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MENSTRUATION AND EDUCATION IN NEPAL

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Menstruation and Education in Nepal
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ABSTRACT

This paper presents the results from a randomized evaluation that distributed menstrual cups (menstrual sanitary products) to adolescent girls in rural Nepal. Girls in the study were randomly allocated a menstrual cup for use during their monthly period and were followed for fifteen months to measure the effects of having modern sanitary products on schooling. While girls were 3 percentage points less likely to attend school on days of their period, we find no significant effect of being allocated a menstrual cup on school attendance. There were also no effects on test scores, self-reported measures of self-esteem or gynecological health. These results suggest that policy claims that barriers to girls' schooling and activities during menstrual periods are due to lack of modern sanitary protection may not be warranted. On the other hand, sanitary products are quickly and widely adopted by girls and are convenient in other ways, unrelated to short-term schooling gains.

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1 Introduction

Over the past several decades, there has been considerable attention placed on increasing schooling in developing countries. Girls' schooling may be particularly important since many studies suggest an effect of female schooling on health, wealth, empowerment, and the health and schooling outcomes of girls' own children later (Behrman and Rosenzweig 2002; Behrman and Wolfe 1989; Wolfe and Behrman 1987; Glewwe 1999). Historically, there has been a gender gap in education throughout developing countries, as measured by literacy, enrollment rates, and total years of schooling. While primary school enrollment rates have become fairly equal between boys and girls in much of the world, there remains a gender gap in the rate of progression to secondary school (King and Hill 1993). For example, in Nepal, 46 percent of boys enroll in secondary school as opposed to 38 percent of girls (Nepal Demographic and Health Survey 2001; Huebler 2009). Lower educational attainment among girls may be due to a number of factors such as fewer job opportunities for girls, parental or societal favor towards boys, or parents who are credit constrained who may be more likely to invest in their sons (Parish and Willis 1993; Garg and Morduch 1998; Banerjee 2004; Oster forthcoming; Qian 2008). Girls may also face additional constraints associated with puberty that may differentially place burdens on them. Consistent with this, later years of primary school - when drop-out rates are highest for girls - often coincides with the ages of puberty.

Women throughout the world face challenges during their monthly period. Some of these challenges are biological or physical, such as experiencing cramps, fatigue, or PMS. Other challenges may be particularly difficult for women living in developing countries. In many cultures, there are menstrual taboos or restrictions that limit women's mobility (Buckley and Gottleib 1988; Block Coutts and Berg 1994). Another challenge involves managing menstrual blood without modern sanitary products. In many cases, women use cloths during their menstrual cycle, which must be washed frequently. For young school girls, limited access to toilets, water, and the lack of privacy, may make personal care difficult and embarrassing when they have their period, which could result in lower rates of school attendance or performance.

Combining these facts - lower secondary school attendance, and puberty onset, a number of organizations have suggested that menstruation, in particular, may drive dropout and low attendance rates at school. These organizations have estimated large effects of menstruation on girls'

schooling. The typical calculation put forward is that if a girl misses 4 days of school every 4 weeks (due to her period), she may miss 10 to 20 percent of her school days (World Bank 2005). These organization have suggested that providing girls with modern sanitary products may help them to be able to attend school during their periods, thereby increasing attendance rates of girls and reducing the gender gap (LaFraniere 2005, Tjon a Ten 2007, Mawathe 2006). There have been a number of projects initiated by NGOs and sanitary product manufacturers to increase availability of these products in developing countries (Deutsch 2007, Callister 2008, Cooke 2006). On the other hand, while management of menstrual blood may be a barrier to schooling, other constraints associated with menstruation may be more of a barrier to schooling than lack of sanitary products. Existing evidence of girls missing school during their periods come from either case studies or self-reported data asking girls whether or not they miss school due to menstruation (see for example Beyene 1989; Herz 1991; Mehrah 1995; Chung 2001; Bharadwaj and Patkar 2004), which may be biased self-reports.

In this paper we estimate the causal impact of the providing modern sanitary products on girls' schooling. In this evaluation we enrolled a sample of 198 adolescent girls and their mothers in four schools in Chitwan, Nepal and randomized (at the individual level) allocation of menstrual cups to half of the sample. A menstrual cup is a small, silicone, bell-shaped device which is used internally during menstruation; the cup fills, and must be emptied and washed approximately every twelve hours. With proper care, it is reusable for up to a decade. We collected baseline and follow-up surveys as well as monthly time diaries recorded by the girls. We also collected official school records and made unofficial attendance checks to measure the effects on school outcomes.

In contrast to existing claims about menstruation and education, we do not find evidence that menstruation technology affects school attendance. In our preferred specification, we find that girls who do not have access to menstrual cups are 2.6 percentage points less likely to be in school on days they are menstruating. Although this is smaller than the 10-20% estimates by policy makers, it is still could be considered a substantial effect on these days. However, we find no significant effect of providing menstrual cups on girls attendance and can reject even very small effects. With 95% confidence we can reject gains in schooling of 0.5 total days gained among girls in the treatment group per academic year. Similarly, we find no effects of being given a menstrual cup on test scores. This is not due to low adoption of the cup: 60% of the treatment girls report using the cup by six

months into the study. The low impact of modern sanitary products may be due, in part, to the fact that sanitary products only help with management of menstrual blood, rather than cramps or fatigue. Girls in our study report that the primary reason they miss school during their periods is due to cramps.

Despite the lack of schooling effects, this study does support some value to these products. Among the treatment girls, 61 percent ever used the cup between the baseline and follow-up meetings and take-up among the control girls who were later given the cup was similarly high. In addition to reporting ease and convenience with mobility and management of menstrual blood, girls who were in the treatment group spent 20 minutes per day less doing laundry on days they had their period. Our results suggest that there are indeed barriers for girls related to menstruation. However, merely providing modern sanitary products to girls may not be the solution to removing or reducing these barriers.

We proceed as follows: we first describe the experimental design and data in Section 2. Section 3 presents the empirical strategy. Section 4 presents the results and Section 5 presents a discussion of non-schooling effects of menstrual cup allocation. Section 6 concludes.

2 Experimental Design, Survey and Data

2.1 Research Design and Timeline

The study began in November, 2006 and included four schools in and around Bharatpur City in Chitwan District, Nepal; of these, two were urban schools and two were peri-urban. From school rosters of girls who were enrolled in school at the beginning of the school year, 60 seventh-grade and eighth-grade girls from each school were invited, with their mothers, to participate in the study. Participation in the study was contingent on attendance at the first study meeting at which time girls received pens and stickers, and mothers received 100 Nepali Rupees ($1.45). If a mother was not available, girls could bring an older female relative or guardian to the meeting. Column 1 of Panel A of Table 1 shows the total number of girl participants in each school; between 7 and 12 of the invited students in each school were not able to attend the meeting and therefore did not participate in the study (Approximately 17.5 percent across all schools). Columns 2 and 3 in Panel A show the composition of the older female participants: 79% of girls participated with their mothers.

At the initial meeting, a baseline survey was administered to both girls and their mothers. The survey included questions on basic demographics, schooling, menstruation, and self-esteem. At the end of the initial meeting, the randomization was carried out. Girls had been given identification numbers, and the randomization was done with a public lottery, drawing twenty-five numbers out of a bag. Girls whose numbers were drawn were assigned to the treatment group with their mother or guardian (we did not randomize girls and their mothers separately). The treatment girls were asked to remain at the meeting and each treatment girl and her female guardian were given a menstrual cup. A nurse gave detailed instructions to those in the treatment group on the use of the menstrual cup.[1]

At the meeting, girls were given a booklet of diaries for each month. Diaries consisted of three main sections. First, a calendar in which girls would circle the days that they begin and end their period each month. Second, a chart for the first 6 days of each month in which girls would record their activities for each hour of the day categorized into predefined categories (e.g., cooking, playing with friends, taking care of others, doing housework, doing laundry, doing agricultural work, doing homework, being at school, watching tv). The third section asked specific questions for each of the first six days (i.e. time of arrival and departure at school) as well as questions on menstruation (i.e. if the girl had her period). Girls were trained how to fill out these diaries at the initial meeting.

After the initial meeting girls were followed for approximately fifteen months (through January, 2008). During this time, there was an in-school nurse visit approximately once per month, at which time girls were also given the opportunity to ask questions. In addition, at each nurse visit, the diary for that month was reviewed and corrected with the girl if there were any inconsistencies or problems.

In February, 2008 a second meeting was held in each school. At this meeting a follow-up survey, similar to the baseline survey, was administered. At this meeting the control girls and their mothers or female guardians were given the menstrual cup. One hundred and eighty-three of the girls in the study attended the follow-up meeting. Of the 15 girls not able to attend the meeting all but one were interviewed by enumerators at a later date (these included 7 treatment and 7 control girls). Questions from the baseline and follow-up surveys allow for measuring changes in behaviors and attitudes in response to being allocated a menstrual cup. In both surveys, girls were asked questions about their school attendance and performance, as well as measures of self-esteem,

[1] One of the mother-daughter pairs randomized to the treatment group decided not to accept the menstrual cup. We analyze the intention to treat effect, and keep this girl in our sample for analysis. This girl and her mother were each interviewed at the follow-up survey.

empowerment, and health. We discuss construction of indexes of these measures below. After the final meeting, nurse visits to the schools continued for three months to observe the timing of menstrual cup take-up among the control girls.

2.2 Sanitary Product and Menstrual Cup Use

Among our sample, the average age of menstruation is 12.8, with 87% of girls having had their period at the baseline survey (Table 1). Use of sanitary pads is not very common; only 25% of the girls had ever used them, and only 2% reported using them regularly. The primary sanitary protection is rags. In contrast to Nepal, most women in industrialized countries use tampons and sanitary napkins. However, these products might not be the most suitable for school girls in developing countries such as Nepal. Each girl would need a large and continuous supply of these products which would not be feasible for most of these girls because the products are not available or are unaffordable. In addition, the product would need to be disposed of, which raises sanitary issues and limits the ability to keep the period private.[2] Another benefit to using a menstrual in the context of an evaluation of sanitary products is that girls are not as likely to share the products, thus reducing the chances for contamination in the experiment. The girls were given instructions not to share and there was only one cup given per girl, rather than a supply of pads that might be more prone to sharing across treatment and control groups.

The sanitary technology we use in this project is a menstrual cup, specifically the MoonCup brand cup, shown in Figure 1.[3] The cup is a small, silicone, bell-shaped cup which is inserted in the vagina to collect menstrual blood. For most women, the cup is emptied approximately every twelve hours during menstruation. With proper care, the cup is re-usable for up to a decade. There is no risk of Toxic Shock Syndrome, and generally no risk of complications from the cup. This menstrual cup has been FDA approved in the United States.

2.3 Sample Characteristics and Data

Panel B of Table 1 presents some baseline demographic summary statistics for the girls. The average age is 14, and girls are evenly divided between the 7th and 8th grades, as was designed by the stratified randomization. Education levels of parents is quite low - on average mothers have only

[2]When the girls were asked why they do not use pads, availability or knowledge of pads is the largest barrier stated (56 percent). Approximately 19 percent report that pads are uncomfortable and 11 percent report that their parents do not approve. Very few, only 2 percent, report that money is a barrier to purchasing pads. However, it is not clear that even if these pads were available, if the girls would be able to afford them.

[3]For more information, see http://www.mooncup.co.uk/ .

completed 2.7 years of schooling with fathers completing 5.6 years of schooling. The four schools are located in both peri-urban and rural communities and agriculture is important in the households. On average, households own 2.2 chickens, 0.9 water buffalo and 2 sheep. This is also evident in the fact that only 66 percent of fathers and 32 percent of mothers work for pay. Girls also sometimes work for pay - 22 percent report doing so. In our sample, approximately 47 percent households report being of high Hindu caste, 13 percent report being of a Tibetan or Hills ethnic group, 6.8 percent report belonging to a low Hindu caste, 4.7 percent report being Newari, and 28 percent report being Tharu. Despite the large differences in ethnicity, the majority, 92 percent, practice the Hindu religion.

In addition to data collected directly from the girls, official school records of test scores and attendance were collected for each student in school for the academic years prior and post-intervention. Attendance was recorded for each day indicating if the school was closed (for example a holiday or due to strikes), or if a student was present or absent. This information is typically recorded by the teacher and then stored in the head teachers office after the end of the school year. Across the four schools, in the pre-intervention academic year, there were between 145 and 169 days of instruction. This does not differ greatly from the United States where there is usually 180 days of instruction per year. In these official data, students were marked present 85.8 percent of the time.

Our project also made a series of unannounced visits during the school year to collect attendance data. These visits were randomly assigned between 8:00 am to 3:00 pm and were made two times per month for approximately 10 months. Based on these random attendance checks, girls were recorded present 86 percent of the time. Finally, we use a third source of attendance data: the time diaries recorded by the girls themselves. In these diaries, on average, girls reported going to school 51 percent of the time.[4] It is reasonable that the attendance rates from the time diaries are significantly lower than both the official and unofficial measures of attendance given that these questions were not conditional on the day (girls answered these questions on Saturday) and whether school was closed for a holiday or exam.

It is worth noting that these three measures of attendance differ due to differing reporting mechanisms and reporting times. The comparisons between each attendance measure are presented

[4]School attendance was recorded in two different ways on the time diaries. First, girls recorded their activities each hour of the day, including a category indicating "being in school". The second way attendance was recorded was by explicitly asking if the girl went to school on that day, and if so, at what time did she arrive and what time did she leave. These measures have a correlation coefficient of 0.88. We use a combination of these attendance measures which marks a girl present if the girl answered that she was in school for either of these questions. Results in the paper are robust to using either measure of attendance.

in Appendix A on days that we have multiple observations.[5]

3 Empirical Strategy and Cup Adoption

3.1 Empirical Strategy

A standard analysis for a randomized evaluation involves comparing the difference in mean of an outcome variable between the treatment and control groups. The randomized allocation of the cup allows for non-biased estimates of the difference between treatment and control girls. However, we have two ways to make our estimates more precise with difference-in-difference estimates: first, we use data from before the intervention as a control and second we use data during menstrual days and non-menstrual days.

To be precise, for the analysis, in some cases we have data before and after the intervention; in this case we estimate effects of being allocated a menstrual cup as a difference-in-difference estimate, before and after the intervention between treatment and control girls. We estimate:

$$Y_{it} = \alpha + \delta_1 Treatment \cdot After_{it} + \delta_2 After_{it} + \gamma_i + \epsilon_{it} \quad (1)$$

In this specifications, $Treatment$ is an indicator of being in the treatment group, $After$ is an indicator that the question was asked at the follow-up survey, after the intervention, and $Period$ indicates if the girl had her period on a particular day. We include individual fixed effects and cluster standard errors for each girl. The coefficient of interest is δ_1 which indicates the impact of being allocated to the treatment group.

In other cases, we have daily data available only after the intervention. In that case, we utilize the fact that we know the days that girls are menstruating and estimate the difference-in-difference between the treatment and control girls on days they have, and do not have

[5]Official and unofficial attendance (random checks), matched 87 percent of the time. Given the variation in times students arrive or leave school and that random attendance checks occurred throughout the day, it is not surprising that some observations do not match. Unfortunately, we do not know what time the official attendance was recorded nor what time the girl would have reported arriving or leaving school. Of the five random checks that coincided with the first six days of the month when time diaries were recorded, unofficial attendance and time diaries reported by girls matched 80 percent of the time. In all but one of the cases, the reported arrival time or leaving time was within one to two hours of the unannounced visit. Official attendance and time diary attendance matched 69 percent of the time, with the majority of errors being when a girl recorded being present and the school reported being closed or not having a regular school day.

their periods. More specifically, we estimate the following:

$$Y_{it} = \alpha + \beta_1 Treatment \cdot Period_{it} + \beta_2 Period_{it} + \gamma_i + \epsilon_{it} \quad (2)$$

In the case where we have daily data - specification (2) - we include month, year, and day of week fixed effects.[6]

3.2 Baseline Characteristics by Treatment Status

Estimating the causal impact of being allocated a menstrual cup on schooling relies on the identifying assumption that treatment and control girls are similar, except that the treatment girls were given menstrual cups. The treatment and control group were generally balanced on observable characteristics (Table 2). There was no difference in previous use of menstrual pads, or whether a girl's father had knowledge of when the girl got her period. Treatment girls have similar baseline test scores as control girls and have roughly the same rates of school attendance, although treatment girls attend approximately 1.3 percentage points more than control girls.

Treatment girls were ten percentage points more likely to have started their periods. Given the small sample size, it is not surprising that there are some statistically significant differences between the treatment and the control groups. However, if in the unlikely case that girls who had begun their periods were in someway able to influence the survey team to enroll them into the treatment, this would threaten the validity of the randomization and identification strategy for measuring the causal effect of having menstrual cups. There are several reasons why we believe this should not be a concern. First, the difference between the likelihood of menstruating among the treatment and control girls was only significantly different in one of the schools. The results in this paper are robust to excluding this school. Second, the randomization was a public lottery in front of all of the mothers and girls in which identification numbers were written down immediately. The public nature of the lottery makes it difficult for girls to "game the system" in order to be included in the treatment group. In addition, girls and their mother did not know about the menstrual cup prior to the lottery and thus would not have incentive to try to game the system. Third, only 87 percent of the mothers or guardians were still menstruating and we find no significant difference of the likelihood of menstruating among the treatment women and control women.

Our identification strategy (discussed below) involves comparing treatment and control girls

[6]Results are robust to a similar specification using date rather than day of week fixed effects (Results not shown).

either before and after the intervention, or between days when they had or did not have their period. We include individual fixed effects in each estimate; thus, any remaining individual differences between the treatment and the control group will be differenced out.

3.3 Adoption of the Menstrual Cup

Among girls in the treatment group, adoption of the menstrual cup was relatively high. Figure 2 shows the use of the menstrual cup among the treatment girls in the sample, beginning two months after introduction, January 2007 continuing through January 2008. These usage data were recorded by the nurse on monthly school visits. Usage of the menstrual cup increases dramatically in the first six months, from 10% in January to 60% in June. After this, usage is fairly constant, with little movement from June 2007 to January 2008.

Additional evidence that girls in the treatment group used the menstrual cup come from the baseline and follow-up surveys. Girls were asked "Girls use different methods to soak up the blood during their period. Which methods do you normally use?". If girls reported using any pads, they would be asked how many pads they used during their period. If girls reported using any rags during their period, they were asked how many rags they normally use during their period. Table 3 presents the difference-in-difference estimate of the impact of being allocated a menstrual cup on reported uses of sanitary products. The main effect of being allocated the menstrual cup was a substitution with rags. Treatment girls were 35 percentage points less likely to be using rags after the intervention with no statistically significant reduction in use of pads. It should be noted that overall use of rags is quite high (85 percent) in comparison to the lower use of pads (26 percent). On average, treatment girls report washing washing one less rag per menstrual cycle than the control.

In sum, we see that girls in the treatment group on average adopted the menstrual cups and substituted away from rags. We next turn to estimating the causal effects of being in the treatment group on schooling.

4 Effects of Menstrual Cup Allocation

4.1 Schooling

Table 4 presents the effects of being allocated menstrual cups on daily school attendance as measured by three different sources of attendance data: official, unofficial and time diary data. Each column represents OLS regressions after the intervention that compare girls in the treatment group

and the control group when they have and do not have their period.

Using official school data - where we have daily attendance observations - girls who were not given a menstrual cup are 2.6 percentage points less likely to attend school on days they are menstruating (Table 4, Panel A, Column 1). Time diary data also indicates a negative effect of menstruating on school attendance: the effect is approximately twice that of the official data at 0.054. In addition to school days lost, girls in the control group report being in school approximately 21 minutes less when they have their period (Table 4, Panel A, Column 4). It should be pointed out that the random attendance checks indicate no significant difference between attendance of girls when they have their period and when they do not, although the sample size is relatively small and the confidence interval is wide (Table 4, Panel A, Column 2).

Despite the difference in school attendance between days when girls have their period and days when they do not, we find no significant treatment effects of being allocated the menstrual cup. In our preferred specification, where we have the most attendance observations (Table 4, Panel A, Column 1), the point estimates of the treatment effect on official attendance is close to zero (-0.007; standard error 0.017), and we can reject an effect on attendance over 0.021 percentage points with 95% confidence. The treatment effect on random attendance checks is also close to zero, with a negative point estimate of -0.08 (Column 2). We can reject a treatment effect on the random attendance checks of anything over 0.027 with 95% confidence. The treatment effect using the self-reported diaries is slightly higher, but is still not significantly different than zero (0.024, standard error 0.041). However, the confidence interval is wider and we can only reject an effect over 0.10 with 95% confidence. Similarly, the effect of being allocated a cup on time in school reported by girls in diaries is not statistically different than zero, but the confidence interval of the treatment effect is relatively larger (Column 4).[7]

While girls are more likely to miss school on days of their period, these effects are not as large as policy makers and advocates put forward. Using the point estimates in our specification from official attendance data, girls miss approximately 0.64 days of school per year due to their period (180 days * 4.5 period days * 0.026 days lost during periods * 0.86 non-period attendance

[7]Given that not all girls in the treatment group were actually using the cup each month, the intention to treat estimates may underestimate the effects on girls who were using the cup. However, if those who benefit most from using cup are more likely to adopt (for example, if they work more for pay or if they have more to gain because they have longer or heavier periods), the treatment on the treated estimates are likely be biased upward. We estimate the treatment on the treated effects of menstrual cup use by instrumenting use by being assigned to the treatment group in which case the effects on official and unofficial attendance are -0.042 and -0.095 respectively (standard errors 0.060 and 0.223) and are not statistically significantly different from zero. The program effect on attendance measured by the time diaries is slightly larger, 0.111, with a standard error of 0.127 (Results not shown).

rate /28 period days per month). Even in calculating school days missed from the time diary data only yields 1.3 days of school missed per month.

In terms of the effects of the menstrual cup, our preferred estimate suggests that at most, providing modern sanitary products results in a 0.021 percentage point increase in the likelihood of attendance on school days when girls have their period. This translates to at most, a gain of 0.5 days of school per year (or 0.003 years of school). For an intervention to increase schooling among girls, this is an extremely small effect. In contrast to the effects of providing menstrual cups, other randomized interventions that reduce the cost of schooling, provide incentives to attend, or improve health of students, have found much larger gains to attendance. Deworming children in Kenya resulted in increased attendance of 7 percentage points (Miguel and Kremer 2004) and there were similar increases in attendance among pre-schoolers in India who were randomly given iron supplements and deworming medicine (Bobonis, Miguel and Sharma 2004). A program that gave uniforms to students found an increase in 0.046 years of schooling (Evans and Kremer 2005). Another program that provided uniforms, textbooks and built classrooms found decreases in dropout rates and increases in 15 percent years of schooling (Kremer et al. 2002). Providing direct incentives also result in relatively large attendance gains. Offering merit based scholarships increased school participation among girls in Kenya by 3 percentage points, or approximately 5.4 days of school (Miguel, Kremer and Thornton 2008).

There may be many reasons why girls' school attendance is lower on days that they have their period. We have some qualitative evidence as to these mechanisms. Table 4, Panel B presents girls' answers at the baseline to why they missed school in the previous academic year during their period. There were a variety of answers that mainly related to either physical reasons (cramps or fatigue) or logistical reasons (managing menstrual blood). Many girls, 43.8 percent, listed cramps as the main reason why they did not want to go to school during their period. We also asked girls how they managed to change their cloths during school days and the majority (68 percent) indicate only limited difficulty with dealing with menstrual rags at school. The remaining reported that they go home to change their rags. This might suggest only limited scope for an impact of providing modern menstruation products to girls on their school attendance.

4.2 Grades

Given that we do not observe gains in school attendance on days when there is regular classroom instruction, it is not likely that we will observe substantial direct effects of being allocated a

menstrual cup on gains in school performance. However, there may be indirect effects on school performance if girls who use the menstrual cup are better able to concentrate during school because they do not need to worry about changing their rags or the rags leaking during instruction. We report the effects of being allocated to the treatment group on school performance in Table 5. Girls were asked at the baseline and the follow-up surveys which division in school they were (1 is the top, 2 in the middle, and 3 is the bottom), up to which grade they believed they would study, if they thought they were a good student, and if they thought they would make the top division in the next school year. There is no effect of being allocated the menstrual cup on these answers.

In addition, we have both baseline and post-intervention test scores for each subject exam. On average, 89 percent of the girls took the post-intervention exam. The likelihood of taking the exam was not affected by being in the treatment group (Table 5, Panel B, Column 1). For those who did take the exam, we standardize each exam by the mean and standard deviation of the girls in the control group, for each school and grade (due to the different tests). There is no significant impact of being assigned to the treatment group on normalized test scores.

5 Benefits of Menstrual Cups?

We find no direct benefits of being allocated menstrual cups on school attendance or test scores. Moreover, we can reject program effects larger than a 0.021 percentage point gain, which is equivalent to 0.5 additional days of school. However, the girls appeared to have liked the cup as revealed by high adoption rates. In the follow-up survey 61 percent of the treatment girls reported that they would use the cup in the future and in nurse visits 3 months after the follow-up survey, 61 percent of the treatment girls and 56 percent of the control girls reported using the cup. Our data reveal that rather than changes in schooling behavior, the primary benefits of the menstrual cup were related to increased convenience of menstrual blood management and increased mobility.

Qualitatively, when asked what the good things were about the menstrual cup, treatment girls reported that it was easy to use (31 percent), convenient for walking and cycling (14 percent), that they didn't need to wash rags (19 percent), and that it was convenient to manage menstrual blood (25 percent). Our time diary data filled out by the girls throughout the project help to further quantify the convenience of having a menstrual cup. On days that girls were menstruating, they spent approximately 22 additional minutes doing laundry and were 18 percentage points more likely to do any laundry at all (standard errors 4.0 and 0.03 respectively); this additional time spent was

presumably in order to wash menstrual rags. Being given a menstrual cup significantly reduced the amount of time doing laundry on period days. Girls in the treatment group spent 20 minutes less time on laundry than the control girls on period days and were 18 percentage points less likely to do any laundry at all as compared to control girls on their period days (standard errors 4.6 and 0.04). Thus, menstrual cups entirely reduced additional time for laundry on days girls were menstruating (Results not shown).

We find that girls who were menstruating were three percentage points less likely to be in school on days they were menstruating. There are several mechanisms through which policy makers have postulated that menstruation and lack of sanitary products may be a barrier to girls schooling. Some proposed reasons include cultural taboos preventing girls from attending school (Deutsch 2007), reduced gynecological health due to unsanitary cloths, or lower self-esteem or empowerment that might be related to worries about changing menstrual cloths. While we do not measure the causal effects of these factors on schooling directly, we find no evidence that providing menstrual cups affects daily activities, gynecological health, or self-esteem.

For example, although girls spend approximately 50% less time (10 minutes) doing religious worship and 50% less time cooking (17 minutes) on days when they are menstruating, there was no difference on time allocation towards these activities between the treatment and control girls on period days. Our survey gives insight into why time use on these activities, and others, was not affected by being given a menstrual cup. Girls were asked whether some activities were limited during their period and if so, the reasons why. Religious activities such as doing puja (religious worship) or touching a cow (holy deity) were almost completely eliminated and almost half of the girls completely eliminated household activities related to food and water (cooking rice, eating with family, or fetching water) during a girl's period. When asked why they did an activity less during their period, the overwhelming response for girls on these activities was "it's just our culture". Our questions do not allow us to understand if girls self-impose these cultural restrictions on themselves or if they are due to others in society (such as families members). Our results, however, indicate no effects of modern menstrual products on these type of activities .

Using follow-up survey questions on self-reported symptoms of vaginal discharge, pain urinating, having sores or itching, we see little evidence that the menstrual cups had an effect on gynecological health (either positive or negative). We also find no impact on period-specific symptoms of cramps or PMS (results not shown).

Lastly, we asked a number of questions to elicit self-esteem or empowerment.[8]For each measure, we find no significant program impact. However, there are three important caveats to this analysis. First, our small sample of girls makes it difficult to detect changes with precision. Second, our follow-up survey was conducted only one year after the menstrual cup was allocated and self-esteem or empowerment may take longer to change. Third, it is very difficult to quantify self-esteem and empowerment in the context of a survey instrument and these questions were only asked on the day of the follow-up meetings, rather than when girls were at home on their own.

6 Conclusion

Policy advocates for girls' education have suggested large losses in schooling due to menstruation and the lack of proper sanitary hygiene in developing countries. In this paper we evaluate the effects of being allocated a menstrual cup among adolescent girls in Nepal. In terms of the effects of menstruation on schooling, we find that girls are less likely to be in school on days of their period. However, in contrast to public policy claims that the effects of menstruation on girls' schooling is large, our results indicate that the effects are small. Girls miss on average 1.3 days of school over the course of the year due to their period. Not only are these effects small, but our estimates suggest that at most, providing modern sanitary products results in a 0.021 percentage point increase in the likelihood of attendance on school days when girls have their period. This translates to at most, a gain of 0.5 days of school per year.

We find no evidence that the menstrual cup increased grades, gynecological health, or self esteem. However, there were benefits of the menstrual cup and adoption rates were high. However, the main effects of providing menstrual sanitary products appear to be convenience. Girls who were given the menstrual cup decreased their use of rags and number of rags washed. They also spend 20 minutes less on laundry because they do not have to wash their rags. They report being able to cycle with ease, and "forgetting" they have their period. While increasing schooling for girls' is a priority

[8]Empowerment statements included: It is wrong to use contraceptives or other means to avoid/delay pregnancy; It is alright for a couple to kiss before marriage; if they have decided to marry; A husband should make most decisions in the household; A girl should be married before her first menstruation; Girls and heir families should start looking for a husband after they get their first period; Women should not be touched during their monthly period; the girl can do most things as well as other girls. Individuals were asked if they agreed or disagreed at varying levels and responses were coded from one to five with five indicating more empowerment. Self-esteem statements included: "In the past week, how many times did you: not feel like eating; feel proud of yourself; feel happy; feel ashamed; feel that you were unable to express opinions to others; feel pressure to do something you did not want to do; feel free to say what you wanted to". Responses were coded as "not at all; Rarely (less than once per week); Some of the time (about 1-2 times per week); Occasionally (3-4 times per week); Most of the time (5-7 times per week); or Don't know".

for development agencies, gains for girls overall well-being should not be underestimated and this product may be a cheap and easy way to help ease the burden of puberty for girls in developing countries.

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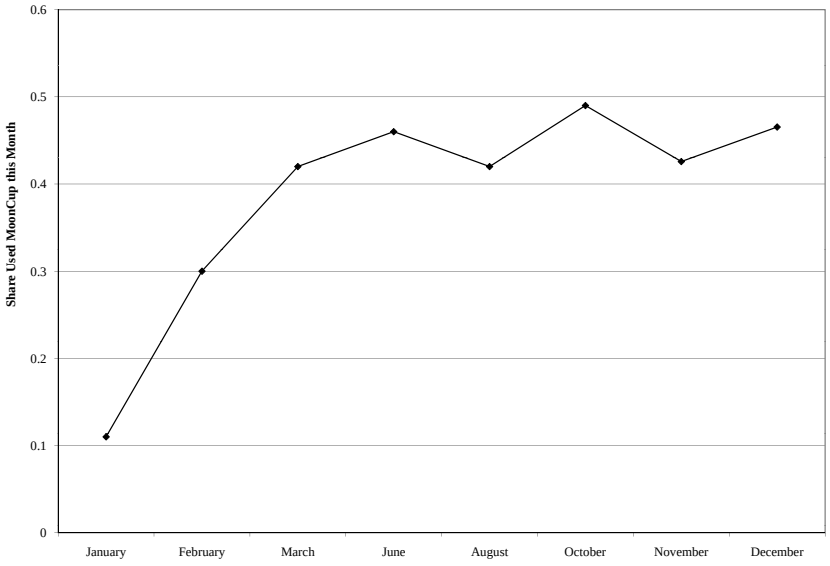
Figure 1: MoonCup Photo

Figure 2:
MoonCup Usage Over Time



Notes: This figure shows MoonCup Trial and usage over time. MoonCups were distributed in November or December, depending on the school.

Table 1: Summary Statistics

Panel A: Sample Size

	Girls	Mothers	Female Guardians
School 1	54	41	13
School 2	48	33	13
School 3	48	42	6
School 4	48	35	8

Panel B: Demographics

	Mean	SD	Observations
Age	14.2	1.23	197
7th Grade (0/1)	0.53	0.5	197
Father Hindu Ethnicity	0.47	0.5	197
Menses at baseline (0/1)	0.87	0.33	197
Age at first menses	12.8	1.01	172
Ever used sanitary pads (0/1)	0.25	0.43	172
Works for money (0/1)	0.22	0.41	197
Normalized Testscores	-0.04	1.01	197
Attendance (Official)	0.86	0.35	37388

Notes: This table shows summary statistics on sample sizes and basic demographics. All girls were in either 7th or 8th grade. One girl (and her mother) assigned to the treatment group did not want to participate in the menstrual cup study and did not take the menstrual cup. Age at menses and use of sanitary pads are reported only for girls who have their menses at baseline. Normalized test scores were based on total score for 2006 test scores and were normalized by the scores of girls in the control group. Attendance is measured from official school data before the intervention.

Table 2: Baseline Characteristics by Treatment and Control

	Treatment (N=98)	Control (N=)	Difference
Age	14.208	14.237	-0.029
7th Grade (0/1)	0.505	0.557	-0.052
Father Hindu Ethnicity	0.465	0.485	-0.019
Menses at baseline (0/1)	0.921	0.825	0.096**
Mother menses at baseline (0/1)	0.898	0.870	0.028
Works for money (0/1)	0.218	0.216	0.001
Ever used sanitary pads (0/1)	0.215	0.300	-0.085
Normalized test scores	-0.072	0.000	-0.072
Attendance (Official)	0.870	0.856	0.013**

Notes: Columns present the average values by treatment and control group among respondents at the baseline. Normalized test scores were based on total 2006 test scores and were normalized by the scores of girls in the control group. Attendance is measured from official school records after the intervention.

Table 3: Impact of Menstrual cup on Sanitary product use and privacy

	Any Rags	Number Rags	Any pads	Number of pads	Any cup
	(1)	(2)	(3)	(4)	(5)
Treatment * After	-0.353***	-1.085**	-0.037	-0.154	0.644***
	[0.091]	[0.420]	[0.099]	[0.694]	[0.068]
After	0.155***	0.505*	0.186**	0.814	
	[0.056]	[0.275]	[0.076]	[0.561]	
Observations	396	395	396	395	396
R-squared	0.61	0.62	0.69	0.7	0.79
Average	0.85	2.6	0.26	1.4	0.16

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Columns present OLS regressions. Regressions in include individual fixed effects as the dependent variable contains pre- and post-intervention observations for each girl. Any rags and any pads represent whether the girl answered to using rags or pads (respectively) normally during her menstrual period. Rags washed indicaes the number of times rags are washed. Each specification clusters standard errors at the individual level.

Table 4: Schooling

Panel A: Effect of Menstrual Cup Allocation

	Present in School			Time in School
	Official	Unofficial	Time Diary	Time Diary
	(1)	(2)	(3)	(4)
Treatment * Period	-0.007	-0.088	0.024	17.222
	[0.017]	[0.055]	[0.041]	[15.656]
Period	-0.026**	0.037	-0.054**	-21.180*
	[0.012]	[0.039]	[0.027]	[11.145]
Observations	31819	2549	8075	8075
R-squared	0.11	0.21	0.25	0.31
Average	0.86	0.86	0.58	175.04

Panel B: Reasons for Missing School because of Period

Cramps	43.82
Cramp and bleeding	7.87
Bleeding	13.48
Clothes (Changing/Washing)	13.48
Don't want to go	8.98
Difficult to walk/sit	5.62
Seeing/touching others	2.24
Have to be outside home	4.49

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Columns in Panel A present OLS estimates predicting daily attendance or time in school (minutes) after the intervention. Controls also include month, year, and individual fixed effects and each specification clusters at the individual level. Attendance is measured from three sources: official school records, random attendance checks, and from self-reported time diaries.

Table 5: Impact of Menstrual Cup distribution on Academic Performance

Panel A: Self-Reported Academic Performance	Division	Thinks will make first division	Thinks is good student	Thinks will study up to this level
	(1)	(2)	(3)	(4)
Treatment * After	0.1	-0.024	-0.003	0.201
	[0.261]	[0.152]	[0.072]	[0.155]
After	-0.063	0.171	0.118**	0.067
	[0.179]	[0.110]	[0.052]	[0.115]
Observations	356	336	370	385
R-squared	0.63	0.69	0.71	0.77
Average	1.47	0.7	0.91	11.4

Panel B: Academic Performance	Took Exam	Total	Nepali	English	Math	Science	Social Studies	Population/ Environment	Health	Civics
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treatment * After	-0.033	-0.17	0.011	-0.197	-0.315	-0.056	-0.042	0.095	-0.403	-0.256
	[0.083]	[0.289]	[0.268]	[0.377]	[0.300]	[0.273]	[0.276]	[0.281]	[0.494]	[0.485]
After	-0.165***	-0.036	-0.044	0.047	-0.027	-0.043	-0.026	-0.103	0.059	-0.077
	[0.058]	[0.184]	[0.168]	[0.208]	[0.188]	[0.201]	[0.200]	[0.188]	[0.307]	[0.326]
Observations	396	352	352	353	352	352	352	352	294	294
R-squared	0.57	0.75	0.78	0.68	0.72	0.74	0.72	0.76	0.7	0.7
Average	0.89	-0.09	-0.005	-0.09	-0.07	-0.07	-0.01	-0.16	0.00	-0.06

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Columns present OLS regressions. Regressions include individual fixed effects as the dependent variable contains pre- and post-intervention observations for each girl. Each specification clusters standard errors at the individual level. Test scores are normalized by the scores of comparison girls for each grade and subject of the exam.

Appendix A: Comparing Measures of Attendance

Official	Unofficial	Obs (1)	Percent (2)
Matched attendance		2186	0.87
Closed	Absent	8	0.00
Closed	Present	128	0.05
Absent	Present	78	0.03
Present	Absent	119	0.05
Time Diary	**Unofficial**	(1)	(2)
Matched attendance		147	0.80
Absent	Present	16	0.09
Present	Absent	20	0.11
Time Diary	**Official**	(1)	(2)
Matched attendance		6,318	0.69
Absent	Present	247	0.03
Present	Closed	2365	0.26
Present	Absent	250	0.03

Notes: Observations are at the respondent-day level. Attendance comes from three main sources: Official school records where teachers recorded whether each student was present or absent or if school was closed. Unofficial attendance checks on randomly assigned days and time from the Menstruation project team. Time diaries which were self-administered on the first 6 days of each month for approximately 10 months which asked 1) if girls had gone to school that day and 2) recorded school attendance based off of recorded daily activities for each hour. There was some discrepancies for the time diary measures, although the two attendance measures have a correlation coefficient of 0.88. Official and unofficial attendance records rates only on days where school was not marked as being closed. Time diaries measures rates of attendance for each day.