POLICY BRIEF

WASH and Maternal and Newborn Health

Time to Act

Acknowledgements

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Photo (left)

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Summary

Due to the multiple pathways through which poor access to water, sanitation and hygiene (WASH) may adversely impact maternal and newborn health (MNH) outcomes [2], the time to act has arrived. This briefing paper documents the state of the evidence on WASH and MNH and the Sanitation and Hygiene Applied Research for Equity (SHARE) Consortium's contribution to our understanding, highlights opportunities for future research, and offers insights that could influence policy and improve programming in both sectors globally. In doing so, it offers a powerful argument in favour of using WASH to support efforts on MNH to leverage greater progress in reducing maternal and neonatal mortality, and offers concrete recommendations as to how this opportunity might be seized.

Definitions:

Global definitions of maternal mortality are varied and complex.

The World Health Organization (WHO) defines **maternal death** as *"the 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"*. The WHO also refers to **pregnancy-related death** which is *"the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death"* [1].

Further definitions can be found in Benova et al. 2014 [2].

Background: the WASH and MNH Nexus

The *"deep dark and continuous stream of mortality"* described by William Farr in 1876 when discussing maternal mortality (MM) in England [3] remains a reality in much of the world today. Childbirth presents as much a risk of death as a moment of life for many women and the infants they bear. The negative consequences of childbirth can go beyond the burden of mortality and morbidity experienced by the mother and newborn, affecting also the health of infants, children and other members of the family [4].

Progress towards attaining Millennium Development Goal (MDG) 5 – reducing MM by three quarters between 1990 and 2015 – has been slow and geographically and socio-economically uneven [5]. With 289,000 maternal deaths still occurring every year across the globe [6], it is clear that traditional maternal health interventions alone have not been sufficient to adequately address this issue.

There is a strong correlation between MM and WASH [2]. Furthermore, the causal link between hand-hygiene at childbirth and MNH is well established historically [7-9]. However, existing MNH approaches pay insufficient attention to the contribution of WASH on MNH outcomes.

SHARE has funded and supported a number of studies over the last five years that have helped bolster the evidence base on this critical issue: a systematic mapping and evaluation of the direct and indirect pathways between WASH and MNH [10], a systematic review into the impact of WASH on MM [2], a series of secondary data studies, and in-depth assessments of WASH coverage and status in health care facilities in a number of countries. SHARE has also been involved in a call to action [5] published in PLOS Medicine authored by both academics and representatives from leading international agencies, arguing that leveraging WASH to support efforts on MNH is a significant missed opportunity, and offering recommendations on how this opportunity might now be seized.

The Evidence Base

What we know

The importance of WASH to health is well documented [11-14], and the link between the handwashing of birth attendants and infection at childbirth has been established since as early as 1795, thanks to the work of Gordon, Holmes and Semmelweis [7, 9]. In addition,

while we know less about the impact of water and sanitation on MM, numerous direct and indirect mechanisms through which poor sanitation and water may lead to the ill health of women have been documented:

Poor sanitation can result in hookworm [15] and Ascaris Lumbricoides [16], both of which cause anaemia and increase the risk of maternal death. It can also lead to Listeria, for which the infection rate is more than 17 times higher in pregnant women [17] and is associated with spontaneous abortion and pre-term birth [18, 19]. Schistosomiasis, another risk posed by poor sanitation (amongst other things), is associated with ectopic pregnancy, anaemia and undernutrition [20-22], all of which place pregnant women at greater risk of poor maternal health outcomes. Furthermore, there is evidence to suggest that repeated early childhood infections of this sort or of diarrhoeal diseases can cause stunting [23, 24], which for women can lead to an increased risk of obstructed labour and MM in later life [25-28]. Indirect effects of poor sanitation on maternal health include the increased risk of pre-eclampsia and anaemia caused by urinary tract infections arising from harmful coping mechanisms such as delayed relief or reduced water or food intake associated with lack of safe access to facilities [29-33].

Unsafe water management can increase the risk of contamination via faecal-oral routes and can encourage mosquitoes carrying malaria and dengue – diseases posing high risks to pregnant women [18, 34] – to breed. **Water collection**, an activity that often falls to women, can cause spinal injuries, hernias, genital prolapse, and an increased risk of spontaneous abortion [35, 36]. It can also present substantial caloric expenditure and thus hinder weight gain. Distant water sources, which have been shown to reduce water consumption per person [37], can impact on personal hygiene, which can increase risk of urinary and reproductive tract infections associated with pre-eclampsia and anaemia [32, 33] and risk of infection during delivery and post-partum. **Drinking unsafe water** can also pose maternal health risks. Arsenic or fluoride contamination of groundwater has been linked to higher rates of spontaneous abortion and stillbirth [38, 39], metals have been shown to have similar adverse health outcomes for pregnant women [40, 41], and saline intrusion has been linked to higher rates of hypertension during pregnancy during the dry season in the coastal areas of Bangladesh [42].

Another potential mechanism is through the deterrent effect that a perceived lack of WASH services in health facilities may have on the health-seeking behaviour of pregnant women, which could result in adverse effects on their, and their babies', health outcomes [5].

The Evidence Gap

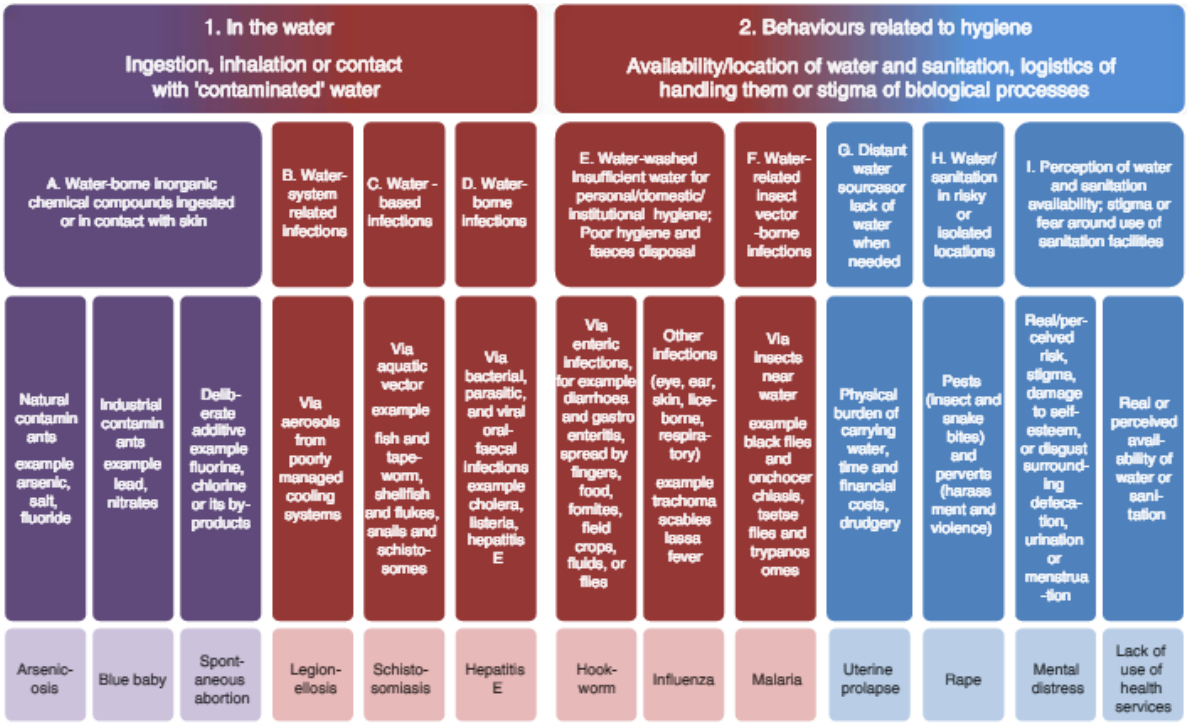
At the inception of SHARE in 2010, while the plausibility of the impact of water and sanitation on MM could be inferred from the direct and indirect impacts of WASH on MNH documented above, these multiple, complex and often overlapping pathways lacked methodical mapping and appraisal. Furthermore, much of the evidence about these pathways was weak, based on observational studies and anecdotal evidence.

SHARE's Contribution

Since 2010, SHARE has funded five studies on the relationship between WASH and MNH, which have helped advance our understanding of this area.

1. An exploration of the links between WASH and MNH

A conceptual framework [10] used three lenses to produce the first methodical documentation of the risk factors identified above (*'What we know'* section). The first was the Bradley classification, which identified four main pathways of water-related disease transmission [43]. A gender lens and a life-course lens were also used. Through the first systematic evaluation of its kind, this framework showed that WASH affects the risk of adverse MNH outcomes. The framework identified 77 potential chemical, biological and behavioural mechanisms linking WASH to MNH, and showed that these exposures are multiple and overlapping and may be distant (in time) from the immediate health outcome. Figure 1 summarises this exercise. This work was carried out by the London School of



Hygiene and Tropical Medicine (LSHTM).

Figure 1: Dimensions, components and examples of health effects in conceptual framework linking WASH with maternal and reproductive health.

Source: Campbell et al., 2015 [10].

2. A systematic review and meta-analysis exploring the association between WASH and MM

A systematic review [2] carried out by LSHTM focused on one of the mechanisms identified in the conceptual framework – the impact of WASH on MM. This review showed evidence of the association between poor sanitation and increased MM and between poor water and increased MM. In particular, four of five ecological studies that considered sanitation found that poor sanitation was associated with higher MM. Furthermore, meta-analysis of adjusted estimates in individual level studies indicated that women in households with poor sanitation were three times more likely to die from maternal causes than those with adequate sanitation access. In addition, four of six ecological studies assessing water environment found that poor water environment was associated with

higher MM. The only individual-level study looking at the adjusted effect of water showed a significant association between poor water access and increased MM.

Follow-on research by the team drew on existing data to further investigate this link between poor WASH and MM in Afghanistan [44], Pakistan (unpublished at the time of writing) and Bangladesh (unpublished at the time of writing). The study in Afghanistan found that women in households with unimproved water access had 1.91 higher odds of pregnancy-related mortality compared to women in households with improved water access, and found a non-statistically significant association between unimproved toilet facilities and pregnancy-related mortality. This work was carried out by LSHTM.

3. An assessment of the water and sanitation environments of birth settings

With the multiple plausible pathways of association between WASH and MNH mapped and evidence of the substantial magnitude of association between WASH and MM established, existing data sources were used to assess WASH coverage in home and facility birth settings in one case study country. The Tanzania 2010 Demographic Health Survey and the 2006 Service Provision Assessment were used in an assessment of the WASH environment surrounding births that concluded that less than one-third of all births in Tanzania took place in a water and sanitation-safe environment [45]. This work was carried out by LSHTM.

4. Needs assessments of infection prevention control and WASH in maternity units in Zanzibar and India

SHARE co-funded, with the Water Supply & Sanitation Collaborative Council, operational research exploring WASH conditions in healthcare facilities in Gujarat, India, that was able to provide greater depth on coverage, status and use than existing data sources. The "WASH & CLEAN study" developed a suite of tools to perform a 'situation analysis' of the state of maternity unit WASH and infection prevention and control (IPC) [46]. Following this, an operational study in Zanzibar adapted these tools to perform an in-depth needs assessment exploring WASH and IPC conditions in maternity units [47]. Both studies found WASH conditions to be sub-optimal. In Zanzibar, poor functioning of water systems emerged as an issue in almost half the facilities surveyed, while one third of facilities reported no functional hand-washing stations in their maternity areas. Furthermore, delivery beds were found to be contaminated with multiple organisms, and overcrowding was reported to be an issue, with 62% of facilities reporting women having to share a maternity bed at least once a day. This work was carried out collaboratively by several academic institutions and international organisations. Among these are the Indian Institute of Public Health, Gandhinagar, the University of Aberdeen, Zanzibar Ministry of Health, the Soapbox Collaborative, the Pemba Public Health Laboratory and WaterAid. To provide a cross-cultural comparison and through leveraged funding from the Soapbox Collaborative, the study extended to Bangladesh.

5. An assessment of the association between poor sanitation and adverse pregnancy outcomes (APOs)

In 2013 SHARE funded a population-based cohort study in Odisha, India, to assess the effect of poor sanitation during pregnancy on adverse pregnancy outcomes (APO). The findings, published in June 2015 in the journal PLOS Medicine [48], were that poor sanitation in general, and open defecation in particular, were strongly associated with APO after adjusting for a broad range of biological and socio-economic factors. This is the first rigorous epidemiological study to demonstrate this relationship and the results have

potentially important implications for MNH policy in high burden settings. The work was led by the Asian Institute of Public Health in collaboration with the University of Iowa, LSHTM, Emory University and the University of Nebraska Medical Center.

In summary, this collection of papers provides important new evidence for how poor WASH acts as a determinant of MNH and the scale of this problem. The conceptual framework elaborates the multiple and complex ways in which poor WASH can increase the risk of MNH problems. Although the systematic review found no experimental studies, the observational studies identified show a strong association between water and sanitation and MM after adjusting for confounding. Using nationally representative household and health facility data, the Tanzania case study shows how few women give birth in settings with improved water and sanitation. The health facilities studies in India, Bangladesh, and Tanzania describe in detail the WASH conditions faced by women who deliver in health facilities in high burden settings. Finally, the cohort study on WASH and APO in India provides the first rigorous evidence that poor sanitation during pregnancy is associated with an increased risk of preterm birth, low birthweight, spontaneous abortion and still birth.

What We Still Do Not Know

SHARE-funded work has added to the evidence-base on the impacts of WASH on MNH outcomes, strengthening the case for integrating WASH considerations into new and existing efforts to improve MNH. This in turn has helped strengthen global calls for further collaboration between WASH and maternal health [5], and has inspired further research. SHARE's research has also fed into a WHO-led effort to develop a global strategy on and action plan for WASH in health care facilities[1].

Nevertheless, while there is sufficient evidence that WASH may improve MNH outcomes to justify greater cross-sectoral commitment to addressing the WASH-MNH nexus, there is still a great deal we do not know. Answering the following questions would further strengthen the case for increased investment, ensure that these investments are appropriately targeted, and ensure better tailoring/designing of interventions.

- Additional systematic reviews are required to explore key potential risk mechanisms linking WASH to maternal and newborn outcomes identified in the conceptual framework [10].

- Further evidence on these direct and indirect mechanisms is needed. For example, to what extent are maternal deaths caused by other poor WASH-related infections, such as influenza and malaria, contracted by pregnant women during pregnancy and puerperium? What effect does drinking chemically contaminated water before and during pregnancy have on maternal health outcomes? These and many more research questions are captured in the systematic review [2].

- How does access to WASH at different points in a woman's life course affect these pathway(s) to MM [2]? Does it vary across different contexts?

[1] The call to action paper [5] was referenced in WHO and UNICEF's *'Water, Sanitation and Hygiene in Health Care Facilities'* report [49]. The India WASH & CLEAN work [46] was presented at a WHO-led workshop in March 2015 where the report was officially launched.

- What effects do different types of WASH interventions have on specific maternal health outcomes, and does the relative importance of these differ across various settings [5]?
- How best can WASH be incorporated into efforts to improve MNH?
- What responsibilities and bottlenecks for WASH in health facilities exist?

Recommendations

In 2013, nearly 300,000 maternal deaths occurred; many of these were avoidable and most of them occurred in low and middle income countries [6]. SHARE and its research partners have helped address this problem through research that increases recognition that WASH is a key determinant of maternal health. This research contributed significantly to the evidence-base underpinning a prominent call to action by experts from both sectors, in a paper published in PLOS Medicine last year, where the following recommendations were made [5]:

1. ***Donors, national governments and agencies should support and implement the forthcoming WHO strategy on WASH in health care facilities.***

This will require: high-level political recognition that WASH is a critical component of MNH strategies; reorienting management and budgeting priorities and standards to include the necessary infrastructure and supplies, training, and monitoring; and applying simple, low-cost practices at the facility level to maintain basic hygiene and sterile conditions, particularly in delivery rooms and operating theatres.

2. ***The implementation of the WHO Every Newborn Action Plan (ENAP) should be supported in its entirety, with a specific emphasis on WASH.***

To ensure ENAP and related initiatives result in improved MNH outcomes, they must be translated into national roadmaps that adequately reflect the role of WASH in terms of financial and human resourcing, monitoring systems, and training of health care staff; and that link MNH efforts to existing national plans and programmes to improve access to WASH and improve public health.

3. ***WASH should be embedded in national and global implementation and monitoring frameworks for Universal Health Coverage (UHC).***

The drive to achieve UHC is a unique opportunity to redress the neglect of public health in recent decades, as it positions prevention and treatment side by side as core components of a well-functioning health system. WASH is crucial for the success of the UHC model as it contributes to both aspects. Any monitoring frameworks on UHC should include performance indicators on access to WASH at household and health care facility levels and across all health services. Data on these performance indicators should be routinely collected, shared, and used to plan and prioritise actions and resources.

4. ***WASH should be embedded in the post-2015 development framework.***

This is a crucial opportunity to address the shortcomings of existing goals and targets and encourage cross-sector action to improve health outcomes through addressing WASH in both domestic and health care facility settings. All stakeholders engaged in discussion on the post-2015 development framework should ensure that a dedicated goal on universal access to WASH is included, and that the framework is adequately structured to reflect the need for cross-sectoral action by embedding WASH aspects in the proposed health goals and targets.

5. Ensure adequate financial resourcing to WASH as a core health strategy.

In recognition of the importance of WASH as a determinant of MNH, more and better-targeted investment in water and sanitation infrastructure in national budgets and a redoubling of efforts to meet targets towards achieving universal access by 2030 are required. Sustainability, accessibility, and affordability, at household and health care facility levels, should also be reflected, and aid policy and financial channels should be adjusted to enable the use of aid resources to implement multi-sectoral and integrated MNH plans and programmes.

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Research for sanitation and hygiene solutions

The SHARE Research Consortium comprises eight organisations that have come together to generate rigorous and relevant research for use in the field of sanitation and hygiene. The purpose is to join together the energy and resources of the five partners in order to make a real difference to the lives of people all over the world who struggle with the realities of poor sanitation and hygiene.

SHARE is led by the London School of Hygiene and Tropical Medicine (LSHTM) and includes the following partners:

- Centre for Infectious Disease Research, Zambia
- Great Lakes University of Kisumu, Kenya
- International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B)
- International Institute for Environment and Development (IIED)
- Mwanza Interventions Trial Unit, Tanzania
- Shack/Slum Dwellers International (SDI)
- University of Malawi (College of Medicine and Polytechnic)
- WaterAid

The SHARE core team work from LSHTM.

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