Sanitation Marketing Toolkit

Study Design and Questionnaire Tips:
Things to Consider When Designing Quantitative Surveys and Questionnaires to Better Measure, Define and Understand Sanitation Behaviors

PROVIDING GUIDANCE TO RESEARCHERS IN THE DEVELOPMENT OF SANITATION SURVEYS

The purpose of this document is to provide guidance for project managers and researchers in the design, analysis and presentation of data from formative research studies to investigate sanitation behavior. It focuses on resources that are available to help develop research objectives and determine sample sizes for quantitative research. The document presents core behavioral indicators that are most relevant for measuring sanitation behavior in the context of intervention strategies, and considers appropriate target groups to administer questionnaires to. The document also presents background information on the Water and Sanitation Program (WSP) behavior change framework, SaniFOAM, and addresses how factors in the framework can be measured with multi-item scales, what these are, and why they are included in questionnaires. Additional questions and considerations are provided to help ensure questionnaires and analysis measure appropriate behavior change factors. The document also discusses the rationale and use of segmentation analysis, how results can be presented and findings interpreted, as well as important considerations for questionnaire and sampling designs. Finally, measurement guidance includes information on selecting the right outcomes for segmentation, and identifying and measuring the right determinants.

More detailed guidance on sample questions and multi-item scales is provided in the prototype questionnaire document.

BEFORE YOU START: IMPORTANT DOCUMENTS AND INDICATORS TO REVIEW

The WHO/UNICEF Joint Monitoring Program (JMP) provides estimates of sanitation coverage across countries and over time, and provides information on proportions of households that use unimproved, improved latrine or/and shared latrines or have no latrine. An example of this information is provided in Figure 1.

When designing your survey objectives, a good starting point would be to review these JMP statistics for your country. This information will help to design appropriate survey objectives and methods, and assist with sample size calculations for quantitative research. Latrine ownership rates may also be useful to help determine what type of survey method (qualitative or quantitative) should be used. Examples of how this information may serve to inform study objectives and methods are provided in Box 1.

FIGURE 1: EXAMPLE OF JMP REPORTING

Country, area or territory	Year	Population (x 1000)	Percentage urban population	USE OF SANITATION FACILITIES (percentage of population)												Proportion of the 2011 population that gained access since 1995 (%)
				URBAN				RURAL				NATIONAL				
				Improved	Unimproved			Improved	Unimproved			Improved	Unimproved			
					Shared	Unimproved	Open defecation		Shared	Unimproved	Open defecation		Shared	Unimproved	Open defecation	
Hungary	1990	10 376	66	100	0	0	0	100	0	0	0	100	0	0	0	NA*
	2000	10 211	65	100	0	0	0	100	0	0	0	100	0	0	0	
	2011	9 966	69	100	0	0	0	100	0	0	0	100	0	0	0	
Iceland	1990	255	91	100	0	0	0	100	0	0	0	100	0	0	0	18
	2000	281	92	100	0	0	0	100	0	0	0	100	0	0	0	
	2011	324	94	100	0	0	0	100	0	0	0	100	0	0	0	
India	1990	873 785	26	50	17	5	28	7	1	2	90	18	5	3	74	19
	2000	1 053 898	28	54	18	6	22	14	3	4	79	25	7	5	63	
	2011	1 241 492	31	60	20	7	13	24	4	6	66	35	9	6	50	
Indonesia	1990	184 346	31	61	8	12	19	24	6	22	48	35	7	19	39	25
	2000	213 395	42	67	9	8	16	33	8	17	42	47	8	14	31	
	2011	242 326	51	73	10	3	14	44	11	10	35	59	10	7	24	
Iran (Islamic Republic of)	1990	54 871	56	84	–	16	0	76	–	23	1	81	–	18	1	33
	2000	65 342	64	91	–	9	0	85	–	14	1	89	–	10	1	
	2011	74 799	69	100	–	0	0	99	–	0	1	100	–	0	0	

Source: WHO/UNICEF 2013, page 22

BOX 1: USING HOUSEHOLD LATRINE OWNERSHIP DATA TO DESIGN YOUR SURVEY QUESTIONS: TWO HYPOTHETICAL COUNTRY EXAMPLES

Niger: The 2013 JMP data from Niger show that less than ten percent of rural households use a toilet facility; 4% use improved latrines, 3% use an unimproved latrines and 2% share a facility. The remaining 91% have no toilet facility and are classified as open defecators. In this example, designing a survey to understand reasons for using a latrine or making latrine upgrades may have less programmatic relevance, given that only one in ten households actually have a latrine. In this instance, latrine access and availability are key barriers to use. As such, research objectives may be more relevant if they focus on reasons as to why household do not own latrines and what are the barriers to latrine acquisition, rather than focusing the study objectives on barriers to latrine use.

Indonesia: Data from Indonesia show that 44% of households have an improved latrine facility, 10% have unimproved facilities, 11% share a toilet facility and 35% have no facility (open defecation). In this context, it makes more sense to design research studies and questions to address barriers towards latrine use, and probe into motivations for upgrades given variation in household ownership and behaviors. Barriers to latrine acquisition are also of relevance in this context given that one in three are open defecators.

Tips:

- Reviewing the UNICEF/WHO JMP statistics is a first step in the research design process, and will help to inform sample size calculations and developing research objectives. However, other documents can also be utilized to help inform your research objectives. Review your countries latest Demographic and Health Survey (DHS), which will provide additional detail on the specific type of latrine owner by households (e.g., flush/pour flush to piped sewer system, flush/pour flush to septic tank, flush/pour flush to pit latrine, ventilated improved pit (VIP) latrine, etc.). The DHS will also provide indicators on latrine ownership (improved, unimproved, shared and no latrine [open defecation]). See Figure 2 for an example of this indicator from Bangladesh.
- Review other sanitation research that may be relevant to the country or context that you are conducting your research in. This may include peer-reviewed manuscripts, which can be accessed through PubMed, or other grey literature available through the internet.

FIGURE 2: EXAMPLE DHS INDICATOR: HOUSEHOLD SANITATION FACILITIES, BANGLADESH 2011

Table 2.2 Household sanitation facilities

Percent distribution of households and de jure population by type of toilet/latrine facilities, according to residence, Bangladesh 2011

Type of toilet/latrine facility	Households			Population		
	Urban	Rural	Total	Urban	Rural	Total
Improved, not shared facility	39.6	31.7	33.7	43.3	34.4	36.6
Flush/pour flush to piped sewer system	6.5	0.1	1.7	6.8	0.1	1.8
Flush/pour flush to septic tank	12.7	3.1	5.6	13.5	3.7	6.1
Flush/pour flush to pit latrine	0.9	0.5	0.6	0.9	0.6	0.7
Ventilated improved pit (VIP) latrine	8.6	7.8	8.0	9.6	8.6	8.8
Pit latrine with slab	10.8	20.0	17.7	12.4	21.4	19.3
Composting toilet	0.0	0.0	0.0	0.0	0.0	0.0
Shared facility[1]	25.6	16.7	18.9	22.3	14.9	16.7
Flush/pour flush to piped sewer system	4.5	0.1	1.2	4.0	0.0	1.0
Flush/pour flush to septic tank	6.5	0.9	2.3	5.4	0.9	2.0
Flush/pour flush to pit latrine	0.8	0.3	0.4	0.7	0.3	0.4
Ventilated improved pit (VIP) latrine	6.0	3.8	4.4	5.2	3.5	3.9
Pit latrine with slab	7.7	11.6	10.6	7.1	10.2	9.4
Composting toilet	0.0	0.0	0.0	0.0	0.0	0.0
Non-improved facility	34.8	51.6	47.4	34.3	50.7	46.7
Flush/pour flush not to sewer/septic tank/pit latrine	18.1	0.1	4.6	17.4	0.1	4.3
Pit latrine without slab/open pit	13.8	37.1	31.3	14.1	36.6	31.2
Hanging toilet/hanging latrine	2.0	8.6	6.9	1.9	8.8	7.1
No facility/bush/field	0.9	5.8	4.6	0.8	5.2	4.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Shared sanitation facility						
Not shared	54.5	62.2	60.3	59.7	66.2	64.6
Shared with						
1-4 households	25.6	33.9	31.8	23.0	30.2	28.5
5-9 households	11.7	3.3	5.4	10.0	2.9	4.6
10+ households	7.9	0.6	2.4	7.1	0.6	2.2
Don't know/missing	0.2	0.1	0.1	0.3	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number	4,305	12,836	17,141	19,158	59,752	78,909

[1] Shared facility of an otherwise improved type

Source: NIPORT et al. 2013, page 13

Take-away message: Rates of latrine ownership and open defecation should be used as a starting point when developing studies. Resources for this are available from the WHO/UNICEF JMP and DHS reports. For quantitative research this information will be particularly important to facilitate sample size calculations and ensure that the study is sufficiently powered to make comparisons between target groups (e.g., between improved and unimproved latrine owners). This information may also be useful for deciding whether or not qualitative or quantitative research is merited, which is discussed further in the data analysis and presentation of results section.

MEASURING BEHAVIOR: INCLUDING SURVEY QUESTIONS TO ADDRESS LATRINE COVERAGE AND USE

In this section, measurement of behavior is addressed. This will help to ensure appropriate and relevant behaviors are measured in survey questionnaires.

Household Latrine Ownership

Understanding household sanitation facilities and type of facilities (improved, unimproved or shared) is a key indicator and central to understanding sanitation coverage. This indicator is:

- Proportion of households with improved, shared, non-improved facility or no facility (open defecator)

This indicator has been adopted by the WHO/UNICEF JMP to show estimates of sanitation coverage across countries and over time and provides insights as to whether a household has access to an unimproved, improved latrine or shared latrine. This indicator also serves as the backbone of monitoring change over time, as well as trying to understand the relationship between other outcome variables being assessed in a survey.

How to collect latrine ownership in your survey? Questionnaires should follow the formative used in the DHS, where latrine ownership is assessed in the household assets module. This module is completed by the head of the household or the representative (see example questions for Bangladesh in Figure 3).

FIGURE 3: EXAMPLE LATRINE OWNERSHIP QUESTIONS FROM A DHS SURVEY, BANGLADESH

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP

107	What kind of toilet facility do members of your household usually use?	FLUSH OR POUR FLUSH TOILET
		  FLUSH TO PIPED SEWER
		    SYSTEM 11
		  FLUSH TO SEPTIC TANK 12
		  FLUSH TO PIT LATRINE 13
		  FLUSH TO SOMEWHERE ELSE 14
		  FLUSH, DON'T KNOW WHERE 15
		PIT LATRINE
		  VENTILATED IMPROVED
		    PIT LATRINE 21
		  PIT LATRINE WITH SLAB 22
		  PIT LATRINE WITHOUT SLAB/
		    OPEN PIT 23
		COMPOSTING TOILET 31
		BUCKET TOILET 41
		HANGING TOILET/HANGING
		  LATRINE 51
		NO FACILITY/BUSH/FIELD 61
		
		OTHER _____ 96
		      (SPECIFY)
			
			→ 110

108	Do you share this toilet facility with other households?	YES .... 1 NO 2	 → 110
109	How many households use this toilet facility?	NO. OF HOUSEHOLDS IF LESS THAN 10 .... [0][ ] 10 OR MORE HOUSEHOLDS .... 95 DON'T KNOW 98	

Source: NIPORT et al. 2013, page 298

The main question asks about the kind of toilet facility that members of the household normally use. Response options are specific to latrine types that are available in the country where the survey is being implemented but generally include response options that reference flush or pour flush latrines, pit latrines and no facility/bush/field.

In addition to this question, two other questions are also asked to determine if the facility is shared and if so, with how many households. It is important to assess if the toilet facility is shared, as shared toilets are not considered improved by JMP standards.

What if national definitions of "improved latrines" differ from the JMP definition? What can you do?
While it is recommended that the DHS question regarding latrine ownership is included in the survey, it is important to note that definitions of latrine coverage and ownership (improved, unimproved, shared and no facility) may vary by national standards and definitions. For example, in Ethiopia aspects such as safety and privacy are considered in the national definition of improved versus unimproved latrines (see Figure 4).

FIGURE 4: DEFINITION OF SANITATION FACILITIES IN RURAL ETHIOPIA USING NATIONAL CRITERIA

Sanitation Group	Location of Facility	Sanitation Facility Characteristics				Lid/Cover on Toilet (squat hole)*	Lid/Cover Intact
		Construction Material					
		Floor	Walls	Door	Roof		
Unimproved sanitation owned by househwold (HH)	Attached to house or within HH compound	Mud or wood (not easy to clean)	Sesame stalk, leaf, or no wall (does not provide safety or privacy)	Cloth curtain, curved entrance with un-plastered walls, plastic sack, canvas, or no door (does not provide safety or privacy)	No roof or thatch roof	No (or inadequate covering)	No
Improved sanitation facility owned by HH	Attached to house or within household compound	Brick/ cement, stone, or stone and wood (must be easy to clean)	Brick and ce-ment, metal sheets, stone, stone/mud, mud, sheets of bam-boo matting, thatch, wood, canvas (must provide safety and privacy)	Metal sheet, sheet made of bamboo matting, wood, curved entrance with plastered walls, flat wood, sheets made of bamboo matting (must provide safety and privacy; can be bolted)	Tin, asbestos, ce-ment slab, wood, stone, tiles, thatch, cloth, plastic, can-vas, wood and canvas, dry sticks, bamboo matting, stalk, plastic sack, chaff (provides at least minimal cover from rain/sun)	Yes	Yes
Open defecation	No toilet found						
Facility out-side of HH compound (implicit sharing)	Any facility found outside of the household compound was assumed to be shared with other compounds. These households are also categorized as improved or unimproved according to the criteria above.**						

* Because of the small number of improved sanitation facilities in this study, facilities were considered improved even if the cover was not on the pit hole during the time of observation (although this only adds three additional cases).
** National standards categorize any shared facility as unimproved. However, this study categorizes shared facilities as either unimproved or improved depending on its characteristics.

Source: Table taken from an unpublished internal study conducted in 2014 by the Water and Sanitation Program (WSP).

Prior to developing survey questionnaires, researchers should review national definitions and ensure that these differences can be captured in survey questionnaires. This may mean modifying some of the questionnaire response options to allow for specific latrine elements to be captured or, adding in additional questions. In your report, it would be useful to present the indicator according to JMP standards, as well as latrine coverage according to national definitions, as a means to attune the reader to any differences. What indicators should be presented in your report, and what behaviors should be segmented on, should be discussed with stakeholders who will use the data.

Tips:

The DHS question used to capture latrine ownership asks about the kind of toilet facility that members of the household normally use. While this question is currently considered the gold standard and used for JMP reporting on latrine coverage, researchers can also consider making a number of improvements to this question without changing the integrity or meaning:

- When developing your questionnaire, review your countries latest DHS to see how response options have been organized and questions structured. Work with sanitation experts to ensure response options to the questions are also meaningful and reflect accurate and relevant latrine options. Some DHS questionnaire may be out of date and sanitation markets may have changed in terms of product availability and latrine types.
- Prior to commencing the survey, photos of different latrines types should be taken to help illustrate the different latrine response options. These can also be used during training of interviewers to help them become familiar with the different latrine types.
- When administering the questionnaire, use a prompt card to help the interviewee understand the subtle differences between certain latrine types. Ensure there are questionnaire prompts to remind the interviewer to use the prompt card when the question is administered.
- Confirm the latrine type though interviewer observations. A checklist can be used to assess if the pit is lined, what type of superstructure is in place, if the latrine is functioning. These additional questions can serve to check the reliability of answers to the structured questionnaire, and can be used by supervisors and team leaders to cross check the data quality. Alternatively, include interviewer instructions that tell the interviewer to observe the latrine if the respondent is unsure which type of toilet they have.
- Finally, given the way this question is asked, "What kind of facility do members of your household normally use," there is an assumption that if the respondent answers "no facility," then the household does not own a latrine. However, it is widely acknowledged that while households may have latrines, they may not be used. As such, it would be wise to include an additional question that confirms whether or not the household owns or has access to a latrine as a means to verify answers.

Take-away message: It is recommended that the DHS line of questioning is replicated in your surveys. It will allow your study outcome measurement to be aligned with international standards. Following this guidance will contribute to the validity of your results measurement and thereby provide the most accurate and relevant results on which to base program decisions. Following this guidance also strengthens the relevance of research findings, especially where results can match other findings. That said, improvements to the line of questioning can be made, namely through the use of prompt cards and interviewer observations.

Latrine Use Behavior

What other questions can you include to measure latrine ownership and behavior regarding latrine use? The importance of measuring household latrine ownership is established in the previous section. However, the sanitation literature acknowledges that having a latrine, or having access to a latrine, does not ensure that it is used. Given the focus of sanitation behavior change communication, measurement of actual latrine use is also important to help understand whether or not household members use their latrine. The extent to which a latrine is used will help to further understand behavior, and measures an indicator that is different from ownership.

Some additional questions to consider can focus on a respondent's latrine use at last defecation, or frequency of latrine use in the last week. Suggested behavioral indicators are:

- Proportion of respondents who used a latrine at last defecation
- Among those households that own a latrine, proportion of respondents who consistently (always) used their latrine when they defecated at home (in the last week)
- Among those households that own a latrine, proportion of respondents who used a latrine the last time they defecated at home.

A number of possible questions to arrive at those indicators are presented in Figure 5. These questions should be answered by the respondent, and answered in terms of his or her behavior, and not that of the households.

FIGURE 5: SAMPLE BEHAVIOR QUESTIONS

	1 =Yes
1. The last time you defecated, did you use a latrine?	0= No
2. The last time you defecated at home, did you use a latrine?	1=Yes
	0=No
3. In the last week, when you defecated at home, how often did you use your household latrine? ? Interviewer read out responses. One response only	1=Never
	2=Rarely
	3=Sometimes
	4=Most of the time
	5=Always

What are some of the challenges or limitations of these sample questions? Researchers however should be aware of some of the challenges with measurement of latrine use. If we ask the general question: "Did you use a latrine that last time you defecated?" this line of questioning does not allow for the behavior to be situated. For example, perhaps the respondent was traveling, in the village shopping, at a neighbor's house, or at work. You could consider using the following question to help situate the behavior in Figure 6. In addition, response options to the question: "The last time you needed to defecate, where were you?" could be specified according to the context of your survey rather than being left open ended (e.g., in the field working, traveling, at a neighbors, shopping, travelling, walking to the village, etc).

What to do if you need to measure use latrine use among all household members? Assuming a household owns a latrine, it may be important to understand the extent to which all household members use a latrine, and not just the respondent's self reported behavior. Research questions may want to explore differences in latrine use according to age or gender among households that own a latrine. In the past, research questions have included a general question such as "Do all household members use this latrine," or "How frequently do all household members use this latrine?" For those households that report the latrine is not used by everyone, additional questions then ask the respondent to state which groups don't use the latrine (e.g., men, women, children, elderly, etc). However, this line of questioning is not very accurate. A more robust way to capture this information would be to use a household roster (see Figure 7).

Using a household roster would enable indicators on behavior to be shown at the individual level for all household members. This would allow project managers to understand more about the differences in defecation practices by different household members.

FIGURE 7: SAMPLE OF A HOUSEHOLD ROSTER

1. Identification code	2. Names of HH Members	3. Sex	4. Age Enter ages for all household members	5. The last time [name] defecated at home, did [name] use a latrine
	Record first name only	1 = Male 0 = Female	Enter "00" for children less than 1 year of age. Enter "99" if don't know.	1 = Yes 0 = No 99= Don't know
01	[_____]	[___]	[___|___]	[___]
02	[_____]	[___]	[___|___]	[___]
03	[_____]	[___]	[___|___]	[___]
04	[_____]	[___]	[___|___]	[___]

There are, however, some challenges with the household roster. It may be a bit more complex to administer, and require additional interviewer training. Moreover, there is the concern regarding how reliable responses would be, if, say, a single representative is answering on defecation practices for all household members. It would also be impractical to have every household member answer a question on their defecation behavior. For young children in the household, it is probably best to try and assess their behavior through their caregiver, rather than the household head. Another option could be to use the roster to identify certain target groups that project managers might be interested in. Such as household members that spend their days farming outside the house, female household members, and/or households with children under five to investigate stool disposal. The household roster can then be used as a means to administer a separate module for which the target group(s) answers a series of short questions on their behavior, or caregivers in the case of children's behavior (see section on safe stool disposal for further discussion).

Despite these challenges, using a household roster is a better approach to measure of all household members behavior, rather than just assessing this through a general question administered to a single respondent such as, "How often do family members use this latrine?"

Tips:

- To address frequency of defecation in a latrine, it is recommended that a shorter time frame is used to capture defecation behavior as a means to overcome recall bias. For example, if you ask a respondent about how often they used a latrine in the past month, or over the past six months, it is likely that respondents will have difficulty remembering. This will influence the accuracy of their answers and impact on the quality of your findings. As such, consider probing into defecation practices "in the last week." In addition, specifying whether or not a latrine was used at home will help to strengthen conclusions regarding the use of latrines among households that own latrines.
- Consider including questions that assess access to latrines when at work, travelling or outside the homestead generally. This information may be useful to include when exploring reasons for consistent latrine use.
- Given the poor durability of many pit latrines, while a household might own a latrine, it could well be that the latrine is not functioning. To further situate the respondent's self-reported behavior and determine access to latrines, an additional question may be asked to determine if the latrine is functioning on the day of survey. Other surveys have asked about functionality in the last three months, or used interviewer observation to assess latrine functionality.
- Qualitative research may consider probing further into behaviors, by exploring where people were the last time they needed to defecate and whether or not there were latrines available to them, and reasons for not using their latrine at home.

Take-away message: Household latrine ownership is essential to measure. However, while a latrine may be available at home, this does not tell us to what extent it is being used. Measurement of self-reported behavior will address this. These purpose level indicators can also be used to understand the relationship between actual behavior and other components included in the questionnaire (such as wealth, knowledge, respondent attitudes, etc.).

FIGURE 8: EXAMPLE QUESTIONS FROM THE UGANDA DHS REGARDING STOOL DISPOSAL IN CHILDREN

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
553	CHECK 215 AND 218, ALL ROWS: NUMBER OF CHILDREN BORN IN 2006 OR LATER LIVING WITH THE RESPONDENT ONE OR MORE ☐　　　　NONE ☐ RECORD NAME OF YOUNGEST CHILD LIVING WITH HER AND CONTINUE WITH 554 _____ (NAME)		→ 556
554	The last time (NAME FROM 553) passed stools, what was done to dispose of the stools?	CHILD USED TOILET OR LATRINE ..... 01 PUT/RINSED 　INTO TOILET OR LATRINE .... 02 PUT/RINSED 　INTO DRAIN OR DITCH .... 03 THROWN INTO GARBAGE .... 04 BURIED .... 05 LEFT IN THE OPEN .... 06 OTHER _____ 96 　　　　　(SPECIFY)	

ANOTHER BEHAVIOR TO CONSIDER: SAFE STOOL DISPOSAL

Why should you consider measuring safe disposal of children's stools? Another indicator related to sanitation behavior includes disposal of children's stools. The proper disposal of children's feces is important in preventing the spread of disease. If feces are not properly disposed of, disease may be spread by direct contact or through animal contact. The safe disposal of children's feces is of particular importance because children's feces are more likely to be the cause of fecal contamination in the household environment than other causes, as they are often not disposed of properly and may be mistakenly considered less harmful than adult feces.

How can you measure safe stool disposal? The indicator measured in the DHS is as follows:

- Percent distribution of youngest children under age five living by the manner of disposal of the child's last fecal matter
- Percentage of children whose stools are disposed of safely, according to background characteristics

Children's stools are considered to be safely disposed of if the child uses a toilet or latrine, the child's stool is put in or rinsed into a toilet or latrine, or the stool is buried.

This indicator is assessed using two questions, which include identifying the youngest child living in the household, and then determining the manner in which stools were disposed of the last time they defecated (see Figure 8). Figure 9 presents an indicator presentation example from the DHS for the disposal of children's stools in Uganda.

Another measure to determine safe stool disposal may be to use a household roster to identify the number of children under five living in the household, and then administer a questionnaire module to assess the behavior of the caregiver regarding the stool disposal, for each child under five in the household. In the example provided in Figure 10, there are five people living in the household. There are two children under five years of age, Stephen and Rose. Elizabeth is the caregiver of both of these

FIGURE 9: EXAMPLE OF THE INDICATOR PRESENTATION: DISPOSAL OF CHILDREN'S STOOLS, UGANDA DHS 2011

Table 10.11 Disposal of children's stools

Percent distribution of youngest children under age 5 living with the mother by the manner of disposal of the child's last faecal matter, and percentage of children whose stools are disposed of safely, according to background characteristics, Uganda 2011

Background characteristic	Child used toilet or latrine	Put/rinsed into toilet or latrine	Buried	Put/rinsed into drain or ditch	Thrown into garbage	Left in the open	Other	Don't know/ Missing	Total	Percentage of children whose stools are disposed of safely[1]	Number of children
Age in months											
<6	3.6	44.2	1.3	19.7	13.2	2.8	14.7	0.5	100.0	49.1	784
6-11	4.6	69.5	4.8	5.4	6.8	1.9	6.9	0.0	100.0	78.9	812
12-23	5.4	79.2	6.1	1.7	2.7	1.4	3.5	0.0	100.0	90.7	1,324
24-35	13.8	72.0	6.2	1.1	1.2	3.2	2.1	0.4	100.0	92.0	885
36-47	47.2	42.4	2.5	0.3	2.3	2.4	2.8	0.0	100.0	92.1	517
48-59	63.6	24.7	4.1	0.5	0.5	3.3	3.2	0.1	100.0	92.4	309
Toilet facility[2]											
Improved, not shared	22.7	66.6	0.8	2.6	3.1	0.9	2.9	0.3	100.0	90.2	735
Shared[3]	13.9	71.4	1.1	7.0	2.7	0.5	3.2	0.2	100.0	86.4	679
Non-improved	13.6	59.6	6.1	5.2	5.5	3.0	6.7	0.1	100.0	79.3	3,215
Residence											
Urban	19.0	67.5	1.0	7.6	2.4	0.3	2.1	0.1	100.0	87.5	690
Rural	14.4	61.6	5.1	4.6	5.1	2.7	6.2	0.2	100.0	81.2	3,941
Region											
Kampala	19.0	69.9	0.0	7.5	2.2	0.0	1.5	0.0	100.0	88.9	299
Central 1	14.3	72.2	1.2	1.4	5.3	3.0	2.7	0.0	100.0	87.6	454
Central 2	17.8	69.5	0.3	2.8	4.6	0.0	5.0	0.0	100.0	87.6	473
East Central	14.7	65.3	1.1	6.3	7.0	1.2	3.5	0.9	100.0	81.0	502
Eastern	9.0	66.1	9.7	4.1	4.3	1.9	4.9	0.0	100.0	84.8	761
Karamoja	7.7	18.4	14.5	6.9	20.5	24.0	8.0	0.0	100.0	40.6	172
North	13.3	49.7	12.0	5.3	2.4	1.2	16.2	0.0	100.0	74.9	430
West Nile	12.3	66.6	5.8	3.7	1.4	0.9	8.6	0.8	100.0	84.7	280
Western	17.8	61.5	2.0	7.0	6.6	2.9	2.0	0.2	100.0	81.3	685
Southwest	21.9	59.7	3.0	6.3	0.7	0.8	7.6	0.0	100.0	84.7	575
Mother's education											
No education	15.3	52.0	7.3	4.4	6.2	6.9	7.7	0.1	100.0	74.6	675
Primary	13.5	63.5	5.0	5.3	4.2	2.0	6.2	0.3	100.0	82.0	2,877
Secondary+	19.4	66.3	1.4	4.9	5.1	0.2	2.7	0.0	100.0	87.1	1,078
Wealth quintile											
Lowest	7.8	47.0	13.3	6.0	9.0	6.7	10.1	0.1	100.0	68.1	1,008
Second	15.0	63.0	4.4	4.7	3.2	2.3	7.4	0.0	100.0	82.4	981
Middle	13.8	67.8	2.1	5.1	4.7	1.6	4.5	0.5	100.0	83.7	908
Fourth	17.4	68.7	1.4	4.7	4.3	0.4	2.9	0.3	100.0	87.4	838
Highest	22.8	68.0	0.2	4.7	2.0	0.0	2.3	0.0	100.0	91.0	895
Total	15.1	62.5	4.5	5.1	4.7	2.3	5.6	0.2	100.0	82.1	4,631

[1] Children's stools are considered to be disposed of safely if the child used a toilet or latrine, if the faecal matter was put/rinsed into a toilet or latrine, or if it was buried.
[2] See Table 2.2 for definition of categories
[3] Facilities that would be considered improved if they were not shared by two or more households

Source: UBOS and ICF International, Inc. 2012, page 138

children. She would then be administered a separate questionnaire module to assess her behavior regarding how she disposes of Stephen's stool, and then be administered the same module again to assess how she disposes of Rose's stool. So a questionnaire module would be completed for each child. This module could include the aforementioned DHS questions, as well as any other factors you think might be important to include. This has the advantage in allowing for differences in behavior to be investigated by child's age and allows for an understanding of behavior among all children under five in the household, rather than just the youngest child.

FIGURE 10: EXAMPLE OF A HOUSEHOLD ROSTER TO IDENTIFY CHILDREN UNDER FIVE IN THE HOUSEHOLD

1 ID	2. Names of HH Members	3. Sex	4. Age Enter ages for all household members	5. CAREGIVER'S ID Only enter caregiver's ID for anyone less than 5 years
	Record first name only	1 = Male 0 = Female	Enter "00" for children less than 1 year of age. Enter "99" if don't know.	
01	[Paul]	[_1_]	[2 ι 8]	[__]
02	[Elizabeth]	[0]	[3 ι 3]	[__]
03	[Francis]	[_1_]	[0 ι 7]	[__]
04	[Stephen]	[_1_]	[0 ι 4]	[0 ι 2]
05	[Rose]	[0]	[0 ι 2]	[0 ι 2]

WHO TO INTERVIEW?

Who to administer your questionnaire to depends on the research objectives. In quantitative surveys, latrine ownership questions have typically been administered to the head of the household or representative, as part of determining the household assets. However, depending on your research objectives, you may choose to administer certain sections of the study instrument to different household members. For example, if a study objective is to measure safe disposal of children's feces, it may be most appropriate to administer the survey, or modules of the survey, to caregivers of children under the age of five. Or in instances where gender roles may be important, administering certain sections of the questionnaire to female household heads may also be relevant.

Take-away message: As part of designing your survey it is important to determine your target group and determine who is the most appropriate person to interview. This should be clearly stipulated in the study design, and approaches to identifying that person in the household should be clarified. Survey questionnaires should then be administered in a consistent manner across households, rather than in an *ad hoc* fashion. Examples of poor research practice include administering the questionnaire to anyone in the house that agrees to be interviewed, or leaving it up to the interviewer to determine who should be selected.

QUESTIONNAIRE DEVELOPMENT: UNDERSTANDING FACTORS THAT INFLUENCE BEHAVIORS

To design effective behavior change programs, it is important to understand what factors influence the behavior(s) of interest. This may include factors such as beliefs or attitudes of a behavior or product, factual knowledge about product costs, availability of products and services or social drivers. The SaniFOAM framework has been developed as a means to guide instrument development, frame research objectives, and facilitate results interpretation for sanitation marketing (Devine 2009) (see Figure 11). Potential determinants include theoretical components of opportunity, ability and motivation to perform the desired behavior. Within these themes are a number of factors, which are believed to influence sanitation behavior.

FIGURE 11: THE SANIFOAM FRAMEWORK

Focus	Opportunity	Ability	Motivation
Target population	Access/availability	Knowledge	Attitudes and beliefs
Desired behavior	Product attributes	Skills and self-efficacy	Values
	Social norms	Social support	Emotional/physical/ social drivers
	Sanctions/ enforcement	Roles and decisions	Competing priorities
		Affordability	Intention
			Willingness to pay

Source: Devine 2009

One approach to exploring what factors influence a particular behavior is through the use of multi-item scales.

What are multi-item scales? Multi-item scales consist of a number of statements (referred to as items) that can be used to measure variables that are not directly observable and may vary over time, or by populations, in their strength or magnitude. Such variables are often referred to as latent variables (DeVellis 2003)[1].

What is central to their measurement is that they are scored on a Likert scale. A Likert scale is where responses to items in a scale are assigned values. Examples include measures of agreement (e.g., strongly agree=4, agree=3, disagree=2, strongly disagree=1), or satisfaction (not at all satisfied=1, a little satisfied=2, satisfied=3, very satisfied=4, and extremely satisfied=5).

Examples of the scaled items are presented in Figure 12. Refer to the prototype questionnaire for examples of additional scales.

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[1] The difference between multi-item scales and indices is that multi-item scales measure latent constructs that are believed to have a common source or cause. Indices, on the other hand, are made up of a set of items that can be used to measure latent or observable variables that do not have a common source, but can be combined to form a construct (Netemeyer 2003). For example scores on a scale of attitudes are believed to be caused and reflect a respondent's level or degree on a latent theoretical variable. Scores on an SES index, on the other hand, are not believed to be caused or reflect a latent SES variable that exists within individuals. Instead SES scores are made up of different characteristics or categories of information such as income, education that do not share a common cause but when combined make up a person's SES.

FIGURE 12: SAMPLE SCALED QUESTIONNAIRE ITEMS

	Strongly disagree	Disagree	Agree	Strongly agree
Drivers				
Open defecation provides no privacy	1	2	3	4
People who defecate in the open put their children at risk of disease	1	2	3	4
People who defecate in the open put the whole community at risk of disease	1	2	3	4
Open defecation is embarrassing	1	2	3	4
Competing priorities				
In this community people would rather buy a mobile phone than build a latrine	1	2	3	4
School fees are more important than improving a latrine	1	2	3	4
A household needs a bicycle more than a latrine	1	2	3	4

There are at least three defining characteristics of multi-item scales (Spector 1992):

1. A scale must comprise of at least three or more items to be considered a multi-item scale. Otherwise, these would be individual items. For example, attitudes towards latrine safety should have at least three items measuring this factor. Likewise, perceptions regarding latrine affordability should have at least three items measuring this construct.
2. Each item measures something that is continuous and can vary from positive to negative. For example, an item to measure beliefs around the acceptability of open defecation, can vary from very positive to highly negative.
3. There is no right answer for each item since the purpose is to capture the range of responses.

During the analysis stage, a series of psychometric tests will be run to assess the reliability and validity of the different scales that have been included in a questionnaire. Psychometric tests are a series of analytical methods used to assess how good or bad items perform statistically. For example, these tests help to tell us if items are assessing a "similar" factor (e.g., to what extent items relate to social norms versus another factor, such as attitudes) and if they are sensitive enough to distinguish between behaviors (e.g., latrine ownership versus no ownership). Items that have "good" properties are then combined or summed into a composite score. A composite score is the sum of all the responses that are given to each question included in the multi-item scale, divided by the number of items in the multi-item scale. This score is what will be shown in segmentation tables and these underlying attitudinal constructs can be compared between different target groups (e.g., the extent to which open defecators are more or less likely to agree that latrines are affordable as compared to latrine owners).

Why should multi-item scales be used? There are a number of reasons to use multi-item scales in your questionnaire.

First, multi-item scales provide better measurement of theoretical factors that are not easily measured by a single question. Many measured social characteristics are broad in scope and cannot be assessed with a single

question. Multi-item scales will be necessary to cover more content of the factor you are trying to measure. For example, social norms around open defecation can comprise of beliefs that open defecation behavior has been practiced by generations and that everyone in the community is doing it, and that it has been learned since childhood. Asking a handful of questions that are slightly different from each other helps to provide better measurement of such a complex factor. The fact that scales have different response options and use several items to measure a factor allows for a larger variation in terms of the choices that respondents have and thus more precision in responses. Also, the reliability of a multi-item measure is higher than a single question. Many things can influence people's response (e.g., mood, a specific thing they encountered that day). It is could be possible that people give a wrong answer or interpret a question incorrectly. As a multi-item measure has several questions targeting the same factor, this makes it more reliable than a single question.

There are a number of practical uses for multi-item scales. Multi-item scales can improve the meaningfulness of results as they help to provide in-depth information about determinants of behavior. This in turn allows project managers to address the most relevant determinants of behavior, and provides them with detailed information underlying the relevant factors.

Take-away message: Multi-item scales allow for the strength or magnitude of the SaniFOAM factors to be measured against sanitation behaviors. By using multi-item scales, this increases the chances of detecting potentially powerful but subtle determinants of sanitation behavior. There are opportunities to modify scales for your survey as well as draw on existing scales that have been tested for their psychometric properties.

Tips:

- Psychometric analysis has been completed on a number of scaled items, and a scale bank is available from which "good" scales can be selected. These scaled items can be found in the prototype questionnaire, which includes a module that provides a list of scales according to the SaniFOAM framework that have been found to be reliable in a number of different studies. Additional instructions regarding how to select the multi-items scales are provided in the prototype questionnaire document.
- Response options to Likert scales should comprise of three, four or five options. There should not be a "don't know" option as we are not measuring a fact or knowledge of a factor, rather a belief. So in theory, everyone should be able to answer or have an opinion on the statement.
- Determining what response scale should be used should be pilot tested prior to commencing the survey, as there may be cultural differences and preferences in the response options. In some cultures or languages, it may be argued that scaled responses are not feasible, despite evidence to the contrary. Indeed, there are examples of cross-cultural questionnaires using Likert responses, which have been successfully translated and utilized across many different countries and cultures (e.g., see the WHOQOL Group 2005). However, if there is still uncertainty regarding the use of Likert scales for your survey, this could be tested by piloting the questionnaire. Analysis could be run on the pilot data to test the psychometric properties. Alternatively, or in addition to a pilot test, consider using a three point Likert scale (e.g., agree, neither agree nor disagree, and agree), which may be easiest for the respondent to comprehend.
- Ensure that questions are designed so that they can be administered to all respondents. This is necessary as we want to be able to make comparisons between different target groups, and is particularly important for segmentation analysis. If, for example, questions are only administered to people that own latrines then we cannot compare their responses with non-latrine owners.

- Related to the previous point, ensure that items can be answered by all respondents. For example, to answer an assessment of product attributes such as "My latrine is easy to keep clean" assumes that the respondent owns a latrine. However, this could be rephrased such as "Latrines are easy to keep clean" and the statement can be administered to all respondents.
- It is clear that sanitation research may want to investigate perceptions regarding improved latrines, and scaled items can be used to explore perceptions regarding this (e.g., "improved latrines are more durable than unimproved latrines"). In this instance, it is recommended that a prompt card/photo is used to illustrate the differences between latrine types. This will help to ensure that the respondent "knows" what an improved latrine is versus an unimproved latrine, and is responding to questions with a clear reference point.
- A time frame should be included in the preamble, which asks the respondent to think about his or her beliefs towards statements in the last two weeks. This is important to ensure better reliability and validity of responses. For example "In the following questions, I will ask you how you feel regarding different sanitation behaviors. If you are unsure about which response to give to a question, please choose the best one you can. There are no right or wrong answers. Please keep in mind your beliefs, attitudes and perceptions. We ask that you think about how your feelings to the last two weeks."
- When developing items, consider the following suggestions:
  - Ensure that items are simple to understand (e.g., Latrines are easy to use)
  - Avoid using double negatives as this can be confusing to respondents (e.g., Latrines that do not function are not clean).
  - Include questions that are both positively and negatively phrased. This will help to prevent a respondent from arbitrarily "agreeing" with everything. For example "latrines cost a lot of money" and "latrines are inexpensive."
  - Ensure items ask about one concept, and only one concept. For example, responses are harder to interpret with the following statement: "Open defecation is a normal practice in our community since this has been practiced for generations." Perhaps open defecation is a normal practice, but not because it has been practiced for generations. This statement would be better conceptualized as two separate items.
- In addition to agreement/disagreement scales, other response options may be considered. Examples are provided in Figure 13.

FIGURE 13: SAMPLE QUESTIONS

QUESTION	RESPONSE OPTIONS				
Accessibility and Access to Latrines					
• How difficult is it for you to access a latrine when you need to? • How convenient are latrines? • How easy is it for you to find a latrine when you need to defecate?	Not at all (1)	Not much (2)	A moderate amount (3)	Very much (4)	An extreme amount (5)
Access to Materials and Resources					
How satisfied are you with the availability of sanitation hardware stores in your community?	Very dissatisfied (1)	Dissatisfied (2)	Neither dissatisfied nor satisfied (3)	Satisfied (4)	Very satisfied (5)
Affordability					
To what extent do you have financial difficulties?	Not at all (1)	Not much (2)	A moderate amount (3)	Very much (4)	An extreme amount (5)
How satisfied are you with your financial situation to purchase or make upgrades to your latrine?	Very dissatisfied (1)	Dissatisfied (2)	Neither dissatisfied nor satisfied (3)	Satisfied (4)	Very satisfied (5)
Product Attributes					
How would you rate the cleanliness of latrines? How would you rate the durability of latrines? To what extent do you believe that latrines are hygienic?	Not at all (1)	Somewhat (2)	A moderate amount (3)	Mostly (4)	Extremely (5)
How satisfied are you with the durability of latrines?	Very dissatisfied (1)	Dissatisfied (2)	Neither dissatisfied nor satisfied (3)	Satisfied (4)	Very satisfied (5)
Social Support					
How happy are you with access to sanitation information?	Not at all (1)	Somewhat (2)	A moderate amount (3)	Mostly (4)	Extremely (5)
Social Norms					
To what extent do you believe open defecation is a normal practice in your community?	Not at all (1)	Not much (2)	A moderate amount (3)	Very much (4)	An extreme amount (5)
How common is it for people in your community to defecate in the open?	Never	Rarely	Sometimes	Most of the time	Always
Self-efficacy					
How would you rate your own ability to build a latrine?	Very poor (1)	Poor (2)	Neither poor nor good (3)	Good (4)	Very good (5)
Drivers					
To what extent do you believe latrines are safe to use?	Never (1)	Rarely (2)	Some of time (3)	Most of the time (4)	Always (5)

WHAT ELSE TO INCLUDE IN YOUR QUESTIONNAIRE?

The SaniFOAM framework includes a number of factors that may not necessarily be captured by Likert scales. These may be addressed through questions that allow for yes/no answers (namely knowledge) or categorical answers, (e.g., Who makes the household decisions: Male household head [1], female household head [2], joint decision [3], etc.). In contrast to the Likert scales, these response options have no numerical meaning (e.g., categorical responses are typically used for questions on education, latrine ownership, household possessions etc.) and may allow for multiple responses.

Factors that have been measured using dichotomous or categorical responses include the following:

- Availability of sanitation hardware and shops and masons (Are there masons in the village, or in nearby village/town, who can construct toilets?)
- Knowledge (How much does a hygienic latrine cost? How can diarrhea be prevented in your household?)
- Product attributes (What do you like most and like least about the attributes of your current defecation place (e.g., "nothing," cleanliness, privacy, safety, good health, comfort, convenience, get to work/school on time versus dirty, pay to use, distance, shared with others, hard to maintain, lack of comfort, smell, queues, fills up/difficult to empty).
- Decision making (Who usually decides how household money will be used? Who would make decisions about latrine purchases or upgrades?)
- Affordability (How much did you pay for your latrine?)
- Willingness to pay? How much do you believe [prompt] this latrine costs? Would you be willing to pay X% more for this latrine?)
- Intention (Have you considered installing a latrine? To what extent do you think you will build a latrine in the next 12 months? What types of improvements are you planning to make?)
- Competing priorities (When extra money is available in your household, how is this usually spent?)
- What are the top three reasons for building a household latrine/toilet? (e.g., convenience, good health, cause germs, heat, smell, dirt, feces, pests, easy to keep clean, cleanliness, privacy/dignity, safety/security, visitors/guests, avoid sharing with others, comfort, prestige/pride).
- What are the three biggest constraints to your installing a household latrine/toilet? (e.g., high costs, no one to build, water table/soil condition, technical complexity, savings/credit issues, competing priorities, tenancy issues, limited space, permit problems, satisfaction with toilet, lack of decision making).

How do I know what factors to measure with a Likert scale? Scaled items provide a valuable means to measure and assess the SaniFOAM opportunity, ability and motivational factors, with the exception of knowledge (see discussion on this below). There is also scope to measure, for example, "perceived availability of sanitation shops" through a Likert response option, as well as whether or not the respondent is aware of a sanitation shop in their village (yes/no) or/and has ever been to a sanitation shop (yes/no). In addition, there are structured questions that will tap into willingness to pay, which will be useful to unpack how much people are willing to pay for latrines. Product attributes, such as the most important attributes of an ideal latrine, or what one likes or dislikes about their current latrine, can be measured through Likert scales and multiple response options. Previous sanitation surveys have included a range of questions and these are presented in the questionnaire protocol.

Other considerations include what indicators are needed to inform results frameworks and what information will be relevant for guiding project managers in their decision making.
Should knowledge be measured using a Likert scale? Knowledge is a fact, and the extent to which the respondent "knows" the correct answer. This can be measured as "true or false," "yes or no," or with categorical response options (e.g., How can diarrhea we prevented in your household? Washing hands [1],

Using a latrine [2], Boiling water before drinking [3] etc.), but should not be measured as a level of agreement using a Likert scale, as we want to assess the respondents ability to correctly or incorrectly state the answer.

What other background or population characteristics should I include in my questionnaire? A number of other background determinants can be included in your survey. These will be important to help with targeting different populations and may help to unpack additional barriers or motivators to latrine use. For example, in the global literature review (WSP 2014), perceptions of soil quality, as well as perceptions regarding the availability of water were found to influence sanitation behavior. These components can also be included in the analysis to control for different factors that may influence the behavior. Some suggestions that are specific to latrine ownership are as follows:

- Perceptions regarding the soil quality and land access (i.e., if respondents believe they have enough land or space to construct a latrine, and sufficient access to water)
- Distance/time needed to walk to the nearest latrine
- Distance to nearest latrine from the household
- Age of latrine
- History of latrine purchase, such as how much was paid for the latrine, how it was constructed and from where it was purchased
- Location of latrine (in or outside of household)
- Number of household family members
- Latrine functionality
- Availability of sites for open defecation

Other more traditional questions to consider will help to explore differences across wealth quintiles, and other population characteristics. Exposure to media may also be valuable to include as a means to assess the extent to which populations have been exposed to sanitation messaging.

- Socio-economic status (income, asset list)
- Age, gender, employment, education and marital status
- Residence urban/rural
- Administrative unit: district/province/region
- Ethnicity/tribe
- Exposure to media

Are there other contextual factors that should be considered? In addition to the population and background characteristics, there are a number of contextual factors that you may wish to consider when designing your survey. These are not necessarily components that are included in questionnaires, but rather information to consider which may influence when you conduct your survey, how results can be interpreted or/and how to stratify your survey.

Coverage and availability of latrines
Where coverage of sanitation interventions is low, availability and other demographic variables such as socioeconomic status and area of residence (urban/rural), perceived affordability of latrines, competing priorities, may likely be more relevant determinants. Where coverage of sanitation interventions is higher, and people can generally access latrines, other SaniFOAM variables are likely to be more relevant and motivations for behavior may be more complex.

Land space and soil profile

The relative ease at which latrines can be built may vary according to soil and land profile, and access to water. Different determinants could be more relevant in some environments, than others. Likewise, barriers to latrine use may be very different in urban versus rural contexts. Researchers may want to consider stratifying survey design and analysis to identify relevant determinants in the context of different geographical areas.

Seasonal factors

Use of latrines may be affected by season. In the global review of literature (WSP 2014), latrine use was less common during the rainy season in East Africa as many latrines had collapsed. Households were less likely to build or rebuild during this period, as land is flooded. Likewise, open defecation was less common during the dry season in East Java, Indonesia, as rivers (where defecation occurs) have dried up. The season in which data collection occurs is an important consideration, although it cannot be controlled for in a model using cross-sectional data. It is however important to acknowledge when planning surveys and comparing results of latrine ownership with other national data.

Should I include all the SaniFOAM factors in my questionnaire? How do I know which ones to include? It is not necessary to include all of the SaniFOAM determinants in your questionnaire. In fact, depending on the context, behaviors of interest, and country of your research, different SaniFOAM variables may be more or less relevant as behavioral determinants in different contexts. It is also important to note that behavioral determinants are contextual, and they can change over time, particularly as intervention coverage scales up.

Summarized in Box 2, a recent review of the SaniFOAM drivers of latrine ownership and use suggests the importance of social norms, access and availability, self-efficacy to build latrines, affordability, and a number of emotional drivers as determinants of behavior (WSP 2014). It is also noted that other factors in the framework are less well understood, such as the role of sanctions (rules and enforcement), knowledge and values. Table 1 present the key findings of the review and highlights implications when designing research studies in the future.

BOX 2: SUMMARY OF A GLOBAL REVIEW TO UNDERSTAND BARRIERS AND DRIVERS OF HOUSEHOLD LATRINE OWNERSHIP AND DEFECATION

The review included qualitative and quantitative studies from Cambodia, Ethiopia, India (Rajasthan, Meghalaya, and Bihar), Indonesia (East Java), Kenya, Malawi, Peru, Tanzania, and Uganda. The studies were conducted between 2006 and 2012.

The most salient factors influencing rural sanitation behavior that emerged from the review include access and availability to functioning latrines, sanitation products and services, latrine product attributes (e.g., perceptions of cleanliness and durability), social norms around open defecation, perceptions of latrine affordability, self-efficacy to build latrines and competing priorities for other household items. The review also identified a number of emotional drivers. These include shame and embarrassment associated with open defecation, as well as perceptions of improved social status, privacy, and convenience associated with latrine ownership and use. A number of socio-demographic and other background characteristics influence sanitation behavior. These include socioeconomic status, as well as contextual factors that vary by region or country, such as perceptions of physical and geographical conditions (such as access to water and soil profile).

The review identified several other factors, including knowledge, enforcement of rules or regulations, values, intention to build latrines, roles and decision making, beliefs and attitudes, availability of masons to build latrines, and their self-efficacy to do so. However, it is less certain how these aspects influence sanitation behavior, thus limiting the strength of the conclusions that can be made. This may be due to the different research objectives and interview guides of the studies, quality of the data and reporting, regional differences, and/or their relevance to sanitation behavior.

TABLE 1: KEY FINDINGS OF THE WSP GLOBAL REVIEW: IMPLICATIONS FOR FUTURE RESEARCH

SUMMARY OF FINDINGS	IMPLICATIONS FOR FUTURE RESEARCH
Focus	

Non-mutable characteristics that influence improved sanitation behavior varied by:
• Socio-economic status
• Respondent perception's of:
   o temporal and seasonal factors
   o land ownership and access
   o physical and geographical conditions (such as access to water and soil profile)
	Assessment of these background characteristics and perceptions of contextual factors will be important information for project managers. Significant factors will help guide and target interventions and further understand respondent's perceptions of environmental barriers. Routine assessment of other background characteristics such as gender, age, household size etc. will also provide information on key demographic determinants.
	
	Household assets should routinely be included as a means to measure equity across key indicators.

Opportunity	
Access and availability	
• Having access to a functioning latrine • Knowing where to find suppliers and masons	During analysis, consistent use of a latrine should be addressed among latrine owning households, and exclude households that do not have a latrine, as the key research question is to understand why people who own latrines do not use them. A measure can be included to address latrine functionality. Studying the supply side in more detail, or searching for existing information on this and presenting this in your report, will provide support for actual availability of materials, sanitary hardware, and product pricing.
Product attributes Positive latrine product attributes were identified such as: • easy to keep clean • durable • modern • easy to construct • affordable	
Social Norms • Social norms that open defecation is normal, traditional or acceptable served as a barrier to latrine acquisition and use.	There may be value in addressing positive social norms, such as norms around the use of public toilets or norms geared towards purchasing improved latrines. This may be particularly relevant when latrine ownership is high.
Sanctions and enforcement • Sanctions and enforcement may be important in some contexts, where there are village rules or laws that prohibit open defecation.	Prior to commencing a research study, a policy or regulatory review could be conducted to investigate what formal sanctions may be in place. Assuming laws or sanctions are in existence, interview guides could be adapted to further investigate how this may influence sanitation behavior.
Ability	
Affordability Affordability barriers were associated with: • levels and fluctuation of income • ability to save • lack of financing • credit options for home improvement • awareness of actual costs versus perceptions of costs to build latrines.	Respondent's perceptions of latrine costs and upgrades vis-a-vis estimates of actual latrine costs should be estimated. This information can then be presented in the report to highlight the extent to which there is a true affordability barrier.
Self efficacy • Knowing a mason to assist with latrine construction is important in contexts where labor is relied on, such as when landscape is challenging or improved latrines/upgrades are desirable.	Self-efficacy questions should distinguish between skills for constructing improved versus unimproved latrines.
Knowledge • The extent to which respondents understood the relationship between health, open defecation and exposure to human excreta was unclear.	Knowledge questions should be administered to test respondent's capacity to provide correct information regarding disease transmission and routes, rather than attitudinal questions. Knowledge, according to the SaniFOAM framework also includes awareness of different latrine types.
Roles and decisions Decision makers vary across cultures and regions and may also evolve over time.	Understanding the roles and dynamics of the decision-making process will allow more effective targeting and messaging.

Motivation	
Attitudes and beliefs • Misconceptions regarding the harmfulness of children's feces, as well psychological refuges were noted (e.g. open defecation is not harmful as fish eat the feces).	In general, these three motivational factors are more difficult to explore using structured questionnaires, and concepts such as social status, embarrassment, shame may be under-reported, while other answers may be over-reported. For example, when asked why a household has a latrine, answers such as "health and hygiene" may be common as respondents try to give the "right" answer (Curtis et al. 2009). Similarly, responses such as "privacy" and "convenience," may be over-reported as these may be more "top of the mind." Measuring attitudes and beliefs, values, and drivers, using multi-item scales will be particularly important to address this issue. There has also been some conceptual overall for these three factors in previous surveys. When using scales to measure these three factors, consider the wording and content of the items for each factor. Check that the items reflect the SaniFOAM definition of the construct the item is intended to measure.
Values • Latrine owning households are perceived as modern and progressive. This was generally under-reported in surveys, but when presented, acknowledged as relevant to sanitation behaviors.	
Drivers • Open defecation was a source of embarrassment, particularly for target groups that had used facilities or had access to facilities at some point in their lifetime. Owning a latrine was associated with a number of positive feelings, such as honor, pride, improved status, and respect, as well improved privacy and comfort.	
Competing Priorities • Latrine ownership has lower priority in terms of family expenditure. • Certain events, such as a wedding, welcoming guests, in-laws joining families, may raise priority for a home latrine above other demands on household resources.	This concept was only measured as a scaled item in one the WSP surveys to date. It was found to be an important predictor of the segmentation model. The scales items are presented in the prototype questionnaire.
Satisfaction • Levels of satisfaction with current defecation practices vary by country and target group but are associated with sanitation behavior.	Satisfaction as a driver per se may be better addressed by looking at satisfaction towards different concepts, such as satisfaction with ones access to latrines, satisfaction towards latrine attributes, satisfaction that a latrine is durable and safe etc. rather than satisfaction as a general determinant.

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Tips:

- As a means to understand equity and access to latrines, it is important to measure household assets. This information can then be used to construct household wealth indices, and these can be included in segmentation models to observe whether there are socio-economic differences. To ensure you have the "right" questions to in your survey instrument, simply use the questions that are included in the DHS. This will ensure that you can explore relationship between latrine ownership, use and wealth quintiles, and allow for more robust conclusions to be made regarding latrine ownership, behavior and equity.

Take-away message: There are a number of additional questions that can be included in your survey instrument. What is included may be more of an art than a science, but reviewing recent literature, utilizing the SaniFOAM framework to guide the inclusion of questions/factors, and working with sanitation experts should help to ensure the relevancy of the survey instrument. Prototype questionnaire modules are also available to help guide the questionnaire development. A global review provides suggestions as to which SaniFOAM factors and background characteristics may be most relevant to include, according to the different behavior(s) of interest.

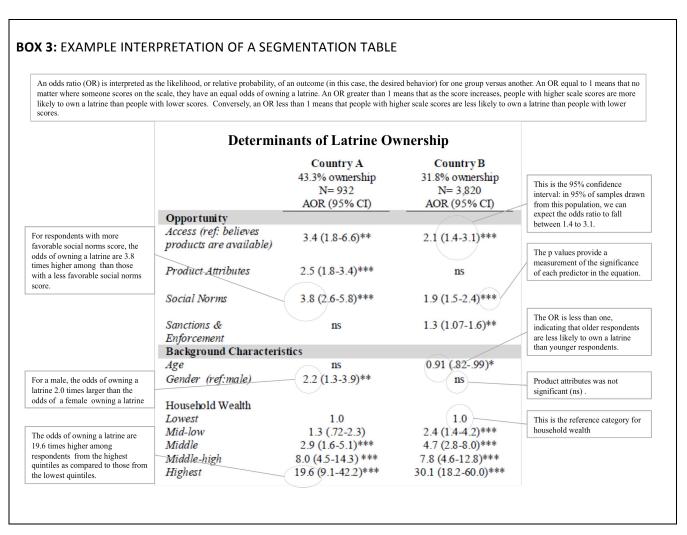**DATA ANALYSIS AND PRESENTATION OF RESULTS USING SEGMENTATION**

What is segmentation? Segmentation is a process of taking a diverse population of people and dividing them up according to a common characteristic, such as a shared behavior. In the context of sanitation research, populations can be segmented according to household latrine ownership versus no ownership, use of a latrine at last defecation versus no use of a latrine at last defecation, owner of an improved latrine versus owner of an unimproved latrine.

What is segmentation analysis? Segmentation analysis explores the relationship between the behavior of interest, with a number of determinants and population characteristics. Results show which determinants relate to the behavior of interest, by illustrating which factors are significantly different for the behaviors being measured (e.g., latrine ownership versus no ownership). In the context of the SaniFOAM framework, segmentation analysis may explore how perceived availability and affordability of latrines, as well as positive product attributes, social norms around open defecation, as well as wealth and respondent education, are associated with those households that own latrines and those that do not.

Analytical techniques then test the extent to which different factors are significantly associated with the behavior of interest, and results are reported as odds ratios. In addition, results may also be reported using means or proportions to help understand differences between compared groups, and can be stated in terms of a group profile "Households that do not own latrines are significantly more likely to believe the defecation is normal in their community than compared to latrine owners."

In the context of the SaniFOAM framework, segmentation behaviors of interest may include latrine ownership or consistent use of a latrine. Potential determinants include aspects of opportunity, ability and motivation to perform the behavior, as well as background or population characteristics such as socio-economic status, seasonality, and perceptions of soil quality. Measurement of these items includes the use of multi-item scales, as well as other dichotomous variables or continuous variables (such as respondent knowledge, primary decision maker, wealth indices, gender etc.).

What else to consider? Segmentation analysis requires a certain level of data analysis experience and skill set. Project managers should consider whether or not research agencies have the capacity to produce such analysis, and if not, whether the analysis can be outsourced. If segmentation analysis does not seem like a feasible output, then questionnaires may focus more on "reasons" for behavior. For example, asking respondents: "What are the reasons for building a household latrine/toilet?"; "What are the biggest constraints to installing a household latrine/toilet?"; and "What motivates households to build or improve latrines?" These questions may also be best addressed through qualitative research methods. Using findings from WSP formative research studies, Box 3 shows an example of how a segmentation table can be interpreted.

BOX 3: EXAMPLE INTERPRETATION OF A SEGMENTATION TABLE

An odds ratio (OR) is interpreted as the likelihood, or relative probability, of an outcome (in this case, the desired behavior) for one group versus another. An OR equal to 1 means that no matter where someone scores on the scale, they have an equal odds of owning a latrine. An OR greater than 1 means that as the score increases, people with higher scale scores are more likely to own a latrine than people with lower scores. Conversely, an OR less than 1 means that people with higher scale scores are less likely to own a latrine than people with lower scores.

Determinants of Latrine Ownership

	Country A 43.3% ownership N= 932 AOR (95% CI)	Country B 31.8% ownership N= 3,820 AOR (95% CI)
Opportunity		
Access (ref: believes products are available)	3.4 (1.8-6.6)**	2.1 (1.4-3.1)***
Product Attributes	2.5 (1.8-3.4)***	ns
Social Norms	3.8 (2.6-5.8)***	1.9 (1.5-2.4)***
Sanctions & Enforcement	ns	1.3 (1.07-1.6)**
Background Characteristics		
Age	ns	0.91 (.82-.99)*
Gender (ref:male)	2.2 (1.3-3.9)**	ns
Household Wealth		
Lowest	1.0	1.0
Mid-low	1.3 (.72-2.3)	2.4 (1.4-4.2)***
Middle	2.9 (1.6-5.1)***	4.7 (2.8-8.0)***
Middle-high	8.0 (4.5-14.3) ***	7.8 (4.6-12.8)***
Highest	19.6 (9.1-42.2)***	30.1 (18.2-60.0)***

Annotations:

For respondents with more favorable social norms score, the odds of owning a latrine are 3.8 times higher among than those with a less favorable social norms score.

For a male, the odds of owning a latrine 2.0 times larger than the odds of a female owning a latrine

The odds of owning a latrine are 19.6 times higher among respondents from the highest quintiles as compared to those from the lowest quintiles.

This is the 95% confidence interval: in 95% of samples drawn from this population, we can expect the odds ratio to fall between 1.4 to 3.1.

The p values provide a measurement of the significance of each predictor in the equation.

The OR is less than one, indicating that older respondents are less likely to own a latrine than younger respondents.

Product attributes was not significant (ns) .

This is the reference category for household wealth

Why is segmentation it important for understanding sanitation behavior? Results shown in a segmentation table provide information that researchers and project managers can use to develop a profile of those who perform desired sanitation behaviors as compared with those who do not. This profile informs marketing and behavior change communication strategies. Segmentation analysis also allows for the relationship of different variables to each other to be explored, and allows project managers to understand what factors may be more meaningful than others. This may be especially useful to help draw out the main conclusions of a report, and to facilitate a better understanding of the most important determinants.

What behaviors should you segment on? Why is sample size important to consider? It is important to select the right outcomes for segmentation, and identify and measure the right determinants. Behaviors that can be segmented on include ownership of a latrine as well as self-reported latrine use. When determining what types of behaviors to segment on, it is important to consider sample size requirements and outcome measures, as summarized in Table 4.

When identifying the "right" behaviors to segment on, it is important to consider latrine coverage. When trying to understand latrine use (rather than ownership), we recommend that this behavior is only studied among households that own a latrine. Owning a latrine is a prerequisite for sanitation behavior change. So in instances where latrine coverage is low, segmentation analysis to understand latrine use may not be possible as a very large sample size would be needed. However, if there is still reason to explore latrine use in low coverage populations, it may make more sense to use qualitative research to probe into motivational factors for this specific population. Similarly, if few households own improved latrines, but a program objective is to understand reasons for making latrine upgrades, large sample sizes will be required. Again, qualitative research may be merited. Table 4 provides further details on the sample size assumptions behind segmentation.

Likewise, while a whole variety of determinants may have been assessed in the questionnaire, at the analysis stage researchers should consider what is theoretically sound to include in a segmentation analysis. For example, if one is trying to understand latrine use, factors of affordability and availability of latrines are less relevant, as we explore determinants of use among households that already have a latrine. As such, barriers of availability and affordability have already been overcome. Availability and affordability will however be important to assess if the research objective includes making upgrades or acquiring improved latrines, or purchasing any type of latrine.

What are some of the things I should consider when interpreting findings? Given the cross sectional nature of the data, it is important to note that segmentation analysis does not test for causality. So, for example, while we may make statements that "Latrine owners are significantly more likely to believe that sanitation stores are available in their community than non-latrine owners," this finding could be due to the fact that latrine owners already own a latrine and are therefore more likely to know of sanitation stores than non-owners. We cannot with confidence state that having this belief "causes" households to obtain a latrine. However, the analysis does allow us to test for significance and takes into account the effect of different SaniFOAM factors and other background characteristics in the model. It is therefore more robust than simply running multiple correlations between the behavior of interest on an individual variable, or simply presenting frequencies of findings with no statistical comparisons.

TABLE 4: SEGMENTATION BEHAVIORS: CONSTRUCTION AND REQUIREMENTS

Behavior of interest	Indicator construction	Questionnaire requirements	Sample size requirements
Latrine ownership Households with latrines versus no latrine (open defecation)	Denominator: All sampled households	Whether or not the household owns or has access to a shared latrine must be determined. Interviewer observation may also be used to determine latrine availability. Latrine functionality may also be assessed.	Sample size should take into consideration the estimates of latrine ownership versus no ownership (open defecation) to ensure differences can be detected between these two groups.
Improved latrine ownership Households with improved latrines versus unimproved latrines	Denominator: All sampled households with a latrine	The type of latrine must be identified. Training and data collection tools (visual aids of different latrine types) can assist data collectors in properly identifying latrines types and ensure reliability of responses when identifying an improved latrine.	Sample size calculation should take into account estimated ownership of improved latrines, so that the study is powered to detect a difference between improved and unimproved latrine ownership rather than overall latrine ownership. The sample size must also take into account the percentage of households with a latrine to ensure enough households are visited to obtain the necessary number of respondents that own latrines.
Latrine use at last time Among households with a latrine, proportion of respondents that used a latrine versus those that did not use a latrine, at time of last defecation in the home	Denominator: All sampled households with a latrine	Questions should ask if the respondent used the household latrine last time they defecated at home.	To understand behavior with respect to use, segmentation of this indicator should be conducted among latrine owning households. Sample size must take into account the level of latrine ownership to ensure a large enough sample size of respondents. The sample size must also take into account the estimates of latrine use among respondents with access to a latrine.
Consistent latrine use Proportion of respondents that consistently used a latrine versus those that did not consistently use a latrine, in the last week	Denominator: All sampled households with a latrine	The frequency of defecation in a latrine in the last week must be assessed. "Consistent" use should be defined as those that always use a latrine. Additional questions may also want to address access to latrines outside the home, at work or when traveling and included in the segmentation model to account for accessibility to latrines outside the home.	As above

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Take-away message: Results shown in the segmentation table provide information that researchers and project managers can use to develop a profile of those who perform desired sanitation behaviors as compared with those who do not. This profile informs sanitation marketing and behavior change communication strategies, and thus segmentation results can be a very useful tool to guide program decision making. Sample sizes must be carefully reviewed during the study design development stage to ensure a large enough sample size to make meaningful conclusions.

Tips:

- If researchers are interested in exploring gender differences for example, segmentation analysis may be run on a sub-sample of female respondents.
- When developing a segmentation table, consider what makes sense to include in the analysis. Also, don't forget to include background characteristics as well as wealth indices, which should be routinely included.
- It will also be useful to include a table that presents the means and percentages for the SaniFOAM factors, as well as background characteristics, that are included in the segmentation analysis.
- How results are presented will vary on need. Some project managers may wish to only see the significant determinants, while other may like to see the full model to know what was not significantly related to the behavior.

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