
Title registration for an evidence gap map: Interventions for promoting uptake of safe water, sanitation, and hygiene for consumption at home, schools and health facilities in low- and middle-income countries

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Title of the review

Interventions for promoting uptake of safe water, sanitation, and hygiene for consumption at home, schools and health facilities in low- and middle-income countries: an evidence gap map

Background

According to the Joint Monitoring Program (JMP), an estimated 844 million people still do not use improved water sources and 2.3 billion lack access to even a basic sanitation service. Limited, or no, access to safe facilities for eliminating human waste, gathering clean drinking water, or practicing hygienic washing and food preparation practices exposes individuals to higher-levels of contagious pathogens and can contribute to the outbreak and chronic presence of preventable infections. Beyond the health consequences, poor quality water, sanitation, and hygiene (WASH) conditions may also lead to long-term adverse social and economic outcomes. Rural, poor and, vulnerable households have particularly limited access to adequate facilities and inequities, which are often regionally focused, and are often particularly harmful for women and girls (WHO/UNICEF JMP, 2017).

Policy relevance

As the world strives to achieve the Sustainable Development Goals (SDGs), what works, and for whom, remain contentious issues. Unlike the Millennium Development Goals which aimed to halve by 2015 the 1990 proportion of people with inadequate access to water supply and sanitation, the SDGs are aspirational, aiming for universal coverage by 2030, and adding targets for hygiene. The SDG targets are as follows (WHO/UNICEF JMP, 2017):

- To provide safe and affordable drinking water for all, measured by population using safely managed drinking water that is an improved drinking water source, located on premises, available when needed and free from contamination (SDG 6.1).
- To end open defaecation and provide adequate and equitable sanitation for all, measured by population using safely managed sanitation services and a basic handwashing facility with soap and water (SDG 6.2). Safely managed sanitation is defined as an improved facility where excreta is treated and disposed of in situ or off-site.
- To ensure all men and women have access to basic services, including basic drinking water, sanitation and hygiene (SDG 1.4).

To support achieving these ambitious targets, decision makers need access to information about what approaches have been evaluated to promote uptake of clean water, sanitation and hygiene, and on the effectiveness of these different approaches in achieving improvements in

quality of life outcomes. We will therefore provide an up-to-date assessment of the primary and synthesised evidence base for populations in low- and middle-income countries and regions.

Objectives

Evidence gap maps (EGMs) use systematic methods of evidence collection and appraisal to articulate the available evidence base on particular interventions and outcomes, as well as the absolute gaps and synthesis gaps that exist in the evidence base (Snilstveit et al., 2016). The overall aim of this EGM is to identify, map, catalogue and summarise existing primary evidence on the effects of interventions to improve access to, and quality of, WASH infrastructure, services, and practices in low- and middle-income countries (LMICs), and to critically appraise and summarise the existing synthesised evidence on WASH in LMICs.

In 2014, 3ie published an evidence gap map (EGM) online on the effectiveness of WASH interventions in improving quality of life outcomes (Waddington, PrasannaKumar and Cairncross, 2015). WASH research is well-embedded in academic and professional research institutions and produces a large and increasing number of rigorous impact evaluation and systematic review studies annually (Cameron et al., 2016). The present study aims to capture studies undertaken since 2014 (update searches) as well as broaden the included interventions and outcomes to better reflect policy and research debates on the effects of WASH interventions in 2018 (update scope) (Waddington et al., 2018). The update of the map's scope aims to cover behavioural outcomes and WASH interventions at healthcare facilities.

The new updated evidence gap map will address two main questions:

1. What evidence exists from high quality impact evaluations and systematic reviews, which can be used to inform policy?
2. What gaps exist in primary evidence (absolute gaps) and systematic reviews (synthesis gaps) that can be filled by new research?

Existing reviews

There are many existing systematic reviews that look at specific or broad intervention and outcome categories within the WASH sector. These include single intervention, single outcome reviews such as on the effect of hand hygiene on infectious diseases (Aiello, 2008), of water treatment interventions on diarrhoea (Clasen et al., 2015) or of providing gender segregated toilets on girl's education (Birdthistle, 2011). They also include multiple intervention reviews such as on the effects of water, sanitation, and hygiene interventions on childhood diarrhoea (Waddington et al., 2009; Cairncross et al., 2010), including reviews

drawing on mixed methods (quantitative and qualitative evidence) on sanitation and hygiene behaviour change interventions (de Buck et al., 2017). Other reviews examine evidence on willingness to pay for clean water (Null, 2012), for example.

We are not aware of an evidence gap map or systematic map on WASH interventions, apart from the map 3ie produced in 2014. This evidence map is now out-of-date, with a large number of new primary studies and reviews having been conducted. Moreover, the framework used in that map, which focuses on water, sanitation and hygiene technologies, is no longer relevant given the increasing emphasis placed on behaviour change promotion.

Intervention

The evidence gap map will focus on the provision of WASH technologies that have been traditionally defined as for personal and household consumption. We will, however, be expanding the map slightly to include an ecological aspect that reflects where participants use the technology in their physical environment. We will include WASH interventions that provide these technologies to a household, community, school, or health facility. This captures the four major physical environments in which WASH interventions are implemented and a participant might use the technology.

Water, sanitation and hygiene interventions have two important components to them – the ‘what’ and the ‘how’. The ‘what’ describes the technology that the participants end up with (for example, a latrine) and the ‘how’ describes the mechanism of the intervention (for example, whether you give a toilet directly to a household or use a subsidy to help them buy one for themselves) (de Buck et al., 2017). The included mechanisms and technologies are chosen so that all common WASH programmes would be eligible based on mechanism.

Mechanisms for providing WASH technologies can be classified into four main groups; direct provision, health messaging, psychosocial ‘triggering’, and market-based interventions. The below definitions have been adapted from relevant literature in the field (De Buck et al., 2017; Pattanayak et al., 2006):

- Direct provision mechanisms cover all interventions where hardware (such as a latrine or water purifier) is provided for free and has been chosen by an external authority (such as a non-governmental organization).
- Health messaging, most often focused on sanitation or hygiene, is typically a directive educational approach designed to help individuals, or communities, improve their health through increasing their knowledge and/or skills.
- Psychosocial ‘triggering’ falls into two subcategories of directive and participative approaches. Both subcategories use behavioural factors which have been derived from

psychosocial theories (such as emotions, like disgust and the desire to be a good parent, or social pressure) to motivate behaviour change, rather than reason. An example of this approach is community-led total sanitation (CLTS) where the community is encouraged to discuss how they would like sanitation practices to change, identify problem areas (e.g. 'walks of shame'), and use social cohesion and pressure to motivate people to construct latrines and stop practicing open defecation (Kar and Chambers, 2008).

- Market-based mechanisms try to change people's behaviour by changing the wider system around them. These approaches include pricing reform, improving operator performance, private sector (PS) and small-scale independent provider (SSIP) participation, and community driven development (CDD).

WASH technologies for household and personal consumption can be classified into four main, related, groups: water quantity, water quality, sanitation (hardware) and hygiene (sanitation software) (Esrey et al., 1991):

- Water quantity technologies provide a water supply or distribution system. Water may be supplied to communities at source, such as through a public standpipe, or at point-of-use (POU), such as being piped directly to households.
- Water quality technologies provide the means to protect water from, or treat water to remove, microbial contaminants. Examples of water treatment technologies include filtration, chlorination, flocculation, solar disinfection, boiling, and pasteurising. Water quality improvements are most commonly undertaken in the household, rather than at the source, though this class of interventions also includes treatment at source and provision of containers for safe transportation and storage of water.
- Sanitation technologies provide means to dispose of excreta (such as faeces), through new or improved latrines or connection of existing latrines to the public sewer.
- Hygiene technologies consist of hygienic practices, such as handwashing, and facilitators of these such as soap and hand sanitizers.

There are different combinations and ways of presenting evidence from both multiple mechanisms and technologies, which we will consider further during the data extraction phase.

As we are focusing on personal and household WASH interventions, we will exclude studies that look at WASH interventions in agriculture, commercial food preparation, and ones that focus on animal excreta. We will also exclude studies on vector control and reducing water consumption (i.e. water conservation) as whilst these studies can be on water, their objective is not the usual WASH one (i.e. to improve participant's access to clean water).

We will exclude all studies without a clearly defined WASH intervention. Programmes that combined a WASH intervention with a non-WASH one will be included if the WASH component is defined as a primary element.

Population

We will include studies on any population within a low- or middle-income country. This includes geographic locations, such as rural, urban, slum, or refugee camp, as well as age groups (i.e. children) or gender-based programmes.

We will exclude studies which are conducted under outbreak conditions, such as epidemics of cholera as this map aims to describe the evidence on what works under endemic conditions found regularly in LMICs.

Outcomes

We will include studies that report the following types of quality of life outcomes:

- (1) Health impacts including, but not necessarily limited to:
 - a. diarrhoeal disease
 - b. acute respiratory infections (ARIs)
 - c. other water related infections such as helminths
 - d. pain and musculoskeletal disorders
 - e. psychosocial health and safety
 - f. reproductive health outcomes
 - g. mortality.
- (2) Nutritional impacts including, but may not be limited to:
 - a. measures of stunting (e.g. height-for-age Z-scores, HAZ)
 - b. wasting (e.g. weight-for-height Z-scores, WHZ, and body mass index, BMI)
 - c. underweight (e.g. weight-for-age Z-scores, WAZ).
- (3) Social and economic impacts, for example:
 - a. educational outcomes (e.g. absenteeism)
 - b. time use
 - c. labour market outcomes (e.g. employment and wage)
 - d. measures of income, consumption, and income poverty.

We expect many studies will focus on outcomes among children (e.g. diarrhoeal morbidity and mortality) but will also include studies that only report outcomes for adults.

- (4) We will also include studies even if they only report on the following types of behavioural and attitudinal outcomes:
 - a. water quantity used/consumed

- b. water treatment practices
- c. latrine use or defaecation practices (including construction of facilities for 'triggering' interventions)
- d. hygienic behaviour (e.g. observed hand washing practices, measurement of hand contamination)
- e. willingness to pay (WTP) in 'real world' transactions.

We will exclude studies that only report measures of knowledge and attitudes; for example, a hygiene education program that reports the proportion that know that bacteria can cause infections would be excluded or a WTP study that focuses on hypothetical transactions only.

Study designs

This evidence gap map will include impact evaluations and systematic reviews of the effectiveness of technologies and intervention mechanisms. Impact evaluations are defined as programme evaluations or field experiments that use quantitative approaches applied to experimental or observational data to measure the effect of a programme relative to a counterfactual representing what would have happened to the same group in absence of the programme. Impact evaluations may also test different programme designs. We will include both completed and on-going impact evaluations and systematic reviews; to capture the latter, we will include prospective study records in trial registries or protocols when available.

Study design criteria for includable studies are outlined below:

- a) Experimental designs allocating the participants to the intervention using randomised or quasi-randomised mechanisms at individual or cluster levels.
 - a. Randomised control trial (RCT) with assignment at individual or cluster level (e.g. clustering at village, school, health facility)
 - b. Quasi-RCT using a quasi-random method of prospective assignment (e.g. natural experiment using as-if random assignment, or alternation of clusters)
- b) Non-randomised designs with selection on unobservables:
 - a. Regression discontinuity (RD) with prospective assignment based on a threshold on an allocation variable, with prospective or retrospectively designed methods of analysis
 - b. Panel data or pseudo-panels with analysis to account for time-invariant unobservables (e.g. difference-in-difference, DID, or fixed- or random-effects models)
 - c. Cross-sectional studies using multi-stage or multivariate approaches to account for unobservable confounding (e.g. instrumental variable, IV, or Heckman two-step estimation approaches)
- c) Non-randomised designs with selection on observables:

- a. Cross-sectional or panel (controlled before and after) studies with an intervention and comparison group using methods to match individuals and groups statistically (e.g. PSM) or control for observable confounding in adjusted regression.
- b. Pipeline designs.
- d) The following impact evaluation study designs will only be included in the specific circumstances described.
 - a. Reflexive controls (pre-test/post-test with no control/comparison group) will be included for studies reporting time use outcomes.
 - b. Case-control designs will be included for studies conducted at healthcare facilities measuring mortality.
- e) Studies explicitly described as systematic reviews and that describe methods used for search, data collection, and synthesis. We will exclude reviews of efficacy studies undertaken in a clinical or laboratory setting.

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Lead review author: The lead author is the person who develops and co-ordinates the review team, discusses and assigns roles for individual members of the review team, liaises with the editorial base and takes responsibility for the on-going updates of the review.

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Roles and responsibilities

Give a brief description of content and methodological expertise within the review team. It is recommended to have at least one person on the review team who has content expertise, at least one person who has methodological expertise and at least one person who has statistical expertise. It is also recommended to have one person with information retrieval expertise.

Please note that this is the *recommended optimal* review team composition.

- **Content:** Sandy Cairncross is Professor at London School of Hygiene and Tropical Medicine and leads the Environmental Health Group and is Research Director of the Sanitation and Hygiene Applied Research for Equity (SHARE) Consortium. He has published a large number of primary studies and systematic reviews of WASH impacts. Hugh Waddington led a systematic review of WASH diarrhoea impacts and is an impact evaluation and systematic evidence specialist.
- **Systematic evidence methods:** Hugh Waddington and Sandy Cairncross have both published systematic reviews and meta-analyses. Hannah Chirgwin attended Campbell Collaboration training on systematic reviews.
- **Statistical analysis:** not applicable for this title.
- **Information retrieval:** John Eyers has worked as an information retrieval specialist for various Cochrane and Campbell Systematic Review Coordinating Groups.

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Potential conflicts of interest

Sandy Cairncross was involved in the development of sanitation and hygiene interventions in southern Africa and he and Hugh Waddington have each published systematic reviews of WASH interventions. We are not aware of any conflicts of interest that might affect the outcomes of this evidence gap map.

Preliminary timeframe

Note, if the protocol or review is not submitted within six months and 18 months of title registration, respectively, the review area is opened up for other authors.

- Date you plan to submit a draft protocol: May 2018
- Date you plan to submit a draft report: August 2018