



PROMOTING SANITATION AND NUTRIENT RECOVERY THROUGH URINE SEPARATION: THE ROLE OF HEALTH AND HYGIENE EDUCATION AND SOCIAL ACCEPTANCE FACTORS

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ABSTRACT

The VUNA project aims to develop a sanitation system that is affordable, produces a valuable fertiliser, reduces pollution of water resources and promotes health. The social acceptance component of this project is vital because effective sanitation is not only about providing a well-designed toilet and effective waste management, but also about providing users with a facility that caters to their needs and is sensitive to their cultural lifestyle. The social aspects of the study used qualitative and quantitative approaches to investigate acceptance of a Urine Diversion Dehydration Toilet (UDDT) and to explore the role of health and hygiene education in promoting acceptance, usage and maintenance of the UDDT. Key findings indicate lower levels of acceptance of UDDTs amongst the elderly, who are accustomed to traditional pit toilets. The quantitative survey confirmed that 14% of household still maintain pit latrines on their premises, and an association was found between low satisfaction with UDDTs and the presence of a pit latrine. The qualitative results reveal that many residents aspire to own a flush toilet, which is perceived to be indicative of household wealth. A dominant concern about UDDTs was their odour. There is a clear need for communities to be informed of the benefits of UDDTs in the context of water scarcity, and that odour issues can be limited by effective UDDT management and maintenance. There is a further need to address the perception that UDDTs are only a temporary sanitation measure until the roll out of flush toilets. This paper discusses the plan for health and hygiene education in region in the future based on these findings.

KEYWORDS

urine diversion dehydration toilet, social acceptance, sanitation, maintenance, public health, hygiene, education

1 INTRODUCTION

One of South Africa's development priorities is the provision of safe water and proper sanitation. According to the National Census 2011 (Statistics South Africa 2011), approximately 1.3 million households in South Africa are without access to piped water, the majority being Black households. Moreover as many as 748,597 households around the country have no toilet system at all, while 8,242,924 have flush toilets connected to a sewage system (Statistics South Africa, 2011). The former hinders basic hygiene practices and promotes health risks. Furthermore, access to adequate sanitation is fundamental to personal dignity and security, social and psychological well-being, public health, poverty reduction, gender equality, economic development and environmental sustainability (DWAf, 2001).

Sanitation in the past has been seen mainly as a technical issue including building toilets, providing and maintaining the sewer systems, while economic, social and other aspects have been given less consideration (RSA, 1996). Globally, efforts have been made to develop simple, relevant solutions to sanitation problems; but these developments are often unsuccessful because the context in which these needs emerge is often overlooked. It has become increasingly clear among stakeholders including large cooperations that social considerations are vital in the effective provision of effective sanitation, in that good sanitation

requires the community to be part of the decision making and it is important that they participate in creating a safe living environment (Glaxo Smith Kline, 2013). DWAf (2006) emphasizes that the sanitation technology needs to be carefully chosen based on the permanence of the settlement, the technical aspects, financial costs, design, expectations and environmental considerations. In addition, the social lifestyle and culture of the community must be considered, particularly when introducing a new technology such as Urine Diversion Dry toilets (UDDTs), since sanitation is a personal issue, and it requires a new approach to the basic function of going to the toilet and most importantly it requires the handling of faeces and urine (Holden and Austin, 1999).

To address the backlog in sanitation eThekweni Municipality has installed more than 75,000 UDDTs since 2003 in areas previously lacking sanitation (Buckley et al., 2008). Three surveys have been conducted by the Health Science Research Council (HSRC) between 2003 and 2008 to investigate the acceptance of the UDDTs. However, this is the first study to focus on the role of health and hygiene education in improving acceptance, use and maintenance of the UDDT. The VUNA project commenced in 2010 with the aim to promote sanitation by recovering nutrients from the urine collected in UDDTs. VUNA is a collaborative project between the Swiss Federal Institute of Aquatic Science and Technology (Eawag), eThekweni Water and Sanitation (EWS), the University of KwaZulu-Natal (UKZN) and the Swiss Federal

Institutes of Technology in Zurich (ETHZ) and Lausanne (EPFL). The project partners are convinced that the value of the nutrients contained in urine can be used to lower costs for sanitation, provide a valuable local fertiliser, reduce pollution of water resources and increase the acceptance of UDDTs (Etter et al, *subm.*).

The provision of toilets is only a component of good sanitation as health and hygiene education is an integral mechanism in breaking the cycle of disease (Mvula Trust, 2001). The eThekweni municipality has made provision of health and hygiene education as part of the package when rolling out sanitation projects. Health and hygiene education is a process by which individuals and groups of people learn to behave "in a manner conducive to the promotion, maintenance or restoration of health" (Park, 2000). Health and hygiene education is most effective when it is relevant and sensitive to the social environment in which it will be rendered (WHO, 2010). It is important that health and hygiene education is developed in a manner that it can influence attitudes, perceptions, knowledge and social norms. The education can be relayed to communities using different interactive communication methods including entertainment education and print material (Bensley and Brookins- Fisher, 2008). It is best to use all these methods to relay the health message so that all age groups of community are accommodated. Health and hygiene education informs users of correct use and management of the toilet, and simultaneously has the potential to also improve social acceptance by familiarising users with the technology and encouraging the maintenance of its good working condition, which limits blockages and odours.

This paper describes results of the social acceptance studies within the VUNA project, which apply qualitative and quantitative approaches to assess community perceptions of UDDTs in the eThekweni Municipality. This focuses particularly on local levels of satisfaction with UDDTs, key concerns with UDDTs and associations between these. The main focus of this paper is on the qualitative studies, while a first data set of the quantitative study has already been published by Roma et al. (2013). The quantitative component of the study was conducted in 2011 and comprised a structured, closed-ended questionnaire of fourteen questions that was administered to 17449 households in 65 areas of the eThekweni Municipality.

The results of the large-scale quantitative survey were presented in Roma et al. (2013). Here, we summarize some of the results, which are used for a comparison with the results of the qualitative survey; the mean household size was 6.80 residents, while minimum household size was one resident and maximum household size was 30 residents. Results indicated that 14% (2243) of households still had a pit latrine on the premises, and 84% of these were still in use. A Pearson Chi Square test revealed an association between low satisfaction with UDDTs and the presence of a pit latrine ($X^2 = 9.328$, $df = 2$, $p = <0.05$).

8.4% (1465) of respondents had converted their UDDTs to flush toilets, and these households were no longer considered in the survey. Of the remaining respondents 70% (11 130) were not satisfied with their UDDT, 23% (3736) were satisfied with their UDDT, while 7% (1047) were very satisfied with their UDDT. Problems with the UDDTs as mentioned by the respondents are presented in Table 1. Of all problems mentioned by respondents, odour was mentioned the most often (27%). A Pearson Chi Square test revealed an association between odour complaints and poor connection of the urine pipe when the pedestal was moved ($X^2 = 46.114$, $df = 1$, $p = <0.001$).

Table 1: Problems with UDDTs as mentioned by respondents.

Problem	No. of mentions	% of mentions
Smell	11319	27
Problems with toilet door	9097	22
Poor construction	5063	12
Urinary pipe not connecting properly	4949	12
Cleaning the chamber	3155	8
Having to cover faeces with sand	1764	4
Keep the chamber dry	1500	4
Poor maintenance	1462	3.5
Incorrect use by household members	1169	3
Vandalism	827	2
Other	1145	3
TOTAL	41450	100

2 METHODOLOGY

In the social acceptance studies within the VUNA project, quantitative and qualitative methods were used to assess local perceptions of UDDTs. Quantitative data collection focussed on a large well distributed sample that allowed for a statistical assessment of factors that influence acceptance and usage of UDDTs, while qualitative research methods were used to explore the richness, depth, and complexity of the social context in which UDDTs are encountered and utilised. The qualitative methods allowed the researchers to interrogate attitudes, behaviours, concerns, motivations, aspirations, culture and lifestyles and how these influence acceptance, use and maintenance of UDDT toilets. Symbolic interaction theory was used to provide a basis to understand the creation of meaning and the meaning that comes from interaction (Griffin, 1997).

The qualitative assessment focussed on a smaller sample in three peri-urban areas of eThekweni, namely Zwelibomvu (West), Lower Maphephetheni (North) and Hlanzeni (South). Random sampling formed the basis of the selection of the households for the study. In each study area 40 households were randomly selected from an aerial map using the metro number which is allocated by EWS to all households that they have provided with water or sanitation service. At each household a short questionnaire was administered on the first visit to ascertain if the household was (1) maintaining the toilet properly, (2) not maintaining the toilet properly or (3) not using the toilet. The latter groupings helped in forming the homogenous focus groups. Each randomly selected household was represented by one adult member of the household.

Purposive sampling was used in selecting the key informants as they were selected according to their involvement in the UDDT project, the position they hold in their community and their knowledge about the UDDT. According to Marshall and Rossman,

(1999) triangulation is essential to check and establish credibility of the study, this method was used in data collection where (1) desktop analysis was exercised to mine existing data (2) In-depth interviews were undertaken with key informants, namely ward committee members, ward councillors and previous local facilitators, (3) focus groups discussions of ten participants were undertaken with selected household members and they were homogenous in nature. Short open ended interview schedules were developed for these in-depth interviews and focus group discussions to facilitate discussion, and freedom of expression. Probing was used to elaborate and clarify the matters being discussed. All interviews and focus group discussions (FGD) were tape recorded, transcribed word for word in Zulu and translated to English to preserve meaning. The qualitative data were analysed manually through the process of content analysis, data were verified, then statements were used to code and make meaning from words, thereafter categories were developed and were later linked to get a more complete meaning. The findings were used to develop the health and hygiene education programme

3 RESULTS

121 people participated in focus group discussions and 25 key informants were interviewed in the qualitative component of the study. More than 60% of participants were females and the ages varied from 22 to 63 years. The household participants were grouped into categories based on the condition of their UDDT, as presented in Table 2.

Table 2: List of categories and definitions.

Category	Explanation	Number
Maintainer	The UDDT in a good condition: all items intact e.g. door, vent pipe etc. in place. The broken items are repaired using appropriate materials.	17%
Non-maintainer	The UDDT is in a bad condition: it has broken items, and the broken items are either not repaired or repaired using inappropriate material.	80%
Non-user	Households that have a UDDT but choose not to use it.	3%

Overall, 80% of households were not maintaining the UDDT properly i.e. broken items were not repaired, toilet items were repaired with unsuitable material (Figure 1), doors were missing (Figure 2), urine and faecal matter were mixed, and/or the toilet was not kept in a usable and hygienic state. However, only less than 3% were not using their toilet. A proportional number of participants reported that they do not regard the UDDT as a permanent asset of their household and they aspire to have a flush toilet. The perception is that the flush toilet is for the rich and the UDDT is for poor people (e.g. "No one who thinks highly of you will give you this toilet [UDDT]...I feel undermined"..., focus group discussion). This perception is encouraged by the fact that the middle class group in the community are changing the UDDT to flush or septic tank toilets (e.g. "Why is the ward councillor not using it [UDDT] if it a good toilet", focus group discussion). A large proportion in the non-maintainers' category reported that the person who directly received health and hygiene education

either has migrated or is deceased. Whereas, in the maintainers' category those who directly received education were still living in the household and were between 45 and 57 years old. In the non-maintainers' category there was a high reporting of family members that used or abused alcohol. The perception within this category is that women are given a task to look after the UDDT because they are undermined and exploited. The maintainers' category reported that they allocate tasks regarding maintenance of the UDDT to different members within the family. The maintainers' category had on average more children within the household compared to other categories. The maximum size of the family in the maintainers' category was seven members.

In the focus group discussions participants between the ages of 20 and 29 years were more accepting of the UDDT as a permanent asset. The maintainers articulated more information when asked about how to use and maintain the UDDT compared to other categories. A large proportion of participants reported that they did not receive education mainly because the direct recipient of the education in the household did not cascade the information to the rest of the family.

Many people chose to build the toilet far away from the house anticipating a bad smell. All participants reported that children below 4 years were not allowed to use the UDDT but to do open defecation due to risk of falling; it was reported that at night most adult either use a potty or defecate or urinate outside (e.g. "It is just too dangerous to let a small child use these toilets... I know many people do not use the toilet at night ...it is just too far and you might even be bitten by a snake", ward committee member). The participants reported that they are not aware of how their neighbours feel or how they are maintaining the UDDT. In overall the participants reported that there was poor cascading of information from the person who received it to other members of the household.

There was a range of perspectives regarding the use of urine. A proportional number of the participants reported that they do not mind to have their urine collected and to be processed to a fertiliser (e.g. "I really do not mind to have my urine taken as long as I am not the one doing it", focus group discussion). However, less than 30% of the participants were not happy mostly because of their cultural and religious beliefs (e.g. "You will never know with people, I fear that they might take my urine and use it to bewitch me", focus group discussion).

The participants elaborated on a numbers of issues that hindered them from accepting the UDDT as a permanent asset of their household. The lack of acceptance was evident from the poor maintenance. One of the major challenges that were reported by users is the emptying when the toilet is full and the changing of vaults (e.g. "Tell me who likes to see their own faeces... I did it once and I could not eat the whole day", focus group discussion). The latter was a common reason that non-users did not even start to use the UDDT but rather used it as storage or bathing area. Of those who were not using the UDDT, their plans were to convert it to flush or septic tank systems and they were all using traditional pit toilets. The other discouraging factor that was reported was poor quality of material used in building the UDDT; as a result many of the UDDTs visited had a pedestal in disrepair (Figure 1) and/or missing or damaged door (Figure 2). Problems with the toilet door were the second most prevalent problem (see Table 1) in the quantitative survey by Roma et al. (2013). The issues with the pedestal did not feature strongly in the quantitative survey. However, a broken or poorly repaired pedestal can result in the UDDT failing to separate urine from faecal matter, rendering the vault contents moist and thus promoting odour. Issues



Figure 1: Poor maintenance pedestal.



Figure 2: Missing door.

associated with keeping vault contents dry and odour did feature as concerns in the quantitative survey (Table 1).

The shallowness of the vault was another negative aspect reported by the majority of the participants, which results to vaults filling up quickly and having to empty once every year. This will be interrogated further in an additional quantitative survey in April 2014.

4 DISCUSSION

Perceptions of UDDTs

The UDDT toilet does not appear to be a topic of community interest, since people reported that they did not know how their neighbours feel about or whether they maintain the UDDT. Symbolic interactionism theory emphasises that it is through interaction that meaning is created and sustained and influences are created. The younger generation appear to have greater acceptance of the toilet, possibly because these toilets were installed when they were very young and they grew up using these toilets. The older generation were less accepting of UDDTs and more focused on its disadvantages. It appears that they are more accustomed to sanitation alternatives and have not adapted to the new technology, which requires a change of mind-set. The quantitative survey by Roma et al. (2013) indicated that 14% of households still had a pit latrine on the premises, and 84% of these were still in use and a significant association between low satisfaction with UDDTs and the presence of a pit latrine was found.

Those who accepted the UDDTs in the focus groups appeared to be more informed about their benefits and confirmed the importance of education in promoting user acceptance. Many participants aspired to have a flush toilet mainly because they hold the perception that the UDDT was provided as a temporary measure and that an improved sanitation system is soon to be introduced to their community. These findings reveal a lack of understanding of the resources required to install flush toilets across

eThekweni and the feasibility of these systems in remote and hilly terrain. The health and hygiene education programme will aim to address these issues, while also highlighting the benefits of UDDTs, particularly in the context of water scarcity, which is likely to be exacerbated in the future due to predicted climate change.

Household members chose to locate the UDDT far from the house because they expected it to be odorous. The positioning of the toilet away from the house discouraged its use at night and discouraged the washing of hands as the yard tap was located at some distance. These issues will be addressed by the education programme to find ways together with the community on how they can achieve sufficient health and hygiene with the water and sanitation resources at their disposal despite their positioning. Concerns about odour suggest that the users were not fully informed about the UDDT technology, since if maintained properly, it is not likely to produce a bad smell. This is one of its benefits over traditional pit latrines. However, the quantitative survey by Roma et al. (2013) did reveal that poor maintenance rendered odour issues the most significant complaint (27%) about the UDDTs. Results confirmed an association between odour complaints and poor connection of the urine pipe when the pedestal was moved. Poor understanding of the maintenance and management of UDDTs was likely the result of only one household member receiving information on the UDDT at installation, with the assumption that this would be passed on to other household members. Furthermore, communities are dynamic and families have moved into homes in the region subsequent to the education programmes. Future health and hygiene education mechanisms developed on the basis of these findings will be conducted on the weekends to ensure that information reaches as many household members as possible. It is also recommended that these are repeated intermittently to keep the community informed.

Health and hygiene education programme

The findings revealed a clear need to disseminate information on the benefits of UDDTs and why this technology was chosen as the most appropriate for many of eThekweni's communities. It

was also very evident that children from 6 years are comfortably using UDDT and in most cases older children from 10 years play a role in maintaining the toilet within the household. Therefore the education programme must seek to reach all age groups in the community to ensure sustainability of the UDDT. The health and hygiene education programme developed will use three materials, namely leaflets, posters and comic booklets that were specifically informed by the findings of this particular study. The materials will address (1) how to use UDDT properly, (2) how to maintain UDDT properly, (3) the sanitation policies and future plans for the eThekweni municipality, (4) scarcity of water and tips on saving water, (5) importance of using the toilet and risks of open defecation, and (6) the importance of each UDDT item to encourage appropriate maintenance. Previous education was given during the day and within the working hours (8am-4pm) when many household members were not at home. The proposed household health and hygiene education programme will be implemented on weekends, while a further programme will be implemented on weekdays in schools to reach out to children. The programmes will be conducted by individuals with formal tertiary training and who will be carefully trained on the materials to be delivered, with regular refresher training. The household program will encourage residents to teach children from a potty training age how to use the UDDT to help instill the value of proper use and maintenance of the toilet for its sustainability as well as for improve health and hygiene within the household.

The areas visited had not been formally introduced to urine collection and the potential for urine to be converted to a fertiliser. Most participants heard about this during the interviews or focus groups, although some had heard people from other communities talking about this. Since it is through interaction that meaning is created and sustained, it is recommended that eThekweni addresses these issues across the region, providing sound information on urine collection approaches and its potential for fertiliser since incorrect information from within the community could ultimately influence acceptance of these practices.

It is clear from these results that a constant flow of information is important in encouraging the use and maintenance of the UDDTs and to keep people interested in the sanitation technology and its effective use. The constant consultation with the community will place sanitation institutions in a position to address issues as they arise on time. Moreover, the messages shared need to be standardised from national to local level to curb confusion and expectations that are not in line with the country's and the Municipality's future plans.

5 RECOMMENDATIONS

The eThekweni municipality continues installing UDDTs in the rural and peri-urban areas that are still lacking sanitation. Adapting to a new sanitation product is a process and how long it takes varies from one community to the next. EWS must continuously learn from communities and use that information to modify their strategies and interventions. The aim is that each community is continuously provided with health and hygiene education that they can identify with, to encourage the proper use and maintenance of the UDDT. Moreover, sanitation institutions can use health and hygiene education processes as channels that communities can use to report and communicate their concerns, aspirations and needs about water and sanitation in an environment that is not threatening. In this way the local, provincial and national government will be able to keep abreast with water and sanitation issues but most importantly to address issues timely and develop informed interventions. The collection and re-

use of urine is another issue that people will need education on before it can be introduced to their communities. Since education on this has been localised and information is disseminating across community boundaries, it is important that sound information from the local authority is provided and its benefits highlighted to promote acceptance of a sensitive issue. Finally it is recommended that EWS continues with large scale quantitative surveys and in-depth interviews to gauge community perceptions of UDDTs and changes in these perceptions over time. Another quantitative survey is to be launched in April 2014 to assess such changes since the 2011 survey and to interrogate perceptions of a vault cleaning service.

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