

Background

- Fecal contamination of water and food causes diarrhea, currently responsible for the deaths of 760,000 children under the age of five annually, and also a leading cause of child malnutrition worldwide.¹
- Child malnutrition can also be caused by environmental enteropathy, which inhibits children's absorption of nutrients as they grow. This condition is also associated with exposure to unsanitary environments and has been hypothesized to be linked to fecal contamination in the home environment.²
- Lack of adequate sanitation has been linked to child stunting both in Cambodia and elsewhere, with findings indicating that open defecation can inhibit children's growth.³
- Sanitation coverage in rural Cambodia is currently on the rise from 25% in 2012.⁴
- Even when a house has a toilet, children under 5 are often unable to use it for fear of their falling in, injuring themselves, or dirtying the latrine⁵, meaning they continue to practice open defecation around the home, exposing family members to pathogens transmitted through feces.
- Children's feces pose a greater risk than those of adults:
 - They are more infective than adults' feces and less likely to be disposed of safely.⁶
 - They are the "...most important contaminant in the household environment with the highest risk of exposure to young infants."⁶
 - Some have hypothesized that when sanitation is improved, the largest health benefit of all is attributed to the safe disposal of children's stools.⁵
- Very little research has been done on children's sanitation worldwide, and virtually none in Cambodia other than a few questions on the Cambodia Demographic and Health Survey (DHS).
- We set out to understand how Cambodians in rural and peri-urban settings manage their small children's defecation with the ultimate goal of designing an intervention or product to help with hygienic management of children's feces.



Inside of typical Cambodian pour-flush latrine



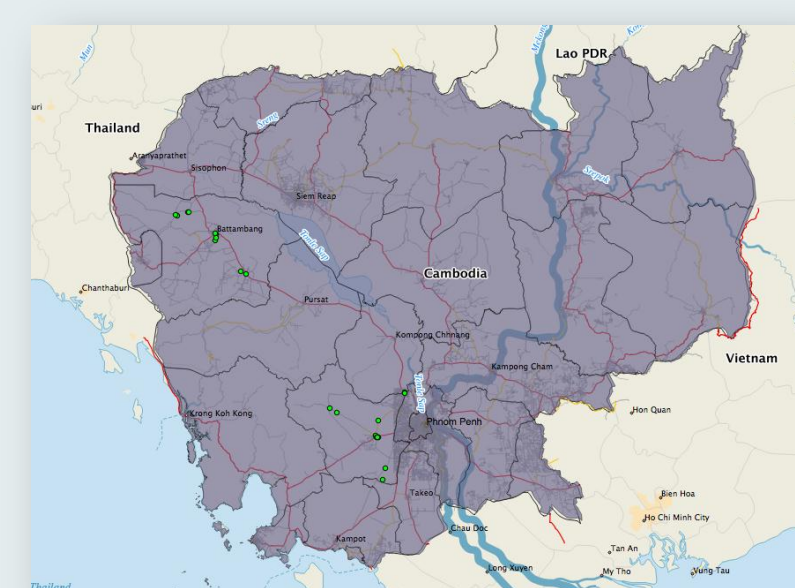
External shelter of typical Cambodian latrine



Research Methods

Household Survey

- Survey households had to have a working latrine that the family used: we wanted to focus on households that already had a hygienic location for feces disposal to try to understand best practices
- Survey households had to have at least one child who had not reached his or her 5th birthday
- Surveyed ~130 primary caregivers of children <5 years of age
- Conducted in 21 villages across 2 provinces varying by geographic and socioeconomic position; survey villages were purposively selected to represent a mix of urban and rural settings with varying proximity and access to national roads and permanent markets
- In each province, villages with >80% sanitation coverage were eligible to be included in the survey
- In each village, 5-8 households were surveyed
- Survey sample included ~150 children between the ages of less than 1 month to just under 5 years old
- The survey questions focused on practices regarding location of child defecation, transport of children's feces, and final disposal location and methods
- Additionally, the survey asked questions geared at understanding perceptions of dirtiness, factors driving behavior around managing children's feces, and barriers to safe practice with children's feces



Focus Group Discussions

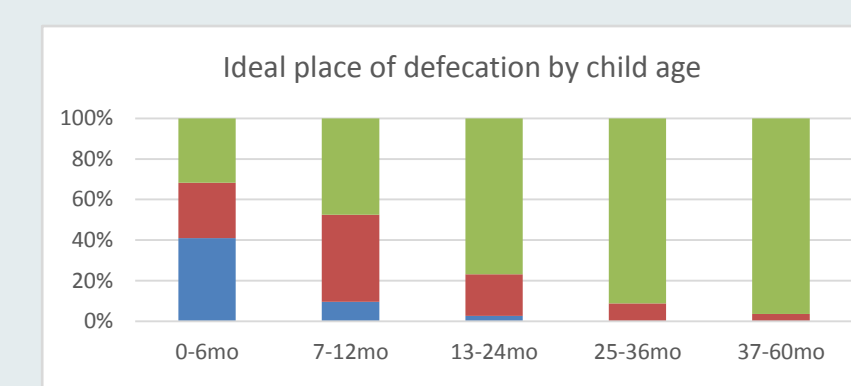
- After the conclusion of survey data collection, 4 focus group discussions were held, 2 in each province
- Discussion was used to gauge consumer reactions to various products for managing children's sanitation, both new and familiar, including several styles of potties, reusable diapers, and a "Safe Squat" style latrine training mat



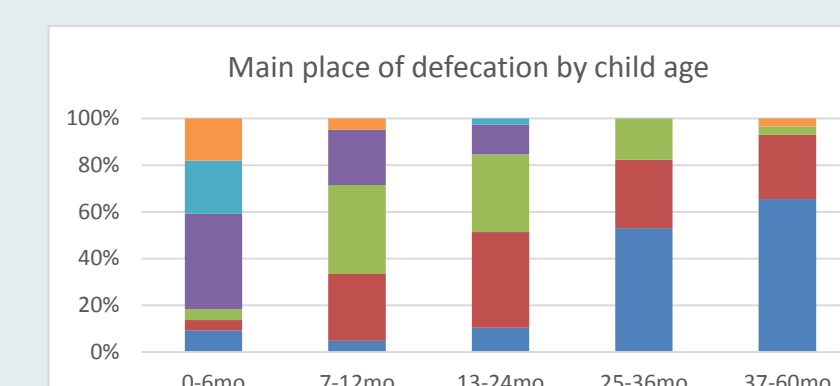
Results

Household Survey

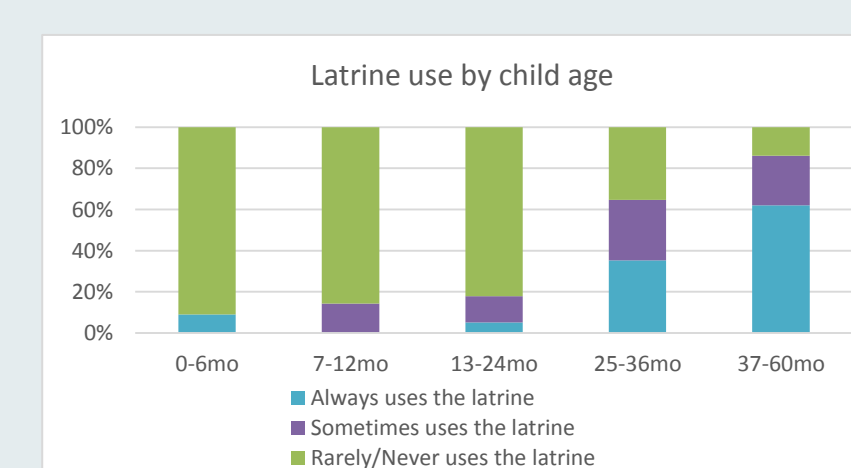
- Site of Defecation:** The most common defecation site was the **latrine** (31%), followed by **potty** (29%), then **open defecation** in the yard (20%). Other sites included **disposable diapers**, **cloth diapers**, **paper towels** and **clothing**.
- Transportation of Feces:** When children defecated somewhere other than the latrine, feces were commonly moved in a **potty** (38%), with a **shovel** (24%), **scoop** (11%) or other tool (27%) such as a **disposable diaper**, **plastic bag**, or **scrap of trash**.
- Disposal of Feces:** 63% of the time, child feces were ultimately put in the latrine (children defecated directly there (26%) or feces were placed there after defecation elsewhere (for example, in a potty) (37%)). Other disposal sites were **burial** (20%), in the **garbage**, **burning**, and throwing into **woods**.



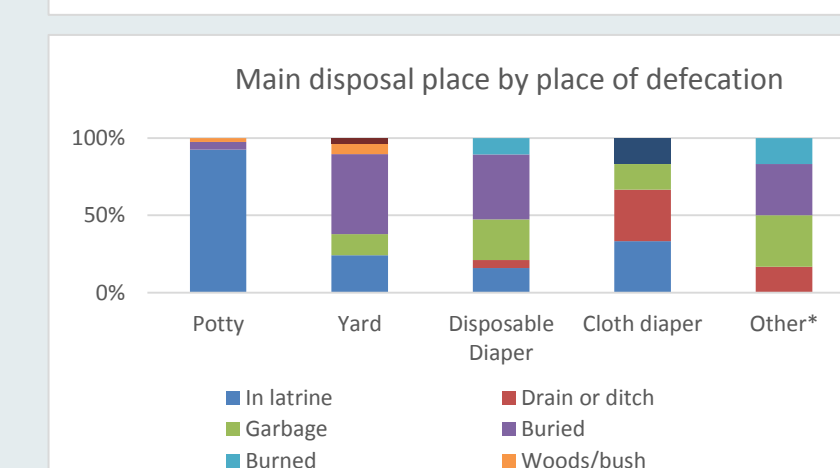
Even when children are very small, many caregivers' ideal place of defecation is the latrine, with this portion rising as children grow.



From 2 years up, more than 80% of children are defecating in a potty or the latrine, with children 7-24 months being most likely to defecate in the open around the home.



From age 3 up, more than 50% of children are sometimes or always using the latrine, suggesting that children under three pose the biggest challenge in terms of hygienic place of defecation.



The likelihood of child feces ending up in the latrine is 92% when children use a potty. When children defecate in locations other than a latrine or potty, feces are likely disposed of in the garbage or buried.



Potties

- Most likely to lead to disposal in latrine (93% of the time)
- Cheap (<\$1)
- Easy to clean
- Widely available
- Can start training to use at just a few mo.
- Used for both children and adults
- Require adult assistance due to instability



Shovels & Scoops

- Used for feces removal and burial after open defecation but do not lead to disposal of feces in latrine
- Durable, multipurpose
- Keep feces far from caregiver when handling
- Generally satisfactory, easy to use



Disposable Diapers

- Burned, buried, or disposed in garbage
- Widely available, though expensive and sometimes used sparingly (eg. at night)
- Valued for ease and convenience
- Perceived as being for "rich" families



Cloth Diapers

- Lead to disposal of feces in latrine ~30% of the time
- Used for infants only
- Valued for their low cost but much more labor-intensive
- Wastewater from washing rarely disposed of in latrine
- Satisfactory except when homemade



Other Tools

- Include dustpans, ash, paper towels, plastic bags, wet wipes, bits of trash, and brooms
- Can be homemade
- These tools seldom lead to disposal of feces in the latrine
- Levels of satisfaction are generally high, with the exception of all homemade tools

Barriers to latrine use

- When asked why children do not always use the latrine, respondents stated their child was **too small** (81.5%), child **couldn't squat** (12%), and child could **fall** (12%). Other responses included that the child was **afraid**, that the caregiver was **busy**, that it was **too hard** to teach the child to use it, that **no one else** could help if the caregiver was absent.
- When asked the biggest challenges in teaching children to use the latrine, caregivers cited the child being **too small** (24%), the latrine pan being **slippery** (20%), difficulty of **cleaning the child** and **flushing** the latrine (20%), the child being **afraid** (17%), having to **wait** with the child (16%), that it is hard to teach the child to **squat** (20%), and that it is hard to **hold** the child (6%).
- When asked what help children need when using the latrine, caregivers named **cleaning the child** (73%), **flushing the latrine** (53%), **holding** the child (25%), **waiting** with the child (18%).

Attitudes and Perceptions Regarding Children's Feces

- When asked to rank the dirtiness of adult feces, children's feces, animal feces, and dirt, 45% of respondents ranked children's feces **second dirtiest**, 30% ranked them **third dirtiest**, and 23% ranked them **least dirty**.
- When asked how they would feel if a neighbor left his/her child's feces in the open, 67% stated this would be **unhygienic** or **smelly**, 55% stated they would be **disgusted**, 43% said they'd be **angry**, 22% said they would worry about **flies** and **other vectors**, and 12% stated they would **confront their neighbor** about it.
- 98% of respondents said that managing children's feces was **as important** or **more important** than other household tasks

Other Findings of Interest

- Most caregivers said children could **independently** use the latrine at age 5 and could use it **consistently** (every time) at 7.
- When children defecate on the ground, feces are rarely disposed of in the latrine because caregivers fear dirt and pebbles can **clog** or **damage** latrine pipes.
- After defecation, many caregivers wash children's bottoms with their **feet**, not their hands. Many said this was a practice they learned from older generations; its merit as a hygienic practice merits further research.
- Factors most likely to be associated with hygienic disposal of children's feces were the **age of the caregiver** (with those between 28 and 37 most likely to dispose of feces hygienically), **years of latrine ownership** (6-10 years most likely to dispose hygienically), and **child age** (children 37-60 mo. most likely to have feces disposed of hygienically).

Focus Groups

- Overall, participants valued durability, versatility (products that can be used by more than one age group), ease of cleaning



Plastic potties were very appealing to participants, particularly the stability of their base, which frees caregivers to do other things while children defecate. They are easy to wash, lightweight, and convenient for disposal into latrine.



The potential cost savings of **reusable diapers** was interesting to participants, but they impose a high burden in terms of time and labor. Would need to be quick-dry, easy to wash, adjustable, and waterproof.



Safe Squat was not popular with participants because it was seen as cumbersome or, in some cases, redundant as children who could use it could almost squat on a latrine pan. Wood was not the ideal material, and the Safe Squat could not be used for other age groups.

Discussion

- The Cambodia 2010 DHS found that 20% of feces of children under 3 were disposed of hygienically.⁷ These study findings indicate that where there is a functioning improved latrine, 62.8% of the feces of children under 5 are disposed of hygienically.
 - This likely reflects the fact that our sample included children between 3-5, whose feces are more likely to be disposed of hygienically.
 - Though there are high rates of latrine use among children over 2, and though the latrine is almost universally selected as the ideal defecation place for children of this age group, participants still reported high levels of satisfaction with defecation sites other than the latrine, indicating there may be challenges inherent in motivating families to get small children to use the latrine more consistently.
- For our household sample, access to water was not an issue, and some studies have found that access to water can be a determinant of safe practice with children's feces management.⁸
- Our household sample purposefully differed from the average Cambodian household in that they had a history of latrine ownership and use (were early adopters). This may indicate higher socioeconomic status. Further exploration of children's sanitation management for families of lower socioeconomic status may be necessary.
- Differentiated solutions may be needed to encourage safe disposal for different age groups. Children under 2 are the least likely to have feces disposed of hygienically, at 5 children can use the latrine independently, and by age 7, children are consistently using a latrine.
- All findings could be subject to self-reporting bias; respondents demonstrated high levels of awareness about sanitation and hygiene and may have wanted to show "best behavior" during the survey and demonstrations.



- Safe disposal of children's feces is cited by respondents as a high priority, but there remains low awareness of the danger of children's feces. Perceptions of dirtiness in managing children's feces could be further researched.
- Even in households where children's feces are disposed of hygienically, disposal of wastewater from washing children and diapers remains an issue: wastewater is often thrown onto ground around household or drained to the yard. This issue also merits further research.
- Further investigation is also needed into handwashing practices around managing children's sanitation: high rates of handwashing with soap, both after disposing of feces and after washing children's bottoms, were reported, but were likely influenced by self-reporting bias.
- Further investigation is needed into how caregivers rid household environment of fecal matter post-defecation.
- Our results show high levels of interest in products for children's sanitation among participants. In general, products for managing children's sanitation were readily available close to the home at prices participants were willing to pay, indicating that market channels for children's sanitation products are already in place. This is promising in contemplating the potential for introducing improved products for managing children's feces.
- The perception that products presented in the focus groups were "modern" or "from the city" indicates their allure with rural consumers; nevertheless, the "willing to pay" price points they cited for each product was still quite low. It is encouraging that norms and social sanctions against children's feces left in the open are already in place; this indicates a promising starting place for any potential intervention.
- The youngest mothers with the youngest children and the newest latrines were those least likely to dispose of children's feces hygienically. This indicates that habit-building is an important factor in hygienic disposal of children's feces, and points to the importance of continuing to increase latrine coverage in rural Cambodia.
- Context matters greatly, and these study findings are not necessarily generalizable beyond Cambodia

Conclusions

- The greatest challenges in hygienic feces disposal are for children <2, before learning to use potty or latrine
- Disposable diapers continue to grow in popularity in Cambodia, but do not lead to disposal of feces in a latrine
- Latrine ownership makes safe disposal of children's feces much more likely
- Next steps will include further research into issues outlined above, investigating solutions for managing children's sanitation in the wider Mekong Delta region, designing a product that can be used for children and the elderly, and continuation of market-based expansion of latrine coverage in Cambodia.

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Contact Information

Molly Miller-Petrie, MSc, LSHTM: mmpetrie@gmail.com
Lindsay Voigt, WaterSHED Cambodia: lindsay@watershedasia.org, www.watershedasia.org