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## Menstruation and School Absenteeism: Evidence from Rural Malawi

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### Abstract

The provision of toilets and menstrual supplies has emerged as a promising programmatic strategy to support adolescent girls' school attendance and performance in less developed countries. We use the first round of the Malawi Schooling and Adolescent Survey (MSAS) to examine the individual- and school-level factors associated with menstruation-related school absenteeism. The MSAS is a school-based longitudinal survey of adolescent students enrolled in coed public primary schools in the southern districts of Machinga and Balaka who were aged 14–16 in 2007. Although one-third of female students report missing at least one day of school at their last menstrual period, our data suggest that menstruation only accounts for a small proportion of all female absenteeism and does not create a gender gap in absenteeism. We find no evidence for school-level variance in menstruation-related absenteeism, suggesting that absenteeism is not sensitive to school environments. Rather, co-residence with a grandmother and spending time on school work at home reduce the odds of absence during the last menstrual period.

### Introduction

Over the past two decades, girls' school participation in most low-income countries has increased rapidly. Not only are girls more likely to be enrolled in school, they are also completing more years of schooling than in the recent past (Grant and Behrman 2010; National Research Council 2005). As more girls remain in school past menarche, their status as students may come into conflict with other social statuses and expectations. Substantial attention has been focused on the issues of early marriage and childbearing, particularly as determinants of premature school dropout (Bledsoe and Cohen 1993; Bledsoe et al. 1999; Eloundou-Enyegue and Stokes. 2004; Eloundou-Enyegue 2004; Lloyd and Mensch 2008). Less attention has been given to the effect that menarche itself and the management of monthly menstrual periods may have on school attendance, learning outcomes, and continued school enrollment.

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The management of menstruation<sup>1</sup> has recently emerged as a domain for interventions designed to maintain adolescent girls' school attendance with the ultimate goal of reducing dropout rates and supporting adolescent girls through secondary school. Public discourse (e.g., Chatterjee 2010; Jones 2010; Kristoff and WuDunn 2009) has focused on issues such as toilet availability and access to feminine hygiene supplies as factors influencing female absenteeism and school dropout. Furthermore, a new body of literature addresses the impact of menstrual management on adolescent girls and their identity development during the transition to adulthood (Sommer 2010). However, none of these studies has provided evidence for a causal relationship between menstruation and various school outcomes for girls. While menstruation may negatively impact girls' quality of life in particular cultural and physical environments, it is unclear whether girls' schooling outcomes can be attributed directly or indirectly to the inconveniences and discomforts of monthly bleeding.

As a starting point, little evidence exists for a gender difference in absenteeism in sub-Saharan Africa or in other less developed regions. An analysis of the 2005–2006 MICS data from 12 African countries found similar rates of absence from school for boys and girls (Loaiza and Lloyd 2008). The lack of a gender difference in absenteeism suggests that, if menstruation does indeed affect school attendance for girls, other factors that contribute to absenteeism are more prominent for boys.

In this article, we use data from the Malawi Schooling and Adolescent Survey (MSAS), a school-based survey of 1,675 14–16 year old students sampled from 59 primary schools and their catchment areas in two rural districts in southern Malawi, to examine the factors associated with menstruation-related absenteeism. This region was chosen because of the relatively high rate of HIV among adolescent girls (NSO and ICF Macro 2011). We also recognized it is an area that was historically disadvantaged in terms of education both during the British colonial period and during the Banda regime which ended during the early 1990s (Kendall 2007). Malawi is a country with one of the highest recorded rates of absenteeism among adolescents in sub-Saharan Africa according to nationally representative household data from 12 countries participating in UNICEF's Multiple Indicator Cluster Surveys in 2005; 15 percent of students were absent for two or more days in the week before the survey, with no difference in the prevalence of absenteeism for boys and girls (Loaiza and Lloyd 2008). Our data allow us to examine the factors that are associated with school absences during the respondent's last menstrual period. We focus on school characteristics, such as the quality and cleanliness of toilet facilities and the source of the water supply, and on individual characteristics, such as experiences of privacy in the school toilets, travel time to school, co-residence with adult female relatives, and school engagement and parental involvement.

## Menstruation and Schooling

Menarche poses a unique challenge to schooling, particularly as more girls remain in school at ages beyond the onset of puberty. Although the meaning of menarche varies across

<sup>1</sup>Although some scholars have defined menstrual management or regulation as the set of beliefs and practices aimed at maintaining a regular menstrual cycle (van de Walle and Renne 2001), in this article we use the more common definition of menstrual management that focuses on managing the physical issues and inconveniences of a menstrual period.

cultural settings, in Malawi it is widely interpreted as a sign that a young woman is no longer a child and is physically ready for sexual activity. Readiness for sex signals readiness for marriage, a status that conflicts with ongoing school enrollment (Munthali et al. 2006; Poulin 2007; Grant 2012). There is qualitative evidence that, at least in the past, the beginning of menses was a reason for female school dropout, since young women were encouraged to marry soon after menarche (Helitzer-Allen 1994, cited in Kalipeni 1997). A recent study in Malawi found that the age of menarche was significantly associated with the timing of school dropout, but that the association was fully explained by the timing of sexual debut (Glynn et al. 2010). Thus, the onset of menarche may have an indirect effect on schooling attainment, as parents' perceptions of a daughter's sexual readiness influence their willingness to continue investing in adolescent girls' schooling and may lead parents to be less committed to maintaining their daughters' enrollment and attendance relative to their sons (Grant 2012).

In contrast to the potential link between the onset of menstruation and school dropout, popular and policy discourse has focused on the indirect ways that menstruation influences schooling attainment via absenteeism and the ability to learn. Menstruation creates a set of physical, socio-cultural and economic challenges that may interfere with a young woman's ability to attend school or to participate fully in classroom activity (Kirk and Sommers 2006). Although focus group studies and anecdotal reports allude to this association, few studies have used actual attendance data to quantify the effect of menstruation. One exception is a recently published paper that combined official school attendance rosters with time diaries kept by seventh and eighth grade girls in the rural Chitwan Valley, Nepal (Oster and Thornton 2011). This study found that girls were significantly more likely to be absent from school on days when they experienced their menstrual period relative to other school days, but that the overall impact on attendance was very small, totaling 0.4 days of school missed per girl over a 180 day school year.

The lack of adequate sanitary materials may be one barrier to school attendance. Commercially produced products may be unavailable in rural areas or prohibitively expensive for most families; for example, multiple studies in Nigeria found that fewer than one-third of urban adolescent girls used commercially produced sanitary materials (Abioye-Kuteyi 2000; Adinma and Adinma 2008; Kanyike, Akankwasa and Karungi 2003). Reliance on cloth rags may restrict physical mobility, as girls may not have adequate supplies to prevent leaks or maintain hygiene. Cloth menstrual materials must be regularly washed, which becomes problematic for families who cannot afford soap, and the additional time required to launder rags may reduce time devoted to homework and studying (Kirk and Sommers 2006). Evidence from China suggests that, controlling for other measures of family socio-economic status, girls from households that have limited access to water are more likely to drop out of school post-menarche compared to girls from households with better access, due to difficulties remaining clean during menstrual periods (Maimaiti and Siebert 2009). Girls' school attendance might also be disrupted by the physical discomforts of menstruation, including menstrual cramps, headache, backache, nausea, and diarrhea. Pharmacological treatments, such as painkillers, may not be readily available and are likely too expensive for poor rural families.

Diverse NGOs are targeting these issues through the provision of feminine hygiene supplies. Moreover, the government of India recently announced a plan to spend \$32 million to subsidize sanitary napkins for poor adolescents (Chatterjee 2010). The evidence that such interventions will have a beneficial effect on school attendance is lacking. Indeed, in the Chitwan Valley study, in which girls were randomly assigned to receive a menstrual cup—an inserted, reusable device that collects menstrual blood and requires less water for cleaning and self-care during menstruation—the researchers found no significant impact on the school attendance rates of the treatment group (Oster and Thornton 2011).

School facilities may also influence the regular attendance of female students during their menstrual periods. The availability and privacy of toilets on school grounds determine whether female students are able to change their sanitary materials and wash themselves during the school day. The absence of a sense of privacy and safety in the latrines means that menstruating students may be anxious that their condition will be discovered by other students (Sommers 2010), while inadequate water supplies may interfere with the ability to remain clean, prevent odor, and rinse away menstrual blood from the latrine facilities (Mahon and Fernandes 2010). Even when adequate toilet and water facilities are available, teachers, the majority of whom are male in rural Malawi, may be insensitive to the needs of female students and allow only infrequent toilet breaks. Class participation may also be interrupted during menstruation, as girls may be hesitant to stand up in class or go to the chalkboard for fear of revealing possible leaks or other evidence of their condition (Kirk and Sommers 2006).

UNICEF and other international agencies have attempted to address these issues through campaigns to build and improve school toilet facilities in many less developed countries (Birdthistle et al. 2011). Most of these projects, however, have not been embedded within randomized studies and the evidence base remains very thin as to whether the provision of school toilets has an impact on menstruation-related absenteeism or affects gender differences in school attendance (Birdthistle et al. 2011).

Another issue is that female students may not be well informed about menstruation, leaving them poorly prepared to deal with the physical issues of their menstrual period. Although life skills classes are taught in almost all primary and secondary schools in Malawi, the curriculum does not include much material about puberty. The main life skills textbook includes only one lesson about puberty and is more focused on the biological changes of puberty than in teaching female students about personal hygiene or strategies for menstrual management (Malawi Institute of Education 2008). Traditionally, such information was provided by either community-based initiation camps that were conducted shortly after the onset of puberty or older female relatives (Munthali and Zulu 2007). A recent survey found that mothers, grandmothers, and other female relatives were the most common source of information for girls in Malawi about puberty and menstrual management, suggesting that co-residence with female relatives may improve girls' access to information (Munthali et al. 2006).

Finally, it is possible that menstruation creates a reason for school absence among girls who are already less motivated and receive less encouragement from family to attend school.

Although absenteeism itself may be interpreted as a dimension of behavioral disengagement from school, evidence from the United States suggests that it is correlated with measures of student academic motivation and parental involvement (Finn 1989; Fredericks, Blumenfeld and Paris 2004).

## Research Focus

In this analysis, we use school-based data from rural Malawi to examine the school-and individual-level factors associated with menstruation-related absenteeism. First, we explore the gender differences in the reasons for school absence that were provided by male and female students. Then, we look more closely at the correlates of menstruation-related absenteeism and test the following five hypotheses:

1. Toilet availability and cleanliness and the convenience of a water source will be significantly associated with girls' reports of menstruation-related absenteeism.
2. In addition to school-level sanitation facilities, girls' comfort with school facilities (i.e., their reports of privacy of school toilets) will influence their attendance.
3. Girls who live further from school and have longer commutes will have worse attendance during their menstrual period because they may not have access to toilet facilities en-route to school.
4. Assuming that girls' school attendance during their menstrual period may be affected by the level of social support (i.e., advice and assistance) that they receive at home, co-residence with older female relatives will improve school attendance during that period.
5. A girl's own motivation to study and attend school will be negatively associated with menstruation-related absenteeism.

## Method

### Data Source

We use data from the first round of the Malawi Schooling and Adolescent Survey (MSAS), a longitudinal study of adolescents conducted by the Population Council in southern Malawi. The original school-based sample consists of 1,675 14–16 year old male and female students who were randomly sampled from the enrollment rosters at 59<sup>2</sup> randomly selected primary schools in the Machinga and Balaka districts.<sup>3</sup> The probability of a particular school being included was proportional to its enrollment in 2006. The 30 schools visited in Machinga represented nearly 20 percent of the schools in the district, and the 29 in Balaka represented nearly 25 percent. At each school, approximately 30 students stratified by gender and age who were enrolled in standards 4–8, the last four years of primary school, were interviewed. The first wave of data was collected from May to July 2007. This period

<sup>2</sup>The initial sample included 60 primary schools, but one school in Balaka district could not be reached in 2007 because a bridge had washed away during the rainy season.

<sup>3</sup>A second sample of 875 out-of-school respondents was drawn from the villages around these primary schools.

of data collection covered the length of the second term of the school year, which coincided with the winter harvest season.

We limit this analysis to the first survey round, to minimize the effect of school dropout on patterns of school attendance. By the second survey round in 2008, one-quarter of female students were no longer enrolled in school; marriage was the most common reason for dropout reported by the female respondents.

The MSAS focuses on the role of school quality and experience in shaping the transition to adulthood. The main survey module collected extensive information via a conventional face-to-face interview conducted by young Malawian research assistants of the same gender regarding the respondents' schooling history, experiences, aspirations, and attitudes, in addition to questions regarding socio-demographic characteristics and transitions to adulthood. Sensitive questions—sexual behavior, domestic violence, school-based violence and abuse—were asked via an Audio-Computer Assisted Survey Instrument (ACASI) that provided greater privacy for the respondent. Furthermore, at each school the research assistants conducted a survey of school facilities and interviewed teachers in grades 4–8 regarding their qualifications and professional experiences. Prior to the fieldwork, extensive pilot testing of the questionnaire was conducted in four primary schools in Zomba, a nearby district.

The full sample contained 835 female students, of which 88.5 percent had begun menstruating. Nineteen respondents were missing the variable for privacy in the school toilets and an additional ten respondents were missing the variable for the amount of time it took to travel to school. The main analysis is restricted to female students who have begun menstruating and for whom data are not missing, an analytic sample of 717 female respondents.

### Measures of Dependent Variables

The MSAS included two modules that examined school absenteeism. In the face-to-face survey, all students were asked whether they were absent on the last school day before the day of the interview. Respondents who reported an absence were asked why they were absent, but were not provided with a list of possible responses. Multiple responses were possible. Respondents were also asked to report how many days they attended school over the prior two school weeks. We converted this variable into a dichotomous variable for whether or not they reported any absence in the prior two weeks.

The second module focused on menstruation-related school absences. Given that menstruation is a sensitive topic that respondents may be uncomfortable discussing, even with a female interviewer, these questions were asked in the ACASI section of the survey. Female respondents were first asked whether they had begun menstruating. Those students who answered “yes” were then asked whether they had ever missed school because of their menstrual period and, if yes, how many days they missed the last time they had their period. These two questions were used to create a binary variable that indicated whether or not a female student had missed any days of school the last time she experienced her menstrual



period. This module also asked female students why they missed school during their last menstrual period.

### Measures of Independent Variables

All of the regression analyses control for a set of socio-demographic variables, including the grade in which the respondent was enrolled at the time of the survey, the respondent's household wealth quartile, household ownership of a bicycle, mother's and father's school attainment, ethnicity, and number of siblings. Subsequent regression models test our research hypotheses by adding a series of school- and individual-level variables.

The socio-demographic control variables represent the material and social resources that may support school attendance (Table 1). Household wealth is measured by an index of asset ownership. A principal components analysis scored a set of fifteen household assets,<sup>4</sup> and then used the first eigenvalue to construct quartiles of household wealth. We also include as a separate variable measuring whether the respondent's household owns a bicycle. This variable can be interpreted in many ways, all relevant for schooling; not only may bicycles serve as both an income generating asset and as a means of transporting respondents to school, they also represent wealth accumulation at the household level. Finally, we include binary variables for whether the respondent's mother and father ever attended primary school.

We also control for the respondent's ethnicity. Approximately 39 percent of respondents identify as members of the Yao ethnic group. The Yao have a matrilineal kinship system, whereby property is inherited through a woman's family and married couples live in the wife's village (Mitchell 1956). Approximately 85 percent of the Yao in this sample are Muslim, making it difficult to disentangle the relationship between ethnicity and religion. A quarter of the respondents are Lomwe, a matrilineal ethnic group common in Southern Malawi and neighboring Mozambique. An additional 20 percent of respondents identify as Chewa. The Chewa are the largest ethnic group in Malawi and are also matrilineal, although evidence suggests that, over the course of the twentieth century, many Chewa have begun to adopt patrilineal practices in regions with scarce agricultural land (Phiri 1983; Takane 2008). The remaining 15 percent of respondents are classified here as "other", a category which includes the Ngoni, Nyanja, and Sena ethnic groups. In the regressions, Yao is the reference category.

Two other socio-demographic variables were included: grade in which the respondent was enrolled and the respondent's number of siblings. The relatively narrow age range of the respondents—14 to 16 years old at the start of the school year—belies substantial heterogeneity of experience. Almost one quarter of respondents were enrolled in each of standard 6, 7 and 8, with the remaining quarter divided between standards 4 and 5. The correlation between the age of the respondent and the grade in which the respondent was enrolled is not particularly strong ( $R=0.1942$ ); twenty-five percent of female students

<sup>4</sup>The household asset index was based on the household ownership of the following items or amenities: mattress, sofa, table, chair, lamp, television, radio, cell phone, mosquito net, motorcycle, car, tin roof, electricity, boat and books. The average household reported owning 4.9 items.

entered school after age seven and over 90 percent had repeated at least one grade, producing this pattern.

In order to test our hypotheses, the models contain a set of school- and individual-level variables including: type of toilet facilities available at school, the cleanliness of school toilets, the source of water at school, student reports of school toilet privacy, travel time to school, co-residence with an adult female, and school engagement and encouragement. For our first school-level variable, we define a categorical variable for the type of toilet facilities available for girls in each school: ventilated improved pit (VIP) latrine, standard pit latrine, traditional pit latrine, and no toilet access. Slightly more than half of the respondents attend schools that have a standard pit latrine with a cement floor whereas only 11 percent of respondents attend schools where there is no toilet access. Sixteen percent attend schools with a VIP pit latrine toilet, with a cement floor, lid, and fly trap. The remaining students attend schools with a traditional pit latrine with a mud floor. In the regressions, the standard pit latrine is the reference category. The second indicator of sanitation facilities is the cleanliness of school toilets. Cleanliness was determined by the field supervisor on the first day of interviews at a sample school. Supervisors were instructed to code a toilet as: “clean” if there were no or few odors, the buildings were in good order, there was no litter, and the floors, walls and doors were mostly unstained; “dirty” if there was a noticeable odor, less than half of the buildings were damaged, there was some litter, and some staining on the walls and doors; and “filthy” if the toilets were malodorous, most or all of the facilities were in poor condition, there was much litter, and there was widespread staining. Almost half of respondents attend schools that had “clean” toilets, whereas 21 percent of respondents attended schools that had “filthy” toilets. Finally, information on the source of the school’s water supply is also included. Access to clean water may influence the ease with which female students are able to attend to their personal needs during their menstrual periods; water sources that require more labor limit the amount of water that is available for handwashing and personal hygiene. Eighty-five percent of the respondents attended schools that were served by a borehole, while the remaining respondents were fairly evenly divided between schools that had piped water, received their water from wells or springs, and those that drew their water from a lake or river; in the regressions, attending a school served by a borehole is the reference category.

Toilet privacy was measured in the ACASI section of the survey. Female respondents were asked whether their classmates had ever peeped into the toilet while the respondent was using it. On average, only eight percent of respondents reported a lack of privacy in the school toilets.

The face-to-face survey asked respondents to estimate how much time it took to travel to school each day. Responses were coded as less than 30 minutes, 30 to 60 minutes, and more than one hour. Forty percent of respondents travelled less than 30 minutes from home to school each day, 35 percent travelled 30 to 60 minutes, and almost 25 percent travelled more than one hour. In the regression, travel time less than 30 minutes was the reference category.

To measure whether a female student lived with adult female relatives, the interviewer filled out a household roster. Three separate binary variables were created from the roster: whether



the respondent lived with her mother, with at least one grandmother, and with at least one aunt. Seventy-five percent of female respondents lived with their mother, 15 percent had a co-resident grandmother, and almost 10 percent had a co-resident aunt. One-third of respondents who lived with their grandmother also lived with their mother. Eleven percent of respondents did not live with any of these types of older adult women.

Finally, the face-to-face survey included a set of variables that measured various dimensions of school engagement and parental encouragement.<sup>5</sup> In this analysis, we included three variables that have bivariate associations with menstruation-related absenteeism. First, we include a binary variable for whether the respondent studies at home. This variable captures both a student's motivation to study as well as their parents' encouragement of schoolwork. Almost 90 percent of respondents study at home. Second, we include a binary variable for whether the parent helps the respondent with her schoolwork. Half of respondents report that a parent assisted with schoolwork. The final binary variable indicates whether the parent talks to the respondent's teacher; the question does not specify whether these conversations are initiated by the parent or the teacher. Only 20 percent of respondents have parents who talk to their teacher. These three variables are not strongly correlated with each other; the strongest association is between reporting parents who help respondents with their schoolwork and parents who talk to the respondent's teacher, but even this correlation is weak ( $R=0.16$ ).

## Data Analysis

We begin with an analysis of the different reasons that male and female students report absences on the last school day, and the reported contribution of menstruation to overall absenteeism. We then use logistic regression analyses to test the above-listed hypotheses about the school- and individual-level correlates of menstruation-related absenteeism.

The first part of the analysis is a descriptive exploration of the prevalence of school absenteeism and the reasons for absenteeism reported by male and female students who were absent on the last school day prior to the day of the interview. We then compare the proportion of female respondents who missed this school day due to menstruation to the proportion of female students who reported missing any days of school during their last menstrual period.

We then use logistic regression to identify the school- and individual-level characteristics associated with menstruation-related absenteeism.<sup>6</sup> This analysis is restricted to female respondents who have begun menstruating. All regression models contain the socio-demographic control variables. Each model sequentially adds the independent variables to

<sup>5</sup>These modules began with a series of questions about parental involvement in school and adolescent's school engagement that were included in the 1988 National Education Longitudinal Survey (NORC 1988). Since these questions were developed to study the student population in the United States, the questions were pilot-tested in Malawi and edited and simplified in response to the findings from the pilot testing. For other questions about school engagement, there was either insufficient variance or no bivariate association with menstruation-related absenteeism.

<sup>6</sup>Logistic regressions examine the linear relationship between the logit transformation of the probability of an outcome ( $\text{logit } p_i = \log(p_i/(1-p_i))$ ) and the set of independent variables (Powers and Xie 2000). We present the results of these regressions in Tables 4 and 5 as odds ratios. These can be interpreted as the odds that a student will be absent for one category of an independent variable relative to the odds of absence for the reference category.

test our hypotheses. The standard errors are adjusted for the clustering of respondents at the school level. Given that the data are hierarchical in structure, with students sampled from 59 primary schools, we first explored the hypotheses using a multi-level regression analysis. We found no school-level variance in the pattern of menstruation-related absenteeism ( $\rho = 2.44\text{e-}7$ ) in a simple model without covariates. This finding suggests that for female students, menstruation-related absenteeism is an individual-level process that is not sensitive to school environments. Furthermore, the likelihood ratio test indicated that the inclusion of a school-level random intercept does not improve the fit of the model relative to a non-hierarchical model.<sup>7</sup>

After running the series of nested models that test our hypotheses about the factors associated with menstruation-related absenteeism, we also conduct a robustness check. First, we replicate the full regression model for each of our two other absenteeism variables: absence on the last school day and any absence over the prior two school weeks. Then, in order to determine whether the factors associated with menstruation-related absenteeism are unique, we use post-estimation Wald tests in Stata (StataCorp 2009) to assess whether the regression coefficients estimated for menstruation-related absenteeism are significantly different from the coefficients estimated for the two other absenteeism variables.

## Results

### Descriptive Results

In this sample, absenteeism on the last school day prior to the interview is very high; approximately 20 percent of all male and female students reported having been absent (Table 2). The most frequent cause of absenteeism was illness; approximately one third of male and female respondents who did not attend the previous school day reported that they were absent because they were sick. Sixteen percent of female students and ten percent of male students were absent due to the need to work at home, but this difference was not statistically significant. Male students were significantly more likely than females to be absent because they needed to run errands for their family (13 percent and 3.5 percent, respectively). The only other stated reason for school absenteeism with a statistically significant gender difference was missing school in order to play (2.7 percent for males compared to 0 percent for females). Slightly more than a fifth of both female and male respondents did not provide a reason for their absence on the last school day.

Only 2.4 percent of female absences on the last school day were attributed to menstruation; put another way, the face-to-face survey suggests that 0.5 percent of all female students were absent on the last school day due to menstruation. When the question was expanded to include the cause of any absence since the start of the school year, only 14 girls volunteered that they had missed school because of their menstrual period. These reports of menstruation-related absenteeism contrast with the reports provided in the ACASI. In the privacy of the computer instrument, almost 32 percent of female respondents who have

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<sup>7</sup>The MSAS is a multi-level dataset, with students nested within schools. A school-level random intercept is the random deviation of each school's mean estimate from the overall mean. The likelihood ratio test compares the fit of the regression model with the random intercepts to the fit of the same model without the random intercepts (Rabe-Hesketh and Skrondal 2008).

begun menstruating reported that they missed at least one day of school the last time that they had their menstrual period, with an average length of absence of 2.8 days.

If we assume that all female students have a regular menstrual cycle, that the average menstrual period lasts for five days, and that approximately 16 percent of female students would be menstruating on a given day,<sup>8</sup> we would expect 2.8 percent of female students to be absent on any given school day due to menstruation-related issues.<sup>9</sup> First, this estimate is approximately five times greater than the prevalence of menstruation-related absences reported for the last school day. Even if young female adolescents do not have regular menstrual cycles, it would appear that menstruation-related absences are underreported in the face-to-face survey, most likely due to both the potential embarrassment of revealing something so private to the interviewer and the way this question was asked. If all female students who did not provide a reason for their absence missed school for menstruation-related issues, then as many as 4.2 percent of female students were absent on the prior school day because of menstruation. It is also possible that respondents who missed school due to menstruation-related symptoms, such as menstrual cramps, headaches or diarrhea, may have attributed their absence to illness.

A second conclusion that can be drawn from the descriptive analysis is that the relative impact of menstruation on girls' school attendance may be small relative to other sources of absenteeism. Menstruation-related absenteeism does not create a female disadvantage in school attendance, given that there is no significant gender difference in the overall prevalence of absenteeism. If we assume that female students who were absent during their menstrual period otherwise would have attended school, then menstruation-related absenteeism makes the prevalence of absenteeism among girls more similar to that of the average boy. Female students who were absent during their last menstrual period missed an average of 2.8 days of school; over the duration of a 180 day school year, this sub-set of female students would miss 12 days of school due to menstruation or approximately 3.8 days per pupil across the entire population of female students. This population-level estimate is considerably higher than the 0.4 missed days estimated by Oster and Thornton (2011); however, their analysis is based on daily attendance data that allow them to calculate the marginal rate of being absent on a menstrual day relative to a student's underlying propensity to be absent on a school day when they are not menstruating. The general level of absenteeism is also very high in our sample, suggesting that it is unlikely that all of our respondents would have otherwise attended school.

Among female students who reported an absence during their last menstrual period, heavy bleeding was the most common reason for absenteeism, accounting for almost half of all menstruation-related absences (see Table 3). An additional 20 percent of respondents missed school because of cramps or headaches, and 17 percent were absent due to menstruation-

<sup>8</sup>Assume that girls bleed 5 days out of 28. That means the likelihood of a girl who has gone through puberty menstruating on any one day in a month is 18%. Since approximately 90% of the sampled girls have gone through puberty, about  $.9 \times 18\% = 16\%$  are menstruating on any one day.

<sup>9</sup> $31.7\%$  girls missed school at time of last menstrual period multiplied by  $16\%$  female students menstruating on a given school day multiplied by 2.8 days average length of menstruation-related absence, divided by five school days per week =  $2.8\%$  of all female students would be expected to have a menstruation-related absence on a given school day.

related diarrhea. Lack of sanitary napkins and limited access to water were not mentioned as frequently, although these are probably subsumed under absences attributed to heavy bleeding; respondents were not allowed to give multiple reasons for absence in the ACASI.

### Menstruation-Related Absenteeism

Although menstruation does not appear to be a substantial source of female absenteeism, it is important to understand the factors that affect menstruation-related absenteeism. In this article, we examine some of the factors that may be amenable to policy interventions to decrease female absenteeism. The base model (see Table 4) shows that none of our socio-demographic control variables are significantly associated with menstruation-related absenteeism.

The second model adds the school-level variables to the socio-demographic controls. School toilet availability, toilet cleanliness, and school water facilities are not significantly associated with an absence at the time of the respondent's last menstrual period. These findings are not surprising given that the preliminary analysis showed no school-level variance in menstruation-related absenteeism. This suggests that school-level characteristics play a limited role in menstruation-related absenteeism. Given the non-significance of the school-level variables, we exclude these variables from subsequent models.

The third model examines whether a student's experience of privacy when using school toilet facilities is associated with an absence at the time of her last menstrual period. Although the construction of the toilet facilities may be a school-level characteristic, the perceived lack of privacy is specific to the student. We find that students who thought that the school toilets lacked privacy have more than twice the odds of being absent during their last menstrual period. The Wald statistics, however, indicate that this regression model is not jointly significant (Wald chi-squared=18.16,  $p=0.254$ ).

We add a categorical variable for the time that it takes each student to travel from home to school to the fourth model. Students who travel 30 to 60 minutes to school have 79 percent higher odds of menstruation-related absenteeism compared to students who travel less than 30 minutes. Travel times of more than one hour are also associated with higher odds of menstruation-related absenteeism, although the difference is not statistically significant ( $p=0.632$ ).

The fifth model adds three indicators of co-residence with older female relatives. There is no statistically significant association between menstruation-related absenteeism and co-residence with the respondent's mother or with at least one aunt. This is not surprising, given the lack of a bivariate association for these variables (see Table 1). Co-residence with a grandmother, however, reduces by half the odds that a respondent reported having missed any days of school at the time of her last menstrual period, although this association is marginally significant ( $p=0.052$ ).

The final model adds indicators of individual motivation and parental encouragement. Female students who studied at home had a third of the odds of being absent at the time of their last menstruation compared to students who did not study at home. Having parents who

helped with their homework also lowers the odds of menstruation-related absenteeism, although this association was only marginally significant ( $p=0.090$ ). There is no significant association between menstruation-related absenteeism and having parents who talked to the respondent's teachers. These findings suggest that more academically motivated female students whose parents are invested in their schooling may be more determined not to let menstruation interfere with school attendance.

In addition to these findings, the magnitude of association for several of the other significant covariates strengthens in the final model. After controlling for individual motivation and parental encouragement, the association between menstruation-related absenteeism and co-residence with a grandmother becomes statistically significant. The magnitude of the odds ratio for a perceived lack of privacy in school toilets also increases across these models.

Table 5 presents the results of our analysis of the association between the independent variables from the full model and our two other absenteeism variables: absence on the last school day prior to the interview and any absence in the prior two school weeks. It is possible that the factors that are significantly associated with menstruation-related absenteeism are associated with absenteeism in general, and do not reflect individual characteristics that support or discourage school attendance during a menstrual period.

In the first model, we find that none of our variables of interest are associated with being absent on the last school day. When we test whether the coefficients in this model are significantly different from the coefficients estimated for menstruation-related absenteeism (Table 4, Model 6), however, we find that only two of the coefficients for the variables of interest are significantly different. The difference between the negative association between living with a grandmother and absence during the last menstrual period and the null association estimated for absence on the last school day is marginally significant (chi-squared=2.72,  $p=0.099$ ). Likewise, the negative association between studying at home and absence during the last menstrual period is also significantly different (chi-squared=11.68,  $p=0.001$ ) and in the opposite direction from the association for absence on the last school day. All other key variables have overlapping confidence intervals with the estimates obtained for menstruation-related absenteeism.

In the second model, we find that several of our key variables are associated with an absence in the prior two school weeks. Living more than 30 minutes away from the school increased the odds of being absent. Students who studied at home were less likely to be absent, although, surprisingly, students whose parents helped them with their homework were significantly more likely to be absent. When we test the coefficients in this model against those in the final model for menstruation-related absences, the results were similar to those found above: only co-residence with a grandmother and studying at home are significantly different across the two models. Even though studying at home reduces the odds of both menstruation-related absence and any absence in the last two weeks, the size of the coefficient is significantly greater for absence during the last menstrual period (chi-squared=4.20,  $p=0.0405$ ). The magnitude of the association between co-residence with a grandmother and menstruation-related absenteeism is also significantly greater (chi-squared=3.60,  $p=0.0578$ ). Taken together, these findings suggest that we can only identify

co-residence with a grandmother and studying at home as factors that are uniquely associated with menstruation-related absenteeism.

## Discussion

We find no evidence for a gender difference in the overall rate of absenteeism. Although one-third of female students report missing at least one day of school during their last menstrual period, our data suggest that this only accounts for a small proportion of all female absenteeism. Furthermore, boys are influenced by other factors such that their likelihood of being absent on any one day is essentially the same as their female peers.

None of our school-level variables were associated with menstruation-related absenteeism. This result is consistent with our finding that there was no school-level variation in this outcome. Our sample of schools included the full range of variation in facilities available in rural schools, from VIP toilets and functioning piped water systems to schools where no toilet existed and water was brought by the bucketful from nearby lakes and rivers. In the context of these results, it is difficult for us to see improved toilets either in terms of numbers available or the degree of cleanliness as promising strategies for improving the daily school attendance of post-pubescent girls. It is possible that more modern facilities with faucets and flush toilets would make a difference; however, such facilities are not feasible in most rural areas where piped water is rarely available. Improvements to school facilities may, however, make a substantial contribution to students' quality of life. Reducing the stress of menstrual management for female students may enhance their ability to concentrate on schoolwork and improve learning outcomes, although this relationship has not been examined here.

Although the level of perceived privacy in the school toilets is significantly associated with the odds that a female student missed at least one day of school during her last menstrual period, this association is not significantly different from the association between perceived privacy and our other measures of absenteeism. Given that this variable's inclusion in a regression model does not significantly explain variation in our dependent variable, it appears to have little association with menstruation-related absenteeism. Even though perceived privacy is an individual-level measure, it is also a function of the latrine construction materials and design as well as the presence of adequate locks on the toilet door.

The only individual characteristics that are robustly associated with an absence during the last menstrual period are co-residence with a grandmother and spending time studying at home. Grandmothers and other older female relatives are a traditional source of information about puberty for girls in Malawi (Munthali et al. 2006), and co-residence may facilitate the flow of information about how to manage the physical issues of menstruation that may interfere with school attendance. More material on personal hygiene and menstrual management could be added to the life skills curriculum for female students, in order to provide information for girls who do not have access to these traditional sources of knowledge. New curricula focused on female puberty have recently been adopted in Tanzania (Sommer 2011), although it is too early to determine whether these changes will



affect female absenteeism. Our findings also suggest that more academically oriented female students whose parents are invested in their education may be more motivated to avoid missing school.

Although other individual-level factors were associated with absence during the last menstrual period, none of the estimated coefficients were significantly different from the coefficients estimated for the other measures of absenteeism. Therefore, we suspect that these other variables, such as the distance from school, are potentially associated with all absenteeism, not just absences related to menstruation.

Given how few girls are absent due to their menstrual period on any given school day, we believe that the variable absence on the last school day does not capture many menstruation-related absences. Absences in the past two weeks, on the other hand, may be capturing some absences due to the respondent's last menstrual period. In an alternate model (results not shown), we examined the association between our key independent variables and absences in the last two weeks restricted to the sub-sample of female students who did not report missing school at the time of their last menstrual period. There were no significant differences in the coefficients estimated in this model and the model run for the full sample of post-pubescent female students, suggesting that this bias is not a cause for concern.

In general, we suspect that school absence during a menstrual period is more closely related to the severity of the physical symptoms experienced by an adolescent. The prevalence of symptoms was not measured in this study, so we are unable to test their association with menstruation-related absenteeism. However, almost 85 percent of girls who reported missing school during their last menstrual period listed cramps, diarrhea, or heavy bleeding as the primary reason for their absence. Increasing the availability of affordable analgesics that lessen pain during menstruation may reduce absenteeism. While contraceptive pills that regulate menstrual intensity might prove effective at regulating the menstrual systems of girls with symptoms that impede school attendance, birth control pills are not widely used in Malawi particularly by unmarried adolescents (NSO and ICF Macro 2011), making this an unlikely policy option. Even if use of analgesics, anti-diarrheal medications, or hormonal contraceptives improved the physical symptoms experienced during a menstrual period, however, our findings suggest that this would not make a large impact on the overall rate of absenteeism.

The main limitation of our study is our reliance on self-reports of absence from school during last menstrual period. We believe that the quality of reporting for this question was improved by using the ACASI, which provided greater privacy than the face-to-face survey instrument. However, we have no external means of validating these reports. This approach also focuses on absences during the last menstrual period, rather than capturing ongoing patterns of absenteeism related to menstruation. Our data do not provide a complete picture of how a student's school attendance has been affected by menstruation over the course of a school year. Other studies have used official school attendance records, combined with prospective student reports of their menstrual cycle, to capture this information more fully (Oster and Thornton 2011). It is unclear, however, how our measurement would bias our results. Evidence from the United States suggests that menstrual cycles in adolescents are

often irregular and typically longer than cycles in older women (American Academy of Pediatrics et al. 2006). By assuming that female students have regular 28 day menstrual cycles and that those students who missed school at the time of their last menstrual period miss school every time that they have their period, we may be overestimating the impact of menstruation. In contrast, we may be underestimating the impact of menstruation on absenteeism if students who did not miss school the last time they had their menstrual period are occasionally absent for this reason. Our data, however, suggest that this underestimation is not the case, as only seven percent of female students who report ever missing school due to menstruation did not report missing any days at the time of their last menstrual period.

Our findings have implications for understanding the effect menstruation has on adolescent girls in poor African settings with high rates of absenteeism. While the management of menstruation is undoubtedly a concern for female students in the region, the results presented here suggest that it is unlikely that the provision of sanitary supplies or improvement of toilet facilities will increase adolescent girls' attendance substantially, although undoubtedly it would improve the quality of their lives.

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**Table 1**

Descriptive characteristics, 14–16 year old female students, Malawi School and Adolescent Survey, 2007

Variables	14–16 year old female students
Grade enrolled, %	
Standard 4	5.5
Standard 5	16.3
Standard 6	23.6
Standard 7	25.9
Standard 8*	28.7
Household asset quartile, %	
Low*	18.9
Low-Mid	21.7
High-Mid	24.9
High	34.4
Household owns bicycle, %	64.6
Ethnicity, %	
Yao*	38.7
Chewa	19.3
Lomwe	25.3
Other	16.7
Number of siblings, mean	4.5
Mother attended primary school, %	62.5
Father attended primary school, %	83.4
Type of toilet at school, %	
No toilet	11.3
VIP toilet	15.5
Standard Pit Latrine*	57.6
Traditional Latrine	15.6
Cleanliness of toilet at school, %	
Clean*	47.0
Quite dirty	39.0
Filthy	14.0
Source of school water supply, %	
Piped water	6.7
Borehole*	83.6
Well/spring	5.5
Lake/river	4.2
Thinks school toilets not private, %	6.4
Travel time to school, %	
Less than 30 minutes*	40.0
30–60 minutes	35.2

Variables	14–16 year old female students
More than one hour	24.8
Lives with mother	72.1
Lives with grandmother	15.8
Lives with aunt	9.2
Studies at home, %	89.8
Parents help with homework, %	50.2
Parents talk to teacher, %	20.1
N	717

Note:

\* indicates reference category.



**Table 2**

Prevalence of absenteeism and distribution of causes of absence on the last school day, 14–16 year old students, Malawi School and Adolescent Survey, 2007.

	Male	Female	p-value
Absent yesterday/last school day, %	21.0	19.8	0.5236
Any absence in the prior two school weeks, %	52.7	52.1	0.7877
Missed any school days last menstrual period, %	--	31.7	--
Mean number of days missed, if any	--	2.8	--
<b>Stated reason for absence on last school day, %</b>	<b>(N=185)</b>	<b>(N=172)</b>	
Sick	34.1	34.3	0.9607
Work at home	10.3	15.7	0.1269
Uniform dirty	11.9	9.3	0.4294
Errands	13.0	3.5	0.0012
Family member sick	4.9	6.4	0.5311
Attend funeral	3.2	2.3	0.6008
Market day	2.7	1.2	0.2957
Watch siblings	2.2	1.2	0.4644
Rather play	2.7	0	0.0299
Menstruation	--	2.3	--
Other	7.0	8.7	0.5533
No reason given	20.5	21.5	0.8225

Note: Multiple responses possible. P-value determined by t-test of means.

**Table 3**

Distribution of causes of absence during last menstrual period, 14–16 year old female students, Malawi School and Adolescent Survey, 2007

Reasons	(N=236)
Cramps, headache, or pain	19.5
Diarrhea	17.4
Heavy bleeding	47.9
Lack sanitary napkins or rags	2.5
Lack of water or place to clean	7.2
Other	5.1
No reason given	0.4

**Table 4**

Logistic regression results (odds ratios), absent at last menstruation, 14–16 year old female students past puberty, Malawi Schooling and Adolescent Survey, 2007

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Current grade enrolled (ref. Standard 4)						
Standard 5	1.01	1.05	1.02	1.00	0.97	0.90
Standard 6	1.25	1.25	1.35	1.37	1.37	1.49
Standard 7	1.33	1.40	1.47	1.44	1.41	1.54
Standard 8	1.35	1.34	1.47	1.52	1.47	1.78
Household wealth quartile (ref. Low)						
Low-Middle	0.90	0.89	0.91	0.91	0.90	0.90
High-Middle	1.01	1.01	1.03	0.98	0.96	0.99
High	0.99	1.02	0.99	1.01	0.98	1.13
Household owns a bicycle	0.78	0.77	0.79	0.79	0.79	0.81
Ethnic group (ref. Yao)						
Chewa	0.87	0.87	0.88	0.91	0.90	0.98
Lomwe	0.80	0.79	0.81	0.80	0.81	0.86
Other	1.18	1.19	1.20	1.17	1.17	1.14
Number of siblings	1.02	1.02	1.02	1.03	1.02	1.01
Mother attended primary school	1.15	1.19	1.14	1.14	1.15	1.14
Father attended primary school	0.97	0.97	1.00	0.99	1.01	1.05
School toilet type (ref. standard pit latrine)						
VIP pit latrine		1.06				
Traditional pit latrine		0.85				
No toilet		0.65				
School toilet cleanliness (ref. Clean)						
Dirty		1.00				
Filthy		0.87				
Source of school water (ref. Borehole)						
Piped		1.11				
Well/spring		0.72				

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Lake/river		1.96*				
None		0.74				
Perceived lack of privacy in school toilet			2.24*	2.32*	2.37*	2.64*
Time to travel to school (ref. less than 30 minutes)						
30–60 minutes			1.79***	1.81***	1.79**	1.79**
More than one hour			1.10	1.10	1.15	1.15
Lives with mother				0.79	0.76	0.76
Lives with grandmother				0.55+	0.48*	0.48*
Lives with aunt				1.31	1.35	1.35
Studies at home					0.32***	0.32***
Parents help with homework					0.71+	0.71+
Parents talk to teacher					0.72	0.72
Number of observations	717	717	717	717	717	717
Wald chi-squared	7.02	-	18.16	29.29*	34.4*	103.3***
Degrees of freedom	14	21	15	17	20	23
Log pseudolikelihood	-444.69	-441.79	-441.64	-436.40	-432.85	-419.55

**Table 5**

Logistic regression results (odds ratios), absent on the last school day and any absence during last two school weeks, 14–16 year old female students past puberty, Malawi Schooling and Adolescent Survey, 2007

	Absent on last school day	Any absence in past two weeks
Current grade enrolled (ref. Standard 4)		
Standard 5	1.63	1.20
Standard 6	1.87+	1.01
Standard 7	1.43	0.83
Standard 8	1.32	0.76
Household wealth quartile (ref. Low)		
Low-Middle	1.23	1.18
High-Middle	1.11	0.77
High	0.83	0.87
Household owns a bicycle	0.65+	1.03
Ethnic group (ref. Yao)		
Chewa	0.76	0.88
Lomwe	0.49**	1.08
Other	1.11	1.18
Number of siblings	1.09+	1.08*
Mother attended primary school	0.88	1.02
Father attended primary school	1.37	0.90
Perceived lack of privacy in school toilet	1.25	1.40
Time to travel to school (ref. less than 30 minutes)		
30–60 minutes	1.19	1.41*
More than one hour	0.81	1.27
Lives with mother	0.91	0.90
Lives with grandmother	1.00	1.10
Lives with aunt	1.07	0.80
Studies at home	1.38	0.65+
Parents help with homework	1.20	1.66*
Parents talk to teacher	0.63	1.05
N	717	717
Wald Chi-squared	57.02***	32.74+
Degrees of freedom		
Log pseudolikelihood	−331.93	−475.69