Educational Attainment and the Timing of First Birth in Amhara Region, Ethiopia

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Introduction

The timing of marriage and childbearing can have far-reaching consequences for the health and economic capabilities of young women in Africa. However, an important consideration in establishing the causal pathways for these associations involves addressing issues of selection. Are girls from disadvantaged backgrounds more likely to marry and give birth at earlier ages?

This study examines the relationship between educational attainment and the timing of first birth, for girls in a rural region of Ethiopia. Education serves as an indicator of socioeconomic status, which reflects the family's place in society according to their economic resources and social standing. Investment in education is one of the ways that socioeconomic status can be transferred from parents to their children. The age of first birth is an important indicator of reproductive health for adolescents (Mensch, Bruce and Greene 1998; Rindfuss and John 1983). According to the World Health Organization, reproductive health is defined as a woman's physical, mental and social well-being in relation to the reproductive system at all stages of her life(World Health Organization 2008). The significance of investing in adolescent reproductive health is notably summarized in a report by the Center for Global Development entitled *Girls Count: A Global Investment and Action Agenda* (Levine et al. 2008). The authors state:

> Girls' welfare today shapes the prospects for future families. The health and educational achievement of future generations is directly related to the physical and intellectual condition of today's girls and young women, who will bear and prepare the children of the next decade (P. 2)

Early childbearing is associated with numerous adverse health, economic and social effects for both the mother and the child, many of which persist into adulthood. In countries such as Ethiopia where early marriage is prevalent, most adolescent births occur within the context of

marriage. This makes it is difficult to disentangle the effects of early childbearing from the those of marriage (Bledsoe and Cohen 1993).

Child marriage, defined as marriage of girls below the age of 18 years, is considered a human rights violation by various international agreements and national policies (Bunting 2005). It is often driven by poverty and supported by social norms that foster gender inequalities (Levine et al. 2008). Marriage increases the frequency of exposure to unprotected sex for young girls, which increases their risks of becoming pregnant or contracting sexually transmitted diseases and cervical cancer (Nour 2006). According to studies in Kenya, Zambia and Zimbabwe, married adolescents are more likely to be infected with HIV than other sexually active girls their own age (Clark 2004; Clark, Bruce and Dude 2006; Gavin et al. 2006). Behaviors that increase this risk include higher frequency of sex, lower likelihood of using condoms, and a greater likelihood of having older partners (Clark, Bruce and Dude 2006).

Health effects of early childbearing operate through a combination of biological, behavioral and psychological mechanisms (Magill and Wilcox 2007). Compared to adult mothers, adolescent mothers are more likely to experience maternal mortality, anemia, and obstetric complications . In addition, their infants are at higher risk for preterm birth, low birth weight, poor nutritional status and fetal death. However, these effects should be viewed within the context of maternal and child health conditions in a given society. In poor countries, the health of women and children is also influenced by a range of social and economic factors such as the mother's education, access to health care services, decision-making power, acceptance of contraceptives, and employment opportunities (Gill, Pande and Malhotra 2007; Taffa and Obare 2004).

Socioeconomic Status and Early Childbearing

Social determinants of the age of first birth can be grouped into three main categories: simultaneous factors, background factors, and early adolescent factors (Rindfuss and John 1983). Education is viewed as a simultaneous factor because of its bi-directional association with the timing of childbearing. School attendance during the period of adolescence can delay childbearing by delaying the age of marriage. In addition, girls with higher levels of education are more likely to have knowledge about and access to contraceptives, which could delay their age at first birth.

The positive association between education and the age of marriage and first birth has been demonstrated in several studies conducted in developing countries. Singh and Samara examined determinants of early marriage for women using Demographic and Health Surveys (DHS) data from 40 developing countries (Singh and Samara 1996). They found large differentials in the timing of marriage by education. For example, in most Sub-Saharan African countries, women with some secondary education were 50% to 85% less likely to marry below the age of 20 than less-educated women. A study in Kenya using DHS data showed that the strong positive association between education and age of marriage persisted after controlling for potential confounders (Ikamari 2005). Choe and colleagues estimated Cox proportional hazards models estimating the effect of respondent's education on the timing of first birth in Nepal (Choe, Thapa and Mishra 2005). They found that having a secondary school education or higher significantly reduced the hazard of first birth compared to having no education, adjusting for parent's education, region , region, urban/rural residence, development level of district and ethnicity.

On the other hand, marriage or childbearing can also limit a girl's educational attainment. For young girls, marriage brings new roles and responsibilities that impact her future expectations and opportunities (Nour 2006; Singh and Samara 1996). Marriage and childbearing further reduce the likelihood that an adolescent female will continue her education, even if the opportunities are available. According to Eloundou-Enyegue (2004) gender differences in educational attainment in Cameroom are largely attributable to rates of adolescent pregnancy. However, in a recent study using DHS data from Burkina Faso, Cameroon, Cote d'Ivoire, Guinea and Togo, Lloyd and Mensch (2008) found that child marriage was a better predictor of school dropout than early childbirth.

In addition to accounting for the bi-directional association between education and early childbearing, studies examining this topic must also control for background factors such as parent's socioeconomic status (SES). Adolescents with limited resources are more likely to be married at a younger age and to engage in farm or other labor activities during their adolescence instead of attending school (Mensch, Bruce and Greene 1998). Families of relatively higher socioeconomic status are expected to place more value in education and to have more resources available to pay for their daughters' education. Educated mothers might be more likely to adopt changing norms favoring the delay of marriage and childbearing because they are more aware of the negative consequences of early marriage. Bates and colleagues provide some support for this hypothesis in a study of mothers and daughters in six rural villages in Bangladesh (Bates, Maselko and Schuler 2007). They found that maternal education was associated with a slower transition to marriage for daughters, but the association was no longer statistically significant after controlling for daughter's education and other covariates. Mother-in-law's education was

positively associated with the age of first birth for daughter-in-law's, and this association remained significant after adjusting for potential confounders.

Early adolescent factors that might be associated with the timing of first birth include family size, birth order, and living in a two-parent versus one-parent family. Children from larger families and higher birth orders might be more disadvantaged under the assumption that parents, particularly those in rural areas, have a limited set of resources to distribute to all members of their households. Loosing a parent to death or divorce at a young age could further reduce the amount of resources available to an adolescent. These factors might result in less educational opportunities and greater incentives for marriage as a way to improve her future economic security or to reduce the burden of responsibility for her parents. Several studies in developed countries have found significant associations between adolescent pregnancy and living in a single-parent family, or having a larger family size (Miller, Benson and Galbraith 2001; Moore et al. 1993; Wu and Martinson 1993).

The purpose of this paper is to examine the effect of a girl's education attainment and her family background on the timing of marriage and first birth. The study tests the following hypotheses: (1) education attainment is positively associated with the age of first marriage, and (2) the associations between education and the ages of marriage and first birth will remain robust after controlling for background factors (parents education and parents household SES) and early adolescent factors (parents death status at age 9, family size and parity).

Data & Methods

1. Survey Design

The first dataset is a representative sample of adolescent girls between the ages of 10 and 19 from Mecha and Yilmana Densa Woredas in Amhara Region of Ethiopia. The data were

collected by Population Council in 2004 and 2006, as baseline and endline information used to evaluate the impact of the Berhane Hewan program. The main purpose of this program was to reduce the high rates of early marriage through interventions at the individual and community levels. The program was implemented by the Ministry of Youth and Sports, Regional Youth and Sports Bureau and Population Council in Mosebo Peasant's Association in Yilmana Densa; the Enarmirt Peastant's Association in Mecha Woreda was identified as the control area for the study.

Similar sample selection and data collection techniques were utilized during baseline and endline. This involved listing all households in the study area, collecting basic demographic information on all household members, and randomly selecting households with adolescents. All households with male or female adolescents between the ages of 10 and 19 were considered eligible at baseline, however, only households with females adolescents were included at endline. The number of adolescents selected from each Peasant's Association was proportionate to the size of the population. In the case of households with more than one eligible adolescent aged 10 to 19, a Kish grid (Kish 1965) was used to select one adolescent.

Local interviewers were recruited from the study areas to administer the surveys. Minimum qualifications included prior interviewing experience, and a secondary school education. All interviewers were relatively young in age, so as to make adolescents more comfortable and responsive. Interviewers received a one-day training prior to the initial household listing and an additional five-day training before conducting surveys. During the training, they reviewed each item on the survey and engaged in practice and mock interviews. For open-ended questions, they were trained to probe respondents and record responses verbatim. Interviewers made up to three attempts to locate and interview selected adolescents.

Due to the sensitive nature of the topics covered in the surveys, adolescents were interviewed by interviewers of the same gender.

The survey instrument was largely close-ended, with a few open-ended questions aimed at obtaining more detailed information on issues for which prior knowledge is limited. Topic areas included household composition and assets, education, time use, migration, attitudes and expectations, reproductive health knowledge and practice, marriage pregnancy and childbirth and sexual activity. The baseline and endline questionnaires were identical, with the exception that the endline questionnaire also included questions on exposure to the intervention. The questionnaire was translated into Amharic and back-translated to English to ensure accuracy. Interviewers obtained informed consent from all respondents and all resident parents or guardians. Completed questionnaires were checked by supervisors for data quality and completeness. Data was entered into Epi-Info and later converted to Stata version 9.2 for analysis.

2. Analytic Subsample

The analytical sample was created by combining data from two cross-sectional surveys. The dataset includes 456 girls interviewed at baseline and 909 girls interviewed at endline, totaling 1,365 girls. The sample excludes 21 girls who were missing information on their current age and the age of first birth.

3. Key Variables

The focal relationship for the first paper is the association between socioeconomic status as the independent variable, and reproductive health as the dependent variable. Socioeconomic status (SES) reflects the family's place in society according to their economic resources and social standing (Marmot, Kogevinas, and Elston 1987). Investment in children's education is one

of the ways that socioeconomic status can be transferred from parents to their children (Becker 1962). SES is operationalized as a respondent's educational attainment. Due to the timing of pregnancy, which typically occurs approximately 9 months prior to the timing of birth, educational attainment is measured as a time-varying covariate and lagged by two years to accurately describe the effect of education attained prior to pregnancy.

According to the World Health Organization, reproductive health is defined as a woman's physical, mental and social well-being in relation to the reproductive system at all stages of her life(World Health Organization 2008). The age of first birth is an important indicatorsof reproductive health for adolescents (Mensch, Bruce, and Greene 1998; Rindfuss and John 1983). In this study, the childbearing is measured as the number of years until her first birth. In both cases, girls who have not yet married or given birth are censored at the time of the interview. Due to the low ages of marriage and first birth in Ethiopia, the risk of having a birth is set to begin at the age of 9.

Marriage typically precedes childbearing in Ethiopia and it has a bi-directional association with education. In the model estimating the hazard of first birth, the age at marriage is not included in the analysis because 99 percent of girls who had a first birth were married.

The analysis controls for two family background variables—parent's education and parent's household socioeconomic status. Since the majority of parents had no education, parent's education is collapsed into a dichotomous variable indicating whether either of the parents had ever been to school. Parents' household SES is measured as a dichotomous variable indicating whether the house of the respondent's parents had a corrugated iron roof. This item was selected from a variety of household living conditions items in the survey because it: (1) has sufficient variation, (2) is a more stable measure that is less likely to have changed between the

period of risk for first birth and the time of the interview (3) has at least a medium correlation with other measures of household living conditions such as owning a radio (r=0.3), owning a bed or table (r=0.3), owning a pit latrine (r=0.3) and (4) has a strong positive association with the age of first birth and education in the bi-variate analysis. Although this variable is measured at the time of the survey, we will include it in the analysis based on the assumption that the relative level of household living conditions would not have changed substantially over a 10 year period.

Two indicators of early adolescent factors are included in the analysis. The death status of a parent is a dichotomous variable indicating whether the respondent's mother or father had died before the beginning of the period of risk (age9). A Wald test of two separate coefficients for having lost a father and having lost a mother at the age of nine indicated that there was no significant difference in the effects of these two coefficients on the timing of first birth (p=0.788). Measures of family size and birth-order were combined into one variable to address concerns that some respondents' mothers may not have completed childbearing by the beginning of the risk period. The new measure consists of three dummy variables indicating whether the respondent was from: (a) a small family (<=3 children), or (b) a large family (>3 children) with low parity (first, second or third-born), or (c) a large family (>3 children) with high parity (fourth or higher parity). This variable was created using responses to questions about the total number of children born to the respondent's mother, and the number of children born to the mother before the respondent's birth.

4. Data Analysis

We use survival analysis to examine the probability of first marriage and first birth at each period of risk after excluding those who had already experienced the event, and those who were censored before experiencing the event. First, we use the lifetable method to compare

survival probabilities for the timing of marriage and childbearing across various sub-groups for relevant independent variables. We use log-rank tests for the equality of survival functions to test these bi-variate associations. Next, we examine bivariate associations between education and other independent variables by regressing years of schooling on each variable.

We conduct multivariate analysis using a Cox proportional hazards models to determine the effect of each covariate on the timing of first birth after adjusting for other covariates. Schoenfeld residuals are used to test the assumption of proportional hazards, with the null hypothesis that the slopes of the curves are not equal to zero. The advantage of using the Cox model rather than other parametric event-history models is that coefficients can be estimated without having to make assumptions about the shape and nature of the baseline hazard rate (Box-Steffensmeier and Jones 2004). To control for potential differences in survey periods or regions, the models are stratified by region and survey year to allow for different baseline survival functions for each group. We use the Efron method of handling ties because it provides more accurate estimates than the Breslow method in samples with a large number of ties (Allison 1995). However, the disadvantage of the Efron method is that sampling weights cannot not be applied to the data. We conduct sensitivity analysis by comparing models estimated using the Efron method with models applying sampling weights and using the Breslow method for ties.

We examine changes in the coefficient for the focal relationship across models to identify spurious, redundant, moderating and mediating effects of other independent variables. Models are compared using the Bayesian Information Criterion (BIC). The BIC is calculated as $-X^2 + df * \log(n)$, where the degrees of freedom are the number of parameters and n is the number of events (births) (Raftery 1995).

Preliminary Results

Survival probabilities for the age of first marriage and the age of first birth for girls between the ages of 10 and 19 in the Amhara Adolescent Survey sample are shown in Figure 1. The probability of remaining unmarried by age 18 is approximately 50 percent, while the probability of remaining without a birth by the age of 18 is approximately 60 percent. As shown in Table 1, only one-third of girls were married in this sample (34%) and one in six girls had given birth (15%). Almost all of the births occurred within the context of marriage (99%). Two-thirds (66%) of the girls had ever been to school; the mean years of education among those who had been to school was 4.1, ranging from 1 year to 11 years. The survival probabilities of remaining unmarried or without a birth by the age of 18 varied significantly ($p<0.001$) by education (Table 2). Probabilities for remaining unmarried by age 18 ranged from 0.08 for girls with no education, to 0.19 for girls with some education (<6 years), to 0.51 for girls with a primary school education (>=6years). Similarly, the probabilities for not having a birth by the age of 18 were positively associated with education: 34 percent with no education, 81 percent with some education, and 96 percent with primary education.

Table 3 shows results from Cox Proportional Hazards models estimating the association between education and the timing of first birth using the Breslow and Efron methods for handling ties. Based on Model B, which produces slightly more conservative estimates, parents' education is moderately associated with a reduced hazard of first birth, while having more siblings—regardless of parity – significantly increases the hazard of having a birth ($p<0.01$). For girls whose parents are both alive, each additional year of education decreases the hazard of first birth by 50 percent (HR = 0.49, $p<0.001$), net of other covariates. For girls who reported that at least one parent is deceased, each additional year of education decreases the hazard of first birth

by 20 percent (HR = 0.79 (or 0.49 *1.61), $p<0.001$), net of confounders. These results support the hypothesis that girls from more disadvantaged backgrounds are at greater risk for early childbearing and education is instrumental in delaying the age of first birth for adolescent girls in this region of Ethiopia.

Figure 2. Weighted Life-Table Survival Probabilities for Age at First marriage and Age at First Birth, Amhara Adolescent Survey, Girls ages 10 to 19 (N=1365).

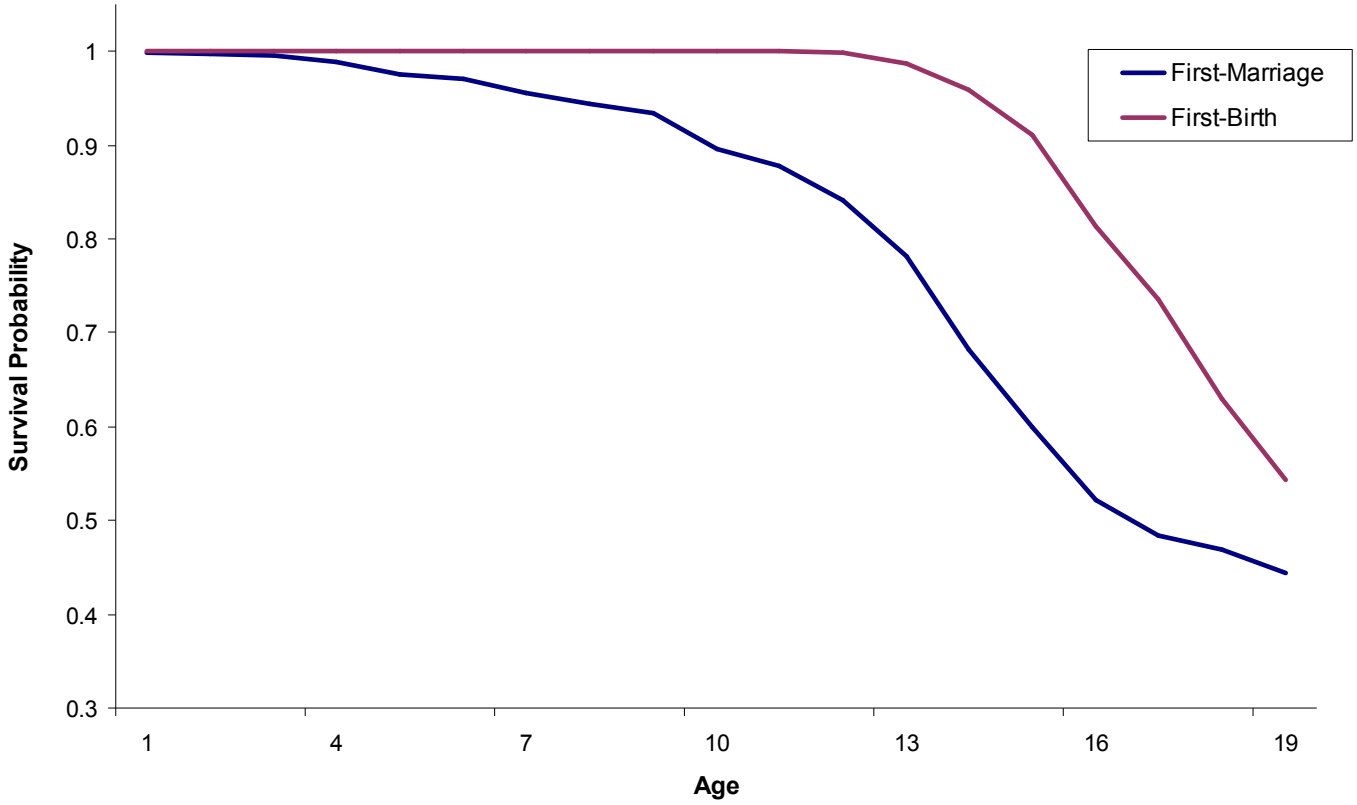

Table 1. Description of Sample: Means and Standard Deviations of Selected Measures, Amhara Adolescent Survey, Girls ages 10 to 19 (N=1365).

Measures	Mean	Standard Deviation	Min.	Max.
Age	14.23	2.95	10	19
Married	0.34	0.47	0	1
Age at marriage[a]	12.43	2.55	1	19
Had a First Birth	0.15	0.35	0	1
Age at first birth[b]	15.99	1.59	12	19
Education attainment (years)	2.76	2.76	0	11
Education attainment if >0	4.07	2.42	1	11
Parent educated	0.18	0.38	0	1
Household SES				
Has a corrugated roof	0.70	0.46	0	1
Parent deceased by age 9	0.13	0.34	0	1
Family Size and Parity				
Small family	0.15	0.36	0	1
Large family, low parity	0.27	0.44	0	1
Large family, high parity	0.58	0.49	0	1
Religion				
Orthodox	0.98	0.12	0	1

[a] n = 344 girls who were married and had information on age at marriage.
[b] n = 200 girls who had a first birth.

Table 2. Un-adjusted Lifetable Estimates of Survival Probabilities for Not having a First Birth and Not being Married at Age 18 by Selected Covariates, Amhara Adolescent Survey, Girls ages 10 to 19 (N=1365).

	Age at First Birth		Age at First Marriage	
Covariates	Survival Probability (95% CI)	Log Rank Test[a] P-value	Survival Probability (95% CI)	Log Rank Test[a] P-value
General Sample	0.50 (0.44 – 0.56)		0.19 (0.15 – 0.24)	
Marriage		0.000		
No	0.99 (0.95 – 1.00)			
Yes	0.30 (0.24 – 0.36)			
Education		0.000		0.000
None	0.34 (0.28 – 0.41)		0.08 (0.05 – 0.12)	
1 to 5 years	0.81 (0.65 – 0.90)		0.19 (0.11 – 0.30)	
6 years or more	0.96 (0.89 – 0.98)		0.51 (0.37 – 0.64)	
Parent educated		0.002		0.036
No	0.47 (0.41 – 0.53)		0.19 (0.15 – 0.24)	
Yes	0.77 (0.59 – 0.88)		0.21 (0.10 – 0.34)	
Household SES: Corrugated Roof		0.001		0.008
No	0.40 (0.31 – 0.50)		0.14 (0.08 – 0.21)	
Yes	0.56 (0.49 – 0.63)		0.23 (0.17 – 0.29)	
Parent Deceased		0.661		0.222
No	0.51 (0.44 – 0.57)		0.51 (0.44 – 0.57)	
Yes	0.49 (0.32 – 0.63)		0.49 (0.32 – 0.63)	
Family Size and Parity		0.002		0.149
Small family	0.79 (0.62 – 0.89)		0.32 (0.19 – 0.47)	
Large family, low parity	0.46 (0.34 – 0.56)		0.19 (0.12 – 0.27)	
Large family, high parity	0.48 (0.40 – 0.55)		0.60 (0.55 – 0.64)	
Region		0.008		0.001
Mecha	0.50 (0.42 – 0.57)		0.15 (0.10 – 0.20)	
Yilmana Densa	0.51 (0.42 – 0.60)		0.28 (0.20 – 0.36)	
Survey		0.208		0.478
Baseline	0.51 (0.41 – 0.60)		0.19 (0.13 – 0.27)	
Endline	0.50 (0.43 – 0.57)		0.20 (0.15 – 0.25)	

[a] Estimates based on a log-rank test for equality of survivor functions by covariates for all ages.

Table 3. Cox Proportional Hazard Regression Results of Association between Education and the Timing of First Birth after Adjusting for Confounders, Amhara Adolescent Survey, Girls ages 10 to 19 (N=1365).

	Age at First Birth	
	Model A Efron	Model B Breslow & Weights
	HR(95% CI)	HR(95% CI)
Lagged Education (yrs)	0.478*** (0.38 – 0.59)	0.492*** (0.40 – 0.61)
Parent Educated		
None		
At least one	0.531* (0.30 – 0.96)	0.561† (0.31 – 1.00)
Household SES: Roof		
No		
Yes	0.917 (0.68 – 1.23)	0.927 (0.769 – 1.25)
Family Size and Parity		
Small family		
Large family, low parity	3.136** (1.59 – 6.20)	2.823** (1.3 – 5.58)
Large family, high parity	3.221*** (1.68 – 6.18)	2.900** (1.51 – 5.55)
Parent Deceased		
None		
At least one	0.870 (0.57 – 1.34)	0.889 (0.58 – 1.37)
Education * Parent Deceased	1.64** (1.20 – 2.24)	1.611** (1.18 – 2.20)

Note: Model A was estimated using the Efrom method for ties. Model B includes sampling weights and used the Breslow method.
† p<0.10 ; * p<0.05 ; ** p<0.01 ; *** p<0.001

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