Burden of diarrhoea from WASH: process and lessons learned

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Why estimate EBD?

Useful for:

- Awareness raising
- Communicating
- Provide rational basis for prioritizing public health actions
- Basis for economic evaluation
- Engaging other sectors
Comparative risk assessment for estimating disease attributable burden

Exposure distribution in the population
Exposure-response relationship

Attributable fraction

\[ AF = \frac{\sum (Pe \cdot RR_x) - 1}{\sum (Pe \cdot RR_x)} \]

Disease burden attributable to risk factor

Attributable incidence, mortality, DALYs

Access to water, proportion exposed (pe)

Relative risks (RR)

Disease burden estimates per disease, or epidemiological data

Incidence, mortality, DALYs
Process –

1. Exposure response for drinking water and diarrhoea

- Systematic review of the literature for exposure-response matching exposure information
  - Meta-regression on WSH and DD, input from expert group


![Reduction in diarrhoea](chart)

- Improved source: 11%
- Piped on premises: 23%
- HWTS: 45%
- High quality: 79%
2. Exposure synthesis matching the exposure response curve

- Retrieve data from the WHO/UNICEF Joint Monitoring Programme
- Complete with data from DHS on household water treatment practices
- Model exposure to current year
World's use of drinking-water sources, and associated risk reductions

- Unimproved water source: 0% (10% risk reduction)
- Improved community source: 11% (23% risk reduction)
- Piped on premises: 23% (26% risk reduction)
- HWTS: 45% (25% risk reduction)
- High quality: 79% (16% risk reduction)

Source:
- Wolf et al. 2014
- Prüss-Ustün et al. 2014
Process –
3. Estimate PAF and multiply with disease statistics

- Calculate the PAF

\[ AF = \frac{\sum (Pe_x \cdot RR_x)}{\sum (Pe_x \cdot RR_x)} - 1 \]

- Multiply with the number of deaths / disease burden for the specific disease
  - Diarrhoea is available
    - 133 diseases and injuries available from WHO
    - A few more from IHME
World's use of sanitation facilities, and associated risk reductions

- Unimproved sanitation: 36% use, 0% risk reduction
- Improved sanitation, no sewer: 28% use, 16% risk reduction
- Sewer connection with treatment: 36% use, 69% risk reduction

World's handwashing after potential contact with excreta, and associated risk reductions

Freeman et al. 2014
Handwashing after toilet use

Freeman et al. 2014

Handwashing prevalence
Diarrhoea burden from WASH

- 842,000 diarrhoea deaths
- 362,000 child deaths
- 58% of diarrhoeal disease
- 1.5% of all deaths

Prüss-Ustün et al. 2014
Limitations

- Drinking-water assessments are based on the use of facilities, rather than the actual water quality.

- Exposure is limited for:
  - Meaningful assessments of good coverage of drinking water quality.

- Exposure-response relationships are limited for:
  - diarrhoea and drinking water of safe quality, community sanitation or handwashing.
  - many health outcomes, such as hepatitis, fluorosis, arsenicosis, or lead poisoning
Conclusions

- BoD estimation requires:
  - Established causality
  - Exposure-response relationship
    - Systematically compiled / accepted by the scientific community
    - Matching exposure data, representative for the world, or region of interest (or extrapolation possible)

- Limited information is acceptable to a certain point as long as hypotheses are clear and estimates are transparent.
Further reading and upcoming results

- Full information on diarrhoea burden from WASH in 5-paper series in August 2014 issue TMIH
- Preventing diarrhoea through better water, sanitation and hygiene
- Updates on other WASH-related diseases in preparation
A team effort