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The contribution of qualitative research to identifying the underlying influences to sanitation and hygiene behavior: A systematic review

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An abstract of
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Rollins School of Public Health of Emory University
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Abstract

The contribution of qualitative research to identifying the underlying influences to sanitation and hygiene behavior: A systematic review

By Laura Wright

Background: Access to sanitation and hygiene facilities is essential for improved health and quality of life. Despite their importance to health, many individuals do not use these facilities. Little is understood about why this is, and qualitative research is a potential tool to research this. To date, there is limited qualitative research regarding sanitation and hygiene behavior. Qualitative research is key to framing answers to underlying influences and patterns for uptake of healthy sanitation and hygiene behaviors.

Goal: The goal of this study was to identify the use of qualitative research methods in understanding barriers and influences on sanitation and hygiene behaviors, examine how the defined influences may affect each other and influence behavior, and identify the gaps in knowledge and opportunities for future research.

Methods: A systematic review of peer-reviewed literature from the past 10 years was conducted to identify articles that used qualitative research to examine influences on sanitation and hygiene behaviors. Eighteen eligible articles were identified from which data were extracted on the behavioral influences on hygiene and sanitation, how these extracted influences related to one another to influence behavior, and the gaps in knowledge.

Results: The qualitative research was found to be centered on study populations of African mothers, and rural groups, and the use of in-depth interviews and structured observations were the most common methods found. Research focused on two topic areas: handwashing and excreta disposal. Social cultural norms, distance to and desirability of sanitation and hygiene facilities influence both these behaviors. In addition, cost to change behavior, family health and safety, and presence of sanitation facilities influences excreta disposal. The use of media (T.V & radio) and education regarding healthy sanitation and hygiene behaviors can positively affect the influence of social cultural norms. Gaps in the published literature included studies in Latin America, and amongst males, fathers, and the elderly.

Conclusion: Qualitative research on sanitation and hygiene behavior focuses on understanding social cultural norms of handwashing and excreta disposal. Social and cultural influences may be an effective area to intervene to improve behavior change. Interventions could potentially be accomplished through the use of media or education. The cost to change behavior may also be important, though not as important as social cultural influences.

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I am extremely grateful for Dr. Monique Hennink, who also put in an immense number of hours helping me understand different and confusing areas of the research, and guided my findings to a deeper and more insightful level. I have learned so much from your guidance, and am so appreciative of your positive and eager help, which also helped me remain excited throughout the process.

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Table of Contents

Literature Review	1
<i>Sanitation and Hygiene as a Health Issue</i>	1
<i>Sanitation and Hygiene Behavior</i>	2
<i>Conceptual Frameworks for Behavior</i>	3
<i>Systematic Reviews</i>	5
<i>Current work on sanitation and hygiene behavior within the Scientific Community</i>	7
<i>Need for further work</i>	7
<i>Goal and Aims</i>	8
<i>Significance</i>	8
Role	9
Manuscript	10
Introduction	11
<i>Sanitation and Hygiene as a Health Issue</i>	11
<i>Sanitation and Hygiene Behavior</i>	12
<i>Meta syntheses</i>	13
Methods	15
<i>Overview</i>	15
<i>Article Identification</i>	15
<i>Article Screening</i>	16
<i>Synthesis/ Analysis</i>	17
<i>Conceptual Framework</i>	19
Results	21
<i>Key findings within the literature</i>	21
<i>Socio-cultural influences on sanitation and hygiene reported in reviewed articles</i>	25
<i>Interaction of Influences identified within the reviewed articles</i>	27
<i>Gaps in knowledge within the reviewed articles, and areas for future research</i>	28
<i>Conceptual Framework</i>	30
Discussion	31
<i>Overview</i>	31
<i>Social cultural norms, the most common influence</i>	31
<i>Cost of ownership of facilities vs. Social Cultural Norms</i>	32
Public Health Implications	36
Appendix	37
<i>A) Extraction Details</i>	37
<i>B) Characteristics of reviewed articles</i>	39
References	41

Literature Review

Sanitation and Hygiene as a Health Issue

Access to sanitation and hygiene facilities is considered a human right, as it not only improves health, but also quality of life [2]. The use of sanitation and hygiene facilities is one of the most important issues facing the developing world today. Ensuring improved coverage of these facilities has become a major goal within the Millennium Development Goals, and promotion of hygiene and sanitation is considered to be the single most cost effective way or reducing the global burden of infectious disease [3, 4]. By 2020, the goal is to expand access to improved sanitation facilities to 77% of the global population [5]. Current efforts are lagging behind this goal, however, an estimated 2.6 billion people currently lack adequate sanitation [6]; this has led to a renewed effort by many organization to improve access and use of sanitation facilities globally [5].

Though the differentiation between sanitation and hygiene can sometimes be unclear, in general, sanitation refers to the containment and disposal of human waste, and a sanitary living environment [7]. This includes toilets with sewer lines or septic connections, pit latrines, proper disposal of baby diapers, or any other human waste containment system, or method to remove human waste from the open environment [8]. Hygiene includes practices surrounding hand washing, such as post defecation hand washing (with or without soap), and hand washing prior to food preparation; it also includes other general cleansing practices such as the use of toilet paper, or other anal cleansing practices, bathing, and cleaning of food [8].

Access to proper sanitation and hygiene facilities helps stop the transmission of fecal material from people's hands or the environment to being ingested by individuals [4]. This

pathway, known as the ‘fecal – oral pathway’, is the mechanism by which excreta is transmitted through the environment, and potentially leads to adverse health effects such as diarrhea, respiratory diseases and other infectious diseases [9]. Studies have shown that those without access to proper sanitation and/or hygiene facilities are at greater risk for health issues throughout their lifetime than those who have consistent and easy access [9-13]. Conversely, with an increase in access to sanitation facilities and improved sanitation and hygiene practices, studies have observed a reduction in diarrheal disease by 60% [6] and in respiratory illnesses by 40% [14].

Sanitation and Hygiene Behavior

Behavior can generally be defined as the manner in which a person conducts themselves; within the context of sanitation and hygiene this can be more comprehensively known as a person’s actions or practices in regards to sanitation and hygiene[13]. Examples of sanitation and hygiene behavior include: safe disposal of human excreta, personal or domestic hygiene practices, food and water hygiene, consumption of safe water, and safe wastewater disposal [7]. By focusing on two categories, safe human excreta disposal and personal hygiene, a more precise examination of behavior can be conducted. Safe human excreta disposal includes use and maintenance of a latrine, as well as using sanitation products such as toilet paper, water and soap. Personal hygiene includes use of hand washing facilities, use of soap, ash or other substances after defecation, handling of fecal matter, or before preparing food. These are key behaviors for decreasing the fecal material on hands and within the environment.

Improving people’s sanitation and hygiene behavior is the most efficient approach for improving use of the facilities. Behavior change should be a primary focus for improving

sanitation and hygiene use as it is the most cost effective method of breaking the fecal-oral pathway, and reducing diarrheal disease and other infectious diseases, in developing countries [3, 4]. Several reports have found that even in areas with access to latrines or hand washing stations, when little effort has been made in improving behavior, unhealthy sanitation and hygiene behaviors can still be seen [4, 13, 15, 16]. This shows that improving sanitation and hygiene use does not require the costly advancement of technology [4], but rather efforts towards the modification of behavior.

Conceptual Frameworks for Behavior

One common method of simplifying complex mechanisms to explain behavior is through the use of conceptual frameworks. Conceptual frameworks are useful for analyzing results from available studies and to inform on the design of new research[1]. Conceptual frameworks provide a framework through which to understand the influences on particular behaviors, as well as prioritize these influences, behaviors or populations [1]. Consequently these can be used to improve the effectiveness of interventions aimed at changing behavior, and identify the appropriate indicators to monitor, so as to measure success [1]. Many researchers to date have adopted conceptual frameworks to understand mechanisms for behavior change around a range of health behaviors, including vaccination, diet, exercise HIV/AIDS prevention, family planning, and many others [1, 17-19]. More recently, conceptual frameworks have been developed to examine sanitation and hygiene behavior and mechanisms for behavior change[1] .

The Social Ecological model is a conceptual framework that has been developed to explain underlying influences on human behavior[20]. It provides a framework for understanding competing and interacting influences between individual, relational, community and societal

influences on human behavior. This provides one strategy to interpret behavioral effects by placing the focus within a social logic, and relationally dividing up influences.

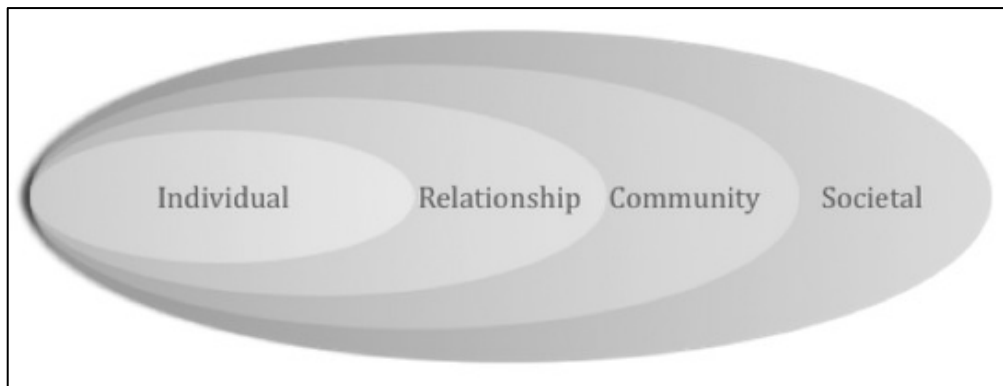


Figure 1: Social Ecological Model[20]

SaniFOAM is a conceptual framework developed specifically to examine water, sanitation and hygiene behavior, with a focus on influencing behavior change. Its aim is to improve behavior change for populations previously without basic sanitation services, or those with low utilization of sanitary facilities [1]. This conceptual framework distinguishes three main types of influences on behavior: Opportunity, Ability and Motivation. Opportunity identifies if the individual has the chance to perform changed behavior, where ability ascertains if the individual is capable

of performing it, and motivation shows if the individual wants to perform the action. SaniFoam interprets these influences on a more contextual

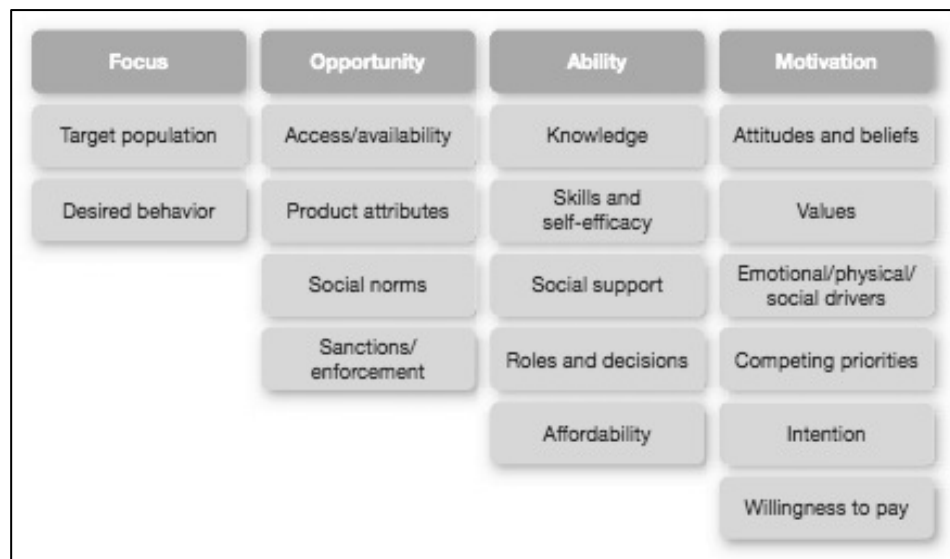


Figure 2: SaniFoam [1].

scale, examining ones surroundings and environment to determine influences of behavior.

Though these conceptual frameworks pose useful approaches to sanitation and hygiene behavior, and have been used to design both qualitative and quantitative research projects [1] focusing on behavior change, there are some improvements that could be made to create a more comprehensive framework of behavior. The social ecological model focuses largely within the social structure of behavior, creating a conceptual framework based on these influences. This presents an incomplete approach to understanding behavior as it overlooks the influences one's environment imposes. Unlike SaniFOAM which examines sanitation and hygiene behavior exclusively, the social ecological model was designed to be used within the context of a variety of behaviors, and is therefore lacking in the specificity needed for an investigation within sanitation and hygiene. The SaniFOAM conceptual framework operates largely within environmental influences such as opportunity and ability yet has a very basic incorporation of social and cultural influences. Because of this, there is a need to develop a more inclusive conceptual framework that effectively addresses all these influences, specifically in regards to sanitation and hygiene behavior.

Systematic Reviews

Another useful tool when examining complex scientific literature is to approach the subject using a systematic review. Systematic reviews are a common method for summarizing scientific evidence from the literature on a specific issue; these differ from general literature reviews in that they allow for a more objective appraisal of evidence through the systematic selection of literature that meets specific criteria and extraction of data from that literature, thereby ensuring a “systematic” review of literature and data. A systematic review is a “robust

way of comparing research and proceeds according to well determined steps” [21]. Systematic reviews can also demonstrate when there is a gap in research in a particular area, and are thereby a tool for identifying areas where further work could be conducted [22, 23].

Within systematic reviews, a method for analyzing and synthesizing the information extracted from literature is a meta-analysis or meta-synthesis. Meta-analyses are typically used for the statistical analysis of quantitative information, while meta-synthesis are used for examining qualitative information within published research [24]. Meta-analyses are common and have been used widely for many years. However, meta-synthesis are relatively new, but growing in popularity in the scientific literature. Meta syntheses were originally met with skepticism, as the synthesis of tentative findings from qualitative research methods into a more comprehensive understanding seemed to operate contrary to some scholarly thoughts [21]. However the purpose of a meta-synthesis, in comparison to a meta-analysis, is that they are interpretive as opposed to deductive, and “through maintaining small sample size of literature, these qualitative analysis seek to understand and explain phenomena, not increase a certainty in cause and effect conclusions” [21]. Through the examination of qualitative results as a group, and formal synthesis of these findings, the influences within the literature can be enhanced [24]. Past meta-synthesis have been used to examine support of breastfeeding mothers, HIV-positive mothers, healing from sexual violence, and many other topics [17-19]. Through the use of meta-synthesis, these studies were able to identify key influences within these complex processes. For these reasons, a meta-synthesis would be useful to investigate how key influences interact and explain sanitation and hygiene behavior.

Using the information examined within meta-synthesis, it is possible to incorporate and display interactions of key influences within a conceptual framework. This practice of proposing

conceptual frameworks from a systematic review has been used in other areas, including work performance and physical activity [25, 26].

Current work on sanitation and hygiene behavior within the Scientific Community

There have been some efforts to investigate specific areas within sanitation and hygiene through the use of a systematic review, however no known efforts, whether quantitative or qualitative, have been made to investigate underlying behavioral influences on sanitation and hygiene.. Current work to date includes, systematic reviews examining health outcomes in regard to sanitation and hygiene behavior, including a meta-analysis of health effects such as diarrheal disease, respiratory diseases, among others, in relation to observed sanitary and hygienic behaviors [27, 28]. Another published systematic review examined motivators of caretaker's (eg: Mothers, child Guardian within household) use of soap when hand washing, and whether these behaviors were planned or habitual [4]. Though these pose useful investigations in the field of sanitation and hygiene, there is still the need to investigate the basic influences that effect sanitation and hygiene behavior.

Need for further work

Due to the complexity within the sanitation and hygiene behavior literature, there is a need to synthesize the underlying influences for sanitation and hygiene behavior and document their relationships to understand the pathway to behavior change. Through a systematic review of literature addressing sanitation and hygiene behavior, we can investigate the trends and patterns identified in the literature as a whole. This can be used to define key influences for behavior change reported in published articles, and assess where there may be current gaps in knowledge.

Goal and Aims

The goal of this study is to identify the contribution of qualitative research to identifying the underlying influences to sanitation and hygiene behavior, through a systematic review of peer-reviewed literature over the past ten years. The specific aims are to:

- 1) Identify the trends within the literature to determine where and how research for sanitation and hygiene behaviors are being conducted,
- 2) Define key influences for sanitation and hygiene research, and how these influences interact, and
- 3) Identify gaps in knowledge within the articles and opportunities for future research.

Significance

This project will synthesize current knowledge to provide a reference for future research and highlight gaps in current knowledge. In improving sanitation and hygiene behavior, public health, or multi-disciplinary groups could use this reference to determine influences that should be addressed and considered. This study will synthesize information into condensed understandable information. This systematic review will also provide a stronger understanding of what the basic influences are for sanitation and hygiene behavior, and how they interact. Through this understanding we can better identify which influences are the strongest, or most important to change or intervene at, when conducting a project or intervention.

Role

The author's role in this manuscript was the systematic review of the literature, identification of articles, extraction and synthesis of data, writing of all sections, and development of the tables and figures.

Manuscript

Title

The contribution of qualitative research to identifying the underlying influences to sanitation and hygiene behavior: A systematic review

Authors

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Abstract

Access to sanitation and hygiene facilities is essential for improved health and quality of life. Despite their importance to health, many individuals do not use these facilities. Little is understood about why this is, and qualitative research is a potential tool to research this. To date, there is limited qualitative research regarding sanitation and hygiene behavior. Qualitative research is key to framing answers to underlying influences and patterns for uptake of healthy sanitation and hygiene behaviors.

The goal of this study was to identify the use of qualitative research methods in understanding barriers and influences on sanitation and hygiene behaviors, examine how the defined influences may affect each other and influence behavior, and identify the gaps in knowledge and opportunities for future research.

A systematic review of peer-reviewed literature from the past 10 years was conducted to identify articles that used qualitative research to examine influences on sanitation and hygiene behaviors. Eighteen eligible articles were identified from which data were extracted on the behavioral influences on hygiene and sanitation, how these extracted influences related to one another to influence behavior, and the gaps in knowledge.

The qualitative research was found to be centered on study populations of African mothers, and rural groups, and the use of in-depth interviews and structured observations were the most common methods found. Research focused on two topic areas: handwashing and excreta disposal. Social cultural norms, distance to and desirability of sanitation and hygiene facilities influence both these behaviors. In addition, cost to change behavior, family health and safety, and presence of sanitation facilities influences excreta disposal. The use of media (T.V & radio) and education regarding healthy sanitation and hygiene behaviors can positively affect the influence of social cultural norms. Gaps in the published literature included studies in Latin America, and amongst males, fathers, and the elderly.

Qualitative research on sanitation and hygiene behavior focuses on understanding social cultural norms of handwashing and excreta disposal. Social and cultural influences may be an effective area to intervene to improve behavior change. Interventions could potentially be accomplished through the use of media or education. The cost to change behavior may also be important, though not as important as social cultural influences.

Introduction

Sanitation and Hygiene as a Health Issue

Access to sanitation and hygiene facilities is considered a human right, as it not only improves health, but also quality of life [8]. Access to proper sanitation and hygiene facilities prevents or reduces the transmission of fecal material from people's hands or the environment to ingestion by individuals [4] and reduces the risk of infectious disease (such as diarrheal, respiratory, and other infectious diseases) throughout their lifetime [9-13]. Ensuring improved coverage of these facilities has become a goal within the Millennium Development Goals, and promotion of hygiene and sanitation is considered to be the single most cost effective way or reducing the global burden of infectious disease [3, 4]. By 2020, the goal is to expand access to improved sanitation facilities to 77% of the global population [5]. Current efforts are tailing behind this goal, however, an estimated 2.6 billion people currently lack adequate sanitation [6]; this has lead to a renewed effort by many organization to improve access and use globally [5]. This has resulted in a large output of literature that shows a variety of influences and factors that affect sanitation and hygiene; though at this point in time, little synthesis of this information has been conducted.

Sanitation is defined as the containment and disposal of human waste through management or recycling, and maintenance of a sanitary living environment [7]. This includes toilets with sewer lines or septic connections, pit latrines, proper disposal of baby diapers, or any other human waste containment system, or methods to remove human waste from the open environment [8]. Hygiene is defined as practices surrounding handwashing and other cleansing practices. This includes post-defecation hand washing (with or without soap), and pre-food preparation hand washing; it also includes other general cleansing practices such as the use of

toilet paper, or other anal cleansing practices, menstrual management, bathing, and cleaning of food [8].

Sanitation and Hygiene Behavior

Sanitation and hygiene behavior is defined as a person's actions or practices in regards to sanitation and hygiene [13]. One example of sanitation and hygiene behavior is safe human excreta disposal, which includes use and maintenance of a latrine, as well as using sanitation products such as toilet paper, water and soap. A second example of sanitation and hygiene behavior is personal hygiene which includes use of hand washing facilities, use of soap, ash or other substances after defecation, handling of fecal mater, or before preparing food.

Sanitation and hygiene behavior change is an increasingly important focus within the field of sanitation and hygiene. Behavior change has been found to be the most cost effective method of breaking the fecal-oral pathway, and reducing diarrheal disease and other infectious diseases, in developing countries [3, 4]. By focusing on changing unhealthy behaviors, greater levels of positive sanitary or hygienic practices have been observed [2], and efforts made toward the modification of behavior have been found to be cheaper interventions compared to technology based interventions such as latrine material changes [4]. With a focus on behavior change, greater improvements in healthy behaviors will be seen, and at a lower net cost than attempting to improve sanitation or hygiene technology. There is little consensus however, on how best to influence behavior change for sanitation and hygiene, and what methods are most effective [2].

There has been some effort made to gain a further understanding of drivers of behavior change in sanitation and hygiene, however the majority of sanitation and hygiene behavior

research is investigated using quantitative methodology, making qualitative research more difficult to locate. Though the quantitative research is useful for testing hypothesis, looking at cause and effect links and making predictions, qualitative information is useful for understanding and interpreting social interactions to examine the breadths and depth of the phenomena being investigated [29, 30]. It is for this reason that qualitative data is desirable for examining sanitation and hygiene behavior, as it is through qualitative research that questions for personal experience and views are answered.

Within the research regarding sanitation and hygiene behavior, there hasn't been any effort to examine trends within common influences or perceptions between them. Through examining the research as a group, further information as to key influences or common trends for behavior change may become apparent. Due to this, there is the need to investigate the complexity of sanitation and hygiene behavior, so as to understand the basic influences, and how these key influences interact.

Meta syntheses

To address this need, it is important to conduct a systematic review [21-23], specifically a meta-synthesis. While meta-analyses are used for the statistical analysis of quantitative information, meta-synthesis are used for examining qualitative information within published research [24]. The purpose of a meta-synthesis is to be interpretive as opposed to deductive, "through maintaining small sample size of literature, these qualitative analysis seek to understand and explain phenomena" [21]. A meat-synthesis would be best for an examination of qualitative results of sanitation and hygiene behavior as a group, and formal synthesis of these findings, so as to enhance the complex processes found within the literature [24].

As described, there is a need to synthesize the underlying influences for sanitation and hygiene behavior and document their relationships to understand the pathway to behavior change. Through a thorough investigation of the literature addressing sanitation and hygiene behavior we can investigate common trends and patterns, define key influences for behavior change, and identify current gaps in knowledge. By doing this a reference material will be created to aid in future fieldwork for sanitation and hygiene by providing these influences in an easy to use conceptual framework. Thus, the goal of this study is to identify the influences that affect sanitation and hygiene behaviors, through a systematic review, using peer-reviewed literature from the past ten years.

Methods

Overview

The goal of the study was addressed through three steps. First, a systematic review of the peer-reviewed literature was conducted. The primary aim of the systematic review was to identify peer-reviewed articles, using qualitative data to examine the influences on sanitation and hygiene behaviors. Second, once eligible articles were identified, data were extracted from the articles using a data extraction instrument. Data that was extracted included: major behavioral influences reported; how these influences relate to one another; the overall gaps in knowledge on behavioral influences. Third, extracted data were incorporated into a conceptual framework to illustrate how these influences relate to one another.

Article Identification

To obtain peer-reviewed articles describing qualitative data of the influences on sanitation and hygiene behaviors, the search terms included sanitation and hygiene, toilet, latrines, and human waste, various qualitative method search terms, and “behavior” search terms (Table 1) in three databases: PubMed, Web of Knowledge, and Embase. A limit was set for human subjects, English language, and literature

Table 1 Search Strategy (adapted from McInnes *et al.* 2008)

Databases	PubMed, EMBASE, Web of Knowledge
Search Terms	Sanitation Hygiene Toilet* Latrine* “Human Waste” Behavior Culture (Health Knowledge, Attitudes, Practice [Mesh Terms]) “Focus Groups” Interview* Observation Ethnography “In-depth Interview” or “In depth interview” Published in English Human Subjects yr= “2002-2013”
Limits	

Note: * = plurals of word e.g. Toilet and Toilets.

published only within the past ten years (2002-2012). The limit on years was to ensure research conducted since the most recent aims set for the Millennium Development Goals for sanitation and hygiene in 2002. This date was chosen because there was a renewed effort by many groups and organizations to address the issue of sanitation and hygiene access in developing countries; hence an increase in relevant, applicable literature began being formulated. The search was run January 20th, 2013 and a total of 43 documents were identified.

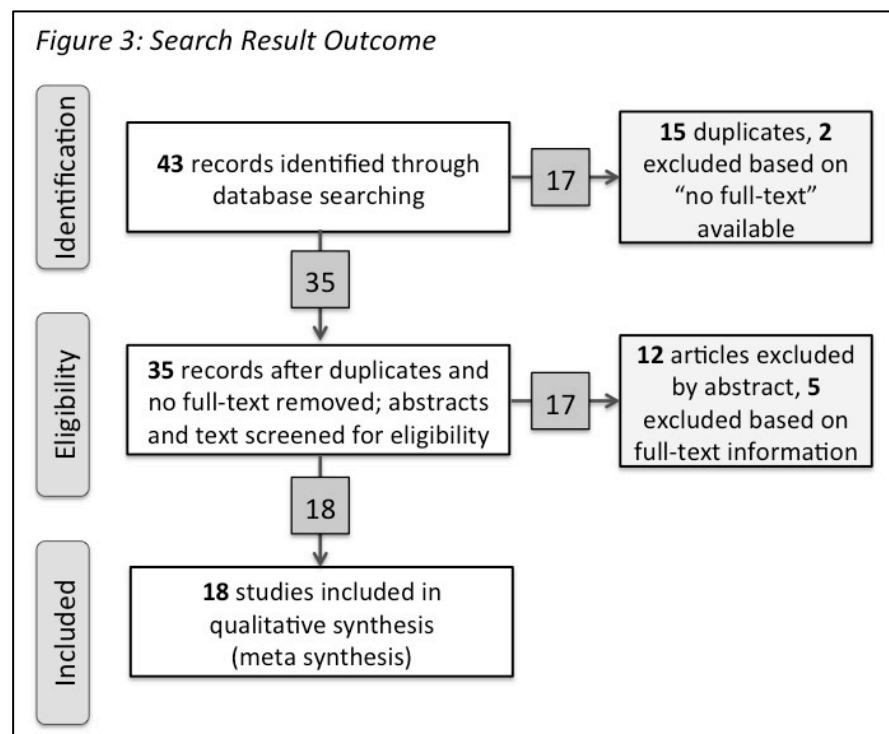
Article Screening

From the 43 initial documents retrieved, across all the three databases, 15 duplicates were removed and two articles could not be found in full text format and were therefore excluded.

Thirty-five eligible articles and abstracts were retained. All abstracts were screened and considered eligible if they included two components. The first component was a discussion of sanitation or hygiene

behavior, specifically regarding toilets, latrines, or human waste disposal.

The second component was the use of qualitative methods such as interviews, observation, focus groups, and ethnographies. Five documents were further



excluded because the documents did not discuss the results of qualitative methods outside of the abstract or data were presented in a numerical, non-qualitative format. Seventeen articles were excluded based on the content of their abstracts and text and 18 articles were retained as eligible. During this screening, if the first author could not assess eligibility of an article, a secondary review by a co-author was conducted for consensus. The process of the screening is detailed in Figure 3.

Synthesis/ Analysis

When all data had been extracted and cleaned from all 18 documents, the data were then classified into categories including year published, topic, journal name and type, study design, method mix, research methods, study country, study continent, population residence, study population, first author location, primary influence themes, secondary influence themes, effects on influences, effects between influences, and sources of bias by author and reviewer. These categories were then tabulated to identify basic frequencies within each category (Appendix 1).

Topic was categorized by main behavior focus within document pertaining to sanitation and hygiene. Journal type was decided first on the title of Journal name if explicit for which subject area it pertains to; journals with titles not clearly within one subject area was then examined at the journal website where brief overviews of the were examined for the most common topic published within journal, with some secondary review with a co-author for consensus. Study Design was decided based off information within both the abstract and methods section of the document where the goal of the study was stated. Exact criteria for category are detailed in (Appendix A). Method mix and research methods were determined from examining the methods section and extracting the methods used. Research method categorization

is also outlined in more detail in (Appendix A). Study Location was determined from the document, however for further synthesis a second category of study location continent was also included. Continent was chosen for the larger area synthesis due to its recognized and finite countries included within each continent. Population residence was determined by the study location described within the text and categorized between Urban, Rural, Peri-urban or a combination of these. Studies that were not explicit with region, and no data was available to further determine this, were labeled as “no data”. Study population was determined from the population described in the methods section of the documents where population was described.

Mothers include any study focusing on mothers and female heads of household. Household includes both the male and the female head of household responding, or male, female and some other family member. A document was categorized as community if the data was obtained from diverse sources outside and away from households, school children included studies of students at school, as well as of school aged children at school, at home, and elsewhere. Refugees include people living within both short and long-term refugee camps, and travelers include people in transit from one location to another at public facilities. First Author location is the location where the first author was based out of at the time of publication. Influences were extracted. Influences were identified within the results and discussion sections of documents; data was extracted and recorded in detailed text, then further synthesized into specific categories. Detailed explanation of each influence can be found in (Appendix A).

The data as a whole was then critically analyzed for general gaps in knowledge within the literature. To accomplish this, data extraction categories were examined for trends, and common areas of research within each sub-category (geographic region, qualitative methods, study population, etc.) These sections were then examined to determine if there were gaps within the

obtained research. This was done by determining if research generally focused within specific topics or subject areas; this aided in determining what was consequently excluded within the literature.

Conceptual Framework

To create the conceptual framework, the first step was to synthesize the primary influences identified within each text. This was done by examining the main influence text recorded for the main overarching theme within the text, and synthesizing the text to a single word descriptor. Once all descriptors were recorded, further synthesis of descriptor words was completed to create a more uniform usage of words between different texts. Specific meanings were assigned to the words to ensure systematic usage and proper allocation of word to synthesized meaning.

Secondly, a similar synthesis of secondary influences, and their interaction with the primary influences was conducted. This was done by synthesizing the text for secondary influences into more concise wording. Full sentences were kept for secondary influences to keep the important information of how influences were interacting. Once synthesized, the information within the secondary influences was matched to its primary synthesized influence. All secondary influences with the same primary influence were grouped together, so as to visualize all secondary influences as a group that interact on the primary influence in question.

The third step was to divide the synthesized primary influences into similar categories. This was done by examining all primary influences as a group and examining their common trends. In the desire to maintain a non-complex framework that identifies noteworthy trends, it was desirable to maintain 3-4 categories of influences. It was also desirable to divide influences

by how these influences interacted within the individual (e.g. internally, externally, etc.) due to the expectation of using this framework for future intervention work within the field of sanitation and hygiene. By having it divided by these factors, it would be easier to determine at what level within a population to focus future work. By doing this, three distinct categories were determined within the primary influences.

Results

Key findings within the literature

Characteristics of reviewed articles

To identify the characteristics of reviewed articles information about the research (topic, region, population) and the publication (year, author location) were summarized. Table 2 shows that the most common research topic areas were excreta disposal and hand washing, with fewer articles on household hygiene and food preparation. Household hygiene refers to the cleaning of surfaces within the house, and food preparation includes hygienic practices in cleaning food and food preparation surfaces. Articles on handwashing focused on general hand washing, with 4 articles specifically examining hand washing with soap. The majority of articles on excreta disposal focused on latrine use (12/14 articles, 86%), the remaining articles focused on disposal of diapers, and child feces management. Half of all articles conducted research in Africa and almost one-third in Asia. No reviewed articles were conducted in Latin America and few studies were conducted in developed countries. The majority of articles conducted research amongst rural study populations (56%) and a third amongst peri-urban populations (33%), the remaining studies focused on urban study populations.

Table 2: Characteristics of reviewed articles

Characteristic	Number of Articles,(%)
Study Topic:	
Excreta Disposal	14 (78%)
Handwashing	12 (67%)
Household Hygiene	3 (17%)
Food Preparation	2 (11%)
Study Region:	
Africa	9 (50%)
Asia	5 (28%)
Europe	2 (11%)
North America	1 (6%)
Other	1 (6%)
Residence of Study Participants:	
Rural	10 (56%)
Peri-Urban	6 (33%)
Urban	3 (17%)
Other	1 (6%)
Country of First Author:	
England	5 (28%)
United States	4 (22%)
Other	8 (44%)

Figure 2 shows the different types of study populations in the reviewed articles. The overwhelming majority of articles focused on mothers as the target populations with 44% of studies focusing on mothers, over twice as many than any other type of study population.

Authors were predominantly based at institutions in England and the US, authors from all other countries (including two from Europe, three from Asia, three from Africa and one from North America) published only one article (Table 2).

Further patterns were found when assessing several characteristics of articles together. Over a quarter of articles focused on African mothers when examining geographic region and study population together, no other groupings were as prominent. In addition, all articles where the first author was based in the US focused on Africa, and almost half of the articles conducted research in the same geographic region as the first author's institution. Finally, all research from US based first authors focused on latrine use, while all research from UK based first authors focused on hand washing.

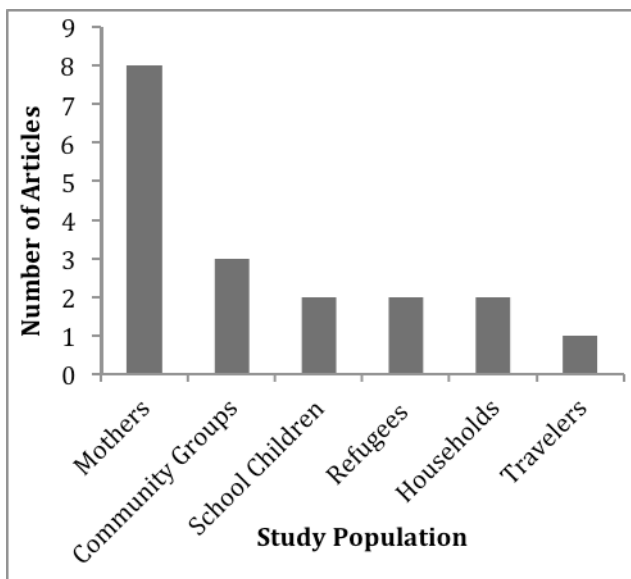


Figure 2: Mothers, compared to other study populations, were most often studied among reviewed articles

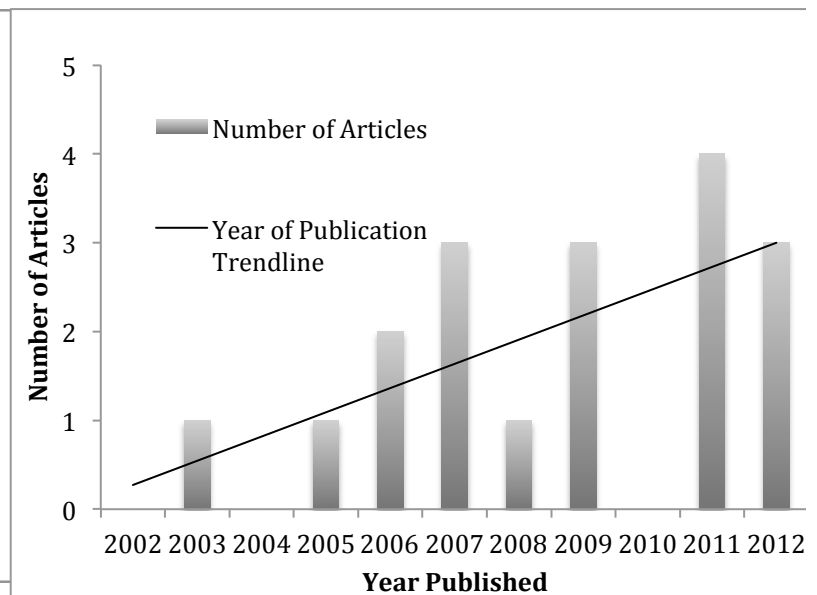


Figure 3: The number of reviewed articles has generally increased over the past ten years

Figure 3 shows the number of articles by year of publication. Although the numbers are small, there is a clear increase in the number of articles using qualitative methods for sanitation and hygiene research over the past ten years, with the number of articles published doubling between 2002 and 2012. In conclusion, the increasing yearly number of publications selected show a focus on excreta disposal and hand washing, rural populations and mothers, while geographic region focused in Africa and Asia.

Research methods used in reviewed articles

Table 3 shows the overall study design, research methods and method mix used in reviewed articles. The criteria for article inclusion in this review was the use of qualitative methods, however, almost half of eligible articles used a mix of qualitative and quantitative methods (44%). An equal proportion of articles (44%) used multiple qualitative methods, while few studies used only a single qualitative method (11%).

Articles were categorized into four types of study design: substantive, exploratory, explanatory, and evaluative (each are defined in the methods section), which provide an indication of how qualitative research methods are being used in research on hygiene and sanitation. Overall, the

Table 3: Methods used in reviewed articles.

Research Methods Used	Number of Articles, (%)
Study Design:	
Substantive	6 (33%)
Exploratory	4 (22%)
Explanatory	3 (17%)
Evaluative	5 (28%)
Research Methods:	
In-Depth Interviews	15 (83%)
Structured Observations	13 (72%)
Focus Group Discussions	8 (44%)
Other ¹	4 (22%)
Method Mix:	
Qualitative & Quantitative Methods	8 (44%)
Multiple Qualitative Methods	8 (44%)
Single Qualitative Method	2 (11%)

Note : Substantive: Qualitative data only, standalone, not mixed methods

Exploratory: Qualitative components occur prior to other research

Explanatory: Qualitative component occurs after observational research

Evaluative: Qualitative component occurs after intervention

¹Not specified

majority of studies used a study design involving mixed methods (exploratory, explanatory, evaluative), which together comprised 67% of articles; while the remaining 33% were substantive, involving only the use of qualitative research methods (single and multiple). These mixed qualitative methods included for example the use of both in-depth interviews and focus group discussions, while studies using a single qualitative method refer to the use of one qualitative method, such as Jenkins et al. [45] which used only in-depth interviews. Mixed qualitative and quantitative methods included studies that used of a survey alongside one or more qualitative methods. Multiple qualitative methods, such as Ataymbe et al. [33] who used In-depth interviews, focus group discussions, structured observations and a survey to inform influences for behavior.

The range of qualitative research methods used in articles are shown in table 3. In-depth interviews were the most common qualitative method used with nearly every study using this method. Structured observation was used almost as extensively as in-depth interviews, with 72% of articles using this method. In comparison, fewer studies used focus group discussions and other types of qualitative methods.

Further patterns were found when assessing several characteristics of articles together. Structured observations were used most commonly in evaluative studies, for example Diallo et al [41] used this combination to examine to evaluate the acceptability of latrine use after an intervention. In contrast, in-depth interviews were used most often in substantive studies, for example Jenkins et al [45] use of in-depth interviews to examine why people want latrines in rural Benin. Structured observations were most common within studies where the first author was located in England, while in-depth interviews were more often used in research where the first author is located in the US.

Socio-cultural influences on sanitation and hygiene reported in reviewed articles

Table 5 shows the type of socio-cultural influences on hygiene and sanitation reported in reviewed articles. Articles are divided into two main topic areas (hand washing and excreta disposal), with a range of influences reported under each topic.

Table 4: Influences on hand washing and excreta disposal identified from reviewed articles

Topic	Synthesized Influences	Count	Citation
Hand washing & Household Hygiene	Social Cultural Norms	8 ¹	[31-38]
	Distance	6	[31, 34, 36, 38-40]
	Education	3	[14, 35, 38]
	Family Health and Safety	2	[34, 39]
	Disgust	2	[34, 35]
	Cost	2	[40, 41]
	Media Use	1	[38]
	Desirability	1	[40]
Latrine Use & Excreta Disposal	Social Cultural Norms	7	[31-33, 36, 42-44]
	Desirability	6	[31, 32, 36, 40, 41, 45]
	Distance	6	[31, 36, 39, 40, 46, 47]
	Cost	4	[39-41, 43]
	Presence of Facilities	4	[31, 36, 41, 45]
	Family Health and Safety	4	[39, 45-47]
	Education	3	[14, 36, 43]
	Social Status	2	[32, 47]
	Privacy and Comfort	2	[46, 47]
	Media use	1	[44]
	Political Environment	1	[33]

¹ All counts add up to over 100% due to multiple influences identified within each article.

Social cultural norms were found to be the most commonly identified influence on sanitation and hygiene behaviors with 8 articles on hand washing reporting this influence, and 7 articles on excreta disposal. Social cultural norms represent behaviors that are influenced by ones social and community bonds, including a desire to appear a certain way, or behave as

expected. Le et al [32] provides an example of social cultural influences, whereby the use of fish pond toilets was considered normal within the study community. Despite the cost of improving the facilities or education on good sanitation practices, the use of fish pond toilets was so engrained in the culture that to change behaviors one would have to address this cultural barrier.

The next most commonly identified influence on both hand washing and excreta disposal was distance to facilities. This includes the physical distance to a facility, or the time it would take to complete the action (e.g. hand washing). Biran et al [30] report that mothers were unwilling to use up their time to travel the far distance to use public latrines, therefore open defecation was more common.

Desirability was identified as a socio-cultural influence in articles on excreta disposal; this refers to idea that the facilities or behaviors fit within what is socially desired or acceptable. For example, if there was poor maintenance of a facility or if facilities were believed to be needed or important, this would influence the “desirability” of the facility. In a study by Abrahams et al. [43] school children were less likely to use the school latrines because of the odor and poor maintenance, but also because they desired facilities with brighter colors, and to be better lit. This presents another barrier or consideration for improving behavior change, in that it is important to consider the desires of the population when constructing a sanitation and hygiene facility.

Articles on excreta disposal presented a second group of common socio-cultural influences, found 4 times within the reviewed articles. These influences include cost, presence of facilities, family health and safety. Cost represents the financial cost of constructing or maintaining a latrine, presence of facilities is based on the presence or absence of sanitation or hygiene facilities, or present in insufficient numbers for use, and family health and safety

represents the desire to protect ones family from disease or other harm from either the use or non-use of facilities.

In conclusion, social-cultural norms and distance to facilities were the most commonly identified influences for hand washing and excreta disposal, and excreta disposal also included desirability. Cost, presence of facilities, family health and safety were also found several times within the reviewed articles for excreta disposal, though less often than the previously mentioned influences.

Interaction of Influences identified within the reviewed articles

To understand how the influences for sanitation and hygiene behavior influence one another, all interactions between influences was extracted from the reviewed articles, synthesized and grouped according to a common influence. The most common interaction was found for social cultural norms, which included influences from both media use and knowledge. Both of these were found as an influence within the reviewed articles, however they were not seen as often as social cultural norms. However, when they were mentioned, they were most often in relation to affecting social cultural norms. For example, Carolini et al. [31] describe T.V media as a social activity, watched as a group, which influenced social norms of the group when media regarding improved hygienic practices were advertised.

Table 5: Interactions between influences identified from reviewed articles

Interactions Between Influences²	Count	Citation
Media, Knowledge, and Social Cultural Norms	5	[34, 36, 40, 43, 44]
Gender Females, and Social Norms, Comfort, Privacy, Convenience, Family Health & Safety	4	[31, 34, 35, 47]
Gender Males, and Prestige, Social Status, Disgust	2	[35, 47]
Study Population, and Desirability	3	[31, 40, 41]
Socioeconomic status, Cost, and Income	2	[32, 47]
Family Age, and Desirability	1	[47]
Disgust, and Family Health & Safety	1	[39]
Length of time, and Education	1	[14]

² The topics listed within each row indicate the interactions between influences described in the reviewed articles; each influence is separated by a comma

There were specific groupings of influences for males and females, showing many influences to be gender specific. Women were found to be more affected by influences such as social cultural norms, privacy, convenience and family health and safety, while males were most influenced by social status, prestige, cost and disgust. Juda et al [37] provide an example, whereby gender differences are reported in influences on hand washing in public restrooms in England. In this study the knowledge of safety for doing the behavior was more influential, where the idea of disgust was more important for men. In conclusion, media use and knowledge affect the influence of social cultural norms, and many influences are gender specific.

Gaps in knowledge within the reviewed articles, and areas for future research

To identify specific areas where further research was needed, all reviewed articles were considered as a whole to determine trends within both topic areas; gaps in knowledge were identified by the absence of articles in a specific area. Three major areas were found to have gaps in knowledge, which were geographic region, study populations, and influences.

Within the extracted articles, there was a distinct concentration in research regarding Africa and Asia, showing that there was a lack of research in Latin America and the Middle East, which represent large areas of diverse cultures and people groups where behavioral research would be beneficial. Europe, North America and Australia were also excluded. There was also large focus on mothers, children in schools, households and communities within reviewed articles. This shows an absence of research for men or fathers specifically, though a proportion of these influences could be included within “household” studies. Similarly, research investigating the elderly was also not seen within the reviewed articles and there was little research found in regard to people when away from the house, such as traveling, working, shopping, etc.

Influences of family interactions or common family bonds were lacking, this includes expectations for care for the elderly, childcare, or spousal and in-law relationships. Political infrastructure and built environment were also absent from research influences, these influences relate to access of materials for facilities or the facilities themselves. More specific characteristics or aspects within ones culture that influence behavior are further influences that are absent from within the reviewed articles.

In conclusion, there is an absence of reviewed articles investigation the geographic regions of Latin America and the Middle East, study populations of fathers, men, and the elderly, and influence of family bonds, political infrastructure, built environment and specific aspects within culture.

Conceptual Framework

An initial goal within the study was to represent key influences and their interactions in a conceptual framework. However, once all influences were identified and research, the representation of the findings within in the confines of a conceptual framework was found to not be feasible. With further research and investigation of influences however, this has the potential to be addressed in the future.

Discussion

Overview

The goal of this study was to identify the underlying influences for sanitation and hygiene behavior through a systematic review of the literature over the past ten years. Through this systematic review, it was found that social cultural norms were the most often identified influence for hand washing and excreta disposal behavior. For excreta disposal, cost of facility ownership was identified less often than social cultural norms. Social cultural norms were reported to be influenced by media use and education for healthy sanitation and hygiene behaviors. Gaps in knowledge and areas for future research were identified for Latin America, males and the elderly.

Social cultural norms, the most common influence

Social cultural norms and desirability of facilities were mentioned most often as an influence for sanitation and hygiene behavior, specifically hand washing and excreta disposal. This may be because social cultural influences and interactions are critical for behavior. Mechanic et al. [48] state that behavior is “culturally ingrained and built into patterns of work, family life and recreation”, and behaviors are accepted if they operate within that framework. A randomized control study found that an intervention to address the perception of schizophrenia was more successful when administered in a group as compared with an individual setting [49] because social interactions created a stronger affinity by the participants for the information or practices being taught, in this case, changing personal beliefs and thoughts regarding a mental illness. Other sources have found that acting within social structures and cultural norms have been highly effective in impacting uptake of practices or behaviors [50]. Conversely, with unsuccessful programs, the blame is often placed on cultural unacceptability [51]. This shows

that it is likely that impact of social cultural influences is important for changing sanitation and hygiene behaviors.

Cost of ownership of facilities vs. Social Cultural Norms

Cost of ownership of sanitation and hygiene facilities was found as an influence for behavior change in relation to excreta disposal, but it was found much less often than social cultural norms. Because of this finding, we hypothesize that cost is an important factor for behavior, but it is less important than social cultural norms. It has been seen in other studies that cost of ownership of sanitation facilities has an effect on choices that people make, but is also weighed against other factors to determine the benefits of the cost of ownership, as opposed to the “risks” of not using, such as the impact on health [52]. As previously discussed, the expectations of one’s social or cultural group is a strong influence for many, and most people are more receptive to ideas that operate within that framework [48]. No studies were found that directly compare the “risk” of financial cost versus the “benefit” of the cost, and which has a larger impact on individuals. This may be an individual difference and un-definable by population. What we can say, however, is that there is a balance between these two influences that must occur in order for behavior to be changed [52].

Impact of Media and Education on Social Cultural norms

Social cultural norms were reported to interact with the influences of education and media use. This interaction may occur because media and education have a large impact on social cultural norms due to the integral impact they have in our every-day lives. Media has been described as highly integral to our culture, and that its subtle impacts affect many areas of our lifestyle, due to its prolific nature [53]. Programs aimed at improving various behaviors have

seen that by using media, their interventions are often met by the groups with positive responses, and have been found to be effective at influencing behavior [54]. Other sources have stated that differences in education are a major component of culture and social circles [55, 56], showing that people of similar education often are in more similar social strata or groupings [56]. Because of this, we can assume much of the positive impact of media and education on social cultural norms is due to the impact these have on changing or affecting these norms.

Implications for future research

The largest gaps in knowledge were in reference to geographic region and study populations. Within the eligible articles, there was no research within Latin America. Within the eligible articles, males and the elderly were not included in study populations. There were also three main geographic areas where research was being conducted. These geographic areas include first authors from England (specifically the London School of Tropical Medicine and Hygiene), the US and then also first authors from the country in which the study was being conducted. It would be expected that research in Latin America should come from within Latin American countries themselves, or from the US as the US is geographically and financially more accessible than from England. However, we see most of the research from US authors being conducted in Africa. We do know that sanitation and hygiene facility use is an issue in parts of Latin America based on other, non-qualitative research being conducted in the area [57-59]. We also know there is also the infrastructure in place to conduct studies in these areas due to the existing projects, and qualitative methods have the potential to be incorporated into this existing work.

Perhaps there are technical barriers with utilizing qualitative research in these areas, and it would be important to emphasize the importance of qualitative research in these areas, both for Latin American and American researchers.

Within study populations in the reviewed articles, there was no focus on men or the elderly. In the categories of “household” or “community” that were included, some response from men or elderly groups may have been included, however there was no direct record of this. Regardless, less is known in detail regarding these groups compared to “mothers” as several studies focused solely within “mothers”. It is similarly important to study the elderly or men in as much unique detail, as it may provide further important influences for behavior change, specific to these people groups.

This bias towards study population selection could also be affecting the quantity of certain influences that were identified within the literature. As previously stated, gender does affect influences, and it was seen that women were more influenced by social cultural norms, and distance to facilities, two of the most powerful influences. With a more qualitative studies involving men or the elderly, different influences may surface as more important. Men were also found to be more influenced by cost and social status. Had more men been directly included in studies, the relative commonality of these influences compared to others may have been different.

Study Strengths and Limitations

Some study limitations include, first, that all literature obtained was limited to the English language. There may be further studies with influences on behavior for sanitation and hygiene within works in other languages. A second limitation may be the choice of date limit placed on

the systematic review. However, from our research we see that there was a definite increase in literature in more recent years. The final limitation identified was that the systematic review of the literature and extraction of information from within the articles was conducted by a single reviewer. To ensure that all key influences were identified, a secondary review by another person would be desirable to ensure consistency.

Strengths include first that all methods and extraction criteria were well documented and recorded to ensure reproducibility of this study. Secondly, all questionable articles, extraction information, categorization and any other questionable areas were reviewed by a secondary source for clarity. Finally the use of a meta-synthesis was an effective method for extracting and examining qualitative information. Other strengths included method direction and clarity from a source with expertise in qualitative data, and further dialogue regarding sanitation and hygiene behavior by several key sources who were knowledgeable in the field. Another strength of this study was that the protocol for identifying and limiting studies to be included in the systematic review was clearly outlined into a specific linear format, which is easily replicable.

Conclusions

Results show, and other literature indicates, that social cultural influences and interactions are important for behavior, and that cost is an important factor, but it is less important than social cultural norms. It is also likely that media and education have a large impact on social cultural norms due to the integral impact they have in our every-day lives. Qualitative methods have been useful in understanding social and cultural influences on sanitation and hygiene behaviors, though there are still several gaps in knowledge within the researched articles, which may impact the diversity of influences found.

Public Health Implications

- Social cultural norms are the most commonly mentioned influence in reviewed articles on behavior change; hence efforts to improve healthy behaviors should consider these influences.
- Social cultural norms, desirability and distance to sanitation and hygiene facilities are more important than cost of these facilities. Future research should focus on these areas to create more sustainable and cost effective changes to behaviors.
- An effective way of influencing social cultural norms is through the use of educating populations through media use, such as TV and radio.
- The impact of influences varies by gender. Future research should be gender specific to address the differing influences between males and females.
- There are gaps in qualitative research on sanitation and hygiene in Latin America, and among the study populations of men, and the elderly. Future research should aim to incorporate these groups.
- Qualitative research in this area has used a variety of methods to determine influences, some of which are unique to traditional qualitative research. The use of unique and novel methods such as structured observations, projective techniques, and photovoice should be further explored in sanitation and hygiene behavior research.

Appendix

A) Extraction Details

Study Design Details:

Exploratory

- Qualitative components occur prior to other research/ intervention component AND
- Aimed to inform development of an intervention, questionnaire, guideline, or program
OR
- Part of a mixed methods study (and informing quantitative data collection)

Explanatory

- Qualitative component occurs after observational (e.g. survey) research component AND
- Part of a mixed methods study
- Collecting data to understand findings in quantitative data

Evaluative

- Qualitative component occurs after intervention/program AND
- Collecting data ABOUT an existing program (not just recruiting from a program/location)
- Examining experience, use, perceptions, etc. regarding the intervention

Substantive

- Qualitative data only/ standalone (e.g. Exploring perceptions, experiences, etc. regarding sanitation and hygiene facilities)
- NOT mixed methods
- NOT exploratory, explanatory, or evaluative

Method Categorization:

Focus Group Discussion

- Any focus group discussion, or group interview

In-Depth Interview

- Any in-depth interview, Key Informant Interview, Structured or Semi-Structured Interview

Structured Observation

- Any mention of a structured observation
- This category excludes ethnographic observation and participant observation

Other

- Any method not a Focus group discussion, in-depth, interview, or structured observation

Influence Extraction:

- **Social Cultural Norms:** This includes behaviors that are generally accepted as “normal” within a household, community, or culture at large; what is socially or culturally acceptable. This also includes religious norms, for what is considered acceptable within the culture or constraints of a particular religion. This also includes social status or prestige within a social or community group due to sanitation or hygiene facilities.
- **Distance:** This includes barriers to access due to excessive time needed to complete the behavior, (e.g. Time spent hand washing, cleaning household, etc. too great), or time or distance was too great to reach the facility itself (e.g. latrine facilities located far away and not worth the trip).
- **Presence of Facilities:** Physical availability of facilities, either in insufficient number, or simply lacking any facilities at all. Different than “distance ” due to actual lack of facilities as opposed to there, but too far away.
- **Desirability:** The general desire for a facility, including a want for particular features or attributes of a facility. Also if there is a perceived need or importance associated with facility or behavior that drives a want or desire for facilities. The acceptability and maintenance status of a facility was also included in this category as it influenced that desirability for use. If not well maintained or unacceptable, the facility was undesirable.
- **Privacy and Comfort:** The drive, use or desire for a sanitation or hygiene facility due to the desire for privacy or comfort specifically.
- **Disgust:** This refers to the feeling of disgust or repulsion due to a perceived, believed or tangibly dirty environment, or unsanitary conditions; a desire specifically for personal or environmental hygiene, and cleanliness.
- **Education:** Education includes any education a person had received or previous knowledge they had in relation to sanitation and hygiene. This also includes level of education for the person in general, and literacy levels.
- **Media Use:** One's ownership and use of a media source, either TV or radio.
- **Family Health and Safety:** This represents one's desire to protect and nurture one's family and particularly children, either by use or non-use of facilities. This also includes personal safety and health.
- **Cost:** Actual financial cost of constructing and maintaining a sanitation or hygiene facility. This included both a constraining influence of too high a price, as well as positive influence for higher rental income if latrine included.
- **Political Environment:** Availability of materials and facilities based off the current political environment within a region.

B) Characteristics of reviewed articles

Citation	Topic	Year Published	Journal Type	Study Design	Method Mix	Research Methods	Study Country	Study Continent	Population Residence	Study Population	First Author Location
[40]	<ul style="list-style-type: none"> Excreta Disposal Handwashing 	2012	Medical	Exploratory	Mixed Methods (Qual/ Quant)	Structured Observations, In-Depth Interviews <i>Quantitative Survey</i>	Thailand, Ethiopia and Kenya	Africa/ Asia	Peri-Urban	Refugees	England
[41]	<ul style="list-style-type: none"> Latrine Use Handwashing 	2012	Public Health	Exploratory	Mixed Methods (Qual/ Quant)	In-Depth Interviews, <i>Quantitative Survey</i>	Mozambique	Africa	Peri-Urban	Mothers	USA
[36]	<ul style="list-style-type: none"> Latrine Use 	2012	Public Health	Explanatory	Mixed Methods (Qual/ Quant)	Structured Observations, Diary Writings, Picture Drawings, In-depth Interviews, Focus Group Discussions, <i>Quantitative Survey</i>	Vietnam	Asia	Rural	School Children (6-11 years old)	Vietnam
[31]	<ul style="list-style-type: none"> Latrine Use Handwashing 	2011	Environmental Sciences	Exploratory	Mixed Methods (Qual/ Quant)	In-Depth Interviews, Focus group discussions, Structured Observations, <i>Quantitative Survey</i>	Uganda	Africa	Rural	Refugees	Uganda
[39]	<ul style="list-style-type: none"> Excreta Disposal Handwashing Household hygiene 	2011	Public Health	Substantive	Mixed Methods (Qual/Qual)	Photovoice, In-depth Interview	Tanzania	Africa	Peri-Urban	Mothers	USA
[42]	<ul style="list-style-type: none"> Excreta Disposal 	2011	Social Sciences	Exploratory	Mixed Methods (Qual/ Quant)	In-Depth Interviews, Focus Group Discussions, Structured Observation	Pakistan	Asia	Rural	Community groups	Sweden
[14]	<ul style="list-style-type: none"> Latrine Use Handwashing 	2011	Social Sciences	Evaluative	Mixed Methods (Qual/ Quant)	Structured Observations, <i>Quantitative Survey</i>	Bangladesh	Asia	Rural	Mothers (Children < 5 years old)	Banglade
[43]	<ul style="list-style-type: none"> Latrine Use 	2009	Environmental Sciences	Explanatory	Mixed Methods (Qual/ Quant)	Focus Group Discussions, In-Depth Interviews, <i>Quantitative Survey</i>	Vietnam	Asia	Peri-Urban	Mothers	German

[35]	• Handwashing	2009	Public Health	Substantive	Qualitative	Structured Observations	England	Europe	Rural	Travelling Public	England
[38]	• Handwashing	2009	Medical	Evaluative	Mixed Methods (Qual/Qual)	Structured observation In-Depth Interviews	Kenya	Africa	Rural	Mothers (Children < 5 years old)	England
[44]	• Handwashing	2008	Medical	Evaluative	Mixed Methods (Qual/Qual)	Focus Group Discussions, In-depth interviews, Structured Observation <i>Quantitative Survey</i>	Ghana	Africa	*No Data	Mothers (Children < 5 years old)	England
[32]	• Latrine Use • Handwashing	2007	Public Health	Explanatory	Mixed Methods (Qual/ Quant)	Focus Group Discussions, <i>Quantitative Survey</i>	India	Asia	Rural	Community groups	India
[46]	• Latrine Use	2007	Environmental Sciences	Substantive	Mixed Methods (Qual/Qual)	In-Depth Interviews, Structured observation	Niger	Africa	Rural	Households	USA
[37]	• Latrine Use • Handwashing	2007	Environmental Sciences	Evaluative	Mixed Methods (Qual/ Quant)	Structured Observations, <i>Quantitative Survey</i>	Egypt	Africa	Urban	Mothers	Egypt
[45]	• Latrine Use	2006	Medical	Substantive	Mixed Methods (Qual/Qual)	Focus Group Discussions, In-depth interviews, Structured observations	South Africa	Africa	Peri-Urban and Urban	Female Students (12-17 years old)	South Africa
[33]	• Excreta Disposal • Handwashing • Food Preparation	2006	Public Health	Evaluative	Mixed Methods (Qual/Qual)	In-Depth Interviews, Structured observations.	Mexico	North America	Peri-Urban and Rural	Community groups	Mexico
[47]	• Latrine Use	2005	Social Sciences	Substantive	Qualitative	In-Depth Interviews	Benin	Africa	Rural	Households	USA
[34]	• Handwashing • Household Hygiene	2003	Social Sciences	Substantive	Mixed Methods (Qual/Qual)	Structured Observations, In-Depth Interviews, Focus group discussions, Projective techniques	England	Europe	Urban	Mothers (Children <1 year old)	England

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