Title registration for a review proposal: Water, sanitation and hygiene (WASH) interventions to combat diarrhoea among children in developing countries: systematic review of effectiveness and sustainability

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Submitted to the Coordinating Group of:

☐ Crime and Justice
☐ Education
☑ International Development
☐ Social Welfare
☐ Other

Plans to co-register:

☐ No
☐ Yes:
☑ Maybe: Cochrane Infectious Diseases Group
TITLE OF THE REVIEW

Water, sanitation and hygiene (WASH) interventions to combat diarrhoea among children in developing countries: systematic review of effectiveness and sustainability

BACKGROUND AND OBJECTIVES

Half the developing world population – some 2.5 billion people – lack access to flush toilets and other forms of improved sanitation; 1.1 billion people defecate in the open (WHO/UNICEF, 2012). Despite improvements in water coverage in recent decades, leading WHO/UNICEF to conclude that the Millennium Development Goal drinking water target has been met, an estimated 750 million people still live without improved water sources. There are serious adverse health consequences of poor access to water, sanitation and hygiene (WASH), particularly in children, including diarrhoea, respiratory illness, trachoma, and death. Diarrhoeal disease is the second biggest killer of children under the age of five, worldwide, contributing to around one-fifth of fatalities in developing countries, or 2.5 million deaths per year (Kosek et al., 2003; WHO/UNICEF, 2009). Improved WASH systems can protect the body from diarrhoeal disease by reducing exposure to vectors in the environment (through cleaner systems for elimination of human waste, hygienic bathing and food preparation practices, and purification of drinking water). Additionally, improved WASH systems can have important social and economic implications, by saving time in communities where proximity to water is an issue and by increasing safety for women and girls who do the majority of water collection for the household in many low and middle income countries.

Access to WASH interventions is inequitably distributed. Poorer people and those living in rural areas are less likely to have access to improved water and sanitation (UN, 2011). Inequities are also regionally focused; in Africa in particular, only 60 percent of people have improved water sources, while less than one-third use an improved sanitation facility (ibid.).

Our objective is to synthesise evidence from high quality impact evaluations to provide a comparative assessment of the effects of access to water, sanitation and hygiene on child diarrhoea in low and middle income countries. The review will also assess whether intervention benefits are sustained. The review will draw on a theory of change, collecting and synthesising data on compliance/adherence to interventions, in an attempt to explain differences in comparative effects and sustainability, as well as on secondary outcomes such as time-savings and mortality contained in the studies.

EXISTING REVIEWS

In recent years, a number of reviews have been conducted to examine the impacts of WASH interventions on diarrhoea (Esrey et al., 1991; Curtis and Cairncross, 2003; Fewtrell and Colford, 2004; Fewtrell et al., 2005; Clasen et al., 2007; Aiello et al.,
2008; Arnold and Colford, 2007; Ejemot et al., 2008; IEG, 2008; Schmidt and Cairncross, 2009; Waddington et al., 2009; Hunter, 2009; Clasen et al., 2010; Cairncross et al., 2010). Results from recent reviews suggested that in terms of comparative efficacy, interventions providing household water treatment and promoting hand-washing with soap have the biggest impacts on diarrhoeal disease, while source water treatment is not effective due to recontamination. Sanitation may be highly effective, though the evidence base on this intervention is thin. However, there are also concerns that positive results from household water treatment interventions are severely biased due to presence of placebo effects (Schmidt and Cairncross, 2009), and that question the sustainability of adoption of household water treatment (Arnold and Colford, 2009; Waddington et al., 2009).

The review is an update of Waddington and Snilstveit (2009; itself an update of Fewtrell and Colford, 2005). It will extend the coverage for those impact evaluations conducted since, and include additional interventions (eg hand sanitizers) and outcomes (time savings, mortality).

**DEFINE THE POPULATION**

Populations in low- or middle-income countries, as defined by the World Bank at the time of the intervention are eligible. Studies must use data collected at the level of the individual. The review will focus on effects on children, usually defined as those under 71 months of age.

**DEFINE THE INTERVENTION**

Interventions are classified into groups and sub-groups of related interventions (Fewtrell et al., 2004):
- Water supply: including provision or improvement in water supply and/or distribution, such as the installation of a hand pump or household connection, either at the community or household level.
- Water quality: water treatment for the removal of microbial contaminants and/or clean storage, either at the community or household level.
- Hygiene: including hygiene and health education and the encouragement of specific behaviours, such as hand-washing with soap, and provision of hand sanitizers.
- Sanitation: providing improved means of excreta disposal, including latrines, sewer connections.
- Multiple WASH: those which introduced a combination of water, sanitation and/or hygiene elements to the study population. These also include complex interventions combining sanitation and hygiene such as community-led total sanitation.

Comparison conditions eligible include other WASH intervention, pipeline (wait-list), or usual access. Information on comparison conditions will be collected and sub-groups analysis performed.

**OUTCOMES**

*Primary outcomes*
The primary outcome is diarrhoea morbidity, measured under non-outbreak conditions. Studies will be excluded that explicitly concern extreme diarrhoeal disease outbreaks such as cholera.

**Secondary outcomes**

Intermediate outcomes will be collected along the causal chain, from assessments of functionality and knowledge transfer, to behaviour change as measured by compliance or adherence to the intervention. This information may be reported by care-givers, observed by field staff, or measured by biological assessment of pathogen contamination or presence of the purification agent in samples collected.

We will also collect data reported in included studies on mortality outcomes and time-savings resulting from the intervention.

**STUDY DESIGNS**

Impact evaluations are eligible for quantitative synthesis based on experimental design – randomised controlled trials (RCTs) with assignment at individual level or community (cluster) levels – and quasi-experimental methods, including studies with baselines and concurrent control groups matched by confounding variables, studies employing a pipe-line (waiting-list) approach, and ex post (cross-sectional) studies applying appropriate methods of statistical matching (e.g. propensity-score matching, PSM) to survey data. In addition, for time savings outcomes only, eligible study designs will also include reflexive controls (pre-test post-test). We will include studies based on interventional and observational data.

Excluded studies will be those which do not attempt to control for confounding, including those studies which compare self-selected exposure groups. Owing to concerns of external validity, we will also exclude from quantitative synthesis studies based on disease reporting to health facilities, such as case-control designs.

We will synthesise quantitative data on effect sizes using inverse-variance weighted random effects meta-analysis.

We will include studies of any duration, including studies collecting follow-up data from included study intervention groups. Where these follow-up data are based on reflexive controls, they will be analysed separately.

**AUTHOR(S) REVIEW TEAM**

List names of those who will be cited as authors on the final publication.

**Lead reviewer**

This 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

Name: Hugh Waddington
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Postal Code: WC1H 0PD
Content: Prof Sandy Cairncross has dedicated his academic career to sanitation epidemiology, and has been involved in numerous primary studies and systematic reviews (e.g. Curtis and Cairncross, 2003; Cairncross et al., 2010). Prof Howard White led a review on water and sanitation for the World Bank (IEG, 2008) and was involved in the previous version of this study (Waddington et al., 2009). Prof Zulfiqar A. Bhutta is an expert in maternal and neonatal health and nutrition, having led numerous primary studies and systematic reviews in this area (e.g. Bhutta et al., 2012). Hugh Waddington led the previous review of WASH interventions (Waddington and Snilstveit, 2009) of which this is an update.

Systematic review methods: All team members have previous experience in systematic review methodology, including search, data collection, statistical analysis, theory-based synthesis.

Statistical analysis: Hugh Waddington, Zulfiqar A. Bhutta and Zohra Lassi have previous experience in effect size extraction and methods of meta-analysis, while Hugh Waddington and Howard White also have previous experience in calculating effect sizes from regression-based study designs.

Information retrieval: Zohra Lassi, Jai Das, Zulfiqar A. Bhutta and Hugh Waddington have previous experience in developing search strategies.
POTENTIAL CONFLICTS OF INTEREST

We are not aware of any conflicts of interest arising from researcher or financial interests. Hugh led the previous review of WASH interventions (Waddington and Snilstveit, 2009) of which this is an update. Prof Sandy Cairncross has dedicated his academic career to sanitation, and has led numerous primary studies and systematic reviews (Curtis and Cairncross, 2003; Cairncross et al., 2010). Prof Zulfi Bhutta is an expert in maternal and neonatal health and nutrition and has led numerous primary studies and systematic reviews in this area (Bhutta et al., 2012). Prof Howard White led a review on water and sanitation for the World Bank (IEG, 2008).

SUPPORT

We do not anticipate requiring support at this time.

FUNDING

Financial support is from 3ie and Aga Khan University. We are not planning to apply for additional financial support specific to this systematic review.

PRELIMINARY TIMEFRAME

Note, if the protocol or review are not submitted within 6 months and 18 months of title registration, respectively, the review area is opened up for other reviewers.

• Date you plan to submit a draft protocol: April 2012
• Date you plan to submit a draft review: September 2012

DECLARATION

Authors’ responsibilities
By completing this form, you accept responsibility for preparing, maintaining and updating the review in accordance with Campbell Collaboration policy. The Campbell International Development Group will provide as much support as possible to assist with the preparation of the review.

A draft protocol must be submitted to the Group within six months. If drafts are not submitted before the agreed deadlines, or if we are unable to contact you for an extended period, the Group has the right to de-register the title or transfer the title to alternative authors. The Group also has the right to de-register or transfer the title if it does not meet the standards of the Group and/or the Campbell Collaboration.

You accept responsibility for maintaining the review in light of new evidence, comments and criticisms, and other developments, and updating the review at least once every three years, or, if requested, transferring responsibility for maintaining the review to others as agreed with the Group.

Publication in the Campbell Library
The support of the International Development Group in preparing your review is conditional upon your agreement to publish the protocol, finished review and subsequent updates in the Campbell Library. Concurrent publication in other
journals is encouraged. However, a Campbell systematic review should be published either before, or at the same time as, its publication in other journals. Authors should not publish Campbell reviews in journals before they are ready for publication in CL. Authors should remember to include the statement: ”This is a version of a Campbell review, which is available in The Campbell Library”.

I understand the commitment required to undertake a Campbell review, and agree to publish in the Campbell Library. Signed on behalf of the authors:

Form completed by: Hugh Waddington Date: 12 March 2012