Community Interactions and Sanitation Use by the Urban Poor: Survey Evidence from India's Slums

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Abstract

While the current scholarship on sanitation access is important, the actual use of sanitation facilities is critical in reducing sanitation-related health problems. We explore variation in the use of sanitation facilities among slum dwellers who have access to them by identifying social interactions in slums that serve as information channels that promote public latrine use. Using an original survey in New Delhi, we find that slum dwellers who frequently interact with slum leaders, more so than other community leaders, are more likely to use their public latrines regularly, even after considering individual attitudes toward sanitation.

Keywords: India; sanitation; slums; slum leaders; latrine use; social networks

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1 Introduction

According to the United Nations, 2.3 billion people worldwide lacked access to sanitation in 2017. Poor sanitation causes waterborne diseases, such as diarrhea, stomach worms, and trachoma, which pose serious health risks in low- and middle-income countries. In particular, diarrheal disease is one of the leading causes of child mortality worldwide and responsible for about 31 percent of deaths among children under five in South and Southeast Asia and 25 percent in Sub-Saharan Africa (Walker et al., 2012). This is serious problem in India, which has one of the world's worst records with over forty percent of its population lacking access to basic sanitation (WHO, 2017). Solutions to poor sanitation so far focus on increasing coverage of sanitation facilities through innovative approaches that are low-cost and suitable to local context (Moe and Rheingans, 2006). But evidence suggests that many of the sanitation facilities are not being used even if they are available (Barnard et al., 2013).

Why are sanitation practices better among some slum dwellers than others? In this study, we seek an explanation for variation in the use of sanitation facilities among slum dwellers who have access to them with a focus on information delivery through social interactions. Information delivery through health education interventions have been widely studied as a means of promoting sanitation use, but other information channels that are accessible to slum dwellers on a more regular basis such as through social networks have not yet been explored. Our main objective is to identify social interactions in slums that serve as useful vehicles for information on issues related to their public sanitation facility, and, in turn, increase an individual's propensity to use latrines in slums. Using an original survey of slum dwellers in New Delhi, we find that slum dwellers who are frequently interacting with slum leaders, more so than other community leaders, are more likely to use their public latrines regularly.

This paper contributes to the literature in two ways. First, we focus on factors affecting latrine use when infrastructural access has been provided. Many scholars and policymakers have tackled

the issue of poor sanitation by focusing on the delivery of resources to build household sanitation facilities. In India, the central government launched the 1999 Total Sanitation Campaign and then then 2014 Swachh Bharat Abhiyan or 'Clean India Campaign' to eliminate the practice of open defecation in rural areas by subsidizing the construction of toilets. Despite large investments in increasing sanitation coverage, India's progress on reducing sanitation-related deaths and diseases has been slow. Some studies attribute the ongoing sanitation-related health problems to socio-cultural factors such as a lack of awareness of the benefits of hygiene or the absence of shame surrounding the practice of open defecation (Dongre et al., 2006; Pattanayak et al., 2009). Apart from culture, other factors that may influence sanitation use despite access has not been considered such as the social channels and networks available to the urban poor to learn about healthy behaviors and express their needs and concerns regarding sanitation. Our study contributes to the literature on the adoption of health behaviors by investigating social factors influence the use of sanitation facilities.

Second, while the issue of sanitation has largely been considered a rural issue, we direct attention to poorer urban communities where households are left without basic services and vulnerable to sanitation-related diseases. A meta-study estimates that on average a child under six in urban areas of India has a diarrhea incidence rate of 1.09 times a year, which is only a slight improvement than one in rural regions with a rate of 1.71 (Lakshminarayanan and Jayalakshmy, 2015). The large health inequalities are also present within cities, where hygiene-related diseases are more concentrated among the poor compared to the middle or upper class (Sohrabi and Tumin, 2016; Agarwal et al., 2007). Explanations on the causes of these urban health inequalities have been limited to identifying challenges in supply-side factors such as a lack of coverage and access to clean water and sanitation (Bartlett, 2003; Tumwebaze et al., 2013). We know far less challenges faced in urban areas regarding the use of basic services that impact health, such as sanitation.

In India, studies show that the level of deprivation of basic needs in slums depends on the degree of security in housing tenure (Mahadevia, 2010; Saravanan, 2013). That is, living standards

are generally better in slum communities where households have secure residential status because it encourages community members or local governments to invest in basic infrastructure and services. What is alarming, however, is the growing population in slum communities that do not have housing tenure. For example, in Delhi, only a fourth of slum dwellers are in planned communities that have housing tenure (Sheikh and Banda, 2014). Our study focuses on variation in the use of public sanitation facilities in a particular category of slum communities in India that do not have legal ownership of their house but where a local government agency is mandated to provide access to basic services like sanitation. Due to the insecurity of housing tenure, households in these slums rely on the government for basic services and therefore often depend primarily on public sanitation facilities rather than private ones. Since community latrines are government-provided, this allows us to focus on the factors affecting use separate from the barriers in access.

2   Literature review: The importance of sanitation use

Scholars have examined a range of individual drivers that determine sanitation access. Jenkins and Scott (2007) investigate the decision-making process of latrine uptake and find that the main reasons for individuals wanting to install a household latrine were convenience and cleanliness while the main obstacles preventing them were limited space and high costs. In contrast, another study argues that latrine ownership has little to do with health reasons, and instead find households own latrines to signal their prestige and status in a community (Jenkins and Curtis, 2005). Other scholars have considered the impact of socioeconomic factors such as religion on latrine adoption. In particular, a cross-national study of Bangladesh, India, and Nepal find that Hindus value purity and pollution and are more likely to practice open defecation in rural areas compared to non-Hindus due to their beliefs that nearby latrines may not be pure Vyas and Spears's (2018).

While sanitation provision and ownership is important, it is only the first step in addressing water and sanitation issues. In order to reduce infant mortality caused by sanitation-related diseases, the usage of latrines and hygienic behavior is critical. In India, Geruso and Spears (2018)

find that infant mortality is lower in neighborhoods with more Muslims because, while both Hindus and Muslims have access to sanitation, Muslims are more likely to use latrines than Hindus. These positive health behaviors reduce contamination and the health benefits are enjoyed by the entire neighborhood, even to those who may practice open defecation. This implies that facilitating communities to promote the collective use of sanitation leads to greater benefits. Despite large investments in sanitation facilities by governments, there is a wide gap between sanitation access and actual usage.

Existing research on information and latrine use has primarily focused on health education. Hygiene education and promotion have been identified as an important factor in changing sanitation behavior by public health scholars. These studies, often based on health education interventions, find that increasing awareness of hygienic practices through community health clubs, such as using the pouring method of hand washing, using individual cups, and using safe fecal burial methods, create incentives for households to construct and use latrines (Waterkeyn and Cairncross, 2005). These hygiene behaviors were also more likely to be practiced regularly and persistently over time with health education (Cairncross et al., 2005). This suggests that having accurate knowledge on the health benefits of using latrines and having confidence in proper hygienic practices will promote latrine use.

Other public health studies, however, show that health education alone is not effective in changing sanitation behaviors, even when the health benefits are understood by users. This is partly due to costs of latrine construction (Guiteras et al., 2015). Thus, education must be accompanied by the provision of appropriate infrastructure such as handwashing stations or latrines. A different study emphasizes that health promotion programs are only effective when low-cost solutions to sanitation facilities appropriate in the local context are suggested (Contzen et al., 2015). Because of space constraints and the cost burden of building private latrines in slums, public latrines, which is the focus of this study, may be the only option for safe sanitation practices in slum communities. Extending these previous studies, we examine individual propensities to use public latrines in

slums by focusing on community interactions that shape information flows on sanitation practices.

2.1 Community interactions and sanitation use

While research using health education interventions help assess the impact of one-time exposures to health messages, these studies overlook other channels and methods of information delivery that are available to individuals in their daily lives. Individuals in their everyday life interact with different community members to learn about community issues such as sanitation use, be persuaded by other community members' actions, and express their own needs for sanitation. That is, the various community interactions and information available to citizens from these relationships form shared norms about sanitation and hygiene that may serve as an important factor in promoting latrine use.

Recently, scholars have examined the role of social interactions on latrine ownership and management. Shakya et al. (2015) find that individuals who know someone who owns a latrine are more likely to own one as well. Fuller et al. (2016) find a much stronger association between sanitation ownership among neighboring households and lower rates of stunting compared to a household's own latrine status, which underscores the importance of collective latrine ownership for realizing the full health benefits of sanitation. Other studies find that communities with more group associations along with community leaders are more likely to have success in community-based sanitation management because higher social capital allows communities to overcome collective action problems associated with sanitation maintenance Dickin et al. (2017); Bisung et al. (2014).

Similarly, these social interactions may also promote public sanitation use in urban slums through various mechanisms that should be explored. First, social interactions may encourage the use of public toilets by increasing consciousness of the benefits of hygienic activities. The increased exposure to information that motivates other members of the community to use public toilets helps spread norms that discourage the practice of open defecation. Unlike health education interventions, these motivations spread through social interactions may or may not be directly related to health. Community-led total sanitation programs that promote constructing la-

trines through local empowerment find that people who built latrines take great pride and suggest their neighbors to do the same (Harvey, 2011). Social interactions also help spread a sense of safety in using public latrines and reducing emotional stresses related to sanitation. Scholars have found that practicing open defecation due to a lack of access to toilet facilities causes emotional stress, especially among women and girls, from fear for personal security as well as from feelings of shame and indignity (Hirve et al., 2015). Therefore, interactions among community members that promote usage of public latrines will help individuals realize that public latrines are a safe and emotionally less burdensome alternative to open defecation. In sum, we should expect that using public latrines can be encouraged when there are people who relate to at least one of the various benefits of using latrine facilities.

Second, the influence of social interactions on increasing public latrine use may depend on local leaders, such as slum leaders, who act as influential agents in the community and resolve various issues that arise in the community (Bodin and Crona, 2008). To our knowledge, Auerbach and Thachil's (2018) research is the first to survey a large sample of slum leaders in India, who are the ones centrally involved in demanding community development to local political representatives. According to their study, slum dwellers actively seek leaders in their communities who can help them with everyday problems often for a small fee. Therefore, slum leaders emerge in these communities, not through elections, but by accumulating a following from slum residents through the successful handling of everyday demands. Auerbach and Thachil (2018) find that slum leaders help deliver access to various types of public goods as the middlemen between political parties and slum dwellers. In this sense, they emerge from competitive environments because slum dwellers have many community members that they can go to for help, but only the ones who are effective in lobbying with parties or solving problems are likely to be approached.

While these studies have focused on the connectivity between slum leaders and members outside the slum community such as political party organizations, our study focuses on slum leaders' interactions with residents in the same slum. While slum leaders serve as political brokers, they

also serve as communicators of community issues and their solutions to these issues so that they can claim credit for resolving important problems. Regarding sanitation, slum leaders are more likely to communicate information on the status and maintenance of public latrines that have been built to serve the slum community. They are also more likely to be attuned to the slum dwellers' concerns about sanitation and shared latrine facilities in the community.

Previous studies have noted other existing social networks that help improve India's slums, although not in the context of sanitation use. Slum networking projects in the city of Ahmedabad where community participation is central to slum upgrading has been successful due to partnerships between civil society groups among slum dwellers as well as local non-governmental organizations (NGOs) private businesses (Das and Takahashi, 2009). Evidence from slums in the cities of Jaipur and Bhopal show that organized neighborhood associations serve as development committees and improve slums by taking a community's demands to state offices (Auerbach, 2017). Auerbach (2016) finds that slums with stronger networks with political parties, through party workers living in slum settlements, are more likely to have better public services such as access to paved roads, trash removal, and piped water. He further adds that whether these party networks are used to promote slum dwellers to resolve their own community problems or used to raise and deliver group concerns to political representatives, slum leaders were often involved. Therefore, we should expect to see these social interactions associated with behavior that is beneficial for the entire slum community including public latrine use. In particular, we expect that local leaders, such as slum leaders, may be more influential in motivating public latrine use.

3   Method

3.1   Study Context

The study focuses on slum dwellers in Delhi, where approximately 16 percent of the city's population live in slum areas (Census, 2011). These are areas determined to be "unfit for human habitation" and "detrimental to safety, health or hygiene" due to poor living standards and lack

of basic infrastructure including "narrowness or faulty arrangement of streets, lack of ventilation, light or sanitation facilities" (DUSIB, 2010). A 2012 National Sample Survey conducted by the government estimated 6343 slums in Delhi with varying degrees of legal recognition and land tenure (of Delhi, 2012).

In this study, we focus on a particular type of slum settlement, known as jhuggi jhopri clusters (JJ clusters), which was officially recognized in 2010 by the Delhi Urban Shelter Improvement Board (DUSIB) Act. In terms of a governing body, DUSIB is responsible for providing basic services such as access to clean water and sanitation for JJ clusters. This agency operates under the Delhi's Ministry of Urban Development. In 2011, DUSIB estimated that there are 685 JJ clusters in Delhi where close to 420,000 households reside. This is about 12 percent of the total households in Delhi.

A characteristic of JJ clusters is that they are built on public land, owned, for example, by the national railway agency. Therefore slum dwellers are not entitled to the house they live in and face possible eviction at any time (Heller and Mukhopadhyay, 2015). The insecurity of housing tenure creates a lack of incentive for households to invest in private latrines even if they are willing to bear the costs. Therefore, households in these slums instead rely on community latrine facilities that are provided by DUSIB. Because public latrines are provided by the local government, this allows us to focus on use of the public latrine facilities separate from provision or access.

3.2 Data collection

This study is based on an original two-stage survey conducted by the authors that interviewed slum community members and their slum leaders from March to April, 2017 in New Delhi. First, twelve local political constituencies (assembly constituencies) were selected by the authors across the seven parliamentary constituencies that comprise Delhi, in order to ensure that a geographically wide range of slum communities in different areas of Delhi was represented. Using DUSIB's list of 685 JJCs in Delhi, 30 slum communities were randomly selected across twelve political

constituencies (assembly constituencies) by selecting two or three slums within each constituency. Then, twenty-seven households were systematically sampled in each slum community by selecting a head of household or spouse in every "nth" household for interview. In consultation with survey experts in Morsel India, the starting point for each slum was predetermined. This results in a total sample size of 810 households. We provide more details on the sampling method in section A.1 of the online appendix.

In addition to the household surveys, we also interviewed slum community leaders, who were identified by the household survey respondents. At the end of an household interview, each respondent was asked to identify a slum leader. The first two slum leaders that were identified by two different households were selected for interview. We conducted semi-structured interviews with two slum leaders in each of the thirty slum communities. Both household and slum leader questionnaires were conducted face-to-face and contained open- and close-ended questions.

The surveys were conducted by Morsel India, a private company that specializes in survey research, under the supervision of the authors. Interviews with individuals in each household were conducted in Hindi with either a head of household or the spouse of the head of household, with an aim to have two-third of the total sample be women. The reason for over-sampling women was to ensure that the study included women who acted as the head of household as well as those who did not. Each interview lasted approximately 30 minutes by enumerators who were experienced in slum surveys and were trained by the authors.

This research received ethical approval from the Institutional Review Board and verbal informed consent was obtained at the respondent-level prior to participation. The respondents were informed that participation was voluntary with the option of withdrawing from the surveys at any given time and not compensated.

3.3 Data analysis

The outcome variable is daily use of household's access to a government-built community or shared latrine, most commonly referred to as a community toilet complex. This is captured by two questions. We first asked "Do you have access to a public toilet or shared toilet?" The possible options were 'public (government-built) toilet/community toilet complex', 'shared in a building (workspace)', 'shared outside', 'no access to a shared toilet', or 'other, specify'. If more than one public toilet was available, respondents were asked to base their answers on their most used public latrine. Then we asked "How often have you used the public latrine in the past 6 months?" The possible answers are 'daily', 'once/twice a week', 'once/twice a month', and 'once/twice every 6 months. Responses from these questions were then recoded as a dichotomous outcome that is 1 if the individual is a daily user of a community toilet complex and 0 otherwise. Based on this measure, the dependent variable shows that 52.2 percent of slum dwellers are daily users of the community latrine complex. Among the daily users, 55 percent are male and 51 percent are female.

The main independent variables of interest are the frequency of interactions with different types of community members that participate in solving community problems. In order to identify who slum dwellers interact with, respondents were first asked who he or she went to in order to solve community problems. Then, these responses were recorded for interactions with each of the problem solvers mentioned on the following five-point scale: 'more than twice a week', 'once or twice a week', 'once or twice a month', 'once or twice every six months,' 'never'.
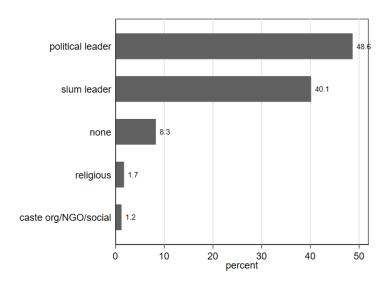
Figure 1: Community problem solvers as identified by slum dwellers (n=810)

The two most frequent responses were political leaders and slum leaders. Figure 1 shows that 48.6% responded that political leaders are the main problem solver in the community. This response was closely followed by slum leader, which received 40% of the responses. Respondents were less likely to go to religious leaders or any members from civil society organizations or NGOs. Appendix Figure A1b disaggregates these figures by gender of the respondent and shows that both men and women responded political leaders and then slum leaders as their top two choices for problem solvers. An interesting difference between men and women is that 12% of women responded "nobody" as a problem solver, and this was the third highest response for women. In comparison, only 1% of men gave this response.

Table 1 provides a summary of household respondent characteristics. In the next section we provide both descriptive analysis of the data as well as results from empirical analysis.

Table 1: Demographic characteristics of household respondents (n=810)

Variable	Percentage (unless otherwise noted)
Age	42 years (range: 19-83)
Sex	Female: 66
	Male: 34
Marital status	Married: 89
	Not married: 11
Education	2.9 years
Living in this neighborhood	23.5 years
Number of people in household	5.8 people (1-25)
Number of children ($<$18yrs)	1.4 children (0-10)
Self-reported daily income	391.6 rupees (approx. USD 5.99)
Caste	Backward class: 41.6
	Scheduled caste: 40.5
	Forward class: 15.2
	Scheduled tribe: 2.4
	None: 0.4
Religion	Hindu: 72.1
	Muslim: 27.0
	Christian:0.37
	Sikh: 0.25
	Buddhist: 0.25
	Employment Full-time: 74.8
	Part-time:15.1
	Other: 10.1

4 Findings

4.1 Community interactions and community latrine use

Table 2: Community interaction and community latrine use

DV: daily use of community latrine complex	all	men	women	attitudinal
	(1)	(2)	(3)	(4)
Frequency of interactions with:				
slum leader	1.30***	1.34**	1.28**	1.28***
	(0.11)	(0.16)	(0.15)	(0.11)
political leader	0.97	0.99	1.00	1.02
	(0.15)	(0.20)	(0.17)	(0.14)
religious leader	0.75**	0.86	0.61***	0.74**
	(0.10)	(0.15)	(0.11)	(0.09)
civil society organization or NGO	1.00	0.76	1.21	1.01
	(0.11)	(0.15)	(0.22)	(0.12)
Sanitation attitude & urgency:				
awareness of poor sanitation				1.04
consequences				(0.29)
non-urgency of sanitation				1.29*
				(0.19)
Socioeconomic attributes:				
female head of household	0.61***		0.58***	0.65***
	(0.10)		(0.10)	(0.10)
Muslim	0.44**	0.71	0.33***	0.45**
	(0.16)	(0.36)	(0.14)	(0.17)
other religion	0.54		0.58	0.51
	(0.43)		(0.56)	(0.47)
SC/ST/OBC	1.44*	1.12	1.65**	1.38*
	(0.36)	(0.33)	(0.37)	(0.09)
living standard	0.04***	0.08**	0.03***	0.04***
	(0.03)	(0.10)	(0.03)	(0.03)
constant	5.46***	4.13**	6.54**	2.09
	(3.03)	(2.78)	(4.82)	(2.93)
Obs.	810	274	536	810

Notes: Odds ratios reported with clustered standard errors at slum level in parentheses.
Significance levels: * p<0.05; ** p<0.01;** p<0.001

Results in Table 2 shows the odds ratios using a logit model for all households in column 1. We also report disaggregated results by gender in columns 2 and 3 to explore gender dimensions often associated with sanitation such as women's stronger preference for sanitation use. The outcome variable is daily use of a community toilet complex.
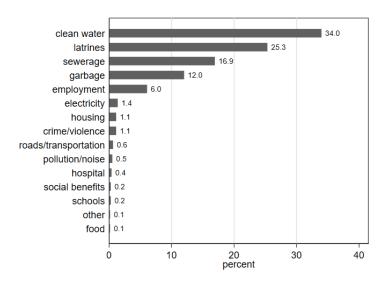
The results show that there is a relationship between daily use of a community latrine and the frequency of interaction with some problem solvers but not others. In all four columns, there is a

positive and statistically significant association between household members having more frequent interactions with their slum leader and regularly using a community latrine facility. Column 1 also shows that there is a negative association between interactions with religions leaders and using a community latrine facility. In contrast, the coefficients for political leader is not statistically significant in any column. In terms of socioeconomic characteristics, female household heads, Muslims, and low income households are less likely to use public community latrines. At the same time, members of disadvantaged caste groups are more likely use them, although this coefficient is weakly statistically significant. In Appendix Table A1, we show that the result is robust even after controlling for identification of a slum leader as the main problem solver in the community. We interpret this as showing that the simple presence of a problem solver does not have an influence, instead what matters is the frequency of interaction with the problem solver.

Disaggregating responses by gender as shown in columns 2 and 3 suggest that men and women have different propensities in community latrine usage depending on who they interact with when dealing with community problems. Both men and women with more frequent interactions with slum leaders are more likely to use community latrines daily and the size of the coefficient are similar between men and women. For women, however, interactions with religious leaders have a statistically significant negative relationship with using a community latrine. The results also show that increased interaction with self-help groups or civil society organizations does not influence community latrine usage.

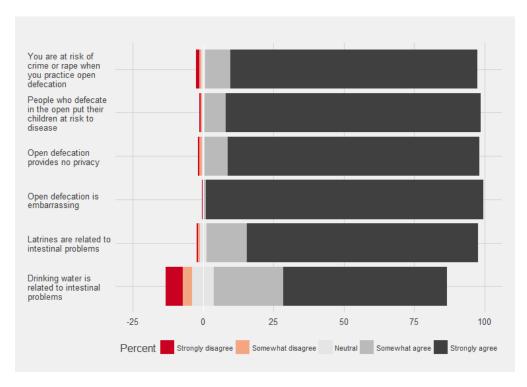## 4.2 Sanitation attitudes and community latrine use

In column 4, we include measures of individual sanitation attitudes and priorities because one of the main challenges of promoting sanitation use is the lack of understanding of the importance of using latrines as opposed to practicing open defecation. In order to obtain these measures, we asked respondents about their attitude towards sanitation and their relative preference in solving sanitation issues as opposed to other problems in the community. Here we first discuss our findings

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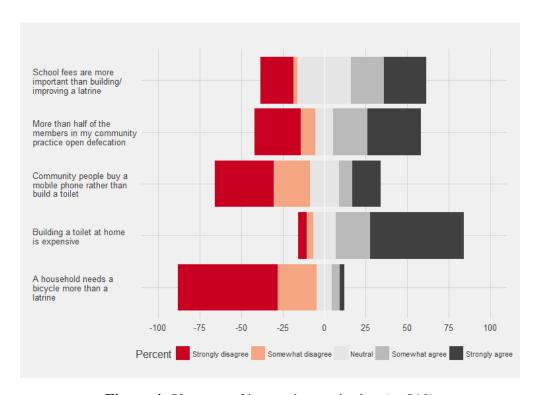**Figure 2:** Most important problem as identified by slum dwellers (n=810)

from descriptive statistics of sanitation attitude and priorities and then our results from multivariate analysis with the inclusion of these factors.

In our household surveys we first asked respondents to identify the most important problem in their slum communities today. As shown in Figure 2, for slum dwellers, a lack of clean water was considered the most important problem (34% of total responses), followed by a lack of latrines (25%), and poor quality sewerage (17%). The next important community problems identified by slum community members were garbage collection and then employment. This shows that the top four responses, which constitutes 88% of the total responses, are regarding water-related hygiene issues. Furthermore, men and women share the same priorities regarding the top five most important problems in their community, with the top two being clean water and sanitation (see Appendix Figure A1). It is also interesting to note the high urgency placed on latrine access despite the existence of a cheaper option of practicing open defecation.

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Figure 3: Attitude towards sanitation issues (n=810)

When exploring the attitude of slum dwellers towards sanitation, respondents are highly aware of the negative impact of poor sanitation that ranges from emotional harm to risks in health and security. As shown in Figure 3, almost all respondents expressed that the practice of open defecation is embarrassing and provides no privacy. In addition, most community members linked open defecation to other serious public health problems, including increased risk of crime and rape, children's disease, and intestinal problems. There was more agreement that intestinal problems are related to a lack of latrines (97% respond as 'strongly agree' or 'somewhat agree') than to poor drinking water (83% respond as 'strongly agree' or 'somewhat agree'). To capture the awareness of the consequences of poor sanitation, we aggregate the list of attitudinal questions by calculating respondents' average score.

Figure 4: Urgency of improving sanitation (n=810)

In order to examine the urgency of sanitation issues, we asked about improving sanitation over securing other types of needs. In contrast to the unambiguous opinion that poor sanitation poses several risks to the community, household members gave more varied responses to the level of urgency of improving sanitation. As shown in Figure 4, 52.6% of respondents agreed and 36.6% disagreed that open defecation was practiced by more than half of the community members, acknowledging that the problem is widespread. At the same time, however, about 77% of respondents agreed that building a toilet at home is expensive. About a quarter of the respondents agreed that community members would prioritize purchasing mobile phones over building a latrine and only 7.3% of respondents agreed that people would prioritize bicycles over a latrine. Responses were more divided regarding school fees and latrines. 45.4% agreed that school fees were more important than latrines, 32.2% were neutral, and 22.4% disagreed. We take the average score for each respondent as measures of their sanitation urgency.

Using the same model as in our original analysis, we include our measures of 'awareness of the

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negative consequences of poor sanitation' and 'degree of urgency in solving sanitation problems' from the indicators described above. The results in column 4 of Table 2 show that the coefficient on the slum leader variable is still positive and statistically significant, indicating that interactions with a slum leader increases the likelihood of regularly using community latrines even after controlling for individual attitudes about sanitation and urgency of sanitation relative to other problems. The results also show that slum dwellers who do not consider sanitation problems to be urgent are more likely to use community latrines, but this coefficient is only weakly statistically significant at the 90 percent level. This implies that individuals who do not perceive large problems with their community latrines are more likely to use them. Interestingly, higher awareness of sanitation-related issues and consequences is not associated with using a community latrine.

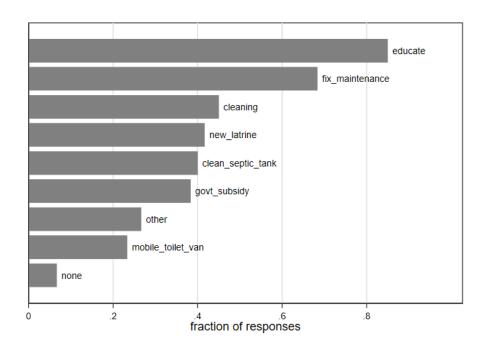## 4.3   The role of slum leaders

The result that households with more interaction with a slum leader are more likely to use community latrines leads us to the question of what slum leaders do for their communities and for sanitation in particular. We interviewed a total of sixty slum leaders who were identified by household members. In our sample, all of slum leaders mentioned that they were not formally elected and that they became a slum leader through various informal means. The most common response was that they became slum leaders by continuously helping others with small problems in the community.

In contrast to household members who ranked latrines as second most important, slum leaders expressed that the lack of latrines is the most important problem in their communities (38.3% of total responses). This is followed, with a wide gap, by sewerage issues (20%), lack of clean water (18.3%), and then garbage problems (15%). These four problems were also considered the most urgent by household members, although in different order (results in Appendix Table A2).

We then asked slum leaders to tell us about the different types of actions they took to improve

sanitation in the past six months. As shown in Figure 5, more than 80 percent of the slum leaders responded that they educate people on the use of toilets to improve sanitation. This implies that slum dwellers with more frequent interactions with slum leaders may acquire more knowledge about the benefits of sanitation and are encouraged to use public latrines. This was closely followed by fixing a maintenance issue with public toilets, and then finding someone to do the day-to-day cleaning of the common toilets. We asked about cleaning septic tanks separately because it is not necessarily part of a daily cleaning routine, but still very important for hygiene.

Overall, these responses show the variety of activities done by slum leaders regarding community latrines that ranges from education to daily maintenance and cleaning. There were lower response rates for constructing new latrines or obtaining government subsidies for new latrines. This implies that availability and access to latrines is less problematic compared to the education and management of latrine use.

Figure 5: Slum leaders' activities on improving latrines in past 6 months (n=60, multiple responses)

5 Discussion

The urban poor face considerable challenges in accessing basic services, such as sanitation facilities consequential for health. Our study underscores a neglected aspect of demand, which are user-side barriers of community latrine use caused by information delivery. We find that while slum dwellers interact with different types of community leaders and organization members, having more frequent access to slum leaders in particular is more likely to promote regular use of community latrines. This remains true even after controlling for an individual's attitude towards sanitation and relative priority of sanitation compared to other needs in their slums.

This finding is consistent with current studies that have noted the role of slum community leaders in India in public goods provision that work as brokers for political party networks to increase the provision of public goods in slums (Auerbach, 2016). Auerbach (2013), who studies eighty slum communities in cities in the Indian states of Rajasthan and Madhya Pradesh, finds that while having slum leaders is common, they vary widely in their scope and effectiveness of public goods provision and are generally more responsive when democratically elected. Our study provides evidence on the types of activities that slum leaders conduct to improve sanitation in particular, even among those who are informally chosen to serve as a leader. The slum leaders in our sample, who mostly gained recognition through their activities for the community, identified sanitation as the most pressing issue in the community and pursued a wide variety of activities to help solve this problem including education regarding hygiene, fixing maintenance issues, and cleaning the latrine facilities. Another interesting finding is that political leaders, who are often the providers of public latrines, are not influential in promoting behavioral changes regarding sanitation within slum communities. Building on previous studies that show that health promotion interventions are effective (Hosain et al., 2003; Fewtrell et al., 2005), our study suggest that utilizing slum leaders in health promotion may also be a low-cost and effective way to deliver health information on a daily basis when designing policy.

Our findings also relate to the literature on gender and sanitation. Women are often linked to water and sanitation problems because of the increased health and security risks (Padhi et al., 2015) as well as emotional stress associated with a lack of latrine facilities (Reddy and Snehalatha, 2011). From this, some scholars stress the importance of gender- and context-specific solutions to sanitation due to social norms that shape everyday hygiene behavior (Khanna and Das, 2016). For example studying the case of rural Rajasthan, O'Reilly (2010) notes an unexpected consequence of having private household latrines is that it further restricts women's mobility in public places and promotes women's seclusion at home. Thus, female participation in designing solutions to promote access to and use of latrines is critical. Our survey reveals that about 12% of women responded that they do not have anyone they contact about community problems. In contrast, only 1% of men gave this response. This suggests that the channels and methods available to women in receiving information about sanitation use and other everyday issues may be different from that of men's.

5.1 Limitations

Our study relies on the regular use of a self-identified public latrine by slum community members. However, there are two factors that may potentially affect regular use that should be noted. First, there is wide variation in the size of slum communities, thus public latrines are shared by different numbers of slum dwellers. According to DUSIB's 2011 data which are likely to be underestimates of slum populations, in our slum sample, there are on average 779 households per slum, and they range from around 80 households to as many as 5000 in a community. Slum dwellers living in larger slums who perceive the community toilet complexes to used by more people may be less inclined to use them. The second factor is that most public latrines require a small fee for use. According to our observations during fieldwork, the fee is generally around 2 rupees (or USD 0.03) per use. In our survey question that asks how difficult latrine access is when needed, 53 percent replied that it was difficult and 45 percent replied that it was easy. A study of how user

fees or the number of regular users per facility affect these responses would be a promising avenue for future research.

We also were only able to interview a limited number of slum leaders in communities where several leaders may exist. In our sampling for slum leaders, selecting the most agreed upon leaders from all of the household interviews in each slum could have helped select more popular or powerful slum leaders, but we selected the first two leaders who were mentioned by two different households due to costs and time. However, it was usually the case that the enumerators had to ask other household members to help locate the slum leader so we do not believe our sample of slum leaders are those who are not widely recognized. Another weakness of our survey is that we could not verify how slum dwellers differentiated between slum leaders and political leaders when asked about different community members in the community. We believe that this may have led to an underestimate in the percent of people who go to slum leaders because it is more likely that households misidentify some slum leaders as political leaders and less likely that slum leaders were misidentified as political ones. However, our interviews with slum leaders, who responded that they are not the formally elected political party leaders, shows that slum dwellers, who identified these slum leaders in the sampling process are able to differentiate between slum leaders and political ones. Future studies should think about the dynamics of having several informal leaders in a slum community, including leaders of NGOs, and the consequences this has on sanitation quality.

Moreover, our study is specific to a sample of slum communities in New Delhi, therefore the results may not be generalizable to slum communities in other countries where they may be other members from the broader community who play a key role in sanitation-related activities. Lastly, because our study is based on cross-sectional survey, we are unable to make conclusions on the direction of the relationship between public latrine access and community interactions.

6   Conclusion

While research on sanitation has traditionally focused on coverage and access, this study focuses on why people do not use sanitation facilities that they have access to. In particular, we focus on the role community interactions have on promoting latrine use, as an everyday source of information for slum community members. Using original surveys of slum community members in New Delhi, our main finding is that increased frequency of interaction with slum leaders, rather than political, religious, or civil society leaders, is more likely to lead to the regular use of a community latrine complex, even after controlling for individual attitudes toward sanitation. Our interviews with slum leaders show that, regarding sanitation problems, most of their activities are focused on education and maintenance issues of the community latrine complex.

With rapidly increasing rates of urbanization, one of the challenges that the world is facing is improving the living conditions for the poor in cities. Our study sheds light one of the neglected populations in the sanitation literature by focusing on slum communities in urban areas. Slum community members in New Delhi identified clean water and access to latrines as the two most important problems in their community. Focusing on attitude towards sanitation, household members have a good understanding that a lack of sanitation is linked to having health risks and associated feelings of embarrassment with the practice of open defecation. Therefore, moving beyond a lack of awareness of hygiene, this study illuminates that one possibility in improving sanitation use is utilizing social networks as communication and education channels that individuals can access regularly.

References

Agarwal, Siddharth, Aravinda Satyavada, S Kaushik, and Rajeev Kumar. 2007. "Urbanization, urban poverty and health of the urban poor: status, challenges and the way forward." *Demography India* 36 (1): 121.

Auerbach, Adam Michael. 2013. *Demanding development : democracy, community governance, and public goods provision in India's urban slums*. Doctoral dissertation, University of Wisconsin–Madison.

Auerbach, Adam Michael. 2016. "Clients and communities: The political economy of party network organization and development in India's urban slums." *World Politics* 68 (1): 111–148.

Auerbach, Adam Michael. 2017. "Neighborhood associations and the urban poor: India's slum development committees." *World Development* 96: 119–135.

Auerbach, Adam Michael, and Tariq Thachil. 2018. "How Clients Select Brokers: Competition and Choice in India's Slums." *American Political Science Review*: 1–17.

Barnard, Sharmani, Parimita Routray, Fiona Majorin, Rachel Peletz, Sophie Boisson, Antara Sinha, and Thomas Clasen. 2013. "Impact of Indian Total Sanitation Campaign on latrine coverage and use: a cross-sectional study in Orissa three years following programme implementation." *PloS one* 8 (8): e71438.

Bartlett, Sheridan. 2003. "Water, sanitation and urban children: the need to go beyond "improved" provision." *Environment and Urbanization* 15 (2): 57–70.

Bisung, Elijah, Susan J Elliott, Corinne J Schuster-Wallace, Diana M Karanja, and Abudho Bernard. 2014. "Social capital, collective action and access to water in rural Kenya." *Social science & medicine* 119: 147–154.

Bodin, Örjan, and Beatrice I Crona. 2008. "Management of natural resources at the community level: exploring the role of social capital and leadership in a rural fishing community." *World development* 36 (12): 2763–2779.

Cairncross, Sandy, Kathleen Shordt, Suma Zacharia, and Beena Govindan. 2005. "What causes sustainable changes in hygiene behavior? A cross-sectional study from Kerala, India." *Social science & medicine* 61 (10): 2212–2220.

Census. 2011. *Census of India*. Office of the Registrar General and Census Commissioner.

Contzen, Nadja, Iara Helena Meili, and Hans-Joachim Mosler. 2015. "Changing handwashing behaviour in southern Ethiopia: a longitudinal study on infrastructural and commitment interventions." *Social Science & Medicine* 124: 103–114.

Das, Ashok K, and Lois M Takahashi. 2009. "Evolving institutional arrangements, scaling up, and sustainability: emerging issues in participatory slum upgrading in Ahmedabad, India." *Journal*

of Planning Education and Research 29 (2): 213–232.

Dickin, Sarah, Elijah Bisung, and Karim Savadogo. 2017. "Sanitation and the commons: The role of collective action in sanitation use." *Geoforum* 86: 118–126.

Dongre, AR, PR Deshmukh, BS Garg et al. 2006. "The impact of school health education programme on personal hygiene and related morbidities in tribal school children of Wardha district." *Indian Journal of Community Medicine* 31 (2): 81–82.

DUSIB. 2010. "The Delhi Urban Shelter Improvement Board Act." *Government of Delhi*.

Fewtrell, Lorna, Rachel B Kaufmann, David Kay, Wayne Enanoria, Laurence Haller, and John M Colford Jr. 2005. "Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis." *The Lancet Infectious Diseases* 5 (1): 42–52.

Fuller, James A, Eduardo Villamor, William Cevallos, James Trostle, and Joseph NS Eisenberg. 2016. "I get height with a little help from my friends: herd protection from sanitation on child growth in rural Ecuador." *International journal of epidemiology* 45 (2): 460–469.

Geruso, Michael, and Dean Spears. 2018. "Neighborhood sanitation and infant mortality." *American Economic Journal: Applied Economics* 10 (2): 125–62.

Guiteras, Raymond, James Levinsohn, and Ahmed Mushfiq Mobarak. 2015. "Encouraging sanitation investment in the developing world: a cluster-randomized trial." *Science* 348 (6237): 903–906.

Harvey, Peter. 2011. "Community-led total sanitation, Zambia: stick, carrot or balloon?" *Waterlines* 30 (2): 95–105.

Heller, Patrick, and Partha Mukhopadhyay. 2015. Categorisation of Settlement in Delhi. Technical report Centre for Policy Research.

Hirve, Siddhivinayak, Pallavi Lele, Neisha Sundaram, Uddhavi Chavan, Mitchell Weiss, Peter Steinmann, and Sanjay Juvekar. 2015. "Psychosocial stress associated with sanitation practices: experiences of women in a rural community in India." *Journal of Water Sanitation and Hygiene for Development* 5 (1): 115–126.

Hosain, GM Monawar, Subas Saha, and Afroza Begum. 2003. "Impact of sanitation and health education on intestinal parasite infection among primary school aged children of Sherpur, Bangladesh." *Tropical doctor* 33 (3): 139–143.

Jenkins, Marion W, and Beth Scott. 2007. "Behavioral indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana." *Social science & medicine* 64 (12): 2427–2442.

Jenkins, Marion W, and Val Curtis. 2005. "Achieving the 'good life': Why some people want latrines in rural Benin." *Social science & medicine* 61 (11): 2446–2459.

Khanna, Tina, and Madhumita Das. 2016. "Why gender matters in the solution towards safe sanitation? Reflections from rural India." *Global Public Health* 11 (10): 1185–1201.

Lakshminarayanan, Subitha, and Ramakrishnan Jayalakshmy. 2015. "Diarrheal diseases among children in India: Current scenario and future perspectives." *Journal of natural science, biology, and medicine* 6 (1): 24.

Mahadevia, Darshini. 2010. "Tenure security and urban social protection links: India." *IDS Bulletin* 41 (4): 52–62.

Moe, Christine L, and Richard D Rheingans. 2006. "Global challenges in water, sanitation and health." *Journal of water and health* 4 (S1): 41–57.

of Delhi, Government. 2012. "Urban Slums in Delhi." *National Sample Survey 69th Round Survey*.

O'Reilly, Kathleen. 2010. "Combining sanitation and women's participation in water supply: an example from Rajasthan." *Development in Practice* 20 (1): 45–56.

Organization, World Health, and the United Nations Children's Fund. 2017. Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines. Technical report United Nations.

Padhi, Bijaya K, Kelly K Baker, Ambarish Dutta, Oliver Cumming, Matthew C Freeman, Radhanatha Satpathy, Bhabani S Das, and Pinaki Panigrahi. 2015. "Risk of adverse pregnancy outcomes among women practicing poor sanitation in rural india: a population-based prospective cohort study." *PLoS medicine* 12 (7): e1001851.

Pattanayak, Subhrendu K, Jui-Chen Yang, Katherine L Dickinson, Christine Poulos, Sumeet R Patil, Ranjan K Mallick, Jonathan L Blitstein, and Purujit Praharaj. 2009. "Shame or subsidy revisited: social mobilization for sanitation in Orissa, India." *Bulletin of the World Health Organization* 87 (8): 580–587.

Reddy, B Suresh, and M Snehalatha. 2011. "Sanitation and personal hygiene: What does it mean to poor and vulnerable women?" *Indian Journal of Gender Studies* 18 (3): 381–404.

Saravanan, VS. 2013. "Urbanizing diseases: Contested institutional terrain of water-and vector-borne diseases in Ahmedabad, India." *Water International* 38 (7): 875–887.

Shakya, Holly B, Nicholas A Christakis, and James H Fowler. 2015. "Social network predictors of latrine ownership." *Social science & medicine* 125: 129–138.

Sheikh, Shahana, and Subhadra Banda. 2014. In-situ Upgradation of Jhuggi Jhopri Clusters. Technical report Centre for Policy Research.

Sohrabi, Maryam, and Makmor Tumin. 2016. "Health Issues and Challenges among Indian Urban

Poor." *Journal of Health Management* 18 (3): 460–472.

Tumwebaze, Innocent Kamara, Christopher Garimoi Orach, Charles Niwagaba, Christoph Luthi, and Hans-Joachim Mosler. 2013. "Sanitation facilities in Kampala slums, Uganda: users' satisfaction and determinant factors." *International journal of environmental health research* 23 (3): 191–204.

Vyas, Sangita, and Dean Spears. 2018. "Sanitation and Religion in South Asia: What Accounts for Differences across Countries?" *The Journal of Development Studies*: 1–17.

Walker, Christa L Fischer, Martin J Aryee, Cynthia Boschi-Pinto, and Robert E Black. 2012. "Estimating diarrhea mortality among young children in low and middle income countries." *PloS one* 7 (1): e29151.

Waterkeyn, Juliet, and Sandy Cairncross. 2005. "Creating demand for sanitation and hygiene through Community Health Clubs: A cost-effective intervention in two districts in Zimbabwe." *Social science & medicine* 61 (9): 1958–1970.

A   Appendix

A.1   Sampling Strategy

Part 1: Community Member Surveys

The objectives of the slum dweller survey is to determine the major problems the community is facing in terms of basic services, find various channels that community members use when solving community problems, understand demand for sanitation in particular and triggers for actual usage of latrines, and evaluate awareness of health benefits related to sanitation. We interviewed the main decision makers for household-related problems, whom we identified as the head of households or the spouse of the head of households. The interviews were conducted face-to-face with a structured questionnaire that lasted about 20 to 30 minutes each. Using DUSIB's list of JJCs, the following procedure for sampling was used:

- 2 assembly constituencies were chosen from each of the parliamentary constituencies (excluding New Delhi parliamentary constituency)

- For each assembly constituency, 2-3 slum communities were chosen (based on size). (6 smaller ACs * 2 slums)+(6 larger ACs * 3 slums) = 30 slum communities

- In each slum community, the head or spouse of head of household was interviewed for 27 households. Interviewers selected every 10th household to interview starting from a random geographic point within the slum community.

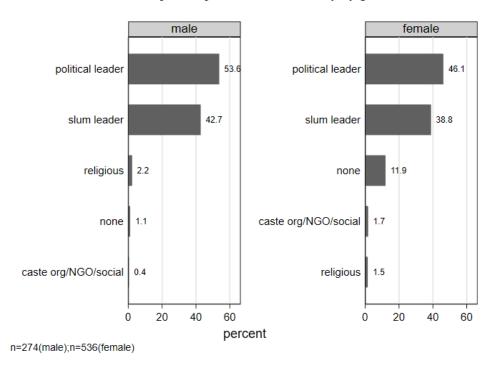The total sample size was 810 individuals (27 households * 30 slum communities).

Part 2: Community Leader Interview

The objective of the slum leader interview was to understand their role as a slum leader, especially in terms of their policy priorities and implementation methods. Household members who were

interviewed in Part 1 were asked to identify their community leader. The first two community leaders that were identified and then cross-checked by another household member was interviewed. The slum leader interviews used semi-structured questionnaires and lasted about 20 minutes.

(a) Most important problem in community by gender

(b) Problem solvers by gender

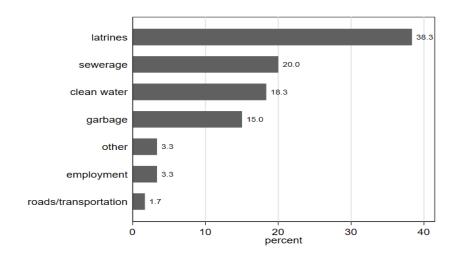**Figure A1:** Community problems and solvers by gender (female n=536; male n=274)

Figure A2: Most important community problems by slum leader

Table A1: Robustness: Community Problem Solvers and Latrine Use

DV: Daily use of community latrine complex	First solver
	(1)
Frequency of interactions with:	
slum leader	1.36***
	(0.11)
political leader	0.97
	(0.14)
religious leader	0.74**
	(0.10)
civil society organization or NGO	0.99
	(0.11)
First problem-solver identified:	
slum leader	0.61*
	(0.17)
political leader	0.71
	(0.19)
Other group leader (religion,civil society, NGO)	0.28
	(0.93)
Socioeconomic attributes:	
Female head of household	0.60***
	(0.12)
Muslim	0.43**
	(0.17)
Other religion	0.54
	(0.49)
SC/ST/OBC	1.46*
	(0.28)
Living standard	0.03***
	(0.02)
constant	8.38***
	(4.87)
Obs.	810

Notes: Odds ratios reported with clustered standard errors
at slum level in parentheses.
Significance levels: * $p<0.05$; ** $p<0.01$;** $p<0.001$