

Potential long-term consequences of school closures: Lessons from the 2013-2016 Ebola pandemic

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Research Article

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Abstract

The COVID-19 pandemic has seen an unprecedented shutdown of society. Nearly 1.725 billion children across the globe have been affected as over 95% of countries closed schools as the virus spread in April 2020. Much attention has been given to school closures as non-pharmaceutical mitigation tools to stem the spread of the disease through ensuring social distancing. Within education, focus has been given to keep students connected through remote learning and the immediate needs of schools upon reopening. This study takes a longer-term view. Using Demographic Health Surveys and Multiple Indicator Cluster Surveys from before and after the 2013-2016 Ebola outbreak in Guinea and Sierra Leone, this study examines changes in enrolment and dropout patterns, with targeted consideration given to traditionally marginalized groups. With schools closed for seven and nine months in the two countries, the length and intensity of the Ebola pandemic is the only health crises in the past century to come close to the school closures being experienced in 2020. Findings suggest that youth in the poorest households see the largest increase in dropout rates post-Ebola and that this impact can persist for years. Two years after being declared Ebola-free an additional 22,000 of the poorest secondary age youth remained out of school than would have been expected based on the pre-outbreak dropout rate. To halt the likely expansion in inequality post-pandemic, these results point to the need for longer term, sustainable planning that includes comprehensive financial support packages to groups most likely to be impacted.

Background And Methods

The COVID-19 pandemic is unlike anything the world has seen over the past century. As of June 18, 2020, nearly 8.5 million individuals have been infected, with nearly half a million deaths (Worldometer 2020). In response, and despite certain economic hardships, governments have shut down society to stem the spread of the disease through social distancing. School closures have been nearly universally used as a mitigation tool. While a recent review found limited research and a marginal association between school closures and disease transmission (Viner et al. 2020), past studies have highlighted the potential of school closures to slow the outbreak (Jackson et al. 2013) and countries have routinely relied on school closures (UK DOH 2014). At the peak of school closures, in April 2020, over 95% of countries had fully or partially closed schools, affecting an unprecedented 1.725 billion children across the globe.

Schools are slowly starting to reopen in some countries, with mixed success. Concerns over safety led England to halt plans to further open primary schools (Coughlan 2020). In South Korea and Israel, some schools had to re-close after infection rates flared up (Gaudiano and Goldberg 2020). Governments, teacher unions, and universities are putting in place plans to allow for the re-opening and continuation of learning. The potential negative consequences of having youth out of school and the unique challenges of opening facilities with an ongoing global pandemic have focused attention on short term response and recovery. This study explores the longer-term impact of closing schools during a pandemic. Drawing on household survey data, descriptive and inferential statistics are used to explore (1) if, and to what extent, school disruptions during the 2013-2016 Ebola outbreak in Guinea and Sierra Leone changed the expected pattern for enrolment amongst school age youth and (2) if, and to what extent, alterations

disproportionately affected marginalized groups. Results from this study suggest a post-outbreak surge in dropouts that is concentrated in secondary age youth from the poorest households. This effect persists over time resulting in an additional 22,000 more youth dropping out of school across the two countries, than would have been expected pre-outbreak. Results from this study have implications for education planners as they prepare to recover from the COVID-19 crisis. By highlighting both those at greatest risk of not returning and the longer time horizon, this study encourages education systems to adopt a longer term, sustainable approach using ambitious but realistic timelines as they attempt to restart and rebound.

This study starts with a review of school disruptions and their relationship with educational outcomes. This is followed by a look at school closures and past pandemics. The 2013-2016 Ebola pandemic is then introduced, as well as the data and methods used in the analysis. Following a presentation of the results, a discussion section contrasts key characteristics of the Ebola pandemic and the COVID-19 pandemic before providing a few preliminary lessons for education planning purposes.

School disruptions and educational outcomes

School disruptions include both planned and unplanned stoppage of education through the closing of facilities. Common reasons for school disruptions include infectious disease outbreaks (Cauchemez et al. 2014), natural disasters (Andrabi et al. 2020; Bangkok ADPC 2008; Esnard et al. 2018), and inclement weather (Stuart et al. 2013). In a study of unplanned, non-pandemic related school closures in the United States between 2011 and 2013, 79% of closures were due to inclement weather, 14% due to natural disasters, and 4% due to infrastructure issues. Only 4% of closures lasted more than four days (Wong et al. 2014).

To see a relationship between school disruptions and educational outcomes the disruptions must be of substantial length. For this reason, most research has examined disruptions due to disasters or looked at school holidays or transitions. Learning loss over school holidays is commonly reported (Slade et al. 2017) and disproportionately affects children in low income families (Quinn et al. 2016). Children out of school for the summer holidays in Latin America lose nearly three months of prior learning (Busso and Munoz 2020). In Malawi, Slade and colleagues (2017) reported a 0.38 standard deviation decrease in reading scores during the three-month transition from grade one to grade two. During a similar transition in Ghana, foundational numeracy test differences represented a 66% loss in learning gains, with a complete elimination of learning gains for those without books or reading materials at home (Sabates and Carter 2020).

Lower achievement is also more common among students that have experienced natural disasters. Comparing test scores of students in Thailand affected and not affected by flooding, Thamtanajit (2020) reported a 0.03 to 0.11 standard deviation decline, depending on grade and subject. Research suggests that effects are greater for economically disadvantaged students (Lai et al. 2018) and can persist over time (Andrabi et al. 2020). Four years following the 2005 Pakistan earthquake, family living standards

had recovered, but those whose schools were closed for an average of 80 days experienced learning loss that put them one and a half to two years behind their peers (Andrabi et al. 2020).

In comparison to student achievement, enrolment patterns are understudied. Some have suggested those in higher risk areas for natural disasters are more prone to drop out (Bangkok APDC 2008), however, research relating specifically to health crises and student re-enrolment is relatively rare (see Carvalho et al. 2020 for a review). A study on post outbreak absenteeism following a five-day school shut down due to seasonal influenza in one United States city found no differences between those affected and those not (Rodriguez et al. 2009). In Liberia, post-Ebola phone surveys found that one month after the outbreak, one in four households reported their children had not yet returned to school (Carvalho et al. 2020). Meyers and Thomasson (2017) explored the long-term effect of the 1916 Polio outbreak and found that those that were 14 to 17 years old during the outbreak had lower attainment in 1940. Specifically, a one standard deviation increase in the number of community cases per 10,000 was associated with a 0.07 year decrease in education attainment. Results, however, represent an upper bound estimate as effects are unable to differentiate those directly afflicted with polio and those indirectly effected through school closures. This is due, in part, to the assumption that state-level polio morbidity is an accurate measure of school disruption.

Enrolment and learning can both be negatively affected by the destruction or disruption of educational facilities. During the Ebola outbreak, schools in Sierra Leone were used as Ebola treatment centres, leading to hesitation amongst families to return to school (Berry and Davis 2020). Earthquakes (Bangkok ADPC 2008) and hurricanes have also led to the destruction of schools, increasing the difficulty of post-crisis education. As a result of 1998 Hurricane Mitch, 4,835 out of 20,942 public school classrooms were destroyed (Smith 2013). In 2017, following destruction by Hurricanes Maria and Irma, Puerto Rico permanently closed approximately one-quarter of their schools (Finucane et al. 2020).

School closures and past pandemics

In health crises featuring a communicable disease school closures are a commonly used non-pharmaceutical intervention. School closures can be an effective mitigation tool to slow the transmission of disease (Jackson et al. 2013) but is best used in combination with other strategies (Markel et al. 2007; Viner et al. 2020) and is often done too late, in a reactionary manner after the peak of infections have past (Cauchemez et al. 2009). Key considerations in deciding to close schools include the case fatality rate and infection rate amongst youth (Cauchemez et al. 2014; UK DOH 2014). The COVID-19 pandemic has seen a nearly global shutdown of education systems. By mid-April 2020 95% of countries had at least partially closed their schools (UNESCO 2020). Prior to resumption, schools in Pakistan, Indonesia, South Africa, Zambia, and Malawi are expected to be closed for over 100 days (Crawfurd et al. 2020a). For South Africa this equates with losing 25% to 57% of the 'normal' school year (van der Berg and Spaull 2020). With schools closed for over 70% of the academic year, the Education Cabinet Secretary of Kenya recently declared the school year lost, with student required to repeat their classes upon reopening

(Muraya 2020). In Europe, schools in France and Germany re-opened after being closed for over 50 days, while in England schools were shut for just over 80 days before resuming at some capacity (Crawford et al. 2020a).

The breadth and length of school closures are one of many features that set the COVID-19 pandemic apart. In their systematic review of school closures due to seasonal or pandemic influenza, over half of the studies investigated by Jackson and colleagues (2013) reported school closures of less than 14 days. Across 8 countries during the 2009 H1N1 outbreak school closures lasted an average of 3 to 8 days (Cauchemez et al. 2014). In Mexico, the source country for the 2009 H1N1 pandemic, schools closed for 14 days from April 27 to May 10 (Herrera-Valdez et al. 2011). Targeted, city levels closures during the H1N1 pandemic were seen in Bangkok, Thailand – three weeks (Chieochansin et al. 2009), Auckland, New Zealand – four days (Stuart et al. 2013), and Hong Kong – one month (Wu et al. 2010). Information on school closures for the 1918-1919 Influenza Pandemic that killed at least 50 million people and infected one-third of the global population (CDC nd) is difficult to find. Drawing from news articles, Stern and colleagues (2009) find inconsistent closures across the United States. While districts in Los Angeles and Denver shut down for 85 and 82 days respectfully, many of the largest districts, including New York City and Chicago, decided against closing.

The regional intensity and the length of closures during the Ebola outbreak in West Africa make it the only education system shutdown that can come close to what the world is currently experiencing. The 2013-2016 Ebola outbreak in West Africa had more cases, deaths, and recoveries than all other prior Ebola outbreaks combined (Shultz et al 2016). Prior to this outbreak, Ebola had never crossed national boundaries. The 2013-2016 outbreak was the first to be recognized as a pandemic with reported cases spread across 10 countries. Sierra Leone was the epi-centre of the outbreak with all districts in the country reporting at least one case of Ebola (Amara et al. 2017) and 99.9% of all cases were concentrated in Guinea, Liberia, and Sierra Leone (Shultz et al. 2016). Schools in these three countries were closed for seven (Guinea) to nine (Sierra Leone) months, resulting in 486 to 780 lost learning hours (UNDP 2015). The education of an estimated 5 million children was influenced by shut downs (Rohwerder 2020).

Beyond the education system, the Ebola pandemic took a heavy toll on countries in the region. For Sierra Leone and Guinea, progress in overcoming years of turmoil and political unrest was stymied when the Ebola outbreak hit. World Bank estimates for economic growth as percent of GDP in 2015 were adjusted from 4.3% to -0.2% in Guinea and from 8.9% to -2.0% in Sierra Leone (Bordner 2015). In Sierra Leone, average annual household income declined from US\$336 to US\$131 over the course of the outbreak (Berry and Davis 2020). Youth lost parents, with 850 losing at least one parent to Ebola in Guinea (The New Humanitarian 2015) and 5,666 losing at least one in Sierra Leone (Amara et al 2017) and 30% of children were unable to receive routine vaccines during the outbreak (CDC 2015).

This Study

This study uses data from Sierra Leone and Guinea to explore the immediate and long-term influence of the 2013-2016 Ebola pandemic on enrolment. Using publicly available household survey data from before and after the outbreak, descriptive and inferential statistics are applied to investigate two research questions: (1) how has the pandemic influenced the enrolment patterns of school age youth in Sierra Leone and Guinea? and (2) does the pandemic disproportionately effect the most marginalized? Liberia was not included in this study as household surveys from at least two periods before the Ebola outbreak and one time period following the outbreak were not available. Household surveys include both the Demographic Health Survey (DHS) and the Multiple Indicator Cluster Survey (MICS). DHS and MICS both provide nationally representative data. The two surveys are increasingly aligning their questionnaires and conduct data collection at different years to provide a more coherent picture of country activity and trends (Lisowska 2016). In contrast to national assessments, the DHS and MICS, as household surveys, are able to capture those individuals not currently attending school. Prior research has combined DHS and MICS data to explore changes in education enrolment (Putnick and Bornstein 2015; Smith-Greenaway and Heckert 2014). Additionally, the two surveys act as the primary sources of data for UNESCO's World Inequality Database on Education.

In each survey and year, the sample is limited to the school age population. In Sierra Leone the school age population is age 6 to age 18, with 6 to 11 representing primary school age and 12 to 18 representing secondary school age. The comparative numbers in Guinea are ages 7 to 19 for school age, 7 to 12 for primary school age, and 13 to 19 for secondary school age (UIS nd). The multiple survey years provides for a cohort level comparative analysis. For a complete breakdown of descriptive statistics see Appendix A.

Education status is calculated by disaggregating the identified age group into three categories:

1. Currently enrolled – those that have attended school at some time during the current school year
2. Drop out – those that have previously attended school but have not attended school at any time during the current school year
3. Never enrolled – those that have never enrolled in school

Primary and secondary age enrolment in this study therefore differs from primary and secondary net enrolment, as the primary concern of this study is that youth are attending school and the level in which they are attending is not considered.

Demographic categories for this study are drawn from past literature but limited to those that provide comparative measures over survey type and year. As a result, four categories are chosen: sex, location, orphan status, and wealth. Sex is a binary variable coded 1 for female and 0 for male. Location is a binary variable coded 1 for rural and 0 for urban. Orphan status is calculated from survey questions that ask whether the identified youth's biological mother and biological father are still alive. If both biological parents are dead the youth is considered an orphan (coded = 1), if any biological parent is alive the youth

is a non-orphan (coded = 0). Finally, wealth is measured through MICS and DHS provided wealth quintiles. Quintile one includes the poorest youth. Quintile five includes the wealthiest youth.

To address the research questions a combination of descriptive and inferential statistics are used. Proportions are examined over time to provide an overview in response to research question one. For research question two, change in dropout rate between pre- and post-outbreak samples are calculated. Dropout rate here equals number that have dropped out divided by those that have ever attended (dropped out + currently enrolled). In addition, logistic regression is ran to predict the changes in likelihood of being included in the dropout category. Odds ratios are provided to ease the interpretation of results.

The 2013-2016 Ebola Pandemic and Enrolment Patterns

Figure I overlaps the Ebola outbreak with enrolment rates of school age youth in Sierra Leone and Guinea between 2005 and 2018. The black dots and bar indicate the first and last cases as well as the period during which schools were shut down in each country. The World Health Organization (WHO) reports that the first case of Ebola in Sierra Leone occurred in May 2014 (WHO 2014a). Schools throughout the country shut down immediately thereafter in June 2014 and remained closed until March 2015 (UNDP 2015). Guinea is identified as ground zero for the outbreak. We now know that a two-year old boy from the village of Meliandou was the country's first case, in December 2013 (Shultz et al. 2016). However, it was not until March 2014, that Guinea confirmed the deadly fever sweeping across one of its regions was Ebola (WHO 2014b). Schools were closed in June 2014 and reopened in January 2015 (UNDP 2015). West Africa was declared Ebola free in January 2016 (WHO 2016).

In both Sierra Leone and Guinea an unclear connection between the Ebola outbreak and school enrolment are seen in Figure I. A larger percentage of primary and secondary age youth are enrolled in Sierra Leone than Guinea throughout the time period. Both countries see slow growth in overall school age enrolment, which is driven by a declining proportion of those that have never enrolled in school. The larger portion of youth attending school at any time has also resulted in an increased percentage of those that have dropped out. In Guinea the benefits of greater enrolment over time seem to be concentrated in the primary age group.

When focusing on years directly before and after the Ebola outbreak we see some small differences in the patterns by school age group. In both Sierra Leone and Guinea, the primary age enrolment increases after the outbreak. In contrast, secondary age enrolment sees a slight dip in Sierra Leone, from 73.0% in 2013 to 71.8% in 2017, while in Guinea the gap between enrolment of primary age youth and secondary age youth widens during the outbreak. While this macro level aggregation of enrolment by country may hint at a few differences post-outbreak, it tells us nothing of the change in composition of school attendees.

Dropout Rate Changes Among Marginalized Groups

To examine how the Ebola outbreak affected the most marginalized, tables I and II explore the change in dropout rates by gender, location, orphan status, and wealth. Each table provides information for dropout rates from the survey directly before (2013 in Sierra Leone and 2010 in Guinea) and the survey(s) after (2017 in Sierra Leone, 2016 & 2018 in Guinea). Dropout rates are calculated as a percent from those that have ever been to school.

In Sierra Leone (Table I), dropout rates for both primary age and secondary age increased following the outbreak. Although the dropout rate remained relatively low amongst the primary age group, some groups saw disproportionate spikes post-outbreak. This included primary age youth in rural areas, where dropout rates increased by 15.09%, orphans, where dropout rates increased by 44.02%, and those in the poorest quintile, where dropout rates increased by 62.77%. As dropout rates for the secondary age group started from a higher baseline (overall drop rate in primary age in 2013 was 2.08% compared to 11.76% for secondary age), the percentage change is not as drastic. However, similar to primary, we can see that boys appear to be more affected, as well as those in rural areas (10.92% increase in dropout rate) and those in the poorest category (13.42% increase). The change in dropout rates for orphan, and its distinction from the primary age group, may be due to the small sample size of orphans in the dataset. This makes conclusions on effects for orphans very sensitive to small shifts across surveys and suggests all results related to the orphan category should be interpreted with caution.

Table I: Change in Dropout Rate by Age Group: Sierra Leone

Year	2013 (%)	2017 (%)	Change from 2013 (% change)
Primary Age			
Overall	2.08	2.22	+6.73
Girls	1.91	1.96	+2.62
Boys	2.26	2.49	+10.18
Rural	2.32	2.67	+15.09
Orphan	2.34	3.37	+44.02
Poorest	2.31	3.76	+62.77
Secondary Age			
Overall	11.76	12.77	+8.59
Girls	14.24	15.12	+6.18
Boys	9.10	10.22	+12.31
Rural	15.30	16.97	+10.92
Orphan	13.47	10.12	-24.87
Poorest	18.71	21.22	+13.42

In Guinea (Table II), survey results from 2016 and 2018 can be seen as more immediate and longer-term impacts of the Ebola outbreak. Here we see that the greatest immediate change in dropout rate occurs in primary age students and, relative to the overall change in dropout rate for that age group (10.20% increase), only girls see an excessive increase in dropout rate (17.98% increase). In both the primary and secondary age cohort there is little evidence of sustained changes in dropout rates among traditionally marginalized groups. The noticeable exception is found amongst the poorest secondary age youth. Immediately following the Ebola outbreak, the dropout rate for individuals in this category increased by 10.90% (relative to a 7.3% decrease in overall secondary dropout rate) and continued to increase in the

2018 survey, representing a 17.91% increase from the pre-outbreak mark (relative to a 2.58% decrease in overall secondary dropout rate).

Table II: Change in Dropout Rate by Age Group: Guinea

Year	2012	2016	Change from 2010 (% change)	2018	Change from 2010 (% change)
Primary Age					
Overall	4.02	4.43	+10.20	4.01	-0.25
Girls	4.45	5.25	+17.98	3.96	-11.01
Boys	3.65	3.68	+0.82	4.04	+10.68
Rural	5.63	6.19	+9.95	5.23	-7.10
Orphan	9.31	8.17	-12.24	5.99	-35.66
Poorest	7.79	7.43	-4.62	7.63	-2.05
Secondary Age					
Overall	20.54	19.04	-7.30	20.01	-2.58
Girls	28.03	25.16	-10.24	25.54	-8.88
Boys	14.15	13.82	-2.33	14.94	+5.58
Rural	26.02	25.78	-0.92	28.71	+10.34
Orphan	27.16	22.03	-18.89	20.89	-23.09
Poorest	29.82	33.07	+10.90	35.16	+17.91

Taken together, results from tables I and II suggest that youth in the poorest households see the largest increase in dropout rates post-outbreak and that this impact can persist for years. Those in rural areas are also susceptible to disruptions while gender differences seem to vary by country and age group. Finally, the Ebola outbreak appears to have done more harm to the dropout rate in Sierra Leone than in Guinea.

Table III uses logistic regression to predict who is likely to drop out pre- and post-pandemic in Sierra Leone and Guinea. As girls, youth in rural areas, orphans, and those in the poorest quintile represent traditionally marginalized groups in each country it is not surprising that most odds ratios are above 1.00 and significant, suggesting that they are more likely than the relative reference categories to dropout. Looking at differences in odds ratios before and after the Ebola outbreak can draw attention to additional vulnerability experienced by groups. Results reinforce those found in tables I and II suggesting the poorest are the hardest hit. For primary age youth in the bottom wealth quintile in Sierra Leone, the odds that they dropped out increased from 1.03 times greater than all other youth (not significantly different) to 1.81 times greater ($p < .01$). The likelihood that the poorest secondary age youth dropped out in Sierra Leone also increased, from 1.54 times greater ($p < .01$) than the reference group to 1.75 times greater ($p < .01$). In Guinea, the poorest secondary age youth saw an increased and sustained likelihood of dropout.

Table III: Predicting Dropout by Age Group (Odds Ratios Provided)

Sierra Leone			Guinea			
Year	2013	2017	Year	2012	2016	2018
Primary Age			Primary Age			
Girls	0.85	.80*	Girls	1.28*	1.55***	1.03
Rural	1.37*	1.43**	Rural	2.48***	3.05***	1.95***
Orphan	1.19	1.69	Orphan	2.83*	2.08	1.87
Poorest	1.03	1.81***	Poorest	1.68***	1.37*	1.81***
Secondary Age			Secondary Age			
Girls	1.43***	1.38***	Girls	2.36***	2.32***	1.77***
Rural	1.98***	1.89***	Rural	1.97***	2.56***	2.57***
Orphan	1.81***	1.22	Orphan	1.88**	1.74*	1.71*
Poorest	1.53***	1.74***	Poorest	1.46***	1.87***	1.68***

Notes: *** $p < .01$ ** $p < .05$ * $p < .10$

Table III also illustrates the precarious position of youth in rural Guinea. Amongst secondary age youth in the country the odds of dropout of those in rural areas increases from 1.46 times greater ($p < .01$) than urban youth pre-outbreak to 1.87 times greater ($p < .01$) immediately following the outbreak and remained above the pre-Ebola number two years later ($OR = 1.68, p < .01$). The odds that rural primary age youth have dropped out sees a substantial increase immediately following the outbreak (from $OR = 2.48, p < .01$ to $OR = 3.05, p < .01$) which rescinds in the latest survey ($OR = 1.95, p < .01$).

To examine what these numbers mean in practice the pre- and post-outbreak dropout rates for both countries are used to estimate the net decrease in enrolment numbers amongst the poorest. In Sierra Leone the increased dropout rates are exasperated by the shift in overall poverty toward the youth after Ebola (see Appendix A). Changes in dropout rates amongst the poorest in Sierra Leone indicate that approximately 4,530 more primary age youth and 5,770 secondary age youth in the bottom wealth quintile dropped out of school than would have been expected pre-pandemic. In Guinea, the immediate impact of the Ebola outbreak for the poorest secondary age youth was an additional 11,640 dropouts. The longer-term impact in Guinea for this group resulted in approximately 6,080 additional dropouts for a total of 17,720 excess dropouts in 2018, relative to the pre-pandemic rate in Guinea.

Discussion

Potential Lessons for the COVID-19 Pandemic

During the Ebola pandemic in Guinea and Sierra Leone changes in enrolment appear to be disproportionately concentrated amongst secondary students in poorer families and in rural areas. Although there is no clear overall discontinuity in enrolment patterns at the national level, disaggregating and investigating proclivity to dropout indicates that marginalized groups are substantially influenced by the pandemic and associated school disruptions and preliminary results suggest this may persist. In practice, this leads to expanding inequality in access for those in poor households.

Results suggest secondary age youth may be particularly vulnerable to school disruptions. This may be due, in part, to older youth taking on additional paid labour during the Ebola lockdown. In Sierra Leone many of the 3 million children in affected communities engaged in economic activity for household survival (Government of Sierra Leone 2015). Children reported increased pressure to participate in ways to support the family (Hallgarten 2020) and these new responsibilities may have been retained given the corresponding economic crisis many experienced. In Guinea, the smaller impact in secondary education may be related to the low enrolment numbers pre-outbreak. Unlike Sierra Leone, it is possible that the most marginalized population have yet to access education. A larger percentage of those in school in Sierra Leone would therefore be in a more precarious position and susceptible to exogenous shocks.

Limited findings specific to orphans and girls were surprising given the past literature suggesting both groups were significantly negatively affected by the Ebola pandemic. For orphans this may be due to how the group was defined. While a large number of children lost one parent to Ebola, limiting the definition of

orphan to a youth without both biological parents severely reduced the sample size. This led to more imprecise results, prone to fluctuations. In addition, while many youth were orphaned during the crisis, some research suggests dropout prevention programs targeting orphans in Sierra Leone have been effective (Hallgarten 2020). For girls, it is well documented that teen pregnancies rose in Sierra Leone during the pandemic, with estimates of new teenage pregnancies ranging from 14,000 to 20,000 (Parnebjork 2016). Directly following the resumption of education in the country, the Minister of Education forbid visibly pregnant girls from re-enrolling, a ban on attendance for pregnant teenagers that was not lifted until 2020 (BBC 2020). So why don't household survey's capture this rise in 'dropouts'? This may be due to the detail in which the question is asked. Both the DHS and MICS ask about attendance in school during the current year but don't define what a school is. After the Minister of Education banned re-enrolment for pregnant girls, a parallel route to education through non-formal learning centres was established. Fourteen thousand and five hundred girls were enrolled in that programme (Parnebjork 2016), limiting the number of dropouts as defined in the current study. The design of this also prohibits causal claims. Differences in dropout rate cannot be directly attributed solely to school closures and are likely to be influenced by multiple compounding challenges brought by the pandemic. Future research should target cohorts that were in the more vulnerable category (secondary, poorest household) when the pandemic hit and use longitudinal data to follow their path post pandemic to more clearly illustrate long terms effects.

Before exploring what education planners preparing for school restarts during the COVID-19 pandemic can learn from the Ebola outbreak, the two diseases need to be compared. As the focus is on the school age populations, lessons are more likely to be transferable if the diseases have similar youth infection rates, case-fatality rates, and modes of transmission. During the Ebola outbreak infections were concentrated in young adults. In Sierra Leone the two most infected age groups were 25 to 29 and 15 to 19 years old (Amara et al. 2017). Across West Africa 20% of Ebola cases occurred in children below the age of 15 (CDC 2015). The disease is transmitted through direct contact with infected skin, blood, or other bodily fluids, this included the shedding of infected cells left on clothing or bedding (Shultz et al. 2016). Individuals had to be symptomatic to be infectious (Berry and Davis 2020) and would remain infectious as long as the virus is present, up to 61 days (Shultz et al. 2016). The case fatality rate for Ebola is high, making it a greatly feared disease. Across the Ebola pandemic 39.5% of those infected died; in Sierra Leone the rate was 28%, in Guinea, 66.7% (Shultz et al. 2016). Finally, survivors are immune to that strand of Ebola for at least ten years (Shultz et al. 2016).

What we are learning about COVID-19 is rapidly changing. To date, there is evidence to suggest that the infection rate amongst youth may be lower. Ten percent of the global cases are within the 15 to 29 age group and those below age 15 make up less than two percent of total cases (WHO 2020a). Exploring age-specific cases across six countries, Davies and others (2020) found that those under the age of 20 are only half as susceptible to infection as those over the age of 20. In Iceland and Japan, children with extended exposure to the virus were less likely to test positive then similarly exposed adults (Crawford et al. 2020b). The virus is transmitted through direct contact with infected persons and through droplets expelled through coughing, sneezing, or talking (Roathan and Byrareddy 2020) allowing it to spread

rapidly. Infected individuals are not always symptomatic. This is especially true in youth where nearly 80% of infected 10 to 19-year olds across 32 geographic settings were either asymptomatic or displaying symptoms at a sub-clinical level (Davies et al. 2020). Asymptomatic carriers can still transmit the virus, but the efficiency of transmission relative to those displaying symptoms is currently unclear. The global case fatality rate for COVID-19 is 5.33% as of June 18, 2020 (Worldometer 2020). However, mortality appears heavily concentrated in the older population. While the global median age for cases is 55, the median age of death is 81 with less than 2% of total deaths occurring before the age of 40 (WHO 2020a). Finally, it is unclear whether, if any, immunity is present in survivors (WHO 2020b).

Differences between Ebola and COVID-19 suggest that personal hygiene measures are essential for any school re-openings, however, social distancing is only necessary during the COVID-19 pandemic (Berry and Davis 2020). Ebola is easier to identify and isolate. With youth with COVID-19 disproportionately asymptomatic, there is increased uncertainty as to whether infected individuals are attending. The fear over the significant Ebola case fatality rate may act to both deter individuals from attending school but can also prompt action as people recognize the severity of the situation and adjust their behaviour accordingly. In contrast, the relatively mild mortality in youth, combined with its more asymptomatic display may lead to false confidence that individuals are beyond harm.

For education planners, this suggests that families may be more comfortable returning to school post-COVID-19 relative to the Ebola pandemic. Children are less likely to feel or look sick and with mortality concentrated in the elderly, less likely to be orphaned during the current pandemic. This could reduce the stigmatisation that kept some from re-enrolling post-Ebola (Hallgarten 2020). The safety and condition of facilities may deter the return to school. If parents are not certain that school is a secure place for their children, they may be held out. Additionally, some schools may be in a state of disrepair following a long shut down. This could be especially true in rural areas. Social distancing measures may also discourage students to return or push them out of school once they have arrived. Distance related policies after Ebola restricted class sizes leading to increased private school enrolment and further impacting the poorest (Santos and Novelli 2017).

Challenges for the poorest and most marginalized were likely compounded during the shutdown. Negative indirect consequences of school closures (Berkman 2008), such as increased physical abuse and sexual exploitation (Hallgarten 2020; Robertson et al. 2020; van der Berg and Spaul 2020), and disproportionate engagement with remote learning (Giannini 2020; Herold 2020), may accelerate youth's exit from the system. To mitigate the impact of the COVID-19 outbreak on those poor students most likely to dropout a comprehensive, long-term package of financial support is needed. Targeted approaches may include cash transfers for the most vulnerable, increasing provision of school meals, and decreasing or eliminating school fees (Carvalho et al. 2020). As the COVID-19 health crisis is compounded by and accelerates an economic crisis, the additional investment in education necessary to ensure those most at risk return to school may be hard earned. Immediately following crises, recovery efforts tend to focus on areas such as health and sanitation over education (Hallgarten 2020). Governments will also be short on funds, forcing public sector cuts, including the furloughing of teachers and closure of public institutions

(Ibqal et al. 2020). Yet, if government and education planners do not recognize the potential long term effects of the pandemic on the most marginalized and provide the necessary resources over time to ensure their return to school the COVID-19 pandemic will certainly have intergenerational impacts as inequality in access to education grows.

Conclusion

School closures are one of multiple societal disruptions during the COVID-19 pandemic. Re-openings are likely to occur through fits and starts as school leaders tackle localized outbreaks and work to keep students and staff safe. Upon resumption, schools face a new reality with plans calling for reduced class sizes, staggered start times, and limited interaction to permit social distancing. Closures during a pandemic are not simply a pause in learning, but an experience that disproportionately detriment those on the margins. Learning gaps widen as ad hoc emergency attempts for remote learning during school closures have largely evaded the most marginalized and in scanning the faces in the room we will need to ask ourselves who is missing? Results from the 2013-2016 Ebola pandemic suggests that the answer to that question is likely to be older students from the poorest households. Recovery for these students is unlikely to be successful if all attention and resources are solely directed toward plans focusing on the immediate needs of schools and students. Instead, a long-term, persistent effort must be instilled that includes comprehensive financial support packages to aid the return of the most marginalized and mitigate the impending expansion in inequality

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Figures



Figure 1

School enrollment patterns by age group and country, pre- and post-Ebola pandemic

Supplementary Files

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- [AppendixA.png](#)