

Patterns and determinants of communal latrine usage in urban poverty pockets in Bhopal, India

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Summary

OBJECTIVES To explore and explain patterns of use of communal latrine facilities in urban poverty pockets.

METHODS Six poverty pockets with communal latrine facilities representing two management models (Sulabh and municipal) were selected. Sampling was random and stratified by poverty pocket population size. A seventh, community-managed facility was also included. Data were collected by exit interviews with facility users and by interviews with residents from a randomly selected representative sample of poverty pocket households, on social, economic and demographic characteristics of households, latrine ownership, defecation practices, costs of using the facility and distance from the house to the facility. A tally of facility users was kept for 1 day at each facility. Data were analysed using logistic regression modelling to identify determinants of communal latrine usage.

RESULTS Communal latrines differed in their facilities, conditions, management and operating characteristics, and rates of usage. Reported usage rates among non-latrine-owning households ranged from 15% to 100%. There was significant variation in wealth, occupation and household structure across the poverty pockets as well as in household latrine ownership. Households in pockets with municipal communal latrine facilities appeared poorer. Households in pockets with Sulabh-managed communal facilities were significantly more likely to own a household latrine. Determinants of communal facility usage among households without a latrine were access and convenience (distance and opening hours), facility age, cleanliness/upkeep and cost. The ratio of male to female users was 2:1 across all facilities for both adults and children.

CONCLUSIONS Provision of communal facilities reduces but does not end the problem of open defecation in poverty pockets. Women appear to be relatively poorly served by communal facilities and, cost is a barrier to use by poorer households. Results suggest improving facility convenience and access and modifying fee structures could lead to increased rates of usage. Attention to possible barriers to usage at household level associated particularly with having school-age children and with pre-school childcare needs may also be warranted.

Keywords sanitation, toilet facilities, India, poverty areas

Introduction

Diarrhoeal disease is estimated to cause 1.87 million deaths among children under five globally per year (Boschi-Pinto *et al.* 2008). Use of safe sanitation is an effective intervention that can reduce the risk of diarrhoeal disease by around 33% (Fewtrell *et al.* 2005), but access to safe sanitation remains a major public health problem. According to the 2001 census in India, 12.04 million (7.87%) urban households in India do not have access to

latrines and defecate in the open. Indian cities are experiencing rapid population growth and an expansion of urban poor. Many of these people live in 'poverty pockets', discrete areas of very high density, poor quality housing, with inadequate provision of basic water and sanitation services. In 2001, about 285 million people, or 27.8% of India's 1.02 billion population, lived in 5161 cities. Projections estimate that 368 million people will be living in Urban India by 2012 (Office of Registrar General and Census Commissioner, Government of India, 2006). For a

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number of reasons including insecurity of tenure, lack of space and affordability, low priority and awareness, household sanitation options are limited, coverage is poor and open defecation remains common in many of Indian's urban poverty pockets. The launch of the National Urban Sanitation Policy by the Government of India during 2008 is a landmark step to consolidate sanitation interventions and is the first major commitment which aims at totally sanitised cities.

The provision of communal sanitation blocks is a means of providing sanitation to the urban poor and has been implemented widely in several Indian cities. Sulabh International, a non-governmental organisation (NGO), has been responsible for building and operating more than 6000 toilet complexes in India providing sanitation access at a low user charge (Pathak 1999). These include public toilets intended to serve itinerant populations in busy, public places and community toilets intended to cater for the needs of resident populations in pockets of poor, high-density housing. In Bhopal, Sulabh operates more than 110 toilet complexes. In Pune and Mumbai, the World Bank-assisted Slum Sanitation Program constructed 330 toilet blocks in the decade to 2005 (Sarkar *et al.* 2006). Many of these facilities have proved capable of sustaining themselves financially, and anecdotal evidence suggests that community management, where implemented, has also been beneficial in promoting dignity and self-confidence among marginalised groups (Hobson 2000).

However, provision of communal sanitation facilities is not a guarantee of access and use. If provision of communal sanitation facilities is to be a key strategy in sanitation provision for the urban poor, this should be informed by a sound understanding of their potential for ending open defecation and particularly the barriers and facilitating factors associated with their use. This exploratory study was conducted in 2008 to examine facility and household characteristics that influence the use of communal sanitation facilities in urban poverty pockets in Bhopal and to understand the extent to which these facilities contribute to ending open defecation within the poverty pockets they serve.

Methods

Selection of latrine facilities/poverty pockets

Latrine facilities were selected using data on sanitation provision and poverty pocket population sizes from an earlier survey of Bhopal poverty pockets (UN Habitat, 2006). From the existing survey data, 56 poverty pockets with a single communal latrine facility in usable condition were identified. Six poverty pockets were excluded because

the survey suggested that no households used the communal facilities. Estimated poverty pocket sizes ranged from 25 to 5000 households. Twelve poverty pockets with populations of fewer than 200 households were excluded because of the expected small numbers of communal facility users. The two largest poverty pockets (5000 and 3000 households) were also excluded. To allow comparison across similar size poverty pockets while covering a range of them, an arbitrary decision was taken to select two poverty pockets with populations of 200–300 households (from a total of 11), two poverty pockets with populations of 600–700 households (from a total of four) and two poverty pockets with populations of 1000–2000 households (from a total of seven). Numbers were allocated to poverty pockets within each population bracket, and selections were made randomly using a random number generator. The poverty pockets selected in this way had latrine facilities that operated under one of two management conditions. Four facilities were operated and maintained by Sulabh International and were built with financial support and land from the local municipal corporation. The other two were owned and operated by the municipality. A seventh poverty pocket (Police Lines) was of interest and included because the facility had a community-based management structure, being the only one of its kind in Bhopal. Construction of this latrine had been funded by WaterAid and UN-HABITAT. It was managed by a community-based organisation of poverty pocket residents established and supported by WaterAid's implementing partner AARAMBH, a local NGO.

Data collection methods

Data on household characteristics, defecation practices and perceptions of the communal latrine facilities were collected using two verbally administered questionnaire surveys and a tally of users at each communal facility. Questionnaires were designed to measure hypothesised positive and negative influences on facility use. The factors measured and their hypothesised directions of influence are shown in Table 3.

One questionnaire was administered as a household survey with a random representative sample of pocket residents to ascertain the extent of facility usage and explore practices and characteristics of non-users as well as users. The other was administered as an exit interview at latrine facilities to collect data on the economic and demographic characteristics of facility users, the purpose of their visit (*viz.* defecation, bathing, urination) and their satisfaction with the facility. Findings relating to user satisfaction will be reported in a subsequent paper.

Exit interviews

At each facility, four enumerators (two men and two women) conducted exit interviews. Enumerators were staff of AARAMBH. Male enumerators interviewed men and female enumerators interviewed women. Data collection took place between 07.00 and 11.00 and between 16.00 and 20.00 h. Enumerators would approach the first user to exit the facility and ask if they were willing to participate in the survey. In the event of a refusal, the next and then the next user would be asked until a volunteer was found. As soon as the interview was over, the process was repeated. This continued until the end of the data collection period or until a quota of 150 interviews had been conducted with respondents of each gender. Latrine users were eligible to take part in the survey if they were older than 12 years.

Household survey

Households were selected by 'random walks' across the poverty pockets. A minimum of 50 households in each poverty pocket was selected by walking a minimum of two transects and visiting every fourth house. Transects were chosen to follow the longest axes across the settlement from the communal latrine facility to the edge of the settlement. To avoid restricting the sample to houses on the main thoroughfares, enumerators tossed a coin on reaching a side alley to decide whether or not to sample houses along the side alley. If a house was empty or declined to take part in the survey, the next house was chosen. This was repeated until a volunteer household was found. In practice, this was not found to be necessary as all houses were occupied and none refused to participate.

Global positioning system readings were taken at the latrine facility and at each surveyed household and used to calculate the straight-line distance between each house and the communal latrine facility.

User tallies

Tallies of users were kept for 1 day at each facility. Over the course of this day, the numbers of men, women, boys and girls (who appeared to be aged <15 years) who used the facility between 0500 and 2100 were recorded.

Facility conditions and cleaning arrangements

Information on the number and condition of latrine cabins, including an assessment of crowding, was taken from existing WaterAid data. Information on opening hours and cleaning arrangements came from the caretaker or a relative of the caretaker or in the absence of a caretaker

from users of the facility. The usage fee was derived from the median amount reported by users in the exit interviews.

Analysis

Variables capturing household and facility operating and management characteristics from the household survey and facility information, including straight-line distance between the house and facility (travel time), were hypothesised to affect usage of communal facilities across the seven pockets (Table 3). A multivariate analysis using binary logistic regression was then used to test the set of factors in Table 3 for significant effects on usage. The analysis was performed on the subset of households without a household latrine. A similar analysis was also conducted on having *ever* used the facility to compare with determinants of regular usage, trial usage being a key step towards regular usage.

Results

Exit interviews revealed that almost all users (95% of men and 96% of women) were visiting the facility for defecation.

Comparison of facility characteristics and usage rates

Latrine facilities differed in terms of their facilities, conditions, management, operating characteristics and rates of usage by the residents of the poverty pocket. The municipal latrines had the lowest fees and were the only ones with 24-h access. The community-managed facility was the newest and in the best condition. Reported usage rates among non-latrine-owning households ranged from 15% to 100%. The tally of users revealed a 2:1 ratio of male to female users that was consistent across all facilities for both adults and children (Table 1).

Comparison of population social, economic and demographic characteristics across poverty pockets

There was significant variation in population characteristics across the poverty pockets (Table 2). Households in the pockets served by municipal latrines appeared poorer. Consistent with apparent differences in wealth, households in the pockets served by Sulabh facilities were significantly more likely to own a home latrine. A significantly greater proportion of non-latrine-owning households in the pockets served by municipal facilities were regular facility users, compared with Sulabh-served pockets, and a significantly greater proportion of municipal pocket households reported ever having used the facility. Households in the

Table 1 Facility characteristics

Characteristic	Facility identification number						
	1.10	3.10	3.20	4.10	4.20	4.30	4.40
Est. pocket population	750	8500	1400	9000	6150	3010	3000
Management type	Community.*	Muni.	Muni.	Sulabh	Sulabh	Sulabh	Sulabh
Years of operation	1.5	11	15	9.5	7.5	11	12
Hours open per day	18	24	24	17	16	16	17
Schedule	0500–2300			0500–2200	0500–2100	0500–2100	0500–2200
Cleaning arrangements	On-site caretaker	None	Local resident	Sulabh	Local resident	No data	Sulabh
Condition	Cleaned & well maintained	Poor	Cleaned	Cleaned & maintained	Cleaned	Maintained	Cleaned & maintained
Monthly subscription fee (INR/h hold)†	50	0	15	40	10	25	20
Crowded	No	No	Yes	No	Yes	No	No
Cabins total (men:women)	12 (6:6)	4 (2:2)	8 (4:4)	14 (7:7)	20 (13:7)	15 (7:8)	20 (10:10)
1-day tally total‡	896	124	554	465	556	343	435
Tally % men	34%	33%	32%	32%	33%	36%	37%
Tally % women	18%	13%	15%	14%	11%	13%	14%
Tally % boys	33%	39%	38%	39%	39%	35%	31%
Tally % girls	15%	15%	15%	16%	17%	16%	18%
% Using facility§	41%	24%	100%	50%	86%	79%	15%

*Managed by a community-based organisation.

†Median amount per month reported paid by subscriber households in the combined short and long exit interview results.

‡All users were counted at each facility over the course of a day, and gender and age (over or under 15 years) recorded for each user.

§Reported usage behaviour among the subset of households without a home latrine from the household survey.

pocket with the community-managed facility were notably smaller than households in the other pockets, with the highest ratio of pre-school-age children to adults in the household, and no sampled households with an elder present. This was the only pocket in which the minimum number of adults in the household was two and also had the lowest mean number of adults per household. These results are suggestive of younger nuclear families, better off in terms of ration card status, and more likely to be engaged in organised income-generating employment or salaried jobs providing steady incomes as dominant in the community-managed facility pocket. Households in the pockets served by municipal facilities were more likely to have school-age and pre-school children, were larger in size, and had the smallest fraction of adults in the household.

Logistic regression analysis of factors affecting communal latrine use

The variables tested in this analysis are shown in Table 3 and the results in Table 4. Determinants of communal facility usage among households without a household

latrine were dominated by facility access and convenience, facility age, cleanliness/upkeep and per-person cash cost to the household to use the facility. Important dimensions of access and convenience included distance and whether or not the facility allows 24-h access. These variables had the expected negative effects on usage. Both the likelihood of regular usage and having ever used the facility increased with age of the facility. Greater number of cabins/squat holes was weakly positive for ever having used the facility but not for regular usage.

There was a positive effect of the proxy variable for facility cleanliness/upkeep (median monthly household subscription fee uniform within each poverty pocket) on facility usage, while cash cost per person within each household (which is inversely related to household size) had a negative effect on usage. Households with a younger or female respondent, having an APL or general ration card (in contrast to BPL or none), renting their home, having no children, having a lower ratio of pre-school children to adults or headed by a labourer were more likely to report being communal latrine users. Having children and a high pre/adult ratio in the household was more strongly and significantly negative for trial usage than regular usage.

A. Biran *et al.* **Communal latrine usage in Bhopal****Table 2** Study population characteristics and defecation practices by management type

Management type characteristic	Community.	Muni.	Sulabh	All	Sign (<i>P</i>) group dif.*†‡
Number of pockets	1	2	4	7	NA
Household sample size	50	99	201	350	NA
Sanitation practice					
Latrine owner	26%	38%	62%	50%	0.000‡
Regular facility user	30%	46%	18%	28%	0.000‡
Open defecator	44%	16%	19%	22%	0.000‡
Ever used facility	40%	55%	32%	39%	0.000‡
Open defecation rate (among non-latrine owners)	59%	26%	51%	44%	0.001‡
Household occupation and ration card status					
No ration card	36%	10%	23%	21%	0.001‡
BPL ration card	34%	48%	25%	33%	0.000‡
APL ration card	30%	41%	52%	46%	0.013‡
Unskilled, day or domestic labourer	64%	83%	59%	66%	0.000‡
Professional/salaried worker	26%	4%	17%	15%	0.001‡
Skilled labourer	6%	9%	6.5%	7%	0.669‡
Housewife	0%	2%	6.5%	4%	0.055‡
Shopkeeper	0%	1%	6.5%	4%	0.023‡
Demographic, lifestyle, and facility-related household characteristics					
Median age respondent	21–30	31–40	21–30	21–30	0.318†
Female respondent	64%	76%	74%	73%	0.291‡
Renter (vs. own house)	8%	5%	10%	8%	0.350‡
Household size	5.36	6.18	6.09	6.10	0.100*
Number of adults	2.94	3.44	3.60	3.46	0.087*
Fraction of adults in household	0.59	0.56	0.62	0.60	0.199*
Elder in household	0%	2%	6.5%	4%	0.055‡
Have school-age child	74%	79%	72%	74%	0.315‡
Number of school-age children	1.86	2.00	1.97	1.96	.563*
Have pre-school child	36%	44%	32%	36%	0.122‡
Number of pre-school children	0.56	0.74	0.53	0.59	0.092*
Ratio pre-school children/adults	0.25	0.23	0.16	0.19	0.125*
Ratio all children/adults	1.03	1.00	0.89	0.94	0.199*
Distance to facility, meters	92.4	150.0	138.9	135.4	0.000*
Distance, Z-score by pocket	0.000	−0.004	−0.009	−0.006	0.998†
Facility cost/hhold/mo (INR)	50	7.42	23.73	22.87	0.000*
Price/person/mo (INR)	11.0	1.4	4.9	4.8	0.000*

P values shown in bold are significant at the 0.05 or 0.01 level.

*Kruskal–Wallis non-parametric test (continuous variables, non-normal distributions).

†ANOVA *F*-statistic (continuous variables, variance homogeneity).

‡Chi-square test (categorical variables).

Discussion

Communal latrine facilities clearly play an important role in catering for the daily defecation needs of a large proportion of the populations living in the poverty pockets they serve. However, it is also clear that provision of these facilities has not resulted in an end to open defecation in the poverty pockets. Furthermore, the facilities are not widely used for disposal of infants' faeces or as places to bring young children to defecate. The health threats resulting from a faecally contaminated environment thus persist.

Convenience and access, facility age, cleanliness and cost, all facility-related features, emerged as having the

greatest impact on usage rates, largely independent of individual household characteristics. Even within the relatively small distances of a poverty pocket, households with no latrine living further from the facility were more likely to use open defecation sites than those living close to the facility. This effect may be more marked if access to the facility is further restricted by opening hours. One implication of this finding is that provision of smaller facilities dispersed throughout the poverty pocket which are accessible 24 h a day may be a more effective means of ensuring use. It is likely that the distance to an acceptable site for open defecation is also an important determinant of facility use. The lack of a convenient open defecation site may

A. Biran *et al.* Communal latrine usage in Bhopal**Table 3** Independent factors hypothesized to influence communal latrine facility use

Variable*	Factor	Predicted influence on regular use	Data source†	Mean or % reporting	
				All respondents (350)	No latrine (174)
Uses facility (D)	Communal facility is usual defecation place.		HH	30.3%	55.7%
Ever use facility (D)	Household has used communal facility at least once.		HH	39.4%	64.4%
Female respondent (I)	Interviewee is women (expected to place greater value on sanitation).	Positive	HH	72.9%	74.1%
Age respondent (I)	Age of interviewee (mid-point year of age bracket). (younger expected to be more open to changing defecation behaviour).	Negative	HH	32.7 years	31.5 years
Renter (I)	Household rents house (vis. owns)	Positive or Negative	HH	8.3%	6.9%
Labourer (I)	Head is unskilled, day, domestic or skilled labourer	Positive or Negative	HH	73.4%	82.8%
Ratio pre-school/adult (I)	Ratio of pre-school children to adults in household. Indicates younger head (highest values indicate single-parent with young children with very limited time to travel to and use facility).	Negative	HH	0.191	0.237
Have children (I)	Household has school-age children in the home. Correlates with lower fraction of adults in household (less cash income, and competing priorities for child education on limited time and income).	Negative	HH	74.3%	75.3%
Better off (I)	Household has APL (above poverty line) or general ration card, in contrast to BPL (below poverty line, poor) or no card (proxy for greater income).	Positive	HH	54.3%	56.3%
Facility age (I)	Number of years for which the facility has operated (likely to be correlated with settlement age and in turn housing conditions such as density that make open defecation less attractive, alternatively, it may capture poor condition of older relative to newer facilities if upkeep has been poor).	Positive or Negative	F	8.92 years	9.01 years
Number of cabins (I)	Number of individual cabins (seats) at facility (expected to reduce queues and waiting times).	Positive	F	13.21	12.24
Restricted hours (I)	Communal facility is open <24 h (restricting access and making use inconvenient at times).	Negative	F	71.7%	64.9%
Distance Z-score (I)	Straight line distance between home and facility, normalized by pocket, an indicator of relative travel time within-pocket representing time cost of use.	Negative	HH & F	-0.0063	-0.0945
Monthly price (I)	Median monthly price (INR) charged to use facility per household. Correlates directly with facility cleanliness, upkeep and condition, as it reflects on-going facility operating and upkeep expenditures. (acts as relative proxy for facility upkeep and cleanliness).	Positive	E	22.9 INR	27.7 INR
Price per person (I)	Monthly price divided by household's size. Indicator of true cost per person for usage by a household. Price per person increases as household size decreases within a pocket. (smaller households have less adults in this population, indicating less disposal cash income. Higher per person price expected to reduce use).	Negative	E & HH	4.81 INR	5.39 INR
Community/WA Managed Facility	Communal latrine facility managed by community group with NGO support (allowing for greater responsiveness to users and sense of ownership in contrast to Sulabh or Municipal ownership & management)	Positive	F	14.3%	21.3%

*D, dependent; I, independent

†HH, household survey; F, facility survey; E, exit interviews.

A. Biran *et al.* Communal latrine usage in Bhopal**Table 4** Community latrine facility usage multivariate analysis results

Variable*	Regular Use (N = 174)*			Ever used (N = 173)†		
	B	Sign.	Exp(B)‡ (95% CIs)	B	Sign.	Exp(B) (95% CI)
Constant	-2.908	0.067	0.099	-0.151	0.930	
Distance (z-score)	-1.020	0.000	0.361 (0.223–0.584)	-1.440	0.000	0.237 (0.134–0.418)
Facility subscription fee	0.152	0.000	1.164 (1.090–1.242)	0.165	0.000	1.179 (1.095–1.270)
Facility age	0.255	0.035	1.291 (1.018–1.637)	0.199	0.096	1.220 (0.965–1.543)
Restricted hours (facility)	-4.218	0.041	0.015 (0.000–0.838)	-5.465	0.017	0.004 (0.000–0.375)
Price to use/person	-0.134	0.071	0.875 (0.756–1.011)	-0.235	0.015	0.791 (0.655–0.955)
Community-managed facility	-0.508	0.540	0.602 (0.119–3.055)	-0.603	0.505	0.547 (0.093–3.226)
Better off (APL hhold)	0.742	0.078	2.100 (0.921–4.791)	0.566	0.210	1.761 (0.727–4.269)
Pre-school to adult ratio	-0.744	0.171	0.475 (0.164–1.378)	-1.158	0.048	0.314 (0.100–0.990)
Have children	-0.745	0.186	0.475 (0.158–1.430)	-1.883	0.010	0.152 (0.036–0.636)
Renter	1.109	0.245	3.033 (0.467–19.703)	1.653	0.110	5.222 (0.686–39.74)
Labourer (head)	0.558	0.286	1.746 (0.627–4.863)	0.031	0.955	1.031 (0.358–2.972)
Age respondent	-0.036	0.027	0.964 (0.934–0.996)	-0.028	0.112	0.973 (0.940–1.007)
Female respondent	0.456	0.327	1.577 (0.634–3.921)	-0.414	0.428	0.661 (0.237–1.840)
Facility cabins (seats)	0.110	0.416	1.116 (0.856–1.456)	0.209	0.144	1.232 (0.931–1.631)
Pseudo R ²	0.34§	0.46¶		0.37§	0.51¶	
Correct % (0.5 cutoff)						
Non-User	70.1%			63.9%		
User	79.4%			89.3%		
Overall	75.3%			80.3%		

*In stepwise backward modelling of this set of independent variables in Table 3, *facility cabin* and *community-managed facility* were removed, resulting in a model with increased significance for the remaining facility-related variables.

† In stepwise backward modelling of the variable in Table 3 for *Ever Used*, *labourer*, *female respondent*, and *community-managed facility* were removed with very little changes to the significance of the remaining variables.

‡ Equivalent to and interpretable as the odds ratio or elasticity.

§ Cox and Snell test statistic.

¶ Nagelkerke test statistic.

drive use of an inconvenient or unpleasant facility and may be one of the reasons underlying the high rate of use of municipal latrines in this study. This is plausible if facility age is correlated with settlement age across the study pockets, and settlements become more dense over time, increasing distances and reducing access to open defecation sites. Unfortunately, we lack the data to explore this relationship.

Getting people to try the facility is a necessary first step towards regular use. The results suggest that households with children and with a high pre-school to adult ratio often do not even take this step. There may be ways to increase trial usage such as free trial membership and ways to improve the experience so as to encourage open defecators to switch to facility use. However, cost will remain an important barrier to overcome in achieving sustained regular use.

Household subscription fees are used to fund upkeep and cleaning, and in this study, fee rate was found to act as a proxy indicator for facility cleanliness and condition. The strong positive effect of monthly subscription fee (uniform

within a pocket) on usage indicates an important effect of upkeep condition and cleaning in increasing both trial and overall regular usage (albeit within the range of monthly prices charged by the facilities in this study of 0–50 INR, representing 0–2.5% of the maximum monthly BPL income threshold and 0–1.7% of the maximum monthly APL income threshold). However, the cash cost per person faced by each household varies with household size within a given pocket, because of the flat per-household monthly subscription fee structure employed by these facilities, with higher per-person monthly usage cost having a significant negative effect on both trial and regular usage.

Poorer households, as indicated by BPL ration card status, were less likely to use the communal facilities suggesting that absolute cost may be an important barrier to facility use. Households with no children or with a lower ratio of pre-school children to adults were more likely to be users of the communal facilities. This may reflect the relatively greater cash income of these households (having a higher ratio of wage earners) and/or that the time demands of childcare restrict the ability of adults to use the

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facilities. It is notable that provision of child-friendly facilities (as is the case at Police Lines poverty pocket) was not sufficient to encourage widespread use of the facilities as a place for children to defecate, and it seems likely that constraints on men's and women's time prevent them from bringing children to the facilities and supervising them during use. It is also possible that children's faeces are regarded as relatively harmless and inoffensive compared with those of adults (e.g. Biran *et al.* 2005) and that their unsafe disposal is therefore socially acceptable.

Assuming an underlying gender balance in the poverty pockets' populations, the 2:1 ratio of male to female users, consistent across all facilities, provides a clear indication that these facilities are failing to cater to the needs of women. This is contrary to the commonly held belief that provision of sanitation facilities is particularly beneficial for women, affording them greater privacy and safety. The gender imbalance in facility use uncovered by the user tallies at facilities would not have been detected if we had relied only on self-reported use from the household survey. The reasons for the imbalance are not apparent from this study. There may be social barriers to use, there may be an inherent gender imbalance in the study population or it may be that the demands on women's time constrain their ability to travel to communal facilities. There is an urgent need to understand and address the barriers faced by women in using sanitation facilities, if indeed female usage rates are significantly lower than males across these poverty pockets.

The tested factors were only able to explain 34–46% of the variability in latrine facility use (pseudo- R^2 values, Table 4). There are other factors related to facility condition and management which may affect usage. From exit interviews, we know that lighting, cleanliness, lack of smell and the availability of soap and water are valued by latrine users. Management type which may be a weak surrogate measure for these and other variables for which we did not have the necessary data to include in the model was not significant after accounting for other facility-related operating and management characteristics for which data were available. It would be useful in future studies to collect repeated measures of the availability of soap, water and electricity, as well as state of cleanliness at latrine facilities to allow this issue to be investigated more fully.

There were significant differences between the populations served by the different management models in terms of wealth indicators and household structure. It is not known if these differences are purely random or if they reflect systematic policy differences between organisations with regard to the selection of appropriate sites for establishing communal latrine facilities.

This exploratory study was based on a small, non-representative sample of communal latrine facilities, and further work should be carried out to confirm the findings in other populations before making general recommendations. However, if the findings of this study are representative of a general pattern, they indicate that a strategy of providing each poverty pocket with a communal latrine facility is not sufficient to address the acute sanitation problems associated with poor urban settlements and is an approach that may systematically exclude women, children and the poorest.

One potentially important short to medium term role for communal facilities may be as a temporary sanitation solution, allowing time for households to acquire their own latrines as their economic situation improves. Such a pattern may account for the relatively high levels of latrine ownership which could have developed over time in the poverty pockets served by Sulabh facilities. The success of such a strategy rests on the assumption that economic improvement is the normal trajectory, that wealthier households will be able and willing to construct their own latrines, and that household latrines provide a sustainable and comprehensive sanitation solution for all household members. The construction of household latrines reduces the customer base for communal sanitation facilities. Unless additional customers are found, for example, from among new arrivals or from non-resident passers-by (the main customer base at many Sulabh facilities but not those included in this study) the financial viability of communal facilities may be threatened. A sound understanding of the needs of the urban poor, the barriers and drivers of latrine acquisition and usage and the economics of comprehensive sanitation provision is needed as a basis on which to develop flexible and appropriate sanitation solutions for marginalised urban populations.

Acknowledgements

This study was funded by WaterAid UK and commissioned by Jerry Adams (WaterAid UK). Salaries for two of the authors (Biran and Jenkins) during the time spent on preparing this manuscript were paid for by Unilever plc under a grant to the London School of Hygiene and Tropical Medicine. Logistical support was provided by WaterAid India and Anup Sahay and his staff at AARAMBH.

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