Investigating the dynamic interactions between supply and demand for rural sanitation, Malawi

Ben Cole, John Pinfold, Goen Ho and Martin Anda

ABSTRACT

Formative market research is the first step in developing evidence-based sanitation marketing programs. In Malawi, the design, implementation and evaluation of rural sanitation marketing programs has been limited. This study applied a mixed methodological approach to examine the dynamic interactions between the supply and demand of sanitation in three rural districts. The supply assessment identified an extremely limited range of latrine options. Sanitation suppliers reported very low household demand for their existing latrine options. An additional constraint reported by suppliers was householders’ perception of a hardware subsidy for latrine construction. The demand assessment found a key constraint of constructing an unlined pit latrine was their short time-in-use (11–13 months). Householders expressed despondency at having to consistently rebuild collapsed, unlined pit latrines. For brick-lined latrines, a key barrier was affordability combined with an over-estimation of construction costs. Key motivations to construct brick-lined latrines included product attributes and social drivers. Wide variations in access to income and use of micro-finance organizations were recorded within and across the study sites. Formative market research is an iterative process from which new lines of investigation arise. This study provides information that will provide a foundation for the ongoing research, design, implementation and monitoring of rural sanitation marketing programs in Malawi.

Key words | constraints, financing, motivators, sanitation, social marketing

INTRODUCTION

Top-down, supply-led approaches to sanitation programs have failed to generate sustained improvements in sanitation coverage in countries with developing economies (Cairncross 2004; Jenkins & Sugden 2006). In response, a growing consensus has developed amongst donor agencies, development organizations and governments to engage the local community to generate demand for sanitation (IWA 2008; Murray & Ray 2010). Two common approaches to support community engagement and generate demand for sanitation are; community-led total sanitation (CLTS) (Chambers 2009) and sanitation marketing (Cairncross 2004; Jenkins 2010).

In comparison to other sub-Saharan countries, Malawi has a relatively low rate of open defecation in rural districts with approximately 1 in 10 households (11%) open defecating (NSO & ICF Macro 2010; WHO & UNICEF 2010). In rural districts, basic sanitation has been reported to range from 32 to 82%, while improved sanitation ranges from 7 to 57% (NSO & ICF Macro 2010; WHO & UNICEF 2010). The Government of Malawi (GoM 2008) has recognized more progress is required to overcome the disparities in sanitation coverage across rural districts. Malawi’s National Sanitation Policy (GoM 2008) and the recent National Open Defecation Free Strategy by 2015 (MoAIWD 2011) identify CLTS and sanitation marketing as the key approaches to improve rural sanitation coverage. A national program for CLTS has been implemented in 12 rural districts (Maulit & Kang 2011). In contrast, there have been fewer attempts at sanitation marketing in rural districts and there is a lack of cohesion and capacity in rural sanitation marketing programs in Malawi (DeGabriele 2009).
Sanitation marketing programs apply social and commercial marketing techniques to generate household demand, matched with adequate and appropriate supply within a supportive policy environment (Cairncross 2004; Jenkins 2010). Over the last decade, government and non-government organizations have partnered with private sector, academia and civil society organizations to implement rural sanitation marketing programs across Asia (Devine 2010; Sijbesma et al. 2010; Baker et al. 2011) and Africa (Jenkins & Curtis 2005; Jenkins & Scott 2007; Water and Sanitation Program (WSP) & PricewaterhouseCoopers 2008). The first-stage of evidence-based sanitation marketing programs is formative market research (Water and Sanitation Program (WSP) 2011). In sanitation marketing programs, formative market research attempts to identify the practices, perceptions and attitudes of householders, suppliers and government representatives towards the existing sanitation market (Jenkins 2010).

To date, there are limited published accounts of sanitation market research conducted in rural Malawi. The main aim of this study was to investigate the dynamic interactions between the supply and demand of sanitation in three rural districts. To achieve this aim the study’s objectives examine the supply and demand of rural sanitation through:

- Examining existing latrine options together with the practices and perceptions of sanitation suppliers.
- Identifying the constraints and motivations of householders to construct a latrine.

Examining the dynamic interactions between sanitation suppliers and householders can reveal important gaps in an existing sanitation market. Cairncross (2004) suggested that existing sanitation suppliers often fail to offer a range of latrine options and predominantly target only the wealthiest households. Lack of access to sanitation products that allow households to move up the sanitation ladder was identified as an important constraint in the evaluation of sanitation programs in Zimbabwe (Whaley & Webster 2011). In Asia, the development of innovative products and services was recognized as an important driver for increased demand for sanitation (Sijbesma et al. 2010; Baker et al. 2011). Understanding the relationship between existing latrine options, suppliers and householders provides a foundation for the development of evidence-based sanitation marketing programs.

Understanding the motivations, opportunities and abilities of householders to purchase/construct a latrine provides insights into the determinants of demand in a sanitation market (Jenkins 2004). Motivation includes the social, physical and emotional drivers to own a latrine (Devine 2009). Jenkins & Curtis (2005) identified 11 behavioural drivers for latrine adoption in rural Benin. The 11 drivers were classified into three categories; prestige/status-related, well-being and situational goals. Research in Ghana demonstrated that households move through sequential decision-making phases prior to constructing a latrine (Jenkins & Scott 2007). In low-income communities the affordability of a sanitation option is an important determinant of demand. Socio-economic conditions such as level of education, family size, life stage and income have been associated with a household’s ownership of a latrine (Jenkins & Curtis 2005; O’Loughlin et al. 2006). Whaley & Webster (2011) found a household’s ability to afford a latrine was a significant barrier to construction in Zimbabwe. Formative research provides vital information on the determinants that can trigger or prevent demand in a sanitation market.

**SITE SELECTION**

The three rural districts chosen were Nkhata Bay, Dowa and Mangochi (Figure 1). Nkhata Bay and Mangochi were chosen due to their proximity to the lakeshore. Lakeshore districts, with sandy soils, were reported to have high rates of open defecation due to collapsing pit latrines. Dowa was selected to represent a district with clay/loamy soils. The next administrative level below the district is the traditional authority (TA). Within each TA, one group of villages was selected using the following criteria: more than 5 villages and/or population greater than 300 households and not more than 90 min drive from the central market place. Local government staff were asked to select a group of villages that represented typical population density and occupations in the TA.
METHODS

The research methodology was influenced by previous formative research conducted in Benin (Jenkins & Curtis 2005) and Ghana (Jenkins & Scott 2007). The research tools were predominantly derived from Jenkins (2010). The research instruments and tools were trialled and pre-tested for one-week prior to use. The study applied a mixed-methodology that utilized qualitative and quantitative methods to investigate the existing market for sanitation. Three research tools were used: in-depth interview, focus group discussion (FGD) and a close-ended, pre-coded questionnaire survey.

Table 1 shows in-depth interviews were conducted with: (1) household heads and (2) sanitation suppliers. For each group a discussion guide was pre-tested and revised. If an issue was consistently reported by participants (i.e. the topic had reached saturation) the interviewer introduced new topics of discussion. Household participants were selected by purposive convenience sampling to represent male and female head of households with no latrine, different latrine types and to capture a range of ages and occupations in the group of villages (Jenkins & Curtis 2005). Supplier participants were purposively sampled by requesting the village chief and local health worker to identify between four to six masons that had constructed a latrine in the last 12 months. The first author was introduced to the household and supplier participants by a local Health Surveillance Assistant (HSA). Manifest content analysis was conducted on each transcript as described by Graneheim & Lundham (2004) using NVivo software 9.

In-depth interviews were conducted by the first author with a translator. Interviews were conducted in Chichewa or the local dialect. All interviews were recorded and transcribed to English by an independent translator. Additional interviews were conducted by two local environmental health officers (EHOs). The EHOs were trained for one-day prior to commencing the interviews. The training covered the intent of the research, ethics and discussion guides.

Gender segregated FGD were conducted at each study site. The participants were identified through informal discussions with the village chief and local HSAs. The participants were selected to include households with and without latrines and with a wide range of age groups (18–68 yrs). Food and drink was provided during the discussions. The key themes and statements were recorded by an independent translator and scribe. Key statements from the transcript were coded into themes (Catterall & MacLaren 1997).

Three local surveyors were trained for one day in the delivery of the questionnaire survey and recording of

Table 1 | Number of in-depth interviews recorded and transcribed

<table>
<thead>
<tr>
<th>Household heads</th>
<th>No latrine</th>
<th>With latrine</th>
<th>Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Dowa</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Nkhata Bay</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Mangochi</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Totals – female</td>
<td>7</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Totals – male</td>
<td>4</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Totals</td>
<td>11</td>
<td>19</td>
<td>14</td>
</tr>
</tbody>
</table>
pre-coded answers. The surveyors included local HSAs and assistant environmental health officers (aEHOs). The surveyors were instructed to move in different directions (North, East, South or West) from a random point in the village. Householders were selected randomly by each surveyor randomly counting the ‘N’th house from the starting point. The ‘N’ being identified as the last digit on a randomly chosen bank note in the surveyor’s purse or wallet. A total of 221 households were surveyed. Frequencies, means and standard errors were calculated for each question and compared across study sites using PASWStatistics v18.0.

One-day participatory workshops were conducted with the local EHO, aEHO and HSAs at each study site. The participatory workshops were used to collate, debate and synthesize the findings of the research. The participatory workshops followed the structure outlined by Jenkins (2010 p. 88).

Ethical considerations

Murdoch University’s human ethics committee approved the research. All participants were informed of their right to not participate in the research. The participants were informed that all comments would be recorded anonymously. The outcomes of the research were described and discussed with all participants. The research tools did not encourage or promote any specific sanitation options or promote any specific set of responses.

Limitations

Geographical coverage

Malawi consists of 28 districts. This study examined only three districts. The study sites were selected to focus on sandy soils. It is recognized that within each district there is wide variation in socio-economic, cultural and environmental conditions. For example, in Dowa the study site was located in the eastern region of the district. The eastern region does not grow tobacco, whereas the western region is a large supplier of tobacco. Growing and selling tobacco would have a substantial impact on the socio-economic condition of the households. It is important that the findings of this study are interpreted in the context of their limited geographical coverage.

Reliability

The structured survey, in-depth interviews and FGD guides were all pre-tested and revised. Logistical and financial constraints determined the sample sizes for the structured survey ($n=221$). The moderate size of the sample reduces the statistical power and hence the level of confidence that can be placed on the findings. There is also the risk of clustering in each village, whereby results for one village are influenced by each other and therefore should be regarded as only one data point. In-depth interviews were conducted until saturation was attained i.e. no new topics of discussion were introduced during additional interviews. The FGD were used to validate the key findings from the in-depth interviews.

Recall and interviewer bias

The householders were asked to recall their previous purchasing habits of latrines. In some cases, the purchase had occurred up to eight years prior to the survey. This presents some risk of householders being unable to recall the exact conditions at the time of constructing their latrine. District-government staff, an international researcher and a translator conducted the interviews. The presence of ‘outsiders’ may have influenced the response of householders. It was attempted to overcome this influence by providing a clear briefing to the village chief prior to the research team arriving at the village. The briefing stressed that the team was conducting formative research and it was not a prelude to a sanitation program commencing in their village. The importance of honesty was also stressed to all householders prior to conducting the interviews and group discussions.

The use of EHO, aEHO and HSA as interview staff presented a risk of insider bias. The risk of insider bias was reduced using; (a) researcher bracketing, (b) triangulation and (c) member checking (described by Teddlie & Tashakkori 2009, pp. 208–213).

Researcher bracketing: Existing biases and pre-conceptions were discussed during the one-day training sessions with EHOs, aEHOs and HSAs.
**Triangulation:** Findings of the EHOs were triangulated with the findings of the first author during a one-day workshop in each district.

**Member checking:** Prior to leaving each district, the findings were presented, discussed and verified/refuted through discussions with assistants to the village chief.

Insider bias was a potential risk in the FGD as the village chief and HSA selected the participants. This risk was minimized through discussing topics that had been captured during the one-to-one interviews. This allowed the research team to triangulate findings between the interviews and FGDs.

**RESULTS AND DISCUSSION**

**Supply assessment**

Existing latrine options represent extremes in cost and durability

The study found an extremely limited range of latrine options was available at each of the three study sites (Figure 2). In the sandy soil sites, only three options were identified. In clay soils, only two options were identified. In study sites with sandy soils (Mangochi and Nkhata Bay), temporary latrines were predominantly unlined pits (hereafter ‘unlined’) or pits lined with a woven basket frame (hereafter ‘nkhokwe-lined’). Circular pits were dug to a depth of 2–3 m and width of 1–1.5 m. The pits had no supporting structure around the collar of the pit. Slabs were constructed using local wood and smeared with clay. Nkhokwe were assembled using local trees and reeds and are scaled-down models of cages used to store maize (see Photo 1). In Mangochi and Nkhata Bay, brick-lined latrines had a rectangular pit with a depth of 2–3 m and width of 1–1.5 m. The walls were brick-lined with cement mortar. A cement slab was placed across the brick collar of the pit to create the floor of the latrine.

In Dowa, with clay soils, two types of latrines were observed. The first type, referred to as temporary, had a rectangular, clay-based unlined pit (3 m depth, 1 m width) and wood slab, which was prone to termite attack and rotting. The permanent latrine type also had a rectangular, clay-based unlined pit (3 m depth, 1 m width) but this was accompanied with a cement or stone slab. These slabs are resistant to termite attack and are impermeable to water. The stone slabs were sourced from hills surrounding the villages. These findings demonstrate the role of the surrounding environment, particularly its soil structure and availability of local building materials, to dictate the availability and type of existing latrine options in the three rural sites.

The estimated time-in-use of a latrine was determined by asking the household two distinct questions in the
structured survey. The first question asked the household to recall the time since installing the latrine (in months), the second question asked the household to predict the length of time the latrine would remain in use (in months). The estimated time-in-use was calculated through the addition of these two questions and provides a measure of the household's actual and perceived use of their latrine.

Clear distinctions were found between the estimated time-in-use of unlined pit latrines based on the soil substrate (Table 2). In Dowa, with clay soils, pit latrines with unlined pits were reported to have an average time-in-use (49 months) that was approximately four times the average time-in-use of unlined pits in Mangochi (11 months) and Nkhata Bay (13 months). Future sanitation programs would need to recognize that the development and promotion of pit linings in areas with clay soils may be redundant. Alternatively, in rural districts with sandy soils, the introduction of affordable pit linings that align with householders’ preferences and needs should be a priority in future sanitation marketing programs.

Householders in Mangochi that owned nkhokwe-lined or brick-lined latrines reported significantly higher costs of construction in comparison to Nkhata Bay householders (Table 2). Construction cost was calculated by summing the external labour (internal or family labour costs were not included) and building material costs reported by the head of each household. Mangochi households reported up to 20 times higher costs than those in Nkhata Bay.

In regard to brick-lined pits, the higher average costs in Mangochi may be the result of the construction of high-quality, high-priced latrines. Interviews with suppliers in Mangochi found they were capable of constructing sophisticated 'wet' and flushing latrine options including pour flush, cistern flush latrines and double-septic tanks. Mangochi residents are predominantly Muslim. Previous sanitation studies have reported a strong preference for flush latrines in Muslim communities (Nawab et al. 2006). Future sanitation marketing programs should remain aware of the impact of religious and cultural norms upon the supply and demand for specific latrine options.

The use of nkhokwe-lined pits demonstrates that some product innovation has occurred to overcome the challenge of collapsing pits in sandy soils. Figure 3 illustrates that nkhokwe-lined pits act as an intermediate step between unlined pits and brick-lined pits in cost and estimated time-in-use. The use of nkhokwe was significantly higher in Mangochi (46%) than Nkhata Bay (10%). The time-in-use of nkhokwe-lined pits in Nkhata Bay (32±33 months) exhibited a standard deviation double that of Mangochi (28±15 months). The higher standard deviation suggests a higher variability in time-in-use at the Nkhata Bay study site. High variability in time-in-use could result in the dissemination of negative customer reviews of nkhokwe, which could adversely impact uptake rates. The higher usage rates of nkhokwe in Mangochi may be due to; more effective demand creation, effective

### Table 2 | Average cost and estimated time-in-use of latrine options

<table>
<thead>
<tr>
<th>District/Soil type</th>
<th>Building materials</th>
<th>Construction cost (MKW)* ± S.D.</th>
<th>Time-in-use (months) ± S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dowa/Clay</td>
<td>Unlined pit, wood slab, grass walls and roof (n=37)</td>
<td>180±500</td>
<td>49±50</td>
</tr>
<tr>
<td></td>
<td>Unlined pit, cement/brick slab, brick walls and grass roof (n=21)</td>
<td>420±1,200</td>
<td>88±37</td>
</tr>
<tr>
<td>Mangochi/Sandy</td>
<td>Unlined pit, wood slab, grass walls and roof (n=18)</td>
<td>No costs reported by householders</td>
<td>11±13</td>
</tr>
<tr>
<td></td>
<td>Nkhokwe pit lining, wood slab, grass walls and roof (n=25)</td>
<td>4,000±700</td>
<td>28±15</td>
</tr>
<tr>
<td></td>
<td>Brick lined pit, cement/brick slab, brick walls and grass roof (n=11)</td>
<td>9,200±2,800</td>
<td>85±53</td>
</tr>
<tr>
<td>Nkhata Bay/Sandy</td>
<td>Unlined pit, stone/cement slab, clay walls and grass roof (n=77)</td>
<td>170±500</td>
<td>13±21</td>
</tr>
<tr>
<td></td>
<td>Nkhokwe pit lining, wood slab, grass walls and roof (n=8)</td>
<td>610±1,300</td>
<td>32±33</td>
</tr>
<tr>
<td></td>
<td>Brick lined pit, cement/brick slab, brick walls and grass roof (n=17)</td>
<td>820±1,800</td>
<td>51±79</td>
</tr>
</tbody>
</table>

*1 USD was equivalent to 150 MKW during data collection.
and responsive supply chain and strong religious and social drivers towards the use of nkhokwe-lined pit latrines.

Mangochi householders reported paying more than six times the construction costs for nkhokwe-lined pits in comparison to Nkhata Bay householders. The higher costs in Mangochi (Table 2) may be the result of inadequate wood supplies resulting in higher costs for construction and transportation fees. Very few trees were observed in the vicinity of the Mangochi study site. In contrast, the Nkhata Bay study site had abundant and varied tree coverage. Further exploration of the perceptions, attitudes and awareness of nkhokwe-lined pits in other lakeside districts would generate important information that could inform the design of new pit-lining options in sandy soils. This information would provide product designers with a stronger understanding of how householders’ perceive and disseminate the attributes of desirable sanitation products.

**Existing sanitation suppliers are constrained by inadequate products and hardware-subsidy programs**

Strong commonalities were found in the training, marketing practices and business models of sanitation suppliers across the three districts. Twelve of the 14 (85%) suppliers had not received any formal training in constructing latrines. The two formally trained suppliers had been trained by a local non-government organization and a training centre located in Blantyre city. All suppliers stated they did not engage in any formal marketing activities but rather waited for customers to approach them. ‘I let my hands speak on my behalf’ (Supplier, male, 33 years, Dowa). The majority of suppliers (10 of 14) stated they did not supply building materials for the construction of latrines. Households were responsible for the collection and payment of building materials prior to the supplier arriving on the construction site.

Existing suppliers reported that sanitation-related business represents a low proportion (10–15%) of their annual income and workload. Suppliers of brick-lined pit-latrines reported their main business activities were the construction of houses and community buildings. Suppliers of nkhokwe pit linings reported farming and labouring as their main form of income generation. Suppliers of brick-lined latrines reported two main constraints to the growth of their sanitation-related business. The first was they were unable to provide latrine options that matched their customers’ preferences, needs and expectations of cost. ‘People are willing, they all come and ask me, but the price is too high and they don’t come back’ (Supplier, male, 45 years, Nkhata Bay). The application of sanitation marketing programs could potentially overcome the mismatch between existing supply and demand. Costs for latrines could potentially be reduced through identifying lower-cost materials or manufacturing approaches via human-centred, participatory, lead-user or emphatic design approaches (Steen et al. 2007). Reduced or delayed payment options via microfinance options or alternative business models for suppliers could also address the price disincentive. These approaches could be developed through subsequent design and implementation of an integrated sanitation marketing program.

The second constraint for sanitation suppliers was the expectation of householders to receive a hardware subsidy to construct a latrine. Householders consistently reported the expectation that hardware subsidies for latrines would return to their village. The suppliers reported the householders’ expectation of free hardware created a disincentive to commit their own income towards constructing a latrine. ‘Villagers keep coming to me and asking “when do I get my free saniplat?”’ No-one has informed them that this program is finished and they don’t believe me’ (Supplier, male, 56 years, Nkhata Bay). This finding aligns with the evaluation of a sanitation marketing pilot program in

![Figure 3](https://iwaponline.com/washdev/article-pdf/2/4/266/384571/266.pdf)
Cambodia where hardware subsidies programs were reported to constrain householder demand and market growth (Baker et al. 2011).

**Existing supply is male dominated**

Only male suppliers of latrines were identified in the three study sites. It was identified that women do not engage in digging latrines as the activity is similar to digging a grave. EHOs reported that cultural norms dictate that only men can dig a grave for an adult. Alongside these cultural considerations, the majority of female interviewees in Nkhata Bay and Dowa expressed an interest in constructing latrines, supplying latrine-related materials and marketing of latrines. ‘Don’t you forget about us, we can also be involved in supplying latrines. Why not? We can run our own business, so why not this one?’

(Female, 42 years, Dowa). This position was supported during the male discussion groups in Nkhata Bay and Dowa. ‘Women are usually responsible for building more than 70% of the home. I see no reason why they couldn’t construct a latrine’ (Male, 55 years, Nkhata Bay). Further investigations should clarify how women’s awareness in sanitation combined with their building and business capabilities could be harnessed in the development of the sanitation market.

**Demand assessment**

**Key constraint to construct an unlined and nkhokwe-lined latrine is their poor durability**

During the interviews and FGD, three sub-themes were identified in relation to the poor durability of unlined and nkhokwe-lined latrines. They were; existing latrine options had failed them, fear of children using unlined latrines and inability to construct latrines during the rainy season.

**Existing latrine options have failed them**

In districts with sandy soils (Mangochi and Nkhata Bay), unlined and nkhokwe-lined latrines were observed to collapse in two ways; (a) total collapse of the internal pit or (b) shifting of the slab. Households reported that groundwater intrusion during the wet season was the reason for the total collapse of the internal pit. Shifting of the slab was reported to occur when surface water ran into the latrine during the rainy season. Poor design of the latrines was an important factor in the collapse of the pit and/or shifting of the slab. Masons reported that shifting of the slab could be dramatically reduced through installation of a watertight roof. ‘The duration depends on how you prepare the roof. If the roof doesn’t leak then it can last a long time. If no plastic, then it can leak and the floor and wall will not last’ (Mason, 42 years, Nkhata Bay). An examination of the efficacy of existing roofing options may identify a cheap, simple solution that would align with the house-holders’ preference for longer-lasting latrines.

The questionnaire survey identified that 28% of households (62 of 221) did not own a latrine. In-depth interviews with householders without latrines identified the overwhelming majority (10 of 11) of households had previously owned a latrine. These households reported their previous latrine had collapsed in sandy soils or was destroyed by termites. Further probing with households identified a consistent theme of despondency about existing latrine options and their durability. ‘I just want to take a rest from always digging a pit. Maybe I’m just lazy but it takes a lot of time and I have to borrow tools each time. But if you wait too long you feel like something is lacking in you’ (Male, 35 years, Nkhata Bay). ‘We are tired of rebuilding, we just dig and it collapses time and time again during the rainy season’ (Female, 47, Mangochi). ‘The wood rots and then I have to find time to collect wood. The strong wood is becoming harder to find and I have to travel a long way to collect it’ (FGD, male, Dowa). Developing latrine options that overcome the collapse of pits, shifting of slabs or destruction by termites could act to re-ignite household demand for sanitation.

Existing unlined and nkhokwe-lined latrine options are failing to match the expectations and needs of their owners, which in turn, result in low willingness to rebuild the latrine. These findings are consistent with Whaley & Webster (2011) who found Zimbabwean households with temporary latrines were unwilling to rebuild a collapsed latrine. Underperforming products have a significantly reduced likelihood of re-purchase by consumers (Oliver 2010). Figure 4 applies Jenkins & Scott’s (2007) conceptual model to represent the ‘delay’ in a householder’s choice to
re-construct an unlined or nkhokwe-lined pit latrine. Product innovation has the potential to break the negative feedback loop through developing sanitation options that prevent the latrine from collapsing.

Fear of existing latrine options
Another significant barrier to building an unlined or nkhokwe-lined pit latrine was the perceived risk they posed to young children. Householders told numerous anecdotal stories about children falling into collapsed pits. A number of parents and guardians stated they would prefer to have no latrine over a latrine that presented a risk to their children. Householders reported preventing children up to the age of 10 from using a basic latrine. ‘We don’t let our children go near the latrine. I always worry about them playing near the latrine and falling inside’ (Female, 56 years, Mangochi). This finding supports Devine (2009) assertion that ‘threat’ is a behavioural determinant of the use of latrines for children, and indeed adults. Habit building during childhood is essential in developing long-term attitudes and practices towards hygiene-related practices (Curtis et al. 2009). Challenging the fear of children using latrines, through product innovation and marketing, has the potential to support life-long habitual use of latrines.

Unable to re-build basic latrines during the rainy season
The rainy season presents the most significant risk of collapse for unlined and nkhokwe-lined pit latrines. During heavy rainfall, the soil becomes wet, resulting in pit walls becoming heavy and mobile. The heavy and mobile walls cause the pit to collapse, displace the slab and encourage rotting of wood foundations and slabs. Households reported that during the rainy season (December–March) they often revert to open defecation and do not rebuild their latrine until the dry season returns (April–May). ‘There is no alternative during the rainy season to go outside due to condition of soil and rainfall’ (FGD, female, Dowa).

Local health workers stated that diarrhoea and cholera outbreaks occurred predominantly during the rainy season. Householders reported returning to the practice of open defecation during the rainy season after their latrines collapsed. The movement of rain over exposed human faeces is a potential pathway for faecal-oral contamination. The collapse of unlined or nkhokwe-lined pit latrines during the rainy season raises questions about their efficacy in reducing the risk of diarrhoeal disease and cholera outbreaks. If this concern is valid, this raises further questions on the public health impacts of sanitation programs that focus on the construction of unlined or nkhokwe-lined sanitation options.

Product attributes and social drivers are key motivators to construct a brick-lined pit latrine
Householders reported product attributes and social drivers were important motivators to construct a brick-lined pit latrine.

Product attributes
Formative market research can identify the product attributes that are most important to the target audience (Devine 2009). The questionnaire survey found cleanliness was the most commonly stated advantage of owning a latrine. In-depth interviews unpacked the term ‘cleanliness’ and found it related to an overall reduction in the effort to maintain and operate a latrine. The reduced operation and maintenance included the ability to wash the slab clean. ‘The inside must be cement to allow for easy and fast
cleaning’ (Female, Mangochi, 45 years). The second component to reduced operation and maintenance was not rebuilding a temporary latrine every year. ‘Building a latrine each year is so much work. We had to collect grass, wood and then dig the pit. And I had to cook for the men and collect water. It was hard work, but now we have a good latrine and I don’t have to worry about any of that’ (Female, 62 years, Nkhata Bay).

Social drivers
A strong and dominant motivation reported by householders to construct a brick-lined pit latrine was the internal and external perception of their surrounding community. The internal perception was related to their perceived standing amongst other members of their village. ‘I can be proud of my latrine. A good latrine shows you are a good member of the community’ (Male, 54 years, Mangochi). The second was inter-village i.e. to improve their standing when guests from other villages or districts came to visit their home. ‘People know you have a latrine, so when people come and visit, you can relax’ (Male, 49, Dowa).

A minority of householders (3 of 30) argued that spending money on a latrine was ineffectual in improving their perceived position within the community. They argued motorcycles, mobile phones or watches were more effective status symbols. These status symbols could be used or worn outside of the village (unlike a latrine which is immobile) and therefore have a wider impact on a householder’s social status.

Privacy
A consistent motivation for a brick-lined pit latrine was privacy. The theme of privacy was predominant in all interviews and discussions with female householders. Privacy was related to protecting themselves from being disturbed by men, children and animals when using the latrine. Male householders identified privacy as a key issue to protect the dignity of their wife and other female members of the household.

Householders’ over-estimate costs of improved latrines

This study supports Cairncross (2004) assertion that householders ‘may underestimate the benefits and overestimate the cost of sanitation’. Interviews and discussions with householders identified the high expectation of costs were related to the expectation that cement must be used to construct their ‘ideal’ latrine. Householders had an expectation of between 50–100 kg of cement would be required to build a cement slab. This amount of concrete is six times more than that required in low-cost slab designs (GRET & IDE Cambodia 2010). DeGabriele (2009) further questions the central focus of cement in latrine construction and states that international donors and government agencies are moving away from the mind-set that only cement can be used to produce an impermeable slab. The change in the Government’s mindset is displayed in Malawi’s National Sanitation Policy which defines ‘improved’ sanitation as requiring an ‘impermeable floor’ (GoM 2008). In support of this shift away from cement, the research observed local materials such as smeared and polished mud were found to seal latrine floors and slabs. The application of local materials and building practices in combination with product development and marketing strategies could overcome the misconceptions of the necessity, and amount of, cement required to construct permanent latrines.

Analysis found that householders’ expectation of high costs associated with brick-lined latrines was not justified. The results in Figure 5 were calculated from data collated in the structured survey (n=159), using the formula:

\[
\text{Cost per year} = \frac{\text{Total cost of latrine (materials+labour)}}{\text{Estimated time-in-use}}
\]

Figure 5 illustrates that costs per year of brick-lined pit latrines were similar or less than the costs for unlined or...
nkholwe-lined latrines. The costs of unlined or nkholwe-lined latrines would be substantially higher as the formula does not account for the loss of income due to time spent re-building the latrines, cost of food for workers or inflation. This suggests that implementing sanitation marketing programs that support households to purchase brick-lined latrines would deliver long-term cost savings to householders. However, the high costs of existing brick-lined latrine options and the requirement for bulk repayment options would continue to act as a barrier to low-income households. Low-income households often have insecure and irregular access to cash and are unable to afford large capital expenditures. Future sanitation marketing programs must remain cognisant of the timing and access to income or finance for low-income households. Sources of income and finance would include their occupation, finance from relatives/friends/neighbours, ceremonial money and awareness/willingness to use micro-finance institutions (MFIs).

**Income, occupation and access to micro-finance institutions (MFIs)**

This study identified a significant association between overall household spending and latrine ownership. Household spending was regarded as a proxy measure of household income. Figure 6 shows households without latrines, with unlined or with nkholwe-lined latrines reported lower levels of spending in the two weeks prior to the survey than households with brick-lined latrines. The level of reported spending is potentially biased through participant recall and influenced by the interviewer's presence in the home. However, the consistent nature of the association suggests that households with a higher income are more likely to invest in brick-lined latrine options. The design of low-cost latrine options that are affordable for low-income households whilst meeting their preferences and needs will be essential to gain wide improvements in sanitation coverage across the study sites.

As income was associated with latrine ownership it was important to understand the sources of income. The occupation of the female and male household head impacted upon the consistency and level of income. The three main occupation groups were farmers, fishermen and small business people. Farming households stated their income was focused around prevailing climatic conditions. Access to income was highest after harvest. For maize crops, Malawi's largest crop, the harvest occurs from May to July. In comparison to farmers, fishing households reported a relatively consistent income throughout the year. Fishermen reported a decrease in their ability to catch fish and a corresponding drop in income during periods of high winds, from June to August. Small business people reported a relatively consistent income throughout the year. The majority of small businesses were run by women and involved trading local and imported goods at local markets. ‘I buy fish and then take these to the market, I then return with some soap and I hope to sell this at our village. Each time I make a little profit, not much, but it is enough to survive’ (Female discussion group, Nkhata Bay). ‘Women will travel together to the market. They will often carry goods to trade and then bring things back to sell or trade with others in the village. Some of them are very successful, they can make a strong profit if they know how to sell’ (Male discussion group, Dowa).

Access to finance offers an alternative source of income into a household. Awareness and access to MFIs was highly variable between the three study sites. Householders in Nkhata Bay expressed the highest awareness and use of MFIs (including Opportunity International Bank of Malawi and National Banking Service). In Nkhata Bay, it was reported that women were predominantly responsible for taking and servicing loans. ‘Most of the people getting loans are women and that is causing no problems in the home or families’ (HSA, 30 years, Nkhata Bay). In contrast, householders in Dowa had limited experience with MFIs. Experiences of village saving groups were mentioned but
criticized for their high interest rates. ‘The local saving group is too expensive, they charge high interest rates, you have to pay 50% interest’ (FGD, women, Dowa). In Mangochi, very low awareness of MFIs was expressed; this was accompanied with no interest in accepting loans. ‘We don’t take loans from banks here, I would prefer to save’ (FGD, male, Mangochi). Future sanitation marketing programs would need to be tailored to account for the wide variability in awareness, access and acceptance to MFIs in rural districts.

CONCLUSION

Overall, the research indicates the three study sites offer fertile environments to apply sanitation marketing approaches to improve sanitation coverage. The research demonstrates that demand for latrines is currently not matched with the supply of affordable nor desirable sanitation products or services. The development of affordable latrine options that respond to the households’ preferences and needs could act to re-stimulate demand. On the supply side, the development of locally-sustainable business models will be required to ensure sanitation suppliers are motivated and engaged to match the demand for affordable and desirable latrines.

Cultivating demand whilst matching it with adequate supply will require the design, testing and refinement of an integrated sanitation marketing program. A simple and rigorous monitoring system must accompany future sanitation marketing programs. The monitoring system would allow practitioners and policy-makers to make evidence-based decisions to refine and adapt rural sanitation marketing approaches in Malawi.

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