

# COCHRANE COLUMN

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The aim of the Column is to highlight Cochrane Reviews of relevance to public health, and to stimulate debate on relevance, feasibility and acceptability. This month we feature the review by Ejemot *et al.* on hand washing for prevention of diarrhoea.

The Cochrane Collaboration (<http://www.cochrane.org>) is an international, non-profit organization that

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prepares and disseminates up-to-date systematic reviews on the effects of healthcare interventions in order to help people make well-informed decisions. Systematic reviews aim to answer focused healthcare questions by systematically identifying and evaluating all relevant research studies and synthesizing their results.

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## Hand washing for preventing Diarrhoea

RI Ejemot,\* JE Ehiri, MM Meremikwu and JA Critchley

### Background

Diarrhoea causes over 2.2 million deaths every year, mostly among children under 5 years of age<sup>1,2</sup> in low and middle income countries. When prolonged, it contributes to reduced resistance to infections, impaired growth and development.<sup>3</sup>

Most, diarrhoea disease pathogens are transmitted through the faeco-oral route,<sup>4</sup> and over 70% of all diarrhoea cases can be attributed to contaminated food or water.<sup>4–6</sup> Any behaviour that increases human contact with faecal matter, such as omitting hand washing after defecation, after handling children's faeces, and before handling food can all contribute to transmission.<sup>7–10</sup> In particular, hand contact with ready-to-eat food (food consumed without further washing, cooking or processing/preparation by the consumer) represents an important mechanism by which diarrhoea-causing pathogens contaminate food and water.<sup>11</sup>

A number of strategies for control of diarrhoea have been identified by the WHO.<sup>12</sup> These include improvement of water supply for households and communities<sup>13</sup> as well as hygiene promotion interventions.<sup>14</sup> The latter constitutes a range of activities aimed at encouraging individuals and communities to adopt safer practices within, in order to prevent hygiene-related diseases that lead to diarrhea;<sup>15</sup> hand washing is one such intervention.

Hand washing may require infrastructural, cultural and behavioural change, which take time to develop, as well as substantial resources such as soap and water.<sup>16–18</sup> Given the many possible ways to reduce diarrhoeal disease, it is important to assess the effectiveness of hand washing interventions.

### Methods

#### Search strategy

We searched the Cochrane Infectious Diseases Group Specialized Register, CENTRAL (*The Cochrane Library* 2007, Issue 2), MEDLINE, EMBASE, LILACS, PsycINFO, Science Citation Index and Social Science Citation Index, ERIC (1966 to May 2007), SPECTR, Bibliomap, RoRe, The Grey Literature and reference lists of articles. We also contacted researchers and organizations in the field. Our search was not restricted by publication status or language.

#### Selection criteria

Randomized controlled trials, where the unit of randomization was an institution (e.g. day-care centre, household or community), or individuals, comparing interventions specifically to promote hand washing or general hygiene promotion including hand washing with controls.

#### Data analysis

We identified three categories of studies—institution-based interventions (day-care centres or primary

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**Table 1** Summary of meta-analysis results

Setting	Number of trials	IRR in diarrhoeal episodes	95% CI	Total number of participants
Institution-based	2 (adjusted for clustering effects)	0.61 <sup>§</sup>	0.40 to 0.92	7,711 children
	5 (unadjusted)	0.77 <sup>§</sup>	0.66 to 0.89	
Community-based	4 (adjusted for clustering effects)	0.68 <sup>§</sup>	0.52 to 0.90	8,055 children
	1 (unadjusted)	0.70	0.54 to 0.92	

<sup>§</sup>Pooled incidence rate ratio (IRR)

schools), mainly conducted in industrialized countries, community-based interventions conducted in low- and middle- income countries, and interventions in people at high risk of diarrhoea. Given the differences between interventions in these settings, we analysed and presented the results separately.

Most trials reported either the incidence rate ratio and 95% CI (confidence interval), or the number of episodes of diarrhoea and the person-time at risk, but few reported the proportion of the population experiencing at least one attack of diarrhoea. The trial among AIDS patients reported information only on the mean number of diarrhea episodes and standard deviation.

## Results

Fourteen randomized controlled trials met the inclusion criteria. Eight trials were institution-based in high-income countries, five were community-based in low or middle-income countries, and one was in a high-risk group (AIDS patients). Considering only trial results which adjusted for cluster randomization, interventions promoting hand washing resulted in a 39% reduction in diarrhoea episodes in children in institutions in high-income countries (IRR 0.61, 95% CI 0.40 to 0.92; 2 trials) and a 32% reduction in such episodes in children living in communities in low or middle-income countries (IRR 0.68, 95% CI 0.52 to 0.90; 4 trials). The trial in 148 adult AIDS patients also showed a significant reduction in episodes of diarrhoea (Weighted mean difference  $-1.68$ , 95% CI  $-1.93$  to  $-1.43$ ).

## Conclusions

Hand washing can reduce diarrhoea episodes by about 30%. This significant reduction is comparable to the effect of providing clean water in low-income areas. The challenge is to find ways of encouraging people to wash their hands properly. Trials with longer follow up and that test different methods of promoting hand washing are needed.

The full text of the Cochrane Review is available in *The Cochrane Library*: Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA. Hand washing for preventing

diarrhoea. *Cochrane Database of Systematic Reviews* 2008, Issue 1. Art. No.: CD004265. DOI: 10.1002/14651858.CD004265.pub2.

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## Commentary: Hand washing for preventing diarrhoea

Stephen P Luby

Ejmot's *et al.*'s<sup>1</sup> review of the efficacy of hand washing promotion in reducing diarrhoeal disease underscores the potential of hand washing promotion to benefit populations globally. To fully realize this potential, critical gaps in our scientific knowledge need to be addressed.

The available research provides little guidance on how to effectively deliver hand washing promotion at large scale. The hand washing promotion activities included in the Cochrane Review were efficacy studies, on average targeting fewer than 1000 households or individuals. The most common approach used to promote hand washing was repeated visits to encourage improved practices. Such an approach is unaffordable when targeting the over 1 billion people who live on less than 1US\$ per day and are at highest risk of enteric disease.

We lack evidence to guide what advice public health professionals should give low income families with a limited water supply and limited budget to meet basic nutritional and other household needs. How much money and time should they invest in soap and water? If there is not enough money and water for everyone in the household to wash their hands at all recommended times, what is the most important time to wash hands with soap? If soap is not available, what benefit is there to washing with water alone, especially when that water is often contaminated? What benefit is there from using mud or ash as a hand cleansing agent?

Only very limited information is available on the efficacy of hand washing promotion in preventing severe or fatal diarrhoeal episodes. Fatal diarrhoea may result from pathogens and pathophysiology that is not interrupted by occasional hand washing. The reviewed studies depend on reported diarrhoea, which is often quite mild. There is also a risk that

study subjects who receive a hand washing promotion intervention may under report disease to meet the expectations of study implementers. Studies with sufficient power to assess changes in hospitalization or mortality rates for severe diarrhoea would clarify the impact of hand washing on episodes of diarrhoea of clear public health significance. If properly designed, such studies could also address the risk of differential underreporting of minor episodes.

With the potential for health benefits that this meta-analysis demonstrates and the important uncertainties that remain, what actions should public health professionals take immediately? First, public health programmes should promote hand washing. The best available evidence reviewed in this meta-analysis suggests that hand washing promotion reduces diarrhoea by 30%, and there is additional evidence that hand washing reduces respiratory disease.<sup>2</sup>

Second, we should invest in well-designed studies addressing the key uncertainties in hand washing promotion and in rigorous evaluations of hand washing intervention programmes. Such investment is likely to provide knowledge that will produce cost-effective life-saving interventions.

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# Commentary: Hand washing for preventing diarrhoea

Val Curtis

## What's in a number?

By how much exactly does hand washing promotion in the community cut the risk of diarrhoea? This Cochrane Review suggests about 30% on average, our previous review from 2002 said 42–47%,<sup>1</sup> a more recent review by Fewtrell *et al.* suggested 44%,<sup>2</sup> and the best conducted recent trial, by Luby *et al.*<sup>3</sup> in Pakistan, came up with a figure of 53%. Cochrane Reviews can provide effect estimates that are a huge boon for evidence-based decision-making, especially when there are many well-conducted studies that can be reviewed. However, it is less clear what should be concluded from systematic reviews such as this where the evidence comes from studies that are few, methodologically flawed and show evidence of systematic bias.

In this excellent and meticulous review of studies on the effect of hand washing on diarrhoeal disease, the authors rightly declined to conduct a meta-analysis to provide a point estimate of effect because of the paucity of studies. For example, only five trials of interventions in the community met their inclusion criteria. And even within this set, studies were riddled with methodological problems. As they point out, hand washing intervention studies cannot be double-blinded and consequently may have been biased towards an inflated effect. Publication bias was likely. Two studies did not focus on soap, two were interventions that did not concentrate solely on hand washing, and none had adequate measures of compliance. However, when the authors pooled the results for the three community-based studies where the intervention focused on hand washing alone and soap was provided, the pooled estimate of effect was 43% (95% confidence interval 25–66%).

Everyone wants numbers. Health policy makers need to know if promoting handwashing is a good use of scarce resources in poor countries. Those of us engaged in designing hand wash promotion programmes in developing countries, for example in connection with the Global Public-Private Partnership for Hand washing with Soap, need numbers to help

make our case, both to funders and to Governments in the countries where we work. Economists used such numbers in the recent review of priorities for interventions of disease control in developing countries (interestingly, hygiene promotion was ranked as the most cost-effective intervention of all at 3.4 dollars per DALY saved).<sup>4</sup> Even soap companies, several of whom have shown willing to take up the case of hand washing in Asia, Africa and Latin America, need numbers so as to calculate how much their investment benefits people, otherwise they cannot sustain their involvement.

Those of us working in public health in developing countries are therefore bound to have our arms twisted to provide our best guesses of the effect of a concentrated campaign on hand washing with soap on diarrhoea incidence in the community. What should we then say? In my view, the first and foremost lesson of this review is that our evidence for such a potentially life saving and cost-effective intervention is shockingly shaky. We urgently need well-conducted rigorous trials of hand washing with soap in several developing countries with verifiable outcome measures, not just for diarrhoea, but for respiratory infections too. Until we have the numbers for effect size from such trials the public health community will have to live with the uncertainty.

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