

The value of Hygiene Promotion

Cost-effectiveness analysis of hygiene promotion interventions

Background report for WELL Briefing Note 14
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Summary

The focus of this study is the assessment of the cost-effectiveness of hygiene promotion methods. Its objective is to review the existing methodologies for measuring the cost and effectiveness of hygiene promotion approaches and to identify strengths and weaknesses in order to learn from sector experiences and indicate directions for future development.

The study consists of two parts: a literature review and a field investigation. Through the literature review, an overview was made of which CEAs have been undertaken in the water and sanitation sector, which aspects of water supply, sanitation and hygiene were evaluated, what results were found and what methods the researchers used for their investigations. The field study was done in Kenya and looked at the experiences of project managers with CEA and their interests in including CEAs in their projects/programmes.

Several sector studies included in the literature review indicate that hygiene promotion is more cost-effective than other water and sanitation interventions. This effectiveness is greatest in combination with improved and affordable and accepted water and sanitation services. This study therefore recommends to give more priority to hygiene promotion as a separate component in a water and/or sanitation programme or as a project or programme on its own.

The hygiene promotion programme studies that were covered by the literature review and the field investigation often focus on the inputs and the outputs of a programme. Not one study looked at the full range of input, processes, outputs, effectiveness and impacts. Cost-effectiveness has only been measured in four cases according to the literature review and none according to the field investigation.

The study recommends that CEA becomes part of every project proposal and every project evaluation. By doing so, hygiene promotion methods can be compared in terms of cost-effectiveness and the most cost-effective hygiene promotion methods can be retained and replicated by the sector. In this way, CEA can ensure that the developing world gets the best 'value for money' in its efforts to achieve the MDGs.

The methodologies used for the CEAs in the projects mentioned in this study have been developed on an *ad hoc* basis. The importance of CEA studies calls for a clear, simple and sound methodology that can be used at project and programme level and whose results can be accepted and validated by the sector. The development of such a methodology is urgently needed, and is under development under the WELL programme.

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1. Introduction

1.1 Background

1.1.1 Millennium Development Goals

The Millennium Development Goals (MDGs) were agreed to by the international community at the UN Summit of 2000. For the water and sanitation sector the MDGs were defined as follows: halving 'by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation'. A total of 147 heads of State and Government and 189 nations committed themselves to these goals, to be reached by 2015. As this target date for the MDGs approaches, the need to monitor progress toward achieving them has been widely acknowledged and numerous initiatives are under way.

Billions of dollars have been spent in the developing countries for improving community water supply and sanitation. Investments are huge, yet it is little known whether the resulting installations also result in *effective use*. Only when the poor not only have facilities, but also *use them effectively* do such investments have an impact – access alone is not enough (Boot & Cairncross, 1993).

Water and sanitation related infectious diseases still belong to the most prevalent causes of disease and death in developing countries. This makes it imperative to investigate whether the investments do indeed result in the expected use and improvements of hygiene, and in consequence have a positive impact on the lives of the poor and the national public health in terms of lower morbidity and mortality.

The budgets of national governments and donor agencies are not sufficient to meet all needs. Therefore it is essential that the available budget achieves maximum impacts at the lowest cost. For this reason, not only the *effectiveness* of water and sanitation interventions should be monitored, but also the *cost-effectiveness* of water and sanitation interventions is extremely important.

1.1.2 Definition of Cost-Effectiveness Analysis

Cost-effectiveness is defined as the cost, in monetary terms, of producing a unit of effect, such as reduction in the number of diarrhoea cases, through some intervention, such as a hygiene programme (Varley et al. 1997). A *cost-effectiveness analysis* provides answers to the following questions: Did the expenditures and investments in the water and sanitation sector achieve their intended results? If so, did these results lead to the desired impact? What was the real cost of the investment made? Was the impact achieved at the lowest possible costs? It allows programme managers, governments, donors and researchers to compare programme costs with programme performance. A programme may, for example, spend US\$ 10,000 on interventions and reduce the number of diarrhoeal cases from 10,000 to 8,000. The cost-effectiveness of this programme is then expressed as US\$ 5 per case of diarrhoea averted. Costs do not just relate to investments made by external donors, but also by national and local governments and not in the least, the households who are the intended beneficiaries of an intervention.

In this study, *effectiveness* is defined as change in conditions and behaviour resulting from a hygiene promotion programme in the field. The result that a hygiene promotion has for health is here defined as *impact*. *Efficiency* is a term which further qualifies the effectiveness. Efficient projects reach their targets at lowest cost in the shortest time (Shordt, 2000).

1.1.3 Purpose of the study

The focus of this study is the assessment of the cost-effectiveness of hygiene promotion methods as part of, or in addition to investment programmes and projects for water supply, sanitation and/or health and hygiene. The study does *not* compare the cost-effectiveness of hygiene promotion interventions in comparison with interventions in other sectors, such as primary health care or immunisation.

The objectives of this study are to review the existing methodologies for measuring the cost and effectiveness of hygiene promotion approaches and to identify strengths and weaknesses in order to learn from sector experiences and indicate directions for future development.

1.1.4 Structure of the study

The study consists of two parts: a literature review and a field investigation. Through the literature review, carried out by IRC, an overview was made of which CEAs have been undertaken in the water and sanitation sector, which aspects of water supply, sanitation and hygiene were evaluated, what results were found and what methods the researchers used for their investigations. The field study was done in Kenya by NETWAS and looked at the experiences of project managers with CEA and their interests in including CEAs in their projects/programmes. The findings of both studies are reported and analysed and result in recommendations on whether and how CEAs link to sector investment programmes.

2. Measuring cost-effectiveness using DALY

2.1 Definition and use of Disability-Adjusted Life Years (DALY)

When a programme's performance is to be expressed in terms of reductions in morbidity and mortality figures, as is often the goal of a hygiene promotion programme, the programme's effectiveness is often expressed as the amount in US\$, spent per case of illness averted, death averted and averted disability-adjusted life year (DALY).

The concept of the DALY (Disability-adjusted Life Year) was introduced by Murray and Lopes (1996) in their Global Burden of Disease Study to estimate the relative importance of different diseases. The concept combines the burden from death and disability in a single index. Among the leading causes of lost DALYs worldwide in 1990, diarrhoeal diseases ranked second with 99.6 millions of DALYs lost.

DALY estimations are widely used to determine the cost-effectiveness of a health sector intervention. They permit the comparison of the burden from water, sanitation, and hygiene with the burden from other risk factors or diseases. The WHO estimates that an intervention is cost-effective when it costs less than US\$ 25 per DALY saved. The World Bank (1993) suggests a cut-off ceiling for cost-effectiveness at US\$ 150 per DALY saved as the defining criterion for cost-effective interventions for child survival programmes.

2.2 Using DALYs in sector studies for assessing the cost-effectiveness of hygiene promotion

DALY measurements are excellent for comparing the impact of different diseases on the health of the world population. A CEA using DALY can be applied to show that interventions in a particular sector can be more beneficial than, or at least as beneficial as, interventions in other sectors. There are several examples where the DALY measurement is used *at sector level*. The three largest studies were selected because they compare similar issues and make reference to each other: Varley et al. (1998), Cairncross (2005) and Larsen (2004). In the section below, the findings from these three studies reviewed have been summarised.

The outcomes of all three studies strongly indicate that hygiene promotion is more cost-effective than other water and sanitation sector interventions and is as cost-effective as some of the most important child survival interventions used by the health sector.

These studies have proven that improved hygiene, keeping faecal matter away from hands, food and water in the domestic environment is a factor of equal importance as provision of water and sanitation facilities, if not more. Larsen (2004) suggested that one of the fundamental weaknesses of the programmes undertaken by various developing countries to attain the MDG is the tendency to give priority to water supply over sanitation and sanitation over hygiene. The above mentioned CEA studies can be used to support this statement.

All three studies suggest that the impact of hygiene promotion is larger and more cost-effective when water and sanitation facilities are in place. However, the conclusions of the three studies differ in the *degree* of cost-effectiveness. Cairncross gives the highest cost-effectiveness (US\$ 3.35/DALY), Varley the lowest (US\$ 20/DALY) and Larsen in-between (US\$ 15/DALY).

The main reason why the outcomes of the studies vary is that all used different sources for their data and all used average values from a large range of studies for costs and

effectiveness. The exact data needed for input in the DALY estimations are not always available and have to be estimated which decreases the accuracy of the cost-effectiveness figures resulting from it. The use of this method at programme level is therefore not recommended. A more appropriate method of CEA has to be applied as discussed in Section 3.

2.3. The limitations of DALY estimates

Most of the cost-effectiveness analysis studies of hygiene promotion that were found were carried out at a *global sector level*. A CEA using DALYs has its limitations for use at programme level. The following reasons explain this:

- DALY calculations require many data that may not be easily available at programme level, such as the mean duration of a diarrhoea episode, the number of episodes of diarrhoea per year, the case fatality rate and the mean age at onset;
- Formulae must be programmed in a spreadsheet or a calculator to calculate the YLL and YLD. There is no single calculation method which can be easily applied and whose data can be easily verified;
- Improved water supply, sanitation and hygiene offer a number of potential health impacts. For each of these impacts, such as a reduction of diarrhoeas, intestinal worms, eye and skin diseases, different data would have to be compiled.
- Non-health benefits, such time and energy saved for collecting water, a greater privacy, safety and convenience and reduction of poverty through the developmental use of water and time gains are not taken into consideration when calculating DALYs.

However, hygiene promotion programmes can always use the existing literature on sanitation and water related DALYs to indicate which benefits their interventions may have on the reduction of diarrhoeal diseases, if it can be demonstrated that the required hygiene conditions and practices have been realised.

3. Assessing the cost-effectiveness of hygiene promotion as part of programme studies

3.1 The framework

To have a better understanding of what has been analysed for hygiene promotion interventions, a framework was developed outlining various steps of the process of hygiene promotion (Fig. 1). Hygiene promotion inputs (I) are turned into processes (II). Processes lead to outputs (III) and effectiveness (IV). Effectiveness leads to impacts (V). Costs are compared with effectiveness to determine cost-effectiveness.

Inputs consist of *activities, materials and equipment* and *financial inputs*.

Processes describe the ways of working that projects and programmes follow. This is not necessarily the prescribed way of working.

Outputs are described in terms such as: number of sessions held, number of participants educated (men, women), number and types of materials produced, number of people trained and number of hygiene/sanitation facilities installed.

Effectiveness is a measure of the extent to which objectives are achieved. This can be expressed by the *quality of process* (an assessment by outsiders or with the user groups of how good these processes have been), *direct results* (often related to behaviour change) and *sustained results* (do interventions have to be implemented continuously, if their effect is to be sustained, or are such changes self-sustaining?).

Impact on health measures the effectiveness of a project or programme on the improvement of the health of the population and is mostly expressed in a reduced (or increased) occurrence of a particular or several diseases.

Cost-effectiveness compares costs with quality of process, direct results, sustained results and sometimes also impacts.

The shaded boxes in Figure 1 and in Table 1 indicate what steps in the process of hygiene promotion are not well measured by programme studies. They include materials and equipment, processes, quality of process, sustained results, impact and cost-effectiveness.

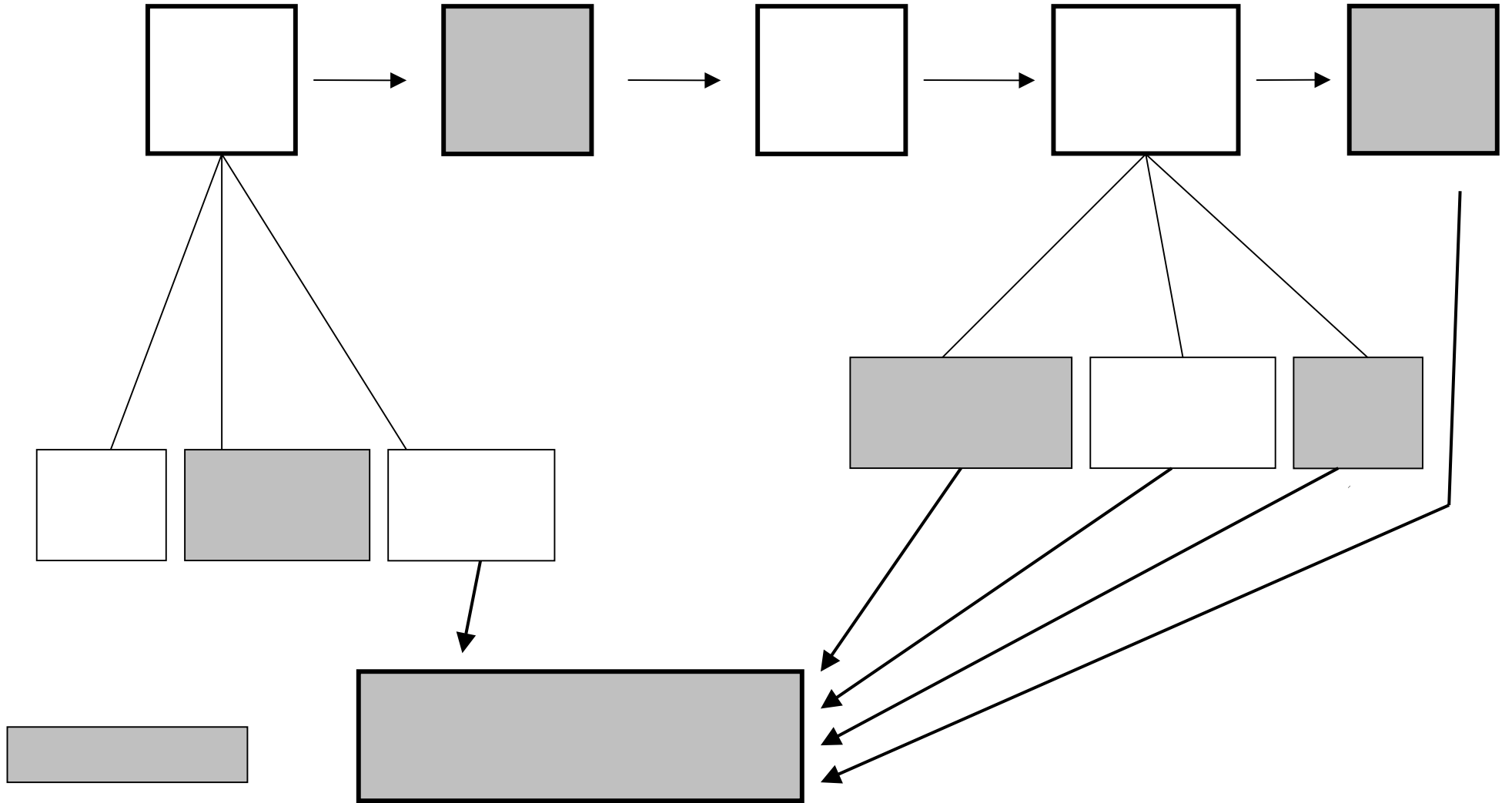


Table 1: Overview of data collected and analysed by programme evaluations and studies

Study	Inputs			Processes	Outputs	Effectiveness			Impacts (on health)	Cost-effectiveness
	Activities	Materials and equipment	Financial inputs (costs)			Quality of processes	Direct results	Sustained results		
Quick et al. (1999)	X				X		X		X	
Talukder S. H. et al. (2002)	X				X		X			
Aziz et al. (1990)	X	X	X		X		X		X	
Bamberger (2004)					X		X	X		
Shordt (2004)							X	X		
Maxwell Stamp (1999)			X				X			X
Borghini (2002) (on Saniya programme)	X		X				X			X
Brikké et al. (2000) (on Saniya programme)	X	X	X	X	X	X	X			X
Waterkeyn (2003)	X		X				X			X
Dieleman (1997)	X	X		X	X	X	X			
Phillips (1997)	X		X				X			X
van Wijk and Koutou(1995)	X	X	X		X	X	X	X		

X means 'collected'; blank means 'not collected'; shaded means 'often NOT measured'

3.2 Examples of programme cost-effectiveness studies (Ic + IV)

The present review sought examples of CEA methods applied at *programme* or *project* level to compare programme costs with effectiveness or health impacts. Only a limited number of examples were found by the literature review. They are summarised below. The field investigation in Kenya did not find any programme that measures cost-effectiveness. However, most of the programme managers interviewed expressed a keen interest in a clear, simple and sound methodology to measure cost-effectiveness.

3.2.1 Saniya programme in Burkina Faso

One of the few cases where cost-effective analysis data exist and have been documented objectively is the Saniya programme in urban Burkina Faso. Borghi et al. (2002) prepared an article on the cost-effectiveness of the programme.

To estimate the cost-effectiveness of the three-year Saniya hygiene promotion programme in Bobo-Dioulasso (population: 341,000), behaviour change associated with the prevention of diarrhoeal diseases, was measured. The programme's effects were estimated through a time-series method of observing 37 319 mothers. In particular, hand-washing with soap after cleaning a child's bottom rose from 13 to 31% and safe disposal of children's stools rose from 80% to 84%. Hand-washing with soap after latrine use by mothers increased from 1 to 17%. It was concluded that the programme changed the hygiene practices of 18.5% of mothers of young children and it was therefore seen as an effective programme.

Health impacts were not measured, but Borghi et al. (2002) uses the literature (six studies were considered) to estimate that the impact of hand washing with soap is likely to result in an average reduction in diarrhoea incidence of 42%. It was assumed that 10% of children with diarrhoea are taken to see a health agent and another 10% see a traditional practitioner. The assumption that 3.7 % of children with diarrhoeal disease require hospital admission was taken from a study in the same town in Burkina Faso (Soton, 1994). Based on a global review study (Bern et al. 1992) it was assumed that 1.21% of childhood diarrhoea case result in death. These figures, used in combination with the above mentioned result on increased hand washing by 18.5%, lead to the following estimates of the impact of the programme: 8638 cases of diarrhoea averted; 864 outpatients averted; 324 hospital referrals averted and 105 deaths averted.

Borghi's data show that the total cost to the provider of the three-year intervention was US\$ 292,000. That is converted to US\$ 0.65 US per head of population covered or US\$ 4.55 per 7-person household, after deducting the cost of the international research component. The significant proportion represented by overheads is illustrated by the fact that 63% of this total is composed of administration and undifferentiated start-up costs of the project. Most of the remaining costs were accounted for in roughly equal measure by house-to-house visits, discussions in health centres, hygiene lessons in schools, and street theatre presentations. The total costs of the programme of US\$ 292,000 divided over the 8638 cases of diarrhoea diverted results in a cost of 24 US\$ per case diverted. The programme could be replicated in other parts of Burkina Faso at less cost because the costs of action research can be a lot less (Unicef, 2000).

Additional costs were incurred by the 18.5% of households which complied, practising improved hygiene as a result of the programme, amounting to US\$ 7.3 per compliant household per annum. More than 90% of this was the cost of soap for hand washing.

On the other hand, on the basis of the observed increase in prevalence of hand washing with soap, the intervention was estimated to avert sufficient diarrhoea morbidity and mortality to save \$15 per compliant household per year in direct costs of medical care and indirect costs due to lost

productivity. Household savings per diarrhoea episode averted were estimated based on interviews with households and health workers. Figures on savings to the provider for each diarrhoea episode averted (treatment costs saved) were obtained from literature.

Cost-effectiveness of the study is not expressed in DALYs. Borghi *et al.* (1999) measure cost-effectiveness by stating costs per diarrhoeal episode averted, per outpatient visit averted, per hospital referral averted and per death averted. The study is concluded by mentioning that the programme has been cost-effective because it reduces the occurrence of childhood diarrhoea in Burkina Faso at less than 1% of the Ministry of Health budget and less than 2% of the household budget and could be replicated at lower costs.

3.2.2 ZimAHEAD in Zimbabwe

Waterkeyn (2003) describes the ZimAHEAD rural hygiene promotion programme and its costs and resulting behaviour change as evidenced by a number of spot observation indicators. In the two districts, Makoni and Gutu Districts, in which the Community Health Clubs approach was examined, it was successful in increasing the prevalence of hand washing with soap among the club members by 6% and 37% respectively, and reducing the prevalence of open defecation by 29% and 98% respectively. The marginal cost of the intervention, using existing health staff, was US\$ 4.00 per club member, or an average of US\$ 0.67 per member of an affected household. Including the salaries of these staff would roughly double the figure to about US\$ 1.40 per capita.

In a third district, Tsholotsho District, the proportion of households using a ladle to draw water increased from 3% to 93% and the proportion with an improved pit latrine from 40% to 80%, as well as improving other aspects of hygiene behaviour, at a cost of US\$ 3.33 per household (Waterkeyn 2003).

3.2.3 Hygiene education in Guatemala

Phillips *et al.* (1987) estimate a cost of US\$ 5.00 (in 1982 dollars) per mother educated in hygiene, based on a review of a hygiene education programme in Guatemala. Assuming that roughly one in ten members of the population are mothers of young children, this is equivalent to about US\$ 0.50 per capita. An average difference of 14% in annual incidence of diarrhoea occurred between children under 5 years of age whose mothers had participated in the hygiene education programme and those whose mothers had not participated. The average annual incidence of diarrhoea in children less than 5 years of age is 2.2 episodes per child. In this case 0.31 episodes of diarrhoea in children less than 5 years of age are averted annually per mother educated. Putting this together with cost estimates, and assuming that the impact of the programme lasts for a year gives US\$ 16 per episode averted.

3.2.4 Community managed services in Niger

In their evaluation of the PHV project (Community Managed Services) in Niger, Nibakure and van Wijk (1996) compared the effectiveness of two hygiene promotion approaches in similar populations and using the same cost framework. These were (i) social marketing of improved sanitation and hygiene by project paid village promoters, and (ii) community managed hygiene and sanitation improvements. Under the latter approach, each neighbourhood in a village choose a male volunteer who promoted sanitation and hygiene with the other men of their area and a woman who did the same with the other women. The resulting outcomes were laid down in a village social map. The village leadership used the map and held meetings with the neighbourhood leaders to coordinate the programme and monitor progress. Over a period of 18 months, and given cohesive villages with strong leadership, community managed hygiene and sanitation had 5% more outputs than the social marketing approach in the other villages. Use of

the facilities was not measured. The cost of the promotion programme was only 1.8% of the costs of the construction of the water supplies.

4. Conclusions and recommendations

4.1 Conclusions

4.1.1. Relevance of hygiene promotion interventions

From the three overall sector reviews discussed in this paper, it can be safely concluded that hygiene promotion has a substantial positive impact on people's health, in particular on the reduction of diarrhoeal diseases. The assumed reduction in incidence varies, however, from study to study. The studies also show that the impact of hygiene promotion is larger and more cost-effective when water and sanitation facilities are in place. The sector reviews further strongly indicate that hygiene promotion is more cost-effective than other water and sanitation sector interventions and is as cost-effective as some of the most important child survival interventions in the health sector.

4.1.2 Lack of completeness of programme studies

Hygiene promotion studies often focus on the inputs and the outputs of a programme. Not one programme review by the literature study or by the field investigation looked at the full range of input, processes, outputs, effectiveness and impacts. Cost-effectiveness has only been measured in four cases according to the literature review and none according to the field investigation. This does not mean that hygiene promotion interventions cannot be cost effective, but that no good conclusions can be drawn from the studies. This is the case when studies at programme level are not complete and/or do not use sound methods, as discussed below.

4.1.3 Methodological aspects

Regarding methods of measurement, none of the CEAs used at programme or project level used DALY indicators, because of the complexity involved. Instead, the four CEA programme studies review related the costs of a unit of achievement to specific improved conditions and/or practices (cost per capita showing improved condition/behaviour) or to health impact (cost per diarrhoeal case averted, cost per outpatient visit averted, etc).

Another finding from the study was that the methods and tools used in the implementation of the programme are rarely described in detail. This is important, because only then can they be replicated when the study shows that their use has led to effective change. At present, there is often no detailed description or analysis of the effectiveness of the materials and methods, so no conclusions can be drawn on the effectiveness of a particular hygiene promotion method or tool.

Data on costs of hygiene promotion interventions are also often missing in an assessment. A major limitation to their study is that such information does not appear as separate items or budget lines in the overall budget of the programme or project. Furthermore, the focus of a programme evaluation is often on the programme as a complete intervention and not on a particular component such as hygiene promotion.

Only one comparative cost-effectiveness study was found that compared two different types of hygiene promotion intervention in the same programme. In the study of the PVP Community Managed Services project in Niger, the effectiveness of these interventions was assessed within the same or similar populations and using the same cost framework (Nibakure and van Wijk, 1996). Because comparative CEAs are lacking, the current studies are not helpful to draw conclusions on the cost-effectiveness of different hygiene implementation methods. In the rare examples of programme CEAs listed above, no programme intervention alternatives existed. The CEA then usually compares the programme to a 'do nothing' alternative. Ideally CEA would

compare at least two alternative interventions and will make recommendations for the most cost-effective approach or variation.

4.2 Recommendations

4.2.1 Increased priority for hygiene promotion

This study shows that hygiene promotion is more cost-effective than other water and sanitation interventions. This effectiveness is greatest in combination with improved and affordable and accepted water and sanitation services. More priority should therefore be given to hygiene promotion as a separate component in a water and/or sanitation programme or as a project or programme on its own.

The sector studies reviewed here show that the outcomes for cost-effectiveness may vary widely, depending on which data are used for DALY estimates. It seems that so far no single method for CEAs using DALYs has been agreed upon. All the same, these sector CEAs are useful to advocate hygiene promotion interventions in policies and programmes. They should be used to draw attention to the magnitude of the problem and to show that hygiene promotion is cost-effective in comparison with other interventions.

4.2.2 Measuring cost-effectiveness

The use of DALYs at project or programme level is not recommended. The precise data needed for the DALY calculations are difficult to obtain and often estimations are used which decrease the accuracy of the cost-effectiveness analysis. More appropriate methods of CEA to be applied at programme or project level include the following:

- studies of hygiene conditions and practices before and after certain hygiene promotion interventions with specific methods and costs;
- longitudinal studies which assess behaviour changes over a period of time involving intervention with given methods and costs, preferably with the participation of the target populations (participatory learning);
- cost-effectiveness studies that assess not only the inputs, methods, costs and results but also the effectiveness of processes e.g. of the participation of women and men, and the poor, in planning, implementation and management;
- comparative studies that assess the cost-effectiveness of different approaches to hygiene promotion with comparable target populations.

When doing cost-effectiveness studies of hygiene promotion interventions, the full range of inputs, processes, outputs and results needs to be measured and described. If their reliability can be guaranteed, impact data on health and/or socio-economic development should also be gathered and analysed.

The sustainability of behaviour change is fundamental in the calculation of cost-effectiveness. It should take into account not only the morbidity and mortality averted during the implementation of the intervention, but for a number of years – say five – thereafter.

All aspects of the programme should be measured and described in detail to ensure reliability of the analysis and to allow for replicability. Reliability can be enhanced by making mention of probing and cross-checking. Sound methodologies for evaluations have been developed. Their use is recommended to give a clearer picture of the behaviour change resulting from hygiene promotion interventions.

4.2.3 Including CEA of hygiene promotion in projects and programmes

CEA should become part of every project proposal and every project evaluation. By doing so, hygiene promotion methods can be compared in terms of cost-effectiveness and the most cost-effective hygiene promotion methods can be retained and replicated by the sector. In this way,

CEA can ensure that the developing world gets the best 'value for money' in its efforts to achieve the MDGs.

Planners of environmental health programmes need to be made aware that CEA methods and tools exist and can be included in their projects and programmes. They can then learn which methods and tools for the promotion of behaviour change are effective and cost-effective and how they can maximise the impact of their efforts. If the CEA indicates that a programme method is highly cost-effective, other programmes can adopt the aspects that made it cost-effective.

The methodologies used for the CEAs in the projects mentioned in this study have been developed on an *ad hoc* basis. The importance of CEA studies calls for a clear, simple and sound methodology that can be used at project and programme level and whose results can be accepted and validated by the sector. The development of such a methodology is urgently needed, and is under development under the WELL programme.

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