Education and Fertility: Experimental Evidence from Kenya

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This paper provides experimental evidence on the relationship between education and early fertility in a developing country. We exploit experimental variation in the cost of education for a cohort of 18,000 students in Western Kenya. Students in Kenyan primary schools wear uniforms which typically cost about $6. In 163 schools randomly selected from among 328, students enrolled in grade 6 at baseline (2003) received free uniforms for the last three years of primary school (from 2003 to 2005). Girls in those schools were 2.4 percentages point less likely to drop out of primary school by 2005, and 4.5 percentage points more likely to have graduated from primary school by 2007. These effects correspond to changes of -13 percent and +9 percent, respectively. By the end of 2005, girls who received uniforms were 1.7 percentage points less likely to be married and 1.5 percentage points (10 percent) less likely to have started childbearing. The effects persisted after the end of the education subsidy: at the end of 2007, when most of these adolescents had left school, girls in the treatment group were still 2.6 percentage points (8 percent) less likely to have started childbearing. These results imply a surprisingly large impact of access to education of adolescent girls on early fertility, at least among girls who are likely to drop out of school.

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1 Introduction

Early fertility remains common in much of the developing world. According to the Kenya Demographic and Health Survey for example, half of rural mothers interviewed in 2003 had their first child before leaving their teen years (Central Bureau of Statics et al., 2004), and 24% of girls aged 15 to 19 had started childbearing. Adolescent girls who start childbearing before they reach full physical maturity have higher rates of maternal morbidity and mortality. In addition to its direct effect on health, early fertility has a negative influence on young women's education and earnings opportunities, since girls are usually forced to drop out of school upon marriage or pregnancy (Ambrus and Field, 2008). Since mother's human capital has impact on their children (Behrman and Rosenzweig, 2002), this is another channel through which early pregnancy could affect long term human capital and growth. Even holding constant total lifetime fertility, earlier fertility leads to faster population growth. For all these reasons, delaying onset of fertility is a policy priority in most developing countries, and for international organizations.

While early pregnancy does cause lower education, it is also widely believed that education can delay the onset of fertility, through a variety of channels. First it may improve the wife's bargaining power inside the marriage (Thomas, 1990). Second, it may equip girls with a better ability to process information, potentially increasing knowledge of contraception options (Rosenzweig and Schultz, 1989, Thomas, Strauss, and Henriques, 1991). Sex-education has become more common, particularly in countries with widespread HIV, and this specific content may directly affect knowledge of contraception options, as well as incentives to avoid risky sexual activity. Third, education can increase the opportunity cost of women's time leading them to have fewer, more highly educated children (Becker, 1960, De Tray, 1973). In many settings, including ours, pregnant girls typically have to leave school, which makes the opportunity cost of being pregnant high, particularly for girls financially able and willing to go to school. In contrast, when girls drop out, getting married and starting one's own family is often perceived as a way to escape from a subservient position in the family home.

Empirically there is a strong positive correlation between education and delay in the onset of fertility, and a strong negative correlation between education and the number of children (see Strauss and Thomas (1995) for a review of the literature). However, this may not indicate a causal relationship running from education to fertility, both due to the potential for reverse causality, and to possible omitted variables: girls who drop out of school early are also probably those most at risk of having children early.

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Several studies have tried to address this identification issue. Some studies exploit school expansion as a source of exogenous drop in the cost of schooling. Breirova and Duflo (2002) use a large school construction program in Indonesia to construct instruments for years of education of both women and men. The instrumental variable estimates suggest that women's education does not reduce total fertility but increases the age at marriage and decreases the number of children born before the woman turned 15. Using a similar strategy Osilii and Long (2008) also find a causal effect of education on fertility in Nigeria. Both papers focus on primary education, and the effect of secondary education on early fertility could potentially be much larger, if part of the effect of secondary education is to increase a young woman's opportunity cost of time.

Similar results of schooling expansion have been found for secondary school in developed countries: Black, Devereux, and Salvanes (2004) find increases in education resulting from compulsory schooling laws decreased teenage pregnancy in the US and Norway, and that the effects in the two countries were of very similar magnitude. Also in Norway, Monstad, Propper and Salvanes (2008) find increases in education did not lead to decreased fertility but did lead to childbirth at older ages.

In contrast, McCrary and Royer (2008), using exact cutoff dates for school entry, find that young women who get extra schooling because they are born a few days before the cutoff for school entry are equally likely to become mothers, and become mothers at the same age. While they conclude that "education does not affect fertility", their results can in fact be reconciled with those of the earlier studies McCrary and Royer identify the effect of more years of education obtained in early childhood, for people who drop out of school around the same age (for example 16, when they are allowed to). This is a different conceptual experiment than asking girls (or giving them the opportunity) to stay one more year in school, say, from age 16 to age 17. When we compare two girls who both dropped out at 16 but were born on either side of the September 1 cutoff, one has one more year of schooling than the other, but by virtue of starting school earlier. The two sets of results can thus be reconciled if what affects the probability of teenage pregnancy is the fact of being in school during teenage years, rather than the content being taught.

In this paper, we provide experimental evidence that the decrease in dropout rates caused by a reduction in the cost of education has a causal effect on teenage fertility in Kenya. We exploit randomly assigned variation in the cost of education for around 18,000 primary school students in Western Kenya (primary school in Kenya goes till grade 8). Kenyan primary school students wear uniforms, and parents are expected to pay for uniforms which cost about $6. Although the government officially declared in 2003 that pupils should not be forced to leave school because they did not have uniforms, historically many

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school headmasters sent away children who lacked uniforms. [5] Social pressure to wear a uniform often continues to be strong. The non-profit organization ICS Africa provided a free uniform in early 2003, and another one 18 month later regardless of the grade reached, to a cohort of 12-14 year old students (boys and girls) enrolled in grade 6 in 2003 in 163 primary schools randomly chosen from among 328. Since the abolition of primary school fees in 2003, the uniform is the only remaining cost of attending primary school in Kenya. Since per capita GDP was US$360 at the time of the program, uniforms were a significant expense for poor families. Providing uniforms reduced dropout rates between 2003 and 2005 from 17.9% to 15.5% for girls, and from 13.0% go 10.5% for boys. By 2007, graduation rates from primary school were 4.5 percentage points higher among girls in uniform schools (relative to a graduation rate of 48% in the comparison group) and 3.6 percentage points higher among boys (relative to a graduation rate of 55% in the comparison group). This is a large response for a non-trivial but still relatively small transfer[6], and confirms other evidence of high elasticity of schooling and health decisions with respect to direct costs (see Kremer and Holla (2008) for a review).

The uniform program substantially reduced early pregnancy. By 2005, 14% of the girls in the comparison group were pregnant or had had a child. In the group that received the uniform, only 12.5% were pregnant or had had a child (a difference of 1.5 percentage points, slightly more than 10 percent). By 2007, the girls in the treatment group had not yet caught up with their comparison group counterparts: the difference between the treatment and comparison group remained 2.6 percentage points (by then, 30% of the girls of the comparison group had started childbearing). These results (as well as the results on education) are robust to including unaffected (older) cohorts in the sample as an additional comparison group, with school fixed effects.

There are caveats to this interpretation of the reduced form evidence, however: the new uniforms may have had a direct impact on the fertility of girls who were not going to drop out anyway, for example by increasing their self esteem, or reducing their temptation to have a relationship with men who give gifts or pay for uniforms in exchange for sexual favors.

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[5] Evans, Kremer and Ngatia (2009) show that a 2001 program that gave free school uniforms significantly reduced school absenteeism by 38%. Effects were much larger for poorer students who did not previously own a uniform: a 64% reduction in school absenteeism. The sample in that study consisted of considerably younger children in the same region of Kenya.

[6] The effect is lower, but in the same order of magnitude, as that of the much larger PROGRESA Conditional cash transfer in Mexico. PROGRESA transferred at least $175 dollars per year per child conditional on maintained school enrollment, and increased enrollment in secondary school (for students of ages comparable to the students in our

The experiment allows us to distinguish the impact on fertility of sexual education per se from the value of education in general (or the opportunity cost of being pregnant). In half the treatment schools and half the comparison schools, teachers were trained on how to deliver the official HIV/AIDS education curriculum. Evidence from focus group discussions and student interviews suggests that students in schools with trained teachers were indeed more likely to be exposed to a curriculum on HIV which emphasizes abstention and fidelity. There was no impact of this program on fertility, however, suggesting that it is education in general, rather than sexual education, that reduced fertility in the groups that received the uniforms.

Our findings are consistent with a recent paper by Baird, McIntosh and Őzler (2009), which examines the impact of a cash transfer experiment on schooling and fertility outcomes among teenage girls and young women in Malawi. They find that both conditional (on school participation) and unconditional cash transfers had large impacts on school girls school participation: the re-enrollment rate among those who had already dropped out of school before the start of the program increased by two and a half times and the dropout rate among those in school at baseline decreased from 11 to 6 percent. Furthermore, they find a decline in marriage and pregnancy rates.

The remainder of the paper proceeds as follows. Section 2 describes the Kenyan context and program design. Section 3 presents the underlying conceptual framework. Section 4 presents the data, and Section 5 presents the results. Section 6 concludes.

2 Background: Context and Study Design

2.1 Background on Education in Kenya

2.1.1 Education in Kenya

Primary school in Kenya consists of 8 grades. Grade repetition is common, and as a result many students are 15, 16, or even older, by the time they reach eighth grade (if they do). In 2003, the newly elected government abolished school fees, barred primary schools from charging any fee, and provided them with a grant for teaching materials, with the explicit objective of achieving universal primary education. Since then, schools are not allowed to charge fees. They are also not supposed to refuse entry into the classroom to students without a uniform, but this part of the policy is not always enforced on the ground, and

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sample) by 9.2 percentage points for girls and 6.2 percentage points for boys, from their initial levels of 67 and 73 percent, respectively (Schultz, 2004).

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students often face strong social pressure to wear a uniform. Students with old, torn uniforms may feel embarrassed. The cost of the uniform is about $6, in a country where the GDP per capita is $360. It is the only remaining direct cost of education in public primary schools.

Dropping out before completing eighth grade is common, especially for girls. About 27% of girls and 13% of boys who reach sixth grade dropout before completing eighth grade.

2.1.2 HIV prevention and Sex Education in Kenya

In 1999, the Kenyan government established a national curriculum on HIV/AIDS education to reach children in primary school. The national HIV curriculum was developed with the assistance of UNICEF, and was the outcome of an extensive consultation process within the Kenyan society that included many stakeholders, including religious groups. The primary-school HIV/AIDS curriculum teaches basic medical facts about AIDS, HIV transmission, prevention, and care for people living with AIDS. It stresses abstinence as the most effective way to prevent pregnancies and infection with sexually transmitted diseases, followed by fidelity. Contraceptive methods are not mentioned in the official children textbook. Condoms can be discussed in class at the teacher's discretion or in response to questions, but the curriculum does not call for teachers to promote condoms to primary school children.

2.2 Study Design

We exploit two programs implemented by ICS Africa, a non-profit that has been operating in Western Kenya since 1995, with funding from the Partnership for Child development. The first program consisted in reducing the cost of education by providing free school uniforms. The second program consisted in training teachers on how to deliver the national HIV/AID prevention curriculum to primary school students. Before we describe the two programs in detail below, we start by describing the sampling frame.

2.2.1 Sampling Frame

The study took place in two districts of Western Kenya: Butere-Mumias and Bungoma districts.[7] A total of 7 divisions were sampled from those two districts. All public primary schools in those 7 divisions, amounting to 328 schools total, were sampled for the study. None of these schools had participated in any randomized experiment prior to this one. All the schools that were selected to participate in the study agreed to participate. Schools in the sample have, on average, two other primary schools within a 2 kilometer radius.

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The 328 schools sampled for the study were stratified and then randomly assigned to one of four arms using a random number generator. The four arms were as follows:

	# schools (N =328)	Uniforms Program	Teacher Training Program
Group C	82		
Group U only	83	Yes	
Group TT+U	80	Yes	Yes
Group TT only	83		Yes

The following variables were used to create the strata: the administrative division the school is in, the quartile in which the school performance fell at the 2002 national examination, and whether the school had gender ratio among upper primary pupils that was above or below the median in 2002.

2.2.2 Uniforms Program

Between January and July 2003, ICS Africa distributed a free school uniform to around 5,000 girls and 5,000 boys enrolled in grade 6 at the onset of the school year (January 2003). Baseline enrollment data was collected from all the schools before announcing the program in order to avoid creating incentives for transfers. Only children enrolled at the time of the baseline were eligible to receive free uniforms. Local tailors visited the schools to take children's measurements and made the uniforms. ICS subsequently delivered them to the children through a school visit. Girls who benefitted from the program were 13.1 years old on average, while the average age among boys was 13.8 years.

In the Fall 2004, ICS distributed a second uniform to the same set of students, conditional on them being still enrolled in the same school. (For logistical reasons, it was not possible to track individual students to their new school to provide them with a uniform in case of a transfer). In order to provide incentives to the students to remain in school, it was announced at the onset of the program that students still enrolled in the same school would be eligible for a second uniform (no matter what grade they were in). Students who had lost or damaged their uniform in-between the two rounds of distribution did not receive a replacement uniform.[9]

2.2.3 Teacher Training Program

By early 2000s, many Kenyan teachers reported not feeling comfortable teaching the official HIV/AIDS curriculum without having been trained. Starting in 2002 the government engaged in a large scale effort

[7] These districts have recently been split into multiple districts. We use the 2003 names.
[9]Students with torn uniforms are allowed in school. Most students in Kenyan primary schools own only one uniform that they wear everyday for as long as it fits. Students typically wash their uniform themselves after school and let it dry overnight.

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to train teachers. ICS Africa teamed up with the government in 2003 and helped implement the national training program for 184 primary schools in 2003. Schools sampled for the Teacher Training were asked to send three upper primary teachers to participate in a 5-day training program.

The training sessions were conducted jointly by one facilitator from the AIDS Control Unit of the Ministry of Education (ACU-MOEST), two facilitators from the Kenya Institute of Education (KIE), and one trained staff member from ICS. The teacher training covered a wide range of topics, including basic facts on HIV/AIDS, condom demonstration, information on Voluntary Counseling and Testing, and AIDS education methodology.

In addition to delivering HIV information in the classroom, trained teachers were advised to set up health clubs to deliver HIV information outside of the classroom. A year after the training, 86% of the schools whose teachers had been trained had established health clubs.

In 2005, ICS revisited half the schools that had received this teacher training, and encouraged them to organize a debate among students on the motion: “School children should be taught how to use condoms”, a motion suggested in the official Facilitator’s Handbook that teachers had received as part of the national training (p. 66, KIE 1999). All students in grades 7 and 8 were supposed to attend the debate. The debate was followed by an essay competition for students in grades 7 and 8. The essay question was: “Discuss ways in which you can protect yourself from HIV infection now and at later ages in your life”. The essays were graded by outside teachers hired by ICS during school break. In each school 4 students (two boys and two girls) got prizes for “best essay”. Both debates and essay writing are established practices in Kenyan schools, and teachers agreed to organize these activities in 95% of sampled schools.

2.2.4 Verifying Balance

Table 1 presents summary statistics on the 328 schools in our sample, by treatment group. For each characteristic, column 4 presents the p-values of the test that the difference between the “Uniforms Only” schools and the “No Uniforms” schools is zero. Column 6 presents the p-values of the test that the difference between the “Uniforms + Teacher Training” schools and the “No Uniforms” schools is zero. Only two of the thirty p-values are smaller than 0.10, suggesting that the randomization was effective at creating balance between the groups.

In what follows, all schools sampled for the Uniform Distribution are referred to as the "Uniforms schools", and schools that did not receive uniforms are called the "comparison schools". Students enrolled in grade 6 in 2003 are referred to as the "treatment cohort", by opposition to students enrolled in older cohorts (grade 7 or 8 in 2003). The schools sampled for the Teacher Training on the HIV education curriculum are called “Teacher Training” schools.

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3 Conceptual Framework

Paying for school uniforms reduces the cost of being enrolled, which should have a direct effect on enrollment. There are various reasons why this program may in turn affect sexual behavior and teenage pregnancies. First, there is the content of what is being taught in school. The program may induce girls to stay in school longer and thus increase their human capital. Another effect of the program is that it increases the value of being in school, and therefore the advantage of delaying sexual activity (or using contraception) in order to avoid pregnancy, since girls who become pregnant typically have to leave school.[10] Moreover, pregnancy may be a desirable outcome for a girl that is not in school, because it allows her to be married and gain her independence by starting her own family. It is costly, however, if being in school is valuable, since it precludes the option of being in school.

To fix ideas, consider the following simple model. Imagine that utility is derived from being in school, being pregnant, and having sex: For individual i, utility U_i can be written:

$$U_i = S_i V_i^S + P_i V_i^P + X_i V^X$$

Where S_i is equal to 1 if individual i is in school, and 0 otherwise, V_i^S is the value of being in school, P_i is equal to 1 if individual i is in pregnant, and 0 otherwise, V_i^P is the value of being pregnant, X_i is equal to 1 if individual i is sexually active, and 0 otherwise, and V^X , is the value of being sexually active. All the utilities are individual specific, and are normalized relative to the value of being sexually active. Specifically, note $V_i^S = V^S + \varepsilon_i$ and $V_i^P = V^P + \upsilon_i$ before the introduction of the uniform program.

The individual maximizes utility subject to the constraints that she cannot be pregnant and in school at the same time, and that being sexually active increases the probability that she is pregnant:

$$S_i = 0 \text{ if } P_i = 1$$

and

$$P_i = pX_i$$

Consider the decision to have sex or not. Girl i will compare:

[10]Though legally entitled to remain in school, girls who become pregnant face strong social pressure to leave school. Historically, girls were expelled for pregnancy.

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$$[U_i \mid X_i = 0] = \max_{\{S_i=0,1\}} S_i V_i^S = \max\{0, V_i^S\}$$

and

$$[U_i \mid X_i = 1] = pV_i^P + (1-p)\max\{0, V_i^S\} + V^X$$

$[U_i \mid X_i = 0]$ is greater than $[U_i \mid X_i = 1]$ if and only if:

$$p\max\{0, V_i^S\} - pV_i^P - V^X > 0$$

which is equivalent to:

$$p[\max\{0, V^S + \varepsilon_i\} - (V^P + \upsilon_i)] > V^X$$

The value of V^S and V^P and the joint distributions of ε_i and υ_i will determine the number of girls who will choose to remain sexually inactive. The school uniform program will increase the value of being in school, which will increase the number of girls who decide to stay sexually inactive for two reasons. First, it will increase the number of girls for whom, conditional on not being pregnant, being in school is more desirable than not being in school. This will induce the fraction of those among them for whom being pregnant is valuable while not in school to delay sexual activity. Second, it will increase the gap between the value of being in school and the value of being pregnant (and being sexually active) for those who preferred being in school than not being in school conditional on not being pregnant, and will lead more women to avoid sexual activity to avoid the risk of being pregnant.

4 The Data and Estimation Strategy

4.1 The Sample

The core sample of analysis is the cohort of students that were enrolled in Grade 6 at the onset of the study, i.e. January 2003, in one of the 328 primary study schools. In total, this cohort includes 9,523 girls and 9,788 boys, with an average of 29 girls and 30 boys per school. In addition, we have data on two older cohorts: students who were enrolled in grades 7 or 8 in 2003. These two cohorts combined have a total of 16,102 girls and 15,820 boys.

4.2 The Data

Two types of data were collected: school enrollment and attendance; and childbearing data.

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School enrollment and attendance

In order to determine if reducing the cost of school reduced dropout rates, we conducted 6 unannounced school visits over the course of 4 years. At each visit, we did a roll call using the list of students enrolled at the baseline, and enquired about the whereabouts of the absent students: are they still enrolled in this school? Have they changed school? Have they dropped out?

Childbearing

Information on childbearing and marital status was obtained during those same unannounced visits to primary schools. At each visit, the list of all students in the baseline sample was read aloud to pupils enrolled in upper grades at the time of the visit, and for each of the baseline students the following questions were asked: Is Mary still in school? If yes, in what grade? In what school? Does she still live in the area? Is she married? Does she have any children? If so, how many? How old is her first born? Is she pregnant?

To check whether this method of collecting childbearing and marital outcomes generates relatively accurate data, a random subsample of 1840 girls were sampled to be "tracked" at home and interviewed about their fertility history in 2006. Girls reported as having started childbearing were oversampled. Of the 1840 girls sampled for this exercise, about 40% could be interviewed in person within 6 months of the roll call. Appendix Table A1 presents the rates of consistency between the roll call data and the girls' own report. We find that 88% of those who were reported as having started childbearing by their former schoolmates had indeed started childbearing, and 79% of those who were reported as not having started childbearing had indeed not started.[11] The consistency level for the latter is lower, presumably because pregnancies might have been conceived (or become apparent) in between the roll call and the home visit. The longer the gap between the roll call and the home visit, the lower the consistency rate, unsurprisingly. The consistency level is greater when look at the "ever had a child" outcome (rather than ever started childbearing, which includes current pregnancies). Overall, the roll call method appears to provide remarkably accurate information (if we take the girls' own report as "true"). Furthermore, the level of consistency between the two sources does not appear to vary across treatment groups.

4.3 Estimation Strategy

Since the Uniform Distribution Program was randomly assigned, schools should be similar in expectation

[11] For 46% of the girls sampled for the home visit, we could interview a female relative (typically, the mother, grandmother or sister). We find an overall consistency rate of 84% for those reported as having started childbearing, and 83% for those reported as not having started childbearing, when we include those surveys.

across groups, along both observable and unobservable dimensions. (Baseline statistics, presented in Table 1, confirm that there was no significant difference in observable school characteristics across groups at the start of the program.) Thus the effectiveness of the Uniform Distribution Program can be evaluated by simple comparison of the outcomes across groups.

In practice, this is implemented in a simple regression framework. For each individual-level outcome, the estimation equation for the effect of the uniform is:

$$O_{i,s} = \alpha_1 + \beta_1 U_s + \mu_{1,s} + \epsilon_{1is} \qquad (1)$$

where O_{is} is the outcome for student i enrolled in school s at baseline. U_s is an indicator variable equal to 1 if the school was sampled for the Uniforms program. Error terms are assumed to be independent across schools, but are allowed to be correlated across observations in the same school. Regressions were run with and without individual (age) and school-level controls. Not surprisingly given the random assignment of schools to the programs and the very large sample size, the results are essentially identical, so the tables report only the results without these control variables.

We can separately look at both the uniform and the teacher training program for the affected cohort by estimating the following equation:

$$O_{i,s} = \alpha_2 + \beta_2 U_s + \gamma_2 T_s + \delta_2 (U_s * T_s) + \mu_{2,s} + \epsilon_{2is} \qquad (2)$$

where T_s is an indicator variable equal to 1 if the school was sampled for Teacher Training on HIV education. Estimates of the coefficient β_2 will measure the effect of the uniforms distribution on the outcome of interest, absent any other program. The effect of the Teacher Training program will be captured by γ. Finally, the effect of both programs conducted in conjunction will be capture by the sum $\beta_2 + \gamma_2 + \delta_2$.

Finally, while all tables below present results of linear probability models, we have run the regressions with probit or logit specifications and found that the results are unchanged (results available upon request).

5 Results

5.1 Impact on Schooling

Tables 2 and 3 present the results of OLS estimates of the effects on a series of educational outcomes. Table 2 presents the estimates for girls and Table 3 presents the estimates for boys. In both tables the odd-

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numbered columns present the estimates of equation (1) and the even-numbered columns estimate equation (2). At the bottom of each panel, for even columns, we compute the total effect on those affected by both programs (Uniforms + Teacher Training), estimated by the sum $\beta + \gamma + \delta$, and we present the p-value for the test that this sum is equal to zero.[12]

The first two outcomes in Table 2 suggest that the uniforms program helped marginal students remain in school. Girls in schools where free uniforms were provided were 2.4 percentage points less likely to have dropped out by the end of 2005, and the effect persisted through 2007. Overall, the dropout rate among girls decreased 20% among girls in Uniforms schools, and correspondingly the likelihood that girls had completed primary school by the end of 2007 was 4.5 percentage points (12%) higher. Similar effects can be seen among boys (Table 3). These results confirm that paying for uniforms is an important barrier to access to education in Kenya.

Since the majority of students were still in school at the time of follow-up (25% of them in primary school and 30% in secondary school), the data on the number of years of schooling received by students is truncated. Thus, measuring the impact of the program on the average number of months of education completed at the time of follow-up likely underestimates program impact on educational attainment. Columns 9 and 10 in Table 2 suggest that, so far, the Uniforms program generated a gap of 0.07 years of schooling between girls who benefitted from the uniforms program and girls who did not.

Interestingly, the last column of Table 2 suggests that, conditional on still being in school by 2005, girls in Uniform Schools were more likely to have progressed through grades 6 and 7 and to have reached grade 8, the final year of primary school, by 2005 (Table 2, Column 11). The point estimate for boys is also positive, but much smaller in magnitude and insignificant, probably due to the fact that boys are typically more likely to be promoted than girls to start with. This effect on grade promotion is difficult to interpret. Why would the distribution of free uniforms affect grade progression, in particular for girls? Because of the differential attrition (fewer students dropped out in the Uniforms schools), we should expect the average "ability" in the Uniforms schools to be lower, and thus promotion rates to be lower. We can think of several possible explanations for the observed increase in promotion rates among girls in Uniforms schools. First, the presence of the program could have increased the intrinsic motivation of students in the treatment group. Second, while the provision of a second uniform after 18 months *was not* conditioned on promotion, it is possible that the students or their parents thought that it was. This would

[12] Appendix Table A2 shows that attrition in the various outcomes studied in Table 2 was not differential across treatment groups.

have created an extrinsic incentive to exert effort and perform well in class.[13] Third, if the school administration and the teachers thought that uniforms would be renewed only for those students who passed, they might have decided to be more generous in their assessment of the students' performance. We do not have data to know which of these explanations is the most likely, or to what extent they participated in the observed increase in promotion rates among baseline students in the uniforms schools.

Teacher training on the HIV curriculum had no significant impact on educational attainment of either boys or girls. The even columns also show that the combined effect of the teacher training and the uniform program was very close to the effect of the uniform program [at all]. There are even some variables (drop out by 2007 for example) for which the interaction is significantly negative, that is the teacher training program reduced the impact of the uniform program. These are the variables for which there is a small direct effect of the teacher training program, so the negative interaction is telling us that students are not affected by both programs.

5.2 Impact on Teen Childbearing and Marriage

We now turn to whether the program reduced the incidence teenage pregnancy and marriage. Table 4 shows OLS regressions estimating program impact on girls' marriage and childbearing at the end of 2005 (2.5 years after baseline) and the end of 2007 (4.5 years after baseline). Odd columns estimate equation (1) and even columns estimate equation (2). Appendix Table A4 shows that attrition in the various outcomes studied in Table 4 was similar across treatment groups.

While 14.4 percent of girls in comparison schools had ever been pregnant by the end of 2005, this share was 1.5 percentage points (10%) lower in Uniforms schools. Girls were also 1.7 percentage points (14%) less likely to be married by the end of 2005. This is not surprising since among this age group, marriage is more often a consequence rather than a cause of pregnancy (as indicated by the fact that mean pregnancy rate is greater than the mean marriage rate).

By 2007, the gap between the two groups had increased in absolute value: girls in uniform schools were by then 2.6 percentage point less likely to have started childbearing. This implies a lower percentage reduction, since by 2007, 30% of the girls have started childbearing. But this suggests that the girls do not "catch up" by 2007, so the delay in pregnancy persists beyond the immediate effect in primary school.

[13] Note that we measured school attendance by conducting two to three unannounced school visits per year. We find

Figure 2, shows that the uniforms program reduced teenage pregnancy across all age groups, although the largest impact was for older girls, those who were already 15 at baseline.

In contrast, teacher training on the HIV curriculum had no significant impact on teen childbearing in schools without the uniform program. Moreover, surprisingly, at least in 2005, the teacher training program appears to have had the perverse effect of *reducing* the impact of the school uniform program. The interaction between the school uniform and the teacher training programs is negative and significant for the probability of being married and having begun pregnancy by 2005. The combined effect of both programs in 2005 is close to zero (so that the point estimate suggests that girls who received a uniform and whose teachers were trained are actually as likely to be married and to have had a child as girls who received neither program, though the confidence interval includes a positive effect). By 2007, this negative interaction is less strong, but is still present. This also implies that the effect of receiving *only* the uniform is actually larger than what we found in the combined sample: receiving just the uniform reduce the probability to have started pregnancy 3 percentage points in 2005, and 4.3 by 2007, respectively.

These results are troubling, as they suggest that the HIV curriculum may play a counter-productive role in an environment where barrier to education are reduced. Because the curriculum insists on fidelity and marriage as a second best to abstinence (with condoms at best mentioned as a distant third option), one possible explanation for this result is that the girls who are on the verge of dropping out and starting a family are encouraged to do so, even when the uniform would otherwise get them a chance to stay in school. However, we do not see a different interaction effect in schools were ICS implemented the "critical thinking" add-on in 2005. Since this add-on program consisted in a debate on condom use, it could have counteracted the abstinence-until-marriage-only message. However, as it was implemented two years into the study, marginal girls might have already dropped out of school at the time and not benefitted from it.

Table 5 examines program impact on boys. Both marriage and fertility are very low among boys even by the end of our sample period (only 2% of boys are married by the end of 2007), and there is therefore no power to distinguish the effect of uniform provision.

The effects on fertility are surprisingly large by comparison to the effect on education: by 2007, the program-induced reduction in the fraction of girls who have started childbearing is almost as large (2.6 percentage point) as the reduction in drop out (3 percentage points). It would seem tempting to use table 2

no effect of the uniforms program on attendance.

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and table 4, respectively, as the first stage and the reduced form of an instrumental variable strategy of the effect of education on early fertility. However, this is probably not legitimate: this instrumental strategy is valid only under the additional assumption that the uniforms had no direct effect on the pregnancy status of girls. There are several reasons why this identification restriction may not hold. First, the availability of the uniform increases the value of being in school (since it decreases the cost), even for girls who would not have dropped out. In our model, it will induce some girls who would not have dropped out, but who were on the verge of doing so, to delay sexual activity (or use contraception) to avoid becoming pregnant. Second, a new, clean uniform may make the girls more proud, or reinforce their identity as “school girls”, and thus gives them more confidence to say no to sex or marriage. Third, not having to pay for the uniform may reduce the temptation to engage in a relationship with a “sugar daddy”, who can provide for the cost of the uniform. All of these suggest that the instrumental variable estimate will be biased upwards.

Nevertheless, the fact that the two reduced form estimates of the effect of the programs on fertility are approximately the same size suggest a very large impact of the ability to stay in school on delay on adolescent behavior and fertility in Kenya (some of it direct, and some of it indirect, through the reduction in drop out).

6 Conclusion

It is widely believed that improving the education of women is a critical step in reducing fertility and improving child health in developing countries. The findings of this paper helps shed some light on this important question. Using experimental data, we show that reducing the cost of education by providing free uniforms to students conditionally on their enrollment in school leads to reductions in the dropout rates of both boys and girls, and to reductions in teen childbearing and marriage rates. This suggests that girls who have access to completely free education are willing and able to defer childbearing and marriage in order to rip the benefits of education.

The findings of this paper imply a particularly important role of the ability to stay in school: the effect on the number of pregnancies averted by 2007 is almost as large as the effect on drop out. As we discussed, this does not imply that every girl who did not drop out because of the program would have had a child otherwise, since some girls who would have stayed in school if not pregnant may also have been induced by the program to remain sexually inactive or use contraception. But this suggests that giving girls additional motivation to delay their first pregnancy (the opportunity to go to school if they do so) is an

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extremely powerful way to reduce early fertility. Most government and international effort have focused on ease of access to basic education (up to grade 6 or 9). This result suggest that education gains in the upper end of that range, or even secondary school, especially for girls, may have a much larger impact on reducing early fertility than we would expect based on the causal effect of years of primary education.

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References

Ambrus, Attila, and Erica Field (2008). “Early Marriage, Age of Menarche, and Female Schooling Attainment in Bangladesh”, *Journal of Political Economy* 116(5): 881-930.

Baird, Sarah, Craig McIntosh and Berk Ozler (2010). “When and why do cash transfers work? Evidence from a schooling program in Malawi”, mimeo, UC San Diego.

Becker, Gary S. (1960). An Economic Analysis of Fertility, in *Demographic and Economic Change in Developed Countries*, Universities---National Bureau Conference Series 11, Princeton: Princeton University Press, 1960, pp. 209--240.

Becker, G. and H. G. Lewis (1973). On the Interaction Between the Quantity and Quality of Children, *Journal of Political Economy*, Part 2: New Economic Approaches to Fertility, 81 (2), S279--S288.

Behrman, Jere R. and Mark R. Rosenzweig (2002). Does Increasing Women's Schooling Raise the Schooling of the Next Generation?, *American Economic Review*, 92 (1), 323--334.

Black, Sandra, Paul Devereux and Kjell Silvanes. (2008). “Staying the classroom and out of the maternity ward? The effect of compulsory schooling laws on teenage births”. *Economic Journal* 118 (july) 1025-1034.

Breierova, L. and E. Duflo (2004) The Impact of Education on Fertility and Child Mortality: Do Fathers Really Matter Less Than Mothers?, NBER Working Paper #10513.

Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], and ORC Macro. (2004). *Kenya Demographic and Health Survey 2003*. Caverton, Maryland: CBS, MOH, and ORC Macro.

Duflo, Esther (2001), Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment, *American Economic Review*, 91:4, 795---813.

Duflo, Esther., Dupas, P., Kremer, M. and S. Sinei (2006) HIV prevention education in primary schools: Evaluating Kenya's national program. unpublished manuscript, MIT Abdul Latif Jameel Poverty Action Lab.

Dupas, Pascaline (2009). “Do Teenagers Respond to HIV Information? Experimental Evidence from Kenya”. NBER Working Paper #14707.

Evans, David, Michael Kremer, Mũthoni Ngatia (2009). “The Impact of Distributing School Uniforms on Children’s Education in Kenya”, mimeo, World Bank.

Gersovitz, M. et al, (1998) “The Balance of Self-Reported Heterosexual Activity in KAP Surveys and the AIDS Epidemic in Africa,” *Journal of the American Statistical Association*, vol. 93, pp. 875-883.

McCrary, J. and H. Royer (2008). "The Effect of Female Education on Fertility and Infant Health: Evidence From School Entry Policies Using Exact Date of Birth", unpublished manuscript, Michigan University.

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Schultz, T. Paul (2004). “School subsidies for the Poor: Evaluating the Mexican Progresa Poverty Program”. *Journal of Development Economics*. 74(1): 199-250.

Schultz, T. Paul (2004). School Subsidies for the Poor: Evaluating the Mexican Progresa Poverty Program. *Journal of Development Economics* 74(1): 199-250.

Strauss, John and Duncan Thomas. (1995). “Human Resources: Empirical Modeling of Household and Family Decisions,” in J. Behrman and T.N. Srinivasan, eds., *The Handbook of Development Economics*, Vol. 3A, Amsterdam: Elsevier.

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Figure 1: Age Distribution of Girls at Baseline (March 2003)

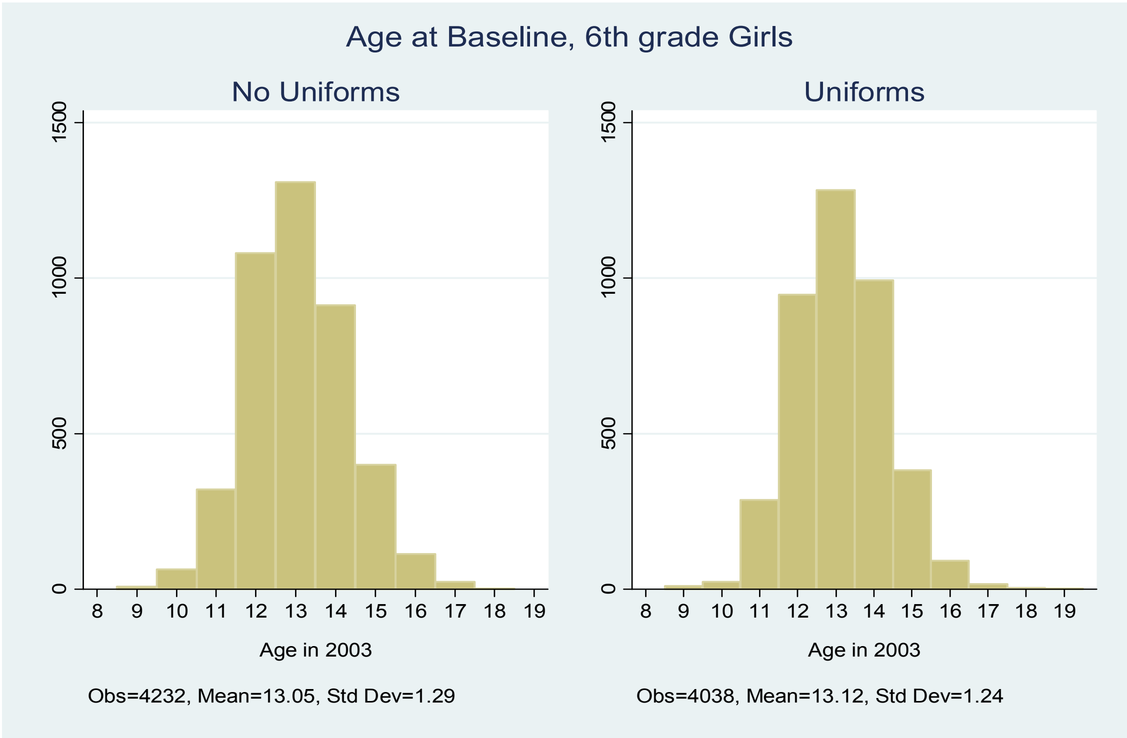
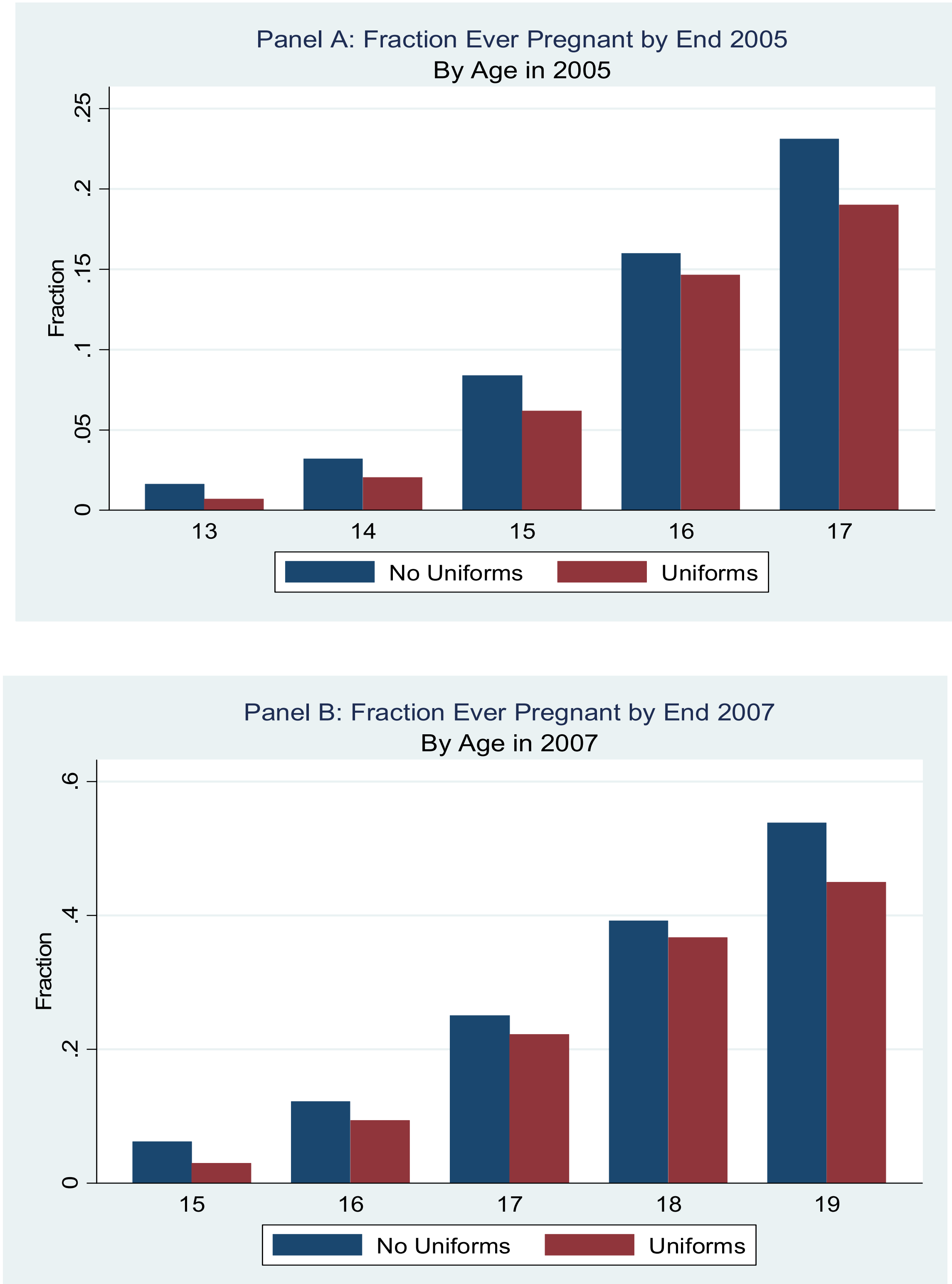


Figure 2: Impact of Uniforms Program on Teenage Pregnancy, by Age



Notes: Pregnancy status for girls enrolled in grade 6 in 2003. Panel A: 590, 1995, 2519, 1863, and 753 observations for ages 13, 14, 15, 16, and 17, respectively. Panel B: Data from 553, 1825, 2316, 1700 and 691 observations for ages 15, 16, 17 , 18 and 19, respectively.

Table 1. Verifying Randomization: Baseline School Characteristics, by Treatment Group

	Uniforms Only (T1)	Uniform + HIV Teacher Training (T2)	Control Schools (C)	Difference (T1-C)	*P-Value (T1-C=0)*	Difference (T2-C)	*P-Value (T2-C=0)*
Panel A. Baseline Characteristics of Schools							
Average Score on Primary School Graduation Exam (KCPE) in 2003	255.2	248.6	249.3	5.9	*0.097*	-0.8	*0.468*
	[29.6]	[32.0]	[26.1]				
School Size	464.6	473.8	498.9	-34.3	*0.292*	-25.1	*0.587*
	[203.1]	[185.7]	[194.3]				
Sex Ratio (Female/Male) among Students in 2002	1.016	1.012	1.016	0.000	*0.945*	-0.004	*0.823*
	[.124]	[.105]	[.135]				
Number of Latrines on school compound	11.6	9.9	11.1	0.54	*0.215*	-1.13	*0.081*
	[6.3]	[5.7]	[5.5]				
Number of primary schools within 2 km radius	2.01	2.06	2.06	-0.04	*0.845*	0.01	*0.925*
	[1.95]	[1.8]	[1.76]				
Total Number of Teachers in 2003	14.2	13.8	14.6	-0.40	*0.786*	-0.76	*0.282*
	[4.2]	[4.4]	[4.7]				
Average Age of Teachers in 2003	40.0	39.6	39.6	0.34	*0.455*	0.03	*0.845*
	[3.1]	[3.8]	[3.5]				
Sex Ratio (Female/Male) among Teachers in 2003	1.22	1.30	1.15	0.07	*0.856*	0.15	*0.281*
	[1.]	[.987]	[.829]				
Share Ever Pregnant by End 2005 Among Girls in Grade 8 in 2003	0.21	0.23	0.23	-0.02	*0.202*	0.00	*0.768*
	[.14]	[.15]	[.13]				
Share Married by End 2005 Among Girls in Grade 8 in 2003	0.13	0.16	0.14	-0.01	*0.187*	0.03	*0.045*
	[.12]	[.13]	[.1]				
Panel B. Baseline Characteristics of Study Cohort (Grade 6 in 2003)							
Average Number of Girls in Grade 6	29.3	28.0	29.4	-0.17	*0.866*	-1.47	*0.446*
	[15.4]	[14.4]	[14.]				
Number of Boys in Grade 6	28.2	30.3	30.4	-2.20	*0.226*	-0.13	*0.737*
	[13.3]	[14.7]	[14.1]				
Sex Ratio (Female/Male)	1.064	0.963	1.012	0.05	*0.131*	-0.05	*0.152*
	[.412]	[.356]	[.325]				
Averge Age among Girls	13.21	13.18	13.14	0.07	*0.469*	0.04	*0.861*
	[.56]	[.59]	[.6]				
Averge Age among Boys	13.8	13.8	13.8	0.01	*0.895*	0.00	*0.975*
	[.62]	[.62]	[.66]				
Number of Schools	82	83	165				

Notes: School Averages. Standard deviations in brackets.

Table 2. Educational Achievement for Girls

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Dropped Out of Primary School by End of 2005		Dropped Out of Primary School by End of 2007		Had Completed Primary School by End of 2007		In Secondary School at End of 2007		Years of Schooling since Baseline by End of 2007		Had Reached Grade 8 by 2005 *(if did not dropout)*	
β	Uniforms	-0.024	-0.035	-0.030	-0.055	0.045	0.055	0.035	0.035	0.073	0.120	0.053	0.082
		(0.010)**	(0.014)**	(0.014)**	(0.019)***	(0.019)**	(0.028)**	(0.017)**	(0.025)	(0.030)**	(0.040)***	(0.020)***	(0.030)***
γ	Uniforms		0.022		0.051		-0.023		0.000		-0.098		-0.059
	x Teacher Training on HIV		(0.020)		(0.028)*		(0.039)		(0.035)		(0.059)*		(0.040)
δ	Teacher Training on HIV	0.001	-0.010	-0.001	-0.026	0.018	0.029	0.003	0.003	-0.020	0.027	0.005	0.034
		(0.010)	(0.014)	(0.014)	(0.019)	(0.019)	(0.026)	(0.017)	(0.023)	(0.030)	(0.039)	(0.020)	(0.026)
	Observations	9169	9169	8906	8906	9010	9010	8734	8734	8717	8717	7526	7526
	Mean of Dep. Var. (Control)	0.179	0.179	0.272	0.272	0.476	0.476	0.272	0.272	3.279	3.279	0.400	0.400
	β + γ + δ		-0.023		-0.030		0.061		0.038		0.049		0.057
	p-value (Test: β + γ + δ = 0)		0.147		0.136		0.028		0.125		0.269		0.034

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table 3. Educational Achievement for Boys

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Dropped Out of Primary School by End of 2005		Dropped Out of Primary School by End of 2007		Had Completed Primary School by End of 2007		In Secondary School at End of 2007		Years of Schooling since Baseline by End of 2007		Had Reached Grade 8 by 2005 *(if did not dropout)*	
β Uniforms	-0.025	-0.031	-0.029	-0.038	0.036	0.042	0.029	0.032	0.054	0.061	0.023	0.034
	(0.009)***	(0.013)**	(0.012)**	(0.017)**	(0.019)*	(0.026)	(0.017)	(0.024)	(0.026)**	(0.036)*	(0.020)	(0.029)
γ Uniforms		0.012		0.018		-0.012		-0.006		-0.014		-0.021
x Teacher Training on HIV		(0.019)		(0.025)		(0.039)		(0.035)		(0.053)		(0.041)
δ Teacher Training on HIV	0.002	-0.004	0.011	0.002	-0.006	-0.001	-0.007	-0.004	-0.012	-0.006	-0.007	0.003
	(0.009)	(0.014)	(0.012)	(0.019)	(0.019)	(0.026)	(0.017)	(0.023)	(0.026)	(0.040)	(0.021)	(0.028)
Observations	9477	9477	9250	9250	9352	9352	9054	9054	9037	9037	8249	8249
Mean of Dep. Var. (Control)	0.130	0.130	0.198	0.198	0.549	0.549	0.332	0.332	3.445	3.445	0.461	0.461
β + γ + δ		-0.023		-0.018		0.029		0.022		0.041		0.016
p-value (Test: β + γ + δ = 0)		0.088		0.306		0.281		0.390		0.265		0.568

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table 4. Marriage and Fertility Outcomes for Girls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Married by End of 2005		Married by End of 2007		Ever Pregnant by End of 2005		Ever Pregnant by End of 2007		Had child(ren) by End of 2005		Had child(ren) by End of 2007		Had child(ren) by Age 16	
β Uniforms	-0.017	-0.028	-0.019	-0.025	-0.015	-0.030	-0.026	-0.043	-0.005	-0.013	-0.020	-0.038	-0.018	-0.027
	(0.008)**	(0.011)**	(0.013)	(0.017)	(0.009)	(0.013)**	(0.014)*	(0.019)**	(0.007)	(0.010)	(0.012)*	(0.016)**	(0.010)*	(0.015)*
γ Uniforms		0.023		0.012		0.031		0.036		0.016		0.036		0.019
x Teacher Training on HIV		(0.016)		(0.025)		(0.018)*		(0.028)		(0.014)		(0.024)		(0.020)
δ Teacher Training on HIV	0.009	-0.002	0.018	0.012	-0.005	-0.020	0.005	-0.012	-0.005	-0.013	-0.001	-0.019	0.003	-0.006
	(0.008)	(0.011)	(0.012)	(0.017)	(0.009)	(0.013)	(0.014)	(0.020)	(0.007)	(0.010)	(0.012)	(0.016)	(0.010)	(0.014)
Observations	9128	9128	8374	8374	9110	9110	8335	8335	9139	9139	8597	8597	7309	7309
Mean of Dep. Var. (Control)	0.119	0.119	0.260	0.260	0.144	0.144	0.307	0.307	0.100	0.100	0.246	0.246	0.120	0.120
β + γ + δ		-0.007		-0.001		-0.019		-0.019		-0.010		-0.021		-0.015
p-value (Test: β + γ + δ = 0)		0.469		0.962		0.151		0.347		0.301		0.245		0.319

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table 5. Marriage and Fertility Outcomes for Boys

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Married by End of 2005		Married by End of 2007		Had child(ren) by End of 2005		Had child(ren) by End of 2007	
β	Uniforms	-0.008	-0.005	-0.005	-0.001	0.002	0.005	0.001	0.003
		(0.003)**	(0.005)	(0.007)	(0.009)	(0.004)	(0.006)	(0.004)	(0.005)
γ	Uniforms		-0.005		-0.008		-0.007		-0.004
	x Teacher Training on HIV		(0.006)		(0.013)		(0.009)		(0.008)
δ	Teacher Training on HIV	-0.001	0.002	0.003	0.007	-0.003	0.001	-0.002	0.000
		(0.003)	(0.006)	(0.007)	(0.011)	(0.005)	(0.007)	(0.004)	(0.006)
	Observations	9383	9383	8564	8564	8887	8887	8880	8880
	Mean of Dep. Var. (Control)	0.019	0.019	0.058	0.058	0.035	0.035	0.026	0.026
	β + γ + δ		-0.008		-0.002		-0.001		-0.001
	p-value (Test: β + γ + δ = 0)		0.084		0.829		0.873		0.844

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table 6. Pregnancy Hazard Model (Girls only)

	If did not have a child as of roll call visit *t-1:* has a child as of roll call visit *t*					
	(1)	(2)	(3)	(4)	(5)	(6)
In school as of roll call visit *t-1*	-0.2634	-0.2988	-0.2988		-0.2675	-0.2675
	(0.0094)***	(0.0076)***	(0.0076)***		(0.0087)***	(0.0087)***
Uniforms		0.0002	-0.0013	-0.0071	-0.0007	-0.0022
		(0.0016)	(0.0022)	(0.0031)**	(0.0015)	(0.0021)
Uniforms			0.0031	0.0060		0.0031
x Teacher Training on HIV			(0.0032)	(0.0045)		(0.0031)
Teacher Training on HIV		-0.0023	-0.0038	-0.0025	-0.0014	-0.0029
		(0.0016)	(0.0023)	(0.0031)	(0.0016)	(0.0022)
Gap (in days) between visits *t-1* and *t*	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Age in years as of roll call visit *t*					0.0043	0.0043
					(0.0005)***	(0.0005)***
Constant	0.2369	0.2849	0.2856	-0.0075	0.1850	0.1856
	(0.0088)***	(0.0089)***	(0.0089)***	(0.0064)	(0.0125)***	(0.0125)***
Individual Fixed Effects	Yes					
Location Stata Dummies		Yes	Yes	Yes	Yes	Yes
Observations	56812	56812	56812	58370	52681	52681
Number of girls	9372	9372	9372	9451	8270	8270
R-squared	0.15	0.23	0.23	0.01	0.21	0.21

Data source: 8 roll call visits conducted at primary schools at regular intervals between March 2004 and July 2007. The average time between two visits is 5 months.

Standard errors clustered at the level of the primary school of origin.

Table A1. Reliability of Roll Call Method to collect Fertility Data

Gap between Roll Call and Home Visit	Roll Call consistent with Girls' Own Report (%)	Group Differences in Consistency Level				
		Coeff on "TT"	p-val (TT = 0)	Coeff on "Uniforms"	p-val (Uniforms = 0)	N
Panel A1. Girls reported as having started childbearing according to roll call						
< 4 months	0.893	-0.037	0.356	0.004	0.910	252
< 6 months	0.882	-0.045	0.137	0.043	0.149	560
Panel A2. Girls reported as NOT having started childbearing according to roll call						
< 4 months	0.795	-0.111	0.207	-0.046	0.605	83
< 6 months	0.717	0.021	0.752	0.000	0.999	184
Panel B1. Girls reported as having ever had a child according to roll call						
< 4 months	0.933	-0.002	0.962	-0.012	0.725	179
< 6 months	0.936	-0.011	0.687	0.026	0.313	390
Panel B2. Girls reported as NOT having ever had a child according to roll call						
< 4 months	0.795	-0.098	0.136	-0.044	0.52	156
< 6 months	0.737	-0.030	0.547	0.021	0.671	354

Data source: 1,840 girls were sampled for "home tracking". Those girls were randomly selected among 40,000 girls enrolled in grades 5-8 in 2003 in one of the 328 schools participating in the program. The random sampling was done after stratifying by childbearing status (according to the Roll Call). Girls reported as having started childbearing (i.e., ever pregnant) were oversampled and represented 70% of those sampled for home tracking. About 40% of sampled girls could be found and interviewed in person within 6 months after the roll call.

Table A2. Attrition in Educational Achievement for Girls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Missing Dropped Out of Primary School by End of 2005		*Missing* Dropped Out of Primary School by End of 2007		*Missing* Had Completed Primary School by End of 2007		*Missing* In Secondary School at End of 2007		*Missing* Years of Schooling since Baseline by End of 2007		*Missing* Had Reached Grade 8 by 2005 *(if did not dropout)*	
β Uniforms	0.005	-0.004	0.000	-0.008	0.002	-0.005	0.009	0.008	0.009	0.007	-0.019	-0.036
	(0.005)	(0.006)	(0.006)	(0.008)	(0.006)	(0.007)	(0.009)	(0.010)	(0.009)	(0.010)	(0.011)*	(0.014)**
γ Uniforms		0.017		0.017		0.014		0.003		0.004		0.036
x Teacher Training on HIV		(0.010)*		(0.012)		(0.011)		(0.018)		(0.019)		(0.021)*
δ Teacher Training on HIV	0.002	-0.007	-0.003	-0.011	-0.002	-0.008	0.002	0.000	0.002	0.000	0.002	-0.016
	(0.005)	(0.005)	(0.006)	(0.008)	(0.006)	(0.007)	(0.009)	(0.013)	(0.009)	(0.013)	(0.011)	(0.014)
Observations	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523
Mean of Dep. Var. (Control)	0.037	0.037	0.065	0.065	0.054	0.054	0.083	0.083	0.085	0.085	0.210	0.210
$\beta + \gamma + \delta$		0.006		-0.002		0.001		0.011		0.011		-0.016
p-value (Test: $\beta + \gamma + \delta = 0$)		0.398		0.834		0.907		0.416		0.396		0.340

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table A3. Attrition in Educational Achievement for Boys

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Missing Dropped Out of Primary School by End of 2005		*Missing* Dropped Out of Primary School by End of 2007		*Missing* Had Completed Primary School by End of 2007		*Missing* In Secondary School at End of 2007		*Missing* Years of Schooling since Baseline by End of 2007		*Missing* Had Reached Grade 8 by 2005 *(if did not dropout)*	
β Uniforms	-0.004	-0.005	-0.002	0.003	-0.003	0.002	-0.001	0.004	-0.001	0.004	-0.027	-0.034
	(0.005)	(0.005)	(0.007)	(0.009)	(0.006)	(0.007)	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)***	(0.013)***
γ Uniforms		0.003		-0.010		-0.009		-0.008		-0.010		0.014
x Teacher Training on HIV		(0.010)		(0.012)		(0.011)		(0.016)		(0.016)		(0.021)
δ Teacher Training on HIV	0.006	0.005	0.000	0.005	0.001	0.005	0.000	0.004	0.000	0.005	0.007	0.001
	(0.005)	(0.006)	(0.007)	(0.009)	(0.006)	(0.007)	(0.009)	(0.012)	(0.009)	(0.011)	(0.010)	(0.015)
Observations	9788	9788	9788	9788	9788	9788	9788	9788	9788	9788	9788	9788
Mean of Dep. Var. (Control)	0.032	0.032	0.055	0.055	0.045	0.045	0.075	0.075	0.077	0.077	0.157	0.157
β + γ + δ		0.003		-0.002		-0.002		0.000		-0.001		-0.019
p-value (Test: β + γ + δ = 0)		0.809		0.879		0.816		0.967		0.975		0.196

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table A4. Attrition in Marriage and Fertility Outcomes for Girls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Missing Married by End of 2005		*Missing* Married by End of 2007		*Missing* Ever Pregnant by End of 2005		*Missing* Ever Pregnant by End of 2007		*Missing* Had child(ren) by End of 2005		*Missing* Had child(ren) by End of 2007	
β Uniforms	0.001	-0.006	0.004	0.003	-0.001	-0.010	0.007	0.002	-0.001	-0.008	0.007	-0.003
	(0.005)	(0.006)	(0.011)	(0.012)	(0.005)	(0.006)	(0.010)	(0.012)	(0.005)	(0.006)	(0.008)	(0.011)
γ Uniforms		0.015		0.002		0.018		0.010		0.016		0.021
x Teacher Training on HIV		(0.010)		(0.021)		(0.011)*		(0.021)		(0.010)		(0.016)
δ Teacher Training on HIV	0.004	-0.004	-0.005	-0.006	0.005	-0.004	-0.004	-0.009	0.004	-0.004	-0.018	-0.028
	(0.005)	(0.006)	(0.010)	(0.015)	(0.005)	(0.006)	(0.010)	(0.014)	(0.005)	(0.006)	(0.008)**	(0.009)***
Observations	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523
Mean of Dep. Var. (Control)	0.041	0.041	0.121	0.121	0.043	0.043	0.125	0.125	0.040	0.040	0.097	0.097
β + γ + δ		0.005		-0.001		0.004		0.003		0.004		-0.010
p-value (Test: β + γ + δ = 0)		0.582		0.966		0.668		0.851		0.695		0.416

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).

Table A5. Attrition in Marriage and Fertility Outcomes for Boys

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Missing Married by End of 2005		*Missing* Married by End of 2007		*Missing* Had child(ren) by End of 2005		*Missing* Had child(ren) by End of 2007	
β Uniforms	-0.003	-0.006	0.003	0.004	0.003	0.007	0.003	0.008
	(0.006)	(0.007)	(0.011)	(0.014)	(0.008)	(0.011)	(0.008)	(0.011)
γ Uniforms		0.005		-0.001		-0.009		-0.009
x Teacher Training on HIV		(0.011)		(0.021)		(0.017)		(0.017)
δ Teacher Training on HIV	0.003	0.000	-0.001	0.000	0.001	0.005	0.001	0.006
	(0.005)	(0.006)	(0.011)	(0.015)	(0.008)	(0.010)	(0.008)	(0.010)
Observations	9788	9788	9788	9788	9788	9788	9788	9788
Mean of Dep. Var. (Control)	0.041	0.041	0.125	0.125	0.092	0.092	0.093	0.093
β + γ + δ		-0.001		0.003		0.003		0.005
p-value (Test: β + γ + δ = 0)		0.978		0.894		0.750		0.723

Notes: Estimates obtained through OLS regessions. Standard errors clustered at the school level. Panel A includes only students in the cohort affected by the uniforms program (grade 6 of 2003). Panel B includes two older cohorts (grades 7 and 8 of 2003) and Panel C includes one younger cohort (grade 5 in 2003).