

## Assessing hygiene cost-effectiveness

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WASHCost is a five-year action research project investigating the costs of providing water, sanitation and hygiene services to rural and peri-urban communities in Ghana, Burkina Faso, Mozambique and India (Andhra Pradesh). The objectives of collecting and disaggregating cost data over the full life-cycle of WASH services are to be able to analyse costs per infrastructure and by service level, and to better understand the cost drivers and, through this understanding, to enable more cost-effective and equitable service delivery. WASHCost is focused on exploring and sharing an understanding of the costs of sustainable services (see [www.washcost.info](http://www.washcost.info)).

## Contents

<b>Acknowledgements</b> .....	<b>II</b>
<b>Abbreviations</b> .....	<b>IV</b>
<b>1 Introduction</b> .....	<b>1</b>
1.1 Purpose of this working paper.....	1
1.2 Structure of this working paper.....	1
<b>2 Why is hygiene important for water and sanitation services?</b> .....	<b>2</b>
2.1 Typology of water-related diseases.....	2
2.2 The effect of WASH interventions on health.....	3
<b>3 Is hygiene promotion a service or an intervention?</b> .....	<b>5</b>
<b>4 Hygiene promotion interventions: cost-effectiveness</b> .....	<b>6</b>
4.1 Costs of hygiene promotion interventions.....	7
4.2 Effectiveness of hygiene promotion interventions.....	8
<b>5 Levels of hygiene effectiveness</b> .....	<b>9</b>
<b>6 Summary and next steps</b> .....	<b>10</b>
<b>References</b> .....	<b>12</b>
<b>Annex 1: Hygiene promotion effectiveness flowcharts</b> .....	<b>14</b>

## Tables

<b>Table 1:</b> Transmission routes of various water-related diseases.....	<b>2</b>
<b>Table 2:</b> Hygiene effectiveness ladder.....	<b>9</b>

## Figures

<b>Figure 1:</b> The F-diagram for transmission of faecal-oral diseases.....	<b>3</b>
<b>Figure 2:</b> Effectiveness [%] of WASH interventions to reduce diarrhoea morbidity in children under 5.....	<b>3</b>
<b>Figure 3:</b> Summarised hygiene effectiveness ladder.....	<b>10</b>

## Abbreviations

WASH	Water, Sanitation and Hygiene
WSP	Water and Sanitation Program (World Bank)
HIP	Hygiene Improvement Project (USAID)
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
M&E	Monitoring and Evaluation

# 1 Introduction

## 1.1 Purpose of this working paper

**The purpose of this working paper is to introduce a conceptual approach to assess the cost-effectiveness of hygiene promotion. It introduces the use of *hygiene effectiveness levels* as a tool to analyse and compare the costs and outcomes of a number of hygiene promotion interventions. It should be read together with *Working Paper 2, Ladders for assessing and costing water service delivery* (Moriarty et al., November 2011), which provides conceptual grounding of service levels and service level indicators and *Working Paper 3, Assessing sanitation service levels* (Potter et al., July 2011)<sup>1</sup>.**

The purpose of the water, sanitation and hygiene (WASH) ladders is to provide a common framework to analyse and compare WASH cost data (collected across different country contexts) in the context of different service delivery norms and standards. It is envisaged that the WASH service ladders can be used as part of the process of setting norms and targets with respect to ongoing service delivery.

The emphasis in WASHCost is on collecting and understanding full life-cycle service costs, including the recurrent operational, maintenance and appropriate support costs needed to maintain service delivery. This represents a fundamental shift away from the focus (which has been prevalent in the WASH sector) on capital investment in water and sanitation facilities to a broader and more realistic understanding of the full costs of sustainable water and sanitation services.

The methodology and tools set out in this paper are currently being tested in WASHCost focus countries and a detailed methodology for data collection and findings will be presented in a Briefing Note to be published by the end of 2012.

It is foreseen that the methodology described here will be tested and replicated in future research, thus contributing to the development of a credible evidence base on the cost-effectiveness of hygiene promotion interventions. Modifications made from field testing will result in a framework which aims to contribute to better budgeting and planning for hygiene promotion, in turn contributing to more effective interventions that impact on improved health.

## 1.2 Structure of this working paper

The first part of this working paper addresses background and introduces the purpose of the paper. Section 2 locates hygiene promotion within water and sanitation services and highlights its importance in relation to public health. Section 3 details the difference between hygiene promotion as an intervention and as part of a broader public or environmental health service. It also highlights the purpose of a cost-effectiveness analysis. Section 4 describes cost-effectiveness in relation to hygiene promotion interventions. In Section 5, a proposed hygiene promotion effectiveness ladder is introduced. Finally, Section 6 sets out the next steps for hygiene cost-effectiveness studies. The Annex introduces three flowcharts to be used to allocate hygiene effectiveness to various levels on the proposed hygiene promotion effectiveness ladder.

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<sup>1</sup> Both are working documents of the WASHCost team, aimed at providing a framework for data analysis to be used and tested within the WASHCost programme to help refine the evolution of the WASHCost thinking and approach. Feedback and comments on these, and this paper, are sought from interested readers.

## 2 Why is hygiene important for water and sanitation services?

Many water and sanitation-related diseases can be avoided by adopting specific key hygiene behaviours. This section looks at why considering hygiene behaviour and provision is vitally important as a component of water and sanitation service delivery.

### 2.1 Typology of water-related diseases

Sustainable water and sanitation services are crucial to improving livelihoods and public health, but unless these services are used effectively and hygienically, the benefits will be dramatically undermined. The importance of hygiene in WASH services becomes clear in the context of routes and barriers to WASH-related disease transmission.

A seminal study by White, Bradley and White (1972) provides insight into the transmission routes of various water-related diseases. Cairncross and Valdmanis (2006) adapted this classification to incorporate specific disease groups rather than just transmission routes. This adapted version is displayed in table 1.

**Table 1** Transmission routes of various water-related diseases

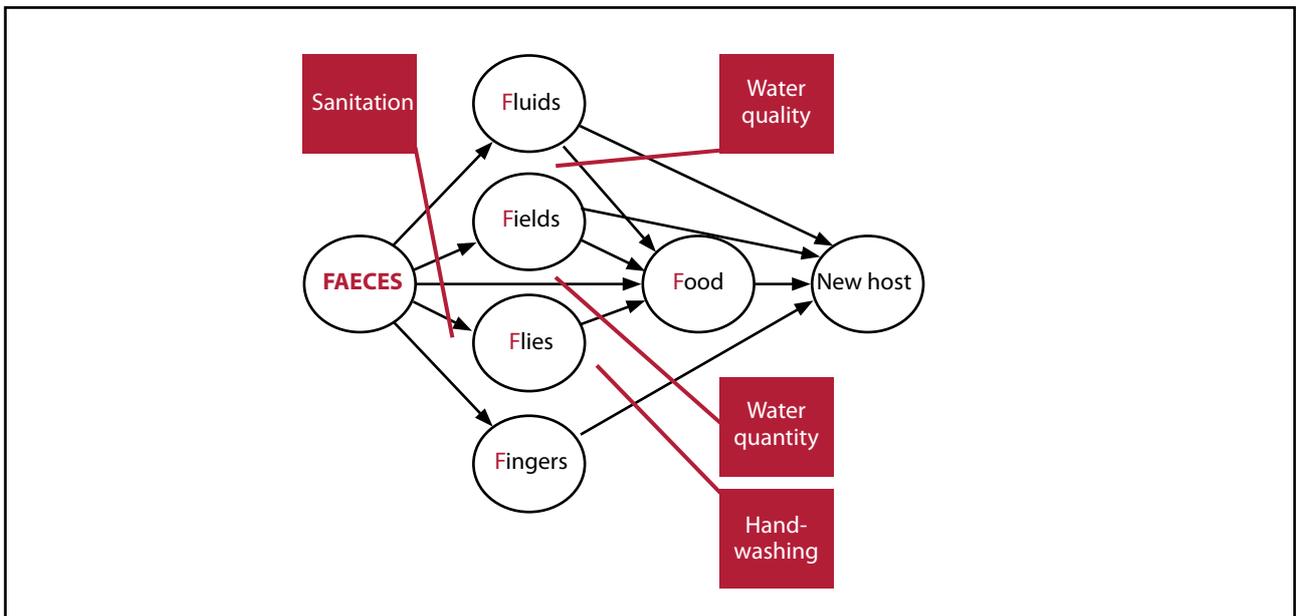
Transmission route	Description	Disease group	Examples
Waterborne	The pathogen is in water that is ingested	Faeco-oral	Diarrhoeal disease, dysenteries, typhoid fever
Water-washed (or water scarce)	Person-to-person transmission because of lack of water for hygiene	Skin and eye infections	Scabies, trachoma
Water-based	Transmission via an aquatic intermediate host (for example a snail)	Water based	Schistosomiasis, guinea worm
Water related insect vector	Transmission by insects that breed in water or bite near water	Water related insect vector	Dengue, malaria, trypanosomiasis

Source: Cairncross and Valdmanis, 2006.

Cairncross and Valdmanis (2006) note that almost all waterborne infections transmitted faeco-orally can be transmitted through other routes as well, such as by contamination of fingers, food, crops and flies, which are all 'water-washed' routes. Improving the quality of water for consumption will only affect the transmission of diseases which are transmitted through the waterborne route. The spread of water-washed diseases can be contained by improved sanitation and hygiene. Improved hygiene requires improvements in the quantity and quality of water available.

Figure 1 (see next page) display the classic F-diagram which details the various routes of transmission and the interventions which block them. The transmission routes in table 1 are schematically presented by the arrows which move from infected faeces towards a new host. The interventions that block these routes are represented by the four red boxes. The lines extending from the boxes show which transmission routes are blocked by which intervention.

**Figure 1** The F-diagram for transmission of faecal-oral diseases



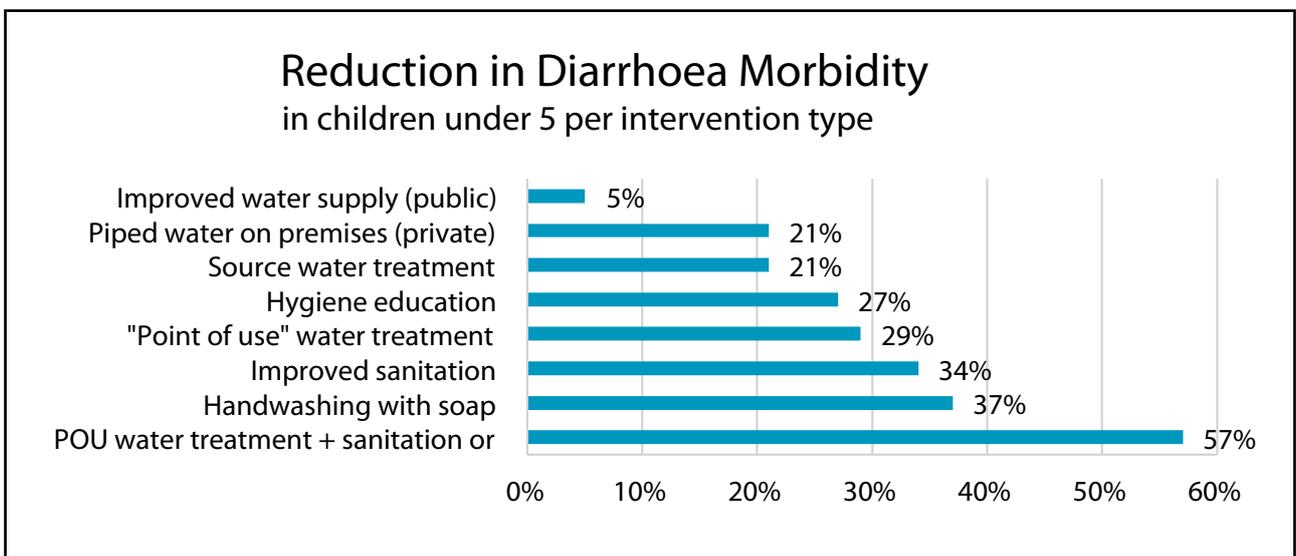
Source: Wagner and Lanoix, 1958.

It is clear that access to adequate quantities of water for hygiene purposes and the availability of safe and hygienic means of excreta disposal will only have the desired effect of improving quality of life by reducing the burden of disease when these facilities are used appropriately and hygienically (Boot and Cairncross, 1993).

## 2.2 The effect of WASH interventions on health

The primary aim of hygiene promotion interventions in WASH is to improve health. The findings of a meta-analysis of recent studies and reviews of the linkages between hygiene and diarrhoea in children under five are summarised in Figure 2 below.

**Figure 2** Effectiveness [%] of WASH interventions to reduce diarrhoea morbidity in children under 5



Source: 3IE, 2009.

Figure 2 shows that hygiene education is equally as effective as point-of-use water treatment and five times more effective than improved water supply at reducing diarrhoeal morbidity in children under five. The 3IE study illustrates the strength of combining hygiene promotion with water and sanitation service provision.

Evidence from a number of studies suggests that hygiene programmes need to be an integral part of water supply and/or sanitation interventions to achieve behaviour change. They claim that the success of hygiene interventions is largely influenced by the presence of sanitation and water facilities and that without facilities, hygienic behaviours do not improve (WaterAid Uganda, 2003). This shows that the importance of hygiene as an intervention to reduce childhood disease, but also stresses the importance of having complementary water and sanitation facilities if the intervention is going to be successful.

### 3 Is hygiene promotion a service or an intervention?

Water and sanitation services need to be hygienically used and managed for users to realise the health and livelihood benefits of these services. A range of approaches, methodologies and tools have been developed and used by the water, sanitation and hygiene (WASH) sector to facilitate and support users to manage and use water and sanitation services and installations more hygienically. Specifically, it is useful to differentiate between hygiene services, interventions and promotion, as follows.

**Hygiene promotion** is defined in this paper as: "...the planned approach to preventing diarrhoeal and other water and sanitation related diseases through the widespread adoption of safe hygiene practices" (Curtis and Kanki, 1998: p. 10).

The WSP-SA (2000) describes this in more detail: "Hygiene promotion includes strategies that encourage or facilitate a process whereby people assess, make considered choices, demand, effect, and sustain hygienic and healthy behaviours. This would encompass personal, domestic, and environmental hygiene practices and any action or initiative taken to erect barriers to disease".

**Hygiene service** can be seen as a public or environmental health function and therefore a 'service' undertaken by public or environmental health departments or service providers. A service, contrary to an intervention, is not restricted to a particular time frame or project cycle.

**Hygiene promotion interventions** are project cycle-based activities aimed at changing hygiene behaviours in targeted populations within a particular time frame. Hygiene promotion interventions in WASH typically aim to contribute to improved health. A range of approaches, methodologies and tools have been developed and used by the WASH sector to facilitate and support users to manage and use water and sanitation services more hygienically. Ideally hygiene promotion should be seen as a public or environmental health function and therefore as a 'service' either undertaken by public or environmental health departments or by the sanitation provider or utility. However, in reality, water and/or sanitation infrastructure related hygiene promotion is usually an 'intervention' that happens in a project cycle. Unfortunately, as Shordt (2003) noted: "...single interventions or treatments that are not supported by follow up and education may have limited results and not lead to sustainable health improvement". In addressing hygiene service provision, it is central to the concept of this paper that different levels can be identified.

So, within the context of a 'service', a graduated typology of hygiene services could be described as follows:

**Ideal:** Environmental or public health-driven hygiene promotion integrated/linked to water and sanitation infrastructure development promotion activities.

**Basic:** Adequate water and sanitation infrastructure-related hygiene promotion interventions.

**Unimproved:** Inadequate water and sanitation infrastructure-related hygiene promotion.

However, it would be beyond the realistic scope of WASHCost research to collect cost and service level data for the full range of hygiene services in any focus country; it is therefore necessary to concentrate data collection on WASH-related hygiene promotion interventions. WASHCost will cost selected hygiene interventions that are believed to be successful and where there is cost data available. This study seeks to cost successful hygiene promotion interventions to provide hitherto unknown insights into the true costs of an effective and sustainable intervention.

The use of the term 'adequate' as a criterion for a basic hygiene service begs the question 'what is adequate'? Little has been done to draw together disparate claims with respect to different approaches and effective, sustainable hygiene behaviour change interventions. Indeed, no widely accepted benchmarks currently exist in the sector. WASHCost seeks to address this by developing the hygiene cost-effectiveness ladder and assessment tools.

## 4 Hygiene promotion interventions: cost-effectiveness

Developing a credible evidence base on the cost-effectiveness of hygiene promotion is important to advocate for continued and improved investment in hygiene promotion, and for strengthening knowledge in the sector on the kinds of interventions that are effective.

The potential impact of the cost-effectiveness studies to date has been diluted by the use of different methodologies, indicators and approaches. Little has been done to synthesise and pull together common indicators and findings to generate a broad evidence base, or to conduct multi-country studies using consistent or comparable indicators and methodologies. While studies of hygiene services will be the focus of specific research in the final year of the WASHCost project, research on the cost-effectiveness of hygiene promotion interventions in Ghana, Burkina Faso, Mozambique and Andra Pradesh India will contribute to sector knowledge on the effectiveness of these interventions.

Economic evaluations of infrastructure-related aspects of water supply and sanitation interventions (hardware) have been undertaken frequently, for instance by Hutton and Haller (2004), but evaluations of the social and institutional aspects of water and sanitation improvement and hygiene promotion interventions (software) are far less common. A possible explanation for this might be the relative ease with which cost information on hardware components can be gathered compared with determining the costs of software components.

A recent cost analysis carried out by the WASHCost team in Mozambique provided a first step towards assessing the value for money of hygiene promotion interventions (Reep, 2010). However this earlier study limited itself to an analysis of costs. WASHCost is currently in the process of collecting data for another study that expands on the previous cost analysis by also assessing the intervention's effectiveness. The geographical scope of this study will also include research on hygiene promotion interventions in Burkina Faso, Ghana, Mozambique and Andra Pradesh, India.

Activities that fall within this definition are not only carried out to promote good hygiene behaviours, but also as a means of creating demand for other WASH services. It can be debated whether the main purpose of hygiene promotion is disease prevention or demand creation, but as both are required to achieve safe hygiene practices and improved public health, the differentiation is unnecessary.

In a cost analysis it is difficult to differentiate activities and costs associated with demand creation for hygiene-related hardware such as latrines and hand-washing facilities, and those activities related to hygiene promotion for behavioural change. Creating demand for improved water and sanitation also contributes to the prevention of water-related diseases, regardless of the primary motivation of those carrying out the activity. Demand creation is therefore included as part of hygiene promotion in this approach to analysing the costs and effectiveness of hygiene promotion interventions.

Comparisons of costs to, and effects on, all stakeholders and approaches in various countries can be made at various levels:

1. Within a single country assessing one approach (intervention) to hygiene promotion:  
Comparing the behavioural outcomes and costs before and after an intervention and comparing these to the alternative of not having an intervention will enable conclusions to be drawn about the intervention's cost-effectiveness

2. Within a single country assessing two (or more) different approaches to hygiene promotion:  
Comparing the costs and effects of different approaches to hygiene promotion within a single country<sup>2</sup>
3. Comparison of costs and outcomes of one or various approaches to hygiene promotion interventions across two or more countries<sup>3</sup>.

## 4.1 Costs of hygiene promotion interventions

**Life-cycle costs** are defined as: "...the aggregate costs of ensuring delivery of equitable and effective hygiene interventions to a population in a specific area" (Fonseca, et al., 2011). This means that all costs incurred during the start-up, implementation and maintenance phases of hygiene promotion interventions are included in the analysis.

Costs are incurred at various stages and by various stakeholders before, during and after completion of the intervention. It is important to try and capture all the costs of all the stakeholders at these various stages. Note that costs in this context may refer to financial costs, i.e. monetary investments, or economic costs such as time spent on hygiene promotion activities by community members within the target population. This analysis will be conducted over three stages: at the baseline, during the intervention and after the intervention. The activities undertaken in each stage are:

### Baseline:

Given that there will most likely have been hygiene promotion activities before the current intervention, it is important to try and capture the costs of these previous activities, although this may not be easy. However, even a qualitative assessment of previous hygiene promotion activities may help explain variations in baseline hygiene behaviour as well as pointing to the ultimate effectiveness of new interventions. It is also important at this stage to capture both the financial (monetary) and economic (including value-of-time) costs incurred at household level in attaining the current level of hygiene service. These costs will be compared with those found during and after the intervention to track behaviour changes.

### During the intervention:

There are two broad categories of costs incurred during a hygiene intervention: those incurred by the organisation undertaking the intervention and those incurred by the household. Taken together these can be termed the costs of behavioural change.

The costs associated with the intervention will be determined through a three-step approach, after Drummond, et al. (2005: pp. 89-90):

1. Identify all resource categories associated with the intervention that is being analysed
2. Quantify the use of the identified resource categories
3. Value the resources associated with the intervention.

This provides a structured way to capture the financial costs of labour and material associated with the intervention. Using this three-step approach means that the total cost of an intervention is equal to the sum of all the resources used multiplied by their unit costs.

The costs to the household of taking part in the intervention include economic and financial elements, in that they require a commitment of time. Such values are not easily quantified and require an assessment of what other productive activities have been forgone to take part in the intervention. Of course, the financial costs incurred by the household in taking part in the intervention should also be quantified.

<sup>2</sup> Any conclusion about differences in efficacy between approaches needs to be viewed in the context of their implementation; when target groups are not similar on other variables, the differences may have other causes.

<sup>3</sup> Note: same as under point 2.

**After the intervention:**

Sustaining behavioural change will also have a cost. In the case of the target population this will typically include increased expenditure on soap and water. In the ideal situation of a fully integrated hygiene service, as described on page 11, service providers will also incur costs during this 'maintenance' phase. These include the costs of maintaining a certain service level of hygiene behaviour. In reality, once contracts are closed, service providers do not often incur costs beyond the end of a single project cycle.

## 4.2 Effectiveness of hygiene promotion interventions

Given that the ultimate aim of hygiene promotion interventions is to reduce morbidity and mortality, it seems logical to assess their effectiveness in terms of their impact on these two factors.

However, evidence to assess the health impacts of hygiene promotion interventions is derived from Randomised Controlled Trials (RCT's) and hygiene promotion cannot be easily randomised. Furthermore, it is not possible to control all other variables in the target population, such as 'competing' interventions, e.g. vaccination or malaria prevention campaigns.

Fortunately, the causal link between hygiene behaviour change and its impact on morbidity and mortality is already well established, as described in section 2.1. It therefore makes sense to assess the efficacy of hygiene promotion by quantifying the outcome of the intervention, namely behavioural change, or key hygiene behaviours in the target population.

The key indicators of hygiene behaviour are aligned with the three main hygiene behaviours known to have the greatest positive impact on individual health, as suggested by Hernandez and Tobias (2010), based on a thorough review of confluence in the existing literature. These indicators are:

- Faecal containment and the use of a latrine
- Hand washing with soap or substitute at critical moments, particularly after defecation and before preparing food
- Safe water-source and management at household level.

These indicators will be used to assess the effectiveness of hygiene interventions in the WASHCost focus countries. Variables within each indicator relate to a spectrum of levels ranging from no service to highly improved. In order to populate these service levels, variables such as the frequency and inclusivity of household use of latrines and soap are measured. This aims to capture more nuanced behavioural changes as a result of each intervention. The composition and construction of the service ladders are set out in the next section.

## 5 Levels of hygiene effectiveness

Building on existing literature on hygiene behaviour change indicators (e.g. Water Supply & Sanitation Collaborative Council, the United States Agency for International Development's Hygiene Improvement Project, and many others), the proposed levels of hygiene effectiveness are set out in table 2 below. It should be noted that the entire hygiene effectiveness ladder is consistent with the 'basic' service level described in Section 3, i.e. 'Adequate water and sanitation infrastructure-related hygiene promotion'. The ideal situation of environmental or public health-driven hygiene promotion integrated with or linked to water and sanitation infrastructure development is deliberately omitted from the current hygiene effectiveness ladder in recognition of the reality that this level of service is not found in any of the WASHCost focus countries.

The three flowcharts attached as Annex 1 to this paper are the proposed decision-making tools used to populate the effectiveness levels. As indicated in Section 1.1, the methodology for using these flowcharts will be elaborated in a forthcoming WASHCost Briefing Note *Methodology for assessing hygiene cost-effectiveness*.

**Table 2** Hygiene effectiveness ladder

Effective-ness levels	Faecal containment and latrine use	Hand washing with soap/ substitute	Drinking water source and management
Highly improved	<ul style="list-style-type: none"> <li>- All household members use a latrine all the time</li> <li>- The latrine used separates users from faecal waste</li> </ul>	<ul style="list-style-type: none"> <li>- Washing station in the household supplied by a household tap providing adequate water</li> <li>- Soap or substitute available and used at critical times</li> </ul>	<ul style="list-style-type: none"> <li>- Protected water sources always used</li> <li>- Collection vessel (if necessary) is regularly cleaned with soap or substitute</li> <li>- Water storage vessel (if necessary) is covered</li> <li>- Water is drawn in a safe manner</li> </ul>
Improved	<ul style="list-style-type: none"> <li>- All household members use a latrine most of the time.</li> <li>- The latrine used separates users from faecal waste</li> <li>- When there is no access to a latrine, faeces are generally buried</li> </ul>		<ul style="list-style-type: none"> <li>- Protected water sources always used</li> <li>- Collection vessel (if necessary) is regularly cleaned with ash or soap</li> <li>- Water storage vessel (if necessary) is covered</li> <li>- Water is not drawn in a safe manner</li> </ul>
Basic	<ul style="list-style-type: none"> <li>- All or some household members use a latrine some or most of the time</li> <li>- When there is no access to a latrine, faeces are generally buried.</li> <li>- The latrine separates users from faecal waste</li> </ul>	<ul style="list-style-type: none"> <li>- Household or compound has a washing station with safe water storage</li> <li>- Soap or substitute available and used at critical times</li> </ul>	<ul style="list-style-type: none"> <li>- Protected water sources always used</li> <li>- Collection vessel (if necessary) is regularly cleaned with soap or substitute</li> <li>- Water storage vessel (if necessary) is uncovered</li> <li>AND/OR</li> <li>- Water is not drawn in a safe manner</li> </ul>
Limited	<ul style="list-style-type: none"> <li>- The latrine does not provide adequate faecal separation</li> <li>AND/OR</li> <li>- All/some family members generally do not bury faeces when not using a latrine</li> <li>AND/OR</li> <li>- All family members practice burying faeces</li> </ul>	<ul style="list-style-type: none"> <li>- Household or compound has a washing station with unprotected water storage</li> <li>AND/OR</li> <li>- No soap or substitute is available AND/OR is not used for hand washing</li> </ul>	<ul style="list-style-type: none"> <li>- Protected drinking water sources are not always used</li> <li>AND/OR</li> <li>- Collection vessel is not cleaned</li> </ul>
None	Open defecation	Household members have no specific place to wash their hands and usually do not wash their hands after defecation	Unsafe sources mostly/always used to collect drinking water

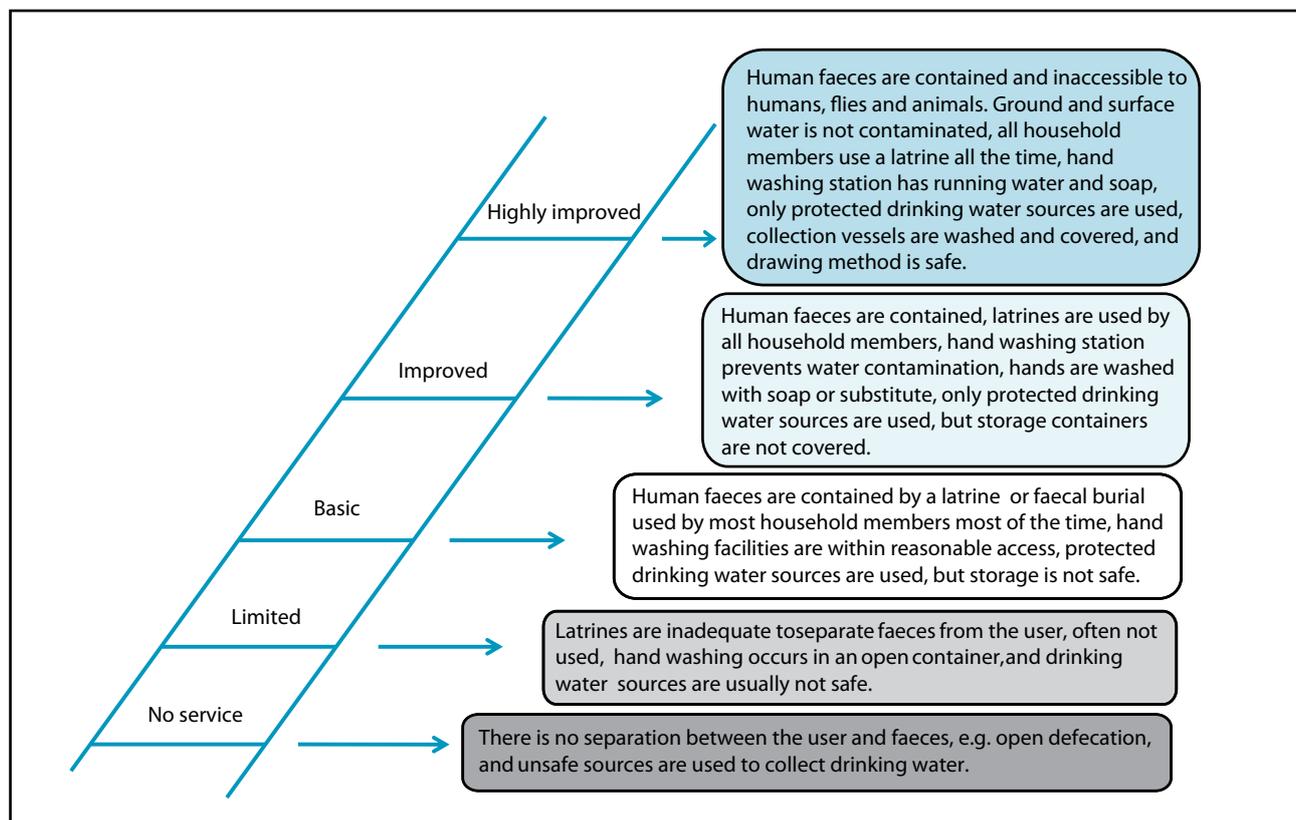
## 6 Summary and next steps

This working paper has reviewed the importance of hygiene promotion in the context of water and sanitation services, and within the broader context of public health. It has explored the concept of hygiene promotion as a service and provided a rationale for assessing the cost-effectiveness of hygiene promotion interventions linked to water and sanitation infrastructure development.

A hygiene effectiveness ladder has been proposed based on three key indicators:

- Use of sanitary facilities for the disposal and containment of human excreta
- Hand washing with soap or substitute at critical times, i.e. after defecation and before preparing food
- Use of improved water supply services, systems and methods for the effective treatment, safe storage and drawing of drinking water in the household.

**Figure 3** Summarised hygiene effectiveness ladder



The paper has also argued that hygiene promotion will be more likely to result in sustainable behaviour change if it is an ongoing, integrated service. Hygiene promotion can be seen as a public or environmental health function and therefore as a 'service' undertaken either by public or environmental health departments, or by the sanitation provider or utility. However, water and/or sanitation infrastructure-related hygiene promotion is usually an 'intervention' that happens in project cycles.

Although hygiene promotion interventions are conceptually part of broader public and environmental health services, they are rarely planned, managed and/or implemented in an integrated manner. Improved integration of water and

sanitation-related hygiene promotion interventions within a framework of broader public and environmental health services will strengthen the overall impact of WASH services.

Where possible, WASHCost will develop case studies on water and sanitation-related hygiene services such as those delivered through schools, mass campaigns or other programmes such as HIV/AIDS prevention and awareness initiatives. In order to understand hygiene as an integrated public health service, these case studies will need to look beyond the current focus countries where better developed district health services can be found.

While district health services are developing in many countries as part of health and water and sanitation sector reform processes, there are practical steps that both WASH and public health sector actors can take to strengthen coordination and linkages towards more effective, integrated hygiene service delivery.

It is recommended that hygiene promotion planners and implementers improve linkages with local health district, primary health care or public health services, and:

- Share and validate baseline study findings
- Identify common objectives
- Identify respective roles and responsibilities for training, facilitation, implementation, monitoring, support and follow-up
- Ensure health messages are consistent, complementary and clear
- Feed hygiene promotion monitoring and evaluation (M&E) information to local public or environmental health service departments
- Provide specific information regarding follow up, monitoring and support.

Following the World Bank (2003: p. 3) and others, it is also recommended that the public health sector:

- “Work with agencies that plan, develop and manage water resources and basic water and sanitation services to advocate and promote these investments, and ensure that activities to promote hand washing, safe disposal of faeces and continuous use and cleanliness of sanitation facilities are included
- Work with the agency responsible for monitoring water quality and sanitation to help ensure that this monitoring is carried out
- Provide other sectors with reliable data on water associated diseases and effectiveness of interventions to facilitate better decisions with respect to water and sanitation projects
- Provide leadership for action in hygiene education, including building coalitions with private sector agencies to achieve better results, and
- Design, implement, and monitor hygiene education and promotion components of water supply and sanitation”.

In order to test and refine hygiene cost-effectiveness approaches and methodology, WASHCost focus countries will identify country-specific sub-indicators under each composite indicator, and the means for their calculation based on data that can realistically be collected through in-country research. The methodology and tools set out in this paper are currently being tested in WASHCost focus countries and a detailed methodology and findings will be published in a Briefing Note in 2012.

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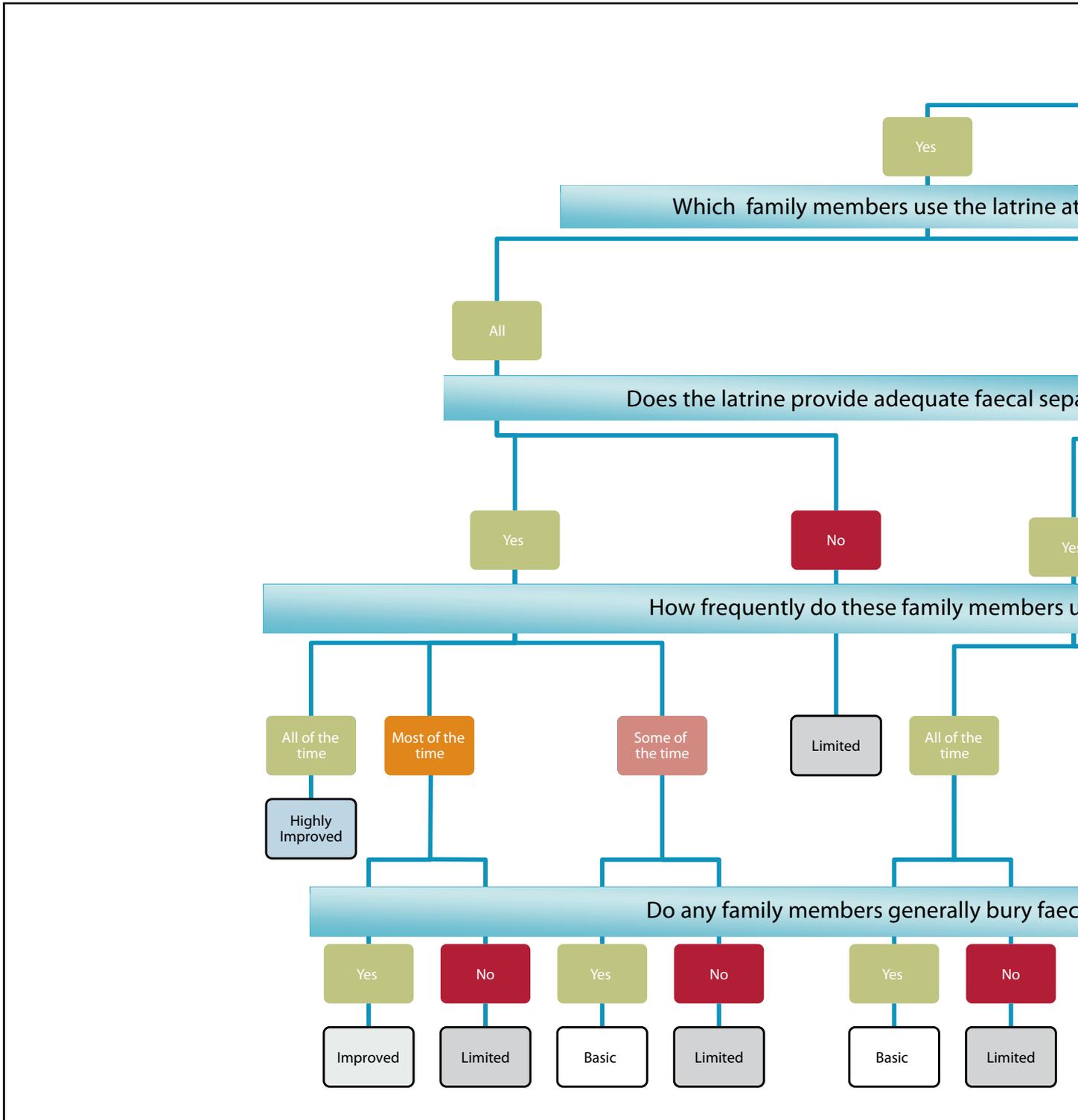
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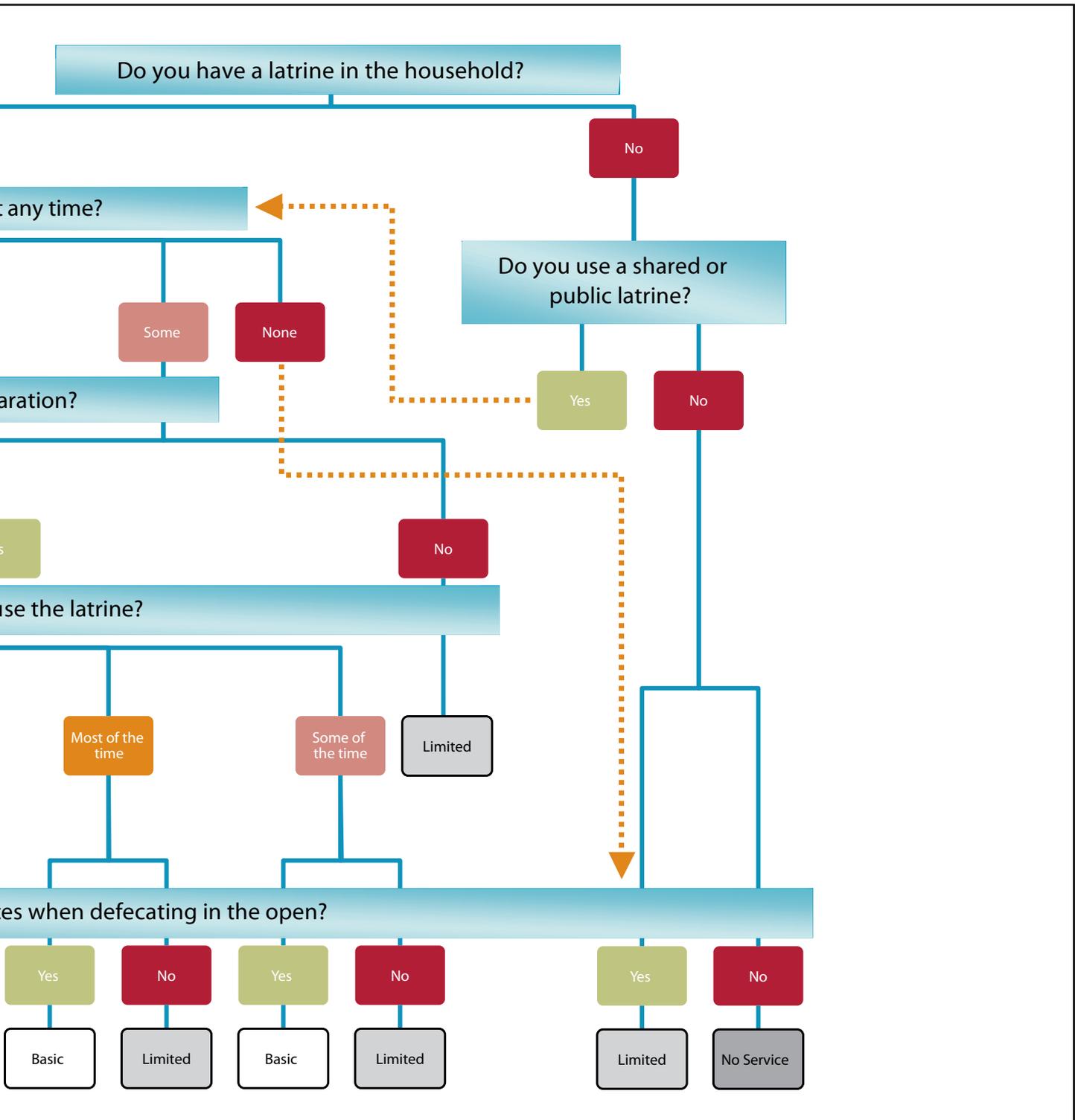
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# Annexes

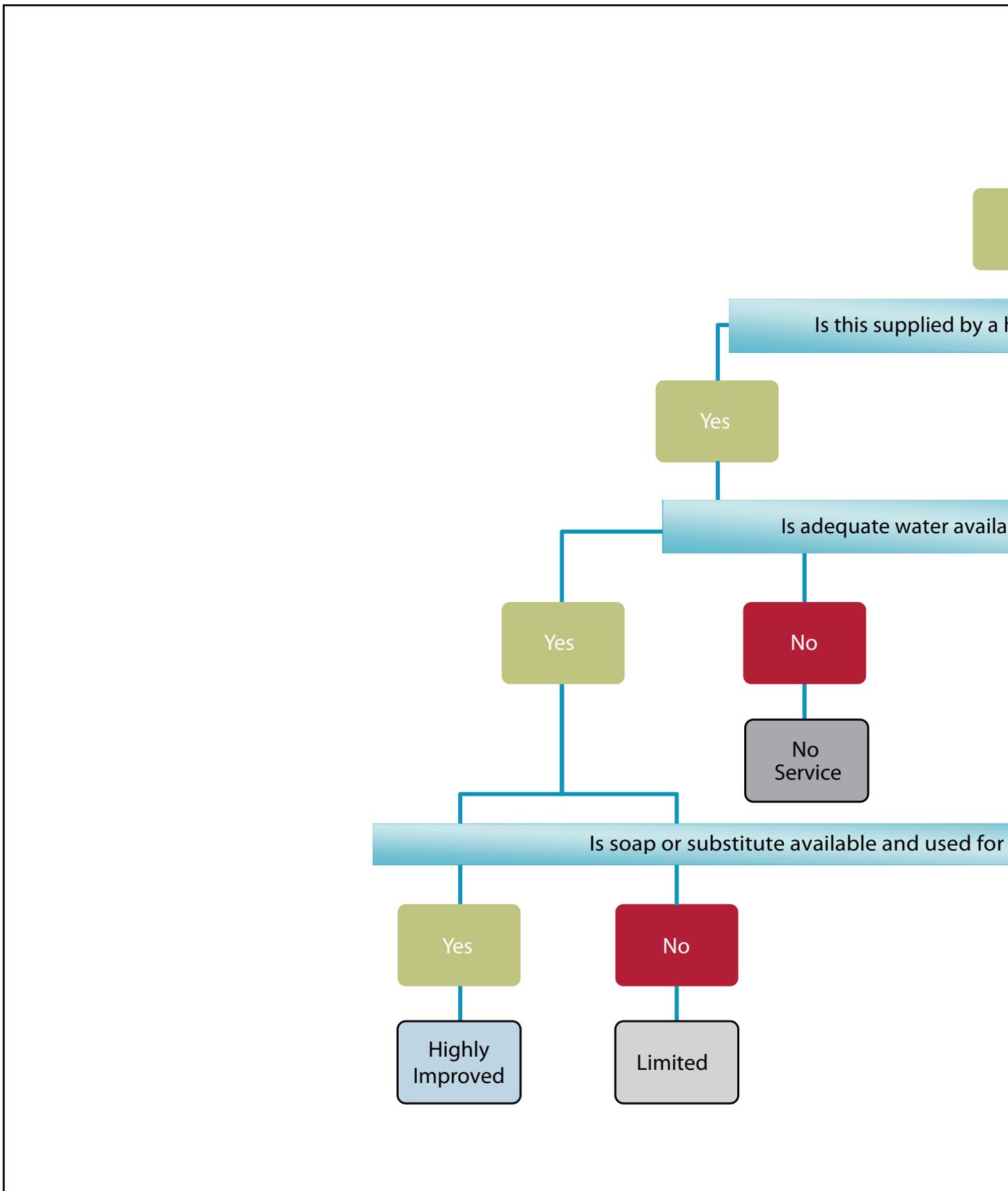
## Annex 1: Hygiene promotion effectiveness flowcharts

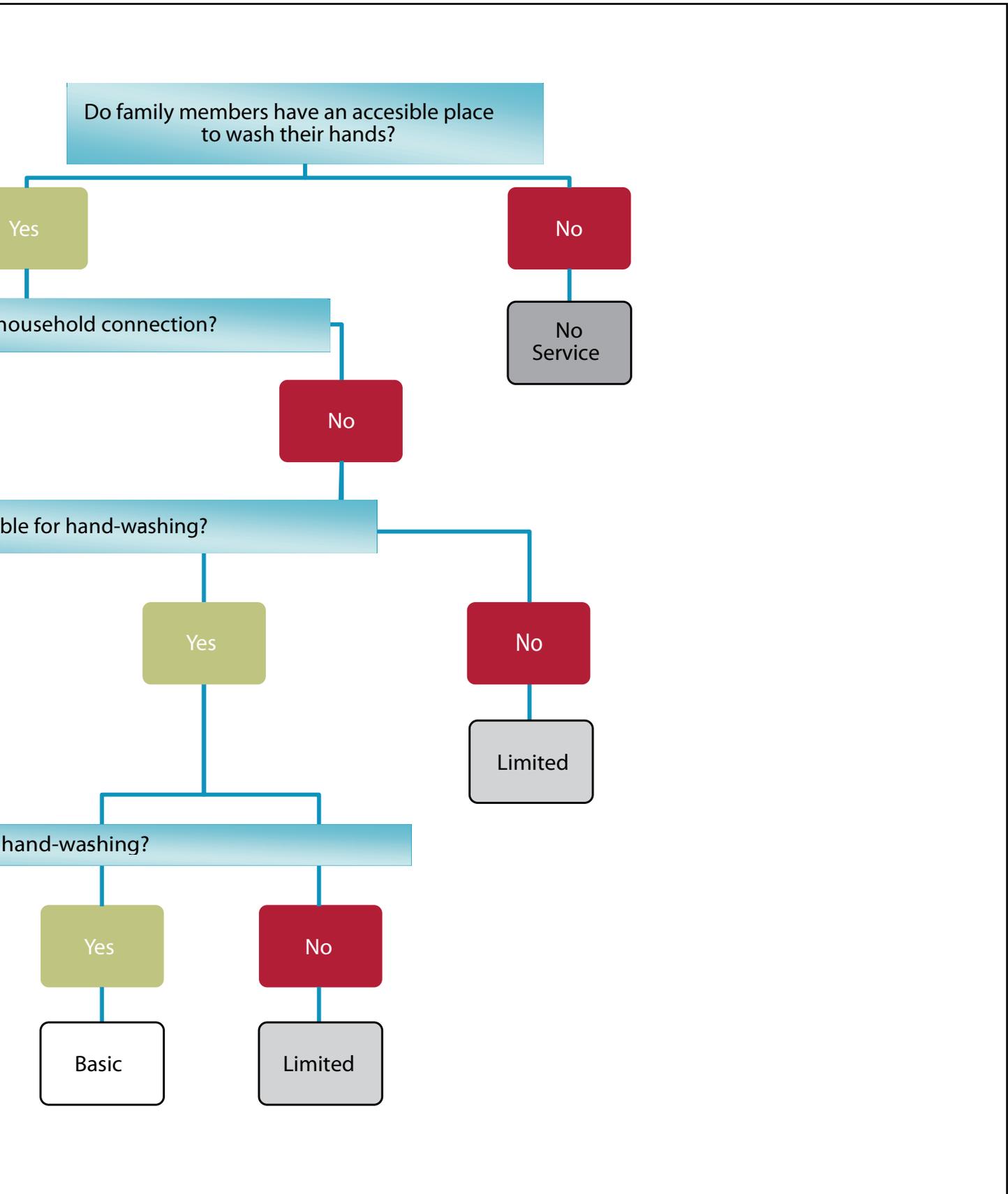
Indicator 1: Faecal containment and latrine use





Indicator 2: Hand washing with soap or substitute





Indicator 3: Drinking water source and management

