

RESEARCH ARTICLE

# Sanitation services for the urban poor: A social capital approach to sanitation challenges in informal settlements

Ivy Chumo<sup>1\*</sup>, Blessing Mberu<sup>1</sup>, Cynthia Wainaina<sup>2</sup>, Wanjiru Murigi<sup>1</sup>, Leunita Sumba<sup>3</sup>, Caroline Kabaria<sup>1</sup>

**1** African Population and Health Research Center (APHRC), Urbanization and Wellbeing Unit, Nairobi, Kenya, **2** Kenyatta University, Nairobi, Kenya, **3** Women in Water and Sanitation Association (WIWAS), Research Division, Nairobi, Kenya

\* [ivychumo@gmail.com](mailto:ivychumo@gmail.com)



## Abstract

Poorly managed sanitation is degrading, unhealthy and far too dominant among the urban poor. The conventional solution to poorly managed onsite sanitation and/or open defecation is for governments to provide adequate sanitation at subsidized prices. Few governments in low and middle income countries can subsidize access to sanitation facilities for people living and working in informal settlements. This leaves the urban poor in informal settlements to face challenges in accessing safely managed sanitation, with some residents and manual pit emptiers adopting social capital approaches. We sought to identify sanitation challenges along the value chain and social capital approaches to addressing the challenges. We used qualitative approaches. Our target population were manual pit emptiers and community members. We analysed data using conventional content analysis methodology. We grouped sanitation challenges into those that are outside individual households and those that are at the individual household. Challenges outside the household could not be controlled at the individual level, and included legislative, physical, and social challenges, while challenges at the individual household could be controlled at individual level, and included health, financial and technical challenges. As a result of these challenges, both the manual emptiers and community members adopted social capital approaches, which included the use of reciprocity and trust, networks and information channels and norms to counter the challenges. Sanitation challenges along the sanitation value chain should persuade policymakers and practitioners that sanitation extends beyond the four walls of a sanitation containment facility, to include emptying, transportation, treatment and disposal. Many of the challenges could be attributed to governance outside the sanitation sector. Hence long-term improvement of sanitation conditions in informal settlements ought to be supported by broader policies and strategies like social capital that begins by thinking outside “the sanitation box”.

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**Data Availability Statement:** We have provided a sample of transcripts (anonymized data). All the data cannot be shared publicly at the moment because, other manuscripts are underway being written using the same dataset. Once all the manuscripts are completed, data will be available from the APHRC data portal Institutional Data Access / Ethics Committee (contact via <https://aphrc.org/microdata-portal/>) for researchers who meet the criteria for access to confidential data.

## Introduction

Access to basic safe sanitation is far from reality for many people [1]. The 2030 Agenda of sustainable development established 17 Sustainable Development Goals (SDGs) [2]. The SDG

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target 6.2 calls for universal access to adequate and equitable sanitation services by 2030, and established indicators that go beyond the types of facilities to include emptying, transportation, disposal, treatment, and recycling of sanitation products [3]. One of the indicators for measuring this target is the proportion of the population using “safely managed sanitation services” [2,4]. Access to safely managed sanitation is a fundamental human right, yet, many people in Low and Middle-Income Countries (LMICs) have limited access [5]. Similarly, residents living and working in informal settlements face many challenges and diminished opportunities to realize their sanitation needs [6,7]. In 2017, 29% of Kenya’s population had basic sanitation (facilities that are not shared with other households) and only 5% had access to the sewer system [4]. Approximately 20% of the population in urban areas use toilets connected to the sewer system, and 47% use pit latrines [4]. In Nairobi for example, over half of the population live in informal settlements [8], where residents mainly use poorly managed on-site sanitation facilities and/or open disposal of faecal waste [9–11].

There is substantial consensus that poorly managed sanitation is degrading, unhealthy and far too dominant among the vulnerable populations in urban areas [12–14]. There is disagreement on solutions yet, sanitation data and interventions in informal settlements are not disaggregated [15,16]. High quality, accessible, trusted, timely, open, and reliable disaggregated data is critical to generating valuable information for decision-making in real time [17]. Governments may be willing to pass regulations that formally require households to achieve high sanitation standards, even higher than the low-income residents would collectively choose [18]. However, the result is often a combination of exclusion and marginalization from access to services, near absence of the public sector, little or no service provision and often few regulations enforced for sanitation, more evident in informal settlements [19,20]. Indeed, by focusing attention on formal regulations and sanitation standards that are better suited to the general population [8,18], sanitation standards often fail to benefit those most in need in informal settlements [18,21].

The conventional solution to poorly managed onsite sanitation and/or open defecation is for the government to provide adequate sanitation at subsidized prices or impose regulations requiring sanitation workers, house owners and occupiers to meet certain minimal sanitation standards [18]. In affluent urban settlements, this is usually relatively straightforward to organize and agree on politically [22,23]. However, few governments in LMICs are able to subsidize prices to the point where people living in informal settlements can afford [18,24]. The beneficiaries of the services and subsidies are often a few relatively well-off people who can understand the system and capture the subsidies [25,26]. This leaves the urban poor in informal settlements to face challenges in accessing safely managed sanitation, with a majority having access to rudimentary sanitation facilities or none at all [3,27]. Consequently, urban poor residents and manual pit emptiers who provide sanitation services in the informal settlements have adopted social capital approach. The social capital is a network of relationships among people who live and work in a society, enabling that society to function effectively [28]. It builds on interpersonal relationships, a shared identity, understanding, norms, values, trust, cooperation, and reciprocity, to achieve effective functioning of social groups and their collective or individual goals. In search of pathways to address the sanitation challenges among the urban poor, communities build on the structure of relations between and among community actors in the informal settlements [29]. Coleman identified three forms of social capital (i.e. reciprocity and trust, networks and information channels, and norms enforced by sanction) which are useful for resolving challenges [29,30].

Going beyond sanitation challenges to understanding pathways to solutions through social capital can enhance safely managed sanitation for the urban poor [18,31]. Consolidating empirical research on the challenges and social capital solutions is relevant for policymaking

[32]. The inadequate data and a lack of disaggregate data for informal settlements by government is a major hindrance to development efforts by governments and planning agencies [33,34], thus making the urban poor “invisible” [35]. This study seeks to address the data gap by documenting sanitation challenges along the sanitation value chain (i.e., containment, emptying, transportation, treatment and disposal) and the specific social capital approaches to addressing identified sanitation challenges.

## Theoretical and conceptual framework

We grounded our work on the structural social capital theory. The theory is studied using a network approach [36], and is defined specifically in terms of networks, stressing the norm-laden nature of relationships within and between them [37]. The structural dimension of social capital relates to the properties of the social system and various components of social organisation that make up society [36].

Three components of the theory as proposed by Putnam’s concept are norms and obligations, trust and reciprocity, networks, especially voluntary associations [38], which constituted a part of the conceptual framework (Fig 1). In our study case, the actors (manual emptiers and residents in informal settlements) capitalize on the three components of structural social capital to address sanitation challenges internal and external to individuals and households. Social capital is inherently social, as such most forms of capital are developed through combined actions (i.e. collaborative actions by manual emptiers and residents in informal settlements). Societies with large stocks of social capital are able to better manage resources, have better capacity to offer services and easily adapt behaviour interventions [1]. Social capital has been faced with debates about its substance and utility, as it regards theoretical and methodological shortcomings of usefulness, as a key construct in service provision [1,30]. In this study, like other studies, the theory makes it easier for people to engage in mutually beneficial collective action by lowering transaction costs through trust, norms and expectations [36].

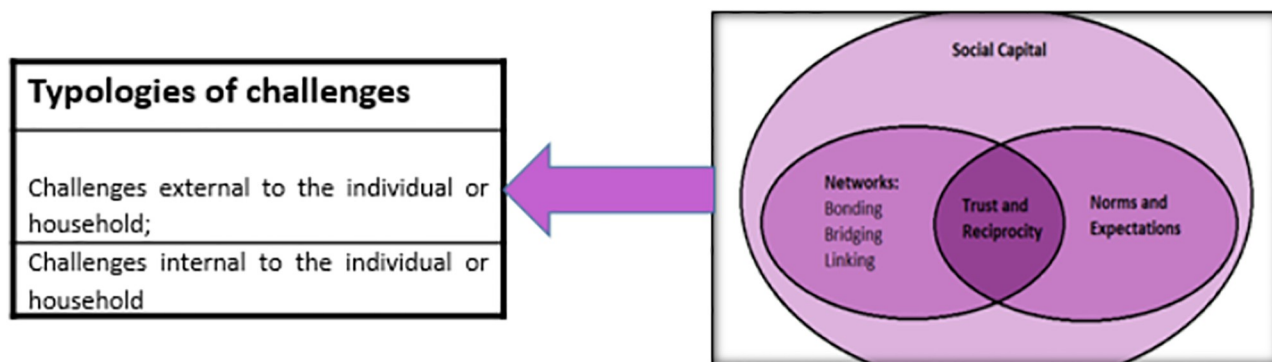
Social capital plays a role towards resolving some sanitation challenges. We acknowledge that there could be other factors that were not uncovered in this study, which contributes to resolving the challenges. Social capital plays a significant role in providing access to information, increasing social cohesion, reducing opportunistic behaviour, boosting participation, enhancing responsiveness and efficiency, reducing transaction costs, providing insurance against risk and uncertainties, and solving collective action problems [29,36]. As such it is applicable in our study where manual pit emptiers and community residents build on increased social cohesion, participation, responsiveness and problem solving while preferring local solutions to sanitation challenges in the informal settlements. This was done through trust, reciprocity, norms, expectations and networks (Fig 1).

## Methods

The study is reported per a set of standardized criteria for reporting qualitative research (COREQ) [39].

## Study design

This was a qualitative study, using focus group discussions (FGDs) and In-depth interviews (IDIs). The qualitative methods are typically more flexible, as they allow greater spontaneity and adaptation of the interaction between the researcher and the study participant. In addition, with qualitative methods, the relationship between the researcher and the participant is often less formal than in quantitative research, as study participants have the opportunity to respond more elaborately and in greater detail than is typically the case with quantitative



**Fig 1. Conceptual framework.**

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methods. In turn, researchers have the opportunity to respond immediately to what participants say by tailoring subsequent questions to information the participant has provided [40].

### Study setting

The study was conducted in Korogocho and Viwandani informal settlements in Nairobi, in the areas covered by Nairobi Urban Health and Demographic Surveillance System (NUHDSS) initiated in 2002 by the African Population and Health Research Center (APHRC) [41]. Inadequate data and a lack of disaggregate data for informal settlements by government and decision makers is a major hindrance to development efforts by governments and planning agencies [33,34], thus making the urban poor “invisible” [35]. Korogocho has a stable and settled population and residents have lived in the area for many years without immigrating [42], while Viwandani is located next to an industrial area with many highly mobile youths who work or seek jobs in the industrial area [42]. Each of the study sites were divided into 8 units/villages or polygons for ease with sampling.

### Target population, sampling and sample size

The population of interest were community residents and manual pit emptiers working in the informal settlements. Participants were selected by purposive sampling with a focus on maximizing diversity of background, experience, role, and geography. Respondents were selected from the two study sites as participants in In-depth Interviews (IDIs) or Focus Group Discussions (FGDs).

IDIs were conducted with 14 respondents composed of two community leaders, four manual pit emptiers leaders, and one sub-country officer in each of the study sites. The respondents had had leadership roles for long or had worked within the settlements for a longer period than the rest of their mates to the best knowledge of the researchers and were willing and available to take part in the study. FGDs were conducted with women, youth, and men groups; community health volunteers and manual pit emptiers. Two women, two men and two youth were selected from each of the 8 villages in each study site. Where a selected participant from any of the 8 villages was not available, he/she was replaced with a participants with the same characteristics). The individuals included in the study ought to have resided in the study area for a longer period than the others in the same category to the best knowledge of the researchers (that was on averagely 15 years). There were 6 groups of organized manual emptiers at the time of the study, with 3 groups operating in each of the study sites. Some pit emptiers were

Table 1. Study participants and Sample size.

Data collection	Strata	Frequency-Korogocho	Frequency-Viwandani
FGDs	Manual emptiers	4 (8 participants in each group)	4 (8 participants in each group)
	Women groups	2 (8 participants in each group)	2 (8 participants in each group)
	Youth groups	2 (8 participants in each group)	2 (8 participants in each group)
	Community Health Volunteers (CHVs)	2 (8 participants in each group)	2 (8 participants in each group)
	Men groups	2 (8 participants in each group)	2 (8 participants in each group)
Total FGDs		12	12
IDIs	Manual emptiers	4	4
	Community leaders (Village heads)	2	2
	Sub-county officers	1	1
Total IDIs		7	7

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not in any organized group, and since they were difficult to trace, snowballing was used to identify them if they worked in the study sites; they then formed 2 groups (1 in each study site). Two groups of CHVs who had served for a longer period of time (over 10 years) were included. Therefore, our sample size was composed of 24 FGDs (i.e., 12 FGDs in each of the study sites, with each FGD composed of 8 participants) and 14 IDIs (i.e., 7 participants in each site) (Table 1).

### Data collection

The interviews were guided by an in-depth interview guide which had questions on sanitation challenges along the value chain (What are the sanitation challenges along the sanitation value chain?) and social capital strategies for countering sanitation challenges (What are the social capital strategies for resolving sanitation challenges). Specific questions covered sought to probe on external and internal challenges along the sanitation value chain and on three key social capital strategies of networks, trusts and reciprocity, and norms and expectations. Interviews were conducted in English and/or Swahili and were held at a locations convenient and comfortable to the participants (mostly in a quiet community hall or at the participants' workplaces). These interviews were conducted by trained Research Assistants who were accompanied by a Researcher. The interviews were recorded using voice recorders and backed up with notes that were written in notebooks by the Research Assistants. The hand written notes were a source of reference during data transcription of audio-files, mostly in instances where some audio file sections were less audible. Each interview lasted for a maximum of 50 minutes.

Data was also collected through FGDs to complement the information obtained from the IDIs, and also to obtain information from individuals who may not readily disclose information through interviews. The FGDs were mainly held at community halls conducted by a team composed of a moderator, a note taker and a team leader. The moderator guided the discussion, the note taker took notes and observed any non-verbal cues, and the team leader's role was to oversee and troubleshoot any problems, clarify any issues or questions from the research assistants, and perform spot checks to enhance the quality of data. The discussions lasted for at least 1 hour.

### Data quality control

Research assistants were selected if they had been endorsed by community leaders in the study sites and if they had at least 5 years of experience in qualitative research. The Research

Assistants were trained for 5 days on the aims of the study, data collection process, data collection tools, and research ethics. From the team of trained Research Assistants, two members with leadership experiences were selected as field supervisors. During fieldwork, field supervisors accompanied the Research Assistants to ensure that probing was done correctly and to assess any threats to data quality. Debriefing sessions were held at the end of each working day to highlight the major findings, review the effectiveness of probing techniques, and assess progress. The researchers also checked the completeness of data daily and gave feedback to the Research assistants.

## Data management and analysis

Data analysis began during data collection and continued until data collection was complete. Audio recordings were transcribed into MS Word ([S1 Data](#)) and cross-checked by a third party to ensure that all the information had been captured in the transcript. The transcripts were translated to English (where necessary) and again cross-checked to ensure that the translation did not alter the meanings of the data. After translation, the transcripts were imported into NVIVO 12 software (QSR International, Australia) for coding and analysis. Each transcript had a unique identifier comprising date and participant identifier to enhance anonymity and facilitate informed analysis. Analysis was done using conventional content analysis by reading the transcripts multiple times to gain a sense of the flow of the discussion. Thereafter, coding was done by following emergent issues (codes) such as sanitation challenges at the containment, emptying process, transportation process and disposal, and strategies for countering the sanitation challenges. This coding was applied to all transcripts and as new issues emerged, they were added to the list of codes and the transcripts were read again to ensure that all the transcripts had been coded adequately. Similar issues were combined into single categories through consensus discussions. The next step entailed producing "tree nodes" or major categories that were inductively synthesized from the previous steps. The categories identified formed the basis for providing a robust picture of sanitation challenges and social capital for addressing sanitation challenges in informal settlements.

## Ethical considerations

The study was approved by AMREF Health Africa's Ethics & Scientific Review Committee (ESRC), REF: AMREF-ESRC P747/2020. We also obtained approvals from National Commission for Science, Technology and Innovation (NACOSTI), REF: NACOSTI/P/20/7726. Approval was also obtained from the Liverpool School of Tropical Medicine (LSTM) and the African Population and Health Research Centre (APHRC) internal ethical review committee. All participants provided informed written consent before participating in an interview including consent for using photos and videos if there were any.

## Results

Challenges can be characterized and defined in different ways [43] for this research, it encompasses challenges faced by individuals and households relating to the sanitation service chain. We grouped the challenges influencing sanitation services into those that are outside individual households and those that are at the individual household. We also present the social capital approaches to addressing challenges as summarized in [Table 2](#).



Table 2. Study themes and sub-themes.

Themes- Typologies of challenges	Sub-themes
Challenges outside the individual or household;	• Legislative challenges: i.e., lack of tenure security, lack of sector coordination
	• Physical challenges: e.g., lack of access to services
	• Social challenges: e.g., lack of community cohesion, <i>and working in groups</i>
Challenges at the individual household;	• Health challenges: e.g., risky behaviours (personal and of others) increasing disease risk
	• Financial challenges: e.g., ability to pay for services, security of income
	• Technical challenges: e.g., limited technical knowledge or awareness of health risks
Social capital approach	1. Reciprocity and trust, 2. Networks and information channels, 3. Norms enforced by sanction

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## Theme one: Sanitation challenges along the value chain

### a) Capture and containment

**Legislative challenges: Lack of secure tenure and land titles.** Lack of secure tenure was described to be a significant constraint. Relying on landowners (who had challenges in land tenure and land titles) to provide facilities usually left tenants vulnerable to poor or no access to sanitation services. Land owners typically preferred to invest in more profitable rent-generating buildings than constructing sanitation facilities. Tenants were not allowed to build permanent structures on a landlord's property even if they were willing to generate ideas and make the investment. Some community members were also described to be unwilling to make any contribution to sanitation facilities because they were vulnerable to the will of landowners and had little voice and recourse to protection provided for in the legislation.

*"We rely on landowners and landlords to construct sanitation facilities here in our plot. We have no control and no voice to construct a facility on our own. You know the landowners are mostly interested in using any available space to build other rental houses for a profit. In many plots with sanitation facilities, they are few and poorly managed."*

(FGD, Female Youth, Viwandani).

*"The environment is just not conducive for constructing sanitation facilities, how can you spend time and few resources you have to construct a sanitation facility, in spaces that you do not own and you lack a voice to defend your rights!"*

(FGD, Male person, Korogocho).

**Physical challenges: Poor infrastructure planning, lack of access to services.** Physical constraints included the lack of space for on-site latrines and unplanned areas making sewer construction extremely challenging, difficult terrain such as steep slopes, and narrow or unpaved access. All make it harder to construct sanitation facilities in the first place and for on-site systems to be constructed.

*“There are no spaces over here to construct public toilet facilities. Even if anyone would like to construct a sewer system, where will the sewer line pass and yet there is no space? The poor terrain and lack of spacious paths make the construction of toilet facilities challenging”*

(IDI, Sub-county official, Viwandani).

**Social challenges: Community cohesion.** Study participants considered social fragmentation a reason for greater challenges resulting from less sense of community support in the urban context. This exacerbated the extent to which shared and public latrine blocks are hygienic, compared to privately owned facilities. The study participants associated the poor maintenance of public sanitation facilities with little community cohesion and shared responsibility. Some participants described how some shared and public latrines were generally less hygienic and people were forced to resort to open defecation when latrines were not accessible, especially at night or when they were unhygienic. They stated that shared latrines were better maintained if there was a shared responsibility and a high level of responsibility.

*“We do not know each other in the plot so why should I bother cleaning the sanitation facilities? Everybody minds their own business. Sometimes there is open defecation just in our plot because the sanitation facilities are dirty. There is a duty roster but few residents are willing to clean the sanitation facilities”*

(FGD, Male Manual pit emptier, Viwandani).

*“I would say the worst are those public toilets that anyone can just use at any time. You cannot even pass near there, it has a bad smell but some people still use them because there are no options. . . The sanitation facilities owned privately by youth or women groups are thriving well but many people do not have money all the time to use them because you have to pay for them to use”*

(FGD, Female CHV Korogocho).

**Health challenges: Risky health and hygiene behavior.** Study participants described how they resorted to finding solutions on their own when they did not have access to sanitation facilities. The solutions included a risky behavior of combined solid, liquid, and faecal waste management that is usually being disposed of close to homes, hence detrimental to health. Despite that some participants were aware of the health impacts, they did not have better alternatives, while some were not aware of the health risks but considered imitating options used by others around them.

*“When we cannot access sanitation facilities, we resort to solutions that are being used by others. Like when I arrived in our plot, the women there were disposing faecal waste of children from potties together with the solid waste just near the compound”*

(FGD, Female Youth, Korogocho).

*“I know poor disposal of faecal waste causes health challenges, but we have no other option around here”*

(FGD, Male Youth old, Korogocho).



**Financial challenges: Ability to pay for services.** One of the main challenges highlighted by study participants who were keenly responsible for access to sanitation facilities was the high cost of constructing sanitation facilities or paying for the associated pit emptying services of on-site systems. They reported high charges that could even go beyond their weekly household income yet, households in urban areas are typically dependent on irregular cash incomes. Residents of slum settlements who are prone to multiple vulnerabilities like older persons, PWD and those living in flood-prone areas were willing to pay but needed significant financial support mechanisms to be in a position to construct an improved latrine or to be able to pay and use a sanitation facility.

*“We are willing to pay for latrine emptying and even cleaning service because of my condition, but they are so expensive. Even persons with disability, the sickly and those living in areas prone to flood. We just need financial support”* (FGD, Male Female person, Korogocho). *“If I had the ability, or if anyone had the financial capability in our plot, we would not be struggling to have good sanitation”*

(FGD, Female Person, Viwandani).

Study participants described how accruing debts to address other competing needs exacerbated vulnerability over the long term, rather than improve it of the community members.

*“People have high debts borrowed for school fees, or for buying food for the family and are repaying them. As such sometimes everyone in the plot is not able to contribute money to empty the toilet or to construct an additional toilet facility”*

(FGD, Male CHV, Korogocho).

**Technical challenges: Limited technical knowledge.** Study participants described how their limited knowledge of risks related to the construction of quality sanitation facilities, cost of construction and good sanitation practices affected access to adequate sanitation services. A lack of knowledge amongst the construction team and manual emptiers was identified to have led to poorly constructed and emptied sanitation facilities, often with poor quality services placing households in a very vulnerable position. Some descriptions of collapsed sanitation facilities after poor construction or poor emptying of sanitation facilities were impediments to constructing a replacement or emptying a facility in future, forcing people to resort to other unsafe sanitation practices.

*“I had to relocate from the plot I lived before, I think the people who were constructing the sanitation facility were not knowledgeable so it collapsed after one week and people resorted to open defecation”*

(FGD, Female Youth, Korogocho).

*“Manual emptiers should be trained on their work well. The last time they emptied toilets at our plot, a toilet facility ended up being weak and it just collapsed just after the emptying. We ended up remaining with one facility and we are so many in the plot”*

(IDI, Male Village head, Viwandani).

## **b) Emptying, transport and disposal**

Those most directly facing challenges during the emptying, transport and disposal phases of the service chain were the manual pit emptiers. Households and communities often faced challenges indirectly as a result of poor quality practices of the collectors and operators. Study participants described how there was extremely limited if any, effective transport, treatment and disposal of wastewater or faecal sludge in the informal settlements. This is because the disposal was done mostly informally and rarely formally. The challenges faced by manual emptiers are described below.

**Legislative challenges: Lack of regulated operations.** The challenges common to many manual emptiers were unregistered service providers. The registration mechanism to issue permits did not always involve manual empties. Even if manual pit emptiers would have wanted to be formally employed, there were few incentives to do so whilst they operated informally. Only a few manual emptiers were registered in associations, leaving a majority with no representation at the county administration level to actively participate in decisions that affect their work. Manual pit emptiers who were not registered described how registration mechanism was not implemented well to incorporate their views, and that their work was majorly informal with very little or no benefits at all. Whilst the legislation requiring registration exists, manual pit emptiers remain vulnerable to the city authorities deciding to enact legislation without adequate knowledge or compliance notice period. Consequently, other manual pit emptiers not in associations could find themselves out of work because they were mostly unregistered.

*“Most of the manual emptiers are not registered because the registration mechanism is not implemented well to incorporate us and our views. Sometimes we would like to be formally employed like other professions but our work is still not formal with very little or no benefits at all”*

(FGD, Male Manual pit emptier, Korogocho).

*“We are not usually represented in decision making at the city authorities because we are not registered. Our issues then remain with us, no one support most of us who are not registered”*

(IDI, Male Manual pit emptier, Viwandani).

**Physical challenges: Poor infrastructure planning, lack of access to services.** Physical constraints include unplanned areas making manual emptying and transportation extremely challenging, difficult terrain such as steep slopes, and narrow or unpaved access to main paths during transport of faecal waste. All make it harder to have access to emptying services. This in turn restricts the number of emptying trucks that can operate viably and the extent to which treatment facilities can access and process waste.

*“We have a lot of difficulties in transporting the faecal waste because there are narrow paths and the terrain is not good at all. The challenge is a temptation to many of our colleagues to dispose of waste in wrong places”*

(IDI, Male Manual pit emptier, Viwandani, Female).

**Social challenges: Social cohesion and working in groups.** Study participants associated the poor emptying of sanitation facilities with poor social cohesion. As much as some emptiers worked in groups, due to few opportunities, there were many reported cases of low cohesion.

*“We work as a group but we do not know each other that much. . . Sometimes some emptiers dispose of wrongly and when community members meet with you they accuse you of other people’s mistakes. I would say there is just a need for every person to be responsible, even when you are not the owner or when you know you are likely to relocate from the area”*

(FGD, Male Manual pit emptier, Korogocho).

**Health challenges: No physical protection.** Emptiers of on-site sanitation systems were at significant risk from not only the faecal waste that accumulates in pits, vaults and septic tanks, but also from a range of domestic, commercial and industrial waste products that were also disposed of in the same on-site systems. Emptiers rarely received training in understanding what the health risks are or how to minimize them, whilst working with equipment that was old and prone to breakdowns.

*“Pit latrines contain many potentially harmful items in addition to faecal sludge, including, oils and detergents, broken bottles, batteries, metal, syringes, pharmaceutical products, chemical and industrial pollutants that are harmful to health”*

(FGD, Manual pit emptier, Viwandani, Male).

*“I have never seen manual emptiers being trained on their work. Many organizations who come to the community get to train CHVs, teachers, business entrepreneurs and other groups. I have never seen anyone training manual pit emptiers”*

(IDI, Village head, Korogocho, Male).

Households who employ the services of manual pit emptiers can be vulnerable to health impact of poor quality emptying and transport operations, for example, if faecal waste is being disposed of at, or close to living areas, water supplies, urban agriculture and public spaces.

*“Health impact goes beyond the toilet to include individuals next to where disposal is done are susceptible to WASH related diseases”*

(FGD, CHV, Viwandani, Male).

**Financial challenges: No job security.** The manual emptiers usually did not have a secure source of income, as they were paid for a day’s work by a landowner or tenants. Consequently, they did not have health insurance or any form of social security. The informal nature of their employment is a primary indicator of financial challenge. Workers who are injured or become ill as a result of the work did not receive employment-based healthcare and had no income whilst unable to work.

*“We only get paid when we work so if you are sick for two months, you have no income and you have no one to pay for your health bills”*

(IDI, Manual pit emptier, Korogocho, Male).

**Technical challenges: Limited technical knowledge.** Study participants described how some manual emptiers were not skilled and some sanitation facilities collapsed due to poor

emptying services. This acts as an impediment to emptying a facility in future, forcing people to resort to other unsafe sanitation practices once a facility is full.

*"Manual emptiers should be trained on how to do their work well. The last time they emptied toilets in our plot, one ended up being weak and it just collapsed just after the emptying. We ended up remaining with one facility and we are so many in the plot"*

(FGD, Female Youth, Viwandani).

## Theme two: Social capital approach to sanitation challenges

### 1. Reciprocity and trust,

Trust played a role in the effectiveness of manual emptiers and residents sharing sanitation facilities and resources. For example, a manual emptier with good intentions but without the ability to deliver on expectations cannot be trusted. Trust enhanced capacity of manual pit emptiers and residents to assess and validate knowledge as it evolved by scrutinizing knowledge claims from colleagues and other actors. Trust among the residents reduced challenges on social cohesion and allows many people to access few sanitation available as a result of tenure challenges.

*"We share sanitation facilities and so it is upon us to trust ourselves in this plot. We also trust the emptiers who come and do the emptying work at night while we are asleep. You know some of our property is left outside overnight"*

(FGD, Female Person, Korogocho).

Individual manual pit emptiers did the emptying work in groups, as it was not possible to do the emptying at an individual level. While they were not at work, manual pit emptiers would lend protective clothes to their friends who would be at work. Their actions was because they trusted that it will enable their colleagues prevent occupation health challenges and health risks, and that their protective gears would be returned. Manual pit emptiers needed trust at work as their tasks were dominated by contingency, exit and risk. Trust was needed as role expectations and familiar relationships were no longer helpful in collective interaction at work. Trust and reciprocity were likely to resolve some challenges related to health and job security.

*"We share protective gears among ourselves. If you own one, you lend it to your friend when you are not at work and you trust that he will bring it back. Trust is good because it enable us to assess, evaluate and validate any information we receive. . . and judge if it is a trust or a mistrust"*

(FGD, Female Manual pit emptier, Viwandani).

### 2. Networks and information channels,

Manual pit emptiers worked in groups as it is impossible to do emptying as an individual. More often, the emptiers would convene meetings for capacity building, formulation of rules, decision making and consultations. Residents in informal settlements also convened meetings for information sharing, decision making and formulation of rules. Such meetings often led to collective actions that reduced technical and health related challenges of manual

pit emptiers. This is because manual pit emptiers would have their capacity to perform their tasks strengthened, and also consequently may reduce health risks associated with accidents while at work.

*“We held the meeting and agreed that everyone should clean the toilet once a week”*

(FGD, Female Person, Korogocho).

Membership in of manual pit emptiers in groups, and involvement in the social networks developing within these and in the social relations arising from the membership, were utilized in efforts to improve the social position and address technical, financial and social challenges.

*“I can say we {manual emptiers} are a network because one cannot do emptying on their own. We do the job as a group. Some of our meetings are for capacity building, consultation, decision making or even social support of each other”*

(IDI, Male Manual pit emptier, Viwandani).

### *3. Norms enforced by sanction*

There were defined norms and structures for resolving sanitation challenges in the sanitation value chain. At the containment stage, norms were commonly in the form of a duty rota, and each household had a specific day(s) when they cleaned sanitation facilities in their compounds. Failure to abide by the norms led to sanctions that included being forced to vacate the compound or households sharing the sanitation facility would deny them access to the facility.

*“We have rules for cleaning the toilet. For example, I clean the toilet every Sunday. If you fail to clean the toilet, you will be punished. My neighbour was thrown out of the compound because she was often not doing her duty. Other times, one can be denied access to the sanitation facility for some time”*

(FGD, Male Youth, Korogocho).

Norms enforced in the form of sanctions by community members sharing sanitation facilities, that included cleaning the facility and accommodating sharing of facilities, were key in addressing sanitation challenges related to health challenges and few sanitation facilities as a result of land tenure challenges.

*“Cleanliness of the sanitation facilities is next to godliness. I would say there is just a need for every person to be responsible, even when you are not the owner or when you know you are likely to relocate from the area, these would likely reduced illness related to poor sanitation. It also allow many residents in the community to access few available toilets”*

(FGD, Female person, Korogocho).

Manual emptiers also had norms for the emptying, transporting and disposal of sanitation waste. In instances where fellow emptiers would fail to perform their duties as expected, they were not allowed to do any emptying work by the fellow emptiers. This helped resolved health related challenges.

*"It is always a rule that we dispose faecal waste far from the households. If we find any one of us disposing of wrongly, we do not allow them to use the emptying carts in future"*

(IDI, Male Manual emptier, Viwandani).

## Discussion

The goal of this paper was to identify sanitation challenges along the value chain and social capital approaches to addressing the challenges in the two informal settlements in Nairobi, Kenya. By analysing data collected from manual pit emptiers and community members working and living in informal settlements, it emerged that social capital approach has a tendency of resolving a portion of sanitation challenges in informal settlements. Because of the failure of the government and formal service providers to adequately provide the sanitation services, households and individuals have heavily involved themselves in ensuring that this happens. We acknowledge that there could be other factors that implicitly or explicitly address sanitation challenges. However, in this study, we explore how social capital was used to resolve some sanitation challenges.

We present findings on internal and external constraints facing sanitation service users and service providers in informal settlements. Physical constraints included a lack of space for on-site latrines, unplanned areas making sewer construction extremely challenging, difficult terrain such as steep slopes, flood-prone areas and narrow or un-paved access. Physical constraints make it harder to construct toilet facilities and for on-site systems to have access to emptying services [44,45]. This also restricts the number of emptying trucks that can operate viably and the extent to which treatment facilities can accept and process waste. Financial constraints included the limited willingness or ability of users to pay for infrastructure and services, or of the service providers to charge for sewerage or emptying services. Financial constraints were exacerbated by the high operation and maintenance costs of equipment and sanitation value chain processes, as well as the limited skills and availability of operators and technicians [46]. Legal and social constraints included weak or non-existent tenancy agreements restricting investment in improved infrastructure or services. More recently, there has been greater attention given to understanding the social and legal constraints affecting levels of service provision for the urban poor [47,48]. Other studies also described how sanitation challenges were related to legislation, physical environment, social, family and personal health, wider public health, access to finance, and low levels of knowledge and awareness [34], yet the studies did not uncover the constraints along the sanitation value chain, being uncovered in this study.

There is a potential for the contribution of social capital towards resolving some sanitation challenges, as demonstrated the case study. However, there are other structural and policy issues. For example, the Constitution of Kenya makes access to some basic services including sanitation a basic right for all, further reinforcing the need to urgently respond to the prevailing sanitation crisis [49]. The first step is usually acknowledging that we have a huge challenge that calls for identification and rethinking of strategies. Kenya has made efforts in implementing the roadmap that aims to make the country access to safely managed sanitation, as well as harmonizing approaches between sectors such as health, water, planning, urban, and environment with sanitation, by adopting a multi-sectoral approach. In addition to efforts made, in informal settlements, social capital is among important strategies in addressing massive challenges. The presence of social networks meant embedding an individual in a potentially supportive environment. Other than networks, trust and norms were important components of



social capital. The components are not mutually exclusive, that is, a community can be high in both trust and networks and low in norms.

Analyses that explored the interaction between these different types of social capital can be prolific for determining extend of addressing challenges [37], including sanitation challenges in informal settlements. Manual emptiers and informal urban residents with strong networks had clear norms to guide their social cohesion hence reduced sanitation challenges. The presence of social networks means embedding an individual in a potentially supportive environment, and it is a necessary base for providing and receiving support [1,30]. One crucial function of social capital is its deployment of trust [29]. Some level of trust is implicit in almost any concept of community [50]. Trust promoted the sharing of ideas and resources without compromise. Manual pit emptiers needed trust in the work environment, more so when we leave the sphere based on familiarity and enter a work dominated by contingency, complexity and risk. This is because trust is needed when role expectations and familiar relationships no longer help us to anticipate the reactions of our individual or collective interaction [38]. Generalized trust creates the basis for "brave reciprocity", and social networks and associations that are not means for realizing the short-term interests of any specific groups. These two factors in turn create trust [36,38]. One of the strengths of social capital strategy in this study, was its ability to promote the accumulation of knowledge by providing a normative and legal framework within which people could share ideas. This will add to other studies describing how there were expectations that social capital will result in improvements to the asset without it being appropriated for individual gain at the expense of a common good [1].

### Limitation of the study

Limitations of the study is in the confinement in only two informal settlements in Nairobi, Kenya. Further, in each study site; with eight villages, one participant was selected to represent each of the study groups. Where a selected participant from any of the 8 villages was not available, he/she was replaced with a participants with the same characteristics). However, it provided valuable insights for future studies on challenges in the sanitation value chain and social capital approach to the challenges in Kenya's informal settlements, and the approach was informative. Social capital may only resolve some sanitation challenges, and other aspects not studies can resolve other challenges. However, the study did describe a clear interface between social capital and the challenges as opposed, as there is a need for a survey to quantitatively explore the same.

### Conclusion

The findings of this study have significant policy implications that could shape the focused policy of guaranteeing safely managed sanitation in the country, for the benefit of all, particularly those living in informal settlements. The right of all Kenyans to safe and quality sanitation is enshrined in the Kenyan Constitution, yet our study revealed that challenges in accessing safe sanitation are acute for people living and working in the two selected informal settlements. To foster strategies to address sanitation challenges, community and manual pit emptier's coordination should always promote social capital approach. Social capital strategies of trust, networks, support, or cohesion that exists among a group of individuals within a specific community, provide potential pathways that go beyond community to lower the government's expenses on providing free and subsidized sanitation facilities at the community.

Strong networks and observance of norms deployed can exert social control and preserve social values to counter challenges in sanitation. Many of the potential solutions to sanitation challenges require multifaceted interventions. Community users and manual emptiers play a

key role in managing sanitation challenges by observing social norms, values and trust. Despite the role that social capital approach can resolve sanitation challenges, challenges external to the household are intractable and not possible to be realised exclusively. The government ought to plan for informal settlements, as urban planning in general requires a strong public administrative system with good coordination between various ministries to solve the issues of tenure, land division, planning and prioritisation of sanitation services.

It is worth to note that many of the sanitation challenges in informal settlements can be attributed to matters of governance that prevail outside the sanitation sector. In particular, the issues of housing, land tenure and planning of settlements contribute significantly to the failure of network expansion in these areas. Hence the long-term improvement of sanitation conditions in informal settlements in developing countries should be countered by broader policies and strategies like social capital that begin by thinking outside “the sanitation box”.

## Supporting information

**S1 Data. Anonymized sample data.**  
(ZIP)

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## Author Contributions

**Conceptualization:** Ivy Chumo, Blessing Mberu, Caroline Kabaria.

**Data curation:** Ivy Chumo.

**Formal analysis:** Ivy Chumo.

**Funding acquisition:** Blessing Mberu, Caroline Kabaria.

**Investigation:** Ivy Chumo, Blessing Mberu, Caroline Kabaria.

**Methodology:** Ivy Chumo, Blessing Mberu, Caroline Kabaria.

**Project administration:** Ivy Chumo, Blessing Mberu, Caroline Kabaria.

**Resources:** Blessing Mberu, Caroline Kabaria.

**Software:** Ivy Chumo.

**Supervision:** Blessing Mberu, Caroline Kabaria.

**Validation:** Ivy Chumo, Blessing Mberu, Caroline Kabaria.

**Visualization:** Ivy Chumo, Blessing Mberu, Cynthia Wainaina, Caroline Kabaria.

**Writing – original draft:** Ivy Chumo.

**Writing – review & editing:** Ivy Chumo, Blessing Mberu, Cynthia Wainaina, Wanjiru Murigi, Leunita Sumba, Caroline Kabaria.

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