



Background Paper on Measuring WASH and Food Hygiene Practices – Definition of Goals to be Tackled Post 2015 by the Joint Monitoring Programme.

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1 Introduction

1.1 List of Acronyms

| | |
|--------|--|
| AIDS | Acquired Immunodeficiency Syndrome |
| HIV | Human Immunodeficiency Virus |
| JMP | Joint Monitoring Programme |
| LSHTM | London School of Hygiene and Tropical Medicine |
| MDG | Millenium Development Goals |
| PLWHA | People Living With HIV/ AIDS |
| QMRA | Quantitative Microbial Risk Analysis |
| RCT | Randomised Controlled Trial |
| ToR | Terms of Reference |
| UNICEF | United Nations Children’s Fund |
| USAID | United States Agency for International Development |
| WASH | Water, Sanitation and Hygiene |
| WHO | World Health Organization |

1.2 Background

In 2013 the United Nations General Assembly will be asked to decide what development goals the international community should seek beyond 2015. The decision will be made based on a proposal that will be submitted to the General Assembly. This proposal will include goals, targets and indicators pertaining to water, sanitation and hygiene (WASH). The indicators proposed will reflect principles associated with the human right to drinking water and sanitation.

Four working groups have been organized to review goals, targets and indicator options for each one of the areas of concern: water, sanitation, hygiene and equity and non-discrimination. The working groups will make proposals to a Core Consultative Group to be set up by the World Health Organization (WHO)/United Nations Children’s Fund (UNICEF) Joint Monitoring Programme (JMP) for Water Supply and Sanitation. This Consultative Group will consolidate the proposals from the working group and propose a post-2015 goal for the three WASH sector areas, including targets and indicators.

The United States Government, through the State Department and the United States Agency for International Development (USAID), is taking the lead in organizing the hygiene working group with the help of USAID’s WASHplus project. A background paper has been commissioned from London School of Hygiene and Tropical Medicine (LSHTM) by USAID to inform stakeholder discussion about the future goals, targets and indicators that should be pursued by the international community post 2015 in the area of hygiene. The background paper covers three topics: handwashing with soap, menstrual hygiene and food hygiene and considers vulnerable populations in household and institutional settings (including schools, health facilities and other places where disease prevention for vulnerable populations is important). Vulnerable populations include neonates, children under five years of age, and people living with Human Immunodeficiency Virus (HIV)/ Acquired Immunodeficiency Syndrome (AIDS) (PLWHA).

1.3 Where are we now?

The Millennium Development Target on water and sanitation is to “[r]educe by half the proportion of people without sustainable access to safe drinking water and basic sanitation.” The world has probably met, as of 2010, the improved water source goal but is expected to miss the sanitation target by about 13 percentage points [1].

Setting Millennium Development Goals (MDG) targets for water and sanitation has spurred progress, however the third item in the WASH triumvirate; namely hygiene, did not have an MDG target and has been relatively neglected. This, despite the fact that hygiene promotion is at least as effective and cost-effective in preventing morbidity and mortality as the provision of water and sanitation facilities [2-3].

There are a variety of hygiene behaviours known to be important for health and wellbeing. These include handwashing with soap, the safe use of sanitation facilities to dispose of stools, including those of infants, hygienic food preparation and menstrual hygiene management. One of the reasons that none of these has been incorporated within the MDGs is the difficulty in finding indicators of progress, since such behaviours are difficult to measure objectively [4-6].

In this paper we focus on three hygiene topics considered key for a number of reasons. The practice of handwashing with soap has a strong evidence base as a key intervention capable of reducing diarrhoeal disease by 30-50% [2, 7-9] and respiratory infections by 16-23% [10-11]. Since the formulation of the current MDGs considerable experience has accrued in how to improve this everyday hygiene habit [12]. Poor food hygiene is a major cause of morbidity globally and it has been suggested that up to 70% of diarrhoea episodes in developing countries may be food-borne [13-14]. However there is a shortage of evidence concerning its impact on morbidity and mortality in developing countries. Menstrual hygiene management is an issue for almost half the world's population (adolescent girls and women) particularly in low- and middle-income countries. It is a cause of shame, social stigma and school absenteeism [15-16] and potentially contributes to an increased risk of reproductive tract infections [17-18]. Highlighting all three topics through the new MDG process could bring much-needed international attention to focus on these neglected issues.

In this paper we set out the rationale for the adoption of each of these issues in the post- MDG process, setting out the strongest possible arguments grounded in the available evidence. We do not attempt to assess the importance of these issues relative to others in the sector or to provide a balanced view across sectors in considering possible candidates for post-millennium targets and goals.

Water, sanitation and hygiene are important for child health largely because they prevent the faecal-oral transmission of the pathogens that cause diarrhoeal diseases that kill in the order of 1.5m children a year [19]. Whilst water and sanitation infrastructure provide the physical conditions for hygiene, they cannot alone prevent the transmission of these diseases in domestic or institutional settings. Sanitation has to be used in a hygienic manner by all to prevent excreta reaching the environment and to prevent excreta contaminating water supplies. Handwashing with soap can both help to prevent diarrhoeal organisms reaching the environment and prevent the subsequent contamination of food and water. Handwashing is thus important to food hygiene, as is the protection of food from flies which may carry faecal pathogens, as well as safe storage and heating of foodstuffs and maintenance of clean surfaces and utensils. Women and girls need sanitation facilities, support and supplies so as to be able to manage menstruation in a private and dignified manner.

Hand hygiene in hospitals is vital for the prevention of cross-infection of the hospital acquired infections which cause pneumonia, skin, blood and gastro-intestinal infections. Active institutional management is required both to maintain facilities and to support and monitor staff and patient hand hygiene. Institutional management is also key to school hygiene where sanitation and water infrastructure have to be maintained, soap supplies managed and a culture of handwashing inculcated. Special attention to providing suitable facilities and supplies for girls is required for dignified menstrual management.

Thus for all of the hygiene issues we consider here there is a need for water and sanitation infrastructure and for its active management as well as for sustained attention to support and promote hygienic behaviour.

1.4 Methods

In this paper we review evidence from recent published and grey literature. Sources were located through searches of online databases and personal communication with specialists in the fields of interest.

Since hygiene has been a neglected subject for research investment, the evidence base is patchy and incomplete. In this paper we take our evidence from four types of source, which are:

- 1) arguments of plausibility: If a hygiene behaviour seems a plausible cause of infection transfer then we do not discount it for lack of strong evidence.
- 2) microbiological evidence: studies that have tracked the carriage of pathogens or pathogen indicators can provide indicators of risk and can provide quantitative evidence of risk, even though few detailed Quantitative Microbial Risk Analysis (QMRA) studies are available
- 3) observational studies: poor hygiene has frequently been associated with disease outcomes in descriptive, non-interventional studies. Although these studies are prone to confounding and other biases we still look to well designed observational studies for indications of potential risk practices
- 4) randomised controlled trials (RCTs): whilst these are the gold standard for evidence of risk, in hygiene they have been few and far between and can still be difficult to interpret because hygiene interventions cannot be blinded, leading to other sorts of bias in estimates of risk.

Beyond immediate health outcomes (e.g. diarrhoea, respiratory infections) we also look for evidence concerning distal health outcomes (e.g. nutritional status, cognitive development) as well as questions of productivity, educational and social outcomes (e.g. school attendance, time away from work, etc); and equity, non-discrimination.

Since health outcomes are worse in poorer sectors of society we looked, in particular, at evidence concerning poorer countries and poorer communities within those countries. We considered evidence about hygiene in the domestic sphere, in health care settings, schools and workplaces. It would not have been appropriate for this exercise to attempt new systematic reviews of these issues. Many have already been carried out and further reviews would have contributed little.

1.5 Terms of Reference

The table below sets out the tasks of this review taken from the terms of reference (ToR). The full ToR are included as annex 1.

| No. | Task |
|-----|--|
| 1 | Make a case for the global relevance of handwashing with soap at given junctures, presenting available outcome data from the literature to substantiate the rationale. Include evidence suggesting which handwashing junctures have health outcome implications. Address the importance of targeting households and institutions. Focus on a rationale that would make handwashing with soap attractive to the public sector. |
| 2 | Make a case for the global relevance of menstrual hygiene management from an educational, health, equity perspective. Use available data to substantiate the justifications. Discuss whether this issue requires targeting household or institutions, or both, and address how this issue can be made attractive for governments. |
| 3 | Make a case for the global relevance of food hygiene practices to prevent disease among vulnerable target groups (children under five, PLWHA, etc.). Use available data to substantiate the justifications. Narrow down the issues of importance in food hygiene for eventual government involvement. |
| 4. | Review the international experience associated with tracking across countries the issues of interest: handwashing with soap, menstrual hygiene and food hygiene practices. |
| 5 | Propose goals and targets of international relevance that may be pursued in the areas of handwashing with soap at critical junctures, menstrual hygiene management and food hygiene, keeping in mind government involvement and actions that may target households and institutions. Develop a comprehensive long list of indicators to measure each target. These proposed goals, targets and indicators will form the substance of the discussion for the JMP Hygiene Working Group. |
| 6 | Discuss the advantages and challenges of measuring handwashing with soap, menstrual hygiene and food hygiene practices that reduce disease and the lessons learned at the international level that will streamline future measurements. Consider monitoring measures that would be useful to governments and the international community at large both for households and institutions. |

1.6 Section References

1. WHO U. Progress on sanitation and drinking-water–2010 update. Geneva: World Health Organization. 2010.
2. Cairncross S, Hunt C, Boisson S, Bostoen K, Curtis V, Fung I, et al. Water, sanitation and hygiene for the prevention of diarrhoea. *Int J Epidemiol.* 2010; 39(Sup 1):193-205. [doi:10.1371/journal.pmed.1000058].
3. Jamieson D, Bremen J, Measham A, Alleyne G, Claeson M. *Disease Control Priorities in Developing Countries.* Oxford: Oxford University Press; 2006.
4. Cousens S, Kanki B, Toure S, Diallo I, Curtis V. Reactivity and repeatability of hygiene behaviour: structured observations from Burkina Faso. *Social Science And Medicine.* 1996;43(9):1299-308.
5. Curtis V, Cousens S, Mertens T, Traoré E, Kanki B, Diallo I. Structured observations of hygiene in Burkina Faso, validity, variability and utility. *Bulletin of the World Health Organisation.* 1993;71(1):23-32.
6. Biran A, Rabie T, Hirve S, Schmidt W, Curtis V. Comparing the performance of indicators of handwashing practices in rural Indian households. *Tropical Medicine and International Health.* 2008;13(2):278-85.
7. Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *American Journal of Public Health.* 2008;AJP. 2007.124610 v1.
8. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *Lancet Infectious Diseases.* 2003;3:275-81.
9. Ejemot R, Ehiri J, Meremikwu M, Critchley J. Hand washing for preventing diarrhoea. *Cochrane Database of Systematic Reviews.* 2008(1).
10. Rabie T, Curtis V. Handwashing and Risk of Respiratory Infections: A Quantitative Systematic Review. *Tropical Medicine and International Health.* 2006;11(3):269-78.
11. Ensink J. Health impact of handwashing with soap. WELL Factsheets [serial on the Internet]. 2004: Available from: <http://info.lut.ac.uk/well/resources/fact-sheets/fact-sheets-htm/Handwashing.htm>.
12. Curtis V, Schmidt W, Luby S, Florez R, Touré O, Biran A. Hygiene: new hopes, new horizons. *The Lancet Infectious Diseases.* 2011;11(4):312-21.
13. WHO, *Basic Principles for the preparation of safe food for infants and young children.* Geneva: World Health Organization, 1996
14. Esrey, S.A. Food contamination and diarrhoea. *World health,* pp. 19-20, January-February 1990
15. Tracey Crofts and Julie Fisher. Menstrual hygiene in Ugandan schools: an investigation of low-cost sanitary pads. *Journal of Water, Sanitation and Hygiene for Development Vol 2 No 1 pp 50–58*

16. Sommer, M. 2010. Where the education system and women's bodies collide: The social and health impact of girls' experiences of menstruation and schooling in Tanzania. *Journal of adolescence*, Volume 33, Issue 4, August 2010, Pages 521–529
17. Wasserheit JN(1989) Reproductive tract infections in a family planning populations in rural Bangladesh. *Studies in Family Planning*, Vol. 20, No. 2 (Mar. - Apr., 1989), pp. 69-80
18. Younis N, Khattab H, Zurayk H, el-Mouelhy M, Amin MF, Farag AM. 1993 A community study of gynecological and related morbidities in rural Egypt. *Studies in Family Planning*, May-Jun;24(3):175-86.
19. Unicef, WHO. Diarrhoea: Why children are still dying and what can be done. New York: Unicef 2009.

2 Handwashing

2.1 List of Acronyms

| | |
|-------|------------------------------------|
| A | Ascaris |
| aOR | Adjusted Odds Ratio |
| AIDS | Acquired Immunodeficiency Syndrome |
| ARI | Acute Respiratory Infection |
| ART | Antiretroviral Therapy |
| CI | Confidence Interval |
| DALY | Disability Adjusted Life Year |
| DHS | Demographic and Health Survey |
| HWWS | Handwashing With Soap |
| HCAI | Healthcare-Associated Infection |
| HIV | Human Immunodeficiency Virus |
| HIP | Hygiene Improvement Program |
| MICS | Multi Indicator Cluster Survey |
| OR | Odds Ratio |
| PLWHA | People Living With HIV/ AIDS |
| RCT | Randomised Controlled Trial |
| RSV | Respiratory Syncytial Virus |
| SARS | Severe Acute Respiratory Syndrome |
| STHs | Soil-transmitted Helminths |
| UK | United Kingdom |
| USD | United States Dollar |
| WHO | World Health Organization |

2.2 Rationale for the need to focus on hand washing

Handwashing is probably the most researched hygiene behaviour in developing countries. Although rinsing hands with water is a common practice, the benefits associated with handwashing are largely attributed to the use of soap - a far rarer practice [1-2]. In this section we examine the rationale for focusing on handwashing with soap and the benefits arising from undertaking this hygiene behaviour.

Health impacts

With the potential to save one million lives a year and costing 3USD per DALY averted, handwashing with soap has been viewed as one of the most cost-effective way of reducing the global infectious disease burden [3].

Diarrhoea

Diarrhoeal diseases are a common cause of morbidity and the leading cause of death among children under-five, accounting for 19% of mortality in this age group [4]. Most diarrhoea is caused by bacteria, viruses and protozoa in human faeces spread from the stool of one person to the mouth of another. Hands can act as a vector for transmission of faecal pathogens, either via direct person-to-person transmission or by contaminating food that is later consumed. Handwashing after defecation and before handling food is therefore a biologically plausible mechanism for interrupting pathogen transmission. Strong evidence from observational studies and randomised controlled trials suggest that handwashing with soap could reduce the risk of diarrhoea by up to 47% [5-7]. Although soap increases the length of time for which hands are washed and more effectively dislodges pathogens from hands than water alone. A recent observational study in Bangladesh found handwashing with water only can also be effective at reducing childhood diarrhoea although the risk reduction in those using soap was nearly twice as high [8].

Waterborne transmission is an efficient mode of introducing disease to a population rapidly and at scale. Thus epidemics of diseases such as cholera and typhoid fever, particularly in complex emergency situations, are often initiated by contaminated water. Once introduced, epidemics can perpetuate through person-to-person transmission, hence hygiene – specifically handwashing with soap – is advocated as a control measure during outbreaks. Evidence suggesting promoting handwashing with soap is protective against cholera mainly comes from case control studies carried out in outbreak settings [10-13]. A systematic literature review of the impact of hygiene promotion interventions in cholera or typhoid epidemics has not yet been conducted.

However, the majority of the global disease burden from diarrhoea is not epidemic but endemic and is classed as ‘water-washed’ rather than waterborne since it is transmitted by a number of faecal-oral routes that can be interrupted by improved hygiene practices [9].

Acute Respiratory Infections

Acute Respiratory Infections (ARIs) cause 4.2 million deaths a year, of which 1.6 million are among children under five [4]. Although respiratory pathogens are predominantly transmitted via the airborne route, bacteria and viruses shed from the nose, mouth or anus have been recovered from hands and fomites (objects) [14-18]. Handwashing with soap can reduce viral load on hands [19]. Although evidence for the potential for viable influenza virus to be transferred from hands to the respiratory tract is lacking, laboratory and epidemiological studies with other respiratory viruses (rhinovirus and RSV) have shown transmission is possible by this route [20]. It is thus biologically plausible for influenza transmission to occur via hand contact with the mouth or nose and for hand-hygiene to be a valid control measure. A randomised trial in Hong Kong suggested an effect of hand hygiene on influenza, although due to the small study size the researchers could not rule out chance [21]. Systematic reviews of the evidence have concluded that handwashing with soap or use of sanitisers could reduce the risk of respiratory infection by 16-21% (pooled estimates) [22-23]. A cluster-randomised trial of a handwashing promotion intervention in Pakistan reported a 50% reduction in pneumonia [24]. The study had some methodological flaws - observers assessing the outcome had also implemented the intervention which may have over-inflated handwashing rates in the intervention arm - but was the first reported study in a low-income setting.

Fung & Cairncross (2007) [25] found that the SARS epidemic induced high levels of self-reported hand-hygiene compliance. Handwashing promotion could also play a role in mitigating pandemic influenza, particularly during the early stages. However, despite being widely promoted as a control measure during

the 2009 H1N1 pandemic, a review of the evidence by the UK Department of Health [26] suggests that the impact of hand hygiene on influenza transmission may be small, and compliance - particularly in schools - may be low. The review concluded that good hand-hygiene practices could contribute to reducing household transmission [26]. However, household transmission may not be prevented if control measures are not implemented rapidly and adhered to [27].

Other diseases

Frequent bouts of diarrhoea in childhood could contribute to under-nutrition, possibly as a result of environmental enteropathy, a disorder of the small intestine [28-29] and may adversely affect growth and cognitive development [30-31]. The extent to which diarrhoea contributes to these long-term effects has not yet been elucidated but is thought to be substantial [29]. Children recovering from diarrhoea could also be more susceptible to pneumonia [32].

Soil-transmitted helminths (STHs) are among the most common chronic infections worldwide, estimated to infect over a billion individuals in tropical and subtropical regions, mainly in low- and middle- income countries [33]. STHs are predominantly transmitted when eggs are deposited in the environment (via faeces), develop to infective stages and are transmitted via ingestion or across the skin boundary (hookworm). Thus prevalence is highest in areas where hygiene is poor, safe water and sanitation facilities are lacking and health services are insufficient [33]. STH infections rarely result in death, but they affect nutrition, resulting in anaemia, loss of appetite, intestinal damage and reduced absorption of vitamin A [34-35], impacting on growth and cognition at critical stages of a child's development [36]. School-age children are particularly vulnerable to these negative outcomes as they harbour the greatest worm burdens [35]. We could expect that behaviours which increase the likelihood of ingesting eggs affect transmission and reinfection rates. Given the "soil-mouth" transmission route, it is plausible that failing to wash hands or using a substance other than soap could be a risk factor for *A. lumbricoides* (ascaris) e.g. if soil is used in defecation fields and soil is contaminated with infective stage eggs. The plausibility argument receives further support from a study in Tajikistan which found ascaris eggs on the hands of 30% of a sampled population of medical clinic outpatients [70]. A recent review found weak evidence that hand-washing can reduce ascaris infection [37].

Trachoma is a bacterial eye infection which can cause blindness. It is prevalent in areas of extreme poverty lacking adequate water for hygiene. Though handwashing is a highly plausible means of controlling its incidence, a review of randomised and quasi randomised controlled trials on face washing found only two eligible trials and concluded that there is some evidence that face washing can reduce severe trachoma when it is combined with antibiotic treatment [38].

Epidemiological studies also point to a protective effect of handwashing on skin infections, for example, the cluster-randomised control trial of handwashing in Pakistan [24] included impetigo as an outcome measure and observed that handwashing and daily bathing reduced incidence of impetigo by 34%.

Vulnerable populations

In this section we consider the following vulnerable populations in turn: women during childbirth; neonates; people living with HIV-AIDS (PLWHA); and hospital patients.

One of the most striking health inequalities is the disparity in maternal mortality rates seen within and between countries (lifetime risk of death of 1 in 6 in the poorest regions compared with 1 in 30,000 in Northern Europe) [39]. According to a WHO review, up to 12% of maternal deaths in low-income countries

are due to puerperal sepsis/infections [40]. Estimates are subject to methodological difficulties and the actual contribution of sepsis to maternal mortality could be higher. Home birth in unhygienic conditions is a described risk factor for puerperal sepsis, although epidemiological studies have been primarily conducted in high-income settings. Hand cleansing forms part of the package of plausible, widely accepted preventative measures [41] although there is a paucity of data on the impact of hand cleansing on reducing maternal mortality due to sepsis, handwashing with soap can substantially reduce hand contamination [42].

Almost four million newborns die each year in low- and middle-income countries. A third of these deaths are attributed to infections [4]. It is estimated that universal coverage of existing interventions (including handwashing) could reduce neonatal mortality by up to 72% [43]. However, the protective effect of handwashing at this time is relatively under-studied, partially because of difficulties determining the relative importance of individual components of neonatal care packages. A recent review of the current (generally poor quality) evidence concluded that sepsis and tetanus deaths could be reduced by clean birth practices at home (by about 15% and 30% respectively) or in a facility (by about 27% and 30% respectively), and by clean postnatal care packages (40% reduction) [44]; current evidence suggests that maternal and birth attendant handwashing with soap could have an important impact on neonatal survival.

The reviewed evidence demonstrates that handwashing with soap can protect against a range of negative health outcomes. As people living with HIV/AIDS (PLWHA) are vulnerable to co-infections, handwashing can also protect PLWHA from opportunistic infections such as diarrhoea and skin diseases, the consequence of which may be faster disease progression and early death. A randomised controlled trial among PLWHA suggested that handwashing reduced the incidence of diarrhoeal episodes [6]. Diarrhoeal disease may also cause individuals on antiretroviral therapy (ART) not to absorb therapeutic dosages of the medication and therefore has wider consequences [45-47]. HIV-positive children and HIV-negative children with HIV-positive mothers are at greater risk of poor nutritional status (which can be caused by enteric infection) [48].

Hospital patients represent another important vulnerable population. Nursing homes residents are similarly at risk of healthcare-associated infections (HCAs) due to their vulnerable age, use of medical devices and antibiotics, impaired mobility and frequent hospitalisations [49]. In high-income countries 5-15% of admitted hospital patients can acquire an HCAI. Limited data are available from low-income countries, but infection control practices are far less stringently adhered to and the burden could be far higher. The evidence is presented in a comprehensive WHO Report [50]. According to this report, transmission of pathogens predominantly occurs via the hands of health workers. Evidence from over 20 interventions to improve hand hygiene compliance show temporal associations between intervention and reduced incidence of HCAs and cross-contamination [50] though there are no RCTs.

Non-health impacts

In addition to the health benefits of handwashing, ill health has economic implications such as lost productivity of the patient and caregiver, and school absenteeism.

Children from schools promoting handwashing with soap during a cluster-randomised controlled trial in China were demonstrated to be absent for 43% fewer days [51]. A similar trial in Kenya found an impact on girls' absenteeism [52] and similar effects have been seen in other studies where handwashing or hand sanitiser have been promoted [53-54]. These findings are not unexpected given the impact of handwashing on health.

As previously described, worm infections can impact on child growth and cognition. Deworming has been demonstrated to reduce absenteeism among school children by 25% [55], to dramatically improve cognition (half year of schooling) in younger siblings of school children [56], and to result in over 20% higher earnings and 12% more hours worked when children are adults [57]. Although the evidence for handwashing impacting on helminth infection is limited, it is plausible that handwashing could also produce similar, albeit lesser, effects to deworming.

The evidence presented above, although not a systematic literature review, details the range of benefits that could arise from promotion of handwashing with soap. The table below summarises the evidence for health and other benefits outlined above.

| Immediate health benefits | | |
|--|---|---|
| Outcome | Type of evidence | Notes |
| Diarrhoea | | |
| Endemic diarrhoea | RCTs and observational studies | Up to 47% reduction in risk [5-7] |
| Epidemic diarrhoea | Observational studies (No systematic literature review) and biological plausibility | suggested protective effect: <ul style="list-style-type: none"> - aOR¹ handwashing with soap = 0.25[0.09-0.71] [10] - aOR handwashing after toilet = 0.19 [0.09 - 0.39] [11] - aOR observed presence of hand soap = 0.1 [0.04-0.4] [12] - aOR handwashing before eating = 0.2 [0.1–0.6] [13] |
| Diarrhoea among PLWHA | RCT | RCT suggests handwashing reduces diarrhoeal diseases in PLWHA[6] |
| Respiratory infections | | |
| Acute Respiratory Infections | Systematic review and RCT | - 16-21% reduction in risk [22-23] 50% reduction in pneumonia [24] |
| Pneumonia | Observational study and biological plausibility | Possibly reduced susceptibility to pneumonia through reduction in diarrhoea [32] |
| Acute Respiratory Infections (pandemic) | Biological plausibility | Potential impact in epidemic situations (SARS/Influenza) [25-26] |
| Healthcare associated infections | | |
| Health care-associated infections | Observational evidence (good quality) | handwashing reduces incidence of HCAs and cross-contamination in hospital settings [50] |
| Puerperal sepsis/infections (maternal mortality/morbidity) | Biological plausibility and limited microbiological evidence | Up to 12% of maternal deaths caused by sepsis/infections. <ul style="list-style-type: none"> - Biologically plausible impact of handwashing and standard intervention: handwashing with soap reduces hand contamination [42] Lack of epidemiological data. |
| Neonatal infections | | |
| Neonatal infections | Biological plausibility | - Estimated reduction in deaths as result of <u>clean birth practices</u> : sepsis (15% at home, 27% in a facility); tetanus (30% at home and in facility) [44] Estimated 40% reduction in deaths as result of <u>clean postnatal care</u> [44] |

¹ Adjusted Odds Ratio (aOR) shows the odds of diarrhoea in those practicing specified handwashing with vs. those not statistically controlling for other possible influencing factors.

| Distal health benefits | | |
|-------------------------------------|--|---|
| Outcome | Type of evidence | Notes |
| Co-infections among PLWHA | Biological plausibility | - diarrhoeal diseases are associated with mal-absorption of ARVs [45-47] |
| Other benefits | | |
| Under-nutrition | Observational evidence and biological plausibility | - Unknown but possibly substantial impact on nutrition mediated via reduction in diarrhoea and environmental enteropathy [28-29] - Diarrhoea and poor nutritional status (and negative outcomes) more common among HIV+ individuals [48] |
| Child growth and development | Observational evidence and biological plausibility | - Potential impact via reduction in prevalence of undernutrition due to reduction in diarrhoea (and environmental enteropathy) [30-31] and soil-transmitted helminths [36] (Cognitive impairment) |

Opportunities for intervention

When to intervene

As laid out in the health impacts section above, handwashing can directly interrupt the transmission of faecal-oral pathogens and respiratory viruses, and could plausibly reduce transmission of soil-transmitted helminth infections. As transmission can occur directly or via contaminated food or water, handwashing is commonly targeted towards five key junctures: AFTER risk of contact with faecal matter (defecation or cleaning a child) and BEFORE handling food (food preparation, feeding someone and eating). Globally, practice of handwashing with soap at these times is rare [2].

What is the evidence for the opportunity for intervention at these specific junctures? Luby (2011) recognised that promoting handwashing at five critical times could require an infeasible number of handwashes to take place [58]. They found that handwashing before food preparation and after defecating significantly reduced child diarrhoea, particularly when soap was used (before eating OR = 0.30; 95% CI = 0.19–0.47 and after defecating OR = 0.45; 95% CI = 0.26–0.77). As this was an observational study and individuals who handwash before food preparation are rare, these “handwashers” could be different in other ways that could confound the outcome measure. However, inadequate hand hygiene among infected food handlers is a key factor contributing to outbreaks in high-income [59]; handwashing at this time is no doubt an important intervention moment. The exact contribution of different transmission routes to disease burden and the relative effectiveness of interventions targeted towards these routes is unknown but likely to differ in different environments.

According to World Health Organisation guidelines for hand hygiene in health care settings [50], the critical times for hand hygiene are: 1) before touching a patient, 2) before clean/aseptic procedure, 3) after body fluid exposure risk, 4) after touching a patient and 5) after touching a patient’s surroundings. Hand rubbing with alcohol gel is effective and often promoted above handwashing with soap[50].

Where to intervene

The evidence points to three main areas where hygiene promotion would be feasible and could have considerable benefit:

Households: Handwashing promotion conducted in the community is usually targeted towards caregivers of children under five where the greatest health impacts can be made. Household interventions could similarly target caregivers of PLWHA or birth attendants attending home births.

Hospitals / health care settings or care homes: Promoting good hand hygiene amongst carers and patients/visitors can prevent most health care-associated infections (HCAI) acquired in hospitals and nursing homes. This reduces the extent of serious illness, premature mortality and suffering and the associated costs of care and prolonged hospital stays. Hand hygiene can also improve maternal and neonatal outcomes.

Educational settings: Schools offer the opportunity to change hand hygiene behaviour at scale and introduce and develop lifelong behaviours as well as preventing illness and associated school absences. Intervention in schools may be especially important if schools serve as foci for transmission, as suggested by the 2009 influenza pandemic.

Relevance for Public Sector

The evidence suggests that investing in hand hygiene promotion can improve school attendance, reduce healthcare costs, contribute to epidemic control and most crucially, reduce under-5 mortality from diarrhoea and acute respiratory infections. Substantial evidence for the benefits – health and otherwise – of handwashing should be of interest to the public sector. Hand hygiene should be promoted at critical times in a range of different settings to achieve the greatest benefits.

2.3 Proposed Targets and indicators for handwashing

In this section we discuss different measurement approaches and propose targets and indicators for monitoring handwashing behaviour.

Measurement of Handwashing Behaviour

Measuring handwashing is challenging because this practice is often conducted in private, it is socially or culturally sensitive (e.g. requires discussion or monitoring of post-defecation hygiene practices), is practiced inconsistently, is inaccurately recalled and requires that soap and water are available at the location where handwashing takes place. There is no simple, reliable indicator that can be universally employed to assess the extent to which hands are washed at critical times. Here we discuss the merits and limitations of different methods, and how and where they can be employed.

Self report

Self reported data e.g. “how many times did you wash your hands with soap yesterday?” are relatively easy to collect in a cross-sectional household survey at any level (e.g. national representative surveys or programme sample surveys). It is straightforward and rapid. However, self reported handwashing behaviour has repeatedly been shown to be prone to social desirability bias which result in over-estimates of “good” behaviour [e.g.60]. It would be reasonable to postulate that self-report generates less valid data when the individual questioned is aware of the “correct” response e.g. healthcare workers. Self reported-data are also dependent on accurate recall of habitual behaviours that may be enacted without conscious effort and therefore poorly remembered. Luby (2011) found that reported handwashing before feeding a child was associated with reduced diarrhoea prevalence (aOR 0.60 [0.42-0.84]), although as this practice is typically

rare, it is likely that these individuals are different in other ways that could be associated with diarrhoea prevalence.

Environmental “spot checks”

Environmental “spot checks” can be rapid and relatively easy to conduct in a range of settings from households to institutions. Spot checks, such as the presence of soap in a kitchen or at the usual handwashing station, can be used to infer handwashing behaviour and may be useful predictors of poor hand hygiene [61]. Proxy indicators have been shown to be strongly correlated with socio-economic status (i.e. wealthier households more frequently possess an indicator such as soap) [62]. The presence of water at the designated handwashing station has been associated with reduced respiratory infections (aOR 0.84 [0.70-0.99] [58]).

Assessing the cleanliness of a child’s finger pads / nails / palms is similarly easy to check during a survey and can be another useful proxy of hand hygiene practices – Luby (2011) found that clean finger pads were associated with less diarrhoea (aOR 0.82 [0.68-0.99]) [58].

Skills demonstration

Handwashing demonstrations can be conducted during household or school surveys. Luby (2011) showed that soap use during demonstrations was associated with reduced diarrhoea (aOR 0.69 [0.57-0.83]) and that air drying hands was associated with reduced respiratory infections (aOR 0.41 [0.26-0.65]) [58].

Knowledge assessment

Asking people questions to determine their knowledge is quick and easy and can form part of a survey e.g. “What are the key times you should wash your hands with soap and why?”. Knowledge might serve as a proxy for behaviour. However, knowledge and practice are known to not always correlate.

Direct observation of behaviour

Structured observation captures a person’s actual behaviour by observing them over a defined period of time. Observation is widely-regarded as the most valid of the currently available methods for measuring behaviour [61, 63]. Observation is more resource-intensive than other methods, requires training and intensive supervision, is complicated when more than one household member is observed and is vulnerable to reactivity (changes in behaviour due to the presence of an observer) [64] which could compromise the validity of the results. One study found only individuals with higher socio-economic status and educational levels were reactive [65], suggesting reactivity is not a concern in all households. Handwashing behaviour may be inconsistently practiced, so measurement on one day may not be a reliable indicator of a household’s handwashing status, although this should average out at population level [63]. Although direct observation is possible on large samples this can be expensive and also presents problems of logistics and quality assurance. Smaller samples, though not nationally representative, could be taken repeatedly from particular settings to monitor trends over time. The costs involved may render direct observation unsuitable for routine monitoring at national level and its primary purpose may be for evaluation in circumstances in which substantial changes in behaviour may reasonably be expected

Hand microbiology

Testing for the presence of specific microbes on hands may be a useful way of inferring handwashing behaviour in an objective way. However, although many have attempted to do this, few have found signals from the data that rise above the noise level [68-69]. This is because levels of hand contamination can vary

considerably over the course of even a few hours, which may compromise the validity and reliability of this approach [65-66]. Hand microbiology can also be costly and requires some expertise.

Commercial soap sales

Commercial companies monitor sales of soap. Temporal association between increased soap sales and large-scale interventions could indicate a change in behaviour. However, soap sales fluctuate for many reasons (e.g. discounting, distribution, competitive landscape, economic trends) so may only provide useful supporting evidence concerning HWWS. The frequency with which soap is procured in a school, hospital or health centre could, however be monitored over time.

Soap loggers

Electronic soap loggers fitted into bars of soap can record soap movement and thus imply soap use [67]. Soap loggers may be less prone to reactivity than other methods and may give a more accurate representation of actual behaviour [65]. However, the process of collecting logger data is time consuming to organise and complex to interpret, as well as requiring considerable initial outlay to procure the loggers and associated hardware and software. The only proven system is still proprietary and not commercially available.

Service Capacity and Delivery

Evaluating commitment to, capacity for and delivery of hygiene promotion could also be used to assess progress, particularly at policy level.

Existing Monitoring tools and Indicators

DHS² and MICS³ surveys provide standardised, internationally comparable and nationally representative data for a wide range of indicators. The UN Water/WHO's Global Annual Assessment of Sanitation and Drinking-Water (GLAAS), first published in 2010, provides information on the resources and investments being made in water and sanitation. Other indicators specific to use among HIV programmes⁴ and in schools (SWASH)⁵ are also in use. In the DHS, MICS and SWASH programs handwashing indicators focus on hardware by measuring the presence of a dedicated handwashing place with water and/or soap and appropriate location of washbasins (SWASH, schools only). In HIV programs these indicators are expanded to cover the policy level, institutional level and the household level including software elements such as carer knowledge and appropriate policies in place.

Proposed Indicators for handwashing

It is hard to measure handwashing behaviour and we have no perfect approach. The choice of measurement approach depends on the level at which evaluation takes place (national, sub-national etc.). Whilst it is unlikely that the true prevalence of HWWS can be estimated accurately, if an indicator is used consistently and data collected periodically it can still serve as a useful measure of changes in behaviour in populations over a period of time. Triangulation (corroborating data by use of more than one method) may also be employed. Biran (2008) found a high degree of correlation between spot checks and self reported HWWS but no good correlation between proxy and observation measurements [61]. Ram (2010) also found that different handwashing measures do not correlate well with soap use [65]. Generally speaking, observed data

² http://www.measuredhs.com/pubs/pdf/DHSQ6/DHS6_Questionnaires_3Jan2012.pdf

³ http://www.childinfo.org/mics4_questionnaire.html

⁴ <http://www.hip.watsan.net/page/4381>

⁵ <http://www.swashplus.org/Documents/Summary-%20Key%20Monitoring%20Questions.pdf>

are considered more objective than data that have been inferred or self reported, although the latter measures are easier to collect and less labour-intensive. However, it is expensive and labour-intensive to collect high quality observational data at a national scale [63].

Based on a review of the evidence we propose handwashing targets centred around: i) handwashing of caregivers (of children under 5 and of persons living with HIV/AIDS), ii) handwashing of birth attendants, iii) in schools and iv) among healthcare workers in hospitals.

Targets and indicators in each of the four themes relate to the provision of facilities, knowledge of the correct behaviour and actual handwashing behaviour. This gives us 13 candidate targets with measurable indicators for the MDGs.

Suggestions for policy targets are also proposed.

| Category | Indicators | Definitions | Monitoring measures |
|--|---|--|---|
| <p>Target 1: By 2025, all households will have handwashing stations equipped with soap and water</p> <p><i>*Handwashing station: a designated place for handwashing that is easily accessible to all household members</i></p> <p>Sub-target 1: By 2020, 70% of households will have handwashing stations equipped with soap and water</p> | | | |
| Handwashing facilities (household level) | <ul style="list-style-type: none"> • % households with soap & water present at the designated place for handwashing (handwash station) • % households with soap & water present at any location in the household for handwashing (handwash station) • Presence of handwash station in/near toilet, and in/near kitchen | Define <i>near</i> as within 10 paces of latrine / kitchen [this definition is used by HIP] | Proxy spot check of facilities at household level Household surveys e.g. DHS, MICS Data should be reported by wealth quintile. Oversampling of caregivers of PLWHA. |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Spot checks of handwashing facilities are a proxy for handwashing behaviour; handwashing cannot be practiced without a handwashing station (and soap) and presence of water at the handwashing location has been associated with reduced pneumonia (Luby 2011) while presence of soap and water in general can predict non-handwashing behaviour (Biran 2008), • Current DHS questions (Q137-9) and MICS survey questions (Handwashing Module 3.21 & 3.22) include spot check of facilities | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Proxy indicators do not always correspond well with actual behaviour (e.g. <i>presence</i> of soap does not always translate to <i>use</i> of soap) (Biran 2008) [1] • Presence of soap strongly correlated with socio-economic status (Luby 2008) [2] • This indicator should therefore be used in conjunction with other measures of handwashing behaviour and/or proxies | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|---|--|---|
| <p>Target 2: By 2025, all caregivers of children under 5 and of PLWHA will know <i>how</i> and <i>when</i> to practice handwashing with soap</p> <p>* 'Caregiver': mother or individual caring for child under 5 years old or caregiver of a person living with HIV/AIDS (PLWHA)</p> <p>*'How' – To be defined – e.g. using running water, soap, lather/rub hands for at least 20 seconds</p> <p>*'When' – To be defined e.g. Five critical times: after risk of faecal contact (defecation / child stools) and before food handling (eating, food prep and serving)</p> <p>Sub-target 2: By 2020, 70% of caregivers of children under 5 and of PLWHA will know how and when to practice handwashing with soap</p> | | | |
| Handwashing Knowledge (household level) | <ul style="list-style-type: none"> • % of caregivers who know all/at least three critical times for handwashing • % of caregivers who washed hands <i>correctly</i> • % of caregivers who use soap when asked to demonstrate handwashing • % of caregivers who wash both hands when asked to demonstrate handwashing • % of caregivers who air dry or use a clean towel to dry hands after handwashing when asked to demonstrate handwashing | <p>Critical times listed under target</p> <p>Correct handwashing: met all criteria – running water, soap, lather/rub hands for at least 20 seconds</p> | <p>Household surveys e.g. DHS, MICS</p> <p>Data should be reported by wealth quintile. Oversampling of caregivers of PLWHA.</p> <p>Handwashing demonstrations can also be conducted during household surveys.</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing at critical times can reduce diarrhoea and other negative health outcomes. Assessing knowledge of critical times (the first indicator listed) can be found in the HIP expanded indicator list (http://www.hip.watsan.net/page/4381). According to HIP, the M&E working group of PPPHW accept testing knowledge of critical times as an indicator. • Handwashing demonstrations are another useful proxy of handwashing behaviour. Luby (2011) showed that soap use during demonstrations was associated with reduced diarrhoea and that air drying hands was associated with reduced respiratory infections [3]. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Proxy indicators for behaviour do not always correspond well with actual behaviour. • These indicators should therefore be used in conjunction with other measures of handwashing behaviour and/or proxies | | | |

| Category | Indicators | Definitions | Monitoring measures |
|--|--|--|--|
| <p>Target 3: By 2025, to halve the proportion of times when caregivers (of children under 5 and PLWHA) do not practice handwashing with soap at critical times</p> <p><i>Five critical times: after risk of faecal contact (defecation / child stools) and before food handling (eating, food prep and serving)</i></p> <p><i>* Caregiver: mother or individual caring for child under 5 years old or caregiver of a person living with HIV/AIDS (PLWHA)</i></p> <p><i>*40% above baseline measurement</i></p> <p>Sub-target 3: By 2020, to cut by 20% the proportion of caregivers (of children under 5 and PLWHA) not practicing handwashing with soap at critical times</p> | | | |
| Handwashing Behaviour (household level) | <ul style="list-style-type: none"> • % of all observed critical handwashing occasions accompanied by handwashing with soap • % of observed defecation events accompanied by handwashing with soap • % of observed events involving cleaning a child accompanied by handwashing with soap • % of observed events involving handling food (preparation, feeding a child or eating) accompanied by handwashing with soap • % of caregivers reporting washing hands with soap at critical times yesterday | Cleaning a child: cleaning a child after they have defecated | Structured observation of handwashing behaviour Self-reported behaviour. Oversampling of caregivers of PLWHA. National surveys that could be repeated periodically in select regions / groups |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing at critical times can reduce diarrhoea and other negative health outcomes. • Structured observation is recognised as the most <i>valid</i> measure of handwashing behaviour | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Observing the behaviour of more than one person at a time can be problematic, while recording only one critical time e.g. after defecation, would greatly increase sample size | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|---|---|--|
| <p>Target 4: By 2025, handwashing facilities OR alcohol gel will be available for <i>all</i> births (home and facility)</p> <p>*Handwashing facilities: designated handwashing station with water and soap</p> <p>Sub-target 4: By 2020, to halve the proportion of births (home and facility) taking place in the absence of handwashing facilities OR alcohol gel</p> | | | |
| <p>Handwashing facilities (household and institutional for maternal/neonatal health)</p> | <ul style="list-style-type: none"> • % of home “clean birth kits” including soap • % of births (home and facility – hospital/health centre etc) where soap and water and / or alcohol gel available for handwashing | <p>“Six cleans” make up a clean birth: clean hands, clean perineum, clean delivery surface, clean cord cutting implement, clean cord tying, and clean cord care.</p> | <p>National survey of health facilities</p> <p>Local health centre records of births in given geographic region</p> <p>Specific surveys conducted during post-natal services</p> <p>Track sales of birthing kits / soap procured by midwives etc</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing is an important hygiene measure at this time with evidence of health benefits | | | |
| <p>Disadvantages:</p> | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|--|--|--|
| <p>Target 5: By 2025, all birth attendants will know when hands should be cleansed prior to and during delivery</p> <p>*Birth attendant: any individual (skilled or unskilled) contacting the mother or newborn during delivery</p> <p>*Hand cleansing defined as handwashing with soap <i>or</i> handwashing with alcohol gel</p> <p>*'When' – requires definition.</p> | | | |
| <p>Sub-target 5: By 2020, to halve the proportion of birth attendants not knowing when hands should be cleansed prior to and during delivery</p> | | | |
| Handwashing Knowledge | <ul style="list-style-type: none"> • % of birth attendants who can recount all times when hands should be washed • % of midwifery schools with documented evidence of training on hand hygiene | Hands should be washed prior to delivery and before contacting the neonate | <p>National survey (including unskilled birth attendants and stratified by wealth quintile)</p> <p>Survey of midwifery schools</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing is an important hygiene measure at this time with evidence of health benefits. Knowledge is a prerequisite of behaviour. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Knowledge and practice do not always correlate and data should be triangulated with other indicators / targets for birth attendant handwashing | | | |

| Category | Indicators | Definitions | Monitoring measures |
|--|--|-------------|---|
| <p>Target 6: By 2025, all birth attendants will <i>universally</i> practice hand cleansing prior to and during delivery</p> <p>*Birth attendant: any individual (skilled or unskilled) contacting the mother or newborn during delivery</p> <p>*Hand cleansing defined as handwashing with soap <i>or</i> handwashing with alcohol gel</p> <p>Sub-target 6: By 2020, to reduce by half the proportion of birth attendants not practicing hand cleansing prior to and during delivery</p> | | | |
| Handwashing Behaviour | <ul style="list-style-type: none"> • % of birth attendants reported <i>by mother</i> to have been observed to cleanse hands (with soap and water <i>and/or</i> alcohol gel) during and/or prior to delivery and/or before handling the newborn • % of birth attendants reporting <i>always</i> cleansing hands (with soap and water <i>and/or</i> alcohol gel) during / prior to delivery and before handling a newborn • % of birth attendants <i>observed</i> to cleanse hands (with soap and water <i>and/or</i> alcohol gel) during / prior to delivery and before handling a newborn | | <p>National survey (including unskilled birth attendants and stratified by wealth quintile)</p> <p>Survey of mothers attending post-natal clinics</p> <p>Oversampling new mothers during household surveys</p> <p>Surveys of health facilities to observe handwashing behaviour of birth attendants (equity of access considered)</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing is an important hygiene measure at this time with evidence of health benefits for mother and child • Rhee (2006) assessed birth attendant handwashing using maternal recall | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Evidence for health benefits to neonate is weak (although plausible) and hard to measure (current RCT underway in Bangladesh). • Unless mothers are educated/trained, they may not reliably look for evidence of HWWS by birth attendants. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|--|--|---|
| <p>Target 7: By 2025, all schools will have handwashing stations equipped with water and soap</p> <p><i>*Handwashing station: a designated place for handwashing that is easily accessible for all school children to use at key times (e.g. after toilet, before eating)</i></p> <p><i>*school children in full-time education who have received teaching on handwashing with soap (age will vary in each country)</i></p> <p>Sub-target 7: By 2020, 70% of schools will have handwashing stations equipped with water and soap</p> | | | |
| <p>Handwashing facilities (in schools)</p> | <ul style="list-style-type: none"> • % of schools (primary and secondary) with running water* / soap / HW stations located in or near point of defecation and classrooms and <i>accessible</i> to children • % of schools where ratio of functional handwashing stations is adequate in relation to the number of latrines | <p>Running water = Running water' is defined as having the potential for one person to create a stream of water under which both hands could be washed simultaneously.</p> <p>Accessible = within reach of young children, soap easily available at moment when it is required</p> <p>Near = within 10 paces as defined by the Hygiene Improvement Project (http://www.hip.watsan.net/page/4381)</p> | <p>Spot check of facilities conducted as part of National school survey</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing promotion in schools can impact directly on health, improve menstrual hygiene management, reduce absenteeism etc. this cannot be practiced without provision of facilities • This indicator on running water is adapted from the SWASH tool <ul style="list-style-type: none"> ○ http://www.swashplus.org/Documents/Summary-%20Key%20Monitoring%20Questions.pdf | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • The greatest disease burden is among younger children | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|--|-------------|--|
| <p>Target 8: By 2025, all school children will know when to wash hands with soap</p> <p>* Five critical times: after risk of faecal contact (defecation / child stools) and before food handling (eating, food prep and serving)</p> <p>*school children in full-time education who have received teaching on handwashing with soap (age will vary in each country)</p> <p>Sub-target 8: By 2020, 70% of school children will know when to wash hands with soap</p> | | | |
| Handwashing knowledge (in schools) | <ul style="list-style-type: none"> • % of school children (primary and secondary) who know all/at least three critical times for handwashing • % of school teachers (primary and secondary) who know all/at least three critical times for handwashing | | School survey in primary and secondary schools |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing at critical times can impact directly on health, improve menstrual hygiene management, reduce absenteeism etc. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Knowledge does not always mean practice and this indicator should be used together with other school indicators. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|--|---|--|---|
| <p>Target 9: By 2025, to halve the proportion of school children not practicing handwashing with soap at critical times in school</p> <p><i>*critical times to be measured: after defecation and before eating</i></p> <p><i>*school children in full-time education who have received teaching on handwashing with soap (age will vary in each country)</i></p> <p>Sub-target 9: By 2020, to reduce by 20% the proportion of school children not practicing handwashing with soap at critical times</p> | | | |
| Handwashing practice (in schools) | <ul style="list-style-type: none"> • % of children with visibly clean finger pads / palms or finger nails • % of primary /secondary school children reporting washing hands with soap before eating lunch and after defecation yesterday • % of all observed critical handwashing occasions accompanied by handwashing with soap • % of observed defecation events accompanied by handwashing with soap • % of observed events before eating accompanied by handwashing with soap | Visibly clean finger pads: classified by fieldworkers as “unclean” if visible dirt seen on finger pads, otherwise classified as “clean”. | <p>School survey in primary and secondary schools</p> <p>Indicators measured by spot check (finger pads), self report (survey questions) and overt structured observation</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Handwashing at critical times can impact directly on health, improve menstrual hygiene management, reduce absenteeism etc. • Hand cleanliness is often used as a proxy for handwashing. Luby (2011) found visibly clean finger pads among children was associated with less diarrhoea. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • May be challenging to conduct structured observation in schools | | | |

| Category | Indicators | Definitions | Monitoring measures |
|--|---|--|--|
| Target 10: By 2025, handwashing facilities OR alcohol gel will be available in <i>all</i> hospitals and health centres *Handwashing facilities: designated handwashing station with water and soap Sub-target 10: By 2020, to halve the proportion of hospitals and health centres without handwashing facilities OR alcohol gel | | | |
| Handwashing facilities (health institutions) | <ul style="list-style-type: none"> • % of health facilities with appropriate number of handwashing stations / alcohol gel points • % health facilities with soap & water and/or alcohol gel present at the designated place for handwashing (handwash station) • % of health facilities using alcohol gel that have alcohol gel in stock | Health facility: hospital or health centre “Appropriate number of handwashing stations” is related to size of institute and number of wards. Each separate ward/room should have a handwash station or be within 10 paces of a handwash station / alcohol gel point | Spot checks of health facilities during national surveys |
| Advantages: <ul style="list-style-type: none"> • Spot checks of handwashing facilities are a proxy for handwashing behaviour; handwashing cannot be practiced without a handwashing station (and soap) / handrubbing cannot be practiced without alcohol gel. Presence of water at the handwashing location has been associated with reduced diarrhoea (Luby 2011) | | | |
| Disadvantages: <ul style="list-style-type: none"> • Location of handwashing station is not the only predictor of handwashing behaviour among healthcare professionals [4-5] | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|--|-------------|--|
| <p>Target 11: By 2025, all healthcare professionals in hospitals and health centres will know the WHO Five Moments for Hand Hygiene</p> <p><i>*WHO Five Moments: 1) before touching a patient; 2) before clean/aseptic procedures; 3) after body fluid exposure/risk; 4) after touching a patient; and 5) after touching patient surroundings</i></p> <p><i>*'Healthcare professionals' – to be defined.</i></p> <p>Sub-target 11: By 2020, 70% of healthcare professionals in hospitals and health centres will know the WHO Five Moments for Hand Hygiene</p> | | | |
| Handwashing knowledge (health institutions) | <ul style="list-style-type: none"> % of healthcare professionals, by cadre, who can list <i>all five</i> of the WHO five moments for hand hygiene | | National survey of healthcare workers in nationally representative sample of health facilities |
| <p>Advantages:</p> <ul style="list-style-type: none"> WHO five moments for handwashing are evidence-based, field-tested international guidelines which define the key moments (critical times) at which hands should be washed in a healthcare setting. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> Knowledge and practice are not always aligned. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|---|-------------|--|
| <p>Target 12: By 2025, to halve the number of healthcare professionals in hospitals and health centres who do not practice appropriate hand hygiene</p> <p><i>*Appropriate hand hygiene - WHO Five Moments: 1) before touching a patient; 2) before clean/aseptic procedures; 3) after body fluid exposure/risk; 4) after touching a patient; and 5) after touching patient surroundings</i></p> | | | |
| <p>Sub-target 12: By 2020, to cut by 20% the proportion of healthcare professionals in hospitals and health centres not practicing appropriate hand hygiene</p> | | | |
| Handwashing practice (health institutions) | <ul style="list-style-type: none"> • % of healthcare professionals, by cadre, who report washing hands with soap at <i>all</i> five WHO moments yesterday • % of healthcare professionals <i>observed</i> to wash hands at all five WHO moments • Rate of surgical site infection etc. | | <p>National survey of healthcare workers in nationally representative sample of health facilities. Self report and overt structured observation.</p> <p>Hospital audit</p> <p>Monitoring consumption of handwashing materials as proxy for behaviour</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • WHO five moments for handwashing are evidence-based, field-tested international guidelines which define the key moments (critical times) at which hands should be washed in a healthcare setting. • Monitoring infection rates could indicate compliance with handwashing | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Handwashing practice among healthcare professionals who know the desired behaviour may be overestimated • Monitoring infection rates subject to confounding. Less useful for cross-hospital comparisons. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|--|--|-------------|--|
| Target 13: By 2025, every government will have policies in place to promote the practice of handwashing with soap | | | |
| <i>*Policies in place in schools, HIV programmes, health facilities (general and maternity)</i> | | | |
| Policy | <ul style="list-style-type: none"> • % of primary schools where the national hygiene programme is implemented • % of secondary schools where the national hygiene programme is implemented • % of national plans including guidance / policy on integrating hygiene promotion into HIV programmes • % of HIV budget dedicated to hygiene promotion • % of midwifery schools able to produce evidence of training on handwashing • % of governments producing local/minority language educational materials for health professionals, schools and general population • % of national plans with comprehensive strategy for implementing WHO multimodal hand hygiene strategy in healthcare settings • % of countries participating in Global Handwashing Day (GHD_ activities • Number of hours per month of air time (TV and/or radio) given to the promotion of HWWS • % of population exposed to HWWS messages via mass media. • % of governments with no fiscal policies that present a barrier to soap access | | <p>Independent policy review</p> <p>Indicators in schools adapted from GLAAS Survey question, Section C: Hygiene Promotion.</p> <p>Indicators also adapted from M&E tool for HIV indicators in WASH programmes from HIP (ref).</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Allows locally adapted and relevant solutions and flexible achievement of the target • Having high level policy statements raises the priority of the issue across a wide range of institutions (schools, health etc) • Policies can specifically focus on equity issues | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Policy does not necessarily lead to practice. • Questionnaire completed by one individual who may not have access to accurate information. | | | |

2.4 Handwashing References

1. Burton, M., et al., *The effect of handwashing with water or soap on bacterial contamination of hands*. Int J Environ Res Public Health, 2011. **8**(1): p. 97-104.
2. Curtis, V.A., L.O. Danquah, and R.V. Aunger, *Planned, motivated and habitual hygiene behaviour: an eleven country review*. Health Educ Res, 2009. **24**(4): p. 655-73.
3. Cairncross, S. and V. Valdmanis, *Water supply, sanitation, and hygiene promotion*. In: *Disease Control Priorities in Developing Countries (2nd Edition)*. New York: Oxford University Press. 771-792. 2006.
4. Black, R.E., et al., *Global, regional, and national causes of child mortality in 2008: a systematic analysis*. Lancet, 2010. **375**(9730): p. 1969-87.
5. Curtis, V. and S. Cairncross, *Effect of washing hands with soap on diarrhoea risk in the community: a systematic review*. Lancet Infect Dis, 2003. **3**(5): p. 275-81.
6. Ejemot, R.I., et al., *Hand washing for preventing diarrhoea*. Cochrane Database Syst Rev, 2008(1): p. CD004265.
7. Bartram, J. and S. Cairncross, *Hygiene, sanitation, and water: forgotten foundations of health*. PLoS Med, 2010. **7**(11): p. e1000367.
8. Luby, S.P., et al., *The effect of handwashing at recommended times with water alone and with soap on child diarrhea in rural Bangladesh: an observational study*. PLoS Med, 2011. **8**(6): p. e1001052.
9. Cairncross, S. and R. Feachem, *Environmental Health Engineering in the Tropics. An Introductory Text. (2nd ed.)* Chichester: John Wiley & Sons. 4-7. 1993.
10. Mahamud, A.S., et al., *Epidemic cholera in Kakuma Refugee Camp, Kenya, 2009: the importance of sanitation and soap*. J Infect Dev Ctries, 2012. **6**(3): p. 234-41.
11. Kone-Coulibaly, A., et al., *Risk factors associated with cholera in Harare City, Zimbabwe, 2008*. East Afr J Public Health, 2010. **7**(4): p. 311-7.
12. DuBois, A.E., et al., *Epidemic cholera in urban Zambia: hand soap and dried fish as protective factors*. Epidemiol Infect, 2006. **134**(6): p. 1226-30.
13. Hutin, Y., S. Luby, and C. Paquet, *A large cholera outbreak in Kano City, Nigeria: the importance of hand washing with soap and the danger of street-vended water*. J Water Health, 2003. **1**(1): p. 45-52.
14. Ansari, S.A., et al., *In vivo protocol for testing efficacy of hand-washing agents against viruses and bacteria: experiments with rotavirus and Escherichia coli*. Appl Environ Microbiol, 1989. **55**(12): p. 3113-8.
15. Boone, S.A. and C.P. Gerba, *Significance of fomites in the spread of respiratory and enteric viral disease*. Appl Environ Microbiol, 2007. **73**(6): p. 1687-96.
16. Gwaltney, J.M., Jr., P.B. Moskalski, and J.O. Hendley, *Interruption of experimental rhinovirus transmission*. J Infect Dis, 1980. **142**(6): p. 811-5.
17. Gwaltney, J.M., Jr., P.B. Moskalski, and J.O. Hendley, *Hand-to-hand transmission of rhinovirus colds*. Ann Intern Med, 1978. **88**(4): p. 463-7.
18. Gwaltney, J.M. and J.O. Hendley, *Rhinovirus transmission: one if by air, two if by hand*. Trans Am Clin Climatol Assoc, 1978. **89**: p. 194-200.
19. Grayson, M.L., et al., *Efficacy of soap and water and alcohol-based hand-rub preparations against live H1N1 influenza virus on the hands of human volunteers*. Clin Infect Dis, 2009. **48**(3): p. 285-91.
20. Goldmann, D.A., *Transmission of viral respiratory infections in the home*. Pediatr Infect Dis J, 2000. **19**(10 Suppl): p. S97-102.
21. Cowling, B.J., et al., *Facemasks and hand hygiene to prevent influenza transmission in households: a cluster randomized trial*. Ann Intern Med, 2009. **151**(7): p. 437-46.
22. Rabie, T. and V. Curtis, *Handwashing and risk of respiratory infections: a quantitative systematic review*. Trop Med Int Health, 2006. **11**(3): p. 258-67.
23. Aiello, A.E., et al., *Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis*. Am J Public Health, 2008. **98**(8): p. 1372-81.
24. Luby, S.P., et al., *Effect of handwashing on child health: a randomised controlled trial*. Lancet, 2005. **366**(9481): p. 225-33.

25. Fung, I.C. and S. Cairncross, *How often do you wash your hands? A review of studies of hand-washing practices in the community during and after the SARS outbreak in 2003*. *Int J Environ Health Res*, 2007. **17**(3): p. 161-83.
26. United Kingdom Department of Health (Pandemic Influenza Preparedness Team), *Respiratory and Hand Hygiene in an Influenza Pandemic. Scientific Evidence Base Review*. Available at: http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_125430.pdf. Accessed March 2012. 2011.
27. DiVita, M.A., et al., *Impact of Intensive Handwashing Promotion on Household Transmission of Influenza in a low income setting: preliminary results of a randomised controlled clinical trial*. 2011 ASTMH Conference Abstract.
28. Prüss-Üstün, A., et al., *Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health*. World Health Organisation, Geneva. Available at: http://whqlibdoc.who.int/publications/2008/9789241596435_eng.pdf. Accessed March 2012. 2008.
29. Humphrey, J.H., *Child undernutrition, tropical enteropathy, toilets, and handwashing*. *Lancet*, 2009. **374**(9694): p. 1032-5.
30. Checkley, W., et al., *Multi-country analysis of the effects of diarrhoea on childhood stunting*. *Int J Epidemiol*, 2008. **37**(4): p. 816-30.
31. Lima, A.A., et al., *Persistent diarrhea signals a critical period of increased diarrhea burdens and nutritional shortfalls: a prospective cohort study among children in northeastern Brazil*. *J Infect Dis*, 2000. **181**(5): p. 1643-51.
32. Schmidt, W.P., et al., *Recent diarrhoeal illness and risk of lower respiratory infections in children under the age of 5 years*. *Int J Epidemiol*, 2009. **38**(3): p. 766-72.
33. de Silva, N.R., et al., *Soil-transmitted helminth infections: updating the global picture*. *Trends Parasitol*, 2003. **19**(12): p. 547-51.
34. Crompton, D.W. and M.C. Nesheim, *Nutritional impact of intestinal helminthiasis during the human life cycle*. *Annu Rev Nutr*, 2002. **22**: p. 35-59.
35. Hotez, P.J., et al., *Helminth Infections: Soil-transmitted Helminth Infections and Schistosomiasis*. 2006.
36. Stephenson, L.S., C.V. Holland, and E.S. Cooper, *The public health significance of Trichuris trichiura*. *Parasitology*, 2000. **121 Suppl**: p. S73-95.
37. Fung, I.C. and S. Cairncross, *Ascariasis and handwashing*. *Trans R Soc Trop Med Hyg*, 2009. **103**(3): p. 215-22.
38. Ejere, H., M.B. Alhassan, and M. Rabiou, *Face washing promotion for preventing active trachoma*. *Cochrane Database Syst Rev*, 2004(3): p. CD003659.
39. Ronsmans, C. and W.J. Graham, *Maternal mortality: who, when, where, and why*. *Lancet*, 2006. **368**(9542): p. 1189-200.
40. Khan, K.S., et al., *WHO analysis of causes of maternal death: a systematic review*. *Lancet*, 2006. **367**(9516): p. 1066-74.
41. Seale, A.C., et al., *Maternal and early onset neonatal bacterial sepsis: burden and strategies for prevention in sub-Saharan Africa*. *Lancet Infect Dis*, 2009. **9**(7): p. 428-38.
42. Luby, S.P., et al., *Microbiologic effectiveness of hand washing with soap in an urban squatter settlement, Karachi, Pakistan*. *Epidemiol Infect*, 2001. **127**(2): p. 237-44.
43. Darmstadt, G.L., et al., *Evidence-based, cost-effective interventions: how many newborn babies can we save?* *Lancet*, 2005. **365**(9463): p. 977-88.
44. Blencowe, H., et al., *Clean birth and postnatal care practices to reduce neonatal deaths from sepsis and tetanus: a systematic review and Delphi estimation of mortality effect*. *BMC Public Health*, 2011. **11 Suppl 3**: p. S11.
45. Isaac, R., R.G. Alex, and T.A. Knox, *Malabsorption in wasting HIV disease: diagnostic and management issues in resource-poor settings*. *Trop Doct*, 2008. **38**(3): p. 133-4.
46. Brantley, R.K., et al., *AIDS-associated diarrhea and wasting in Northeast Brazil is associated with subtherapeutic plasma levels of antiretroviral medications and with both bovine and human subtypes of Cryptosporidium parvum*. *Braz J Infect Dis*, 2003. **7**(1): p. 16-22.

47. Bushen, O.Y., et al., *Diarrhea and reduced levels of antiretroviral drugs: improvement with glutamine or alanyl-glutamine in a randomized controlled trial in northeast Brazil*. Clin Infect Dis, 2004. **38**(12): p. 1764-70.
48. Filteau, S., *The HIV-exposed, uninfected African child*. Trop Med Int Health, 2009. **14**(3): p. 276-87.
49. Niclaes, L., et al., *Consequences of MRSA carriage in nursing home residents*. Epidemiol Infect, 1999. **122**(2): p. 235-9.
50. World Health Organisation, *WHO Guidelines on Hand Hygiene in Health Care: a Summary. First Global Patient Safety Challenge. Clean Care is Safer Care*. Available at: http://www.chp.gov.hk/files/pdf/who_ier_psp_200907_eng.pdf. Accessed April 2012. 2009.
51. Bowen, A., et al., *A cluster-randomized controlled trial evaluating the effect of a handwashing-promotion program in Chinese primary schools*. Am J Trop Med Hyg, 2007. **76**(6): p. 1166-73.
52. Freeman, M.C., et al., *Assessing the impact of a school-based water treatment, hygiene and sanitation programme on pupil absence in Nyanza Province, Kenya: a cluster-randomized trial*. Trop Med Int Health, 2011.
53. Meadows, E. and N. Le Saux, *A systematic review of the effectiveness of antimicrobial rinse-free hand sanitizers for prevention of illness-related absenteeism in elementary school children*. BMC Public Health, 2004. **4**: p. 50.
54. Talaat, M., et al., *Effects of hand hygiene campaigns on incidence of laboratory-confirmed influenza and absenteeism in schoolchildren, Cairo, Egypt*. Emerg Infect Dis, 2011. **17**(4): p. 619-25.
55. Miguel, E. and M. Kremer, *Worms: Identifying impacts on education and health in the presence of treatment externalities*. Econometrica, 2004. **72**(1): p. 159-217.
56. Ozier, O., *Exploiting Externalities to Estimate the Long-Term Benefits of Early Childhood Deworming*. unpublished working paper, U.C. Berkeley. Accessed November 2011 at <http://www.dewormtheworld.org/>, 2010.
57. Baird, S., et al., *Worms and Work: Long-Run Impacts of Child Health Gains*. mimeo, University of California, Berkeley, 2011.
58. Luby, S.P., et al., *Using child health outcomes to identify effective measures of handwashing*. Am J Trop Med Hyg, 2011. **85**(5): p. 882-92.
59. Todd, E.C., et al., *Outbreaks where food workers have been implicated in the spread of food-borne disease. Part 3. Factors contributing to outbreaks and description of outbreak categories*. J Food Prot, 2007. **70**(9): p. 2199-217.
60. Manun'Ebo, M., et al., *Measuring hygiene practices: a comparison of questionnaires with direct observations in rural Zaire*. Trop Med Int Health, 1997. **2**(11): p. 1015-21.
61. Biran, A., et al., *Comparing the performance of indicators of hand-washing practices in rural Indian households*. Trop Med Int Health, 2008. **13**(2): p. 278-85.
62. Luby, S.P. and A.K. Halder, *Associations among handwashing indicators, wealth, and symptoms of childhood respiratory illness in urban Bangladesh*. Trop Med Int Health, 2008. **13**(6): p. 835-44.
63. Cousens, S., et al., *Reactivity and repeatability of hygiene behaviour: structured observations from Burkina Faso*. Soc Sci Med, 1996. **43**(9): p. 1299-308.
64. Bentley, M., et al., *The Use of Structured Observations in the Study of Health Behaviour*. The Hague, The Netherlands: IRC International Water and Sanitation Centre. 1994.
65. Ram, P., et al., *Water and Sanitation Program Technical Paper: Improving Measures of Handwashing Behavior*. Available at: http://www.wsp.org/wsp/sites/wsp.org/files/publications/WSP_ImprovingMeasures_HWWS.pdf. Accessed March 2012. 2010.
66. Ram, P.K., et al., *Variability in hand contamination based on serial measurements: implications for assessment of hand-cleansing behavior and disease risk*. Am J Trop Med Hyg, 2011. **84**(4): p. 510-6.
67. Biran, A., et al., *The effect of a soap promotion and hygiene education campaign on handwashing behaviour in rural India: a cluster randomised trial*. Trop Med Int Health, 2009. **14**(10): p. 1303-14.

68. Pinfold, J. V. and N. J. Horan (1996). "Measuring the effect of a hygiene behaviour intervention by indicators of behaviour and diarrhoeal disease." *Transactions of the royal society of tropical medicine and hygiene* 90: 366-371.
69. Luby, S. P., M. Agboatwalla, et al. (2007). "Field trial of a low cost method to evaluate hand cleanliness." *Tropical Medicine & International Health* 12(6): 765-771. <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-3156.2007.01847.x/full>
70. Romanenko, N.A. and R.K. Mirzoeva, [Role of hands in transmission of ascarid eggs in the Republic of Tadjikistan]. *Med Parazitol (Mosk)*, 2006(4): p. 60.

3 Food Hygiene

3.1 List of Acronyms

| | |
|--------|---|
| AIDS | Acquired Immunodeficiency Syndrome |
| C | Centigrade |
| CP | Country Programme |
| DALY | Disability Adjusted Life Year |
| DHS | Demographic and Health Survey |
| FAO | Food and Agriculture Organization |
| FH | Food Hygiene |
| GI | Gastrointestinal |
| HWWS | Handwashing With Soap |
| HACCP | Hazard Analysis and Critical Control Points |
| HH | Households |
| HIV | Human Immunodeficiency Virus |
| M&E | Monitoring and Evaluation |
| UK | United Kingdom |
| UNICEF | United Nations Children’s Fund |
| USA | United States of America |
| WASH | Water Sanitation and Hygiene, |
| WHO | World Health Organization |

3.2 Rationale for the need to focus on food hygiene

The right to adequate food was first recognized in the Universal Declaration of Human Rights in 1948 and reaffirmed at the World Food Summit of 1996 [1]. It has also been recognized that the right to food should not be limited and interpreted in a narrow sense of dietary value only but also cover food hygiene practices for the purposes of food policy design and implementation. However, ‘food hygiene promotion’, despite its potential impact on reducing child mortality and morbidity is not well researched and implemented, especially in low income settings. This paper discusses current knowledge on food hygiene promotion with an emphasis on low income settings where the mortality and morbidity burden attributable to poor food hygiene is expected to be greatest. We propose global targets for improving food hygiene and indicators based on which progress can be assessed.

Definition of Food Hygiene and scope of the paper

For the purposes of this paper, ‘food hygiene’ means behaviours that reduce microbial contamination and growth, and protect from food-borne illness caused by microorganisms. Food hygiene refers to food preparation (such as hand washing with soap before or during preparing food, maintaining a certain cooking temperature, washing utensils), food handling (reducing cross-contamination between cooked and raw food, maintaining proper kitchen hygiene), feeding (washing both hands with soap before feeding a child) and food storage (storage at low temperature, re-heating before consumption). Settings covered in this paper, is relevant include domestic (households), institutional settings (e.g. schools, hospitals, child care centre) and street vendors. We exclude

industrial food safety and other elements of the service sector. In this paper we further disregard food-borne contamination such as arsenic poisoning or pesticides. Public health interventions able to address these diseases are very different from those targeting domestic food hygiene and are beyond the scope of this work.

Food-borne illness – causes and disease burden

Food-borne infections are caused by a variety of bacteria, viruses, and parasites. Among these are a wide range of organisms associated with diarrhoea such as Norovirus, Rotavirus, Salmonella, Shigella, *Clostridium perfringens*, *Campylobacter* spp., *Staphylococcus aureus*, *Vibrio cholerae*, *E.coli* (e.g. ETEC, EHEC, EIEC) and Cryptosporidium. Typhoid (caused by *Salmonella typhi*) and Hepatitis A can also be transmitted via food. Some foodborne pathogens, such as *Listeria monocytogenes*, *Toxoplasma gondii*, cause disease predominantly in immune-compromised people, pregnant women and the foetus.

Food-borne diarrhoeal diseases, which are preventable and treatable, remain a leading cause of death among children under five years of age and may be one of the major public health problems in low income settings. The global estimate for the number of deaths from diarrhoea dropped from 4.6 million before 1980 to 3.3 million per year between 1980-1990, to 2.6 million deaths per year [2] between 1990-2000, to 1.5 million in 2008 [3]. The latest figure (2010) estimates that diarrhoeal diseases cause approximately 1.3 million deaths in children every year [4] with more than 80% of these deaths occurring in Africa and South Asia [5]. Despite this drop, the absolute figures are still substantial. The proportion of these deaths directly attributable to food-borne infections is subject to speculation- especially since in contaminated environments it is hard to ascribe incident infection to any one single cause. Morbidity data are available mostly from high income countries, with far fewer studies having been carried out in the low income countries where morbidity is likely to be highest. Annually, up to 17% of people in the US are estimated to suffer from food-borne infections with, approximately 3,000 deaths [6]. In UK, as many as 1 in 5 people develop gastrointestinal (GI) illness each year [7] with perhaps up to 500 deaths [8]. In Australia, 5.4 million get sick annually from eating contaminated food and it is thought that up to 20% of this illness results from food handling behaviours [9]. Sometimes food-borne disease outbreaks may take on large proportions. For example, in 1994, an outbreak of salmonellosis due to contaminated ice cream occurred in the USA, affecting an estimated 224,000 persons. In 1988, an outbreak of hepatitis A, resulting from the consumption of contaminated clams, affected some 300,000 individuals in China [10]. It is difficult to say which particular factor is most common cause of food-borne illness but UK data suggest that 39% of outbreaks are due to inappropriate storage of food, 31% are due to inadequate cooking, 20% due to cross-contamination [11].

Many low income countries lack adequate surveillance data for food-borne disease. Therefore it is difficult to estimate the impact on public health and the economy in these settings. What is assumed about food-borne infections is often based on expert opinion and biological plausibility, rather than data from epidemiological studies [12]. Nevertheless, there are several factors suggesting that food-borne infections are likely to be a particular problem in low-income settings [13]. Hot climate, poor storage facilities and faecal contamination of the environment all make food-borne infections in poor settings more likely [14]. There is little reason to assume that they do not cause a substantial disease burden and economic impact in low income countries. In poor settings, these problems may be compounded by limited maternal awareness about the link between diarrhoea and improper food handling, insufficient time for cooking due to fuel shortage, time gaps between meal preparation and feeding, environmental contamination due to lack of sanitation, and washing utensils in contaminated water [15].

Microbiological studies have demonstrated the ability of many pathogens to grow quickly in food, especially in hot climates [16, 17]. Contaminated weaning food, in particular, has been suggested as a major contributor to diarrhoea in low-income settings [18] although observational studies gave inconclusive results [19]. According to some authors up to 70% of diarrhoea episodes in developing countries may be food-borne [20, 21]. A 2003 WHO report estimated that around 40% of all food-borne infections may originate in the home [22]. The few available data as summarized

by the Food and Agriculture Organization (FAO) in the year 2003 [23] demonstrate the severity of the problem. For example 721 food-borne outbreaks and 1,199 sporadic cases of food-borne disease were reported in Hyderabad and Secunderabad, India during 1984-89 (a large number of unreported cases can be assumed). *V. cholerae* was found throughout Peru in fish and molluscs. In Liberia in 1989, 19 to 32 percent of food samples contained significant numbers of enterobacteria. In 1992, a large outbreak of bloody diarrhoea caused by *E. coli* 0157 occurred in Swaziland. In Vietnam, 30 to 57 percent of students in university hostels in Hanoi suffered from diarrhoea over the period 1984-88, mainly because food was poorly prepared and/or stored. In Thailand 207,580 cases of food-borne diseases were reported over the period 1981-86. In Mexico, 14,412 food-borne cases per year were reported during 1981-90. More rigorous reporting and monitoring system for food-borne infection in low-income setting are yet to be developed.

Diarrhoea caused by food-borne infections may contribute to malnutrition, a major public health challenge in many poor settings. In low income countries, 27 percent of children under the age of five are stunted and 23 percent are underweight. In Africa, about 24 percent of children are underweight and 35 percent are stunted; between 35 million and 50 million children under age five are affected. In Asia, average underweight rates are somewhat higher than in Africa (26 percent). In several large South Asian countries, both underweight and stunting rates are nearly double those in Africa (38 to 51 percent) [24]. Under-nutrition is therefore worst in South Asia, which has 92 million stunted and 89 million underweight children. Food hygiene may indirectly improve nutrition by reducing diarrhoea.

Vulnerable groups for food-borne infections

Young children and immuno-compromised people are particularly vulnerable to food-borne infections and its consequences. In many countries, children aged between 4 and 6 months are given complementary food and thus exposed to food-borne pathogens [25]. Weaning foods prepared under unhygienic conditions are often heavily contaminated with pathogens and are likely to be a major risk factor for diarrhoeal diseases and associated malnutrition [26]. Community-based studies conducted in Peru from July 1982 to June 1984 showed that infants had nearly 10 episodes of diarrhoea in their first year of life with weaning food suggested as a major route of transmission [27].

Diarrhoea is a common symptom of Human Immunodeficiency Virus (HIV) & Acquired Immunodeficiency Syndrome (AIDS) infection and results in significant morbidity and mortality [28]. A study of HIV positive infants in the Democratic Republic of Congo found that the risk of dying from diarrhoea is 11 times greater than for infants who were HIV negative [29]. HIV positive babies with acute diarrhoea were six times more likely to develop persistent diarrhoea. HIV negative babies born to HIV positive mothers were also at 3.5 times greater risk of developing recurrent bouts of diarrhoea than babies born to HIV negative mothers [30]. It seems likely, therefore, that food hygiene programmes would be of particular benefit for these two vulnerable groups, children under five and people affected by HIV & AIDS. For these vulnerable groups, domestic settings (households), schools, hospitals, HIV/AIDS care centres, and childcare centres are probably key settings in which to promote food hygiene.

Food hygiene in street vendors

Street vendors serve large parts of populations in many low and middle income countries [59]. Food hygiene among street vendors is often poor as a consequence of weak regulation and food hygiene enforcement by relevant authorities, poor access to clean water for washing food items [73] and poor knowledge on hygiene practices [60-63]. Poor food hygiene among street vendors has been implicated in epidemics and endemic transmission of cholera in Guatemala [64] and paratyphoid in Indonesia [65]. A study from Nigeria found that children who were fed mainly with foods bought from street vendors also had a three times higher risk of severe diarrhoea [67]. High rates of microbial contamination of street vendor food have been frequently observed in many low and middle income settings [68-72]. Thus street vendors are a plausible cause of food borne infection, with the potential of causing outbreaks by serving many customers in a short time.

Economic impact of food-borne illness/diseases

The global estimates of economic impact of food-borne illness are difficult to collate because most low income countries lack appropriate data. Detailed data are available for a number of industrialised countries. Economic costs include costs of outbreak investigations, treatment cost, loss of income, loss of productivity due to absenteeism, and loss of sales when consumers avoid particular products. In the US the estimated medical costs, productivity losses and value of premature deaths due to diseases caused by five food-borne pathogens (*Campylobacter*, non-typhi *Salmonella*, *E. coli* O157, *E. coli* non-O157 STEC and *Listeria monocytogenes*) in 2000 are estimated at \$6.9 billion per year. The assumed cost of each death ranges from \$8.9 million for children who die before their first birthday to \$1.7 million for individuals who die at age 85 or older [31]. Hence, food contamination creates an enormous social and economic burden on communities and their health systems. In low income countries, where the problem of diarrhoeal disease is far greater, the effect on economic activity and development may be substantial. The 2006 Disease Control Priorities Project on diseases in developing countries did not specifically comment on the cost-benefit ratio of food hygiene interventions [32]. The components of food hygiene interventions that are related to handwashing practices (see first section) are likely to be highly cost-effective [32]. The same may apply to other food hygiene measures at the household level that require behaviour change but little other investments by governments or households.

International experience

Few efforts have been made to promote food hygiene at large scale in low-income countries. The World Health Assembly in 2000 identified prevention and control of food-borne diseases as a public health priority. Recent efforts such as the WHO initiative to estimate the Global burden of food-borne diseases [33], and a number of regional declarations and strategy papers tried to harmonize the efforts to reduce food-borne infection. The Regional Committee for Africa adopted a resolution on food safety in September 2003. In the South East Asian Region, countries committed themselves to a 10-point strategy to reduce the burden of food-borne diseases in 1998. Progress toward achieving the strategy's objectives has been inconsistent

Evidence on the effectiveness of improving food hygiene in low income settings

Potential interventions to reduce food-borne infections include hand-washing before food preparation and handling, safe food storage, avoidance of contaminated foods, adequate cooking and reheating, cleaning of kitchen surfaces and utensils, and handwashing before eating or feeding children [34]. Most knowledge of the effect of food hygiene on morbidity and mortality is based on expert opinion and observational studies rather than randomised controlled trials. However, a number of studies have shown the potential of such interventions. A review of data from 12 developing countries suggests that it is possible, even in poor communities, to improve the nutritional status of infants and young children through weaning education. Weaning education was found effective in preventing malnutrition even without the provision of supplementary food in the Philippines [35]. Similarly, weaning education was an integral part of the India Population Project in the state of Karnataka, where weaning education may have reduced diarrhoea mortality among children under 5 years of age by 2-12% [36].

Basic principles for preparation of safe food for infants and young children

- Cook food thoroughly
- Avoid storing cooked food
- Avoid contact between raw foodstuffs and cooked foods
- Wash fruits and vegetables
- Use safe water
- WASH hands repeatedly
- Avoid feeding infants with a bottle
- Protect foods from insects, rodents and other animals
- Store non-perishable foodstuffs in a safe place
- Keep all food preparation premises meticulously clean

Source: Y.Motarjemi et al, *World Health Forum*, Volumn 15, 1994

Handwashing with soap and water at different times during food preparation and before child feeding is promoted in many handwashing campaigns worldwide. The impact of such campaigns on actual behaviour remains unclear. It

has been shown in a study in Ghana that mass media can spread handwashing messages effectively at national level [37] and some observational studies suggest that handwashing before preparing food is a particularly important opportunity to prevent childhood diarrhoea [38].

Improper storage and handling of cooked food could contribute substantially to food-borne illnesses, since at ambient temperature many pathogenic organisms multiply. Temperatures between 20 and 40 degrees centigrade are optimal for the growth of bacteria in food, while temperatures below 6 or higher than 60 degrees centigrade inhibit growth [39]. While storing it is also necessary to cover the food to protect from dust, flies, insects and domestic animals. In combating food-borne infections, the control of time factors during cooking and storage of food needs special attention in education on health, and food safety as well as improving general hygiene [40]. One study from Tanzania found substantial differences in coliforms and Enterobacteriaceae counts in food storage time less than 4 hours versus those with storage time greater or equal to 4 hours [41], highlighting that long storage without adequate re-heating may be the most important risk behaviour in food preparation. In a further study from Nigeria counts of *E-coli* and *S aureus* increased from 10^4 to above 10^8 after 24 hours at 37 degrees centigrade [42]. A study carried out in Bangladesh to determine the growth of diarrhoea-causing bacteria in cooked food showed that counts of *Shigella flexneri* in boiled rice, lentil soup, milk, mashed potato, fish and beef increased 2-3 logs within 6 hours. These studies demonstrated that food can support the growth of diarrhoea-causing bacteria. Hence food borne transmission could be a mode of transmission when hygienic food practices and facilities for refrigerating food are lacking. Eating of cold leftovers including drinking from an unprotected water supply independently demonstrated an increased risk for diarrhoea [43].

Unclean pots, cooking utensils, baby bottles, teats, etc. are a potential source of contamination. A study in rural Kenya showed that 44% of dishes were unsafe from a hygienic point of view [44]. Hazard analyses carried out in households in the Dominican Republic reported that kitchen knives and blenders were contaminated with *Salmonella* spp. and indicated that babies' bottles are not always effectively washed or boiled [45]. In Vietnam, the risk of diarrhoea was significantly higher in children of mothers who prepared food on the ground rather than on a table [46]. An in-depth study conducted in slums in North Eastern Brazil using methods such as ethnographic assessment, community survey, structured observation and household trials showed that 53-80% of mothers were able to sustain new behaviours; spoon-feeding was the most difficult to adopt wholly [47]. In Peru, when tea was given to children after a period of time, it remained uncontaminated if served in a cup, but 35% of the samples were found to be contaminated with faecal coliforms if the tea was offered in a baby bottle [48]. Hence, bottle feeding should be discouraged or the bottle should be cleaned properly before feeding to the baby.

The cooking practice of most women in low income settings involves cooking once per day, around midday, which means that re-heating is usually employed for the evening meal. The temperature used is often below 60 degrees centigrade. Large numbers of bacteria may have grown since the time it was first cooked and may not be killed in sufficient quantities when the food is re-heated in the evening [49]. A recent study conducted in peri-urban Mali using Hazard Analysis and Critical Control Points (HACCP) methods showed that traditional cooking was very effective in eliminating faecal contamination; reheating was as effective as cooking when executed correctly, and behavioural corrective actions were effective in controlling faecal contamination at other critical control points (e.g. serving the child after cooking and after reheating) [50]. Fuel availability is important in food hygiene because where fuel for cooking is short supply, household may, in a bid to save energy, prepare large quantities of food in advance and then store it until needed [51].

A few international initiatives have been launched, such as the WHO 'Five Keys to Safer Food' initiative in which 'food hygiene' messages were translated into 40 languages [52]. However the scale and effectiveness of these interventions is not yet reported. Recently, the "Five keys to Safer Food" methods have been applied to street vendors in Ghana, in a study that highlighted the lack of putting knowledge into practice among street vendors [74].

Identification of critical control points to minimize hazards

Historically, HACCP methods were used to reduce the microbiological contamination in commercially prepared food in industrialized countries. However, this approach may be applicable to evaluate food safety in homes as well [53]. A WHO/FAO expert committee on food safety recommended that the HACCP approach be used in homes in low-income settings [54]. HACCP includes seven principles i) conduct a hazard analysis, ii) determine critical control points, iii) establish critical limits, iv) establish monitoring procedures, v) establish corrective action, vi) establish verification procedures, vii) establish record-keeping & documentation procedures [55]. Small-scale intervention studies conducted in peri-urban Mali [56] and Nigeria [57] showed that the level of microbiological contamination in weaning foods can be reduced by introducing HACCP methods. However, health outcomes are yet to be explored. Sufficiently simple food hygiene interventions replicable at scale are yet to be designed and tested. Behaviour change programmes based on the hazard-analysis-critical-control-point approach, taking into consideration the many socio-cultural, psychological and situational factors that determine food hygiene behaviour, should be considered for national infant feeding or food and nutrition programmes [58]. The HACCP approach may be particularly promising for interventions targeting street vendors [59,75].

Food hygiene is thus an area of huge potential importance for reducing the global burden of disease. However, evidence as to what particular interventions are effective and can be applied on a large scale in low income home and institutional settings is extremely limited. Much more work is needed in this domain globally.

Summary of evidence for the main health benefits that may be realised by improved food hygiene.

| Health benefits of food hygiene | |
|---|--|
| Diarrhoea | <p>Biological plausibility strong based on microbiological studies</p> <ul style="list-style-type: none"> - Common diarrhoea pathogens grow quickly in food [16,17] - Children are exposed to contaminated food including weaning food [39-45] <p>Some evidence on health impact of food hygiene from cohort and cross sectional studies [20, 21, 27]</p> <ul style="list-style-type: none"> - The evidence does not allow quantification of health effects due to confounding and bias issues. <p>Randomised controlled trials on microbiological effectiveness of simple food hygiene measures at household levels suggest substantial reduction in microbial contamination [56,57]</p> <p>No evidence from randomized health outcome trials currently available.</p> |
| Diarrhoea (epidemic) | <p>Strong evidence from outbreak investigations implicating inadequate food hygiene as the primary cause in low and middle income settings [23].</p> <p>No evidence from randomized trials. The effect of food hygiene promotion on reducing the frequency of diarrhea epidemics remains unexplored</p> |
| Other benefits of handwashing with soap | |
| Under-nutrition | <ul style="list-style-type: none"> - Unknown but possibly substantial impact on nutrition mediated via reduction in diarrhoea and environmental enteropathy - Diarrhoea and poor nutritional status (and negative outcomes) more common among HIV+ individuals |
| Child growth and development | <ul style="list-style-type: none"> - Potential impact via reduction in prevalence of undernutrition due to reduction in diarrhoea (and environmental enteropathy) |

Below we set out targets and indicators on food hygiene that could be adopted by the international community.

3.3 Proposed Target and Indicators:

We propose a mix of policy, programmatic, behavioural, microbiological and epidemiological targets and indicators to track progress. We show advantages and disadvantages of each target/indicator in the table below.

Food hygiene is a cross-cutting theme. Some practices and outcomes can be measured through already existing monitoring mechanisms such as complementary feeding habits assessed in Demographic and Health Surveys (DHS), however, certain food hygiene practices, such as maintaining appropriate cooking and re-heating temperature, washing hands with soap before feeding baby, covering food, etc, require additional efforts. Domestic food hygiene practices are difficult to measure, as differences between reported and actual behaviours are to be expected.

| Target-1: By the year 2018, each country prioritizes 'food hygiene' in their policies / strategies | | | | | |
|--|--|---|--|--|--|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Policy and strategic environment | # of countries with adequate policies and strategies in place for 'food hygiene promotion' | Food Hygiene National policy / strategy or similar | Country report, WHO/United Nations Children's Fund (UNICEF) joint report | Conducive policy environment for food hygiene (FH.) Low cost indicator. | Policy declarations may have little connection with efforts on the ground |
| | # of countries with clearly defined institutional homes or focal institution for 'food hygiene' promotion | Focal ministry, department or institutions | Country report, WHO/UNICEF joint report | Accountable institution to look after food hygiene. Low cost indicator. | Performance of institution difficult to measure |
| | # of countries prioritizing 'food hygiene' as cross-cutting theme under 'health, nutrition, WASH, education and HIV/AIDS sector' | Inclusion of 'food hygiene' in plan of action of health, nutrition, Water Sanitation and Hygiene (WASH), HIV/AIDS, and education sector | Sectoral ministry annual report, Health management report, nutrition report, WASH report, HIV/AIDS, education report | Targets those responsible for FH programmes. Low cost indicator. | Central level priority may have little connection with efforts on the ground |

| Target-2: By the year 2020, each country has 'food hygiene promotion' interventions / initiatives | | | | | |
|---|---|--|--|--|---|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Scalable food hygiene intervention | Existence of 'food hygiene promotion' national programme guideline | A national programme guideline on 'food hygiene promotion' | Country Report or annual report of any sector, WHO/UNICEF joint reports | Support to harmonize the efforts in country. Low cost indicator. | None |
| | Evidence of scalable 'food hygiene intervention' package development targeting children <5yrs and PLHIV at HH settings, street vendors, childcare centre, schools and hospitals | Food hygiene intervention as defined in programme guideline | Annual reports of all relevant sectors, country reports, WHO/UNICEF joint reports, sectoral ministry reports | State and non-state sector can use the same tools, Low cost indicator. | None |
| | Evidence of execution of 'food hygiene' intervention targeting to HH having <5yrs children and PLHIV | Food hygiene intervention as defined in programme guideline | Annual report of all relevant sectors, country reports, WHO/UNICEF joint reports, sector reports | Enforce to execute the programme at country programme(CP) level | Logistically challenging to monitor actual programme delivery : expensive |
| | Evidence of execution of 'food hygiene' intervention at street vendor, schools, childcare centre, HIV/AIDS care centre and hospitals | Food hygiene intervention as defined in programme guideline | | Enforce to execute the programme at CP level | Logistically challenging to monitor actual programme delivery; expensive |
| | Evidence of allocation of separate budget line for 'food hygiene promotion' at national budget | National budget includes 'food hygiene promotion' budget line | National budget sheet, budget speech, Redbook | Commitments from state on 'food hygiene', Low cost | None |
| | Evidence of responsible institutions allocated separate budget for 'food hygiene promotion' | Separate budget line for 'food hygiene' | Respective ministry budget allocation sheet, departmental budget allocation sheet | Food hygiene programme will have budget in place | Utilization of budget |
| | Per child or per person 'food hygiene' programme cost | Per child / per person net cost involved in promoting 'food hygiene' | Respective ministry budget allocation sheet, departmental budget allocation sheet | enables cost-comparisons with other promotional programmes | Cost varies by country due to different context. Low/high investment doesn't demonstrate cost-effectiveness |
| | Evidence of formulation of 'microbiology advisory board/committee' to oversee food contamination issues | Committee comprises of high level policy makers including civil societies and partners | WHO/UNICEF joint report, annual report, country report | Indicators to show the high level political commitment | Policy focus only |

| Target-3: By the year 2025, improved food hygiene behaviour practiced by targeted people | | | | | |
|--|---|---|--|--|--|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| H-washing with soap | % of caregivers practicing handwashing with soap before preparing food | Washing both hands with soap before preparing any types of food; Caregivers to children <5 & PLHIV | Demographic and Health Survey (DHS), household survey, national monitoring and evaluation (M&E) system, research study reports, annual reports | Reduce food contamination and protect against the ingestion of pathogens. Good opportunity to integrate this behaviour with Handwashing With Soap (HWWS) initiatives | Differences in reported vs observed behaviours |
| | % of caregivers practicing handwashing with soap before feeding baby | Washing both hands with soap before feeding baby; Caregivers to children <5 & PLHIV | | | |
| | % of people sustaining handwashing with soap before eating food | Washing both hands with soap before taking food | | Strongly linked with evidence | |
| | % of people who cooked food adopting frequent handwashing with soap while cooking | Washing hands with soap more than 1 times while cooking | | | |
| | % of caregivers / mothers who correctly mention at least three key times for handwashing with soap when asked | 3 key times here refers to: before preparing food, before eating and feeding to baby | | | |
| Food Storage | % of householders who correctly mention at least two key aspects of food storage when asked | Key aspects: storage temperature, covered cooked food. | DHS, household survey, national M&E system, research study reports, annual reports | Will help to design the intervention. | Reported vs actual behaviours |
| | Proportion of households (HH) having refrigerator at home | Refrigerator which can maintain temperature <8 ⁰ Centigrade (c) | | Proxy for correct storage temp, help to estimate budget for Gov/donor. Some evidence of impact | Might be linked with wealth rather than food hygiene |
| | % of HHs in developing countries storing cooked food at ambient temperature | Food stored >2 hrs in normal room temperature (eg.20-40 ⁰ c) | | Will help design intervention and focus intervention. This will be proxy to see the growth of microbes in food. Strong evidences | Expensive to monitor |
| | % of HH maintaining adequate food storage temperature when observed | Food storage temperature maintained below 5 ⁰ c or above 60 ⁰ c | | | |
| | % of HH covering leftover food while storing | Protected from direct exposure, dust, flies, insects, animals etc | | | |
| | % of households detected with infectious dose of microbes in food samples | Ready to eat food samples tested and <i>E.coli</i> and coliforms counted (infectious dose limit recorded) | Inspection report, annual report, laboratory report, sector M&E report etc | Good predictor for early warning | Costly indicators |

| Target-3: By the year 2025, improved food hygiene behaviour practiced by targeted people (cont.) | | | | | |
|--|---|---|---|--|---|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Kitchen / food cleanliness | Proportion of HH using clean or washed utensils while cooking or serving when observed | Fully washed with clean water before cooking or cleaning utensils, or properly dried, eg in sunlight, or heat | Inspection report, HH survey report, sector M&E, programme report | Proxy to estimate the contamination. Some evidence from observational studies | Imprecise indicator |
| | Proportion of HH practicing 'separation of cooked and raw food/meats' in kitchen surfaces | Separate place, utensils, knife for cooked and raw food/meat | Inspection report, HH survey report, sector M&E, programme report | Proxy to estimate contamination. Some evidence from observational studies | |
| | Proportion of HH kitchen surfaces free from infectious doses of faecal coliforms and <i>E.coli</i> when swabbed | Surface sample check for faecal matter (eg <i>E.coli</i> or coliforms). Infectious dose as per international standard | Inspection report, HH survey report, sector M&E, programme report, country lab report | Proxy to estimate HH contamination and good predictor for early warning for illness | Expensive indicators |
| | % of mothers who can communicate the problem of cross-contamination in kitchen when asked | Cross-contamination: possible transformation of germs, dust, and unhygienic products | DHS, household survey, national M&E system, research study reports, annual reports | helps prioritize low cost interventions | Knowledge =/=behaviour |
| Food temperature | % of HH who correctly mentioned at least two key aspects of food temperature when asked | Key aspects: Adequate cooking temperature, need to cook child food frequently | DHS, household survey, national M&E system, research study reports, annual reports | Will help to focus the intervention. Weak evidence | Knowledge =/=behaviour Reported vs observed behaviours |
| | Proportion of household maintaining adequate cooking temperature | Cooking temperature $\geq 70^{\circ}\text{C}$ (immediately after cooking) | | Good predictor for early warning system and support to prioritize intervention. Some evidence from observational studies | |
| | Proportion of household maintaining adequate re-heating temperature (if practiced) | Re-heating temperature $\geq 70^{\circ}\text{C}$ (immediately after re-heating) | | | |
| | % of HH not adding contaminated ingredients at stage when no further heat is applied | Ingredients such as raw material etc | | | |
| | % of HH cooking child's food repeatedly in a day | Each time before feeding to baby <5yrs | Household survey, national M&E system, research study reports, annual reports etc | Good predictor to estimate food contamination. Some evidence | Reported vs observed behaviours |

| Target-3: By the year 2025, improved food hygiene behaviour practiced by targeted people (cont.) | | | | | |
|--|---|---|--|--|---------------------------------|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Food feeding and eating practices | % of HH who correctly mentioned at least two key aspects of proper feeding practices when asked | Key aspects: Exclusive breastfeeding up to six months, washing raw items before eat | DHS, Household survey, national M&E system, research study reports, annual reports etc | Support to prioritize intervention | Reported vs observed behaviours |
| | % of mothers practicing exclusive breastfeeding for six months | Feeding only mother's breast milk for 6 months | | Support to prioritize intervention and predictor for diarrhoeal cases. Strong evidence | |
| | % of HH using clean spoon instead of bottle to feed their under five year old children | Use of clean spoon instead of bottles | DHS, Household survey, national M&E system, research study reports, annual reports etc | Support to prioritize intervention. Some evidence | |
| | % of HH reported proper washing / cleanliness of raw food items before eating / cooking | Washing all raw food with clean water before eating / cooking | Household survey, national M&E system, research study reports, annual reports etc | Support to prioritize intervention. Weak evidence | |
| | Proportion of weaning food prepared using safe / clean water | Weaning food: food targeted for children aged 6-24 months | | Support to prioritize intervention. Some evidence | |

| Target-3: By the year 2025, improved food hygiene behaviour practiced by targeted people (cont.) | | | | | |
|---|---|---|--|---|--|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Food hygiene in institutional setting (school, childcare centre, hospitals, HIV/AIDS care centre) and in street vendors | % of people who cook food in institutions with adequate knowledge of key aspects of food hygiene when asked | Key aspects: Food storage, cooking temperature, re-heating practices, personal cleanliness | Small scale survey | Can help design institutional intervention | Knowledge =/=practice |
| | % of school children, children in day-care centre, hospital patients, PLWHA practicing handwashing with soap before taking food | Washing both hands with soap before taking any food | Household survey, national M&E system, research study reports, observation | Support to prioritize intervention. Some evidence | |
| | % of street vendors, schools, childcare centre, HIV/AIDS care centre and hospitals having dedicated refrigerators to store food | Refrigerator which can only be utilized to store food and can maintain temperature <8°C | Observation, survey report, annual report, hospital / school / childcare centre report | Strong proxy to observe either institution practice proper storage practices | |
| | % of food samples recorded as contaminated from street vendors , school, childcare centre, HIV/AIDs care centre and hospital food | Ready to eat food samples tested and microbes counted eg <i>E.coli</i> & coliforms. Infectious doses will count as 'contaminated' | Inspection report, outbreak report, annual report, programme report, laboratory annual report, sector M&E report | Good predictor for early warning system. | Expensive, may not be predictive |
| | Proportion of institutional kitchen / street vendors surfaces free from infectious doses of faecal coliforms and <i>E.coli</i> when swabbed | Surface sample check for faecal matter (eg <i>E.coli</i> or coliforms). Infectious dose as per international standard | Inspection report, HH survey report, sector M&E, programme report, country lab report | Proxy to estimate HH contamination and good predictor for early warning for illness | Expensive, may not be predictive |
| | Proportion of institution maintaining adequate cooking and re-heating temperature when observed | Cooking & re-heating temperature ≥70°C (immediately after cooking) | Survey, observation, inspection report | Good predictor for early warning system and support to prioritize intervention. | Expensive |
| | % of institutional cooks / street vendors whose hands are clean when swabbed during cooking | Clean hands: absence of infectious dose of microbes when swabbed | Survey, inspection, microbiology test | | Expensive, may not be predictive |
| | Number of institution practicing HACCP approach to control the quality of food | Hazard analysis critical control points using 7 standard steps | HACCP report | The most common means of ensuring institutional food hygiene in developed economies | Limited evidence from low –income countries. |

| Target-4: By the year 2025, improved food hygiene behaviour leads to reductions in the microbial loads in different foods | | | | | |
|---|---|---|---|---|----------------------|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Microbiology | % of tested weaning food free from infectious dose of microorganism at different critical times | Microorganism such as <i>E.coli</i> , faecal coliforms; times: immediately after cooking, after re-heating, storage | DHS, Household survey, street vendor survey, national M&E system, research study reports, annual reports, lab annual report | Good predictor of target behaviour | Expensive, logistics |
| | % of tested child food free from infectious dose of microorganism at different times | | | | Expensive, logistics |
| | % of tested food ready to consume by hospital patients free from infectious dose of microorganism at different times | | | | Expensive, logistics |
| | % of tested food ready to consume from street vendors free from infectious dose of microorganism at different times | | | | Expensive, logistics |
| | % of ready to consume food by PLHIV tested and free from infectious dose of microorganism at different times | | | | Expensive, logistics |
| | Existence of functional food quality surveillance system with adequate resources targeting institutions and street vendors | Food quality surveillance responsible for HH, street vendors and institutional food inspection and monitoring | National report, policy analysis / strategy report, observation, WHO/UNICEF joint report | Demonstrate the state's commitment and ensures that food microbiology is part of food hygiene promotion, Low cost indicator | |
| | Existence of microbiology lab to routinely inspect and test the food samples from HH, street vendors and institutional settings | National microbiology lab or similar | Observation, annual report, WHO/UNICEF joint report | | |

| Target-5: By the year 2025, improved food hygiene behaviour leads to improve health outcomes at HH and institutional setting | | | | | |
|--|--|--|--|---|--|
| Category | Indicators | Definition | Monitoring measures | Advantages | Disadvantages |
| Food-borne illness / outbreaks | % reduction of domestic and institutional or street vendor associated food-borne illness / outbreaks after introduction of 'food hygiene intervention' | Illness / outbreak associated with food in HH or institution food such as % of diarrhoeal episode associated with food-borne | DHS, country health data, sectoral report, outbreak investigation report, diseases surveillance data | Demonstrate impact of food hygiene interventions on health outcomes | Trends over time affected by improvements in surveillance and other secular trends |
| | % reduction of diarrhoeal episodes among weaning children and PLHIV | Weaning period: child 6-24 months of age | Health management data by age group, diarrhoea, annual report | Ensure adequate monitoring of food-borne infection associated with food | Trends over time affected by improvements in surveillance and other secular trends |
| | % reduction of diarrhoeal outbreak in school, health care setting, HIV/AIDS care centre, hospital or related to street food after introduction of Food Hygiene promotion | Diarrhoeal outbreak as defined by WHO. Types will be determined based on different pathogens | Outbreak investigation report, health management data, annual report | | |
| | Number and types of food-borne outbreaks in domestic and institutional settings | | | | |
| | Evidence of incorporation of 'food-borne diseases' as part of national diseases surveillance system | Government owned national diseases surveillance system. | National diseases surveillance guideline | Cheap Ensures adequate monitoring of food-borne infection associated with food | Trends over time affected by improvements in surveillance and other secular trends |
| | Reduction in growth faltering among weaning age children | Under-nutrition | Health management data, nutrition report, annual report | Ensure effectiveness of weaning education | Difficult to attribute |

3.4 Food Hygiene References

1. FAO (2011). Right to Food, Making it Happen, Progress and Lessons Learned through Implementation. The Food and Agriculture Organization of the United Nations, 2011
2. Keusch G.T. et al (2006). Disease Control Priorities in Developing Countries. (Oxford University Press, 2nd edn, 2006
3. WHO/UNICEF (2009). Diarrhoea: Why children are still dying and what can be done, UNICEF/WHO, 2009.
4. Black et al (2010). "Global, regional and national causes of child mortality in 2008: a systematic analysis". Lancet 2010
5. Black et al (2010). "Global, regional and national causes of child mortality in 2008: a systematic analysis". Lancet 2010
6. CDC, (2011). Centre for Disease Control and Prevention, 1600 Clifton Rd, Atlanta
7. Bloomfield SF, Exner M, Fara GM, et al (2009). The global burden of hygiene-related diseases in relation to the home and community. An IFH expert review; published on [http:// www.ifh-homehygiene.org](http://www.ifh-homehygiene.org)
8. The FSA Food-borne Disease Strategy 2010-15, UK, 2010.
9. B.A.Mullan, (2006). Hygienic food handling behaviours. An application of the Theory of Planned Behaviour.
10. WHO, 2007. Food safety and food-borne illness. Fact sheet N237. <http://www.who.int/mediacentre/factsheets/fs237/en/>
11. IFH, 2008. Food-borne diseases and the home. Information & Hygiene Advice sheet, August 2008
12. Curtis, V., Schmidt., Luby S., Florez R., Toure O., Biran A.,2011. Hygiene:new hopes and new horizons. Lancet Infect Dis.,11(4):312-21.
13. Lanata CF. Studies of food hygiene and diarrhoeal disease. Int J Environ Health Res 2003; 13: S175–83.
14. Val Curtis et al (2011). Hygiene: new hopes, new horizons, Lancet Infect Dis 2011.
15. Deborah D. Marino (2007). Water and Food Safety in the Developing World: Global Implications for Health and Nutrition of Infants and Young Children. Journal of the AMERICAN DIETETIC ASSOCIATION. 2007
16. Islam MS, Hasan MK, Khani SI. Growth and survival of *Shigella flexneri* in common Bangladeshi foods under various conditions of time and temperature Applied and Environmental Microbiology 1993;59(2):652-4.
17. Lanata CF. Studies of food hygiene and diarrhoeal disease. Int J Environ Health Res. 2003 Jun;13 Suppl 1:S175-83.

18. Motarjemi Y, Kaferstein F, Moy G, Quevedo F. Contaminated weaning food: a major risk factor for diarrhoea and associated malnutrition. *Bull World Health Organ* 1993; 71: 79–92.
19. Lanata CF. Studies of food hygiene and diarrhoeal disease. *Int J Environ Health Res* 2003; 13: S175–83.
20. WHO, Basic Principles for the preparation of safe food for infants and young children. Geneva: World Health Organization, 1996
21. Esrey, S.A. Food contamination and diarrhoea. *World health*, pp. 19-20, January-February 1990
22. Bloomfield SF, Exner M, Fara GM, et al (2009). The global burden of hygiene-related diseases in relation to the home and community. An IFH expert review; published on [http:// www.ifh-homehygiene.org](http://www.ifh-homehygiene.org)
23. FAO, 2003. The Economics of Food Safety in Developing Countries. Agricultural and Development Economics Division. ESA Working Paper No. 03-19
24. The World Bank. Repositioning Nutrition as Central of Development. A strategy for large scale action, 2006. Washington, DC 20433 USA.
25. Ehiri JE, Prowse JM. Child Health promotion in developing countries: the case for appropriate integration of environmental and social interventions? *Health Policy and Planning*, 1999, 14 (1): 1-10
26. Motarjemi Y. Kaferstein F. Moy G. Quevedo F. Contaminated weaning food: a major risk factor for diarrhoea and associated malnutrition. *Bulletin of the World Health Organization*. 71(1):79-92, 1993
27. Black R.E., Lopez de Romana G., Brown K.H., Bravo N., Grados Bazalar O., Creed Kanashiro H. Incidence and etiology of infantile diarrhoea and major routes of transmission in Huascar, Peru. *American Journal of Epidemiology*. 129 (4) (pp 785-799), 1989. Date of Publication: 1989
28. Katabira ET (1999) Epidemiology and management of diarrhoeal disease in HIV-infected patients. *International Journal of Infectious Disease* 3(3):164-7
29. Thea D M, St Louis M E, Atido U, Kanjinga K, Kembo B, Matondo M, Tshiamala T, Kamenga C, Davachi F and Brown C (1993) A prospective study of diarrhoea and HIV-1 infection among 429 Zairian infants, *New England Journal of Medicine* 329(23):1696-702
30. Keuch G T, Thea D M, Kamenga M, Kakanda K, Mbala M, Brown C and Davachi F (1992) Persistent diarrhoea associated with AIDS, *Acta Pediatric Supplement* 9(381):45-48
31. FAO. (2003). The Economics of Food Safety in Developing Countries. Agricultural and Development Economics Division. ESA Working Paper No. 03-19
32. Bloomfield SF, Exner M, Fara GM, et al (2009). The global burden of hygiene-related diseases in relation to the home and community. An IFH expert review; published on [http:// www.ifh-homehygiene.org](http://www.ifh-homehygiene.org)

33. WHO (2006). WHO consultation to develop a strategy to estimate the global burden of food-borne diseases. Tacking Stock and Charting the way forward. Geneva 25-27, 2006.
34. Valerie Curtis, Sandy Cairncross, and Raymond Yonli. (2000). Review: Domestic hygiene and diarrhoea – pinpointing the problem. *Tropical Medicine and International Health*. volume 5 no 1 pp 22–32 January 2000.
35. Jones.E.M.&Munger.S.J. Applications of a field guide for evaluation of nutrition education to programs in the Philippines. Washington, DC, Agency for International Development, 1978
36. Ashworth A. Feachem RG. Interventions for the control of diarrhoeal diseases among young children: weaning education. *Bulletin of the World Health Organization*. 63(6):1115-27, 1985.
37. Scott, B; Schmidt, W; Aunger, R; Garbrah-Aidoo, N; Animashaun, R; (2008) Marketing hygiene behaviours: the impact of different communication channels on reported handwashing behaviour of women in Ghana. *Health Educ Res*, 23 (3). pp. 392-401
38. Stephen P. Luby et al. (2011). The Effect of Handwashing at Recommended Times with Water Alone and with Soap on Child Diarrhea in Rural Bangladesh: An Observational Study. *PLoS Medicine*, 2011.
39. Lanata CF. Studies of food hygiene and diarrhoeal disease. *Int J Environ Health Res*. 2003 Jun;13 Suppl 1:S175-83.
40. Ifediora, A. C. Nkere, C. K. Iroegbu, C. U. Weaning food preparations consumed in Umuahia, Nigeria: evaluation of the bacteriological quality. *Journal of Food Technology*. 2006. 4: 2, 101-105. 15 ref
41. Kung'u JK et al. Bacterial populations in complementary foods and drinking-water in households with children aged 10-15 months in Zanzibar, Tanzania. *Journal of Health, Population & Nutrition*. 27(1):41-52, 2009 Feb.
42. Ifediora, A. C. Nkere, C. K. Iroegbu, C. U. Weaning food preparations consumed in Umuahia, Nigeria: evaluation of the bacteriological quality. *Journal of Food Technology*. 2006. 4: 2, 101-105. 15 ref
43. Molbak K. Jensen H. Ingholt L. Aaby P. Risk Factors for Diarrheal Disease Incidence in Early Childhood: A Community Cohort Study from Guinea-Bissau. *American Journal of Epidemiology*. 146(3):273-82, 1997 Aug 1
44. Van Steenberghe, W.M. et al. Machakos project studies: agents affecting health of mother and child in a rural area of Kenya. Bacterial contamination of foods commonly eaten by young children in Machakos, Kenya. *Tropical and geographical medicine*, 35: 193-197 (1983).
45. Michanie, S. et al. Critical control points for foods prepared in households in which babies had salmonellosis. *International journal of food microbiology*, 5: 337-354 (1987).
46. Takanashi K et al (2009). Survey of food hygiene practices at home and children diarrhoea in Hanoi, Viet Nam. *J Health Popul Nutr* 2009 Oct;27(5):602-611
47. Monte CM. Ashworth A. Nations MK. Lima AA. Barreto A. Huttly SR. Designing educational messages to improve weaning food hygiene and practices of families living in poverty. *Social Science & Medicine*. 44(10):1453-64, 1997 May

48. Black R.E., Lopez de Romana G., Brown K.H., Bravo N., Grados Bazalar O., Creed Kanashiro H. Incidence and etiology of infantile diarrhoea and major routes of transmission in Huascar, Peru. *American Journal of Epidemiology*. 129 (4) (pp 785-799), 1989. Date of Publication: 1989
49. Lanata CF (2003): Studies of food hygiene and diarrhoeal disease, *International Journal of Environmental Health Research*, 13:S1, S175-S183
50. Toure, O. Coulibaly, S. Arby, A. Maiga, F. Cairncross, S. Improving microbiological food safety in peri-urban Mali; an experimental study. *Food Control*. 2011. 22: 10, 1565-1572. 25
51. Ehiri JE. Azubuike MC. Ubbaonu CN. Anyanwu EC. Ibe KM. Ogbonna MO. Critical control points of complementary food preparation and handling in eastern Nigeria. *Bulletin of the World Health Organization*. 79(5):423-33, 2001
52. World Health Organization. Prevention of Food-borne Disease: Five Keys to Safer Food. Available at: <http://www.who.int/foodsafety/consumer/5keys/en/print.html>.
53. WHO/international commission on microbiological specifications for foods. Critical control points system in food hygiene. VPH 82-37. WHO, Geneva.
54. FAO/WHO, 1984. The role of food safety in health and development. WHO technical report Ser705.
55. Motarjemi Y. Kaferstein F. Moy G. Quevedo F. Contaminated weaning food: a major risk factor for diarrhoea and associated malnutrition. *Bulletin of the World Health Organization*. 71(1):79-92, 1993
56. Touré, O., et al., Piloting an intervention to improve microbiological food safety in Peri-Urban Mali. *Int. J. Hyg. Environ. Health* (2012), doi:10.1016/j.ijheh.2012.02.003
57. Oranusi SU et al. Hazards and critical control points of kunun-zaki, a non-alcoholic beverage in Northern Nigeria. *Food Microbiology* 20 (2003) 127–132
58. Motarjemi Y. Kaferstein F. Moy G. Quevedo F. Contaminated weaning food: a major risk factor for diarrhoea and associated malnutrition. *Bulletin of the World Health Organization*. 71(1):79-92, 1993
59. Moy G, Hazzard A, Käferstein F. *World Health Stat Q*. Improving the safety of street-vended food. 1997;50(1-2):124-31.
60. Azanza MP, Gatchalian CF, Ortega MP. Food safety knowledge and practices of streetfood vendors in a Philippines university campus. *Int J Food Sci Nutr*. 2000 Jul;51 (4):235-46.
61. Mensah P, Yeboah-Manu D, Owusu-Darko K, Ablordey A. Street foods in Accra, Ghana: how safe are they? *Bull World Health Organ*. 2002;80(7):546-54
62. Rheinländer T, Olsen M, Bakang JA, Takyi H, Konradsen F, Samuelsen H. Keeping up appearances: perceptions of street food safety in urban Kumasi, Ghana. *J Urban Health*. 2008 Nov;85 (6):952-64. Epub 2008 Sep 27.
63. Estrada-Garcia T, Lopez-Saucedo C, Zamarripa-Ayala B, Thompson MR, Gutierrez-Cogco L, Mancera-Martinez A, Escobar-Gutierrez A. Prevalence of *Escherichia coli* and *Salmonella* spp. in street-vended food of open markets (tianguis) and general hygienic and trading practices in Mexico City. *Epidemiol Infect*. 2004 Dec;132 (6):1181-4.

64. Koo D, Aragon A, Moscoso V, Gudiel M, Bietti L, Carrillo N, Chojoj J, Gordillo B, Cano F, Cameron DN, Wells JG, Bean NH, Tauxe RV. Epidemic cholera in Guatemala, 1993: transmission of a newly introduced epidemic strain by street vendors. *Epidemiol Infect.* 1996 Apr;116 (2):121-6.
65. Vollaard AM, Ali S, van Asten HA, Widjaja S, Visser LG, Surjadi C, van Dissel JT. Risk factors for typhoid and paratyphoid fever in Jakarta, Indonesia. *JAMA.* 2004 Jun 2;291 (21):2607-15.
66. Ekanem EE, Adedeji OT, Akitoye CO. Environmental and behavioural risk factors for prolonged diarrhoea in Nigerian children. *J Diarrhoeal Dis Res.* 1994 Mar;12 (1):19-24.
67. Barro N, Ouattara CA, Nikiema PA, Ouattara AS, Traoré AS. [Microbial quality assessment of some street food widely consumed in Ouagadougou, Burkina Faso]. *Sante.* 2002 Oct-Dec;12 (4):369-74.
68. Wanyenya I, Muyanja C, Nasinyama GW. Kitchen practices used in handling broiler chickens and survival of *Campylobacter* spp. on cutting surfaces in Kampala, Uganda. *J Food Prot.* 2004 Sep;67 (9):1957-60.
69. Castillo A, Villarruel-López A, Navarro-Hidalgo V, Martínez-González NE, Torres-Vitela MR. Salmonella and Shigella in freshly squeezed orange juice, fresh oranges, and wiping cloths collected from public markets and street booths in Guadalajara, Mexico: incidence and comparison of analytical routes. *J Food Prot.* 2006 Nov;69 (11):2595-9.
70. Ghosh M, Wahi S, Kumar M, Ganguli A. Prevalence of enterotoxigenic *Staphylococcus aureus* and *Shigella* spp. in some raw street vended Indian foods. *Int J Environ Health Res.* 2007 Apr;17(2):151-6.
71. Garin B, Aïdara A, Spiegel A, Arrive P, Bastaraud A, Cartel JL, Aissa RB, Duval P, Gay M, Gherardi C, Gouali M, Karou TG, Kruey SL, Soares JL, Mouffok F, Ravaonindrina N, Rasolofonirina N, Pham MT, Wouafo M, Catteau M, Mathiot C, Mauclere P, Rocourt J. Multicenter study of street foods in 13 towns on four continents by the food and environmental hygiene study group of the international network of pasteur and associated institutes. *J Food Prot.* 2002 Jan;65(1):146-52.
72. Chumber SK, Kaushik K, Savy S. Bacteriological analysis of street foods in Pune. *Indian J Public Health.* 2007 Apr-Jun;51(2):114-6.
73. von Holy A, Makhoane FM. Improving street food vending in South Africa: achievements and lessons learned. *Int J Food Microbiol.* 2006 Sep 1;111(2):89-92. Epub 2006 Jul 20.
74. Donkor ES. Application of the WHO five keys of food safety to improve food handling practices of food vendors in a poor resource community in Ghana. *East Afr J Public Health.* 2009 Aug;6(2):148-51.
75. Rane S. Street vended food in developing world: hazard analyses. *Indian J Microbiol.* 2011 Jan;51(1):100-6. Epub 2011 Jan 26.

4 Menstrual Hygiene

4.1 List of Acronyms

| | |
|--------|---|
| AIDS | Acquired Immunodeficiency Syndrome |
| BV | Bacterial Vaginosis |
| BRAC | Bangladesh Rural Advancement Committee |
| EMIS | Education Monitoring Information Systems |
| GLAAS | Global Analysis and Assessment of Sanitation and Drinking-Water |
| HIP | Hygiene improvement Project |
| HIV | Human Immunodeficiency Virus |
| JMP | Joint Monitoring Programme |
| MHM | Menstrual Hygiene Management |
| PID | Pelvic Inflammatory Disease |
| PLWHA | People Living With HIV/ AIDS |
| PTCs | Public Toilet Complexes |
| RCT | Randomised Controlled Trial |
| RTI | Reproductive Tract Infection |
| TSS | Toxic Shock Syndrome |
| UNICEF | United Nations Children's Fund |
| UTI | Urinary Tract Infection |
| URTI | Upper Reproductive Tract Infection |
| VVC | Vulvovagina Candidiasis |
| WASH | Water, Sanitation and Hygiene |
| WHO | World Health Organization |

4.2 Rationale for the need to focus on menstrual hygiene

This third part of the paper addresses menstruation and menstrual hygiene management (MHM). After defining the two concepts, we lay out the rationale for including them in the monitoring of progress on hygiene in terms of their impact on the health and social development of girls and women. We summarise and review the available research and on the indicators used in large monitoring or intervention programmes that have included measurement of MHM. Finally, we draw conclusions on the opportunities and challenges to measure MHM globally and recommend goals and targets along with indicators that could be used to measure progress in improving the quality and quantity of good menstrual hygiene management.

Concepts and impacts

Menstruation is a natural monthly occurrence in healthy adolescent girls and pre-menopausal adult women. The mean age of its onset varies by geographical region, race, ethnicity and other characteristics, but is normally between the ages of 8 and 16. The average age of starting menopause is estimated at 50-60 years, resulting in around 3000 days of menstruation in an average woman's lifetime [1]. Globally women and girls

have developed their own personal strategies to cope with menstruation. These vary greatly from country to country, and within countries, dependent on an individual's personal preferences, available resources, economic status, local traditions and cultural beliefs and knowledge or education. Changing societies will also bring with them challenges for the management of menstruation. Issues such as increased urbanisation and the rise in formal schooling will challenge traditional methods for managing menses privately and successfully.

Box 1: Definition of menstrual hygiene management

In this report good menstrual hygiene management (MHM) is defined as being able to use a clean and dry menstrual management material, either a locally made or mass manufactured pad/tampon or a cup, which is changed at least once per day for the duration of a menstrual period and being able to use soap and water for body hygiene⁶.

Our definition requires appropriate 'hardware' including access to material to absorb or collect menstrual blood; access to water and soap; to adequate sanitation facilities that allow privacy; to disposal facilities for menstrual materials; and to an appropriate and private place to dry any materials for reuse. It also requires adequate 'software', including female and male understanding and appreciating of menstruation's natural cause, the value of its hygienic management and the selection and care of suitable materials. Good menstrual management should allow sustainable, hygienic, private and comfortable management of menstruation and be accessible to all menstruating women and girls.

Menstruation is a natural and beneficial biological phenomenon. It concerns women and men alike, as it is among the key determinants of human reproduction and parenthood. Yet its nature and the challenges of hygienic management have many health and social implications, with both economic and environmental impacts. Here we address especially the outcomes from health and social research on which most data is available. Not addressed for a lack of data are the wider economic implications, e.g. from lost days of work and schooling and environmental contamination and its environmental health risks. Also not addressed are the economic implications for individual households. Because of the scale menstruation occurs these wider impacts could also affect global poverty.

Health Outcomes

It is plausible that poor MHM, defined as any strategy that falls beneath the standards in the definition given above, can be detrimental to health. Health outcomes for which associations with poor menstrual hygiene have been proposed include lower reproductive tract infections (RTIs), such as vulvovaginal candidiasis (VVC) and bacterial vaginosis (BV), urinary tract infections (UTIs) and menstrual disorders such as dysmenorrhoea (menstrual pain). It is well established that untreated lower RTIs (from any cause) can lead to serious complications such as upper RTIs including pelvic inflammatory disease (PID); adverse pregnancy outcomes including ectopic pregnancy; and infertility.

Females living with Human Immunodeficiency Virus (HIV)/ Acquired Immunodeficiency Syndrome (AIDS) (PLWHA) are more susceptible to bacterial vaginosis and vulvovaginal candidiasis infections. They are also

⁶ This definition is purposefully narrow, for example it is likely that girls and women should change material more than once per day especially during the early part of their period. However, for practical application during measurement a definition needs to strike a balance between simplification and precision to remain useful.

more susceptible to progression of lower reproductive tract infections to the more serious upper tract infections and their effects. Vulvovaginal candidiasis is also associated with reduced CD4 counts [2].

The link between poor menstrual hygiene and health outcomes has been investigated in seven observational studies and one randomised controlled trial (RCT) to our knowledge. No systematic reviews were located which collate the health effects of MHM on health. The observational studies focused on different aspects of menstrual hygiene and each association reported here is specific to the deviation from good practice investigated. The observational studies focused on different aspects of menstrual hygiene and each association reported here is specific to the deviation from good practice investigated. The studies primarily investigated lower RTIs (6/7 studies) but also included measures of anaemia (3/7), menstrual disorder (2/7), UTI (2/7), upper RTI (1/7) and secondary infertility (1/7).

Of the studies investigating urinary tract infection and anaemia no studies reported an association [3,4,5] although prevalence of anaemia was found to be higher for those with poor MHM [3]. Both studies investigating menstrual disorder found association with MHM [3-4]. Unfortunately neither study undertook detailed analysis and this failure to adjust for confounding means these observational findings are of limited value.

The majority of the studies looking at lower reproductive tract infections and MHM (as specifically defined in each study) reported an association (4/6). Final reported strength of effect following adjusted analysis showed that those with worse MHM were at around 1.7 times the risk of having RTIs [4,5,6]. Two studies contradicted these findings and found no association. These studies were of a lower quality than those which found associations. One suffered from serious methodological shortcomings in exposure definition [3] and the other had a very small sample size [7].

One study investigated the association between the unclean absorption of menstrual blood, lochia⁷ and secondary infertility [8]. It was found that whilst the use of unclean materials for absorption of menstrual blood was not associated, the use of unclean material for absorption of lochia was associated with a threefold increase in the odds of secondary infertility.

One randomised controlled trial has been conducted into the effectiveness of the 'mooncup', a device for capturing menstrual blood [9]. This study was poorly conducted and not published. The report of the findings of the study is unclear as to the health benefits of this method of management.

Qualitative research has also highlighted discomfort and skin irritation from the use of locally adapted methods for menstrual hygiene management [10]. This study was not followed up with any statistical investigation of this association. A cross-sectional observational study found comfort (71%); 'no discharge' (19%); and 'no itching' (24%) as stated advantages of sanitary pads [11].

This body of evidence contains some common methodological limitations. The majority of evidence lies in observational (cross-sectional) data which are open to confounding and issues such as reverse causality i.e. that an individual may have changed their menstrual practice due to an infection or other ailment rather than that the management method caused the infection or ailment. Research primarily focused on women of all ages, which may underestimate the effects in those most at risk. Studies primarily relied on objective exposure or outcome measures such as self-reported hygiene (7/7 studies), and self-reported health

⁷ lochia is the vaginal discharge that typically continues for 4 to 6 weeks after birth.

outcomes (3/7 studies), despite evidence from clinical confirmation studies that these are likely to be overestimates [6]. The body of evidence suffers greatly from the lack of standardisation with varying methods being used to categorise menstrual management, making comparison between studies difficult. Finally, there is limited adjustment for confounding. This is likely to be due to the fact that menstruation hygiene is considered only as a confounding factor at the outset of these studies, rarely as a primary investigative issue. There is clearly a great need for further research, in particular into the possible associations between RTI and MHM. There remains no randomised controlled trial investigating whether improvements in MHM affect health outcomes.

There is a more comprehensive body of evidence investigating potential associations between the use of mass manufactured sanitary products and health outcomes including toxic shock syndrome (TSS) and dermatological complaints in high income countries. TSS is an extremely rare outcome and of little relevance to the majority of women in the countries of interest for this report-as far as we know. A comprehensive review of the evidence found that external absorbent 'liners' are safe when used as intended and do not promote VVC or urinary tract infections [12]. This review was supported in its conclusions on vulvovaginal candidiasis and bacterial vaginosis by a recent high quality RCT [13]. As tampons are increasingly promoted in low-income countries it will be important to remain vigilant as to the possible health consequences of use in conditions of poor hygiene and less frequent changing.

In conclusion, we can say that the evidence base for the negative health effects of poor MHM is underdeveloped, but that the strongest evidence indicates that there is a plausible link between poor menstrual hygiene practices (such as using absorbents washed and dried in unsanitary conditions [6] and not boiling absorbents between uses [5], and reproductive tract infections (RTI). Evidence for the positive health effect of interventions through the promotion of good menstrual hygiene is non-existent, as no intervention program has reported health outcomes.

The global burden of lower reproductive tract infections is known to be substantial, but the proportion of this burden that can be attributed to poor menstrual hygiene management, as opposed to sexually transmitted infections; iatrogenic infections or endogenous infections caused by other infectious agents cannot be ascertained using the available data. It does however appear probable, due to the plausible infection route and the high prevalence that health gains will result from substantially improved MHM. These will most likely be in terms of reduced lower reproductive tract infections.

In addition there are wider social and equity reasons beyond health to support the encouragement of MHM and the monitoring of progress against related indicators and these are dealt with in the following section.

Social Outcomes

Across the globe, menstruation and its management have had important social and cultural implications which in turn impact development. In many cultures girls become marriageable and/or regarded as able to bear children with the onset of menstruation [10,14]. Pregnancies and deliveries at a young age are in turn associated with higher death rates for the mothers and the babies. The sexual and disgust connotations of menstruation make it a taboo subject for girls to raise, often even with their mothers [10]. Without good information, young girls are often frightened at the onset of their period and may think that they will die [15]

Females also face gender-related difficulties in MHM. Most must use old cloths, tissues, toilet paper or similar free, but unsuitable materials to catch the flow [15-18]. Lack of private places to wash and dry the cloths can force them to re-use still half-soiled and humid materials, making them feel uncomfortable and

dirty [19,20]. The practice may increase the risk of RTIs which at worst can render a woman infertile, one of the greatest personal tragedies and social disgraces irrespective of her personal and socio-cultural circumstances [21]. Lack of awareness and education for men, and taboos around discussing the subject can prevent girls and women from asking for money for sanitary materials from their fathers and husbands. Most commercial sanitary napkins are still priced too high to be affordable for the poor [18,51]. There are, however, some large scale actions to produce and market the materials at low cost or cross-subsidize sales including that of Bangladesh Rural Advancement Committee (BRAC).

Menstruation is still used as a reason to forbid women many activities including touching water and food, socialising, attending religious ceremonies, travel and attending school [14, 18, 19, 22-26]. Although forbidden by the Supreme Court in 2005, some Nepalese women may still be forced to spend their days of menstruation in a bare hut or cattle shed because of their 'impure state' [27]. Many other countries have similar menstrual sequestration rituals.

Girls who menstruate have given this as a major reason to miss school. However, visibility of this issue is hampered by the taboo nature of the subject, which makes them give illness and not MHM as the reason for their absence to their teachers. This, in turn, leads teachers to deny that sanitation is a reason for girls' absence or that there is a need for education on menstruation in schools [18,23,28]. Staying longer in school reduces death during child birth: "Each additional year of education prevents two maternal deaths for every 1000 women" [29]. Girls' education has also been linked with improved population health including increased contraceptive uptake, decreased fertility rate, improved child health, increased vaccination rates and decreased infection rates with HIV. Thus interventions that increase years of schooling may have important secondary health outcomes.

Girls' absence from school during menstruation can have both physical and psychological causes [18,30]. First, they may lack physical provisions for MHM such as if toilets are locked, must be shared with boys or otherwise lack privacy. Furthermore, toilets are often soiled, smelly, lacking water and soap for washing and a private open air space to dry wet cloths and a closed bin or incinerator for used pads. Lack of MHM provision in school toilets was one of several reasons given for low usage of toilets by girls. Menstrual pain is another reason for girls to go home. Once home they are afraid to go back for fear of being scolded or found out [18,30]. The use of latrine pits for the disposal of MHM materials can increase fill rates and may also lead to clogging and emptying problems [20,23].

Girls also report feelings of fear, confusion and shame in class due to leakage and dropping of sanitary material, bad smell ('like rotten eggs') and staining of clothes, teasing, fears of pregnancy and experience of harassment by male students and teachers as well as conflicting social expectations and a sense of powerlessness to take action [18,25,30,50]. "In one school, girls reported that male teachers began looking at them 'differently' when they started menstruating and would tease them upon returning to school [after a short absence]" [19]. A study in 30 rural and 6 urban schools in South Africa showed that poor toilets and sexual harassment and violence at toilets led to poor school attendance by girls at the onset of adolescence [49]. Not surprisingly, girls report that tensions caused by these feelings in addition to abdominal pain distract them from learning [14,20]. The problems are exacerbated by the lack of presence of and counselling from female teachers and a sense of inability among male teachers to address MHM issues, although they may be aware of girls dropping out of school at the age of menstruation [19,31].

Data on absence from class and school drop-out rates due to menstruation are predominantly qualitative. The little quantitative evidence on girls going or staying home due to menstruation is conflicting. Studies in

Uganda [20, 31] report that 33%-61% of menstruating girls miss time at school due to lack of sanitary napkins. Both studies used self-report, which often gives less reliable data in case of sensitive topics [32]. Problems faced include the following issues: attendance records in schools are often poorly kept or sometimes taken by other students who may cover for friends; girls may report 'illness' so it is hard to attribute the reason for absence; girls newly menstruating may be irregular for a year or two which can make tracking absences difficult; and girls may sneak out for a few hours and return which won't be captured by daily attendance records. Two studies used long-term record keeping by the girls themselves before and after providing sanitary napkins [33] or on non-menstruation and menstruation days [26]. The latter found a very small and statistically non-significant difference. However, the study did not look at other potentially important factors such as MHM provisions in the schools. Scott et al, on the other hand, found significant improvements of 9% to 14% in recorded class attendance from access to sanitary napkins and/or MHM education [33]. In their study schools there was either no toilet, or water and privacy were lacking. A systematic review into the linkages between separate toilets for girls and school attendance was inconclusive. However, the data were analysed without taking account of age with respect to menstruation and MHM provisions in school may have been among the influencing factors [35].

Whilst MHM in schools has been increasingly researched, there is little research on MHM in urban slums, despite rapid urban growth and the vulnerability of girls and women in these areas. A study on street dwellers in Dhaka [36] found that public toilets were absent and ablution practices limited. Failures of municipal services may particularly effect adolescent girls and women and include very low access to public toilet complexes (PTCs), poor gender designs, illegal extortion by public operators (who may demand 25% of the family's income), evasion of action by responsible authorities and politicians and frequent sexual harassment and rape [37,38]. Problems increase during menstruation: "When no services are present or useable, 'holding on' [not urinating and defecating] for most of the day is a tough task and is very difficult during menstruation" [38]. Indian women need bathing provisions for MHM and do not like to be seen 'doing their business'. This is one reason why in Mumbai 80% of the 3500 PTCs designed and built by contractors who won World Bank tenders are now out of operation [39]. The PTCs for women are now women-designed, -built and -managed under a local alliance of an NGO and 2 CBOs [38]. Research on the socio-economic, psychological and health impacts of MHM for women and girls with HIV/AIDs and poor young women working in sweatshops and factories could not be located.

Environmental impacts relate especially to the disposal of menstrual hygiene materials. When using sanitary napkins, an average middleclass woman will dispose 15,000 pads during her total number of days of menstruation. Globally, over 12 billion pads and tampons are disposed of annually, filling up latrine pits or ending up in city dumps and landfills. Currently they also form an estimated 6.3% of the so-called sewage-related debris along rivers and beaches [23].

Main health and social outcomes and associations with menstrual hygiene management

| Menstrual hygiene management and health evidence | |
|--|--|
| Reproductive tract infections | <p>Plausible link but weak and mixed evidence. 3 observational studies suggest an association between specific aspects of MHM and increased lower reproductive tract infections [4,5,6]. 2 observational studies suggest no link [3,7]. No systematic pooling possible due to divergent methods / exposure measures.</p> <ul style="list-style-type: none"> - aOR protective effect of 'good' vs. 'poor' menstrual hygiene = 0.74 [4] - aOR effect of not boiling and drying cloth vs. boiling and drying or using disposable absorbent = 1.66 [5] - aOR effect of using rags vs. using no rags during menses = 1.74 (1.33-2.27) [6] <p>Although plausible no evidence that variation in menstrual management is more likely to lead to more serious upper reproductive tract infections.</p> |
| Urinary tract Infections | <p>Plausible link but no association found following two observational studies. No RCTs conducted.</p> |
| Anaemia | <p>Debatable plausibility, anaemia associated with menstruation but not necessarily management. No association found following two observational studies. No RCTs conducted.</p> <ul style="list-style-type: none"> - Higher prevalence of UTI found in 1 observational study amongst those with poorer MHM but effect not seen once adjusted for potential confounders |

| Menstrual hygiene management and social outcomes evidence | |
|---|---|
| School absenteeism | <p>Plausible association supported by qualitative and observational evidence but inconclusive intervention studies:</p> <ul style="list-style-type: none"> - Observational studies show self reported 33%-61% increase in absence due to lack of MHM materials [20, 31] - Intervention studies showed mixed results. 9% - 14% in recorded class attendance from access to sanitary napkins and/or MHM education [33]. One RCT of mooncup showed no effect [26]. - Systematic review of impact of provision of girls' toilets on education outcomes showed no effect [35]. <p>Null evidence should be read in light of complexity of investigation.</p> |
| Exclusion from society (other than school) | <ul style="list-style-type: none"> - Qualitative evidence shows strongly that women and girls are excluded from some activities during menstruation depending on cultural and social context [14, 18, 19, 22-27] - Plausible link but limited evidence that improved menstrual management changes this situation, complex issue to investigate |

4.3 Proposed targets and indicators

Past international monitoring experiences

There have been few attempts to monitor MHM in national or international programmes. This lack of attention is likely to be due to the combination of a general reluctance to discuss the topic, challenges around enquiring on an individual or household level about such a personal issue, the lack of standardised measures for outcomes (both health and social outcomes), the absence of tested effective MHM-related interventions (e.g. in schools) and the lack of clarity about the relationship between MHM and outcomes.

Attempts to measure progress on provision of the hardware components of MHM are those most commonly included in monitoring programmes. Different organisations have included monitoring questions about sanitation facilities at household level, without asking any specific question related to MHM. For example the World Health Organization (WHO) / United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) for Water Supply and Sanitation monitors the number of households that use improved sanitation facilities, essential for privacy and dignity in managing menstruation [42]. The Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) takes this further and explicitly includes MHM [43]. The monitoring tool includes questions that are intended to collect information about the number of public centres that have improved sanitation and hand-washing facilities and the policies that are in place to promote good MHM facilities:

- What is the percentage of schools and hospitals/healthcare centres in your country that have improved sanitation facilities, including access to improved water sources and soap for hand-washing?
- Do national sanitation policies/strategies include specific provisions for women, including menstrual hygiene management needs?
- Do hygiene promotion strategies include targets for vulnerable and marginalized groups? ('Women, including menstrual hygiene management needs' specified in question)

Indicators have also been developed in some programmes to assess MHM in Schools. UNICEF, together with other stakeholders launched the "Call to Action for WASH in Schools" campaign [44]. The campaign incorporates six key action points, one of which calls for improved monitoring of WASH in Schools programmes. National monitoring systems for WASH in schools as a whole are often weak; many countries do not have even basic data on the WASH situation in schools.

The campaign promoted a set of basic monitoring questions on WASH in Schools to be incorporated into national Education Monitoring Information Systems (EMIS) including:

- What facilities and programmes are there in the school for promoting safe and private menstrual hygiene for older girls?
- What menstrual hygiene education sessions are provided for girls?
- Are there private washing facilities for cloth napkins (such as a tap and basin inside a lockable toilet stall)?
- Are there private disposal/incineration facilities for disposable napkins?
- Is there any kind of napkin distribution programme?

The monitoring system recommended observation to clarify progress against these indicators as well as focus group discussions on MHM with both boys and girls. These indicators are currently under review by UNICEF.

HIP (Hygiene improvement Project) was a 6-year USAID-funded program (2004-2010) [45] that sought to reduce diarrhoeal diseases and improve child survival through the promotion of three key hygiene practices: hand-washing with soap, safe faeces disposal, and safe storage and treatment of household drinking water. This program incorporated specific indicators about MHM in its programme:

- % of female clients reporting hygienic disposal of soiled feminine hygiene products
- % of caregivers reporting appropriate washing of soiled rags used for client menstrual hygiene

In Bangladesh, the Environmental Sanitation, Hygiene and Water Supply Project promoted MHM across 34 districts and initially 4800 primary schools and pilot secondary schools. Direct reported impacts are increased self-esteem and assertiveness. The involved government departments are however reluctant to include MHM into their community and school monitoring systems as policy makers consider talking about it is against norms and values [40].

There have also been some attempts to monitor MHM in emergency situations. WASH cluster HP Project 2007 UNICEF [46] produced a list of indicators for monitoring hygiene promotion in Emergencies⁸, and among the suggested five essential indicators which should always be monitored as a priority. They included one related with MHM:

- Women are enabled to deal with menstrual hygiene issues in privacy and with dignity

They suggested a proxy indicator for monitoring the effectiveness of MHM of whether 'Appropriate sanitary materials and underwear for all women and girls are available' and suggest collecting data on 'Reports of satisfaction with provision of menstrual materials from women'.

We can summarise the different indicators that have been used in the above programmes into five main groups:

- Indicators to measure hardware at household or public places level (hardware)
- Indicators that attempt to measure the presence of MHM at policy level.
- Indicators to monitor MHM at school level (hardware and software)
- Indicators to monitor MHM in emergency situations.
- Indicators to monitor MHM in vulnerable groups, such as people living with HIV/AIDS (focus more on safety issues)

The main lessons learnt from these past attempts are as follows:

- Objective indicators to measure hardware (e.g. number of toilets that offer privacy) are more often applied than those to measure 'software' (e.g. awareness of good MHM practice)
- Terms such as 'hygienic', 'appropriate' and 'menstrual hygiene management' remain variously defined (or undefined) in different indicator sets
- Hardware measurements often seek to measure multiple aspects e.g. water supplies and hand-washing facilities in schools, presence of separated girl/boys toilets, toilet/boys and toilet/girls ratios, availability of appropriate sanitary materials,
- The question remains as to whether the provision of hardware leads to good MHM

⁸ In addition the following article, recently published, was not available to the authors at the time of writing but may include relevant material: Sommer, M. (2012) Menstrual hygiene management in humanitarian emergencies: Gaps and recommendations. *Waterlines* (Sommer, M. pers. comm. May 2012).

- There have been some attempts to measure social outcomes (e.g. school absenteeism in the UNICEF programme), but many challenges exist around measuring this outcome
- There is high danger of 'recall bias' and subjectivity due to the nature of self-reported MHM and social outcomes
- There remains no consensus or standard way to collect data about MHM

While quantitative data on the health and socio-economic benefits of improved MHM (mainly on girls' school attendance) remain inconclusive, mainly due to weak research designs or failure to address the full complexity of the issues, a growing body of qualitative research provides evidence of the socio-cultural and mental health benefits from improving MHM of adolescent school girls. Other, but much less researched areas are the opportunities and benefits of increasing access for all women and girls in the menstruating age groups to low-cost sanitary napkins (both the washable and disposable type) and of including provision for MHM in the design and management of communal sanitation blocks in densely settled low-income urban areas.

Improving MHM in and through schools is attractive because of the opportunities which the school sector offers to improve hardware concurrently with knowledge, attitudes and behaviours, not only of girls, but also boys, teachers, parent-teacher associations and school management [46, 52]. Such improvements do not require large increases in investment costs on top of those made for proper Water Sanitation and Hygiene (WASH) facilities and services in schools. One study found that an extra 3% could make toilets inclusive for all, although the costing did not look at the specific costs for MHM [47]. Out of 60 countries surveyed in the South 27 have included WASH in schools in their national plan of action [47], a number that is expected to have increased substantially in 2012 [48]. Further advantages are the world-wide structure for monitoring provided by the educational system, the presence of national monitoring systems for schools, including for WASH in School as supported by UNICEF and the already well-developed knowledge of physical, psychological and educational indicators that can be monitored. Last but not least, providing support through the school system to girls who start to menstruate affords the opportunity to prevent negative health impacts from poor menstrual hygiene for a growing percentage of girls and their future daughters worldwide, from the moment that they start menstruating up to their menopause.

Other challenges include the inconvenient positioning of MHM between the disciplines of reproductive health and environmental health in the health sector. The specific needs of women in the design and implementation of hygiene and sanitation programmes are largely ignored by environmental health and the issues beyond clinical health outcomes are considered beyond the remit of reproductive health. Also a challenge is the failure to fully recognise the value and requirements of MHM in the educational sector and the problem of reaching girls who are not in school (who are also likely to be the poorest and facing the largest health risks). Our review further indicates that if MHM is to be addressed through a partnership between the education and water supply and sanitation sector, interventions and measurement of outcomes and impacts must be holistic and go beyond construction of facilities and monitoring of school dropout and class attendance.

Based on this review our proposed long-list of indicators is presented below.

| Category | Indicators | Definitions | Monitoring measures |
|---|--|--|---|
| Target 1: By 2025 every school (how realistic is this? e.g. government schools, private schools, home schools will have sufficient gender appropriate latrines | | | |
| Sanitation facilities in schools | % of schools (serving any girls aged > 10 years) with sufficient gender appropriate latrines | <p>Gender appropriate latrine: latrine reserved for females that provides privacy, water, soap and disposal facility for absorbents</p> <p>Sufficient: WEDC gives the following on student/toilet ratio by sex:</p> <ul style="list-style-type: none"> - Girls: 1 cubicle for every 25 girls, (minimum 4 cubicles) including 1 cubicle for disabled girls - Boys: 1 cubicle for every 50 boys (minimum 4 cubicles) including 1 cubicle for disabled boys and at least 1 metre of urinal for every 50 boys. | Governmental / UNICEF WASH in Schools program monitoring system |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Relatively easy to measure (observable) - observations provide more reliable data, when done well, than interviews • Can be relatively easily included in national monitoring of the formal school system, esp. if this already includes monitoring of WASH (now in 92? countries – check UNICEF). Private schools may or may not be part of government monitoring system of schools. • Strongest evidence base for educational outcomes associated with poor provision for menstrual hygiene management (although remains limited) • Studies have shown a reduced attendance at school attributed to inappropriate provision of facilities • Onset of menstruation without MHM provisions in schools strengthens trend of earlier drop-out of girls from education than boys • Higher education levels for girls statistically associated with later marriage, smaller family after marriage and higher income. Countries with higher levels of education for women have higher GDPs • Synergy with other potential indicators and development/poverty reduction indicators e.g. female school attendance, maternal deaths, etc. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Excludes (pre)adolescent girls of menstruation age that are not in school from the data base and visibility, e.g. working girls • Limited evidence that provision of WASH facilities actually results in improved attendance – studies draw conclusion from stated reasons for absenteeism. • No (or: hardly any) monitoring of <u>MHM facilities</u> included in WASH in schools monitoring • Monitoring MCH provisions for girls with disabilities adds to complexity and cost of data collection, analysis and use, but without such data no insights • Difficult to measure school absenteeism leading to difficulty in ever establishing this link • Possible publication bias / researching bias into this topic vs. other topics due to ease of methodology • Achieving this target does not necessarily equate to widespread improvements in health (c. 85% of menstruating women are not in school) | | | |

| Category | Potential indicators | Definitions | Monitoring measures |
|---|---|--|---------------------------------------|
| Target 2: By 2025 every girl aged 10-16 will be aware of how to hygienically manage their menstruation | | | |
| Menstrual hygiene management knowledge (in schools) | <ul style="list-style-type: none"> • % of schools with MHM in their curriculum • % of girls who received information regarding MHM in school before the onset of menstruation • % of girls aged 10-16 who can answer a basic set of questions regarding MHM • % of teachers who can answer a basic set of questions regarding MHM | <p>‘Basic set of questions’ will need to be defined</p> <p>We suggest to develop questions to test basic knowledge about physiology and management of menstruation</p> | <p>School-based survey</p> <p>DHS</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Indicators can be chosen to measure knowledge at a variety of levels – existence in curriculum, delivering of lessons and understanding of lessons by both teachers and pupils • Some evidence that improved knowledge including guidance on pragmatic management of menses leads to improved MHM • Can also measure knowledge and attitudes of male headmasters teachers and students and visualise progress for males | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Girls that do not attend school or drop out are excluded • Cultural stigma regarding asking about menstruation requires more inputs e.g. for advocacy, design, testing , sharing and use of data • Selection bias in measuring at educational level – those most at risk may not be in education (that goes for all school-tied indicators) • Where does responsibility lie for educating girls? With schools or with family? Conflict between home / religious / cultural beliefs and institutional beliefs • Methodological challenges and flaws in the evidence that better knowledge leads to improved behaviour including limited adjustment for confounding, recall bias • Time-lag between education and health benefits as this indicator targets one age cohort • Due to apparent dropping age of menarche must be assured that intervention and monitoring starts in schools at the appropriate level? (e.g. middle to late primary depending on the country’s average age of enrolment) • Decision-makers in schools may often be male-dominated – possible lack of priority to issues perceived as ‘women issues’ | | | |

| Category | Potential indicators | Definitions | Monitoring measures |
|--|---|--|---|
| Target 3: By 2025 every women will be aware of how to hygienically manage their menstruation | | | |
| Menstrual hygiene management knowledge (everywhere) | <ul style="list-style-type: none"> Govt. / Public-Private Partnership spending on mass media promotion of good menstrual hygiene management % of health centres (of all types) teaching good MHM in their reproductive health clinics % and names of countries that include teaching of MHM in their MCH curricula and training programs? % of women who recall receiving some information regarding MHM % of women who can answer a basic set of questions regarding MHM % of health workers who can answer a basic set of questions regarding MHM | <p>‘Basic set of questions’</p> <p>We suggest to develop questions to test basic knowledge about physiology and management of menstruation</p> | <p>Clinic survey</p> <p>DHS / MICS</p> <p>Commercial sales of menstrual materials in selected areas over time</p> <p>Use of menstrual materials over time</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> Indicators can be chosen to measure knowledge at a variety of levels – as before Some evidence that improved knowledge of menstruation leads to improved MHM (and sales of MSH materials? With local production as a intermediate factor?) Case studies possible with large NGOs, e.g. WaterAid, BRAC Avoids time lag as education targeted at all women Possible to measure effects of marketing campaign on use if campaign links with access to affordable materials via the commercial and not-for-profit private sectors Measurement of teaching on the ground and impact on knowledge can be done in a sample of clinics and ?) | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> Cultural stigma regarding asking about menstruation Selection bias in measuring in health centres– those most at risk may not be attending A proper sample needs to comprise governmental as well as non-governmental (private commercial and not-for-profit) health centres Does not cover information through other communication channels Methodological challenges and flaws in the evidence that better knowledge leads to improved behaviour including limited adjustment for confounding, recall bias | | | |

| Category | Potential indicators | Definitions | Monitoring measures |
|--|---|--|--|
| Target 4: By 2025 every woman will have access to materials for hygienic menstrual management | | | |
| Access to hygienic menstrual management materials | <ul style="list-style-type: none"> • % of women reporting available and affordable menstrual hygiene products (absorbent pads / tampons) in local area • % of health centres offering them? • % of shops or pharmacies stocking them? • % of women reporting that they are able to change their 'material' at least once per day of menstruation (either new disposable or newly washed (with soap?) and dried pad / cup) | <p>Hygienic MHM = Being able to use clean and dry menstrual management material, either a locally made or mass manufactured pad/tampon or a cup, which is changed at least once per day for the duration of a menstrual period and to use soap and water for body hygiene</p> <p>Affordable = Household is able to purchase enough to be able fulfil the requirements for good MHM</p> | <p>DHS</p> <p>Survey Health centre</p> <p>Sales of menstrual hygiene materials by commercial sector and SMEs (especially those linked with NGOs)</p> |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Some evidence access to materials for hygienic menstrual management leads to improved MHM • It could be a proxy indicator easy to measure. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Cultural stigma regarding asking about menstruation • Methodological challenges in collecting this data (recall bias) • Methodological challenges and flaws in the evidence that presence of these products in public/private places leads to improved MH behaviour including limited adjustment for confounding. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|---|--|---------------------------|
| Target 5: By 2025 every government will have in place a policy to promote improved menstrual hygiene management | | | |
| MHM Policy | <ul style="list-style-type: none"> • Existence of locally relevant policy that promotes good menstrual hygiene management <i>e.g. building regulations that stipulate menstrual disposal facilities in institutional toilets</i> • Policy governed by Minister of one of four high level ministries (education, health, water and sanitation, environment or social affairs) • Existence of monitoring of policies implementation by independent body (e.g. health / education inspectorate) • Policy should be drafted following clear national consultation with women • All of the above exist at central and local levels of government • % of relevant national institution with physical access to policy document / able to answer basic set of questions on policy • % of relevant national institutions able to clearly demonstrate implementation of policy • % of governments who have in place fiscal policies that encourage MHM (e.g. removal of VAT on menstrual hygiene products) | Policy is a written statement either enshrined into law through and made widely available to | Independent policy review |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Allows locally adapted and relevant solutions and flexible achievement of the target • Having high level policy statements raises the priority of the issue across a wide range of institutions (schools, health, workplaces, etc.) • Allows the opportunity to be prescriptive in what policies we prefer to see put in place vs. allows governments to make their own policies which they believe to be most likely to promote good MHM | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Policy does not necessarily lead to practice • Policy making process is not standard across geographies and this indicator would be more challenging to some forms of government than others • Challenges at the monitoring and policy levels due to male power dominance. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|---|--|--|--|
| Target 6: By 2025 social attitudes and behaviours are more positive toward good menstrual hygiene management | | | |
| Social attitudes | <ul style="list-style-type: none"> • % of parents who have spoken to their children about menstruation • % of people (or adolescent girls) who think that menstruation is not a natural occurrence • % of men who understand menstruation • % of women who feel supported by their husbands during menstruation • % women reporting any restrictions on their freedom during menstruation | 'Freedom' could be defined by the respondent | 2-3 questions on Social Attitudes Survey |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Establishes clearly the values to aspire to • Proxy indicator to measure the importance of MHM in the society. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Severe difficulties with measurement, definitions • Cultural stigma regarding asking about menstruation • Methodological challenges in collecting this data (Gender pressure for answering these questions) • Flaws in the evidence that knowledge of perceptions about MH would lead to improved MH behaviour. | | | |

| Category | Indicators | Definitions | Monitoring measures |
|--|---|---|--|
| Target 7: By 2025 good menstrual hygiene management is accessible to all | | | |
| Equity of access | <ul style="list-style-type: none"> • % of disabled people reporting that they have access to affordable and adequate MHM • % of the poorest quintile reporting that they have access to affordable and adequate MHM • Menstrual hygiene advice is available in all relevant local languages • Indicators can be used as above (access, knowledge, practice, policy) but focus on marginalised groups. | Disability and other marginalised groups to be defined in line with international agreed standards. | As for general population but for specific subsets |
| <p>Advantages:</p> <ul style="list-style-type: none"> • Ensures action is being taken among those groups likely to be bearing the most burden. | | | |
| <p>Disadvantages:</p> <ul style="list-style-type: none"> • Challenges in how to reach the poorest quintiles of the population and the most needed. | | | |

4.4 Menstrual Hygiene References

1. McVeigh E, H. R., and Guillebaud J (2008). Oxford Handbook of Reproductive Medicine and Family Planning. Oxford, Oxford UP.
2. Canadian Guidelines on Sexually Transmitted Infections — Public Health Agency of Canada — January 2008. Available at: <http://www.phac-aspc.gc.ca/std-mts/sti-its/pdf/408vagdis-eng.pdf>
3. Bulut A, Filippi V, Marshall T, Nalbant H, Yolsal N, Graham W. 1997 Contraceptive choice and reproductive morbidity in Istanbul. *Studies in Family Planning*, 28(1):35-43.
4. Bhatia JC, Cleland J 1995. Self Reported Symptoms of Gynaecological Morbidity and their Treatment in South India. *Studies in Family Planning*, 26(4): 203-216.
5. Younis N, Khattab H, Zurayk H, el-Mouelhy M, Amin MF, Farag AM. 1993 A community study of gynecological and related morbidities in rural Egypt. *Studies in Family Planning*, May-Jun;24(3):175-86.
6. Wasserheit JN(1989) Reproductive tract infections in a family planning populations in rural Bangladesh. *Studies in Family Planning*, Vol. 20, No. 2 (Mar. - Apr., 1989), pp. 69-80
7. Morison, Ekpo, West, Demba, Mayaud, Coleman, Bailey, Walraven. Bacterial vaginosis in relation to menstrual cycle, menstrual protection method, and sexual intercourse in rural Gambian women. *Sex Transm Infect* 2005;81:242-247 doi:10.1136/sti.2004.011684
8. Ali TS et al. Unhygienic practices during the menstrual, partum and postpartum periods. *J HEALTH POPUL NUTR* 2007 Jun;25(2):189-194
9. Oster EF and Thornton RL (2009). Menstruation and Education in Nepal. NBER Working Paper Series 2009, w14853. Cambridge, Mass. USA: National Bureau of Economic Research. Available at: www.nber.org/papers/w14853.pdf - 2011-12-05 (Accessed 5 April 2012)
10. McMahon, S.A. et al. 2011. The girl with her period is the one to hang her head: Reflections on menstrual management among schoolgirls in rural Kenya. *BMC International Health and Human Rights* 2011, 11:7. Available at <http://www.biomedcentral.com/1472-698X/11/7> (Accessed 6 April 2012)
11. Abdel-Hady El-Gilany, Karima Badawi and Sanaa El-Fedawy. Menstrual Hygiene among Adolescent Schoolgirls in Mansoura, Egypt. *Reproductive Health Matters*. Vol. 13, No. 26, The Abortion Pill (Nov., 2005), pp. 147-152
12. Farage M, Bramante M, Otaka Y, Sobel J. Do panty liners promote vulvovaginal candidiasis or urinary tract infections? A review of the scientific evidence. *Eur J Obstet Gynecol Reprod Biol*. 2007 May;132(1):8-19. Epub 2007 Jan 3.
13. Giraldo PC, Amaral RL, Juliato C, Eleutério J Jr, Brolazo E, Gonçalves AK. The effect of "breathable" panty liners on the female lower genital tract. *Int J Gynaecol Obstet*. 2011 Oct;115(1):61-4. Epub 2011 Jul 27.

14. Sommer, M. 2010. Where the education system and women's bodies collide: The social and health impact of girls' experiences of menstruation and schooling in Tanzania. *Journal of adolescence*, Volume 33, Issue 4, August 2010, Pages 521–529
15. Khanna A, Goyal RS, Bhawsar SB, 2005: Menstrual Practices and Reproductive Problems: A Study of Adolescent Girls in Rajasthan. *Journal of Health Management* 2005, 7(1):91-107.
16. Adika, V.O, Yabga, J, Apiyanteide, F.A, Ologidi, P.W and Ekpo, K.E. 2011. Perception and behaviour on use of sanitary pads during menstruation among adolescent school girls in Bayelsa State, Nigeria. *Advances in Applied Science Research*, 2011, 2 (6):9-15. Available at www.pelagiaresearchlibrary.com (Accessed 6 April 2012)
17. Khisro, S.S. N. and A. U. Rahman, 2011. Paving Way for Menstrual Hygiene Management in Rural Pakistan. Paper presented at the Third Asia Regional Sanitation and Hygiene Practitioners Workshop, Dhaka, Bangladesh, 31 January -2 February. Available at <http://www.irc.nl/page/68322> (Accessed 6 April 2012)
18. Piper-Pillitteri, Sally (2011). *School menstrual hygiene management in Malawi: More than toilets*. London, UK: WaterAid. Available at; http://www.shareresearch.org/Resource/Details/menstrualhygienemanagement_malawi (Accessed 5 April 2012)
19. McMahan, S.A. et al. 2011. The girl with her period is the one to hang her head: Reflections on menstrual management among schoolgirls in rural Kenya. *BMC International Health and Human Rights* 2011, 11:7. Available at <http://www.biomedcentral.com/1472-698X/11/7> (Accessed 6 April 2012)
20. Tracey Crofts and Julie Fisher. Menstrual hygiene in Ugandan schools: an investigation of low-cost sanitary pads. *Journal of Water, Sanitation and Hygiene for Development* Vol 2 No 1 pp 50–58
21. Dyer, SJ, N Abrahams, M Hoffman and ZM van der Spuy, 2002. Men leave me as I cannot have children: women's experiences with involuntary childlessness. *Human Reproduction*, 17 (6):1663-1668 Available at: <http://humrep.oxfordjournals.org/content/17/6/1663.abstract> (Accessed 15 April 2012)
22. Anandalakshmy, S.,1994. *The Girl Child and the Family: An Action Research Study*. Research/Technical Report no. 143. New Delhi, India, Indian University and Ministry of Human Resources Development. Available at: LINK to come from MvW
23. Bharadwaj, S. and Patkar, A. (2004). *Menstrual hygiene and management in developing countries: Taking stock*. Mumbai, India: Junction Social. Available at: <http://www.mum.org/menhydev.htm> (Accessed 6 April 2012)
24. Keerti Jogdand, Pravin Yerpude. A Community-based Study on menstrual hygiene among adolescent girls – India. *Indian Journal on Maternal and Child Health*. January 2011
25. Kanyemba, A. 2011. *Growing up at school: A guide to menstrual management for school girls*. Pretoria, South Africa: Warer Research Commission. Available at:

- http://docs.watsan.net/Downloaded_Files/PDF/Kanyemba-2011-Growing.pdf (Accessed on 9 April 2012)
26. Oster, E. and Thornton, R. (2011) Menstruation, Sanitary Products and School Attendance: Evidence from a Randomized Evaluation. *American Economic Journal: Applied Economics* 3, (1) 91–100. Available at: <http://www.aeaweb.org/articles.php?doi=10.1257/app.3.1.91> DOI:10.1257/app.3.1.91 (Accessed 6 April 2012)
 27. Rehman, Teresa, 2011. Water shortages impede hygiene for women. Alertnet, 15 December 2011, <http://sanitationupdates.wordpress.com/2011/12/15/water-shortages-impede-hygiene-for-nepalese-women/>
 28. IRIN (2011). Nepal: Separate toilets for schoolgirls, a justified investment? <http://www.irinnews.org/Report/92216/NEPAL-Separate-toilets-for-schoolgirls-a-justified-investment> (Accessed 6 April 2012)
 29. Brocklehurst, C. and Bartram, J. (2010). Swimming upstream: why sanitation, hygiene and water are so important to mothers and their daughters. *Bulletin of the World Health Organization* ; vol. 88, no. 7 ; p. 482. Available at: doi: 10.2471/BLT.10.080077 (Accessed 6 April 2012)
 30. Kumar, R. cited in Carrard, N. and K. O’Riordan, 2011. Menstrual Hygiene Management. Civil Society WASH learning Fund. Canberra, Australia: AusAid. Available at: http://www.wsscc.org/sites/default/files/publications/civilsocietywashlearningfund_menstrual-hygiene_2011.pdf (Accessed on 14 April 2012)
 31. Mooijmans, A., 2006. Girl-friendly toilets for schoolgirls: Helping adolescent girls. <http://www.washinschools.info/page/319> (accessed 24 April 2012)
 32. Fenton, Johnson, McManus and Erens. Measuring sexual behaviour: methodological challenges in survey research. *Sex Transm Infect* 2001;77:84-92 doi:10.1136/sti.77.2.84
 33. Scott L, Dopson S, Montgomery P, Dolan C, Ryus C, 2009. Impact of Providing Sanitary Pads to Poor Girls in Africa. University of Oxford .
 34. Colclough , C., P. Rose and M. Tembon (2000) Gender inequalities in primary schooling: the roles of poverty and diverse cultural practice. IDS working paper no. 78. Brighton, UK, University of Sussex: Institute of Social Studies. Available at: <http://www.sciencedirect.com/science/article/pii/S0738059399000462> (Accessed 12 April 2012)
 35. Birdthistle et al 2011. What impact does the provision of separate toilets for girls at schools have on their primary and secondary school enrolment, attendance and completion? A systematic review of the evidence. DFID Publication, July 2011
 36. Uddin, MJ et al., 2009. Health needs and health-care-seeking behaviour of street-dwellers in Dhaka, Bangladesh. *Health Policy and Planning* 24:385–394. Available at doi:10.1093/heapol/czp022 (accessed 15 April 2012).
 37. Sharma, S.S. (2006). Women’s Needs, Women’s Action: Toilet Development in Urban and Rural Communities of India. Philadelphia, USA, Drexel University: MSc Thesis in Science, Technology, and

- Society. Available at http://idea.library.drexel.edu/bitstream/1860/898/1/Sharma_Sanya.pdf (Accessed on 15 April 2012)
38. Sheikh, S. (2008). Public toilets in Delhi: An emphasis on the facilities for Women in Slum/Resettlement Areas. CCS Working Paper No. 192. New Delhi, India: Centre for Civil Society, Summer Research Internship Programme 2008. Available at: <http://ccs.in/ccsindia/downloads/intern-papers-08/Public-toilets-in-Delh-192.pdf> (Accessed 15 April 2012).
 39. NSDF, Mahila Milan and SPARC, 2004 - Toilet talk: Looking for a simple place to sit. Mumbai: National Slum Dwellers Federation, Mahila Milan Society for Promotion of Area Resource Centres. Available (excerpt) at <http://asiasociety.org/policy/social-issues/human-rights/looking-simple-place-sit> (Accessed on 14 April 2012)
 40. Nahar Q and Ahmed R (2006). Addressing special needs of girls challenges in schools. Paper presented at the 2nd South Asian Conference on Sanitation, Islamabad, Pakistan, 2006. . Available at http://www.wateraid.org/documents/plugin_documents/addressing_the_special_needs_of_girls.pdf
 41. Wickramasinghe, D., 2012. Managing menstrual hygiene in emergency situations: How far from reality? Paper presented at the Third Asia Regional Sanitation and Hygiene Practitioners Workshop, Dhaka, Bangladesh, 31 January - 2 February. Available at: <http://www.irc.nl/page/68629> (Accessed 16 April 2012).
 42. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Available at: <http://www.wssinfo.org/>
 43. GLAAS (Global Annual Assessment of Sanitation and Drinking-Water. 2010 UN-Water). Available at http://www.unwater.org/downloads/UN-Water_GLAAS_2010_Report.pdf
 44. UNICEF 2011. WASH in school: Monitoring package. Available at: http://www.unicef.org/wash/schools/files/wash_in_schools_monitoringpackage_.pdf
 45. HIP (Hygiene Improvement Project USAID, 2011). Available at: <http://www.hip.watsan.net/>
 46. Mooijman, A. and Sijbesma, C., 2009. Water supply, sanitation and hygiene facilities and related education in faith-based schools. In: [Alliance of Religions and Conservation - Bath, GB, ARC](#), 2010. *Faith in water*, Salisbury, UK, July 5th – 7th 2009 : conference papers . [online] Bath, UK: Alliance of Religions and Conservation, ARC. Available at: http://docs.watsan.net/Downloaded_Files/PDF/Mooijman-2009-Water.pdf (Accessed on 24 April 2012)
 47. JONES, H., 2011. Inclusive design of school latrines – how much does it cost and who benefits? Briefing Note 1. Loughborough: WEDC. UNICEF 2011. WASH in school: Monitoring package. Available at: http://www.unicef.org/wash/schools/files/wash_in_schools_monitoringpackage_.pdf
 48. Murat, personal communication: 9 April 2012

49. Bility KM and H Onya, 2000. Water use, sanitation practices, perceptions and hygiene education in primary school children in the Northern Province and Western Cape, South Africa. Pretoria, South Africa, Water Research Commission. (Accessed 24 April 2012)
http://www.wrc.org.za/Pages/DisplayItem.aspx?ItemID=7081&FromURL=%2fPages%2fKH_AdvancedSearch.aspx%3fk%3dWater%2buse%252c%2bsanitation%2bpractices%252c%2bperceptions%2band%2bhygiene%2beducation%2bin%2bprimary%2bschool%2bchildren%2bin%2bSouth%2bAfrica%26
50. Avenh, 2008. A Study on Violence Against Girls in Primary Schools and its Impacts on Girls' Education in Ethiopia. Save the Children Denmark and Addis Ababa, Ethiopia: Ministry of Education and Ministry of Women's Affairs.
http://www.ungei.org/resources/files/Study_on_Violence_Against_Schoolgirls_final.pdf (Accessed 24 April 2012)
51. Kirk, J. and M. Sommer 2006. Menstruation and body awareness: linking girls' health with girls' education. Amsterdam, the Netherlands: Royal Tropical Institute.
<http://www.kit.nl/smartsite.shtml?ch=fab&id=5582> (Accessed 24 April 2012).
52. Sommer, M. "An Early Window of Opportunity for Promoting Girls' Health: Policy Implications of the Girl's Puberty Book Project in Tanzania" *International Electronic Journal of Health Education*

5 Conclusions

We have reviewed the case for the importance of hand, food and menstrual hygiene as candidates for post-MDG goal and target setting. Of the three themes, handwashing with soap at key times is the one which has been the subject of most research and therefore is associated with the strongest evidence base. This evidence suggests that handwashing with soap has the potential to protect against a range of infections including: diarrhoeal diseases, respiratory infections, skin infections (e.g. impetigo), soil-transmitted helminths, trachoma, undernutrition, co-infections among HIV+ individuals, maternal and neonatal infections, health-care associated infections. The strongest evidence is for diseases transmitted via the faecal-oral route. The benefits of handwashing with soap stem directly from the health gains as well as possible economic and social benefits that arise as a result of these gains.

Handwashing with soap at key times is also the theme in which most experience has accumulated in relation to intervention development and the measurement of behaviour change outcomes. Even so, measurement of actual handwashing prevalence is difficult, prone to inaccuracies and biases and probably not practical at national level. This presents a problem for setting targets and measuring progress. One strategy might be to set targets / goals around implementation of behaviour change interventions (e.g. number of people reached) and to combine this with evaluation data to ensure the quality of interventions.

Food hygiene has high biological plausibility as an important contributor to public health but is under-researched and therefore lacks the sort of evidence base that is associated with HWWS. Research in this area should be a priority since the high plausibility of poor food hygiene as a route to infection suggests that improved food hygiene might bring large health benefits.

Identifying the main source(s) of contamination of cooked food and foods consumed raw will be important in determining whether behaviour changes are needed in addition to those already addressed when promoting HWWS at key times. Access to energy may prove an important factor in allowing poor households to store and prepare food safely.

Menstrual Hygiene Management is the most neglected of the three themes. The combination of health and gender politics makes this perhaps the most emotive of the three themes, whilst reluctance to discuss the issue makes it the least considered. The likelihood of large health gains from improved MHM seems low, however there are major social benefits to be gained from tackling this issue. There may be important non-health benefits to be gained from improving conditions for hygienic menstrual management and more efforts should be made to gather the data needed for these to be assessed objectively.

The importance of water for all three hygiene themes should be a spur for the international community to ensure that progress towards ensuring easy access to reliable water sources for all. Good sanitary facilities also underlie all of these three issues, with a need for good handwashing and MHM facilities and the ability of sanitation to prevent onward transmission of fecal pathogens into food.

In this report we have offered a long list of potential targets with measurable indicators which could be adopted by the international community to direct attention to these hitherto neglected issues. The next task is to collectively consider their completeness, appropriateness, feasibility and usefulness in galvanizing future progress in hygiene.

6 Annexes

6.1 Annex 1: Terms of Reference

Terms of Reference

Background Paper on Measuring WASH and Food Hygiene Practices

Definition of Goals to be Tackled Post 2015 by the JMP

January 30 2012

Background

In 2013 the UN General Assembly will be asked to decide what development goals the international community should seek beyond 2015. The decision will be made based on a proposal that will be submitted to the General Assembly. This proposal will include goals, targets and indicators pertaining to water, sanitation and hygiene (WASH). The indicators proposed will reflect principles associated with the human right to drinking water and sanitation.

Three working groups have been organized to review goals, targets and indicator options for each one of the areas of concern: water, sanitation and hygiene. The working groups will make proposals to a Core Consultative Group to be set up by the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. This Consultative Group will consolidate the proposals from the working group and propose a post 2015 goal for the three WASH sector areas, including targets and indicators.

The working groups are expected to conduct the following tasks:

1. Define the goal(s) and targets of internal relevance within the subject area.
2. Develop a comprehensive long list of indicators to measure each target.
3. Develop a short list of indicators to measure each target.
4. Refine selection and wording of final short list of indicators.
5. Develop final list of indicators per target based on review of member states and broader stakeholders.

The US Government, through the State Department and USAID, is taking the lead in organizing the hygiene working group and USAID's WASHplus project is helping to meet this commitment.

The World Health Organization (WHO) is providing guidance to the different working groups to ensure that they all consistently follow an established path to complete their designated tasks.

Terms of Reference: Background Paper

To support the hygiene working group, a consultant/organization knowledgeable in the areas of WASH, menstrual hygiene and food hygiene is needed to prepare a background paper to inform an initial stakeholder discussion about the future goals, targets and indicators that should be pursued by the international community post 2015 in the area of hygiene, with a concentration on three topics: handwashing with soap, menstrual hygiene and food hygiene. The issues addressed by the background paper will take into account the fact that the target audience for hygiene practices in these three areas will be both households and institutions. Institutions, in this context, may include schools, health facilities and other appropriate places where relevant disease prevention for vulnerable populations is important. These vulnerable populations would include neonates, children under five years of age, and people living with HIV/AIDS (PLWHA). The indicators will eventually be proposed to the UN General Assembly and should be

written in a manner that would enable them to gain acceptance from the public sector. So, the rationale and final recommendations need to be 'bankable' and realistic.

Tasks

1. Make a case for the global relevance of handwashing with soap at given junctures, presenting available economic and health outcome data from the literature to substantiate the rationale. No new analysis of the body of literature in this regard is expected. Address the importance of targeting households and institutions. Focus on a rationale that would make handwashing with soap attractive to the public sector.
2. Make a case for the global relevance of menstrual hygiene management from an educational and health perspective. Use available data to substantiate the justifications. Discuss whether this issue requires targeting household or institutions, or both, and address how this issue can be made attractive for governments.
3. Make a case for the global relevance of food hygiene practices to prevent disease among vulnerable target groups (children under five, PLWHA, etc.). Use available data to substantiate the justifications. Narrow down the issues of importance in food hygiene for eventual government involvement.
4. Review the international experience associated with tracking across countries the issues of interest: handwashing with soap, menstrual hygiene and food hygiene practices.
5. Propose goals and targets of international relevance that may be pursued in the areas of handwashing with soap at critical junctures, menstrual hygiene management and food hygiene, keeping in mind government involvement and actions that may target households and institutions. Develop a comprehensive long list of indicators to measure each target. These proposed goals, targets and indicators will form the substance of the discussion for the JMP Hygiene Working Group.
6. Discuss the advantages and challenges of measuring handwashing with soap, menstrual hygiene and food hygiene practices that reduce disease and the lessons learned at the international level that will streamline future measurements. Consider monitoring measures that would be useful to governments and the international community at large both for households and institutions.

Qualifications

A hygiene expert or organization with a minimum of 10-15 years of experience and published papers in professional literature in the areas of handwashing with soap, menstrual hygiene, and food hygiene.

Deliverables

- One draft and one final discussion paper not more than 30 pages long (single spaced). Reviewers of the draft document will have one week to provide comments. The consultant will have one week after receiving the comments to make the suggested changes to the initial draft.
- One presentation at a workshop bringing together hygiene specialists. Workshop to be held in Washington, DC on April 17-18, 2012.
- Participation in discussions regarding goal, target and indicator setting at workshop.

A trip to Washington DC will be required to make the presentation at a 2-day workshop.

Outline of Background Paper

- | | |
|---|---------|
| 1. Background | 2 pages |
| 2. Rationale for the need to focus on handwashing with soap at critical junctures | 4 pages |
| 3. Rationale for the need to focus on menstrual hygiene issues | 4 pages |

- | | |
|--|-----------|
| 4. Rationale for the need to focus on food hygiene issues | 4 pages |
| 5. Opportunities and challenges for measuring handwashing with soap at critical junctures, including recommendations for goals, targets and indicators that may be tracked internationally | 4-5 pages |
| 6. Opportunities and challenges for measuring menstrual hygiene, including recommendations for goals, targets and indicators that may be tracked internationally | 4-5 pages |
| 7. Opportunities and challenges for measuring (specific) food hygiene practices, including recommendations for goals, targets and indicators that may be tracked internationally | 4 pages |
| 8. Conclusions and overall recommendations | 2 pages |

Annexes may be added to the report.

Period of Performance

Six weeks after work order has been provided. Expected start up is by the end of February 2012. The consultant will submit the draft paper three weeks after being contracted. One week later the consultant will receive feedback and will have one week to make recommended changes to the paper. Upon approval of the final version, the consultant will prepare a presentation for the Hygiene Working Group Meeting. WASHplus will edit the final paper at the same time as the presentation is prepared and distribute the background paper one week prior to the two- day meeting of the group. .

Selection Criteria

1. Project Proposal: The proposal will be evaluated according to each of the following (80 points):

- a. **Institutional capacity and corporate experience** – Description of similar work, solid references, and corporate capability statement (10 points).
- b. **Practical experience in subject matter** – Examples of both implementation and measurement experience at the global level in all three topics of interest (30 points).
- c. **Publications in professional literature** – Institution/consultant's publication record in different subjects of interest (10 points).
- d. **Experience in hygiene goal setting and target and indicator definition** (20 points).
- e. **Project Timeline – Measures the extent to which there is a clear definition of concrete project activities and a reasonable schedule of activity duration** (10 points).

2. **Cost (Financial Plan) (20 points):** Total projected costs must be realistic and 1) maximize cost-effectiveness; 2) ensure appropriate administrative overhead cost; 3) accurately budget for the requirements and work effort described in the technical proposal.

Offerors must submit a proposed budget with sufficient detail to allow evaluation of elements of costs proposed (sample budget format attached as Annex A.) Budgets should be submitted in US dollars only. Budget notes/documentation must be incorporated. Overhead rates shown, if any, must be justified (e.g., via a US government agency approved overhead rate, NICRA, or equivalent [full disclosure on past performance under similar contracts, including breakdown of cost elements associated with fringe benefits, overhead, and/or profit/fee.]). Complete and signed 1420 forms (template included in Annex B) and Curricula Vitae for all personnel included in the proposal may be submitted as part of the proposal.

Tentative Timeline for the Implementation of the Activity**Post-2015 Hygiene Working Group**

| Tasks | 3/5 | 3/12 | 3/19 | 3/26 | 4/2 | 4/9 | 4/16 | 5/1 |
|--|-----|------|------|------|-----|-----|------|-----|
| Draft background paper | | | | | | | | |
| Review draft (WASH plus and selected members of Hygiene Working Group) | | | | | | | | |
| Produce final version of paper | | | | | | | | |
| Edit final paper (done by WASHplus) | | | | | | | | |
| Prepare presentation(s) for 2-day meeting of Hygiene Working Group | | | | | | | | |
| Travel to and make presentation at 2-day meeting | | | | | | | | |
| Distribute final report | | | | | | | | |

Payment Schedule

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|--------------|-----|
| Draft paper | 25% |
| Presentation | 25% |
| Final paper | 50% |