

The usage of urinals in Kenyan schools

MATTHEW C. FREEMAN, MARIELLE SNEL, MOHAMED EL-FATIH YOUSIF, SAMUEL GITAHU, FAROOQ KHAN, SAMUEL WACHIRA and INGEBORG KRUKKERT

This study focused on the usage of urinals in Kenyan schools and the potential impact of constructing urinals to improve access to school sanitation facilities. Our objectives were: to assess the latrine use patterns for sanitation infrastructure at Kenyan primary schools and to determine the optimal pupil: latrine ratio where adequate urinals are provided. Calculations were based on observation and pupil report. Boys' urinals are relatively inexpensive to construct and maintain, may be longer lasting, require little in the way of behaviour change, and can accommodate a large number of boys at one time. Construction of boys' urinals in order to provide additional latrines for girls may be the most cost-effective, equitable solution in both the short and long term and may offset the cost of more expensive facilities for girls. Access to urinals will help alleviate congestion at latrines, improve conditions, reduce maintenance costs, and sustain latrines longer.

Keywords: sanitation, urinal facilities, Kenya

Children lose more than 270 million school days as a result of diarrhoea-related diseases

THERE IS CONSIDERABLE EVIDENCE of the impact of improvement of sanitation and hygiene on diarrhoeal disease and worm infection (Esrey et al., 1985, 1991; Fewtrell et al., 2005; Ziegelbauer et al., 2012). Of the 2 billion people infected with soil-transmitted helminths (STH), it is estimated that school-age children exhibit the greatest morbidity (Crompton, 1999; Hotez et al., 2006). STH infection is directly related to faecal exposure, either through ingestion or skin exposure. Chronic intense infection can adversely affect growth and cognitive development in school children (Brooker and Bundy, 2008). Children lose more than 270 million school days as a result of diarrhoea-related diseases (Hutton and Heller, 2004).

Matthew Freeman (mcfreem@emory.edu), PhD MPH, is an Assistant Professor in the Department of Environmental Health, Center for Global Safe Water, Emory University, Atlanta, Georgia, USA. Marielle Snel, PhD, is a programme officer at IRC International Water and Sanitation Centre in The Hague. Mohamed El-Fatih Yousif is a senior WASH professional, who has headed UNICEF WASH programmes in Yemen, Somalia, Eritrea, Pakistan, Nigeria, and Kenya.

Samuel Gitahi is a WASH Specialist at UNICEF Kenya responsible for WASH in Schools, Sanitation and Hygiene promotion, and water quality. Farooq Khan is a WASH sector consultant, based in Islamabad, Pakistan. Freelance consultant Samuel Wachira has a strong research background and has had several assignments in the WATSAN area.

Ingeborg Kruekert is a programme officer and sanitation and hygiene specialist at IRC.

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A number of studies have demonstrated the impact of improved school WASH conditions on absenteeism

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A number of studies in Kenya have demonstrated the impact of improved school WASH conditions on absenteeism. Two evaluations of a water treatment and hygiene intervention found reductions in absenteeism in Kenyan primary schools of up to 35 per cent (O'Reilly et al., 2008; Blanton et al., 2010). A recent study in Western Kenya suggests that a water treatment and hygiene intervention, with or without the addition of sanitation, can reduce absenteeism by over 50 per cent for girls (Freeman et al., 2012).

Currently, more than 60 per cent of all schools in Africa lack sufficient sanitation facilities (UNICEF, 2009, 2010). Even in schools with facilities, unhygienic sanitation hinders the ability of students to concentrate and learn at school (WSCC and WHO, 2005). In Africa, the lack of basic sanitation facilities further decreases the enrolment of girls in primary schools. Girls spend more time in schools when the number of sanitation facilities is adequate (UNICEF, 2006). In addition, the need for improved access to sanitation goes beyond improved health and addresses issues of children's rights and gender equity (Pearson and McPhedran, 2008).

Since the introduction of Kenyan free primary education in 2003, the enrolment rate of students has tripled (CSAE, 2008). This increase in the number of pupils has not been matched by a proportional increase in the number of sanitation facilities. According to the Kenyan Ministry of Public Health and Sanitation, schools should adhere to a standard ratio of 1 toilet for 25 girls and 1 toilet for 30 boys (Government of Kenya, 2008). These ratios however remain unattained (Emory University, 2006). Even in cases where the number of sanitation facilities is adequate, they are often in poor condition, discouraging their use among children (Njuguna et al., 2009).

Long lines and poor conditions are often cited as reasons for increasing the number of latrines at school. However, increasing the number of urinals in schools could alleviate congestion at latrines, reduce maintenance costs for latrines, sustain the latrines longer, and encourage more students to use school facilities. Urinals are cheaper, can be used by more students during breaks, and may be more durable. Here we conducted a study of latrine and urinal use in Kenyan primary schools to determine the potential effect of promotion of urinals as part of the government standard latrine approach. Factors considered included use patterns, cost, and sustainability.

We evaluated the sanitation conditions and use in 45 Kenyan schools

Methodology

We conducted an exploratory evaluation of the sanitation conditions and use in 45 Kenyan schools in four of the eight administrative provinces between September and October 2010. We relied on UNICEF to identify and purposively sample schools; schools with urinal

Long lines and poor conditions are reasons for increasing the number of latrines at school

access were over-sampled. The provinces and districts were identified for logistical purposes and to include urinal facilities supported by UNICEF, the Government of Kenya, or non-governmental organizations.

This study employed a mixed methods approach – utilizing both quantitative and qualitative techniques – in order to comprehensively assess the role of urinals in the context of schools in Kenya. Head teachers from each school were asked open-ended questions about cost and maintenance of sanitation facilities. Latrine and urinal costs were derived from conversations with masons throughout the study area. Researchers conducted observations at the school to determine the presence of urinals and latrines, the capacity of the sanitation facilities and condition of the structures. The usage of urinals and latrines were observed by two enumerators throughout a single school day. Enumerators were positioned in unobtrusive locations in order to maximally observe facility use without altering pupil behaviour. In order to quantify the time taken either for urination or defecation by pupils, enumerators observed and noted the time taken by at least 10 students in either the urinal or latrine. Facility usage was observed during and in-between break time to determine the patterns of usage. Within each school, we randomly selected 10 per cent of pupils to be interviewed about their use of the school's sanitation facilities and attitudes about the urinals. Random selection was done through the use of class registries. A total of 4,433 pupils were selected, 2,026 (45.7 per cent) of whom were female. Pupils were asked about their use of urinals and latrines at the school that school day. The semi-structured questionnaire included both open and closed response questions.

We determined the optimal capacity of the urinals based on observation of the number of pupils who used the facility at one time during the 15 minute morning break. For estimation purposes, we assumed that sufficient behaviour change approaches will be applied where all or nearly all students that urinate will use urinals. The limitations of this approach are that: 1) students who want to urinate may continue to use the latrine; and 2) by improving access at the school we may increase the demand. As such, these numbers are used for informational and policy purposes. Quantitative data were entered, cleaned, and analysed using SPSS v.12 and STATA version 10.

Since no studies of this kind have been previously conducted, data collected in the study were exploratory in order to capture the breath of conditions within the Kenyan context. As such, data derived from this study should be used to guide future studies and policy development. However, as with *all* research studies, caution should be exercised when attempting to apply the findings globally.

Results

School sanitation facilities

The median number of pupils at the 45 sampled schools was 782 (range 162–2,228). Three schools were all-girls schools. The median percentage of girls to boys at the 39 mixed gender schools was 48 per cent (range 29–54 per cent). All single gender schools were located in Mombasa District in Coast Province: three schools were all girls, while three were boys only.

Over two-thirds (67 per cent) of the schools surveyed had at least one urinal for boys, while only 19 per cent of schools had one urinal for girls (Table 1). Overall, one in every three schools did not have a urinal for boys, girls, or both. All three boys-only schools had urinals, while none of the three girls-only schools had urinals.

Of the 45 schools in the study that had urinals, 8 (17 per cent) had both boys' and girls' urinals, while 20 (44 per cent) had boys' urinals only. No schools had only girls' urinals. The mean number of urinal blocks for boys was two (range 1–7), while all eight schools with girls' urinals had only one block. Only 17 (61 per cent) of the schools with boys' urinals had at least one block that was in working condition. None of the urinal blocks in Mombasa District was found to be in working condition.

The Government of Kenya policy is that all schools have a sanitation facility. All schools in this study did have some form of latrine, yet the condition and access to these facilities varied widely. Among schools with boys (n=43), two (5 per cent) did not have any latrines in working condition. Within the remaining schools, there were a median of 6.5 working latrine doors (range of number of doors in good working condition: 1–29) with a median pupil:latrine ratio of 55:1 (not including urinals). Three (7 per cent) schools with girls did not have working latrines for girls. The median number of working latrines was higher (8, range 2–21) and the pupil latrine ratio was 52.7

Overall, one in every three schools did not have a urinal for boys, girls, or both

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Table 1. Distribution of urinals by location

<i>Province</i>	<i>Urinals for boys n=42</i>	<i>Urinals for girls n=42</i>
Nyanza (n=10)	8 (80%)	4 (40%)
North eastern (n=10)	1 (10%)	0 (0%)
Coast (n=13)*	8 (80%)	1 (10%)
Rift valley (n=10)	9 (90%)	1 (10%)
Nairobi (n=2)	2 (100%)	2 (100%)
Total (n=45)	28 (67%)	8 (19%)

* Coast Province: 7 co-ed schools, 3 all-girl schools, and 3 all-boy schools

(18–263). Fourteen (33 per cent) schools exceeded the Government of Kenya latrine ratios for boys by three times (90:1) and 14 (33 per cent) schools exceeded the ratio for girls by three times (75:1). Eleven (24 per cent) exceeded the ratio by three times for both boys and girls. These schools were primarily found in Nyanza (3) and North Eastern (4) Provinces.

Utilization of sanitation facilities

Based on data collected from pupil self-report, the majority of pupils use the school’s sanitation facility (urinals or latrines) for urination during the school day. We found that 2,287 (95 per cent) boys and 1,803 (89 per cent) girls used the school sanitation facilities during at least one of the break times. A majority of boys (57 per cent) only used the facility for urination, while 38 per cent of boys defecated at least once during the day (that includes defecation during one break and urinating during the other). The results for girls were similar: 57 per cent only urinated, while 32 per cent defecated at least once, though a greater proportion (11 per cent) did not use the facility at all (Figure 1).

We were interested in monitoring the use of sanitation facilities at different times of day to assess the most congested times and difference in latrine and urinal use. Through self-report of latrine and urinal use during the morning break, we determined 72 per cent of boys urinated, while 11 per cent at least defecated. Among schools with urinals, 84 per cent of boys used facilities during break, and the use was evenly split between urinals and latrines (Figure 2). Facility use was considerably lower among boys in schools without urinals (63 per cent), and a slightly higher percentage of boys went to the bush. Overall, boys in schools without urinals were three times

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We assessed the most congested times and difference in latrine and urinal use

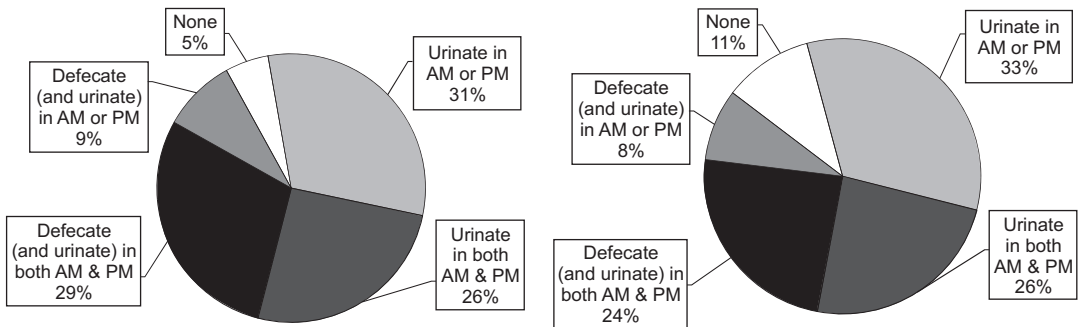


Figure 1. Use of sanitation facilities during break times for girls (left, n=2,026) and boys (right, n=2,407). Those that ‘defecated in both AM and PM’ used the facilities in both breaks. They defecated in at least one of those breaks, and either defecated or urinated in the other.

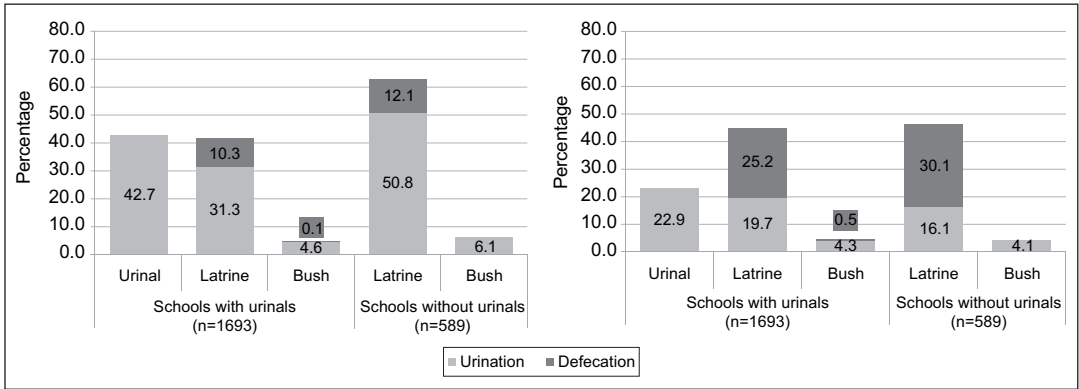


Figure 2. Boys' latrine and urinal use during morning (left) and afternoon (right) breaks

(10.2 per cent vs. 3.2 per cent) more likely to report not using the school sanitation facilities during break times.

During the lunch break, fewer boys used the facilities (67 per cent), though nearly 30 per cent used latrines for defecation. Similar to the morning, a similar proportion of boys used the latrines for defecation (25 per cent in schools with urinals, 30 per cent in schools without urinals) (Figure 2). A similar proportion used the bush; however, overall use of facilities was considerably higher in schools with urinals (69 per cent), compared with schools without urinals (46 per cent).

The patterns of latrine use for girls during the morning and lunch breaks were similar to those of boys. During the morning break, 1,249 (62 per cent) urinated, while 269 (13 per cent) defecated. A higher proportion of girls in schools with urinals used facilities during the morning break (84 per cent) than in schools without urinals (63 per cent) (Figure 3). There was a similar pattern for girls after the lunch

The patterns of latrine use for girls during the morning and lunch breaks were similar to those of boys

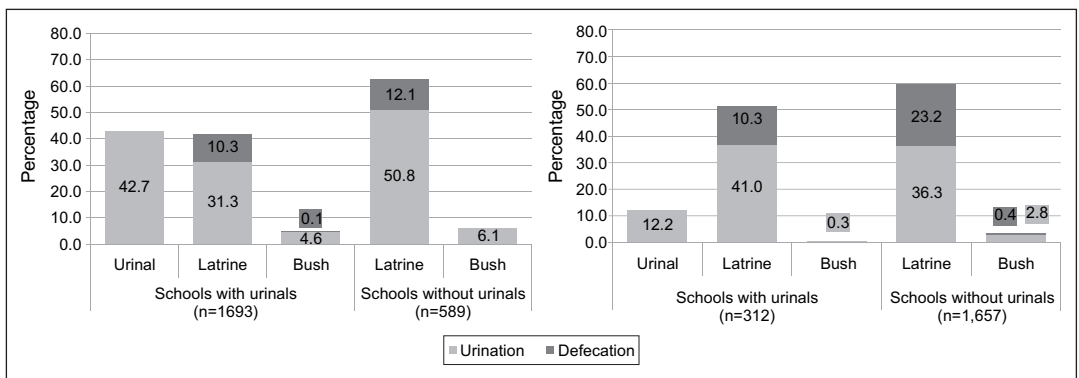


Figure 3. Girls' urinal and latrine use during morning (left) and afternoon (right) break

break: 64 per cent used the facilities in schools with urinals as opposed to 59 per cent in schools without.

A higher proportion of girls defecated after lunch in schools without urinals (23 per cent) compared with those with urinals (10 per cent). Overall, girls in schools without urinals were nearly twice (11.2 per cent vs. 6.4 per cent) as likely to *not* use the school sanitation facilities compared with those with urinals (data not shown).

Many of the girls noted that they were not comfortable using the urinals for a variety of reasons

Based on responses to open-ended questions, many of the girls noted that they were not comfortable using the urinals for a variety of reasons, such as lack of privacy, queuing, and uncleanliness of the urinals. Of the 234 girls at schools with urinals who reported urinating during the morning break time, 191 (82 per cent) chose not to use the urinal and opted instead for the latrine or the bush. Of all respondent girls who reported urinating during the morning break from schools with urinals, those that did not use a urinal gave the following reasons: 73 (31 per cent) were not comfortable, 48 (21 per cent) said the urinals were not clean, and 32 (14 per cent) said there was congestion.

Pupil to latrine/urinal ratios

Based on observation, we determined that boys urinated for an average of 1.5 minutes and defecated for 2.5 minutes. For girls, those numbers were 2 minutes and 3.5 minutes, respectively. Data from the 15 minute morning break was used to quantify a revised pupil:latrine and pupil:urinal ratio for boys and girls. Based on the proportion of pupils that urinated and defecated and the duration of each use, the following acceptable ratios were calculated for the number of latrines and urinals needed in a school:

Boys: 98 boys per urinal + 55 boys per latrine

Girls: 12 girls per urinal + 33 girls per latrine

Using that same equation, if the school only had latrines, we calculate the need for 9 girls per door and 12 boys per door.

Latrine costing

Cost is one of the main considerations for developing an ideal urinal to latrine ratio at a school

Cost is one of the main considerations for developing an ideal urinal to latrine ratio at a school. We found that a six-door latrines facility (US\$2,809) is more expensive than either a block of girls' urinals (\$2,459) or boys' urinals (\$1,744). The addition of tiles for the floor in the urinals raises the cost by approximately \$2,000, though it creates an added benefit of improving maintenance and sustainability of the facility. The construction of urinals may translate into an added expense during construction, but these costs will be offset

by improved maintenance of the latrine, reduced pit filling, and the additional health benefits of easy to clean sanitary facilities. The cost of construction of single latrine 'door' is nearly three times the cost of construction of a urinal 'door'. Construction of urinals is also economical in terms of space and time savings for students.

Discussion

Our findings suggest that the predominant use of sanitation facilities at school are for urination

More pupils in schools with urinals used the sanitation facilities, indicating facilities may be better maintained and less congested

Our findings suggest that the predominant use of sanitation facilities at school are for urination. We expect that construction of urinals will minimize the demand for and alleviate the strain on latrines, and thus serve three key purposes: 1) reduce the need for construction of new latrine facilities; 2) improve latrine conditions, thus increasing use and access; and 3) reduce maintenance costs and increase longevity of more costly latrines. One of the most interesting findings from this study was that more pupils in schools with urinals used the sanitation facilities, indicating that these facilities may be better maintained and less congested than those in schools without urinals.

We found that including urinal provision in schools will dramatically alleviate congestion at sanitation facilities. Urinals were found to be a relatively cheap way to mitigate the high cost of constructing new latrines. Boys' urinals are relatively inexpensive to construct and maintain, may be longer lasting since they don't require a dug pit, require little in the way of behaviour change, and can accommodate a large number of boys at one time. With a fixed amount of money, construction of boys' urinals can help offset the costs of constructing more latrines and urinals for girls. Construction of boys' urinals in order to provide additional latrines for girls may be the most cost-effective, equitable solution in both the short and long term. Access to urinals will help alleviate congestion at latrines, improve conditions, reduce maintenance costs, and sustain latrines longer.

The considerable difference in the required ratios between boys and girls highlights the need to consider the equity aspect of construction of sanitation facilities for girls, especially in the light of recent work showing that WASH in schools approaches can dramatically reduce absenteeism for girls. The findings here underscore the need to pay special attention not to *equivalent* allocation, where boys and girls have the same access, but *equitable* allocation of resources, where girls have more facilities to accommodate their needs.

The ratios of pupils to urinal and latrine were calculated using the facility use patterns observed at the study schools. Given that many schools did not meet the Government of Kenya recommended pupil: latrine ratio and that maintenance was probably sub-optimal, it is likely that children are avoiding the use of latrines. Thus, it is likely

With a greater number of well-designed facilities, we expect more children will use the facilities

that demand for sanitation facilities is *even higher* than that observed in this study, underscoring the need for additional sanitation facilities. This conclusion is enhanced by data that reveal that a substantial proportion of pupils preferred to use the bush rather than the latrines or urinals. With a greater number of well-designed facilities, we expect more children will feel comfortable using the facilities. As such, the calculations of pupil to urinal ratios are intended as a guide to emphasize the need for more urinals.

Based on existing technologies in Kenya, boys' urinals that can accommodate seven boys at one time are the most cost-effective approach to reducing congestion. Girls potentially do like urinals because they smell less, but only if they provide privacy and space for personal hygiene (walls, doors with locks, water/soap). Urinals construction should therefore be paired with behaviour change education. Based on formative research, girls' urinals are cheaper to construct and maintain, do not require a pit, and are highly acceptable. However, they will not reduce the overall number of doors needed, since the current technologies require private stalls, similar to private latrine doors. It should be stated that the girls' urinal is a relatively new development in Kenya although they are easy to use and provide enough privacy for the girl students.

There are additional factors that need to be considered when assessing the full and long-term cost of the sanitation facilities that were beyond the scope of this study, namely:

- number of existing facilities available in the school and type;
- working condition of the existing latrines (and ability to rehabilitate);
- potential for and availability of pit emptying services;
- frequency of urinations in relation to defecation within school environment (and presence of school feeding programmes);
- cultural attitudes to usage and design (special significance for girls' urinals and facilities for disabled children);
- total population of a school (and age distribution);
- availability of materials; and
- climate, subsurface geology, and groundwater potential.

Urinals in schools have an important role in the WASH in Schools sector

Urinals in schools have an important role in the overall WASH in Schools sector. Although this exploratory study has shown that students are more likely to urinate than defecate in school, most schools continue to principally construct latrines. Latrine rehabilitation and construction or rehabilitation of urinals could alleviate the stress on existing conditions and lessen the need to construct new latrine facilities. The subsequent discussion includes suggested recommendations, divided into the following categories: health,

education and behaviour change, technical feasibility, financial costs, and community support and student engagement.

Limitations

There are a number of key limitations to this study. First, observations and calculations for urination and defecation may be subject to reporting bias. There are a number of reasons that children may not honestly report their sanitation practices to a school observer. Children may be ashamed to report that they used the bush, thus latrine use may be overstated. Second, observations on sanitation practices were conducted at schools with sub-optimal facilities. Thus, these calculations may understate the true demand for sanitation facilities at school if those facilities were clean, private, and well-maintained. We would expect that addition of urinals would lead to more pupils using the facilities at school. Additionally, it should be considered that even though children are urinating, it will require behaviour change education and a change in culture for a substantial proportion of children to utilize these facilities.

Recommendations

- Construction of sanitation facilities – even urinals – needs to be accompanied by proper handwashing facilities to prevent disease transmission. Handwashing facilities require water and soap to be positioned ideally within 10 metres of every latrine/urinal block. The use of powdered soap mixed with water has been shown to be an acceptable and cost-effective solution for providing soap throughout the school year (Saboori et al., 2010).
- Construction of urinals or latrines needs to be accompanied by a comprehensive behaviour-change programme to educate pupils on the need for proper hygiene and sanitation. Education on the proper use of sanitation facilities will improve use among children who are unaccustomed to using sanitation facilities and will improve maintenance.
- An emphasis on girls' latrines in relation to urinals needs to take into consideration that girls who are menstruating will require more privacy than would be provided in a urinal and therefore will require more facilities than boys. Since boys' latrines are relatively inexpensive and require little in the way of behaviour change, construction of boys' latrines in order to provide additional latrines for girls may be the most cost-effective, equitable solution. In order to accommodate menstruating girls,

Construction of urinals or latrines needs to be accompanied by a comprehensive behaviour-change programme

Girls who are menstruating will require more privacy than would be provided in a urinal

It is important to reflect on the technical designs to accommodate disabled students

- these latrines need to be private, clean, especially large to allow girls to change pads and wash, and have a nearby source of water.
- Waterless urinals can and should be designed to collect urine through drainage pipes and tanks. This option removes the need to dig a pit or construct a soak pit, and the use of urine for agriculture can be ecologically beneficial and economical. Of course, behaviour change education in the design of use of urine in agriculture is critical and the design of these urinals should be considered carefully so that the urine is collected and used safely.
 - Urinals in schools can have a niche in, for example, difficult geographical circumstances (e.g. hard rock ground). These niche markets could be further developed and can provide the key to making urinal usage more successful in efforts towards potentially scaling up.
 - Although within the context of this study the issue of urinals and latrines for disabled students has not been observed, this does not underestimate the importance of reflecting on the technical designs to accommodate these students. In terms of urinal usage this may entail adapted designs for one of the urinals/latrines.

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Appendix

Table A1 is a summary table of latrine and urinal use observational patterns. Our calculations were based on the assumption that under ideal conditions latrines would be used for defecation only, which would only be feasible with considerable behaviour change education, but would be approached with improvements in latrine conditions.

The optimal ratios for latrines were calculated as shown in Boxes A1 and A2 based on the available data. The calculations were done using data from the 15-minute morning break, since it is a more congested time for use of the sanitation facilities for both urination and defecation (although more students defecate in the afternoon break, since it is longer, the strain on facilities is not as severe). The calculations are presented here using a hypothetical school of 1,000 boys and 1,000 girls.

Table A1. Amount of time to use the sanitation facilities for urination and defecation (based on averages during peak breaks in a day)

<i>Activity</i>	<i>Boys</i>		<i>Girls</i>	
	<i>Urination</i>	<i>Defecation</i>	<i>Urination</i>	<i>Defecation</i>
Time spent urinating/defecating (min)	1.5	2.5	2	3.5
a.m. break urination/defecation (%)	78	10	62	13
p.m. break urination/defecation (%)	38	28	42	21
Percentage of students using latrine for urination/defecation (not including bush)	43	100	81	100

Box A1. Boys to urinal/latrine ratio

1,000 boys (morning break) 72% urinate, 11% defecate
 1.5 min to urinate, 2.5 min to defecate
 Median urinal capacity is 7 students

Urinals

Time for use of urinal during break time slots / Mean duration of urination = 15 min / 1.5 min = 10 available time slots in a break per urinal 'slot'

The average boys' urinal has 7 'slots'. Therefore, within a 15 min break time 70 boys can use one urinal (10 time slots x 7 slots). With 1,000 boys and 72% of students urinating, we need to accommodate 720 pupils in 15 minutes

Urinals needed = 720 boys / 70 slots per 15 min break = 10.2 urinals for 1,000 boys = **98 boys per urinal**

Latrines

Time for use of urinal during break time slots / Mean duration of defecation = 15 min / 2.5 min = 6 available time slots in a break per latrine door

With 1,000 boys and 11% defecating, we need to accommodate 110 boys in 15 minutes

Latrine doors needed = 110 boys / 6 slots per 15 min break = 18.3 doors for 1,000 boys = **55 boys per latrine**

Ratios based on field data: **98 boys per urinal + 55 boys per latrine**

Scenario with latrines only

With 6 available slots for defecation and 10 available slots for urination per 15 minute break, and the need to accommodate 720 urinations and 110 defecations:

72 doors for urination and 18.3 doors for defecation for 1,000 boys. Therefore, these data suggest a pupil to latrine ratio of **11 boys per door**

Box A2. Girls to urinal/latrine ratios

1,000 girls (morning break) 62% urinate, 13% defecate
 2 min to urinate, 3.5 min to defecate
 Urinal capacity average 7 students

Urinals

Time for use of urinal during break time slots / Mean duration of urination = 15 min / 2 min = 7.5 available time slots in a break per urinal 'slot'

Girls urinals do not have slots similar to boys, so here the calculation is for 'slots'

With 1,000 girls and 62% urinating, we need to accommodate 620 pupils in 15 minutes

Urinals needed = 620 girls / 7.5 slots per 15 min break = 82.6 urinals for 1,000 girls = **12 girls per urinal slot**

Latrines

Time for use of urinal during break time slots / Mean duration of defecation = 15 min / 3.5 min = 4.3 available time slots in a break per latrine door

With 1,000 girls and 13% defecating, we need to accommodate 130 girls in 15 minutes

Latrine doors needed = 130 girls / 4.3 girls per 15 min break = 30.2 doors for 1,000 girls = **33 girls per latrine**

Scenario with latrines only

With 7.5 available slots for defecation and 4.3 available slots for urination per 15 minute break, and the need to accommodate 620 urinations and 130 defecations:

82.6 doors for urination and 30.2 doors for defecation for 1,000 girls

Therefore, these data suggest a pupil to latrine ratio of **9 girls per door**, the same overall number calculated if urinals are also used