

Research Paper

The social dynamics around shared sanitation in an informal settlement of Lusaka, Zambia

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ABSTRACT

This study explored the social dynamics affecting collective management of shared sanitation in the Bauleni compound of Lusaka, Zambia. In-depth interviews were conducted with landlords ($n = 33$) and tenants ($n = 33$). Elinor Ostrom's eight design principles for the management of common-pool resources was used as a framework to analyse the data. Social capital within plots was also assessed. Pit latrines were predominantly shared by landlords and tenants on residential plots. However, unwelcome non-plot members also used the latrines due to a lack of physical boundaries. Not all plot members fulfilled their cleaning responsibilities equally, thereby compromising the intended benefits for those conforming. Landlords typically decided on latrine improvements independent of tenants. Latrines were not systematically monitored or maintained, but punishment for non-conformers was proportionate to the level of infraction. There was no system in place for conflict resolution, nor local organizations to regulate the management of sanitation. Lastly, there were few enterprises associated with peri-urban sanitation. Social capital was moderately high, and tenants were willing to invest money into improving sanitation. The social dynamics illuminated here provide an important basis for the development of a behavioural intervention targeted towards improving urban sanitation.

Key words | common-pool resources, Ostrom, shared sanitation, social dynamics

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INTRODUCTION

Globally, progress towards the achievement of universal sanitation remains slow. According to the most recent Joint Monitoring Programme report, 2.3 billion people lack access to basic sanitation – toilets built to safely separate excreta from human contact (WHO & UNICEF 2017). Sub-Saharan African countries continue to suffer disproportionately from poor sanitation with 72% of their

population lacking access to basic sanitation (WHO & UNICEF 2017). This situation is only worsening as shown with the increase of 261 million people using unimproved facilities from the period 1990–2015 (WHO 2015). Poor sanitation is associated with infectious diseases, the most common being diarrhoea (Mara *et al.* 2010). In Zambia, 16% of children under the age of five experience episodes of diarrhoea annually and 66% of these episodes were severe and required medical attention (Central Statistical Office (CSO) (Zambia) 2014). Additionally, 390,000 Zambian children died as a result of diarrhoea in 2015 (You *et al.* 2015).

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Improved sanitation refers to the hygienic separation of excreta from human contact (WHO & UNICEF 2017). However, 43% of Zambians live in high density urban areas and largely depend on onsite sanitation that may fail to protect them from excreta (WHO 2015). Pit latrines in these areas are poorly built, lacking a concrete lining or an adequate slab, thereby contaminating groundwater and the soil (Kennedy-Walker *et al.* 2015). Furthermore, 24% of toilets in urban Zambia are used by more than one household in a given residential plot (WHO 2015). These toilets are referred to as shared household toilets, which are different from community toilets (shared by many households in a community) and public toilets (open to the public) (Cardone *et al.* 2018). Sustainable Development Goal (SDG) number 6.2 emphasizes universal access to individual household toilets defined as use by a single household, i.e., improved sanitation that is not shared by the year 2030. This target seems ambitious in view of the slow progress being made around sanitation and ongoing debate about whether shared sanitation must always be considered 'limited' (Evans *et al.* 2017). Therefore, intermediate efforts should consider ways to make currently shared sanitation more hygienic and relevant for public health. To this end, it is important to examine the social dynamics around shared sanitation and the potential it has to contribute to adequate hygiene standards.

Elinor Ostrom's work on common-pool resource (CPR) management (Ostrom 2002) provides a foundation for exploring the social dynamics surrounding shared sanitation. CPRs are resources that have multiple users, for which it is difficult to exclude users and the use by one user decreases resource benefits or enjoyment for other users (Steins & Edwards 1999). Various projects concerning shared resources have been instigated based on CPR theory and are typically referred to as 'commons projects' (Saunders 2014). In developing countries, commons projects have been adopted to promote ownership and sustainability among local institutions by allowing them to set rules and manage their own local resources with minimal government intervention (Roe *et al.* 2009). The assumption underlying CPR-based programmes is that local communities are motivated to cooperate with one another and manage and use their resources fairly in exchange for a perceived benefit. To this end, Ostrom identified a set of principles by which a community can manage such a resource so that it is not

overused and consequently destroyed, without recourse to a higher-level regulatory body. Ostrom's eight principles (Table 1) have been successfully applied to a variety of types of common-pool resources – a large review of 91 studies that investigated Ostrom's principles concluded that they are empirically supported and should be used as a framework to understand the complexities involved in the management of shared resources (Cox *et al.* 2010).

Ostrom hypothesized that in order for a CPR to be used sustainably and efficiently: (1) there should be set rules that

Table 1 | Ostrom's design principles for managing a common-pool resource

1. Clearly Defined Boundaries

Individuals or households with rights to withdraw resource units from the common-pool resource are clearly defined, as are its boundaries

2. Congruence

- A. Appropriation rules define a distribution of benefits that is roughly proportionate to the costs imposed by provision rules
- B. Appropriation rules restricting time, place, technology, and/or quantity of resource units are appropriate for local conditions

3. Collective-Choice Arrangements

Most individuals affected by rules regulating operation of the resource can participate in modifying those rules

4. Monitoring

Monitors, who actively audit common-pool resource conditions and appropriator behaviour, are accountable to the appropriators and/or are the appropriators themselves

5. Graduated Sanctions

Appropriators who violate operational rules are likely to receive graduated sanctions (depending on the seriousness and context of the offence) from other appropriators, from officials accountable to these appropriators, or from both

6. Conflict-Resolution Mechanisms

Appropriators and their officials have rapid access to low-cost, local arenas to resolve conflict among appropriators or between appropriators and officials

7. Minimal Recognition of Rights to Organize

The rights of appropriators to devise their own institutions are not challenged by external governmental authorities

8. Nested Enterprises

Appropriation, provision, monitoring, enforcement, conflict resolution and governance activities are organized in multiple layers of enterprises, nested from the lowest level up to the entire interconnected system

Adapted from Ostrom (2002).

set boundaries of the shared resource; (2) users should benefit in proportion to the investment they make to uphold the rules; (3) decision-making on the shared resource should be participatory and inclusive of all users; (4) the condition and use of the shared resource should be monitored; (5) there should be a negative consequence for failure to adhere to the rules around the shared resource which should be graduated to the size of the offence; (6) mechanisms to resolve conflicts must be in place; (7) users should be able to manage the shared resource with minimal government interference; and (8) there should be established means for supporting management of the shared resource at all levels of organization. These principles demonstrate both macro and micro level influences on the management of a CPR.

A shared toilet within a residential plot can be considered a CPR in that it is used by many people to fulfil a valuable need (disposal of excreta) but may be unregulated and over-used and subsequently destroyed. Ostrom's eight principles for managing common-pool resources have previously been used in Kenya to investigate determinants for the quality of shared sanitation (Simiyu *et al.* 2017b). The study found that the quality of a toilet deteriorated as the number of people using it increased. Despite the presence of boundaries, collective decision-making and monitoring of the toilet, the duty rota for cleaning the toilet did not function as people did not clean the toilet when they were supposed to.

Additionally, the social dilemma framework has been used to explore the factors contributing to cooperation and collective action in shared toilet cleaning (Tumwebaze & Mosler 2014b). Based on a number of existing studies, they reported 11 factors including trust, group size, gender and motives, as influencing cooperation and collective action.

A third perspective is also relevant to this discussion of sanitation management and related to Ostrom's principles: social capital. Social capital is defined as a network of relationships held together by trust, reciprocity, collective action and networking (Johnson 2016). People rely on one another for resources that will help them in various ways, including financial and emotional well-being. A study conducted in rural Kenya found that higher social capital is important in promoting collective action for water and sanitation programmes (Bisung *et al.* 2014). This and other studies demonstrate the need for social capital as a catalyst for improved sanitation in high density communities (Wakefield *et al.* 2001).

This study applies both Ostrom's eight principles and the social capital perspective to the problem of understanding the dynamics underlying shared toilet construction, maintenance, and improvement. The findings from this study are relevant for toilet improvement interventions and can be used to assess Zambia's likelihood of improving the quality of its shared sanitation systems.

METHODS

Study setting and population

The study was conducted in a peri-urban area located in Lusaka, Zambia called Bauleni compound. This area is a typical peri-urban environment with a population of 64,000 people, divided into crowded, unplanned plots, typically consisting of a landlord and several tenant households. Sanitation is typically provided at plot level. In order to select a study area within Bauleni, a map of the area was obtained from Google Earth and divided into zones. Visibly crowded zones were identified and one of these areas (Zone A) was selected for exploration to avoid contaminating a planned future trial in the compound (Appendix, available with the online version of this paper). Plots on which both landlords and tenants lived were chosen for this study.

Data collection

Exploratory qualitative research techniques were employed to investigate CPR principles related to sanitation. In-depth, semi-structured interviews (IDI) were used to collect information from landlords and tenants. Toilet quality was observed directly, and questions derived from Ostrom's eight principles (Table 1) were used to elicit responses around the factors underlying toilet construction, maintenance and improvement.

We further asked questions around the levels of social capital on the plot. Quantitative indicators of social capital measured various dimensions of the construct, such as trust (can you leave your child with another plot member?), solidarity (are you willing to help another plot member on the plot?), and the effect of group affiliation (do you trust your tribe member as much as others?). These indicators were adapted to this peri-urban setting from a study on rural sanitation in Indonesia (Cameron *et al.* 2015).

Sample size and recruitment

A sample of 33 landlords and 33 tenants was acquired prior to reaching information saturation (Malterud et al. 2016). Purposive sampling was used to collect data from equal numbers of landlords and tenants as well as to ensure that at least one-third of respondents were male. Plot members found at home were asked if there was a resident landlord present; if so, the landlord was identified and asked to participate in the study. If not, the tenant was asked to participate. If there was no resident landlord present, research assistants would ask whoever was present whether they knew of a resident landlord within the zone.

Ethical considerations

The study was approved by the University of Zambia Biomedical Research Ethics Committee (UNZABREC) (ref: 023-06-16) and the London School of Hygiene and Tropical Medicine (LSHTM) Ethics Committee (ref: 11714). Written consent was obtained from all participants prior to conducting the interviews.

DATA ANALYSIS

Interviews were voice recorded and transcribed. Framework analysis was used to analyse the data (Malterud et al. 2016). Transcripts were first broadly coded by each Ostrom's principle (which represented the main themes) using NVIVO 10. Codes were subsequently refined to identify differences in sanitation cleaning, construction, maintenance and improvement. This information was transferred to Excel for further analysis.

RESULTS

A total of 44 females and 22 males were interviewed on 66 plots. Landlords were generally older than tenants and had lived on their plots longer than the tenants (median time 20 years vs 1 year 4 months). There was a median of 4 tenants' houses and 15 people on a plot; these people typically shared one pit latrine.

Clearly defined boundaries

Boundaries of who could use a plot's toilet were defined by fences surrounding the plot, social pressure, and locks on toilet doors. Interviewees indicated that it was generally socially unacceptable for non-plot members to use the toilets. Participants believed that an outside lock was necessary to effectively exclude non-plot members. However, in practice, many toilets did not have outside locks.

'Behind our toilet there is a bar that does not have a toilet. When we are sleeping people from the bar come and use the toilet and mess it up very badly because there is no door or lock' (Tenant).

There were situations where some neighbours who did not have toilets asked either a tenant or the landlord for permission to use the toilet on their plot. If the neighbour had a good relationship with the tenant or landlord, this permission was granted, and seemed not to lead to conflict within the plot. In cases where the neighbours were not friends with the tenant or landlord, permission, if sought, was not granted.

Congruence of costs and benefits

Enjoying the benefits of a sanitation facility entails the need to maintain its level of cleanliness. There are quite clear rules on the roles that plot members play relating to sustaining the CPR: landlords were responsible for toilet construction (including improvement) and physical maintenance. Some tenants willingly contributed their time and labour to non-technical jobs like digging a pit; only a few tenants contributed their own money. Generally, tenants had the responsibility of cleaning the toilets and an unwritten rota was in place on most plots.

'It is my responsibility to do the repairs for the toilet, for example right now I'm tiling the toilet. Even if it gets full it's my responsibility to make sure I empty it, because if I am going to keep a tenant on my plot, then that person will need a toilet' (Landlord).

In some cases, tenants were solely responsible for cleaning the toilet while in other cases both landlords and tenants

were held responsible. Many tenants strongly felt that landlords should also clean the toilet in order to set an example. On plots that had more than one tenant household, cleaning responsibilities were shared between the households, with each being given an equal number of days or weeks to clean the toilet. However, tenants often felt that their toilet was dirty because fellow tenants did not put in enough effort to clean the toilet when it was their turn. Landlords equally complained about tenants not cleaning the toilet when they were supposed to, especially in the case of male tenants.

'There's a problem on this plot, some of us clean the toilet but others refuse to clean. Even when it comes to sweeping [the toilet], some of us sweep and others don't, so the landlord needs to do something about this situation' (Tenant).

The number of days given for cleaning did not depend on the size of the household. Thus, a single male/female would have the responsibility of cleaning for the same number of days as a household with a family, demonstrating some lack of congruence. There are also cultural rules that interfere with a fair burden being placed on all plot members. In particular, many participants, in general, believed that the toilet should not be cleaned by a man as it was not culturally acceptable for a man to clean bodily waste including urine, faeces or menstrual blood, especially from a woman. However, not all participants agreed with this cultural norm.

Some tenants were displeased at the state of their toilets and complained about the length of time it took for their landlords to repair or improve them. This caused some to leave the plot – the ultimate expression of a perceived imbalance between contribution to, and benefits derived from, the toilet – while others chose to stay because they did not have the financial capacity to live on a plot with a better toilet.

Collective choice arrangements for toilet improvements and repairs

Over the longer term, continuing to enjoy the benefits of sanitation on the plot depends on collective agreements about investments such as new construction or repair (e.g., after flooding). Decisions around toilet improvements were made

solely by the landlords, typically without consulting tenants. The only times that landlords reported speaking to tenants about sanitation concerned enforcing the cleaning rota, complaining about the cleanliness of the toilets or resolving a disagreement between tenants. On plots where tenants got along, they came together to solve problems around sanitation by contributing their time, money or effort.

'On this plot, we get along. I remember when the landlord was building a toilet, we knew it would take about 3 months to build. So as tenants, we came together and held a meeting with the landlord to tell him that the toilet will take too long to build and we will be inconvenienced. We decided to all help with building the toilet, so those who were available put in their time and effort to build our current toilet and we completed this job quickly' (Tenant).

However, on plots where there was poor cohesion, tenants individually complained to the landlord (as in the example cited under conflict resolution mechanisms below).

Monitoring of cleanliness

Another important principle to ensure continued availability of a CPR is policing of its current state and identifying who is responsible for that state. In the case of sanitation, the current state is largely about cleanliness. Both landlord and tenants suggested that they inspected the toilet to see whether it was clean. However, not all landlords monitored the toilet regularly and the few that did, did so only haphazardly. When landlords found the toilet dirty, they reported that they would talk to the tenant about it and tell them to clean it. However, not all tenants would clean the toilet even after being told. Tenants would also remind fellow tenants to clean the toilet when they had not cleaned it. Some tenants said when they would go in to use the toilet, they were able to see whether it was clean or not and would either clean it themselves or ask the person responsible to clean it, if they knew who it was, which was rare. One tenant took this task very seriously:

'I do the monitoring myself, I go to the toilet to see whether its clean. If it's dirty, I organise a meeting with all the tenants and we discuss cleanliness. I do this

because many people are using the same toilet and can spread disease. So, I talk to them as a group because we are many and I cannot know who has not cleaned the toilet or messed it up' (Tenant).

Graduated sanctions

When things go awry, there must be a mechanism to ensure that those that deviate from the rules of the system are punished. However, for the system to work properly, the punishment must be of appropriate severity; otherwise, a sense of fairness in the punishments will be lost. In Bauleni, landlords and tenants reported that no serious punishments occur as a result of not cleaning the toilet. Some landlords had threatened to evict tenants if they leave it dirty. Tenants on such plots were aware of these threats and said their landlord was serious about keeping the toilet clean. However, none had actually evicted anyone on such grounds, which would be disproportionate punishment. Tenants on a plot also reported gossiping (social sanction) about other tenants who did not keep the toilet clean. The only common punishment given for sanitation-related offences was for tenants to replace anything they broke, such as a toilet lock. Tenants also report using scolding as a means of excluding outsiders seen to intrude.

Conflict-resolution mechanisms

Conflicts inevitably arise when managing a shared resource and having appropriate mechanisms in place is important to resolve conflicts and avoid escalation. Conflict was more common between tenants than between landlords and tenants. Electricity, solid waste management and toilet cleaning were the most frequently reported sources of conflict. Electricity on a plot was shared and landlords charged their tenants a standard amount towards meeting the electricity bill. While tenants were supposed to pay their electricity on a particular day of the month, not all tenants paid on this particular day, which could incite conflict. Additionally, not all tenants cleaned the toilet when they were supposed to, which also led to conflict among tenants and, in a few cases, between landlords and tenants. Tenants also reported conflict as a result of personality clashes, treatment of

children, noise pollution and solid waste disposal, where households paid for their own solid waste, but others would sneak their waste into others' piles. Conflict was usually manifested through ceasing communication, arguments or physical fights. Landlords were usually approached to sort out conflicts between tenants, typically by sitting the aggrieved person down, talking through the problem and finding a solution. On plots with an older person, that person could take the responsibility to resolve the conflict whether they were a landlord or tenant. However, in some cases where conflict was not resolved the tenant either left the plot or was evicted by the landlord.

'We always argue with the tenant who lives there because they don't clean the toilet. For us to resolve this problem, I told the landlord to give us two days each for cleaning the toilet because that one [fellow tenant] does not clean the toilet. At least if it's two days, they will be forced [or held accountable] to clean often than waiting for their week to come ... When it's their week, the toilet will just remain dirty. When I told the landlord, he imposed that rule so now they are forced to clean' (Tenant).

Minimal recognition of rights to organize

The social arrangements made to support and guide use of a common resource must themselves be open to modification if they are not working. At the point that a tenant is assuming occupancy, they are told of the rules around cleaning the toilet, maintaining cleanliness on the plot, rent payment days and garbage disposal. However, these were not bound by any formal agreements. Additionally, both landlords and tenants reported not knowing any laws or regulations regarding landlord and tenant agreements around sanitation. The only known regulation was a law against loud noise in the form of music played at night.

Nested enterprises

Finally, residential plots are embedded in a larger community that might provide support, or significantly constrain, sanitation maintenance or improvement. An important connection for plot-based sanitation is to implement faecal

sludge management systems at the community level. However, in Bauleni, only a few landlords reported using pit emptying services in either manual or mechanical form. Some had only seen or heard of mechanical pit emptying while others do not have any knowledge of pit emptying. No one reported actually using such a service. This means that expensive emptying of toilets is necessary, leading to a failure of the sanitation system when a landlord delays emptying the toilet or constructing a new one.

Social capital

Respondents generally reported high levels of willingness to work together with those on the plot, but this was less common in practice. 97% of participants were willing to help plot members who were in need and the majority reported willing to contribute time (89%) and money (84%) to improve the plot. 74% of tenants said they were willing to contribute money to improve the sanitation on their plot. With respect to child care, 77% of all participants said they could leave their child with other plot members if they left for a few hours. However, with respect to money, only 43% believed plot members would return money to them if they happened to drop it, and trust for community members outside the plot was much lower. Asked about practices, only 49% agreed that other plot members actually contributed money for plot improvement while 67% felt they worked together to improve a plot. Landlords were generally more willing to contribute materially to plot welfare. In comparison to landlords, tenants were much more trusting of others on the plot.

DISCUSSION

On-site sanitation, which is usually shared by landlords and tenants in Bauleni, can be analysed using Ostrom's principles for CPR management, contributing to understanding why the management of shared toilets may fail.

With respect to clearly defined boundaries, the first principle, we learned that landlords and tenants generally do not allow outsiders to use the toilet on their plot. However, toilet intrusion was hard to manage as most plots were not enclosed by a fence and had no outside lock on their toilets

to prevent use by outsiders. This may pose a public health concern in terms of increased risk of diarrhoeal disease due to an increase in the number of users (Heijnen *et al.* 2014). In order to protect the toilet from use by unwanted people, a suggested strategy would be to influence landlords to work towards setting clear boundaries for toilet use, both physical (solid fence and door lock) and social (disapproval of intruders). As the owners of the land, these boundaries should be the sole responsibility of the landlords to enforce and must be well communicated to in-plot members.

Second, there should be a set of rules for those sharing a sanitation system and there should be congruence between cost and benefit in applying these rules (Ostrom 2002). In Bauleni compound, just as in urban informal settlements in Kenya and Ghana, landlords are responsible for the physical components of a toilet (Jenkins & Scott 2007; Simiyu *et al.* 2017a). However, there was incongruence in cleaning practices related to the lack of a monitoring system and agreed upon consequences for non-compliance. The lack of accountability in maintaining a toilet allowed tenants to 'cheat' in terms of not fulfilling their responsibility (Ostrom 2002). Sanctions, although very limited, were imposed at a level related to the degree of rule-breaking, such as being scolded or the subject of gossip. Hence, close monitoring of the duty rota and the dynamics of who does the monitoring need discussion and agreement, as does the type of punishment, to ensure it does not infringe upon human rights as in the case of Community-led total sanitation (CLTS) (Bartram *et al.* 2012). Therefore, strategies for collective decision-making around rules and punishments among plot members are needed to ensure that the rights and responsibilities of all involved are respected.

Tenants' perceived inability to express dissatisfaction may be influenced by the unbalanced landlord-tenant relationship, which is commonly believed to be exploitative in nature, with tenants being suppressed and subjected to poor conditions including lack of proper sanitation (Scott 2013). Ostrom's framework takes into consideration the effect of disproportionate power relations, in this case with landlords having more power as rent receivers than tenants as rent givers (Ostrom 2002). Tenants in a peri-urban area of Kigali felt this way, saying that their landlords were more concerned about making money than improving toilets (Tsinda *et al.* 2013). Further evidence suggests that

non-resident landlords are reluctant to make improvements to the toilet as they were more interested in receiving their rental income (Bisung et al. 2014). Thus, if landlords' interests are not centred on improving toilets but on other personal gains, shared household toilets will only deteriorate. Due to the effect power relations may have on the effectiveness of a shared resource, healthy power relations between landlords and tenants should be stipulated as a catalyst for users of a shared resource. This can be achieved through empowerment strategies for the right to organize among tenants supplemented with regular group meetings between landlord and tenants, where productive dialogue is encouraged.

Conflict should be expected among people sharing a resource like sanitation (Jewitt 2011; Tumwebaze & Mosler 2014a; Simiyu et al. 2017b). Our data confirmed that conflict between tenants was common, especially when it concerned a shared resource like electricity or sanitation. Landlords and older plot members were seen primarily as conflict resolvers when there was a disagreement and can be used as part of a strategy to encourage productive dialogue. However, our findings also indicate that tenants generally think social capital on the plot (and by extension, in the neighbourhood) is higher than landlords do, perhaps because they have greater involvement on a day-to-day basis with each other. The exception is money: tenants are less willing to help financially, or to believe money will be returned to them, within the plot. This is consistent with the distinction in roles between landlords and tenants in terms of financial obligations. These data also suggest that a lack of trust between landlords and tenants might be one reason for the poor levels of communication and collaboration between them, leading to weak monitoring and maintenance systems for shared toilets. The study findings suggest that residents on a plot need to build on their social capital for them to effectively manage their shared sanitation facility. Specifically, relationships among plot members (both landlords and tenants) should be strengthened to encourage collective action towards managing their latrine. In order to harness this attitude, communication between landlords and tenants should be encouraged as a potential mechanism towards collective decision-making around sanitation. Effective decision-making must overcome the social, psychological and any economic and technical barriers to

improved sanitation. Overcoming these barriers may seem impossible; however, through strategic dialogue, social organization within plots and with other relevant stakeholders, plot members may be able to successfully improve their sanitation (McGranahan & Mitlin 2016).

CONCLUSION

In order to reduce the negative public health effects of shared household toilets used by both landlords and tenants, sanitation users should improve toilet management in a number of ways, including strengthening boundaries around sanitation, establishing more effective management rules and productive dialogue between landlords and tenants, to improve the management of latrines. Being aware of the social dynamics on resident landlord plots provides a basis for the development of interventions targeting the better maintenance and improvement of shared sanitation.

REFERENCES

- Bartram, J., Charles, K., Evans, B., O'Hanlon, L. & Pedley, S. 2012 *Commentary on community-led total sanitation and human rights: should the right to community-wide health be won at the cost of individual rights?* *Journal of Water and Health* 10 (4), 499–503.
- Bisung, E., Elliott, S. J., Schuster-Wallace, C. J., Karanja, D. M. & Bernard, A. 2014 *Social capital, collective action and access to water in rural Kenya*. *Social Science & Medicine* 119, 147–154.
- Cameron, L. A., Olivia, S. & Shah, M. 2015 Initial Conditions Matter: Social Capital and Participatory Development. IZA Discussion paper No. 9563. SSRN. Cameron, Lisa A. and Olivia, Susan and Shah, Manisha, Initial Conditions Matter: Social Capital and Participatory Development. IZA Discussion Paper No. 9563. Available at SSRN: <https://ssrn.com/abstract=2708376>
- Cardone, R., Schrecongost, A. & Gilsdorf, R. 2018 *Shared and Public Toilets: Championing Delivery Models That Work*. World Bank, Washington, DC, USA.
- Central Statistical Office (CSO) (Zambia) MoHMZ, and ICF International 2014 *Zambia Demographic and Health Survey 2013–14*. Central Statistical Office, Ministry of Health, and ICF International, Rockville, MD, USA.
- Cox, M., Arnold, G. & Villamayor Tomás, S. 2010 *A review of design principles for community-based natural resource management*. *Ecology and Society* 15 (4), 38. <http://www.ecologyandsociety.org/vol15/iss4/art38/>.
- Evans, B., Hueso, A., Johnston, R., Norman, G., Pérez, E., Slaymaker, T. & Trémolet, S. 2017 *Limited Services? The Role*

- of *Shared Sanitation in the 2030 Agenda for Sustainable Development*. IWA Publishing, London, UK.
- Heijnen, M., Rosa, G., Fuller, J., Eisenberg, J. N. S. & Clasen, T. 2014 [The geographic and demographic scope of shared sanitation: an analysis of national survey data from low-and middle-income countries](#). *Tropical Medicine & International Health* **19** (11), 1334–1345.
- Jenkins, M. W. & Scott, B. 2007 [Behavioral indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana](#). *Social Science & Medicine* **64** (12), 2427–2442.
- Jewitt, S. 2011 [Geographies of shit: spatial and temporal variations in attitudes towards human waste](#). *Progress in Human Geography* **35** (5), 608–626.
- Johnson, L. 2016 [What is social capital?](#) In: *Social Capital and Community Well-Being* (A. G. Greenberg, T. P. Gullotta & M. Bloom eds). Springer, Switzerland, pp. 53–66.
- Kennedy-Walker, R., Amezaga, J. & Paterson, C. 2015 [Is the sanitation sector ready for the post 2015 goals? Lessons learnt from Zambia](#). In: *38th WEDC International Conference*. Loughborough University, Loughborough, UK.
- Malterud, K., Siersma, V. D. & Guassora, A. D. 2016 [Sample size in qualitative interview studies: guided by information power](#). *Qualitative Health Research* **26** (13), 1753–1760.
- Mara, D., Lane, J., Scott, B. & Trouba, D. 2010 [Sanitation and health](#). *PLoS Medicine* **7** (11), e1000363.
- McGranahan, G. & Mitlin, D. 2016 [Learning from sustained success: how community-driven initiatives to improve urban sanitation can meet the challenges](#). *World Development* **87**, 307–317.
- Ostrom, E. 2002 [Reformulating the commons](#). *Ambiente & Sociedade* **10**, 5–25.
- Roe, D., Nelson, F. & Sandbrook, C. 2009 *Community Management of Natural Resources in Africa: Impacts, Experiences and Future Directions*. IIED, London, UK.
- Saunders, F. 2014 [The promise of common pool resource theory and the reality of commons projects](#). *International Journal of the Commons* **8** (2), 636–656.
- Scott, P. 2013 *Dealing with Land Tenure and Tenancy Challenges in Water and Sanitation Services Delivery*. WSUP (Water and Sanitation for the Urban Poor), London, UK.
- Simiyu, S., Swilling, M. & Cairncross, S. 2017a [Decision-making on shared sanitation in the informal settlements of Kisumu, Kenya](#). *International Journal of Environmental Health Research* **27** (5), 377–393.
- Simiyu, S., Swilling, M., Cairncross, S. & Rheingans, R. 2017b [Determinants of quality of shared sanitation facilities in informal settlements: case study of Kisumu, Kenya](#). *BMC Public Health* **17** (1), 68.
- Steins, N. A. & Edwards, V. M. 1999 [Platforms for collective action in multiple-use common-pool resources](#). *Agriculture and Human Values* **16** (3), 241–255.
- Tsinda, A., Abbott, P., Pedley, S., Charles, K., Adogo, J., Okurut, K. & Chenoweth, J. 2013 [Challenges to achieving sustainable sanitation in informal settlements of Kigali, Rwanda](#). *International Journal of Environmental Research and Public Health* **10** (12), 6939–6954.
- Tumwebaze, I. K. & Mosler, H.-J. 2014a [Shared toilet users' collective cleaning and determinant factors in Kampala slums, Uganda](#). *BMC Public Health* **14** (1), 1260.
- Tumwebaze, I. K. & Mosler, H.-J. 2014b [Why clean the toilet if others don't? Using a social dilemma approach to understand users of shared toilets' collective cleaning behaviour in urban slums: a review](#). *Journal of Water Sanitation and Hygiene for Development* **4** (3), 359–370.
- Wakefield, S. E. L., Elliott, S. J., Cole, D. C. & Eyles, J. D. 2001 [Environmental risk and \(re\)action: air quality, health, and civic involvement in an urban industrial neighbourhood](#). *Health & Place* **7** (3), 163–177.
- World Health Organization 2015 [WHO/UNICEF Joint Water Supply, and Sanitation Monitoring Programme. Progress on sanitation and drinking water: 2015 update and MDG assessment](#). World Health Organization.
- World Health Organization & UNICEF 2017 [Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines](#). WHO and UNICEF, Geneva, Switzerland.
- You, D., Hug, L., Ejdemyr, S. & Beise, J. 2015 [Levels and Trends in Child Mortality](#). Report 2015. Estimates developed by the UN Inter-agency Group for Child Mortality Estimation.

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