Access to improved sanitation facilities in low-income informal settlements of East African cities

ABSTRACT
Throughout Africa, the population in urban areas is increasing rapidly, often exceeding the capacity and the resources of the cities and towns to accommodate the people. In sub-Saharan Africa, the majority of urban dwellers live in informal settlements served by inadequate sanitation facilities. These settlements present unique challenges to the provision of sustainable and hygienic sanitation, and there is insufficient information on access to improved facilities. This paper reports findings of a study undertaken in low-income informal settlements using a mixed methods approach to assess access to sanitation and identify the barriers to household uptake of improved sanitation facilities. More than half of the respondents (59.7%) reported using sanitation facilities that are included in the WHO/UNICEF Joint Monitoring Programme definition of improved sanitation. However, a high proportion of these facilities did not provide access to basic sanitation. Less than 5% of all the respondents did not report problems related to sustainable access to basic sanitation. The findings highlight the urgent need to develop specific and strategic interventions for each low-income informal settlement, to upscale the sustainable access and use of improved sanitation in urban centres.

Key words | access, barriers, East Africa, improved sanitation, informal settlements, mixed methods

INTRODUCTION
Providing safe and adequate sanitation in informal urban settlements, to improve health and sustainable livelihoods, is challenging due to their unique social, environmental, economic, institutional and demographic characteristics (Foppen & Kansiime 2009; Katukiza et al. 2010; Mara et al. 2010; Isunju et al. 2011). Owing to the rapid increase in population in urban areas of most developing countries, the vulnerable and marginalised end up living in informal settlements where basic sanitation coverage is much lower than the average for urban areas (Grimm et al. 2008; Foppen & Kansiime 2009). According to recent estimates made by UN-Habitat, 62% of urban dwellers in sub-Saharan African live in informal settlements (UN-Habitat 2011).

Throughout Africa, the rate of increase in the urban population often exceeds the capacity, resources and services that the authorities can allocate to providing sanitation to the local population (Kariuki 2011). Attempts to increase access to improved sanitation as defined by the World Health Organization/United Nations Children’s Fund (WHO/UNICEF) Joint Monitoring Programme (JMP) (WHO/UNICEF 2012) in low-income informal settlements have yielded slow progress partly because of inadequate information on the sanitation situation in these
areas. It is generally reported that the most used form of sanitation in informal settlements is on-site sanitation that is often shared and may not provide dignity and privacy for the users (Van Der Geest 2002; Katukiza et al. 2012; Tumwebaze et al. 2013). Furthermore, poorly constructed and maintained, sanitation facilities can contaminate water sources and transmit waterborne diseases (Nyenje et al. 2010; Isunju et al. 2011). Beyond the use of on-site sanitation, there is insufficient information on what proportion is improved or adequate to provide full public health and socioeconomic benefits to the users. The aim of this study was to determine the proportion of households in low-income informal settlements, with access to improved sanitation. It builds on the findings of a household survey by applying a mixed methods approach to analyse the factors associated with access to improved sanitation (Okurut et al. 2013; Tsinda et al. 2013).

Three East African cities of Kampala (Uganda), Kigali (Rwanda) and Kisumu (Kenya) were used as case study cities. Low-income informal settlements of the three cities have unique challenges to the provision of sanitation, forcing some inhabitants to defecate in the open (Sano 2007; Maoulidi 2010; Tumwebaze et al. 2013). The settlements are illegally located on land and/or have substandard structures in the urban context and are often lying on hilly slopes (Kigali) or wetlands (Kampala) or black cotton soil (Kisumu) that make the construction of sanitation facilities difficult. Although the WHO/UNICEF JMP for water and sanitation reports that, in 2010, the three East African countries of Kenya, Rwanda and Uganda had urban sanitation coverage of 32, 52 and 34%, respectively (WHO/UNICEF 2012), it does not point out the disparities in conditions within the formal and informal parts of the urban area. This gives an inaccurate picture of the sanitation situation in the informal urban context.

It is important therefore to understand the real situation of improved sanitation coverage in informal settlements, considering both the JMP definition, as well as the broader definition developed by the Millennium Task Force as ‘access to, and use of excreta and wastewater facilities and services that ensure privacy and dignity, ensuring a clean and healthy living environment for all’ (Centre On Housing Rights and Evictions, COHRE et al. (2008)), which better reflects the human right to sanitation. This knowledge will help policy-makers decide upon the best approaches to improve access in low-income informal settlements as opposed to the conventional approaches in planning for formal urban areas.

The conventional approaches of planning for sanitation that puts the emphasis on the supply of technologies to users does not address the needs of the end users (Hogrewe et al. 1993; Varley et al. 1996; Samanta & Van Wijk 1998; Jenkins & Scott 2007) and has not realised the much needed progress in informal settlements. To meet the sanitation needs of the end users sustainably, effort is required to understand the barriers that exist to building improved sanitation so that specific and appropriate strategies can be developed for the local context.

**METHODOLOGY**

This study used mixed methods to assess access to improved sanitation facilities in low-income informal settlements of three cities in East Africa. Mixed method research involves the use of both quantitative and qualitative approaches so that the overall strength of the study is greater than using either approach on its own (Creswell & Clark 2007). The mixed methods included diagnostic study, transect walks, household surveys, focus group discussions (FGDs) and interviews. A diagnostic study of the sanitation situation in the case study cities was conducted to understand what is known about the cities, upon which eight low-income informal settlements were purposively selected for the study. The three cities, and the settlements, were selected for their similarities and differences in the provision of sanitation facilities that exist in and between each. The study settlements selected have urban characteristics with high population densities and poor neighbourhoods and have been reported to have sanitation-related problems. The study sample size in each city was determined using a simplified sample size formula for proportions (Israel 1992). A stratified probability survey was used to administer questionnaires to household heads or adult members of 5,387 households in the eight settlements of the three case study cities between May and September 2012. The sample sizes for Kigali \(n = 1,794\), Kampala \(n = 1,666\) and Kisumu \(n = 1,927\) were determined using the national
statistics of the study settlements for the three cities and were large enough to allow for comparative analysis of sub-groups (National Institute of Statistics for Rwanda, NISR (2008); Kenya National Bureau of Statistics, KNBS (2010); Uganda Bureau of Statistics, UBOS (2011)). The survey questionnaire was designed to collect information on demographic characteristics of the households, type of sanitation currently used by the household, the problems associated with the usage of the facilities and the reasons why some households lack improved sanitation. There were 64 closed questions. The survey questions were developed on the basis of detailed diagnostic reports conducted in each of the case study counties, followed by transect walks with household visits in each of the selected case study settlements.

The household samples for the surveys in each settlement were selected using random route sampling techniques in proportion to the population of the settlement. Boundaries of the primary sample units (cells/zones/villages) in each study settlement were first identified with the help of the respective local authorities (guides) during transect walks through the settlements. Transect walks were also used to collect community information by making observations and by informal questioning. The researchers then randomly selected a number of routes with clearly identifiable physical features through the primary sample unit and, by walking along every route from the start to end; the nth household was systematically selected to constitute the study sample until the required households for each route were completed. To ensure that every household in the settlement had an equal chance of being selected, 10 households were systematically selected along each random route and the number of random routes in each primary sample unit was determined as a proportion of the total sample required for the whole settlement. At the sampled household, the researcher first explained to the respondent the purpose of the survey and asked to have the verbal consent of the respondent to take part in the research, before asking questions from the survey questionnaire.

Findings from the household survey were used to develop qualitative tools for more in-depth understanding (Johnson & Onwuegbuzie 2004) of access to improved sanitation from the perspectives of tenants, owner occupiers, local authorities, community health workers, upper primary school pupils, persons with disability, and city officials. Samples for the qualitative study were purposively selected from residents and people who provide sanitation services in the settlements, with the aim of bringing together the most productive sample (6–12 persons) to discuss or answer the questions until new explanations stop emerging from the data. When an appropriate sized sample could not be found from a particular group, interviews were conducted with representatives of that group. The study conducted a total of 83 FGDs by gender, except for local authorities and 99 interviews between March and July 2013: this was made up of 23 FGDs and 28 interviews in Kampala, 26 FGDs and 28 interviews in Kigali and 34 FGDs and 43 interviews in Kampala. Interview and FGD guides were developed for each city using the findings of the household surveys. The researcher facilitated the FGDs and conducted interviews in a language best understood by the group or individual, and later translated the data into English. The groups or individuals were encouraged to express their views, and interesting points were followed up with prompts and probes, to get a more in-depth understanding of access to improved sanitation. The survey questionnaire, FGD and interview guides were pilot tested before being administered in the communities, and all the staff involved with the data collection were familiar with the local languages and were trained before conducting the field work.

Owing to the difference in the cost of living in the three countries and the inaccurate income data, deprivation was used as a multidimensional scale to measure the poverty levels across the three cities. A deprivation index was constructed using variables linked to the ability to afford basic needs and then normalised to have distributions around the mean for samples as a whole so that we could make comparisons between different groups in the total sample and compare within each county. The variables on ability to afford basic foods, essential clothes, lighting, fuel for cooking and potable water (constantly, sometimes and never) were used to develop a multidimensional index for the level of deprivation for each household, relative to the deprivation scale of the city. For each city, the households were then classified as: very deprived, deprived or not deprived.
For a sanitation facility to provide full public health and socioeconomic benefits, it must meet certain conditions. The facility should be easily accessible, ensure privacy, dignity, cleanliness and a healthy environment for all (COHRE et al. 2008). This research evaluated the conditions of each sanitation facility based on problems with usage reported by users or households. Smell, shared usage, difficult to clean, insects, fills quickly, costs of emptying, blocks frequently, lacks privacy, cost of paying for usage (in case of public/community toilets), distance from dwelling, safety, not available when need to use and water ingress, were some of the common problems that can be associated with on-site sanitation systems in informal settlements (COHRE et al. 2008; Katukiza et al. 2012; Tumwebaze et al. 2013). As the problems were self-reported, they are indicative of problems in the sanitation facilities and mean that systems might not be providing the full public health and socioeconomic benefits. Therefore, only sanitation facilities of improved technology with no self-reported problems of any sort were considered acceptable by the user and were likely to offer sustainable access to provide full public health benefits.

Statistical Package for the Social Sciences (SPSS version 20) was used to analyse the household survey data for frequencies, rates and proportions. Cross tabulations were carried out to examine relationships between variables. Pearson Chi-square values were used to determine the strength of relationships between variables at a 95% significance level. The survey and the methodology were given a favourable response from the Ethics Committee at the University of Surrey.

RESULTS AND DISCUSSIONS

The settlements

From the diagnostic study and observations made during the transect walks and household survey in the eight study sites, the settlements were found to have the conditions that define informal urban areas. The settlements are located illegally on land and/or are unplanned with congested housing structures that are not in compliance with the city council standards, and present varied challenges in the provision of improved sanitation. The houses, mainly of single-roomed households, are made of mud/burnt clay bricks(sheet/stone walls with tin/corrugated iron sheets and occasionally cemented floors. The two settlements of Gatsata and Kimisagara in Kigali are sited on hill slopes with rocky grounds, and valley floor with high water table, respectively, making it difficult to dig pit latrines, while the valley floors are also prone to flooding. The three settlements in Kampala: Bwaise III, Namuwongo-Soweto and Kisenyi II are low-lying areas, mostly reclaimed wetlands with a high water table and prone to flooding. The communities of Manyatta B, Nyalenda B and Obunga settlements in Kisumu have low-lying black cotton soil and are rocky in a few places, with a high ground water table that occasionally floods. The conditions in Kisumu were also described by residents during a FGD:

‘Soil conditions are very poor and easily destroyed by rainfall. During dry seasons it’s better, but during rainy seasons, there is a lot of floods in the area leading to many diseases’, Focus group discussion, male owner occupiers, Kisumu.

The household survey results indicate that the low-income informal settlements of the three cities have different demographic characteristics that vary in both social and economic aspects. The majority of respondents (61.3%) were female; with the highest in Kigali (66.2%) and lowest in Kisumu (54.6%) while in Kampala it was 63.7%. About half of the respondents (44.7%) were aged from 25 to 35 years, while the proportions of respondents in the age groups 16–24 and over 36 years were almost equal, 26.9 and 26.5%, respectively. The settlements in Kisumu have high proportions of tenants (Figure 1(a)) and deprived (either very deprived or deprived in the deprivation index developed) households (Figure 1(b)) compared to the settlements in Kigali and Kampala.

With regard to the education level of the respondents, the household survey showed that the majority of residents were educated up to primary/secondary level, the highest in Kisumu; though Kampala reported the highest proportion of respondents with higher education level (see Figure 2).

It is theorised that both geophysical characteristics of an area and the socioeconomic characteristics of households...
influence the type of sanitation facility used at a household level (Hogrewe et al. 1993). Before a household decides to install an improved sanitation facility, a number of factors influence the decision process; from preference, through to intent, to finally making a choice to adopt to a better facility (Jenkins & Scott 2007). This means that the different levels of sanitation coverage in the three case study cities may, to some extent, be explained by the differences in demographic characteristics of the cities.

Sanitation facilities

This paper considers improved sanitation ‘technologies’ to include flush toilet connected to sewerage system/septic tank, ventilated improved pit latrine, pit latrine with a slab, composting toilet and urine diverting dry toilet. In this definition, we specifically focus on the technologies used, excluding issues of sharing, privacy, etc. Improved sanitation ‘facilities’ is used where consideration of sharing and problems are reported.

From the household survey it is evident that there are appropriate sanitation systems being built, generally in low-income informal settlements of the three cities, with about 77.4% of privately owned facilities being improved sanitation technologies. However, more than half of the improved technologies were self-reported to have problems. The self-reported problems with existing improved technologies significantly (p < 0.0005) varied between the cities but were mainly related to shared usage (65.5%), smell (54.0%) and insects (46.9%). Other problems were safety (45.0%), cleanliness (39.4%), lacks privacy (34.9%), fills quickly (29.9%), water ingresses (26.4%), distant from dwelling (24.2%), not available when needed (22.4%), blocks frequently (15.9%), and cost of emptying (15.0%).
The reported problems with the existing facilities point to inadequacy of the facilities to provide full public health and socioeconomic benefits to the users and renders them unimproved (COHRE 2008). Considering improved sanitation technologies with no reported problems, less than 5% of the facilities in the study sample meet the conditions required for improved sanitation facilities (Table 1). From observations, it was also noted that the majority of the facilities had no hand washing amenities for hygienic purposes.

The household survey results on open defecation (Table 1), compares with the figures reported for the same cities in other studies: less than 1.0% in informal settlements in Kampala, 17.5% in Kisumu and about 1.0% in Kigali (OZarchitecture 2007; Maoulidi 2010; Tumwebaze et al. 2013). Though the same studies also reported on access to sanitation facilities as 20.4% private sanitation facilities in Kampala, 82.2% improved facilities in Kisumu, and about 83.0% private facilities in Kigali, the figures are high compared to the findings from this study (Table 1). Despite the three studies generalising informal settlements in each of the three cities, they give no information on the conditions of the improved technologies. Many scholars have urged that it is possible to have an improved sanitation technology, which is not used due to undesired conditions or where the user demands are not met (Mara et al. 2010; Peal et al. 2010; Okurut et al. 2014). The findings on access to improved sanitation facilities with no self-reported problems, in this study, give a better picture of the situation in low-income informal settlements. The household survey findings on access to improved sanitation facilities were also supported by the views of the participants in the majority of the FGDs:

‘Most of the households here don’t have what fits to be a toilet. Some are far away especially those who use public toilets do not go there at night and so opt to use polythene bags and dump them into the open. Due to the bad toilets, some children fall sick. Cholera and other disease outbreaks have been reported in these settlements’, Focus group discussions, female tenants, Kampala.

From the household survey, Kisumu has lots of improved sanitation technologies but also had the highest numbers of households sharing each stance (mean ± standard deviation: 6.8 ± 1.7) compared to Kigali (4.3 ± 2.4) and Kampala (6.3 ± 1.6). Tumwebaze et al. (2014) reported that hygienic maintenance of shared toilets in informal settlements of urban areas is difficult, which may, in part, explain why there are many improved technologies but very few of acceptable and adequate conditions for full benefits in Kisumu, resulting in high rate of open defecation. FGDs with upper primary school pupils in Kisumu revealed that people cannot use toilets that have been dirtied by non-members of their households. Conflicts were reported related to cleanliness in shared toilets:

‘We usually disagree especially in cleaning among ourselves, some people do not want to clean and the landlords are absent. We even try to identify the faeces by asking what diet one had last meal to be able to tell who has defecated on the side. You can hear someone saying “for us we ate ‘embuta’ (Nile perch), so this

<table>
<thead>
<tr>
<th>Household sanitation system</th>
<th>Kigali (%)</th>
<th>Kampala (%)</th>
<th>Kisumu (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General classification by technology type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open defecation</td>
<td>0.3</td>
<td>0.2</td>
<td>17.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Unimproved technology</td>
<td>42.8</td>
<td>1.7</td>
<td>17.3</td>
<td>20.9</td>
</tr>
<tr>
<td>Public facilities</td>
<td>0.7</td>
<td>41.2</td>
<td>0.1</td>
<td>13.0</td>
</tr>
<tr>
<td>Improved technology</td>
<td>56.2</td>
<td>56.9</td>
<td>65.3</td>
<td>59.7</td>
</tr>
<tr>
<td>Private and no problem with usage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private toilets</td>
<td>26.7</td>
<td>11.7</td>
<td>1.2</td>
<td>15.7</td>
</tr>
<tr>
<td>Private improved technology</td>
<td>18.3</td>
<td>11.3</td>
<td>0.8</td>
<td>9.9</td>
</tr>
<tr>
<td>Private improved technology having no self-reported problems</td>
<td>7.5</td>
<td>6.1</td>
<td>0.1</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 1 | Category of sanitation facilities reported by respondents
faeces cannot be for some body from our house”, Focus group discussion, female tenant, Kampala.

The existing situation highlights more concerns in Kisumu compared to the other two cities. To explain the trend of improved sanitation facilities requires an understanding of “who has improved technology?” by relating access to the demographic characteristic of the households.

**Distribution of sanitation technologies among the different households**

Responses to the household survey showed that the likelihoods of owner occupiers and tenants having improved sanitation technologies are similar; however, a higher proportion of tenants practised open defecation (Figure 3(a)). This finding highlights further that property ownership can influence one’s defecation practice, which may be one of the reasons for low coverage in informal settlements, where the majority of the inhabitants are tenants. The reason is further supported by Miah & Weber (1991), who have urged that because tenants have stronger ties with their rural origin where they are likely to return and remit a significant portion of their income, they tend not to invest in improved sanitation facilities in the city.

The level of education of the respondent also had an effect on access to sanitation, with open defecation not reported in households where members had a higher level of education (Figure 3(b)). The trend of sanitation type with education shows that the likelihood of practising open defecation reduces with increasing level of education.

The results of the household survey showed that Kampala had the highest proportion of owner occupiers with improved technologies, and that there was significant variation ($p < 0.0005$) across the three cities. The proportions of households with improved technologies increased with increase in level of education across the cities, except in Kisumu where there was no consistent trend (Table 2).

The findings suggest that formal education exposes households to information and knowledge about good sanitation, and encouraging people to go to school can be one way of improving access to sanitation in low-income informal settlements. Property owners need to provide some rules and guidelines on hygienic defecation practice for their tenants.

**Reasons for lacking access to improved sanitation**

The household survey showed that the majority of respondents who practised open defecation in Kisumu reported either lack of space (42.0%) or inability to afford (39.3%) as the main reason for lacking a private sanitation facility. These barriers have been reported elsewhere; such as in a study conducted in Ghana to assess household demand for improved sanitations in rural and peri-urban areas, the authors also found that many respondents cited space (48.4%) and high cost (33.6%) as the constraints to constructing toilets (Jenkins & Scott 2007).
Though lack of space in Kisumu was considered a major barrier among those who practised open defecation, some areas in the settlements were not too congested, as observed during the transect walks and household surveys. Pit latrines that get full were manually emptied and the content poured into shallow excavations within the court-yard. This was supported by responses of a group of 99 owner occupiers in the same survey, who indicated lack of money (75.8%) and topography (16.2%) as the most significant barriers faced in building a household sanitation facility (Figure 4), whereas only 6.1% reported lack of enough space.

In the FGDs with local authorities in Kampala, the participants gave slightly different views from what the household survey revealed. Though they ranked finance, topography (high water table) and high population as the major barriers in the order, they also mentioned culture as one of the hindrances to people using toilets, and the poor attitude of landlords towards the welfare of their tenants and conditions surrounding their houses:

‘We have people from different countries coming with different cultures and there is open defecation; you do not expect such people to behave like us; for example instead of coming to the toilet someone defecates on the railway line and also in polythene bags (buveera). This is the system; even old people use polythene bags. A person during the daylight can use a polythene bag and throw it on the roof of the neighbour’, Focus group discussions, local council authority (LC), Kampala.

Another local council member said:

‘Like when you have a visitor and the toilets are closed at night, this is a shortcut we always use. For example yesterday we were seated here with the chairman and a journalist, a man appeared at this public toilet, the people were using it and this drunken man stood there; in a few seconds we saw faeces dropping down the man’s trousers as he was waiting to go in the toilet; people saw this’.

Table 2 | Proportion of households using improved sanitation technologies stratified by occupancy status and levels of education

<table>
<thead>
<tr>
<th>Variable</th>
<th>Kigali</th>
<th></th>
<th>Kampala</th>
<th></th>
<th>KisuM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Improved technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupancy Owner occupiers</td>
<td>351</td>
<td>55.5</td>
<td>331</td>
<td>71.8</td>
<td>61</td>
<td>54.5</td>
</tr>
<tr>
<td>Tenants</td>
<td>658</td>
<td>56.7</td>
<td>617</td>
<td>51.2</td>
<td>1,199</td>
<td>66.1</td>
</tr>
<tr>
<td>Education No school</td>
<td>85</td>
<td>47.8</td>
<td>104</td>
<td>49.5</td>
<td>38</td>
<td>67.9</td>
</tr>
<tr>
<td>Primary school</td>
<td>508</td>
<td>53.1</td>
<td>297</td>
<td>51.3</td>
<td>858</td>
<td>62.1</td>
</tr>
<tr>
<td>Secondary school</td>
<td>386</td>
<td>62.4</td>
<td>474</td>
<td>60.8</td>
<td>375</td>
<td>74.1</td>
</tr>
<tr>
<td>Higher education</td>
<td>30</td>
<td>75.0</td>
<td>56</td>
<td>90.3</td>
<td>9</td>
<td>60.0</td>
</tr>
</tbody>
</table>

Figure 4 | Most important barriers to building a toilet for owner occupiers.
From the household survey, a reasonable proportion in Kigali also reported no emptying service providers (6.7%) compared to less than 1% in the other cities. In the Kigali settlements, 99.0% of the households do not empty their toilet. This was also captured during a key informant interview with a health and sanitation officer in Kigali:

‘Instead of emptying toilets, people pour excreta in the swamps or in the trenches off the main roads and others just close off the toilets and dig up new ones; they cannot afford the emptying services. The challenges to providing good sanitation are that houses are congested and accessibility to their homes is difficult and mind-sets of people. People do not want to change their lifestyles’, Interview, City official, Kigali.

Even where households use an organic solution (11.8%), which is a microbial technology used to decompose and suppress the sludge and create more space in the toilet for further use in Kigali, at some point the toilet fills up.

The study shows that the cities have many and varied challenges in providing improved household sanitation and that specific and targeted interventions are required for each city. For instance, the many unimproved technologies in Kigali could be a result of the lack of service providers coupled with the fact that the settlements have the highest proportion of squatters (24.0%) and eviction notices (9.5%) in the cities, and thus residents cannot invest in better technologies. Solving this will require opening up the market for sanitation services and reforms on the land tenancy system in low-income informal settlements.

The results of the survey highlight the low level of access to improved sanitation and unhygienic human waste disposal practices in low-income informal settlements of these cities which pose a health risk to the lives of the community and a burden to urban authorities.

‘In this area, we use spring water which comes from underground. In case there is a heavy downpour, the water changes colour, yet that is the only source of water for all purposes in this area. We do not know exactly what causes that. Toilets in this place are emptied into the drainage channel; sometimes it happens during the day and it creates foul smell in the area’, Focus group discussion, male tenants, Kampala.

In Kigali, a male tenant also expressed the risks and challenges of poor sanitation practices:

‘There are still some people who discharge faecal matter in the drainage channels mainly during the night when they are not seen and this happens when their toilets are full and they do not have any other space to dig another one. Waste can be seen at the sides of the streams and the accumulation of these attracts insects and flies, which causes diarrhoea to some children playing around and bad smell in the surroundings. Some toilets do not have privacy thus women and girls become uncomfortable using them’, Focus group discussion, male tenants, Kigali.

The effect of poor sanitation from a single household can result in contamination of water sources used by the community, causing diseases, high costs for water treatment and many other unnecessary expenses for both individual households and urban authorities.

**CONCLUSION AND RECOMMENDATIONS**

Though some improved sanitation technologies by the JMP definition can be found in low-income informal settlements, the majority are unable to provide full public health and socioeconomic benefits to the users. Shared usage, smell, insects, safety, cleanliness and lack of privacy are the top six conditions that render them unimproved. The barriers to access improved sanitation vary between cities and will thus require specific interventions tailored for each city. Kigali has many unimproved technologies and needs education on appropriate technologies and opening up the market for sanitation service providers like constructors and emptiers. Kampala has many public toilets that are constructed far from their user households due to space and topographical problems and needs development of appropriate technologies for the settlements. Kisumu has the highest proportion of deprived households and improved technologies but with highest number sharing and unhygienically...
emptied, high levels of open defecation and hence the need for social interventions.

The findings imply that the unhygienic human waste disposal practices in low-income informal settlements pose a risk to the health of inhabitants in and around the settlements, and quality of water sources, and a burden to urban authorities. As a result, households are unnecessarily spending time and money to treat or attend to family members who are sick with sanitation-related illness. Governments are directly and indirectly spending lots of resources on medicine, water treatment as a result of contaminated sources, restoring the ecosystem lost by contamination, and many other costs. The situation highlights an urgent need to develop specific strategies that will improve sanitation conditions in each low-income informal settlement or city based on its unique characteristics and challenges. Efforts to increase sustainable access and use of improved sanitation in urban centres should give special attention to the population in low-income informal settlements and understand the specific unique challenges for appropriate solutions.

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