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The interaction between learning, mental health and wellbeing during the COVID-19 pandemic: A longitudinal mixed-methods study in Ethiopia

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ABSTRACT

The COVID-19 pandemic has profoundly disrupted education and exacerbated mental health challenges in Ethiopia, where prolonged school closures and limited access to remote learning have disproportionately affected vulnerable populations. This paper investigates the experiences of primary school students during pandemic-related school closures and reopening, and the consequences this had on their learning, mental health, and wellbeing. It combines quantitative data from over 2000 students tracked from Grades 4–6, together with qualitative data from in-depth interviews with a subsample of these students who experienced a decrease in their learning during this time. Our quantitative data show that 42 percent of students in the sample experienced a decline in numeracy test scores following school closures, with an average loss of 10 percentage points. Students with lower self-reported mental health and wellbeing, as well as those from the poorest families, were disproportionately affected—about 12 % more likely to experience learning loss than peers with better mental health or from wealthier families. Our qualitative findings highlight key factors that shaped students' experiences, including a lack of access to learning resources, increased household responsibilities, economic hardships, and heightened stress due to uncertainty about the future. Girls were more likely to have been involved in domestic work activities, which left them with less time to spend on education. Our findings point to the need for targeted interventions to support the specific needs of students most affected by crises, focusing on both their academic learning and their mental health and wellbeing.

1. Introduction

The COVID-19 pandemic led to unprecedented school closures around the world, affecting approximately 1.6 billion students (United Nations Education Science and Cultural Organisation (UNESCO), 2020). While these closures were necessary as a public health measure to limit the virus's spread, they also caused significant disruptions to learning. This disruption further strained already fragile education systems, where longstanding challenges were already present (Kaffenberger and Pritchett, 2022; Soudien et al., 2021; World Bank, 2022). Even prior to the pandemic, many countries experienced a "learning crisis"—a situation marked by persistently low learning outcomes despite gains in school enrolment and access (Pritchett and Viarengo, 2023; Clarke, 2022; Sandefur, 2018). According to the World Bank (2018), millions of children attend school but fail to acquire the foundational skills necessary for their future. The pandemic further deepened this crisis, with prolonged school closures leading to significant learning losses, projected to be as high as 0.6 years of schooling when adjusted for quality (Azevedo et al., 2021). It may also translate to a 0.68 percentage point reduction in global GDP growth (Jakubowski et al., 2023).

In Ethiopia, considerable progress has been made in expanding access to education over the past few decades, with primary school enrolment increasing significantly (Ministry of Education, 2020a). However, concerns about education quality persist, particularly among marginalised groups, such as girls, children from low-income households, and those living in rural areas (Iyer et al., 2020). The pandemic compounded these pre-existing disparities, creating a dual crisis of access and quality in the country. School closures disproportionately affected vulnerable children who lacked access to remote learning opportunities due to a digital divide, economic hardship, and household

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responsibilities (Yorke et al., 2021). Girls faced increased risks of school dropout due to factors such as early marriage, teen pregnancies, and domestic burdens (Ford et al., 2021; Jones at al., 2021).

Beyond academic disruptions, the pandemic has also had profound implications for students' mental health and wellbeing. The sudden closure of schools, social isolation, and uncertainty surrounding the pandemic have contributed to heightened levels of stress, anxiety, and depression among children (Bayley et al., 2023; Porter et al., 2021). These psychological challenges, in turn, negatively impacted students' ability to engage in learning, creating a cycle of disengagement (Schady at al., 2023) and emotional distress (Tadesse et al., 2021). Research has shown that students with stronger social and emotional skills are more resilient in coping with stress, enabling them to maintain their mental health and continue learning despite adversity (Bayley et al., 2023; Diamond, 2014; Immordino-Yang and Damasio, 2007). Additionally, social skills facilitate supportive relationships with family and peers and serve as protective factors that promote wellbeing and educational persistence (Butler at al., 2022; Camfield and Tafere, 2009).

While a growing body of literature has explored the educational impacts of COVID-19, much of this research has focused on high-income countries, with limited studies in low-income countries such as Ethiopia. Studies examining the interaction between learning, mental health, and wellbeing have often relied solely on either quantitative or qualitative methods, typically using cross-sectional designs (see for example, Fekadu et al., 2022; Tadesse et al., 2021; Chimbutane et al., 2023; Ssentumbwe et al., 2024). Although those approaches are valuable, they may not fully capture students' lived experiences during the pandemic in relation to their pre-pandemic experiences. Therefore, a more nuanced, mixed-methods approach with a longitudinal data is needed to understand the complex dynamics between learning, mental health, and wellbeing in the context of Ethiopia. This study sought to address this gap by examining the impact of COVID-19-related school closures on primary school students, with a specific focus on how mental health and social-emotional skills interact with student learning.

This article builds on the work of Bayley et al. (2023) by examining the interaction between learning and mental health and wellbeing through a mixed-methods approach. To guide this analysis, we present an emerging conceptual framework that outlines the relationships between the key variables in our study (Fig. 1). This framework posits that students' mental health and wellbeing act as intermediaries between their social skills and academic performance. Specifically, it suggests that children with stronger social and emotional skills are better equipped to manage stress, maintain psychological resilience, and sustain learning engagement (Diamond, 2014). Supportive relationships with family and peers further bolster students' emotional wellbeing, helping mitigate the adverse effects of crises, such as COVID-19 (Butler et al., 2022; Ford et al., 2021). The framework also integrates socio-economic status as critical factors influencing students' educational experiences, recognising that the pandemic has disproportionately affected disadvantaged groups. By incorporating these dimensions, this study provides a comprehensive analysis of how school closures shaped learning outcomes in Ethiopia, offering insights into both medium policy responses and long-term educational reforms in a low-income setting.

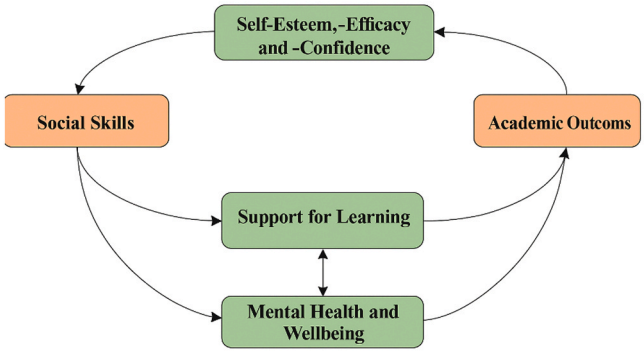

Fig. 1. Emerging conceptual framework of the interplay between academic outcomes, mental health, wellbeing, and social skills.

Source: Bayley et al., (2021), p. 38

This study is guided by the following research questions:

I. To what extent did COVID-19 related school closures affect students' educational access and learning and what unique challenges did those who experienced a decline in learning face?
II. What is the relationship between students' mental health and wellbeing and their learning outcomes during the COVID-19 pandemic?
III. How did the interplay of gender and socio-economic factors shape the experiences of students during the COVID-19 school closures and how did these factors contribute to variations in their learning outcomes?

Based on these research questions, this study hypothesised that primary school students in Ethiopia with lower levels of self-reported mental health and wellbeing during the COVID-19 pandemic would be more likely to experience a decline in learning outcomes. It also posited that those children from poorer households would be more vulnerable to both learning loss and poor mental health and wellbeing than students from wealthier families. Furthermore, this study hypothesised that girls would be more negatively affected than boys during the pandemic.

In the next section, we provide a background context for Ethiopia from the perspective of the COVID-19 pandemic and a summary of the literature that informed this study. We then discuss the data and methods used in this study. This is followed by the findings from our quantitative survey and interviews with students who experienced a decline in their learning following the COVID-19 pandemic. Our findings are brought together in the discussion section, and we identify the main contributions and policy implications of our study in the concluding section.

2. Context and literature review

2.1. Ethiopian context

Ethiopia, located in the Horn of Africa, is the second most populous African country after Nigeria, with a population projected to be around 132 million in 2024 (Worldometer, 2025), 80 percent of whom live in rural areas across 90 different ethnic and linguistic groups (Central Statistics Agency (CSA), 2013). The government of Ethiopia prioritises rapid economic growth as a core part of its development strategy, but human development indicators remain low, ranking 176th out of 192 nations by 2023 (United Nations Development Programme (UNDP), 2023). The country has also recently faced a complex array of social and political challenges, including inflation, recurrent conflicts, violence, climate shocks, and large-scale displacement, all of which have disrupted livelihoods and social services (United Nations High Commissioner for Refugees (UNHCR), 2023).

The Ethiopian education system has undergone a major transformation in recent years, supported by international donors. From being relatively low levels of access in the late 1990s, it has shifted towards universal access (Iyer et al., 2020). The General Education Quality Improvement Programme (GEQIP), launched in three phases since 2008, has aimed to strengthen access to quality of education, particularly for marginalised groups, especially girls, children with disabilities, and those in pastoralist areas (Asgedom et al., 2019).

In 2020, however, the COVID-19 pandemic disrupted education worldwide. Most countries reacted swiftly, locked down their economies, and closed their schools to halt or at least slow down the spread of the virus. Like many countries, the Ethiopian government closed schools following the first identified case in the capital city, Addis Ababa, on the

16th of March 2020, for two weeks in the first instance, and then extended it until October 2020. On March 20, 2020, the government declared a six-month-long State of Emergency that strictly prohibited mobility. Nationwide, these closures resulted in more than 26 million learners staying home for almost eight months (Kim et al., 2024).

For many Ethiopian students, learning during school closures was extremely limited, despite the government's efforts to create educational programmes via national television and radio stations (Yorke et al., 2021). In Ethiopia, where learning poverty—the inability of a child to read and comprehend a basic story by the age of 10—is already as high as 90 percent (World Bank, 2019), such school closures and barriers to the use of remote educational resources are expected to result in considerable learning loss for students, particularly for children from less advantaged families.

In addition to this interruption in their education, students were automatically promoted to the next grade with only 45 days of catch-up classes (Ministry of Education, 2020b). In other words, those who were in Grade 5 in March 2020 were promoted to Grade 6 when schooling resumed in October 2020. This suggests that school closures in Ethiopia could hinder students' ability to catch up on lost learning (Ford et al., 2021; Araya et al., 2022a) and increase their stress, potentially leading to long-lasting consequences for their school progress, mental health, earning potential, and socioeconomic status for years to come (Favara et al., 2022).

2.2. Learning outcomes during the COVID 19 pandemic

The impact of COVID-19 on learning outcomes has been widely studied across various contexts; however, empirical findings remain mixed. In some high-income countries, research suggests that students experience little or no learning loss. For instance, studies in Sweden, Austria, and Denmark have found no significant decline in academic performance during school closures (Fälth et al., 2021; Thomas, 2021; Birkelund and Karlson, 2023). Similarly, Iqbal and Patrinos (2023) reported that grade 5 students in Uzbekistan did not experience learning loss, with mathematics test scores improving post-reopening. In urbanised areas of Indonesia, students demonstrated gains in numeracy, largely attributed to direct parental involvement, which particularly benefited lower-achieving students (Lim et al., 2022).

However, these cases represent exceptions, rather than norms. Most studies in high-income countries have found substantial learning losses and increased educational inequality. Patrinos et al. (2022) consolidated evidence from 36 robust studies, revealing an average learning loss of 0.17 Standard Deviation (SD) equivalent to approximately half a year of schooling. A systematic review by Donnelly and Patrinos (2021) also found similar losses, averaging 0.13 SD across seven high-income countries. A more recent empirical study using the 2023 Trends in International Mathematics and Science Study (TIMSS) data further showed a global decline in student achievement, with an average drop of 0.11 SD in mathematics performance across 71 education systems. The effects were more pronounced among low-performing students, girls, and linguistic minorities, with impact sizes reaching 0.22 SD (Gajderowicz et al., 2025).

In low- and middle-income countries, the effects of school closures were even more severe and widespread. In South Africa, Grade 4 students lost between 62 percent and 81 percent of their year of learning, with girls being disproportionately affected in reading (Ardington et al., 2021). In Uganda, proficiency in literacy and numeracy among students declined by 5 percent and 13 percent, respectively, between 2018 and 2021 (National Assessment of Progress in Education, Uganda, 2021). Similarly, in rural Kenya, school closures led to an estimated learning loss of 0.36 SD (Whizz Education, 2021). Angrist et al. (2021) also modelled the long-term impact of COVID-19 on learning in five African countries, including Ethiopia. Their model estimated that in the short term, students could lose up to a year of learning. For a child in grade 3, however, the current learning deficits could lead to a total loss of up to 2.8 years by Grade 10.

Overall, while a few countries have maintained or even improved learning outcomes through resilient education systems (Fälth et al., 2021; Thomas, 2021; Birkelund and Karlson, 2023) and strong parental engagement (Lim et al., 2022), the vast majority, particularly in low-income settings, have experienced significant learning losses. Limited access to remote learning resources and prolonged school closures exacerbates educational inequalities, with the most vulnerable students, such as those from disadvantaged socioeconomic backgrounds (Betthäuser et al., 2023), students with disabilities, and girls (Jones et al., 2021)—experiencing the greatest setbacks.

2.3. The impact on students' mental health and wellbeing

The COVID-19 pandemic has had profound effects on students' mental health and wellbeing, with significant implications for their engagement in learning (Schady et al., 2023). Recent evidence from various countries, including Ethiopia, has shown a significant association between children's experiences during the pandemic and their increased levels of anxiety, depression, and self-esteem (Bayley et al., 2023; Alamolhoda et al., 2022; Porter et al., 2021). For instance, more than half (53 percent) of surveyed households in the Middle East and North Africa reported that their children struggled mentally and emotionally during the pandemic (United Nations Children's Fund (UNICEF), 2020). Beyond depression and anxiety, students also faced difficulties concentrating on their studies, a challenge reported by more than 50 percent of lower-secondary students in several African countries (UNESCO Institute of Statistics (UIS), 2022; Schady et al., 2023).

More specifically, students in Ethiopia experienced heightened stress and anxiety (Tadesse et al., 2021), leading to reduced motivation to learn, as reported by parents and caregivers (Kim et al., 2021b). The pandemic also exacerbated existing vulnerabilities, with children and adolescents facing mental health challenges due to school closures, limited support systems (Yorke et al., 2021) and reduced employment opportunities for parents (Favara et al., 2022). Girls faced amplified difficulties owing to reinforced gender norms and increased social isolation (Jones et al., 2020; Ford et al., 2021). Notably, data from a Young Lives report showed that both anxiety and depression levels remained higher in Ethiopia than in India and Vietnam during the same period of lockdown (Porter et al., 2021), which could potentially affect their future education and development (Favara et al., 2022).

3. Methodology

3.1. Quantitative data and method

3.1.1. Data and sample

The analysis in this study draws on data from the Research on Improving Systems of Education (RISE) Ethiopia research project,[1] a five-year, mixed-methods study (2018–2022) which explored the design, implementation, and impact of the government's comprehensive education reform programme, the General Education Quality Improvement Programme for Equity (GEQIP-E).

In 2018/19, RISE Ethiopia sampled 168 schools from seven regions, proportional to the population in each region. Schools were selected based on a purposive sampling approach following RISE research design requirements, which included (a) incorporating schools targeted in the first phase of the GEQIP-E reforms, (b) incorporating schools from

[1] https://riseprogramme.org/countries/ethiopia.html

Young Lives School Surveys[2] and finally, (c) a random selection of other schools to represent both urban and rural populations in each region of Ethiopia. As our sample students were selected randomly from up to two classes in each school, we also applied sample weights to control the school size in each region.

The quantitative analysis in this study was based on data collected during two periods: June 2019, before school closures, and January 2021, after schools reopened. However, following the reopening of schools in October 2020, it was not possible to revisit 20 schools in Tigray, 4 schools in Oromia, and 6 schools in Benishangul Gumuz due to conflict and insecurity in these regions. Thus, this study covered 138 primary schools surveyed before and after school closures.

Table 1 reports the sample students by region assessed in June 2019 and January 2021 from the 138 schools. In June 2019, the sample included 2917 students with test scores in mathematics, but this declined to 2346 students after the school reopened. This means that approximately 19.6 percent of the students did not return to school after COVID-19 school closure, with a slight difference between boys (18.6 percent) and girls (20.8 percent). To mitigate bias due to sample dropout, we further applied attrition weights and adjusted our initial sample weights for our quantitative analysis (see Araya et al., 2022b, for modelling sample attrition in a follow-up survey).

3.1.2. Measurement

Students' learning outcomes were measured by numeracy tests administered at the end of Grade 4 and the start of Grade 6. At the end of grade 4, 25 multiple-choice items were administered. Again, the 25 multiple-choice items, along with an additional five multiple-choice items, were administered in January 2021 to the same students at the start of Grade 6, once schools reopened from the lockdown. The additional five questions were based on the course content of grade 5 students. Using the 25 common mathematics items between the two school surveys, we calibrated all test items into Item Response Theory (IRT)-scaled score points and then linearly transformed them into percentages.

In addition to the mathematics test, data were collected on the students' mental health, wellbeing, and social skills. Mental health and wellbeing were assessed using a set of questions focused on emotional state, energy levels, and access to basic needs over the two weeks preceding the school survey. Social skills were similarly measured through questions evaluating confidence in social interactions, empathy, helpfulness, and respect for others following the Children's Self-Report Social Skills Scale and the Matson Evaluation of Social Skills with Youngsters (MESSY). Responses to these questions were recorded on a 5-point Likert scale. To ensure consistency, we standardised the mental health and wellbeing scores, with the mean Z-scores generated from the standardised value of each question. The higher the mean Z-scores, the better the students' mental health and wellbeing. Similarly, the social skills questionnaires underwent rigorous psychometric analysis, with factor scores derived for further interpretation (see Bayley et al., 2023).

Our quantitative analysis also accounts for socioeconomic status and child-specific factors, including household wealth, primary caregiver's literacy status, rural versus urban residence, gender, child's primary activity during school closures, and educational achievement prior to the pandemic. Household wealth index was measured using a family's housing quality, access to services, and ownership of consumer durables, each with equal weight. It ranged from 0 to 1, with higher values indicating higher socioeconomic status (Briones, 2017). All child and household attributes were derived from data collected before school closures. Except for household wealth, these variables were not expected to change during the pandemic or after school closures. Even in the case of household wealth, the relative ranking of households was unlikely to change significantly, making wealth groupings (quintiles) relevant to our analysis. Similarly, to simplify our interpretations, we grouped mental health, wellbeing, and social skills Z-scores into tertiles. We used STATA 17 software to analyse our quantitative data.

Table 1
Number of sample students tracked in June 2019 and January 2021 by region.

	Jun-2019			Jan-2021		
	End Grade 4			Start Grade 6		
	Girls	Boys	Total	Girls	Boys	Total
Addis Ababa	226	238	464	204	218	422
Amhara	252	264	516	220	221	441
Benishangul Gumuz	172	199	371	107	126	233
Oromia	406	444	850	300	371	671
SNNP	226	209	435	177	167	344
Somali	138	143	281	116	119	235
Total	1420	1497	2917	1124	1222	2346
Attrition (%)				20.8	18.4	19.6

Source: Authors' compilation of RISE Ethiopia data

3.1.3. Analytical approach

Learning loss was calculated by comparing each student's test score at the start of Grade 6 (January 2021) with their test score at the end of Grade 4 (June 2019) using the following equation:

Learning Difference (LD) = Test Score at Grade 6 − Test Score at Grade 4 ———(1)

A student experiences a learning loss if the LD is below 0. This allowed us to determine the percentage of students who exhibited a decline in their learning scores after schools resumed. After identifying the students who experienced learning loss, we created a binary outcome, assigning 1 if the LD was negative and 0 if the LD is 0 or above. Based on this binary outcome, we conducted a logistic regression of the following form to estimate the association between Learning Loss (LL) and mental health and wellbeing (MHW):

$$LL_i = B_0 + B_1 MHW_i \quad + \quad B_2 X_i + e_i \tag{2}$$

where LL is the probability that student i experienced learning loss during the pandemic, MHW refers to the mental health and wellbeing of the student, and X represents various factors including child characteristics, family wealth, child activity during the pandemic, rurality, and previous learning achievement administered in October 2018 (which is a proxy for students' innate ability). e_i is an error term clustered at the school or regional levels.

However, it is important to note that in Eq. 2, MHW could be an endogenous variable. This endogeneity may arise from reverse causality or omitted variable bias (Antonakis et al., 2014). For instance, there might be a feedback relationship between LL and MHW. A decline in learning could exacerbate a student's mental health issues, creating a situation where MHW and LL simultaneously affect one another (Angrist and Krueger, 2001). Furthermore, there may be other unobserved factors such as parental involvement or community support that affect both MHW and LL, thereby leading to a correlation between MHW and the error term (e_i). This creates an endogeneity problem that can bias our estimate, leading to incorrect inferences from Eq. 2.

To mitigate the endogeneity problem, we used students' social skills as an instrumental variable (IV), assuming that social skills are likely to be strongly correlated with MHW, as students with higher social skills may have better coping mechanisms and mental resilience (Vestad and Tharaldsen, 2022; Fullerton et al., 2021). Our assumption is that students' social skills influence learning outcomes primarily through mental resilience rather than having a direct effect on learning,

[2] Young Lives School Survey was a research initiative under the broader Young Lives project, focused on understanding how schools and education systems impact children's learning outcomes and equity. It was conducted in Ethiopia, India, Vietnam, and Peru in multiple rounds between 2010 and 2011 and 2016–2017

particularly during a shock like COVID-19 (see the conceptual framework depicted in Fig. 1). Based on this assumption, we estimate our IV model in two stages: The first stage has the following form.

$$MHW_i = \pi 0 + \pi SocialSkills_i + \pi_2 X_i + ui \quad (3)$$

In the first stage, the MHW is regressed on social skills and other covariates (X), where "SocialSkills" is the instrumental variable. The second stage has the following form:

$$LL_i = B_o + B_1 \widehat{MHW}_i + B_2 X_i + e_i \quad (4)$$

Where $\widehat{MHW}$ represents the predicted values of MHW from the first stage, which are used to estimate the impact on Learning Loss (LL). By doing this, we use the variation in MHW explained by social skills to mitigate the endogeneity problem that might appear in Eq. 2.

3.2. Qualitative participants, data collection and analytical approach

The qualitative analysis builds on the quantitative findings, by offering nuanced, context-rich insights into students' lived experiences during the school closures. As part of the wider RISE Ethiopia study, we conducted semi-structured interviews with 24 students, who were selected based on their grade 4 learning outcomes and household wealth, with the aim of ensuring diversity in academic performance and socio-economic background. These students were drawn from four purposively selected schools, representing Ethiopia's regional and rural-urban diversity, as well as variation in GEQIP reform implementation (including areas where support was provided for girls' education and students with disabilities).

This paper focuses on a subsample of eight of these students from the wider qualitative group, who experienced learning loss between Grade 4 and Grade 6, identified through a decline in their mathematics scores. This subsample aimed to capture the experiences of students most negatively affected by school closures, while ensuring variation across gender and household income level. We included both boys and girls from each school and students from the lowest, middle, and highest-income households across the four schools.

Table 2 presents the characteristics of the eight selected students, identified by pseudonyms, including their gender (four girls and four boys) and age (12–15 years), location and wealth status. Half of the participants were from urban areas (Addis Ababa and urban Benishangul Gumuz), and the other half resided in rural areas (rural Benishangul Gumuz and rural Oromia). Two students came from the wealthiest (fifth) quintile, while three each belonged to the medium (third) and lowest (first) wealth quintiles.

3.3. Procedure and analytical approach

Interviews were conducted in students' preferred languages by trained fieldworkers with prior experience in qualitative research, many of whom had been involved in previous rounds of the RISE Ethiopia study. Same-gender matching was used, with male researchers interviewing boys and female researchers interviewing girls. Many fieldworkers were familiar with the research sites and had established rapport with participants in earlier data collection rounds.

Each interview lasted approximately one hour and was audio-recorded, transcribed, and translated into English during transcription. All transcripts were cleaned to remove identifying information such as names and locations in accordance with ethical guidelines. Informed consent was obtained from both students and their caregivers prior to participation.

Data were analysed by the authors using thematic analysis following Braun and Clarke's (2006) six-phase approach. This involved 1) familiarisation with the data through repeated reading of the transcripts, 2) generation of initial codes, 3) searching for patterns across the data, 4) reviewing and refining themes, 5) defining and naming themes and 6) producing the report. Coding was conducted in Atlas.ti using an inductive approach, allowing themes to emerge from the data rather than being imposed in advance. The coding and interpretation process was discussed among the authors to reach analytical consensus. The analysis focused on how learning loss intersected with gender, socio-economic background and geography, offering in-depth insight into the barriers faced by the most affected students.

4. Findings

4.1. Quantitative findings

4.1.1. Sample statistics

First, we describe the characteristics of the sample students. Although we had 2346 students with test scores in mathematics at both the end of Grade 4 and the start of Grade 6, we excluded 61 students because they appeared to be outliers because they were older than their classmates. Thus, our quantitative analysis is based on the numeracy test scores of 2285 students.

Table 3 reports the main descriptive statistics of those 2285 sample students. Approximately two-thirds (63 percent) of our sample came from rural schools, with gender distribution being nearly equal (52 percent boys and 48 percent girls). On average, the participants in our sample were 12.9 years old at Grade 6. Our sample also came from households with an average size of 5.8; and an average household wealth index of 0.3. Maternal literacy levels were low, with only around one-quarter (28 percent) of mothers able to read a sentence. Half of the children had attended preschool centres before starting Grade 1.

After schools reopened by the end of October 2020, students were retrospectively asked whether they had continued learning during school closures. Access to remote learning was limited during school closures: only 40 percent of our sample students continued learning during school closures, with the majority (32 percent) reading textbooks. Only one-quarter of them listened to educational radio programmes or watched educational TV programmes, while about 17 percent used online/mobile learning applications.

In terms of mental health and wellbeing, the bottom tercile showed a score of −0.83 SD while the second and third terciles reported scores of 0.12 and 0.73 SD. Similarly, for social skills, the bottom tercile scored below 0 (-0.85 SD), while the second and third terciles reported scores of

Table 2
Subsample of eight students for the qualitative study.

Name[a]	Region	Gender	Age	Wealth status[b]	Primary caregiver's literacy	Mathematics score (%)		Learning loss (% ppts)
						G4	G6	
Kassa	Addis Ababa	Boy	13	Highest	Yes	47	22	−25
Meron	Addis Ababa	Girl	13	Medium	Yes	65	51	−14
Seida	Urban Ben. Gumuz	Girl	13	Medium	Partial	36	28	−8
Haile	Urban Ben. Gumuz	Boy	13	Lowest	No	43	27	−16
Alem	Rural Ben. Gumuz	Girl	12	Highest	Yes	40	27	−13
Abinet	Rural Ben. Gumuz	Boy	12	Lowest	No	37	28	−8
Narobe	Rural Oromia	Girl	13	Lowest	No	45	28	−17
Itafa	Rural Oromia	Boy	15	Medium	No	44	39	−5

Table 3
Descriptive characteristics of sample students.

Variable	N	Mean/ %	SD
Proportion of children who are boys	2285	0.52	0.5
Child's age in years	2285	12.95	1.35
Household size	2285	5.84	1.99
Wealth index	2285	0.3	0.2
Proportion of children who attended preschool	2285	0.43	0.5
Proportion of primary caregivers who cannot read at all	2285	0.62	0.49
Proportion of primary caregivers who can read only part of a sentence	2285	0.1	0.3
Proportion of primary caregivers who can read a whole sentence	2285	0.28	0.45
Proportion of schools located in urban areas	2285	0.37	0.48
Proportion of students who continued learning during school closures	2285	0.4	0.49
• met with a teacher	2285	0.19	0.39
• listened to educational radio programmes	2285	0.25	0.43
• watched educational TV programmes	2285	0.24	0.43
• used online /mobile learning apps	2285	0.17	0.38
• completed work given by a teacher	2285	0.25	0.43
• completed work given by my caregiver	2285	0.27	0.44
• read school textbooks	2285	0.32	0.46
Social skills- low levels (Z-scores)	732	−0.85	0.61
Social skills- medium levels (Z-scores)	792	0.16	0.14
Social skills- high levels (Z-scores)	761	0.71	0.17
Mental health and wellbeing- low levels (Z-scores)	739	−0.83	0.55
Mental health and wellbeing-medium levels (Z-scores)	781	0.12	0.15
Mental health and wellbeing-high levels (Z-scores)	765	0.73	0.21
% Mathematics test score Grade 4 (End year)	2285	47.28	18.4
% Mathematics test score Grade 6 (Start year)	2285	49.5	18.9
Proportion of students who experienced a learning loss	2285	0.42	0.5
Average learning loss by those who experienced a decline in learning (% ppts)	960	−10.07	9

0.16 SD and 0.71 SD, respectively. While students in the bottom tercile, with scores below 0 SD, were perceived to have lower social skills and poorer mental health and wellbeing, those in the second and third terciles were considered to have relatively better social skills and improved mental health and wellbeing.

4.1.2. Distribution of learning loss/gain (percentiles) after schools reopened

In our sample, we found that 42 percent of the students scored lower than their pre-COVID-19 performance, while 58 percent did not experience learning loss or at least maintained their pre-COVID-19 performance. On average, those who experienced a decline in learning showed a decrease of approximately 10 percentage points (see Table 3). However, this average masks variations in learning loss across different segments of the data distribution. To explore this, we used a percentile distribution, in which the median (50th percentile) divided the data into two halves (Fig. 2). The bottom 1 percent experienced a learning loss of approximately 33 percentage points, while the bottom 5 percent and 10 percent experienced losses of 21 and 15 percentage points, respectively. By contrast, the top 5 percent and 1 percent achieved learning gains of 25 percent and 39 percent, respectively.

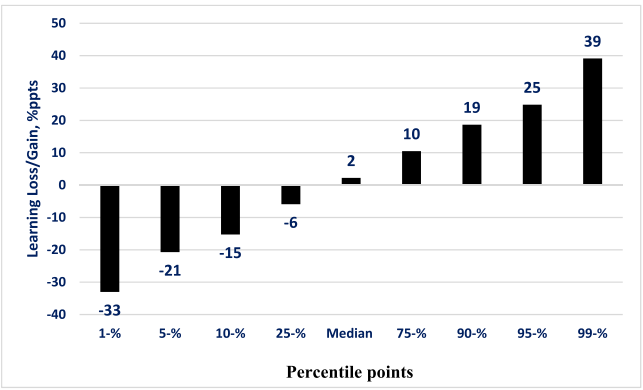

Fig. 2. Distribution of learning loss/gain (percentiles) after schools reopened.

4.1.3. Who experienced learning loss after schools reopened?

As mentioned above, approximately 42 percent of students returning to school after reopening experienced an average learning loss of approximately 10 percentage points in their mathematics tests. Table 4 reports the proportion of students who had experienced learning loss in line with self-reported mental health, wellbeing, and other characteristics, including gender, socioeconomic status, location, primary caregiver's literacy status, main activity during the pandemic, and learning achievement before the pandemic.

Students with lower levels of self-reported mental health and wellbeing experienced higher levels of learning loss than those with medium-to-high levels of mental health status. This difference was statistically significant (Chi2(2) = 20.79, $P < 0.000$). More specifically, students with higher self-reported mental health and wellbeing experienced a lower proportion of learning loss (39 percent) than did students with lower self-reported mental health and wellbeing (47.2 percent). This indicates an eight percentage point gap in the share of learning loss between students with lower and higher levels of mental health and wellbeing.

Similarly, a significantly higher percentage of children from the poorest income group experienced learning losses (51.4 percent versus 38.7 percent for the richest). Students whose primary caregivers were not literate were also more likely to experience learning loss (44.5 percent versus 37.5 percent). We also found that a slightly higher proportion of boys and those from rural areas experienced learning loss compared to their counterparts, but this difference was not statistically significant. Regarding activities during school closures, students who were working or helping at home experienced slightly higher levels of learning loss than those who stayed at home while reading textbooks (43.4 percent, 44 percent, and 39 percent, respectively).

4.1.4. Multivariate analysis of the interplay between learning, mental health and wellbeing

Table 5 reports the association between mental health and wellbeing and the probability of experiencing learning loss based on logistic regression analyses. Both columns in Table 5 report the marginal effects from logistic regressions, calculated with standard errors clustered at different levels: Column 1 clusters at the school level, while Column 2 clusters at the regional level. Nevertheless, we do not observe any statistically significant differences between these two estimations, except for a minor difference in the standard errors related to the literacy of primary caregivers and the age of the children. Accordingly, our interpretation will primarily focus on the results presented in Column 1.

The findings indicated that students with medium and high scores in mental health and wellbeing were approximately 10 percent and 11 percent less likely to experience learning loss than those with low mental health and wellbeing, respectively. This means that students with relatively higher mental health and wellbeing scores were less prone to learning loss than their peers with lower scores, supporting the observed correlation between better mental health, wellbeing, and learning loss (Table 4).

Our analysis controls for several socioeconomic factors and shows significant heterogeneity among many of these, particularly regarding household wealth, parental education, activities during school closures, and pre-pandemic learning achievement.

Children from the poorest families were 12.2 percent more likely to experience learning loss than those from the two wealthiest quintiles, which was statistically significant at the 1 percent level. We also found that a primary caregiver's literacy helped protect against learning loss, reducing the likelihood of a child experiencing it by approximately 4.4 percent. Children who were able to continue learning (such as reading books) during school closures were 9 percent less likely to experience

Table 4
Bivariate analyses on the share of students who experienced learning loss by mental health and wellbeing and socio-demographic factors during the pandemic.

		N	%	test
All		2285	42.01	
Mental health and wellbeing	Low	739	47.21	Pearson Chi2(2)= 20.79; P < 0.000
	Middle	781	40.13	
	High	765	39.00	
Gender	Girls	1105	40.72	Pearson Chi2(1)= 1.45; p < 0.227
	Boys	1180	43.22	
	diff		−2.50	
Wealth (quintile)	1st (poorest)	381	51.44	
	2nd	457	45.08	Pearson Chi2(4) = 23.14; P < 0.000
	3rd	463	39.52	
	4th	493	37.53	
	5th (richest)	491	38.70	
Location	Rural	1434	43.31	Pearson chi2(1) = 2.63
	Urban	851	39.84	P < 0.104
	diff		3.46	
Primary caregiver's literacy	Cannot read at all	1417	44.53	Pearson Chi2(2) = 9.8; p < 0.007
	Able to read only part of a sentence	231	38.96	
	Able to read whole sentence	637	37.52	
Main activity during school closures	Staying at home playing	379	45.38	Pearson chi2(3) = 5.4946; P < 0.139
	Engaged in remote learning	1074	40.32	
	Staying at home helping/working outside	772	43.39	
	Playing outside home	60	33.33	
Learning performance before the pandemic	Low	753	28.00	Pearson chi2(2) = 100; P < 0.000
	Medium	746	44.70	
	High	786	52.80	

learning losses than those who had no chance of continuing to learn during school closures. Those who stayed outside during the lockdown were particularly less likely to experience learning loss, at 13.3 percent less likely than those who stayed at home. A possible reason for this result could be that children who stayed outside during the lockdown had more opportunities for social interaction, physical activity, and informal learning, despite their health risks. The marginal effect of previous learning achievement was large, such that previous high-achieving students had a greater tendency to experience learning loss than lower achievers. This could be partly because of the already low base for low achievers, which is a comparison group in this case. That is, the more you have, the more you are likely to lose when shocks occur, and vice versa. Age had a limited effect (only marginally at the 10 percent level), and gender and rurality were not statistically significant predictors of learning loss in our model, suggesting that students were not differentially impacted by the pandemic based on these characteristics when considering other factors.

4.1.5. *Instrumental variable estimation: robustness check*

To test the robustness of the association reported in Table 5, we conducted instrumental variable (IV) estimation to address the potential endogeneity between learning and mental health and wellbeing. The possible feedback relationship between these variables suggests that a decline in learning could worsen a student's mental wellbeing, leading to a situation in which mental health, wellbeing, and learning mutually influence each other. Furthermore, in our endogeneity tests, we rejected the null hypothesis that mental health and wellbeing were exogenous. As seen at the bottom of Table 6, our robust regression F-statistic of 7.73 ($P < 0.000$) at the school level and 29.29 ($P < 0.000$) at the regional level also indicates the presence of endogeneity. To account for this, we used social skills as an instrument of mental health and wellbeing. This is expected to help isolate the effects of mental health and wellbeing on learning while minimizing endogeneity concerns.

In our first-stage F-test, we found social skills to be a relevant instrumental variable for mental health and wellbeing, with a coefficient of 0.99 ($t = 39.85$ & $P < 0.000$). Likewise, the robust F-statistic of 1591.38 from our first-stage regression exceeded the commonly accepted threshold of 10, confirming that social skill is not a weak instrument for mental health and wellbeing in the context of our study.

Table 6 presents the IV estimation results, controlling for relevant socioeconomic factors and clustering standard errors at the school (Column 1) and regional levels (Column 2). The Wald chi-square statistic is 254.13 at school and 88.45 at regional levels, indicating that the overall IV model is statistically significant ($P < 0.000$).

The IV estimate for mental health and wellbeing is −0.093, which is statistically significant at the 1 percent level ($P < 0.000$). This confirms that students with better mental health and wellbeing experienced a lower likelihood of learning loss during the COVID-19 pandemic. Specifically, a one standard deviation improvement in self-reported mental health and wellbeing scores reduced the probability of learning loss by approximately 9.3 percent. This negative relationship indicates that students with better mental health and wellbeing are less likely to experience learning loss, highlighting the importance of mental wellbeing in academic outcomes. These results further highlight the need for an educational system that strengthens psychosocial support for students to enhance their preparedness for future disruptions (Bayley et al., 2023).

Our IV estimate is also controlled for several covariates for gender, age, location, family wealth index, child activity during the pandemic, and previous learning achievements. Similar to the results reported in Table 5, we found heterogeneous experiences of learning loss in many of them. However, the estimated marginal effects for those covariates are omitted from Table 6 for brevity but are available on request.

In the next section, we delve into an in-depth analysis of the lived experiences of eight students who experienced learning loss, identified through our quantitative data (Table 2). While our quantitative analysis revealed broad patterns, our qualitative analysis deepened our understanding by providing nuanced insights into the specific circumstances and coping mechanisms of students. Drawing on their experiences, we gained insights into their perspectives on the impact of school closures on mental health and wellbeing, which added a human dimension within which to contextualise the quantitative findings. This approach offers a more comprehensive understanding of the challenges and successes faced by students during pandemics.

4.2. *Qualitative findings*

4.2.1. *Primary activities during COVID-19 school closures*

In the previous section, we considered how a broad group of students engaged in a range of activities during the COVID-19 pandemic. This

Table 5
Logistic regression on the impact of mental health and wellbeing on the probability of experiencing learning loss during the pandemic (marginal effects).

	1	2
Mental health and wellbeing- low (ref)		
Medium	−0.102***	−0.102***
	(−3.55)	(−3.92)
High	−0.109***	−0.109***
	(−4.20)	(−2.93)
Child is a boy (=1)	0.00403	0.00403
	(0.19)	(0.22)
Child's age in years	0.0125*	0.0125**
	(1.75)	(2.56)
Locality (urban=1)	−0.0366	−0.0366
	(−1.01)	(−1.19)
Wealth index (1st quintile - poorest (ref)		
2nd quintile (poorer)	−0.0578	−0.0578
	(−1.62)	(−1.43)
3rd quintile (medium)	−0.110***	−0.110**
	(−2.95)	(−2.41)
4th quintile (rich)	−0.129***	−0.129***
	(−3.04)	(−2.74)
5th quintile (richest)	−0.122***	−0.122**
	(−2.93)	(−2.12)
Primary caregiver's literacy- cannot read (ref)		
Able to read only part of a sentence (=1)	−0.0154	−0.0154
	(−0.43)	(−0.60)
Able to read the whole sentence (=1)	−0.0443*	−0.0443**
	(−1.75)	(−2.33)
Staying at home playing during school closure (ref)		
Engaged in remote learning (=1)	−0.0917***	−0.0917***
	(−2.88)	(−2.61)
Staying at home helping/working (=1)	−0.0886***	−0.0886**
	(−2.76)	(−2.37)
Playing outside home (=1)	−0.133**	−0.133***
	(−2.09)	(−3.55)
Low learning (before the pandemic)-(ref)		
Medium	0.192***	0.192***
	(7.05)	(4.24)
High	0.316***	0.316***
	(10.76)	(13.00)
N	2285	2285

Note: "t statistics in parentheses"; *** $p < 0.01$", ** $p < 0.05$; * $p < 0.1$. Estimation (1) reports results with standard errors clustered at the school level, while estimation (2) reports results with standard errors clustered at the regional level. Mental health and wellbeing and previous learning achievement are categorised into terciles, while the wealth index is divided into quintiles for ease of interpretation.

Table 6
IV estimation of the impact of mental health and wellbeing on the probability of experiencing learning loss during the COVID-19 pandemic (marginal effects).

		(1) IV	(2) IV
Mental health and wellbeing, Z-score		−0.093***	−0.093***
		(0.014)	(0.014)
Child characterises		Yes	Yes
Household characteristics		Yes	Yes
Constant		0.257***	0.257***
		(0.094)	(0.069)
N		2268	2268
Wald chi2(15)		254.13***	88.45***
First-stage regression summary statistics			
	R-sq.	0.6272	0.6272
	Adjusted R-sq.	0.6247	0.6247
	Partial R-sq.	0.5993	0.5993
	Robust F (1135; 5)	1591.38***	337.911***
Tests of endogeneity	Robust regression F (1135; 5)	7.73115***	29.2947***

Note: Standard errors in parentheses; in Equation (1) F-statistic is adjusted for 136 clusters in schools; and in Eq. (2) F-statistic is adjusted for 6 clusters in a region; both (1) and (2) are controlled for child characteristics (gender, age, time use during the pandemic, and previous test achievement) and household characteristics (wealth index, primary care literacy and location of residence).

mostly included activities within the home, such as staying at home, helping family members, reading textbooks, or playing, while the wider group of students were less likely to engage in activities outside the home. In relation to the students included in the qualitative study who had experienced learning loss during the pandemic, these students shared their experiences of balancing their work responsibilities (both paid and unpaid) and educational activities during school closures. Some apparent differences emerged in relation to gender and socioeconomic status in our sample. Girls in our qualitative sample were more likely to have been involved in domestic work activities and boys were more likely to engage in agricultural activities. Students from poor families were more likely to mention greater work responsibilities, including engaging in income-generating activities.

Girls spoke of increased domestic responsibilities, which left them with less time to spend on education. Meron, from a middle-income family in Addis Ababa, described how she was, "…*supporting [her] family a lot",* and, as a result, concentrated less on her studies. Alem, from a high-income family in rural Benishangul Gumuz, described having increased domestic responsibilities during school closures and working alongside her family in their shop. Narobe, from a poor family in rural Oromia, discussed how she engaged in both domestic and paid work activities and, as a result, did not have time to study:

In the morning, I prepare breakfast…then I arrange our home…then I prepare lunch for the family…then I wash clothes…I was working in potato harvest collection during the closure of the school…working in income generating activities harms me more than its benefits (me).

All girls, regardless of wealth, believed that an increase in work responsibilities negatively affected their education as they subsequently had less time available for studying.

Among the boys in our study, differences in experiences were more apparent across socioeconomic statuses. For example, Kassa, from a high-income family in Addis Ababa, said that he spent his time at home when the schools were closed. Itafa, from a middle-income family in rural Oromia, balanced his time between herding cattle and playing football with friends. In contrast, Haile, from a poor family in urban Benishangul Gumuz, described having increased responsibilities and engaging in paid work activities:

As school was closed due to Corona, I was working at the neighbourhood…For example, I fetched water … I was paid 10 birr [15p] per one jerry can. So if I could bring 10 jerry cans per day, I could earn 100 birr [£ 1.54] …Besides, I was collecting and selling the bamboo leaves, which are used to feed the donkeys. I was selling it 80–100 birr. We were doing such things until the school was reopened.

Similarly, Abinet, from a poor family in rural Benishangul Gumuz, spent most of his time engaged in agricultural activities, while also completing several household tasks/activities: *"I would eat my breakfast, I would take livestock to the grazing field, I would look after a baby, and I would carry out if any task at home".* Like the girls in our study, the boys indicated that their increased work responsibilities meant that they did not have time to study.

4.2.2. Learning experience during COVID-19

Based on our survey data, we found that students from the poorest families and those who lived in rural areas experienced greater learning loss, with boys being slightly more affected than girls. None of the students included in our subsample (i.e., those who experienced learning loss) engaged in formal education activities during school closures. They did not listen to the educational radio programme broadcast by the government, mainly because they did not have a radio or simply because they lacked interest in doing so. In rural areas, some of our participants were unaware that these programmes were available, even though they had a radio. Teachers were described as inaccessible during this time. Itafa from rural Oromia explained that most teachers returned to their homes, which were often in another community or region during the lockdown.

No teacher helped or advised me to study… We did not ask our teachers to

help us at that moment. Some of the teachers moved out of the community. Only a few of the teachers were residing here during the closure of the school.

Instead, the participants adopted their own self-directed strategies to continue their education, which mostly involved reading textbooks. For instance, Seida from urban Benishangul Gumuz studied the dictionary at home with her brother.

There was no distance learning during COVID-19 school closures, but I have been studying the dictionary at home. I have been studying the dictionary together with my elder brother… I have not communicated with other people and even my teachers as there was no distance learning."

However, not all students had the opportunity to read textbooks at home as Narobe, from a poor family in rural Oromia, stated that she "*… did not have textbooks during the closure of the school."* Instead, she spent her time revising the material in her exercise books. While none of our participants reported having contact with teachers, family members, especially older siblings, were identified as providing vital support for their learning. For example, Haile explained that although his parents were not educated and could not help him with his schoolwork, they encouraged him to continue learning throughout, which motivated him to do so. Through the accounts of the students, we came to realise that the self-directed activities that they engaged in were insufficient for progressing their learning and that they may not have acquired significant new learning during this time.

Students spoke of the different strategies that had been implemented once their schools reopened, including tutorial classes to help them catch up on their learning, shift classes to enable social distancing, and the automatic promotion of all students to the next grade without examinations. Some students spoke of the positive impact of catch-up classes, which allowed them to cover important material they had missed. However, others believe that government policies such as the shift system and automatic promotion would negatively impact their learning. For example, the shift system introduced to facilitate social distancing by reducing class sizes meant that students only attended school three out of five days per week, which participants suggested would potentially have a negative impact on their education. Similarly, some felt that the government's policy of automatic promotion to the next grade, regardless of whether they had covered the curriculum, would negatively impact their learning, meaning that they would miss out on important materials.

4.2.3. Students' mental health and wellbeing

As highlighted earlier, the consequences of school closures extend beyond academic learning, and it is crucial to understand the impact of the pandemic on students' mental health. Our quantitative data revealed a correlation between learning loss and lower levels of self-reported mental health and wellbeing. This was also reflected in our qualitative interviews, where students who experienced learning loss shared their experiences of fear, anxiety, and uncertainty during the pandemic. They recalled the fear and anxiety that they experienced early on, particularly as they did not know how the crisis would affect them and if they could return to school. Itafa captures these feelings in rural Oromia:

Missing my education was one challenge. I did not face any other challenge other than missing my education. The other challenge was the disease. I became scared since the disease was viral and communicable via the respiratory system. I did not move to the local town because of the pandemic….I did not know if the school would reopen because of the pandemic…I was scared since the disease was communicable and viral.

Kassa, from Addis Ababa, said that the stress and fear of the pandemic meant that students did not pay enough attention to their education:

At that time, I was in the first semester of Grade 5. Then we were shocked when the pandemic was spreading. Not only the students but the teachers as well were shocked about it. Honestly, no one was paying attention to education; rather, we were worried about the pandemic. So… even during the lockdown period, we did not pay attention to our education in the way that we should have. Of course, we read and got information from different sources, but it was insufficient.

As noted by Kassa, due to the stress and fear caused by the pandemic, students were not concentrating on their education. Other negative impacts of COVID-19 school closures included reports of increased social isolation during this time. Participants spoke of having no contact with friends or classmates during school closures and of being bored in their houses alone. For example, Kassa said that,

After the COVID-19 pandemic, most of us were not able to meet and communicate with our neighbours as well as with our classmates. My friends around here were also locked in their house for many days.

Other students had limited contact with their friends, with Haile from urban Benishangul Gumuz explaining that he could meet some, but not all of his friends, while Alem, in rural Benishangul Gumuz, explained that as her friends lived in distant villages, she could only meet them maybe once a week. These challenges are likely to negatively impact students' mental health and wellbeing. Therefore, all the students in our study who were interviewed were happy to return to school to continue their education and meet their friends again, as captured by Meron: "*I was happy as I am eager to continue my education. I was very happy for meeting my classmates and friends."* This finding suggests a positive correlation between schooling, mental health, and wellbeing.

5. Discussion

In this section, we integrate the findings from the quantitative and qualitative analyses in line with our research questions and highlight the policy implications.

5.1. Students' education and learning during the COVID-19 school closures

The quantitative and qualitative analyses in this study provide complementary insights into the impact of COVID-19 school closures on students' access to education and learning.

The quantitative findings revealed that nearly half (42 percent) of the students in the sample had experienced learning loss. This was especially pronounced among those who reported poorer mental health and wellbeing, as well as among those from lower-income families. These findings align with those of Guariso and Nyqvist (2023) in India, who documented significant learning losses among children from resource-poor households. The confounding effect of socioeconomic status on learning outcomes during the pandemic is a recurring theme in the literature, as seen in studies from several countries (e.g., see Angrist et al., 2021; Ardington et al., 2021; Betthäuser et al., 2023; Gajderowicz, 2025; Hevia et al., 2021; Jakubowski et al., 2023; Patrinos, 2022; Patrinos et al., 2022). These studies highlight how the pandemic exacerbated pre-existing educational inequalities; a concern echoed by Kim et al. (2021a). Similarly, Jones et al. (2021) explored how social determinants, such as gender and poverty, intersect, deepening the educational disadvantages faced by adolescents during the pandemic. The long-term implications of these disparities are particularly alarming, as early grade learning deficits could nearly triple in magnitude over a seven-year period from grade 3 to grade 10 (Angrist et al., 2021).

Our qualitative data contributed a nuanced understanding of the specific challenges faced by students, particularly those from lower-income backgrounds, during school closures. Many of these students were forced to balance paid or unpaid work responsibilities with their education, which severely hindered their ability to focus on learning. This intersection between socioeconomic status, work responsibilities, and academic outcomes is a crucial finding, resonating with similar studies in comparable contexts. For example, Guariso and Nyqvist (2023) found that Indian children who lacked parental support and resources were more likely to experience greater learning losses, reinforcing the connection between family resources and educational success.

These challenges were further emphasised by the quantitative

findings, which revealed significant disparities in access to formal educational activities during school closures. Approximately one-third (32 percent) of the students reported reading textbooks as their primary educational activity at home, with urban students being more likely to engage in this form of self-directed learning. However, many students who experienced learning loss did not participate in formal educational activities such as listening to educational radio programmes or receiving teacher support. This was often due to inaccessible teachers, limited awareness of available resources, and a lack of motivation to engage (Schady et al., 2023). These findings challenge the assumption that lack of technology access was one of the main causes of learning interruptions (Hereward et al., 2020), highlighting systemic gaps in communication and support structures.

Self-directed learning, particularly through textbook reading, emerged as the primary coping mechanism during school closure. However, this strategy alone proved to be insufficient for meaningful learning progress. This observation aligns with Lim et al. (2022), who found that, while some students experienced "learning gains" through self-directed learning, especially in a supportive home environment where parents could teach at their level, these gains were uneven and often inadequate. This means that structured support for self-directed learning, such as remote tutoring or community-based initiatives, could help mitigate learning losses in future crises. This idea is further supported by Gajderowicz et al. (2025), who highlighted the long-lasting impact of school closures and emphasised the need for targeted interventions to support vulnerable students in the post-pandemic era.

5.2. The interplay of learning, mental health, and wellbeing during the pandemic

The COVID-19 pandemic has had profound, far-reaching effects on students' academic performance, mental health, and overall wellbeing. This study highlighted the complex interplay between these factors. Our quantitative and qualitative findings consistently underscored the strong connection between lower mental health and wellbeing; and learning loss. Students who experienced greater learning loss often reported poorer mental health and wellbeing, a pattern that aligns with prior research on the pandemic's impact on children's psychological health (Alamolhoda et al., 2022; Bayley et al., 2023; Loades et al., 2020; Porter at al., 2021). This link emphasises the need to understand the broader, multifaceted impacts of the pandemic on students, as mental health challenges appeared not only because of disrupted learning, but also as an aggravating factor in educational outcomes.

Our findings showed that students from lower-income households were disproportionately affected by both learning loss and lower mental health. These students reported significantly lower mental health scores, which we attribute to the compounded economic strain and increased work burden faced by financially constrained families during the pandemic. Economic instability often exacerbates feelings of stress, concern, and fear, further hindering academic engagement and performance (Zuilkowski et al., 2024; Wagner et al., 2024; Hu et al., 2021). This pattern is consistent with research showing that financial insecurity during the pandemic was a key contributor to the mental health decline observed in vulnerable populations in low- and middle-income countries, including Ethiopia (Jones et al., 2021; Favara at al., 2022). Furthermore, our analysis revealed that students with higher social skills—skills that foster emotional regulation, empathy, and peer relationships—were less likely to experience severe learning losses. This suggests that socio-emotional competencies can serve as protective factors, helping students navigate the challenges posed by crisis and the mental health difficulties that follow (Bayley et al., 2023).

Qualitative data further enriched these quantitative findings, shedding light on the lived experiences of students during school closures. Many students reported feelings of fear, unease, and social isolation, especially as the uncertainty of the pandemic increased. The lack of contact with friends and disruption of daily routines contributed to heightened stress levels, reinforcing the notion that social stability and peer interaction are crucial to students' emotional and academic well-being. In this context, the reopening of schools served as a critical turning point for many students, offering them a sense of relief and emotional recovery. Schools provided not only a structured environment for academic learning but also social stability and peer support, which were essential for students' emotional recovery post-pandemic (Bayley et al., 2023).

Moreover, the importance of socio-emotional learning (SEL) has emerged as a key theme in both quantitative and qualitative findings. Our study underscores the necessity for schools to integrate SEL programs into their curriculum, focusing on coping strategies, resilience-building, and peer support. This is supported by Bayley et al. (2023), who argued that schools have a unique opportunity to foster both academic success and emotional wellbeing during crises. SEL programs can mitigate the adverse effects of learning loss, particularly in vulnerable communities, and can help build resilience in the face of future challenges.

While our findings suggest that the psychological toll of the pandemic played a significant role in learning loss, it is important to consider the potential cognitive impacts of the COVID-19 infection itself. Although our analysis did not directly measure the cognitive effects of the virus, we acknowledge that such effects may have contributed to the observed learning losses. Emerging evidence from studies, such as Hampshire et al. (2024), indicates that even short-duration COVID-19 symptoms may be associated with cognitive deficits following recovery. However, our data suggest that the broader mental health and wellbeing impacts of the pandemic, rather than direct cognitive deficits from infection, were more likely the driving force behind the learning loss. Future research could explore this relationship in greater detail by incorporating health data to better understand how COVID-19 infection and mental health intersect and affect academic outcomes.

5.3. The need for targeted support for students beyond the COVID-19 pandemic

Our study, combining both quantitative and qualitative data, offers valuable insights that can inform post-pandemic policy in Ethiopia, particularly in terms of supporting disadvantaged students who have experienced significant setbacks in both learning outcomes and mental health and wellbeing following the school closures.

One of the most pressing issues emerging from the pandemic is the high disparity in educational outcomes based on socio-economic status. Students from lower-income families were disproportionately affected by learning loss, and their mental health was affected by added economic strain during the pandemic. To address these disparities, policies need to prioritise targeted support for these families. This includes providing free or subsidised educational resources such as textbooks, online learning platforms, and mobile-based educational solutions where applicable. In rural areas, where resources are even scarcer, it is essential to increase outreach to caregivers to ensure that families are aware of and able to access these supports. Building on the findings of our study, Ethiopia needs to invest in low-cost, scalable solutions, such as educational radio programmes and SMS-based platforms, which can bridge gaps in access to technology and serve as effective tools for remote learning (Jordan, 2023; Kizilcec et al., 2021). Using "low-tech" had particularly been effective in Batswana during the pandemic (Angrist et al., 2020).

The interplay between mental health and learning outcomes observed in our study underscores the need to prioritise mental health as a part of educational recovery strategies in the long term. Ethiopia's education system needs to integrate socio-emotional learning (SEL) programs into curricula to help students build resilience, cope with stress, and manage emotions. These programmes, designed to support students' mental health and emotional wellbeing, are critical for

mitigating the long-term psychological effects of the pandemic and preventing further academic setbacks. Research supports the positive impact of SEL on both wellbeing and academic performance (Bayley et al., 2023) and incorporating such programmes will help students recover from the mental health challenges exacerbated by school closures or similar crises.

In addition, expanding access to mental health services in schools is crucial. Training teachers to recognise signs of distress and to establish on-site counselling services can provide essential support for students. Our findings echo the literature, which shows that students experiencing high levels of stress and anxiety are at greater risk of academic decline (Pascoe et al., 2020). This means that mental health services should not be an afterthought, but an integrated part of the education system, ensuring that students are supported holistically (Bayley et al., 2023).

Our findings also emphasise the need for better teacher support, particularly in times of crises. During the pandemic, teacher availability and engagement were significant factors influencing learning outcomes. The Ethiopian government needs to invest in teacher training to enhance its ability to teach remotely and manage learning environments during crises. Remote learning methods must be incorporated into teacher preparation programmes, and teachers should be equipped with tools to communicate effectively with students through both digital platforms and traditional media such as community meetings and radio programmes. A key aspect of this is ensuring that teachers are aware of the available resources and are equipped to engage with students, particularly those from disadvantaged backgrounds, to reduce the risk of further learning loss.

Our study found that self-directed learning, particularly through textbook reading, emerged as a common coping mechanism during school closures. However, this strategy is often insufficient to sustain academic progress. To ensure that students continue to learn effectively during future crises, policies need to focus on providing structured support for self-directed learning. This can include remote tutoring, community-based educational initiatives, and the use of technology to facilitate guided learning as demonstrated by Angrist et al. (2020). Students from low-income families, who may not have had access to adequate resources or parental support during the pandemic, would benefit from structured learning support, ensuring that they can make up for lost learning in a more focused and guided manner.

While the pandemic presented unprecedented challenges, it has also shown the resilience of students who were able to adapt and continue learning despite difficulties. Our study highlights the importance of fostering resilience and self-efficacy, especially among students who have experienced significant learning loss. Policies need to incorporate resilience-building programmes within schools, such as group activities or workshops that focus on communication, coping strategies, and mental health awareness. These interventions should be designed not only to support academic recovery, but also to promote emotional recovery and strengthen students' ability to navigate future crises. By focusing on resilience, Ethiopia's education system can help students not only recover but also thrive post-pandemic.

Finally, addressing the digital divide is essential for mitigating the effects of future crises. While technology was often touted as a key solution to continuing education during the pandemic, our study revealed that many students lacked awareness of available resources, despite their potential to support learning. Ethiopia needs to prioritise ensuring that all students, regardless of their socioeconomic background, have access to educational technology and resources. This includes investing in affordable technological solutions and partnerships with telecommunication companies to provide subsidised internet access for low-income families. Furthermore, efforts to provide take-home educational materials for students who lack internet access can offer an immediate and tangible way to bridge the educational gap during future disruptions.

6. Conclusion

In this study, we employed a mixed-methods approach, incorporating both quantitative and qualitative data from the RISE Ethiopia research study to examine students' experiences during the pandemic. We focused on the effects of school closures on academic learning, and how mental health and wellbeing interact with students' learning progress.

Together, the quantitative and qualitative findings offer a comprehensive understanding of the challenges students faced during the pandemic, particularly the interconnected nature of academic learning, mental health, and overall wellbeing.

The findings show that access to learning during the pandemic was severely limited in Ethiopia. Prolonged school closures and increased work responsibilities during these closures have reduced the time available for education. While students' self-directed learning strategies provided some mitigation, they were insufficient. Nearly half (42 percent) of the sampled students returned to school with an average learning loss of 10 percentage points, with those reporting poorer mental health and wellbeing, as well as students from lower-income families, disproportionately affected. Our qualitative particularly indicated that students from low-income families experienced additional adverse effects of the pandemic, including heightened work responsibilities that negatively impacted their academic learning, mental health and wellbeing. This implies that given the long-term economic impact of the pandemic, it is crucial to identify the specific needs of low-income students and provide tailored support to address these challenges.

Finally, it is important to approach our findings with some caution, as our analysis is observational and does not directly measure the cognitive effects of COVID-19. We have limited information regarding whether the observed learning loss linked to school closures is due to the direct cognitive impacts of COVID-19 infection, such as memory impairment. Although we cannot rule out the possibility that some students may have experienced direct cognitive deficits due to infection, our data do not provide sufficient evidence to support this hypothesis. Future research could address this by incorporating health data to better distinguish between the cognitive effects of the infection and the broader mental health and wellbeing impacts on learning outcomes of students.

CRediT authorship contribution statement

Louise Yorke: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nardos Chuta:** Writing – review & editing, Investigation, Formal analysis, Data curation, Conceptualization. **Mesele Araya:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Pauline Rose:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Demissie Abebech:** Writing – review & editing, Methodology, Data curation, Conceptualization.

Compliance with ethical standards

Dual site ethical approval was obtained for the quantitative and qualitative studies from the Faculty of Education, University of Cambridge, and College of Education and Behavioural Studies of Addis Ababa University. Prior to the interviews, informed consent was obtained from all participants. We also secured government approval from the Ministry of Education to undertake fieldwork.

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Declaration of Competing Interest

The authors declare no competing interests.

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