Infant and Young Child Faeces Management:

Potential enabling products for their hygienic collection, transport, and disposal in Cambodia

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Abstract

Background

Despite evidence that children's faeces play a major role in diarrheal disease transmission through the contamination of the household environment, relatively little priority has been given to research and interventions in this area. In Cambodia, only 20% of children's faeces were disposed of in an improved sanitation facility according to the 2010 Demographic and Health Survey. This study explores current practices and the role that enabling products may play in increasing hygienic management practices.

Methods

A household survey was conducted in 130 houses in 21 villages and two provinces in Cambodia. Four focus group discussions were conducted, two in each province. Households were restricted to those with an improved sanitation facility and at least one child under five. Results were analysed using STATA13 and explanatory variables were tested individually and using logistic regression to control for child age. Focus group results were analysed qualitatively.

Results

Main place of defecation, method of moving faeces, and main place of disposal differed depending on child age, with children under two least likely to have their faeces disposed of hygienically. Overall, 62.7% of households reported using a hygienic main disposal site while 35.7% reported doing so consistently. Factors associated with hygienic disposal included the number of years a household had owned a latrine, the age of the caregiver, the consistency of adult latrine use, and the presence of tools for child faeces management in the latrine.

Discussion

The results demonstrate a need for interventions targeting the hygienic management of faeces of children under five in Cambodia, and particularly for children under two. The technologies most likely to facilitate hygienic disposal for these age ranges include reusable diapers, potties, and potentially latrine seats. Design features should ensure child safety, time-savings, cost-savings, ease of disposal, and ease of cleaning. Product marketing will also need to address hygiene behaviours related to child cleaning and caretaker hand washing to ensure reduction of disease transmission.

Introduction

The diarrheal disease burden

Diarrheal disease is caused by a variety of microbial pathogens primarily transmitted through the faecal-oral route. Pathogens can be spread from faeces to a new host through fingers, fomites, flies, fluids, fields and food, as illustrated in the well-known F-Diagram(1). Access to safe water, sanitation, and hygiene (WASH) play a key role in breaking faecal-oral disease transmission pathways, and lack of access to WASH is estimated to be responsible for 88% of the global diarrheal disease burden(2).

Diarrheal disease is the second greatest cause of mortality for children under five worldwide, accounting for nearly 800,000 deaths a year, primarily in developing countries(3). Repeated infection with diarrheal pathogens and helminths can cause long-term consequences including stunting, lowered IQ, and environmental enteropathy(4). Diarrheal disease also contributes to adult morbidity and mortality, leading to substantial hours lost to productivity and requiring increased medical expenditures(5). Diarrheal disease particularly affects the world's poorest populations, who are the most likely to lack access to WASH and health services and the least able to sacrifice time and resources to illness. In addition, poor nutrition and lack of access to health services increases the risk of diarrheal mortality(6).

Current priority interventions for preventing diarrheal disease include ensuring access to clean water and improved sanitation, and promoting hygiene behaviours, primarily hand washing with soap. Meta-analysis has shown that these interventions reduce diarrheal diseases from 15-48%(7, 8), with hand washing with soap showing the greatest impact. The management of children's faeces has not received the same attention as a potential target behaviour to reduce diarrheal transmission, though the World Health Organization (WHO) identified it as one of three "key water related behaviours for promotion(9)." Children's faeces are more likely to contain enteric pathogens than those of adults(9), and open defecation by young children contaminates the household environment, a key site for diarrheal disease transmission for children and adults(10).

Faeces management for infants and young children

Children's faeces management is a multistep process, and each step presents an opportunity for disease transmission or prevention. The six main steps and their associated behaviours are outlined in Table 1.

Table 1 Children's faeces management steps and related hygiene behaviours

Disease transmission behaviours	*Disease prevention behaviours*
Step one: defecation site	
Faeces enter the environment through open defecation	Safe containment through use of improved sanitation facility, or capture in age-appropriate hygienic containment product such as a diaper or potty
Step two: faeces transport	
Faeces come into contact with caretaker's hands when moved	No direct contact with caretaker's hands through use of tools such as shovels
Step three: faeces disposal	
Faeces left in the environment or disposed of un-hygienically	Disposal into an improved sanitation facility or adequate burial or treatment; contaminated disposable materials such as diapers adequately burned or treated
Step four: cleaning the tool	
Tools not cleaned or wastewater disposed of in the yard or open environment	Equipment such as potties, shovels, and reusable diapers cleaned with soap or a disinfectant such as bleach, and wastewater disposed of in an improved sanitation facility
Step five: cleaning the child	
Child not cleaned or wastewater disposed of in the yard or open environment	Child cleaned with soap and wastewater disposed of in an improved sanitation facility
Step six: hand washing with soap	
Caretaker's hands not washed after any point of contact with child's faeces	Caretaker's hands washed with soap after each point of contact with child's faeces

These steps may be completed in various orders and may be interrupted by other household tasks, with particular implications for hand washing. Few studies have investigated hygiene behaviours associated with children's faeces management. Prevention strategies will need to consider all six behaviours in order to disrupt diarrhoeal disease transmission pathways.

A systematic review by Gil, et al.(9) identified a range of children's defecation sites used worldwide, including diapers, potties, the yard, the latrine, or in a river. Defecation locations varied by age, with infants generally using diapers, toddlers using potties, and older children using the yard or, rarely, the latrine. The range of final disposal practices included washing a reusable diaper, removing faeces from the soil, burying the faeces, a dog eating the faeces, moving faeces to an open location away from the home, throwing faeces in a river, disposing of faeces in a latrine, or not moving the faeces at all. Across all study areas, the majority of children were washed by a caretaker following defecation. Hand washing practices by caretakers after cleaning the child varied by child age. Use of soap in either activity was low.

The meta-analysis conducted by Gil et al. found that non-hygienic practices, such as open defecation, stools not removed from the soil, and children seen eating faeces increased the

risk of diarrheal disease by 23% (OR 1.23 CI 1.15-1.32) compared to hygienic behaviours, such as use of a latrine, potty, or diaper. Hygienic practices provided modest protection against diarrheal diseases, though results varied between studies, with some showing increased risk with the use of latrines by children.

Of four additional studies identified by the Child Health Epidemiology Reference Group (CHERG) at the London School of Hygiene and Tropical Medicine (LSHTM) in their update to the Gil analysis(11), two showed a protective effect for safe stool disposal (OR 3.36 and RR 1.45, CI 0.99-2.12) while two did not. Considered together with the studies from the Gil analysis on children's faeces disposal, CHERG concluded the data was "strongly suggestive of a protective effect of hygienic practice."

Factors cited as barriers to hygienic practice(9) included the time and energy required for disposal, inaccurate perceptions of the harmlessness of children's faeces, limited resources, and perceptions of dangers surrounding latrine use for young children. One strategy to address these barriers is to encourage use of well-designed products to facilitate more hygienic infant and child faeces management processes.

Enabling products for faeces management

Products and materials used in the child faeces management process vary between countries and communities, and have different implications for hygienic management of faeces based on design features. The role of latrines and products in facilitating hygienic child faeces management practices has been explored in several studies.

While research in Mozambique has shown that access to a sanitation facility is positively associated with safe stool disposal(12), children under-five are much less likely to use sanitation facilities even in houses that own one, and often continue to practice open defecation(9). A study in Peru investigating the role of potties in hygienic faeces management in an urban shantytown(13) suggested that latrines are not a suitable technology for children under four, and that diapers and potties should be promoted as a part of children's sanitation projects. Determinants identified for hygienic faeces disposal included child age, effort required, available resources, and perceptions of dirtiness. Mothers were eager to switch children to potties at a young age in order to avoid the time and effort required to wash diapers, but potty training was cited as a challenge.

In Nigeria, a behavioural trial to improve hygienic faeces disposal in rural communities resulted in increased use of chamber pots by participants in the intervention arm compared to the control (60% and 6%, respectively), and reduced rates of defecating on the floor (from

72% to 25%), showing great potential for behavioural interventions(14). The study also identified defecation on the floor, mothers' lack of hand washing with soap after child cleaning, and pit latrines as risk factors for diarrheal infection.

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICCDR, B) has conducted research to guide product development for child faeces management(15). A study that provided potties and "sani-scoops" for child and animal faeces disposal in Bangladesh found high rates of reported use of the products among households with children under three (67% and 89%, respectively) but no statistically significant difference in the presence of human faeces in or around households before and after the intervention, despite a reported increase in children defecating in a potty (from 15% to 84%)(16). Identified barriers to use included difficulties potty training and perceptions of the harmlessness of animal and children's faeces.

The Cambodian context

In Cambodia, only 37% of households have access to an improved sanitation facility, and the per cent of children defecating in an improved facility is probably much lower(17). The 2010 Cambodia Demographic and Health Survey (DHS) found that faeces of only 20% of children under 3 were disposed of into an improved sanitation facility, and 26% into any sanitation facility(18). Cambodia ranked 6th out of 8 countries in East Asia and the Pacific in per cent practising safe stool disposal(19).

Diarrheal incidence in Cambodia decreased in every age group of children under-five between 2005 and 2010. In both years, rates were lowest in children 0-5 months, who may receive partial protection from breastfeeding, and 24-59 months. Rates were highest from 6-11 months of age in both years. In 2010, children 0-5 months experienced 2.79 cases per year, children 6-11 months 4.26 cases, 12-23 months 3.45 cases, and 24-59 months 2.2 cases per year(20). In addition, 40% of Cambodian children were stunted, according to the 2010 DHS report(18).

A recent consumer study undertaken by WaterSHED showed a high level of use of newly purchased improved latrines in rural communities by adults (96-97%), but a lower rate of use among children under five (84-86%)(21). Substantial research into product design for hand washing devices has already been conducted in Cambodia(22), and the HappyTap hand-washing device(23) is scheduled to be introduced to the Cambodian market by WaterSHED in 2014.

In summary, there is substantial evidence to support the connection between hygienic faeces management and a reduction in diarrheal disease. In Cambodia, there is a need to address this issue, as rates of non-hygienic disposal and under-five mortality are both high. Product use is one potential intervention for improving hygienic faeces management, and some products are available in the Cambodia market. However, there is a need to understand the range of current unhygienic and hygienic management practices, barriers and motivators to hygienic behaviour, and the potential appeal of enabling products among Cambodian child caretakers in order to design an appropriate and effective intervention.

Aims and objectives:

Project aim

To conduct formative research on current infant and young children's (IYC) faeces management practices in rural and peri-urban Cambodia and identify consumer attitudes towards potential commercial enabling products for hygienic faeces collection, transport, and disposal.

Project objectives

1) To identify current practices and use of equipment or materials for IYC faeces management among caregivers with at least one child under five-years of age in households with an improved sanitation facility.

2) To determine barriers and motivators for hygienic faeces management, including access to equipment or materials, time required, access to water, sanitation facility design, age and number of children, and other factors.

3) To inventory the range of products already developed for IYC faeces management and disposal in both developed and developing countries and assess their relevance for Cambodia.

4) To investigate the acceptability and appeal of relevant enabling products from among globally available low-cost products for supporting hygienic IYC faeces management, and potential barriers or motivators for their purchase and correct use in Cambodia.

Materials and Methods

To address objectives 1, 2 and 4, data were collected in two stages. In stage one, a household survey was conducted with 130 households including 164 children under five in 21 purposefully selected villages Kampong Speu and Battambang provinces, Cambodia. In stage two, four focus group discussions (FGDs) were conducted in a subset of sampled villages, two in each province. Data were collected in collaboration with WaterSHED Asia and local enumerators/facilitators trained by LSHTM/WaterSHED. Data collection for each stage was preceded by training at the WaterSHED office and pilot testing in two non-study villages in Kampong Speu province. Local ethics approval is included in annex 7.

Stage one recruitment and data collection

Given project goals, sample size calculations and village randomization were not necessary methodological features. Instead, provinces and villages were purposefully selected for diversity as possible in terms of water sources, socio-economic status, geographical setting, and proximity to major roads and markets.

Two provinces were selected for the household survey: Kampong Speu, a relatively poor province located close to the capital of Phnom Penh, and Battambang, an agriculturally and commercially thriving province on the border with Thailand. A total of 21 villages representing 13 communes and 9 districts were selected. To be included, villages were required to have improved sanitation coverage of at least 80%(24) and were restricted to areas in which WaterSHED had a local presence.

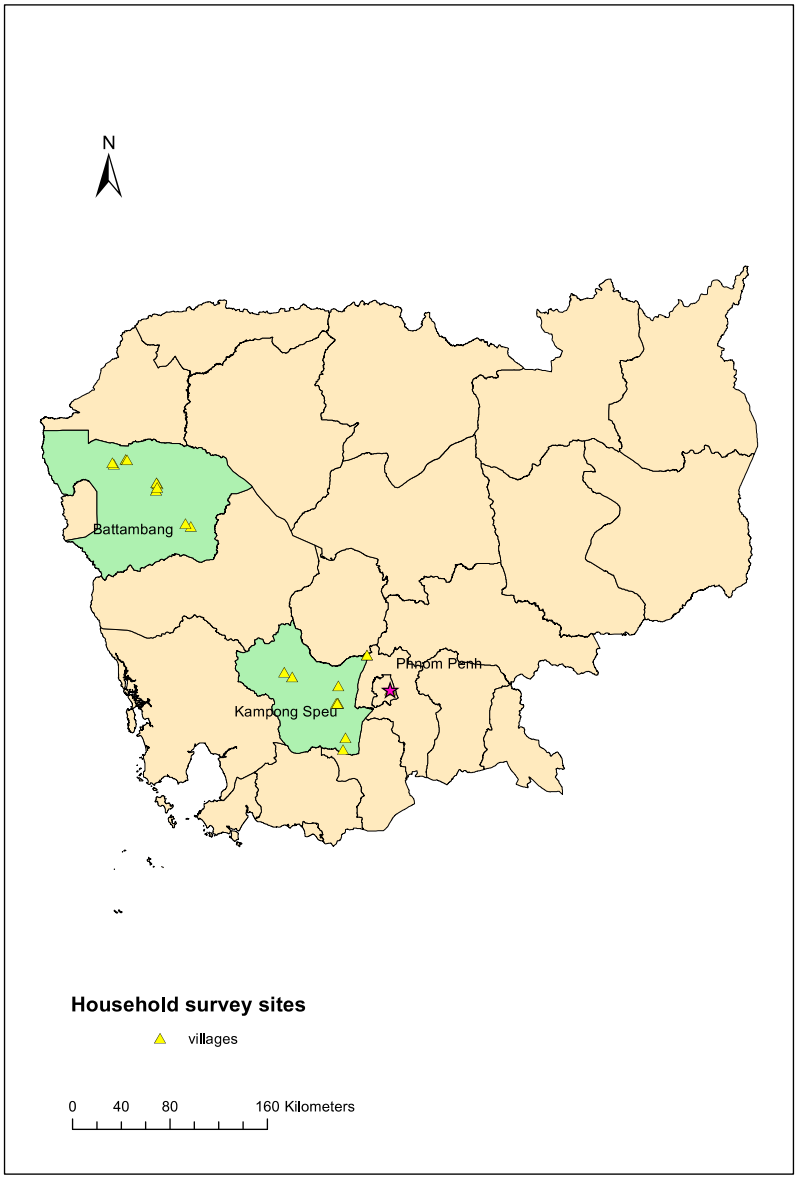


Figure 1 Map of household survey sites in Cambodia

In each village, up to 8 eligible households were selected using a random walk procedure for a total of 130 enrolled households. Informed consent was obtained from each participant. Eligibility criteria for households included:

1. Ownership and use of an improved sanitation facility
2. At least one child under five

Eligibility criteria for participants included:

1. Over 18 years of age
2. Primary caregiver of at least one child under five

Households without a latrine were excluded, as they lacked the means for safe disposal of faeces into an improved sanitation facility. However, households without a latrine are generally among the poorest and most vulnerable populations, and further research into facilitating hygienic faeces management among those without latrines may be needed.

The survey included closed and open ended questions, spot checks for latrines and hand washing areas, and a simulated demonstration of how and where faeces were handled, transported, and disposed, as well as subsequent cleaning of the child and hand washing. The survey and consent form are provided in annexes 3 and 4.

Data was collected verbally, recorded onto paper questionnaires by trained enumerators who were native Khmer speakers, and later entered into excel. Each household received a unique number identifier and personal information was collected only on the consent form.

Stage two recruitment and data collection

Two FGDs of six participants each were conducted in Kampong Speu province on August 1st, 2014. Two FGDs of seven participants each were conducted in Battambang province on August 5th.

Villages were selected for diversity of disposal practices, including where positive behaviours were identified during the survey. Participants were caregivers from surveyed households. FGDs were conducted using a question guide (annex 5) administered by a trained facilitator in the local language and audio recorded following verbal consent (annex 6). A trained note taker and simultaneous translator also provided support during the FGDs.

Questions focused on participants' reactions to sample products brought to each village, pictured in annex 1. These included locally produced reusable cloth diaper covers that could be adjusted using snaps or Velcro, reusable diaper pads, and a collection of children's potties with diverse design features such as backs, arms, and covers in different sizes and colours. A "safe squat", or cover for a latrine hole designed for small children, was adapted from a pilot in Kenya(25) and locally produced in Phnom Penh. Additional questions focused on participants' ideal defecation place for their child and reasons why.

Stage one data analysis

Analysis was conducted using STATA13. Logistic regression was used to test the association between individual explanatory variables and the outcome variable of hygienic faeces disposal. Explanatory variables were tested one at a time. Because child age is a

major determinant of practices, regression controlled for child age. All associations presented are age-adjusted and p-values are from the Wald test.

Hygienic disposal was based on the main site of disposal reported by caretakers. Disposal sites were grouped into “hygienic” and “non-hygienic”. While some researchers consider burial to be a hygienic disposal method, in this study, safe disposal was limited to disposal into an improved sanitation facility where faeces could be separated from the environment, in accordance with the definition used by the Joint Monitoring Program(26).

Tests for association were conducted only on variables considered to have a plausible relationship. As more than 15 statistical tests were run, the Bonferroni correction was applied to reduce individual test Type I error rates so that the overall study family-wise error rate remained at p=0.05. Associations were assessed against the normal p-value of 0.05 and the corrected value (0.05/15 = 0.003). However, given the exploratory nature of the study and small sample size, associations were still considered significant below p=0.05.

Stage two data analysis

Stage two data were analysed according to the World Health Organization/Special Program for Research and Training in Tropical Diseases Focus Group Manual(27). The note taker used the recording to expand notes from the FGDs. Key themes and outcomes were identified, and summaries created and compared across each village. Common themes and outliers were assessed for each group and across all groups.

Global product inventory

An online web and image search for terms including “potties”, “children’s toilet”, and “diapers” identified hundreds of products for children’s sanitation. A search of these same terms with the addition of “Africa” “Southeast Asia” and “Latin America” did not reveal distinct products. Searches targeting specific countries including Peru, Tanzania and Cambodia were searched in detail to provide examples (Peru search conducted in Spanish). A short literature review of articles related to “child faeces management and disposal” revealed further products used in hygiene trials or research. Finally, a field-based search for commercial products was conducted in markets around Phnom Penh, Cambodia.

Results

Stage one: Household surveys

Participant and household characteristics

The survey was completed in full in all but one enrolled household. Detailed sample characteristics are provided in Tables 2-4. Primary caregiver's ages varied from 20-74 years and 88.4% were female. The main source of household income was business or sales (38.0%) salaried work (28.7%) or agricultural production (25.6%). The majority of households had 1-5 members over age five living in the house (64.3%) and one child under age five (74.4%). 82.7% of households had animals in or around the living area.

Families had owned their latrine for 1-20 years, the largest percentage from 2-5 years (43.4%). Latrines were nearly all pour flush (97.6%) fitted with a pan or pedestal. 85% of latrines had a modern superstructure, and 46.5% were within 3 meters of the house. 83% of participants were "satisfied" or "very satisfied" with their latrines. 96.1% of adults reported always using a latrine.

The main water source for households in both the wet and dry seasons was piped water into the house or yard (53.5% and 61.2%, respectively). For 90.7% of households, their source was on-site in the wet season, compared to 86.9% in the dry season. In both seasons, the majority paid for water.

Table 2 Participant and household characteristics (N=129)

Variable	Categories	N	%
Age of caregiver			
	18-35	63	48.8%
	35-50	23	17.8%
	50 and older	43	33.3%
Gender of caregiver			
	Male	15	11.6%
	Female	114	88.4%
Education of caregiver			
	None	17	13.2%
	Some primary	54	41.9%
	Some secondary or above	58	45%
Main source of household income			
	Agricultural Production	33	25.6%
	Business/sales	49	38.0%
	Salary	37	28.7%
	Other	10	7.8%
Number of people over five in the household			
	1-5	83	64.3%
	6-9	39	30.2%

	10 or more	7	5.4%
Number of people under five in the household			
	One	96	74.4%
	Two	25	19.4%
	Three or more	8	6.2%
Number of years of latrine ownership			
	1 year or less	10	7.8%
	2-5 years	56	43.4%
	6-10 years	35	27.1%
	11-20 years	24	18.6%
	20+ years	4	3.1%
Latrine type *2 missing			
	Pour flush w/ pan	102	80.3%
	Dry pit	3	2.4%
	Pour flush w/ pedestal	22	17.3%
Latrine super-structure *2 missing			
	Modern	108	85.0%
	Traditional	10	7.9%
	Inadequate	9	7.1%
Latrine floor type *2 missing			
	Tile	89	70.1%
	Cement	35	27.6%
	Dirt	3	2.4%
Latrine pan type *2 missing			
	Ceramic	123	96.9%
	Other	4	3.2%
Distance from house to latrine *2 missing			
	0-3 meters	59	46.5%
	4-6 meters	34	26.8%
	7-10 meters	15	11.8%
	More than 10 meters	19	15%
Satisfaction with latrine			
	Very Satisfied	45	34.9%
	Satisfied	62	48.1%
	Dissatisfied	22	17.1%
Frequency of adults using latrine			
	Always	124	96.1%
	Sometimes	5	3.9%
Animals in and around the house *2 missing			
	Yes	105	82.7%
	No	22	17.3%

Water access			
Question	**Categories**	**N**	**%**
Main source of water: wet season			
	Piped into house or yard	69	53.5%
	Standpipe/well/borehole	22	17.1%
	Rainwater	24	18.6%
	Bottled water	1	0.8%
	Surface water	13	10.1%
Main source of water: dry season			
	Piped into house or yard	79	61.2%
	Standpipe/well/borehole	25	19.4%
	Bottled water	3	2.3%
	Surface water	22	17.1%
Water source site: wet season			
	Yes	117	90.7%
	No	12	9.3%
Water source on site: dry season			
	Yes	112	86.9%
	No	17	13.2%
Pay for water: wet season			
	Yes	66	51.2%
	No	63	48.8%
Pay for water: dry season			
	Yes	82	63.6%
	No	47	36.4%

Characteristics of children under five

The survey was completed for a total of 145 children, ranging in age from less than one month to 59 months. The largest percentage (26.9%) were between 13-24 months and 51.7% of the children were male. Children were cared for primarily by their mother (56.6%) or grandmother (29.7%).

Table 3 Characteristics of children under-five (N=145)

Variable	Categories	N	%
Child age			
	0-6 months	22	15.2%
	7-12 months	21	14.5%
	13-24 months	39	26.9%
	25-36 months	34	23.5%
	37-60 months	29	20.0%
Child gender			
	Male	75	51.7%
	Female	70	48.3%
Main person responsible for caring for the child			

	Child's mother	82	56.6%
	Child's father	3	2.1%
	Child's grandmother	43	29.7%
	Child's grandfather	11	7.6%
	Other	6	4.2%

Village characteristics

71.4% of the villages were rural, and 28.6% were peri-urban and near to or in the District Capital. Sanitation coverage in the villages ranged from 80-100%. 52.4% of the villages did not have a paved road, and 45% were more than 1 kilometre (km) from a permanent market.

Table 4 Village characteristics (N=21)

Variable	Categories	N	%
Village density			
	Rural	15	71.4%
	Peri-urban	6	28.6%
Improved sanitation coverage			
	80-84%	4	19.1%
	85%-89%	9	42.9%
	90%-94%	1	4.8%
	95%-100%	7	33.3%
Paved road in village			
	Yes	10	47.6%
	No	11	52.4%
Distance to nearest permanent market *1 missing			
	In village	5	25%
	Less than 1km	4	20%
	2-5 km	8	40%
	More than 5 km	3	15%

Attitudes and perceptions on hygiene

When asked to compare the faeces of children, adults, animals, and dirt, 1.6% of caregivers ranked children's faeces as dirtiest, while 23.3% ranked it as least dirty (Table 5). Almost universally, caregivers ranked adults' faeces as dirtier than children's (97.7%). Children's faces were considered cleaner than animals by 42.6%, and cleaner than dirt by 34.9%.

When asked how they would feel if a neighbour left their child's faeces out in the yard, 57.3% said it would be unhygienic or smelly, 54.8% said they would feel "disgusted", 42.75% said they would feel angry or upset, and 25% said they would worry about germs and diseases spreading (Table 5). When asked about the importance of managing children's faeces relative to other household tasks, 52.7% said it was more important; only 2.3% said it was less important.

Children's latrine use

Mean age at which households felt a child could use a latrine alone was 5 years, while the mean age for consistent use was 7 years.

When asked why children did not always use the latrine, 93.5% said their child was too small or couldn't squat, and 12% stated that their child might fall down. When asked challenges their child had experienced or was likely to experience when starting to use the latrine, 24.2% said they would be too small, 20.3% said it would be hard for their child to clean themselves and to flush, 19.5% said the latrine was too slippery, and 17.2% said the child would be afraid. When asked what help caretakers needed to provide for their child to use the latrine, 73.2% said they needed to clean the child's bottom, and 52.9% said they needed to flush the latrine (Table 5).

Child cleaning and hand washing

Caretakers reported cleaning their child immediately after defecation (66.9%) or after disposing of the faeces (33.1%). Water used to clean the child was thrown in the yard (43.3%) or washed directly into the latrine (28.4%) in most cases. Most caregivers reported washing their hands after cleaning their child (79.7%); less than 1% of households said they did not wash their hands at any point. Of the caretakers who reported if they used soap to wash their child or not, 78.2% reported using soap and one reported using wet wipes, while of those who reported if they used soap to wash their hands, 93.6% reporting using soap. However, in the spot checks there was often no soap present around water sources. In addition, no disinfectant supplies were identified during the survey that might be used to clean child faeces management equipment.

Table 5 Attitudes and perceptions on hygiene

Variable	Categories	N	%
Ranking of children's faeces dirtiness compared to adults', animals', and dirt			
	Most dirty	2	1.6%
	Second dirtiest	58	45%
	Third dirtiest	39	30.2%
	Least dirty	30	23.3%
Feelings if a neighbour left their child's faeces out in the yard *5 missing			
	Disgusted	68	54.8%
	Angry/upset	53	42.8%
	Unhygienic/smelly/dirty	71	57.3%
	Would confront the neighbour or chief	16	12.9%

	Germs/spreads disease	31	25%
	Could step in it	4	3.2%
	Judge as poor caregiver	5	4%
Importance of managing children's faeces			
	More important than other household tasks	68	52.7%
	As important as other household tasks	58	45%
	Less important than other household tasks	3	2.3%
Age at which a child can use a latrine alone *2 missing			
	Mean (Standard deviation SD)	127	5 (1.71)
Age at which a child can use a latrine consistently			
	Mean (SD)	129	7 (2.13)
Reasons why children do not always use the latrine *N=108 of those who don't always use the latrine			
	Child is too small/can't squat	88	93.5%
	Too hard to teach the child to use it	3	5.6%
	Child can't clean themselves	2	1.9%
	Child could fall	13	12%
	Child is afraid	7	6.5%
	Caregiver is too busy/ absent	3	9.3%
	No need to contain faeces	2	1.9%
	Latrine would get dirty	2	1.9%
	Inconvenient time i.e. at night, traveling	2	1.9%
	Animals and mosquitos in latrine	3	2.8%
Challenges anticipated when child starts to use latrine/experienced when child began using latrine *1 missing			
	Child afraid	22	17.2%
	Child too small	31	24.2%
	Too slippery	25	19.5%
	Have to wait with child	20	15.6%
	Hard to clean child and flush	26	20.3%
	Hard to squat	21	16.4%
	Hard to teach child to use it	6	4.7%
	Have to hold child	7	5.5%
	Child might contact faeces	3	2.3%
	Latrine might get dirty	3	2.3%
What do caretakers need to do to help the child use the latrine? *6 missing			

	Clean the child's bottom	90	73.2%
	Pour flush	65	52.9%
	Hold the child	30	24.6%
	Wait with the child	22	17.9%
	Wash the child's hands	11	8.9%
	Dress and undress the child	5	4.1%
	Teach the child to use it	13	10.6%
	Open the door	2	1.6%
When does the caretaker clean the child *5 missing			
	After child defecates	83	66.9%
	After disposing of faeces	41	33.1%
Does the caretaker use soap to clean the child *1 missing			
	Yes	69	53.9%
	No	18	14.1%
	Unknown	40	31.3%
	Does not wash child	1	0.8%
Where is the water used to clean the child disposed of *2 missing			
	Thrown in yard	55	43.3%
	Washed into latrine	36	28.4%
	Washed down drain	34	26.8%
	Thrown far from the house	2	1.6%
When are the caregivers' hands washed *1 missing			
	After cleaning the child	102	79.7%
	After disposing of child's faeces	8	6.3%
	After cleaning and after disposing	14	10.9%
	Other times	3	2.3%
	Doesn't wash	1	0.8%
Does the caregiver use soap to wash their hands *1 missing			
	Yes	87	68%
	No	6	4.7%
	Unknown	34	26.6%
	Doesn't wash	1	0.8%
Is the caregiver interested in trying a new product *1 missing			
	Yes	54	42.2%
	No	74	57.8%

Children's faeces management practices

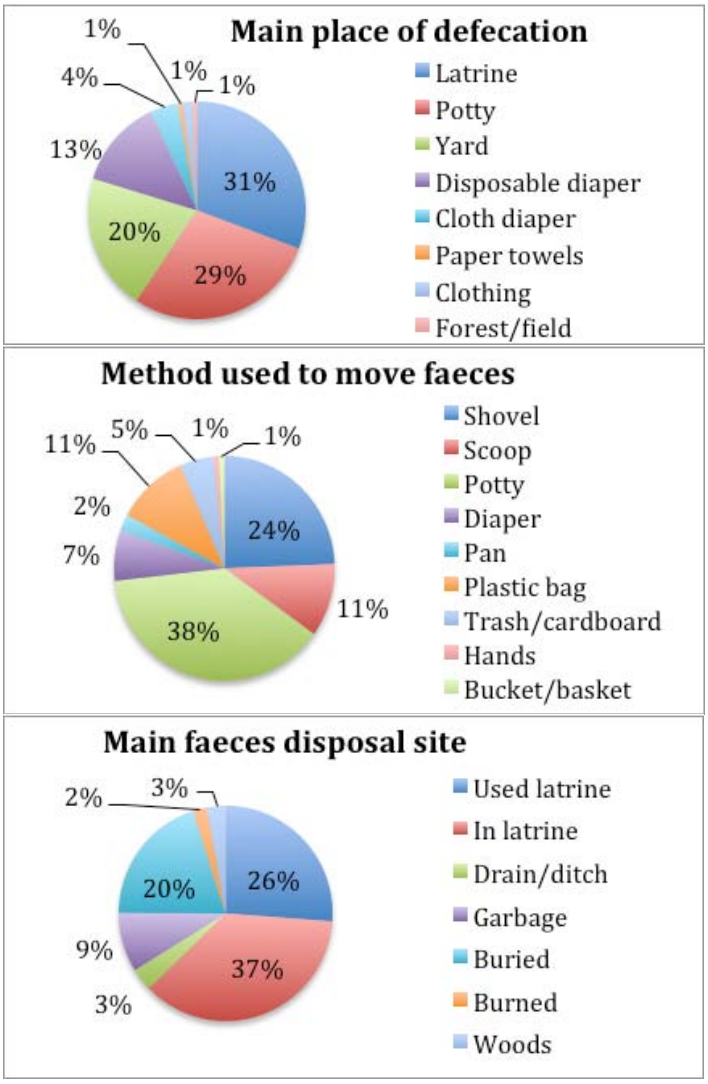
Step 1 – defecation site: Main sites of children's defecation were the latrine, a potty, the yard, a disposable diaper, or a reusable diaper.

Step 2 – transport: Primary methods used to move faeces when defecation occurred outside the latrine were potties, shovels, scoops, plastic bags, or diapers. Less 10% reported using pans, trash, cardboard, buckets, baskets, or hands.

Step 3 – disposal: Main sites of children's faeces disposal when the latrine was not used for defecation were the latrine, buried, or the garbage. Less common were the woods, a drain or ditch, and burning.

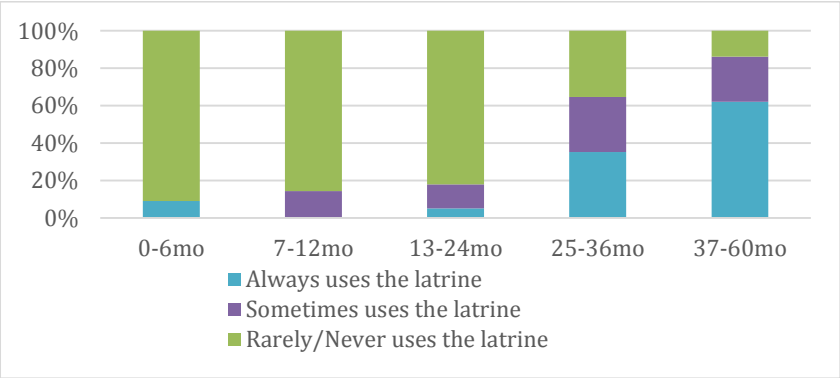
Overall, 62.7% of households reported defecation or disposing of faeces hygienically in the latrine as their main practice. However, over 50% of households reported using alternative disposal sites in addition to the main site. If hygienic faeces disposal is defined as households who only ever reported using a hygienic disposal site, only 35.7% of households reported consistent hygienic disposal practices.

Figure 2 Main place of defecation, method used to move faeces, and disposal site



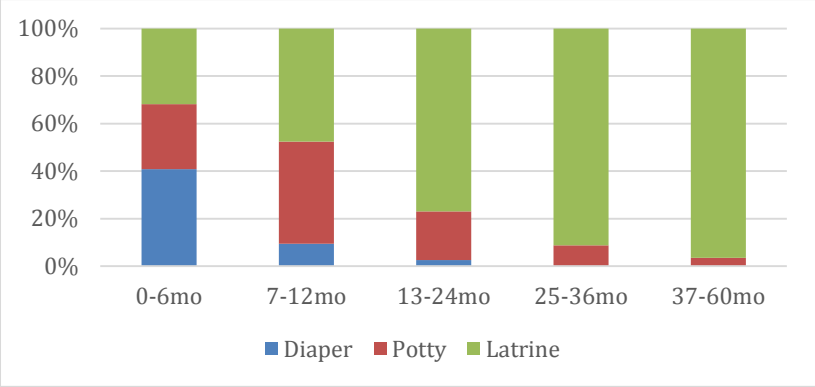
Place of defecation and final disposal site varied substantially depending on child age. Up until two years of age, less than 10% of children were reported to "always" use the latrine, although two children less than 6 months were reported to "always" use it by being held over the latrine. At two years of age, the per cent of children "always" using the latrine increased substantially to 35.3%, and after age three reached 62.1%.

Figure 3 Latrine use by child age



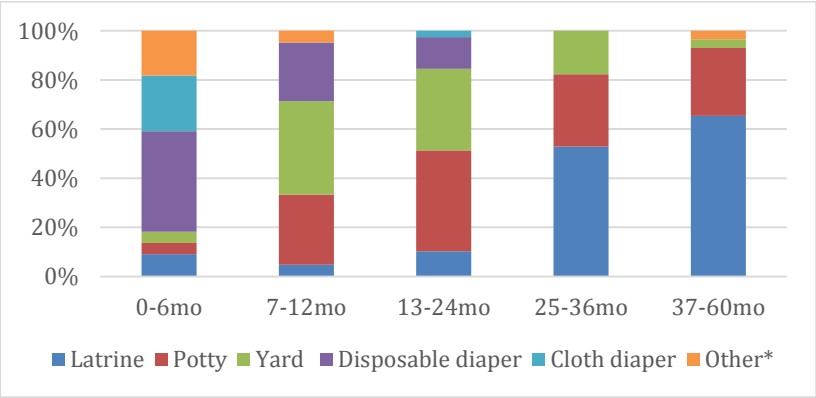
The ideal place of defecation for children 0-6 months old was the diaper (40.9%), for children 7-12 months the potty (42.9%) or latrine (47.6%), and for children over 12 months the latrine (87.3%). The latrine was viewed as ideal primarily for being “hygienic or clean” (62.5%) while the potty was viewed as ideal because it was “age appropriate” (44.3%) and the diaper because it was “easy to clean” (63.6%).

Figure 4 Ideal place of defecation by child age



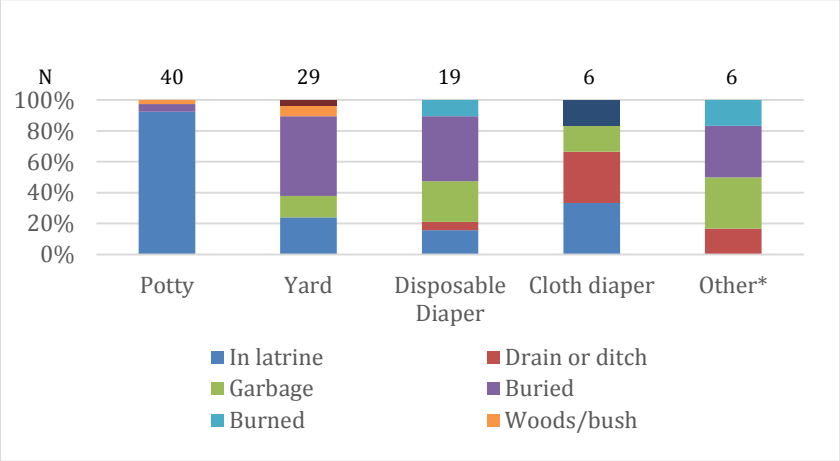
Children aged 7-12 or 13-24 months were most likely to defecate in the yard or elsewhere in the open (38.1% and 33.3%). Younger children 0-6 months were most likely to use diapers while children over two were most likely to use latrines. Potty use was highest at 13-24 months (41.0%) but remained prevalent up to 59 months.

Figure 5 Main place of defecation by child age[1]



Final disposal of children's faeces also varied by defecation place: 92.5% of children who defecated in potties had their faeces disposed of in the latrine, compared to 20% of all those who defecated elsewhere. Faeces captured in cloth diapers were more likely to be disposed in the latrine (33.3%) than those captured in a disposable diaper (15.8%). When looking at those who reported a method of transporting faeces, only 29.4% of faeces moved with a shovel and 8% with a scoop were deposited in the latrine, while shovels and scoops were the tools most likely to be used to bury faeces (64.7% and 66.7%). Many participants cited the latrine filling up or clogging as reasons they did not use a shovel or scoop to dispose in the latrine. Only 17.4% of non-diaper disposables were used to dispose of faeces in the latrine.

Figure 6 Main disposal place by place of defecation[1],[2]

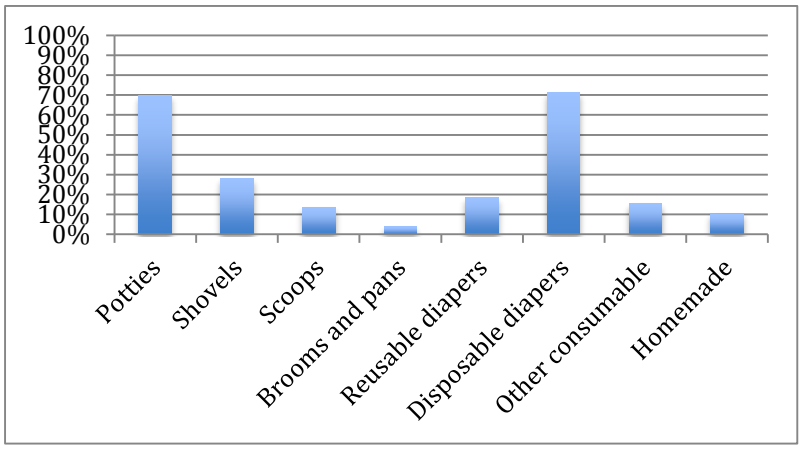


[1] Other sites of defecation included on paper towels, in the child's clothes, in the forest or a field, or on furniture
[2] Of the those who reported defecation outside the latrine

Tools for children's sanitation

Equipment identified for defecation and faeces transport included reusable and disposable items. Household ownership of purchased reusable tools included potties (69.8%), shovels (27.9%), scoops (13.2%), brooms and pans (3.9%), and reusable diapers (18.6%). Ownership of consumables included disposable diapers (71.3%), and wet wipes, paper towels, and cotton and plastic pads (15.5%). 10.1% of households had a homemade tool (scoop or diaper). Mean number of tools owned per household was 2.3 (SD 0.89). Of these tools, only reusable or disposable diapers appeared to be dedicated specifically to IYC faeces management, while potties were used by multiple generations and shovels served other uses in the household. In this context, both potties and diapers are considered a containment (Step 1) and transport (Step 2) tool as they serve both purposes.

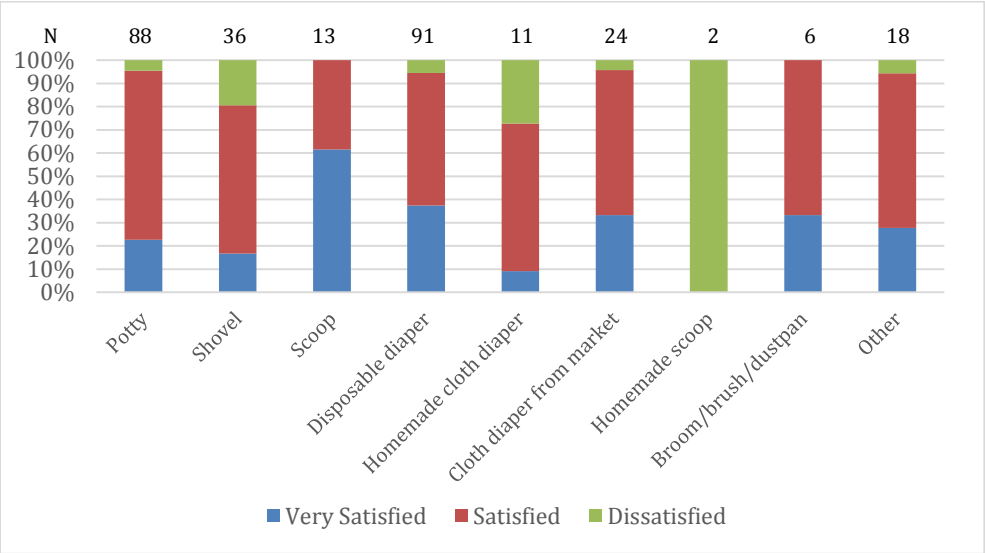
Figure 7 Children's faeces management tools owned by study households



While used items opportunistically available around the house such as trash, cardboard, and plastic bags were also used in faeces management, they were not considered tools. Additional tools observed for washing children included reusable items, such as brushes for washing out potties and basins for washing diapers and children, and consumables such as wet wipes, paper towels, and soap, though these were not analysed as a part of this study.

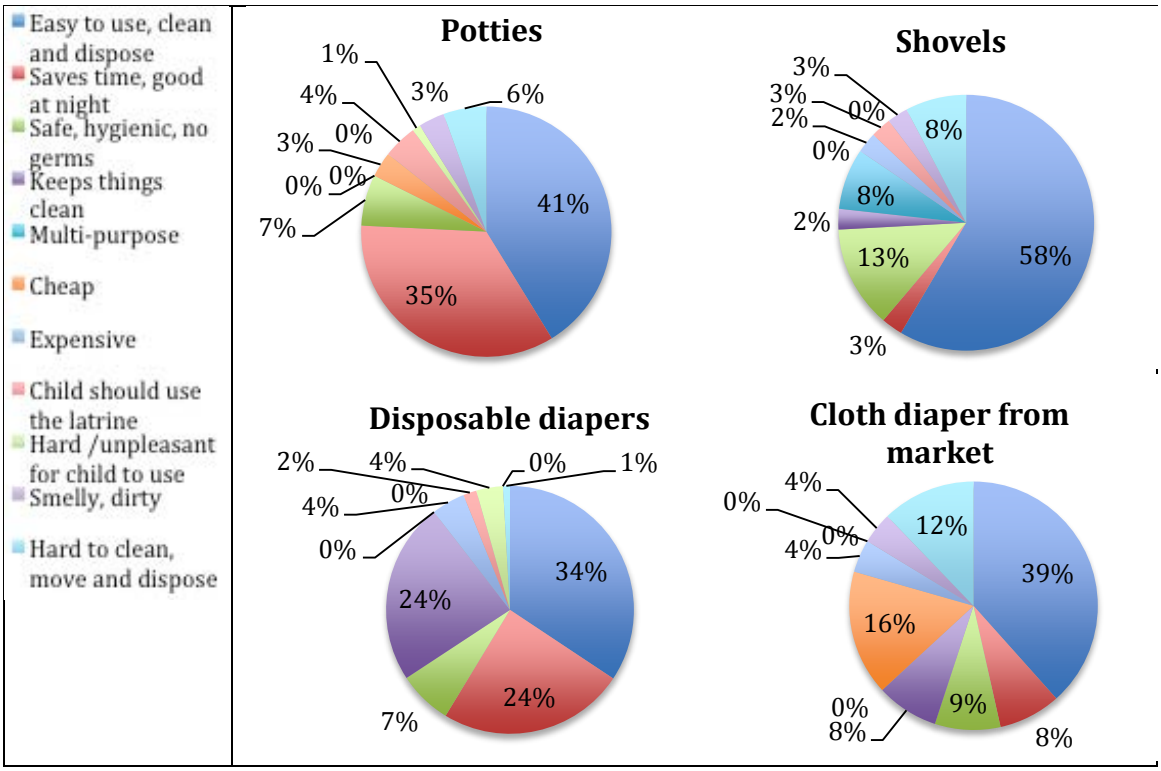
When participants were asked to rank their satisfaction with their tools, 95.4% of participants were "satisfied" or "very satisfied" with potties, 80.6% with shovels, 100% with commercially purchased scoops, 94.5% with disposable diapers, 72.7% with homemade cloth diapers and 95.8% with cloth diapers bought in a store.100% of those using homemade scoops were dissatisfied.

Figure 8 Satisfaction with faeces management tool by tool type *9 missing



Primary reasons for satisfaction with tools included that they were easy to use to dispose of faeces and to clean; that they saved time, especially at night; that they were safe and hygienic; that they kept items/the household clean; that they were multi-purpose; and that they were cheap. Main reasons for dissatisfaction included that tools were expensive; that they were difficult to use to dispose of faeces or to clean; that they were smelly or dirty; or that the caregiver disliked having to use any tool as the child should use the latrine.

Figure 9 Reasons for satisfaction/dissatisfaction with tool by tool type



Prices for products varied from 467 Cambodian Riel per unit (reusable diaper from market) to 40,000 per unit (potty) for reusable items and 364 Riel (one cotton pad) to 9,000 Riel (one high quality disposable diaper) for disposables [1]. Overall, shovels were the highest cost items per unit, while disposable diapers were the lowest cost items per unit.

The majority of all products were purchased at a nearby permanent market (89.3%). Others were purchased in a small shop, in Phnom Penh (as far as 88 km away), from a traveling salesman, or in a pharmacy, health clinic, or supermarket. Products were purchased at a median distance of 1 km from home. The majority of potties, disposable diapers, brooms and dustpans were bought less than 1 km away, while the majority of shovels, scoops, and cloth diapers were purchased 1-5 km away.

Predictors of hygienic child faeces disposal

Child age was strongly associated with hygienic disposal, with increasing rates of disposal in older age groups. Children over age three had 45 times the odds of having their faeces disposed of hygienically compared to infants 0-6 months of age.

Table 6 Odds of hygienic child faeces disposal by child age, 95% confidence interval (CI), and p-values

Child age	Odds ratio	95% CI	P-Value*
0-6mo	-		
7-12mo	5.67	1.18-27.25	0.030
13-24mo	8.31	2.07-33.43	0.003
25-36mo	21.72	4.75-99.43	<0.001
37-60mo	45.33	8.14-252.33	<0.001
*Wald test			

After adjusting for age, factors associated with hygienic child faeces disposal included the age of the caregiver, presence of tools for child faeces management in the latrine, how long households had owned their latrine, and consistency of adult latrine use (Table 7). Latrine ownership of 6-10 years had the highest odds of hygienic disposal, while mothers aged 27-38 years had the highest odds of hygienic disposal. Those households with tools in the latrine had nearly four times the odds of hygienic disposal compared to those without, while those who reported that adults in the household only sometimes, rather than always used the latrine had lower odds of hygienic disposal. When the variables were put into a single logistic regression model to investigate co-linearity, the relationships described above remained consistent, but the p-values for tool presence, adult latrine use, and caregiver age groups over 37 years rose above p=0.05.

[1] 1,000 Cambodian Riel is equal to 25 US cents, 10,000 Riel to 2.50$USD, and 40,000 Riel to 10$USD.

Table 7 Explanatory variables and age-adjusted odds of practicing hygienic child faeces disposal, 95%CIs, and adjusted p-values

Variable	Categories	Odds ratio	95%CI	P-Value*
Years of latrine ownership				
	1 year or less	-		
	2-5 years	9.42	1.47-60.17	0.018
	6-10 years	24.03	3.29-175.52	0.002
	More than 10 years	15.91	2.09-121.04	0.008
Age of caregiver				
	18-27	-		
	28-37	6.64	1.86-23.77	0.004
	38-47	2.46	0.55-11.06	0.241
	48-57	4.23	1.11-16.16	0.035
	57 and above	4.81	1.28-18.07	0.020
Presence of tools in latrine				
	No	-		
	Yes	3.87	1.21-12.39	0.023
Adult latrine use				
	Always	-		
	Sometimes	0.086	0.01-0.95	0.045
*Derived from the Wald Test in a logistic regression model controlling for child age, testing each explanatory variable separately				

Though not statistically significant, a number of other interesting relationships were identified during analysis. Households less satisfied with their latrine were less likely to dispose of faeces hygienically. Caretakers with higher levels of education, households with piped water on site, households with a greater ratio of adults to children, and households in peri-urban areas were more likely to dispose of faeces hygienically. The less dirty a household perceived child faeces to be, the more likely a household was to dispose of faeces hygienically, with the exception of those few (N=2) who perceived it to be the dirtiest and had a high rate of hygienic disposal (50%).

Stage two: Focus group discussions

Summary

Focus groups were excited about the sample products and the majority had never seen products with these design features before. Interest in products depended on child age, but the potties were very popular in all groups and the reusable diaper covers with cloth inserts received mixed but generally positive responses. The safe squat was considered difficult to use and was not popular in any group. Key design features for the reusable diapers were

waterproof covers and absorbent pads that allowed for infrequent washing and fast drying, and price. Diaper materials were valued for duration of use, and preferences differed for frequent urination (absorbency) versus multiple defecation events (durability). For potties, key features were stability when the child is seated and ease of disposal and cleaning. Participants expressed a low price point for diapers (from 25 US cents to $2.50 USD per diaper) compared to potties (from $2.50 to $7.50).

Several common themes emerged in terms of consumer preferences, including versatility (a product could be used for children continuously as they grow or for both children and the elderly), convenience and time-savings (a product could free the caregiver to do other things and be used in a variety of locations), ease of cleaning, and cost-savings. Participant feedback on design features of specific products is presented in Table 8. A full FGD report including photos is included in annex 1.

Table 8 Focus group discussion theme matrix

Topic	FGD Number				Total (4)
	1	2	3	4	
1. **Reusable diapers**					
a. Save money	X	X	X	X	4
b. Hard to wash	X	X	X	X	4
c. Velcro and snaps good to adjust size	X	X	X		3
d. Diaper rash may be a problem	X		X		2
e. May need to be changed more often	X		X		2
2. Potties					
a. Stable, would not have to hold the child to use	X	X	X	X	4
b. Cover is useful	X		X	X	3
c. Removable pan is useful		X	X		2
d. Easy to clean and carry	X	X		X	3
e. Child might break the plastic			X	X	2
3. Safe squat					
a. Difficult to use		X	X		2
b. Safer for small children than latrine	X		X	X	3
c. Elderly can't use			X	X	2
d. Child could get hurt	X	X			2

Global inventory of children's sanitation products

Overall, products available online internationally fell into the following categories:

- Disposable diapers and reusable cloth diaper inserts and covers
- Potties
- Toilet seats
- Combination products (usually including a potty, removable seat, and convertible step stool)

A complete global inventory is provided in table 1 of annex 2.

Cambodian products

In Phnom Penh, a variety of disposable diapers, potties, and related hygiene products were available in baby-oriented stores and in public markets. Potty designs varied from simple chamber pots to complex toy shapes. Toilet seats and collapsible travel potties were also available. Table 2 of annex 2 includes a complete product list.

Discussion

Explaining hygienic disposal practices

The higher rate of hygienic child faeces disposal among study participants compared to the DHS finding of 20% in Cambodia(18) may be explained by several factors. First, this study was limited to households with an improved sanitation facility, and latrine ownership has been tied to hygienic disposal(12). This study focused on children under-five and older children were more likely to have their faeces disposed of hygienically, although children under-three in the study still had a high rate of hygienic disposal (54.9%). Finally, the study population may have owned their latrines for longer, as study villages were restricted to those with over 80% coverage.

Overall, the youngest caretakers with the youngest children and the newest latrines were least likely to dispose of faeces hygienically, indicating that experience and habit building may influence hygienic disposal and representing a target group for children's sanitation interventions. While households that had owned a latrine for 6-10 years were 24 times more likely to dispose of faeces hygienically, controlling for child age, than households that had owned a latrine for under a year, this association somewhat weakened for households that had owned a latrine for over 10 years. It's possible that these houses felt their latrine was too old, or were accustomed to latrine ownership but had not formed hygienic disposal habits. Households that built a latrine longer ago may have also had unobserved characteristics associated with lower odds of hygienic disposal. Overall, increasing latrine coverage should be a major focus of interventions to enable hygienic children's faeces disposal.

Older mothers were more likely to practice hygienic disposal, though mothers aged 28-37 were most likely to dispose hygienically. Consistency of adult latrine use was also associated with hygienic disposal, which may indicate that adults who prioritize hygienic practice for themselves are more likely to extend this practice to their children. Finally, the presence of children's faeces management tools in a latrine was strongly associated with hygienic disposal. However, this may be a case of association, rather than causation, as those who practice hygienic disposal are more likely to leave a tool in the latrine after disposing. The majority of tools present in latrines were potties, highlighting their particular role in hygienic disposal.

Perceptions and attitudes

The role that perceptions of children's faeces play in influencing hygienic disposal remains unclear. Households attributed a high level of importance to managing children's faeces,

even though there was low awareness of the dirtiness of children's faeces as compared to other types of faeces. This indicates that conceptions of dirtiness may not be required for hygienic disposal, and that conversely the conception that children's faeces are less dirty may facilitate hygienic disposal by increasing willingness to interact with them, or may indicate the reverse effect that with increasing contact required for hygienic disposal, caretakers became accustomed to and less disgusted with handling their children's faeces. This is an important observation, as low awareness of the dirtiness of children's faeces has been reported in other regions(9). The potential impact of this concept on other hygiene practices will need to be further explored.

High levels of disgust and anger at the faeces of neighbours' children being left out may provide social motivation to clean up faeces. This indicates that sanitation norms and values are already present, even if they do not ensure hygienic practice. In addition, nearly all participants were familiar with the health implications of faeces management, often citing "lack of germs" and "avoiding the spread of disease" as reasons to use the latrine. However, research in other countries has shown that motivators for owning and using a latrine are rarely primarily health-related(28) and knowledge of health risks may not be a sufficient motivator for hygienic faeces disposal. Many participants cited avoiding "bad smells" as a primary reason for wanting their child to use the latrine.

Consumer interest and product design

The study results indicate high levels of ownership and interest in products for IYC faeces management in Cambodia among latrine owning households. In general, products were available close to participant's homes and at prices participants were willing to pay, indicating that current market conditions are amenable to hygiene management product sales. Some products, such as shovels and scoops, were valued as multi-purpose tools, while potties were used by multiple household members, including children and adults, and diapers were used exclusively for managing children's faeces. Participant interest in the FGD sample products indicated that there may be interest in tools dedicated to IYC management, but as IYC-specific items (with the exception of disposable and reusable diapers) were not generally available to study participants, the issue will need further exploration.

Product appeal will depend on price and utility - consumables, such as disposable diapers can only be used once, while hardware such as a shovel may represent a high cost but can be used for life, and for a variety of tasks. Age-specific products, such as potties, may have

a shorter period of usefulness to a household unless they are adapted to be used at multiple ages.

Latrines

The increasing rates of children over two using a latrine, and the near universal selection of the latrine as the ideal defecation place for children over two points to positive potential for interventions to increase children's use of latrines. However, satisfaction with faeces current management was high even for those whose children defecated in the yard, indicating that motivating children to use the latrine may require extra effort compared to allowing them to defecate wherever they like.

Barriers to children using the latrine were mainly based on child age and size, and the time a caretaker is required to spend with small children when they begin using latrines. While children under two were the least likely to use the latrine, caretakers felt that a child would not be able to use one without assistance until age five, and not consistently until age seven, with some participants citing ages up to twelve. This implies that even children over age five may experience barriers to consistent latrine use not identified in this study. The Safe Squat(25), a product designed to promote earlier latrine use by reducing barriers to small children using dry pit latrines in Kenya, was not a popular product concept with Cambodian participants as presented in the FGDs. However, further research into product designs such as seats fitted over latrines or behaviour change latrine-training strategies could be implemented to overcome some of the identified barriers to small children using latrines.

Scoops and shovels

The finding that in Cambodia shovels and scoops are much less likely to be used to dispose of faeces in the latrine due to their potential to clog it indicates that safe child faeces disposal interventions promoting scoops(15) may not be appropriate for the Cambodian context. Ideally, a tool should prevent children's faeces from coming into contact with the environment at all, as with a diaper or potty. A scoop or shovel may facilitate hygienic disposal, but was most commonly used to bury faeces in this study, a practice that was not considered hygienic as rains and animals had a high likelihood of uncovering the faeces. However, for households with no latrine, a scoop may serve as a solution to ensure caretakers are not coming into direct contact with faeces and that faeces is removed from the immediate household environment.

Potties and reusable diapers

The results show the potential for potties and reusable diapers to facilitate hygienic disposal in the age groups least likely to have faeces disposed of hygienically, as children under one commonly use diapers and children under two commonly use potties, and these products had the highest likelihood of being used for hygienic faeces disposal, compared to shovels and disposable diapers. The link between potties and hygienic disposal is consistent with other study findings(13).

For potties, participants cited the ease of use, transport, and cleaning, in addition to the time saved, especially at night, as key advantages. The FGDs identified the stable base, back, pan cover, and lightweight, easily cleaned material as key design features. The sample potty features offered time-savings compared to current practice. Participants noted that with the stable sample potties, they could engage in other household tasks while their children used the potty, rather than having to hold and wait with the child. In addition, ease of disposal into the latrine represents energy savings compared to burying faeces. Research in other countries has shown that children may reject potties if mothers try to force them to use them at a young age (under a year) or if they have experiences falling off them(9). The ability of potties to be used at multiple child ages was important to participants, as children often use a potty at night even after they are old enough to use the latrine during the day. Thus, product designs will need to address consumer preferences for use at multiple ages. Given the high rates of safe disposal and high levels of consumer satisfaction for potties, investing in increasing potty uptake and proper use by improving potty designs for the Cambodian market has significant potential to improve hygienic practices.

For the reusable diaper covers with pads, key advantages were the cost-savings, as well as the ease of use, disposal, and cleaning. However, many participants felt it was hard to use, dispose of faeces with, and clean these diapers. In Cambodia a large number of households reported using disposable diapers, in contrast to a relative absence of mention of these products in current research(9). Disposable diapers were highlighted as a time-saving device during the night in the FGDs, and it is probable that ideal faeces management practices for Cambodian households with a latrine will necessitate different products for use at night compared to the day. Disposable diapers can be a hygienic method of managing children's faeces if properly disposed of, through burning or sanitary trash disposal. Disposable diapers were less likely to be hygienically disposed than reusable diapers, and are thus not the ideal primary defecation product. Reusable items could potentially be utilized during the day while consumables such as disposable diapers could be utilized at night.

Compared to the current practice of using disposable diapers, reusable diapers require increased time and energy to wash and dry them. This barrier is partially countered by the cost-savings of reusable diapers, but the price point participants named was still quite low, and the long-term savings of reusable diapers may need to be emphasized in marketing. In addition, reusable diapers are not always washed into the latrine, and the exposure risk of washing them into the yard presents a challenge for improving hygienic practice. Behaviour change messaging around proper wastewater disposal and hand washing promotion could be incorporated into marketing campaigns to increase impact on hygienic practice.

Participants found both the sample potties and reusable diapers to look “new” and “modern”, and a focus on these themes in marketing may facilitate uptake. Participants were aware of varying quality between products, and could cite the price of a high versus low quality diaper or potty. In addition, homemade products such as diapers and scoops had the lowest overall satisfaction rates among consumers, despite sharing similar designs to the market versions, indicating potential consumer preference for market bought products. Thus there may be potential for a high quality product to overcome low price point barriers.

A challenge to increasing hygienic faeces disposal practices will be ensuring consistent hygienic practice in each step (1-6), each of which represents an additional burden of time and energy to caretakers.

Hygiene practices in the faeces management process

Although products have the potential to facilitate hygienic faeces disposal, they also may also increase household contamination through improper cleaning, wastewater disposal, and lack of hand washing. Many caretakers reported cleaning reusable diapers in the yard, representing a potential transmission route through a contaminated environment. Caretakers generally did not mention washing shovels and scoops unless they were “dirty”. Hygienic tool cleaning practices included using basins to wash diapers and brushes to wash potties into latrines. No consumable cleaning items for tools or disinfectants, such as bleach, were identified. Households generally reported washing children in the yard, but the potential risk of contamination from this process is likely much lower, given the smaller quantity of faeces entering the environment.

It is important to note that while all but one household reported washing their hands, many caregivers mentioned that they wash their hands as a part of the child-cleaning process, which does not always involve soap. This finding is in line with findings at the global level(9). More participants reporting using soap for hand washing than for child cleaning. Caregivers

who wash their hands after cleaning the child but before disposing of faeces may not wash them again before moving to another task. Interestingly, several houses reported washing their children with their feet, rather than hands. This practice was often referred to as “traditional” and had been passed down from older generations. This may present an opportunity to promote a traditional hygienic practice. However, this study was not able to collect sufficiently detailed information to paint a complete picture of this cleaning method.

Several studies have demonstrated the importance of access to sufficient quantities of water for the practice of hygienic behaviours, such as hand washing(7). Access to water did not appear to be a barrier for Cambodian study households, as the majority had on site access to piped water. The rate of piped water access in the study was much higher than DHS findings of 12.3% (wet season) and 14.1% (dry season). Villages with high levels of latrine coverage may also have higher levels of piped water coverage. Water quality was not investigated as a part of this study.

Conclusions

The study findings show a strong need for children’s sanitation interventions in Cambodia targeting children under five years of age, and particularly children under two, who are the least likely to use the latrine and the most likely to have their faeces disposed of un-hygienically. Based on these findings, the products in Table 9 have been identified to facilitate the hygienic management of children’s faeces in Cambodia. In this context, hygienic management implies that faeces do not come into contact with the environment; are transported in a device that is likely to be disposed of in the latrine; and are disposed of in an improved sanitation facility. Tools should be easy to clean, and additional tools may be needed to ensure the child can be washed, wastewater disposed of hygienically, and for the caretaker to wash their hands.

Table 9 Faeces management steps and potential tools to facilitate hygienic practice in Cambodia

Step one: defecation site	
Hygienic:	Reusable or disposable diaper, potty, latrine
Unhygienic	Yard, furniture, paper towels
Step two: faeces transport	
Hygienic:	Reusable or disposable diaper, potty
Unhygienic	Hands, leaves
Step three: faeces disposal	
Hygienic:	Latrine (direct, or from potty or reusable diaper) Burned or sanitary garbage disposal (disposable diaper)
Unhygienic	Buried, garbage, left in yard

Step four: cleaning the tools	
Hygienic:	In basin emptied into latrine (ideally using soap or disinfectant)
Unhygienic	In yard, down drain
Step five: cleaning the child	
Hygienic:	Over latrine, in basin emptied into latrine
Unhygienic	In yard, in basin emptied into yard
Step six: hand washing with soap	
Hygienic:	With soap after transport, disposal, and child cleaning
Unhygienic	Not washed at key contact points

Based on these criteria, the promotion of the following tools are recommended for Cambodia:

Table 10 Recommended tools to facilitate hygienic faeces management in Cambodia by child age

Child age	Product/material
0-6 months	Reusable diaper + behaviour change messaging (Disposable diaper for night/travel)
6-12 months	Reusable diapers and/or small potty (Disposable diaper for night/travel)
12-24 months	Potty
36-48 months	Potty and latrine introduction
48-60 months	Latrine (Potty at night)

The following design features are recommended:

Table 11 Recommended design features for child faeces management products in Cambodia

Tool	Ideal age	Design features
Reusable diapers	Birth-6 months/1 year	-Lightweight waterproof fabric cover that can dry quickly -Multiple inserts or inserts made of a durable material -Snaps and/or Velcro to adjust diaper size for multiple child ages -Bright attractive colour that can also disguise stains -Low price-point and focus on the lifetime savings aspect of reusable diapers -Behaviour change messaging on proper disposal of soiled wastewater from diaper washing
Potties	6 months-5 years	-Potty back and wide base to increase stability for children

		-Removable pan for easy cleaning -Pan cover -Lightweight, cleanable, durable material -Handle to facilitate transport to latrine -Exciting colour and design to increase product appeal

The findings of this study reinforce the potential impact of children's sanitation products on the hygienic management and in particular the hygienic disposal of children's faeces in Cambodia.

Limitations & Recommendations

Study limitations

The household survey questions lacked precision, and restrictions on participant's responses were insufficient to gather the ideal level of detailed information on current practices. Many participants answered about practices related to defecation place, method of transport, and disposal place inconsistently, which created errors in the data analysis stage when attempting to directly map associations between various faeces management steps. In some households, entire families participated in the study survey alongside the primary interviewee, which may have influenced what participants reported. In addition, it has been well documented that the use of questionnaires in this type of research may yield biased results, as participants are likely to report practicing "good" behaviours – such as hand washing with soap – more frequently than they actually do, irrespective of actual practices(9). Thus reporting bias is likely to have influenced the results from the household survey. However, as the study was exploratory, these errors are understood to be present and have been considered when looking at the implications of the data.

Because villages were only included if they had over 80% coverage of improved sanitation facilities, they were likely to differ from other villages in Cambodia in terms of incomes and access to markets – most villages with this level of sanitation coverage were located along or near major roads or outside larger towns. In addition, a high number of village chiefs' houses were included in the survey as they expressed interest when the project was introduced to them, and their status may make them distinct from typical Cambodian households in these provinces. Though socio-economic and other factors were not analysed as a part of this study, their impact should be considered when interpreting the significance of the study findings and their generalizability.

This study was specifically targeted at Cambodian households with an improved sanitation facility, and is not generalizable to other contexts, though similar findings have been reported in other regions.

Recommendations

Future implementation in Cambodia

- Conduct a pilot study promoting the use of locally manufactured and marketed potties and diapers on hygienic faeces disposal, targeting children aged 0-36

months. Include behaviour change messaging around hygienic disposal and associated hygiene practices including wastewater disposal and hand washing.

- Assess the potential of products to overcome the barriers identified in this study, including low price points, short duration of product suitability by age, consistent use of products without use of alternate sites, and associated hygiene behaviours.

- Continue market-based efforts to expand latrine coverage to reach 100% of Cambodian households, targeting the poorest and most vulnerable.

- Target first time mothers and new latrine owners with education on safe IYC faeces disposal using child-friendly potties and diapers.

Further research in Cambodia

- Explore potential intermediate hygienic solutions for households without access to a latrine.

- Explore the feasibility of developing a product that can be used by both young children and the elderly.

- Explore in greater detail the interplay and timing of faeces disposal, child cleaning, and hand washing and identify potential target points for behavioural interventions.

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Annexes

Annex 1: Complete findings from the focus group discussions

Diapers:

Advantages:

All four focus groups noted that using the sample diapers would be cheaper than using disposable diapers, as they could be reused and are long lasting. Three focus groups liked the Velcro and snap design features for adjusting the size as children grow, allowing them to be used for longer. Two groups thought these diapers would be good for travel, though other groups expressed concern that diapers would need to be changed more frequently than disposable diapers. Several groups mentioned that the sample diapers would be for preferable older children, not for infants, and could be used up to five years old at night, though other groups mentioned that they thought the diapers could be used from birth or age two weeks onward. One group noted that using reusable diapers would be easier than digging, which they had to do to dispose of disposable diapers.

Disadvantages:

All four focus groups expressed a great deal of concern about the time and effort needed to wash the sample diapers. Two groups expressed concern about how long it would take the heavier fabric to dry. Participants felt that the removable insert would dirty

quickly – one group decided the diapers could only ever be used for urination and not defecation, because the pad would dirty. Other groups stated that they would throw away the pad after a few uses, or that they would want to buy a diaper that came with many pads. While some groups expressed concern that they could not leave the sample diapers on all night (as they do with disposable diapers), others saw them as being ideal for night use. Several groups noted they might need to change the diapers more often. Diaper rash was a major concern for two groups, one of which stated that they buy diapers based on which will not give their child a rash, and stick with that brand.

Design recommendations:

Future diaper designs should consider using lighter weight waterproof fabric that can dry quickly, and providing many inserts or inserts made of a different material for inside the diaper. Although participants seemed attracted to the affordability aspect of the sample diapers, they still named a low price point in terms of willingness to pay for reusable diapers. Future sales efforts may need to focus on the lifetime savings aspect of reusable diapers. Additionally, if reusable diapers are to be promoted as a hygienic means of managing small children's faeces, attention will need to be paid to training regarding hygienic cleaning of the diapers and proper disposal of soiled wastewater from diaper washing.

Potties:

Advantages:

Participants were generally the most excited about the potties. The most popular design feature was the improved stability of the sample potties over their current potties. All four groups liked the back and mentioned that they would not have to hold their child while they used a potty with a back, allowing them to do other things while their child defecated. Some groups liked the arm feature, but others found it unfamiliar and thought it might break. Three of the groups mentioned that it would be easy to carry the potties to the latrine and clean them. Three groups mentioned that they liked the cover for the potty – though one group mentioned that this would allow them to delay disposal if they were busy, which might increase un-hygienic practices. The removable pan feature seemed well received but was not of central importance to any group.

Disadvantages:

Two groups thought the plastic potties might break, especially if children played with them. One group mentioned the potties would need to be stored out of children's reach so that they would not play with them. However, another group though that it would appeal to their child to defecate on the potty if they were entertained by it.

Design recommendations:

In general, the back, stable base and cover for the pan appeared to be the key features, as well as the lightweight aspect and ease of faeces disposal and cleaning. One participant mentioned that a simple handle would be nice for transporting the potty. A simple plastic design incorporating these features at a low price is recommended for trial. Other materials could be explored to increase durability. Overall, participants seemed excited to purchase these kinds of potties and often asked to purchase the samples. The price point for the potties was higher than that for diapers.

Safe squat:

Advantages:

Three groups felt the squat would be safer to use than the latrine for very small children, as the hole was smaller and the child would not fall into it. They noted that only children who could walk would be able to use it. One group liked the wooden material, but groups found it either too light (child could move it) or too heavy.

Disadvantages:

Generally, the safe squat was poorly received by all four groups. Most felt that it offered few real advantages – once a child was big enough to use it, they were almost ready to use the latrine anyway. In addition, though it was safer to have a small hole, many participants worried the children would hurt themselves using it. One group felt the wood was a good material, but should be heavy so children cannot move it, while another group suggested using plastic instead for ease of cleaning. Two groups noted that it could not be used by the elderly. Stability was also an issue for the squat – participants felt children would not be able to use it without arms or another feature to hold, though some said children could hold onto the handles. Another disadvantage that set it apart from the potties in the eyes of the participants was that it might be cumbersome to move, and by the time it was positioned over the latrine for a child to use, the child might have defecated already, indicating that portability and convenience are key for consumers.

Design recommendations:

The safe squat was not a popular item, and participants in all groups engaged less with the squat than with any other item. Few touched it or tried to pick it up. It seemed participants felt it would be as difficult or more difficult to use than current methods and offered no real advantage. Redesigning the squat to be made of a lightweight, easily transported, and easily cleaned material and incorporating a balance feature that could be utilized by children and the elderly could decrease barriers to use, but marketing this product would be difficult.

Overall, groups felt the sample products looked “modern” or like they were for “rich kids” – all had the appeal of the new and were well received as attractive and “comfortable”. Price points were low for all sample products, and varied from 25 cents to 2.50 USD for diapers and 2.50 to 7.50 USD for potties.

Annex 2: Faeces management and disposal tools: a global inventory

Developed countries (USA and UK)

An online web and image search for terms including “potties”, “toilet training”, “children’s toilet” and “diapers” identified hundreds of products for children’s bathroom needs. Most products were identified on the websites of large retailers, including Amazon, Walmart, Target, and Toys R Us. Smaller, baby oriented and organic business websites were also utilized through targeted searches. Finally, websites compiling baby recommendations were analyzed for product recommendations. Overall, available products fell into the following categories:

- Diapers and nappies
- Potties
- Toilet seats
- Combination products (usually including a potty, removable seat, and convertible step stool)

Diapers and nappies:
Diapers on the market are either disposable or reusable. Reusable, cloth diapers are available on many green baby websites as organic products. Disposable diapers can be purchased in bulk (150-190) for around $50. Reusable cloth diapers are available in packs of 5-10 for about $15.

Potties:
Available potties generally share a similar design consisting of a plastic pot under a plastic toilet seat. Potties vary by seat backing, color, overall shape, and branding. More technologically advanced potties incorporate ipad holders, music, or personalized audio settings. In addition, “travel potties” are collapsible, portable versions of the above products. Prices vary from $3 (Ikea) to $90 (FisherPrice). Advertisements for these potties generally promoted the attractiveness and child appeal of the potties and ease of transportation and cleaning. Biodegradable potties are available from Beco.

Toilet seats:
Toilet seats are smaller, plastic rings or seats that fit over or fix onto a traditional adult indoor toilet. Seats vary by color, branding, and texture (hard or soft). Several “folding travel seats” are also on offer. Prices varied from $9 (Mommy’s Helper) to $36 (Prince Lionheart). More complex children’s toilet seats are also available, many of which include hardware such as legs and steps, at higher prices ($26-$60). Additional accessories on offer include hooks that attach to the side of a traditional toilet and hold a ring or seat for storage purposes.

Combination products:

The majority of products available feature some type of convertible, combination feature. Combinations generally include a potty with a removable seat that can be placed over a traditional indoor toilet and a base that can be converted to a step stool. Many products exist that combine any two of these elements separately. Prices vary from $7 (Pottete) to $44 (PRI). Many combos could also be converted into travel sets. Several combos came with potty-training materials.

Other products:
A variety of related products are also on the market dealing with infant hygiene and potty training. There is a diverse array of products targeting boys, including training urinals. There are also many brands of potty liners, both disposable and reusable. Potty-training products include dolls, books, apps and kits. Other related products included a hand washing extender, which could be placed on a normal faucet to facilitate hand washing by younger children. Various types of potty training pants with removable backs are also available. Hygiene products include an array of wipes, soaps, and cleaning products, all available as organic products as well.

Developing countries (Tanzania, Peru, and Cambodia)

An internet content and image search of the same terms listed above with the addition of "Africa" "Southeast Asia" "Latin America" did not reveal many distinct products. Searches targeting specific countries were more successful, and Peru, Tanzania and Cambodia were searched in detail to provide examples (the Peru search was conducted in Spanish). A short literature review of scholarly articles related to "child faeces management and disposal" revealed further products used in hygiene trials or identified through related research. Finally, a field-based search for available products was conducted in markets around Phnom Penh, Cambodia.

Overall, it appears that similar products, including diapers and potties, are available for purchase from online companies in Tanzania, Peru, and Cambodia. However, the cost of these items is likely well above the cost that poorer residents would be able to afford. It was difficult to identify the full range of products available at the community level through online, rather than field-based research.

Tanzania
In Tanzania the website Kaymu.com sells disposable diapers, potties, and reusable diapers. Products ranged in price from $8.50 (disposable diapers) to $34 (potties). The per capita GDP in Tanzania is about $608 per year. No other specific websites were identified.

Peru
A variety of products can be ordered online in Peru, including seats, potties, and diapers. Prices range from about $7-60 (for a seat and potty, respectively). Several online merchants and resale sites exist to market these products. The GDP per

capita in Peru is higher, at $6,573, but a great deal of diversity of incomes exists within the country.

Cambodia
Products available online in Cambodia primarily include diapers. Both Kaunmac.com and Baby Shop offer diapers, though prices were only available for bulk purchases ($35-50). 122 shops are listed online in the Cambodian Yellow Pages for children and kids, predominantly in Phnom Penh. Specific products and prices could not be identified online. The GDP per capita in Cambodia is $946.

In Phnom Penh, a variety of potties were available in baby-oriented stores and in the public markets. Designs varied from simple chamber pot type potties made of metal or plastic to more complex plastic potties, some in toy shape and featuring a variety of patterns and accessories. Most complex potties featured a removable pan for easy disposal. Toilet seats and collapsible travel potties were also available. Prices for potties varied from less than $1 to over $20 for the various designs. A sample of products available in Cambodian markets is available in table 2.

The scientific literature on infant and young child for faeces disposal identified a variety of tools currently used in this process, including diapers, potties, and adult latrines. Mother's clothing was also frequently identified as the site or tool utilized for infant defecation or cleaning. Sanitation related tools also include shovels and scoops or leaves and sticks for transporting faeces, leaves for cleaning potties, and corners of diapers, clothes, or other cloth for wiping the baby.

Scientific literature tool inventory

Diapers
Diapers were indicated as the main disposal product in Peru (in children under 1.5), Burkina Faso (in children under 1 or under 6 months), Bangladesh (in children under 6 months) and in Nigeria, the Philippines, Sri Lanka, and Nicaragua (unspecified age groups). Diapers are generally cloth, and are washed, dried and reused by the mother or primary caretaker. The burden of time and unpleasantness of this task were cited in several studies.

Potties
Children's potties identified in the literature had less diversity of style and branding than those identified in developed country markets. Most potties were simple buckets or plastic designs. In Bangladesh, horse, duck, and other brightly colored potties have been developed.

Adult latrines

Latrines were cited as the defecation location for many children over the age of three. Few details were provided and no children's seats were mentioned.

Sanitation tools
Transport:
Many studies noted that leaves and grass were used to transport faeces deposited in the household or yard to the final disposal site. In Bangladesh, a mini-hoe was developed and marketed to assist in this process.

Cleaning the child:
Tools mentioned for cleaning the baby after defecation included leaves, soft paper, the edges of diapers, and the mother's clothing.

Gil et al. provided the following breakdown of technologies used by age in the studies included in their literature review:

Practice/Region/ Country	Age (in months)
Diapers	
Africa: Burkina Faso	2-36 < 36 <6
Asia: Philippines	<24
Latin America: Mexico	<24 24-60 <24 <12 12-23
Nicaragua Peru	24-35
Potties	2-36 0-35 6-36 m < 36
Africa: Burkina Faso	< 36
Asia: Philippines	< 24
Latin America: Mexico Peru	<24 24-60 < 12 12-23 24-35 > 36
Household´s soil area	2-36 0- 35 < 36 < 60
Africa : Burkina Faso Nigeria 15	
Asia :Bangladesh Indonesia Philippines Sri Lanka	6-23 < 12 < 24 < 60
Latin America: Mexico Peru	< 24 24-60 < 36 m < 12 12-23 24-35
Latrines	6-23 24-60
Africa: Indonesia Nigeria	
Asia: Sri Lanka	< 60
Latin America: Mexico Peru	< 24 24-60 < 12 12-23 24-35 > 36
Rivers	6-23
Asia: Indonesia	
Outside/Bushes/Fields	< 36
Africa: Burkina Faso	
Nigeria	24-60
Latin America: Peru	<12 12-23 24-35 > 36
Backyard	2-36
Africa: Burkina Faso	
Asia: Indonesia	<36
Latin America: Peru	<12 12-23 24-35 > 36

Categorizing products by child age and sanitation step

Formative research conducted in Cambodia on infant and young child faeces disposal practices revealed that most caregivers have different product preferences at different ages for their children, beginning with diapers for the youngest children, followed by potties and eventually by direct use of the latrine. However, consistency of use of these products was not 100%. For instance, many children using a latrine might continue to use a potty at night or a diaper when they had diarrhoea. Many adults own potties for use at night.

Additional tools were identified when considering the entire process of defecation and disposal. From a hygiene perspective, the key steps in this faeces management process include faeces defecation place, faeces transport (to the latrine or other disposal place), faeces disposal (in the latrine or other location) washing the tools, cleaning the child, and hand washing.

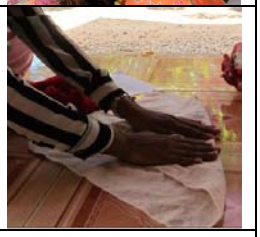
Products identified for faeces transport included a number of shovels used to collect and bury or otherwise remove faeces, including flat shovels, scooped shovels, plastic bans with brooms, and homemade scoop; plastic bags or pieces or cardboard used to move faeces to alternate sites; diapers to move faeces to be buried, burned, or thrown away; baskets, buckets, and pots used to temporarily store used diapers, and potties typically used to transport faeces to the latrine. Faeces disposal tools were similar to the above, in addition to water and brushes used to rinse out potties into the latrine. No tools for washing tools were identified. Tools for cleaning the child included hands and feet, as well as large basins in which small children could be washed and water disposed in a latrine or elsewhere. Hand washing tools were identified in a previous WaterSHED study and are included in the Cambodian product inventory (table 2).

Table 1: Selection of Global Products

Name	Detail	Cost	Source	Image
	Summary	**USD**	**Web address**	
Developed/USA				
Seats				
Arm and Hammer Potty Seat	Comes in assorted colors, includes deodorizing disc, contoured shape for child, non-skid material	12.99	http://www.amazon.com/Arm-Hammer-Secure-Comfort-Colors/dp/B00674S1Y0	
Potties				
Summer infant Lil Poo Potty	Pot section is removable. Available in raspberry, teal, white and pink. Splash guard and back.	10.99	www.amazon.com/Summer-Infant-Lil-Potty-White/dp/B00A0ID90A	
Combos				
Fisher Price Ducky Fun 3-in-1 Potty	Includes potty, removable seat, and converts into stepstool. Removable legs. Musical system.	27.99	http://www.amazon.com/Fisher-Price-Ducky-Fun-3-in-1-Potty/dp/B003G2YUTG	
Diapers				
Pampers cruisers	152 disposable diapers. Absorbent. Available plain or in designs. Multiple sizes.	51.86	http://www.amazon.com/Pampers-Cruisers-Diapers-Economy-Count/dp/B00DDMITQ4/ref=sr_1_1?s=baby-products&ie=UTF8&qid=1398090766&sr=1-1	
Hygiene				
Pampers sensitive baby wipes	9 packs of 63 wipes. Contain aloe and chamomile.		http://www.amazon.co.uk/Pampers-Sensitive-Baby-Wipes-Packs/dp/B003P2UU6Y	
Developing (tools from research)				

Sani-scoop mini hoe	Small shovel adapted for use in clearing children's faeces. Sharp edge with curved sides to prevent faeces from sliding off. Long, light handle to avoid exposure to smell and provide ease in lifting and carrying.		Bangladesh, ICDDR' B	
Potty	Horse and duck shaped, brightly colored plastic potties. Ears can be utilized for balance.		Bangladesh ICDDR' B	
Peepoo bags	Single-use disposable toilet bag lined with urea to facilitate safe decomposition in the soil	3 US Cents	Available in various urban slums and other target areas through Peepoople	
Tanzania				
Kraft fantastic potty	Unisex, for birth-24 months	36.72 (60,000 TZS)	http://tz.kaymu.com/kraft-fantastic-potty-31414.html	
Peru				
Bacin Froggy Precious Planet Fisher Price Para Niño Bebes	Fisher Price frog design potty. Plastic, basin, no back. Removable pot.	28.83 (80 soles)	http://articulo.mercadolibre.com.pe/MPE-408807657-bacin-froggy-precious-planet-fisher-price-para-nino-bebes-_JM	
Cambodia				
Huggies	Huggies diapers	Unknown	http://www.babycarecambodia.com/?p=product	

Table 2: Cambodian Product Inventory

Name	Detail	Cost	Source	Image
	Summary	**USD**	**Location sold**	
Safe disposal products				
Diapers				
	Huggies disposable diapers		Field	
	Disposable diapers		Field	
	Cloth square folded into a diaper		Field	
Seats				
	Collapsible travel seat			 
	Cushioned seat			

	Seat with insert for trash bag			
Potties				
	Potty with removable tray		Phnom Penh store	
	Potty with removable tray	14.50 USD	Phnom Penh store	
	Potty with removable tray	9.50 USD	Phnom Penh store	
	Potty with removable tray		Phnom Penh store	
	Potty with removable tray		Phnom Penh store	
	Potty with removable tray		Phnom Penh store	

	Potty with removable tray		Phnom Penh store	
	Potty with removable tray		Phnom Penh store	
	Potty with removable tray		Phnom Penh store	
	Animal themed potty with ears for grip		Phnom Penh store	
	Convertible step stool, potty, and seat		Phnom Penh store	
Other				
	Chamber pots	1-4 USD	Phnom Penh market	
	Adapted seat for latrines			
	Adapted seat for the elderly with chamber pot	20-50 USD	Phnom Penh store	

Safe squat	Adapted latrine seat for children		Piloted in Kenya	 Figure 3 Design used for research in 2012
	Adapted latrine seat for children		Modified for field testing in Cambodia	
Faeces transport products				
	Small straight shovel with curved end		Field	
	Wide flat shovel		Field	
	Metal dust pan		Field	

	Flat 90 angle shovel		Field	
	Plastic scoop made from oil container, broom		Field	
	Plastic dust pan, brush		Field	
Child cleaning products				
	Wet wipes			
	Paper towels			
	Basin for washing child		Field	
	Basin for washing diapers		Field	

Hand washing products: please see appendix L, "Assessment of household handwashing practices and enabling equipment options in Cambodia" Aprajita Anand and Marion Jenkins, UNC-WaterSHED Asia

HHID # _____

Water SHED
Water, Sanitation & Hygiene Enterprise Development

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

[Respondent must be an adult (18+) member of the household who is the primary caregiver of a young child (<5). Interviewers should spend a few minutes building rapport with the respondent.]

A. Interview Identification

No	Question	Coding
1	HHID number	
2	Province name and code	
3	Commune name and code	
4	Village name and code	
5	Date of Interview	dd ___ ___, mm ___ ___, 2014 Start time: …… End time: ……
6	Interviewer name	
7	Supervisor	
8	Checked by	

B. Respondent Information

No	IDE #	Question	Coding
9		Do you have a latrine that you use?	1. Yes ☐ 2. No ☐
10		What is your age?	_____ years
11		What is the gender of the respondent? *[Please answer by observation only.]*	1. Male ☐ 2. Female ☐
12		What is your occupation? *[Don't read them the options]*	1. Professional/Technical ☐ 2. Factory worker ☐ 3. Day labourer ☐ 4. Civil service ☐ 5. Salaried Service/Sales/Commercial ☐ 6. Agricultural ☐ 7. Student ☐ 8. None 9. Other ☐ specify _____
13		What level of schooling did you achieve? *[Don't read them the options]*	1. None ☐ 2. Pre-school/ Kindergarten ☐ 3. Some Primary ☐ 4. Finished Primary ☐ 5. Some Secondary ☐ 6. Finished Secondary ☐ 7. Higher ☐
14		What is your relationship to the head of the household? *[Don't read them the options]*	1. Self ☐ 2. Spouse ☐ 3. Son/daughter ☐ 4. Other ☐ specify _____
15		What is the gender of the head of household? *[Don't read them the options]*	1. Male ☐ 2. Female ☐ 3. Both ☐
16		What is the occupation of the head of the household? *[Don't read them the options] [Check all that apply]*	1. Professional/Technical ☐ 2. Factory worker ☐ 3. Day labourer ☐ 4. Civil service ☐ 5. Salaried Service/Sales/Commercial ☐ 6. Agricultural ☐ 7. Student ☐ 8. Other ☐ specify _____
17		How many total people over the age of five (have passed their fifth birthday) live (eat and sleep) in this house?	_____
18		How many people under five (have not yet passed their fifth birthday) live (eat and sleep) in this house?	_____
19		What was the main (biggest) source of your cash income of all your family members in the last 12 months? *[Read all options. Check only 1.]*	1. Selling rice ☐ 2. Selling non-rice crop ☐ 3. Selling animal product ☐ 4. Fishing ☐ 5. Farm labour ☐ 6. Business/trading ☐ 7. Salary (gov't/factory/other) ☐ 8. Gift from others ☐ 9. Other ☐ specify _____

C. Water Access

20		What is the main **wet** season source of water used for members of your household?	1=Piped water into dwelling ☐ 2=Piped water to yard/plot ☐ 3=Public tap/standpipe ☐ 4=Tubewell/borehole ☐ 5=Protected dug well ☐ 6=Unprotected dug well ☐ 7=Protected spring ☐ 8=Unprotected spring ☐ 9=Rainwater collection ☐ 10=Improved rainwater collection ☐ 11=Bottled water ☐ 12=Cart with small tank/drum ☐ 13=Tanker-truck ☐ 14=Surface water (river, dam, lake, pond, stream, canal, irrigation channels) ☐ 15=Other ☐ specify _____
21		In the wet season how long does it take to go to the main source, get water, and come back?	1. On site ☐ 2. Delivered to home ☐ 3. Offsite ☐_____minutes 4. Don't know ☐
22		In the wet season how much do you pay for water from the main source?	In amount paid per day in Riel _____ R / d 1. Don't pay for drinking water ☐ 2. Don't' know ☐
23		What is the main **dry** season source of water used for members of your household?	1=Piped water into dwelling ☐ 2=Piped water to yard/plot ☐ 3=Public tap/standpipe ☐ 4=Tubewell/borehole ☐ 5=Protected dug well ☐ 6=Unprotected dug well ☐ 7=Protected spring ☐ 8=Unprotected spring ☐ 9=Rainwater collection ☐ 10=Improved rainwater collection ☐ 11=Bottled water ☐ 12=Cart with small tank/drum ☐ 13=Tanker-truck ☐ 14=Surface water (river, dam, lake, pond, stream, canal, irrigation channels) ☐ 15=Other ☐ specify
24		In the dry season, how long does it take to go to the main source, get water, and come back?	1. On site ☐ 2. Delivered to home ☐ 3. Offsite ☐_____minutes 4. Don't know ☐
25		In the dry season, how much do you pay for water from the main source?	In amount paid per day in Riel _____ R / d 1. Don't pay for water ☐ 2. Don't know ☐
26		How do you treat your drinking water? *[Read all options, check all that apply.]*	1. Boil ☐ 2. Add bleach/chlorine ☐ (mark product type) 3. Strain it through a cloth ☐ 4. Use a ceramic water filter ☐ (mark model) 5. Use a sand filter ☐ (mark if BioSand) 6. Solar disinfection ☐ 7. Let it stand and settle ☐ 8. Don't know ☐ 9. Don't treat ☐ 10. Other ☐ specify _____
27		Does the house have storage jugs for water?	1. Yes ☐ 2. No ☐

28		If yes, how many?	_____ jars

HHID # _____

D. Roster of Children Under 5

"Now I would like to ask you about each child under five that lives in this house. Starting with the youngest child, can you tell me…?"

[Complete questions 1-6 for each child. Select one child who "always/sometimes" uses the latrine and one child who "rarely/never" uses the latrine for whom the respondent is the primary caregiver and complete all questions for each child. Please refer to each child by name as you go through the questions.]

Roster of Children Under Five

No.	Question	Child 01	Child 02	Child 03	Child 04	Child 05
1	**Child ID**					
2	Name of child					
3	Age of child (months)					
4	Gender of child	1. Male ☐ 2. Female ☐	1. Male ☐ 2. Female ☐	1. Male ☐ 2. Female ☐	1. Male ☐ 2. Female ☐	1. Male ☐ 2. Female ☐
5	Are you the primary caregiver for this child?	1. Yes ☐ 2. No ☐	1. Yes ☐ 2. No ☐	1. Yes ☐ 2. No ☐	1. Yes ☐ 2. No ☐	1. Yes ☐ 2. No ☐
6	How often does this child use the latrine?	1. Always ☐ 2: Sometimes ☐ 3. Rarely ☐ 4: Never ☐	1. Always ☐ 2: Sometimes ☐ 3. Rarely ☐ 4: Never ☐	1. Always ☐ 2: Sometimes ☐ 3. Rarely ☐ 4: Never ☐	1. Always ☐ 2: Sometimes ☐ 3. Rarely ☐ 4: Never ☐	1. Always ☐ 2: Sometimes ☐ 3. Rarely ☐ 4: Never ☐

No.		Question	Child 01	Child 02
1		**Child ID**		
2		Name of child		
7		What is your relationship to *[child]*? *[Don't read them the options]* *[If not parent read question 6, otherwise skip to 7]*	1. Parent ☐ 2. Grandparent ☐ 3. Aunt/Uncle ☐ 4. Sibling ☐ 5. Other ☐ specify _____	1. Parent ☐ 2. Grandparent ☐ 3. Aunt/Uncle ☐ 4. Sibling ☐ 5. Other ☐ specify _____
8		Do the *[child]*'s parents live in this house?	1. Yes ☐ 2. No ☐	1. Yes ☐ 2. No ☐
9		Who is the main person responsible for helping *[child]* defecate? *[Don't read them the options]*	1. Child's Mother ☐ 2. Child's Father ☐ 3. Child's Grandmother ☐ 4. Child's Grandfather ☐ 5. Child's Sibling ☐ what age _____ 6. Other ☐ specify _____	1. Child's Mother ☐ 2. Child's Father ☐ 3. Child's Grandmother ☐ 4. Child's Grandfather ☐ 5. Child's Sibling ☐ what age _____ 6. Other ☐ specify _____
10		When this person is absent, who is responsible for helping *[child]*	1. Child's Mother ☐ 2. Child's Father ☐ 3. Child's Grandmother ☐ 4. Child's Grandfather ☐ 5. Child's Sibling ☐ what age	1. Child's Mother ☐ 2. Child's Father ☐ 3. Child's Grandmother ☐ 4. Child's Grandfather ☐ 5. Child's Sibling ☐ what

		defecate? *[Don't read them the options]*	_____ 6. Other ☐ specify _____	age _____ 6. Other ☐ specify
11	PLACE OF DEFECATION	Now, I'd like to ask you some questions about the place *[child]* defecates. What is the usual place *[child]* defecates at home? *[Don't read them the options]*	1. Latrine ☐ 2. Potty ☐ 3. Yard ☐ 4. Diaper/cloth ☐ 5. Other ☐ (specify)_____	1. Latrine ☐ 2. Potty ☐ 3. Yard ☐ 4. Diaper/cloth ☐ 5. Other ☐ (specify)_____
12	PLACE OF DEFECATION	Does *[child]* ever defecate anywhere else? *[Don't read them the options]*	1. Latrine ☐ 2. Potty ☐ 3. Yard ☐ 4. Diaper/cloth ☐ 5. Other ☐ (specify)_____	1. Latrine ☐ 2. Potty ☐ 3. Yard ☐ 4. Diaper/cloth ☐ 5. Other ☐ (specify)_____
13	PLACE OF DEFECATION	What is the ideal place you would like *[child]* to defecate?		
14	PLACE OF DEFECATION	Why is this the ideal place you would like *[child]* to defecate?		
15	TRANSPORT	Thank you. Now, I'd like to ask you some questions about moving *[child]*'s feces. When *[child]* defecates somewhere other than a latrine, what do you do with the feces? *[Don't read them the options]* *[If "Move them," continue to 16-19. If otherwise, skip to 20.]*	1. Move them ☐ 2. Leave them ☐ 3. Other ☐ Specify _____	1. Move them ☐ 2. Leave them ☐ 3. Other ☐ Specify _____
16	TRANSPORT	When *[child]* defecates somewhere other than a latrine, how do you move the feces?	1. Hands ☐ 2. Leaves/grass ☐ 3. Cloth ☐ 4. Tool ☐ Specify _____ 5. Other ☐ specify _____	1. Hands ☐ 2. Leaves/grass ☐ 3. Cloth ☐ 4. Tool ☐ Specify _____ 5. Other ☐ specify _____

		[Don't read them the options]		
17	TRANSPORT	How satisfied are you with your means of moving *[child]*'s feces?	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐
18	TRANSPORT	Why are you *[satisfied/ dissatisfied]* with your means of moving *[child]*'s feces? *[Please prompt: are there any other reasons?]*		
19		When *[child]* defecates somewhere other than a latrine, after you move the feces, what do you do at the defecation site?	1. Nothing ☐ 2. Cover with dirt ☐ 3. Wash with water ☐ 4. Other ☐ specify _____	1. Nothing ☐ 2. Cover with dirt ☐ 3. Wash with water ☐ 4. Other ☐ specify _____
20	FECES DISPOSAL	Thank you. Now I'd like to ask you some questions about the place you dispose of *[child]*'s feces. Where are *[child]*'s feces usually disposed of?	1. Child used toilet or latrine ☐ 2. Put/rinsed into toilet or latrine ☐ 3. Put/rinsed into drain or ditch ☐ 4. Thrown into garage ☐ 5. Buried ☐ 6. Left in the open ☐ 7. Other (specify) ☐	1. Child used toilet or latrine ☐ 2. Put/rinsed into toilet or latrine ☐ 3. Put/rinsed into drain or ditch ☐ 4. Thrown into garage ☐ 5. Buried ☐ 6. Left in the open ☐ 7. Other (specify) ☐
21	FECES DISPOSAL	Are they ever disposed of anywhere else?	1. Child used toilet or latrine ☐ 2. Put/rinsed into toilet or latrine ☐ 3. Put/rinsed into drain or ditch ☐ 4. Thrown into garage ☐ 5. Buried ☐ 6. Left in the open ☐ 7. Other (specify) ☐	1. Child used toilet or latrine ☐ 2. Put/rinsed into toilet or latrine ☐ 3. Put/rinsed into drain or ditch ☐ 4. Thrown into garage ☐ 5. Buried ☐ 6. Left in the open ☐ 7. Other (specify) ☐

E. Latrine Use & Children's Defecation

No	IDE #	Question	Coding
29		Does your latrine belong to you?	1. Yes ☐ 2. No ☐ specify to whom _____
30		How long has your house owned a latrine?	_____ years
31		Is your latrine in working order? If not, what is wrong with it?	1. Yes ☐ 2. No ☐ explain_____ _____ _____
32		How satisfied are you with your latrine?	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐
33		Why are you satisfied or dissatisfied with your latrine? *[Please prompt: Is there any other reason?]*	
34		In general, how often do adults in this household use the latrine to defecate?	1. Always ☐ 2. Sometimes ☐ 3. Rarely ☐ 4. Never ☐
35	NEW	Please rank the following according to how dirty you think they are: mud/dirt, adult feces, animal feces, children's feces. *[Please write the numbers 1-4 with 1 being most dirty.]*	____ Mud dirt ____Adult feces ____Animal feces ____Children's feces
36	NEW	How would you feel if your neighbor always left their child's feces in the yard? *[Prompt: why?]*	
37	NEW	Compared to your other household responsibilities, how important is managing your children's feces?	1. The same ☐ 2. Managing feces is more important ☐ 3. Managing feces is less important ☐ 4. Don't know ☐
38	NEW	Why?	
39		Now I'd like to ask you some questions about your children and using the latrine. You mentioned earlier that some of your children don't always use the latrine. Why do your children not (always) use the latrine? *[Don't read them the options]* *[Prompt for any other reason; mark all that apply.]*	1. Could fall in ☐ 2. Too small ☐ 3. Could hurt themselves ☐ 4. Could dirty the latrine ☐ 5. Could get sick because of flies/smells ☐ 6. Too difficult to teach them to use it ☐ 7. Caregiver too busy to help them ☐ 8. Tradition of open defecation ☐ 9. No need to contain children's feces ☐ 10. Don't know ☐ 11. Always use ☐ 12. Other ☐ specify_____

40		When he/she starts to use the latrine, what challenges do you anticipate? **OR:** When he/she started to use the latrine, what challenges did you experience? *[Don't read them the options]* *[Prompt for any other reason; mark all that apply.]*	1. Child afraid ☐ 2. Latrine pan too big for child to use ☐ 3. Latrine pan slippery ☐ 4. Requires a lot of time to wait with child ☐ 5. Difficult to clean child afterward ☐ 6. No challenges ☐ 7. Other ☐ specify _____
41		At what age do you anticipate he/she will be able to use the latrine on his/her own (without assistance from a caregiver)? **OR:** At what age was he/she able to use the latrine on his/her own (without assistance from caregiver)?	_____ months
42		At what age will he/she be able to use the latrine consistently (every time)?	_____ months
43		What help do your children need when they use the latrine?	
44		When your children defecate somewhere other than a latrine, how quickly do you move the feces after defecation?	1. Immediately ☐ 2. Later ☐ specify ____hours ____minutes
45		When your children defecate somewhere other than a latrine, what could prevent you from moving the feces immediately? *[Do not read them the answers.]*	1. Too busy ☐ 2. Unaware child had pooped ☐ 3. Not at home at time of defecation 4. Nothing always move ☐ 5. Other ☐ specify _____
46		*[For those who dispose of feces **in a latrine**, complete questions 47-48. Otherwise, skip to 49.]* Now I'd like to ask you a little more about where you dispose of your children's feces. You mentioned earlier that you dispose of your children's feces in the latrine. In your opinion, what are the advantages of using the latrine to dispose of children's feces?	
47		If you did not have a latrine, where would you dispose of children's feces?	
48		How would you feel using this disposal place?	
49		*[For those who do **not** dispose of feces in a latrine complete questions 49-52. Otherwise, skip to 57.]* You mentioned earlier you dispose of your children's feces somewhere other than a latrine. How satisfied are you with the feces disposal site you use?	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐
50		What do you like or dislike about this place?	

51		Why do you not dispose of children's feces in the latrine? *[Please prompt for reasons: is there any other reason?]*	
52		What would make it easier to dispose of feces in the latrine?	
53		Are you satisfied with your current methods of managing the defecation of children under 5?	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐
54		Why are you *[satisfied/dissatisfied]* with your current method of managing small children's defecation? *[Please prompt]*	
55		If you could do something differently when collecting and disposing of your child's feces, what would you do? *[Please prompt]*	
56	NEW	What materials or products would you need to do that?	
57	NEW	Thank you. Now I would like to ask you some questions about cleaning up after your child defecates. Do you clean your child after he/she defecates? *[If No, skip to 62. If Yes, continue with 58-61.]*	1. Yes ☐ 2. No ☐
58	NEW	If yes, when do you clean your child?	1. After defecation ☐ 2. After disposal ☐ 3. Later ☐ 4. Other ☐Specify _____
59	NEW	If yes, what do you do with the water you use to wash your child?	1. Thrown in yard ☐ 2. Washed down latrine ☐ 3. Other ☐ specify _____
60	NEW	Do you wash your hands during this process?	1. Yes ☐ 2. No ☐
61	NEW	If yes, when? *[Don't read the options]*	1. After cleaning child ☐ 2. After moving feces ☐ 3. After disposing of feces ☐ 4. Other ☐ Specify _____
62		What do you do in your household to prevent children from getting diarrhea? *[Do NOT read options; check all that apply.]*	1. Pray/make offerings to spirits/ancestors ☐ 2. Use a latrine ☐ 3. Cook food properly/eat soon after cooking ☐ 4. Be careful about what kinds of food you eat ☐ 5. Boil drinking water ☐ 6. Wash vegetables with clean water ☐ 7. Make formula with clean water ☐

			8. Wash hands with soap after defecation ☐ 9. Wash hands with soap before preparing food/eating ☐ 10. Wash hands with soap after cleaning a child's anus ☐ 11. Clean cooking and eating utensils ☐ 12. Don't know ☐ Other ☐ specify _____
63		Do you manage your child's feces differently when your child has diarrhea? How?	1. Yes ☐ How: _____ _____ _____ No ☐

F. Enabling Products

64		Do you own any children's potties? *[If Yes, continue with questions 62-63. If no, skip to 64.]*	1. Yes ☐ 2. No ☐
65		How many potties do you own?	_____ potty(ies)
66		Who uses these potties?	1. Children ☐ age _____ 2. Elderly ☐ 3. Disabled ☐ 4. Other ☐ Specify_____
67		What kind of potty(ies) do you own?	1. Plastic with seat/toy style ☐ 2. Plastic "cup" ☐ 3. Metal "chamber pot" ☐ 4. Other ☐ specify _____
68		Do you purchase anything for infants (0-12 mo.) to contain their feces?	1. Yes ☐ specify _____ 2. No ☐
69		Do you currently use any (other) equipment, tools, or things to assist in collecting and disposing of your children's feces?	3. Yes ☐ specify _____ 4. No ☐
70		Would you be interested in trying any new products? Which?	1. Yes ☐ specify _____ 2. No ☐

Enumerator, for each product mentioned by the participant in section F, please ask the following questions:

Question	Product	Satisfaction	Why?	Where?	Distance? (km)	Price?
71	Re-usable diapers	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐				
72	Potty	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐				
73	Scoop	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐				
74	Other (specify) _____	1. Very satisfied ☐ 2. Satisfied ☐ 3. Dissatisfied ☐ 4. Very dissatisfied ☐				

H. Demonstrations

Enumerator, please take respondent through steps of child cleansing demonstration and feces disposal demonstration.

Feces collection, disposal and child cleaning demonstration

*We would like to ask you to do a bit of role-playing. We would like you to act as if your youngest child has just defecated. Please take us to the place your child usually poops. Please take us, step by step, through what you would usually do after your child poops. Please explain what you are doing to us at each step, as you simulate the actions. Please take the normal amount of time to do each step, as if it were really happening. Please continue through each step until you would normally move on to a new task. **** **Be sure to ask about if they clean the child and where, and if they store the tools and where***

[Enumerator: please prompt and ask follow up questions to each step as needed. Please tick each step that is completed and add comments.]

	Step:	Done?	Comments:	Notes:
75	Child defecates	1. Yes ☐ 2. No ☐	Where?	
76	A consumable or tool is used to move the feces	1. Yes ☐ 2. No ☐	What type? Consumables? Tools? Hands? Is any other tool ever used?	
77	The feces are disposed of in the latrine	1. Yes ☐ 2. No ☐	Flushed?	
78	The feces are disposed of elsewhere	1. Yes ☐ 2. No ☐	Where?	
79	The respondent washes the child	1. Yes ☐ 2. No ☐	Where? With what?	
80	The respondent washes their hands	1. Yes ☐ 2. No ☐	Where? With what?	
81	The tools are stored	1. Yes ☐ 2. No ☐	Where?	
82	The tools are washed	1. Yes ☐ 2. No ☐	How?	
83	Child is cleaned	1. Yes ☐ 2. No ☐	Where? How?	
84	Soap is used	1. Yes ☐ 2. No ☐	What type?	
85	Other tools or consumables are used	1. Yes ☐ 2. No ☐	What?	
86	The caretaker washed their hands afterwards with soap	1. Yes ☐ 2. No ☐		
87	The caretaker rises their hands with no soap	1. Yes ☐ 2. No ☐		

88	The dirty water is disposed of in the latrine	1. Yes ☐ 2. No ☐		
89	The dirty water is disposed of elsewhere	1. Yes ☐ 2. No ☐	Where?	

90 Debrief:	
What is easy about this process? What is difficult? Are you ever interrupted while you are engaged in these activities? Other comments?	

I. Spot Observations by Enumerator

Enumerator, please complete by direct observation.

No	IDE #	Question	Coding
91		Is the latrine inside the house? *[If No, continue to question 33. If Yes, skip to question 34.]*	1. Yes ☐ 2. No ☐
92		How far is the entrance to the latrine from the entrance to the house?	1. 0-3 meters ☐ 2. 4-6 meters ☐ 3. 7-10 meters ☐ More than 10 meters ☐
93	NEW	What kind of latrine structure does the household have?	1. Modern ☐ 2. Traditional ☐ 3. Incomplete ☐ 4. In disrepair ☐
94		What type of toilet does the household have?	1. Pour flush ☐ 2. Dry pit ☐ 3. Pedestal ☐ 4. Other ☐ specify _____
95		Type of pan does the toilet have? (material)	1. Concrete ☐ 2. Wood ☐ 3. Plastic ☐ 4. Ceramic ☐ 5. Other ☐ specify _____
96		What is the area around and under the toilet covered with?	1. Tile ☐ 2. Cement ☐ 3. Wood ☐ 4. Plastic ☐ 5. Dirt ☐ 6. Other ☐ specify _____
97		Is there an electric light in the toilet shelter?	1. Yes ☐ 2. No ☐
98		Is there a water source located inside the toilet shelter?	1. Concrete (built into wall) ☐ 2. Concrete jug (freestanding) ☐ 3. Plastic container ☐ 4. No water source on property ☐ 5. Water source in yard ☐ distance from toilet _____ 6. Other ☐ specify _____
99		Is there a handwashing station on the property?	1. Yes ☐ 2. No ☐
100		If yes, what materials are present at handwashing station? *[Check all that apply]*	1. Bar soap ☐ 2. Liquid soap ☐ 3. Powder soap ☐ 4. Ash ☐ 5. Towel ☐ 6. Bowl or basin 7. Handwashing device ☐ 8. Other ☐ specify _____
101		Are there currently any tools for child defecation in or near the toilet shelter?	1. Yes ☐ 2. No ☐
102		If yes, what types?	1. Potty ☐ 2. Shovel ☐ 3. Seat ☐ 4. Other ☐ specify_____

			5. None ☐
103		Are animals present around the house?	1. Yes ☐ which _____ Where _____ 2. No ☐

Spot observations (if a child defecates while you are at the house, please answer the following):	
Place of defecation	1. In the house☐ 2. In the yard☐ 3. Other☐ Specify _____
Time between defecation and disposal/transport by caretaker	1. Immediately☐ 2. ____ Minutes☐ 3. ____Hours☐
Tools used to move or assist in feces disposal	1. Hands☐ 2. Leaves/grass☐ 3. Cloth☐ 4. Tool☐ specify _____
Place of disposal	1. Latrine☐ 2. Not moved☐ 3. Bushes☐ 4. Other☐ specify _____
Does the caretaker wash the child's bottom? With soap?	1. Does not wash☐ 2. Washed with water☐ 3. Washed with water and soap☐ 4. Other ☐ specify _____
How long after defecation is the child washed?	1. Immediately☐ 2. _____Minutes☐ 3. _____Hours☐
Does the caretaker wash their hands?	1. Does not wash☐ 2. Washed with water☐ 3. Washed with water and soap ☐ 4. Other ☐ specify _____
How long after disposal are hands washed?	1. Immediately☐ 2. _____Minutes☐ 3. _____Hours☐
Where does the washing take place?	1. Handwashing station☐ 2. Yard☐ 3. Other☐ specify _____
What is done with the used water?	1. Thrown in latrine☐ 2. Thrown in yard☐ 3. Other☐ specify _____
Other comments/observations	

Annex A: Village characteristics:

To be observed/calculated by the enumerator

No	Question	Coding
1	Village ID	
2	What is the density of the village where the respondent lives? *[Enumerator, please determine by direct observation]*	1. Rural ☐ 2. Urban ☐
3	What is the distance to the nearest paved road?	1. In the village ☐ 2. Outside the village ☐ Distance _____ Km
4	What is the distance from the village to the nearest permanent market?	_____ Km
5	What improved water sources*, if any, are available in the village?	1. Piped water connection in dwelling, house or yard ☐ 2. Public tap or standpipe ☐ 3. Tube well or borehole ☐ 4. Protected dug well ☐ 5. Protected spring ☐ 6. Rainwater harvesting ☐ 7. Other ☐ specify _____
6	What percent of households have an improved latrine?	_____%
7	Number of houses that refused to participate?	_____

Infant and young child faeces management and potential household enabling products for their hygienic handling and disposal in Cambodia

Participant Information and Consent Form – Household Survey

(Read by Interpreter and left with Participant)

Hello, my name is… . Does your household have a latrine that you use? Is there a young child smaller than 5 years old living here at this house? Is the mother or another caretaker of this child at home now?

If yes to all 3, continue.

No to any, thank them and move on, or if only mother/caregiver is absent, ask if they will be back soon.

PART I: INFORMATION SHEET

PURPOSE OF RESEARCH

We are here today to do a study to learn about what people in Cambodian villages do when their young children need to use the bathroom [to defecate], what they do or use to get rid of their children's faeces, and how they clean up afterwards. We will use what we learn from talking to mothers in this study to see if there are ways to make it easier in households like yours to do these daily tasks. The study is being done by the London School of Hygiene and Tropical Medicine, a university in England that does research on public health problems worldwide, with support from WaterSHED, a Cambodian NGO. WaterSHED helps local businesses in Cambodia to design and promote the sale of affordable water and sanitation products, such as pour flush latrines and water filters, to improve the lives of rural families.

SELECTION OF PARTICIPANTS AND PROTOCOL

We would like to talk with you [the mother or caregiver] about what you do when your child needs to defecate. If you agree to participate in this study and talk to us today, we will ask you about what you do when your child needs to defecate, your experiences and opinions related to managing your child's faeces, and the things you use to help you do this. We will also ask about your household's water and sanitation situation and hygiene practices and some questions about your socio-economic situation. We will take notes to help us remember what you tell us. All together our interview with you will take approximately forty-five minutes to an hour.

You can ask as many questions as you like and we will take the time to answer them. You do not have to agree to talk to us. You can choose to say no and this will not affect any existing or future relationship with WaterSHED**.** If you agree to participate in the interview, any answers that you give will also not affect your household's relationship with WaterSHED.

RISK AND DISCOMFORTS

This interview should not make you uncomfortable and does not pose any risks. If you decide not to answer some or any of the questions, just tell me at any time and I will stop the interview. You can decide not to answer some or all of the questions with no penalty. Participation in this study may mean that you share personal information with us, but the information you share will be handled confidentially and personal identifying information will not be linked to the information you share with us during your interview. Your name

and personal information will be kept separately in a locked cabinet, and you will receive a number that appears instead of your name on the interview notes so that it will not be possible for researchers to identify you personally when they analyse your responses with all the other interviews collected. After we have analysed the interviews we collect for this study, your personal information will be destroyed. If you feel that the behaviour of the interviewer is inappropriate or any questions are inappropriate, please contact WaterSHED by calling Ms. Sieng Mai on 023 650 2054. If you have any follow-up questions after this interview you can contact WaterSHED on the same number.

PART II: CERTIFICATE OF CONSENT

(Read by Interpreter and retained by Interpreter)

HOUSEHOLD ID #:

VILLAGE NAME:

I have read the information sheet/it has been read to me, and I have had the opportunity to ask questions which have been answered to my satisfaction. I understand that:

1) *I can leave the interview at any time without asking for permission.*
2) *I will not be disadvantaged if I do not take part. If I do choose to take part in the interview, any answers that I give will also not affect what types of services I receive.*
3) *I can refuse to answer any questions that I am not comfortable with.*
4) *My personal data and information will be handled with utmost care and kept confidential.*
5) *All the information will be kept confidential.*
6) *I may raise a concern or make a complaint.*
7) *Knowing all of this information, I voluntarily agree to take part in this study.*

Signature/Thumb print of Participant _____

Date _____

Print Name of Participant _____

Phone number

Village

Commune

District

Signature of Interpreter _____

Date _____

Print Name of Interpreter _____

Infant and young child faeces management and potential household enabling products for their hygienic handling and disposal in Cambodia

FGD schedule and question guide

- Before activity starts, make sure there is an appropriate # of participants. Invite extras to leave but give a gift/snack.

1. **Welcome and Introductions – Molly and Lindsay**
   - Why are we here? We are here because we need your help. We want to learn about children's sanitation in Cambodia, so we would like to ask you some questions because you all have small children. We are here to learn from you! We are interested in children and children's sanitation in Cambodia, and you all know much more about it than we do. We want to learn from you and hear your opinions. Anything you say will be a big, big help for us.
   - Introduce selves, team and everyone's roles

2. **Verbal Consent**
   Read form

   start recording

3. **Guidelines for participation**

Great, before we begin our discussion, I have a few reminders about the discussion

- I have a list of questions for our discussion.
- We would like everyone to contribute to the discussion. Please try to give others a chance to also make contributions.
- Please speak 1 at a time, so that our note taker can capture all of the different views and opinions you have without missing important contributions
- You need not speak directly to me, but we want you to share your views with everyone in the group and reflect on each others' ideas.
- You should feel free to speak freely. There are no right or wrong answers. Each person may have a different experience or view, and we are interested in hearing the different views.
- Let's all listen to each other; be respectful of each person's opinion
- After the discussion, we hope you will join us for some snacks

4. **Icebreaker**
   a. How are you feeling today? Why? (with partner)
   b. Game? (Try to stand up back to back with your partner? Warm-up/give each other massages? Big chief?)

5. **Introductions**
   Go around circle and each participant introduces his/herself:
   a. Name
   b. The age and gender of child they care for

c. The main place that child defecates – does someone else have a child that defecates somewhere else?
d. The thing you dislike most about managing children's defecation

6. General questions

a. What is ideal place you would like your child to defecate? Why?
b. At what age can a child defecate in this place?
c. What is the challenge of getting your child to defecate in the ideal place?
d. Has anyone found a way to overcome this challenge? Can you tell us about it?

7. Game in teams to introduce products

a. Call everyone's attention to the range of products and ask (indicating diapers) "What are these? Do you guys know what these are? And these (potties)?"
b. Divide group into 2 teams, team diaper and team potty. Each group is given all the samples of that product. "Now we're going to play a little game. Each team has several products. You are going to learn as much as you can about these products and then teach the other group about them. The team that does the best will get a small gift! We will ask you questions about the products and you have to discuss together with your team."
    i. First question: what is this and how does it work (each team has a few minutes to play with items and figure them out)
    ii. These products are similar but all a little different from each other. Can you find the differences between them? (as many as you can!)
    iii. What are some advantages and disadvantages of each of these products?
    iv. Which one of these products do you as a team like best? Why?
    v. Each team presents results to group, showing how to use each product, and facilitators decide who has done best and give prize (Stickers? Snacks? Candies? High fives? Or just give prizes to everyone).

8. Focus on Diapers

a. Ok, now let's focus on diapers. (move diapers to center of circle, potties to the side) Who here uses diapers? What kind?
b. Have you ever seen diapers like these before?
c. What age child would use these diapers?
d. If a child defecates in these diapers, where would you dispose of feces? Wash the diaper?
e. How are these diapers better than what you use now? How are they worse?
f. Do you prefer the diapers you use now or these? Why? What do you most like and dislike about these (new) diapers?
g. If you could use any of these for a day, which one would you choose and why? What do you like most about it? (go around) How much would you pay for your favorite one?

9. Focus on Potties

a. Ok, now let's focus on potties. (move potties to the center, diapers to the side) Who here uses potties? What kind?

b. Have you ever seen potties like these before?
c. What age child would use these potties?
d. If a child defecates in these potties, where would you dispose of feces? Wash the potty?
e. How are these potties better than what you use now? How are they worse?
f. Do you prefer the potties you use now or these? Why? What do you most like and dislike about these (new) potties?
g. If you could use any of these for a day, which one would you choose and why? What do you like most about it? (go around)
h. How much would you pay for your favorite one?

10. Safe Squat

a. (Move potties to the side, bring out safe squat) Now, how about this? What is it? How does it work? (lay photo of latrine pan on the ground and let them figure out how to use it)
b. What do you think about this product? Have you ever seen anything like it?
c. Would you be interested in using this product? Why or why not?
d. Many of you said your ideal place for your child to defecate is in the latrine. How would this help you with that?
e. What age child could use this product?
f. What would be the good things and bad things about this product?

11. Wrap Up

a. Looking at all the products you've seen here today (diapers, potties, safe squat), which one would you most like to try and why?
b. Would you change anything about any of these products to make them more useful?
c. What about the idea of putting something over the safe squat/latrine pan?
d. Thanks so much – please have some snacks/soap.
e. While people are having snacks, encourage them to use the Happy Tap and ask if it would help them when washing their kids

Infant and young child faeces management and potential household enabling products for their hygienic handling and disposal in Cambodia

Participant Information and Consent Form – Focus Group Discussion

(Read by Interpreter)

Hello and thank you for coming to be a part of our discussion together today.

PURPOSE OF RESEARCH

My name is _____ and my colleagues are _____. I am from the London School of Hygiene and Tropical Medicine, a university in England that does research on public health problems worldwide, and WaterSHED, a Cambodian NGO that helps local businesses in Cambodia to design and promote the sale of affordable water and sanitation products, such as pour flush latrines and water filters, to improve the lives of rural families. As you know, we spoke with you a few weeks ago at your home to learn about what people in Cambodian villages do to manage their children's faeces. We are here today to talk about your experiences with handling and disposing of your children's faeces, and your experience with using homemade or commercial tools and other materials or equipment to assist with this process. We are interested in your individual views and experiences. The information we get from you will be kept confidential. We will not collect or use your name on any of the information we collect from you today. I will ask questions and my colleagues will take notes. We will be talking for about 1.5 hours. We will also record the conversation using this audio tape recorder so that we don't miss any of the important things that you share with us. The recorder will not record your names (we will turn it on after the introductions). Only the research team will listen to the recording.

You are free to choose not to participate today and this will not affect any existing or future relationship with WaterSHED. If you have any follow-up questions or concerns after this discussion, you can contact Ms Sieng Mai at WaterSHED on 023 650 2054.

If you are willing to participate, but would prefer not to have your voice recorded, please let us know.

Do you have any questions?

Is everyone happy to stay and participate in the discussion?

Yes?

(If anyone says no, thank them politely and allow them to leave)

Is everyone ok to have our discussion recorded today?

All YES, or NO?

(If no, remove and put the recorder away)

PART II: CERTIFICATE OF CONSENT

FOCUS GROUP ID #:
VILLAGE NAME:

ORAL CONSENT RECEIVED:

Names of participants: *Oral consent provided (yes/no):*

Date:

Signature of Witness (local translator/note taker)

Name of Witness

Signature of Interpreter _____

Date _____

Print Name of Interpreter _____

ក្រសួងសុខាភិបាល
MINISTRY OF HEALTH
គណៈកម្មាធិការជាតិក្រមសីលធម៌
សំរាប់ការស្រាវជ្រាវសុខភាពដែលទាក់ទងនឹងមនុស្ស
National Ethics Committee for Health Research

ព្រះរាជាណាចក្រកម្ពុជា
KINGDOM OF CAMBODIA
ជាតិ សាសនា ព្រះមហាក្សត្រ
NATION RELIGION KING

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រាជធានីភ្នំពេញ, ថ្ងៃទី..២៧..ខែ..មិថុនា..ឆ្នាំ2014..

Ms. Molly Miller-Petrie

Project: Infant and young child faeces management and potential enabling products for their hygienic handling and disposal in Cambodia. Version N° 1, dated 12th May, 2014.

Reference: - Your letter on 07th May , 2014
- Summary report of NECHR's secretaries on 19th June, 2014

Dear Ms. Molly Miller-Petrie,

I am pleased to notify you that your study protocol entitled "Infant and young child faeces management and potential enabling products for their hygienic handling and disposal in Cambodia. Version N° 1, dated 12th May, 2014" has been approved by National Ethic Committee for Health Research (NECHR). This approval is valid for twelve months after the approval date.

The Principal Investigator of the project shall submit following document to the committee's secretariat at the National Institute of Public Health at #2 Kim Il Sung Blvd, Khan Tuol Kok, Phnom Penh. (Tel: 855-23-880345, Fax: 855-23-881949):

- Annual progress report
- Final scientific report
- Patient/participant feedback (if any)
- Analyzing serious adverse events report (if applicable)

The Principal Investigator should be aware that there might be site monitoring visits at any time from NECHR team during the project implementation and should provide full cooperation to the team.

Regards,

Chairman

Prof. ENG HUOT

លេខ ២ មហាវិថី គីម អ៊ិលស៊ុង . ខ័ណ្ឌទួលគោក . រាជធានីភ្នំពេញ . ទូរស័ព្ទ (៨៥៥-២៣) ៨៨០ ៣៤៥ . ទូរស័ព្ទដៃ (៨៥៥-១២) ២៨០ ៧៩០ . (៨៥៥-១២) ៨៤២ ៤៤២
2 Blvd KIM YL SUNG, Khan Toul Kork, Phnom Penh , Tel : (855-23) 880 345 , Mobile phone : (855-12) 280 790, (855-12) 842 442

LSHTM Ethics Application & CARE Form

Project Information

1. Full project title

Current infant and young child faeces management and disposal practices and potential enabling products for their hygienic handling in Cambodia

2. Is this research in fulfillment of a degree?

(•) Yes ( ) No

2a. Degree registered for

MSc

2d. Indicate proposed project length:

(•) Standard
( ) Extended

2e. Indicate student type

( ) Distance Learning
(•) Face-to-Face

Applicant Details

3a. Details for LSHTM lead investigator

[redacted]

London

[redacted]

3b. Job title of LSHTM Lead Investigator

Student

3c. Faculty of LSHTM Lead Investigator

[redacted]

3d. Department of LSHTM Lead Investigator

[redacted]

3e. Are you the Chief Investigator for the research project?

- (•) Yes
- ( ) No

3f. Other personnel involved

[redacted]

Student Details

3a. Student details

[redacted]

3a(i). MSc course

Control of Infectious Diseases

3b. Year of study

Year 1

3b(i). Year began MSc

[redacted]

3b(ii) Year expecting to complete MSc

[redacted]

3b(iii). Year began project

[redacted]

3b(iv) Proposed submission date for project

05/09/2014

3c. Supervisor's name

[redacted]

3c (i). Supervisor's email address

[redacted]

3 c(ii). Supervisor's institution

[redacted]

3c (iii). Supervisor status

Confirmed

Project Type

Note that completing the filter will enable and disable sections of the form so you may not see all questions.

4. Select type of project: Project administering questionnaires/interviews for quantitative analysis, or using mixed quantitative/qualitative methodology

5. Is this research project classed as interventional or observational?

- ○ Interventional
- ◉ Observational

Samples

6. Does this research project involve the collection or use of human tissue samples, eg blood?

- ○ Yes
- ◉ No

Fast-Track

7. Is this application for fast-track? Note: MSc applications are not currently available for fast-track

- ○ Yes
- ◉ No

Vulnerable Groups

8. Does this research project involve vulnerable groups?

- ○ Yes
- ◉ No

Geography

9. List countries where the research project is to be conducted:

Cambodia

Outline

10. Give an outline of the proposed project, including background to the proposal. Sufficient detail must be given to allow the Committee to make an informed decision without reference to other documents.

This project will be to conduct formative research on current infant and young child (IYC) faeces management and disposal practices in rural and peri-urban Cambodia and to identify consumer attitudes towards potential commercial enabling products for hygienic faeces management and disposal.

Partner organization WaterSHED (Water, Sanitation & Hygiene Enterprise Development) is an NGO registered in Cambodia. It engages local enterprises and government in the development of sustainable market-based approaches that empower households to be active and informed consumers of water, sanitation and hygiene products and services. A recent consumer study undertaken by WaterSHED showed a high level of use of newly purchased improved latrines in rural communities by adults (96-97%), but a lower rate of use among children (84-86%) (WaterSHED 2013). A greater gap exists in relation to infants, where the common practice is to bury or to discard faeces in the open. This research is not an epidemiological study, but will provide important formative

research on current practices and the potential value of developing enabling products for future interventions related to promotion of hygienic IYC faeces management and disposal in Cambodia and provide insight for potential replication in the Mekong region. Improving IYC faeces control can ultimately help to alleviate the associated diarrhoeal health burden for children under-five and for the communities they live in.

Stage 1: Prior to the initiation of fieldwork, a global search and inventory will be conducted of the array of current equipment and products, both commercial and homemade, available for assisting with IYC faeces handling and disposal in developed and developing countries. A disease prevention/safety lens will be used to categorize these materials according to more or less hygienic disposal practices. Findings from this inventory will then be used to identify preferred designs and features for commercial products, inspired by equipment already being used in Cambodian homes as identified during household visits and focus group discussions in stage 2.

Stage 2: Fieldwork will take place from approximately June 30-August 15. The first stage of data collection will be household based. The researcher will conduct household visits with a translator. 120 household visits will be conducted over a period of 4-5 weeks. Households will be randomly selected based on the following criteria:
1. The household currently owns an improved latrine that they use
2. The household has at least one child under 5
3. The household is within select regions of peri-urban and rural Cambodia

Closed and open ended survey questions, skills demonstrations, and, when possible, structured observations will be used to collect data on current IYC faeces disposal practices, equipment and materials used, and potential barriers or motivators to hygienic IYC faeces disposal. Questions will include the number of children living in the household, the age of the primary caregiver, the main and other sites of IYC faeces disposal, materials and equipment used to aid in faeces transport and disposal, how soon/long after defecation that disposal occurs, if the caregiver washes their and/or the child's hands and child's butt after disposal, a simulated demonstration by the caregiver of the method and steps they use to dispose of faeces at this site, what is done with faeces when a child has diarrhoea, household proximity to a water source, and overall socio-economic status. Each household will be asked to provide written consent to participate in the study. The consent form is presented in annex 1. The interview questions and structured observation form are provided in annexes 2 and 3.

Following the household data collection, focus group discussions (FGDs) will be conducted in a subset of villages to gain a general sense of consumer attitudes. FGDs will take place over 1-2 weeks for a total of 2-4 FGDs. Focus groups will be gender specific, and include the primary caregivers and one other family member from participating households. Pictures, and, when possible, models of potential IYC equipment will be shown to participants, who will be asked to discuss their feelings on the appeal, utility, attractiveness, affordability, and other aspects of the products. Each participant will also be asked to rank the products in order of preference orally or by placing photos of the products in their preferred order. If possible, participants will carry out simulations of product use with locally available products and model faeces near a sanitation facility in the community. These combined data sets should be able to provide well-informed recommendations for the next steps in developing IYC safe faeces disposal enabling products for use in rural Cambodia.

10a. Upload the study protocol, including data collection forms and questionnaires

11. State the intended value of the project, detailing why the topic is of interest or relevance. If this project or a similar one has been done before what is the value of repeating it? Give details of overviews and/or information on the Cochrane database. This area is of increasing importance – please ensure you give a full response.

Diarrhoeal disease is responsible for 4% of all deaths worldwide, primarily in Sub-Saharan Africa and Southeast Asia. Children under-five are particularly impacted – diarrhoeal disease kills more than 1.8 million children per year, making it the second greatest cause of death in that age group. 88% of all diarrheal deaths are attributable to water, sanitation, and hygiene (WASH) related factors (WHO). Many WASH interventions have been shown to reduce morbidity and mortality from diarrhoeal diseases; however, important gaps in proven interventions exist, particularly regarding the disposal of child faeces. Research has shown that even if adults are aware of the risk faeces can cause to human health, most do not see children's faeces as hazardous (Ana Gil et al). As a result, even in houses using improved sanitation facilities, many households continue to allow children to defecate in the open or inside the household. The hygienic disposal of IYC faeces has been shown to reduce incidence of childhood diarrhoea (Beth Scott) and improving these practices represents an important opportunity to improve health at the household level. There is a lack of information available in this area and none available for Cambodia. This study aims to fill an important research gap in IYC faeces management and disposal and to guide further work in this area.

12. Hypothesis statement.

Safe management and disposal of IYC faeces in an improved latrine among rural and peri-urban Cambodian households with such facilities is impeded by the lack of appropriate, user-friendly enabling products to make IYC faeces disposal in a latrine quick, easy and more hygienic than current practice.

13. Overall aim of project

To conduct formative research on current IYC faeces management and disposal practices in rural and peri-urban Cambodia and to identify consumer attitudes towards potential commercial enabling products for hygienic faeces management and disposal.

14. Specific objectives of project

1) To identify current practices and use of equipment/materials related to IYC faeces management and disposal among caregivers with at least one child under five-years of age and with an improved household sanitation facility.
2) To determine barriers and motivators for hygienic faeces management and disposal, including access to equipment/materials, access to water, design of sanitation facilities, time, and other factors.
3) To inventory and categorize the types of technologies and range of products that have already been developed for IYC faeces management and disposal in both developed and developing countries and to assess their relevance and applicability for supporting hygienic IYC faeces disposal in Cambodia.
4) To ascertain the acceptability and appeal of relevant enabling products/product designs which are currently available for IYC faeces management and disposal among Cambodian communities and to identify associated barriers or motivators for their purchase and correct use.

15. List key references (no more than 5), including for methods to be used.

Beth Scott. Unpublished. Child's stool disposal: a review of prevalence of practice and its relationship with health, and recommendations for filling the evidence gaps. LSHTM
Ana Gil et al. 2004. Children's feces disposal practices in developing countries and interventions to prevent diarrhoeal disease: a literature review. Environmental Health Project, USAID
Handwashing enabling products for developing countries: Design features, preferences, and behaviour change from an in-depth product trial in Cambodia. WaterSHED 2012
Understanding household consumers in the emerging sanitation market in Cambodia. WaterSHED 2013
Piloting promotion of low cost sanitary hardware for sustainable disposal of child and animal faeces in rural Bangladesh. ICDDR B

Experience

16. State the personal experience of the applicant and of senior collaborators in the research project in the field concerned, and their contribution to this project. Indicate any previous work done related to the project topic including student and/or professional work, or publications

Student:
Research:
• PATH, 2011-2013, conducted case studies in Peru and El Salvador on working in alliances (national and regional) to improve newborn health. Designed interview instruments and conducted interviews, distilled lessons learned and best practices, and submitted an article based on these findings to the PAHO Journal of Public Health.
• PAHO, 2010-2011, assisted with research for the publication "Water and Sanitation: Evidence for Public Policies Focused on Human Rights and Public Health Results." 2011.
Implementation:
• Cochabamba, Bolivia, 2009-2010, intern with Pro-Habitat, designed and implemented a small-scale grant to add educational (household and primary-school based) and microbusiness components to an eco-sanitation construction project in the outskirts of Cochabamba.

Supervisors:
Supervisors Sandy Cairncross and Mimi Jenkins have extensive experience in conducting water, sanitation and hygiene (WASH) research in developing countries. Collaborating NGO WaterSHED has extensive experience working in Cambodia and in particular on market-based WASH research and program implementation.

16a. Upload the CVs for all main investigators working on the project. For MSc students, please upload your CV only.

Methods

17a. Specify the procedures/methodology to be conducted during the project. For literature reviews, include details on search strategy, search terms, inclusion and exclusion criteria.

Methods of investigation:
Stage 1: Prior to the initiation of fieldwork, a global search and inventory will be conducted of the array of current equipment and products, both commercial and homemade, available for assisting with IYC faeces handling and disposal in developed and developing countries. A disease prevention/safety lens will be used to categorize these materials according to more or less hygienic disposal practices. Findings from this inventory will then be used to identify preferred designs and features for commercial products, inspired by equipment already being used in Cambodian homes as identified during household visits and focus group discussions in stage 2.

Stage 2: Fieldwork will take place from approximately June 30-August 15. The first stage of data collection will be household based. The researcher will conduct household visits with a translator. 120 household visits will be conducted over a period of 4-5 weeks. Households will be randomly selected based on the following criteria:
1. The household currently owns an improved latrine that they use
2. The household has at least one child under 5
3. The household is within select regions of peri-urban and rural Cambodia

Closed and open ended survey questions, skills demonstrations, and, when possible, structured observations will be used to collect data on current IYC faeces disposal practices, equipment and materials used, and potential barriers or motivators to hygienic IYC faeces disposal. Questions will include the number of children living in the household, the age of the primary caregiver, the main and other sites of IYC faeces disposal, materials and equipment used to aid in faeces transport and disposal, how soon/long after defecation that disposal occurs, if the caregiver washes their and/or the child's hands and child's butt after disposal, a simulated demonstration by the caregiver of the method and steps they use to dispose of faeces at this site, what is done with faeces when a child has diarrhoea,

household proximity to a water source, and overall socio-economic status. Each household will be asked to provide written consent to participate in the study. The consent form is presented in annex 1. The interview questions and structured observation form are provided in annexes 2 and 3.

Following the household data collection, focus group discussions (FGDs) will be conducted in a subset of villages to gain a general sense of consumer attitudes. FGDs will take place over 1-2 weeks for a total of 2-4 FGDs. Focus groups will be gender specific, and include the primary caregivers and one other family member from participating households. Pictures, and, when possible, models of potential IYC equipment will be shown to participants, who will be asked to discuss their feelings on the appeal, utility, attractiveness, affordability, and other aspects of the products. Each participant will also be asked to rank the products in order of preference orally or by placing photos of the products in their preferred order. If possible, participants will carry out simulations of product use with locally available products and model faeces near a sanitation facility in the community.

All research will be conducted in the local language through a trained local translator.

Methods of analysis:
Qualitative FDG data will be assessed and key disposal routes as well as barriers, motivators, and other common themes related to IYC disposal will be drawn out from the results of the household observations. Excel will be utilized for entering data from questionnaires and statistical analysis will be conducted in STATA13. Statistical analysis will utilize either Chi Squared or double-sided t-tests to assess the differences between households. If possible, logistic regression will be carried out to assess relevant determinants of hygienic practices.

Focus group opinions for each product will be transcribed and positive and negative reactions to each will be documented. Design recommendations for further product development and field-testing will be developed based on the findings from both research components. The combined data sets should be able to provide well-informed recommendations for the next steps in developing IYC safe faeces disposal enabling products for use in Cambodia.

17b. Specify numbers, with scientific justification for sample size, age, gender, source and method of recruiting participants for the research project.

Up to 120 households will be selected to participate in the household data collection process. This is an exploratory study, with limited resources and time, with the goal to document the array of hygienic and unhygienic practices, any existing use of equipment/products, barriers and motivations, and to develop in-depth understanding of the potential for enabling products to improve practices. Thus sample size is not guided by desire for measuring a particular phenomenon of statistical significance. Key consideration is to obtain a mix of child ages and be able to examine differences in hygienic practice by child age within the sample size.

Only districts for which 2013 data coverage is available will be selected. This includes 15 districts in 3 distinct regions of Cambodia. Districts meeting these criteria in each region will be randomly selected as drawn from a hat. Villages in these districts must have at least 80% of households using an improved sanitation facility to be included. Villages will be stratified into rural and peri-urban, and study villages will be randomly selected from the stratified groups by drawing from a hat. Approximately 6 households per village will be randomly selected by flipping a coin to select a direction to walk in and then asking every other house on that street to participate, continuing to the next house if no one is home or if a household refuses to participate. Households must have at least one child under 5 to be able to participate in the interview. Each household meeting criteria will be asked to participate in the survey visit and will be read the consent form in the local language. Focus groups will be conducted in a subset of the villages, and will include selected members from the surveyed households, forming groups of a 6-12 in each village.

The primary caregiver of the child will be asked to participate in the interviews and skills demonstrations. Up to two household members will be invited to participate in focus groups.

18. Proposed start date of the project

30/06/2014

19. Proposed end date of the project

15/08/2014

20. State the potential discomfort, distress or hazards that research participants may be exposed to (these may be physical, biological and/or psychological). What precautions are being taken to control and modify these? Include information on hazardous substances that will be used or produced, and the steps being taken to reduce risks.

Potential risks associated with participating in the study are expected to be minimal, and include breach of confidentiality and loss of time due to participation in the interview (estimated to be 1-2 hours including consent). It is not anticipated that participation would cause emotional distress or loss of standing in the community.

21. What could stop this project from succeeding, or prevent you from achieving your objectives?
*Please indicate any aspects of your proposed approach which could potentially experience difficulties, e.g. delays with permissions, data collection or storage problems, lack of sufficient comparable information, etc. You may also wish to mention any wider matters which could affect your project, e.g. civil unrest, natural disasters, transport availability.

A) Possible project delays include obtaining local ethics approval and potential delays to local travel during the rainy season. These could reduce available time in the field for data collection.
B) A potential barrier to the project's success is that data collected through self-reporting and/or rapid observations will not capture the true reality of IYC faeces disposal practices, as participants may change behaviours while being observed by an outsider.
C) Obtaining accurate data from study households and from focus group discussions will depend on the quality of the translation to be provided by the WaterSHED translator.

22a. What alternative plans do you have in case you encounter any of the potential problems you have identified?

A) The local ethics approval process has been initiated well in advance of planned travel. In addition, transport will be arranged in coordination with the WaterSHED team, who have a great deal of experience working in rainy season conditions.
B) The focus of the study is on understanding motives and barriers, rather than on accurate measurement of current practice, so this should not present a significant problem. In addition, skills demonstrations will be considered examples of the best possible hygiene practice a participant is capable of, as participants are likely to demonstrate what they believe is the best practice when observed. These demonstrations will also reveal if and how equipment is currently used in picking up, transporting, and disposing of faeces.
C) WaterSHED will help to identify someone with the right skills and some experience with qualitative methods and group discussions, and training and pretesting of the interviewer will take place prior to the initiation of the interviews.

22b. What specific facilities or resources will you personally expect to make use of for your project (eg a local university library, lab facilities, project placement with a specific organisation etc)?

I will be working with WaterSHED Cambodia on this project and using LSHTM data analysis software in London.

Informed Consent

23. State the manner in which consent will be obtained.

Written consent is normally required. When this is not possible, a detailed explanation of the reasons should be given and a record of those agreeing kept.

If any photographs are to be taken, whether for teaching or research purposes, ensure that the participant's consent to their use has been given in line with the provisions in British Medical Journal, 1998, 316, 1009-1011.

Where appropriate, state how the information and consent form will be translated into local languages

The consent form (annex 1) will be translated into the local language, Khmer. Participants can either read the form or have the form read to them by a translator who will be a native Khmer speaker. Participants will then sign the short consent form. Informed consent will be obtained from the household member interviewed, in this case limited to primary caregivers.

23a (i) Please upload information sheet and consent form

23a(ii) Upload recruitment procedures (eg advertisements, emails, posters)

Payments

24. Will payments be made to participants? These should usually not be for more than travelling expenses and/or loss of earnings and must not represent an inducement to take part.

- ○ Yes
- ◉ No

Confidentiality & Data

25. Specify how confidentiality will be maintained with respect to the data collected. When small numbers are involved, indicate how possible identification of individuals will be avoided. Where data will be anonymised, specify how this will be done.

Households will be given a code number as an identifier and personal information will be limited to that collected on the consent form and kept in a secure location (lock box or locked desk drawer). Data will be collected through a verbally administered questionnaire and responses recorded onto the questionnaire. Open-ended interview responses will be typed up in a Microsoft word file as a transcript. These forms will contain only the household code numbers.

26. State how your data will be stored and what will be done with it at the end of the project.

Questionnaires will be coded and entered daily into a Microsoft Excel spreadsheet which will be stored on my laptop. In addition, a backup copy of data set (without any direct identifiers) will be copied onto a USB memory key (as back-up). Direct identifiers and original paper questionnaires will be kept by WaterSHED after completion of the field study and in a locked file cabinet accessible only to authorized individuals for up to 10 years (as required by LSHTM) and then destroyed by shredding.

Funding

30a. Do you have external funding for this project?

- ○ Yes

- [x] No

Local Approval

40. Where the research is to take place overseas, ethical approval must be obtained in the country(s) concerned. Approval from the LSHTM Committee is dependent on local approval having been received.

    For all countries listed in Q9, detail arrangements being made to obtain local ethical and/or regulatory approval.

    Please electronically append copies of local approval letter(s) where this has already been obtained.

    Where you believe local approval is not required, please explain why not and describe any less formal permissions, invitations or support you are being given for this work. Upload local permission letters as applicable.

40a. Where the research is taking place in the UK, please list other UK Committees from which approval is being sought.

Data Sources, Intellectual Property & Permissions

42a. If you expect to use existing data, how will you obtain it?
*Indicate who holds the data, who specifically you will contact, and by when. Any contact so far, especially anything confirmed in writing, should be mentioned.

WaterSHED has agreed to share information and data on relevant WASH topics, and in particular a concept note on IYC disposal in rural Cambodia, as needed. (Contact: Lindsay Voigt)

42b. If you expect to use any public domain data, please give further details.
*Make clear who owns the data and how you will gain access (giving a link if possible). Public domain data must be available to any member of the public, without any restrictions or requirement for special permission, and must not enable the identification of living people.

I do not expect to use public domain data sets.

42c. Will any specific data rights permissions or usage limitations be required regarding data to be used or collected in the project?

- [ ] Yes
- [x] No

42d Will any copyright agreements or intellectual property rights (IPR) agreements be required regarding data to be used or collected in the project?
*Please tick all boxes that apply, and attach copies of any forms/agreements (even if in draft).

- [x] No specific IPR, copyright or permissions issues apply to this project (student retains copyright & claim to related IPR)
- [ ] IPR to be retained by LSHTM (specific LSHTM form to be completed)
- [ ] Copyright to be transferred to LSHTM (specific LSHTM form to be completed)
- [ ] IPR, copyright or other agreements/permissions required with external parties/organisations

42e. Please give any further relevant details about IPR, copyright or other permissions.

NA

Type of risk

43a. Where will the project be carried out?
*Note that work away from LSHTM or outside the UK means any form of work for your project, not just primary data collection. Some courses may have specific restrictions on this.

Some work will take place that entails travel to another country, or to a region of my country that is not my home region

43a (i). Please indicate all locations you expect to work at, and the approximate total amount of project work you intend to carry out at each (in %, including 0% where necessary)

[x] At home	15%
[x] In local libraries	10%
[ ] At place of employment	0%
[x] Other work away from home	75%

43b. Will the project involve working with or handling any of the following materials?

- [ ] Pathogenic organisms
- [ ] Human blood
- [ ] Radiochemicals
- [x] None of the above

43c. Are any other potentially hazardous activities likely to be carried out during the project?

- ( ) Yes
- (•) No

43d. Do any special requirements (e.g. disability-related issues) or other concerns need to be taken into account for either you as a student, research participants or colleagues?

- ( ) Yes
- (•) No

Work away from LSHTM / Home and outside the UK including national or international travel

46a(i). Will the project be based in an established hospital, college, research institute, NGO headquarters, field station or other institutional site?

- (•) Yes
- ( ) No

46a(ii). If 'Yes', please give the name and location of the site(s); describe approximately what proportions of your project will be spent there; and state name and role of person who has confirmed willingness to support you at each site (indicating extent of correspondence, especially what they have confirmed in writing).

Estimated timeline for field work: June 30- August 15
In-country supervision:
Work will be based in Phnom Penh at the WaterSHED office (50%) with some travel to peri-urban and rural villages, including overnight stays (50%). Travel will be by car with a designated driver and field accommodation will be in local guesthouses. WaterSHED will be responsible for local introductions and approvals as required. Lindsay Voigt (WaterSHED) has committed to serving as a local supervisor (please see annex 4).

Contact information:
#39C Street 430 (corner of Street 476)
Sangkat Toul Tompong II, Khan Chamkarmon
Phnom Penh, Cambodia 12311

46b(i) Will you have an 'external supervisor', co-supervisor or other main advisor, or be working with any specific organisation(s), during your work away from LSHTM?

- (•) Yes
- ( ) No

46b(ii) If 'Yes', please indicate the name, role, contact details, and level of support that any such external advisors are expected to provide, and give details about any organisations you will be working with.

Mimi Jenkins, honorary lecturer in infectious and tropical diseases (ITD) at LSHTM and research professor at the University of California, Davis, has agreed to serve as my main external adviser. She will supervise the development of my research methodologies and protocols and provide advice during project implementation and feedback during analysis. (mwjenkins@ucdavis.edu)

As mentioned above, Linsday Voigt of WaterSHED Cambodia has also agreed to serve an an external supervisor and will support project design as well as facilitate the field work portion of the project. (lindsay.voigt@gmail.com)

46c(i) Will the project involve personal visits, interviews or interactions with people in their homes, workplaces, community settings or similar?

- (•) Yes
- ( ) No

46c(ii) If 'Yes', please give details, including approximately what proportion of your project this will involve

The fieldwork potion of the research will consist almost exclusively of household visits, caregiver interviews, and community focus groups. Household-based research will take approximately 4-5 weeks, and focus groups will take an additional 1-2 weeks.

46d(i) Will the project involve lone/isolated work or significant travel?

- (•) Yes
- ( ) No

46d(ii) If 'Yes', please give details, including approximately what proportion of your project this will involve, and state how you can be contacted while working or travelling.

The project will involve significant travel in the form of 7 weeks fieldwork in Cambodia. However, this work will not be lone or isolated, as I will have both a local supervisor and a local NGO working alongside me, as mentioned above. Travel outside Phnom Penh will be undertaken with WaterSHED staff, including a translator. Travel will be by car with a designated driver and field accommodation will be in local guesthouses. I will be available and will maintain contact by email and by local cell phone.

46e. What arrangements are proposed for contact with your main supervisor while you are away from LSHTM? Indicate expected ease and frequency of contact, and communication methods to be used.

I will continue to communicate with Sandy Cairncross by email at least once per week throughout the duration of my fieldwork. If need be, Skype calls can also be arranged as needed.

46f. Please tick to confirm:

- ☑ I have read the LSHTM Code of Practice on off-site work

46g. What form of project work will be undertaken outside the UK? (please tick all that apply)

- ☐ Work at my family home or personal residence only
- ☑ Work at an established hospital, college, research institute, NGO headquarters, field station or other institutional site
- ☑ Work away from my personal residence or an established site

46h. Name the region(s) in which work will be undertaken, as indicated from countries listed in question 9.

Tonle Sap, Plain, Plateau and Mountainous, and Coastal

46i(i) Do the Foreign & Commonwealth Office's (FCO) Travel Advice Notices (www.fco.gov.uk/en/travelling-and-living-overseas/travel-advice-by-country) advise against travel to the regions(s), country or countries involved?

- ○ Yes
- ◉ No

46j. Please tick to confirm:

☑ I will seek specific travel health advice before any international travel as part of my project. *Travel health advice, anti-malarials, vaccinations and medication are available from the Hospital for Tropical Diseases Travel Clinic and will be paid for by the School if you follow the procedure set out in the project handbook (TSO need to sign off a form for you).

46k. Please tick to confirm:

☑ I understand that travel insurance is required when travelling internationally for project purposes. *Free LSHTM travel insurance can be applied for using a separate form, provided the travel is for location-specific project purposes.

Signature Instructions

The form should be completed and finalised prior to signing or requesting signatures. Students should ensure that the Supervisor signs prior to the Course Director. For external supervisors, please ensure that they have registered for an account prior to requesting the signature.

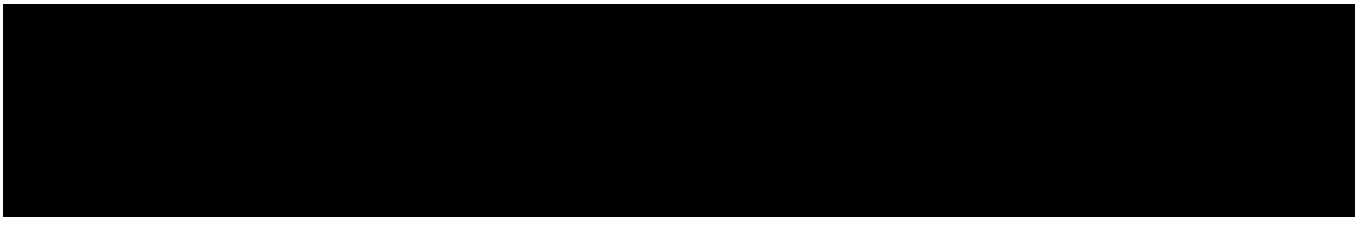
Signature - Applicant

Student signature

Signature - Supervisor

Supervisor signature

Course Director Signature



[redacted]

Faculty of Infectious and Tropical Diseases

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Student's Questionnaire

Candidate No: 107631 MSc: CID

Project Supervisor: Sandy Cairncross/Marion Jenkins

Project Title: Infant and young child faeces management and potential enabling products for their hygienic collection, transport, and disposal in Cambodia

As part of our assessment procedure for student projects we are asking you to complete the following short questionnaire. Please tick the most appropriate statements in each section and bind it into your project. **A copy of this questionnaire must be bound into your finished project report.**

(*Please ensure you tick the correct box*)

Who initiated the project?

- ☒ My supervisor
- ☐ Me

How much help did you get in developing the project?

- ☐ none: I decided on the design alone
- ☒ some: I used my initiative but was helped by suggestions from my supervisor
- ☒ substantial: My supervisor had most say, but I added ideas of my own
- ☐ maximal: I relied on the supervisor for ideas at all stages
- ☐ not applicable: the nature of the project was such that I had minimal opportunity to contribute to the design

How much help did you get in carrying out the work for the project?

- ☐ none: I worked alone with no supervisor input
- ☐ minimal: I worked alone with very little supervisor input
- ☒ appropriate: I asked for help when needed
- ☐ substantial: the supervisor gave me more assistance than expected
- ☐ excessive: the supervisor had to give me excessive assistance to enable me to get data

What was the degree of technical difficulty involved?

- ☐ slight: data easily obtained
- ☐ moderate: data were moderately difficult to obtain
- ☒ substantial: data were difficult to obtain

How much help were you given in the analysis and interpretation of any results?

- ☐ none
- ☒ standard: My supervisor discussed the results with the me and advised on statistics and presentation
- ☐ substantial: My supervisor pointed out the significance of the data and told me how to analyse it

How much help were you given in finding appropriate references?

- ☐ none
- ☒ some: only a few references were provided
- ☐ substantial: most references were given by my supervisor
- ☐ maximal: the supervisor supplied all the references used by me

How much help did you get in writing the report?

- ☐ none: my supervisor did not see the report until it was submitted
- ☐ minor: my supervisor saw and commented on parts of the report
- ☒ standard: my supervisor saw and commented on the first draft of the report
- ☐ substantial: my supervisor gave more assistance than standard

How much time was spent on the project?

- ☐ too little to expect adequate data*
- ☒ sufficient
- ☐ too much*

**if too little or too much, were there any reasons for it, e.g. unforeseen technical problems, lack of materials, etc.?*

During the course of the work was your contact with your supervisor

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☒ Varied but at regular intervals
- ☐ Never

Was this contact with your supervisor

- ☐ too infrequent
- ☒ infrequent but sufficient
- ☐ frequent but not excessive
- ☐ excessive

Please comment on your experiences during the project

Overall, this project was a great experience. However, I do think that this scale of primary data collection may have been a bit overly ambitious on my part – it was quite difficult to complete the protocols and run a household survey, plus focus groups, and also have time to analyse the vast amount of data collected. In the end, I had to focus very narrowly within the data set.

I think that I learned a great deal from completing this project. At times the learning curve was quite steep, and there are many things I would do differently if I were to do another household survey in the future. Learning what didn't work, or what things made data analysis quite difficult, were valuable lessons that I think will inform how I design research projects moving forward.

I felt I had great support from my supervisors and great collaboration from the local NGO. I still felt that I was in charge of and responsible for the project, but the inputs of these experts and colleagues was invaluable in shaping the final design and outcome of the project.

THIS QUESTIONNAIRE MUST BE BOUND INTO YOUR PROJECT REPORT