The Effect of Gender-Related Aspects of School Quality on Schoolgirl Pregnancy in Rural Malawi

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Abstract

The negative association between educational attainment and fertility has been well established. However, research on the role of school quality in the timing and level of fertility has been limited. Rather than pregnancy causing school dropout, these events may be caused by shared underlying factors, including gender inequitable school environments. Using data from the Malawi Schooling and Adolescent Study, we explore the relationship between gender-related aspects of school quality and schoolgirl pregnancy in rural Malawi, controlling for relevant student characteristics. We compare these results with findings on the relationship between school quality and non-pregnancy related school dropout. Overall, our results provide little evidence that gender-related aspects of school quality play an important role in driving either schoolgirl pregnancy or non-pregnancy related dropout in our sample. However, two school-level characteristics appear relevant to our outcomes of interest: presence of a female teacher in the school and distance from the farthest school catchment village. Also, our results indicate the potentially important effects of school context defined more broadly, including the influence of peer groups, on risk of schoolgirl pregnancy and dropout. Student-level characteristics, such as prior school performance, appear to play an important role in school dropout overall. Our findings provide support for the growing body of evidence indicating the interconnected nature of decisions about schooling, sexual behavior, fertility, and marriage.

Background

Since 1990 there has been a dramatic increase in school enrollment globally, and the pace of change has been faster for girls than boys, resulting in a narrowing gender gap in primary school enrollment (UNESCO 2013/14; Grant & Behrman 2010). As a result, adolescent girls in low-income countries are more likely to be in school than out of school (IOM 2005). Over the same period, there have also been changes in the timing of transitions to adulthood, including marriage and pregnancy. The mean ages of marriage and first birth have both increased for girls globally, although age at first sex has remained stable overall, with variations between countries (IOM 2005; Mensch, Grant & Blanc 2006; Hindin & Fatusi 2009). As a result, more adolescents are engaging in premarital sex, and experiencing an increased risk of unplanned pregnancies both during and after leaving school (Lloyd 2005; Biddlecom et al. 2008).

Overall, attending school appears to be protective against early sexual debut and adolescent childbearing. Using Demographic and Health Survey (DHS) data from 50 countries, Lloyd (2007) found that, with a few exceptions, 15-17 year old girls who are still attending school are significantly less likely than their out of school peers to have had sex. This relationship was consistent across countries with different levels of enrollment, suggesting that it may not simply be a reflection of the selectivity of in-school populations. Moreover, girls enrolled in school who were sexually active were more likely to be using contraception. While being in school is protective in general, in some settings schoolgirl pregnancy may be an important cause of school dropout, and a driver of persistent gender gaps in educational attainment. The school environment presumably plays an important role in gender role socialization and thus, perhaps, in the risk of schoolgirl pregnancy.

Using data from the longitudinal Malawi Schooling and Adolescent Study, this paper aims to assess the role of gender-related aspects of school quality in driving the risk of schoolgirl pregnancy and non-pregnancy related school dropout.

Schoolgirl pregnancies and school dropout

Despite widespread policy attention, evidence of the prevalence of schoolgirl pregnancy, as well as the impact of schoolgirl pregnancy on dropout, is mixed. Among countries with primary enrollment rates greater than 50 percent, the relative contribution of pregnancy to dropout rates varies, indicating the potential importance of the school context in mediating this relationship (Lloyd 2005). Eloundou-

Enyegue and Stokes (2004) argued that adolescent childbearing is particularly problematic in terms of schooling outcomes in settings where it occurs frequently but also at a time when girls would be attending school otherwise (i.e. outside of marriage, or in settings with increasing school enrollment). Countries in the middle of adolescent fertility and cultural transitions around gender are therefore most likely to benefit from a policy focus on schoolgirl pregnancy (Eloundou-Enyegue and Stokes 2004).

Estimates of the proportion of school dropout that can be explained by schoolgirl pregnancy vary. Lloyd and Mensch (2008) found that marriage and pregnancy together explained up to 20 percent of school dropout in five francophone West African countries. Schoolgirl pregnancy only accounted for 5 to 10 percent of girls' departures from school, and these factors were decreasing in importance over time. In a study of adolescents in three rural districts of Kenya (Nyeri, Kilifi, Nakuru), Mensch and colleagues (2001) found that childcare was the main reason for leaving school for 5 percent of the girls who dropped out, or about 1 percent of girls who had ever attended school. The authors project that only about 3 percent of girls would leave school due to pregnancy by the time they were 19 years old. More common reasons given for leaving school included: inability to pay fees, having finished the current level, poor performance, and lack of interest. In some settings, however, schoolgirl pregnancy has been found to be a more significant cause of school dropout. Eloundou-Enyegue (2004) found that pregnancy accounts for 13 percent of girls' dropout in grade 6 (the last year of primary school), and 33 percent of dropout in grade 7 (first year of secondary) in Cameroon. A 2006 study of adolescents living in the Kibera slums of Nairobi found that, among girls who were out of school, 14 percent reported that they left due to marriage and 9 percent reported they left due to pregnancy (Erulkar & Matheka 2007). Recent findings from the Malawi Schooling and Adolescent Study in southern Malawi, also used for the current analyses, indicate that as much as one quarter of school dropout may be due to pregnancy (Kelly et al. 2014).

The relationship between schoolgirl pregnancy and school dropout is complex. Rather than schoolgirl pregnancies causing dropout, both pregnancy and dropout may be caused by shared underlying factors, including gender inequitable school environments, lack of economic opportunities for young women, parents' attitudes toward girls' education, and cultural support for early motherhood (Lloyd & Mensch 1999; Lloyd & Mensch 2008; Grant & Hallman 2008). The endogeneity of these events makes it difficult to gain insight into the timing of pregnancy, marriage, and school leaving – and the decision-making process underlying these transitions. Existing evidence reinforces the entangled nature of decisions

about schooling, marriage, and family planning. For example, Duflo and colleagues (2012) report on a randomized evaluation of an education subsidy program implemented in Western Kenya. Provision of two free school uniforms during the last three years of primary school led to a 17 percent reduction in the adolescent pregnancy rate in the beneficiary group. The authors argue that the subsidy led to fewer pregnancies due to a reduction in unprotected sex, but also led some girls to switch from committed relationships to more casual relationships, in which the risk of pregnancy was lower, demonstrating that in some settings decision-making about sexual partnerships and contraception depends on future schooling expectations (Duflo et al. 2012).

Eloundou-Enyegue (2004) points out that many students drop out of school for multiple reasons, and the importance of pregnancy may be either underestimated or overestimated in student reports of reasons for dropout. Therefore, estimates of the effect of eliminating schoolgirl pregnancy on school dropout depend on assumptions about whether pregnancy is the "true and sole" cause of dropout (Eloundou-Enyegue 2004). In many settings, however, girls who become pregnant while attending school may not have continued in school even without the pregnancy. Grant and Hallman (2008) found that girls with poorer school performance in Kwazulu-Natal, South Africa were more likely to become pregnant and to leave school when they became pregnant. Longitudinal research in the Cape Town areas of South Africa has found that girls who become pregnant while enrolled in school begin to report faltering education trajectories several years before the pregnancy takes place, indicating that they were unlikely to have achieved the same level of education as their peers, even in the absence of a pregnancy (Marteleto et al. 2008). Lloyd (2007) theorizes that students who are doing well in school will be more likely to avoid dropping out of school due to pregnancy, including avoiding sex, using contraception, terminating unwanted pregnancies, or negotiating with their parents to delay marriage.

It is also possible that sexual activity itself, or the motivations underlying sexual activity, increases the risk of dropout, regardless of whether a pregnancy occurs. Based on retrospective data from Burkina Faso, Ghana, Malawi, and Uganda, Biddlecom and colleagues (2008) found that both boys and girls who became sexually active while in school were more likely to drop out of school before completing secondary school. Sexually active girls were two to three times more likely to drop out before completing secondary school compared to girls who were not sexually active. Clark and Mathur (2012) find that women who report that they have found a partner who they would like to marry are more

likely to drop out of school than their peers who have not found such a partner, controlling for sexual activity and pregnancy.

School quality and reproductive health

Despite a strong policy and research focus on the effects of schoolgirl pregnancy, less attention has centered on its causes, especially at the school level. Traditionally, school quality has been defined as a series of inputs, such as school facilities, materials, opportunities to learn, and teacher practices, which produce student outcomes such as educational attainment and performance. More recently, however, conceptions of school quality have been expanded to include broader aspects of the school environment, such as teacher attitudes and harassment, as well as non-educational outcomes, such as sexual behavior (Mensch & Lloyd 1998; Mensch & Lloyd 2001; Lloyd 2007; Hewett et al. 2008). Mensch, Clark, Lloyd & Erulkar (2001) argue that, as "the most important socializing institution outside the family," the school environment plays a key role in influencing girls' and boys' transitions to adulthood. Gender roles can be communicated and perpetuated in numerous ways in the school environment, including through teaching and learning materials, teacher and student behaviors, and harassment and violence. Gender role socialization, a key component of the "hidden curriculum" in schools, plays a critical role in informing the different experiences of girls and boys as they transition to adulthood (Lloyd 2005). Mensch and colleagues (2001) found that girls in rural Kenya were less likely to engage in premarital sex if they attended a school where they felt they were being treated equitably. Based on these findings, they argue that efforts aimed at making schools more inclusive and relevant for girls will likely have a bigger impact on dropout than efforts to prevent schoolgirl pregnancies, although both may be important.

Study context

In 1994, the government of Malawi eliminated primary school fees, which was followed by a rapid narrowing of the gender gap in primary enrollment. By 2004, nearly all children had received some education (Macro 2004). However, gender gaps persist in the transition to secondary school (Grant 2012), especially in the southern region of the country. Data from a qualitative study in Mchinji district indicate that, among women who were enrolled in school at age 14, 5 percent of 15-19 year olds and 12 percent of 20-24 year olds became pregnant before they left school (Grant 2012). Despite relatively low levels of schoolgirl pregnancies in their communities, Grant (2012) found that parents' fears of schoolgirl pregnancies present a potential barrier to their daughters' educational attainment. Clark and colleagues

(2009) find that marital aspirations are associated with sexual activity among Malawian women, and that men and women tend to engage in sexual relationships as a precursor to marriage. We hypothesize that gender-related aspects of school quality play an important role in increasing the risk of schoolgirl pregnancy, after controlling for relevant student-level factors.

Methods

Study design and sample

The Malawi Schooling and Adolescent Study (MSAS) is a longitudinal survey carried out in Machinga and Balaka, two rural districts in southern Malawi. At baseline in 2007, 1764 students (889 male, 875 female) and 885 out of school adolescents (423 male, 462 female), ages 14 to 16 in January 2007, were enrolled in the study. Students were randomly selected from 59 randomly selected schools in the study districts. The probability of a school being sampled was proportional to its enrollment in 2006. At each school, approximately 30 students stratified by age and sex were interviewed in standards four through eight, the last four years of primary school. Our student sample reflects the typical educational experience of young people in Malawi. According to the 2004 MDHS, of the 76 percent of 14-16 year olds who were enrolled in school, 92 percent were still enrolled at the primary level. Among 16 year olds, 82 percent of current students were attending primary school (NSO and ORC Macro 2005). However, if a student entered standard 1 on time at age six and progressed through primary school without interruption, he/she should have completed primary by age 14. Therefore, by definition, our student sample is largely composed of students who have experienced some type of delay, and may be somewhat selective. Participants have been re-interviewed annually, retaining 91% of the baseline sample in 2008, 90% in 2009, and 88% in 2010 and 2011. These analyses are focused on girls who were in school at baseline, but descriptive statistics on boys in school at baseline are also presented for the purpose of comparison.

The adolescent survey, administered at all five data collection rounds, included questions on household and family characteristics, educational attainment, schooling history and experiences, household labor, health, marriage, and sexual behavior, as well as literacy and numeracy tests. To address discrepancies in responses in earlier rounds with respect to timing of important transitions to adulthood, beginning in the third round of data collection (2009), adolescent participants were asked to order a set of life events cards displaying pictures of major transitions, including first sex, leaving school, first birth, and first marriage. In the first three survey rounds (2007-2009), school quality data were also collected on sample primary schools, including the quality of facilities, teacher attitudes and credentials, and material inputs.

A total of 326 teachers (standards 4 through 8) and head teachers were interviewed at baseline, representing all 59 sample schools. A school facilities instrument was used to collect information on the physical condition of each school. In both the adolescent and teacher interviews, sensitive questions on gender-based attitudes, teacher practices, and harassment in school, among other areas, were administered using audio computer-assisted self-interviewing (ACASI). The remaining questions were administered through face to face interviews.

Malawi has an 8-4-4 school system, with eight years of primary school followed by four years of secondary school and four years of tertiary education. Most (88 percent) of the schools in our sample include all eight grades of primary school, the remaining schools are junior primary schools (including the first five years only). The majority of sample schools (76 percent) are also operated by religious denominations, while the remaining schools are operated by local education authorities. Despite this difference, the assignment and training of teachers, curriculum requirements, and financing are standardized across schools and managed by the Ministry of Education (Hewett et al. 2008).

Outcome variables

We examine two outcome variables:

1. Schoolgirl pregnancy in each round, defined as becoming pregnant while attending school and subsequently dropping out of school, compared to those who do not become pregnant while attending school (or become pregnant and do not drop out, which is very rare); and
2. School dropout that was *not* preceded by a pregnancy, compared to those who are still attending school at each round.

Our research question is focused on the relationship between school quality and schoolgirl pregnancy, but we compare the results of regression models with these two outcomes in order to explore whether schoolgirl pregnancy reflects a unique set of vulnerabilities above and beyond those experienced by other girls who drop out of school. Although some students in our sample were attending secondary school by round 5, we restrict our analyses to schoolgirl pregnancies and dropout that occur during primary school, since we only have data on primary school quality. In our regression models girls are censored after the last year of primary school.

We identified schoolgirl pregnancies using the data collected in round 5 through life events cards. Girls who report that they became pregnant before they left school are considered to have had a schoolgirl

pregnancy. We linked this information to the timing of dropout for those students, as reported in the adolescent survey, as a proxy for the round in which the pregnancy occurred. While it is possible that some of these pregnancies occurred in earlier rounds than the round when girls dropped out of school, we believe that is uncommon given our understanding that girls usually leave school as soon as their pregnancy becomes visible. Also, the use of data from life events cards increases the likelihood that the sequence of events is accurate (i.e. the pregnancy preceded the dropout), relative to separate reports on the timing of pregnancy and school leaving. For the second outcome, we define dropout as permanent school leaving during follow-up, as reported in the adolescent survey, among girls who do not report that a pregnancy preceded the dropout in the life events cards. These two groups (schoolgirl pregnancy and other dropout) are mutually exclusive.

Explanatory variables

Our models are specified in order to examine gender-related aspects of school quality that we hypothesize are related to schoolgirl pregnancy. While there are likely other aspects of school quality affecting premature school-leaving that have no gender component either because they are experienced equally by boys and girls or because they do not differentially influence girls and boys, we use the same variables in our models of school dropout for the purpose of comparison. The key explanatory variables are a set of primary school-level measures, representing both school characteristics and school-level averages of student responses. School characteristics include: whether the school has any female teachers, whether the school has girls' only toilets, whether girls use playing fields as much as or more than boys, the distance of the school from the farthest village in its catchment area, and the distance of the school from the nearest secondary school. School-level aggregated variables reflect both teachers' and female students' responses on the baseline questionnaires. They include a series of items related to: girls' gender inequity experiences in school, girls' and teachers' school-related gender attitudes, girls' and teachers' attitudes toward gender differences in academic abilities, girls' experiences of corporal punishment and harassment, and teachers' attitudes toward student sexual behavior, including schoolgirl pregnancy. We use summary scales of multiple items representing each of these domains.

Control variables

We include a series of student-level control variables, measured at baseline for female students: age, tribe, mother's and father's education levels, age of entry into primary school, repetition during

standards one through three, and a summary school engagement score. We also include the following time-varying student-level variables: literacy status in English and Chichewa, numeracy status, highest grade attended, and number of household assets as a proxy for household wealth. The literacy assessment involved reading two sentences in each language that were taken from the 2004 Malawi DHS. Students who were able to read both sentences were considered to be literate, while those who could read only partial sentences or not at all were considered to be illiterate. We assess general numeracy status through a summary score on ten math questions involving ordering numbers, addition, subtraction, multiplication, and division. A second numeracy assessment involves two simple word problems related to monetary transactions, requiring both reading and math skills. All numeracy questions were drawn from the Malawi Institute of Education achievement test for standard 3.[1] The time-varying variables are all lagged one data collection round in our regression models to ensure that they preceded the outcomes of interest.

Analyses

First we describe the timing of schoolgirl pregnancies and other school dropout between baseline data collection in 2007 and round 5 in 2011. We then describe characteristics of female students and school quality at baseline, as well as grade attainment by round 5. When relevant, we compare responses from female and male students to gain insight into gender differences in schooling trajectories, attitudes, and experiences.

Our research questions focus on the effects of school characteristics on student outcomes. Therefore, rather than fixed effects models that would simply adjust for clustering of students within schools, we use random effects models in order to estimate the effects of schools on our outcomes. In addition to providing estimated effects of school-level variables such as the presence of a female teacher, random effects models also allow us to identify the proportion of the total residual variance of our models that is attributable to school characteristics (Clarke, Crawford et al. 2010; Rabe-Hesketh & Skrondal 2008; Singer & Willett 2003).

As a first step, we explore the variance components models for both outcomes, assessing the probability of a schoolgirl pregnancy or dropout by round 5 (rather than each round). These models provide

[1] The Malawi Institute of Education is a parastatal organization charged by the Ministry of Education with curriculum development, assessment, and teacher training programs.

estimates of the extent to which student outcomes are clustered within schools, or the intraclass correlation coefficient (ICC). We also present the results of likelihood ratio tests of whether school-level factors (measured or unmeasured) account for a significant proportion of total variance in student outcomes (Rabe-Hesketh & Skrondal 2008). Next, we use logistic regression models to estimate the bivariate associations between each student and school-level variable and the two outcomes of interest. We add random intercepts for students and schools to account for clustering of observations within students, as well as clustering of students within schools. Last, we explore a series of multivariable logistic regression models, again incorporating random intercepts at both student and school levels. For both schoolgirl pregnancy and other dropout, our first two models include only student-level effects. Our third and fourth models include only school-level effects, and our final model includes all student and school-level effects. We present the results of likelihood ratio tests for each model assessing the statistical significance of school-level effects. All analyses were conducted using STATA/SE version 13.1.

Results

At baseline, 11 (1.3%) of the 869 female students had previously had a pregnancy. Table 1 presents the timing of schoolgirl pregnancies and other dropout between baseline in 2007 and round 5 of follow-up data collection in 2011, including primaries that occurred during both primary and secondary school. By round 5, 523 female students (60 percent) had dropped out of school; 14 percent of female students dropped out after a pregnancy and 46 percent dropped out for other reasons (i.e. a pregnancy did not occur before they dropped out). Both the number of new pregnancies and proportion of at-risk female students experiencing pregnancies increase each round, before leveling off in round 5, perhaps reflecting selectivity of the remaining female students. Dropout does not follow a clear pattern, but is highest following rounds 1 and 3.

Tables 2a and 2b provide characteristics of female students at baseline. Students are somewhat evenly distributed across standards 6 through 8, with a smaller group of students in standard 5, and the fewest in standard 4. Although the recommended age of entry into primary school in Malawi is 6, half of sample students were age 7 or older when they entered school. Nearly three quarters of the sample repeated standards 1 through 3 at least once. The result is a largely overage sample of primary school students relative to the ideal age for each grade level. At baseline, 74 percent of female students were literate in English and 94 percent were literate in Chichewa, while 79 percent were numerate based on a general math test, and 60 percent were numerate based on a test involving money-related word problems.

Female students in our sample performed significantly better than male students in literacy at baseline, and similarly to male students in numeracy. By round 5 of follow-up, the impact of dropout and repetition is evident. For example, while 252 students were in standard 8 (the last year of primary school) at baseline, only 28 students had reached form 4 of secondary school by round 5. Female student responses to questions on school engagement varied, but overall indicated low to moderate engagement. On average, female students reported higher levels of school disengagement compared to male students, particularly related to whether they have an adult at school to talk to (33 percent for boys, 19 percent for girls), and whether a teacher would notice if they were absent (20 percent for boys, 12 percent for girls).

Tables 3a through 3c present characteristics of sample schools at baseline. Table 3a shows that two thirds of sample primary schools were located more than five kilometers from the farthest village in their catchment area, indicating the potential travel time for students in that school. Similarly, two thirds of sample schools were located more than 5 kilometers from the nearest secondary school, indicating one potential challenge for students transitioning from primary to secondary, as well as proximity to more densely populated areas. While most schools had playing fields (not shown), nearly half of those schools' fields were used predominantly by boys. The majority of schools (86 percent) also had toilets designated for use by girls.

Table 3b shows female and male student responses on a series of questions about school quality. In terms of gender inequity experiences, girls and boys were generally in agreement that boys are more unruly in class, receive more and harsher punishments, and are assigned more chores than girls. However, their reports conflict with regard to who receives more positive and negative comments from teachers. For example, an equal proportion of girls report that boys and girls receive more positive comments, while a larger proportion of boys report that boys receive more positive comments than girls. In terms of student abilities, overall girls report that boys are better at English and life skills, equally strong at math, and weaker at Chichewa than girls. In contrast, boys report that boys are better than girls in all four areas. Girls report comparable or more equitable general gender attitudes than boys, with the exception of the question of whether girls should get married even if they are still attending school (44 percent of girls and 31 percent of boys agree). Perhaps surprisingly, boys and girls report similarly high levels of corporal punishment and harassment, both on their way to school and at school, with two exceptions: a higher proportion of boys than girls report both that they have been teased or

upset by teachers, and that teachers have made sexual comments to them. It is not clear from the survey question whether the sexual comments referred to the boys themselves, female students, or someone else (Hewett et al. 2008).

Table 3c shows teacher characteristics and responses on similar questions related to school quality at baseline. Based on interviews with head teachers, on average 14 percent of teachers within each sample school were female, and only 42 percent of sample schools had at least one female teacher. In general, the majority of teachers reported equitable general gender attitudes, although three quarters reported that husbands should have more say than wives in family planning decisions, and only about half reported that girls are as intelligent as boys. In line with male students' reports, teachers reported more favorably on boys' versus girls' academic abilities, with the exception of learning Chichewa. The majority of teachers (91 percent) believe that pregnant girls should *not* be allowed to stay in school until they deliver, although they are more supportive of allowing girls to return to school after having a child (39 percent oppose this). While they are evenly split on whether action should be taken against male students who get female students pregnant, the majority of teachers report that action should be taken against male and female teachers who have sex with students.

The analyses in tables 4 through 6 include only pregnancies that occurred while students were attending primary school. Table 4 presents the results of basic variance components models, used to assess the proportion of variation in outcomes explained by school-level factors overall (including factors not included in our regression models). Approximately 7 percent of variation in schoolgirl pregnancy is explained by schools, compared to nearly none of the variation in other dropout (not following pregnancy). While the likelihood ratio test for the schoolgirl pregnancy model is only borderline statistically significant ($p = 0.11$), these results indicate that school-level factors appear more important as drivers of schoolgirl pregnancy than other dropout.

Table 5 presents a series of bivariate odds ratios for the relationship between each student-level and school-level predictor and the two outcomes of interest. All models are adjusted for clustering of students within schools, and clustering of observations over time within students. Overall few of the variables examined are significantly associated with schoolgirl pregnancy in bivariate models. Being a member of the Lomwe tribe (compared to Chewa tribe) is associated with lower odds, while highest grade attended at each round is associated with higher odds of schoolgirl pregnancy. Both English

literacy and numeracy are also associated with higher odds of having a schoolgirl pregnancy in these models. At the school level, girls attending schools with any female teachers have more than three times the odds of a schoolgirl pregnancy, compared to girls in schools with no female teachers. The student-level variables are also helpful in explaining other dropout (not preceded by pregnancy). Age at baseline and age of school entry are associated with higher odds of school dropout, while the following student-level variables are associated with lower odds of school dropout: more household assets, higher mother's educational attainment, and being literate (in English and Chichewa) and numerate. As with schoolgirl pregnancy, the only school-level variable associated with dropout is having any female teachers, but in this case it appears to be protective (OR = 0.52).

Tables 6a and 6b show the results from a series of multivariable multilevel logistic regression models of the relationship between student-level and school-level variables and the two outcomes of interest: schoolgirl pregnancy (6a) and dropout not preceded by pregnancy (6b). The first panel of Table 6a shows that being Lomwe (compared to Chewa) is consistently associated with lower odds of a schoolgirl pregnancy, although this effect is no longer statistically significant after controlling for school-level variables. Even after controlling for age, higher grade repetition, numeracy, and highest grade attended are all, somewhat counter-intuitively, associated with higher odds of having a schoolgirl pregnancy. For example, the results in model 5 indicate that, each additional year of school attendance is associated with twice the odds of having a schoolgirl pregnancy, and being numerate is associated with nearly three times the odds of a schoolgirl pregnancy, controlling for all student and school-level covariates. The second panel of Table 6a shows the results from school-level variables. The only variable that is statistically significantly associated with schoolgirl pregnancy (at the alpha = 0.10 level) is distance of the school from the farthest village that sends students. This relationship is consistent across models 3 through 5, although it is no longer statistically significant in model 5. In all models, this effect indicates that attending a school that is located farther away from students' villages (for example, 5-10 km away instead of 0-5 km away) is associated with an approximately 40 to 50 percent higher odds of having a schoolgirl pregnancy. Not surprisingly given the results for the school-level variables, the school-level ICCs and likelihood ratio tests for models 3 through 5 indicate that school-level covariates do not help to explain the variation in the odds of schoolgirl pregnancies.

Table 6b, showing the results for non-pregnancy related dropout, demonstrates a similar pattern. Again, the results largely mirror the bivariate models shown in Table 5. Age of entry into primary school,

repetition between standards 1 through 3, and highest grade attended are consistently associated with higher odds of dropout, even after controlling for age (and all other covariates). Students who are literate or numerate also appear to be at lower risk of dropping out of school. Students in households with more assets, and where mothers are more highly educated experience lower odds of school dropout after controlling for school-level variables. As with schoolgirl pregnancy, the results indicate that school-level factors do not help to explain the variation in odds of dropout. This is consistent with the variance components models presented in Table 4. Only the presence of female teachers in a school appears to be associated with lower odds of dropout for female students, although this effect is not statistically significant in the final model. Again, the school-level ICCs are approximately equal to zero, and the likelihood ratio tests indicate that school-level variables do not explain dropout.

Discussion

Overall, our results provide little evidence that gender-related aspects of school quality play an important role in driving either schoolgirl pregnancy or non-pregnancy related dropout in our sample. In the variance components models the ICC is close to zero, indicating that school characteristics, both observed and unobserved, do not account for a significant proportion of variance in either outcome. However, in the multivariable regression models, two school-level characteristics appear relevant to our outcomes of interest: presence of a female teacher in the school and distance from the farthest school catchment village, although not always in the expected direction. Also, our results indicate the potentially important effects of school context defined more broadly, including the influence of peer groups, on risk of schoolgirl pregnancy.

In the bivariate regression models, girls attending schools with any female teachers had more than three times higher odds of having a schoolgirl pregnancy compared to girls attending schools without female teachers; this association is no longer statistically significant in the multivariable models. This finding is counter to our expectations about the positive role of female teachers in schools. However, one possible explanation is that female teachers are more likely to be assigned to schools that are closer to towns, and that students living in those areas are more likely to be sexually active. Informal discussions with teachers in our sample schools at baseline revealed that female teachers tend to be concentrated in more populated areas due to their husbands' jobs. Adding distance from the nearest secondary school, a proxy for school location near larger towns, to the bivariate model for female teachers attenuates the association with schoolgirl pregnancy, providing evidence of the potential importance of school location

in driving both presence of female teachers and student risk of pregnancy. Our results also indicate that the presence of a female teacher is associated with approximately 60 percent lower odds of non-pregnancy related dropout for female students. More exploration of the role of female teachers in the lives of female students is warranted.

We also found that girls attending schools drawing from catchment villages within a larger radius are approximately 40 to 50 percent more likely to have a schoolgirl pregnancy than girls attending schools drawing from a smaller geographic catchment area. This variable is an indication of the potential travel distance and time to school, which has been noted as a barrier to school attendance for girls (Grant et al. 2013), and a safety concern to parents. It is possible that students attending these schools are more likely to be sexually active than students who travel shorter distances to school due to less supervision during the school day, more missed days of school, or sexual coercion on their way to school. This relationship is slightly attenuated (and no longer statistically significant) after controlling for student performance in our models, which may indicate an effect of school location on attendance. Although we have concerns about the reliability of sexual behavior reporting in our dataset (Soler-Hampejsek et al. 2013), when students' reports of sexual activity are added to the final model, the effect of distance to the farthest village is further attenuated (OR = 1.30, p = 0.27).

Student-level variables were more helpful in explaining schoolgirl pregnancy than school-level variables, although some of the relationships that emerged were counter to our initial hypotheses. In our first two models including only student-level variables, there was evidence that being a member of the Lomwe tribe (compared to Chewa tribe) was protective against schoolgirl pregnancy. However, in previous analyses we did not find differences by tribe in sexual activity (Kelly et al. 2014). The association with tribal group is no longer statistically significant after adding school-level variables, indicating that some collective aspect of school quality, or the geographic distribution of ethnic groups across our sample, explains the association. Early grade repetition, numeracy, and highest grade attended were also significantly associated with higher odds of having a schoolgirl pregnancy, even after controlling for age in our final model. Given the fact that literacy and numeracy are associated with lower risk of non-pregnancy related dropout, this result is noteworthy and echoes results from previous analyses on schoolgirl pregnancy in our sample, which found that, relative to their sexually active peers, girls who become pregnant while attending school perform equally well – if not better – in terms of literacy and numeracy. However, this finding is contrary to other studies that have identified poorer school

performance as a possible risk factor for schoolgirl pregnancy (Grant & Hallman 2008). While the mechanism underlying this association is not yet clear, it is robust to model specification.

The finding that highest grade attended is associated with higher risk of schoolgirl pregnancy is more consistent with the literature on peer effects on sexual behavior. While much support exists for the protective effects of schooling on adolescent girls (IOM 2005; Lloyd 2009), there is also growing evidence of negative peer influences on sexual activity. Research in South Africa has found an association between higher grade attainment and earlier sexual debut for adolescent girls controlling for age (Marteleto et al. 2008), which Lam and colleagues (2013) argue is a result of girls who are ahead of others for their age interacting with older male classmates. A recent qualitative study in rural Malawi also found that parents express concern that peer pressure to acquire material goods will drive their adolescent daughters to engage in sexual relationships, ultimately resulting in pregnancy and school dropout (Grant 2012). Peer effects on sexual behavior have been explored more thoroughly in the U.S. context, with similar findings (Gaviria & Raphael 2001; Sieving et al. 2006). For example, using data from the National Longitudinal Survey of Adolescent Health, Sieving and colleagues (2006) found that adolescents with more sexually experienced friends at Wave 1 were more likely to initiate sex by Wave 2 than adolescents with less sexually experienced friends. Preliminary analyses in our dataset also support the explanation offered by Marteleto and colleagues (2008). As shown in Table 2b, male students tend to progress farther in school than female students. However, among male and female students who continue in school, boys tend to be farther behind for their age than girls (not shown). The result is that, on average, female students in higher grades may be more likely to become sexually active with older male students than female students in lower grades, controlling for age.

Student-level characteristics were also helpful in explaining the probability of non-pregnancy related dropout. The number of household items is consistently associated with about 7 percent lower odds of school dropout, indicating the role of financial barriers to persistence in school. Prior school performance, measured through literacy and numeracy, is also associated with a 35 to 50 percent lower odds of dropout among female students. Mother's higher education level – but not father's – was associated with about a 20 percent lower odds of school dropout. Finally, similar to schoolgirl pregnancy, highest grade attended is associated with a higher probability of dropping out of school after controlling for age. In this case, a possible explanation is that female students have achieved their own (or their parents') schooling expectations and are beginning the transition to family formation.

There are important similarities and differences in the findings on schoolgirl pregnancy and non-pregnancy related dropout. First, gender-related aspects of school quality do not appear to explain much variation in either outcome. However, the school-level indicators that appear potentially protective are different for the two outcomes: presence of a female teacher is protective against general dropout (but possibly related to higher dropout following a pregnancy), while less dispersed catchment area is associated with lower odds of schoolgirl pregnancy. To the extent that non-pregnancy related dropout is still related to family formation and reproductive health, we might expect the mechanisms to be similar. However, some proportion of non-pregnancy related dropout may be due to factors such as parents' attitudes toward education, household socio-economic status, or lack of interest in school. It is particularly notable that the effects of school performance, measured by literacy and numeracy, are statistically significant in both models but operate in opposite directions: girls who perform well in school are more likely to have a schoolgirl pregnancy than their peers but are otherwise are less likely to drop out of school than their peers. Future analyses will further explore the role of school performance in decision-making about sexual behavior and schooling.

There are several possible interpretations of our weak findings with regard to the effects of school quality on schoolgirl pregnancy. One is that school quality is, in fact, unrelated to risk of schoolgirl pregnancy. Previous analyses of our data provide support for this explanation. Using the same dataset, Kelly and colleagues (2014) found that, while sexually active female students appear to be different from their peers in important ways (e.g. lower grade attainment, earlier marriage aspirations), girls who become pregnant are not discernibly different from those who are sexually active but do not become pregnant. Therefore, it is possible that school quality affects risk of engaging in sex during school, but the event of becoming pregnant is random among those who are sexually active. Another possible explanation for our findings is that, while gender-related aspects of school quality are not related to schoolgirl pregnancy, more general factors not explored in this analysis, such as school facilities and teacher training, are related. However, the low proportion of variation in schoolgirl pregnancy explained by all school level factors indicates that we are unlikely to find different results by examining other aspects of school quality. A third explanation for our findings is that there is insufficient variation in school quality in our school sample to pick up effects on our outcomes. Both districts where our study sample is located are rural and located in southern Malawi. However, Machinga district has received more development assistance, including several multi-year USAID-funded education interventions, since

2003. Previous analyses have indicated that, while there is less variation than expected in characteristics of school facilities and teacher reports of gender-related attitudes, there is likely sufficient variation in certain school-level characteristics in our sample, such as student-teacher ratios and aggregated student experiences of harassment to identify an effect, if one exists (Hewett et al. 2008; Grant et al. 2011).

There are several limitations to this study that should be considered while interpreting our results. We only collected data on school quality in the sample primary schools, so our analyses are limited to dropout (pregnancy and non-pregnancy related) that occurs during primary school. By Round 5, only 70 out of the 122 schoolgirl pregnancies (57 percent) that had occurred took place while students were still attending primary school. Since these pregnancies took place during primary school, it is more feasible to assume that primary school quality might have affected the probability of a pregnancy. Our method for identifying schoolgirl pregnancies was only available for respondents who were successfully re-interviewed in the third or subsequent survey rounds. Therefore, we may have missed pregnancies that occurred and led to dropout among girls who were lost to follow-up after round 2. Another limitation is that 20 percent of female students in our sample switched primary schools after baseline, and their information is linked only to their baseline school. Assuming school switching is random, the effect would be to attenuate associations between school characteristics and student outcomes. However, it is feasible that school switching is associated with the outcomes of interest, and therefore may have biased our results. Future analyses will assess the potential effect of school switching on our findings.

A critical assumption of random effects models is that unobserved school characteristics that influence student outcomes are uncorrelated with student or school characteristics that are included in the model. A common reason that this assumption is violated is the non-random selection of students into schools in most contexts, including Malawi. As a result, the probability of selecting a school varies systematically according to a set of student, household, school, and community factors (Clarke, Crawford, et al. 2010). If there are unobserved factors that are correlated both with school selection and with the probability of having a schoolgirl pregnancy, this assumption would be violated. Clarke and colleagues note that, for the purposes of policy-relevant inference, this concern can be sufficiently addressed through inclusion of rich data on important student and school-level factors. We have included a series of student characteristics, including some household characteristics, in our model that might reflect school selection. In future analyses we will compare our random effects with fixed effects

results to assess more systematically whether this assumption has been violated (Clarke, Crawford et al. 2010).

Last, we focus only on the effects of schoolgirl pregnancies on girls in these analyses, partially because our data do not allow us to examine the risk factors for boys of fathering a pregnancy while attending school, and partially because overwhelming evidence indicates that the effects of pregnancy on girls are more severe than on boys. However, girls in our study report that boys their age are their most common sexual partners. Therefore, future research and interventions seeking to prevent schoolgirl pregnancies should be informed by a clearer understanding of boys' motivations for engaging in unprotected sex, and the impact of pregnancies on their own schooling.

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Tables

Table 1. Timing of schoolgirl pregnancies and other dropout by MSAS data collection round (2007-2011)

Period	Number of Schoolgirl Pregnancies	Number of Students Dropping Out for Other Reasons	Not interviewed at follow-up	Number of At Risk Students	Percent of At-Risk Students Who Drop Out *(without a pregnancy)*	Cumulative Percent of At-Risk Students Who Drop Out *(without a pregnancy)*	Percent of At-Risk Students Who Become Pregnant	Cumulative Percent of At-Risk Students Who Become Pregnant
Round 1-2	27	156	45	869	18.9%	18.9%	3.3%	3.1%
Round 2-3	33	97	60	686	15.5%	29.1%	5.3%	6.9%
Round 3-4	37	108	67	556	22.1%	41.5%	7.6%	11.2%
Round 4-5	25	40	64	411	11.5%	46.1%	7.2%	14.0%
Total	122	401	236	282	--	46.1%	--	14.0%

Includes all pregnancies and dropout that occurred (during primary and secondary school) to female students at baseline.

Table 2a. Characteristics of Female Students at Baseline (n=869)

Age	*number*	*percent*
14	235	27%
15	361	42%
16	217	25%
17	56	6%
Tribe		
Yao	344	40%
Chewa	177	20%
Lomwe	210	24%
Other	138	16%
Grade enrollment at baseline		
4	48	6%
5	137	16%
6	200	23%
7	232	27%
8	252	29%
Age of entry to primary school		
≤ 5	108	12%
6	328	38%
7	228	26%
8	111	13%
9+	94	11%
Times repeated Standards 1-3		
0	226	26%
1	237	27%
2	213	25%
3	115	13%
4+	78	9%
Mother's educational attainment		
No education	317	36%
Some primary	370	43%
Completed primary or more	143	16%
Don't know	39	4%
Father's educational attainment		
No education	143	16%
Some primary	319	37%
Completed primary or more	295	34%
Don't know	112	13%
Household assets at baseline		
≤ 3	299	34%
4-6	325	37%
7+	245	28%
Missing	0	0%

All characteristics reflect status at baseline.

Table 2b. Characteristics of Female Students (compared to male students) at baseline (n = 869 girls, 884 boys)

Schooling Disengagement and Detachment	*Girls*		*Boys*	
Proportion who agree with the following:	*number*	*percent*	*number*	*percent*
…do not attend school regularly	95	11%	88	10%
…(not) attentive in class	42	5%	14	2%
…rarely complete assigned tasks	336	39%	266	30%
…education is *not* important to them	73	8%	49	6%
…they do not respect their teachers	34	4%	10	1%
…no adult at school to talk to	284	33%	169	19%
…do not study at home	88	10%	59	7%
…teacher would not notice if they were absent	173	20%	103	12%
Proportion literate				
English	640	74%	594	67%
Chichewa	814	94%	790	89%
Proportion numerate				
General math questions	690	79%	707	80%
Money word problems	524	60%	527	60%
Highest grade attended by Round 5				
Primary School				
Standard 4	17	2%	18	2%
Standard 5	61	7%	49	6%
Standard 6	96	11%	73	8%
Standard 7	130	15%	94	11%
Standard 8	210	24%	180	20%
Secondary School				
Form 1	109	13%	130	15%
Form 2	153	18%	146	17%
Form 3	65	7%	114	13%
Form 4	28	3%	80	9%

Schooling disengagement, literacy and numeracy reflect status at baseline. Highest grade attained reflects status at round 5 (2011).

Table 3a. Potential Gender-Related Characteristics of School Facilities at Baseline (n = 59)

Distance of primary school from nearest secondary school, government or private	*Proportion*
Below 5km	29%
5km to 9km	31%
10km to 19km	29%
20km or more	11%
Distance of primary school from farthest village	
Below 5km	32%
5km to 9km	51%
10km or more	10%
Missing	7%
Among the older students, who uses the playing fields/grounds during break time?	
Grounds not used	10%
Mostly boys	45%
Mostly girls	3%
Both boys and girls about the same	41%
School facilities	
Proportion of schools that have girls-only toilets	86%

Table 3b. Student Responses on Gender-Related Aspects of School Quality at Baseline (n = 869 girls, 884 boys)

Gender inequity experiences in school	*Girls*	*Boys*
Proportion who agree with the following statements:		
...boys receive more positive comments than girls	18%	38%
…girls receive more positive comments than boys	17%	12%
...girls receive more negative comments than boys	15%	27%
…boys receive more negative comments than girls	37%	21%
...girls are assigned more chores than boys	12%	3%
…boys are assigned more chores than girls	18%	39%
...girls receive more punishment than boys	6%	2%
…boys receive more punishment than girls	35%	53%
...girls receive harsher punishment than boys	6%	2%
…boys receive harsher punishment than girls	43%	64%
...girls are more unruly in class than boys	2%	7%
…boys are more unruly in class than girls	85%	67%
Attitudes toward Student Abilities	*Girls*	*Boys*
Proportion who agree with the following statements:		
...boys are better at learning English than girls	37%	60%
…girls are better at learning English than boys	23%	14%
...boys are better at learning math than girls	30%	55%
…girls are better at learning math than boys	30%	14%
...boys are better at learning Chichewa than girls	10%	26%
…girls are better at learning Chichewa than boys	23%	19%
...boys are better at learning life skills than girls	16%	15%
…girls are better at learning life skills than boys	8%	9%
General Gender Attitudes	*Girls*	*Boys*
Proportion who agree with the following statements:		
…completing secondary education is not as important for girls as it is for boys	3%	4%
...it is better to send boys to school than girls	22%	26%
…a husband's opinion matters more than a wife's in family planning decisions	60%	65%
...girls should get married even if they are still in school	44%	31%
...girls are not as intelligent as boys	32%	41%
Corporal Punishment and Harassment	*Girls*	*Boys*
Proportion who report that this has happened at least once or twice in the current school year:		
…they have been teased/upset on the way to school	20%	19%
…they have been teased/upset at school	27%	26%
…they have been teased/upset by teachers	12%	19%
…they have been punched/slapped/whipped on way to school	14%	16%
…they have been punched/slapped/whipped by schoolmates	14%	13%
…they have been punched/slapped/whipped by teachers	21%	22%
...sexual comments have been made to them on way to school	20%	17%
...sexual comments have been made to them at school	18%	21%
...sexual comments have been made to them by teachers	10%	20%
…they have been touched on breast/genetalia on way to school	8%	6%
…they have been touched on breast/genetalia by schoolmates	9%	8%
…they have been touched on breast/genetalia by teachers	4%	6%
…their schoolmates have peeped into toilet	4%	7%
…their teachers have peeped into toilet	3%	6%

Table 3c. Aggregated Teacher Responses on Gender-Related Aspects of School Quality at Baseline (n = 346)

Teacher Characteristics	*Mean %*	*S.D.*
Proportion teachers who are female at each school	14%	0.21
Proportion schools that have at least 1 female teacher	42%	--
Inequitable Gender Attitudes	*Number*	*Percent*
Proportion who agree/disagree (as specified) with the following statements:		
It is as important for girls to complete secondary school as it is for boys *(disagree)*	122	35%
When a family cannot afford to send all children to school, it is better to send boys than girls *(agree)*	155	45%
When a husband and wife disagree about the number of children to have the husband's opinion matters more *(agree)*	258	75%
A girl should get married when she finds an appropriate spouse, even if she is still in school *(agree)*	129	37%
Girls are as intelligent as boys *(disagree)*	169	49%
Inequitable Attitudes toward Student Abilities	*Number*	*Percent*
*Proportion who **agree** with the following statements:*		
Boys are better in learning English	122	39%
Girls are better in learning English	56	18%
Boys are better in learning Mathematics	144	46%
Girls are better in learning Mathematics	23	7%
Boys are better in learning Chichewa	16	5%
Girls are better in learning Chichewa	43	14%
Boys are better in learning Life Skills	83	26%
Girls are better in learning Life Skills	23	7%
Inequitable Attitudes toward Student Sexual Behavior (respond no to below questions)	*Number*	*Percent*
*Proportion who **disagree** with the following statements:*		
Girls who become pregnant should be allowed to stay in school until just before they deliver	275	91%
Girls who have a baby should be allowed to return to the same school	118	39%
Action should be taken against a male pupil who makes a girl pregnant	156	51%
Action should be taken against a male teacher who has sex with a pupil	84	28%
Action should be taken against a female teacher who has sex with a pupil	112	37%

Table 4. Proportion variance in outcomes by Round 5 explained by school-level factors at R1 (two-level model)

	Intraclass correlation coefficient (ICC)	Likelihood ratio test (H_0: rho = 0)
Schoolgirl pregnancy	0.069	0.11
Dropout (not due to pregnancy)	5.39E-11	1.00

Table 5. Bivariate odds ratios for predictors of schoolgirl pregnancy and dropout

Sample includes female students who were attending school at baseline (n=869)

	Schoolgirl Pregnancy *(pregnancy while attending school)*		**Dropout** *(dropout with no pregnancy preceding dropout)*	
Student-Level Variables	OR (SE)	p-value	OR (SE)	p-value
Age at baseline	0.97 (0.14)		1.15 (0.08)	*
Ethnic group (Ref = Chewa)				
Yao	1.40 (0.34)		1.18 (0.15)	
Lomwe	0.45 (0.17)	*	0.94 (0.14)	
Other	1.03 (0.34)		0.85 (0.15)	
Household assets (T)	1.03 (0.05)		0.90 (0.02)	***
Mother's level of education	1.18 (0.16)		0.82 (0.06)	*
Father's level of education	1.02 (0.13)		0.91 (0.06)	
Age of entry into primary	0.91 (0.09)		1.09 (0.05)	*p = 0.061*
Repetition standards 1-3	1.00 (0.09)		1.07 (0.05)	
Literacy status§				
English	1.39 (0.39)		0.57 (0.07)	***
Chichewa	2.62 (1.89)		0.56 (0.13)	*
Numeracy status (T)				
Math questions	0.95 (0.25)		0.61 (0.08)	***
Money word problems	1.04 (0.25)		0.64 (0.08)	***
Highest grade attended (T)	1.34 (0.16)	*	0.87 (0.05)	*
School engagement score (T)	1.08 (0.11)		1.07 (0.06)	
School-Level Variables				
Any female teachers	3.38 (1.74)	*	0.52 (0.18)	*p = 0.052*
Girls-only toilets	1.17 (0.45)		0.99 (0.18)	
Unequal use of playing fields	0.84 (0.21)		0.93 (0.12)	
Distance of school				
From farthest village	1.17 (0.23)		0.98 (0.10)	
From secondary school	0.83 (0.11)		1.04 (0.07)	
Inequitable school experiences (female students)	1.09 (0.45)		1.34 (0.28)	
Inequitable gender attitudes				
Teacher	0.99 (0.14)		0.97 (0.07)	
Female students	1.26 (0.34)		1.12 (0.15)	
Inequitable ability attitudes				
Teacher	0.91 (0.19)		1.00 (0.10)	
Female students	1.26 (0.49)		1.30 (0.25)	
Inequitable attit. on student sexual behavior (teacher)	0.94 (0.20)		1.16 (0.12)	
School harassment (female students)	1.04 (0.20)		0.99 (0.10)	

* $p < 0.05$; ** $p < 0.01$; ***$p < 0.001$; (T) indicates time-varying

All models adjust for clustering of rounds in students in schools

Table 6a. Multivariable odds ratios for predictors of schoolgirl pregnancy (n = 869 female students, 59 schools)

	Schoolgirl Pregnancy *(pregnancy while attending school, followed by dropout)*									
	Model 1 *(Student-level only)*		**Model 2** *(Student-level only)*		**Model 3** *(School-level only)*		**Model 4** *(School-level only)*		**Model 5** *(Student and School)*	
Student-Level Variables										
Age at baseline	1.00 (0.14)		0.83 (0.13)						0.75 (0.13)	§
Ethnic group (Ref = Chewa)										
Yao	1.16 (0.36)		1.18 (0.37)						1.30 (0.47)	
Lomwe	0.46 (0.20)	§	0.43 (0.19)	§					0.50 (0.24)	
Other	0.89 (0.36)		0.89 (0.36)						0.86 (0.42)	
Household assets*	1.01 (0.05)		1.00 (0.05)						0.98 (0.05)	
Mother's level of education	1.20 (0.18)		1.22 (0.18)						1.14 (0.19)	
Father's level of education	0.99 (0.14)		1.01 (0.14)						1.05 (0.16)	
Age of entry into primary	0.89 (0.09)		1.20 (0.16)						1.25 (0.18)	
Repetition standards 1-3	0.94 (0.14)		1.31 (0.16)	*					1.36 (0.18)	*
Literacy status*										
English			1.24 (0.42)						1.28 (0.48)	
Chichewa			0.83 (0.53)						0.99 (0.76)	
Numeracy status*										
Math questions			2.06 (0.85)	§					2.67 (1.30)	*
Money word problems			0.99 (0.27)						0.97 (0.28)	
Highest grade attended*			1.70 (0.27)	**					1.94 (0.36)	***
School engagement score*			1.13 (0.12)						1.04 (0.12)	
School-Level Variables										
Any female teachers					2.64 (1.96)		2.34 (2.05)		4.18 (3.90)	
Girls-only toilets					1.27 (0.54)		1.55 (0.74)		1.76 (0.89)	
Unequal use of playing fields					0.77 (0.21)		0.74 (0.23)		0.80 (0.25)	
Distance of school										
From farthest village					1.42 (0.31)	§	1.53 (0.34)	§	1.45 (0.34)	
From secondary school					0.84 (0.14)		0.83 (0.16)		0.91 (0.18)	
Inequitable school experiences (student)							0.78 (0.38)		0.56 (0.30)	
Inequitable gender attitudes										
Teacher							0.18 (0.25)		1.20 (0.26)	
Student							1.21 (0.40)		1.33 (0.46)	
Inequitable ability attitudes										
Teacher							0.65 (0.19)		0.64 (0.19)	
Student							1.57 (0.72)		1.76 (0.88)	
Inequitable attit. on student sexual behavior (teacher)							1.16 (0.29)		1.27 (0.33)	
School harassment (student)							1.26 (0.34)		1.00 (0.28)	
LR test	1.00		1.00		1.00		1.00		1.00	
ICC - school level	0.0		0.0		0.0		0.0		0.0	

Table 6b. Multivariable odds ratios for predictors of dropout by female students at baseline (n = 869 female students, 59 schools)

	Dropout - Primary Only *(dropout with no pregnancy preceding dropout)*									
	Model 1 *(Student-level only)*		**Model 2** *(Student-level only)*		**Model 3** *(School-level only)*		**Model 4** *(School-level only)*		**Model 5** *(Student and School)*	
Student-Level Variables										
Age at baseline	1.10 (0.08)		0.99 (0.08)						0.95 (0.08)	
Ethnic group (Ref = Chewa)										
Yao	1.10 (0.18)		1.09 (0.18)						1.04 (0.19)	
Lomwe	1.04 (0.20)		1.00 (0.20)						0.95 (0.21)	
Other	0.98 (0.21)		0.98 (0.22)						0.97 (0.26)	
Household assets*	0.96 (0.02)		0.95 (0.02)	*					0.93 (0.02)	**
Mother's level of education	0.87 (0.07)	§	0.85 (0.07)	*					0.82 (0.08)	*
Father's level of education	0.98 (0.07)		1.00 (0.07)						1.00 (0.08)	
Age of entry into primary	1.11 (0.06)	§	1.29 (0.08)	***					1.33 (0.09)	***
Repetition standards 1-3	1.10 (0.06)	§	1.25 (0.08)	***					1.25 (0.09)	**
Literacy status*										
English			0.68 (0.11)	*					0.64 (0.11)	*
Chichewa			0.55 (0.13)	*					0.49 (0.13)	**
Numeracy status*										
Math questions			0.78 (0.14)						0.67 (0.13)	*
Money word problems			1.02 (0.15)						1.16 (0.19)	
Highest grade attended*			1.56 (0.12)	***					1.69 (0.15)	***
School engagement score*			1.05 (0.06)						1.04 (0.06)	
School-Level Variables										
Any female teachers					0.41 (0.18)	*	0.32 (0.16)	*	0.45 (0.23)	
Girls-only toilets					0.89 (0.17)		0.93 (0.20)		0.99 (0.22)	
Unequal use of playing fields					1.02 (0.14)		0.99 (0.15)		1.03 (0.16)	
Distance of school										
From farthest village					0.96 (0.10)		0.98 (0.11)		0.95 (0.11)	
From secondary school					0.96 (0.07)		0.95 (0.08)		0.98 (0.09)	
Inequitable school experiences (student)							1.39 (0.34)		1.30 (0.33)	
Inequitable gender attitudes										
Teacher							1.00 (0.11)		1.01 (0.12)	
Student							0.96 (0.16)		0.97 (0.17)	
Inequitable ability attitudes										
Teacher							0.94 (0.12)		0.98 (0.13)	
Student							1.24 (0.30)		1.30 (0.33)	
Inequitable attit. on student sexual behavior (teacher)							1.02 (0.12)		0.99 (0.13)	
School harassment (student)							1.13 (0.15)		1.21 (0.17)	
LR test	p = 1.00		p = 1.00		p = 1.00		p = 1.00		p = 1.00	
ICC - school level	0.0		0.0		0.0		0.0		0.0	