

Editorial

Can we afford to overlook hand hygiene again?

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Access to safe and reliable drinking water and sanitation, Millennium Development Goal 7, target 7c, is essential for health and well-being (Esrey *et al.* 1991; Fewtrell *et al.* 2005; Clasen *et al.* 2007) and is recognised as a human right (United Nations General Assembly, Resolution 64/292). Hygiene delivers many of the health benefits associated with water and sanitation and yet is missing from the Millennium Development Goals (MDGs). In 2013, the United Nations General Assembly will convene to agree post-2015 goals and targets for sustainable development. Health should not be sidelined in this process (Singh *et al.* 2012). An updated estimate of the number of lives that could be saved by the practice of good hand hygiene adds weight to the case for this basic life-saving intervention to be included as a measurable indicator of health in the forthcoming goals.

Handwashing with soap (HWWS) is one of the most cost-effective of all public health interventions (Jamieson *et al.* 2006). Alongside sanitation, HWWS after defecation acts as a primary barrier to faecal–oral spread of diarrhoea by preventing faecal matter from entering the environment, while HWWS before eating reduces transmission from faecal pathogens in the environment (Curtis *et al.* 2000). Although respiratory pathogens are primarily transmitted via the airborne route, bacteria and viruses shed from the nose, mouth or anus can also be spread via hands and fomites (Goldmann 2000) and campaigns to prevent influenza have tapped into this (United Kingdom Department of Health 2011). The simple action of washing hands with soap can interrupt the transmission of both diarrhoea and pneumonia, the two biggest causes of deaths of children under five (Liu *et al.* 2012). The latest estimates attribute 0.751 million (uncertainty range 0.538 – 1.031 million) deaths among children aged 1–59 months a year to diarrhoea and 1.071 million (uncertainty range 0.977 – 1.176 million) to pneumonia globally (Liu *et al.* 2012). In 2003, we estimated the annual number of deaths due to diarrhoea preventable by

HWWS at about a million (Curtis & Cairncross 2003). In the light of the revised estimates for child mortality, it is necessary to update these estimates and, in the light of more recent meta-analysis, extend them to include respiratory infections.

There have been a number of reviews of the impact of handwashing with soap on diarrhoea and respiratory infections. For diarrhoea, Curtis and Cairncross concluded that the universal practice of HWWS could reduce the risk of diarrhoea in the community by 47% (pooled estimate, evidence from intervention studies only) or 48% (pooled estimate, reduction in severe outcomes) (Curtis & Cairncross 2003). These estimates were followed by further reviews with a range of different inclusion criteria (Fewtrell *et al.* 2005; Aiello *et al.* 2008; Ejemot *et al.* 2012). Considering all available evidence, the most recent review by Cairncross *et al.* (2010) took 48% (the reduction in risk of severe outcomes) as the figure for inclusion in the global LiST model (Cairncross *et al.* 2010). We therefore also used 48% (95% confidence interval [CI] 24–63%) when calculating the number of deaths due to diarrhoea that could be prevented by HWWS.

Reviews have also consistently suggested that HWWS can reduce the risk of respiratory infections. Two reviews concluded that HWWS could reduce the risk of lower respiratory tract infections such as pneumonia by 21% (95% CI 5–34%) (Aiello *et al.* 2008) and 16% (95% CI 11–21%) (Rabie & Curtis 2006). An update with findings from two subsequent studies (Luby *et al.* 2005; Sandora *et al.* 2005) concluded that HWWS could reduce the risk of lower respiratory tract infections such as pneumonia by 23% (Ensink 2004) (95% CI 11–33%). We opted to use the latest, updated estimate in our calculations. We assume that the number of lives saved is proportional to the reduction in disease risk, as in other studies (Curtis & Cairncross 2003; O'Brien *et al.* 2009; Watt *et al.* 2009). Table 1 shows that 607 000 deaths from

Table 1 Lives saved by handwashing with soap, children 1–59 months

Preventable cause of death	Type of Estimate	Calculations	Estimated number of lives saved
Diarrhoea	Mean	0.751 million × 0.48	360 000
	Low	0.751 million × 0.24	180 000
	High	0.751 million × 0.63	473 000
Pneumonia	Mean	1.071 million × 0.23	246 000
	Low	1.071 million × 0.11	118 000
	High	1.071 million × 0.33	353 000
Total	Mean	0.360 million + 0.246 million	607 000

All calculations were made using the mean number of deaths among children aged 1–59 months as estimated by Liu *et al.* (2012). Assumptions: The number of lives saved is proportional to reduction in risk.

Diarrhoea: Risk reductions in systematic reviews are similar. Calculations use the pooled estimate of 48% reduction in severe diarrhoea from (Cairncross *et al.* 2010). High and low estimates are calculated using the upper and lower confidence limits reported for this estimate.

Pneumonia: Risk reductions in systematic reviews are similar. Calculations use the pooled estimate of 23% reduction from the Ensink update of Rabie and Curtis (Ensink 2004; Rabie & Curtis 2006) and confidence intervals for this estimate calculated by the authors.

diarrhoea and pneumonia among children aged 1–59 months could be prevented annually by handwashing with soap.

These estimates for the potential lives that could be saved through scaling up HWWS exclude a number of other important mortality and morbidity outcomes for which there is suggestive evidence of protection. Around 33% of the 3.1 million deaths occurring annually among neonates are due to infectious causes (Liu *et al.* 2012), and clean birth and post-natal practices – of which handwashing with soap is a component – have been estimated to reduce death due to sepsis and tetanus by as much as 40% (Blencowe *et al.* 2011). Although birth attendant and maternal handwashing could save additional lives, low-quality evidence dissuades us from hypothesising the extent of this impact here. Hand hygiene could further reduce mortality from hospital-acquired infections and maternal sepsis (Seale *et al.* 2009; World Health Organisation 2009). In addition to saving lives, a plethora of other health benefits has been attributed to handwashing with soap, including reductions in healthcare-associated infections (World Health Organisation 2009), puerperal sepsis (Luby *et al.* 2001), skin infections (Luby *et al.* 2005), eye infections (Montessori *et al.* 1998), including trachoma (the latter health improvements come from face washing combined with antibiotic usage) (Ejere *et al.* 2012), and co-infections and disease progression among people living with HIV/AIDS (Isaac *et al.* 2008; Filteau 2009). Other benefits include more school attendance as a result of fewer episodes of illness (Bowen *et al.* 2007; Freeman *et al.* 2011; Talaat *et al.* 2011) and possible improvements in child growth and development as a result of improved

nutritional status (hypothesised to be mediated via reduction in diarrhoea and environmental enteropathy) (Prüss-Üstün *et al.* 2008; Bowen *et al.* 2012). These benefits are described more fully elsewhere (Biran *et al.* 2012).

Global estimates of this nature carry much uncertainty and are limited by the assumptions made, in particular the use of the risk reduction estimates reported in systematic reviews. Studies included in these reviews were conducted in a variety of income settings and even those studies considered to be of reasonable quality have methodological flaws and differed in when and where handwashing was promoted. Furthermore, the extent to which good hand hygiene can reduce the burden of disease is likely to be mediated by factors such as water and sanitation coverage, prevalence of undernutrition, access to health services, predominant transmission routes and pathogen prevalence across settings. The likelihood that a life will be saved as a result of HWWS is greatest in the poorest, most vulnerable and underserved populations such that the average effects suggested in the meta-analyses may, if anything, underestimate the potential impact in these populations. Estimates such as these are useful in assessing the potential contribution of HWWS to child survival strategies and provide a basis for policy dialogue and advocacy.

HWWS with soap has long been identified as a cost-effective intervention to be scaled up as part of child survival strategies (Black *et al.* 2003), and new and innovative programmes are demonstrating that hand hygiene behaviour can be improved cost-effectively (Curtis *et al.* 2011). The absence of a globally binding target that situates HWWS within broader health and development

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strategies has allowed attention to stray from this potentially powerful intervention. As 2015 and the expiry of the current MDGs draws close, expert groups have begun to formulate a potential hygiene goal (Meeting Report of JMP post-2015 Global Monitoring Working Group on Hygiene 2012) by demonstrating both its utility and measurability. In the mid-nineteenth century, Hungarian Ignaz Semmelweis postulated that doctors' hands spread disease. His handwashing intervention immediately reduced mortality from puerperal fever on affected hospital wards, yet he faced much professional resistance and ridicule for his unsubstantiated ideas (Curtis 2004). The sad story of Ignaz Semmelweis teaches us that sometimes the most obvious solutions are most easily overlooked. In 2013, the global health community must reflect on whether it can afford to overlook such an obvious and cost-effective solution as hygiene again.

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