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Original article

The Continued Impacts of the COVID-19 Pandemic on Education and Mental Health Among Sub-Saharan African Adolescents



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A B S T R A C T

Purpose: This multicountry survey assessed the levels and the determinants of the impacts of the pandemic on education and mental health among adolescents in sub-Saharan Africa and the potential factors that may exacerbate these adverse impacts.

IMPLICATIONS AND CONTRIBUTION

The COVID-19 pandemic exerts adverse impacts on the education and mental

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Methods: A phone survey was conducted among adolescents in nine diverse areas in Burkina Faso, Ethiopia, Ghana, Nigeria, and Tanzania between July and December 2021. Approximately 300 adolescents per area and 2,803 adolescents in total were included. The survey collected information on adolescents' sociodemographic characteristics, current COVID-19 preventive measures, and the impacts of the pandemic on daily activities, education, and mental health. Log-binomial models were used to calculate the adjusted prevalence ratios (aPRs) for determinants of education and mental health outcomes.

Results: Overall, 17% of the adolescents were not receiving any education. Compared to boys, girls were 15% more likely than boys to lack fully in-person education (aPR: 1.15; 95% confidence interval [CI]: 1.02, 1.30). Rural residence was associated with 2.7 times the prevalence of not currently receiving any education (aPR: 2.68; 95% CI: 2.23, 3.22). Self-reported experience of the current impacts of the pandemic on daily activities was associated with a higher prevalence of possible psychological distress (aPR: 1.86; 95% CI: 1.55, 2.24), high anxiety level (aPR: 3.37; 95% CI: 2.25, 5.06), and high depression level (aPR: 3.01; 95% CI: 2.05, 4.41).

Discussion: The COVID-19 pandemic presents continued challenges to adolescents' education and mental health. Multisectoral efforts are needed to ensure that adolescents in sub-Saharan Africa do not fall further behind due to the pandemic.

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health of sub-Saharan African adolescents. The lack of in-person education and the difficulty of catching up on education are concerning. Multi-sectoral efforts are needed to ensure that sub-Saharan African adolescents do not fall further behind during the pandemic.

The spread of the coronavirus disease 2019 (COVID-19) has led most countries across the world to take unprecedented measures to respond to this public health crisis [1,2]. While mitigating measures have reduced the spread of the virus [1], lockdowns, stay-at-home orders, and physical distancing guidelines have also led to considerable disruptions of daily lives. These measures have adverse and potentially long-lasting consequences for different population groups in sub-Saharan Africa [3–5].

Adolescents aged 10 to 19 years constitute 23% of sub-Saharan Africa's population [6]. Adolescents generally have mild symptoms and lower death rates when infected with the COVID-19 virus [7,8], so they are less affected by the direct health consequences of the disease. However, adolescents have unique educational and sociodevelopmental needs that have been affected by the many mitigating measures used to control the pandemic [3,9]. For example, the widespread school closures during the height of the pandemic in 2020 resulted in disruptions in the education of adolescents, making them indirect victims of the pandemic [10]. This issue is of concern in sub-Saharan Africa [3], where the education systems, with limited resources for hybrid and online learning, were fragile even before the pandemic. The health and wellbeing of adolescents have also been historically underserved. Our multicountry survey in Burkina Faso, Ethiopia, and Nigeria early in the pandemic, for example, found that the COVID-19 pandemic has exerted vast indirect tolls on multiple facets of adolescents' lives, including partial or complete loss of access to educational opportunities [3]. We reported that during the peak of the pandemic in 2020, when schools were closed, a significant proportion of adolescents experienced disrupted or suboptimal education and many were entirely deprived of education [3,9].

With the school closures, the many critical social protection functions of schools also became absent. Although schools have reopened, the impacts of school closures may be long-lasting. The pandemic aggravates inequities in education among adolescents [9]. Extended periods of home confinements and lack of social interaction have also left adolescents vulnerable to mental health issues [11–13].

As sub-Saharan African countries continue to combat the COVID-19 pandemic, the indirect consequences of the pandemic on adolescent education and mental wellbeing should not be ignored. In this cross-country study, including nine areas in five countries across sub-Saharan Africa, we assessed the current impacts of the pandemic on education and mental health among adolescents. We also evaluated the potential determinants of these outcomes, which will inform the targeting and design of potential interventions to mitigate these adverse impacts.

Methods

Study design and study population

This cross-country study was based on a cross-sectional phone-based survey using computer-assisted telephone interviewing among sub-Saharan African adolescents, adults, and healthcare providers. The survey included Burkina Faso, Ethiopia, Ghana, Nigeria, and Tanzania. We included one rural area and one urban area in all countries except Ghana, which only had a rural locality. Specifically, the areas included were Nouna (rural) and Ouagadougou (urban) in Burkina Faso; Kersa (rural) and Addis Ababa (urban) in Ethiopia; Kintampo (rural), Ibadan (a rural subarea), and Lagos (urban) in Nigeria; and Dodoma (a rural subarea) and Dar es Salaam (urban) in Tanzania. While Ibadan and Dodoma may be generally considered urban settings, sub-areas in Ibadan and Dodoma that were more rural were selected. This survey included nine areas from five countries across sub-Saharan Africa (Figure 1). The national average years of schooling in 2017 was 1.5 years for Burkina Faso, 2.7 years for Ethiopia, 7.1 years for Ghana, 6.2 years for Nigeria, and 5.8 years for Tanzania [14].

The detailed study protocol is available on the website of the Harvard University Center for African Studies (https://africa.harvard.edu/files/african-studies/files/arise_covid_survey_round_2_methods_brief_final.pdf). Briefly, we selected households from sampling frames of existing Health and Demographic Surveillance Systems (HDSSs) or national surveys. Different



Figure 1. Study areas included in a phone-based survey among adolescents in five sub-Saharan African countries, 2021.

household sampling frames were used by different areas depending on the platforms available. Within the sampling frame in each area, approximately 300 randomly selected households with adolescents aged from 10 to 19 years were contacted by phone. The sampling frames and sampling methods for Burkina Faso, Ethiopia, and Nigeria have been described in detail previously [15]. For the new site of Kintampo (Ghana), we used the Kintampo HDSS as the sampling frame, which represents a catchment area of 163,182 individuals and 39,134 households. A total of 3,589 adolescents were randomly sampled from the overall list of households and 1,074 households were contacted until we reached the target sample size of 300 adolescents. For the Dodoma site, we used the Dodoma HDSS as the sampling frame and randomly selected 600 households with adolescents from the sampling frame, and 318 eligible adolescents completed the survey. For the Dar es Salaam site, the sampling frame was the Dar es Salaam HDSS, also referred to as the Dar es Salaam Urban Cohort Study [16]. The Dar es Salaam HDSS includes 14,754 households with 143,452 individuals, of which 30,446 were adolescents. We randomly selected 2,500 households with adolescent members and 655 households were contacted until the 302 adolescents were interviewed.

We conducted the survey between July and December 2021. We contacted all households with adolescents aged 10 to 19 years who participated in a previous survey in 2020 [15]. For adolescents who could not be reached or could not participate again in the current survey, we randomly identified new adolescents from the sampling frame until we reached the minimum target sample size of 300 per site. During the period of data collection, there were no school closures in response to COVID-19 in Burkina Faso, Ghana, Nigeria, and Tanzania and only recommended (not required) school closures in Ethiopia [17].

We obtained oral parental consent and adolescent assent for adolescents aged less than 18 years and oral informed consent from adolescents aged 18 years and more. The adolescents often responded to the interviewers using someone else's (e.g., the household head's) phone. Therefore, to protect the adolescents' privacy, the data collectors instructed all adolescents to receive the interview in a private space away from other individuals in the household, if possible. This study was approved by the Institutional Review Board at Harvard T.H. Chan School of Public Health and ethical review boards in each country and area, including the Nouna Health Research Center Ethical Committee and National Ethics Committee in Burkina Faso, the Institutional

Ethical Review Board of Addis Continental Institute of Public Health in Ethiopia, Kintampo Health Research Centre Institutional Ethics Committee in Ghana, the University of Ibadan Research Ethics Committee and National Health Research Ethics Committee in Nigeria, and the Muhimbili University of Health and Allied Sciences and National Institute for Medical Research in Tanzania.

Data collection

The survey collected information on adolescents' socio-demographic characteristics, current COVID-19 preventive measures, and the current impacts of the pandemic on daily activities, education, and mental health. The complete adolescent survey instrument is available on the website of the Harvard University Center for African Studies (https://africa.harvard.edu/files/african-studies/files/arise_covid-19_survey_round_2_adolescent_household_survey_questionnaire.pdf). The questionnaires were translated into local languages by experienced translators and verified by investigators at each site. Trained research assistants (male and female) with prior data collection experience and good knowledge of the local language were hired to conduct the interviews.

Statistical analysis

For descriptive analyses, we calculated means and standard deviations (SDs) overall and by area for normally distributed continuous variables, medians and percentiles for skewed continuous variables, and counts and percentages for categorical variables. For associational analyses, we focused on outcomes of three domains, including education and mental health outcomes.

The education outcomes included (1) not returning to school after it reopened; (2) not currently receiving education in any modality (including fully in-person education, partially in-person education, take-home materials, online coursework, home-schooling, or other education methods); (3) not currently receiving fully in-person education; and (4) self-reported difficulty catching up on education after school reopened (including slightly difficult, very difficult, and not possible to catch up). The education outcomes were restricted to adolescents enrolled in school prior to the COVID-19 pandemic; self-reported difficulty catching up was additionally restricted to adolescents who returned to school after it reopened. We defined all education outcomes as dichotomous variables. The potential determinants of the education outcomes that were examined included age, sex, country, rural residence, and duration of school closures.

Mental health was assessed using the four-item Patient Health Questionnaire for Depression and Anxiety Scale (PHQ-4) [18], which included four questions related to possible psychological distress over the past two weeks. We computed the total score for potential psychological distress by adding up the scores of the four items, with a range of 0–12. We further categorized the presence and severity of possible psychological distress as none (total score: 0–2), mild (total score: 3–5), moderate (total score: 6–8), and severe (total score: 9–12) [18]. We also created an anxiety subscale (range: 0–6) using the scores of the first two questions and a depression subscale (range: 0–6) using the scores of the last two questions. A subscale score of 3 or more was considered high anxiety and depression levels, respectively [18]. The PHQ-4 has been tested and validated for screening anxiety and depression among adolescents in sub-Saharan Africa

[19]. The mental health outcomes included (1) any potential psychological distress (mild, moderate, or severe), (2) high anxiety level, and (3) high depression level. All mental health outcomes were defined as dichotomous variables. The potential determinants of the mental health outcomes included age, sex, country, rural residence, duration of school closures (for adolescents enrolled in school prior to the COVID-19 pandemic), and experiencing any current impacts of the pandemic on daily activities.

We used log-binomial models to calculate the prevalence ratios (PRs) and 95% confidence intervals (CIs) for the education and mental health outcomes; modified Poisson models were used to achieve convergence whenever necessary [20]. We examined the crude associations between potential determinants and the outcomes in the unadjusted models. In the adjusted models, we controlled for age, sex, country, and rural residence to compute adjusted prevalence ratios (aPRs) with 95% CIs. All analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, North Carolina) at a two-sided α level of 0.05. We handled missing data using the complete case analysis. We did not adjust for multiple testing.

Results

Sociodemographic characteristics

Approximately 2,803 adolescents were interviewed (Table 1). The age of the adolescents ranged from a minimum of 10 years to a maximum of 20 years. The mean age of the participants varied from 14 years in Dar es Salaam (SD: 2.6) and Dodoma (SD: 2.3) to 17 years in Ibadan (SD: 2.0) and Addis Ababa (SD: 2.4). There were roughly equal numbers of girls and boys in most areas, except for Addis Ababa and Kersa, where 62% and 31% were girls, respectively. The proportion of adolescents with at least some secondary school education varied from 16% in Dodoma to 96% in Ibadan. At least 85% of the participants across areas self-identified as students, except in Nouna and Dodoma, where 52% and 57% were students, respectively.

COVID-19 practices and self-reported impacts of the pandemic

Handwashing with soap or hand sanitizer was the most common preventive measure to respond to the pandemic and was practiced by 90% of the adolescents overall, ranging from 61% in Kersa to more than 99% in Ouagadougou (Table A1). Wearing face masks was adopted by 82% of the participants overall, ranging from 34% in Dodoma to more than 98% in Ouagadougou. Social distancing or reducing social gatherings was practiced by 63% overall, ranging from 20% in Dodoma to 93% in Ouagadougou. Regarding the self-reported current impacts of the COVID-19 pandemic on daily activities, 41% of the adolescents overall reported no current impacts, 30% reported staying at home more often, 22% reported increased responsibility at home (e.g., taking care of siblings, cooking, cleaning), and 10% reported gaining weight.

Impacts of the pandemic on education

Among adolescents enrolled in school before the COVID-19 pandemic, 3% did not return to schools after they reopened, ranging from 0.6% in Lagos to 11% in Ouagadougou (Table 2). The proportion of adolescents not currently receiving any education

Table 1
Sociodemographic characteristics of adolescents in a phone-based survey in five sub-Saharan African countries, 2021^a

	Burkina Faso		Ethiopia		Ghana	Nigeria		Tanzania		Total
	Rural	Urban	Rural	Urban	Rural	Rural	Urban	Rural	Urban	
	Nouna	Ouagadougou	Kersa	Addis Ababa	Kintampo	Ibadan	Lagos	Dodoma	Dar es Salaam	
Number of adolescents, N	309	300	300	308	300	319	347	318	302	2,803
Age, years (SD)	15.8 (2.5)	15.8 (2.5)	16.1 (2.8)	17.0 (2.4)	15.6 (2.7)	16.9 (2.0)	16.0 (1.9)	14.4 (2.3)	14.1 (2.6)	15.7 (2.6)
Girls, N (%)	140 (45.3)	161 (53.7)	92 (30.7)	191 (62.0)	153 (51.0)	175 (54.9)	206 (59.4)	175 (55.0)	177 (58.6)	1,470 (52.4)
Highest level of education, N (%) ^{b,c}										
None/religious school/literacy class	38 (12.4)	17 (5.7)	2 (0.7)	1 (0.3)	10 (3.3)	1 (0.3)	0 (0.0)	34 (10.7)	0 (0.0)	103 (3.7)
Some primary school	90 (29.4)	58 (19.3)	139 (46.3)	59 (19.2)	109 (36.3)	3 (0.9)	0 (0.0)	169 (53.1)	109 (36.5)	736 (26.3)
Completed primary school	40 (13.1)	16 (5.3)	30 (10.0)	30 (9.7)	46 (15.3)	9 (2.8)	17 (4.9)	65 (20.4)	52 (17.4)	305 (10.9)
Some secondary/high school	114 (37.3)	186 (62.0)	103 (34.3)	130 (42.2)	127 (42.3)	216 (67.9)	299 (86.2)	48 (15.1)	113 (37.8)	1,336 (47.8)
Completed secondary/high school	11 (3.6)	20 (6.7)	10 (3.3)	50 (16.2)	7 (2.3)	78 (24.5)	27 (7.8)	2 (0.6)	19 (6.4)	224 (8.0)
Tertiary education or higher	13 (4.3)	3 (1.0)	16 (5.3)	38 (12.3)	1 (0.3)	11 (3.5)	4 (1.2)	0 (0.0)	6 (2.0)	92 (3.3)
Occupation N (%) ^d										
Unemployed	21 (6.8)	12 (4.0)	2 (0.7)	5 (1.6)	11 (3.7)	0 (0.0)	0 (0.0)	71 (22.3)	21 (7.0)	143 (5.1)
Student	161 (52.1)	255 (85.0)	278 (92.7)	290 (94.2)	259 (86.3)	309 (97.5)	342 (98.6)	181 (56.9)	267 (88.4)	2,342 (83.6)
Farmer	86 (27.8)	0 (0.0)	16 (5.3)	2 (0.7)	14 (4.7)	0 (0.0)	0 (0.0)	34 (10.7)	1 (0.3)	153 (5.5)
Wage employment	0 (0.0)	2 (0.7)	0 (0.0)	5 (1.6)	3 (1.0)	1 (0.3)	3 (0.9)	0 (0.0)	3 (1.0)	17 (0.6)
Self-employed	7 (2.3)	9 (3.0)	2 (0.7)	6 (2.0)	8 (2.7)	6 (1.9)	2 (0.6)	1 (0.3)	10 (3.3)	51 (1.8)
Casual, off-farm income	6 (1.9)	4 (1.3)	0 (0.0)	0 (0.0)	1 (0.3)	1 (0.3)	0 (0.0)	31 (9.8)	0 (0.0)	43 (1.5)

SD = standard deviation.

^a Values are mean (standard deviation) for age and count (percentage) for other variables.

^b Percentages may not add up to 100% due to rounding.

^c Level of education missing for three adolescents in Nouna, one adolescent in Ibadan, and three adolescents in Dar es Salaam.

^d Occupation missing for two adolescents in Ibadan.

ranged from 1% in Lagos to 64% in Nouna (17% overall). The proportion currently receiving fully in-person education ranged from 29% in Nouna to 97% in Lagos (75% overall). The proportion of partially in-person education was less than 5% in all areas except Addis Ababa, where 10% were receiving partially in-person education. The proportion of take-home materials was less than 5% in all areas except Addis Ababa, Kintampo, and Kersa, with 6%, 12%, and 23% receiving education through take-home materials, respectively. Online coursework, home-schooling, and other education methods were rare (< 4%) in all areas. The proportion of adolescents reporting difficulty catching up with education after returning to school ranged from 20% in Dodoma to 83% in Nouna (62% overall).

Older age was associated with a higher prevalence of not currently receiving any education (aPR for every one-year increase: 1.06; 95% CI: 1.03, 1.10) and a higher prevalence of having difficulty catching up after returning to school (aPR for every one-year increase: 1.04; 95% CI: 1.03, 1.05) (Table 3). Girls and boys were similarly likely to return to school after it reopened (aPR comparing girls to boys: 0.77; 95% CI: 0.48, 1.23) and similarly likely to receive education in any modality (aPR comparing girls to boys: 1.13; 95% CI: 0.97, 1.31). However, compared to boys, girls were 15% more likely than boys to lack fully in-person education (aPR: 1.15; 95% CI: 1.02, 1.30). Rural residence was associated with 2.7 times the prevalence of not currently receiving any education (aPR: 2.68; 95% CI: 2.23, 3.22), 2.2 times the prevalence of not currently receiving fully in-person education

(aPR: 2.23; 95% CI: 1.93, 2.58), and 10% lower prevalence of having difficulty catching up with education (aPR: 0.90; 95% CI: 0.84, 0.96). Longer school closures were associated with a higher prevalence of difficulty catching up (aPR for every one-month increase in duration: 1.01; 95% CI: 1.00, 1.03). The unadjusted model estimates are reported in Table A2.

Impacts of the pandemic on mental health

The prevalence of potential psychological distress varied from 3% in Dodoma to 27% in Ouagadougou (Table 2). The prevalence of high anxiety ranged from 0% in Dodoma to 11% in Kintampo and high depression varied from 0% in Dodoma to 15% in Addis Ababa. Older age was associated with a higher prevalence of potential psychological distress (aPR for every one-year increase: 1.06; 95% CI: 1.02, 1.10) and a higher prevalence of high depression level (aPR for every one-year increase: 1.09; 95% CI: 1.03, 1.16) (Table 4). Rural residence was associated with a 37% lower prevalence of potential psychological distress (aPR: 0.63; 95% CI: 0.52, 0.75) and a 47% lower prevalence of high depression levels (aPR: 0.53; 95% CI: 0.38, 0.74). Currently experiencing any impacts of the COVID-19 pandemic on daily activities was associated with an 86% higher prevalence of potential psychological distress (aPR: 1.86; 95% CI: 1.55, 2.24), 3.4 times the prevalence of high anxiety level (aPR: 3.37; 95% CI: 2.25, 5.06), and 3.0 times the prevalence of high depression level (aPR: 3.01; 95% CI: 2.05, 4.41). The unadjusted model estimates are reported in Table A3.

Table 2Education and mental health among adolescents in a phone-based survey in five sub-Saharan African countries, 2021^a

	Burkina Faso		Ethiopia		Ghana	Nigeria		Tanzania		Total
	Rural	Urban	Rural	Urban	Rural	Rural	Urban	Rural	Urban	
	Nouna	Ouagadougou	Kersa	Addis Ababa	Kintampo	Ibadan	Lagos	Dodoma	Dar es Salaam	
Number of adolescents, N	309	300	300	308	300	319	347	318	302	2,803
Education outcomes ^b										
Not returning to school after it reopened ^c	5 (2.4)	28 (11.2)	13 (4.7)	6 (2.0)	4 (2.0)	3 (1.2)	2 (0.6)	6 (2.7)	2 (0.7)	69 (3.0)
Current education modality ^d										
Not receiving any education	143 (64.1)	51 (19.4)	29 (10.4)	55 (18.3)	21 (10.1)	33 (12.5)	4 (1.2)	52 (23.0)	10 (3.6)	398 (16.7)
Fully in-person education	65 (29.2)	212 (80.6)	177 (63.4)	183 (61.0)	150 (71.8)	217 (82.2)	323 (97.3)	174 (77.0)	271 (96.1)	1,772 (74.5)
Partial in-person education	0 (0.0)	0 (0.0)	3 (1.1)	31 (10.3)	9 (4.3)	2 (0.8)	2 (0.6)	0 (0.0)	1 (0.4)	48 (2.0)
Take-home materials	3 (1.4)	0 (0.0)	64 (22.9)	19 (6.3)	24 (11.5)	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	111 (4.7)
Online coursework	0 (0.0)	0 (0.0)	0 (0.0)	5 (1.7)	1 (0.5)	10 (3.8)	2 (0.6)	0 (0.0)	0 (0.0)	18 (0.8)
Homeschooling	7 (3.1)	0 (0.0)	6 (2.2)	7 (2.3)	4 (1.9)	1 (0.4)	1 (0.3)	0 (0.0)	0 (0.0)	26 (1.1)
Other education methods	5 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (0.2)
Difficulty catching up after school reopened ^e	166 (83.4)	168 (75.7)	178 (67.2)	220 (76.4)	154 (76.6)	114 (45.6)	224 (68.5)	44 (20.2)	114 (41.0)	1,382 (61.5)
Mental health outcomes										
Mild psychological distress ^f	34 (11.5)	57 (19.3)	30 (10.1)	46 (15.0)	43 (14.9)	44 (14.5)	57 (16.7)	8 (2.5)	35 (11.7)	354 (12.9)
Moderate psychological distress ^f	19 (6.4)	21 (7.1)	2 (0.7)	19 (6.2)	16 (5.6)	11 (3.6)	12 (3.5)	0 (0.0)	7 (2.3)	107 (3.9)
Severe psychological distress ^f	8 (2.7)	1 (0.3)	0 (0.0)	5 (1.6)	4 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.7)	20 (0.7)
Any psychological distress ^f	61 (20.7)	79 (26.7)	32 (10.7)	70 (22.9)	63 (21.9)	55 (18.2)	69 (20.2)	8 (2.5)	44 (14.7)	481 (17.5)
High anxiety level ^g	31 (10.4)	13 (4.4)	4 (1.3)	27 (8.8)	33 (11.3)	16 (5.2)	18 (5.2)	0 (0.0)	8 (2.7)	150 (5.4)
High depression level ^g	29 (9.8)	32 (10.8)	4 (1.3)	45 (14.7)	26 (8.9)	18 (5.9)	12 (3.5)	0 (0.0)	11 (3.6)	177 (6.4)

^a Values are median (25th percentile, 75th percentile) for continuous variables and count (percentage) for categorical variables.

^b Among adolescents enrolled in school prior to the COVID-19 pandemic.

^c Missing for 18 adolescents in Nouna, 14 adolescents in Ouagadougou, seven adolescents in Addis Ababa, one adolescent in Kersa, 16 adolescents in Ibadan, three adolescents in Lagos, two adolescents in Dar es Salaam, four adolescents in Dodoma, and five adolescents in Kintampo.

^d Percentages may not add up to 100% due to rounding. Missing for one adolescent in Ouagadougou, one adolescent in Addis Ababa, five adolescents in Ibadan, one adolescent in Dar es Salaam, two adolescents in Dodoma, and one adolescent in Kintampo.

^e Among adolescents who returned to school after it reopened; included slightly difficult, very difficult, and not possible to catch up. Missing for one adolescent in Nouna and one adolescent in Dar es Salaam.

^f Psychological distress was measured using the four-item Patient Health Questionnaire for Depression and Anxiety Scale. Each item had a numeric score of 0, 1, 2, and 3, and the total score was computed by adding up the scores of the four items, with a range of 0–12. The total score of psychological distress was categorized into none (total score: 0–2), mild (total score: 3–5), moderate (total score: 6–8), and severe (total score: 9–12). Missing for 14 adolescents in Nouna, four adolescents in Ouagadougou, two adolescents in Addis Ababa, two adolescents in Kersa, 16 adolescents in Ibadan, six adolescents in Lagos, two adolescents in Dar es Salaam, two adolescents in Dodoma, and 12 adolescents in Kintampo.

^g An anxiety subscale (range: 0–6) and a depression subscale (range: 0–6) were created using the scores of the first and last two questions, respectively; a subscale score of 3 or more was considered a high level of anxiety and depression, respectively.

Discussion

This multicountry and multisite survey finds that the COVID-19 pandemic has continued adverse impacts on adolescents in multiple sub-Saharan African countries. We report that 17% of the adolescents were not receiving any education and that adolescents in rural areas are more likely not to receive education. Adolescents who continue to experience the impacts of the pandemic on daily activities are more likely to have symptoms suggestive of psychological distress and high levels of possible anxiety and depression.

COVID-19–induced school closures bring not only direct loss of education access but also the loss of social protective functions typically conferred by schools and may have left adolescents at increased risks of child labor, early marriages and pregnancies, gender-based violence, and the adoption of unhealthy health behaviors [21–26]. A particular concern was that many adolescents might not return to school after schools reopened [21]. Findings from this analysis highlight the concern picture that a considerable proportion of adolescents (17% of the overall sample) were not currently receiving any education and many (75% of the overall sample) were not receiving fully in-person

Table 3Potential determinants of education outcomes after school reopening among adolescents in a phone-based survey in five sub-Saharan African countries, 2021^a

	Not returning to school after it reopened	Not currently receiving education in any modality	Not currently receiving fully in-person education	Difficulty catching up after school reopened ^b
	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)
Age, years	1.08 (0.98, 1.19)	1.06 (1.03, 1.10)	1.00 (0.97, 1.03)	1.04 (1.03, 1.05)
Female sex	0.77 (0.48, 1.23)	1.13 (0.97, 1.31)	1.15 (1.02, 1.30)	0.94 (0.90, 0.99)
Country				
Burkina Faso	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Ethiopia	0.42 (0.24, 0.74)	0.32 (0.25, 0.39)	0.76 (0.66, 0.87)	0.92 (0.86, 0.97)
Ghana	0.31 (0.11, 0.89)	0.16 (0.11, 0.25)	0.43 (0.34, 0.55)	1.06 (0.96, 1.16)
Nigeria	0.11 (0.04, 0.29)	0.15 (0.11, 0.20)	0.21 (0.16, 0.27)	0.77 (0.70, 0.83)
Tanzania	0.25 (0.12, 0.55)	0.34 (0.26, 0.45)	0.28 (0.21, 0.35)	0.46 (0.40, 0.53)
Rural residence	0.80 (0.49, 1.31)	2.68 (2.23, 3.22)	2.23 (1.93, 2.58)	0.90 (0.84, 0.96)
Duration of school closure, months	0.91 (0.77, 1.07)	0.96 (0.91, 1.01)	0.99 (0.95, 1.03)	1.01 (1.00, 1.03)

aPR = adjusted prevalence ratio; CI = confidence interval.

^a Values are adjusted prevalence ratios (95% confidence intervals) from log-binomial or modified Poisson models. The models adjusted for age, sex, country, and rural residence. The education outcomes were restricted to adolescents enrolled in school prior to the COVID-19 pandemic.^b Among adolescents who returned to school after it reopened.

education. We found that the percentage of adolescents who did not return to school after school reopened varied widely geographically, from 0.6% in Lagos to 11% in Ouagadougou. Due to the lack of historical data on adolescents' dropout rates in these settings, it is unclear to what extent the failure to return to school was a direct result of the pandemic, as opposed to school dropouts who would have been normally expected. The observed wide geographical variation in dropouts is in line with a recent review on school dropouts during the COVID-19 pandemic, and the variation likely reflects underlying differences in baseline dropout rates and other schooling norms [27].

We find that more than half of adolescents in most areas experienced some levels of difficulty in catching up on their education after returning to school. Older adolescents are less likely to receive education, perhaps partially because older adolescents are more likely to have taken on permanent employment during the pandemic when schools were closed. This finding is in line with a recent review which found that school dropouts during the COVID-19 pandemic were highest among adolescents compared to younger children [27]. Adolescents in rural areas are also less likely to be receiving education, perhaps due to the greater opportunity costs to families of the loss of adolescent labor in rural areas than in urban areas [28]. We also find that a longer duration of school closure may be associated with greater difficulty catching up on lost education. These findings highlight the need to make up for lost education, especially among girls, older adolescents, adolescents in rural settings, and adolescents in schools closed for extended periods. The lack of in-person education and the perceived difficulty of catching up on education after returning to school are especially of concern and require urgent actions.

Home confinements related to the COVID-19 pandemic may trigger an elevated level of psychosocial strain and lead to increased mental health disorders [29]. Adolescents may experience more depressive and anxious symptoms during the COVID-19 pandemic [11,30]. Evidence on the pandemic's mental health among adolescents in resource-limited settings has been limited [3,12,13,31]. A multicountry cohort study in Ethiopia, India, Peru, and Vietnam reported that the rates of anxiety symptoms were highest in Peru (41%) and lowest in Vietnam (9%), mirroring the COVID-19 mortality rates in each setting [12]. This study also found that pandemic-related stressors such as

health risks, economic adversity, food insecurity, and educational or employment disruption were all risk factors for anxiety and depression [12]. In a mobile-phone-based survey among parent-adolescent dyads in Kenya, more than a third of adolescents had depressive symptoms, which were positively associated with income losses of the adult household member [13]. Our study indicates a high prevalence of symptoms suggestive of mild psychological distress in most study areas. It is uncertain to what extent the mental health issues stem from the COVID-19 pandemic or its mitigating measures. We find that experiencing any current impacts of the pandemic on daily activities may increase the risks of anxiety, depression, and psychological distress. Our prior household-based, cross-sectional study of adolescents in six sub-Saharan African countries (the same five countries in the current survey plus Uganda) found that older age, female sex, food insecurity, poor access to healthcare, and substance use were all associated with higher prevalence of depressive symptoms and suicidal ideation/behaviors [32]. Continuing efforts are needed to monitor and address the often-ignored mental health challenges among children and adolescents [33–35].

A wide array of factors at the country level, such as the political, economic, social, and structural environments, informed each country's responses and mitigation approaches to the COVID-19 pandemic and the potential impacts of such measures on adolescents. For example, the period of government-mandated universal school closures appears extremely short in Tanzania (only two months or so), which was then followed by mandated school closures at certain levels, recommended (but not mandated) school closures, and then complete school reopening [17]. The brevity of COVID-19-induced school closures in Tanzania may partially explain the slightly smaller impacts of the pandemic on adolescent education (e.g., low prevalence of out-of-school adolescents, higher prevalence of fully in-person education). COVID-19 mitigation measures unequivocally reduced COVID-19 morbidity and mortality. However, these measures may bear unattended consequences on adolescent experience and these must be carefully analyzed considering the exact measures implemented in each setting and context-specific structural changes should be put in place. Enhanced infrastructure for remote learning accessible to adolescents of diverse socioeconomic conditions should be

Table 4Potential determinants of mental health outcomes among adolescents in a phone-based survey in five sub-Saharan African countries, 2021^a

	Any psychological distress ^b	High anxiety level ^c	High depression level ^c
	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)
Age, years	1.06 (1.02, 1.10)	1.04 (0.97, 1.10)	1.09 (1.03, 1.16)
Female sex	1.07 (0.91, 1.26)	1.10 (0.80, 1.50)	1.03 (0.77, 1.37)
Country			
Burkina Faso	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Ethiopia	0.69 (0.55, 0.86)	0.68 (0.43, 1.07)	0.75 (0.52, 1.07)
Ghana	1.22 (0.92, 1.62)	1.72 (1.07, 2.77)	1.29 (0.79, 2.10)
Nigeria	0.78 (0.63, 0.96)	0.69 (0.45, 1.06)	0.43 (0.28, 0.65)
Tanzania	0.40 (0.30, 0.54)	0.19 (0.09, 0.40)	0.20 (0.11, 0.39)
Rural residence	0.63 (0.52, 0.75)	0.82 (0.58, 1.18)	0.53 (0.38, 0.74)
Duration of school closure, months ^d	0.95 (0.91, 1.00)	0.94 (0.87, 1.03)	0.95 (0.87, 1.05)
Current impacts of the COVID-19 pandemic on daily activities			
No impacts	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Some impacts	1.86 (1.55, 2.24)	3.37 (2.25, 5.06)	3.01 (2.05, 4.41)

aPR = adjusted prevalence ratio; CI = confidence interval.

^a Values are adjusted prevalence ratios (95% confidence intervals) from log-binomial or modified Poisson models. The models adjusted for age, sex, country, and rural residence.^b Psychological distress was measured using the four-item Patient Health Questionnaire for Depression and Anxiety Scale. Each item had a numeric score of 0, 1, 2, and 3, and the total score was computed by adding up the scores of the four items, with a range of 0–12. The total score of psychological distress was categorized into none (total score: 0–2), mild (total score: 3–5), moderate (total score: 6–8), and severe (total score: 9–12).^c An anxiety subscale (range: 0–6) and a depression subscale (range: 0–6) were created using the scores of the first and last two questions, respectively. A subscale score of 3 or more was considered a high level of anxiety and depression, respectively.^d For adolescents who were enrolled in school prior to the COVID-19 pandemic.

established for future public health emergencies. Furthermore, The COVID-19 pandemic severely impacted people's livelihoods [36]. The pandemic's impacts on adolescent education and mental health cannot be separated from the impacts on the household level (e.g., the loss of employment and income of the parents), which were not explicitly captured in our survey to the adolescents. Dedicated work is needed to elucidate how contextual factors at the country and household level exacerbate or mitigate the pandemic's adverse impacts on adolescent experience.

The impacts of the COVID-19 pandemic are also compounded by the effects of other contextual factors. The educational systems in Africa were structurally fragile even before the pandemic, with unequal educational opportunities and infrastructure (including resources to pivot to remote learning during emergencies) for different socioeconomic groups [37]. Literacy and learning performance gaps between rural and urban settings in sub-Saharan Africa are documented prior to the COVID-19 pandemic [38]. It was unclear to what extent the rural-urban disparity was the additional impact of the pandemic. Future works are needed to elucidate how the COVID-19 pandemic may have widened the socioeconomic inequities in the education of children and adolescents.

The strengths of this study are the inclusion of multiple countries and cities across sub-Saharan Africa and the measurements of key variables on adolescent education and mental wellbeing. This study also has important limitations that must be considered when interpreting the findings. First, the study countries and areas were selected based on existing connections and infrastructure and the adolescents in each area were not sampled probabilistically. The study effectively used a geographically diverse convenience sample. Therefore, findings from the study are not expected to be generalizable to all adolescents within each locality. Second, the interviewed adolescents resided in households with access to a mobile phone and

good reception. Consequently, the study may under-represent particularly vulnerable adolescents who do not have access to a mobile phone in the household or reside in remote areas without good connectivity and reception. Third, information was collected through the self-reports of adolescents, who often needed to respond to the phone interviewers using someone else's phone. Therefore, measurement error was possible. For example, the extent of learning difficulties was self-assessed and did not rely on objective measurements of learning outcomes. Social desirability bias may have also impacted the accuracy of the questions on mental health [39]. Fourth, the PHQ-4 used for measuring mental health was brief and intended for screening rather than diagnostic purposes. A synthesis of the prevalence of mental health problems in sub-Saharan African adolescents is available elsewhere [40]. Fifth, due to the lack of baseline or historical data on adolescent education and mental health in these localities, we could not disentangle the pandemic's effect from the effects of contextual factors contemporary to the pandemic.

In conclusion, the COVID-19 pandemic continues to exert adverse impacts on the education and mental health of adolescents in sub-Saharan Africa. As the world continues to battle and recover from COVID-19, concerted and multisectoral efforts are needed to ensure that the often-neglected sub-Saharan African adolescents do not fall further behind and have the maximal likelihood of reaching their full potential in their future lives despite the pandemic.

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Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jadohealth.2022.11.012>.

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