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Assessment of the Suitability of slum toilets for use by women and children on promotion of inclusive sanitation: A mixed methods study in Nakuru, Kenya

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ABSTRACT

Women and children encounter challenges in accessing sanitation services. Unless user-friendly designs are adopted for toilets, those living in slums may face difficult choices regarding excreta management. The study examined the suitability of toilets for use by women and children on the promotion of inclusive sanitation in a selected slum in Nakuru, Kenya. The study used a convergent design. Quantitative data were gathered using structured questionnaires from 100 household heads sampled using a proportionate simple random technique. An observation checklist was used to assess the status and suitability of toilets for use by women and children. The data was analyzed in descriptive and logistic regression statistics. Data gathered using focus group discussions was analyzed thematically, and findings were presented in narratives. The study established that use of toilets by women was compromised by inadequate maintenance, privacy, safety and hygiene provisions concerns. Chances of open defecation were 63.7% lower for women who did not fear visiting toilets at night than for those who did and 45.2% lower for women who accessed clean toilets ($p<0.05$). The likelihood of being comfortable with toilets was 3.664 times higher for women who accessed toilets located near households, 6.75 times higher when they considered toilets as safe for use at night, and 7.057 times higher with access to toilets that maintained privacy ($p<0.05$). Although water was available as supplied by the Water and Sewerage Company, handwashing for women was minimal as the facilities mostly lacked water. Children were escorted by caregivers to the toilets as they could not reach the door latches. Distance to toilets for children stood out as a significant factor that discouraged them from using toilets ($p<0.05$). Hand hygiene for children was minimal due to the absence of handwashing facilities, or when present, positioning of the facilities at higher heights than children could reach. The study concluded that sanitation vulnerabilities in slums are amplified by the provision of gender and age-non-responsive sanitation and hygiene facilities. Sanitation programming in slums should incorporate a gender and social lens to promote sanitation inclusivity for women and children. Involvement of women in planning processes of sanitation options in slums could be a worthwhile strategy to ensure that their needs and the needs of their children are adequately addressed

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Introduction

"The Sustainable Development Goals (SDGs) agenda 6.2 expresses a strong stance on universal and inclusive sanitation (United Nations, 2015). Inclusive sanitation access requires that sanitation options address the needs of all residents, where every person can count on safety, privacy, cleanliness, and convenience in toilets to meet their sanitation needs. However, slums particularly in developing countries, represent avenues of difficulties where conditions including sanitation are quite challenging (Belur et al., 2017). Despite the need for inclusivity in sanitation facilities, slum population often access inadequate sanitation, unsafe and less dignified toilets which could predispose them to diseases resulting from inadequate sanitation (Caruso et al. 2017). Although efforts to establish sanitation options in slums have been made, they fall short of ensuring equitable and adequate access for all members (Routray et al., 2017; Belur et al., 2017). A report by United Nations (2021) indicated that over 1 billion people globally live in slums characterized by inadequate sanitation, and among these are women and children. Women and children are presented as groups who systematically lack access to safe sanitation as a result of status and gender (Caruso et al., 2017). These unmet sanitation needs, which too often appear hidden, could amplify inequalities in access to sanitation services for the women and children residing in slums which could mean sanitation non-inclusivity. Inadequate prioritization of group-specific essential sanitation resources is a form of neglect to the vulnerable slum dwellers who require urgent attention, else the Sustainable Development agenda becomes a misapprehension.

Women are often engaged in household chores like child care and domestic hygiene (Silva et al., 2020) and thus require easy-to-access toilets without also having to wait for long in toilets, otherwise they would spend extra hours than they can afford, which could mean unattended duties. Children, therefore, require to be in a position to meet their sanitation needs without necessarily having to be escorted by their busy mothers to toilets. Besides accessibility, women need also to count on cleanliness, where toilets are free from flies, faecal or urine stagnation on the floors as a way of avoiding genital infections (Chaplin & Kalita, 2017) given their unique morphological structure. They also need to count on privacy in toilets which could be difficult if the available toilet superstructures are gapped. Studies for instance by Hazare and Tholiyaa (2023) and Caruso et al. (2017) have accounted on incidences of sexual violence against women in slums due to lack of private toilets and also poor lighting, dark routes to toilets as well as poor location of toilets far from the households. Sanitation implementers in slums should prioritize all users' needs to reverse trends of stresses and inadequacies in sanitation access in informal settlements.

In Kenya, women account for more than 50% of the total population and around 54% of the women are of reproductive age (KNBS, 2019). Women of reproductive age have distinct needs from men as they require access to separate toilets which are also safe for changing sanitary pads and a provision for the safe disposal of their used sanitary materials. However, according to Chaplin and Kalita (2017), this dignified option for women is not granted in many slum toilets and could amplify women's sanitation struggles in slums and compromise their menstrual management ability (Chakravarthy et al., 2019). Separation of toilets by gender is critical for the safety of toilet users, particularly women. A study by Schmitt et al. (2021) found out that sharing of toilets by both genders forced women and girls to bear the humiliation of having to cope with 'peeping toms'. Limited access to the essential dignified facilities, services and supplies for women could position them as victims of embarrassment, bearing shame and distress while meeting their inevitable sanitation needs. Adoption of toilets that address women needs could be a bold step in promoting gender inclusivity in slums which was the aim of this study.

Slums require a vulnerability-oriented lens on sanitation else the vulnerable population, particularly children's ability to meet sanitation needs is compromised. Children fight discomforts and psychosocial battles such as fear of pit contents or of squatting apertures when learning how to use toilets and their mothers also fear that their children may get injured while trying to use toilets (Huda et al., 2021). The fear could attract entertainment of poor sanitation practices such as open defecation by children. Toilets are considered children friendly if their superstructures and slab designs do not pose difficulties, anxiety or fear of use; toilets with an extremely wide aperture can be 'death or injury traps' for children. In

Bangladesh, among the factors that facilitated fear for toilet use by children included the size of the toilet apertures, darkness and slippery nature of toilet floors (Huda et al., 2021). In Brazil, Afio et al. (2016) established that although toilets were provided, children defecated in the open because the door latches were positioned in heights inaccessible by children. Improperly disposed children's excreta could expose the children themselves, who have a tendency of eating soil contaminated with their own excreta, to diarrheal pathogens which are among the leading causes of deaths in various Sub-Saharan Countries, Kenya included (Demissie et al., 2021).

The Sustainable Development agenda on sanitation is a good framework for the provision of improved and inclusive sanitation in slums (Spencer, 2021). However, slums, particularly in developing countries, Kenya included, are way too far to the attainment of the target as residents continue to face challenges of inadequate sanitation access (Kulkarni et al., 2017). Unless user-friendly toilets are availed, slums may not offer an opportunity to realize the sustainable agenda. Inclusivity in sanitation may therefore be attained if sanitation programming in slums do not overlook the sanitation needs for women and children. So far, limited studies have explored vulnerability-related sanitation encounters in slums. Although studies by Áfio et al. (2016), Caruso et al. (2017), Huda et al. (2021), Kulkarni et al. (2017), and Adane et al. (2017) addressed slum sanitation matters, they lack a comprehensive approach on group specific encounters. Particularly, there is no study which has pointed out the gaps in equity of sanitation access in Nakuru slums which could be a significant step in improving the well-being of women and children, conceptualized as vulnerable groups, in the slums.

Objective

The aim of the study was to examine suitability of toilets for use by women and children on promotion of inclusivity in Nakuru slums.

Methodology

The study adopted a convergent mixed design which permitted collection of both qualitative and quantitative data from Kaptembwa slum in Nakuru town, Kenya. Being a growing urban area and a home to various ethnic groups, the area offered an opportunity to explore the intricate issues surrounding sanitation inclusivity with regard to women and children (County Government of Nakuru, 2018).

The study targeted 100 household heads aged above 18 years for quantitative data. The sample size was obtained using Yamane's (1967) formula. The total number of households in the area is 47, 689 (KNBS, 2019; UN, 2020) which was substituted in the following sample size calculation formula at a margin of error of 10% (Adam, 2021).

$$n=N/(1+N(e^2)$$

Kaptembwa slum in Nakuru was purposively selected because it was among the major slums in the area. Household heads from the households in the slum were randomly sampled for participation. The study also targeted 13 purposively selected participants for qualitative data who included 3 household heads, 3 women, 3 children's caretakers, 1 PHO, 2 CHVs and 1 local leader. The groups were selected because they were perceived as having either a direct experience or the desired information on suitability of sanitation for the vulnerable groups in the slum.

Quantitative data was gathered using a structured questionnaire from household heads at the household level. An observation checklist was used to obtain data on the situation of slum toilets in terms of the size of toilet apertures, location of toilets, presence of menstrual management bins, positioning of hand washing taps, height of door latches, separation of toilets by gender and lighting in toilets. Qualitative data was gathered using a focus group discussion guide to gain an in-depth knowledge on suitability of slum toilets for use by women and children.

Analysis of quantitative data from household surveys was done using the Statistical Package for Social Sciences (SPSS) version 29. The data was analysed in descriptive statistics (percentages, frequencies, means and standard deviations). Logistic regression was also performed to examine the relationship between toilets suitability for use by women and children and promotion of inclusivity. Data obtained from the focus group discussion was organized into themes and the findings were presented as narratives to supplement the quantitative data.

Permission to conduct the research was obtained

from the National Commission for Science, Technology and Innovation (NACOSTI). Permission of entry to the slum was sort from a head in the Nakuru Water and Sanitation Services Company (NAWASSCO), who introduced and assigned the Public Health Officer in the slum to the researchers as a guide. Data collection was based on informed consent of participants as participation was on voluntary basis.

Results

Analysis of the findings was done and the demographic characteristics and inclusivity aspects in toilets were as discussed.

Demographic characteristics of respondents

Findings showed that most of the study participants were females (85%) (Table 2). Ages of the majority of respondents lied between 18-33 years and 34-49 years at 48.7% and 38.8% respectively and the mean age was 35 years (standard deviation=0.70). It was noted that only a few (7.5%) participants had not attained formal education while the rest had at least basic level education. The family size for most of the participants was 2-5 members (70%). All the households surveyed had children aged below seven years except for 16.2% of the participants.

The presence of many females at the households denoted that they were the most users of household toilets in the slum, and therefore the toilets needed to be friendly for them to improve usability. The average age of participants was 35 years, the age of formation of families, active child bearing and rearing. The presence of children in households required close monitoring by caregivers for proper faecal disposal, especially when the toilets were scary for children who were too big to fit in diapers but too small to use the toilets unattended due to fear of apertures. The findings were supported in the focus group discussion where a respondent said:

"Children cannot use the toilets alone. Nowadays we encourage mothers to keep potties inside houses for the children to use. Sometimes when too busy and children use potties while outside, they forget to empty them in toilets causing smell and flies. The children keep on defecating in the same potty throughout the day. So, when the potty is inside the houses, mothers will remember to pour contents to toilets as opposed to when outside."

Presence of difficult to use toilets for children could mean postponed duties for the caregivers to monitor them while attending toilets, which could sometimes, with poor monitoring of children, encourage open defecation. In addition, the ratio of household size to toilets should be proportional to the households, which was not so as observed in the slum and as pointed out in the focus group discussion where one toilet could be shared by many households. A focus group discussion member argued that:

"Toilets shared by the households in the plots are usually inadequate. The toilet ratio to number of households is below the required ratio of 1toilet:10 people for shared toilets. The pressure to use the few available toilets is most acute early in the morning when all the residents have woken up and are in need of using the toilets. Sometimes the women, children and the men are queuing up to share the available one or two toilets. It feels embarrassing."

Attainment of at least basic education level implied that majority of residents understood the essence of proper human waste disposal in relation to diseases as such basics were likely to have been taught in schools. However, it was reported in the focus group discussion that residents had no influence on the type of toilets to be provided at their plots, as such was the responsibility of landlords as follows:

"We came and found the toilets here. It is the landlord who does it. We just use the toilets the way they are."

Provision of toilets which least address the sanitation needs of residents could translate to poor disposal of faeces and urine due to toilet avoidance. The findings concurred with results from a study by Afio et al. (2016) in Brazil, Caruso et al. (2017) in Odisha, Huda et al. (2021) and Schmitt et al. (2021) in Bangladesh and who reported open defecation cases as a result of access to user-unfriendly toilets.

Inclusivity of toilets to women and children

The researchers intended to find out whether toilets provided in slums were inclusive and comfortable for use by women and children. As shown in Table 3, many respondents (52.5%) described the available toilets as uncomfortable for use by women or children compared to 47.5% who characterized them as comfortable. Findings showed that although majority of the participants did not associate open defecation with comfortability of toilets for use, some, 36.3%, reported the possibil-

		Frequency	Percentage
Gender	Male	12	15.0%
	Female	68	85.0%
Age	18-33	39	48.7%
	34-49	31	38.8%
	>50 Years	10	12.5%
Level of education	No formal education	6	7.5%
	Primary	23	28.7%
	Secondary	33	41.3%
	Post-secondary	18	22.5%
Household size	<2 members	5	6.2%
	2-5 members	56	70.0%
	6-10 members	16	20.0%
	Over 10 members	3	3.8%
Number of children below 7 years	1 child	27	33.8%
	2-5 children	36	45.0%
	More than 5 children	4	5.0%
	None	13	16.2%
Total (list-wise)		80	100%

Table 2: *Demographic characteristics of respondents*

Statement	Response	Frequency	Percentage
Toilets are comfortable for use by women	True	38	47.5%
	False	42	52.5%
Open defecation by females when toilets are uncomfortable for use	True	29	36.3%
	False	51	63.7%
Toilets are comfortable for use by children	True	38	47.5%
	False	42	52.5%
Open defecation by children when toilets are uncomfortable for use	True	47	58.8%
	False	33	41.2%
Toilets inclusive to both women and children	True	54	67.5%
	False	26	32.5%
Total (list-wise)		80	100%

Table 3: *Inclusivity of toilets to women and children*

ity of females defecating in the open as a result of availability of uncomfortable toilets in slum. Most of the participants (58.8%) believed that open defecation among children was as a result of access to less comfortable toilets for their use. A respondent from the focus group discussion said:

"For adults very isolated cases, however for children you are likely to get their fecal matter outside. This is because, the mothers leave the children at home and go to offer casual labor. Such unsupervised children can defecate in the open before their parents come back home which even attract savaging by dogs. It is sometimes very disgusting"

The results implied that children would mostly need escort to toilets by their mothers else they defecated in the open given their inability to use the toilets when alone. Overall, although 67.5% of the respondents described the toilets as inclusive, slightly more than one third of the participants reported that the toilets were neither inclusive for women nor children. The implication of the findings was that the structures and designs of toilets would disadvantage women and children from toilet use.

Suitability of toilets for use by women and children

Results as indicated in Table 4 show that nearly all the toilets (90%) were not separated by gender suggesting that males and females shared the available toilets. Provision of toilets for males and for females separately in the slum could have been expensive for landlords in such poor settings. Sharing of toilets across gender and age could discourage toilet utilization due to the need for privacy while using toilets and the fear of embarrassment as explained in the focus group discussion where a respondent said:

"The slum toilets in the plots are not labelled by gender instead they are allocated for sharing by households. When children and grown-up men and women share toilets, there is no privacy, the children hear noises in the toilets especially when a person suffers from a stomach ache. It feels embarrassing"

Most participants (75%) indicated that the toilets were located in places where women and children could easily access. However, it cannot be ignored that 25% of participants indicated the contrary opinion. Location of toilets far from households could facilitate their avoidance especially by women at night due to safety issues. A similar study by Hazare and Tholiyaa (2023) pointed out that incidences of sexual violence against women in slums resulted from poor location of toilets far from the households. Findings also showed that more than half of the respondents could not visit the toilets at night as majority (86.2%) of the toilets lacked lighting. Use of unlit toilets not only compromised safety of toilet users but also promotion of hygiene in toilets as a result of fouling of slabs which could disproportionately affect women. In Odisha, a study by Caruso et al. (2017) established that dark routes to toilets hindered utilization of toilets at night. The toilets were therefore unusable unless residents carried their own lighting equipment. As reported in the focus group discussion, that:

"The toilets are usually dark, and one has to carry a candle or a touch. When there is no form of lighting, shared toilets are inappropriately used. It is easy to wet the floor and defecate on the slab when there is no light in the toilets, making the toilets unusable by others. So, at night residents, mostly women, mainly urinate outside the toilets, making most plots smell of urine."

It was observed that 66.2% of the toilets in the slum were smelly and 55% were unclean, characterized with flies and stagnation of urine or faeces on the floors (Figure 1). Observation findings (Figure 1) showed that pit content depth in most (53.7%) of the toilets was less than 1 meter from the slab which attracted odour and flies which suggested the need for frequent emptying of toilets for improved toilet hygiene. Most of the respondents (63.7%) indicated that women did not like using poorly maintained toilets (Table 4). Reluctance to use poorly maintained toilets by women was also reported in India by Chaplin and Kalita (2017) and Panchang (2021) and Biswas et al. (2020) in Mumbai due to their unique morphological structure.

Regarding toilets apertures, many respondents (56.3%) felt that they were okay to be used by children. However, 43.7% believed that the toilet holes were hugely sized and children would fear visiting the toilets. Results obtained in the focus group discussion showed that some facilities for instance, flush toilets, had been adopted in the slum and their apertures were reasonably fit for use by children. However, for pit latrines, apertures were described as huge which attracted toilet use phobia among children as reported by a focus group discussion respondent that:

"Some of the toilets are friendly for use and suit both women and children. Advocating for pour flush toilets has really improved their use. Children can use them. However, where they have not been adopted, the pit latrines are not conducive for use by children as they fear the big apertures and thus defecate outside"

Similar findings were obtained by Huda et al. (2021) in Bangladesh, Muhati-Nyakundi (2022) in Kenya and Mkhize et al. (2017) in South Africa, where the size of toilet drop holes hampered toilet utilization by children.

Toilet door latches were mostly positioned at heights unreachable to children, which discouraged toilet use among children as reported by 68.8% of participants (Table 4). The positioning of door latches higher than the children could access denoted a form of toilet non-inclusivity for children and might have resulted from a lack of clear comprehension of children's sanitation needs by sanitation programmers or implementers in slums, which needed to be addressed.

None of the toilets visited had menstrual management bins. Results from the focus group discussion showed that in the absence of menstrual man-

agement bins in toilets, women and girls folded their used sanitary pads and threw them in the general waste collection points, which would be carried by garbage collectors for disposal together with the other waste. Women reported cultural concerns related to disposal of their sensitive materials in uncertain places. A focus group discussion participant said:

"There are no bins for throwing used pads. It has to be folded completely and placed inside a sack hanged behind the toilet because we don't know how safe it will be disposed by the people who come to pick waste from plots. I hear that if it is seen it can be used for witchcraft and one could develop rashes around private parts."

The findings suggested that the special needs related with menstruation for women needed to be addressed in slum toilets to make them friendly for women and to minimize the struggles and anxieties in the menstrual materials disposal process. Similar findings were reported by Goddard and Marni (2020), Chakravarthy et al. (2019) in Delhi, Chowdhury and Chowdhury (2023) in India and Paromita (2022) in Dhaka where limited access to menstrual management options compromised women's menstrual management abilities.

Regarding hand washing after visiting toilets, 92.5% of households accessed toilets which either lacked handwashing facilities or which had facilities which lacked water for hygiene promotion. Absence of handwashing facilities or water in such facilities implied that residents in the slum rarely washed their hands after visiting toilets which was a form of poor hygiene. When present, some handwashing facilities (15%) were positioned in heights which were considered unreachable by children which discouraged them from washing their hands after visiting the toilets. Lack of children-friendly handwashing facilities after visiting the toilets implied that children were likely to suffer from sanitation-related diseases like diarrhea or cholera because of failing to practice hand hygiene after using toilets.

Observation findings also showed that 66.3% of the toilets had gapped walls which did not maintain user privacy. Such condition in toilets discouraged toilet users, especially women who embraced privacy, from using the toilets. Concerns that children or drunkard men who passed near dwellings would peep at toilet users was reported in the focus group discussion as follows:

"Alcoholics and drug addicts who have lost sense pass near our plot. For me, using a toilet that does not have a door or that has holes in the walls is risky because I fear being seen. Children also attempt to look at adults while using toilets which make one very uncomfortable."

The findings of the study concurred with results from studies conducted by Schmitt et al. (2021), Banka et al. (2021), Panchang et al. (2022) and Khanna and Das (2016) where privacy was a determinant of women comfortability with using toilets.

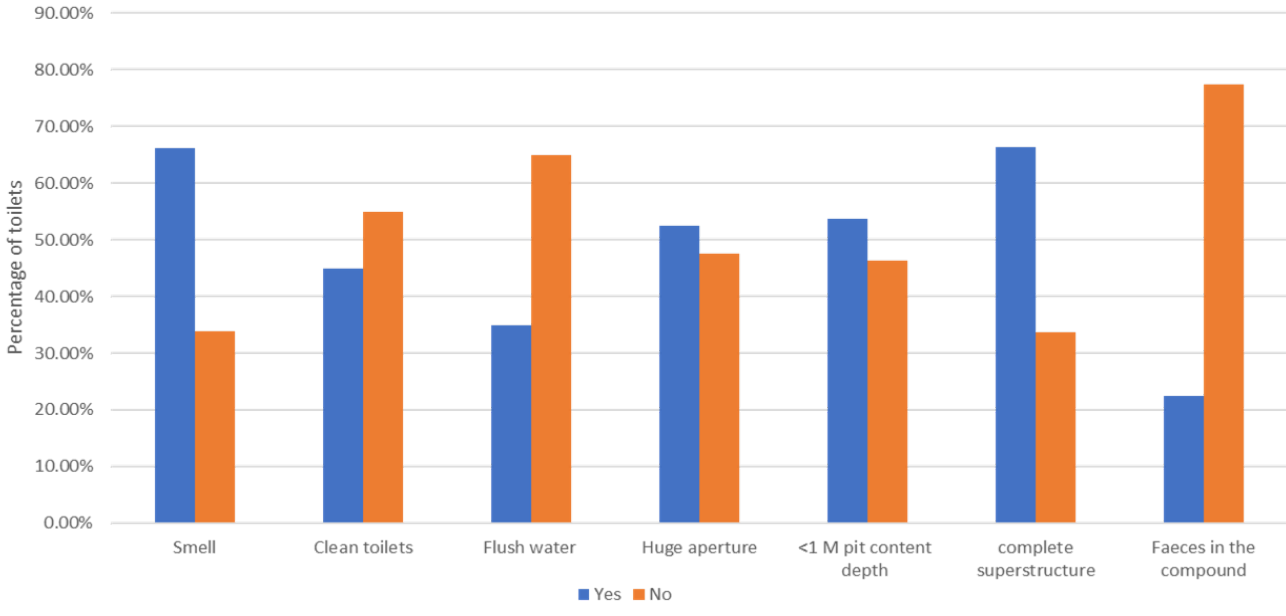

Figure 1: *Observation findings*

Statement	Response	Frequency	Percentage
Toilets are separated by gender	True	8	10.0%
	False	72	90.0%
Toilet location where women and children can easily access	True	60	75.0%
	False	20	25.0%
I can comfortably visit the toilets at night	True	38	47.5%
	False	42	52.5%
Toilets have adequate lighting	True	11	13.8%
	False	69	86.2%
Toilets have well-sized holes. Children do not fear visiting them	True	45	56.3%
	False	35	43.7%
Children do not use toilets because of the high position of door latches	True	55	68.8%
	False	25	31.2%
People especially women do not use poorly maintained toilets	True	51	63.7%
	False	29	36.3%
Frequency of toilet cleaning	Rarely	32	40.0%
	Regularly	31	38.8%
	More than a week	12	15.0%
	Never cleaned	5	6.2%
Menstrual bins	Present	0	0.0%
	Absent	80	100.0%
Handwashing facility with water	Present	6	7.5%
	Absent	74	92.5%
Positioning of handwashing facility in heights reachable by children	Yes	19	23.7%
	No	12	15.0%
	No facility	49	61.3%
Total (list-wise)		**80**	**100%**

Table 4: *Suitability of toilets for use by women and children*

Logistic regression analysis

Logistic regression analysis was conducted using univariable and multivariable analyses to examine the odds of inclusivity of slum toilets for use by women and children. The chances of open defecation as well as comfortability to use toilets were used to gauge whether the available toilets were inclusive to the groups.

Odds of inclusive sanitation for women in slums

In the univariable model for the odds of open defecation (Table 5), women whose toilets were accessible had 44.1% lower chances of practicing open defecation compared to the women who visited toilets located far from households (Unadjusted OR 0.559, 95% CI: 0.353-0.886, p=0.013). The chances of defecating in the open were 71.9% lower for women who were comfortable with visiting toilets at night than for the reference category (p<0.001). The probability of open defecation among women significantly reduced with access to clean toilets, toilets with complete walls, flush water and handwashing facilities (P<0.05). The relationship between separation of toilets by gender and access to toilets with lighting was not statistically significant (P>0.05).

All variables which appeared non-significant in the univariable model were also non-significant in the adjusted (multivariable) model. Besides, the variables that tested significant in the unadjusted model were non-significant in the multivariable model except comfortability with visiting toilets

at night (p=0.005) and access to clean toilets (p=0.009). Women who were comfortable with visiting toilets at night and those who accessed clean toilets had 63.7% and 45.2% lower probabilities of practicing open defecation compared to the reference categories respectively. The findings suggested the essence of enhancing safety of toilets and maintenance status to promote toilet friendliness for women at any time of day and to enhance hygiene for toilet users.

In the univariable model for the odds of comfortability with toilets (Table 5), women had 3.108 higher chances of being comfortable with toilets located in accessible places (Unadjusted OR 3.108, 95%CI: 1.582-6.106, p<0.001) than those located in far distances. Safety of toilets at night seemed to promote comfortability with the available toilets by women (OR 4.743, 95%CI: 2.656-8.469, p<0.001). The chances that slum toilets were comfortable for women increased with access to clean toilets (OR 3.004, 95%CI: 1.805-4.999, p<0.001), toilets with privacy (OR 7.023, 95% CI: 2.608-18.91, p<0.001), toilets (flush) with water (OR 3.816, 95%CI: 2.122-6.864, p<0.001) and handwashing options (OR 2.053, 95%CI: 0.242-0.894, p=0.006).

In the multivariable model, comfortability of women with toilets increased by 3.664, 6.750, 7.057 and 2.283 times with accessibility of toilets, safety of toilets at night, privacy and presence of handwashing facilities respectively (p=<0.05). Other variables were non-significant in the multivariable model. The findings implied that for toilets to be comfortable for use by women in slums, they needed to be significantly near households and safe for use.

Odds of inclusive sanitation for children in slums

Logistic analysis for the odds of toilet inclusivity for children was done and results were as shown in Table 6. Results from the univariable model showed that children who used toilets located in accessible areas had 43.7% lower chances of defecating in the open compared to the children who visited toilets located far from households (OR 0.563, 95%CI: 0.333-0.952, p=0.032). Children could be scared when visiting toilets far from their households especially when their caregivers are engaged. The chances that children would defecate in the open when toilets door latches were positioned at higher heights than they could reach was 1.476 more than when height for the latches was reachable (OR 1.476, 95%CI: 0.917-2.377, p=0.009). Positioning of door latches at higher heights could discourage children from independent use of toilets as they could be unable to open such toilets without help of their caregivers. Caregivers could be engaged in household chores, lacking time to attend to the grown-up children, which could explain the reason for defecation in the open.

The multivariable analysis for the odds of open defecation (Table 6) showed a negative relationship between toilet location in accessible places (OR 0.635, 95%CI: 0.364-1.109, p=0.011) and open defecation. Just like in the univariable model, the relationship between height of door latches and open defecation among children was statistically significant (p=0.020<0.05). The association between open defecation, size of toilet aperture and positioning of handwashing facilities in accessible heights for children showed a non-significant relationship in both the univariable and multivariable models (p>0.05). It was observed that mothers used 'potties' for most children especially when they deemed the toilets as unsuitable for use hence the non-significant relationship between open defection and aperture size.

In the univariable model for the odds of comfortability of toilets for use by children, toilets were regarded more comfortable for children when located in accessible places (OR 4.438, 95%CI: 1.795-10.97, p=0.001), had well-sized apertures (OR 1.618, 95%CI: 1.025-2.555, p=0.039) and handwashing facilities in heights accessible to children (OR 3.128, 95%CI: 1.765-5.545, p<0.001). Toilets whose door latches were positioned at high heights were regarded less comfortable for use by children (OR 0.434, 95%CI: 0.257-0.731, p=0.002). All variables that showed a significant relationship with comfortability of toilets for use by children in the univariable model also recoded a significant relationship in the adjusted model apart from size of toilet aperture (p=0.131>0.05). The findings implied that slum toilets could be more comfortable for use by children when located in places where they could easily access without close monitoring by caregivers and when they could easily open the toilet doors themselves. As well, results suggested that positioning of handwashing facilities at heights reachable by

children could improve comfortability of toilet use by children. However, children's tendency of wasting water might require to be addressed through training by caregivers to achieve maximum hand hygiene for the children in water-scarce areas after visiting toilets.

Variable	Inclusivity versus probability of open defecation			
	Unadjusted ORs (95% CI)	P-value	Adjusted ORs (95% CI)	P-value
Separation by gender	0.837 (0.506-1.386)	0.490	1.059(.564-1.987)	0.859
Accessible location	0.559 (0.353-0.886)	0.013	0.985(0.555-1.749)	0.959
Use at night	0.281 (0.513-0.515)	<.001	0.367(0.183-0.737)	0.005
Adequate lighting	0.001 (0.000-0.012)	0.999	0.011(0.000-0.015)	0.999
Clean toilets	0.366 (0.209-0.640)	<0.001	0.548(0.272-1.106)	0.009
Complete walls (privacy)	0.552 (0.347-0.878)	0.012	1.157(0.597-2.240)	0.666
Flush water in flush toilets	0.361 (0.192-0.679)	0.002	0.890(0.374-2.113)	0.791
Handwashing facilities	0.465 (0.242-0.894)	0.022	0.578(0.266-1.254)	0.165
Variable	**Toilets Comfortability for use by women**			
	Unadjusted ORs (95% CI)	P-value	Adjusted ORs (95% CI)	P-value
Separation by gender	1.034(0.665-1.607)	0.881	0.471(0.218-1.021)	0.056
Accessible location	3.108(1.582-6.106)	<.001	3.664(1.158-11.60)	0.027
Use at night	4.743(2.656-8.469)	<.001	6.750(2.590-17.59)	<.001
Adequate lighting	0.098 (0.000-0.052)	0.061	0.088(0.000-0.054)	0.989
Clean toilets	3.004(1.805-4.999)	<.001	1.908(0.358-2.304)	0.839
Complete walls (privacy)	7.023(2.608-18.91)	<.001	7.057(1.698-29.32)	0.007
Flush water in flush toilets	3.816(2.122-6.864)	<.001	1.500(0.597-3.772)	0.388
Handwashing facilities	2.053 (0.242-0.894)	0.006	2.283(1.030-5.059)	0.042

Table 5: *Odds of inclusive sanitation for women in Nanyuki slums (n=80)*

Variable	Inclusivity and open defecation			
	Unadjusted ORs (95% CI)	P-value	Adjusted ORs (95% CI)	P-value
Accessible location	0.563(0.333-0.952)	0.032	0.635(0.364-1.109)	0.011
Well-sized aperture	0.955(0.610-1.496)	0.841	1.068(0.655-1.742)	0.792
Position of latches	1.476(0.917-2.377)	0.009	1.303(0.774-2.192)	0.020
Handwashing heights	0.635(0.403-1.001)	0.051	0.782(0.467-1.309)	0.350
Variable	**Toilets comfortability for children**			
	Unadjusted ORs (95% CI)	P-value	Adjusted ORs (95% CI)	P-value
Accessible location	4.438(1.795-10.97)	0.001	3.974(1.537-10.27)	0.004
Well-sized aperture	1.618(1.025-2.555)	0.039	1.574(0.874-2.835)	0.131
Position of latches	0.434(0.257-0.731)	0.002	0.519(0.279-0.967)	0.039
Handwashing heights	3.128(1.765-5.545)	<0.001	1.944(1.012-3.734)	0.046

Table 6: *Odds of inclusive sanitation for children in Nanyuki slums (n=80)*

Conclusion and recommendations

The study concluded that accessibility of toilets, latrines safety and operational hygiene facilities were key for women and that provision of children non-responsive sanitation features and hygiene facilities in terms of height discouraged independent toilet use by children. Although progress has been made in improving sanitation status in slums, the toilet facilities were mostly women and children non-centric, a factor which constituted sanitation vulnerabilities. While conceptualizing universal sanitation plans, programming of slum sanitation should incorporate structurally friendly toilets that address the sanitation needs of all users including women and children. To better address women and children's sanitation needs in slums, involvement of women in the planning process is fundamental. The strategy could ensure that the facilities provided respond to women's needs and the needs of children else attainment of inclusive sanitation remain a lengthy process in slums.

Competing interests

The authors declare no competing interest.

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