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Learning in the Time of a Pandemic and Implications for Returning to School: Effects of COVID-19 in Ghana

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Abstract

The Covid-19 pandemic led to school closures all over the world, leaving children across diverse contexts without formal education for nearly a year. Remote-learning programs were designed and rapidly implemented to promote learning continuity throughout the crisis. There were inequalities in who was able to access remote-learning during school closures, though little systematic evidence documenting these gaps exists, particularly in sub-Saharan Africa. In this study, we surveyed 1,844 children in the Greater Accra Region of Ghana, as well as their caregivers and teachers, regarding their engagement in remote learning, literacy and math test scores, and household economic hardships. We document inequalities in access to and engagement in remote-learning activities during the ten months in 2020 in which schools were closed in Ghana. Specifically, children in private schools and children in higher-socioeconomic status households engaged in remote-learning at higher rates and received more support from their schools and caregivers. Further, controlling for demographic characteristics and pre-pandemic learning outcomes, we document gaps in children's literacy and math test scores, with food insecure and low-SES children, as well as children enrolled in public schools before the pandemic, performing significantly worse than their peers (0.2-0.3 SD gap). Finally, children in households that experienced more economic hardships during the pandemic engaged in fewer remote learning activities and had lower literacy and numeracy assessment scores. The findings speak to the potential consequences of increased inequalities due to the pandemic as schools re-open in Ghana and around the world and provide insight into how schools may address these inequalities as children return to the classroom.

Keywords

COVID-19, pandemic, Ghana, school closing, school opening, reopening schools, covid 19 schools responses

Disciplines

Education

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Learning in the Time of a Pandemic and Implications for Returning to School: Effects of COVID-19 in Ghana

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Abstract

The Covid-19 pandemic led to school closures all over the world, leaving children across diverse contexts without formal education for nearly a year. Remote-learning programs were designed and rapidly implemented to promote learning continuity throughout the crisis. There were inequalities in who was able to access remote-learning during school closures, though little systematic evidence documenting these gaps exists, particularly in sub-Saharan Africa. In this study, we surveyed 1,844 children in the Greater Accra Region of Ghana, as well as their caregivers and teachers, regarding their engagement in remote learning, literacy and math test scores, and household economic hardships. We document inequalities in access to and engagement in remote-learning activities during the ten months in 2020 in which schools were closed in Ghana. Specifically, children in private schools and children in higher-socioeconomic status households engaged in remote-learning at higher rates and received more support from their schools and caregivers. Further, controlling for demographic characteristics and pre-pandemic learning outcomes, we document gaps in children's literacy and math test scores, with food insecure and low-SES children, as well as children enrolled in public schools before the pandemic, performing significantly worse than their peers (0.2-0.3 SD gap). Finally, children in households that experienced more economic hardships during the pandemic engaged in fewer remote learning activities and had lower literacy and numeracy assessment scores. The findings speak to the potential consequences of increased inequalities due to the pandemic as schools re-open in Ghana and around the world and provide insight into how schools may address these inequalities as children return to the classroom.

Introduction

The Covid-19 pandemic led to school closures all over the world, leaving children across diverse contexts without formal education for many months. For countries in sub-Saharan Africa that already had a very low learning base (Angrist, Djankov, Goldberg, & Patrinos, 2021), the effectiveness of remote-learning, and its role in widening or mitigating inequalities, remain unknown. Groups at greater risk of poorer educational attainments, including girls and children from the poorest families, likely were and will continue to be disproportionately affected, amplifying existing educational inequalities. While a mounting body of evidence is showing large disparities in engagement in remote learning in high-income countries, with important implications for learning outcomes (Donnelly & Patrinos, 2021), similar gaps have not been systematically documented for lower-income settings, particularly in sub-Saharan Africa.

In the fall of 2020, we embedded into an ongoing longitudinal project a study of the pandemic's repercussions on children's education and broader development for Ghanaian boys and girls aged 9-11 years ($N = 1,844$), their caregivers ($N = 2,048$), and their teachers ($N = 514$). Using phone-based surveys and learning assessments, we investigated child and family reports of engagement in remote learning, as well as other stressors such as food insecurity and economic hardship. Our sample includes children from public (44%) and private (56%) schools, and we examine inequalities in access to and quality of remote learning activities by school sector, as well as by children's household socioeconomic status (SES).

We first provide background on the educational context in Ghana, and present evidence on how the pandemic affected Ghanaian families. We then present our results in three key areas: (i) inequalities in engagement in distance learning activities by public and private schools; (ii) anticipated learning loss and literacy and numeracy assessment score inequalities, and (iii) other

household determinants of learning and well-being inequalities: economic inequality and child food insecurity. We conclude by describing implications for school re-openings and the Ghanaian educational system—and international education more broadly—moving forward.

The Ghanaian Educational Context

Ghana is a lower-middle-income country in West Africa with a population of 32.4 million people (World Bank, n.d.). The adult literacy rate is 76.6%, nearly one quarter (23.4%) of the population lives below the national poverty line, and the average life expectancy is 69 years of age (World Bank, n.d.). Despite significant progress in increasing universal primary school enrollment (UNESCO, 2014), educational quality and learning levels remain low (Angrist et al., 2021). For example, the 2016 National Education Assessment in Ghana showed that only 22% of Primary 4 (P4; equivalent of fourth grade) students achieved proficiency in mathematics, and only 25% attained proficiency in Primary 6 (P6; equivalent of sixth grade). In English, 37% of P4 students and 36% of P6 students achieved proficiency (Ghana Ministry of Education, 2016).

As demand for schooling has grown, the private sector has expanded significantly and helped fill large gaps in communities where public schools have been slower to open (Bidwell & Watine, 2014). In Ghana, the public and private sectors differ in terms of structural characteristics. For example, there are no requirements for teacher credentials in the private sector, while teachers in the public sector are required to have Diplomas in Basic Education obtained from approved colleges of education (Asare & Nti, 2014). Public-sector teachers are classified as civil servants and thus receive guaranteed remuneration levels and job security, while private-sector teachers are generally paid less with no job security (Osei, 2006). Importantly, a large majority of private schools in Ghana charge low fees and cater to low-

income families (known as low-fee private schools), and many schools struggle to cover their costs (Baum, Abdul-Hamid, & Wesley, 2018). Yet, parents often perceive them to be of better quality than public schools (Dixon & Tooley, 2012; Zuilkowski, Piper, Ong'ele, & Kiminza, 2018). Students in private schools outperform their public-school counterparts, and children in private schools tend to come from higher-income and better-educated families (Pesando, Wolf, Behrman, & Tsinigo, 2020). However, very little evidence exists of the differential learning opportunities and learning outcomes of children in private versus public schools during school closures.

Beyond direct learning opportunities, household hardship poses a serious risk to children's educational engagement and learning. In Ghana, large-scale effects of lockdowns due to the pandemic include very high rates of economic hardship and food insecurity. For example, in a representative sample of households, more than 40% of respondents say they have had to limit portion sizes at mealtimes or reduce the number of meals in the past week (Egger et al., 2021). In addition, while 65% of respondents from the same survey report working in February 2020, only 41% of households report working in the past week in April 2020. Of those still working, 41% earned less and 29% worked fewer hours in the past week (Innovations for Poverty Action, 2020).

Decades of research have documented a strong negative link between economic hardship and schooling outcomes in the United States (National Academies of Sciences Engineering and Medicine, 2019) as well as on the African continent (Evans & Mendez Acosta, 2021). Yet few studies to date have reported associations between economic hardship during the pandemic and children's educational opportunities and learning outcomes in Africa. Importantly, data from the Ebola crisis confirm that economically vulnerable children are at highest risk of school dropout

in times of crises (Smith, 2021). Recent studies have documented the link between economic hardship and parent mental health in Ghana (e.g., Atuoye & Luginaah, 2017), as well as the link between caregivers' mental health and support for children's learning during the pandemic in the United States (Lee, Ward, Chang, & Downing, 2021; Xu, Wu, Levkoff, & Jedwab, 2020).

The Current Study

In this study, we provide the first evidence to date of children's learning opportunities and outcomes during Covid-19 induced school closures in Ghana. Using descriptive statistics and regression analyses, we document inequalities in children's access to remote learning activities provided between students attending public vs. private schools, as well as support for remote learning activities at home based on school sector and household SES. In addition, we find significant associations between Covid-induced economic hardship and children's participation in remote learning activities. Finally, controlling for previous learning outcomes before the pandemic, we document inequities in literacy and math test scores across public and private schools, household SES, and household economic hardship.

Methods

Sample

Our sample is drawn from an ongoing longitudinal impact evaluation of a school-randomized trial conducted in the 2015-2016 school year in the Greater Accra Region of Ghana. Quality Preschool for Ghana (QP4G) was a study of preschool quality improvement. Schools were sampled from six districts in the summer of 2015. A listing of all schools was conducted using the Ghana Education Service Educational Management Information System database. Schools were then randomly sampled, stratified by district, and within district by public and private schools, to obtain 240 schools total based on power calculations for the randomized

control trial (Wolf, Aber, Behrman, & Tsinigo, 2019). Eligible schools had to be registered with the government and have at least one KG (kindergarten) class (many schools had both first-year and second-year KG classes, KG1 and KG2). Because there were fewer than 120 public schools across the six districts, every public school was sampled. Private schools (490 total) were sampled within districts in proportion to the total number of private schools in each district relative to the total for all districts.

Children were then sampled within each school. Class rosters for all KG1 classrooms were collected, and an average of 15 children (eight from KG1, and seven from KG2) were randomly selected from each roster to participate in direct assessments. If a school had fewer than 15 kindergarten children enrolled across both classrooms, all children were selected. These children were 49.5% female and on average, 5.2 years-old ($SD = 1.8$) at baseline. Children were followed for three subsequent waves of data collection in-person, with the third follow-up conducted in May-June 2018.

In this study, we conducted a round of phone-based surveys with children and their primary caregiver in October 2020 to collect data specific to the Covid-19 pandemic. All data collectors had prior experience working with children, were trained in the study's research protocols and methodology, and spoke English and local languages (Dangme, Ga, Twi, Ewe, and Hausa). We attempted to reach as many of the children and caregivers who participated in Year 1 (2015-2016) of the project ($N = 3,867$) and were able to reach 48% of children ($N = 1,844$). Following receipt of verbal assent, children were asked several modules related to their well-being and involvement in educational activities during the Covid-19 pandemic, in addition to the assessment of their literacy and mathematics skills. We followed best practices related to phone-based assessments with children (Angrist et al., 2020). Data collectors asked children to locate a

quiet and comfortable seat while engaging in the phone survey, as well as to obtain paper and pencils to solve the math problems. Further, caregivers were also asked to give children privacy while they were engaging in the survey. Prior to starting the assessment, data collectors informally spoke with the children to help them feel at ease, and then administered the survey in the language in which the child was most comfortable. Children were, on average, 10.1 years-old ($SD = 1.2$), 49% male, and 56% were attending private schools prior to school closures.

Primary caregivers of these children (88% biological parents) were invited to participate in a phone survey and identified as “... the person who takes primary responsibility for the child’s education and who could best talk about the child and his or her experiences in school and at home. It may be the child’s parent, a family member, guardian, or another individual.” Caregivers were, on average, 42.1 years-old ($SD = 8.8$) and 62% female. Families were spread across eleven districts in the Greater Accra Region—specifically, Adenta, Ashaiman, GA Central, GA East, GA West, GA South, GA North; Kpone Katamanso, Ledzokuku-Krowor, and Ledzokuku, and Tema West. And lastly, 32% ($n = 650$) of caregivers had at least completed senior high school; we classify these caregivers as having a high socioeconomic status, with the remaining 68% ($n = 1,390$) of caregivers characterized as having a low socioeconomic status. Table 1 presents a more detailed breakdown of caregivers’ highest level of education, amongst other key demographics.

Children’s current teachers were also recruited prior to the Covid-19 pandemic as part of the longitudinal follow-up of this sample, which was halted by the health crisis. As with caregivers and children, data were collected through a phone survey by trained interviewers. Nearly all interviews were conducted in English; three were administered in Twi. Ninety-eight percent of teachers taught at the primary school level, with 56% teaching in private schools and

44% in public schools. There were notable differences in teachers' sociodemographic characteristics by school type: on average, public school teachers had nine additional teaching experience ($M = 14.7$ versus 5.5 years) and were 12 years older than private school teachers (39.5 versus 27.5 years of age). Moreover, 82% of public-school teachers had at least a bachelor's degree, compared to only 14% of private-school teachers.

Measures

Household Hardship

Child food insecurity was measured via as a single item from Baird, Małachowska and Jones (2020), in which children were also asked to report how often they felt hungry within the past four weeks (0 = never; 1 = at least once).

Household economic hardship was captured by asking caregiver respondents whether they had experienced the following three events within the past 15 days: “disruption of daily wage/earnings”; “increase in prices of major food items consumed”; and “illness, injury, or death of household members”. These items were developed by the World Bank as part of an initiative to look at the impacts of Covid-19 on families with young children.

Remote Learning Activities Offered by School

Teachers who reported that their schools engaged in remote learning (54%, $n = 274$) were asked about the ways in which their schools participated: (i) online classes (live and/or prerecorded); (ii) distribution of hardcopy materials to children; (iii) materials distributed via WhatsApp or email or text; (iv) encouragement of students to follow TV and radio learning programs; and (v) community-based group learning. These items were adapted from Hamilton et al. (2020). See Table 2 for descriptive statistics for each item by school type.

Engagement in Remote Learning

Children and caregivers were asked, separately, the same set of five items to assess the various modes in which children were *engaged in distance learning* since schools were closed in mid-March 2020. Respondents were asked whether the child had pursued each of the following activities: (i) independent study (i.e., without direction from teachers); (ii) exercises from teachers; (iii) educational television or radio programming; (iv) online courses; and (v) private tutoring. Sum scores were generated for the child and caregiver report items, resulting in two scales ranging from 0-5 ($M = 1.9$, $SD = 1.12$ for children's reports, and $M=2.20$, $SD = 1.08$ for caregivers' reports). These items were adapted from the Gender and Adolescent Global Evidence Core Respondent survey module (Baird et al., 2020).

Literacy and Math Test Scores

In order to assess children's literacy and mathematic abilities over the phone, we adapted select modules from the Early Grade Reading Assessment (EGRA; RTI International, 2016), Early Grade Mathematics Assessment (EGMA; RTI International, 2016a), and the Young Lives study (Boyden, 2018). *Literacy* included three sub-tasks measuring oral vocabulary (children were asked to list words that began with the letter "B"), spelling (children were asked to spell words such as "flower" and "sun"), oral comprehension (children were read a brief passage in English or local language and asked to respond to comprehension questions [17 items total; $\alpha = 0.68$]). The percentage correct was calculated for each of the individual sub-tasks (scored from 0-1), the average score was subsequently calculated across the three components. *Mathematics* included two sub-tasks measuring number discrimination (identifying the larger number out of a pair), and operations and numbers (solving for mathematics problems including addition, subtraction, and multiplication [16 items total; $\alpha = 0.61$]). The percentage correct was calculated for each of the individual sub-tasks (scored from 0-1), the average score was subsequently

calculated across the two components. Both literacy and math composite variables were standardized with mean (M) of zero and standard deviation (SD) of one for analysis.

Children's Time Use

Children were asked to report on the following: “On a typical weekday from Monday to Friday (not a weekend or a holiday), how many hours do you spend on the following activities last week?” Children reported on the number of hours they spend on seven activities: sleep, caring for others (e.g., younger siblings or the elderly), household chores, working on the farm or other family business, working for pay, studying, engaging in leisure (e.g., playing, using the internet). These items were adapted from Young Lives (Barnett et al., 2013). The number of hours for each category ranged from 0-60.

Children's Access to Learning Materials

We asked children to report on a total of ten (1) ‘yes’ (0) ‘no’ items to capture whether children had access to necessary materials, resources, and space to adequately learn from home. These ten items included books (both school textbooks and other reading material), technological devices (TV, radio, computer or laptop, tablet or e-reader, and internet connectivity), electricity, basic writing materials (i.e., pen, paper, notebook, etc.), and appropriate physical spaces to study and/or attend the virtual class in the home (i.e., desk, chair/mat, access to natural, solar, or electric light).

Analytic plan

First, we conducted attrition analysis to examine the external validity of the sample of children to those originally sampled for the study in 2015. This analysis revealed that children who were present in the 2020 wave differed from the original sample in that they were more likely to be in the QP4G teacher training treatment status ($b = 0.07$, $SE = 0.03$), had higher

baseline socioeconomic status ($b = 0.002$, $SE = 0.001$), more likely to attend a private preschool at baseline ($b = 0.06$, $SE = 0.03$). In addition, they were less likely to be from the Ga South district ($b = -0.10$, $SE = 0.04$). Variables on which there no significant differences between the two groups included parental education, cognitive stimulation, books in the home, literacy, math, social-emotional, executive function, approaches to learning, and the five other study districts.

Next, we calculated a series of descriptive statistics to assess the rates of barriers and enablers to children's engagement in remote learning activities. Finally, we estimated a series of regression models that adjusted for baseline covariates—including children's baseline literacy and math outcomes—and for clustering of children within schools to assess how economic hardship experienced during the pandemic predicted engagement in remote learning and learning assessment scores, as well as gaps in learning assessment scores across sociodemographic subgroups.

Results

Table 1 presents descriptive statistics for the children, caregivers, and teacher samples. Children were, on average, 10.1 years old, and 49.4% were male. Over half (56%) were attending private schools prior to school closures in mid-March 2020. Primary caregivers were majority female (62.0%), 42 years old on average, and 68.1% had less than a secondary high school degree (categorized as “low-SES”). Most caregivers (87.6%) were biological parents of the children. Most caregivers reported a disruption in daily wages/earnings (65.1%) and increases in prices of major food items (56.0%) in the past 15 days due to the pandemic. Nearly one-third of children reported experiencing hunger in the past 30 days.

On average teachers were 32.7 years old with 9.5 years of teaching experience and 56.2% taught in private schools. Educational levels varied among senior high school (30.4%), more than senior high school but no Bachelor's degree (25.3%), and Bachelor's degree or more (44.9%).

Engagement in Remote Learning Activities by Public and Private Schools

The first panel in Table 2 shows teachers' reports of their school's provision of remote learning activities. Statistically significant differences were found in all forms of provision except for community-based group learning. Private schools were more likely to promote individualized learning, to engage in online classes (42.28% versus 5.51%, $p < .001$) and provide materials via WhatsApp, email, or text (61.74% versus 15.75%, $p < .001$). In contrast, public schools were more likely to supply generalized learning through the encouragement of participating in educational TV and radio programming (77.95% versus 26.17%, $p < .001$) and providing hardcopy materials to their students (77.95% versus 32.21%, $p < .001$).

The second and third panels of Table 2 display five common ways in which caregivers and children engaged in remote learning while schools were closed and differences that emerged by school type. In both caregivers' and children's reports, children in private schools were significantly more likely to engage in online courses (9.1% versus 2.9% and 9.9% versus 2.89%, $p < .001$, for children's and caregivers' reports, respectively), have access to private tutors (32.6% versus 20.4% and 38.1% versus 37.4%, $p < .001$, for children's and caregivers' reports, respectively), and receive assignments from their teachers (38.2% versus 25.7% and 50.0% versus 36.2%, $p < .001$, for children's and caregivers' reports, respectively). No statistically significant differences were found for children's independent study or use of educational TV or radio for neither children's nor caregivers' reports. Notably, rates for most of these activities

were generally low, suggesting that many children were not engaging in remote learning activities.

Barriers to Remote Learning

We first report on children's time use, followed by barriers specific to remote learning as reported by teachers and children. For the former, we consider differences for boys and girls; for the latter, we consider differences based on public versus private schools and household SES.

Time Use

Table 3 presents the number of hours children reported spending on four key activities in the previous week. Regarding remote learning, girls and boys reported spending a comparable number of hours on both studying and engaging in paid or unpaid labor. For time spent in other activities, girls reported spending significantly *less time* engaging in leisure activities than boys (with girls spending an average of 7.0 hours per week compared to the 8.6 hours as reported by boys, $p < .001$). In contrast, girls reported spending more time than boys supporting housework, including caring for others and tending to chores (girls reporting an average of 12.3 hours per week compared to 10.6 hours reported by boys, $p = .004$).

Challenges to Remote Learning Participation

Teachers reported on challenges they faced during the school closure period (Table 4). Public and private school teachers reported similar proportions of challenges with distance learning, the most prevalent being that students lacked sufficient devices (86.2%) and internet access (84.4%). Additionally, teachers reported their own challenges with technological access, including lack of devices and internet for teachers themselves (62.6 and 65.4%, respectively). Additional barriers included low student engagement and low caregiver support, and poor support for teachers.

Notably, most children, across both private and public schools had access to basic writing materials, electricity, school textbooks, and a television (see Figure 1). Like reports by teachers, few children had access to technological devices including tablets, computers or laptops, and internet connectivity, particularly children in public schools. The largest disparities in children's access to learning materials at home by school type were for internet connectivity, space for learning at home, access to school textbooks, and access to tablets or e-readers.

Finally, Table 5 presents child reports on how caregivers supported children's remote learning during school closures. Children who attended private schools generally reported higher levels of support, including in organizing study groups, help accessing mobile applications, calling teachers or head teachers, helping with homework, buying learning materials, and telling children to study. Similarly, and unsurprisingly, children in higher-SES household reported higher levels of nearly every support as well.

Household Hardships and Inequalities

We examine experiences of household hardship and its associations with children's educational outcomes. Overall, 30% of children reported that they felt hungry within the past four weeks due to lack of food. Not surprisingly, children were more likely to experience hunger if they resided in a low-SES households (33% versus 22% of their high-SES peers, $p < .001$). Moreover, children attending public schools prior to Covid-19 school shutdowns were also more likely to indicate experiencing hunger than their private school peers (34% versus 26%, respectively, $p < .001$). Importantly, the vast majority of public (but not private) school children reported receiving free school meals as part of the Ghana School Feeding Program before the pandemic. Lastly, more surprisingly, boys were more likely than girls to report hunger (33% versus 27%, respectively, $p = .004$).

Differences in other indicators of household economic hardship were also found by primary caregiver sex (see Table 6). Specifically, female caregivers were more likely to report experiencing disruptions in their daily earnings (68% versus 60%, $p < .001$ for females and males, respectively) and an increase in major food prices (59% versus 51%, $p < .001$ for females and males, respectively) within the last 15 days compared to male respondents. No statistically significant differences were found by caregiver sex related to whether the household experienced a death or illness.

Similar results were found when examining differences by SES (also presented in Table 6). Low-SES households were more likely than high-SES households to experience all three economic shocks: 71% versus 53% for disruptions in daily earnings, $p < .001$, 58% versus 52% for increases in major food prices, $p < .05$, and 15% versus 12% for experiencing a death or illness in the family, $p < .05$. Of the three economic-shocks, 80% of all households experienced at least one, and 7% experienced all three.

Inequalities in Literacy and Math Test Scores

Figures 2 and 3 illustrate the regression-adjusted inequities in children's literacy and math test scores by plotting the standardized gaps between food-insecure and food-secure children, boys and girls, children in public and private schools, and high- and low- SES households. These models control KG class type (KG1, KG2, or mixed KG class), district, children's ages, as well as children's 2015 test scores for each respective outcome and adjust standard errors for the clustering of children within schools.

For math scores, statistically significant differences were found between high-SES children performing 0.28 SD higher than their low-SES peers ($SE = 0.05$, $p < .001$), children in private schools performing 0.25 SD higher than their public-school peers ($SE = 0.06$, $p < .001$),

and food-insecure children scoring 0.21 worse than their food-secure counterparts ($SE = 0.05, p < .001$). No differences were found by child sex. Regarding literacy scores, similar patterns emerged, though the magnitude of group differences was generally larger in comparison to math. Statistically significant group differences were found with high-SES children performing 0.36 SD higher than their low-SES peers ($SE = 0.05, p < .001$), children in private schools performing 0.32 SD higher than their public-school peers ($SE = 0.06, p < .001$), and food-insecure children scoring 0.20 SD worse than their food-secure counterparts ($SE = 0.05, p < .001$). Unlike math, there was variation by child sex with girls scoring 0.10 SD higher than boys ($SE = 0.05, p = .025$).

Finally, we examined the associations between household economic shocks and children's engagement in remote learning, and literacy and math outcomes (Table 7). We model household economic shocks as a cumulative risk index ($M = 1.67, SD = 1.04, range = 0 - 4$), summing the number of shocks that households experienced as the key predictor, while controlling for several key demographic characteristics (children's ages and sex, private vs. public school, district, and baseline academic scores). We find that the cumulative risk index negatively and significantly predicted children's literacy, math, and child-reported engagement in remote learning outcomes ($b = -0.062, SE = 0.023, p = 0.007$; $b = -0.052, SE = 0.023, p = 0.026$; and $b = -.057, SE = 0.025, p = 0.024$, respectively). Interestingly, the cumulative risk index did not significantly predict caregiver-reported engagement in remote learning ($p = 0.745$).

Discussion

This study provides an in-depth snapshot into children's learning opportunities during Covid-19 induced school closures in Ghana. By providing rich descriptive data, as well as inferential statistical models examining inequities in access to remote learning opportunities and

learning outcomes, the results speak to the potential consequences of inequalities as schools re-open in Ghana and around the world and provide insight into how schools may address these inequalities as children return to the classroom. Importantly, our sample is drawn from the Greater Accra Region, the fastest-growing and most developed region in Ghana. Communities were mostly urban or peri urban. Replicating these findings in rural, poorer parts of Ghana would be critical to provide a fuller picture of how children and their families were impacted in the country.

First, we find that school closures may have led to growing learning inequalities in who had access to learning opportunities while schools were closed. This was true for several subgroups of children including children attending private vs. public schools, children living in higher vs. lower-SES households, and children experiencing more severe household economic hardship compared to those experiencing less. Second, we identified several key barriers to distance learning as reported by children, their caregivers, and teachers. These included a lack of access to devices and internet for both teachers and students, as well as a lack of support at home to participate in remote learning activities. Importantly, the most common form of learning engagement was studying alone, and less than half of all children in our sample reportedly engaged in organized learning activities. Third, job loss and food insecurity were widespread and associated with worsening of learning inequalities, after controlling for household characteristic and previous child learning outcomes. This suggests that learning gaps that existed before the pandemic were likely exacerbated during school closures.

What can Governments and Schools Do Moving Forward

Schools re-opened in Ghana in January 2020, after ten months of closure. To reopen schools safely, the Ghana Education Service (GES) implemented structural changes to address

both health and educational needs. For example, each school should be provided with disinfectant and water, sanitation and hygiene (WASH) facilities, as well as washable and reusable facemasks for all staff and students. Further, school buildings were no longer being used for any outside activities¹. School heads were also tasked with splitting large classes into smaller classes to ensure that student seating adheres to social distancing guideline. In addition, adjustments to students' grade transition requirements, curriculum, and assessments were prominent at the kindergarten to the primary school level. Students in kindergarten and primary school were automatically promoted to the next academic level without assessment or examination. To address learning losses specifically, GES has modified the curriculum to promote recovery learning by ensuring that learners can complete truncated courses from the previous school year. End-of-term examinations have been replaced with class exercises and class tests to assess learning. Finally, GES continued to deploy TV, radio, and online classes to augment face-to-face teaching and learning.

Our findings suggest that some additional strategies may help to address learning losses and inequities that likely grew during the pandemic. These lessons are likely relevant for other countries, given widespread documentation of inequalities in access to learning opportunities during school closures within several LMIC countries (UNICEF, 2020).

Targeted Instruction

While schools have now been re-opened for nearly half a year in Ghana, there are several lessons from these findings that suggest schools and governments can pro-actively address these challenges and inequalities as children continue to return to school. First, it will be key to meet

¹ Ghana Education Service. 2021. Guidelines for school re-opening during covid-19 for safe and healthy schools. A resilient education system. Retrieved from <https://ges.gov.gh/wp-content/uploads/2021/01/REOPENING-GUIDELINES-2021.pdf>

students at their learning levels in the classroom. Even before school closures, differing learning levels within the same class groupings posed challenges for teachers and students, and our findings suggest that school closures may have exacerbated this problem given children's varying levels of access to educational support. Targeted instruction—or differentiated learning—includes grouping children according to learning level and teaching to that level. Also known as “teaching at the right level”, targeted instruction is a pedagogical approach developed by the Indian NGO Pratham that trains teachers to assess students' reading and mathematics skills and then regroups students for part of the day according to learning levels rather than ages or grades. Teachers then target teaching to the learning level of each group using tailored learning activities and materials. This technique can be particularly effective in contexts where class sizes are large and many students repeat grades, meaning that students in any one class have an extraordinarily wide range of skill levels and abilities (Banerjee et al., 2016). Rigorous research has shown that targeted instruction improved learning in Ghana, Kenya, India, and elsewhere. Importantly, Ghana's government was piloting an adapted version of targeted instruction before the pandemic (Beg, Fitzpatrick, & Lucas, 2019), suggesting they are well positioned to implement the program on a wider scale across the country. This may be a fruitful policy direction for other countries that face similar situations as in Ghana.

Supporting the Home Learning Environment

The quality of the home learning environment is widely recognized as a key factor supporting young children's early literacy and math skills. Parenting, rather than country environment, is the most important input to early childhood human capital formation (Schoellman, 2016), and this may be even more the case while children were not in school. Engaging parents can be done in scalable ways. For example, York, Loeb and Doss (2019) found

that the READY4K! intervention – a text-messaging program that targeted parents of preschoolers in the United States – increased parental involvement at home and school by 0.15 to 0.29 standard deviations and improved children’s early literacy skills by 0.11 standard deviations. Studies building on a similar model have found that SMS messages can enhance parental engagement in children’s education in both Brazil (Bettinger, Cunha, Lichand, & Madeira, 2020) and Cote d’Ivoire (Lichand & Wolf, 2021). Such programs could be deployed during times of school closures, or when schools re-open to align with governments’ Back to School campaigns.

Ensuring Children have Access to Nutritious Food

While our sample is relatively more advantaged compared with the rest of Ghana, we still found high rates of hunger reported by study children. This is consistent with a recent study documenting widespread food insecurity in poor households in several low- and middle-income countries, including Ghana (Egger et al., 2021). Household food security, defined as stable access to sufficient and nutritious food, is critical to meet children’s developmental and learning needs (Aurino, Fledderjohann, & Vellakkal, 2018; Fram, Bernal, & Frongillo, 2015). Even intermittent food insecurity and malnutrition during early childhood can have detrimental long-term and intergenerational effects on health, education, and income (Behrman et al., 2009), leading to considerable losses for both individuals and societies (Subramanian, Mejía-Guevara, & Krishna, 2016). Similar results were found among primary school-aged children in Ghana (Aurino, Wolf, & Tsinigo, 2020). Research from Ghana and elsewhere shows school meals are scalable and effective and improve nutrition and learning, especially for poorest children and girls (Aurino et al., 2020), suggesting that school feeding programs are key safety nets. It is critical to consider strategies that support children’s food security if schools close again and to

ensure children have access to school meals as they return to school to support their learning. Take-home food rations to distribute at school or cash transfers focused on families with children could help mitigate adverse impacts if schools close again.

Addressing Impacts on Girls

Evidence from other countries indicates that older girls are at greater risk of experiencing learning losses or dropping out of school during times of economic shocks (e.g., Bandiera et al., 2018). A recent synthesis of the evidence suggests that programs that generally aim to increase school enrollment and school quality have larger effects on girls' schooling outcomes (Evans et al., 2019). However, for issues that arose from the pandemic related specifically to girls, more targeted approaches might be needed. During and in the aftermath of the pandemic, it is important to ensure communities and schools make targeted efforts to get girls back into the classroom as schools reopen. This may require both physical infrastructure (e.g., building more community-based schools or providing means of transportation for girls and building more WASH facilities within schools; Ganimian & Murnane, 2016). A recent review of educational programs at scale focused on gender equality found that programs and policies that have boosted access and/or learning for girls across multiple countries include school fee elimination, school meals, making schools more accessible, and improving the quality of pedagogy. Other interventions, such as providing better sanitation facilities or safe spaces for girls, show promising results but either have limited evidence across settings or focus on post-educational outcomes (such as income earning) in their evaluations (Evans, Mendez, & Yuan, 2021).

More research is needed to assess how school closures have impacted girls in rural Ghana. Yet importantly, we did not find gender differences in participation in distance learning, though girls reported spending more time caring for others. Whether we would have identified a

similar pattern of findings in rural regions, where gender disparities are greater, is not clear, and further research is needed to understand gender disparities in rural regions and other parts of the country during school closures and now that schools have re-opened. Interestingly, boys scored lower on math test scores than girls, which is an area that requires further investigation.

Limitations and Conclusions

This study provides an in-depth examination of children's learning experiences during school closures in Ghana. It is one of few studies that documented in such depth and from multiple perspectives—including children, caregivers, and teachers—engagement in remote learning opportunities, inequities in access, and inequities in learning outcomes. But two critical limitations are worth considering when interpreting our results. First, our sample focused on a select group of children in the Greater Accra Region who were enrolled in pre-primary school in the 2015-16 school year and were part of a previous study. Mobility and school dropout are common challenges to the school system in Ghana and many other LMICs, with disadvantaged children experiencing both at higher rates (Kamanda & Sankoh, 2015). This sample is not representative of all of Ghana, and likely represents a more advantaged sub-sample within the broader study given that children were able to be tracked and surveyed. Second, our learning assessments were brief and administered to children over the phone and do not represent the whole of children's literacy and math skills. They provide a very cursory estimate of children's skills. Phone-based learning assessments are new and best practices are still being developed (Angrist et al., 2020). In our sample, 14% of children reported that someone in the household helped them during the phone-based assessment; assessors reported hearing more than 25% receiving help during the assessment. Thus, interpreting the findings related to learning outcomes should consider these key challenges.

Recent efforts to harmonize global data on learning and human capital development show that countries in sub-Saharan Africa have the lowest learning levels globally (Angrist et al., 2021). The Covid-19 pandemic led to school closures all over the world, leaving children across diverse contexts without formal education for many months. Against an already low learning base and existing inequalities in children's access to quality education, the 2020 school closures pose a significant challenge to governments and school as children return to school. Additional research—including retrospective research—is needed to document children's experiences during school closures and the return to school in order to ensure children's learning needs are met.

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Table 1.*Child, Caregiver, and Teacher Sample Characteristics*

	<i>M</i> or %	<i>SD</i>
Children (<i>N</i> = 1,844)		
Male	49.4%	--
Age (in years)	10.06	1.25
Academic skills		
Literacy (baseline)	0.48	0.22
Numeracy (baseline)	0.46	0.19
Literacy (wave 5)	0.53	0.23
Math (wave 5)	0.64	0.20
Engagement in remote learning (child-report)	1.91	1.12
Engagement in remote learning (caregiver-report)	2.20	1.08
Caregivers (<i>N</i> = 2,048)		
Male	38.0%	--
Age (years)	42.22	8.76
Highest education level		
Less than primary school	17.6%	--
Primary school	10.1%	--
Middle school	40.5%	--
Senior high school (SHS)	12.8%	--
More than SHS/SSS, but not Bachelor's	13.9%	--
Bachelor's degree or more	5.2%	--
Married	77.1%	--
Relationship to child		
Biological mother	52.6%	--
Biological father	35.0%	--
Other	12.5%	--
Household economic shocks		
Disruption of daily wage/earnings	65.1%	--
Increase in prices of major food items	56.0%	--
Illness or death of household member	14.2%	--
Teachers (<i>N</i> = 514)		
Age (in years)	32.72	9.81
Highest education level		
Middle or senior high school	30.6%	--
More than SHS/SSS, but not Bachelor's	25.3%	--
Bachelor's degree or more	43.9%	--
Years' experience teaching	9.51	7.89
Works in public school	56.2%	--

Table 2.

One-way Analyses of Variance of Teacher, Child, and Caregiver Reports of Engagement in Remote Learning by School Type

Measure	Private School	Public School	<i>F</i> - statistic	<i>p</i> -value
	%	%		
<i>Teacher-reported School Engagement in Remote Learning (n=274)</i>				
Online classes (live and/or prerecorded)	42.3%	5.5%	59.10	0.000
Provide hardcopy materials	32.2%	78.0%	72.29	0.000
Provide materials via WhatsApp, email, or text	61.7%	15.7%	76.37	0.000
Encouraged TV and radio learning	26.2%	78.0%	99.50	0.000
Community-based group learning	2.0%	5.5%	2.41	0.122
<i>Child-report Engagement in Remote Learning (n=1,709)</i>				
Online courses	9.0%	2.9%	27.01	0.000
Private tutor	32.6%	20.4%	32.58	0.000
School assignments (exercises given by teacher)	38.2%	25.7%	30.62	0.000
Educational TV or radio	47.8%	46.2%	0.48	0.489
Independent study	79.0%	76.5%	1.60	0.206
No participation in remote learning	2.4%	5.8%	13.07	0.000
<i>Caregiver-report Engagement in Remote Learning (n = 1,554)</i>				
Online courses	9.9%	2.9%	29.64	0.000
Private tutor	38.1%	27.4%	19.72	0.000
School assignments (exercises given by teacher)	50.0%	36.2%	29.96	0.000
Educational TV or radio	54.7%	54.9%	0.00	0.945
Independent study	81.7%	78.0%	3.32	0.069
No participation in remote learning	0.2%	0.8%	2.44	0.119

Table 3.*Gender Differences in Children's Time Use*

	Hours per Week		
	Boys	Girls	<i>p</i> -value
Housework	10.56	12.25	0.004
Labor	5.24	5.50	0.620
Studying	8.90	9.48	0.136
Leisure	8.63	7.03	0.000

Note. $N = 1,842$. These data are child reported. The 'labor' category is comprised of two items (working for pay and working for the family farm or business). Likewise, the 'housework' category is made up of two items (household chores and caring for others).

Table 4.*Teacher -Reported Challenges with Remote Learning*

	Percent Endorsement
Assessing students	43.2%
Overwhelmed and unsupported	48.6%
Technology difficulty	49.4%
Difficulty adapting lesson	51.4%
Poor school support	54.3%
Lack of caregiver support	58.9%
Low student engagement	59.3%
Lack of materials	59.7%
Teacher lacked devices	62.6%
Teacher lacked internet	65.4%
Cost of airtime	70.8%
Student lacked internet	84.4%
Student lacked devices	86.4%

Note. $N = 243$. Only teachers who indicated that their schools provided distance learning were asked this question.

Table 5.*One-way Analyses of Variance of Child Reports of Caregiver Support with Remote Learning by School Type and SES*

Measure	Private School	Public School			Low-SES	High-SES		
	<i>M</i>	<i>M</i>	<i>F</i> - statistic	<i>p</i> -value	<i>M</i>	<i>M</i>	<i>F</i> - statistic	<i>p</i> -value
Organize group study	0.14	0.06	25.55	0.000	0.08	0.15	16.15	0.000
Help with accessing mobile app	0.17	0.10	13.4	0.000	0.12	0.19	17.56	0.000
Call teacher or head teacher	0.34	0.22	22.43	0.000	0.26	0.34	9.93	0.002
Pay for tutor	0.50	0.36	28.06	0.000	0.43	0.45	0.60	0.438
Help with schoolwork	0.64	0.58	5.66	0.018	0.60	0.64	2.77	0.096
Provide a space to study	0.66	0.59	6.70	0.010	0.61	0.67	4.72	0.030
Teach with school material	0.62	0.61	0.09	0.765	0.60	0.65	4.47	0.035
Buy learning materials	0.69	0.63	5.03	0.025	0.65	0.72	8.82	0.003
Tell child to review books	0.76	0.66	15.57	0.000	0.70	0.73	1.54	0.215
Reduce household chores	0.67	0.64	1.20	0.273	0.64	0.68	1.48	0.224
Allow time for TV classes	0.65	0.61	2.25	0.134	0.61	0.69	8.60	0.003
Allow time for radio classes	0.14	0.21	12.99	0.000	0.17	0.15	1.00	0.318
Provide internet access	0.26	0.16	22.96	0.000	0.19	0.28	17.09	0.000

Note. Only asked if children reported receiving support from caregiver (N=1,566), 54% of which attend private school

Table 6.*Covid-19 Economic Shocks by Caregiver Sex and SES*

	Female	Male	<i>p</i> -value	Low-SES	High-SES	<i>p</i> -value
Disruption of daily wage/earnings	68.01%	60.36%	0.000	70.61%	53.19%	0.000
Increase in prices of major food items consumed	59.16%	50.72%	0.000	57.78%	51.79%	0.012
Illness, injury, or death of household members	15.01%	12.77%	0.160	15.37%	11.73%	0.0285

Note. $N = 2,024$.

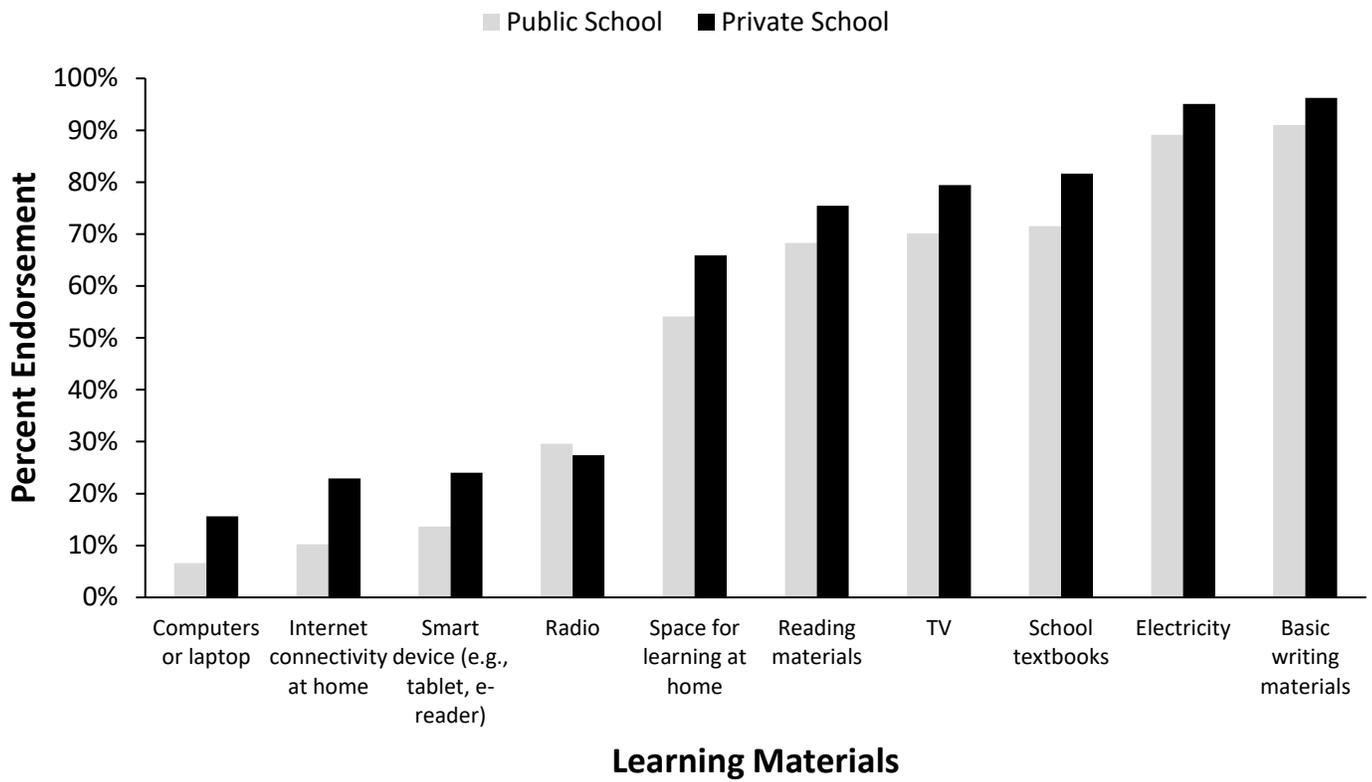
Table 7.

OLS Regression Models of Cumulative Risk Index Predicting Child Learning and Engagement in Remote Schooling

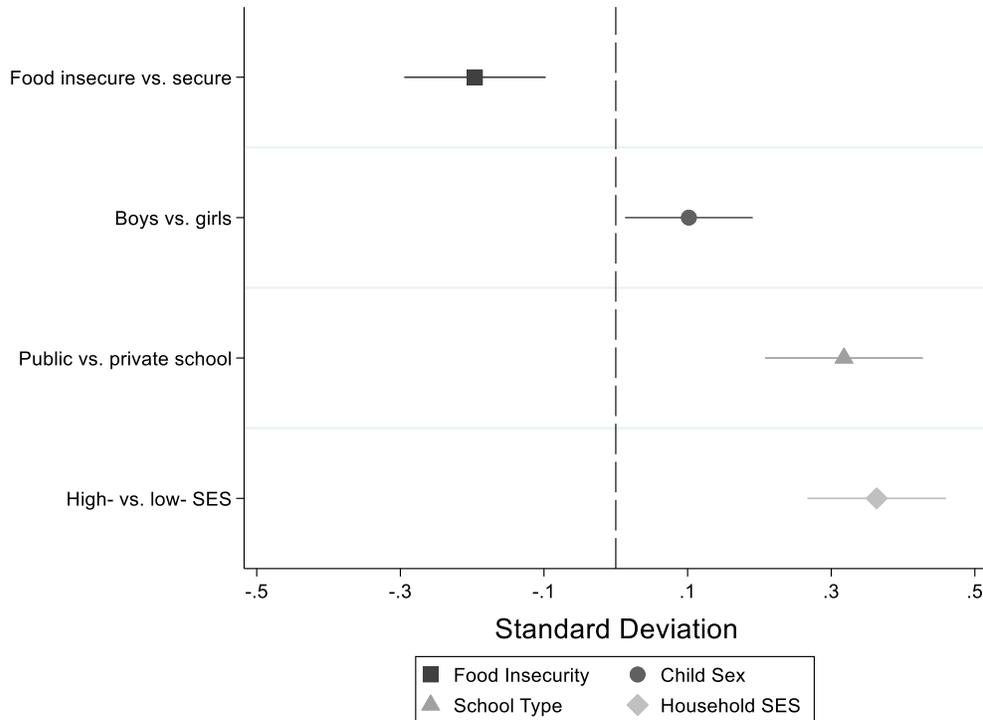
	Literacy assessment	Math assessment	Engagement in remote-learning (child-report)	Engagement in remote-learning (caregiver-report)
Cumulative risk index (0-4)	-0.062** (0.023)	-0.052* (0.023)	-0.057* (0.025)	0.008 (0.024)
Baseline academic outcome	0.307*** (0.030)	0.292*** (0.030)	-- --	-- --
Private school	0.340*** (0.060)	0.258*** (0.058)	0.293*** (0.062)	0.275*** (0.064)
Child female	0.114* (0.048)	0.022 (0.049)	0.137** (0.050)	0.183*** (0.052)
Child age	-0.092*** (0.024)	-0.085*** (0.023)	-0.044+ (0.023)	-0.108*** (0.027)
Constant	0.613* (0.262)	0.634* (0.256)	2.064*** (0.251)	2.820*** (0.290)
Observations	1,476	1,476	1,634	1,513
R-squared	0.160	0.119	0.038	0.050

Notes. Additional control variables include grade level at baseline and district fixed effects (coefficients not shown). Robust standard errors in parentheses

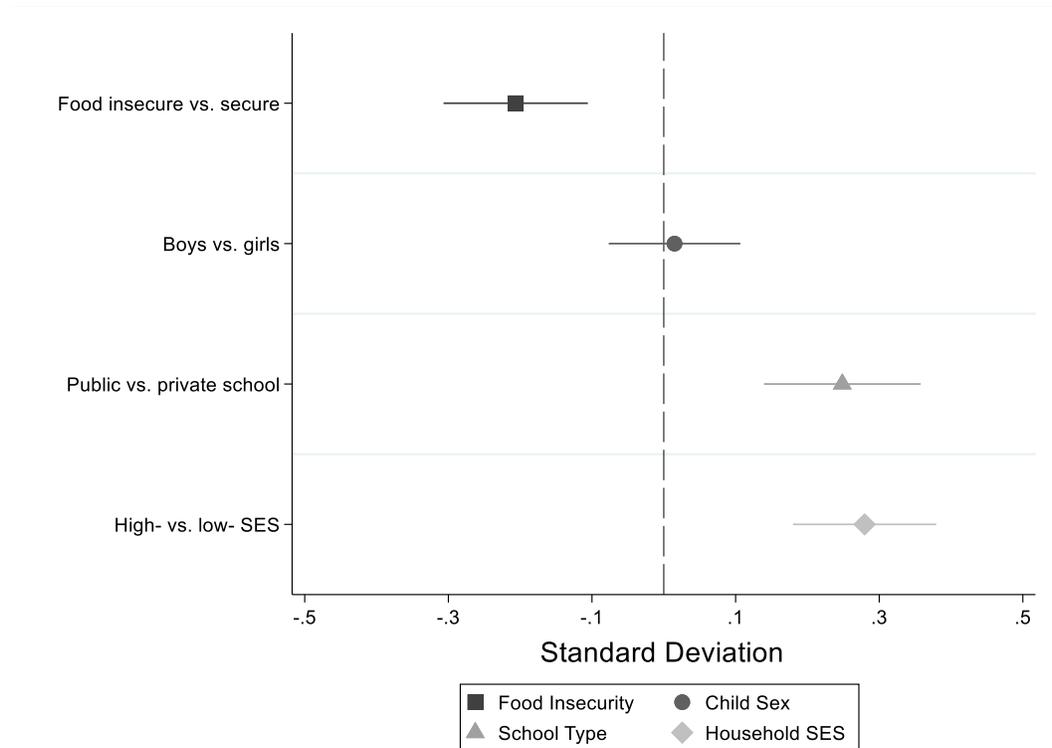
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Figure 1.*Children's Access to Learning Materials at Home*

Notes. $N = 1,709$. Data reported by the child. All differences are statistically significant at $p < .001$, except for access to radio ($p = 0.314$).

Figure 2.*Standardized Learning Inequalities in Literacy Test Scores*

Note. $N = 1,628$. Standardized coefficient plots estimated from in separate regression models that control for children's 2015 academic scores, grade level at baseline, district fixed effects, and child age, with clustered standard errors at the school-level. Food insecure vs. secure ($\beta = -0.20$, $SE = 0.05$, $p < .001$); boys vs. girls ($\beta = 0.10$, $SE = 0.05$, $p < .05$); public vs. private school ($\beta = 0.32$, $SE = 0.06$, $p < .001$); and high vs. low-SES ($\beta = 0.36$, $SE = 0.05$, $p < .001$).

Figure 3.*Standardized Learning Inequalities in Math Test Scores*

Note. $N = 1,628$. Standardized coefficient plots estimated from in separate regression models that control for children's 2015 academic scores, grade level at baseline, district fixed effects, and child age, with clustered standard errors at the school-level. Food insecure vs. secure ($\beta = -0.21$, $SE = 0.05$, $p < .001$); boys vs. girls ($\beta = 0.01$, $SE = 0.05$, $p = 0.749$); public vs. private school ($\beta = 0.25$, $SE = 0.06$, $p < .001$); and high vs. low-SES ($\beta = 0.28$, $SE = 0.05$, $p < .001$).