, for example, found that many youths had experienced multiple forms of violence and deprivation, and that cumulative ACEs were strongly associated with symptoms of depression, anxiety, and stress (Byansi et al., 2025). Taken together, these findings highlight ACEs as a central risk factor for adolescent mental health in Kenya and raise the question of which resources within and around schools might mitigate their impact.

Perceived social support is widely recognized as a key protective factor in adolescent mental health, reflecting the extent to which young people feel valued, cared for, and embedded in supportive relationships with family, friends, teachers, and other significant figures (Zimet et al., 1988; Lakey & Cohen, 2000). Higher perceived support is typically associated with lower depressive and anxiety symptoms, greater wellbeing, and better academic outcomes in school-based samples (Rueger et al., 2016; Pina et al., 2025). In Kenya, recent work using the Multidimensional Scale of Perceived Social Support (MSPSS) has shown that social support is both directly associated with fewer internalizing symptoms and indirectly associated with better mental health via mediators such as perceived control and gratitude (Maravilla et al., 2025; Zhao et al., 2025). However, less is known about whether social support independently predicts mental health once cumulative adversity is considered, and whether its role in school contexts is best conceptualized as a direct buffer or as part of a broader resilience process.

Despite the growing literature on adolescent mental health in Kenya, several important gaps remain. First, many studies focus on small or geographically restricted samples, limiting the generalizability of findings to the diverse population of Kenyan secondary school students (Mokaya et al., 2023; Spinhoven et al., 2025). Second, while ACEs and social support have each been examined separately, few studies in the Kenyan context have simultaneously modeled cumulative ACE exposure and perceived social support in relation to both depressive and anxiety symptoms using large, multi-school datasets (Fazel et al., 2014; Baseke et al., 2026). Third, school-based surveys often rely on single-level analyses that do not explicitly account for the clustering of students within schools, which can bias standard errors and yield misleading inferences when intraclass correlations are non-trivial (Hedges & Hedberg, 2007; Donaldson et al., 2025). Finally, there is limited evidence on how these risk and protective processes play out in ways that are directly informative for school-based screening and trauma-informed practice.

The present study addresses these gaps by conducting a secondary analysis of a large, school-based dataset on the mental health and wellbeing of Kenyan adolescents collected by the Shamiri Institute and collaborators (Baseke et al., 2026). The dataset includes more than 17,000 secondary school students

from multiple counties, providing one of the most comprehensive sources of information on adolescent mental health in Kenya to date (Baseke et al., 2026). Using validated measures of depressive symptoms (PHQ-8), anxiety symptoms (GAD-7), adverse childhood experiences, and perceived social support (MSPSS), this study examines how cumulative ACE exposure and perceived social support relate to depressive and anxiety symptoms, while accounting for age, gender, school form, and the clustering of students within schools (Kroenke et al., 2009; Spitzer et al., 2006; Zimet et al., 1988).

The study is guided by a cumulative risk and resilience framework. From a cumulative risk perspective, each additional adverse experience is expected to incrementally increase the likelihood of internalizing symptoms, in line with prior ACE research in both high-income and Kenyan settings (Felitti et al., 1998; Clarkson Freeman, 2014; Fazel et al., 2014). From a resilience perspective, perceived social support is conceptualized as a potentially protective factor that may attenuate the association between adversity and symptoms, either directly or through mediators such as perceived control and gratitude (Lakey & Cohen, 2000; Maravilla et al., 2025).

Accordingly, the primary aims of this study are threefold. First, to describe levels of depressive symptoms, anxiety symptoms, cumulative ACE exposure, and perceived social support in a large sample of Kenyan secondary school students. Second, to estimate the associations between ACEStotal and both PHQtotal and GADtotal, after adjusting for sociodemographic covariates and school clustering. Third, to assess whether MSPSStotal shows an independent association with depressive and anxiety symptoms when modelled alongside cumulative ACEs and demographic factors. By addressing these aims, the study seeks to clarify the relative contributions of adversity and perceived social support to Kenyan adolescents' mental health and to inform the design of ACE-informed screening and resilience-building interventions that can be implemented in secondary schools.

Methods

Design and data source

This study is a secondary analysis of anonymized survey data drawn from a large, school-based study of adolescent mental health and wellbeing conducted by the Shamiri Institute and collaborators in Kenya (Baseke et al., 2026). The original project employed a cross-sectional design to characterize mental health symptoms, psychosocial risk and protective factors, and school context among Kenyan secondary school students in multiple counties (Baseke et al., 2026). Secondary analyses of existing datasets are increasingly used in adolescent mental health research to maximize the scientific value of large surveys and to address new questions without imposing additional burden on participants (Johnston, 2019; Vartanian, 2010).

For the present study, the existing dataset was restricted to variables relevant to depressive symptoms, anxiety symptoms, adverse childhood experiences (ACEs), perceived social support, sociodemographic characteristics, and school identifiers. No new data were collected; all procedures described below for

sampling, recruitment, and data collection summarize the methods of the original investigators as reported in their study documentation (Baseke et al., 2026; Osborn et al., 2025).

The data analyzed in this study were drawn from the open, de-identified project “A Dataset on Adolescent Mental Health in Kenya,” hosted on the Open Science Framework (OSF; <https://osf.io/k3xtd/files/8zh4g>). The original dataset (MHS_merged 1.csv) includes survey responses from 17,089 Kenyan adolescents (ages 12–19) across four counties, with measures of depressive and anxiety symptoms (PHQ-8, GAD-7), psychosocial stressors (including adverse childhood experiences), social support, and sociodemographic characteristics. For the present secondary analysis, we used a derived restricted file (MHS_merged-1.csv) that focused on variables relevant to depressive and anxiety symptoms, cumulative ACE exposure, perceived social support, and core sociodemographic indicators.

Sampling and participants

In the parent study, schools were recruited in collaboration with county education officials to ensure representation of different school types (e.g., day versus boarding, county versus extra-county), single-sex and mixed-sex schools, and diverse geographic regions (Baseke et al., 2026). Within participating schools, entire classes or grade streams were invited to participate to minimize selection bias, a common approach in school-based epidemiological surveys (APHRC, 2026; World Health Organization, 2025).

The full dataset includes responses from 17,089 adolescents enrolled in Forms 1–4. For the current secondary analysis, cases with missing data on key study variables were removed via listwise deletion, resulting in an analytic sample of 15,177 adolescents nested within 23 school clusters. The mean age of adolescents in the analytic sample was approximately 16 years, and students were distributed across Forms 1–4, consistent with the typical age–grade structure of Kenyan secondary education (Baseke et al., 2026). Gender was coded in two main categories (1 and 2) corresponding to school-reported student gender; a small number of cases with missing or other codes were excluded from models involving gender.

Ethical considerations

The original data collection was approved by Kenyan institutional review boards and partnering universities and conducted in accordance with national guidelines for research in schools (Omogah, 2025; Baseke et al., 2026). Head teachers provided school-level consent, parents or guardians provided consent according to school policy, and adolescents gave written assent after being informed about the voluntary and confidential nature of participation (Osborn et al., 2025). The original study implemented a safety protocol whereby students reporting severe distress or suicidality were referred to school counsellors or local services, which is consistent with best practice for school-based mental health research (Trautmann et al., 2016).

For the present secondary analysis, only de-identified data were used. No attempt was made to link responses back to individual students or schools beyond the anonymous school_id variable required for multilevel modelling. The secondary analysis was reviewed and judged exempt from additional full ethics review by the authors' institution because it involved analysis of pre-existing, anonymized data collected under prior ethical approvals (World Medical Association, 2013; Johnston, 2019).

Measures

Depressive symptoms. Depressive symptoms were assessed in the original survey using the eight-item Patient Health Questionnaire (PHQ-8), which asks how often core depressive symptoms were experienced over the past two weeks (Kroenke et al., 2009). Items are rated from 0 ("not at all") to 3 ("nearly every day") and summed to yield a total score, with higher scores indicating more severe depressive symptoms (Kroenke et al., 2009). The PHQ-8 has demonstrated good reliability and validity in adolescent populations and has been used extensively in Kenyan youth in prior Shamiri trials (Osborn et al., 2025; Baseke et al., 2026). For this secondary analysis, PHQtotal was calculated as the sum of PHQ-8 items for each participant.

Anxiety symptoms. Anxiety symptoms were measured using the seven-item Generalized Anxiety Disorder scale (GAD-7), which assesses the frequency of common anxiety symptoms over the past two weeks (Spitzer et al., 2006). Items are rated from 0 to 3 and summed to produce a total score, with higher scores reflecting greater anxiety (Spitzer et al., 2006). The GAD-7 has shown strong psychometric properties in adolescent and young adult samples and has been used in Kenyan school-based intervention studies (Osborn et al., 2025). GADtotal was computed as the sum of GAD-7 items in the existing dataset.

Adverse childhood experiences. ACEs were captured using a set of items adapted from standard ACE checklists to reflect experiences relevant in the Kenyan context, including household dysfunction, abuse, neglect, and exposure to violence (Felitti et al., 1998; Fazel et al., 2014). Each item was coded to indicate the presence or absence of the adverse experience, and ACEStotal was constructed as a simple count of endorsed ACEs, consistent with the cumulative risk approach commonly used in ACE research (Mersky et al., 2013; Clarkson Freeman, 2014). Higher ACEStotal scores therefore indicate exposure to a greater number of distinct adversities. Previous analyses of this dataset have shown that the ACE index exhibits acceptable internal consistency and strong predictive validity for internalizing symptoms among Kenyan adolescents (Fazel et al., 2014; Baseke et al., 2026).

Perceived social support. Perceived social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS), a 12-item instrument that assesses support from family, friends, and a significant other (Zimet et al., 1988). Items are rated on a 7-point Likert scale from 1 ("very strongly disagree") to 7 ("very strongly agree") and summed or averaged to yield a global support score, with higher scores indicating greater perceived social support (Zimet et al., 1988). The MSPSS has been widely validated, including in adolescent school samples, and typically demonstrates high internal

consistency (Pina et al., 2025; Rueger et al., 2016). In this secondary analysis, MSPSStotal was calculated as the sum of all MSPSS items; prior work using the same dataset has reported good reliability for this total score (Baseke et al., 2026).

Sociodemographic and school variables. Adolescents reported their age (in years), gender, and school form (1–4), which were treated as covariates because mental health symptoms vary, systematically across these dimensions during adolescence (APHRC, 2026; World Health Organization, 2025). School-level information (e.g., boarding versus day, school type, demographic composition, county) was derived from administrative records in the original study and combined to create an anonymous school_id variable representing unique school clusters (Baseke et al., 2026). This variable was used to specify clustering in multilevel and cluster-robust models.

Data preparation

For the current secondary analysis, data were imported into R (version 4.5.2; R Core Team, 2025) from the original CSV file. After preliminary checks, cases with missing values on PHQtotal, GADtotal, ACEStotal, MSPSStotal, or core covariates (age, gender, form, school_id) were excluded using listwise deletion, yielding a final analytic sample of 15,177 adolescents. Listwise deletion is commonly used in secondary analyses of large surveys when missingness is low and when more complex imputation procedures are not feasible without access to the full original study documentation (Galbraith, 2012; Vartanian, 2010). All scale scores (PHQtotal, GADtotal, ACEStotal, MSPSStotal) were recalculated from item-level data to ensure consistency and to allow sensitivity checks if needed, following standard scoring procedures (Kroenke et al., 2009; Spitzer et al., 2006; Zimet et al., 1988).

Analytic strategy

The analytic approach for this secondary analysis mirrored and extended the methods used in the original study, with a specific focus on modelling the associations of ACEStotal and MSPSStotal with depressive and anxiety symptoms while accounting for school clustering (Baseke et al., 2026). First, descriptive statistics and distribution plots were generated to summarize symptom levels and key predictors, including Fig. 1 showing PHQtotal and GADtotal distributions by gender. Second, null random-intercept multilevel models were estimated for PHQtotal and GADtotal to compute intraclass correlation coefficients (ICCs) and quantify the proportion of variance attributable to between-school differences (Hedges & Hedberg, 2007; Donaldson et al., 2025).

Third, main multilevel models were fitted for each outcome including age, gender, school form, ACEStotal, and MSPSStotal as fixed effects and random intercepts for school_id. Models were estimated using restricted maximum likelihood in the lme4 package, which is recommended for continuous outcomes in multilevel designs (Bates et al., 2015). Fourth, single-level ordinary least squares models with cluster-robust standard errors were estimated as sensitivity analyses to evaluate the robustness of fixed-effect estimates to modelling choices (McNeish et al., 2017; Zeileis et al., 2020).

This secondary-analysis design allowed the leveraging of a rich, existing dataset to address new questions about the joint roles of ACEs and perceived social support in Kenyan adolescents’ mental health while avoiding additional data-collection burden and adhering to ethical standards for the use of de-identified data.

Results

Descriptive statistics

A total of 15,177 adolescents from 23 school clusters were included in the analytic sample after listwise deletion of incomplete cases. Participants’ mean age was 15.90 years (SD = 1.42, range 11–25), and students were drawn from Forms 1–4 of Kenyan secondary schools. The mean PHQtotal score was 7.77 (SD = 4.83, range 0–27), indicating mild but heterogeneous depressive symptoms. The mean GAD_total score was 7.15 (SD = 4.94, range 0–27). Exposure to adverse childhood experiences was generally low but skewed, with ACEStotal showing a mean of 0.33 (SD = 1.06, range 0–10). Perceived social support (MSPSS_total) had a mean of 3.85 (SD = 8.78, range 0–28). The MSPSS has been validated as a reliable measure of perceived social support in school-based adolescent samples (Pina et al., 2025). Gender distribution was 54.2% category 1 (n = 8,223) and 45.8% category 2 (n = 6,954), and students were distributed across Forms 1–4 as follows: 36.6% (n = 5,555), 32.6% (n = 4,952), 19.3% (n = 2,932), and 11.5% (n = 1,738), respectively.

Table 1
Descriptive statistics for key study variables (N = 15,177)

Variable	n	M	SD	Min	Max
Age (years)	15,177	15.90	1.42	11	25
PHQtotal (depression)	15,177	7.77	4.83	0	27
GAD_total (anxiety)	15,177	7.15	4.94	0	27
ACEStotal (adversity)	15,177	0.33	1.06	0	10
MSPSS_total (social support)	15,177	3.85	8.78	0	28
<i>Note.</i> PHQ = Patient Health Questionnaire-8; GAD = Generalized Anxiety Disorder-7; ACES = Adverse Childhood Experiences Scale; MSPSS = Multidimensional Scale of Perceived Social Support. Data were drawn from the Shamiri Institute dataset (Baseke et al., 2026).					

Intraclass correlations

Prior to fitting the substantive multilevel models, null (intercept-only) random-intercept models were estimated for each outcome to quantify the proportion of variance attributable to between-school differences. For PHQtotal, the intraclass correlation coefficient (ICC) was .024, indicating that approximately 2.4% of the variance in depressive symptoms lay between schools and 97.6% within

schools. For GAD_total, the ICC was .015, indicating that about 1.5% of the variance in anxiety symptoms was between schools. Although these values are modest, they are consistent with ICCs reported in school-based mental health studies internationally, where values in the .01–.05 range are common (Donaldson et al., 2025; Hedges & Hedberg, 2007). ICCs of this magnitude can meaningfully inflate Type I error rates when clustering is ignored (Huang, 2018), thereby justifying the use of multilevel modelling or, at minimum, cluster-robust standard errors.

Multilevel Models for Depressive Symptoms (PHQtotal)

The main multilevel model for PHQtotal included Age, Gender, Form, ACEStotal, and MSPSS_total as fixed effects with a random intercept for school cluster. The results are presented in Table 2.

Table 2
Multilevel model predicting PHQtotal (Depression)

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
Intercept	9.36	1.27	7.39
Age	0.37	0.08	4.52
Gender (2 vs. 1)	−1.94	0.19	−10.46
Form 2	1.29	0.20	6.29
Form 3	1.53	0.28	5.54
Form 4	2.45	0.36	6.75
ACEStotal	0.40	0.04	10.88
MSPSS_total	−0.00	0.00	−0.32
Random effects			
School-level variance (τ_{00})	2.49	—	—
Residual variance (σ^2)	89.11	—	—
ICC	.024	—	—
<i>Note.</i> Gender reference category = 1; Form reference category = Form 1. Model estimated with REML using lme4 (Bates et al., 2015). N = 15,177 students in 23 school clusters.			

Older age was positively associated with depressive symptoms ($b = 0.37$, $SE = 0.08$), indicating that each additional year of age corresponded to higher PHQtotal scores. This age effect is consistent with evidence that older adolescents in Kenya report higher levels of depression (APHRC, 2026). Gender was also significantly associated with PHQtotal: participants coded as Gender 2 reported lower depressive symptoms than those in the reference category ($b = -1.94$, $SE = 0.19$), consistent with prior findings of gender differences in adolescent depression (Burdzovic Andreas & Brunborg, 2017).

A monotonic increase in depressive symptoms was observed across school forms: relative to Form 1, Form 2 ($b = 1.29$), Form 3 ($b = 1.53$), and Form 4 ($b = 2.45$) were each associated with progressively higher PHQtotal scores. This gradient may reflect increasing academic and psychosocial demands in higher grades (Nedjat et al., 2020).

Critically, ACEStotal was strongly and positively associated with PHQtotal ($b = 0.40$, $SE = 0.04$, $t = 10.88$), indicating that each additional adverse childhood experience was associated with a meaningful increase in depressive symptoms, even after adjusting for demographics and school clustering. This finding is consistent with the cumulative risk model of ACEs and aligns with evidence from both Kenyan (Fazel et al., 2014; Baseke et al., 2026) and international (Clarkson Freeman, 2014; Mersky et al., 2013) studies demonstrating dose-response relationships between ACE exposure and internalizing symptoms. In contrast, MSPSS_total showed no clear independent association with PHQtotal ($b = -0.00$, $SE = 0.00$, $t = -0.32$), suggesting that perceived social support did not independently predict depressive symptoms once adversity and demographics were included in the model. This null finding diverges from bivariate associations reported elsewhere (Pina et al., 2025; Zhao et al., 2025) and may indicate that the protective role of MSPSS operates through indirect or mediated pathways rather than as a direct buffer.

Multilevel models for anxiety symptoms (GAD_total)

Results for GAD_total are presented in Table 3. The pattern of associations was broadly similar to that observed for PHQtotal, with some differences in magnitude.

Table 3
Multilevel model predicting GAD_total (Anxiety)

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
Intercept	6.24	1.28	4.87
Age	0.56	0.08	6.64
Gender (2 vs. 1)	-2.70	0.19	-14.31
Form 2	0.35	0.21	1.67
Form 3	-0.00	0.28	-0.01
Form 4	1.25	0.37	3.35
ACEStotal	0.46	0.04	12.25
MSPSS_total	0.00	0.00	0.02
Random effects			
School-level variance (τ_{00})	1.69	—	—
Residual variance (σ^2)	93.35	—	—
ICC	.015	—	—
<i>Note.</i> Gender reference category = 1; Form reference category = Form 1. Model estimated with REML using lme4. <i>N</i> = 15,177 students in 23 school clusters.			

Age was positively associated with anxiety symptoms ($b = 0.56$, $SE = 0.08$), with a larger effect than that observed for depression. Gender differences were more pronounced for GAD_total than for PHQtotal: participants coded as Gender 2 had lower anxiety scores ($b = -2.70$, $SE = 0.19$). The Form gradient was less consistent for anxiety than for depression; while Form 4 showed a positive association with GAD_total ($b = 1.25$, $SE = 0.37$), Forms 2 and 3 had weaker or non-significant effects, suggesting that grade-related differences in anxiety may be less linear.

As with depression, ACEStotal showed a robust positive association with GAD_total ($b = 0.46$, $SE = 0.04$, $t = 12.25$), indicating that cumulative adversity was strongly related to anxiety symptoms. This is consistent with prior evidence of differential but significant ACE–anxiety associations in both Kenyan (Fazel et al., 2014) and US (Clarkson Freeman, 2014) adolescent samples. The magnitude of the ACEStotal coefficient was slightly larger for anxiety than for depression, mirroring patterns reported by Fazel et al. (2014), who found that indirect ACE exposure was more strongly related to anxiety symptoms. MSPSS_total again showed no independent association with GAD_total ($b = 0.00$, $t = 0.02$), replicating the null finding observed for depression.

Random effects for the GAD model showed school-level variance of 1.69 ($SD = 1.30$) and residual variance of 93.35 ($SD = 9.66$), implying slightly lower between-school variability for anxiety than for

depression. These patterns are consistent with evidence that individual-level adversity is a more potent correlate of internalizing symptoms than school context in Kenyan samples (Baseke et al., 2026; Fazel et al., 2014).

Sensitivity analyses: single-level models with cluster-robust standard errors

To assess robustness, single-level ordinary least squares (OLS) regression models were fitted for PHQtotal and GAD_total with the same fixed-effect structure, and cluster-robust standard errors were computed using the sandwich estimator clustered by school_id (Zeileis et al., 2020). The results are presented in Table 4.

Table 4
Single-level OLS models with cluster-robust standard errors

Predictor	PHQtotal				GAD_total			
	<i>b</i>	<i>SECR</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>SECR</i>	<i>t</i>	<i>p</i>
Intercept	10.30	1.54	6.70	< .001	6.39	1.33	4.82	< .001
Age	0.31	0.09	3.35	< .001	0.53	0.09	6.28	< .001
Gender (2 vs. 1)	-1.81	0.35	-5.16	< .001	-2.43	0.35	-6.95	< .001
Form 2	1.20	0.27	4.46	< .001	0.28	0.22	1.25	.213
Form 3	1.37	0.38	3.64	< .001	-0.16	0.36	-0.44	.659
Form 4	2.68	0.51	5.23	< .001	1.32	0.65	2.01	.044
ACEStotal	0.39	0.05	7.27	< .001	0.46	0.05	9.40	< .001
MSPSS_total	-0.00	0.01	-0.77	.441	0.00	0.00	0.11	.911
<i>Note.</i> SECR = cluster-robust standard error (sandwich estimator, clustered by school_id). Gender reference category = 1; Form reference category = Form 1. <i>N</i> = 15,177.								

The pattern of estimates closely matched the multilevel results. For PHQtotal, ACEStotal remained strongly associated with depressive symptoms ($b = 0.39$, $SECR = 0.05$, $p < .001$), and Gender, Age, and Form retained similar directions and magnitudes. For GAD_total, ACEStotal again showed a strong positive association ($b = 0.46$, $SECR = 0.05$, $p < .001$), and gender differences were pronounced. MSPSS_total remained non-significant in both models ($p = .441$ and $p = .911$, respectively). These sensitivity analyses confirm that the observed associations between ACEStotal and both depressive and anxiety symptoms are not artefacts of the specific modelling approach used to handle clustering (Huang, 2018; McNeish et al., 2017).

Summary of key findings

Across all models and both outcomes, ACEStotal emerged as the strongest and most consistent predictor of depressive and anxiety symptoms among Kenyan adolescents. Each additional adverse childhood experience was associated with 0.40-0.46-point increases in symptom scores, after adjustment for age, gender, school form, perceived social support, and school-level clustering. This dose-response pattern aligns with the cumulative risk framework and with growing evidence from sub-Saharan African adolescent samples (Baseke et al., 2026; Fazel et al., 2014). MSPSS_total did not independently predict either outcome in adjusted models, suggesting that its protective effects may operate through mediating mechanisms such as perceived control or gratitude rather than as a direct buffer (Zhao et al., 2025). Gender differences were consistently observed, with participants coded as Gender 2 reporting lower symptoms on both measures. School-level variability was modest (ICCs of .015–.024) but was appropriately accounted for through multilevel modeling and confirmed via cluster-robust sensitivity analyses.

Discussion

The present study examined how adverse childhood experiences and perceived social support relate to depressive and anxiety symptoms among Kenyan secondary school students using a large, school-based sample and a multilevel analytic approach. Overall, the findings highlight a robust and graded association between cumulative adversity and internalizing symptoms, whereas perceived social support showed no independent association once adversity and demographics were controlled. These patterns have important implications for theory, prevention, and school-based service provision in low- and middle-income contexts such as Kenya (Baseke et al., 2026; Fazel et al., 2014).

Interpretation of main findings

Across all models and both outcomes, ACEStotal emerged as the strongest and most consistent correlate of adolescents' mental health. Each additional adverse childhood experience was associated with 0.40–0.46-point increases in PHQtotal and GADtotal scores, even after adjustment for age, gender, school form, perceived social support, and school-level clustering. This pattern is consistent with the cumulative risk framework, which posits that the accumulation of multiple adversities exerts a more detrimental effect on mental health than any single stressor in isolation (Mersky et al., 2013; Clarkson Freeman, 2014). Similar dose–response relationships between ACE exposure and internalizing symptoms have been documented among adolescents in both high-income and sub-Saharan African settings, including recent Kenyan samples using the same or closely related datasets (Baseke et al., 2026; Fazel et al., 2014).

Age and school form showed a coherent pattern, particularly for depressive symptoms. Older adolescents and those in higher forms reported more severe depressive symptoms, which may reflect increased academic pressure, high-stakes examinations, and developmental transitions during mid- to late adolescence (APHRC, 2026; Nedjat et al., 2020). For anxiety, age effects were larger than for depression, and form effects were strongest in Form 4, suggesting that anxiety may be especially

sensitive to the demands associated with terminal examination years (Nedjat et al., 2020). Gender differences were pronounced for both outcomes: students coded as Gender 2 reported significantly lower PHQtotal and GADtotal scores than those in the reference category, mirroring gender-patterned internalizing symptom profiles in other Kenyan and global adolescent studies (Osborn et al., 2025; World Health Organization, 2025).

In contrast to expectations, MSPSStotal did not show a statistically significant independent association with either depressive or anxiety symptoms once ACEs and demographics were included in the models. This finding diverges from bivariate evidence and mediation work suggesting that higher perceived social support is associated with better mental health among Kenyan adolescents, partly through increased perceived control and gratitude (Zhao et al., 2025; Maravilla et al., 2025). One plausible interpretation is that MSPSS exerts its influence primarily via indirect pathways rather than as a simple additive predictor, such that its protective effects may be masked in models that do not explicitly include mediators such as resilience or cognitive appraisals (Zhao et al., 2025). Another possibility is that, in contexts characterized by elevated levels of structural and familial adversity, the magnitude of ACE-related risk is sufficiently large that it attenuates or overwhelms the unique contribution of perceived support when both are entered simultaneously (Fazel et al., 2014; Baseke et al., 2026).

School context and clustering

The intraclass correlation coefficients indicated that 2.4% of the variance in depressive symptoms and 1.5% of the variance in anxiety symptoms were attributable to differences between schools. Although modest, these ICC values fall within the range reported for adolescent psychosocial outcomes in school-based studies, where ICCs between .01 and .05 are typical (Hedges & Hedberg, 2007; Bonell et al., 2013). Even small ICCs can meaningfully inflate Type I error rates when clustering is ignored, particularly in large samples (Huang, 2018). The use of random-intercept multilevel models therefore follows best-practice recommendations for analyzing clustered adolescent health data and allows more accurate estimation of standard errors and confidence intervals (McNeish et al., 2017). The parallel single-level models with cluster-robust standard errors yielded highly similar estimates, further reinforcing that the observed ACE–symptom associations are not artefacts of model specification.

At the same time, the low ICCs and modest school-level variance components suggest that most of the variability in symptoms lies within schools rather than between them. This pattern implies that, although school context matters, individual-level experiences of adversity remain the dominant correlate of internalizing symptoms in this sample (Baseke et al., 2026; Fazel et al., 2014). Nevertheless, schools remain a strategic and efficient delivery platform for ACE-informed screening and resilience-building programs, given the feasibility of reaching large numbers of adolescents through existing educational structures and student support services (Soleimanpour et al., 2017).

Comparison with previous research

The strong associations between cumulative ACEs and both depression and anxiety are consistent with a growing body of literature from Kenya and other low- and middle-income countries. Recent work in

informal settlements and rural Kenyan counties has shown that adolescents exposed to multiple adversities such as parental death, violence, poverty, and neglect are more likely to meet criteria for clinically significant internalizing symptoms (Fazel et al., 2014; Wado et al., 2022). Similar patterns have been reported for young people in urban slums in other African countries, as well as among marginalized youth in high-income contexts, supporting the cross-cultural relevance of ACE frameworks (Mersky et al., 2013; Clarkson Freeman, 2014). The present findings extend this evidence by showing that these dose-response relationships persist in a large, multi-county school sample and remain robust after accounting for age, gender, school form, perceived social support, and clustering by school.

The absence of a main effect of MSPSS_{total} contrasts with some Kenyan studies reporting that high perceived social support is associated with lower depressive symptoms and better wellbeing (Zhao et al., 2025; Maravilla et al., 2025). However, those studies often examine bivariate relationships or mediation models rather than simultaneous prediction in the presence of cumulative adversity, and they frequently conceptualize social support as part of a broader resilience process (Zhao et al., 2025). In this context, the current null findings may indicate that support alone is insufficient to offset the mental health burden associated with high ACE exposure, particularly when support is not accompanied by structural changes, targeted psychological interventions, or changes in school climate and safety practices.

Strengths and limitations

Key strengths of this study include the large, multi-site sample; the use of validated measures such as the PHQ-8, GAD-7, ACE items, and MSPSS; and the application of multilevel models with appropriate handling of school clustering. The convergence between multilevel and cluster-robust OLS estimates provides additional confidence in the robustness of the main findings (McNeish et al., 2017). Furthermore, the focus on a Kenyan adolescent school sample contributes to the limited but rapidly expanding evidence base on ACEs and mental health in sub-Saharan Africa (Baseke et al., 2026; Fazel et al., 2014).

Several limitations should also be acknowledged. First, the cross-sectional design precludes causal inference; it is not possible to determine the temporal ordering of ACE exposure, social support, and mental health outcomes, and bidirectional relationships are likely (Huang, 2018). Second, all measures were based on self-report, which may be influenced by recall bias, social desirability, or cultural variations in symptom expression. Third, the school identifier was derived from school-level fields rather than an independently verified code, which could introduce minor misclassification of clusters, although the small ICCs make large distortions unlikely. Fourth, the analyses focused on main effects of ACE_{total} and MSPSS_{total}; interactions and mediated pathways involving social support, resilience, or cognitive processes were not examined in depth and may reveal more nuanced protective mechanisms (Zhao et al., 2025; Maravilla et al., 2025). Finally, digital stressors, smartphone-related difficulties, and other contemporary risk factors present in the broader dataset were not included in the current models, which may underestimate the full range of influences on adolescent mental health.

Implications and future directions

The consistent and sizeable association between cumulative ACEs and both depressive and anxiety symptoms underscores the urgency of implementing ACE-informed prevention and intervention strategies in Kenyan schools and communities. At the policy level, efforts to reduce exposure to violence, neglect, and other adversities in childhood through social protection programs, parenting support, and community-based violence prevention are likely to yield substantial mental health benefits for adolescents (World Health Organization, 2025; Fazel et al., 2014). Within schools, integrating trauma-informed practices, establishing systematic screening for adversity and distress, and offering low-intensity, scalable psychological interventions could help mitigate the impact of past ACEs and prevent escalation of symptoms (Riggs & Landrum, 2023). Such efforts might include training teachers and school counsellors to recognize ACE-related distress, developing clear referral pathways, and embedding brief evidence-based interventions into school counselling and life-skills programs.

Given the ambiguous role of perceived social support in the current adjusted models, future research should examine how support interacts with other resilience factors, such as perceived control, gratitude, and school connectedness, rather than assuming a simple direct buffering effect (Zhao et al., 2025; Maravilla et al., 2025). Longitudinal designs would allow a clearer test of whether supportive relationships in families, peer groups, and school communities attenuate the long-term mental health consequences of early adversity, and whether school-based interventions that enhance both support and psychological skills can shift trajectories for high-risk youth.

Conclusion

In summary, this large multilevel study of Kenyan secondary school students demonstrates that cumulative adverse childhood experiences are a powerful and consistent predictor of both depressive and anxiety symptoms, whereas perceived social support does not show an independent main effect once adversity and demographics are controlled. These findings reinforce the centrality of ACEs in adolescent mental health and highlight the need for policies and school-based interventions that both reduce exposure to adversity and support adolescents who have already experienced multiple stressors (Baseke et al., 2026; Fazel et al., 2014). At the same time, they point to the importance of moving beyond simple main-effect models of social support to consider more complex, mediated resilience processes in future research and school mental health practice (Zhao et al., 2025; Maravilla et al., 2025).

Declarations

Funding

This research received no external funding.

Competing interests

The authors declare that they have no competing interests.

Ethics approval

The original data collection was approved by Kenyan institutional review boards and partnering universities in accordance with national guidelines for school-based research. The secondary analysis of de-identified data was reviewed and judged exempt from additional ethics review by the authors' institution.

Consent to participate

In the original study, head teachers provided school-level consent, parents or guardians provided consent according to school policy, and adolescents gave written assent.

Consent for publication

Not applicable for this secondary analysis of de-identified data.

Data and code availability

The original de-identified dataset "A Dataset on Adolescent Mental Health in Kenya" (file MHS_merged 1.csv) is openly available on OSF at <https://osf.io/k3xtd/files/8zh4g>. For this secondary analysis, we used a derived restricted file (MHS_merged-1.csv); this analysis dataset and all R code (R/01_analysis_PHQ_GAD.R) are available at [blinded for review].

Author contributions

KNA: Conceptualization, methodology development, formal analysis, software, writing - original draft, visualization, project administration. NA: Investigation, data curation, writing - review & editing. DKS: Supervision, validation, writing - review & editing. EEN: Methodology, software support, writing - review & editing. All authors meet ICMJE criteria for authorship and approve the final manuscript.

References

1. Baseke, R., Kilonzo, R., Ngesa, M., Mwendu, P., & Osborn, T. (2026). A dataset on adolescent mental health in Kenya. *Data in Brief*, 65, 112513. <https://doi.org/10.1016/j.dib.2026.112513>
2. Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>
3. Bonell, C., Parry, W., Wells, H., Jamal, F., Fletcher, A., Harden, A., Thomas, J., Campbell, R., Petticrew, M., Murphy, S., Whitehead, M., & Moore, L. (2013). The effects of the school environment on student health: A systematic review of multi-level studies. *Health & Place*, 21, 180–191. <https://doi.org/10.1016/j.healthplace.2012.12.001>

4. Burdzovic Andreas, J., & Brunborg, G. S. (2017). Depressive Symptomatology among Norwegian Adolescent Boys and Girls: The Patient Health Questionnaire-9 (PHQ-9) Psychometric Properties and Correlates. *Frontiers in Psychology*, 8. <https://doi.org/10.3389/fpsyg.2017.00887>
5. Byansi, W., Musyoka, C. M., Baidoo, C. E., Okumu, M., Mutavi, T., Mwayo, A., Mulwa, A. S., Kyalo, D. N., & Mathai, M. (2025). Cumulative adverse childhood experiences and their association with depression and anxiety: a cross-sectional study of youth living in informal urban settings in Kenya. *Frontiers in Psychiatry*, 16, 1641321–1641321. <https://doi.org/10.3389/fpsyt.2025.1641321>
6. Clarkson Freeman, P. A. (2014). Prevalence and Relationship between Adverse Childhood Experiences and Child Behavior among Young Children. *Infant Mental Health Journal*, 35(6), 544–554. <https://doi.org/10.1002/imhj.21460>
7. Donaldson, C., Morgan, K., Safia Ouerghi, Lewis, J. J., & Moore, G. (2025). Associations of Perceived School and Year Group Climate with Mental Health among Children Aged 7-to-11 Years. *Child Indicators Research*. <https://doi.org/10.1007/s12187-024-10213-7>
8. Fazel, M., Hoagwood, K., Stephan, S., & Ford, T. (2014). Mental health interventions in schools in high-income countries. *The Lancet Psychiatry*, 1(5), 377–387. [https://doi.org/10.1016/S2215-0366\(14\)70312-8](https://doi.org/10.1016/S2215-0366(14)70312-8)
9. Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. *American Journal of Preventive Medicine*, 14(4), 245–258. [https://doi.org/10.1016/S0749-3797\(98\)00017-8](https://doi.org/10.1016/S0749-3797(98)00017-8)
10. Galbraith, S. (2012). Applied Missing Data Analysis by Craig K Enders. *Australian & New Zealand Journal of Statistics*, 54(2), 251–251. <https://doi.org/10.1111/j.1467-842x.2012.00656.x>
11. Hedges, L. V., & Hedberg, E. C. (2007). Intraclass Correlation Values for Planning Group-Randomized Trials in Education. *Educational Evaluation and Policy Analysis*, 29(1), 60–87. <https://doi.org/10.3102/0162373707299706>
12. Huang, F. L. (2018). Multilevel modeling myths. *School Psychology Quarterly*, 33(3), 492–499. <https://doi.org/10.1037/spq0000272>
13. Johnston, M. P. (2019). Secondary data analysis: A method of which the time has come. *Qualitative and Quantitative Methods in Libraries*, 3(3), 619–626. <http://www.qqml-journal.net/index.php/qqml/article/view/169>
14. African Population and Health Research Center. (2026, February 9). *Kenya National Adolescent Mental Health Survey (K-NAMHS): Key findings*. *Aphrc.org*. <https://aphrc.org/publication/key-findings-kenya-national-adolescent-mental-health-survey-k-namhs/>
15. Kroenke, K., Strine, T. W., Spitzer, R. L., Williams, J. B. W., Berry, J. T., & Mokdad, A. H. (2009). The PHQ-8 as a measure of current depression in the general population. *Journal of Affective Disorders*, 114(1-3), 163–173. <https://doi.org/10.1016/j.jad.2008.06.026>
16. Lakey, B., & Cohen, S. (2000). Social Support Theory and Measurement. *Social Support Measurement and Intervention*, 29–52.

<https://doi.org/10.1093/med:psych/9780195126709.003.0002>

17. Magige, L., Bukania, Z., Mwangi, M., Chuchu, V., Wanjihia, V., Karanja, S., Onteri, S., Macharia, A., & Onger, L. (2025). Prevalence and predictors of depressive symptoms among school-going adolescents in Kenya. *PLOS Mental Health*, 2(11), e0000474.
<https://doi.org/10.1371/journal.pmen.0000474>
18. Maravilla, J. C., Fine, S. L., Ramaiya, A., Li, M., Wado, Y. D., Wahdi, A. E., Odunga, S. A., Nguyen, V. D., Whiteford, H. A., Lawrence, D., Scott, J. G., & Erskine, H. E. (2025). Social support and mental health among adolescents in Kenya, Indonesia, and Vietnam: A latent class analysis using the National Adolescent Mental Health Surveys. *Child and Adolescent Psychiatry and Mental Health*, 19(S1).
<https://doi.org/10.1186/s13034-025-00923-3>
19. McNeish, D., Stapleton, L. M., & Silverman, R. D. (2017). On the unnecessary ubiquity of hierarchical linear modeling. *Psychological Methods*, 22(1), 114–140. <https://doi.org/10.1037/met0000078>
20. Mersky, J. P., Topitzes, J., & Reynolds, A. J. (2013). Impacts of adverse childhood experiences on health, mental health, and substance use in early adulthood: A cohort study of an urban, minority sample in the U.S. *Child Abuse & Neglect*, 37(11), 917–925.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4090696/>
21. Mokaya, A. G., Kikuvu, G. M., Mutai, J., Khasakhala, L. I., & Memiah, P. (2023). Predictors of depression among adolescents joining selected public secondary schools in Nairobi County, Kenya. *Psychology in the Schools*. <https://doi.org/10.1002/pits.22873>
22. Nedjat, S., Hosseinkhani, Z., Hassanabadi, H.-R., Parsaeian, M., & Foroozanfar, Z. (2020). The role of mental health, academic stress, academic achievement, and physical activity on self-rated health among adolescents in Iran: A multilevel analysis. *Journal of Education and Health Promotion*, 9(1), 182. https://doi.org/10.4103/jehp.jehp_161_20
23. Omogah, F. O. (2025). Bridging ethical & security gaps in Kenyan research: a critical analysis of ethical review boards and the data protection authority. *Wellcome Open Research*, 10, 580.
<https://doi.org/10.12688/wellcomeopenres.24902.1>
24. Osborn, T. L., Baseke, R., Kamau, F., Ngesa, M., Kilonzo, R., Agunda, P., Kane, Kongong'a, R., Wasanga, C., Mutiso, V., & Ndeti, D. (2025). *Depression and Anxiety Symptoms Among Kenyan Adolescents: Psychometric Validation, Prevalence Patterns, Network Analysis, and Psychosocial Determinants*.
https://doi.org/10.31234/osf.io/dp57u_v1
25. Pina, D., Pérez-Albéniz, A., Díez-Gómez, A., Pérez-Esteban, A., & Fonseca-Pedrero, E. (2025). Validation of the Multidimensional Scale of Perceived Social Support (MSPSS) in a Representative Sample of Adolescents: Links with Well-being, Mental Health, and Suicidal Behavior. *Psychosocial Intervention*, 34(2), 79–87. <https://doi.org/10.5093/pi2025a7>
26. R Core Team. (2025). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. <https://www.r-project.org/>
27. Riggs, L., & Landrum, T. J. (2023). Trauma-Informed PBIS: How Educators Can Combine Evidence-Based Practices for Behavior Management With Trauma-Informed Care. *Beyond Behavior*, 32(3).

<https://doi.org/10.1177/10742956231201351>

28. Rueger, S. Y., Malecki, C. K., Pyun, Y., Aycok, C., & Coyle, S. (2016). A meta-analytic review of the association between perceived social support and depression in childhood and adolescence. *Psychological Bulletin*, 142(10), 1017–1067. <https://doi.org/10.1037/bul0000058>
29. Soleimanpour, S., Geierstanger, S., & Brindis, C. D. (2017). Adverse Childhood Experiences and Resilience: Addressing the Unique Needs of Adolescents. *Academic Pediatrics*, 17(7), S108–S114. <https://doi.org/10.1016/j.acap.2017.01.008>
30. Spinhoven, P., Nungo, S., van Eijk, A. M., Nyothach, E., Mason, L., Obor, D., Kwaro, D., Phillips-Howard, P. A., & Zulaika, G. (2025). Anxiety, depression, and post-traumatic stress and associated risk factors among out-of-school girls in western Kenya. *PloS One*, 20(5), e0323362. <https://doi.org/10.1371/journal.pone.0323362>
31. Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A Brief Measure for Assessing Generalized Anxiety disorder: the GAD-7. *Archives of Internal Medicine*, 166(10), 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>
32. Trautmann, S., Rehm, J., & Wittchen, H. (2016). The economic costs of mental disorders. *EMBO Reports*, 17(9), 1245–1249. <https://doi.org/10.15252/embr.201642951>
33. Vartanian, T. P. (2010). Secondary Data Analysis. *Secondary Data Analysis*. <https://doi.org/10.1093/acprof:oso/9780195388817.001.0001>
34. Wado, Y. D., Austrian, K., Abuya, B. A., Kangwana, B., Maddox, N., & Kabiru, C. W. (2022). Exposure to violence, adverse life events and the mental health of adolescent girls in Nairobi slums. *BMC Women's Health*, 22(1). <https://doi.org/10.1186/s12905-022-01735-9>
35. World Health Organization. (2025, September 1). *Mental health of adolescents*. WHO. <https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health>
36. World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *JAMA*, 310(20), 2191–2194. <https://doi.org/10.1001/jama.2013.281053>
37. Zeileis, A., Köll, S., & Graham, N. (2020). Various Versatile Variances: An Object-Oriented Implementation of Clustered Covariances in R. *Journal of Statistical Software*, 95(1). <https://doi.org/10.18637/jss.v095.i01>
38. Zhao, M., Miao, H., Zhu, L.-L., Zhang, X.-H., & Zang, L.-W. (2025). Social support and adolescent mental health in Kenya: a parallel mediation analysis of perceived control and gratitude. *Frontiers in Pediatrics*, 13. <https://doi.org/10.3389/fped.2025.1626249>
39. Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52(1), 30–41. https://doi.org/10.1207/s15327752jpa5201_2

Figures

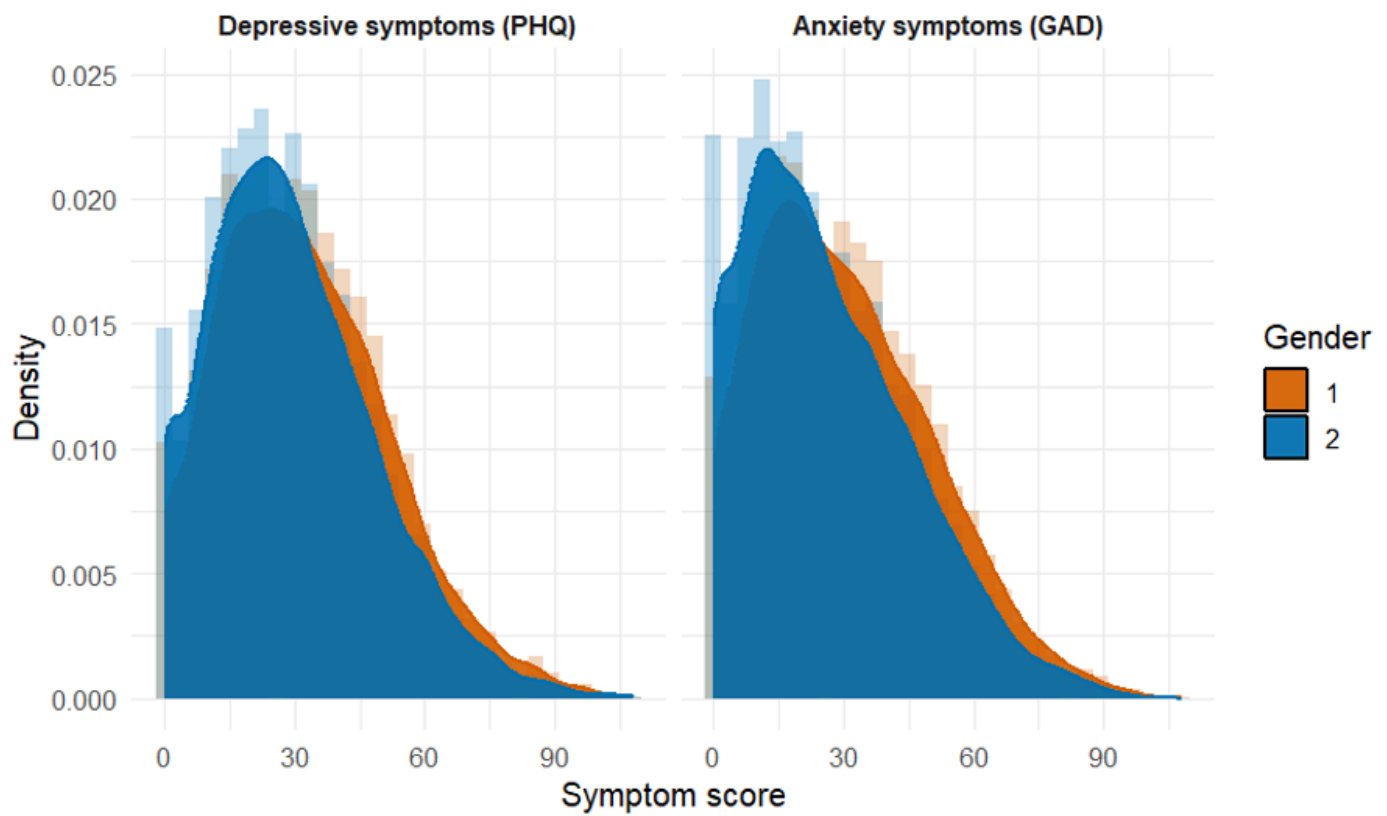


Figure 1

Distribution of depressive and anxiety symptom scores (PHQ and GAD) by gender among Kenyan secondary school students.

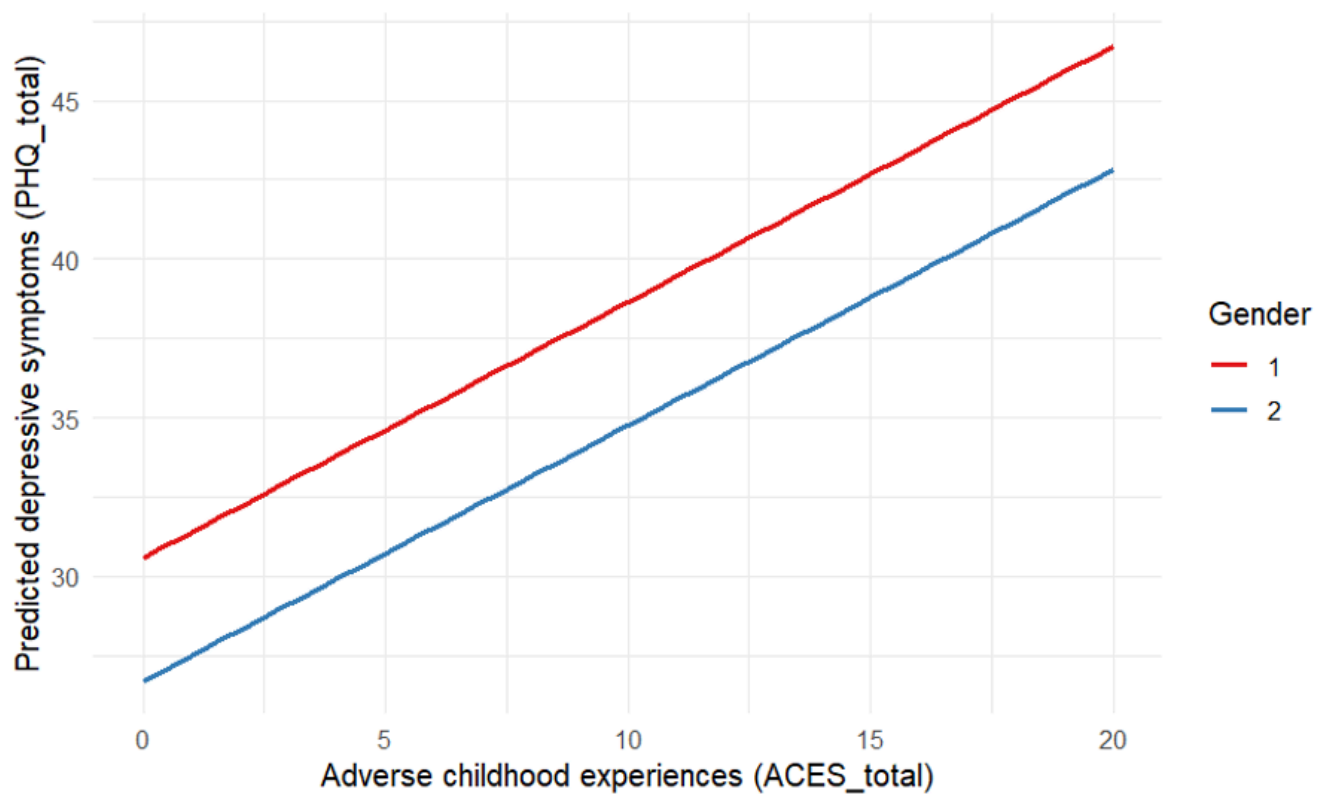


Figure 2

Predicted depressive symptom scores (PHQtotal) across the observed range of adverse childhood experiences (ACEStotal), by gender, from the multilevel model adjusted for age, school form, perceived social support, and school clustering.

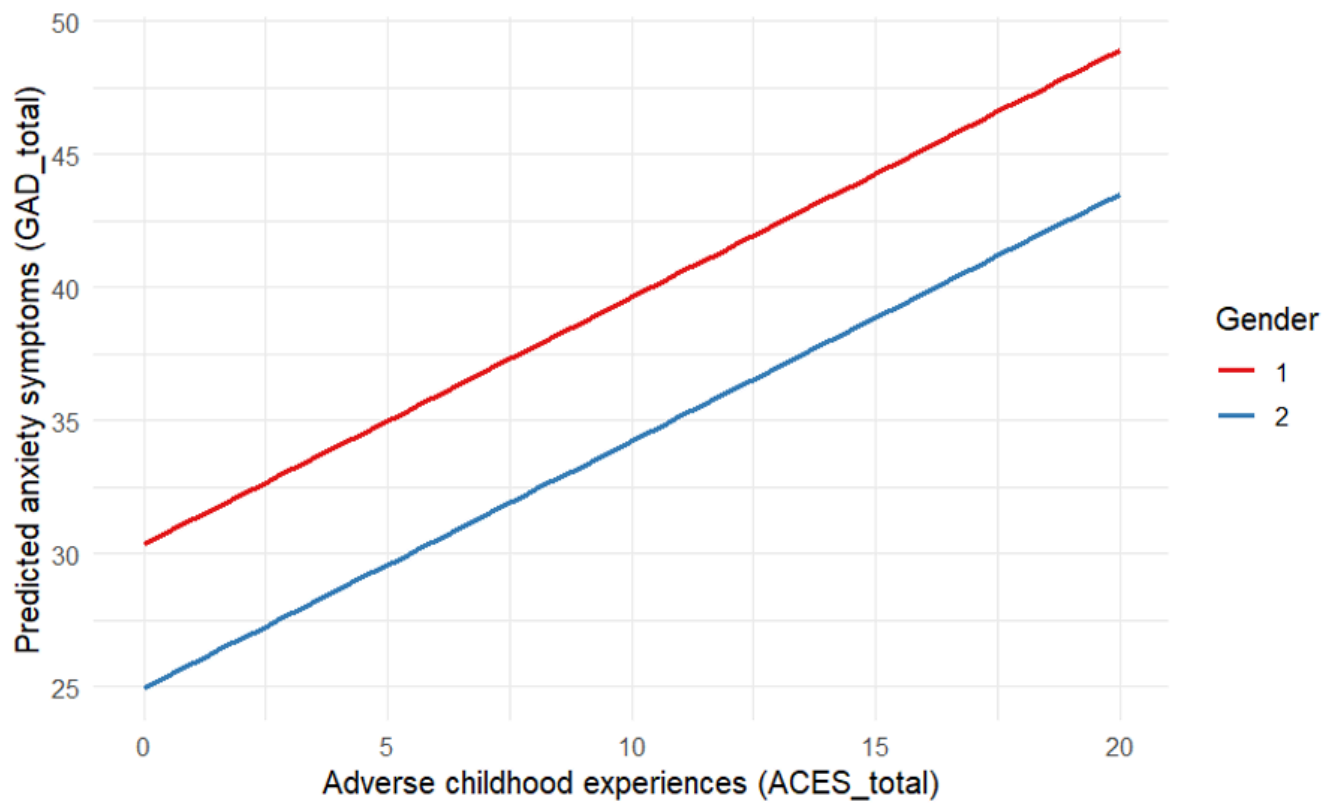


Figure 3

Predicted anxiety symptom scores (GAD_total) across the observed range of adverse childhood experiences (ACES_total), by gender, from the multilevel model adjusted for age, school form, perceived social support, and school clustering.