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Handwashing in the Perinatal Period

Literature Review and Synthesis of Qualitative Research Studies from Bangladesh, Indonesia, and Kenya

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The Maternal and Child Health Integrated Program (MCHIP) is the U.S. Agency for International Development's Bureau for Global Health flagship maternal, neonatal and child health (MNCH) program. MCHIP supports programming in MNCH, immunization, family planning, malaria and HIV/AIDS, and strongly encourages opportunities for integration. Cross-cutting technical areas include water, sanitation, hygiene, urban health and health systems strengthening.

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Table of Contents

List of Tables and Figures.....	iv
Definitions and Acronyms.....	v
Acknowledgments.....	v
Background.....	1
Objectives.....	1
Systematic Review.....	2
Methods.....	2
Results.....	2
Summary of Key Findings from Systematic Literature Review.....	4
Synthesis of Qualitative Research Studies on Handwashing Behavior in the Perinatal Period.....	5
Study Methods.....	5
Description of Study Participants.....	6
Handwashing Behavior of Mothers.....	6
Common Motivators, Facilitators, and Barriers to Maternal Handwashing.....	6
Handwashing by Secondary Caregivers (Table 5).....	8
Insights and Recommendations for Interventions to Improve Handwashing by Mothers and Others in the Perinatal Period.....	10
References.....	14
Synthesis Tables and Figures.....	17
References for Tables and Figures.....	35

List of Tables and Figures

Figure 1. Results of systematic review of biomedical literature on handwashing in the perinatal period.....	17
Table 1. Papers on handwashing in the perinatal period in low- and middle-income country settings identified in systematic review of PubMed database	18
Table 2. Description of qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya (2010–11).....	23
Table 3. Description of participants in qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya (2010–11).....	24
Table 4. Perceptions of newborn vulnerability and preventive benefits of handwashing, and reported and observed handwashing behavior of mothers and secondary household caregivers in qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya, 2010–11.....	25
Table 5. Handwashing behavior of secondary caregivers and birth attendants in qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya, 2010–11.....	27
Figure 2. Theoretical framework to explain motivations of maternal handwashing behavior in the neonatal period.....	29
Figure 3a. Synthesis of findings on motivators, facilitators, and barriers to handwashing among mothers of neonates in Bangladesh, Indonesia, and Kenya, 2010–11	30
Figure 3b. Synthesis of findings on barriers to handwashing among mothers of neonates in Bangladesh, Indonesia, and Kenya, 2010–11.....	31
Figure 4. Intra-familial dynamic of issuance of verbal reminders to wash hands before touching the newborn, Bangladesh, 2010.....	32
Box 1. Putting handwashing into context: The complexity of promoting handwashing during the perinatal period	33
Box 2. Pregnancy and new motherhood: A teachable moment?	33
Box 3. Soap? Ash? Sanitizer?	34
Box 4. Developing a monitoring and evaluation plan for your handwashing promotion program	34

Definitions and Acronyms

Maternal mortality: death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes

MCHIP: Maternal and Child Health Integrated Program

Neonatal period: first 28 days of life

Perinatal Period: the period around childbirth: from the 22nd week of gestation to 7 days after birth

USAID: US Agency for International Development

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Background

The health benefits of handwashing by health providers attending to women in labor were first documented in the 1840s, when Oliver Wendell Holmes and Ignasz Semmelweis separately linked poor hand hygiene of clinicians to postpartum sepsis (1, 2). After noticing that maternal mortality was higher in a ward in which doctors and medical students attended to women following autopsies, Semmelweis instituted handwashing with chloride of lime by clinicians before examination of women in labor (2). This intervention reduced the maternal mortality rate from 18% to less than 3%. Semmelweis implemented this hand hygiene method in two other hospitals, reducing their maternal mortality rates to less than 1% (1). Whereas Semmelweis documented the benefits of handwashing by health workers on maternal mortality, and the protective effects of handwashing for reduction of diarrheal disease and respiratory infections among young children have been well established, largely, these have been limited to study of the post-neonatal period (3).

A compelling analysis (4) by Rhee and colleagues in 2008 brought to light the potential to substantially reduce neonatal mortality in low- and middle-income countries, where approximately 4 million newborns die. Given the magnitude of the effect (potential to reduce neonatal mortality by 40%) suggested by Rhee, in 2010–11, the Maternal and Child Health Integrated Program (MCHIP), a consortium of the USAID-funded organizations working on reproductive, maternal, and child health, funded three studies to investigate the practices, and motivators and barriers related to handwashing in the neonatal period. A fourth study was funded by USAID/Bangladesh. These studies were conducted in Bangladesh, Indonesia, and Kenya and provide a wealth of information on the handwashing behaviors of mothers and others close to newborns, and the motivators and barriers to doing so. This report synthesizes the information from these studies and provides recommendations for practitioners seeking to incorporate handwashing promotion into programs designed to reduce neonatal mortality.

OBJECTIVES

The purpose of this report is three-fold:

1. To report on a systematic review of the biomedical literature regarding handwashing in the perinatal period in low- and middle-income country contexts.
2. To synthesize the information available from the MCHIP- and USAID-funded qualitative research studies on the motivators and barriers, and current practices of maternal handwashing behavior in the perinatal period.
3. To provide recommendations to practitioners seeking to develop and implement programs to promote handwashing to reduce neonatal mortality.

Systematic Review

METHODS

In December 2013, we conducted a literature search of the complete PubMed electronic database (<http://www.ncbi.nlm.nih.gov/pubmed/>) to examine the existing peer-reviewed literature on handwashing during the perinatal period. We compiled a list of key words relating to handwashing (handwash*, hand wash*, hand hygiene), our target population (perinatal neonatal, newborn, maternal, birth attendant), and health effects (child mortality, infant mortality). The literature search was then conducted using all possible combinations of one handwashing key word along with a target population or health effect key word. We reviewed the title and abstract of all papers identified using the combination of key words, and subsequently excluded those not specific to the perinatal period, not relevant to the pre-specified topics, or without a low- or middle-income country focus. We reviewed the full text of the remaining papers and again excluded those that were not relevant to the pre-specified topics or without a low- or middle-income country focus. The remaining papers were read in full and their information is provided in the synthesis below.

RESULTS

Based on the pre-determined combinations of key words, we identified 402 papers from the PubMed database (Figure 1). Of these, 370 papers were excluded because they were deemed not relevant based on review of the title and abstract: they were not specific to the perinatal period, did not have a low- or middle-income country focus, or were not relevant to the pre-specified topics. Among the remaining 32 papers, 18 were subsequently excluded after review of the full text. Thus, a total of 14 relevant papers were identified and included in our review (Table 1).

In clinical settings in low- and middle-income countries, handwashing has been shown to prevent nosocomial infections, and neonatal sepsis in neonatal intensive care units. In a program in a neonatal intensive care unit in Taiwan, hand hygiene promotion consisted of education about key times to wash hands, provision of antimicrobial soaps at each sink, and waterless handrubs available during the campaign (5). As hand hygiene improved from 43% at baseline to 74% in the first year and 80% in the second year, the rate of nosocomial infections decreased from 15.1 episodes per 1,000 patient-days at baseline to 10.5 and 11.9 episodes per 1,000 patient-days during the first and second years. Total nosocomial infection rate in the neonatal intensive care unit also decreased significantly after the program. In Myanmar, handwashing with soap and water significantly decreased the severity of dehydration in infants with acute diarrhea in an intensive care unit (6), suggesting that handwashing prevented clinically relevant diarrhea in these babies.

Few studies have focused on health effects of handwashing among caregivers in the home setting and, largely, the data come from observational studies rather than from randomized controlled trials investigating the health effects of specific interventions. We present below the findings of studies evaluating the effects of handwashing on particular types of infections, as well as on overall neonatal mortality.

Reported handwashing with soap by the traditional birth attendant before delivery has been found to be protective against umbilical cord infection in rural Nepal ($RR_{adj}=0.69$, 95% CI: [0.61, 0.79]); handwashing by the mother during the first 14 days of life was shown to be similarly protective ($RR_{adj}=0.71$, 95% CI: [0.56, 0.91]) (7). The risk of cord infection was 27% lower among infants for whom the mother reported that the birth attendant washed hands with soap before delivery, and 35% lower among infants where the mothers reported “always” washing their hands with soap before handling the baby. In addition, the use of soap provided in clean delivery kits was strongly associated with decreased umbilical cord infection risk ($RR_{adj}=0.51$,

95% CI: [0.45, 0.58]). An observational study from Bangladesh suggests that the odds of tetanus in neonates is reduced by about one-half among neonates for whom birth attendants washed hands with soap before delivery compared to those who did not (8, 9): Bangladesh (OR= 0.49, 95% CI: [0.30, 0.81]). A pooled analysis including the Bangladesh study as well as additional data from Pakistan and India yielded a similar protective effect: OR= 0.51, 95% CI: [0.38, 0.65]).

There is observational evidence supporting the benefits of maternal and birth attendant handwashing to prevent neonatal mortality. In Southern Nepal, newborns whose mothers reported handwashing were at 44% lower risk of death compared to newborns whose mothers did not report handwashing (adjusted risk ratio (RR_{adj}) = 0.56, 95% CI: [0.38, 0.82]). Birth attendant handwashing, as reported by the mother, conferred a 19% lower risk of dying in the neonatal period, compared to (RR_{adj} = 0.81, 95% CI: [0.66, 0.99]). The mortality rate was 41% lower among neonates for whom both mothers and birth attendants were reported to have washed hands (RR_{adj} = 0.59, 95% CI: [0.37, 0.94]), suggesting that the mothers' handwashing confers substantial protection (4). A pooled analysis of observational data from three locations in South Asia (India, Bangladesh, Nepal) found reduced odds of neonatal mortality of 11% in birth attendants who washed hands before delivery compared to those who did not (10).

To date, only one randomized controlled trial has evaluated the effects of a handwashing promotion intervention on neonatal mortality: in Pakistan, Soofi and colleagues investigated the effect of handwashing with soap, independent of and along with umbilical cord application of chlorhexidine, to prevent umbilical cord infection and neonatal mortality (11). The handwashing intervention was modest, consisting of providing participants with bar soap, along with birth attendants encouraging handwashing. There were no significant effects on umbilical cord infection (RR= 0.83, 95% CI: [0.61, 1.13]) or neonatal mortality (RR=1.08, 95% CI: [0.79, 1.48]).

Despite the various observational studies suggesting the health benefits of handwashing during the perinatal period, few studies have examined the practice of handwashing and potential barriers to starting or maintaining proper hand hygiene among mothers, other caregivers, and birth attendants. In rural Nepal, handwashing knowledge was high among traditional birth attendants, but practice varied depending on training status (trained vs. untrained birth attendants) and cultural perceptions of childbirth being unclean and polluting (12). Untrained birth attendants sometimes reported not having enough time to wash hands before delivery, or being “engaged in different tasks” before delivery. Also, if delivery was considered to be polluting, birth attendants reported washing hands with soap following the delivery, instead of before. Similarly, another study targeted toward the traditional birth attendants in southern Nepal found that, although 74% of birth attendants reported washing their hands before delivery (among both ethnic groups), 85% of trained traditional birth attendants reported washing their hands with soap, compared to 65% of untrained (13) birth attendants. In rural Ghana, 79% of birth attendants washed hands before attending to delivery because “the baby should be welcomed with clean hands,” and because of the need to “prevent infection” or “prevent dirt from touching the skin of the baby” (14). Those birth attendants who did not wash their hands simply did not think it was necessary but stated that the behavior would not be difficult as soap was readily available. Importantly, unlike some cultural beliefs in South Asia (12), for example, there was no perception of birthing being polluting, thus removing a potential barrier to clean delivery.

SUMMARY OF KEY FINDINGS FROM SYSTEMATIC LITERATURE REVIEW

Our systematic review of the peer-reviewed literature regarding handwashing in the perinatal period demonstrated that a number of observational studies suggest potentially large health gains from handwashing with soap.

Data from studies with experimental designs, such as controlled trials, demonstrate that handwashing promotion to health workers reduces neonatal infections. Observational studies demonstrate that handwashing by traditional / skilled birth attendants reduces mortality, umbilical cord infections, and neonatal tetanus. In our review of the literature, we did not find published papers on randomized controlled trials of the effects of promoting handwashing to birth attendants attending to births at home.

Handwashing by mothers and birth attendants may reduce the risk of umbilical cord infection, tetanus, and overall neonatal mortality. However, many of these studies are undercut by their reliance on self-report of handwashing behavior, which has been shown repeatedly to overestimate actual practice (15). Moreover, almost all studies were observational in nature. To date, only one randomized controlled trial has been conducted investigating the impact of a handwashing promotion intervention on umbilical cord infection and neonatal mortality; in this study, the handwashing intervention was quite weak, based primarily on the provision of a bar of soap and some encouragement by the traditional birth attendant.

In conclusion, there are sufficient observational data on the health benefits of handwashing by mothers and birth attendants in low- and middle-income countries that efforts to improve handwashing by those closest to newborns are warranted. However, there are major gaps in the literature with respect to the efficacy of particular interventions on handwashing behavior change, the role of hand contamination by familial caregivers other than the mother, and the effects of handwashing promotion to mothers, other caregivers, and birth attendants on neonatal infections and mortality.

Synthesis of Qualitative Research Studies on Handwashing Behavior in the Perinatal Period

In 2010–11, four qualitative research studies were conducted in low- and middle-income countries to describe the handwashing behavior of mothers, other familial caregivers, and birth attendants, and to examine the motivators and barriers to handwashing among mothers of newborns and birth attendants. In this section, we synthesize the information from these studies in order to identify overlapping themes that transcend cultural and geographic diversity, and provide a basis for development of interventions to promote handwashing in the perinatal period.

STUDY METHODS

Four studies, three funded by MCHIP and one by USAID, were conducted in Bangladesh, Indonesia, and Kenya (Table 2). Both studies in Bangladesh were conducted in rural settings, whereas the studies in both Indonesia and Kenya included both rural and urban sites. In all three countries, investigators examined the behavior of mothers of newborns, other household caregivers, as well as birth attendants; whereas the Habigonj study in Bangladesh did include traditional birth attendants, the Matlab study did not. In Habigonj, only traditional birth attendants were included in contrast to Indonesia and Kenya, where both skilled and unskilled birth attendants took part. Because of the similarity in findings from the two Bangladesh studies, we have collapsed the information from the two sites.

Qualitative research methods, specifically in-depth interviews and group discussions, were utilized in all four studies. Direct observation, either by a human observer or by researcher-directed video recording, was used to document the frequency and potential barriers, motivators, or facilitators of handwashing behavior in both Bangladesh studies and in Indonesia. Observation data addressed not only the types of events occurring and whether or not hands were washed, but also contextual details that might inform why hands were or were not washed. There was no observation of handwashing behavior in the Kenya study.

A theoretical underpinning to understanding maternal handwashing in the neonatal period

The investigators in Bangladesh developed a theoretical framework based on the Theory of Planned Behavior and the Social Cognitive Theory (16) to describe the potential influences explaining a mother's handwashing behavior (Figure 2).

In the theoretical framework, several factors are proposed to drive the mother's intent to improve her handwashing behavior during the neonatal period, including perceived advantages of handwashing, normative beliefs and subjective norms, perceived risk of the neonatal period, and the mother's perceived control over her behavior. A normative belief is a mother's perception of whether others believe that she should or should not practice a behavior (*example statement: My mother-in-law believes that I should wash my hands*). A subjective norm is the mother's perception of the behavior itself; that perception is informed by others who influence her (*example statement: I should stay in the room with my baby at all times because my mother tells me that it is not safe to leave my baby alone*). The mother's desire to nurture (e.g., to love and care for her child) also influences her intention to improve her handwashing behavior during the neonatal period.

Self-efficacy (a mother's confidence in her own ability to take the action she chooses to take) and the extent to which the mother actually has control over her behavior both inform the translation of her intent to wash hands into actual handwashing practice. Actual control is influenced by factors beyond the mother's sphere of influence, e.g., because of social constraints, lack of authority

over purchases of household goods. Finally, the framework suggests that pre-existing handwashing habits strongly influence the mother's handwashing behavior in the perinatal period.

Information on motivators, barriers, and facilitators from the various studies is organized according to this theoretical framework. The authors construct a synthesis of the key findings from within and across the countries in order to highlight facilitators, motivators, and barriers.

DESCRIPTION OF STUDY PARTICIPANTS

Between 20 and 26 mothers of newborns took part in the various studies, typically between the ages of 15 and 39 (Table 3). All participating mothers in Indonesia were literate, in contrast to the relatively less educated participants in Bangladesh and Kenya.

HANDWASHING BEHAVIOR OF MOTHERS

Handwashing was frequently reported by mothers of neonates in all studies (Table 4), but there was inconsistency in the report of times at which hands were washed. In Bangladesh, mothers indicated handwashing after cleaning the child's anus. Mothers in Indonesia and Kenya indicated washing hands before handling the baby, with some in Kenya also reporting handwashing before handling the newborn. Handwashing with soap was rarely observed at baby-related events in both Bangladesh and Indonesia. However, some mothers in Bangladesh were observed to wash hands with water alone before breastfeeding.

In Bangladesh and Indonesia, mothers reported handwashing after toileting or defecation, with mothers in Bangladesh also reporting handwashing after cleaning the child's bottom or after coming into contact with cow dung. Although they did not mention it, some mothers in Indonesia were observed to wash hands after contact with the baby's feces or after changing the nappy.

Report of handwashing was common for food-related events, particularly before eating (Indonesia and Kenya), breastfeeding (Kenya), and food preparation (Bangladesh, Indonesia).

Handwashing with soap was observed only before mothers ate rice in Bangladesh; handwashing with water alone was commonly observed before breastfeeding, eating, and serving food. In Indonesia, handwashing was observed after eating, suggesting that the need to remove food particles drove the cleansing. Whereas mothers in Bangladesh reported washing hands at various other times, including after completing household chores, they were not frequently observed to do so. Some mothers in Indonesia were observed to wash hands after household chores and after returning home from outside.

COMMON MOTIVATORS, FACILITATORS, AND BARRIERS TO MATERNAL HANDWASHING

Drivers of handwashing intention

Perceived risk

In all three countries, newborns were perceived to be at unique risk for various health concerns, broadly including infections. Of particular concern were respiratory infections (Bangladesh and Kenya), diarrhea (Indonesia and Kenya), and fever (Indonesia). Morbidities uniquely mentioned by mothers in Indonesia were sprains, fractures, and fever. Measles and skin diseases were mentioned as syndromes of concern by mothers in Kenya. In Bangladesh, there was a prevalent perception that newborns were at risk from bad air (a supernatural belief, rather than a reference to air pollution) or even from "Satan," particularly if left alone by the mother.

Perceived advantages and disadvantages of handwashing

Mothers in Kenya specifically indicated the preventive benefits of handwashing against illness in the neonatal period. The lack of appreciation of maternal handwashing as protecting against infection in the newborn represents a potential barrier to the behavior in Bangladesh and Indonesia.

In all the countries, mothers reported or were observed to prioritize keeping themselves clean. The studies in both Bangladesh and Indonesia indicated that handwashing serves to increase the mother's comfort, either by removing visible dirt, food particles, stickiness, or smells. In Bangladesh, mothers reported handwashing after eating in order to remove chilies or spices, since those could irritate a child's skin. Alleviating disgust by handwashing was also important to mothers in Bangladesh, since human feces (their own or feces of children eating solid/semi-solid foods) were perceived to be disgusting.

In Indonesia, women were observed washing hands after returning from outside the home, suggesting that the world beyond their home was unclean or exposed them to potential contamination.

Normative beliefs and subjective norms

In Bangladesh, mothers reported that their elders warned them against frequent contact with water, because of local humoral beliefs that excessive contact with water by the mother could lead to an increased risk of respiratory infection in the child. Mothers indicated that such proscriptions represent a barrier to handwashing, since washing hands frequently would place them in contact with water many times per day.

Culture- or religion-based practices to protect the newborn included isolating or cocooning the mother with her newborn for 40–45 days (Bangladesh) and up to 2 months (Nomia sect – Kenya). Such practices prevented mothers from washing their hands because they would need to leave their babies in order to go to the handwashing place. This was believed particularly dangerous at nighttime. Implied here is the lack of handwashing materials in the places in which mothers are recommended to spend time with their newborns. Such cocooning practices were not commonly reported in Indonesia.

The guidance of other family members was perceived to influence women's behaviors in Bangladesh and Indonesia; health workers were viewed as influential in this regard in Kenya. Mothers in Indonesia indicated an openness to changing their behaviors during the precious time of new motherhood, particularly based on the advice of others such as elders and midwives. However, the influence of others can also inhibit the adoption or improvement of beneficial health behaviors such as handwashing. In Bangladesh, some mothers described that ridicule or shaming from in-laws prevented them from changing handwashing behaviors.

Desire to nurture

Mothers in Bangladesh identified cleanliness as a nurturing behavior, indicating that a good mother keeps herself and her child clean. In Indonesia, mothers reported making numerous changes to their everyday behaviors (eating more vegetables, avoiding spicy foods, drinking milk) to benefit the health of the baby.

Perceived behavioral control, actual control, and self-efficacy

Mothers in all three countries indicated that a new baby brought numerous additional responsibilities, rendering life very busy. Bangladesh and Kenya mothers indicated that, in the absence of secondary caregivers to assist either with the housework or with the care, particularly of older children, they were pressured for time and felt that they could not leave their work to

wash hands even if they wanted to. Mothers in Indonesia reported that their lives now revolved around the baby and raised a concern about how often they could wash their hands.

Mothers in Bangladesh often reported that they cannot improve their handwashing behavior, even if they wish to do so (a lack of self-efficacy), because of the lack of affordability of soap (a financial barrier to actual control), or the lack of power in their familial structures to spend money in order to procure necessary goods (a societal barrier to actual control). Some did report being able to ask for necessary materials / goods for child rearing. However, others noted that even if materials were given by an external group, elders would reject their use. Such a lack of actual control or self-efficacy was not specified by mothers in Indonesia or Kenya.

Cues to action

Notably, proximity of handwashing materials was noted to be an important facilitator of handwashing across all three sites. Mothers in Indonesia had access to water and soap where they needed them. Mothers in both Bangladesh and Kenya indicated not having these materials available in the rooms where they spent time with their newborns. This was a particular concern at nighttime, when mothers in both countries were less able to leave the room to go in search of materials to wash hands. The availability of necessary materials can serve as a visual cue to prompt handwashing at the times when the mother should wash hands.

Verbal reminders from elders often cued mothers in Bangladesh to wash hands during the busy newborn period, when they might otherwise forget.

Habit

Pregnancy and the neonatal period change a woman's life dramatically (Box 2). During this time, old routines are disrupted, offering the opportunity for new habit formation, according to mothers in Indonesia. It was not clear, though, whether newly adopted behaviors were intended to be sustained long-term and whether they were indeed habitual (i.e., a behavior that is learned and becomes automated and responsive to a specific cue) (17).

Mothers in Kenya and Bangladesh indicated that childhood is the time during which handwashing habits are learned from parents. However, the video or structured observation data indicate that handwashing with soap was not habitual for the vast majority of mothers in either Bangladesh or Indonesia, where observations had been conducted. Handwashing with water alone was observed before 64% to 94% of events of eating rice in Bangladesh, suggesting a habit of hand rinsing at that particular time.

HANDWASHING BY SECONDARY CAREGIVERS (TABLE 5)

Mothers in Bangladesh and Kenya described secondary caregivers from different perspectives. In Bangladesh, mothers of neonates and young infants noted that their own mothers and mothers-in-law serve as advisors, as do other elders. However, the power dynamic is clear. Whereas new mothers are consistently able to ask children to wash their hands before touching the neonate, and may often be able to ask their husbands, they cannot easily do so with their in-laws. Elders, however, remind a new mother to wash hands, which can be helpful when she is so busy.

Women in Kenya described the challenges they faced in getting their husbands to wash hands. They indicated that men wash their hands less frequently than women, perhaps because they feel even busier than women feel.

Handwashing by skilled and unskilled birth attendants (Table 5)

Mothers in the three countries reported that the hand hygiene behavior, particularly of unskilled or traditional birth attendants, was poor during delivery and before cutting the umbilical cord. In Indonesia, traditional birth attendants were viewed as “scary” and “unhygienic,” in contrast to midwives who were more trusted. Although skilled birth attendants and clinicians were reported to advise mothers to wash hands in both Indonesia and Kenya, mothers in Kenya indicated that they often observe health workers not washing hands before attending to the laboring mother. Instead of washing hands, health workers were observed to don gloves.

Whereas traditional birth attendants in Bangladesh informed that they typically wash hands before attending to the delivery, they did indicate that they sometimes have difficulty doing so at the mother’s home, since she may or may not have soap and water. Some noted washing hands at their own home before setting out to the mother’s home. Kenyan skilled service providers noted a number of times at which they wash hands with soap, and reported washing hands before wearing gloves. Notably, they also mentioned not changing gloves between attending to different women, suggesting the potential of the health worker serving as a vehicle for bloodborne and other pathogens.

Whereas skilled service providers in Kenya reported advising mothers to wash hands with soap, traditional birth attendants in Bangladesh and midwives in Indonesia did not stress the use of soap. These health workers in both Indonesia and Kenya did recommend handwashing by the mother before handling the baby but also noted that mothers rarely follow their advice.

Insights and Recommendations for Interventions to Improve Handwashing by Mothers and Others in the Perinatal Period

In this synthesis of qualitative data from three sites, we find a number of motivators, facilitators, and barriers to maternal handwashing, many of which are identified in two or three of the countries. As appropriate, we have fitted these into the constructs introduced in the theoretical framework, and framed them from the mother's perspective (Figures 3a and 3b). Below are key cross-cutting insights from these studies:

- Insight 1: Mothers wash hands because of motivators other than health: disgust, comfort, aspiration, and nurture.
- Insight 2: Mothers have varying appreciation of the vulnerability of newborns to infections that may cause death.
- Insight 3: Conveniently located handwashing materials facilitate maternal handwashing.
- Insight 4: New mothers are busy people and that busy-ness (perceived or actual) prevents them from washing hands.
- Insight 5: Elders / others can help or hinder a mother from practicing good hand hygiene and achieving her nurture goals.
- Insight 6: Reported behavior does not equal observed behavior.
- Insight 7: The hand hygiene behavior of birth attendants must improve, both for the direct implications on the newborn's health and for the opportunity to model optimal hand hygiene behavior to the mother.
- Insight 8: There are substantial evidence gaps in the area of handwashing and neonatal morbidity and mortality.

The following recommendations based on each of the cross-cutting insights are meant to aid practitioners whose goal is to improve the handwashing behavior of mothers and others during the critical newborn period.

Insight 1: Mothers wash hands because of motivators other than health.

Synopsis: Consistent with the findings from numerous formative research studies (17), data from Bangladesh, Indonesia, and Kenya showed that mothers wash their hands because of motivators other than health: disgust, comfort, aspiration, and nurture. The desire to keep their babies clean is trumped by mothers' desire to *appear* clean, suggesting the power of social norms in shaping mothers' perceptions and handwashing behavior.

Recommendations:

1. Avoid the sole use of health-based messaging, since it is unlikely to achieve substantial gains in maternal handwashing behavior that are lasting.
2. Encourage a social norm identifying handwashing with soap as a nurturing behavior that results in raising a child who grows up to be healthy, happy, and successful. Re-fashioning the social norm around handwashing will not necessarily be easy but it may be hugely rewarding. Mothers' groups, peer-to-peer promotion, intentional gossip, social marketing approaches, and other strategies to change the social norm regarding handwashing may be helpful to promote the concept that handwashing is a critical way for a new mother to demonstrate her desire to nurture her newborn.

3. There are limited examples of successful approaches to change behavior based on non-health messages. There is evidence that the SuperAmma campaign achieved significant increases in handwashing behavior (Curtis, Lancet Global Health, in press). This campaign (www.superamma.org) is built on constructs of nurture and aspiration, and seeks to construct a social norm of handwashing. Although the SuperAmma campaign does not directly address handwashing in the neonatal period, program planners may find it a useful basis for design of interventions.

Insight 2: Mothers have varying appreciation of the vulnerability of newborns to infections that may cause death.

Synopsis: While mothers appreciated that their newborns were vulnerable, they were inconsistent in understanding the extent to which handwashing-preventable infections cause death in newborns.

Recommendation:

1. Highlight the vulnerability of the newborn period. Mothers and all secondary caregivers (e.g., grandmothers, aunts, and so on) should be made aware, if they are not already, of the high risk of infections and their consequences to the newborn with the immature immune system.

Insight 3: Conveniently located handwashing materials facilitate maternal handwashing.

Synopsis: Mothers who are cocooned with their newborns for religious or cultural reasons, or who do not have access to handwashing materials in close proximity to where they spend time with their babies, cannot wash hands because of inconvenience or the lack of visual cues.

Recommendations:

1. Provide pregnant women in the 3rd trimester or immediately postpartum with a handwashing kit. The kit should include materials to construct a handwashing station for the location(s) in which they will spend the most time with the newborn. Such materials may be as simple as a kettle, soap dish, and basin for water drainage. Provision of soap sufficient for the duration of the neonatal period may also be needed.
2. Provide alternatives to soap to address the following barriers to handwashing:
 - a. Lack of affordability of bar soap: Soapy water represents a less expensive, but similarly microbiologically effective alternative to bar soap.
 - b. Lack of reliable access to water: Waterless hand sanitizer may represent a viable alternative to handwashing with soap and water for use by birth attendants during labor and delivery, by mothers for whom frequent contact with water is deemed undesirable, or by visitors to newborns during the short duration of the neonatal period.

Insight 4: New mothers are busy people.

Synopsis: Mothers who do not have assistance from family members for household chores or care for older children have particular difficulty with washing hands. They do not have time to step away from the newborn or the home to find handwashing materials. A lengthy list of different critical times for handwashing may be too impractical to be followed by busy mothers.

Recommendations:

1. Increase the convenience of handwashing with soap by facilitating access to materials for use in the locations where mothers spend time with their newborns.
2. In the busy period of new motherhood, mothers and other family members benefit from reminding each other to wash hands with soap at recommended times.
3. Provide practical, feasible recommendations for handwashing, avoiding lengthy lists of critical times at which mothers should wash hands (such as before handling the newborn and after fecal contact and before food preparation). Messaging to “wash hands before handling the newborn” may be too vague or require handwashing too frequently to be feasible for busy new mothers.
4. Consider recommending handwashing at a limited number of key times. For example, breastfeeding may represent a distinct but frequent enough action that promotion of handwashing before breastfeeding will yield substantial improvement in maternal handwashing, even if mothers are not asked to wash hands at any other times.

Insight 5: Elders / others can help or hinder a mother from practicing good hand hygiene and achieving her nurture goals.

Synopsis: Mothers of newborns are strongly affected by their own mothers and mothers-in-law. These secondary caregivers can provide support to the mother sufficient to allow her to prioritize health behaviors such as handwashing. They can also remind her to wash hands when she is overwhelmed by the busy nature of her dramatically changed life. But, they can also pose obstacles to the mother improving her behaviors.

Recommendations:

1. Enlist the support of fathers, grandmothers, and other persons of influence. In many places, mothers cannot improve their own hand hygiene, or that of others, without the support of others more powerful in the family structure. Interventions should:
 - a. Motivate fathers, grandmothers, and grandfathers to play an active role in ensuring the health and well-being of the newborn, and providing access to the necessary tools to wash hands.
 - b. Consider the use of novel approaches to influence prevalent social norms regarding the power of new mothers to safeguard the health of their newborns, either by purchasing necessary materials or by demanding hand cleansing by secondary caregivers and visitors to the newborn.
2. Encourage verbal reminders between mothers and other household members (while taking care not to reinforce traditional power structures that disadvantage the mother).

Insight 6: Reported behavior does not equal observed behavior.

Synopsis: This “insight” is neither novel nor insightful. People report handwashing more frequently than they are observed to wash their hands, consistent with evidence from numerous prior studies (15). Data from Bangladesh and Indonesia reaffirm the utility of direct observation to describe handwashing behavior.

Recommendation:

1. Evaluations of perinatal handwashing promotion programs should include direct observations, in order to estimate accurately the effects of the intervention on handwashing behavior.

Insight 7: The hand hygiene behavior of birth attendants must improve, both for the direct implications on the newborn’s health and for the opportunity to model optimal hand hygiene behavior to the mother.

Synopsis: Traditional birth attendants in all three countries were reported to have sub-optimal handwashing practices, with somewhat better although not optimal handwashing among skilled providers. By not modeling good handwashing behavior, birth attendants miss opportunities to motivate improved maternal handwashing.

Recommendations:

1. Target program activities to address birth attendant hand hygiene.
2. Consider promotion, with or without provision, of waterless hand cleanser since birth attendants are often in a hurry and may not have access to water wherever they go.
3. Employ concepts of professional responsibility and role modeling to encourage improvement in birth attendant hand hygiene.

Insight 8: There are substantial evidence gaps in the area of perinatal handwashing and neonatal morbidity and mortality.

Synopsis: The findings of the systematic literature review demonstrate substantial gaps in the evidence on the health effects of handwashing in the perinatal period, as well as the approaches to motivate improved handwashing by mothers, other household caregivers, and birth attendants.

Evidence gaps:

1. Role of mothers’ hands versus those of secondary household caregivers or other children in transmitting pathogens to neonates
2. Effects of perinatal handwashing promotion interventions on handwashing behavior of mothers, other household caregivers, and birth attendants
3. Effects of handwashing promotion interventions targeting mothers, other household caregivers, visitors to the newborn, and birth attendants on neonatal infections and neonatal mortality
4. Key times at which hands must be washed in order to prevent neonatal infections, balancing health benefits with feasibility of compliance

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Synthesis Tables and Figures

Figure 1. Results of systematic review of biomedical literature on handwashing in the perinatal period

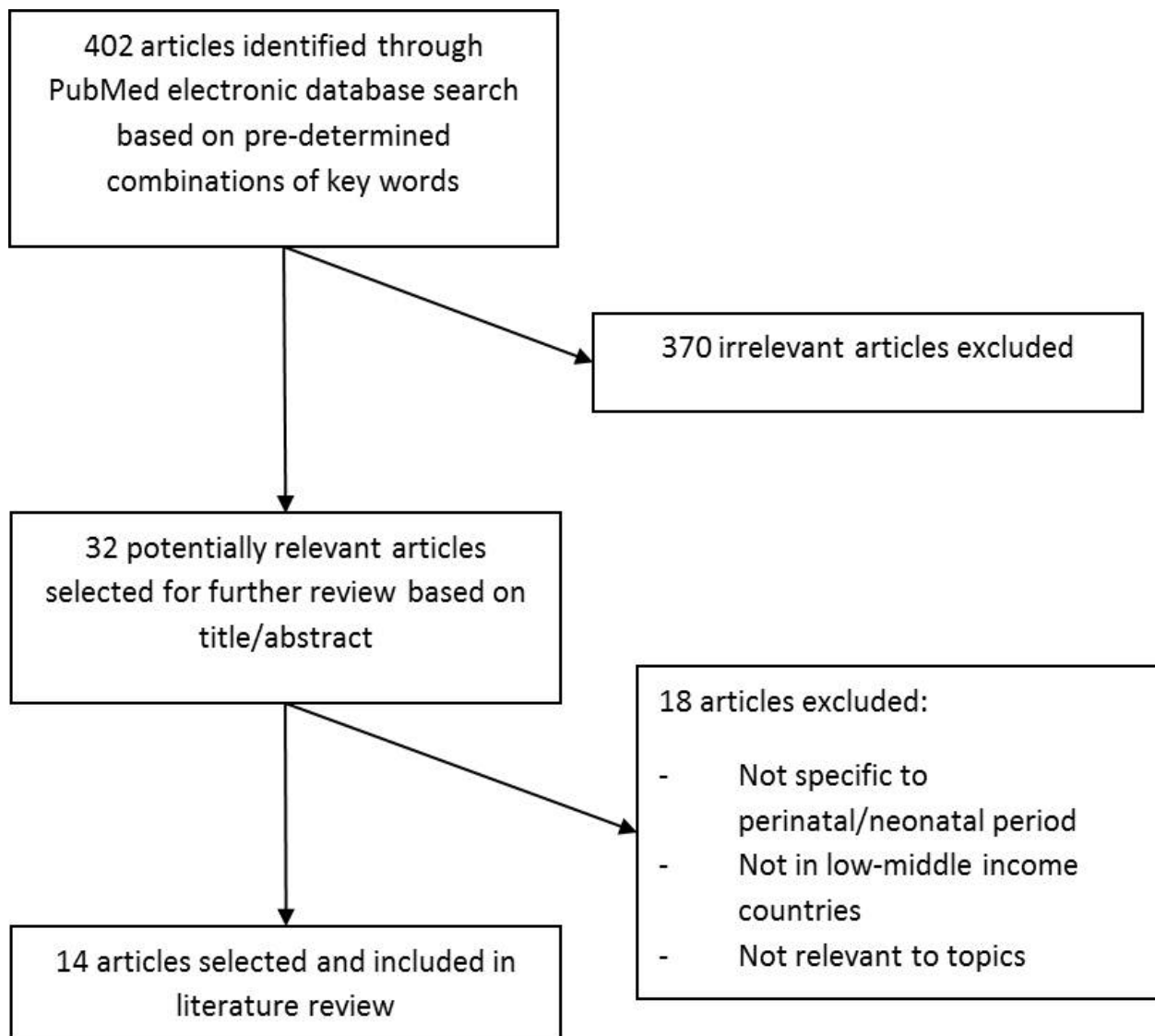


Table 1. Papers on handwashing in the perinatal period in low- and middle-income country settings identified in systematic review of PubMed database

	Author Last Name, Journal, Year	Country of Study (subnational region/city)	Population under Study	Study Design/Methods	Outcome	Key Findings/Abstract
1	Hlady, American Journal of Public Health, 1992	Rural Bangladesh - Rajshahi division	Mothers with eligible infants (born between 3/15/89 and 3/14/90)	<p>Case control study:</p> <ul style="list-style-type: none"> ▪ 11.2 cases (normal at birth, died at 3–30 days following illness, with generalized spasms and at least three out of following signs: trouble opening mouth, cessation of sucking, clenched hands, board-like rigidity) ▪ 336 matched controls 	Neonatal tetanus	<p>Handwashing was associated with decreased risk of neonatal tetanus:</p> <ul style="list-style-type: none"> ▪ $R_{adj.} = 0.49$ (0.30-0.81), $p=0.005$
2	Bennett, 1996	Rural parts of Northern areas of Pakistan	Surveyed mothers of 354 live births	<p>Population based, matched case-control study:</p> <ul style="list-style-type: none"> ▪ Questionnaire asked about description of delivery and perinatal practices for all live births, infant morbidity / mortality ▪ 59 neonatal tetanus cases, 295 matched controls 	Neonatal tetanus	<p>Handwashing by the delivery attendant was protective for neonatal tetanus (OR=0.3 [0.12-0.73], $p=0.003$)</p>
3	Parashar, International Journal of Epidemiology, 1998	Rural Bangladesh	Mothers with eligible infants (born alive during the year ending one month before each survey)	<p>Case control study:</p> <ul style="list-style-type: none"> ▪ 359 cases (eligible infant normal at birth, but died between 3–30 days following illness, with generalized spasms and at least three out of following signs: trouble opening mouth, cessation of sucking, clenched hands, board-like rigidity) ▪ 1,077 matched controls 	Neonatal tetanus	<p>Handwashing by delivery attendant was protective against neonatal tetanus: OR=0.64 (0.47-0.88), $p=0.005$</p>
4	Gupta, 1998	Phagi block of Jaipur district in Rajasthan	<p>All pregnant women in 44 villages identified (for children born between June 1988 and May 1990):</p> <ul style="list-style-type: none"> ▪ 1,988 women included in the study 	<p>Nonrandomized cohort study, supplemented by a retrospective survey using in person interviews:</p> <ul style="list-style-type: none"> ▪ Pregnant women invited to attend maternal and child health clinics at health centers ▪ In-person interview / questionnaire conducted between Jan. 1993 and April 1993 	Neonatal tetanus death	<p>Birth attendant handwashing before delivery: OR for neonatal tetanus death: 2.37(0.80-6.90), $p=0.087$</p>

	Author Last Name, Journal, Year	Country of Study (subnational region/city)	Population under Study	Study Design/Methods	Outcome	Key Findings/Abstract
5	Oo, Journal of Health, Population, and Nutrition, 2000	Myanmar	Neonatal unit of the Yangon Children Hospital, Myanmar (admitted June 1997 - May 1998)	<p>Cross sectional study:</p> <ul style="list-style-type: none"> Rectal swab samples collected from 100 children (age <4 months), diagnosed as acute diarrhea, admitted to hospital Parents were interviewed 	Dehydration in infants with diarrhea	Handwashing with soap vs. handwashing with water only decreases severity of dehydration in infants with acute diarrhea (p=0.006)
6	Won, Infection Control and Hospital Epidemiology, 2004	National Taiwan University Hospital	1,411 admissions to the NICU (from 1998-2001)	<p>Baseline evaluation:</p> <ul style="list-style-type: none"> Collected baseline rates of nosocomial infections in NICU from Jan. 1997 - Aug. 1998 <p>Hand hygiene campaign in Sept. 1998:</p> <ul style="list-style-type: none"> Education, provision of soap / alternate, published guidelines, posters near sinks <p>Observations of compliance with hand hygiene:</p> <ul style="list-style-type: none"> Conducted weekly during 4 1-hour periods 	Hand hygiene behavior Nosocomial infections	As hand hygiene compliance increased from 43% → 74% → 80% (baseline → year 1 → year 2), average rate of nosocomial infections decreased from 15.13 per 1000 patient days → 10.45 → 11.86 (r=-0.281, p=0.079)
7	Mullany, 2007	Southern Nepal (Sarlahi, Nepal)	Recruited women during 6 th month of pregnancy (Infants born between Sept. 2002 and March 2005 were randomized)	<p>Community-based, cluster-randomized trial:</p> <ul style="list-style-type: none"> Three cord care regimens (umbilical stump cleaning with 4% chlorhexidine, cleansing with soap and water, dry cord care) Same basic education messages on clean umbilical cord care, postnatal period / infant thermal care 	Umbilical cord infection	<p>Protective benefit of handwashing with soap, by both the birth attendant before delivery (RR=0.69, [0.61-0.79]), and the mother during the first 14 days of life (RR=0.71, [0.56-0.91]) on umbilical cord infection:</p> <ul style="list-style-type: none"> Multivariable models: Adj. risk of infection was lower when mothers reported always washing hands with soap before handling newborn (RR=0.75, [0.59-0.96]), and when birth attendant washed hands before delivery (RR=0.73, [0.64-0.83])

	Author Last Name, Journal, Year	Country of Study (subnational region/city)	Population under Study	Study Design/Methods	Outcome	Key Findings/Abstract
8	Rhee, 2008	Sarlahi district, rural southern Nepal	Newborn infants enrolled in a community-based trial (infants from Sept. 2002– March 2005): <ul style="list-style-type: none"> pregnant women approached mid pregnancy 	Nested pair of double masked, placebo controlled, cluster randomized, community-based trials: <ul style="list-style-type: none"> Prenatal counseling at time of enrollment (including safe birthing practices – handwashing by birth attendant before delivery) Randomized to single full body skin cleansing and multiple day cord cleansing with chlorhexidine Multiple assessments for questionnaire administration – asked about birth attendant handwashing practices, and signs of omphalitis / other morbidities 	Neonatal mortality	Adjusted risk of death was 19% lower among newborns whose birth attendants washed hands before assisting with delivery, 44% lower among newborns whose mothers sometimes / always washed hands with soap and water / antiseptic before handling child Among newborns exposed to both birth attendant and maternal handwashing, risk of death was 41% lower
9	Thatte, 2009	Agricultural area of southern Nepal	21 traditional birth attendants identified by local community members (attended at least 1 delivery in the previous 3 months, and who have been involved in antenatal, intrapartum, and postnatal care)	7 in-depth interviews, 4 focus group discussions (FGDs)	Handwashing behavior: <ul style="list-style-type: none"> Facilitators and barriers 	Handwashing knowledge varied by training status (untrained TBAs were “engaged in different tasks” or had insufficient time to wash before delivery): <ul style="list-style-type: none"> Varied by beliefs (some believe delivery is “polluting,” or only wash hands with soap after delivery) Some wash hands, then use mustard seed oil before delivery
10	Falle, 2009	Agricultural area of southern Nepal (Sarlahi district) (2003–2004)	93 Traditional birth attendants (who perform all TBA tasks – not just cord cutting)	Survey instrument with questions on practices of TBAs, and opinions / knowledge	Handwashing behavior	Handwashing practice common among both ethnic groups (74%), but varied by training status (trained: 85%, untrained: 65%, p=0.01).

	Author Last Name, Journal, Year	Country of Study (subnational region/city)	Population under Study	Study Design/Methods	Outcome	Key Findings/Abstract
11	Hill, 2010	6 districts in the Brong Ahafo region of Ghana (qualitative data between Dec. 2006 and Jan 2007)	Data from 9,167 women who delivered in the study area between April 2008 and May 2009, birth narratives from 25 women who had delivered in the last 2 months (between Dec. 2006 and Jan. 2007), 30 in-depth interviews (IDIs) and 2 FGDs with women who delivered in the last year or pregnant, 20 IDIs and 6 FGDs with birth attendants, 12 IDIs and 2 FGDs with husbands	<ul style="list-style-type: none"> ▪ Collected quantitative data to determine prevalence of clean delivery behaviors ▪ Collected qualitative data to understand behaviors, and if behavior change was likely 	<p>Prevalence of clean delivery behaviors</p> <p>Practices that are amenable to change/should be prioritized in interventions</p> <p>Factors that influence behaviors</p>	<ul style="list-style-type: none"> ▪ Birth attendants washed hands because “the baby should be welcomed with clean hands,” to “prevent infection,” or to “prevent dirt from touching the skin of the baby” ▪ Did not wash hands because rush to attend to woman, no soap provided by family, forgetfulness, some believe that baby is dirty when born ▪ Did not think behavior change would be difficult because those who did not wash hands simply did not have the knowledge (soap was readily available)
12	Blencowe, 2011	Bangladesh, India, Nepal		<p>Meta-analysis of 4 community based case-control studies, and 1 cohort study:</p> <ul style="list-style-type: none"> ▪ Looking at effect of birth attendant handwashing before delivery 	Neonatal mortality	<p>Pooled estimate shows protective effect of birth attendant washing hands before delivery (all individual studies also showed protective effect: see Bennett, Hlady, Parashar, Gupta) (pooled effect estimate=0.51 (0.38-0.65))</p>
13	Seward, 2012	India, Bangladesh, Nepal	Nepal – community-based monitors ID all pregnancies and followed up to find births India+Bangladesh – key informant ID all births and outcomes	<p>Pooled analysis of 3 randomized control trials (data from 19,754 home birth available):</p> <ul style="list-style-type: none"> ▪ Structured questionnaire administered for all sites around 6 weeks after delivery 	Neonatal mortality	<p>Pooled protective effect of birth attendant washing hands before delivery: (0.89 (0.73-1.09))</p>

	Author Last Name, Journal, Year	Country of Study (subnational region/city)	Population under Study	Study Design/Methods	Outcome	Key Findings/Abstract
14	Soofi, 2012	Dadu (rural area of Sindh province, Pakistan)	Clusters of villages covered by a functional TBA (intervention from Oct.-Dec. 2007)	<p>Two-by-two factorial, cluster-randomized trial:</p> <ul style="list-style-type: none"> ▪ Intervention – received clean birth kit, with chlorhexidine and soap ▪ TBAs demonstrated stump cleansing with chlorhexidine and encouraged family members to wash hands with soap before handling infant ▪ Control group – received birth kit with soap, but no chlorhexidine; ▪ received same handwashing with soap messages <p>Baseline household study before intervention, multiple assessments for handwashing practices, omphalitis, neonatal morbidity information</p>	Umbilical cord infection and neonatal mortality	<p>Protective effect of exposure to handwashing intervention before handling infant on umbilical cord infection (RR 0.83 (0.61-1.13))</p> <p>No significant effect of handwashing intervention exposure on neonatal mortality (RR 1.08 (0.79-1.48))</p>

Table 2. Description of qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya (2010–11)

Characteristics	Bangladesh – Habigonj	Bangladesh – Matlab	Indonesia	Kenya
National neonatal mortality rate in 2011 (deaths per 1,000 live births)*	26 (national) 53 (Sylhet Division)	26 (national) 24 (Matlab)	15	27
Description of study setting and methods				
Setting	Rural Sylhet Division	Rural Chittagong Division	Districts in Serang, near Jakarta: <ul style="list-style-type: none"> ▪ Urban: Kramatwatu ▪ Rural: Pamarayan 	Urban: Korogocho, Nairobi Rural: Bondo, Nyanza
Population(s) in study	<ul style="list-style-type: none"> ▪ Mothers of neonates ▪ Mothers of infants < 1 year old ▪ Father /other secondary female caregivers ▪ Traditional birth attendants 	<ul style="list-style-type: none"> ▪ Mothers of neonates ▪ Mothers of infants < 1 year old ▪ Fathers /other secondary female caregivers 	<ul style="list-style-type: none"> ▪ Mothers of neonates ▪ Mothers of infants < 1 year old ▪ Midwives and traditional birth attendants 	<ul style="list-style-type: none"> ▪ Mothers of neonates ▪ Skilled birth attendants / midwives ▪ Traditional birth attendants
Study methods	Mothers: <ul style="list-style-type: none"> ▪ Semi-structured observations ▪ In-depth interviews ▪ Group discussion Father and secondary caregivers: <ul style="list-style-type: none"> ▪ Group discussions Traditional birth attendants: <ul style="list-style-type: none"> ▪ In-depth interview ▪ Group discussions 	Mothers: <ul style="list-style-type: none"> ▪ Semi-structured observations ▪ In-depth interviews ▪ Group discussions Fathers and secondary caregivers: <ul style="list-style-type: none"> ▪ Group discussions 	Mothers: <ul style="list-style-type: none"> ▪ Video observations ▪ in-depth interviews Midwives <ul style="list-style-type: none"> ▪ Group discussions Traditional birth attendants: <ul style="list-style-type: none"> ▪ Group discussions 	Mothers: <ul style="list-style-type: none"> ▪ Group discussions ▪ Key informant and in-depth interviews ▪ In-depth interviews Skilled service providers and skilled birth attendants: <ul style="list-style-type: none"> ▪ Group discussions

*UNICEF, Committing to child survival: A Promise Renewed, Progress Report 2012

Table 3. Description of participants in qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya (2010–11)

Characteristics	Bangladesh – Habigonj	Bangladesh – Matlab	Indonesia	Kenya
Number of participants	<ul style="list-style-type: none"> ▪ 20 mothers of neonates ▪ 12 mothers of infants ▪ 10 traditional birth attendant ▪ 1 group of 6 mothers of infants ▪ 1 group of 6 fathers ▪ 1 group of 6 female caregivers other than the mother ▪ 2 groups of traditional birth attendants, 7 participants per group 	<ul style="list-style-type: none"> ▪ 20 mothers of neonates ▪ 12 mothers of infants ▪ 1 group of 9 mothers of infants ▪ 1 group of 9 fathers ▪ 1 group of 10 female caregivers other than the mother 	<ul style="list-style-type: none"> ▪ 27 mothers approximately 24 in group discussions 	<ul style="list-style-type: none"> ▪ 26 mothers of neonates ▪ 18 health care workers ▪ 16 traditional birth attendants
Age of mothers	Median age: 21 years	Median age: 20 years	Range: 18–39 years	Range: 15–38 years
Education / literacy of mothers	Majority educated to Class 5 or lower	Majority educated to Class 6 or higher	All were literate, although educational achievement ranged from basic schooling to university	<ul style="list-style-type: none"> ▪ Urban site: secondary school for most ▪ Rural site: primary school for most
Availability of water in the home	Majority reported water sources in close proximity Some mothers reported keeping water in a jug or bowl in the sleeping room until the end of the neonatal period	Not clearly stated	Households had “easy” access to water (included in selection criteria)	Almost all had access to water within 30-minute walk from home
Availability of soap in the home	Not clearly stated Soap not deemed affordable by some mothers and secondary caregivers	Not clearly stated	Households generally had soap available	Not clearly stated

Table 4. Perceptions of newborn vulnerability and preventive benefits of handwashing, and reported and observed handwashing behavior of mothers and secondary household caregivers in qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya, 2010–11

Characteristics		Bangladesh	Indonesia	Kenya
Mothers				
Perceptions of newborn vulnerability to infection / other health concerns	Later infancy perceived more vulnerable to infection than newborn period because of increased exposure due to baby's crawling ability Mothers advised not to go outside to keep the baby unattended because of potential "bad air," which represents a threat to the newborn	Newborns perceived to be vulnerable to sprains / fractures, fever, diarrhea, infections	Newborns perceived vulnerable to measles, cold, or influenza	
Perceptions of preventive benefits of handwashing against newborn infection	Handwashing by the mother, because it leads her to increased exposure to water, perceived to place newborn at risk for respiratory infection Caring for umbilical cord using "dirty hands" can cause inflammation (infection) of the cord.	Little connection between handwashing and prevention of newborn illness	<ul style="list-style-type: none"> ▪ Handwashing cited as important to reduce risk of illness in newborns 	
Times for handwashing with or without soap				
Baby-related events	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ After cleaning child's anus ▪ Before feeding <p>Observed handwashing Handwashing with soap</p> <ul style="list-style-type: none"> ▪ Rare <p>Handwashing with water alone:</p> <ul style="list-style-type: none"> ▪ Before breastfeeding 	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ Before handling the baby <p>Observed handwashing:</p> <ul style="list-style-type: none"> ▪ Rare 	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ Before handling newborn ▪ Before breastfeeding <p>Observed handwashing</p> <ul style="list-style-type: none"> ▪ Observations not conducted 	
Potential fecal contact events	<p>Reported handwashing</p> <ul style="list-style-type: none"> • After toileting / defecation • After cleaning child's bottom • After cleaning cow dung • After cooking with cow dung fuel <p>Observed handwashing Handwashing with soap</p> <ul style="list-style-type: none"> • Rare <p>Handwashing with water alone</p> <ul style="list-style-type: none"> • Rare 	<p>Reported</p> <ul style="list-style-type: none"> ▪ After defecating <p>Observed</p> <ul style="list-style-type: none"> ▪ After contact with baby feces / changing nappy 	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ None <p>Observed handwashing</p> <ul style="list-style-type: none"> ▪ Observations not conducted 	

Characteristics	Bangladesh	Indonesia	Kenya
Food-related events	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ Before cooking ▪ After cooking ▪ Before or during cutting vegetables / fish ▪ Before serving food ▪ After eating <p>Observed handwashing Handwashing with water alone</p> <ul style="list-style-type: none"> ▪ Before breastfeeding ▪ Before eating rice ▪ Before eating other food ▪ Before serving food <p>Handwashing with soap</p> <ul style="list-style-type: none"> ▪ Before eating rice ▪ After eating rice 	<p>Reported</p> <ul style="list-style-type: none"> ▪ Before eating ▪ After cooking <p>Observed:</p> <ul style="list-style-type: none"> ▪ After eating 	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ Before breastfeeding ▪ Before eating <p>Observed handwashing</p> <ul style="list-style-type: none"> ▪ Observations not conducted
Other events	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ After waking up ▪ After finishing household chores, in the evening ▪ After sweeping ▪ When hands are visibly dirty <p>Observed handwashing</p> <ul style="list-style-type: none"> ▪ Rare 	<p>Reported</p> <ul style="list-style-type: none"> ▪ After doing dishes <p>Observed</p> <ul style="list-style-type: none"> ▪ After household chores (e.g., sweeping) ▪ After returning home from outside 	<p>Reported handwashing</p> <ul style="list-style-type: none"> ▪ None <p>Observed handwashing</p> <ul style="list-style-type: none"> ▪ Observations not conducted

Table 5. Handwashing behavior of secondary caregivers and birth attendants in qualitative studies on handwashing in the perinatal period, Bangladesh, Indonesia, and Kenya, 2010–11

Characteristics	Bangladesh	Indonesia	Kenya
Mothers' perceptions of secondary caregivers	<ul style="list-style-type: none"> ▪ Maternal and paternal grandmothers serve as advisors, as do neighbors and other elders ▪ Mothers are able to request fathers to wash hands but cannot easily do so with their in-laws, unless perhaps their hands are visibly soiled ▪ Elders remind a new mother to wash hands ▪ Elders usually do not hold a young child with dirty hands 	Not described	<ul style="list-style-type: none"> ▪ Husbands and children wash their hands less frequently than women ▪ Men wash mostly before and after meals, although women must insist for them to wash before eating ▪ Men feel busier and, thus, feel as if they have less time to wash their hands than women ▪ Children require constant reminders to wash hands
Mothers' perceptions on birth attendants	<ul style="list-style-type: none"> ▪ Minority reported that traditional birth attendants wash hands with water or soap before attending to the delivery ▪ Traditional birth attendants do not wash hands before cutting the umbilical cord 	<p style="text-align: center;">Birth attendants / health workers</p> <ul style="list-style-type: none"> ▪ Midwives are trusted, give medication, and have medical knowledge ▪ Traditional birth attendants viewed as scary, irresponsible, and unhygienic; of low status (more often used by rural women) ▪ Traditional birth attendants are used to provide support after the birth and, thus, have contact with pregnant women and new mothers at the right time for behavior communication ▪ Midwives recommend handwashing before breastfeeding, and how best to clean the umbilical cord to prevent infection 	<ul style="list-style-type: none"> ▪ Pregnant women seek assistance of doctor for health care – skilled, can handle complications during delivery ▪ Hygiene and handwashing sometimes discussed in antenatal care visits, but vague advice and no mention of soap ▪ At delivery, advice on handwashing always given to new mothers, particularly for before breastfeeding ▪ Health care workers are often not washing hands themselves, perhaps because of lack of running water in most facilities ▪ Instead of handwashing, many service providers wear gloves

Characteristics	Bangladesh	Indonesia	Kenya
<p>Attendants' report of their own handwashing behavior</p>	<p>Traditional birth attendants</p> <ul style="list-style-type: none"> ▪ Report washing hands before delivery since germs could affect cervix or umbilical cord from their bare hand; sometimes at their own home and not at the mother's home ▪ Do not wash hands at other times during the delivery process since they are handling "dirty blood" or they are very busy ▪ Typically do not wash hands before cutting the umbilical cord (many do not cut cord because of a belief that the person who cuts the cord remains impure for up to 40 days after delivery) ▪ Perceive newborn to be at risk for pneumonia, cold, diarrhea, jaundice, and tetanus but do not identify handwashing as a preventive measure for these 	<p>Midwives</p> <ul style="list-style-type: none"> ▪ Report often forgetting to wash hands with soap during care 	<p>Skilled service providers</p> <ul style="list-style-type: none"> ▪ Report handwashing after toilet, before / after eating, after attending to clients (before and after delivery and clinical procedures) ▪ Use soap, antiseptic solutions, sanitizer, and detergent for hand cleansing in clinical setting ▪ Most indicating handwashing before glove wearing, but do not usually change gloves between attending to different clients ▪ Observed by study staff to perform basic steps of handwashing (as per MCHIP job aid)
<p>Advice to mothers</p>	<p>Traditional birth attendants:</p> <ul style="list-style-type: none"> ▪ Advise mothers to wash hands with warm water before caring for the cord ▪ Generally do not advise mother to wash hands with soap 	<p>Midwives:</p> <ul style="list-style-type: none"> ▪ Believe mothers should wash hands after cooking, after going out, before breastfeeding, after defecating, and before handling the baby ▪ Mothers rarely follow midwives' handwashing advice ▪ Typically do not promote handwashing with soap to mothers 	<p>Skilled service providers:</p> <ul style="list-style-type: none"> ▪ Attribute childhood illness to poor hygiene, failure to wash hands, and failure to breastfeed ▪ Advise women to wash hands before handling baby, but most mothers do not follow ▪ Demonstrate handwashing with soap for new mothers ▪ Believe that the health advice they provide results in decreased risk of diarrhea and malnutrition, as well as improved hygiene and adherence to breastfeeding

Figure 2. Theoretical framework to explain motivations of maternal handwashing behavior in the neonatal period

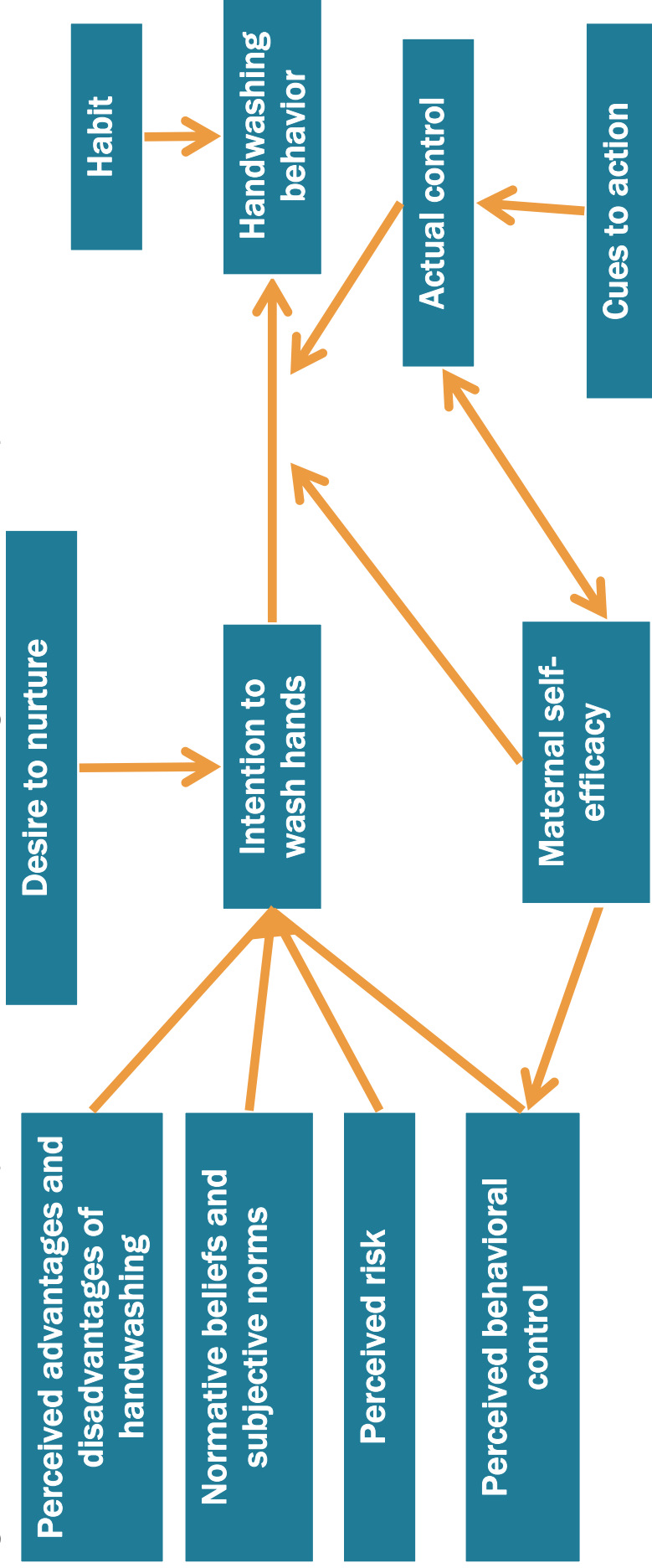


Figure 3a. Synthesis of findings on motivators and facilitators, to handwashing among mothers of neonates in Bangladesh, Indonesia, and Kenya, 2010–11

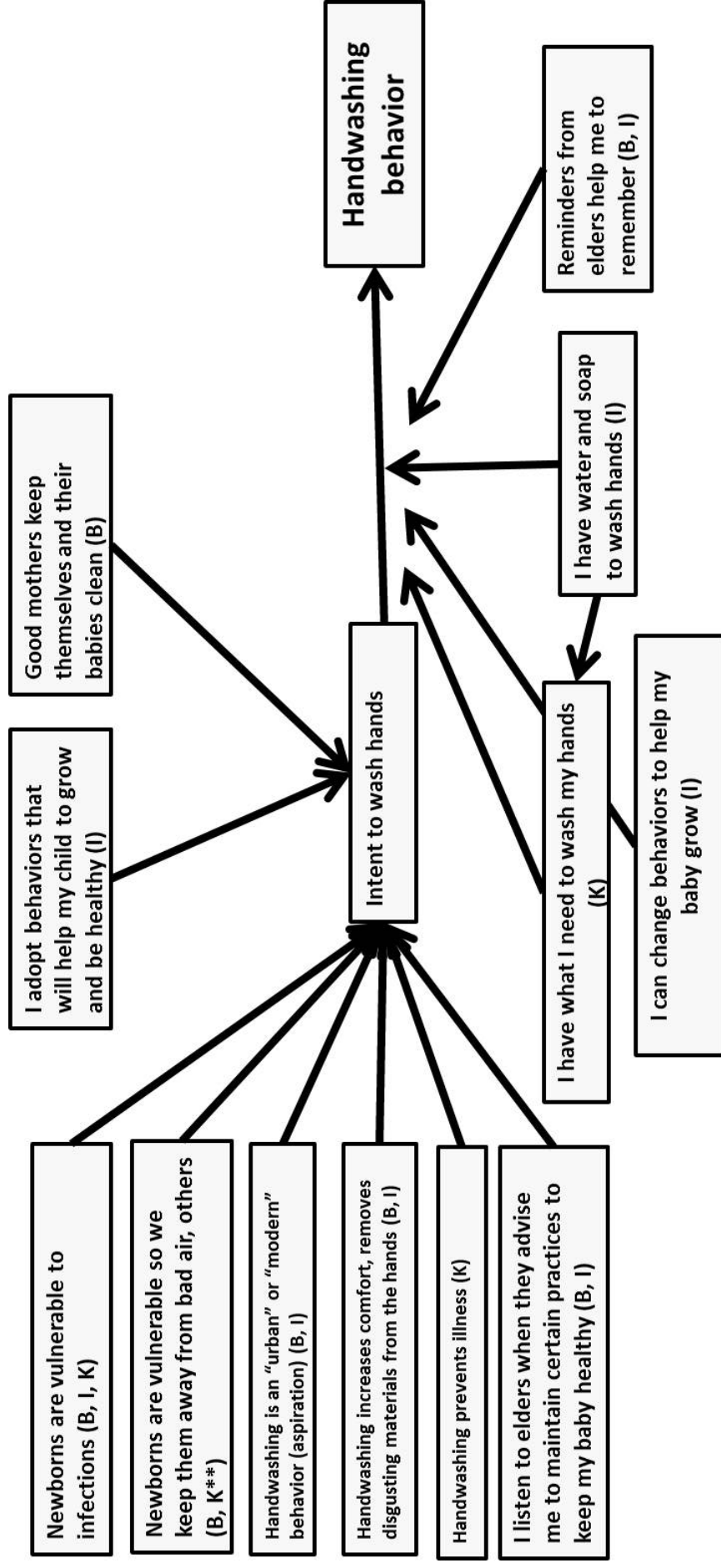


Figure 3b. Synthesis of findings on barriers to handwashing among mothers of neonates in Bangladesh, Indonesia, and Kenya, 2010–11

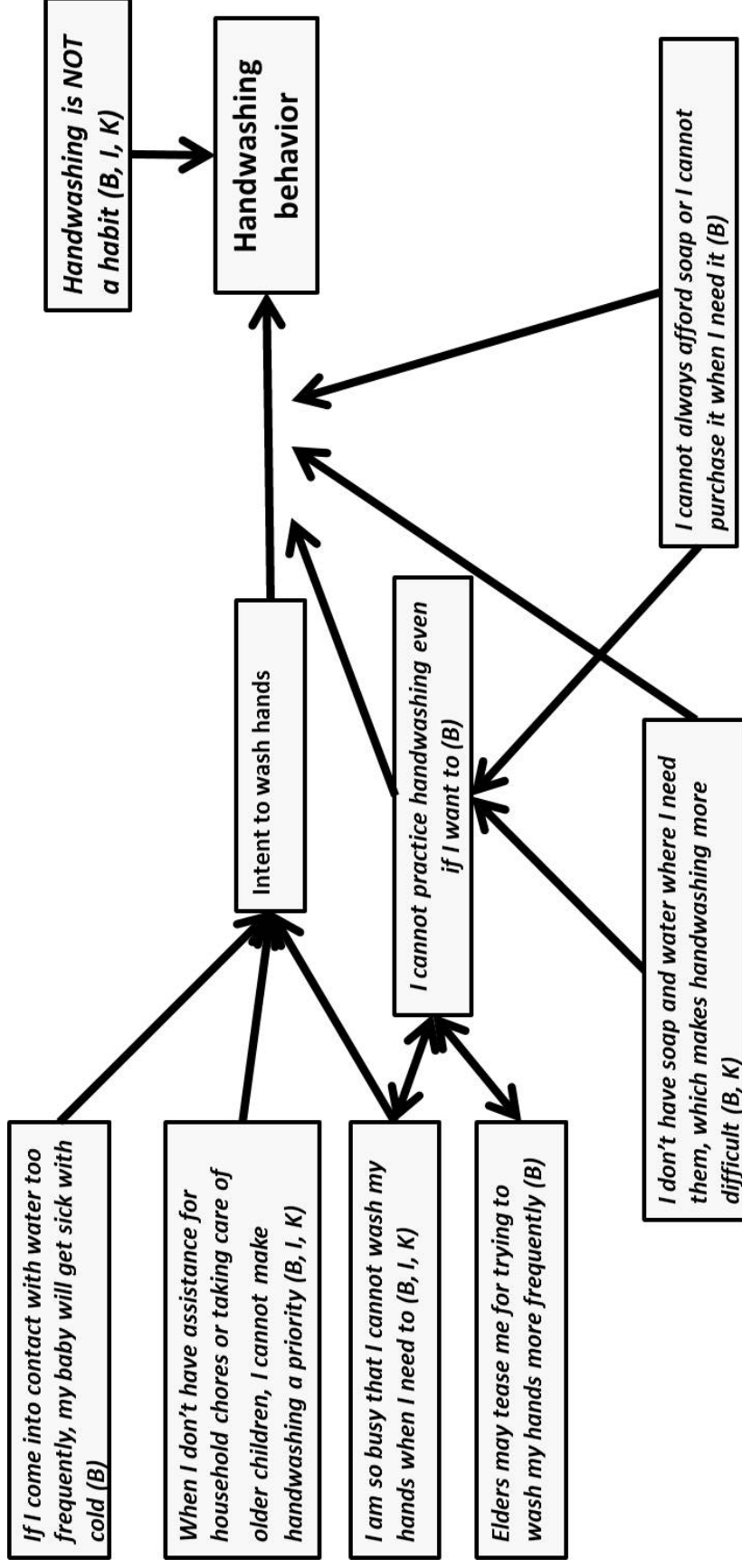
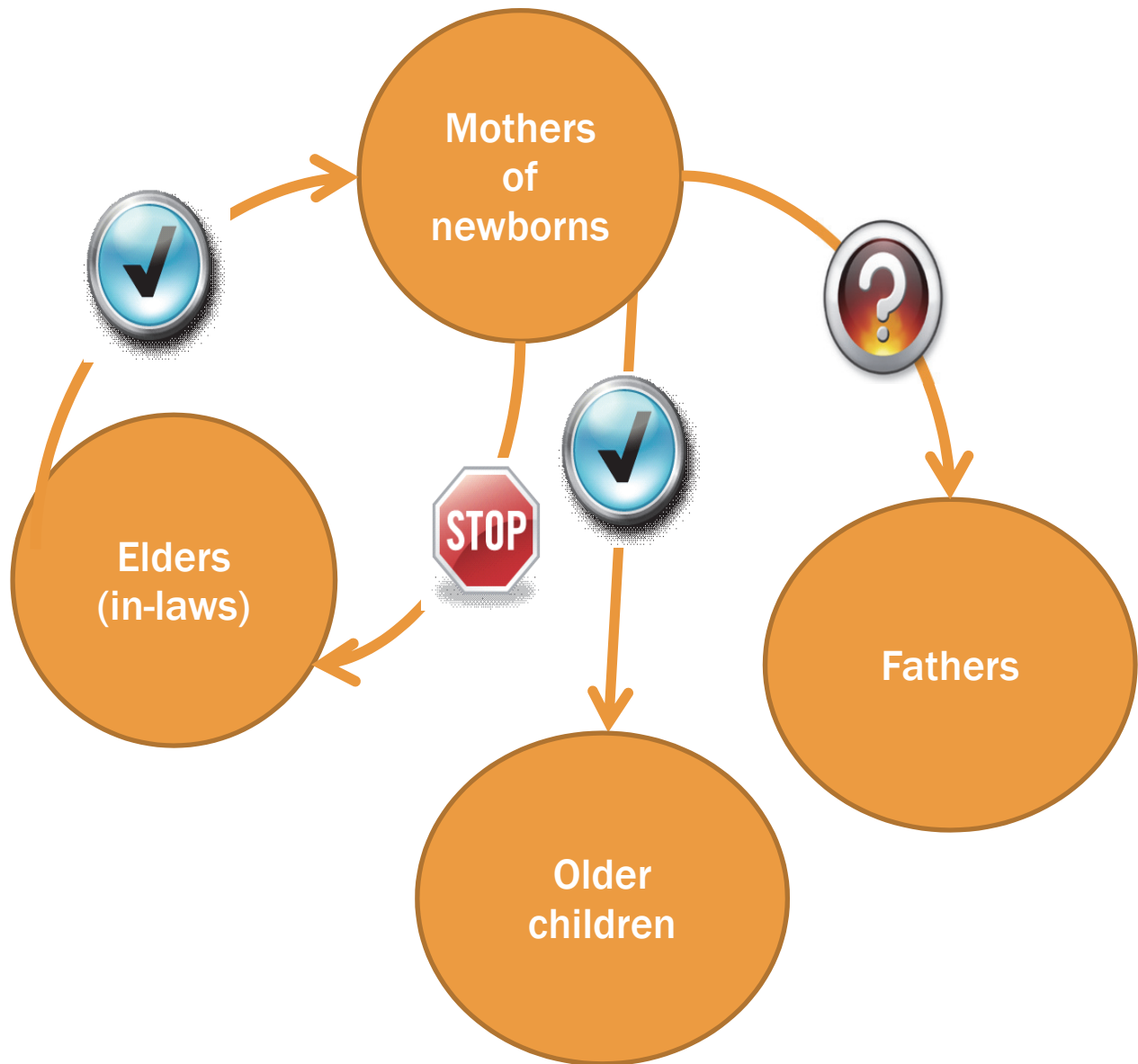


Figure 4. Intra-familial dynamic of issuance of verbal reminders to wash hands before touching the newborn, Bangladesh, 2010



Box 1. Putting handwashing into context: The complexity of promoting handwashing during the perinatal period

Even handwashing enthusiasts cannot deny that handwashing is only one of numerous priorities to be addressed during the vulnerable perinatal period. Pregnant mothers benefit from numerous interventions, including but not limited to antenatal care, tetanus toxoid administration, planning for birth, awareness of danger signs, and so on. Numerous studies have demonstrated the mortality prevention benefits of comprehensive community based care packages to prevent newborn mortality in order to address these various interventions.(1–3) Scalable handwashing promotion programs targeting maternal handwashing in the newborn period will need to be efficient and will need to be nested within the larger context of services and messages delivered to the pregnant woman and new mother in the health care setting and in the community. This is not a small challenge. Handwashing program developers and implementers need to work closely with neonatal health colleagues to determine how best to position handwashing within the overall context of maternal and neonatal health promotion.

Box 2. Pregnancy and new motherhood: A teachable moment?

Pregnancy is a time of substantial change in a woman's life: a potential teachable moment(4). A woman's vision of her own role in her family and society can be transformed by the anticipation of motherhood. Pregnancy and new motherhood can be characterized by heightened emotion and increased perceptions of risk and hopes and expectations of positive things to come. During such a special moment in her life, a woman may be uniquely motivated to make changes in her own behaviors, habits, and environment, and acquire the necessary skills to actuate change, all of which can lead to an increased sense of self-efficacy and, ultimately, the development of positive health habits. There is remarkable potential, thus, to transform a woman's handwashing habit and even to influence her children's handwashing habits, yielding a lifetime of improved health.

However, pregnancy brings with it the need to attend to numerous concerns, including preparing financially, emotionally, and socially for the woman's new role. Moreover, numerous important health messages are aimed at the mother, placing handwashing-specific messages at substantial risk of dilution. Also, while motherhood permanently transforms a woman's vision of her own social role, the decline in emotion and even risk perception during the child's infancy may lead to rapid reversals back to pre-pregnancy behaviors (as seen in several studies of smoking cessation among pregnant women).

There is a need to understand better the types of interventions and approaches that will motivate lifelong adoption of handwashing and other healthy habits. Programs seeking to motivate maternal handwashing in the neonatal and early childhood period may benefit from the great potential of this special moment in a woman's life but should ensure that the various barriers to handwashing behavior change are addressed in order to achieve lasting change.

Box 3. Soap? Ash? Sanitizer?

Question: Which cleansing material should you promote for use during handwashing?

- A. Bar soap
- B. Soapy water
- C. Ash / mud / sand
- D. Waterless hand sanitizer
- E. All of the above
- F. None of the above
- G. I don't know

A common concern for handwashing program planners centers on which material(s) to recommend for hand hygiene. The bulk of evidence for health effects from handwashing supports handwashing with soap or cleaning hands with waterless hand sanitizer (typically, studies have used alcohol-based sanitizers).

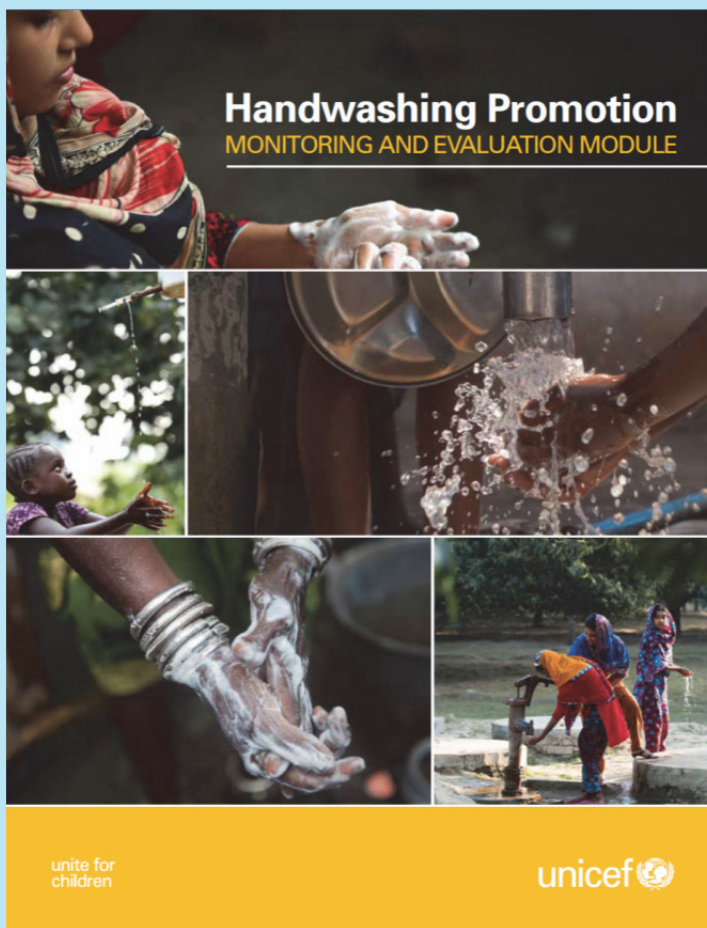
Ash(5) and soapy water (a suspension of powder detergent in water) have both been shown to be similar to soap for removal of organisms such as *E. coli* from hands, but there is little evidence to date supporting their health benefits (largely because they have not yet been studied in this way, not because they have been shown to be ineffective). However, ash and soapy water are more affordable alternatives to bar soap, and certainly to sanitizer, soap's more expensive counterpart. But, ash is increasingly losing favor, perceived by mothers in Bangladesh as ineffective at cleaning dirt and removing germs. Soapy water represents an acceptable and affordable alternative to bar soap (Nuhu Amin, paper in press).

Box 4. Developing a monitoring and evaluation plan for your handwashing promotion program

Need assistance developing a monitoring and evaluation plan for your handwashing promotion program? Check out the Handwashing Promotion: Monitoring and Evaluation Module (available at <http://globalhandwashing.org/resources>). You will find information on the major steps involved in:

- developing monitoring and evaluation plans for handwashing promotion programs
- choosing indicators to meet your program objectives
- selecting appropriate indicators to align with your evaluation objectives
- and collecting and analyzing data. If you need help with measuring handwashing behavior

A synthesis of the evidence is available at <https://www.wsp.org/sites/wsp.org/files/publications/WSP-Practical-Guidance-Measuring-Handwashing-Behavior-2013-Update.pdf>.



References for Tables and Figures

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