

Cognitive Skills, Schooling and Fertility Transition among Young Women in Madagascar

Catalina Herrera and David Sahn
Cornell University

Short Abstract

We analyze whether early pregnancy contributes to school dropout and cognitive skills among young women in Madagascar. We use a panel survey designed to capture the transition from adolescence to early adulthood. The panel follows a cohort of young women, 21-23 years old in 2012, and collects data on the economic and life course events since early childhood. Among the group of young mothers in the cohort, almost half become pregnant while they were attending school and dropped out subsequently. We address the impact of early pregnancy on schooling outcomes and cognitive skills (test score measures) by instrumenting fertility with community level information on access to family planning and related health services. We rely on the community information collected in the panel survey as well as related secondary data sources, including a census of infrastructure in communities throughout Madagascar, which allow us to deal with the endogeneity of program placement.

Extended Abstract

I. Motivation

Low female school attainment, early marriage and childbearing continue to be serious problems in developing countries. Approximately, one quarter of the girls aged 10 to 14 in developing countries are not enrolled in school (Lloyd, 2005) and more than 14 million girls aged 15-19 give birth every year (United Nations Population Fund, 2005), being at risk of maternal mortality and morbidity. Furthermore, young motherhood and low education are also likely to adversely affect their children's well-being since they have less knowledge and financial resources to care for, and invest in the health and well-being of their children.

The role of pregnancy- related school dropout has increasingly gained importance in Sub-Saharan African countries. This is in part due to the recent expansion of female school enrollment in the region. The greater likelihood for girls to attend school after puberty age has put girls at risk of early marriage and pregnancy while they are attending school (Lloyd, 2008). This problem is especially relevant in low income countries such as Madagascar where the total

fertility rate is 4.8 children per woman, 32% of the girls between 15 and 19 years old have a child or are pregnant for the first time, and the family planning prevalence is at 29% (DHS, 2009).

Unlike in the United States (U.S.), the effect of early pregnancy on schooling is poorly understood and under-researched in the context of developing countries. There is empirical evidence on the negative correlation between women's education and fertility, but very few studies address the endogeneity between these two joint decisions. Indeed, some studies have analyzed the impact of education on fertility decisions by using experimental or quasi-experimental settings (Duflo, 2001; Osili, 2008) or simultaneous equation methods (Brien and Lillard, 1994; Angeles, et al 2005; Glick, et al 2011, Marchetta and Sahn, 2012). Nevertheless, with the exception of some empirical evidence from South Africa, very few studies have addressed the causal effect of adolescent fertility on schooling outcomes in the African context.

Indeed, there is still a debate if adolescent pregnancy is a problem itself or whether it is merely a symptom of deeper ingrained disadvantage (McQuest et al, 2012). There is, therefore, a need of rigorous research to inform policy makers on the effects of teenage pregnancy on socioeconomic outcomes in developing countries. If there is a causal link between the age at initial childbearing and the length of schooling for young women, additional efforts to induce girls to stay in school may have substantial benefits in terms of women's own opportunities and, via reductions in family size, higher human capital in subsequent generations.

This paper contributes to this debate and the related empirical evidence by analyzing the effect of early childbearing on school dropout and cognitive skills using unique panel data in Madagascar that allow us to address the endogeneity of education and fertility. Specifically, we employ an instrumental variable strategy, drawing upon both community surveys and previously conducted censuses of infrastructure to identify the age of initial pregnancy, and its impact on school attainment and test score outcomes.

II. Previous Literature

Empirical evidence in developing countries shows a negative association between early childbearing and educational outcomes; however, few studies have identified a causal effect of adolescent pregnancy on schooling, and more broadly, on other socioeconomic outcomes (McQuest et al, 2012). Young girls may have strong preferences for education and labor market success and therefore less preference for children, i.e. schooling and fertility can be joint decisions. Also, family planning programs are not randomly implemented in the communities and may influence a young woman's decisions about her education or age at marriage, and therefore, they might have large indirect effects on her joint fertility and education decisions (Angeles et al 2005; Glick et al. 2011).

The socioeconomic effects of teenage pregnancy in the U.S. have been largely researched. This empirical evidence has mostly used instrumental variable approaches to identify the causal impact of early childbearing on educational attainment. For instance, age of menarche, availability of contraception methods, abortion rates (Ribar,1994; Klepinger et al., 1999) have been used to instrument fertility as well as natural experiments such as miscarriages (Hotz et al. 2005). There is no consensus among these studies on the existence of a causal effect of teenage pregnancy on education or on the magnitude of such an effect on school outcomes. For example, while Ribar (1994) and Randall (1998) present evidence that early childbearing has a negligible effect on girls' dropping out of school, and argue that early drop out is instead related to poor socioeconomic conditions, Keplinger et. al (1999) show that teenage pregnancy decreases years of education among girls.

In the context of developing countries, there is scarce empirical evidence that attempts to establish a causal relationship between early pregnancy and school dropout, partially due to the limited data that can be employed to address the identification challenge of the role of fertility on education. Some studies have used experimental designs to evaluate policy interventions that aim to reduce teenage pregnancy, such as school subsidies (Duflo et al, 2011) and conditional cash transfers (Baird et al, 2011). These rare efforts at randomization have effectively addressed the issue of endogeneity between young women's education and fertility decisions, but they are difficult to replicate and their internal and external validity is limited to similar economic and social contexts.

Our paper is one of the very few studies that have used longitudinal data to evaluate the impact of adolescent pregnancy on school outcomes. This is especially true for Africa. One exception is the study of Ranchod et al. (2011) that, using the Cape Town Area Panel Study (CAPS), implements a propensity score matching approach to measure the impact of adolescent fertility on school dropout. The authors use a set of early life and pre-fertility characteristics to predict the probability of early pregnancy (treatment). They find that school dropout is driven more by socioeconomic conditions than early pregnancy.

The extent to which pregnancy-related school dropout contributes to the reduction in cognitive skills has also been little researched in the context of Africa. Some cross-sectional studies in South Africa have shown an association of test scores performance and fertility (Thomas, 1999) or the initiation of sexual activity (Marletto,2008), but they have not established a causal effect of early pregnancy on cognitive skills. We contribute to the very scarce empirical evidence on this subject by addressing whether early childbearing has an effect on school dropout and cognitive skills, measured by French and Math scores.

III. Data description

The Madagascar Life Course Transition of Young Adults Survey 2011-12 reinterviewed a cohort of young adults, who are now 21-23 years old, and gathered detailed information on them, their spouses, and the households in which they presently reside, as well as their communities. The 2011-12 survey collected detailed retrospective event histories on the cohort members, their families and the range of economic and life-course events and experiences going back to 2004 in Madagascar, the year in which the cohort members were last surveyed in the *Enquête sur la Progression Scolaire à Madagascar* (EPSPAM) survey. The 2011-12 surveys also update histories of community level services, economic and social infrastructure, and shocks, during the eight years since the cohort members were last interviewed. The data contain indirect as well as direct measures of human capital, the latter including tests of cognitive skills in 2003/4 and in 2012.

In the sample of cohort members surveyed in 2012, there are 859 women for whom we have detailed fertility and education history information, including test scores from 2004. Some preliminary descriptive statistics on these women are summarized in Table 1. We observe that 54% (466) of the sample have already had at least one child; we call this group of women “*Ever mothers*”. We call “*Non-Mothers*” their female counterparts in the cohort who have not yet given birth. In our sample, the average age of first birth is 18 years.

<< Table 1 >>

Table 1 shows substantial differences in schooling and cognitive performance between these two groups. While 34% of the *non-mothers* still attend school, only 3% of the *ever-mothers* are enrolled. In fact, preliminary calculations of the difference between the age of awareness of conception and age of dropping out of school suggest that at least 46% of the young mothers got pregnant while they were in school¹. This is consistent with the years of education completed among the two groups. While the group of *ever-mothers* completed 6.2 years of schooling, the corresponding figure for *non-mothers* is 9.25. This difference is reflected in the data on the progression through school. Among the group of *ever-mothers*, only 5% completed upper secondary while this percentage is almost 5 times larger among the *non-mothers*. Also, 17% of the women who have not yet had their first birth have some university education while this percentage among young mothers is negligible.

Additionally, we report in Table 1 that the *non-mothers* have, on average, better performance in the 2012 test scores on Math, French and Life Skills than the *ever-mothers*. This is likely a reflection of the fact that the former group stay in school longer. The share of young

¹ Given that we have an exact women’s children date of birth but not a calendar of their pregnancy, we calculated the age of awareness of conception as the age of the first birth minus 8 months of pregnancy.

women in the upper quintiles of the Math and French test scores distribution is far greater for those who are not yet mothers in 2012 than for those women who have given birth by 2012 (See Figure 1).

<< Figure 1 >>

Regarding the use of family planning among the young women of the cohort, the data shows that 31% of them use at least one method of contraception (modern and/or traditional). Among these users, 37 % have primary, 38% have lower secondary and the rest have upper secondary or higher education. There is no evidence of a positive correlation between the young women's level education and their use of family planning.

From these preliminary descriptive statistics, we cannot infer causality between school attainment, cognition and pregnancy. In the next section, we describe the strategy we employ to address this issue.

IV. Methodology

Our panel survey data provides information to identify the effect of early childbearing on school outcomes and cognitive skills. In particular, the survey includes data on whether specific contraceptive methods are offered at the community health facilities, when the family planning services began and the costs of contraceptives if they are offered. Therefore, we instrument early pregnancy with such community level information on family planning.

More specifically, we will estimate a two-stage model of the following form:

$$Y_i = a + \beta EverMother_i + \rho' X_i + u_i \quad (1)$$

$$EverMother_i = \mu + \delta' Z + \gamma' X_i + v_i \quad (2)$$

Where Y_i is the young woman's school outcomes such as current enrollment, years of education and scores of French and Math in 2012. The instrumental variable Z_i is access to, and duration of exposure to family planning at the community level. In both equations, X_i is a set of control variables including young woman's age, ethnicity, parents' characteristics such as education, wealth, and whether they are alive or not. Also, we include as controls infrastructure community variables such as access to water, electricity, secondary school and regional dummies. Furthermore, our data allow us to estimate a value added model in education by including the 2004 test scores as control variables in the IV estimation of 2012 test scores on early pregnancy.

We are concerned about the possibility of the endogeneity program placement. To deal with the possibility of the nonrandom placement, we follow the approach of Pörtner, et al. (2011) and use information on how local characteristics rank relative to other areas, under the assumption that given limited resources, governments make allocation decisions based, in part, on how different provinces or other administrative units compare along dimensions such as

poverty, ethnic makeup, or school enrollment rates. To do so, we exploit the Madagascar 2001 and 2007 commune census which can be linked to the household survey and includes the information needed to construct the relative ranking across communities.

V. References

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Table 1
Education and Cognitive Performance for Mothers and Non-Mothers

	Ever Mothers	Non Mothers	All
<i>Education variables</i>			
% School Enrolment	3.27	34.00	17.39
Years of Education	6.20 (3.18)	9.25 (3.74)	7.60 (3.77)
% Completed Primary	18.67	10.69	15.02
% Completed Lower Secondary	14.81	14.25	14.55
% Completed Upper Secondary	4.94	23.41	13.39
% Some University	1.93	17.56	9.08
<i>Cognitive skills</i>			
2012 Math Test Score	11.78 (7.10)	16.43 (8.12)	13.97 (7.94)
2012 French Test Score	7.92 (5.75)	12.28 (6.22)	9.98 (6.35)
2012 Life Skills Test Score	14.50 (4.01)	15.74 (3.75)	15.07 (3.94)
No of Observations	466	393	859

Notes: Standard deviations in parentheses.

Source: 2012 Madagascar Life Course Transition of Young Adults Survey

Figure 1

