Water works

The scaling up of low-technology health interventions has been recognised in theory. Practical measures remain few and far between, however. Christian Gericke, Kent Ranson, Christoph Kurowski and Anne Mills suggest a systematic approach to such projects that will assist with both planning and evaluation

The World Health Organization Commission on Macroeconomics and Health has recommended a massive global effort to scale up priority health interventions, that is, those known to prevent or treat diseases that account for a significant burden of ill health in developing nations. We have produced a conceptual framework to help policy decision-makers and programme managers consider and overcome the constraints they face in scaling up interventions.

The use of a conceptual framework allows us to consider complex health interventions in a consistent way. It must identify all the characteristics that may constrain scaling up while also being general enough to be applicable over a wide range of intervention, from socially marketed products for use at home to tertiary care professional services. Finally, it must help identify ways to simplify the intervention.

We have identified four dimensions that should be considered:

- Characteristics of the basic intervention;
- Characteristics of delivery;
- Requirements that the interventions imposes on government capacity;
- Usage characteristics.

Case study: solar disinfection of water

Perhaps the easiest way to consider how the framework might be applied is to look at an example of a simple health intervention with proven efficacy in resource-poor countries yet is not widely used: solar disinfection of water.

Around 1.1 billion people depend on rivers, streams and other unsafe sources of drinking water. Contaminated drinking water is one of the main routes of transmission for diarrhoeal diseases, which cause an estimated 2.2 million deaths annually, mostly among children.

In the absence of safe water supplies for the world's population, there are a number of household water and storage systems capable of rendering contaminated water safe at the point of consumption. Among these is solar disinfection. The simplest and cheapest application of the method consists of storing water in transparent containers that are then placed in direct sunlight. The combination of ultraviolet radiation (in sunlight) and raising water temperatures to 55°C has been shown reliably to destroy all waterborne bacterial and viral pathogens that have been tested, including poliovirus, rotavirus, *Escherichia coli, Vibrio cholerae,* Salmonella and Shigella species. It also inactivates many enteropathic protozoa and helminth eggs.

The method is simple, cheap and effective. Trials in Kenya have shown that children can achieve the task using bottles salvaged from domestic waste in the cities. Simply placing them on the roof of their huts for six hours in bright sunlight or two days in cloudy conditions is enough to achieve disinfection.

The best bottles to use are one- or two-litre PET plastic bottles. Disinfection is more effective if the water is relatively clear – achieved by sedimentation or filtration – and well oxygenated – easily achieved by shaking a three-quarters full bottle for 20 seconds before filling it completely. Painting the base of the bottles black or placing them on blackened zinc roofing sheet can dramatically improve the efficiency of disinfection.

By applying the conceptual framework to solar disinfection, we can begin to get a picture of what the constraints might be on scaling up and how to overcome them. As can be seen from Table 1 (page 12), the limitations are the availability of used plastic bottles in some rural communities, the need for information and education campaigns and for monitoring practice in the first months of use, and climatic conditions – this method cannot be used above 35º latitude.

Solar disinfection cannot address other modes of transmission for diarrhoeal illness, notably person-to-person spread. Probably the biggest impact on the incidence of diarrhoeal diseases could be achieved by combining solar water disinfection with hand washing with soap and safe stool disposal.

Framework in use

The conceptual framework has been used to analyse a number of key health interventions. It has proved useful in categorising low-technology interventions on the basis of their degree of complexity; in identifying supply and demand-side constraints; and in pointing to potential areas for improvement of specific aspects of each intervention. Because it is a systematic approach, it allows for comparison with national benchmarks or with other regions, programmes or countries.

The framework is designed for use by health policy makers, planners and programme managers when considering the expansion of existing projects or the introduction of new interventions. It might help to identify existing gaps in current provision of the interventions and context-specific constraints. It allows those making decisions on scaling to look at intervention complexity alongside other critical factors such as the burden of disease, cost, cost-effectiveness and political feasibility.

Support for scaling up

Despite a recent surge of political interest in scaling up health interventions and a number of well-intentioned programmes specifically devoted to the development of simple technology, the evidence on the effectiveness and implementation characteristics of simple health interventions is scarce.

A reason for this might be that simple, low-tech, inexpensive health interventions do not usually offer an opportunity for industrial profit-making and consequently do not obtain sufficient financial support for their further development and distribution. In addition to the current emphasis on stimulating research and development for new drugs and diagnostic tests, greater attention needs to be given to simple, low technology interventions, including preventive actions.

Crucially, more evidence is needed on the effectiveness of simple and inexpensive health interventions and how best to implement them in highly constrained settings. This should be a priority area for donors and international organisations – but one that has so far been largely neglected.

Sources and resources

1. For more information about the conceptual framework see www.fic.nih.gov/dcpp/wps/wp13.pdf
2. For more information about the Commission on Macroeconomics and Health see www.cmhealth.org/
3. For more information on solar water disinfection see www.sodis.ch/
4. For a full list of references (omitted for reasons of space) please contact Dr Gericke.
5. The points made here form part of *Working Paper 13* of the Disease Control Priorities Project, with funding from the Fogarty International Center, National Institutes of Health, Bethesda, Maryland, USA.

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***Life-saving potential:** the children who often fetch water supplies can also put straightforward disinfection techniques into action.*

Table 1: Application of the conceptual framework to solar disinfection of water

CATEGORY	CRITERIA	APPLICATION TO SOLAR DISINFECTION
1. Intervention characteristics		
1.1 Basic product design	Stability	Used transparent PET plastic bottles, only heavily scratched, old or blind bottles have to be replaced
	Can it be standardised?	Process highly standardisable
	Safety profile	Excellent
	Ease of storage	Storage in same container is an advantage of the method
	Ease of transport	None required
1.2 Supplies	What is the need for regular supplies?	None
1.3 Equipment	High technology equipment and infrastructure requirements	The only requirements are plastic bottles and, depending on climate conditions and roofing type, black paint
	Number of different types of equipment needed Maintenance requirements	No other equipment, infrastructure or maintenance needed
2. Delivery characteristics		
2.1 Facilities	Retail sector Outreach services Primary care Secondary care	Plastic bottles from domestic refuse
2.2 Human resources	What level of medical knowledge is needed?	No medical knowledge needed
	Level of medical supervision needed Intensity of professional services in terms of frequency or duration Management and planning requirements	Initial training and monitoring and guidance can be delivered by community development workers who themselves can be trained by a development agency or NGO
2.3 Communication and transport	To what extent is intervention dependent on communication and transport infrastructure?	No dependency except in very remote rural areas where purchase and transport of used bottles from the city has to be organised
3. Government capacity requirements		
3.1 Regulation/legislation	Need for regulation Need for monitoring of regulatory measures Need for regulation enforcement	None
3.2 Management systems	Need for sophisticated management systems	None
3.3 Collaborative action	Need for intersectoral action within government Need for partnership between government and civil society Need for partnership between government and external funding agencies	Eventually some partnership requirements in promotion of information and education campaigns required
4. Usage characteristics		
4.1 Ease of usage	Need for information/education	Basic information/education on how to use solar disinfection needed. Best delivered as part of a wider sanitation and hygiene strategy incorporating hand washing with soap
	Need for supervision	Some need for monitoring of practice to ensure correct usage in first few months
4.2 Pre-existing demand	Need for promotion	Pre-existing demand is low, therefore substantial need for initial promotion. Pilot projects have shown that once successfully introduced, it is held in high esteem and well sustained over many years
4.3 Black market risk	Need to prevent resale/counterfeit	None