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Determinants of disposal of child faeces in latrines in urban slums of Odisha, India: a cross-sectional study

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Background: Even among households that have access to improved sanitation, children’s faeces often do not end up in a latrine, the international criterion for safe disposal of child faeces.

Methods: We collected data on possible determinants of safe child faeces disposal in a cross-sectional study of 851 children <5 y of age from 694 households in 42 slums in two cities in Odisha, India. Caregivers were asked about defecation and faeces disposal practices for all the children <5 y of age in the household.

Results: Only a quarter (25.5%) of the 851 children’s faeces were reported to be disposed of in a latrine. Even fewer (22.3%) of the 694 households reported that the faeces of all children <5 y of age in the home ended up in the latrine the last time the child defecated. In multivariate analysis, factors associated with being a safe disposal household were education and religion of the primary caregiver, number of children <5 y of age in the household, wealth, type and location of the latrine used by the household, household members >5 y of age using the latrine for defecation and mobility of children <5 y of age in the household.

Conclusions: Few households reported disposing of all of their children’s faeces in a latrine. Improving latrine access and specific behaviour change interventions may improve this practice.

Keywords: child faeces, cross-sectional study, India, sanitation, WASH

Introduction

Poor sanitation is a major cause of faecal–oral diseases, including diarrhoea, which is responsible for >1.6 million deaths annually. In 2015, 2.3 billion people did not have access to at least basic sanitation worldwide, including 892 million people that practiced open defecation. In India, 40% of its population practiced open defecation and only 44% used at least basic facilities.

Child faeces represents a particular threat to human health, as young children have the highest incidence of enteric infections and their faeces are most likely to contain transmissible pathogens. In addition, children tend to defecate in places where other children, who are particularly vulnerable due to their immature immune systems and exploratory behaviours, could be exposed. A review found that child faeces disposal behaviours that are considered risky were associated with a 23% increase in the risk of diarrhoeal diseases (relative risk [RR] 1.23 [95% confidence interval (CI) 1.15 to 1.32]). A recent study analysing Demographic and Health Survey (DHS) data from 34 countries found that child faeces disposal practices were strongly associated with child growth. The study found that improved child faeces disposal practices (child faeces disposed into improved latrines) were associated with reduced levels of child stunting and underweight and increases in height-for-age Z scores and weight-for-age Z scores.

Our research suggests that there are multiple sources of exposure from child faeces beyond defecation and disposal. These include unhygienic collection of faeces or cleaning of surfaces when children defecate on the floor or ground (diapers and potties being rare in many low-income settings) and inadequate hand-washing after disposing of the faeces. However, international monitoring currently defines ‘safe disposal’ of child faeces solely on the basis of whether the faeces ends up in a latrine, either because the child defecated in a latrine or the faeces were subsequently deposited there.
Even in settings with improved sanitation or ‘basic sanitation’, child faeces are often not disposed of in latrines. This creates a potentially important source of exposure to faecal pathogens. A report by the World Bank Water and Sanitation Programme (WSP), presenting analysis from the latest available Multiple Indicator Cluster Surveys (MICS) and DHSS (2006–2012) found that in 15 of 26 locations >50% of households reported unsafely disposing of faeces from children <3 y old (not into a latrine); the percentage of children whose faeces ended up in improved sanitation facilities was even lower. In India, the latest available DHS (2015–2016) found that the faeces of only 34.7% of children end up in a latrine (22.0% from the child defecating directly in the latrine and 12.7% from subsequent disposal in the latrine); an additional 1.5% were buried, until recently also considered ‘safe disposal’. A previous cross-sectional study of child faeces disposal practices among rural households in villages in the State of Odisha, where the Total Sanitation Campaign (TSC) had been implemented at least 3 y before, found that 81.4% of child faeces were disposed of unsafely, with the majority of faeces reported being deposited with solid waste. However, that study did not address the context in urban slums, which were not covered by the TSC and which are likely to present additional challenges due to the absence of land and space for building latrines, higher reliance on more distant shared and public facilities and greater population density and migration that can impact social norms. The health risks presented by children’s faeces are likely to be greater in urban slums due to increased opportunities for exposure and disease transmission.

While the government of India has endeavoured to improve sanitation through a series of initiatives aimed at reducing open defecation, evaluations of these have found limited impacts on child faeces disposal practices. In one such evaluation, the intervention increased the safe disposal of child faeces from 1.1% at baseline to 10.4% in intervention households, compared with 3.1% in the control households (RR 3.34 [95% CI 1.99 to 5.59]). In another study, the intervention also resulted in an increase in safe child faeces disposal of 9 percentage points (27% intervention vs. 18% control; p<0.001). Notably, the sanitation programs evaluated were aimed chiefly at increasing latrine coverage; they included few behaviour change initiatives to increase latrine use, including use by children or for safe disposal of child faeces. While these studies showed some improvements in child faeces disposal, the majority of faeces still ended up in the environment.

Investigating factors that are associated with child faeces disposal may help in understanding the reasons for the low prevalence and identify potential ways to improve these behaviours. Factors that have previously been found to be associated with disposal of child faeces into a latrine include child characteristics and practices (mobility category, defecation site of the child, child age), factors related to water and sanitation access and use (number of years of latrine ownership, access to a latrine in the compound, type of latrine, consistency of adult latrine use, presence/ownership of child faeces management tools, presence of a hand-washing facility and type of water source) and socio-economic and demographic characteristics (urban residence, household wealth, household head’s education, number of children <5 y of age in the household, mother’s education, caregiver’s/mothers age, attendance at health education sessions, media exposure, religion, caste/tribe of head of household).

Informal settlements in urban settings present particular sanitation challenges. We undertook this study to examine the factors associated with the disposal of child faeces in latrines (‘safe disposal’) in urban slums in Orissa, India.

Materials and methods

Study design and setting

Details of the study design and setting have been described elsewhere. Briefly, the study followed a cross-sectional design. The data collection took place in July and August 2014. Households were selected using an adaptation of the Extended Program of Immunization (EPI) sampling method. Households eligible for inclusion in the study were required to meet the following eligibility criteria: have at least one child <5 y of age with a primary caregiver >18 y of age and the primary caregiver reported having access to sanitation facilities (individual household latrines, shared or communal facilities) or belonged to a slum with communal sanitation facilities (even if the respondent reported no one in the household used these). Households that otherwise met such eligibility criteria were nevertheless excluded from the study if the primary caregiver was an Accredited Social Health Activist, an anganwadi (government sponsored child-care and mother-care centre) worker or a person who had worked for health promotion campaigns. The number of participating households in each slum varied due to the varying sizes of the slums and the availability of households with children <5 y of age at the time of the visit. Respondents were the primary caregivers (defined as ‘the one who usually cares for the child’) of the youngest child <5 y of age in each household. Households that were locked, where the primary caregiver was unavailable at the time of the visit, that did not meet the eligibility criteria or that refused to participate were not enrolled and the researchers would go to the next household on the left until they found one that met the eligibility criteria.

Slum selection

The informal settlements (slums) were selected from a list of 23 slums in Cuttack and 39 slums in Bhubaneswar. The selection criteria for the slums was that they had at least 33 households with access to either individual household latrines or functioning community latrines. We excluded three leprosy colonies from our list of eligible slums as well as slums in which pilot activities were previously conducted. This selection process resulted in 20 eligible slums in Cuttack and 28 eligible slums in Bhubaneswar.

Sample size calculation

The primary outcome for this cross-sectional study is the proportion of children <5 y of age whose faeces are disposed of safely (defined here as defecation or disposal in a latrine). Based on previous studies, the sample size was calculated using the average of 30% safe disposal. Using simple random
sampling, the average of 30% safe disposal of child faeces led to a sample size for frequency in a population of 323 households (assuming one child per household) (with 95% confidence). The sample size calculation was adjusted to account for clustering, with an intracluster correlation coefficient of 0.06 based on previous work in rural Odisha. Based on the different sample size calculations in different scenarios, 20 households in 35 clusters (a total of 700 households) was chosen to be the best logistical option. The study was not separately powered for each city but for 35 slums in total. As it was not always possible to find 20 eligible households in each selected slum, we continued selecting slums in the order in which they had been randomly ordered until we reached our target sample size of 700 households. This resulted in the data being collected in 42 slums: 22 in Bhubaneswar and 20 in Cuttack.

Data collection tools
Data collection tools included a structured survey and checklist for spot checks. The survey included questions on socioeconomic and demographic factors, access to sanitation, water and hygiene facilities, availability of potties and diapers and exposure to messages about child sanitation or hygiene. Questions about defecation place and faeces disposal method for the last time each child <5 y of age defecated were included, using wording as per the core questions of the World Health Organization/United Nations Children’s Fund Joint Monitoring Programme on Water and Sanitation (JMP). The age and mobility (whether the child can or cannot walk) of the children, whether they were exclusively breastfed and the consistency of their faeces (solid, liquid, semisolid) the last time they defecated were also recorded. The questions on defecation and disposal practices for the last time the children defecated were asked for all the children <5 y of age in each household (defined as sharing the same cooking pot). Data were also collected on the age and usual defecation places of each family member >5 y of age. Spot-checks were done to determine the type of latrine (flush/pour flush with pit/closed sewer system, flush/pour flush without pit/open sewer system, pit latrine with slab or other) reported by the households as the one used the majority of the time, to check the presence of a potty in the household, whether children were wearing a diaper and to check the availability of soap and water at the specific place identified by participants that was used for hand washing after disposal of child faeces.

The survey, information sheet and consent forms were written in English and then translated into Odia, the local language. A researcher bilingual in Odia and English evaluated the translation. All the researchers who conducted the surveys were fluent Odia speakers.

Data entry and analysis
Data were double entered using EpiData 3.1 (EpiData Association, Odense, Denmark) and analysed using STATA version 14 (StataCorp, College Station, TX, USA). Child faeces disposal was categorized as safe if children’s faeces were reported to have ended up in a latrine, either by the child defaecating directly into the latrine or by subsequent disposal in a latrine. Consistent with JMP definitions for safe disposal, the latrine could be either improved or unimproved. The analysis was performed at the household level, whether a household practiced safe disposal of all the children’s faeces (‘safe disposal household’) or none or only a portion of the children’s faeces were disposed of in a latrine (‘unsafe disposal household’).

An asset index was created by combining household information on the number of rooms for sleeping, household construction type and ownership of items (watch/clock, pressure cooker, radio, television, dish antenna, refrigerator, mobile phone, mattress, bed/cot, chair, table, sewing machine, bicycle, motorbike) using polychoric principal component analysis. The wealth score was divided into tertiles. Most of these (20.3% [95% CI 17.8 to 23.2]) defecated to a sample size for frequency in a population of 323 households. This resulted in the data being collected in 42 slums: 22 in Bhubaneswar and 20 in Cuttack.

Results
Study population and child faeces disposal practices
A total of 694 households with 852 children <5 y of age were enrolled from 42 slums. There was an average of 16.5 respondents per slum (range 3–20). Most households (554/694 [79.8%]) had just one child <5 y of age, while 140 households had more than one child <5 y of age; 18.0% of households had two children <5 y of age and 2.1% had more than two children <5 y of age. Complete data on defecation behaviours were available for 851 children; the missing child belonged to a household with three children and is considered for this analysis as a household with two children.

Overall, 25.5% (95% CI 22.7 to 28.5) of the 851 children were reported to have their faeces end up in the latrine the last time they defecated (faeces of 217 children from 200 households). Most of these (20.3% [95% CI 17.8 to 23.2]) defecated directly into the latrine while the others had faeces deposited there after defecating elsewhere. Notably, only 13.5% (95% CI
11.4 to 16.0) of children had faeces that ended up in improved latrines (improved disposal).

At the household level, 22.3% of households disposed of all the faeces of children <5 y of age in the latrine the last time the child defecated (155/694; 142 households had 1 child, 13 households had 2), 6.5% (45/694) of households disposed of some of the children’s faeces in the latrine (38 households disposed of 50% of the children’s faeces in the latrine, 4 households disposed of 66.7% and 3 households disposed of 33.3%), 71.2% (649/694) disposed of none of the children’s faeces in the latrine (412 with 1 child, 75 with 2 children, 4 with 3 children, 3 with 4 children).

Bivariate analysis

In the bivariate analysis the following factors were found to be associated with safe disposal households (Wald p<0.25): education, age, religion and occupation of the primary caregiver, number of children <5 y of age in the household, wealth, location of the drinking water source, type and location of the latrine, having heard or seen a message about child sanitation or hygiene, use of the latrine by household members >5 y of age and mobility of the children in the household (Table 1). Of those factors, all but age and religion of the primary caregiver were significant at the 0.05 level. Certain other variables were also associated with safe disposal (attending nursery [anganwadi], breastfeeding and age), but these were excluded due to their collinearity with mobility (Supplementary Table 1). Having a place to wash hands with soap and water was excluded since the question was only asked to caregivers who disposed of their child’s faeces (i.e. the child did not defecate directly in the latrine and faeces were not left in the open); what is used to wash a child’s bottom was also excluded because of a lack of reported data. Whether the defecation place of children <5 y of age was improved or not was also associated with the outcome. However, this was not included in the multivariate analysis because it excluded the 114 households in which all children used the latrine. None of the households that reported not using sanitation facilities, despite having access to communal facilities, practiced safe child faeces disposal (see Figure 1). Thus 55 children from 45 households were excluded from the multivariate analysis, resulting in a sample of 796 children in 649 households.

Multivariate analysis

The multivariate analysis resulted in the following variables being significantly associated with being a safe disposal household: education and religion of the primary caregiver, number of children <5 y of age in the household, wealth, type and location of the latrine, defecation behaviours of the household members >5 y of age and the mobility of children in the house (Table 2, Figure 2). A caregiver with higher education than secondary schooling was associated with increased odds of being a safe disposal household compared with the poorest households (middle aOR 0.54 [95% CI 0.33 to 0.89; least poor aOR 0.55 [95% CI 0.32 to 0.94]). Households using an improved latrine located in the compound or in/attached to the dwelling (aOR 2.20 [95% CI 1.24 to 3.91]) and using an improved latrine increased the odds of being a safe disposal household (aOR 4.98 [95% CI 2.63 to 9.42]) compared with households using unimproved latrines outside the compound. Households where all the members >5 y of age were reported to use the latrine always had higher odds of being a safe disposal household (aOR 7.84 [95% CI 1.63 to 37.86]). Households where all the children <5 y of age were ambulatory had 8.49 times the odds of being a safe disposal household (aOR 8.49 [95% CI 4.29 to 16.79]).

Discussion

The factors found to be associated with being a safe disposal household are similar to those of previous studies. Azage and Haile18 found that an increase in caregiver education and a lower number of children in the household were associated with safer disposal. The consistency of adult toilet use has also been found to be associated with safe disposal in other recent studies.14,22

Being a Christian or Muslim was associated with higher odds of safe disposal. This was also found in a recent study analysing the latest India DHS data, which found that Muslim households and ‘other religion’ households had lower odds of unsafe disposal than Hindu households.19 This finding may be explained by Hindu religious rituals that may prevent safe disposal in a latrine, such as cleaning of clothes after entering the latrine.36 The Sanitation Quality, Use, Access and Trends survey also found that religion was associated with use of the latrine, with Muslims using their latrine more than Hindus.37,38

In this study we found that being from a wealthier household was associated with poorer child faeces disposal practices, which is contrary to other studies.12,14,15,18,19 This may be due to confounding of the relationship between wealth and the outcome or that the assets used to generate the wealth categories do not represent wealth accurately.

The strong association of being a safe disposal household with using an improved latrine has been found in other studies.12,18,15,21,23 Additionally, in this study we subgrouped unimproved latrines by distance and found that unimproved latrine users were more likely to be a safe disposal household if the latrine they used was nearer to their dwelling, which may be due to the convenience of disposing of faeces or training children to use a latrine if it’s closer to the house. We have previously described that the reported age of latrine training was younger for children in households using private and shared latrines as compared with communal latrines.9 In addition, for communal latrine user households, it may not be seen as adequate or practical for children to use them.9 A recent study in Accra, Ghana found that children were unlikely to use public toilets.39 A further study in Accra also found that disposal of faeces of children <5 y of age was more common in households
### Table 1. Bivariate analysis assessing association between risk factors and safe disposal households

| Variables                                      | Safe disposal households | N  | Total | %    | OR    | Lower CI | Upper CI | p-Value (Wald) |
|------------------------------------------------|--------------------------|----|-------|------|-------|----------|----------|----------------|
| Education of primary caregiver                 |                          |    |       |      |       |          |          |                |
| Illiterate/no formal schooling                  |                          | 694| 112   | 12.5 | 1.00  |          |          |                |
| Some/completed primary school                   |                          |    |       |      |       |          |          |                |
| Completed secondary school                      |                          | 86 | 350   | 24.6 | 0.95  | 2.80     | 0.078    |                |
| Any level of higher education                   |                          | 42 | 97    | 43.3 | 1.95  | 6.60     | <0.001   |                |
| Age of primary caregiver (y)                    |                          |    |       |      |       |          |          |                |
| 18–24                                          |                          | 48 | 264   | 18.2 | 0.34  | 1.30     | 0.229    |                |
| 25–29                                          |                          | 57 | 257   | 22.2 | 0.81  | 1.89     | NS^a     |                |
| ≥30                                            |                          | 50 | 173   | 28.9 | 1.11  | 2.84     | 0.017    |                |
| Religion of primary caregiver                   |                          |    |       |      |       |          |          |                |
| Hindu                                          |                          | 140| 654   | 21.4 | 1.00  |          |          |                |
| Muslim/Christian                               |                          |    |       |      |       |          |          |                |
| Caregiver has a job                            |                          |    |       |      |       |          |          |                |
| No                                             |                          | 139| 632   | 22.0 | 1.04  | 2.40     | 0.032    |                |
| Yes                                            |                          | 16 | 62    | 25.8 | 0.89  | 2.09     | 0.017    |                |
| Number of children <5 y of age in the household |                          |    |       |      |       |          |          |                |
| 1                                              |                          | 142| 554   | 25.6 | 1.00  |          |          |                |
| 2–4                                            |                          | 13 | 140   | 9.3  | 0.22  | 0.58     | <0.001   |                |
| Number of people >5 y of age living in the household |                      |    |       |      |       |          |          |                |
| 1–2                                           |                          | 39 | 165   | 23.6 | 0.56  | 1.42     | NS^a     |                |
| 3–4                                           |                          | 53 | 253   | 21.0 | 0.59  | 1.63     | NS^a     |                |
| 5–6                                           |                          | 32 | 157   | 20.4 | 0.72  | 2.09     | NS^a     |                |
| 7–16                                          |                          | 31 | 119   | 26.1 | 0.72  | 2.09     | NS^a     |                |
| Wealth                                         |                          |    |       |      |       |          |          |                |
| Poorest                                        |                          | 39 | 232   | 16.8 | 1.00  |          |          |                |
| Middle                                        |                          | 43 | 231   | 18.6 | 0.59  | 1.63     | NS^a     |                |
| Least poor                                     |                          | 73 | 231   | 31.6 | 1.17  | 3.10     | 0.009    |                |
| Gender of head of household                    |                          |    |       |      |       |          |          |                |
| Female                                         |                          | 22 | 127   | 17.3 | 0.83  | 1.99     | NS^a     |                |
| Male                                           |                          | 133| 567   | 23.5 | 1.02  | 1.42     | NS^a     |                |
| Ownership of residence                         |                          |    |       |      |       |          |          |                |
| Owner                                          |                          | 110| 506   | 21.7 | 1.09  | 3.09     | 0.023    |                |
| Tenant                                         |                          | 45 | 188   | 23.9 | 0.73  | 1.42     | NS^a     |                |
| Time in house (y)                              |                          |    |       |      |       |          |          |                |
| <1                                            |                          | 11 | 43    | 25.6 | 0.65  | 2.24     | NS^a     |                |
| 1–5                                           |                          | 30 | 115   | 26.1 | 0.65  | 2.24     | NS^a     |                |
| ≥5                                            |                          | 114| 534   | 21.4 | 0.50  | 1.76     | NS^a     |                |
| Location of drinking water (98.8% improved)    |                          |    |       |      |       |          |          |                |
| Outside compound                               |                          | 49 | 337   | 14.5 | 1.00  |          |          |                |
| In compound                                    |                          | 37 | 135   | 27.4 | 1.09  | 3.09     | 0.023    |                |
| In dwelling                                    |                          | 69 | 221   | 31.2 | 1.45  | 3.77     | <0.001   |                |
| Type of latrine                                 |                          |    |       |      |       |          |          |                |
| Unimproved latrine outside compound             |                          | 26 | 248   | 10.5 | 1.23  | 3.96     | 0.008    |                |
| Unimproved latrine in compound                  |                          | 36 | 160   | 22.5 | 1.23  | 3.96     | 0.008    |                |
| Improved                                       |                          | 93 | 241   | 38.6 | 2.77  | 8.10     | <0.001   |                |
| Ownership of a potty                           |                          |    |       |      |       |          |          |                |
| No/unable to show                              |                          | 141| 648   | 21.8 | 0.69  | 2.59     | NS^a     |                |
| Yes observed                                   |                          | 14 | 46    | 30.4 | 0.69  | 2.59     | NS^a     |                |
| Buy diapers sometimes                          |                          |    |       |      |       |          |          |                |
| No/don't know                                  |                          | 79 | 366   | 21.6 | 0.57  | 1.39     | NS^a     |                |
| Yes                                            |                          | 76 | 328   | 23.2 | 0.57  | 1.39     | NS^a     |                |
| Hand-washing place                             |                          |    |       |      |       |          |          |                |
| No specific place                              |                          | 8  | 159   | 5.0  |      |          |          |                |
| Hand-washing facility                          |                          | 2  | 140   | 1.4  | 0.25  | 0.037    | 1.68     | 0.154           |
| Hand-washing facility with soap and water      |                          | 33 | 230   | 14.4 | 1.29  | 5.33     | 0.008    |                |

Continued
with a within-compound latrine than in households that relied on public latrines.\textsuperscript{40}

The mobility of children is strongly associated to safe disposal. This is likely due to the fact that most safe disposal is due to ambulatory children directly defecating in the latrine. This has also been found in previous studies in rural Odisha.\textsuperscript{10,11}

Similarly, an increase in safe disposal with increasing age of the children has been found in other studies.\textsuperscript{12,14,18–22} This suggests that there is a need to design interventions for younger children who are defecating elsewhere than the latrine.
**Figure 1.** Bar chart proportions of safe disposing households by types of sanitation facilities.

| Variables | aOR  | Lower CI | Upper CI | p-Value (Wald) |
|-----------|------|----------|----------|----------------|
| Education of primary caregiver | | | | |
| Illiterate/no formal schooling | Ref | | | |
| Some/completed primary school | 0.66 | 0.30 | 1.47 | 0.311 |
| Completed secondary school | 1.19 | 0.64 | 2.21 | 0.577 |
| Any level of higher education | 2.01 | 1.03 | 3.94 | 0.042 |
| Religion of primary caregiver | | | | |
| Hindu | Ref | | | |
| Muslim/Christian | 2.89 | 1.11 | 7.51 | 0.029 |
| Number of children <5 y of age in the household | | | | |
| 1 | Ref | | | |
| 2–4 | 0.46 | 0.23 | 0.93 | 0.031 |
| Wealth | | | | |
| Poorest | Ref | | | |
| Middle | 0.54 | 0.33 | 0.89 | 0.017 |
| Least poor | 0.55 | 0.32 | 0.94 | 0.029 |
| Type of latrine | | | | |
| Unimproved latrine outside compound | Ref | | | |
| Unimproved latrine in compound | 2.20 | 1.24 | 3.91 | 0.007 |
| Improved | 4.98 | 2.63 | 9.42 | <0.001 |
| All members of the household >5 y of age use latrine always | | | | |
| No | Ref | | | |
| Yes | 7.84 | 1.63 | 37.86 | 0.01 |
| Proportion of mobility category in household | | | | |
| All/some pre-ambulatory | Ref | | | |
| All ambulatory | 8.49 | 4.29 | 16.79 | <0.001 |

**Table 2.** Adjusted associations between risk factors and safe disposal households (n=649)
Limitations

While we have used the definition of safe disposal promoted by international monitoring (i.e. disposal of child faeces in any latrine, improved or unimproved), we would not recommend this classification of safe disposal. Children’s faeces should at least be considered to be as risky as those of adults and thus should be treated in the same way with regards to disposal.

This article only focuses on associations between households that dispose of all of the children’s faeces in a latrine and possible determinants. However, child faeces management contains several critical points beyond the final disposal place that need to be mitigated to avoid exposure, including the place of defecation, cleaning of that place and hygiene behaviours. Furthermore, the study quantified safe disposal using questions about the last time each child defecated, but this behaviour is likely to change and has not been found to be consistent in other studies.

The results of this study are only generalizable to the population included in the study. Also, this study was conducted during the rainy season and thus behaviours may differ from other seasons. In addition, it has been found that participants overreport ‘desirable’ behaviours of child faeces disposal when data are collected using questionnaires compared with structured observations. We tried to minimize this by using questions about the last time children defecated. In addition, recent evidence suggests that reported and observed behaviour were very similar.

Conclusions

Few households reported disposing of all of their children’s faeces in a latrine. Various characteristics of study participants and their households were associated with the safe disposal of child faeces. Many of these, such as education and religion of the primary caregiver, household wealth, number and ambulatory status of children <5 y of age in the household, are either not amenable to or cannot be changed by short-term interventions. Others, however, such as access, type and proximity to latrines and whether other household members use latrines, are within the purview of sanitation programs. Such programs, however, must address not only deficiencies in latrine coverage, but also deficiencies in practices. Further research should also investigate whether these behaviour change interventions could be enhanced by provision devices that can facilitate safe disposal (e.g. nappies, scoops, potties) while also minimizing other sources of exposure.

Supplementary data

Supplementary data are available at Transactions online (http://trstmh.oxfordjournals.org/).

Authors’ contributions: F.M., B.T. and T.C. conceived and designed the study. F.M., P.R., M.R. oversaw data collection and ensured data quality. F.M. analysed the data with advice from C.N. F.M. wrote the initial draft. All the authors revised the manuscript and approved the final draft. F.M. and T.C. are the guarantors of the paper.

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