Effective interventions to lower the burden of water and excreta related infections

Wolf-Peter Schmidt

Environmental Health Group
London School of Hygiene and Tropical Medicine
Wolf-Peter.Schmidt@lshtm.ac.uk

How do water and excreta related infections spread?

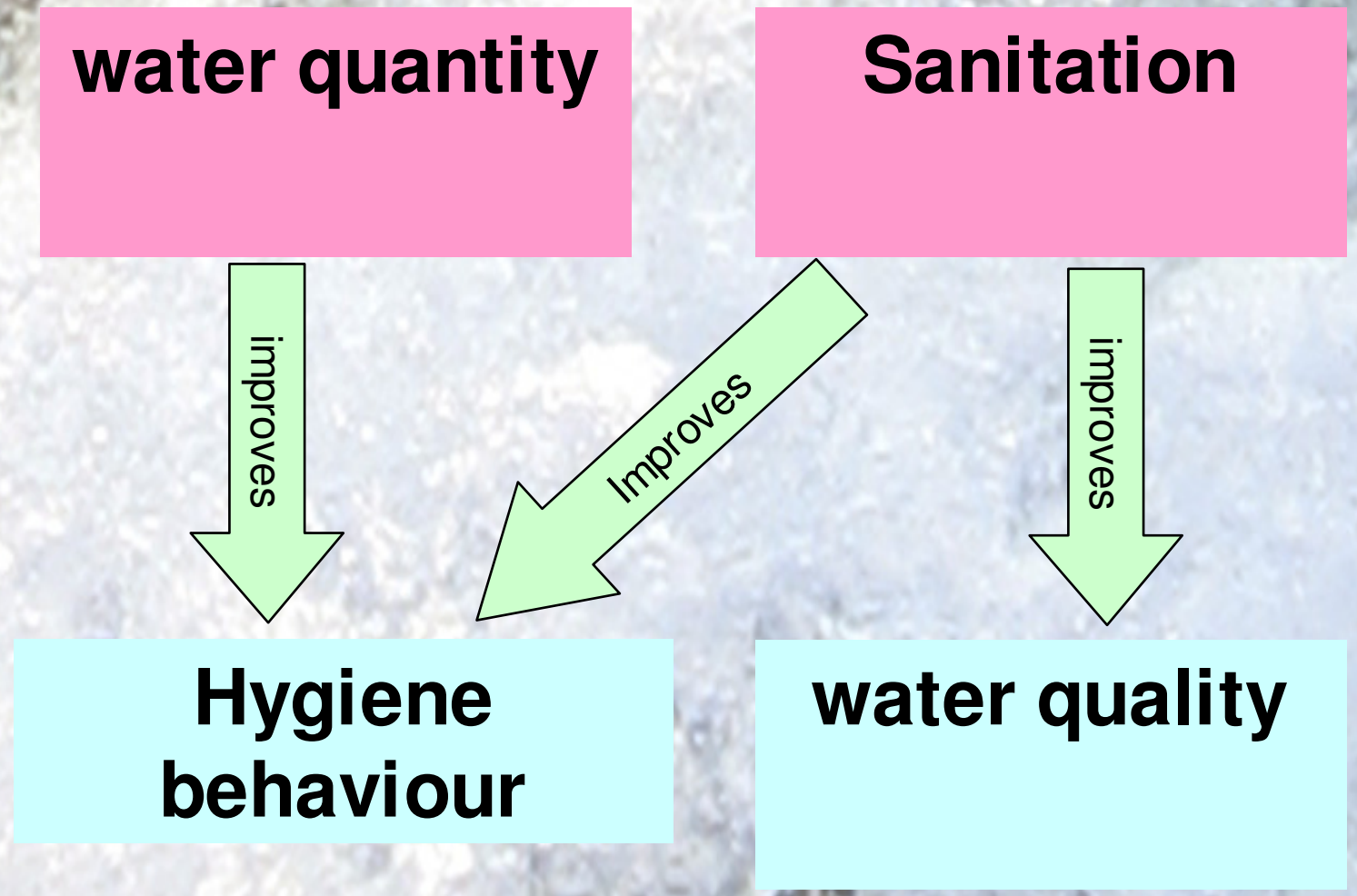
- Person to person
- Soil / environment to person
- Food to person
- Drinking water to person
- Flies are vectors

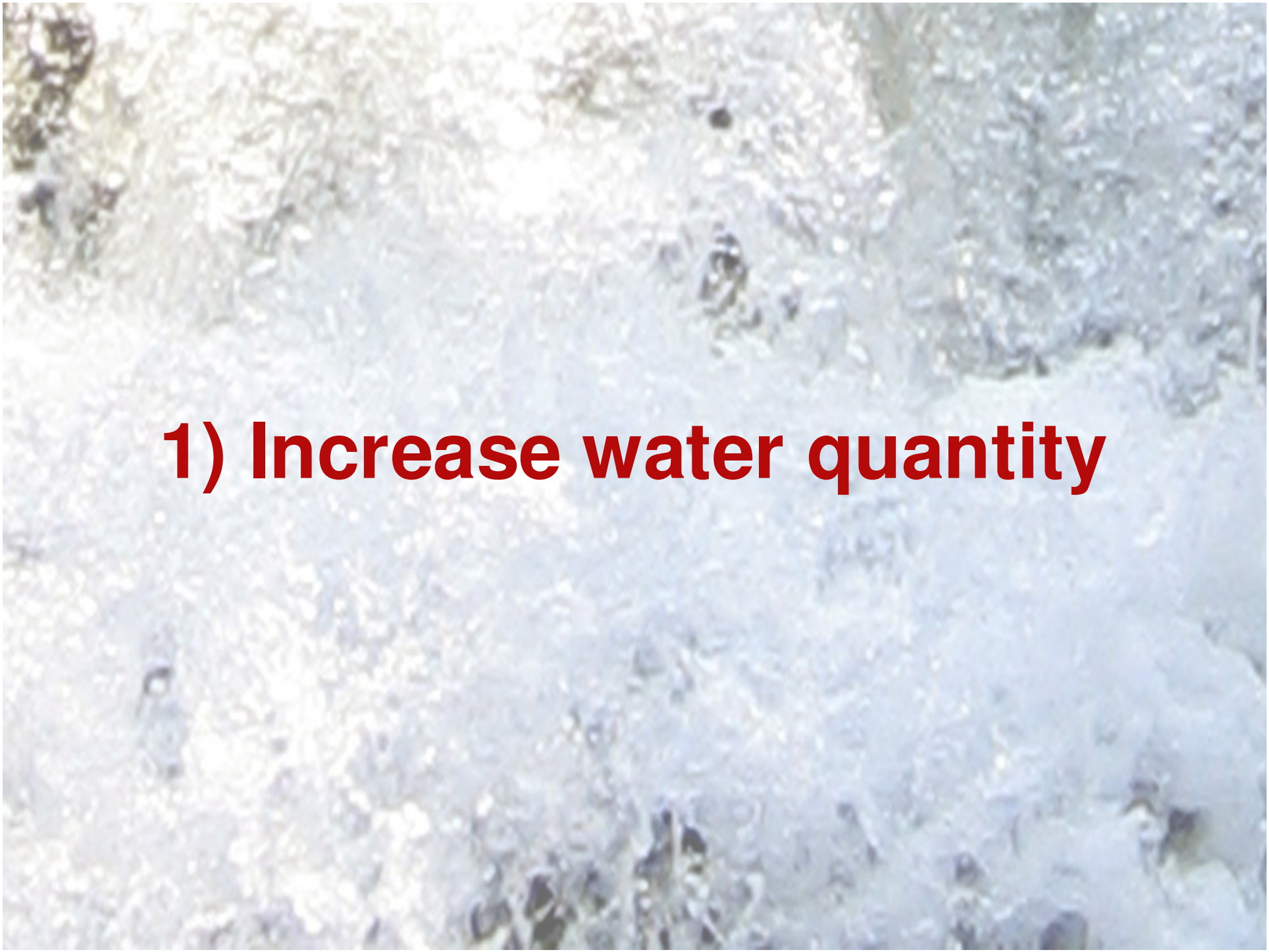
The main water and excreta related diseases

Disease / pathogen	Assumed predominant route of transmission
Diarrhoea (viral, bacterial, protozoal)	*Person to person, soil-person, drinking water, food, flies*
Typhoid fever	*Person to person, drinking water, food, flies*
Cholera	*Person to person, drinking water, food*
Polio	*Person to person*
Intestinal worm infections (Ascaris, Hookworm, trichuris etc…)	*Soil to person (oral or through skin)*
Schistosomiasis	*Through skin in contaminated water*
Guinea worm	*Drinking water*
Trachoma	*Flies, person to person*

From: Chin J et al.: Control of Communicable Diseases Manual{Chin, 2000 69 /id}

What can we do about it?




1) Increase water quantity

Increase water quantity

- **Impact on health difficult to measure**
- **Non-health benefits overwhelming**
  - Saving time
  - Saving money
  - Facilitates personal hygiene and cleanliness

Water access and observed hand washing in 10 Indian villages

Water source	Hand washing with soap after contamination*
House	15%
Yard	9%
Elsewhere	5%

*Adjusted for education and wealth


2) Improving excreta
disposal (sanitation)

Improving excreta disposal (sanitation)

- **Broad effect on many diseases:**
  - ⇨ Diarrhoea, worm infections, cholera, polio, typhoid, schistosomiasis, trachoma
- **Health effect difficult to measure**
- **Many non-health benefits**
  - ❑ privacy, convenience, social status
  - ❑ women: gender equality, security

Different techniques

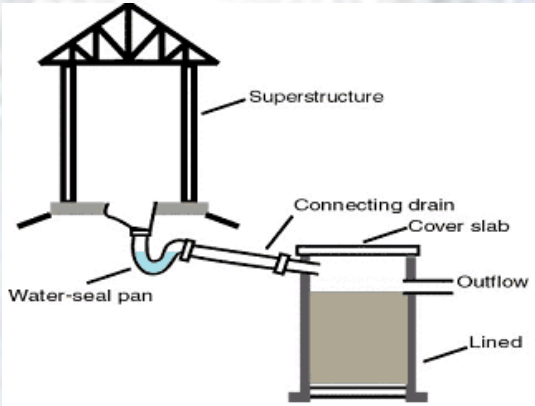
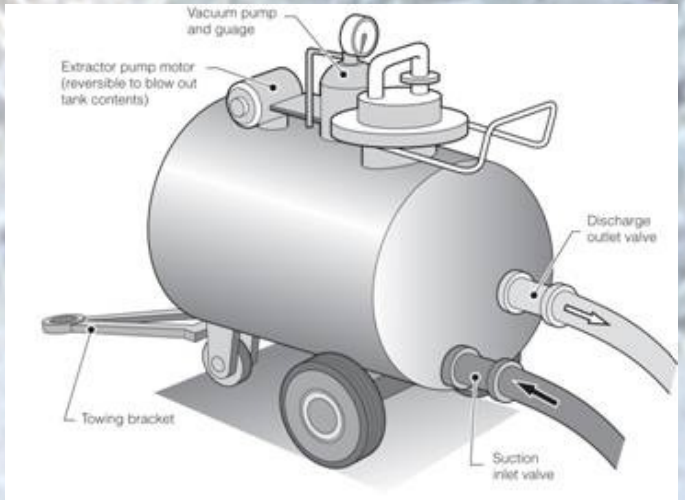


Figure 9: Pour flush latrine pan.



Source: WELL http://www.lboro.ac.uk/well/

Successful sanitation programmes are characterised by

- **Strong political support (local and national)**
- **Sustained involvement of community, schools**
- **Meeting people's demand**
- **Low cost solutions – provided by local craftsmen and service providers**

Source: Black, Fawcett: The last taboo (2008) UNICEF


3) Improving hygiene –
hand washing

Improving hygiene – hand washing

- **Reviews of randomised controlled trials have shown 30% - 50% reduction in diarrhoea**
- **Large study in Pakistan suggests 50% reduction of pneumonia (!)** *(Luby et al, Lancet 2004)*
- **Is this realistic / plausible?**
- **But even if much smaller it could be cost-effective**

Behaviour change is difficult

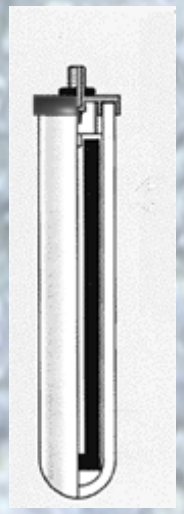
Prevalence of observed hand washing with soap in 10 India villages before and after hygiene promotion

Intervention villages				
	before	after	Change	95% CI
Hands washed with soap	6%	5%	-1%*	[-2%/ +3%]

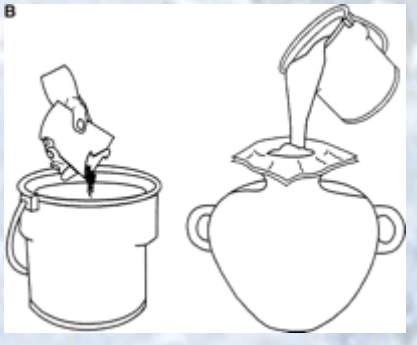
Control villages				
	before	after	Change	95% CI
Hands washed with soap	5%	6%	+1%	[-1%/ +2%]

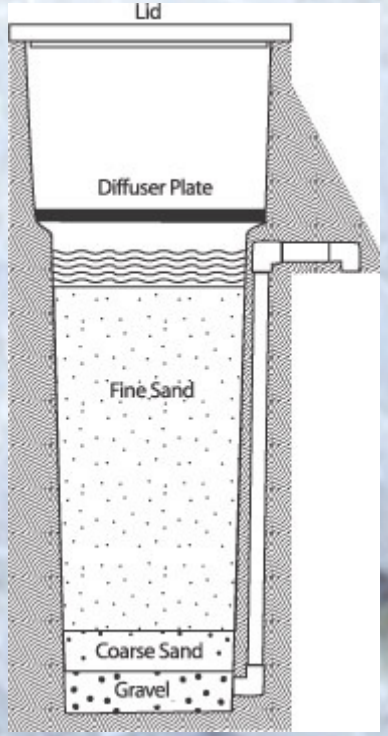
4) Household water treatment

Household water treatment



- Filtration
- Chlorination
- Flocculation
- Solar disinfection
- Biosand filtration





Household water treatment

- Believed to reduce diarrhoea by 30% - 40% (*Clasen T, Schmidt WP et al BMJ 2007*)
- Bias problems as with hand washing studies
- Large multinational companies heavily involved (*Bhandari et al, CMAJ. (2004) 17;170(4):477-80*)
- Improved water storage may be equally effective
- A blinded trial comparing water storage with chlorination showed no effect of chlorine!

Household water treatment

- **Uptake in poor populations very low**
- **Could divert focus from public to the private domain**

Three possibilities:

A. It doesn't work

B. Safe storage is as effective

C. People are unlikely to use it

⇨ **No realistic option except perhaps biosand filtration (water quantity!) or in emergency settings**

Population increase

- Efforts on water and sanitation barely keep up with population increase
- In 2006 around 2.6 billion people had no sanitation
- given current efforts this figure will decline to only 2.4 billion in 2015

Family planning?

- Reduces child and maternal mortality
- Promotes gender equality
- Is feasible and acceptable even in poor populations
- There is an unmet demand for services
- Can contribute to making water and sanitation less of an uphill struggle

(Cleland et al, Lancet 2006;368:p1810-27)

Conclusions

- Water access and sanitation top priority
- Hygiene promotion may contribute to disease reduction
- Household water treatment probably only in exceptional circumstances helpful