Family Planning Outcomes and School Attendance in Sub-Saharan Africa

Abiba Longwe & Jeroen Smits

Abiba Longwe, MSc, Radboud University Nijmegen, Nijmegen, Netherlands
Jeroen Smits, PhD, Radboud University Nijmegen, Nijmegen, Netherlands

Address of Correspondence:
Abiba Longwe
Nijmegen Center for Economics (NiCE)
Institute for Management Research
Radboud University Nijmegen
P.o. Box 9108, 6500 HK Nijmegen,
The Netherlands
Phone: +31243611436/5890
Fax: +31243612379
a.longwe@fm.ru.nl; j.smits@fm.ru.nl

Abstract

To what extent and in which ways does poor reproductive health at the household level influence educational enrollment of young children in Sub-Saharan Africa? This paper sets out to answer this question by analyzing household and district level data on 103,000 primary-school aged children in 287 districts of 30 Sub-Saharan African countries. Negative effects on school enrollment are found for children with short preceding and succeeding birth intervals, who have a very young sibling, or whose mother is pregnant. These findings remain intact when controlling for socioeconomic and demographic household characteristics and economic and health-related context factors. Interaction analysis shows that many effects of SRH outcomes depend on the context in which the household is living. This stresses the importance of a situation-specific approach. Findings indicate that helping families planning their pregnancies better increases children's schooling chances and leads to more effective use of household and context resources.

Introduction

Sexual and Reproductive Health (SRH) is a human right, essential for human development and achievement of the Millennium Development Goals (MDG). Promotion of family planning in countries with high birth rates has the potential to reduce poverty and hunger, avert over 30% of all maternal deaths and nearly 10% of childhood deaths, and to contribute substantially to women's empowerment, achievement of universal primary schooling, and long-term environmental sustainability (Cleland et al., 2006). Smaller families and wider birth intervals resulting from use of contraceptives may allow families to invest more of their resources in each child's nutrition, health, and education (Singh et al., 2004).

In developing countries, complications of pregnancy and childbirth (resulting from poor SRH conditions) are the principal cause of female mortality in the reproductive ages (Maine et al. 1994) and have important long and short-term implications for women's health, productivity and their investments in children. Investments in general health and SRH have been found to contribute to economic growth by reducing production losses, increasing children's ability to learn, and freeing up resources that would otherwise have been spent on treating illnesses (Seligman et. al. 1997; USAID 2005). However, although short run associations of family planning programs with adoption of contraception or age-specific fertility have been assessed, there is much less research on the long run consequences of such programs for socio-economic outcomes at the household level (Schultz 2008).

This paper concentrates on those long run consequences of family planning outcomes at the household level in Sub-Saharan Africa. Using data on 103,000 children of 73,000 mothers in 30 countries we aim to find out to what extent the spacing and timing of births affect the chances of African children to enroll in primary school. The data are analyzed from the perspective of the children. We study whether and to what extent their schooling chances are influenced by the length of their preceding and succeeding birth interval, pregnancy of their mother and the presence of very young children in the household.

Because SRH factors are among many factors that influence young children's schooling, our model also includes socio-economic and demographic characteristics of the household in which the child lives and economic and health-related context factors. Both sub-national regional and national context factors are used. The sub-national level is represented by 287 regions (henceforth called districts) within the countries. Because the

influence of the larger institutional context is captured by the national level, the district variables are expected to represent the more near-by environment of the household (compare Smits, et al., 2005).

To address within the framework of large-scale quantitative research the fact that each situation is unique and the effects of the various factors may differ depending on the circumstances, besides the direct effects of the SRH factors on educational participation also the interactions between them and the other household and context variables are studied. The information thus obtained may be helpful in developing tailor-made policy interventions aimed at improving educational participation in specific situations.

Theoretical background

Figure 1 shows the different groups of factors that are included in our analytical model and their expected direction of influence. In the following paragraphs, we expound on these factors.

The effect of the reproductive health factors on educational participation are indicated by arrow A. The first of them, child spacing is supposed to benefit the mother, the child, as well as all other family members. It allows for time between births so that the mother can rest between pregnancies and maintain good health, be less tired and have more energy (Conde-Agudelo et al, 2007; Conde-Agudelo et al, 2006). She therefore can give more attention to her children and help ensure good health for the family. A well spaced child grows up stronger and healthier and is more likely to enroll in school (Nigerian government 2003).

Not much research on effects of birth spacing on education is available, but negative effects of short birth intervals on early childhood mortality are well established (Yigzaw & Enquselassie, 2010;Maitra & Pal,2008; Makepeace & Pal,2006; Whitworth & Stephenson, 2002; Alam, 1995; Ronsmans, 1996). Longer birth intervals allow parents to devote more time to each child in the early years, ease pressures on the family's finances and give parents more time for activities other than child rearing (USAID, 2006; Shrestha & Manandhar, 2003). Studies focusing explicitly on effects of short birth spaces on education in developed countries (Sweden and South Carolina) have documented negative effects on school readiness and educational attainment (Pettersson-Lidbom and Thoursie 2009; Hayes et al., 2006).

UN estimates reveal that still about 1000 women die daily from pregnancy-related complications, of which 570 live in sub-Saharan Africa and 300 in South Asia (WHO,

2010). Given these complications, girls are often pulled out of school to care for their siblings. Pregnancy of the mother and the presence of young children in the household are therefore expected to reduce the chances of older children to enroll in school. Access to -- as well as correct and consistent use of -- contraceptives can therefore significantly increase girl's schooling (UNFPA 2005). Also the presence of a baby in the household may have a negative effect on other children's schooling, because of increasing care needs of the household (Chernichovsky 1995).). Using data from Ghana, Lloyd and Gage-Brandon (1993) showed that teenage girls are relatively more likely to be withdrawn from school as new siblings are added to the family.

Control factors

Besides by reproductive health outcomes, educational enrollment of African children is influenced by many other factors, both at the level of the household and at the level of the context in which the household lives. Our model therefore contains a number of control factors that are known or expected to be related to educational enrollment (arrows B in Figure 1). Most of them are discussed in detail by Huisman and Smits (2009). At the household level, parental education, father's occupation, and household wealth have been known for long to be important determinants of educational participation in both the developed and developing world countries (Coleman et al., 1966; Jencks, 1972; Shavit & Blossfeld, 1993; Tansel, 2002; Glewwe & Jacoby, 2004; Mingat, 2007; Evangelista de Carvalho Filho, 2008). Demographic characteristics of the child -- age, gender and birth order (Chiswick and DebBurman 2004; Ejrnaes and Portner 2004; Kirdar et al. 2007; Dayioglu et al. 2009) -- as well as of the household they live in – presence of the parents, extended or nuclear family, number of siblings, and age at which the mother got her first child (Booth and Kee 2005; Bradbury 2007; Wichman et al. 2006; Li, Zhang and Zhu 2008) -- are also known to influence education enrollment

Besides these household-level factors, characteristics of the context the household lives in may affect the ability of children to enroll in education. In less developed regions of a country and in rural areas, schooling may entail higher production costs due to more limited availability and accessibility of schools (Hazarika 2001; Smits and Gunduz-Hosgor 2006; Mugisha 2006). Even when schools are available in these areas, they may be of lower quality because of poor facilities and teachers who are less motivated as these are less popular places for them to live and to work. Returns to education are also higher in cities because there are better chances to find a white collar job (Hazarika 2001; Huisman

and Smits 2009). In more modern and urban areas there is also more impact of globalization, including the diffusion of value patterns that stress the importance of education and equality among sexes.

Potential relevant context factors that have not yet been studied very much are characteristics of the available health facilities in the area where a household lives. The presence of good and accessible health facilities can be expected to lead to a better general health status in the area of mothers and children, which may translate into a higher educational enrollment. SRH facilities are also important for educational participation. However, as they will have their major effect through the household-level SRH variables, we do not include them in our model.

Interactions with the context

The effects of SRH outcomes on educational participation of children need not be everywhere the same. Previous research has shown that, for example, the relationship between family size and educational attainment is likely related to a society's level of development, modes of production, and access to schooling, which in turn shapes the relative influence of the family size on the schooling of children (Desai, 1995; King, 1987; Lloyd, 1994; Maralani, 2008). Another example is the finding that higher levels of mothers education may dilute the effect that short birth intervals have on risk of child mortality (Whitworth & Stephenson, 2002).To find out whether also the effects of the SRH factors studied in this paper vary among circumstances, we perform an interaction analysis in which we study to what extent these effects depend on other characteristics of the household and characteristics of the context in which the household lives (as shown by arrows C in Fig.1). As little is known about effects of these SRH factors under different circumstances, this analysis is largely explorative of nature. However, it does not seem unreasonable to suppose that the benefits children can reap from favorable SRH outcomes at the household level – long birth intervals, no pregnant mother, no young siblings – are higher under more difficult circumstances. From this perspective we would expect to find stronger effects of these factors among families with less resources, in less developed areas, in rural areas, and in areas where the quality of the educational facilities is lower and the general health situation is worse.

Data and methods

To answer the research question, we have combined Demographic and Health Surveys (DHS) for 30 Sub-Saharan African countries. Our dataset contains information on all children aged 8-11 born from the women interviewed in the women's surveys. In total, 102,638 children (52,520 boys and 50,118 girls) born from 73,337 women were included. The household-level data on the children, their mothers and households was supplemented with context information at the district and nation-level. District-level information for 287 districts was derived by aggregating from the household surveys. The aggregation was possible because the surveys involved large samples and had a variable indicating the district.

Methods and variables

The data are analyzed with multilevel logistic regression models, including explanatory variables at the household, district and national level. With multilevel analysis it is possible to include explanatory variables at different levels simultaneously and to study interactions among levels (Hox 2002; Snijders and Bosker 1999). The analyses are performed separately for boys and girls. In all analyses robust standard errors (sandwich estimators) are used.

Dependent variable is a dummy variable indicating whether (1) or not (0) children aged 8-11 were attending school at the time of the interview. The upper age limit of 11 was chosen to restrict the analysis to primary education. The lower age limit was put at 8, because compulsory entry ages differ per country and not all children start schooling at the compulsory age (compare Huisman and Smits 2009).

Independent variables include SRH variables, other household-level factors, district characteristics and national characteristics. Child spacing is measured by two dummy variables indicating whether (1) or not (0) the preceding and succeeding birth intervals were less than two years. Presence of a young child in the family is measured by a dummy variable indicating whether (1) or not (0) a child aged less than 3 was present in the household. Pregnancy of the mother is measured by a dummy with categories (0) not pregnant and (1) pregnant.

Of the other household-level factors, father's occupation is measured as (1) farm, (2) lower non-farm and (3) upper non-farm. Employment of the mother is measured by two categories indicating whether (1) or not (0) the mother is gainfully employed. Father's education is measured by three categories: (1) none, (2) at least some primary, and (3) at

least some secondary. Due to low levels of education for women in sub-Saharan Africa, mother's education is measured by a dummy indicating whether (1) or not (0) she has at least some primary education. Household wealth is used as a proxy for income and is measured by an index constructed on the basis of household assets. Using a method developed by Filmer and Pritchett (1999), all households within the country were ranked on the basis of the available characteristics and divided into wealth index deciles. Whether the household is an extended family is measured with two categories: (0) nuclear family, and (1) extended family (more than two adults in the household). Age of the child and age of the mother at first birth are measured in years. For mother's age at first birth also a quadratic term is included in the model, because both starting getting children at a very young age and starting at a relatively old age point to an exceptional position of the mother. Number of siblings and birth order of the child are measured as interval variables.

Of the context factors, level of urbanization is measured by a dummy indicating whether (1) or not (0) the household lives in an urban area. District-level of development is measured by an index constructed on the basis of six variables aggregated from our household datasets: the percentages of households in the district with a fridge, car, telephone, television, electricity, or running water. Of these characteristics the mean was taken of the standardized values. Availability of health facilities in the district is indicated by the percentage of women in the district who delivered their last baby in a hospital and by the percentage of the last-born children of the women in our dataset who received a DTP vaccination. Public expenditure on education and national GDP per capita in Purchasing Power Parity (constant 2000 international dollar) are derived from World Bank (2007).

Children with a missing father were given the mean score of the other children in the database on fathers' education and occupation. Because there are dummies for missing father in the model, this procedure leads to unbiased estimates of these variables (Allison, 2001, p. 87). To address the fact that the effects of the SRH factors may differ depending on the situation of the household, also models with interactions between control factors and the SRH outcomes are estimated. To compute these interaction terms, centered versions of the involved variables are used. Given the large number of possible interactions, only significant interaction effects are included in these models.

Results

Tables 1 and 2 present the results of the multilevel analyses for boys and girls. Models 1 in Table 1 contain only direct effects of the explanatory variables. Models 2 contain beside direct effects also interaction effects between SRH factors and other factors. To keep the tables readable, the interaction effects are presented separately in table 2. All coefficients are odds ratios and are adjusted for all other variables in the model.

Models 1 in Table 1 show that the effects of most of the SRH variables are in line with expectations. The odds of attending school for both girls and boys are significantly reduced by short preceding birth intervals. The effect of a short succeeding birth interval is neither significant for girls nor for boys in Model 1. However, when the interaction effects are added to the model, the effect of the succeeding birth interval becomes significantly negative for both girls and boys. Overall, this effect is weaker than that of the preceding birth interval.

If there is a young sibling in the family, both boys and girls have lower odds of being in school. Pregnancy of the mother is not significant in Model 1, but shows the expected negative effect for both boys and girls in the interaction model. This indicates that mother's pregnancy is important under specific conditions.

The effects of the household-level control factors are largely in line with expectations. Age of the child, household wealth, parental education and occupation have significant positive effects on school attendance of both boys and girls. When the father is missing from the household or when the children live in an extended family, educational participation is significantly decreased. The same is true if the household is living in a rural area. Birth order has no effect on boys' school attendance, but is negatively related to girls' likelihood to attend school. Mothers' age at first birth has a parabolic effect. Both children born to relatively young and to relatively old mothers are less likely to attend primary school.

Most of the context factors show the expected effects on children's educational attendance. Attendance levels for boys and girls are significantly higher in more developed countries, in countries with higher public expenditure on education, in districts where more women give birth in a hospital and in districts where more children received a DTP vaccination. Only the effect of district level of development is not in line with expectations. Both boys and girls go significantly less to school in more developed districts. This may at first sight seem surprising, but might be due to the presence of several other development

related factors in the model (all other context factors and the indicator of living in a rural area), that all show effects in the expected direction.

Interaction effects

Table 2 presents the coefficients of the interaction analysis. As this analysis is largely explorative in nature – we have no clear expectations about interaction effects – no definitive conclusions can be drawn from it. However, this analysis is still important, because it gives a first impression of the degree to which and the way in which the effects of reproductive health outcomes vary across situations.

A first interesting conclusion that can be drawn from it is that, apart from some small changes in the magnitude of the coefficients, there are very few substantial differences between Models 1 and 2 for girls and boys. All household-level and context control factors with significant effects in model 1 remain significant and keep their sign in Model 2. The only substantial changes were the ones discussed above, regarding the effects of succeeding birth interval and mothers' pregnancy.

Table 2 shows that there are significant interaction effects with all four SRH variables, suggesting that all four vary to a certain extent among households with different characteristics or that live under different circumstances. With regard to birth interval, we see that girls with a short preceding birth interval can profit less from their mother's education and that girls with a short succeeding birth interval can profit less from public investments in education. Boys with a short succeeding interval suffer more when their father is missing and profit less from household wealth and investments in education. When the mother is pregnant, girls profit less from household wealth and boys again suffer more from a missing father. When there is a young child in the household, it is more important for girls that the father is present and that he has a high educational level. If there is a young sibling, girls also profit less of household wealth. Boys with a young sibling profit less of their father's education and from living in a city.

Conclusions

We have studied the effects of SRH outcomes (length of preceding and succeeding birth intervals, mother's pregnancy, and presence of a young sibling) alongside other household- and district-level factors on primary school attendance of 103,000 children aged 8-11 in 30 Sub-Saharan African countries. We used multilevel logistic regression analysis in order to include explanatory variables at different levels simultaneously and to study interactions among levels. Poor SRH outcomes were expected to reduce investment in human capital of children, because shorter birth intervals are negative for women's health and reduce the possibilities of mothers to give attention to their children in their vulnerable young years, and because pregnancy of the mother or presence of a young sibling might pull children, particularly daughters, out of school to help at home.

The findings of our study are largely in line with these expectations. Our analyses revealed that, in these countries, children who were born shortly after their preceding sibling, girls who were succeeded shortly by a younger sibling, children with a very young sibling and children with a pregnant mother all had significantly lower odds of being in school than children living in households with more favorable SRH outcomes.

A preceding birth interval of less than two years decreases these odds for boys and girls by about 15%; a similar succeeding birth interval decreases them by 7% for girls and 6% for boys. Having a pregnant mother decreases it by about 9% and presence of a sibling below age three in the family by 11% for boys and by 15% for girls. These effects are independent of each other; which means that they add up. A girl with a siblings below age three, a pregnant mother and short preceding and succeeding birth intervals has an OR of 0.848*0.929*0.852*0.909=0.610 or 39% lower odds of being in school than a girl with longer birth intervals, no young sibling and no pregnant mother. A boy in this situation would have a 0.852*0.939*0.886*0.917=0.650 or 35% reduced odds of being in school.

Besides models with direct effect of the explanatory variables, we estimated models with interaction effects between SRH variables and household- and district-level factors. This interaction analysis was meant to explore whether and how the effects of SRH factors differ among households and contexts with different characteristics and to make the outcomes more situation-specific. Results reveal a substantial number of significant interactions. The idea that the effects of SRH factors differ among contexts and that a situation-specific approach is important is thus confirmed by our data.

Given the explorative nature of the interaction analysis, no far-going conclusions can be drawn from the substantial findings. However, almost all significant interaction

effects point in the same direction: children in households with less favourable RH outcomes seem to be less able to profit from resources available in the household (wealth, parental education; presence of father) or in the context in which the household lives (urbanization, investments in education).

This research contributes evidence to the ongoing debates on linkage between SRH investments and poverty reduction. It also contributes new knowledge to research on factors influencing education participation by demonstrating that poor SRH at household level can be detrimental to the achievement of Millennium Development Goal 2: Universal primary education. The substantial negative effects of short birth intervals, presence of young sibling and mothers' pregnancy on school attendance of children in sub-Saharan Africa stresses the importance of good and accessible SRH facilities. Since SRH directly relates to the achievement of universal primary education, countries should focus their efforts on actual usage of the SRH services by all women of child bearing age.

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TABLE 1 Multiplicative coefficients of multilevel logistic regression analysis

	Girls		Boys	
	Model 1	**Model 2**	**Model 1**	**Model 2**
Household level variables				
Demographic variables				
Age of child	1.215**	1.215**	1.257**	1.257**
Father missing	0.908**	0.905**	0.895**	0.884**
Birth order of child	1.058**	1.058**	1.019	1.018
Number of siblings	0.955**	0.955**	0.970**	0.971**
Extended family	0.931**	0.933**	0.843**	0.843**
Age of mother at first birth	1.082**	1.082**	1.096**	1.097**
Age of mother at first birth square	0.998**	0.998**	0.998**	0.998**
Socio-economic factors				
Education Father				
None	*Ref.*	*Ref.*	*Ref.*	*Ref.*
At least some primary	2.455**	2.463**	2.279**	2.323**
At least some secondary	2.850**	2.791**	2.339**	2.340**
Education mother at least some primary	3.077**	3.076**	2.536**	2.526**
Occupation father				
Farm	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Lower nonfarm	1.433**	1.441**	1.532**	1.538**
Upper nonfarm	1.759**	1.781**	1.587**	1.594**
Mother employed	1.278**	1.276**	1.186**	1.185**
Household wealth	1.140**	1.141**	1.142**	1.142**
Living in a rural area	0.720**	0.725**	0.713**	0.713**
Contextual variables				
Economic factors				
District development index	0.938*	0.935*	0.894**	0.890**
National GDP per capita	1.492**	1.493**	1.473**	1.474**
Educational facilities				
National public expenditure on Education	1.179**	1.179**	1.102**	1.101**
Health factors				
% Hospital births	1.223**	1.224**	1.297**	1.297**
% Vaccination for DPT	1.274**	1.273**	1.164**	1.163**
Reproductive health factors				
Short Preceding birth interval	0.877**	0.848**	0.852**	0.852**
Short succeeding birth interval	0.946	0.929**	0.981	0.939*
Presence of young child in family	0.846**	0.852**	0.918**	0.886**
Mother currently pregnant	0.931	0.909**	0.933	0.917*

** P < 0.01; * P < 0.05

TABLE 2 Multiplicative interaction coefficients of multilevel logistic regression analysis (Extension of Models 2 of table 1)

	Girls	Boys
Preceding birth interval		
Education of mother	0.843**	
Succeeding birth interval		
Father missing		0.838**
household wealth		0.977**
Public expenditure on Education	0.946**	0.956**
Mother currently pregnant		
Father missing		0.802*
household wealth	0.969*	
Presence of young child in family		
Education of father (at least primary)		0.841**
Education father (secondary)	1.265**	
Living in rural area		1.268**
household wealth	0.980*	
Father missing	0.886*	

** P < 0.01; * P < 0.05

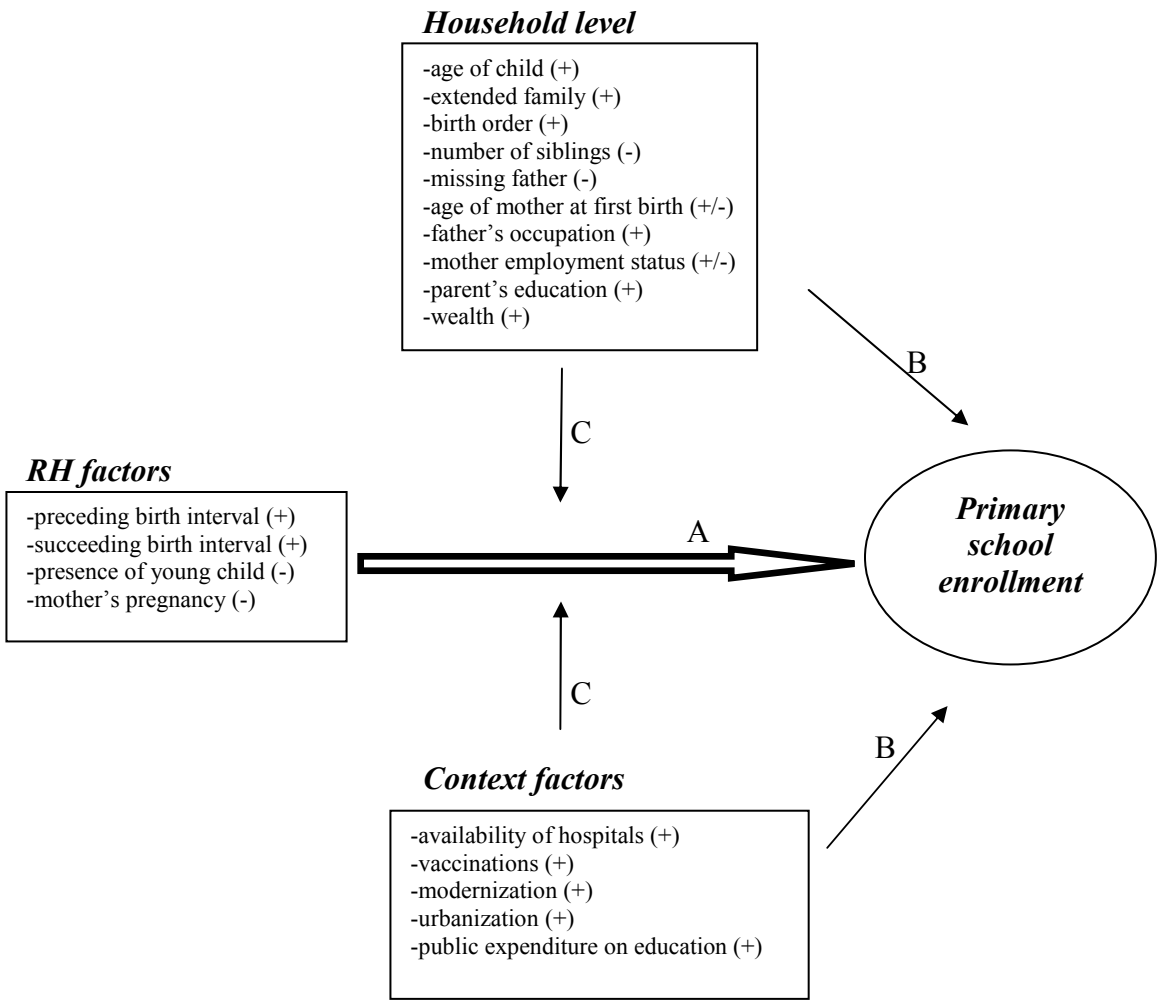

FIGURE 1 Theoretical model of school attendance