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Does living in a community with more educated mothers enhance children's school attendance? Evidence from Sierra Leone

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ABSTRACT

In Sierra Leone girls are 23.4% less likely to attend secondary education than boys. This difference between sexes increases the gender gap in educational attainment since women's education is positively associated with children's educational wellbeing. This paper investigates the relationship between children's school attendance, their mothers' level of education, as well as the overall level of women's education at the community level in Sierra Leone using multilevel statistical modelling techniques and the country's 2008 Demographic and Health Survey data. The findings suggest that, regardless of a child's own mother's education, an increase in the proportion of mothers with secondary or higher education in a community by 10% improves the probability of attending junior secondary school significantly by 8%; a 50% increase improves the likelihood of attending school by 45%. There was no significant relationship between the proportion of better educated mothers in a community and primary school attendance. However, relative to children whose mothers had no formal education, children whose mothers had attained primary, secondary or higher education were 7%, 14% and 22% more likely to attend primary school respectively. Future policies should seek to promote girls' education at post-primary education and develop community based programmes to enable the diffusion and transmission of educational messages.

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1. Background

The association between children's school attendance and women's education in low and middle income countries has been rarely explored. Yet women's education has long been a focus of pledges by the international community. In 1990, the Education for All (EFA) agenda placed an emphasis on girls' education through its policy of universal primary education and equal gender parity (United Nations Educational Scientific Cultural Organisation (UNESCO), 1990). The equal gender principles championed in the EFA agenda were reaffirmed in 1994 at the International Conference on Population and Development and in 2000 at the World Education Forum. Three of the goals established at the World Education Forum (i.e. goals 2, 4, and 5) highlighted the need to improve girls' and women's education. Goal 5 was the most emphatic on this issue promising to eliminate 'gender disparities

in primary and secondary education by 2005 and achieve gender equality in education by 2015 ...' (UNESCO, 2000, p. 36). These goals were recommitted as part of the Millennium Development Goals (MDG), signified by MDG 2 – achieve universal primary education, and MDG 3 – promote gender equality and empower women. Since 1990, therefore, there has been a remarkable increase in the number of girls participating in education (Knodel and Jones, 1996; UNESCO, 2011). In spite of these developments, many countries, particularly those in West and Central Africa, continue to have low gender parity ratios suggesting that there is an under-representation of girls in the education system (Grant and Behrman, 2010; Kazeem et al., 2010). As a result, girls and women in these countries lag behind in the benefits of education such as improved health outcomes and economic prosperity. Using the case of a post-conflict state, Sierra Leone, this paper critically evaluates the relationship between mothers' education and children's schooling, and in particular explores how children's schooling is influenced by the overall level of women's education in the community.

Education confers onto women many advantages not least that which they are subsequently able to transmit to their offspring.

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The most commonly cited advantage is economic. To the extent that education is closely linked to occupation and earnings, women with higher levels of education are significantly more likely than less educated women to have a higher earning power. With this advantage, they are able to enhance their own well-being through better health and nutrition, for instance. A higher earning power also increases women's economic independence and henceforth autonomy within the household which, in turn, enhances their capacity to undertake or participate in household decisions (Heaton et al., 2005; Woldemicael and Tenkorang, 2010). This increase in autonomy introduces another advantage of education. When women are no longer restricted by their dependence on male leadership, they are better placed to pursue their own ambitions and control their own lives. Arguably, a more pervasive influence of education is in a cultural shift in traditional values (such as early marriage and childbearing as well as female exclusion from public life) and the positioning of the child in the family (the intergenerational flow of wealth) (Caldwell, 1980).

There is reason to believe that the advantages which are conferred onto women through educational achievement can be transmitted to their children (Haveman and Wolfe, 1995; Rosenzweig and Wolpin, 1994). That is to say, children who have educated mothers are expected to be significantly more likely than those whose mothers are not educated to: (1) attend school (2) have longer years of schooling and (3) have higher levels of educational achievements (Plug, 2004; Sacerdote, 2002). This is not unexpected as more educated mothers are better able to meet the costs of education as they are more likely to have resources at their disposal to make such investments (Paxton and Schady, 2007). Educated mothers are also more likely to send their children to school and to encourage their children to remain in school and achieve highly because of the values and socialisation which they themselves were exposed to in school (Andrabi et al., 2012; Tramonte and Willms, 2010). The independence and empowerment granted to women through high educational attainment also means that educated mothers are more likely than less educated mothers to send their children to school even in environments where the status of women is low (Bommier and Lambert, 2000; World Bank, 2005). Being more independent, mothers with higher levels of education will have a greater ability to: (1) argue in favour of sending a child to school and (2) invest in a child's education independently of their partners' or household contribution, thereby overcoming any barriers to children's educational participation. Women with lower attainments are unlikely to possess these qualities which enable them to challenge household opposition to education; they are also less likely to have access to the resources that would enable them to sponsor schooling even if they did have a desire to make such an investment.

The idea that mothers' education affects children's schooling is not novel in educational research. In developed countries, studies have demonstrated the significant correlation and causal effect of mother's education on children's learning outcomes and attainment (Haveman and Wolfe, 1995). In low and middle income countries also, there is general consensus that having educated mothers, net of individual and other household factors, is correlated with children's school participation (Huisman and Smits, 2009; Moyi, 2012). However, studies in low and middle income countries have typically used mothers' education as a proxy for socio-economic status. This approach assumes that mothers' education affects children's schooling purely through economic contributions. While the level of education is associated with wealth and earnings, it is not simply through being able to afford the costs of education that mothers with high educational attainments can influence the educational trajectories of their children.

The relevance of the economic interpretation of high educational attainment in the sub-Saharan context is arguably more

applicable to fathers' education. This is because in such societies it is still commonplace to have male-headed households who are the primary breadwinners. Therefore, even when children have educated mothers, the predominant economic investment to education comes from the father (Booth, 2003; Timaeus and Boler, 2007). Studies on orphanhood have confirmed this observation such that paternal orphanhood is closely related to reduced household earnings and household poverty, which in turn results either in the postponement of school enrolment or the withdrawal of children from school (Case and Ardington, 2006). Such evidence is not intended to contravene the argument that mothers' education does have an economic influence on children's schooling. Rather, it is to highlight that the economic interpretation accorded to mothers' education in educational studies may hold a lower tenability in the African setting and, in fact, it may be through the values, knowledge, and modern ethics imparted through formal education that mothers' education affects children's school attendance in low income countries. If this position is assumed, as is the case in the present paper, the relationship between mothers' education and children's school attendance may be conceptualised as also operating at the community level so that the knowledge, favourable attitudes and progressive behaviours of mothers who have attained secondary or higher education do not simply benefit the offspring of these mothers but also benefits children who live in close proximity.

This paper argues that children who live among women with high educational attainment are likely to have a higher probability of attending school than those living in communities with low levels of women's education. This relationship can be conceptualised as operating through a process of social learning and influence, a theory adapted from health research (McNay et al., 2003; Moursund and Kravdal, 2003). Through this process, women with low levels of education are able to observe and learn the tastes and behaviour of more educated women and promote schooling for their children. They are able to acquire information and knowledge, for instance, about the school entry age, the benefits of education or the structure and policies of the education system from more educated women. The result is that children who live in close proximity to women with high educational attainment will have an enhanced probability of attending school even when their own mothers have low levels of education. Based on this hypothesis, the following research question is explored in the present paper:

Does living in a community with higher mothers' education enhance a child's likelihood of attending school after controlling for mothers' education and other socio-economic factors?

Sierra Leone is used as a case study for this research. The country is in West Africa and has a small population of less than five million. It has one of the lowest human development index (180 out of 187 according to the 2011 Human Development Index). The country has a poor health record with 970 maternal deaths per 100,000 births and an under-five mortality rate of 192 deaths per 1000 live births (United Nations Development Programme (UNDP, 2011). Universal primary education was introduced in Sierra Leone in 2001 through the Free Primary Education policy which abolished fees and promised to provide free textbooks and learning materials for primary schools. The 2004 Education Act made it mandatory for all children aged 6–14 years to attend and complete basic education – primary and junior secondary school (JSS). Though these Acts made provisions for compulsory attendance, they did not remove the costs of sending children to school as households continued to pay for registration and educational materials (Government of Sierra Leone, 2007).

The rationale behind the choice of Sierra Leone as a case study is twofold. Firstly, the country has a low level of female educational attainment (Government of Sierra Leone, 2009, p. 2). About 25% of

girls and women have never attended any formal schooling, 25.2% have some primary education, 3.1% have completed primary education only, 9.7% have some secondary education, 1% have completed senior secondary education, and 1.4% have more than secondary education (Government of Sierra Leone, 2009, p. 19). In the 2013/14 Education for All Global Monitoring Report (UNESCO, 2014, p. 368), for the school year ending in 2011, the gross enrolment rate (GER) for primary education in Sierra Leone was estimated as 125%: 129% for boys and 120% for girls. The GER for JSS was 58%; boys again had a higher attendance than girls (65% relative to 52%). This difference between sexes in school attendance is consistent with the general trend in sub-Saharan Africa (SSA). The gender parity index (GPI) at primary education is the same in Sierra Leone and SSA (.93); SSA however has a higher GPI at JSS than Sierra Leone (0.85 compared with 0.79). These figures suggest that girls in Sierra Leone continue to have a lower level of participation than boys and that their attendance worsens as they progress through basic education. They also suggest that whilst girls in Sierra Leone have similar overall levels of access as in SSA at primary school, they are less likely to attend JSS than girls in other parts of the sub-continent. The implications of having an educated female population are significant for the Sierra Leonean populace given the country's low human development and poor maternal and child health. A thorough investigation into the ways in which women's education is related to school attendance may be useful in helping to guide future investments and policy interventions which aim to stimulate demand for female education.

A second rationale is that the country has poor levels of educational participation but there is no research on the determinants of school attendance on the country. Sierra Leone is a poor and undeveloped post-conflict state (after civil wars between 1991 and 2002) with poor educational infrastructure and low human resource. The cessation of the war in 2002 saw massive investments in primary education with secondary education being largely neglected. These investments were made in conjunction with advocacy campaigns for universal primary education. As a result, the net attendance ratio for primary education (62%) is disproportionately higher than for junior secondary (21%) and senior secondary education (7%). The lack of secondary school supply may restrict the likelihood of attendance at this level of education. This drawback may however be mitigated in communities where there is a high proportion of mothers with secondary or higher education through the processes described above. This is especially important for secondary education because the country has had few campaigns or publicity of post-primary education and so the interaction between mothers within communities can be important in diffusing positive knowledge and attitude towards post-primary educational investment in the present study context (Maclure and Denov, 2009).

2. Data

Data from the 2008 Sierra Leone Demographic and Health Survey (DHS) are used for the analysis. This is a nationally representative survey, part of a global programme to collect data for monitoring and evaluating population, health and nutrition programmes. The 2008 Sierra Leone DHS was the first to be conducted in the country. Three questionnaires were administered for the survey: a household questionnaire which yields a response rate of 98%; a questionnaire for male household members (94% response) and for female household members (93% response) (Government of Sierra Leone, 2009, p. 10). Information from all three questionnaires is used in the analysis for this paper but the household dataset is the main dataset used as it contains data on school attendance, mother's education, and socio-economic household characteristics.

2.1. Selection of study sample

The study population for the analysis was children aged 6–14 years whose mothers were alive and living with them at the time of the survey. Children who lived in separate households to their mothers were excluded from the analysis as there was no way to identify their mothers. The overall number of cases used in the analysis was 7126: 4931 were aged 6–11 years and 2195 were aged 12–14 years.

2.2. Study variables

The dependent variable was *attending primary or junior secondary education* at the correct age. For primary education, children aged 6–11 years who were attending primary school or higher at the time of the survey were coded as 1 and the other children within this same age-group who were either not attending school or were attending a lower educational level were coded as 0. For junior secondary education, children aged 12–14 years attending junior secondary school or higher were coded as 1 and those out of school or attending a lower educational level were coded as 0.

The key explanatory variable was the proportion of women with secondary or higher education in a community. In this study, a community is taken to mean a census enumeration area which is often representative of a cluster of villages or small groupings of households. The enumeration areas used in the Sierra Leone DHS were obtained from the country's 2004 population and housing census sampling frames (Government of Sierra Leone, 2009, p. 275). There were 353 clusters in the 2008 Sierra Leone DHS.

The variable for the proportion of women with secondary or higher education was created by binary coding mothers education (none/primary = 0, secondary/higher = 1) and aggregating this information to the community level. Often this approach has the potential of introducing measurement error and biased estimates in the aggregated variable when there are insufficient cases within each cluster to derive a reliable estimate. This limitation is reduced in the present study because of the large sample size of women from which the variable was created. Data from 13,850 women who lived in the same households as their children were used. The mean number of women per cluster was 46 with a standard deviation of 15; the minimum and maximum numbers were 10 and 81 respectively. Two percent of mothers lived in clusters of 10–19 mothers; 17% of mothers lived in clusters where there were 60–81 other mothers. Forty percent and 41% of mothers lived in clusters with 20–39 and 40–59 other mothers respectively.

Table 1 lists the other variables which were included in the analysis. The choice of variables was informed by previous research and so variables which have been shown to be correlated with school attendance have been explored. Five individual level variables were considered for the analysis: sex of the child, household chores, work in last week, and work in family business or farm. At the household level, wealth, mother's education, and sex of the household head were used. Mother's education had four categories: none, primary, secondary, and higher. This variable measures a child's own mother's education; it differs to the variable 'mothers' community education'. The relationship between 'mother's education' and school attendance is interpreted as operating at the household level; that is, the benefits associated with having an educated mother is assumed to affect only the child of the mother. 'Mothers' community education' however assesses whether living in a community with mothers who have attained secondary or higher education increases the probability of children's attendance irrespective of whether a child's own mother

Table 1
Definition of study variables.

Variables	Operational definition	Categories	Coding
<i>Child</i>			
Sex	Sex of child	Boy, Girl	Boy (0), Girl (1)
Work	Child works in paid/unpaid employment outside the home in last week	No, Yes, Missing	No (0), Yes (1), Missing (3)
Chores	Child does household chores	No, Yes, Missing	No (0), Yes (1), Missing (2)
Farm	Child works in family business or farm	No, Yes, Missing	No (0), Yes (1), Missing (2)
<i>Household</i>			
Poor household	Child lives in poor household, created from the wealth index	No, Yes	No (0), Yes (1)
Mother's education	Child's mother's educational attainment	None, Primary, Secondary, Higher	None (0), Primary (1), Secondary (2), Higher (3)
Head's sex	Sex of household head	Male, Female	Male (0), Female (1)
<i>Community</i>			
Poor community	Proportion of people living in a poor household in a community	–	–
Mothers' community education	Proportion of mothers with secondary or higher education in a community	–	–
Agricultural livelihood in community	Proportion of men and women working in agriculture in a community	–	–
Visited health facility	Proportion of women who visited a health facility in the last 12 months for family planning	–	–
Women's mean age at marriage	Average age at marriage for women in a community	–	–
<i>Region/residence</i>			
Rural residence	Type of place of residence	No, Yes	No (0), Yes (1)
Administrative region	Administrative region	Northern, Eastern, Southern, Western	Northern (0), Eastern (1), Southern (2), Western (3)

Note: Variables with coding matrices are categorical variables where '0' means a reference category. All community variables are continuous variables and so do not have coding matrices.

has a high educational attainment. In other words, the variable will address the question of whether the positive relationship between children's schooling and mother's education extends beyond the household level.

The cost of education remains significant for households in Sierra Leone. The DHS does not collect information on school fees or the cost of school-related items (i.e. uniforms, books, transportation). This paper therefore uses household wealth ranking, as measured by the DHS household wealth index, to assess whether the likelihood of attending school reduces significantly with the wealth of a household. The DHS wealth index is constructed on the basis of household assets and amenities such as the type of material used to construct a house, ownership of agricultural land, electricity, television, radio, and access to water and sanitation facilities (Rutstein, 2008). Five quintiles were created from this wealth index score (poorest, poorer, middle, richer, and richest) which, for the purposes of the current analysis, is recoded into two categories (poor and non-poor) to enable an assessment of the difference between households classified as poor and those which are not. Households coded as poor were those classified as poorest and poorer in the original DHS variable; the remaining categories were recoded as non-poor households. The decision to recode the variable was informed by the lack of statistical significance in school attendance between the poorest and poorer children; these two groups of children however had significantly lower attendance than those in the middle, higher, and highest wealth quintiles.

The type of place of residence and administrative region are also used along with community level variables. Since questions on community surroundings are not administered in the DHS, individual and household level information is aggregated to the

cluster level so as to estimate the relationship between community factors and school attendance. As with the community variable for mothers' education, this procedure involves extracting averages and proportions from lower analytical levels and presenting them at the community level. For instance, to create the variable 'poor community', the household level variable 'poor household' was aggregated to the cluster level to derive the proportion of people living in poor households. Since the DHS wealth index is calculated on the basis of availability of assets and amenities at the household level, when this data is aggregated to the cluster level it is indicative of access to facilities and affluence in a community. The variable 'agricultural livelihood in community' was created by using information about employment status from the women and men DHS questionnaires. Individuals who answered that their main source of livelihood was 'agriculture or self-employment' were coded as '1' and all other responses were coded as '0'. The variable was then aggregated to the cluster level to calculate the proportion of people working in agriculture or self-employment. The mean proportion of people living in poor households in a community was 0.37 with a standard deviation of 0.30 and a range of 0–1; the corresponding figures for 'agricultural livelihood in community' were: 0.47, 0.35, and 0–0.97.

In Sierra Leone, the supply and distribution of schools is uneven. The Western Area region, where the capital city is located, has the highest proportion of schools whilst the Northern and Eastern regions suffer grossly from a lack of supply (World Bank, 2007). Controlling for administrative region captures the effect of factors such as school provision that are associated with school attendance but cannot be directly measured in the current

analysis. The variable also accounts for the stratified structure of the DHS survey.

2.3. Missing cases

Among the variables used in the analysis, only four had less than 5% item non-response which was taken into account by including dummy variables to control for non-response. These variables included: household chores, employment status, work in family business or farm, and mother's education. For the mother's education variable, however, children in the missing category were combined with those whose mother's had no education. Results from an initial regression analysis showed that there was no significant difference in school attendance between children who had missing data and those whose mothers had no education; the two categories could then be combined without losing essential information.

3. Methods of analyses

A multilevel logistic regression model was used to estimate the probability of attending the correct level of education among children aged 6–14 years. This type of regression was employed because the outcome was binary. The multilevel model suits best the hierarchical structure of the data (i.e. individual, household, community) and it accounts for the lack of independence between cases.

The regression analysis was performed on two samples: children aged 6–11 and 12–14 years. The reason being that, despite being governed by free and compulsory basic education policies, the net attendance ratios for primary (62%) and junior secondary education (21.0%) in Sierra Leone is very different suggesting that the factors which affect school attendance at these tiers of education may be dissimilar. In addition, the rules of admission to the two educational levels are different. Besides the ability of households to sponsor a child's education, admission to junior secondary school is competitively based on achievement in the National Primary School Examination (NPSE), an examination taken upon completing primary education (World Bank, 2007). By comparison, admission to primary education, theoretically at least, is based on attaining age 6.

Preliminary analysis was first conducted in Stata version 12 before fitting the multilevel model in MLwiN version 2.30. Sampling weights obtained from the Sierra Leone DHS were used in the preliminary analysis but not in MLwiN. The Sierra Leone 2008 DHS over-sampled urban areas, thus requiring weights to be used when conducting national-level analyses (see Government of Sierra Leone, 2009 for further discussion of sampling weights). In the preliminary analysis, univariate and bivariate analyses were performed to understand the distribution of the data and to derive basic correlations between predictor variables and the outcome using two way contingency tables and chi-squared tests. The bivariate analysis is useful for showing how school attendance varies by background characteristics and area of residence. However, because some of the predictors are correlated with one another, the bivariate analysis does not give any indication of the relative significance and strength of the independent variables in predicting the outcome. To achieve this end, multiple logistic regression with multilevel techniques was used in MLwiN. During the model specification Wald tests were performed to assess the contribution of individual covariates and, to assess whether a reference of a categorical variable was significantly different from the contrast groups of that variable. The Likelihood Ratio Test was used to ascertain the joint significance of group variables as well as the contribution of random and contextual effects.

The generic three-level model can be expressed as follows:

$$\log\left(\frac{\pi_{ijk}}{1-\pi_{ijk}}\right) = \beta_{0jk} + \beta_1 x_{1ijk} + \beta_2 x_{2ijk} + \dots + \beta_f x_{fijk} + \gamma_1 Z_{1jk} + \gamma_2 Z_{2jk} \dots + \gamma_m Z_{mjk} + \lambda_1 h_{1k} + \lambda_2 h_{2k} + \dots + \lambda_r h_{rk}$$

$$\beta_{0jk} = \beta_0 + \nu_{0k} + u_{0jk} + e_{0ijk}$$

Child level variables: x_1, x_2, \dots, x_f

Household level variables: z_1, z_2, \dots, z_m

Community level variables: h_1, h_2, \dots, h_r

Children are represented by $i(1 \dots I)$. Households are shown by $j(1 \dots J)$ and clusters are indicated by $k(1 \dots K)$. The response $\log(\pi_{ijk}/(1 - \pi_{ijk}))$ is for child i in household j in cluster k . x represents a child level predictor and β is the associated unstandardised coefficient for this predictor. z is a household level predictor and γ shows the corresponding coefficient for that predictor. h is a community level variable and λ is the associated coefficient. u_{0jk} is the random component at the household level and shows the variability of attending school between children from different households; ν_{0k} is the random intercept at the cluster level showing the degree of variation in school attendance at this level. It is assumed that u_{0jk} has a normal distribution with zero mean and variance $\sigma_{u0}^2 : u_{0jk} \sim N(0, \sigma_{u0}^2)$. ν_{0k} also has a normal distribution with zero mean and variance $\sigma_{\nu0}^2 : \nu_{0k} \sim N(0, \sigma_{\nu0}^2)$. The variance for the child level is shown by e_{0ijk} . In multilevel logistic regression, however, normality is not assumed for level-1 variance since this is constrained to be 1; the variance for the child level is therefore not estimated for the current analysis.

A two level model was fitted for the 12–14 year old sample as the variance at the household level was not statistically significant after controlling for all the covariates ($p > .05$). For the 6–11 year old sample, the variance at the household and cluster levels were still significant after fitting the conditional model. For both samples, 'farm' and 'visited health facility' were excluded from the analysis. The former variable had a strong correlation with 'work' and 'area of residence' such that the majority of children who responded 'yes' to working in a family business or farm also responded 'yes' to having worked in the week prior to the survey; they also disproportionately lived in rural households. Similarly, 'visited health facility' correlated strongly with poor community and area of residence. Further, when controlled for in the regression analyses, the two variables did not significantly contribute to explaining the variation in school attendance and they were not significantly associated with the outcome. For these reasons, they were excluded from the analysis. Note that no significant interactions were observed between the proportion of mothers with secondary or higher education and any of the covariates named in Table 1 above. A significant interaction was however observed between area of residence and the proportion of poor people in a community for children aged 6–11.

The model was fitted in three stages. In the first step, all individual and household level variables were controlled for along with the proportion of mothers with secondary or higher education in a community and random intercepts at the household and cluster levels (Model 1). In step 2, conditional on controlling for the variables in step 1, all other community variables were added: the proportion of poor people in a community (Model 2) was first added followed by the proportion of men and women engaged in agriculture as a main source of livelihood in a community (Model 3). Step 3 developed the model in step 2 by including area of residence and administrative region (Model 4). This modelling process was intended to disentangle the relationship between children's school attendance and the proportion of mothers with secondary or higher education in a community from mediating

effects which may occur through other community or regional factors such as those considered in the present analysis. Studies have shown that living in poor communities, rural communities, and agricultural communities lowers school attendance (Chisamya et al., 2012; Colclough et al., 2000). The relationship between school attendance and these community factors may not necessarily operate independently of each other since, for instance, agricultural livelihood and lower levels of infrastructural development are more likely to be present in rural communities (Moyi, 2012; Siddhu, 2011). Rural communities in turn tend to have lower levels of women's education due to unfavourable cultural attitudes towards girls' education, traditional attitudes to women which position women as subservient and as home makers, and poor school provision (Bekalo et al., 2003; Warrington and Kiragu, 2012). The modelling procedure in steps 2 and 3 are intended to observe whether the relationship between school attendance and the proportion of mothers with secondary or education in a community is robust.

Studies have shown that the relationship between children's schooling and parents' educational attainment differs for fathers' and mothers' education with fathers' education typically showing a stronger effect on children's schooling outcomes (Huisman and Smits, 2009; Sen and Clemente, 2010). If this observation is true in the Sierra Leonean context, it is likely that some of the effect captured by mothers' education is reflecting the unobserved effect of fathers' education. The data used for the present analysis had some limitations which restricted an adequate exploration of this differential relationship between mothers' and fathers' education. Recall that identifying a child's parent was only possible for children who lived in the same household as their parents. Of the 12,403 children aged 6–14 in the household dataset, 10,458 had both parents alive and 5,621 of these non-orphans lived in the same household as both parents. Separate preliminary analyses were performed on the reduced sample of children who lived in the same household as both parents.

To model school attendance with both parents education, variables were added incrementally as in the modelling process above. To begin with, in step 1, controlling for a random intercept at the household and community levels, all individual and household variables along with mothers' community education were added. Next, fathers' education was added followed by the addition of fathers' community education. For the next two steps the remaining community predictors were included in the model after which area of residence and administrative region were added. The results are presented below.

4. Results

4.1. Preliminary

4.1.1. Sample characteristics

The range in the community proportion of mothers with secondary or higher education was 0–0.8; the mean was 0.11 with a standard deviation of 0.16. Table 2 shows the percentage distribution of all children aged 6–14 years by background characteristics. Over half of the sample was age 6–11 years (69.4%). There were slightly more girls than boys (51.4% compared with 48.6%). Seventy-nine percent of children had mothers who had not attended formal education; only 1.5% of mothers had attained higher education. The percentage of children whose mothers had attained primary and secondary education was the same: 8.9%. Forty percent of children lived in poor households. The majority of children lived in rural areas (70.9%) and in the Northern region (48.7%).

Table 2

Percentage distribution of children aged 6–14 whose mothers are alive by socio-demographic background, Sierra Leone, 2008.

Variable	% (n)	Variable	% (n)
Age (years)		Head's sex	
6–11	69.4 (5177)	Male	79.0 (5893)
12–14	30.6 (2282)	Female	21.0 (1566)
6–14 year olds attending correct level of education		Mother's education	
No	49.6 (3700)	None	80.7 (6019)
Yes	50.4 (3759)	Primary	8.9 (664)
Sex		Secondary	8.9 (664)
Boy	51.4 (3834)	Higher	1.5 (112)
Girl	48.6 (3610)	Poor household	
Work		Yes	39.8 (2969)
No	75.0 (5594)	No	60.2 (4490)
Yes	20.3 (1514)	Rural residence	
Missing	4.7 (351)	Yes	70.9 (5288)
Chores		No	29.1 (2171)
No	72.7 (5421)	Region	
Yes	22.5 (1680)	Northern	48.7 (3633)
Missing	4.8 (359)	Eastern	18.7 (1395)
		Southern	18.3 (1365)
		Western	14.3 (1067)

Note: All figures are weighted using the sampling weights from the Sierra Leone Demographic and Health Survey.

4.1.2. School attendance by children's background

Results from chi-squared tests for two way contingency tables assessing the association between attending school at the correct level and predictor variables are presented in Table 3. The results show that the outcome variable was significantly correlated with many of the predictors; but sex, work and head's sex did not significantly correlate with the outcome ($p > .05$). Age of the child had the strongest association with school attendance followed by area of residence, mother's education, and region ($p < .01$). Mother's education was positively associated with attending

Table 3

Percentage distribution of attending correct level of education among children aged 6–14 whose mothers are alive by socio-demographic background, Sierra Leone, 2008.

Variable	% (n)	Variable	% (n)
Age*		Poor household*	
6–11	63.2 (5177)	Yes	42.8 (2969)
12–14	21.5 (2282)	No	55.4 (4490)
Sex		Mother's education*	
Boy	50.3 (5893)	None	46.5 (6019)
Girl	50.5 (1566)	Primary	60.7 (664)
Chores*		Secondary	70.0 (664)
No	46.6 (3834)	Higher	86.3 (112)
Yes	51.7 (3252)	Rural residence*	
Missing	48.4 (373)	Yes	44.5 (5288)
Work*		No	64.7 (2171)
No	51.8 (5594)	Region	
Yes	46.6 (1514)	Northern	44.2 (3633)
Missing	49.8 (351)	Eastern	51.6 (1395)
Head's sex		Southern	50.9 (1365)
Male	50.3 (5893)	Western	69.3 (1067)
Female	50.8 (1566)		

Note: chi-squared test results for two way contingency tables testing for association between attending school at correct level and predictor variables.

* $p < .01$. All figures are weighted.

school at the correct age: 47% of children with mothers who had no education were attending the correct level of education compared to 87% of children whose mothers had attained higher education. Children aged 6–11 years had higher attendance at primary education than did children aged 12–14 at junior secondary education: 63.2% compared with 21.5% ($p < .01$). Children in urban areas (64.7%) and non-poor households (55.4%) had significantly higher attendance than their counterparts in rural areas (44.5%) and poor households (42.8%).

4.1.3. School attendance and mothers' and fathers' education

Table 4 shows the regression results from modelling children's school attendance and mother's as well as father's education. Among 6–11 year olds, mothers' education was only significant in step 1, the variable lost significance after controlling for fathers' education. The proportion of mothers with secondary or higher education was also significant until the proportion of fathers with secondary or higher education in a community education was controlled for. Fathers' education however was significantly associated with primary school attendance in all modelling steps except in step five where it lost significance at $p < .05$ when area of residence and administrative level were added to the modelling process. Among 12–14 year olds, mothers' education was significant at all stages of the modelling process. The proportion of mothers with secondary or higher education was also significantly related to junior secondary school attendance at all stages except in the final stage having controlled for area of residence and administrative region. Fathers' education, by contrast, did not significantly predict school attendance in any of the models. Similarly, the proportion of fathers with secondary or higher education in a community was not a significant predictor of attending JSS except in step 3.

4.2. Regression models

The results from the regression analyses where father's education is not controlled for are presented in Tables 5 and 6 which show the estimated beta coefficients and their associated standard errors. Table 5 shows the results for primary school attendance and Table 6 shows the results for junior secondary school attendance. The interpretation that ensues is conditional on controlling for the predictors in the respective models that are discussed. The results are interpreted using mean predicted probabilities which are calculated in MLwiN by averaging over simulated values of the community variance estimate from the fitted model (Steele, 2009). All probabilities presented refer to the coefficients in Model 4 as this is the final model.

The relationship between primary school attendance and the proportion of mothers with secondary or higher education in a community is significant, conditional on individual, household and community covariates (Models 1–3). However, this relationship loses significance after area of residence and administrative region are added in Model 4 suggesting that this relationship

reflects differences between rural and urban residence and regions. A child's own mother's education is however significantly related to primary school attendance in all models. Compared to children whose mothers have no education, children whose mothers have attained primary, secondary or higher education are significantly more likely to attend primary school between the ages of 6 and 11 years. In Model 4, for children whose mothers have no education, the probability of attending school is .653. The probability of attending school for children whose mothers have primary education is 7% higher than that for children whose mothers have no education ($p < .05$). The probability of attending school for children whose mothers have attained secondary or higher education is 14% and 22%, respectively, higher than children whose mothers have not received any formal education ($p < .05$).

The likelihood of attending junior secondary school among 12–14 year olds is significantly related to the proportion of mothers with secondary or higher education in a community in all models. The relationship is such that, irrespective of a child's own mother's educational attainment, living among mothers with secondary or higher education is predicted to enhance the probability of attending junior secondary school. The probability of a child attending school when he/she lives in a community where there are no mothers with secondary or higher education is .187. Using this probability as a base, a ten percent increase in the proportion of mothers with secondary or higher education in a community is estimated to enhance the probability of attending junior secondary school by 8%. A fifty percent increase in the proportion of mothers with secondary or higher education in a community will result in an increase of 45% in the probability of attending JSS.

Children living in poor and rural communities have a lower likelihood of attending primary school. The significance of living in a poor community is however dependent on controlling for area of residence as shown by comparing Models 3 and 4 in Table 5. An interaction between the two predictors shows that children living in poor rural communities are significantly less likely to attend school than children in poor urban communities (refer to Fig. 1). The predicted probability of attending primary school in a community with no poor household is .705 in rural areas and .801 in urban areas, conditional on controlling for the present interaction and all the covariates in Table 5. Using this probability as the reference, a ten percent increase in the proportion of people living in poor households reduces the probability of attending primary school by 3% in rural areas compared to a .1% reduction in urban areas. This difference in the depreciation of predicted probabilities widens to 12% in rural areas and .8% when the proportion of poor people in a community is increased by 40% and to 29% in rural areas and 2% in urban areas when the proportion of poor people in a community is increased by 90%. Living in a rural area also reduces school attendance at junior secondary education. The probability of attending JSS in rural areas is 41% lower than in urban areas: .168 vs. .285.

Table 4
Results showing significance testing at $p < .05$ from modelling the relationship between primary/junior secondary school attendance and parents' education.

Modelling process	Mother's education		Mothers' community education		Father's education		Fathers' community education	
	6–11	12–14	6–11	12–14	6–11	12–14	6–11	12–14
Step 1 – individual and household level variables, mothers' education and mothers' community education	Yes	Yes	Yes	Yes	Na	Na	Na	Na
Step 2 – all predictors in step 1 and fathers' education	No	Yes	Yes	Yes	Yes	No	Na	Na
Step 3 – all predictors in step 2 and fathers' community education	No	Yes	No	Yes	Yes	No	No	Yes
Step 4 – all predictors in step 3 and all other community predictors	No	Yes	No	Yes	Yes	No	No	No
Step 5 – all predictors in step 4 and area of residence, administrative region	No	Yes	No	Yes	Yes	No	No	No

Table 5

Estimated beta coefficients and their associated standard errors (se) for attending primary school among 6–11 year olds in Sierra Leone, 2008.

Predictors	Model 1	Model 2	Model 3	Model 4
<i>Mothers education</i>				
Mother's education				
Primary	.456 (.193) [*]	.459 (.196) [*]	.450 (.201) [*]	.409 (.207) ^{**}
Secondary	.746 (.240) [*]	.773 (.244) [*]	.781 (.250) [*]	.781 (.258) [*]
Higher	1.281 (.609) ^{**}	1.311 (.619) ^{**}	1.304 (.637) ^{**}	1.315 (.655) ^{**}
Proportion of mothers with secondary or higher education in community	4.274 (.580) [*]	1.045 (.605)	1.794 (.727) [*]	.202 (.805)
<i>Other predictors</i>				
Sex				
Girl	.149 (.093)	.151 (.094)	.152 (.095)	.152 (.097)
Child worked in last week				
Yes	-.032 (.147)	-.023 (.149)	-.007 (.152)	-.009 (.156)
Child does household chores				
Yes	1.311 (.120) [*]	1.328 (.121) [*]	1.367 (.124) [*]	1.411 (.127) [*]
Sex of household head				
Female	-.028 (.143)	-.026 (.146)	-.051 (.149)	-.067 (.154)
Poor household				
Yes	-.640 (.123) [*]	-.544 (.137) [*]	-.573 (.141) [*]	-.614 (.145) [*]
Proportion of people living in poor households in community		-.554 (.316)	-.343 (.315)	-1.138 (.349) [*]
Proportion of men and women engaged in agriculture in community			-1.681 (.309) [*]	-.661 (.361)
Rural residence				
Yes				-1.434 (.282) [*]
Region				
Eastern				.401 (.201) ^{**}
Southern				.528 (.215) ^{**}
Western				.152 (.315)

Note: The coefficients for missing cases are not presented, as they did not significantly differ from the reference.

^{*} $p < .01$.

^{**} $p < .05$.

Household poverty is a significant predictor of both primary and junior secondary school attendance in all models. The difference in probability of attending school between poor and more affluent households is greater for junior secondary education

than primary education. The probability of a child from a poor household attending primary school is 12% lower than that for a child from an affluent household: .615 vs. .699. At junior secondary school, poor children are 34.7% less likely to attend school than

Table 6

Estimated beta coefficients and their associated standard errors (se) for attending junior secondary school among 12–14 year olds in Sierra Leone, 2008.

Predictors	Model 1	Model 2	Model 3	Model 4
<i>Mothers education</i>				
Mother's education				
Primary	-.082 (.190)	-.083 (.190)	-.153 (.188)	-.188 (.118)
Secondary	.008 (.174)	.004 (.175)	.022 (.172)	.03 (.173)
Higher	1.546 (.417) [*]	1.540 (.417) [*]	1.467 (.414)	1.407 (.414) [*]
Proportion of mothers with secondary or higher education in community	3.535 (.381) [*]	3.578 (.407) [*]	1.837 (.466) [*]	1.235 (.528) ^{**}
<i>Other predictors</i>				
Sex				
Girl	-.045 (.110)	-.044 (.110)	-.051 (.110)	-.043 (.111)
Child worked in last week				
Yes	-.099 (.136)	-.099 (.136)	-.060 (.135)	-.03 (.136)
Child does household chores				
Yes	.149 (.177)	.146 (.178)	.138 (.176)	.217 (.175)
Sex of household head				
Female	.077 (.128)	.077 (.128)	.064 (.127)	.076 (.127)
Poor household				
Yes	-.488 (.126) [*]	-.511 (.147) [*]	-.515 (.147) [*]	-.559 (.148) [*]
Proportion of people living in poor households in community		.085 (.283)	.250 (.276)	-.042 (.306)
Proportion of men and women engaged in agriculture in community			-1.570 (.248) [*]	-1.020 (.299) [*]
Rural residence				
Yes				-.704 (.216) [*]
Region				
Eastern				-.215 (.176)
Southern				-.281 (.193)
Western				-.135 (.204)

Note: The coefficients for missing cases are not presented as they did not significantly differ from the reference

^{*} $p < .01$.

^{**} $p < .05$.

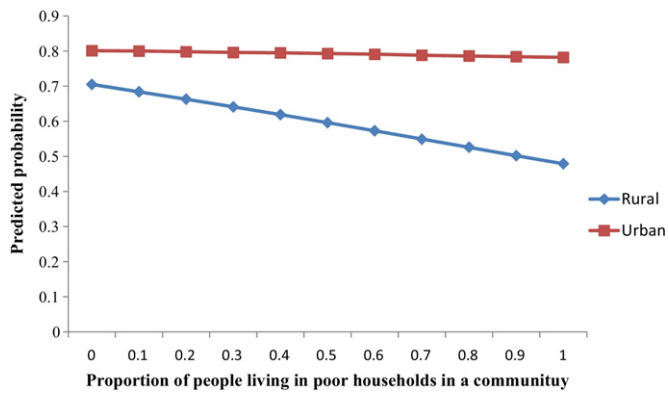


Fig. 1. Line graph showing predicted probability of attending primary school by area of residence and proportion of poor people in a community in Sierra Leone among 6–11 year olds.

their more affluent counterparts: .164 vs. .251. No significant difference was observed between boys and girls for attending both primary and junior secondary school.

The community variance estimates for Models 4 for primary and junior secondary school attendance were significant ($p < .05$). This suggests that after controlling for the selected predictors, there is unexplained variation between communities in both primary and junior secondary school attendance. These results suggest a significant heterogeneity between communities in the probability of attending school. The variation for primary school attendance (.791) is higher than that for junior secondary attendance (.196). The variance for the household level was not statistically significant in the final model for junior secondary school attendance but remained highly significant for primary education (3.266, $p < .05$). This suggests that whilst the probability of attending school is similar for children living in the same household, there is large variability between households indicating that children from different households do not have similar access to primary education, controlling for the covariates in Model 4.

5. Discussion

Living among mothers with secondary or higher education has been found to be associated with junior secondary school attendance but not with primary school attendance. One possible explanation for this difference is as follows. The post-war period in Sierra Leone experienced huge international investments and promotional campaigns to expand access to primary education. As such, households are more likely to be familiar with primary education than secondary education irrespective of their educational attainment. Access to junior secondary education remains limited due to poor investment and progression to this level of education. Women living in communities with a higher proportion of women who attained secondary education may become aware of junior secondary policies and advantages of such schooling. There is a possibility therefore that mothers who have lower levels of education, living among mothers with higher levels of education, have an increased likelihood of passing educational aspirations to their children similar to the educated mothers.

The observation that living in a community with high educational attainment can enhance children's schooling prospects has been noted in other countries such as in Kenya (Oketch et al., 2012), Ethiopia (World Bank, 2005) and Tanzania (Bommier and Lambert, 2000). In Kenya, children's educational attainment has been found to be significantly higher in neighbourhoods with a high average level of education and educational aspiration among parents/guardians. The level of education parents/guardians

aspired for their children was strongly positively related to their own level of education. Neighbourhoods with a high parental/guardian educational attainment and aspiration were largely characteristic of non-slum communities; these communities also have wider and better quality provision of schools and are more affluent relative to slum communities. Oketch et al. (2012) study, though not specifically focused on mothers' education, lends support to the argument advanced in the present paper in that it demonstrates that the benefits of attaining high levels of education can extend beyond the household level through observation and interaction at the community level. The normative behaviour in sending children to school and the value attached to gaining an education by parents/guardians with high levels of education influences those around them to pursue similar ambitions and actions. Other factors within such a community setting, namely school provision and infrastructural development, are significant in realising these ambitions.

Children living in poor rural communities were found to be significantly less likely to attend primary school than children in poor urban communities. The provision of primary school in Sierra Leone is strongly associated with access to services and amenities within a community and the place of residence in which a child lives (Government of Sierra Leone, 1996). Historically, the provision of primary schools was mainly provided in the capital city, Freetown, and other main district capitals like Bo and Kenema. The Northern region had the fewest schools and the lowest levels of educational participation (Government of Sierra Leone, 1996). The Eastern and Southern regions had similar levels of school attendance and school infrastructure. The Western region had the largest supply of educational infrastructure and the highest levels of school attendance (Government of Sierra Leone, 1996). Since the cessation of the civil war, post-war reconstruction efforts invested in the development of primary schools and other social services such as health and water and sanitation community projects (Government of Sierra Leone, 2003). Although post-war reconstruction expanded access to other localities beyond the main district capitals, the level of provision and development is still far greater in urban areas than in rural areas. Therefore, a child living in a poorly developed community in an urban area will have higher probability of attending primary school than a child living in similar conditions in a rural area because he/she is more likely to live in closer proximity to other communities which are likely to be developed and have primary schools (Government of Sierra Leone, 2012). This means that even if a child in an urban area does not live within a community that is developed or has a primary school, he/she may still be able to access a school in neighbouring communities; an option which is less likely in rural areas due to: (1) the relatively lower levels of development; and (2) more sparsely populated households meaning greater travelling time to other localities and hence higher costs of schooling.

Low school attendance in rural communities has been observed in other studies. A combination of inadequate school provision, adverse cultural practices and household poverty in rural communities can limit school participation, especially for girls. Adverse cultural beliefs hinder girls' participation by positioning women as home-makers, physically and intellectually weaker than men, and subservient to men (Colclough et al., 2000; Warrington and Kiragu, 2012). These constructions are exerted at the household and community levels; they are also institutionalised so that even when girls do enter schools or employment their experiences are gendered (Chisamya et al., 2012; Dunne, 2007). Children in rural areas are also less likely to attend school due to higher levels of poverty (Lewin and Sabates, 2012). The direct and indirect costs of education are often unaffordable to poor households. The opportunity costs to education further deter households from sending their children to school where the child's

time is perceived as being better spent in employment, on a farm, or in the home (Admassie, 2003). As children become older, the cost of attending school becomes greater and so they are removed from school. For older girls, research has found that attrition is a common observation in rural areas for cultural and economic reasons related to the preservation of their virginity (to secure a high bride price) and initiation ceremonies in preparation for early marriage (Bekalo et al., 2003; Moyi, 2012).

Controlling for other factors, no difference was observed between boys and girls in attending primary and secondary school in Sierra Leone. This is not to say that boys and girls experience similar educational opportunities in the country. Indeed, the significance of dominant patriarchal cultural values in limiting girls' access and progression in the education system was recognised in the country's 1997–2006 National Education Master Plan (Government of Sierra Leone, 1997, p. 131). Furthermore, Maclure and Denov, 2009 argue that in spite of advocacy campaigns by non-governmental organisations to promote girls' education in Sierra Leone, patriarchal norms remain widespread serving to undermine progress towards fully empowering women. Following the theoretical basis of the current paper, the relationship observed between the proportion of mothers with secondary or higher education in a community and school attendance could have a significant policy implication for improving attendance at post-primary school. That is, if mothers' education at a community level operates through value modification and changes to cultural tastes, it may be presumed that future investments in girls' education might generate a process of change where prevalent traditional beliefs are gradually modified as girls schooling becomes a common reality of universal education (Caldwell, 1980). Such policy intervention might bear greater benefits in rural communities since traditional cultural norms are more typical of these settings and thus reducing cultural barriers might enable a significant number of girls to access the education system.

In support of earlier research, this paper has found that children living in poor households are significantly less likely to attend both primary and junior secondary school. This result reflects evidence from the country's 2003/2004 Integrated and Household Survey which showed that households were incurring significant expenditure in sending their children to school. The survey found that among 6–11 year olds attending primary school, the average cost of registration fees was Le 5112 (conversion: Le 1 = £.00014 as of August 2013); 56% did not pay any registration fees, 43% paid between Le 1–100,000 and 1% paid over Le 100,000 (Government of Sierra Leone, 2007). At JSS, only 8% of children aged 12–14 years did not pay registration fees (Government of Sierra Leone, 2007). In addition to paying for registration, households pay for other costs such as school uniforms, books, transportation and food. There is a continuing cost of attending primary education even after the introduction of free and universal education policies in Sierra Leone. Whilst mothers' education might help to generate more favourable attitudes towards schooling, households will be unable to send their children to school if the cost of doing so is beyond their capacity. In addition to a focus on girls' education therefore, it is recommended that pro-poor school policies be re-introduced. These policies may take the form of waiving tuition and registration fees as well as subsidising the cost of learning supplies and school uniform.

6. Conclusion

Girls' education has formed an important part of global education policy since 1990 through the Education for All agenda. This international commitment was reaffirmed in 2000 as part of the World Education Forum and Millennium Development Goals. Over two decades, the EFA policy has endeavoured to improve girls'

schooling and erode gender disparities in primary and secondary education. Countries in sub-Saharan Africa and in other developing regions have made significant progress towards reducing gender inequalities although some countries lag behind in this process. The rationale for the policy emphasis on girls' education has typically been associated with the benefits of women's education in improving wellbeing, health outcomes, poverty and development. With regard to children's schooling, women's education is often understood as operating through an economic channel insofar as mothers' with higher levels of education are more likely to have higher incomes and thus are better placed to sponsor their children's schooling. This interpretation however is arguably more applicable to father's education because of the higher household earnings and the greater decision making power which they tend to hold in African households. The objective of this paper was to conceptualise the relationship between mothers' education and children's school attendance as operating through the values, knowledge and modern ethics imparted through high educational attainment. It has been argued that this relationship is positive and extends beyond the household level so that, irrespective of their mother's own level of education, children living in communities with a high proportion of mothers' with secondary or higher education will have an increased likelihood of attending school.

Analysis of the 2008 Sierra Leone Demographic and Health Survey shows that living among mothers with high educational attainment does increase the likelihood of a child attending school at junior secondary education but not at primary education. Among 6–11 year olds, the level of a child's mother's educational attainment is related to the probability of attending primary school. Children whose mothers had attained primary, secondary or higher education were significantly more likely to attend school than those whose mothers had no formal education. Children living in poor rural areas were worse off in accessing primary school than children in poor urban areas. Children in rural areas also had significantly lower attendance at junior secondary school than those in urban areas. All things being equal, there was no difference between boys and girls in attending school. However, children from poor households are less likely to be found in school than children from more affluent households.

Sierra Leone is committed to achieving 'Education for All'. In 2001 free and compulsory primary education was introduced. The principle of compulsion was extended to junior secondary school through the 2004 Education Act although attendance at this level was free only for girls in two of the country's four regions. School infrastructure was developed as part of the post-war reconstruction efforts and non-governmental and Christian organisations adopted pro-poor and girl friendly policies to expand access. These efforts have made significant contributions. However, the results from this paper suggest that if Sierra Leone is to realise universal education and in so doing improve the country's poor level of female education, much more needs to be done. One recommendation from this study is that, given the significance of the diffusion of educational advantage at the community level, future policies may seek to develop community based programmes to increase awareness of post-primary education as well as promote attendance at this educational level. These programmes should target poor rural communities since cultural norms in these areas tend to particularly disadvantage girls' schooling. Further, policies should try and reduce the cost of sending children to school by, for instance, removing both tuition and registration fees as well as providing educational supplies because these costs continue to impinge on household budgets. As the cost of secondary education is far greater than primary education, additional programmes like Bangladesh's female secondary stipend which purposely target girls' post-primary education should be considered to retain girls in the education system.

Future research should try to understand the different pathways through which mothers' education may affect school participation in an African context. When data permits, further exploration of these pathways may enhance our understanding of the relationship between mothers' education and children's school attendance. Where data allows, such analysis should control for the effects of fathers' education.

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