



Depression and Anxiety Symptoms, Social Support, and Demographic Factors Among Kenyan High School Students

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Published online: 26 October 2019

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Abstract

Objectives Depression and anxiety are leading causes of youth disability worldwide, yet our understanding of these conditions in Sub-Saharan African (SSA) youths is limited. Research has been sparse in SSA, and prevalence rates and correlates of these conditions remain scarcely investigated. To help address these gaps, this cross-sectional study assessed the prevalence of adolescent depression and anxiety symptoms in a community sample of high school students in Kenya. We also examined associations between those symptoms and psychosocial and sociodemographic factors.

Methods We administered self-report measures of depression and anxiety symptoms, social support, gratitude, growth mindsets, and life satisfaction to 658 students (51.37% female) aged 13–19.

Results Only the measures of depression (Patient Health Questionnaire-9), anxiety (Generalized Anxiety Disorder Screen-7), and social support (Multidimensional Scale for Perceived Social Support Scale) showed adequate internal consistency (Cronbach alpha > 0.70) in the study sample. Findings with these measures among Kenyan youths showed high levels of depression symptoms (45.90% above clinical cutoff) and anxiety symptoms (37.99% above clinical cutoff). Older adolescents reported higher depression and anxiety symptoms, as well as lower social support than younger adolescents. Females reported more anxiety than males, and members of minority tribes reported more anxiety than members of majority tribes.

Conclusions This study highlights the high prevalence of adolescent internalizing symptoms in Kenyan high school students, identifies important correlates of these symptoms, and illustrates the need for culturally appropriate assessment tools.

Keywords Adolescents · Depression · Anxiety · Social support · Global Mental Health · Sub Saharan Africa

Adolescent depression and anxiety symptoms—also referred to as youth internalizing problems—are common and prevalent worldwide (Patel and Stein 2015) contribute 45% of the overall burden of disease in youth ages 15–19 (The Lancet 2017). This burden is especially difficult to evaluate and address in countries with scarce mental health

resources, such as Kenya, where knowledge of rates and correlates of depression and anxiety remains limited (Patel and Kleinman 2003). There is a particular need for research dedicated to understanding depression and anxiety among adolescents in Kenya, because adolescents are particularly vulnerable to developing mental health problems (Patel et al. 2007) and nearly 50% of the Kenyan population is aged 19 or younger (Awiti and Scott 2016; United Nations Children's Fund 2016).

There have been previous attempts to understand rates and correlates of symptomatology in Kenyan adolescents. While some have focused on marginalized and clinical subpopulations, such as adolescents living with HIV/AIDS (Gaitho et al. 2018), pregnant adolescents (Kimbui et al. 2018; Osok et al. 2018), and adolescents at a clinical institution (Kamau et al. 2017), few have focused on adolescents in more normative environments such as schools. Of such studies, one study ($N = 176$, ages 15-to-20) showed that females reported higher depressive symptoms than

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males in Kikuyu secondary schools in Central Kenya (Mitchell and Abbott 1987). Another study ($N=90$, ages 11-to-15) surveyed behavioral and emotional problems in Kenyan youths from the Embu community and reported elevated rates of overcontrolled problems (i.e. somatic concerns), suggesting a possible connection to the strict emphasis on youth obedience in the Embu culture (Weisz et al. 1993).

More recently, levels of anxiety and depression symptoms in Kenyan adolescents were found to vary widely depending on sex, age, and the diagnostic instrument used. In a study with school-going adolescents in Nairobi County ($N=3755$, ages 14-to-18), participating youths received one of three different sets of instruments that measure depression and anxiety symptoms. Even though only 25.7% of the youths who were assessed through the Child Depression Inventory (CDI) self-reported elevated symptoms, 43.17% of all participating youths self-reported clinically diagnostic scores for depression across all other measurement tools used (Ndetei et al. 2008). Similar observations were made regarding the prevalence of anxiety syndromes. On one hand, only 12.9% of youths reported anxiety when the cut-off points for the Multidimensional Anxiety Scale for Children (MASC) was used. On the other hand, 49.3% of the youths had positive scores for moderate to severe anxiety when the Ndetei-Othieno-Kathuku (NOK) Scale for Depression and Anxiety—a locally developed and validated instrument for depression and anxiety in Kenyan adolescents—was considered (Ndetei et al. 2008). These findings indicate that various measures of youth depression and anxiety might place emphasis on different constructs of these syndromes and that the cut-offs points for various instruments might lead to different assessments of the prevalence of elevated symptoms. The findings call for further investigation of the utility of diverse measures for youth depression and anxiety in Sub Saharan Africa.

Another similar study with 1276 school-going adolescents (ages 13-to-22) also in Nairobi County found the prevalence of clinically significant depressive symptoms at 26.4% using the CDI. The study found that the occurrence of depressive symptoms was higher in female adolescents than it was in male adolescents (a finding that is consistent with literature in many places around the world; see Adewuya et al. 2018; Dyer and Wade 2012; Grant et al. 2004; Schraedley et al. 1999). Furthermore, students in boarding schools had more clinically significant depressive symptoms when compared with those in day schools, and depressive symptoms were strongly correlated to age (Khasakhala et al. 2012). Finally, a recent study also examined emotional and behavioral problems in a school setting in Central Kenya ($N=533$, age 12-to-18); results found that 17.53% of adolescents scored in the clinical range of internalizing problems using the Youth Self-Report

questionnaire's broadband scale (which encompasses multiple types of internalizing difficulties, including somatic problems, worry, and depression symptoms) (Magai et al. 2018).

The authors of the above studies called into focus the relatively high prevalence of adolescent anxiety and depression symptoms. Particularly, they highlighted that further investigation is warranted to determine the consistency of such high prevalence findings that tend to vary by sociodemographic factors since the symptomatology of common mental health problems in Kenya and similar Sub Saharan African countries remains a scarcely investigated matter. Furthermore, they called attention to the efficacy of the instruments used to assess these syndromes in the Kenyan socio-cultural context. Because the psychometric properties of the primarily Western instruments remain inadequately investigated in Kenya and similar regions, epidemiological studies in these countries remain seriously handicapped (Khasakhala et al. 2012; Magai et al. 2018; Ndetei et al. 2008). Assessing the psychometric properties of measurement tools, especially free and short measurement tools that can be used at scale, can go a long way in improving our understanding of youth depression and anxiety in developing contexts.

Finally, it is important to investigate the psychosocial correlates of youth depression and anxiety symptoms in Kenyan adolescents. An understanding of the association between internalizing symptoms and psychosocial correlates such as social support, life satisfaction, and gratitude can extend our knowledge of symptom prevalence and severity in that context and possibly shed light into potential risk and protective factors.

As highlighted above, it is important that future investigations into youth internalizing problems in Kenya are done in a matter that takes into consideration the Kenyan socio-cultural context. There are two socio-cultural factors that warrant special consideration when investigating youth symptomatology in Kenya: the first is the nature of the Kenyan education system, and the second is the role of tribal identities.

In the Kenyan education system, upon the completion of the eight years of primary school education, all students are expected to take the national examinations (called the Kenya Certificate of Primary Education and abbreviated as KCPE). Students who attain a passing grade in the KCPE exams are allowed to join secondary schools of varying pedigree. The best performing youths are admitted to top ranked schools known as *national* schools. Through a government-enforced quota system, national schools admit students in a manner that ensures that all forty-seven geographical counties in Kenya are equally represented in national schools (Ndetei et al. 2008). As such, national schools enjoy cultural and socio-economic diversity in their

student and teacher bodies. They are also resource-rich (i.e. they have more teachers, classrooms, and other educational facilities) and produce better academic outcomes (i.e. test-grades and university placements) than other secondary schools in Kenya. After national schools, the next tier of best-performers attend *extra-county* schools. These schools admit students from two-to-five geographically proximate counties. *Extra-county* schools have access to more resources and achieve better outcomes than *county* schools which only admit students from within the county in which they are located. County schools are better off than *sub-county* schools that admit the remaining qualified students who fail to obtain admission to the higher ranked schools (Ndeti et al. 2008). Most national, county and sub-county schools are public boarding schools. Although tuition is subsidized by the government, parents still pay for boarding and other non-tuition costs. Some students who do not attain the cut-off points for admission to any of the above schools may attend day secondary schools run by community-based organization or private institutions. Keeping in mind the nature of the Kenyan education system, students in low-ranked and low-resourced schools might face hardships that might exacerbate mental health symptoms as has been documented with other youthful populations elsewhere (Aneshensel and Sucoff 1996; Dashiff et al. 2009; McLeod and Shanahan 1996).

At the end of the four years of secondary school, all students must take the Kenya Certificate of Secondary Education (KCSE) national examinations. The KCSE examinations is particularly important because it determines life outcomes such as university placement, and future career prospects (Gitome et al. 2013; Mbugua et al. 2012). Consequently, older adolescents about to take these exams face increased psychosocial stress due to the academic pressure to do well in the KCSE exams (Philiias and Wanjobi 2011).

Another important socio-cultural consideration is the fact that Kenya is an ethnically diverse country with at least 42 different tribes. Tribal identities and affiliations have been used historically to consolidate political and economic power by a few majority tribes at the expense of many minority tribes (Ajulu 2002). Tribe-based politics has led to distrust and tribalism that has seen members of minority tribes struggle to gain meaningful education, employment, and resources (Miguel 2004). In some unfortunate circumstances, tribal politicking has stocked tensions that have resulted in clashes like the 2007/2008 post-election violence that led to the deaths of more than 1000 people and the displacement of hundreds of thousands (Mapuva 2010). It is possible that discrimination based on minority (versus majority) tribal identity may be associated with youth depression and anxiety symptoms in Kenyan adolescents. Indeed, perceived discrimination has been found to predict

poor mental health outcomes in Western ethnic minorities (Bhui et al. 2005; Brown et al. 2000; Hwang and Goto 2009; Williams et al. 2003; Williams et al. 1997).

The present study aimed to investigate the prevalence of depressive and anxiety symptoms, as well their socio-demographic and psychosocial correlates in a large community sample of Kenyan adolescents in secondary schools. We hypothesized that youths from minority tribes would report higher depressive and anxiety symptoms and that students from poorly-ranked and poorly-resourced schools would also report higher levels of depression and anxiety symptoms than students from better-ranked schools with more ample resources. We also hypothesized that older students who were approaching the end of secondary education and the KCSE examinations would report higher depression and anxiety symptoms due to increased pressure to succeed. Finally, as female adolescents in Kenya are more likely than their male peers to face pressure to drop out of secondary school (Ministry of Education, Science and Technology 2014), or become teenage mothers (Were 2007), and since gender differences in prevalence rates of depression and anxiety in Kenya adolescents has been documented elsewhere (Khasakhala et al. 2012; Mitchell and Abbott 1987; Ndeti et al. 2008), we hypothesized that females would report higher depression and anxiety symptoms than males. A secondary goal of the study was to investigate the link between psychosocial factors and internalizing problems given the dearth of research on such factors in relation to symptoms among Kenyan youth.

Method

Participants

Eligible participants were adolescents (ages 12–19) attending high schools in Nairobi, Kenya. We recruited 658 high-school students (51.98% female; M age = 15.83, SD = 1.45) out of a possible 3055 students from secondary schools that differed markedly in levels of resources and achievement (as described below). Specifically, we recruited participants from three public schools and two community-run secondary schools. The public schools included two national schools and one county school as classified by the Ministry of Education, Science and Technology. School A (N = 80) and School B (N = 87) are mixed-gender community-run *sub-county* day schools. Schools A and B are located in Kibera, the largest slum in Africa where 200,000 people live in an area the size of Central Park (Kenya National Bureau of Statistics 2010; Kibere 2016). School C (N = 212), is a mixed-gender public *county* school also located in Kibera. School D (N = 132) is an all-boys boarding school and School E (N = 157) is an

Table 1 Characteristics of participating schools

School	Location	Type	Expenditure per student per year	GPA (grade) ^a	School rankings ^b	Study classification
School A	Kibera	Sub-county	\$220	23.26 (F)	6248	Private sub-county
School B	Kibera	Sub-county	\$275	48.83 (C–)	761	Private sub-county
School C	Kibera	County	\$420	32.46 (D–)	3353	Public county
School D	Nairobi suburbs	National	\$800	75.41 (A–)	5	Public national
School E	Nairobi suburbs	National	\$750	71.21 (B+)	31	Public national

^aGPA out of 84 points and based on the 2014 national examinations

^bSchools ranked out of 7950 schools nationally (Kenya National Examinations Council 2015)

all-girls boarding school. Both are *national* public secondary schools in the suburban outskirts of Nairobi.

The schools we chose were academically and resource diverse. As shown by the 2014 KCSE examination results, academic performance varied from an average grade point of 23.26 points (out 84), the equivalent of a failing letter grade, to 75.41 points, the equivalent of an A-letter grade (Kenya National Examinations Council 2015). The schools were also financially diverse; annual costs per student varied from \$120 to \$800 annually (Ministry of Education, Science and Technology 2015). Detailed information on the schools' characteristics can be seen in Table 1. Additionally, the schools varied in tribal representation: schools in Kibera were predominantly composed of minority tribe students while the two national schools have a diverse student body from across the whole country. We chose these schools to maximize the sample's socioeconomic and educational diversity. With a more diverse sample, we are able to strengthen our capacity to address study hypotheses and consider our results more generalizable to diverse youth in Kenya. Of the 658 participants, 424 (64.43%) belonged to a minority tribe, and 379 (57.60%) were from the three schools located in Kibera (sub-county and county schools). See Table 2 for sample demographic characteristics.

Procedure

All procedures were approved by the University Institutional Review Board (IRB) prior to the start of data collection. Upon consultation with local researchers and administrators, it was determined that the University IRB approval would be sufficient as long as necessary approvals from local administrative officials was received (similar to Getanda et al. 2015). Approval was provided by the county education office. Data was collected in a four-week period from early June to early July when schools were in session. Consistent with school policy and customs, the school principals represented parents in receiving information about the study and an opportunity to ask questions. They then provided parental consent on behalf of the parents of any minor adolescents interested in participating in the

Table 2 Participant demographics

Characteristic	Mean (SD)
Age	15.85 (1.41)
Characteristic	N (%)
Sex	
Female	342 (51.98%)
Male	316 (48.02%)
Tribe	
Minority	424 (64.44%)
Majority	227 (35.56%)
School Type	
Public national	279 (42.40%)
Public county	212 (32.22%)
Private sub-county	167 (25.37%)

The sub-county and county schools were located in Kibera, Nairobi, while the national schools were located on the suburban outskirts of Nairobi

study (such parental consent procedures have been used before in other studies with Kenyan adolescents, see Kha-sakhala et al. 2012; Makworo et al. 2014; Ndeti et al. 2008). After this, all interested students provided informed consent/assent before completing the questionnaire battery. Only students who provided informed consent/assent were allowed to take part in the study. The students completed the questionnaire battery in the classrooms or at school halls. 658 students agreed to participate in the study. For the study, all students who elected to participate were considered eligible; and no participants were excluded. At the end of the study school administrators had the option to view aggregated findings from the study for their schools should they so wish.

Participants completed the measures in classrooms at their schools (roughly 45 students per classroom). Participants were instructed not to speak with each other and not to look at each other's questionnaires while completing the measures. They were also told that all their responses would be kept private and separated from any personally identifying information. It is important to point out that English is not only an official language in Kenya but also the primary

language of instruction at all levels of education in Kenya. Therefore, to be admitted into secondary school, students have to demonstrate proficiency and fluency in both written and oral English during the KCPE examinations (Ndetei et al. 2008). As a result, there was no need to translate the questionnaires into any other language. Regardless, members of the study team were available to answer any questions about the questionnaires that the participants had. Participants had approximately 30 min to complete the questionnaires. There were two versions of the questionnaires with measures in different orders to help control for any effects of measure order on participant responses.

Measures

Six questionnaire-based measures were administered to students in the five schools; all of which were pertinent to adolescent mental health or psychosocial functioning. The measures had had little to no prior use in Kenya. Furthermore, since data from our sample allowed us an opportunity to gauge some psychometric properties of such measures, it was decided a priori that an essential requirement for inclusion in study analyses was that measures demonstrate internal consistency within the Kenyan sample, as indicated by Cronbach's alpha values of at least 0.70. Of the six measures that we administered, three did not meet this standard and were thus excluded from further analysis. These were the Satisfaction with Life Scale— $\alpha = 0.47$ (Diener et al. 1985), the Gratitude Questionnaire— $\alpha = 0.56$ (McCullough et al. 2002), and the Implicit Personality Theory Questionnaire— $\alpha = 0.41$ (Yeager et al. 2013; Yeager et al. 2013). The three measures that did meet the $\alpha = 0.70$ minimum standard were the Patient Health Questionnaire-9, PHQ-9 (Kroenke and Spitzer 2002), the Generalized Anxiety Disorder Screener-7 (Spitzer et al. 2006), the Multidimensional Scale of Perceived Social Support (Zimet et al. 1988). Information on these measures is reported below.

We used an 8-version item of the PHQ-9, the PHQ-8 (Kroenke and Spitzer 2002; Kroenke et al. 2009), which excludes one item inquiring about suicidal ideation. PHQ-8 scores are highly correlated with PHQ-9 scores, and the same cutoffs can be used to assess depression severity (Kroenke and Spitzer 2002). The PHQ has been shown to have adequate internal consistency ($\alpha = 0.89$) and test-retest reliability in North American samples (Kroenke et al. 2001). Additionally, it has adequate construct validity; scores on the PHQ are highly correlated with other scales of depression severity and functioning (Kroenke et al. 2001). We used the 8-version item after conversations with school administrators who preferred not to include the ninth item of the PHQ-9 (suicidal ideation) because they thought the stigma associated with suicidal ideation might upset or alienate the students. While the PHQ has been used before

with adults in Kenya (Omoro et al. 2006), this present study is, to our knowledge, the first to report psychometric data for the PHQ-8 in a sample of Kenyan adolescents. Cronbach's alpha for the present study was 0.73, 95% CI [0.70, 0.76].

The Generalized Anxiety Disorder Screener (GAD-7) is a widely used measure that screens for Generalized Anxiety Disorder. It has demonstrated adequate internal consistency (Cronbach alpha = 0.92) in samples of North American youth, and it has demonstrated convergent, divergent, construct, and criterion validity (Spitzer et al. 2006). To the best of our knowledge, this is the first study using the GAD-7 in Kenya. Therefore, we are the first to report psychometric data for this measure in a population of Kenyan youth. Cronbach's alpha for the present study was 0.78, 95% CI [0.75, 0.80].

The Multidimensional Scale of Perceived Social Support (MSPSS) measures personal satisfaction with social support (Zimet et al. 1988). It has demonstrated adequate internal consistency (Cronbach alpha = 0.88), test-retest reliability, and construct validity in a sample of undergraduate students in North America. It also includes three subscales measuring support from friends ("Friends" subscale), support from family ("Family" subscale), and support from significant others ("Significant Others" subscale). To the best of our knowledge, our study is the first to report psychometric data in Kenyan adolescents. Here, Cronbach's alpha for the full twelve-item Multidimensional Social Support Scale was 0.86, 95% CI [0.84, 0.88]; Cronbach's alpha was 0.79, 95% CI [0.76, 0.82] for the four-item Significant Other subscale, 0.80, 95% CI [0.77, 0.82] for the four-item Family subscale, and 0.80, 95% CI [0.77, 0.82] for the four-item Friends subscale.

Tribal demographics

We classified tribes as majority versus minority based on the tribal alliances formed in the recently concluded 2017 Kenyan Presidential Elections. In that election in 2017, the Jubilee Alliance (Jubilee) was considered the majority because they had a 'tyranny of numbers'—a phrase coined in the previous election to emphasize that together the alliance had a majority number of votes to win any election regardless of their platform (Githuku 2013). Tribes affiliated to Jubilee included the Kikuyu tribe and affiliated Bantu-speaking tribes such as the Embu and the Meru tribes (two tribes primarily located around the Mt. Kenya region of Central Kenya), as well as the Kalenjin tribe (an ethnolinguistic group of various tribes that speak the Kalenjin language and who primarily reside in the Great Rift Valley). On the other hand, the minority tribes coalesced under the National Super Alliance (NASA) coalition. Tribes in NASA primarily included the Luo and the Luhya tribes around Lake Victoria, the Akamba in Eastern Kenya, and Swahili-

speaking tribes along the Indian Ocean coast. All tribes were included in the minority versus majority classification to form a dichotomous variable.

Data Analyses

We calculated Cronbach’s alpha to determine the internal consistency of each measure. As noted above, measures with an alpha below 0.70 were excluded from further analyses (Nunnally 1978). For measures that met this standard, we conducted several statistical tests (described in more detail below) to assess the associations between internalizing problems, social support, and sociodemographic factors (sex, age, tribe and school type).

When assessing the associations between depression and anxiety symptoms and sociodemographic factors, we were cognizant that the sociodemographic factors were potentially confounded with one another. Accordingly, for every analysis of one sociodemographic factor, we controlled for the other sociodemographic factors by including them as covariates.

We ran a linear mixed model to assess the association between depression and the following sociodemographic factors: sex, age, tribe and school type (coded as national, county, sub-county; see Table 1). We used a linear mixed model because it allowed us to fit a model that was organized to reflect the hierarchical structure of the data. It is likely that measurements from students in the school are correlated therefore a linear mixed model allows us to account for such correlations (Knafl et al. 2009). A random intercept that allowed for school variation in depression symptoms was included. Sex, age, tribe, and school type were included as covariates. We used the same approach to assess the association between anxiety symptoms and the same sociodemographic factors.

We used Pearson’s correlations to assess the association between social support, depressive symptoms and anxiety symptoms. We also ran an exploratory linear mixed model to assess the association between social support and the sociodemographic factors: sex, age, tribe and school type as explained above.

Missing data were imputed twenty times using Fully Conditional Specification (FCS). We used the multivariate imputation by chained equations (mice) algorithm in R with the linear mixed models fitted and pooled (Buuren and Groothuis-Oudshoorn 2011).

Results

Prevalence and Descriptive Statistics

Table 3 shows descriptive statistics for the PHQ-8, GAD-7, and total and subscale scores for the MSPSS. We also

Table 3 Means, standard deviations, and correlations with confidence intervals

Variable	M	SD	1	2	3	4	5
1. PHQ-8	9.24	5.08					
2. GAD-7	8.40	5.14	0.69** [0.65, 0.73]				
3. MSPSS total	5.09	1.16	-0.24** [-0.31, -0.17]	-0.20** [-0.27, -0.13]			
4. MSPSS significant other subscale	5.22	1.38	-0.23** [-0.30, -0.15]	-0.18** [-0.25, -0.10]	0.91** [0.90, 0.92]		
5. MSPSS family subscale	5.36	1.40	-0.24** [-0.31, -0.17]	-0.18** [-0.26, -0.11]	0.75** [0.72, 0.78]	0.65** [0.60, 0.69]	
6. MSPSS friends subscale	4.48	1.44	-0.14** [-0.21, -0.06]	-0.15** [-0.22, -0.07]	0.69** [0.65, 0.73]	0.48** [0.42, 0.53]	0.30** [0.23, 0.37]

M and SD are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming 2014)

PHQ-8 patient health questionnaire-8 item version, GAD-7 generalized anxiety disorder–screener, MSPSS multidimensional scale for perceived social support

* $p < 0.05$; ** $p < 0.01$

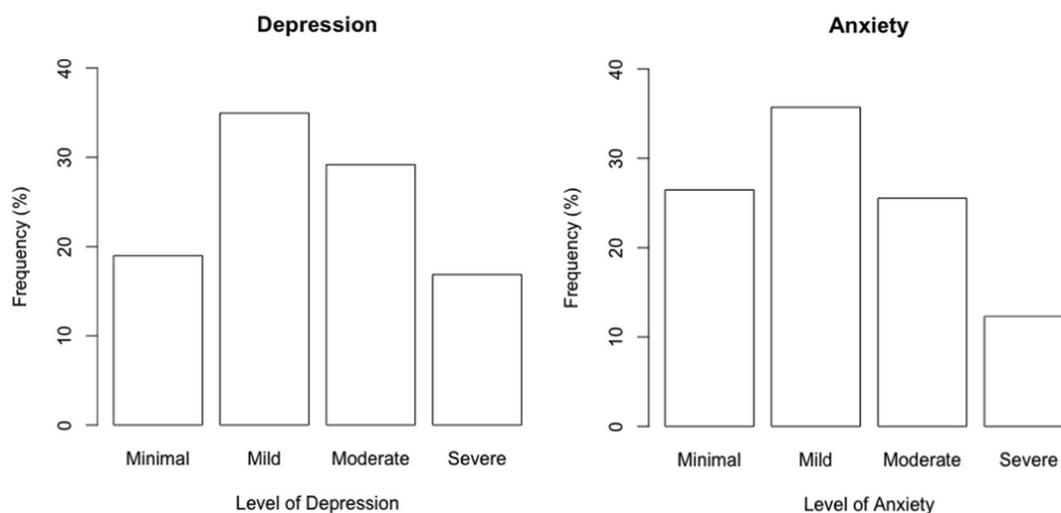


Fig. 1 Levels of depression and anxiety in Kenyan adolescents. The figure shows a high prevalence of moderate and elevated symptoms of internalizing problems among Kenyan adolescents in the present study

calculated rates of mild, moderate, and severe depression and anxiety using norms from studies in primary care on the GAD-7 and PHQ-9 in United States youth samples (Kroenke et al. 2010). Past research has shown that the same cutoffs should be used for PHQ-8 and PHQ-9 (Kroenke and Spitzer 2002). Using cutoffs determined from American samples (Kroenke et al. 2001), slightly more than a third of participants (34.95%) scored in the range of mild depression (5–9), 29.17% scored in the range for moderate depression (10–14), and 16.87% scored in the range for severe depression (15–24) as illustrated in Fig. 1. As also seen in Fig. 1, 35.71% of participants scored in the range for mild anxiety (5–9), 25.53% scored in the moderate range (10–14), and 12.31% scored in the severe range (15–21).

Correlations

Table 3 shows associations among depressive symptoms, anxiety symptoms, and social support. As expected, depression and anxiety were strongly and positively associated with one another, $r(656) = 0.69$, $p < 0.001$, 95% CI: [0.65, 0.73].

Associations Between Social Support, Depressive Symptoms and Anxiety Symptoms

As hypothesized, depression symptoms were negatively associated with social support, $r(656) = -0.24$, $p < 0.001$, 95% CI: [-0.31, -0.17]. Also as predicted, anxiety symptoms were negatively associated with overall social support $r(656) = -0.20$, $p < 0.001$, 95% CI [-0.27, -0.13] (see Table 3). Separately, in an exploratory analysis of the

association between social support and sociodemographic factors, a significant effect for age emerged ($B = -0.10$, $p = 0.003$) and *national* schools ($B = 0.41$, $p = 0.039$), see Table 4. With every increase in age, self-reported social support decreased by 0.10 points while by attending national schools, self-reported social support increased by 0.41 points.

Depressive Symptoms and Sociodemographic factors

We examined the relation between depression symptoms and the sociodemographic variables age, tribe, sex, and school type using a linear mixed model. As predicted, the model revealed significant effects of age ($B = 0.51$, $p < 0.001$, see Table 4). Contrary to our hypotheses, we did not find significant effects of sex ($B = 0.81$, $p = 0.097$). Similar non-significant effects were found for tribe and school type on self-reported depression symptoms emerged (see Table 4).

Anxiety Symptoms and Sociodemographic Factors

We also examined the relation between anxiety symptoms and the sociodemographic variables age, tribe, sex, and school type using a linear mixed model. As predicted, anxiety symptoms levels were higher in older adolescents than younger adolescents ($B = 0.64$, $p < 0.001$), higher in youths from minority tribes ($B = 1.16$, $p = 0.022$), and higher in females than males ($B = 1.27$, $p = 0.004$). Contrary to our hypothesis, anxiety symptoms were not significantly associated with school type (see Table 4 for more information).

Table 4 Results of linear mixed models assessing the associations between depression symptoms, anxiety symptoms, and social support sociodemographic factors in Kenyan adolescents in the present study

Predictors	PHQ-8			GAD-7			MSPSS		
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
(Intercept)	−1.63	2.74	0.551	−1.84	2.58	0.476	6.28	0.61	<0.001
Sex (female)	0.81	0.49	0.097	1.27	0.44	0.004	−0.02	0.11	0.883
Tribe (minority)	0.46	0.53	0.387	1.16	0.50	0.022	−0.02	0.12	0.861
Public county	0.01	0.87	0.994	−0.70	0.73	0.332	0.33	0.22	0.128
Public national	0.56	0.80	0.487	−0.12	0.69	0.862	0.41	0.20	0.039
Age	0.67	0.16	<0.001	0.64	0.15	<0.001	−0.10	0.04	0.005

The model assessing the associations between depressive symptoms and sociodemographic factors revealed significant effects for age. The model assessing the associations between anxiety symptoms and sociodemographic factors revealed significant effects for sex, tribe, and age. The model assessing the associations between social support and sociodemographic factors revealed significant effects for age

Bold values indicate statistical significance $p < 0.05$

PHQ-8 patient health questionnaire-8 item version, GAD-7 generalized anxiety disorder–screener, MSPSS multidimensional scale for perceived social support

Discussion

We administered measures of depression, anxiety, social support, gratitude and life satisfaction to 658 high school adolescents in Kenya to assess the prevalence of adolescent internalizing problems and the sociodemographic and psychosocial correlates of youth depression and anxiety symptoms. Our findings suggest that internalizing problems are highly prevalent amongst high school adolescents in Kenya. Applying scoring guiding from Kroenke and Spitzer (2002), about one in three adolescents in the present sample would be considered mildly depressed and one in four would be considered moderately depressed. Additionally, applying scoring guidelines for the GAD-7 (Spitzer et al. 2006), about one in three adolescents would be considered mildly anxious and one in four would be considered moderately anxious in the study's sample.

These symptom levels observed in this sample appear to differ markedly from those of non-referred adolescents in other regions, both within and outside of Sub Saharan Africa. For instance, in a sample of school-attending adolescents in a rural district in southwest Nigeria ($N = 1713$), 21.2% screened for moderate to severe depression using the same cut-offs as those used in the present study but with the PHQ-9 (Fatiregun and Kumapayi 2014). Another sample of non-referred adolescents attending annual primary care visits in the United States ($N = 2184$) reported rates of depression and anxiety symptoms that are notably different from the findings in the present study. Using the PHQ-2, the first two items of the PHQ-9, the authors reported that 4.8% of the adolescents in their sample screened positive for elevated depression symptoms ($\text{PHQ-2} \geq 3$) (Dumont and Olson 2012). When we used the same criterion and calculated a PHQ-2 score using the first two items of our PHQ-8 measure, 49.24% of the youths in our sample screened positive for elevated depression symptoms. Similarly, using

the GAD-2, the first two items of the GAD-7, Dumont and Olson (2012) reported that 6.3% of the adolescents in their sample screened positive for elevated anxiety symptoms ($\text{GAD-2} \geq 3$). When we used the same criterion and calculated a GAD-2 score from the first two items of our GAD-7 measure, 43.47% of the adolescents in the present sample screened positive for elevated anxiety symptoms. Notably, because these rates of depression and anxiety are so much higher than rates in many other regions, these unusually elevated symptoms of depression and anxiety may signify that these measures are highly sensitive but not especially specific.

Results offered mixed support for study hypotheses. As predicted, older adolescents reported higher depression and anxiety symptoms. As predicted, female adolescents reported higher anxiety symptoms; however, depression symptoms were not significantly associated with sex. Similarly, members of minority tribes reported higher anxiety symptoms, as predicted, but depression symptoms were not associated with minority vs. majority tribal status. School type was not associated with either depression or anxiety symptoms. We also found that social support was negatively linked to both depression and anxiety symptoms, as predicted, and it emerged that age and attending a national school was significantly associated with self-reported social support. Finally, our findings also showed that some measurement tools, especially for potential psychosocial correlates, demonstrated poor internal consistency with the Kenyan adolescent sample.

There are a couple of plausible explanations for the high prevalence of depression and anxiety symptoms in our sample. First, Kenya is a low-income country with many families living in poverty throughout the country and specifically in Kibera. Poverty may contribute to the development and maintenance of depression and anxiety. Poverty is defined by increased stress, difficult living conditions, and

exposure to trauma and violence that exacerbate the development and maintenance of internalizing problems and other mental health problems (Kilburn et al. 2016). If we use the World Bank's definition of poverty as living on less than \$3.10 a day, then 42% of Kenyan families live in poverty, suggesting that a higher prevalence of internalizing problems could be expected. However, a narrower definition of poverty such as living a minimally acceptable life in one's location (Shafir 2017) challenges the drastic prevalence observed since relative poverty may be more influential on mental health outcomes than absolute poverty.

Second, apparent differences in symptom levels across cultures and geographies may be influenced by differences in the appropriateness of the symptom measures employed. Although we reported findings for only those measures that met psychometric standards for internal consistency (and this led us to exclude half of the measures originally included), we were not able to fully assess the cultural appropriateness of the measures. Mental health problems are defined to a significant degree by the subjective perceptions of individuals, and these perceptions are influenced by cultural context (Kleinman 1988). If some of the constructs evaluated by current instruments have different meanings across cultures, or if the wording used does not precisely convey the construct within certain cultures, then mean differences across cultures might be difficult to interpret. Clearly, questionnaire-based measures should only be used across cultures when the target construct can be measured suitably (Epstein et al. 2015), but a construct's cultural suitability can be difficult to assess with certainty. It has been observed elsewhere that the present poor understanding of the cultural appropriateness of measurement tools severely handicaps research into symptomatology of mental health problems in Kenya and other Sub Saharan African countries (Ndeti et al. 2008). Future research will be improved as investigators are able to develop sound criteria for assessing cultural suitability and to rely on measures that meet those criteria.

Consistent with much past research, age emerged as a correlate of both anxiety and depression symptoms in our sample. Older adolescents reported higher depression and anxiety symptoms than younger adolescents. There are several reasons specific to this population why this may be the case. It is possible that the increased academic pressure from parents and school administrators as adolescents approach the KCSE examinations at the end Form 4 might lead to higher self-reported depression and anxiety symptoms. Additionally, older adolescents might be more cognizant of the realities of the living conditions in low-income countries which may lead to increased internalizing symptoms.

Female adolescents reported higher anxiety symptoms than male adolescents. These findings are consistent with other findings that have documented higher anxiety

prevalence in female adolescents than male adolescents (Ndeti et al. 2008; Yonkers and Gurguis 1995). We did not find significant gender difference in depression symptoms. As gender differences in adolescent depression have been documented in Western (Dyer and Wade 2012) and Kenyan samples (Khasakhala et al. 2012; Mitchell and Abbott 1987; Ndeti et al. 2008), it is possible that future studies will reveal similar differences in Kenyan adolescents.

Adolescents from minority tribes reported higher anxiety symptoms than adolescents from majority tribes. However, there was no difference in depression scores. The finding on anxiety is consistent with literature that suggests that minority status predicts poor mental health outcomes in ethnic minority populations in Western samples (Bhui et al. 2005; Brown et al. 2000; Hwang and Goto 2009; Williams et al. 2003, 1997). Our findings suggest that the impact may differ for different forms of psychopathology. Future research might examine whether our findings might reflect characteristics of the measures used, the particular region or school settings we sampled, or other factors.

School type was not associated with any differences in depression or anxiety scores. This finding might also suggest the possibility that exposure to low levels of resources may not impact all forms of mental health symptoms in the same way. It is possible that symptoms of depression or anxiety are more closely linked to internal or interpersonal processes for students than to such macro phenomena as the general level of school resources. However, school type was significantly associated with social support. Students in national schools reported more social support than their peers in other schools. Given the superior human resources in national schools (as mentioned earlier), this finding does not come as a surprise.

Limitations and Future Research Directions

One limitation of our study is that the sample was from the Nairobi region, focused on adolescents in schools, and thus not nationally representative. Another is that the socio-demographic factors we examined were not completely independent of one another; we took steps to address the relations among these variables, but there is no way to completely account for this dependence. A third limitation, noted above, is that the subjective meaning, and thus endorsement, of symptoms is inevitably influenced by cultural context. As a result, there is a need for caution in interpreting mean differences across cultures and in interpreting means that appear to show unusually high symptom levels in a particular culture.

Our study suggests several avenues for future research. First, because we found that certain measures had unacceptably low internal consistency when used with Kenyan youths, the need becomes clear for at least some form of

psychometric assessment as a first step before using measures outside the culture in which they were developed. Additional steps in cross-cultural work might include consultations with local collaboration, qualitative interviews, and development of ideographic measures to complement standardized questionnaires (Sweetland et al. 2014; Wasil et al. 2019). Second, given that a relatively high number of Kenyan youths reported depression symptoms and anxiety, future research on the understanding and treating mental health problems in Kenyan youths within the school context (such as Osborn et al. 2019) is essential. Third, longitudinal research is needed to investigate the extent to which sociodemographic, cultural, and psychosocial factors play a role in the onset, maintenance, and time course of internalizing problems in SSA youths.

Acknowledgements This study was funded by grants from the Harvard University Center for African Studies, the Harvard College Research Program, and the Harvard University Weatherhead Center for International Affairs. The authors are grateful to the principals and school administrators of the five schools that we worked with in Kenya. In particular, we are grateful to Mr. Jarius Akweya for his support.

Author Contributions T.O. designed and executed the study, analyzed the data, and wrote the paper. K.V. designed and executed the study, assisted with data analyses, and wrote the methods and part of the results. A.W. designed and executed the study, assisted with data analyses, and wrote parts of the introduction and discussion sections. J. S. collaborated with the design, data analyses, and writing of the study. J.W. collaborated with the design, data analyses, and writing of the study.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee of Harvard University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent/assent was obtained from all individual participants included in the study. Parental consent was obtained for all underage minors per school customs and policy.

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