

SIMIYU

39th WEDC International Conference, Kumasi, Ghana, 2016**ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT
OF WATER AND SANITATION FOR ALL****Investigating quality of shared sanitation facilities
in informal settlements of Kisumu, Kenya***Sheillah Simiyu (South Africa)***REFEREED PAPER 2376**

The sanitation target was not met during the MDG period, and as the SDG period begins, the goal still remains adequacy and equity in sanitation. Due to lack of space, achieving adequacy in informal settlements is challenging, and sharing of sanitation facilities is common. One concern with shared facilities is difficulty in cleanliness, and a lacuna exists in shared sanitation quality in informal settlements. This study investigated the quality of shared sanitation in informal settlements of Kisumu city in Kenya. Data was collected by interviewing users, and by inspecting sanitation facilities for aspects of quality. The facilities were all pit latrines, most of which offered privacy, but were not hygienically clean. Cleanliness deteriorated with more households sharing, indicating that less attention was given to keeping shared facilities clean. Improvement strategies in informal settlements should not only focus on access but also target group behaviour and practices among shared sanitation users.

Introduction

At the end of the Millennium Development Goals (MDG) period, the sanitation goal was not met; and an estimated 2.4 billion people in the world still lack access to improved sanitation (UNICEF & WHO, 2015). As the Sustainable Development Goals (SDG) period begins, the sanitation target of the sixth SDG is to 'achieve access to adequate and equitable sanitation and hygiene', with focus on among others, those in vulnerable situations. Residents of informal settlements are among those living in vulnerable situations.

Providing adequate sanitation in informal settlements is difficult particularly due to challenges such as lack of space; and therefore, households often share the available sanitation facilities (Tumwebaze, Orach, Niwagaba, Luthi & Mosler, 2013). Some authors have suggested that sharing is the most practical sanitation solution in informal settlements (Schouten & Mathenge, 2010; Kabange & Nkansah, 2015), although shared sanitation facilities are not classified as improved sanitation facilities (UNICEF & WHO, 2015). Concerns with shared facilities include aspects of cleanliness, maintenance and distance from people's homes (UNICEF & WHO, 2008).

Aspects of cleanliness and maintenance define the quality of sanitation facilities, but there is a dearth of studies on quality of shared sanitation facilities in informal settlements. The aim of this study was therefore to investigate the quality of shared sanitation facilities, and the factors influencing this quality in informal settlements of Kisumu city in Kenya.

Study area

Kisumu city is in Kisumu County, in the western region of Kenya. It has a population of approximately 420,000 people (Republic of Kenya, 2013), sixty percent of whom are estimated to be living in informal settlements (UN-Habitat, 2005; Syrjänen, 2008). Residents of these settlements are faced with challenges such as lack of basic services including sanitation facilities (UN-Habitat, 2005).

These residents, most of whom are tenants, live in compounds where they share facilities such as water and sanitation (Karanja, 2010). Approximately half of these compounds lack sanitation facilities and practices such as 'flying toilets' (defecating in a plastic bag which is then hurled away) have been reported (Karanja, 2010). Where sanitation facilities are available, they are mostly pit latrines though septic tanks are

available in few compounds (Letema, van Vliet & van Lier, 2014). The pit latrines sometimes collapse during the rainy season due to poor workmanship, loose soils and high water tables (UN-Habitat, 2003, 2005).

Efforts to improve sanitation in the settlements would therefore need to learn from and make improvements to the existing sanitation conditions. The use of flying toilets for instance may indicate lack of sanitation facilities; but it may also be a pointer to poor conditions of the available sanitation facilities, which drives residents to use other alternatives. This study therefore sought to investigate the quality of the available shared sanitation facilities in the settlements.

Methods

Sampling and data collection

This was a case study research that was conducted between February and March 2014. A preliminary study had earlier been carried out, whose results were used to calculate the required sample size of 80 compounds. The sample size was then divided equally among four informal settlements: Nyalenda A, Nyalenda B, Bandani and Obunga; thus 20 compounds from each settlement.

Due to lack of data, transect walks were carried out within each settlement in order to approximate the total number of compounds and determine the sampling interval. Selection of compounds began from one end, systematically skipping the sampling interval and moving towards the other end. At the compound level, one household was randomly selected, and the household head was interviewed. Knowledge from the preliminary study as well as literature sources had helped to design interview schedule guides and a shared sanitation quality inspection tool (table 1) Respondents were asked questions relating to location of the toilet, users of the toilets, and management practices. After the interview, the shared sanitation facility used was inspected for aspects related to construction materials as well as components of quality.

Quality components were hygiene factors, privacy and slab factors as indicated in table 1. Facilities were classified as 'dirty' if there were visible faeces or other waste materials on the toilet slab, or if the facility was full. Otherwise, they were classified as 'clean'.

Data management and analysis

Data was analysed using STATA (vs13). Quality of shared sanitation facilities was calculated as a score, summed from each of the three main aspects (hygiene, privacy and state of the slab). For hygiene and slab factors, if the answer to any of the questions was No, the facility scored 1, otherwise, it scored 0. However, it was the reverse for availability of a hand washing facility: 1 if yes, and 0 if No. For privacy, the score was 1 if the answer to any of the questions was yes, and 0 if otherwise.

Descriptive statistics (means, standard deviations, frequencies and percentages) were first used to summarise the variables. Pearson's correlation was then used to assess linear correlation among the independent continuous variables.

To assess factors determining quality of shared sanitation, a standard multiple linear regression was performed with the total quality score as the dependant variable. The independent variables were the settlement, superstructure and slab construction materials, location of the toilet, types of users, as well as the number of households sharing a sanitation facility. The hypotheses being tested were that poor quality superstructure material leads to lower quality of shared sanitation facilities; and that more users sharing a sanitation facility results in lower quality. Associations were tested at the 95% confidence level.

Results and discussion

A summary of the study findings has been presented in table 2. In total, 125 sanitation facilities were inspected, which increased the representativeness of the sample. All the inspected facilities were pit latrines, as is common in most informal settlements (Tumwebaze *et al.*, 2013; Semiyaga, Okure, Niwagaba, Katukiza & Kansiime, 2015). In terms of construction material, seventy five percent of the facilities had roofing made from iron sheets, 51% had the superstructure constructed with bricks/stone, and 88% had a concrete slab. The variety in types of construction material shows that residents used locally available (and affordable) materials/resources for construction of their sanitation facilities.

The independent variables in the regression model significantly explained 26% of the variation in quality of the shared facilities ($F(9,115) = 4.4, p < 0.01$). One significant determinant of quality was superstructure construction material, as sanitation facilities constructed with brick superstructure had two scores higher

quality compared to sanitation facilities with iron sheets/mud/wood superstructure; therefore leading to acceptance of the first hypothesis.

Table 1. Quality of shared sanitation score sheet		
Quality factors	Yes	No
1. Hygiene factors		
Is there faecal matter on the slab?		
Are there flies in the facility?		
Is there a smell from the facility?		
Is there a nearby hand washing facility?		
<i>Total Hygiene score (max 4)</i>		
2. Privacy factors		
Does the facility have a door?		
Can the door be locked? i.e. does it hold in place		
Does the door have a locking latch?		
Does the door offer privacy? i.e. no cracks		
Does the facility have a complete superstructure?		
Does the superstructure offer privacy? i.e. no cracks on the superstructure		
Does the facility have a roof?		
Does the roof offer privacy, i.e. no cracks?		
<i>Total Privacy score (max 8)</i>		
3. The slab and other visible factors		
Are there cracks/visible spaces on the slab?		
Is the drop hole too big? (Bigger than the size of a foot)		
Is the drop hole open? (no evidence of a cover)		
Are there standing fluids on the slab?		
Is the facility full?		
Is the facility semi full?		
<i>Total Slab score(max 6)</i>		
Total Quality score (max 18)		

Table 2. Summary of findings and regression results of shared sanitation facilities in Kisumu's informal settlements¹			
Variable	Frequency (%)	Regression Coefficient	P values (CI)
Settlement			
Bandani	29 (23.2)	(Reference)	
Nyalenda A	31 (24.8)	-0.80	0.31 (-2.33 - 0.72)
Nyalenda B	34 (27.2)	-0.16	0.83 (-1.64 – 1.33)
Obunga	31 (24.8)	-0.13	0.87 (-1.71 – 1.45)
Superstructure material			
Iron sheet/Mud/wood	61 (48.8)	(Reference)	
Bricks/stone	64 (51.2)	2.01	<0.01 (0.91 -3.11) [*]
Floor/slab material			
Mud/wood	15 (12)	(Reference)	
Stone /slab	110 (88)	1.30	0.13 (-0.39 - 2.99)
Number of households sharing	Mean 8.4 (2-27) Std dev 4.7	-0.11	0.04 (-0.22 - -0.001) [*]
Rated cleanliness			
Clean	45 (46)		
Dirty	80 (64)		
Hygiene score	Mean 1.3 (0-3) std dev 1.1		
Privacy score	Mean 6.7 (2-8) std dev 1.6		
Slab score	Mean 2.9 (0-6) std dev 1.4		
Total quality score	Mean 10.9 (5-17) std dev 3.1		

This finding is not surprising since bricks are less likely to have crevices and would therefore offer better privacy than iron sheets. In addition, due to the frequent collapse of latrines in the area, it is unlikely that a brick superstructure would be constructed with poor quality slab material, because then the latrine would easily collapse. Conversely, a latrine with iron sheet superstructure is likely to have a slab with other material such as wood, and also more likely to be dirty. In similar fashion, Nakagiri *et al* (2015) report that in informal settlements of Kampala (Uganda), pit latrines with brick superstructure were 'structurally sound' compared to non-plastered latrines which also showed signs of collapse during rainy weather.

The facilities performed better in privacy aspects (mean 6.7) compared to hygiene and slab conditions. These results are an indication that most attention is given to constructing a sanitation facility (the structure), but after construction, less attention (and possibly little research) is given towards keeping shared sanitation facilities hygienically clean and useable; a concern also echoed by Kwirengira *et al* (2014).

Keeping shared sanitation facilities clean and useable thus requires an understanding of usage patterns and practices. Firstly, findings revealed that sanitation facilities were shared by 8 households (averagely), and most of them (64%) were dirty. It is such findings and concerns that led to shared sanitation being classified as unimproved sanitation during the just concluded MDG period. The question therefore would be why shared sanitation facilities are dirty compared to non-shared facilities.

The answer lies in the behaviour of users. During interviews, respondents shed light on their cleaning practices and the challenges faced in keeping their shared facilities clean. In some compounds for instance, some users within the compound did not clean their facilities. As though to explain these findings, Tumwebaze and Mosler (2014) highlight that users' cleaning intentions are influenced by their perceived risks, attitudes, norms, ability and self-regulating factors. These results therefore suggest that shared facilities would be kept clean if users make it 'intentional'. Intentions however, are determined by other factors such as attitudes and ability to clean sanitation facilities. It is thus apparent that individual users of

shared sanitation facilities need to take action towards cleaning sanitation facilities. Nonetheless, it would be unrealistic to assume that every user would share in the same intent, face the same risks, or have the same attitude. Individuals are different, and if they all do not share in the same goal, then one individual's actions may not be fruitful. Group behaviour and practices are therefore important factors.

To illustrate the importance of group practices and number of users, findings of this study showed that compounds with clean toilets had an average number of 7 households sharing sanitation facilities, while dirty facilities had a mean of 9 households. Regression analysis results further indicated that as the number of households sharing sanitation facilities increased, quality of the shared facilities reduced by 0.1 scores; hence accepting the second hypothesis. Similar findings of decreasing cleanliness with increasing number of households sharing are reported in Kampala (Günther, Niwagaba, Lüthi, Horst, Mosler, *et al.*, 2012; Tumwebaze, 2013; Kwiringira *et al.*, 2014; Tumwebaze, Niwagaba, Günther & Mosler, 2014). The role of number of users is explained by difficulties in coordination and cooperation as was severally mentioned by respondents. It is difficult to formulate and agree upon solutions with a larger group than it is with a smaller group. It is also difficult to communicate and cultivate trust in a larger group.

It is therefore clear that for shared sanitation facilities to be kept clean, cooperation from all users is necessary. With fewer users sharing sanitation facilities, it is easier to communicate, cultivate trust, and devise strategies of keeping sanitation facilities clean. With many users it is easy for some to free ride on the actions of others. It is this effect of large groups that have led to recommendations that shared facilities be used by fewer individuals. Gunther *et al* (2012) for instance recommend that sanitation facilities be shared by a maximum of 4 people, while Kabange and Nkasah (2015) recommend that sanitation facilities be shared by 2-3 families. The results from this study however suggest that emphasis should also be directed towards practices that will ensure cooperation, and not only on the number of users. Focussing only on users may suggest fewer users per facility, which may not be feasible in informal settlements.

Conclusion

Results from this study have indicated that sanitation facilities in Kisumu's informal settlements are pit latrines, constructed using locally available materials, and often shared by an average of eight households. These shared facilities are often dirty, and the quality deteriorates with an increase in the number of households sharing. Results point to the role played by users in keeping shared sanitation facilities clean, and to the importance of a smaller user group, which is easier to coordinate and devise effective strategies. What the results suggest is that in informal settlements, much emphasis is laid on improving access, but less attention is given to ensuring hygienic conditions of these facilities. Improvement efforts should therefore focus on cooperation from users of shared facilities who should work collectively towards ensuring that the available sanitation facilities are in proper, useable and hygienic conditions.

Recommendations for policy and further studies

Since this research did not establish a threshold in the number of users of shared sanitation facilities, follow up studies can be carried out to determine the number of users who can effectively cooperate to keep shared facilities clean. For researchers and policy makers, sanitation efforts in informal settlements need not only focus on increasing access to sanitation, but also on improving the quality of sanitation facilities. Though there is need to increase access to sanitation facilities in informal settlements, there is also need to promote cooperation from all users towards keeping the facilities clean. At the local level, sanitation improvement efforts should involve local leaders who should work closely with residents towards improving hygienic conditions of sanitation facilities. These residents need to be sensitised about keeping shared sanitation facilities clean. Public health officers should also inspect sanitation facilities, since dirty facilities are a breeding ground for sanitation related diseases.

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Note/s

¹ The first two columns in the table are descriptive results, and the last two columns are regression results. Column 3 shows coefficients of the regression equation. The last five variables in the table do not have regression coefficients because they were not included in the regression model. The asterisks show the significant variables in the regression model. Categorical variables were converted to 'dummy' variables, one of which was used as a reference variable in the regression model. One of the main challenge in this research was lack of reliable population statistics; nevertheless, the sample size used (125) was deemed appropriate for a case study design approach.

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