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ARTICLE



# Drivers of women's sanitation practices in informal settlements in sub-Saharan Africa: a qualitative study in Mathare Valley, Kenya

Samantha Winter <sup>a</sup>, Francis Barchi<sup>a</sup> and Millicent Ningoma Dzombo<sup>b</sup>

<sup>a</sup>Edward J. Bloustein School of Planning & Public Policy, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA; <sup>b</sup>Department of Sociology and Social Work, University of Nairobi, Nairobi, Kenya

## ABSTRACT

Despite evidence suggesting women are disproportionately affected by the lack of adequate and safe sanitation facilities around the world, there is limited information about the factors that influence women's ability to access and utilize sanitation, especially in sub-Saharan Africa. The purpose of this study was to explore factors influencing women's sanitation practices in informal settlements in Nairobi, Kenya. Information from 55 in-depth interviews conducted in 2016 with 55 women in Mathare Valley Informal Settlement in Nairobi was used to carry out cross-case, thematic analysis of women's common sanitation routines. Women identified neighborhood disorganization, fear of victimization, lack of privacy, and cleanliness/dirtiness of facilities as important factors in the choices they make about their sanitation practices. This suggests that future sanitation-related interventions and policies may need to consider strategies that focus not only on toilet provision or adoption but also on issues of space and community dynamics.

## ARTICLE HISTORY

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## KEYWORDS

Sanitation; women; informal settlements; qualitative; factors

## Introduction

Inadequate sanitation is a leading risk factor for the global burden of disease and child mortality (World Health organization 2017a). In low-income countries, unsafe water, sanitation, and hygiene, combined, account for over 6% of deaths annually and are the primary cause of an estimated 842,000 deaths each year (World Health Organization 2017b). Poor sanitation is associated with transmission of a number of communicable diseases, including cholera, diarrhea, dysentery, and typhoid, as well as neglected tropical diseases such as schistosomiasis and trachoma (World Health Organization 2017b). There is growing evidence that inadequate sanitation is also associated with a number of additional psychosocial stressors, particularly for women (Caruso et al. 2017; Novotný et al. 2017).

For women, poor sanitation has been linked to toxic shock syndrome and vaginal infections resulting from neglectful menstruation practices (Fisher 2008; Mahon and Fernandes 2010; Sommer et al. 2013); urinary tract infections, constipation, and hemorrhoids linked to urine and feces retention (Khanna and Das 2016); and dehydration and hunger associated with withholding food and liquids to avoid having to leave the house to urinate/defecate, especially at night (O'Reilly 2010; Khanna and Das 2016). Additional research suggests that women without access to adequate sanitation may be at higher risk of experiencing non-partner violence (Corburn and Hildebrand 2015; Winter and Barchi 2015; Jadhav et al. 2016; Khanna and Das 2016).

Despite numerous attempts over the past several decades to reduce the number of people lacking access to safe sanitation around the world, 2.3 billion people are still living without access to even basic sanitation facilities such as toilets or latrines (World Health Organization 2016; WHO, UNICEF 2017). Access to safe sanitation is a growing challenge in informal settlements where over 65% of the residents have inadequate sanitation (UN-HABITAT 2014). Given the serious health consequences of poor sanitation for women, understanding the factors that influence their ability to access and utilize safe sanitation facilities is a critical concern for policy-makers and researchers around the world.

Previous studies, largely focused on sanitation in rural settings in south and Southeast Asia, have identified some general factors and motivators associated with people's sanitation preferences, demand, and outcomes. Findings from a recent systematic review of the contextual factors and motivations affecting rural community sanitation in low- and middle-income countries (LMICs) found that privacy, safety, and convenience were the most common factors associated with people's sanitation preferences, namely latrine/toilet construction, ownership, and usage; willingness to pay for a latrine/toilet; or continued use of open defecation, in rural communities (Novotný et al. 2017). Socioeconomic factors such as wealth, housing quality, income, asset ownership, access to loans, education, occupation, and the quality of the sanitation facilities were also common factors associated with rural sanitation outcomes (Novotný et al. 2017). Other factors included spatial and environmental factors (e.g. access to water, suitability of terrain to construct new sanitation facilities, space and landownership, location and accessibility of sanitation facilities, and climate); social factors (e.g. prestige of sanitation, social pressure, shame, social capital, and social learning); health and cleanliness factors (e.g. health problems or improvements and cleanliness/hygiene of sanitation alternatives); demographic factors (e.g. age, gender of the head of household, village size, household size, ethnicity, and family structure); institutional support factors (e.g. subsidies for sanitation; institutional provision and/or maintenance of sanitation; institutional policies, pressure, and sanctions); hygiene and sanitation knowledge, attitudes, and practices (e.g. knowledge of health advantages associated with improved sanitation, experience using toilets/latrines, and handwashing behaviours); satisfaction factors (e.g. satisfaction and/or dissatisfaction with current sanitation practices vs. alternatives); and cultural factors (e.g. religious beliefs or rules about sanitation and hygiene and/or local bylaws or taboos) (Novotný et al. 2017).

Research on sanitation in informal settlements in LMICs has highlighted some additional factors associated with people's ability to access and use sanitation specifically in these environments. These factors include ability to pay to use public toilets (Corburn and Hildebrand 2015; Greed 2015); land tenure and landlord/tenant relationships (Isunju et al. 2011); neighborhood disorganization (e.g. levels of crime, idle youth, stray animals) (Winter et al. In press); conditions and features of public toilets (e.g. access to water in toilet, working doors and locks on toilet stalls, handwashing facilities, and lighting) (Okurut et al. 2014; Corburn and Hildebrand 2015); and toilet management and hours of operation of public toilet facilities (Isunju et al. 2011; Okurut et al. 2015).

Beyond the research that has identified factors associated with people's general sanitation preferences, demand, and outcomes in rural and informal settlement areas, there are a few studies that have explored factors specifically associated with women's sanitation behaviour. Hirai et al. (2016), for example, found evidence that women's decision-making power in the home was associated with the household's sanitation access and outcomes. Several studies found associations between women's experiences of violence and harassment and their sanitation behaviours (Amnesty International 2010; Sommer et al. 2014; Corburn and Hildebrand 2015; Sahoo et al. 2015; Winter and Barchi 2015; Khanna and Das 2016). Additionally, some research suggests that women fear sharing toilets with men and/or prefer toilets with separate gender stalls (Pearson and Mcphedran 2008; Greed 2015). Finally, sense of safety and privacy or the lack thereof have been identified as particularly important factors associated with women's ability and willingness to access and utilize different sanitation alternatives, particularly during times of pregnancy or menstruation (Jenkins and Scott 2007; Pearson and Mcphedran 2008; Schouten and Mathenge 2010; Lagerkvist et al. 2014; Corburn and Hildebrand 2015; Khanna and Das 2016).

Research focused on the factors influencing women's sanitation behaviours emphasizes the importance of understanding the unique sociocultural context surrounding women's sanitation environments and sanitation behaviours (McFarlane et al. 2014; Khanna and Das 2016; Caruso et al. 2017). However, the majority of these studies are focused on rural communities in south and Southeast Asia, leaving a gap in what is known about women's sanitation practices in informal settlements in sub-Saharan Africa. This is a particularly serious gap in the literature not only because of the critically poor sanitation conditions in informal settlements but also because of the extreme vulnerability of women living in these settlements. Women, in informal settlements in Kenya, for example, experience higher rates of violence (Swart 2012), unemployment (Oxfam, Women's Empowerment Link, National Organization of Peer Educators, SITE Enterprise Promotion 2015), and poverty (Kenya National Bureau of Statistics 2018) than women in the general population. This study addresses this gap by providing an in-depth exploration of how women characterize the reasons behind their sanitation practices in informal settlements in Nairobi, Kenya.

## Methods

### Study site

Cross-sectional data for this analysis were collected as part of an ongoing study in Mathare Valley Informal Settlement (Mathare) in Nairobi, Kenya. Mathare is one of the largest and oldest informal settlements in Nairobi. Although the settlement started in the 1920s, government institutions have periodically tried to demolish structures in Mathare and, up to the present, have failed to provide basic services including continuous and adequate water supply and refuse collection (Corburn et al. 2012). Estimates of population density in Mathare range from over 100,000 residents living in less than a square-kilometer (Kenya National Bureau of Statistics 2012) to 200,000–300,000 residents living in a 2–3-sq. km area (Corburn et al. 2012; Lundine et al. 2012). The boundaries of the settlement and the villages and population within are contested; thus, this research focused on the 11 villages that women in the study identified as the major villages comprising Mathare Valley Informal Settlement.

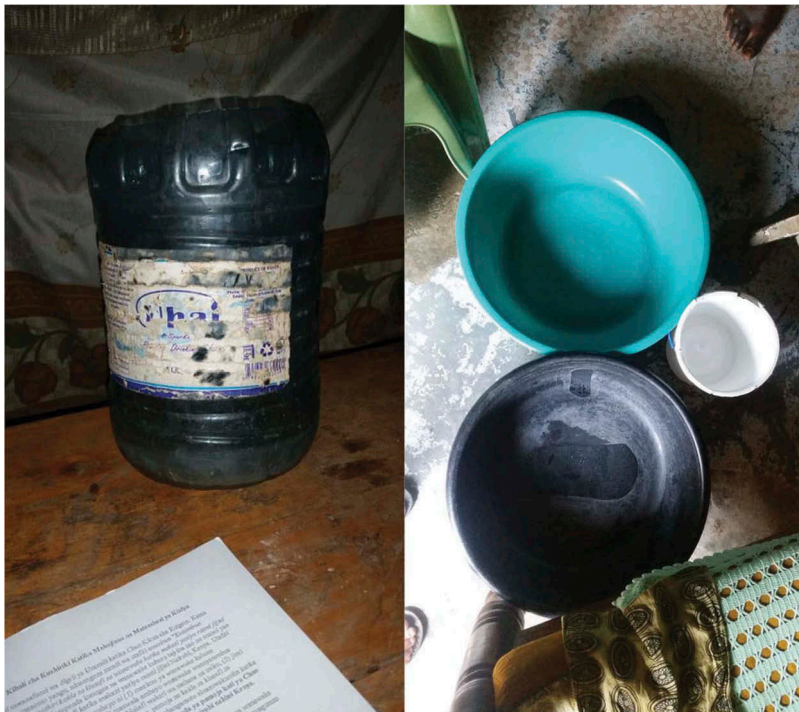
According to 2012 estimates, approximately 83% of the residents in Mathare are renters and the remaining 17% are home owners (Corburn et al. 2012). Approximately 32% of residents are unemployed (defined as individuals not working) and 87% rely on informal businesses and/or casual labor (e.g. clothes washing for women or construction work for men) (Kovacic 2014). Approximately 40% of women in Mathare are unemployed compared to about 20% of men (Kovacic 2014). The average monthly household income is about KES 8500 (about US\$85), which is just above the absolute poverty level in Kenya (KES 6500 for a two-person household); however, estimated average monthly expenditures in Mathare (KES 9100) exceed the average household income in this population (Corburn et al. 2012). Only about 11% of residents report having access to an in-home piped water supply and about 83% rely on shared toilets (Corburn et al. 2012). More recent research suggests, however, that over two-thirds of residents, despite having access to a toilet facility, regularly revert to using flying toilets (plastic bags), buckets, or open defecation to meet their sanitation needs (Corburn and Karanja 2014).

### Data and sample

The purpose of this study was to collect information from women about their experiences with different sanitation alternatives in Mathare and the factors that influence their regular sanitation practices and patterns. In order to recruit women to the study whose sanitation practices represented a broad range of sanitation alternatives, several measures were taken. First, the Chief of Mathare, chairmen from each village, and a local women's organization helped recruit

women for introductory meetings about the study in each village. Women who were interested in participating were asked to sign up and provide basic demographic, sanitation, and contact information. From this list of interested residents, we iteratively selected women whose daily and nightly sanitation practices represented a broad range of the sanitation alternatives available in Mathare, including open defecation; flying or bucket toilets; public facilities; shared, private facilities; and private sanitation facilities (see [Figures 1–4](#) for example).

There were two objectives of our sampling strategy. First, we were aiming for a maximum variation sample, i.e. we wanted to capture responses from women whose sanitation practices represented the diversity of sanitation alternatives available to residents living in Mathare. Second, we aimed to reach theoretical saturation about women's experiences with common sanitation alternatives in Mathare and the factors that influenced their regular use of those alternatives. While we felt we reached theory saturation in terms of women's experiences with and factors influencing their use of common sanitation alternatives about halfway through sampling, we wanted to ensure our first sampling objective—to capture a broad range of sanitation alternatives—was also met. Women's access to different sanitation alternatives and the factors that influenced their sanitation choices varied by village due to geography; accessibility; levels of crime and violence; governmental, non-governmental, and private infrastructure investment; population density; government and/or police presence; and land ownership (e.g. public vs. private or cooperative ownership) differences. Thus, we continued sampling until we felt we had captured the diversity of sanitation alternatives available to residents in Mathare and, in doing so, made sure to include at least 5 participants from each of Mathare's 11 villages – yielding a total sample size of 55 participants. While we had a clear sampling strategy, the responses summarized in this study were derived from a purposive sample and should not be taken to represent the population; rather, we aimed to capture women's experiences with a diversity of sanitation alternatives and



**Figure 1.** Bags, buckets, or open defecation. Use of plastic bags, buckets, or open defecation is a common sanitation management strategy for women in Mathare.



**Figure 2.** Public toilets. Many women in Mathare rely on public toilets, especially during the day.

common factors influencing their use of those alternatives. Very little additional inclusion/exclusion criteria were used in this study; however, we did require that women were over the age of 18 years, were residents of Mathare (not visitors), were able to give consent, and spoke either English or Swahili.

In-depth, semi-structured interviews were conducted with each of the participants. Interviews were carried out over a period of 9 months by the lead author of this study, a representative from Rutgers, The State University of New Jersey with experience living in East Africa and managing projects and research focused on women, water, sanitation, hygiene, and health, and a female graduate student from the University of Nairobi with experience conducting quantitative and qualitative research throughout rural and urban Kenya. All participants provided written consent for the interviews, which were conducted in English and/or Swahili depending on participant preferences. With separate consent from participants, interviews were also audio recorded and transcribed.

### ***Structure of the interview***

Women in the study were asked to describe the sanitation environment in their households and neighborhoods and their own everyday sanitation practices throughout a full 24-h period. Women were also asked to identify and explain those factors that influenced their primary and alternative sanitation options. Questions were designed to allow the important factors to emerge from women themselves rather than to have them answer questions about any hypothesized factors. However, as interviews progressed, probes were occasionally used to gather additional information about potential factors that might influence women's sanitation utilization patterns, such as



**Figure 3.** Plot and building toilets. Some women in Mathare share a toilet with several other houses in a building or in a plot.

time of day/night, the conditions, and/or technological characteristics of available sanitation facilities, privacy, and/or the location of sanitation facilities/sites for urination/defecation.

### ***Analysis strategy***

Audio recordings of the interviews were transcribed and then analyzed in Atlas.ti version 7 (Scientific Software Development 1999). Cross-case, thematic analysis was carried out on the transcripts to investigate factors women identified as influencing their sanitation utilization practices and patterns. Since the lead investigator on this study was a foreigner in Kenya, three separate researchers – the principal investigator and two local female researchers who are native



**Figure 4.** Private and private-shared toilets. Very few women in Mathare have access to a private toilet – used only by one family – or to private-shared toilets – those owned by one family, but shared with other families.

Swahili speakers and familiar with the Mathare context – independently reviewed and coded each woman’s transcripts. Codings were then compared. In instances where researchers’ codes did not agree (approximately 7% of the codes), the full research team discussed discrepancies and agreed upon final codes and resulting findings.

## Results

### *The participants*

Participants in this study ranged from 18 to 72 years old. Almost all of the women had at least one child, and about one-half were married. The majority of women in the study had completed primary school and about one-fifth had completed secondary school. Only one of the women had never been to school, but several had not completed primary. Over half of the participants had a business, but very few (less than a quarter) reported having steady, formal employment, or odd jobs (e.g. washing clothes). Although not all women knew their monthly household income (about a quarter did not), of those who did, most reported monthly incomes between



KES 5000 and 10,000 (about US\$50–100) or below KES 5000. Over two-thirds of the women were also part of local economic, microfinance, and/or savings groups.

Only a few women in this study had access to a private toilet during the day or night. The majority reported using public toilets during the day with most of the remaining women reporting use of building or plot toilets (a plot is a grouping of houses usually surrounded by a wall, fence, hedge, or iron sheets) or bags, buckets, or open defecation. At night, even fewer women reported using private, building, plot, or even public toilets. In fact, almost three-quarters of the women, regardless of their utilization patterns during the day, relied on bags or buckets at night.

## **The factors**

### ***Fear of victimization and crime***

The majority of women (about three-quarters) in this study reported using open defecation near their homes or bags or buckets in their homes to avoid going outside at night. Almost all of these women stated that they reverted to using bags, buckets, or open defecation largely due to a fear of being attacked or ‘bad things’ happening if they were to go outside at night. For example,

These days you fear for yourself. You can go outside and you meet with [people] chasing each other and if they see you, maybe you know them, and they can do something to you or they throw stones and they hit you. Do you see? (Mar, Village 6)

Other women stated that the fear of meeting someone in the toilet at night was a deterrent from going to use it, even if it was in the plot or building, e.g. ‘sometimes you feel something, you go to the toilet, you find a man there, he can do something bad to you’ (Hel, Village 2) or ‘you will get a man there [in the toilet] and you don’t know his intentions . . . something like raping. If he takes you today, tomorrow he’ll take your child. Maybe he is sick. It’s something like that that I fear a lot’ (Ros, Village 9). Relatedly, several of the women in the study talked about training themselves not to defecate at all at night to avoid having to go outside their homes, e.g. ‘it is a must you constrict yourself even if the toilet is just here. There is no security’ (Hel, Village 2). Some women felt that even leaving their homes for a few minutes to go to a toilet in their plot or building would leave them and their homes vulnerable to attack. As one woman expressed,

Sometimes you can go to the toilet. When you return, you meet with a person. He surprises you in the house. You can meet with bad people. Like, you are a woman. You can be raped. You can be forced. They come to the house. They take anything they want, and sometimes they can even kill you. (Ros, Village 10)

Even a few of the women who reported having a nearby, easily accessible toilet at all times (e.g. a private or private-shared toilet) recognized that fear of attacked could prompt women, including themselves, when necessary, to use bags or buckets in the home. For example,

Maybe the toilet is far, see. I told you there is one down there. Another is over there. Now, you can fear a lot to go there at night. Security is not good, you see. Now, there are times, I have told you, it is better a woman goes in a bucket or a paper bag than go outside. She will be risking her life. (Pur, Village 4)

Almost all of the women who talked about general fears of going outside at night and/or being attacked (46 out of 55) also cited fear of rape (41 out of 46) and/or fear of being robbed (23 out of 46) as reasons to avoid going to an outside toilet and/or to justify the use of bags, buckets, or open defecation at night. Some women reported that fear of rape was one of the primary reasons they chose to use a bag, bucket, or open defecation in or near their homes at night, e.g. ‘at night it is this, whatever, bucket because at night you cannot go outside. Often, maybe you can go out and you can get a person that can even rape you’ (Sha, Village 11). Other women specifically expressed fear of rape if they were to go to a public toilet at night. For example, ‘maybe I have gone to the toilet, and I am scared because, like these days, there are many youth. They are drunk, and they can find me there inside. They can enter, they can rape

me, or they rape those other girls' (Flo, Village 5). Finally, several women also cited fear of being robbed as a deterrent to leaving their homes to use a toilet and/or as the primary reason for using bags, buckets, or open defecation in or near their homes at night. For example, 'behind [my house] there is a path that passes, you see. If a person goes outside at night to urinate, a robber can enter and take something. He leaves with it in just that minute' (Mar, Village 3).

Women expressed a number of other fears associated with going outside, using a toilet outside their homes, and or leaving their houses unattended at night, but they were far less common than the fears of being attacked, raped, or robbed. Others included a fear of darkness, fear of drunkards, fear of falling in the toilet, and fear of wild animals.

#### ***Cleanliness/Dirtiness of the toilet/Fear of getting infections/illnesses***

The next most commonly discussed factor by women was the level of cleanliness of their primary toilets. The majority of women (33 women) in this study reported regularly relying on public toilets to meet their daily sanitation needs with another quarter relying on shared plot or building toilets. Public toilets in Mathare are shared, on average, by 85 households or roughly 500 people (Corburn and Hildebrand 2015) and can be shared by upward of 1000 people. Plot and building toilets are frequently shared by 20 households or around 50–100 people. Most of the women using public toilets or even plot/building toilets stated that they were dirty. In fact, many women suggested that they would rather revert to a bucket/bag or open defecation if the toilet was very dirty; particularly, if they felt there was a risk of contracting infections such as vaginitis or candidiasis. For example, 'like you can go, you urinate in the toilet, but that place is dirty. It might splash on you and you start to scratch yourself. You are always getting these things, every time it is this problem' (Elz, Village 7) or, as another woman described,

[Sometimes] the waste will be scattered everywhere so sometimes, I feel, 'I don't need to go there. The bucket is here. I should just urinate there [in the bucket]... See the biggest issue for women is like we can contract diseases easily when the toilets are dirty. Even I have been affected with the, what's it called, candidiasis ... when I was pregnant. So I went to the hospital. I could feel some pain and they told me, 'this is candidiasis, and you contract it from the toilets when they block.' You are pressed, you want to go to the toilet, you don't care—you just go directly there and, you know, when the toilet is just ... floating and you are there ... the water splashes on you ... and those germs make women sick. (Sha, Village 7)

Women with access to their own toilets stated that being able to clean and maintain their facilities regularly was one of the reasons they felt safe using it, e.g. 'after doing a thorough cleaning I will make sure that things are in order. I need to know the condition of that toilet at that moment. If it is not good, I will collect water ... and drain it immediately' (Cla, Village 1). Several women using a plot toilet or private-shared toilet also reported that their toilet was clean, e.g. 'the thing that makes me happy about this toilet is that it is clean and it is a safe place' (Mar, Village 3). However, even women with regular access to a building or plot toilet reported that dirtiness, combined with their fear of getting infections, could sometimes deter them from using it, for example, 'if it is dirty ... I cannot go. You know, the toilet causes illnesses that grab [affect] women. Like if the toilet is dirty, you will itch there' (Mar, Village 3).

In addition to fearing infections, several women also talked about fear of other sicknesses as a factor influencing their decision to use a shared toilet. For example, 'I came to realize that a toilet can bring problems like diarrhea from time to time. We have seen it. At least it is better to keep in mind the cleanliness of that toilet' (Dor, Village 8) or 'maybe you came out and you did not flush. Me, I enter. I don't know you were there, you know. Maybe you are a sick person and that sickness maybe it can affect me' (Hel, Village 3). For some women, the fear of contracting illnesses such as typhoid or cholera was a particularly strong deterrent to using shared toilets, especially during an outbreak. For example,

I fear illnesses, typhoid first ... typhoid is brought by these toilets because the toilet has already blocked. People open it [unblock it] but even those toilet doors are not clean. So it is unavoidable you touch the dirtiness. You have come with that [dirtiness], you find food on the table, you feel hungry, you continue with the food. Now that is the reason we fear the toilet. It is dirty. (Dor, Village 6)

### ***Culture and perspectives***

Almost all of the women in this study reported using a toilet for defecation (long calls) during the day. A majority of these women reported that they used a toilet during the day for defecation because it was simply ‘a must.’ Few women elaborated on this declaration – as if there were no other option. However, a few mentioned that they used a toilet in order to set a good example for their children, e.g.

[The toilet] is a bit far ... I’ll just use [the bag/bucket] then I’ll pour it there, outside. But for the long call, it is a must I should go there [to the toilet] if there is no line. ... Like now, me, I am with older children. Sometimes the biggest child, she is here ... I cannot use the bag here because she might see me. I want to show her she should use the toilet. Even if I fear it, I go. (Mil, Village 2)

Although many women stated that they reverted to using bags, buckets, or open defecation at night for all their sanitary needs, some (8 out of 55) reported that they would continue to use a toilet outside their home at night for defecation despite their fears. For example, ‘for long calls you cannot go in the house’ (Elz, Village 7) and/or ‘for long calls it is a must we go to the toilet outside’ (Pau, Village 11). While this implied sense of obligation was seemingly a driver for many of the women using toilets during the day and for a few women at night, the women who stated they would use a toilet at night also emphasized that they would only go out to use the toilet for defecation and only in extreme circumstances, e.g. ‘it is a must I climb down [to go to the toilet] ... when it is an emergency’ (Her, Village 3) or ‘for stomach problems, it is a must I just go to the toilet’ (Ros, Village 10).

#### ***Cost of using a toilet***

Just over half of the women in this study talked about lack of money as a reason they opted to use bags, buckets, or open defecation for urination and/or defecation in place of visiting a toilet. Most of these women stated that, while they were willing to pay a fee to use a public toilet for defecation during the day, they were unable to pay to use the same toilet for urination (short calls). For example, ‘often, I cannot remove that five shillings for short calls, I just use a bucket. But for long calls it is a must I remove that five shillings’ (Elz, Village 7). For a couple of women in the sample, even paying to use a public toilet for defecation often proved to be too costly, e.g. ‘for me, if I miss to get money, it is a must I put a paper bag there. ... If I am just missing [money] I cannot go to help myself. It is a must I just do this’ (Ros, Village 9). For these women, bags or buckets in the home are frequently the only option. For example,

I want to go [to the toilet] you see, I don’t have money. I will just hold tight, I just come for that bucket. Often you even fear to pour it. Like people will see you. It’s a problem, often you just put it in the house. When it turns to night, you pour it outside. (Jan, Village 8)

On the other hand, some women were actually willing to pay higher rent just to have access to a private toilet. For example,

I pay higher than the other houses because of the toilet ... and the privacy in it. I use my own sanitation place, and I’m happy about it even if I’m paying higher. I feel it is comfortable because it is serving my entire family. (Cla, Village 1)

#### ***Privacy***

Privacy, or the lack thereof, was raised by about half of the women in this sample as an important factor associated with their sanitation utilization practices. The majority of these participants were women who reported having to rely on public toilets to meet their sanitation needs during the day, e.g. ‘you can’t feel comfortable when you are in the toilet. You think, “I can get seized by maybe a man or something” ... In the toilet they can see me’ (Cat, Village 4). A few women talked specifically about the lack of privacy at public toilets as a reason for using bags, buckets, or open defecation for urination rather than going to the public toilet, saying ‘those toilets have been made with iron sheets; so, you can see me if I am there inside. People pass you see. There are some that peep. ... Children if they are playing there, they always know to peep at the mamas’ (Chr, Village 6). Some women who regularly rely on plot toilets also reported that their privacy was often

violated; however, many of the women who reported these privacy issues still opted to use toilets during the day rather than reverting to bags, buckets, or open defecation even for urination, i.e.

Now, we are used to this because that toilet has holes. Now a person can peep at you. It's not a house [superstructure] of stone, this is a house [superstructure] of iron sheets. Now there are times you enter the toilet – there are holes and the door does not have a lock, you hold it with your hand. So, any time a person can hit it, stones can be thrown. Now, you see, you cannot be comfortable. (Dor, Village 6)

Other women in the sample talked about the fear of being seen or the lack of privacy when having to use bags or buckets inside the house or open defecation right outside the house, for example,

Now like that method of long call ... if you can't hold it, it is a must you look for a paper bag, you go outside the door with it and, you know, you are fearing eyes there and you don't know ... even though, at that time, outside it is silent and all the people are there inside, but you don't know what thing will happen. (Car, Village 10)

Yet, despite these women's discomfort and lack of privacy, many of them still felt they had no other option but to use bags, buckets, or open defecation near the home at night because they could not go far from their houses to access a toilet facility.

### ***Accessibility***

A little under half of the women in the study talked about accessibility of toilet alternatives as a factor influencing their sanitation patterns and practices. In particular, women talked about proximity to toilets, hours of operation of toilets, and toilet closures due to flooding or blockages as factors influencing their ability to access or utilize toilets regularly. Proximity was one of the most prominent factors for women who reported being able to use a toilet at all times. For example, one woman stated simply, 'I am very happy the toilet is near. Even at night, I can wake and go to the toilet without worry' (Pur, Village 4). A number of women reported regularly using plot or building toilets and a few women reported using public toilets, at least during the day, because they were, simply, 'nearby' (Sha, Village 11; Car, Village 11). On the other hand, some women stated that they were unable to use a toilet at all because there were no accessible toilets in their area, e.g. 'there are no toilets. There is one, but it is there in the church. There is only that one. There is no other toilet here. Now we are in a bad situation because they are all far away' (Est, Village 2). Other women were willing to travel long distances to use a toilet for defecation during the day but felt the toilets were too far away for urination during the day, e.g. 'there is a toilet far away ... but like for short calls, you know, for that, you cannot go running there' (Jen, Village 10).

In addition to being far away, many public toilets are closed at night. About one-third of the women in the sample stated that their daily toilets were closed or locked at night and several additional women (about 6) stated that their plots locked their gates at night – prohibiting them from going outside to reach a toilet.

About one-fifth of the participants suggested that temporary closures due to blockages, for example, were also frequent factors inhibiting them from being able to access their toilets at all times, even during the day. Several women suggested that toilet blockages could occur as often as once a month and could last for several weeks. Some women reported being able to access an alternative toilet when theirs is temporarily closed, e.g. 'when it blocks, you go to another, but it is far, down there at the end' (Ros, Village 10). Others reported that they had to revert to using bags, buckets, or open defecation when their toilets were temporarily inaccessible, e.g. 'if it blocks, it usually takes a period to open it. We suffer. So me, I usually use a bucket' (Hel, Village 3). Whether women chose to use a different toilet in the area, the building, or plot or revert to bags/buckets, temporary closures, such as blockages, often affected women's sanitation patterns.

### ***Fear of being attacked due to ethnicity***

Although very few women (four) talked about a fear of being attacked while trying to access a toilet during the day, there was one woman who talked specifically about the fear of being

discriminated against while trying to access a public toilet at any time. For her, this was one of the most serious inhibitors to accessing a toilet, i.e.

We are using buckets most of the time. We fear to go there. I told you, these days, I can't even take you there. Like it is a Kikuyu toilet ... you know. They just despise us. They can ask you which government [tribe] you are with ... they will even fight us. (Jan, Village 8)

## Discussion

While there have been several recent studies that have offered evidence of women-specific factors associated with sanitation behaviour (Fisher 2008; Amnesty International 2010; Mahon and Fernandes 2010; Massey 2011; Sommer et al. 2014; Corburn and Hildebrand 2015; Sahoo et al. 2015; Khanna and Das 2016), there is limited information about the drivers of women's sanitation utilization in informal settlements in sub-Saharan Africa. This has remained a serious gap in the literature. The vulnerability of women living in these settlements combined with the persistently poor living and sanitation conditions is associated with serious health consequences for this population – highlighting the need for more research focused on these issues. This paper makes an important contribution to the sanitation and public health fields by examining, in-depth, the factors that shape women's practices in these settlements in Kenya. It reveals that, while availability of and access to sanitation facilities remains important, women in Kenya take into account a far more complex set of psychosocial, structural, and environmental factors when deciding where, how, and when to address their sanitation needs. A number of these factors, particularly fear of victimization and fear of infections, have been understudied in the sanitation field to date. While the findings from this study are not conclusive, and there is a clear need for further research examining the temporal and causal nature of their association, they do suggest that sanitation-related policies and interventions that do not take into account the critical role of the proximal physical and social environments and women's perspectives of those environments may fail to achieve universal sanitation access, especially for women in informal settlements.

By far, the most common driver of women's sanitation practices in Mathare was fear of victimization (e.g. being attacked, raped, robbed, or beaten) at night. This was a particularly influential factor for women opting to use bags, buckets, or open defecation at night; yet, even those with access to a toilet at all times acknowledged fear of violence and crimes as critical factors for other women. This finding builds on evidence from previous research, mostly in South Asia, that suggests women without access to safe sanitation are at higher risk of sexual assault and rape and that this risk can drive sanitation behaviours such as restricting food or liquid intake, retention of feces and urine, and/or use of alternative sanitation methods (e.g. bags or buckets in the home and/or open defecation near the home) to avoid having to go outside or walk long distances to reach a toilet/place to urinate/defecate at night (Sahoo et al. 2015; Khanna and Das 2016; O'Reilly 2016; Caruso et al. 2017). Most of the research to date, however, lumps women's *actual* risk/experiences of violence together with women's *fear* of violence as a single factor influencing women's sanitation practices; however, this bundling of factors may be overly simplistic. Very few women in this study, for example, reported that their actual experiences of violence played a critical role in their current sanitation behaviours. Instead, women in this study highlighted that the *fear* of such violence was the key motivator for them to adopt alternative sanitation management strategies. This may be a key distinction because, regardless of whether or not lack of access to sanitation creates a tangible increase in women's risk of violence and harassment, these findings seem to suggest that women need to feel safe in their environments in order to even consider consistent use of toilets. In addition, these findings underscore how important it is that scholars develop a more nuanced understanding of women's relationship to

violence, both experienced and feared, and how this relationship influences their sanitation practices.

Very few studies, to date, have investigated the role that the proximal social and physical environment plays in women's sanitation behaviours. Results from this study seem to suggest that neighborhood disorganization may play a key role in women's ability to access and utilize sanitation in informal settlements both directly and indirectly. Neighborhood disorganization – defined as 'the inability of local communities to realize the common values of their residents or solve commonly experienced problems' (Bursik 1988) – is frequently represented, empirically, as a measure of people's perceptions of safety, crime, violence, litter, vandalism, alcohol or drug use, etc. in their neighborhood or proximal community. Findings from this study seem to suggest that neighborhood disorganization may play a direct role in women's sanitation practices in Mathare. For example, ethnic discrimination, idle youth, and/or violent crimes – characteristics of neighborhood disorganization – may limit women's ability to access and/or utilize different sanitation alternatives within their settlements. Data collection for this study started at the end of 2015 following corruption allegations against and, consequently, a temporary halt of Kenya's National Youth Service – a government funded organization that, among other programs throughout the country, employed thousands of youth in cleanup and development projects in Mathare. Accordingly, many women in this study suggested that their fears of being attacked were particularly high 'these days' because there were more idle youth – a characteristic of neighborhood disorganization – hanging around public toilets and/or out and about late at night. In addition, several women also mentioned that violent crimes and ethnic discrimination were higher 'these days' because of increasing tribal tensions leading up to the 2017 Kenyan presidential elections – conditions a few women in this study linked to their ability or inability to directly access certain public spaces, including toilets.

In addition to a direct link between neighborhood disorganization and women's ability to access and utilize different sanitation alternatives, findings from this study also suggest a possible indirect role of neighborhood disorganization. For example, women in this study, regardless of the types of sanitation alternatives that were available to them, talked about a *fear* of being attacked, raped, robbed, etc. as a primary reason for their decisions not to go outside at night and, for most, a critical factor in their sanitation decision-making paradigm. While women around the world fear violence when going out alone at night (Nussbaum 2005), findings from this study seem to suggest that crime is commonly perceived to be a serious problem in Mathare and that this perception is associated with a fear that influences women's sanitation choices and practices. Women's perceptions may accurately reflect conditions in Mathare given recent research in Kenya showing that rates of violent perpetration, victimization, and crime are higher in informal settlements than in the general population (Oduro et al. 2012; Parks 2014). While these fears may be unique to this sample of women and, thus, may not reflect the perceptions of all women in Mathare, they do seem to suggest a possible indirect role of neighborhood disorganization in women's sanitation practices, i.e. in highly disorganized communities, such as informal settlements, fear of crime and violence, is a particularly important driver of sanitation choices and behaviours for women.

The next most common factors women in this study identified were the cleanliness/dirtiness of toilets and, relatedly, their fear of infections. A majority of women, regardless of the type of toilet facilities/methods of urine/feces disposal they regularly used, discussed cleanliness, or, more commonly, the lack of cleanliness, as a factor influencing their use of or refusal to use particular toilet facilities. Some women suggested that they would opt not to use a toilet if it was not clean. In particular, a number of women talked about a fear of getting infections if they were to use a dirty facility. There are a few recent studies that suggest that women, without access to sanitation, are more vulnerable to vaginal and urinary tract infections (Fisher 2008; Mahon and Fernandes 2010; Jombo et al. 2011; Pandit and Nagarkar 2017); most of the evidence would suggest this is because women without access to safe and private toilet facilities are more likely to neglect their

menstrual hygiene (Sumpter and Torondel 2013). Findings from this study indicate, instead, that women fear contracting infections from dirty toilet facilities and rather than use a dirty latrine or toilet opt for other sanitation options. In another study, carried out among pregnant women in Nigeria (Jombo et al. 2011), researchers found that over 58% of women with candidiasis attributed the acquisition of the infection to their toilets. Despite these findings, there seems to be very limited research focused on women's risk of contracting vaginal infections from dirty toilet facilities in informal settlements – an area of research which seems important in light of findings from this study.

Other factors, such as privacy, cost of toilets/inability to pay, cultural rules (e.g. 'it is a must'), and accessibility (e.g. hours of operation, proximity, and temporary closures) also emerged as factors for women in Mathare. For example, inability to pay emerged as a common factor for women who regularly opted to use bags, buckets, or open defecation during the day, but not for women who reported regularly using plot, building, or private facilities. These findings suggest that inability to pay could be a factor influencing women's sanitation practices (e.g. women opt to use bags, buckets, or open defecation – free options – when they do not have the money to go to a public toilet), but they may also suggest the opposite relationship (e.g. that having access to sanitation alternatives other than public toilets such as plot, building, or private toilets, eliminates the need to pay to urinate/defecate).

Many of the factors in this study, such as privacy, cost of toilets/inability to pay, cultural rules, and accessibility, are commonly cited in the literature as being associated with people's sanitation behaviours (Joshi et al. 2011; McFarlane et al. 2014). Some of the findings from this study suggest, however, that there may be women-specific burdens associated with these factors. For example, several women in the study stated that even though men are socially and physically able to urinate anywhere free of charge, most public toilets in Mathare provide free urinals for them. Respondents were particularly exasperated about the fact that a woman, on the other hand, is required to pay an entry fee for each and every trip to the toilet even if her intention is only to change a sanitary pad or to urinate. In addition, many women pointed out that in a highly disorganized, 'insecure' community, having to walk long distances or use public toilets – shared by men – made it particularly challenging for women to feel comfortable utilizing the available toilets in their neighborhoods. These findings add another dimension to the sanitation-related gender inequities women experience in these informal settlements – reinforcing the need for further feminist critique of current sanitation policies and procedures, not just at the national or international level, but in the day-to-day norms and rules that govern women's ability to access sanitation.

While this study provided a number of important findings, it was not without limitations. Perhaps the most critical limitation of this study is that the data are cross-sectional. This limits the ability to make any causal claims or explore the temporal nature of the phenomena. It is, for example, not possible to empirically determine the actual factors causing women's sanitation practices and behaviours. With cross-sectional data, one can only look at links between potential factors and women's sanitation behaviours and ask women to provide their opinions about which factors influence their sanitation behaviours.

## Conclusion

Findings from this research revealed that fear of victimization related to neighborhood disorganization was the most common factor associated with women's sanitation utilization in Mathare. This factor is largely connected to a woman's social and/or physical environment. These findings suggest that sanitation policy-makers, researchers, and developers may need to expand their perceptions of the types of interventions and policies that may yield the best results for access to and utilization of sanitation in informal settlements, particularly for women. Future policies and interventions may, for example, need to focus on social- and

community-level programs that improve security, social cohesion, sense of community, and social organization – e.g. interventions focused on space and community dynamics rather than toilet provision and/or adoption. These findings expose a need for future research that explores more social- and/or community-based policy and intervention alternatives.

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## ORCID

Samantha Winter  <http://orcid.org/0000-0001-6629-7642>

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