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Households' ICT Access and Educational Vulnerability of Children in Ghana[1]

Forthcoming: Cogent Social Sciences

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Households' ICT Access and Educational Vulnerability of Children in Ghana

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Abstract

Education is said to be a basic human right, and central to unlocking human capabilities. However, Sub-Sahara Africa (SSA) has the highest number of children out of school and learning disadvantages. Most studies on child vulnerability concentrate on disaster, disability and HIV effects on children. Thus, this study investigates the likelihood of a child being educationally disadvantaged or risk school dropout. Ghana Demographic and Health Survey (GDHS) data for 2014 with binary and multinomial logistic regressions are used to determine the likelihood of a child being educationally disadvantaged. The findings reveal disparity in wealth distribution in Ghana. Wealth of family is a determinant of child success in education and urban household children are less likely to be disadvantaged in learning outcomes. Households' access to ICTs enhances child learning at home and; hence, reduces the risk of a child being educationally disadvantaged. Policy implications and suggestions for further studies are discussed in the paper.

Keywords: Child educational disadvantage; Ghana; Households; ICTs; Wealth disparity.
JEL codes: D1, I21

1. Introduction

This study was motivated by the World Development Report 2018 of the World Bank, which identified Sub-Saharan Africa (SSA) to be the sub-region where most child learning outcomes are very low. This current study examines how household access to ICTs and wealth disparity affects the likelihood of a child being educationally disadvantaged or vulnerable in Ghanaian households. The study examines vulnerability or educational disadvantage of a child as related to household members' efforts in complementing the effort of educational authorities in achieving better education for children in Ghana. Thus, how children will be educational disadvantaged due to certain risk factors from home are examined (Amoo *et al,* 2018). Wealth disparity and access to ICTs could also affect the likelihood of a child getting full educational attainment. Two major reasons motivated this study; most child vulnerability studies are reports (Jopling and Vincent 2016; Fleming 2015; Watson and Chesters,2012), case studies (Serey *et al.,* 2011; Ruma and Dipak, 2014) and mostly on other vulnerability cases such asHuman Immunodeficiency Virus(HIV) (Fleming 2015; Serey *et al.,* 2011; Jukes *et al.*, 2008); also, this study is one of other few studies that attempt to use model (regression) to estimate the likelihood of a child being educationally vulnerable (dropout).

According to the United Nations (UN) Millennium Development Goals (MDGs) evaluation report 2013 "SSA has the highest rate of children leaving school early in the world with slightly more than two out of five children who started primary school in 2010 who will not make it into the last grade" (UN, 2013:16). In recent assessments in Ghana and Malawi, more than four-fifths of students at the end of Grade 2 were unable to read a single familiar word such as '*the'* or '*cat'* (World Bank, 2018).

Economic and reduced parental care and protection may lead to a child losing out of the education system as most children from certain households (mostly SSA) are burdened with domestic and economic responsibilities, which in turn affect their participation in education in relation to attending and succeeding in school (Fleming, 2015). Poverty most consistently predicts failing to complete schooling, but other characteristics such as gender, disability, caste, and ethnicity also frequently contribute to school participation shortfalls. When poor parents

perceive education to be of low importance, they are less willing to sacrifice to keep their children in school—a rational response, given the constraints they face (World Bank, 2018).

Children from the poorest families are less likely to start school. Those who do start school are more likely to drop out early, though at varying rates across countries. In nearly every country, parents' wealth and education attainment are the main determinants of their children's education. On average, in developing countries there, is a 32-percentage point gap between the chances of children in the poorest and richest quintiles completing primary school (World Bank, 2018). Millions of poor parents make difficult choices about whether to educate their children. This cost-benefit assessment—where costs include both the direct cost of school and the opportunity cost of a child's time outside it—determines their children's enrolment, grade completion, and learning outcomes. Learning deficits are largest for poor people (households). In nearly all countries, students' family backgrounds—including parental education, socioeconomic status, and conditions at home (such as access to books)—remain the largest predictors of learning outcomes (Egwakhe and Osabuohien, 2009; Okafor, Imhonopi and Urim, 2011;George *et al.*, 2013; World Bank, 2018).

Ghana remains one of the countries in SSA with a greater number of children with learning risks (see Figure A1 in the Appendix). Over 80% of Grade 2 students could not read a single familiar word such as '*the'* or '*cat'*. In a similar mode, about 70% could not do simple subtraction of two-digit numbers. Ghana initiated a Free Compulsory Universal Basic Education (FCUBE) policy in 1995 that stipulates that all children of school-going age are expected to be in school. This policy could be complemented by the efforts and wellbeing of parents and guidance at home giving the needed attention to the learning needs of the child at home. The home could be an environment where the child can learn a lot after school contact hours. Poor development at home, deprivation, lack of parental care for the education of child among others could mean many children arriving at school unprepared to benefit fully from school lessons, so even in a good school, deprived children could learn less. Slow start to learning means that even students who make it to the end of primary school do not master basic competencies (George *et al.*, 2013).

World Development Report 2018 of the World Bank, identifies as one of the factors to increase child learning outcome, is to increase the frequency and quality of stimulation and opportunities for learning at home (starting from birth) to improve language and motor development, as well as to cultivate early cognitive and socio-emotional skills. Lack of support in education by parents or guardians will have a direct influence on how children, particularly, orphans and vulnerable children (OVC) perform in education (Mwoma and Pillay, 2015).

Studies looking at educational attainment and orphan-hood in southern and eastern Africa found that 'household wealth, gender, and region of residence are all more important predictors of school outcomes than orphan status' (Smiley *et al.,* 2013: 2). Socioeconomic status or poverty may be more strongly linked to educational attainment of children than to orphan status of children. Households' access to ICTs (computer/tablet, internet, mobile phones, TVs, and radio set) could enhance the efforts of the family in increasing the learning outcomes of children at home. The paper acknowledged that the learning gap between rich and poor students is simply a matter of household characteristics though learning gaps between children from 'good' and 'bad' schools also matter. Therefore, this study advances the course of knowledge in this area of research by providing an understanding on: the probability dropping out of school due to learning disadvantages; how households' access to ICTs increases the educational attainment of children, how the parents' efforts in complementing the schools to increase the likelihood of a child not dropping out of school.

2. Theoretical framework and empirical literature review

2.1 Theoretical framework

This paper followed the theoretical arguments underpinning Bronfenbrenner's bio-ecological systems theory which posits that human development reflects the influence of several environmental systems. Bronfenbrenner encapsulated the child's environment as having different interconnected layers nested together with agents (parents, guardians, teachers, and peers) that influence the child's development with varying degrees of directness (McGuckin and Minton, 2014). In addition, parents, guardians, caregivers and family members have a direct influence on the child socialisation within the microsystem since that is the first contact that the child gets from people (McGuckin and Minton, 2014). At this level, the child interacts with his/her family

face to face all the time. The school, teachers, peers, and neighbours form the meso-system whose interaction with the child socialises him/her to influence his/her developmental outcome. Mesosystem in this study is about the connections and interrelationships between the home and school. Parents or guardians support (financial, learning encouragement, allow the child to study) at home for children will have a direct relationship on how the child performs in school and at home.

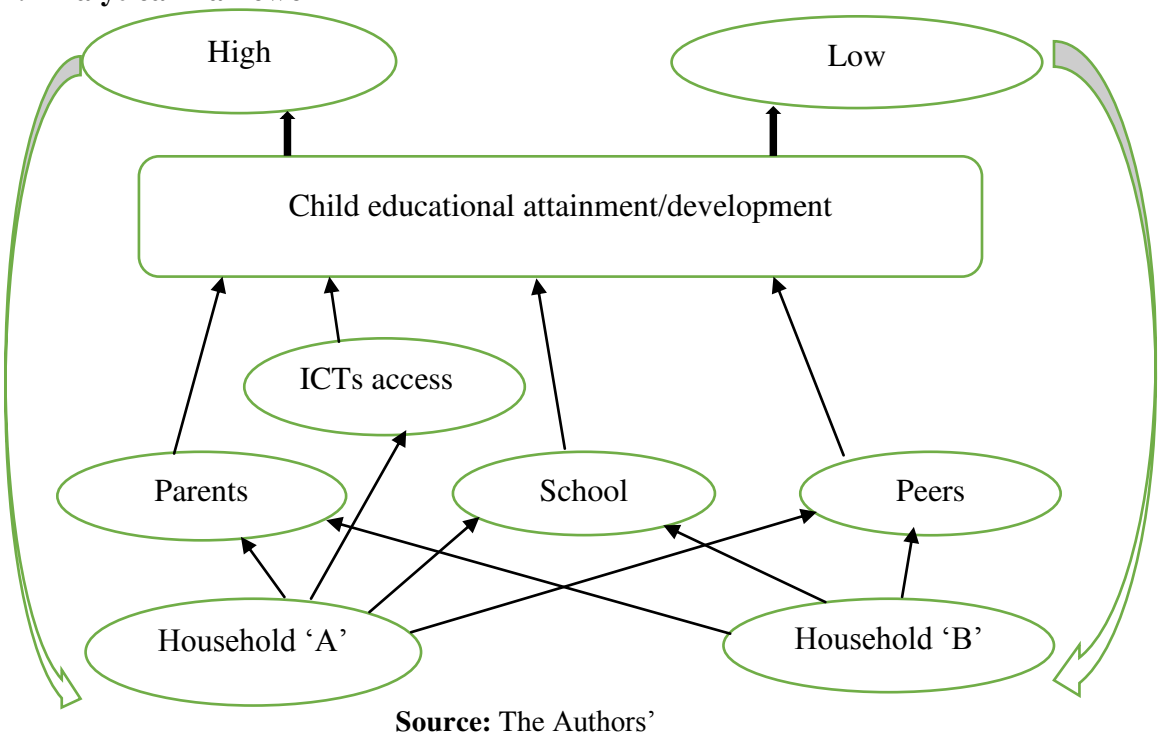
Bronfenbrenner (1979) maintained that the family influences all aspects of a child's development including language, nutrition, security, health, and beliefs. Thus, a child who attends school and performs is a product of his/her family. The relationships children develop in school (with peers, teachers etc.) become critical to their positive development. It is at the school that children develop relationships with adults outside their family for the first time. These connections help children develop cognitively and emotionally (Addison, 1992). Some children may not have such an advantage due to the challenges they go through both at home (engaged in economic activity after school hours, performing household chores, nobody to provide educational materials to the child, nobody to guide child to study at home) and in school that are likely to impact negatively in their learning outcome.

Bronfenbrenner (1979) identified the home as the microsystem where children are socialised to learn how to interact with other social agents in society. Supervision of children by parents/guardians ensures that children become responsible and are not rendered vulnerable to the law by becoming violent to other children (Sund, 2006). Parents supervision at home could include ensuring that children are encouraged to do home/schoolwork, observe personal hygiene, parents/guardians working hand in hand with teachers to ensure that children attend school regularly (Mwoma and Pillay, 2016), give more time to children to learn at home, provide learning materials at home, telling high expectations to child and read to child regularly as these are some of the factors influencing the learning outcomes of children.

The conceptual framework for this study is based on the fact that a household that gives much time to children to learn at home, encourage child to learn, buy books for the child, tell high expectations to child and read to child regularly will help to boost the learning outcome of such

child. Hence, the likelihood of such a child dropping out of school due to poor academic performance will be slim. A child that does not get such things and is also burden by household chores, engaging in economic activities etc. is prone to affect his/her learning outcome and hence regarded as risk factors. The present study also maintained that households that have access to ICTs could help the child learn more than households without access to ICTs. This is depicted in Figure 1.

Figure 1: Analytical framework



Source: The Authors'

In Figure 1, household 'A' is a household that has access to ICTs while household 'B' has no access to ICTs. For the educational attainment of children, this study concord that the effort or interaction of the child with parents, school (teachers) and peers as well as the child access to ICTs plays a major role. A child from household 'A' where the parents encourage the child to read, buy books for the child, tell high expectation to the child and child having access to ICTs to learn has more likelihood of attaining a high education than a child from household 'B' where the child does not receive such attention and has no access to ICTs to learn.

Even in two different households ('A' and 'B') where the children receive same parental care, the same school care and same peer influence, such that, the only difference is one household,

say household 'A' has access to ICTs for children to learn and the other household, say household 'B' has no access. A child from household 'A' has a greater probability to attain higher educational achievement than a child from household 'B'. This study contributes to theory by arguing that the educational attainment of children is more influenced and enhanced by ICTs at home to aid learning.

2.2 Empirical literature review

There are quite a few empirical studies on child vulnerability studies. Much of such studies are in a form of reports, case studies, and on HIV or disability of children. Some studies (Ruma and Dipak 2014; Mwoma and Pillay 2016) used socioeconomic variables to see how it affects the educational attainment of orphans and vulnerable children in society. Ruma and Dipak (2014) sought to understand the educational needs, occupational dynamics, living standards and risk factors of Dewan Tea Garden workers to assess the trend of the educational vulnerability of workers. With a random sampled of 50 households and the use of disaster pressure or crunch model and descriptive statistics (tables, diagrams) they found that poor educational status of workers plays a role between vulnerability and threats and enhancing risk factors of their children. Poverty was found as a prime reason for school dropout. Poor economic conditions are reasons for educational vulnerability.

Serey *et al.,*(2011) studied the impact and gender perspective of positive parents on children education. They explore the special needs of orphans and vulnerable children by focusing more on the educational and economic development and challenges in achieving a 9-year basic education. Using stratified random sampling with a qualitative and quantitative approach they, found that on the educational status of OVC, show that 16% of girls and 11% of boys currently are dropouts. Such dropouts migrate to find jobs elsewhere. That 20% of OVC are engaged in employment which affects their time to learn after school hours.

Mwona and Pillay (2016) sought to study the challenges and interventions of educational support for orphans and vulnerable children in primary schools. They used mixed methods involving descriptive and qualitative designs after interviewing 107 participant primary students and 42 teachers. They found that, with the government implementation of no fee, many OVC have

access to basic education as 88% indicated that government paid their fees and 98.5% revealed that the school provided books and stationery for them. That 71.4% of the teachers encourage learners who were not performing well to work hard. Reading and writing, submitting school work late and not doing their school/homework were the challenges OVC faced. That lack of sufficient time for individual attention both at school and at home affects how teachers care for OVC and the performance of OVC.

Watson and Chesters (2012) studied the Parents as Teachers (PaT) program as to whether it adheres to recognised good practice principles for the delivery of parent education to the families of vulnerable young children. The program provides an extensive curriculum delivered by trained professionals to parents at home on a regular basis during the first three years of a child's life. Using data drawn from a range of sources, including policy documents, previous research and evaluations, exit surveys of clients, observations of home visits and interviews with program staff and clients they found that programs targeted at vulnerable children well before they start school have been shown to produce long-term benefits in the areas of: cognitive/emotional development (such as IQ and behaviour); education (reading and math attainment and high school retention); economic well-being (employment and income); and health. Also, that early interventions focused on educating parents when children are very young should have a positive impact on the developmental outcome of vulnerable children over the long term.

Some other studies conclusions are that there is a link, and positive, between home learning environments and long-term developmental/educational outcomes for children. Anders *et al.* (2011) studied the UK and showed that home learning environment was one of the strongest factors influencing high children attainment in reading at age ten, once child, community, and family factors were controlled. Also, a study by Siraj-Blatchford (2008) summarised that the quality of home learning had a positive and stronger effect on intellectual and social development than parents' nature of work, educational level or income.

The positive influence of the home learning on literacy skills is related to a higher level of parental engagement in home learning activities such as teaching children nursery rhymes, reading to young children, playing with letters and numbers, drawing and painting (Sammons *et*

al. 2004) and encouraging children to learn, buying books for children, help child do school/homework, tell high expectations to child. Senechal and LeFevre (2002) concluded that shared book reading supported children's receptive language development, therefore, parent involvement in early literacy skills underpin children's acquisition of the mechanics of reading. Also, Rodriguez and Tamis-La Monda (2011) concluded that there was a strong relationship between learning environments and the pre-kindergarten vocabulary and emergent literacy skills of young children in their study.

Some other studies looked at penetration of ICTs at home and at school and its effect on learning and academic achievement. Eynon and Malmberg (2011) noted that children who do not have access to internet at home (the author refer to them as peripherals) tend to use internet less often at school. Jackson *et al.*, (2010) also indicated that there is positive association between some aspects of ICT usage and school performance. Other scholars (e.g. Anil and Ozer, 2012) concluded that computer and internet availability at home and at school increased the achievement points on the science tests. Again, after controlling for students' characteristics and family background in an analysis, Spiezia (2011) asserted that ICT use has positive impact on science scores. However, the trend noted is that there is distinction between the effect of ICT use at home or at school. The effect is noted to be larger when ICTs were use at home rather than at school (Vincze, 2016; Delen and Bulut, 2011). Gleaning from the literature, ICT access at home helps to boost children learning outcomes and; thus, reduces the chance of student dropping out of school due to low learning outcomes.

Yet again, in the literature, some scholars investigated the factors that determine household access to ICTs (Karakara and Osabuohien, 2019; Venkatesh and Brouwn, 2001). One of the earliest studies on households' adoption and use of ICTs is that of Venkatesh and Brown (2001) which studied the factors driving personal computer (PC) adoption in American homes. The authors specifically looked at the purchase intention and the use of computers and concluded that attitudinal beliefs, economic status, social outcomes, influence of family and friends, applications for personal use and social influences were determinants of computer purchase behaviour of households. On the other hand, they (Venkatesh and Brouwn, 2001) indicated that lack of knowledge, high cost and information from secondary sources (like TV and radio) makes

parents fear the safety of their children from objectionable content and even people. Also, Bagchi and Udo (2007) indicated that economic development, education, and infrastructures strongly determine ICT adoption by individuals in a country. Again, the cultural settings of a society are deemed to be linked to ICT adoption (Zhao, Kim, Suh, and Du, 2008). It is acknowledged that people with high incomes, good education and high skills are much more likely to have access to ICTs, be capable of using ICTs, benefit from ICTs usage, and to be in political participation by ICTs than people who are not endowed with much of economic, political, cultural capital, geographical location, and gender (Kamal and Qureshi, 2009). Some researchers (e.g. Barrantes *et al.,* 2007; Schmidt and Stork, 2008; Gilwald *et al.,*2010; Al-Hassan *et al.,* 2013) have used probability models to study how socio-economic characteristics have helped in determining individuals' and households' adoption of ICTs and makes conclusions that socio-economic characteristics influences which ICT is adopted.

These studies did not, however, examine how households' access to ICTs could complement the parent effort in delivering parental care and educational development of the child at home. This present study differs by including household access to different ICTs and how it foster child learning at home. Also, other studies that did examine household ICT access and educational performance had conflicting conclusions (Vincze, 2016; Mominó and Meneses, 2007; Fuchs and Woessmann, 2004).

3. A brief overview of educational policies in Ghana

The most notable educational reform was the accelerated Development Plan and the Education Act 1961 (Act 87). The aim was to rapidly expand the educational system and recognise the importance of teacher training colleges/schools to have good trained teachers to educate in schools. This reform also introduced cultural identity, values and practices. The New Structure and Content of Education (NSCE) in 1974 led to introduction of the Junior High School (JHS) and the Senior High School (SHS) system. The Ghana Education Service (formerly Ghana Teaching Service) was set up to implement various policies or reforms (Kadingdi, 2004). Some of the reforms included the Free Compulsory Universal Basic Education (FCUBE) which aimed to improve access to basic education and improve quality of learning and teaching. Also, the Vision 2020 had educational policy objective to ensure all citizens regardless of gender or social

status, are functionally literate and productive at the minimum. Earlier, the 1961 Act (Act 87) mandates that every child who has attained the school-going age (6 years) shall attend a course of instruction and no fee, other than paying for the provision of essential books or stationery, shall be charged in respect of tuition at a public primary, middle or special school (Adu-Gyamfi *et al.*, 2016).

The number of years in primary school has been consistent over the years. That is to say, since the inception of formal education in Ghana around 16thcentury, various reforms has not affected the number of years in primary schooling (Adu-Gyamfi *etal.*, 2016).The current structure of education system in Ghana comprise of six (6) years of primary education made up of three (3) years lower and three (3) years upper primary, three (3) years Junior High School, three (3) years Senior High School and four (4) years University Education (Inkoom, 2012). Formal education starts with kindergarten which helps children to receive basic foundation level which prepares them for transition from home to primary school. Primary education is in two parts; lower primary of 3 years and upper primary of 3 years, which together helps in the growth and development of the child. At the primary level, children are expected to acquire knowledge, develop attitudes and skills to enable them solve problems and satisfy their curiosity (Jophus Anamuah Mensah Committee Report, 2007), help children develop sound moral attitudes and appreciates one's cultural heritage and identity, instil good citizenship in children, understanding on how to leave a healthy life (Adu-Gyamfi *et al.*, 2016; Inkoom, 2012).

4. Data and Methodological Approach

4.1 Data

This study uses data from the Demographic and Health Survey dataset for Ghana (GDHS VI) for 2014.The data followed a two-stage sample design, the first stage involved selecting sample points (clusters) consisting of enumeration areas (EAs). The second stage involved systematic sampling of households. The household listing operation was undertaken in all of the selected Enumeration Area's (EAs) and households to be included in the survey were randomly selected from these lists. Selected households were successfully interviewed. A total of 12,831 households were selected for the sample, of which 12,010 were contacted for the interview and 11,835 were successfully interviewed, yielding a response rate of 99 percent. Out of the total

households of 11,835, some households gave no response to our variables of interest while other households responded that they do not know. For instance, the question whether a household buys books for a child or not and the response was that the household did not know. These households were excluded from our sample and hence our sampled reduced to 5,003 households which gave accurate and full responses to the questions of interest.

The data capture whether a household owns radio, television, mobile phone, computer/tablet, access to the internet as ICTs use by the households. The ICT variables used (radio, television, mobile phone, computer/tablet, access to internet) were coded as dummies of a household having access as equal zero and with no access equal one. For example, if a household has a radio it is coded zero and if it has no access it is given one. Other variables which were coded zero-one are; sex of household head (0=female 1=male), residence of household (0=rural, 1=urban), marital status of household head (0=not currently married, 1=currently married), wealth status (0=poorest, 1=poorer, 2=middle, 3=richer, 4=richest) and has electricity (0=No, 1=Yes). Variables that are continuous were; the age of household head, size of household and number of children in the household. These were not coded since they were continuous. The independent variables were also binary and coded as such (0=No, 1=Yes). Those independent variables are; whether any member of the household encourages the child to read or not; whether any member of the household help child to do homework or not; whether any member of the household reads to the child regularly or not; whether any member of the household tells high expectations to child or not and whether any member of the household helps child to buy books or not. The last independent variable, how often the child brings learning materials home for study, was coded (0=always, 1=often, 2=sometimes, 3=never).

4.2 Methodological Approach

4.2.1 Binary logistic

In a binary outcome, Let P_i represent the probability of a child being educationally disadvantaged, say the likelihood of a child getting someone in the household to encourage him/her to read, and the probability of not getting anybody to encourage him/her to read is given as 1- P_i. This study does not actually observe $P_{i,}$ as Y is a latent variable, but rather it observes

the outcome Y=1 if the child has someone to encourage him/her to read and Y=0 if he/she does not. This is functionally represented as:

$$P_r(Y_i = 1) = P_i \qquad (1)$$

$$P_r(Y_i = 0) = 1 - P_i \qquad (2)$$

It is possible, however, to reformulate these equations in terms of the odds ratio of the probability of a child having someone to encourage him/her to read and the probability of not as follows:

$$\left[\frac{Pi}{1 - Pi}\right] = \frac{1 + e^{(\beta_0 + \beta' Xi)}}{1 + e^{-(\beta_0 + \beta' Xi)}} \qquad (3)$$

$\left[\frac{Pi}{1-Pi}\right]$ is simply the odds ratio in favour of the getting someone to encourage him/her to read, which is simplified as;

$$\left[\frac{Pi}{1 - Pi}\right] = e^{(\beta_0 + \beta' Xi)} \qquad (4)$$

To get the logit model, the natural logarithms of the equation 4is taken and observe that the log of the odds ratio, L, is not only linear in X, but also in the parameters; *L* is called the logit**,** and hence the name logit model for equations like (5).

$$Ln\left[\frac{Pi}{1 - Pi}\right] = Li = \beta_0 + \beta' Xi \qquad (5)$$

Five binary logistic equations were estimated based on the five different kinds of household efforts to achieve greater child learning outcome:

Equation1 is whether any member of the household encourages the child to read or not;

Equation 2 is whether any member of the household help the child to do homework or not;

Equation 3 is whether any member of the household reads to the child regularly or not;

Equation 4 is whether any member of the household tells high expectations to the child or not; and

Equation 5 is whether any member of the household helps the child to buy books or not.

4.2.2 Multinomial logistic

The study also estimated a multinomial logistic of how often the child brings learning materials home for study and this is our equation six. Let P_i represent the probability of a child always bringing learning materials home, such that the probability of not always bringing learning materials home is given as 1- P_i, then we have the following model specification:

$$P_r(Y_i = j|x) = \frac{exp^{[X'_{ij}\beta]}}{1 + exp^{[X'_{ij}\beta]} + \cdots + exp^{[X'_{ij}\beta]}} j = 1, 2, \ldots J \qquad (6)$$

Equation 6 is how often the child brings learning materials home for study. Thus, the empirical model becomes:

$$P_r \ \ Ob(Y_i = j) = \frac{e^{\beta_j X_i}}{\sum_{j=0}^{6} e^{\beta_j X_i}} \ \ j = 1, 2, 3, 4 \qquad (7)$$

Where, j=1, 2, 3,4 represent bringing learning materials home:1=always, 2=often, 3=sometimes, 4=never.

5. Results and discussion

5.1 Descriptive statistics and distribution of variables

The descriptive statistics and distribution of variables are shown in Table 1. The variables education measures the educational level of household head; it shows that 32.4% of the total household heads (5,003) have no formal education while the remaining 67.6% of the household heads have at least primary education. The majority (44.65%) of the household heads have secondary education. The male-headed households comprise of 66.96% as against 33.04% of the female-headed households. Rural household dwellers account for 55.39% while urban dwellers are 44.61%. On marital status, 76.67% of the household heads are currently married and living together while the remaining 23.33% are not currently married (i.e. divorced, widowed, single).

TABLE 1 ABOUT HERE

Table 1 further shows that the poorest households constitute 27.7% and the richest households account for 13.99% of the total number of households in this study. On households' access to ICTs, 90.21% of the households have no access to the internet on any device, while 83.73% of the total households have access to mobile phones. Also, 90.49% have no access to

computer/tablet and 67.04% have access to a TV set. The number of households where any member helps the child to do school/homework is 43.89% of the household as against 56.11% households where nobody helps the child to do school/homework, with 78.21% of households encouraging children to read. Households that tell high expectations to children are 74.8% while 65.04% of households do not read to children regularly.

The regional, as well as rural/urban disparities in household wealth status are reported in Table 2. On the Table, out of a total number of 1,386 poorest households, only 14, representing 1.01% are in Greater Accra region as against 399, representing 28.79% residing in Upper East region. Three regions (namely: Brong-Ahafo, Northern and Upper East) accounts for 77.76% of the total poorest households with all the other seven regions together having 22.24%. If Upper West region is added to these three regions (Brong-Ahafo, Northern, and Upper East), in total the four regions account for 97.6% of the total poorest households. However, these same four regions (Brong-Ahafo, Northern, Upper East, and Upper West) accounts for less than 14% (i.e. 13.99%) of the total number of richest households. Greater Accra and Ashanti regions alone account for 56% of the total households who are richest. When Western region is added to Greater Accra and Ashanti regions, the three regions account for 69.57% of the total richest households. Greater Accra alone has 31.86% of the total households which are richest, which is higher the figure for seven regions (Central, Volta, Eastern, Brong-Ahafo, Northern, Upper East and Upper West) together of 30.42%. This is so partly because, Greater Accra and Ashanti regions have the most populated urban centres with lots of jobs, social amenities, educational institutions, financial institutions and literate people than the other regions.

In furtherance, Table 2 reveals that Brong-Ahafo accounts for the highest number of poorer households (17.88%) with Greater Accra having the least of 2.68%. Four regions (Brong-Ahafo, Eastern, Volta, and Western) together have 60.9% of the total number of households (1,046) which are in the poorer category in terms of wealth status. For richer households, Ashanti region has the highest number (20.02%) with Northern region having the least of 4.17%. For middle wealth status households, Eastern region has the highest value with15.6% followed by Western (15.41%) and Volta (14.83%), while Upper East has the lowest value of 4.36%.

On rural-urban dichotomy and wealth status of the households, 88.46% of the total number of poorest households is from rural settings and 11.54% are from urban areas. Also, 78.78% of poorer households are living in rural areas and 21.22% are urban dwellers. For middle wealth status the households, rural (51.36%) and urban (48.64%) differences are not so much. For richer households, 20.38% are rural households as against 79.62% who are urban dwellers. The majority (almost all) of the richest households (97.14%) are from urban homes with as little as 2.86% living in rural settings. This shows that wealth status depends much on residence nature (whether rural or urban) of households. Urban households are wealthier than their rural counterparts. This is so because urban areas have a lot of job opportunities, social amenities, high financial literacy rate and lots of alternative routes for storing wealth. This finding is attuned to that of Ruma and Dipak (2014) in India.

TABLE 2 ABOUT HERE

5.2 Econometric results

The estimates of the binary logistic results are shown in Table 3. It is found that the age of the household head has a positive relationship with the five different equations estimated. If the age of the household head increases by one year, the probability of a child in that household to be encouraged to read increases by 0.2%, for any member of the household to tell high expectations to child increases by 0.1% and for the household to buy books for the child increases by 0.1%. If a household head is currently not married (divorced, widowed, single), it reduces the likelihood of the child getting encouragement to read by 4% and to do homework by 2%, for the household to buy books to the child reduces by 3%. However, it is only the probability of a child getting encouraged to read which is significant at 5% level. This is so partly because, married homes have both a mother and a father to support the child; thus, the likelihood of the child getting support is higher than a home with a single parent.

Compared to a child from urban household, if a child is from a rural household, the likelihood of that child to get somebody in the household to help do his/her homework reduces by 5.2%, to get somebody to read to him/her regularly reduces by 4% and for anybody buying books for the child reduces by 8%. This is so because rural homes are mostly poor and located in places where

'much' importance is not attached to education and where possible, there may be a household where no member is educated to help the child.

On the educational level of household head, it was found to be more positive and significant in determining the learning outcome of a child. If the household head has primary education, the probability of a child to be encouraged to read in such a household is 3% than a child in a household where the head has no formal education. Compared to a child from household with a head with no formal education, if a child is from a household where the head has a higher education, the probability of that child to get somebody to encourage him/her to read increases by 8%, to do homework is 27%, to read to child regularly is 35.4%, to tell high expectations to child is 5% and to buy books for child is 9%. This is so because, as one is more educated, he or she sees the need to educate his or her children and also highly educated persons can afford to spend more on their children education. This is attuned to those of Shaffril *et al.,*(2010) findings that those who are highly educated or have attended ICT training before use computers at work and at home more than those not educated or have not attended ICT course before and Watson and Chesters (2012) that early interventions focused on educating parents when children are very young should have a positive impact on the developmental outcomes of vulnerable children over the long term.

Table 3 further shows that the wealth status of the household was found to have a positive influence on the child's education or learning outcome. The poorest household is the base category from which we compared other households. A child from a richest household has an increase in the probability of achieving higher learning outcome than a child from poorest household. If a child is from the richest home, he/she has 6.3% more likelihood to get someone in the household to encourage him/her to read than a child from the poorest home. The richest household child has 16.5%, 6% and 5.3% more likely for the household to help him/her do homework, read to him/her regularly and tell high expectations to him/her respectively than a child from the poorest household. This is so because wealthier homes are more educated, or can afford the cost of educating children at home. This finding is in line with UNICEF (2007) indicates that poverty leads to a major issue in contributing to low school attendance, low completion rates and low learning outcomes and Curley *et al.,* (2010) that it is difficult to obtain

an education if children live in poverty and lack resources and access to opportunities, although education is a key factor to overcoming poverty and diseases.

On ICT access and its impact on child learning outcome, Table 3 also reveals that household having access to ICTs at home generally boost the learning outcomes of children. A child from a household that have access to a radio set, such child has an increase in the probabilities of 4.1%, 3.3%, 3% and 5% in getting help from any member of the household to do homework, to read to him/her regularly, to tell high expectations to him/her and help child buy book respectively than a child from a household with no radio set. Also, household ownership of mobile phone helps to enhance the likelihood of encouraging the child to read by 3.1%, read to the child regularly by 7%, tells high expectations to the child by 2.4% and helps the child buy books by 4.4%.

Having access to the internet at home leads to a 7% increase in the probability of a child being encouraged to read and 8.1% increase in the probability of a child receiving high expectation words from the household. However, having a computer/tablet at home reduces the likelihood of household buying books to a child by 9%, though it increases the probability of reading to the child regularly by 4.5%. Having a computer could make it easier for a household to read to the child; hence, discourages buying books for the child as the child could use such ICT (computer) to learn. This is similar to the findings of Deen-Swarray (2016) that Internet adoption was minimal among those with low or non-existent levels of reading or writing and lack of English literacy goes with lower internet uptake. It also corroborates Vincze (2016) where it was noted that there is a positive correlation between computer and internet availability at home and scores in mathematics, reading, and science.

Ownership of TV set is found to have 3% and 4.5% increases in the probabilities of encouraging the child to read and helping the child to do homework. These ICTs are found to have positive impacts on the child's education or learning outcomes because they are tools for study and learning. Having computer and internet access could enable learning and having a radio set or a TV set could allow children to listen to educative programmes and thus be encouraged to learn. These findings are in conformity with those of Vincze (2016).

TABLE 3 ABOUT HERE

A multinomial logit regression of how often the child brings learning materials from school to home for learning was run. The coefficients show marginal effects at representative values where dummy variables are at their discrete values and continuous variables are at their marginal. In table 4, as the age of household head increases by one year, the probability of a child *always* bringing learning materials home increases by 0.1%, to bring learning materials *often* increases by 0.2% and 0.1% for *sometimes*. A child from a female-headed household is 4% more likely to *always* bring learning materials home than a child from a male-headed household. If the household head is currently not married, the likelihood of a child in such home to *always* bring learning materials home reduces by 2.4% and the likelihood of a child to *never* bring learning materials home increases by 4%. This is because a single parent (especially mother) may not be able to encourage the child to well to learn at home and such homes may engage the child in labour activities or household chores. Also, a household that is from a rural setting, the likelihood of a child in such home to *often* bring learning materials home reduces by 2.1% than a child from an urban home.

Educational status of household head is found to have a positive and significant impact on the likelihood of a child bringing learning materials home for learning. Compared to a child from a household where the head has no education, if a child is from a household where the head has secondary education, the probability of such child to *always* bring learning materials home increases by 8% and *often* bring learning materials home increases by 4%. A child from a home where the head has secondary education, the probability for the child to never bring learning materials home reduces by 8.1%, meaning the child will *always* or *often* bring learning materials home.

A household with the head having a higher educational level, children are 14.9% more likely to *always* bring learning materials home and 11% less likely to *never* bring learning materials home. This finding is so partly because, as the household head is educated, he/she knows the importance of educating children and will always encourage children to learn at home. The

household head may also relieve the child from household chores to enable the child to learn. The head may also be able to afford home tuition for children.

It is shown in Table 4 that the wealth status of the household influences how often a child brings learning materials home for studies. A child from a middle wealth status home has 5.8% and 6.6% more likely to always or often bring learning materials to the house respectively than a child from poorest home. Also, such a child is 4.4% and 8% less likely to *sometimes* or *never* bring learning materials home than a child from the poorest household. This means that such child will always or often bring learning materials home than a child from the poorest home. Compared to a child from poorest household, a child from the richer home is 8.9% and 12.7% more likely to *always* and *often* bring learning materials home respectively and 6.3% and 15.2% less likely to *sometimes* and *never* bring learning materials to home respectively. For the richest home, their children have 17% and 14.8% more probabilities than poorest home children to *always* and *often* bring learning materials home and 11.3% and 21% less likely to *sometimes* and *never* bring learning materials home respectively. This finding is so because wealthier homes often know much about the importance of educating children, they can also afford home tuition and children in such home are often not burden with engaging in economic activities or household chores, hence they (children) can learn at home.

TABLE 4 ABOUT HERE

On household access to ICTs, though the coefficients show the expected signs, some of them are not significant. A household that has access to the internet, the probability of a child in such home to *sometimes* bring learning materials home is 8.2% less likely and 10% more likely to *never* bring learning materials home than a child from a household which has no access to the internet. This is explained partly because the internet offers a great deal of platform for learning and hence having access may reduce the likelihood of child bringing learning materials home, since the child can learn through the internet. Also, having access to TV reduces the probability of child bringing learning materials home *always* by 1.7%. However, mobile phone ownership shows that it has 3% more likely to influence children to *always* bring learning materials home and 5.6% less likely to influence children to *never* bring learning materials home. This finding is

in line with Vincze (2016) who found that ICTs at home enhances student performance and learning outcome at school.

6.0 Conclusion and recommendations

6.1 Conclusion

The study examined how household access to ICTs and wealth disparity affects the likelihood of a child being educational disadvantaged or vulnerable in Ghanaian households. There are regional as well as rural/urban disparities in household wealth status. Most(97.6%) of the poorest households are living in four regions; Brong-Ahafo, Northern, Upper West, and Upper East with all the other six regions together have 2.4% of the total poorest households. However, these same four regions account for 13.99% of the total number of richest households. Greater Accra alone has 31.86% of the total households which are richest, which is higher the figure for seven regions (Central, Volta, Eastern, Brong-Ahafo, Northern, Upper East, and Upper West) together of 30.42%. Also, 88.46% of the total number of poorest households is from rural settings and 11.54% are from urban areas. Almost all of the richest households (97.14%) are from urban homes with as little as 2.86% living in rural settings. This shows that wealth status depends much on residence nature (whether rural or urban) of households. Urban households are wealthier than their rural counterparts.

The wealth level of the household is found to be a full determinant of child learning/educational outcome. In effect, wealthier homes have their children having less likelihood to face leaning risk that will affect their learning outcomes. Children from wealthier homes are more likely to receive parental or home education such as encouraged to read, help to do school/homework, to read regularly, to bring learning materials home for studies and for someone to tell high expectations to the child than children from poor (less wealthy) homes. As Ruma and Dipak (2014) put it that poor economic conditions are reasons for educational vulnerability and that poverty is found to be the prime reason for school dropout. Socioeconomic factors such as the age of household head, sex of household head, residence nature of household (rural/urban), marital status of household head, educational level of household head and wealth status of the household all in general influence children learning rate at home. The children from households where the head is well educated, wealthier and lives in urban settings have high probability of

learning much at home to complement that of school than children from poor, uneducated household head and rural homes.

Households'access to ICTs broadly influences the rate of learning outcome of children. Households that have access to ICTs helpto encourage children to read regularly, help to do school/homework than children from households with no access to ICTs. The internet was found to have a greater influence on the learning of children at home such as; read regularly, do homework regularly and bringing learning materials home. A child from a household that have access to a radio set, has an increase in the probabilities of 4.1%, 3.3%, 3% and 5% in getting help from household to do homework, to read to him/her regularly, to tell high expectations to him/her and help child buy book respectively than a child from a household with no radio set.

To conclude, parental or home upbringing of children matters much in the learning outcome and educational success of the child. Lack of support in education by parents/guardians will have a direct influence on how OVC perform in education (Mwoma and Pillay, 2015). Supervision at home could include ensuring that children are encouraged to do home/schoolwork, observe personal hygiene, and that parents/guardians work hand in hand with teachers to ensure that OVC attend school regularly (Mwoma and Pillay, 2016). The study submits that the home which is the first contact by children offers a great deal in the development/education outcome of the child. As noted by Heckman (2006) that environments that do not stimulate the young and fail to cultivate cognitive and non-cognitive skills at early ages place children at an early disadvantage. It surmises that households where children do not get encouragement to read, no one reads to child regularly, no one buy books for the child, no one tells high expectations to the child, no one helps the child to do school/homework, and child does not bring learning materials home as well as no access to ICTs to boost learning at home are at a risk of educational vulnerable. These constitute the risk factors of a child likely dropping out of school due to learning disadvantages at home.

6.2 Recommendations

Based on the findings from the study, we make the following recommendations as briefly highlighted herein:

The Ministry of education should endeavour to formulate policies or programmes that will offer early childhood education and family support during the early years of children, some of which should be targeted at vulnerable young children and their families. These early intervention programmes should involve professionals and paraprofessionals visiting the homes of (mostly poor) families with vulnerable children, to provide parents or caregivers with information, emotional support, access to ICTs, and help with educating parents through their multiple roles of being literacy teachers, parenting coaches, and role models. Similar programmes are implemented elsewhere such as; The Communities for Children (CfC) initiative in Australia; The Parents as Teachers (PAT) Program to vulnerable children and their families from birth to three years of age in Canada.

Also, the ICT4D policy strategy of the government should be pursued and include household access to enable households to better provide home learning environment for children. Wealth status of households significantly affects the adoption of ICTs. Poorer and poorest home are the least adopters of ICTs, thus, policies should encourage the adoption of ICTs by these categories of households. Households having access to ICTs (mobile phones, computers, internet, radio and television) could complement the efforts of parents in giving children a good learning environment at home. Particularly, internet availability at home will help more in raising the learning outcomes of children. Thus, home internet connection should be pursued.

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References

Addison, J. T. (1992). Urie Bronfenbrenner. *Human Ecology, 20(2), 16-20.*

Adu-Gyamfi, S., Donkoh, W. J. &Addo, A. A.(2016). Educational Reforms in Ghana: Past and Present. *Journal of Education and Human Development, 5 (3) 158-172*

Al-Hassan, R. M., Irene S. E. & James, A. (2013) Farm household level impacts of information communication technology (ICT) – based agricultural market information in Ghana. *Journal of Development and Agricultural Economics. 5 (4) 161 – 167.*

Amoo, E. O., Igbinoba, A., Imhonopi, D., Banjo, O. O., Ajaero, C. K., Akinyemi, J. O., Igbokwe, D. & Solanke, L. B. (2018). Trends, determinants and health risks of adolescent fatherhood in sub-Saharan Africa. *Ethiopia Journal of Health Sciences, 28*(4), 433-442.

Anders, Y., Sammons, P., Taggart, B., Sylva, K., Melhuish, E. & Siraj-Blatchford, I. (2011) The influence of child, family, home factors and preschool education on the identification of special educational needs at age 10.*British Educational Research Journal 37(3):421-441*

Anil, D. & Ozer, Y (2012): The effect of the aim and frequency of computer usage on student achievement according to PISA 2006. Procedia – Social and Behavioral Sciences Vol.46 http://ac.elscdn.com/S1877042812021982/1s2.0S1877042812021982main.pdf?_tid=73527f285f1d11e2bac300000aab0f6c&acdnat=135825926_dd4799569c0115aa7add4a947402a906

Bagchi, K. & Udo, G. (2007) Empirically testing factors that drive ICT adoption in Africa and OECD set of nations. *Issues in Information Systems. VIII. (2), 45 – 52.*

Barrantes, R., Galperin, H., Aguero, A., & Molinari, A. (2007) Mobile Opportunities: Poverty and Telephony Access in Latin America and Caribbean. *DIRSI*

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Curley, J., Fred, S., &Han K.C. (2010). Assets and educational outcomes: Child Development Accounts (CDAs) for orphaned children in Uganda. *Child Youth Service Rev., 32: 1585–1590.*

Deen-Swarray, M. (2016). Towards digital inclusion: Understanding the literacy effect on adoption and use of mobile phones and the internet in Africa. *Information Technologies and International Development (special issue) 12 (2) 29 – 45.*

Delen, E. & Bulut, O. (2011) The relationship between students' exposure to technology and their achievement in science and math. In The Turkish Online Journal of Educational Technology 10 (3) http://79.123.150.20/xmlui/bitstream/handle/123456789/346/Erhan%20Delen3.pdf?sequence=1

Edwards, B., Wise, S., Gray, M., Hayes, A., Katz, I., Mission, S., Patulny, R., & Muir, K. (2009) Stronger Families in Australia Study: the impact of Communities for children: *Stronger Families and Communities Strategy 2004-2009 Occasional Paper No. 25* Department of Families, Housing, Community Services and Indigenous Affairs

Egwakhe, A.J & Osabuohien, E.S. (2009). Educational Background and Youth Criminality in Nigeria. *International Forum, 12*(1), 65-79.

Eynon, R. & Malmberg, L.E. (2011) A typology of young people's Internet use: Implications for education. Computers in Human Behavior 56. http://www.sciencedirect.com/science/article/pii/S0360131510002836

Fleming, K. E. (2015). Improving access to education for orphans or vulnerable children affected by HIV/AIDS. Paper commissioned for the EFA Global Monitoring Report 2015, Education for All 2000-2015: achievements and challenges. UNESCO. http://unesdoc.unesco.org/images/0023/002324/232423e.pdf

Fuchs, T. & Woessmann, L. (2004). Computers and Student Learning:Bivariate and Multivariate Evidence on the Availability and Use of Computers at Home and at School. In CESifo Working Paper Series 1321, CESifo Group Munich. http://www.cesifo-group.de/portal/page/portal/DocBase_Content/WP/WP-CESifo_Working_Papers/wp-cesifo2004/wp-cesifo-2004-11/cesifo1_wp1321.pdf

George, T., Olayiwola, W.K., Adewole, M.A. & Osabuohien, E.S. (2013). Effective Service Delivery of Nigeria's Public Primary Education: Role of Non-State Actors. *The Journal of African Development,15(1), 221-245.*

Gilwald, A., Milek, A. & Stork, C. (2010). Gender Assessment of ICT Access and Usage in Africa. *Research ICTafrica.net. 1 (2010) policy paper 5.*

Heckman, J. J. (2006) 'Skill formation and the economics of investing in disadvantaged children' *Science 312: 1900*

Inkoom, A (2012) "Implementation of Initiatives to Reform the Quality of Education in Rural Ghanaian Junior High Schools," Edith Cowan University, Perth, Western Australia, March 2012.

Jackson, L. et al. (2011): A longitudinal study of the effects of Internet use and videogame playing on academic performance and the roles of gender, race and income in these relationships. *Computers in Human Behavior 27.*

Jopling, M & Vincent, S. (2016). *Vulnerable Children: Needs and Provision in the Primary Phase.* New York, Cambridge Primary Review Trust, CPRT Research Survey 6 (new series)

Janus, M. & Duku, E. (2007) 'The school entry gap: socioeconomic, family and health factors associated with children's school readiness to learn' *Early Education and Development 18(3), 375-403*

Jukes, M., Simmons, S., & Bundy D. (2008). Education and Vulnerability: the role of schools in protecting young women and girls from HIV in Southern Africa. *AIDS, 22 (4) 41-56*

Karakara, A.A. & Osabuohien, E.S. (2019). Households' ICT Access and Bank Patronage in West Africa: Empirical insights from Burkina Faso and Ghana. *Technology in Society, 56 (2019) 116–125, DOI* *https://doi.org/10.1016/j.techsoc.2018.09.010*

McGuckin, C. & Minton, S. J. (2014). From theory to practice: Two ecosystemic approaches and their applications to understanding school bullying. *Australian Journal of Guidance and Counselling, 24(1), 36-48.*

Melhuish, E. C., Phan, M.B., Sylva, K., Sammons, P., Siraj-Blatchford, I. & Taggart, B. (2008) 'Effects of home learning environment and pre-school centre experience on literacy and numeracy development in early primary school', *Journal of Social Issues 64(1) 95-114*

Mominó, J. M. & Meneses, J. (2007): Digital inequalities in children and young people: A technological matter? CERI – New Millennium Learners – Meetings and Conferences (Italy-OECD seminar on Digital Natives and Education, Indire, Florence) http://www.oecd.org/dataoecd/0/36/38359326.pdf

Mwoma, T. & Pillay, J. (2015). Psychosocial support for orphans and vulnerable children in public primary schools: Challenges and intervention strategies. *South African Journal of Education, 35(3), 1-9.*

Mwoma, T. & Pillay, J. (2016). Educational support for orphans and vulnerable children in primary schools: Challenges and interventions. *Issues in Educational Research, 26(1), 82 – 97.*

Noble, K.G., Tottenham, N. & Casey, B.J. (2005) 'Neuroscience perspectives on disparities in school readiness and cognitive achievement' *The Future of Children 15(1): 71-89.*

Okafor, E.E., Imhonopi, D., &Urim, U.M. (2011). Utilisation of internet services and its impact on teaching and research outputs in private universities in South-Western Nigeria. *Australian Journal of Emerging Technologies and Society, 9*(2), 135-151.

Rodriguez, E.T. & Tamis-La Monda, C. S. (2011) 'Trajectories of the home learning environment across the first 5 years: Associations with children's vocabulary and literacy skills at prekindergarten' *Child Development 82(4):1058-1075*

Ruma, D. N. & Dipak, N. (2014). Educational Vulnerability and risk factors of Tea Garden Workers with special reference to Dewan Tea Garden Village, Cachar, Assam, India. *International Research Journal of Social Sciences, 3 (9) 14-21*

Sammons, P., Elliot, K., Sylva, K., Melhuish, E., Siraj-Blatchford, I. & Taggart, B. (2004) 'The impact of pre-school on young children's cognitive attainments at entry to reception'. *British Educational Research Journal 30(5) 691-712*

Schmidt, J. P., & Stork, C. (2008). Towards evidence based ICT policy and regulation: e-skills. *ResearchICTafrica.net. Vol 1 2008 policy paper.*

Senechal, M. & LeFevre, J. (2002) 'Parental involvement in the development of children's reading skill: A five-year longitudinal study' *Child Development 73(2) 445-460*

Serey, S., Many, D., Sopheak, M., Sokkalyan, T., Sela, S.A., Chanravuth, L., & Sophal, K. (2011). Addressing the special needs of orphans and vulnerable children (OVCs): A case study in Kien Svay district, Kandal province, Cambodia. *Journal of AIDS and HIV Research 3(2),43-50*

Shaffril, H. A. M., Samah, B. A., Hassan, M. A., & D'silva, J. L. (2010). Socioeconomic factors that impinge computer usage in administration works among village leaders in Malaysia. *Scientific Research and Essays. 5 (23) 3623 – 3633.*

Siraj-Blatchford, I., Taggart, B., Sylva, K., Sammons, P. & Melhuish, E. (2008) 'Towards the transformation of practice in early childhood education: the effective provision of pre-school education project', *Cambridge Journal of Education 38 23-36.*

Smiley, A., Omoeva, C., Sylla, B. & Chaluda, A. (2013). *Orphans and Vulnerable Children – Trends in School Access and Experience in Southern Africa.* Washington, DC: FHI 360: Education Policy and Data Centre. http://www.epdc.org/sites/default/files/documents/Orphans%20and%20Vulnerable%20Chi ld ren.pdf

Spiezia, V. (2011) Does Computer Use Increase Educational Achievements? Student-level Evidence from PISA. OECD Journal of Economic Studies, no. 4. http://dx.doi.org/10.1787/eco_studies-20105km33scwlvkf

Sund, L. (2006). The rights of the child as legally protected interests. *The International Journal of Children's Rights, 14(4), 327-337.*

United Nations (2013). The millennium development goals report 2013. http://www.un.org/millenniumgoals/pdf/report-2013/mdg-report-2013-english.pdf

UNICEF (2007). A human rights-based approach to education for all. United Nations Children's Fund, New York.

United States Agency of International Development & Catholic Relief Services (2008). Education programming for orphans and vulnerable children affected by or vulnerable to HIV: Moving beyond school fees and uniforms. Final report December, 2008. USAID & CRS. http://pdf.usaid.gov/pdf_docs/Pnadp105.pdf

Vincze, A. (2016). The relationship between educational inequalities and ICT access and use at home. *University of Szeged. Belvedere Meridionale 28, no. 1 5 – 26.*

Venkatesh, V. & Brouwn, S.A. (2001). A Longitudinal Investigation of Personal Computers in Homes: Adoption Determinants and Emerging Challenges. *MIS Quarterly, 25 (1) 71-102*

Watson L. & Chester J. (2012). Early Intervention for vulnerable young children and their families through the Parents as Teachers Program. *The Education Institute, University of Canberra, Final Report of a study conducted in partnership with the Office for Children, Youth and Family Support.*

World Bank (2018). Learning to Realize Education's Promise. World Development Report 2018. A World Bank Group Flagship Report. The World Bank, 1818 H Street NW, Washington, DC 20433.

Table 1: Descriptive statistics and distribution of variables

Variable	Measurement	Response	Percent	Obs.
Help child do homework	Any member of household help child to do homework	Yes	43.89	2,196
		No	56.11	2,807
Encourage child to read	Any member of household encourages child to read	Yes	78.21	3,913
		No	21.79	1,090
Read to child regularly	Any member of household read to child regularly	Yes	34.96	1,749
		No	65.04	3,254
Help child buy books	Any member of household helps child to buy books	Yes	45.93	2,298
		No	54.07	2,705
Tell high expectation to child	Any member of household tell high expectations to child	Yes	74.80	3,742
		No	25.20	1,261
Education	Educational level of household head	No education	32.40	1,621
		Primary	15.01	751
		Secondary	44.65	2,234
		Higher	7.94	397
Sex of Household head	Male	Male	66.96	3,350
	Female	Female	33.04	1,653
Residence	Rural	Rural	55.39	2,771
	Urban	Urban	44.61	2,232
Marital status	Currently Married (CM)	(CM)	76.67	3,836
	Not Currently Married (NCM)	(NCM)	23.33	1,167
Wealth status	Poorest	Poorest	27.70	1,386
	Poorer	Poorer	20.95	1,046
	Middle	Middle	20.63	1,032
	Richer	Richer	16.77	839
	Richest	Richest	13.99	700
ICT Access	Access to Internet	Yes	9.79	490
		No	90.21	4,513
	Owned Mobile Phone	Yes	83.73	4,189
		No	16.27	814
	Owned computer/tablet	Yes	9.51	476
		No	90.49	4,527
	Owned radio set	Yes	67.04	3,354
		No	32.96	1,649
	Owned T.V. set	Yes	52.85	2,644
		No	47.15	2,359

Source: Authors' computation based on GDHS data 2014, Obs=observations

Table 2: Wealth distribution based on regional and rural/urban divide (numbers and %)

	WEALTH CATEGORY				
Region/Residence	**Poorest**	**Poorer**	**Middle**	**Richer**	**Richest**
Western	26 (1.88)	132 (12.62)	159 (15.41)	123 (14.66)	95 (13.57)
Central	17 (1.23)	84 (8.03)	99 (9.59)	65 (7.75)	40 (5.71)
Greater Accra	14 (1.01)	28 (2.68)	60 (5.81)	122 (14.54)	223 (31.86)
Volta	98 (7.07)	163 (15.58)	153 (14.83)	65 (7.75)	20 (2.86)
Eastern	59 (4.26)	155 (14.82)	161 (15.60)	95 (11.32)	55 (7.86)
Ashanti	23 (1.66)	79 (7.55)	107 (10.37)	168 (20.02)	169 (24.14)
Brong-Ahafo	151 (25.59)	187 (17.88)	130 (12.60)	77 (9.18)	45 (6.43)
Northern	324 (23.38)	82 (7.84)	69 (6.69)	35 (4.17)	19 (2.71)
Upper East	399 (28.79)	52 (4.97)	45 (4.36)	51 (6.08)	19 (2.71)
Upper West	275 (19.84)	84 (8.03)	49 (4.75)	38 (4.53)	15 (2.14)
Rural	1,226 (88.46)	824 (78.78)	530 (51.36)	171 (20.38)	20 (2.86)
Urban	160 (11.54)	222 (21.22)	502 (48.64)	668 (79.62)	680 (97.14)
Total households	1,386	1,046	1,032	839	700

Note: percentages are within brackets
Source: Authors' computation

Table 3: Binary logit regression (Marginal effects at representative values)

Explanatory variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Age of household head	0.002***	0.001	0.004	0.001**	0.001*
	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)
Sex of household head	0.02	0.01	0.01	0.012	0.019
(Female)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
Marital status of household	-0.04**	-0.02	-0.003	-0.01	-0.028
head (NCM)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Residence of household	0.023*	-0.052***	-0.04**	-0.017	-0.078***
(Rural)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
Educational level of household head					
No education			Base category		
Primary	0.028**	0.043*	0.084***	-0.002	0.002
	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
Secondary	0.054***	0.19***	0.211***	0.04***	0.027
	(0.014)	(0.02)	(0.02)	(0.01)	(0.02)
Higher	0.079***	0.27***	0.354***	0.05**	0.088***
	(0.024)	(0.03)	(0.03)	(0.02)	(0.03)
Wealth status of household					
Poorest			Base category		
Poorer	0.012	0.05**	0.004	0.044***	0.01
	(0.015)	(0.02)	(0.02)	(0.02)	(0.02)
Middle	0.03	0.082***	0.041*	0.051***	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Richer	0.023	0.143***	0.065**	0.038*	-0.014
	(0.024)	(0.03)	(0.03)	(0.02)	(0.03)
Richest	0.063**	0.165***	0.057*	0.053*	-0.003
	(0.029)	(0.04)	(0.03)	(0.03)	(0.04)
ICTs Access and Usage					
Household owns radio set	0.015	0.041**	0.033**	0.028***	0.048***
(Yes)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
Household owns mobile phone	0.031**	0.01	0.067***	0.024*	0.044**
(Yes)	(0.014)	(0.02)	(0.02)	(0.01)	(0.02)
Household owns computer or	0.022	0.021	0.045*	0.003	-0.086***
tablet (Yes)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)
Household has access to	0.068***	0.017	0.02	0.081***	0.01
internet (Yes)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
Household owns a TV set	0.027**	0.045**	0.021	0.015	0.03
(Yes)	(0.013)	(0.02)	(0.02)	(0.01)	(0.02)
Pseudo R^2	0.0491	0.0922	0.0829	0.0346	0.0150
Prob>Chi^2	0.0000	0.0000	0.0000	0.0000	0.0000
LR Chi2 (16)	257.40	632.24	537.08	195.55	103.22
Observations	5,003	5,003	5,003	5,003	5,003

Note: standard errors are within brackets; ***, ** and * denote significant at 1%, 5% and 10% respectively

Source: Authors' Computation

Table 4: Multinomial logit regression (Marginal effects at representative values)
Dependent variable: how often the child brings learning materials home

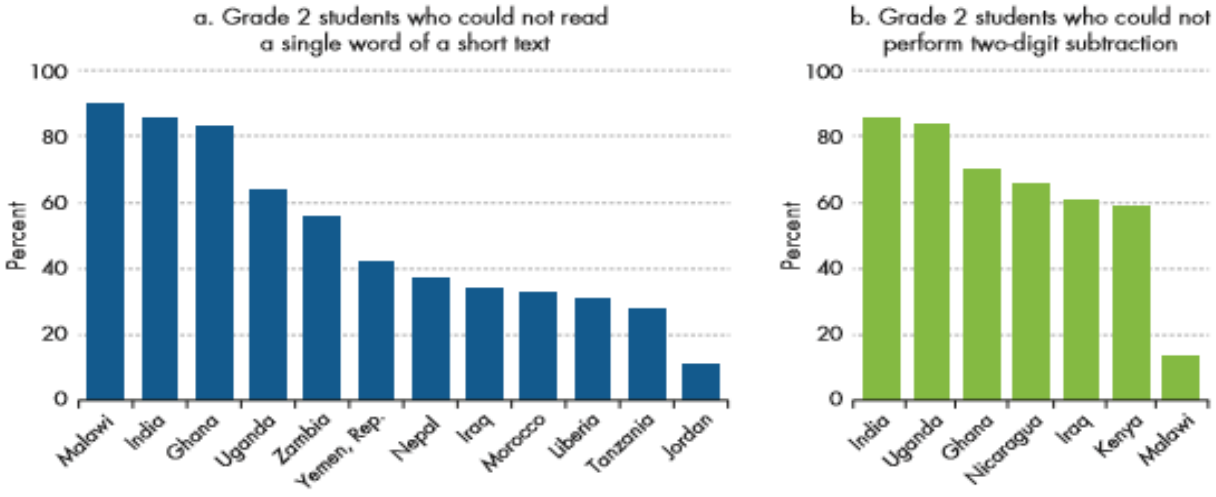
Explanatory variables	Always	Often	Sometimes	Never
Age of household head	0.001*	0.002***	0.001**	-0.003***
	(0.00)	(0.00)	(0.00)	(0.00)
Sex of household head	0.04***	-0.01	0.013	-0.044
(Female)	(0.01)	(0.01)	(0.02)	(0.02)
Marital status of household	-0.024**	-0.01	-0.011	0.04*
head (NCM)	(0.01)	(0.01)	(0.02)	(0.02)
Residence of household	0.002	-0.021*	-0.013	-0.01
(Rural)	(0.01)	(0.01)	(0.02)	(0.02)
Educational level of household head				
No education		Base category		
Primary	0.01	0.04*	-0.02	-0.028
	(0.02)	(0.02)	(0.02)	(0.02)
Secondary	0.08***	0.04**	-0.035**	-0.081***
	(0.02)	(0.02)	(0.02)	(0.02)
Higher	0.149***	0.02	-0.064**	-0.11***
	(0.03)	(0.03)	(0.03)	(0.04)
Wealth status of household				
Poorest		Base category		
Poorer	0.012	0.023*	0.011	-0.045**
	(0.01)	(0.01)	(0.02)	(0.02)
Middle	0.058***	0.066***	-0.044*	-0.080***
	(0.02)	(0.02)	(0.03)	(0.03)
Richer	0.089***	0.127***	-0.063**	-0.152***
	(0.02)	(0.03)	(0.03)	(0.04)
Richest	0.17***	0.148***	-0.113***	-0.21***
	(0.03)	(0.03)	(0.04)	(0.04)
ICTs Access and Usage				
Household owns radio set	0.01	-0.05	0.021	0.025
(Yes)	(0.01)	(0.01)	(0.01)	(0.02)
Household owns mobile phone	0.03*	0.01	0.017	-0.056***
(Yes)	(0.02)	(0.02)	(0.02)	(0.02)
Household owns computer or	0.023	0.014	-0.032	-0.010
tablet (Yes)	(0.02)	(0.02)	(0.03)	(0.03)
Household has access to	-0.017	-0.002	-0.082***	0.10***
internet (Yes)	(0.01)	(0.02)	(0.03)	(0.03)
Household owns a TV set	-0.017**	0.004	0.02	-0.01
(Yes)	(0.01)	(0.01)	(0.02)	(0.02)
Pseudo R^2		0.0487		
Prob>Chi^2		0.0000		
LR Chi2 (48)		635.83		
Observations		5,003		

Note: standard errors are within brackets; ***, ** and * denote significant at 1%, 5% and 10% respectively
Source: Authors' Computation.

Appendix

Figure A1: Shortfall in learning starts early

Percentage of grade 2 students who could not perform simple reading or math tasks, selected countries



Source: World Bank (2018)