Burden of diarrhoea from WASH:
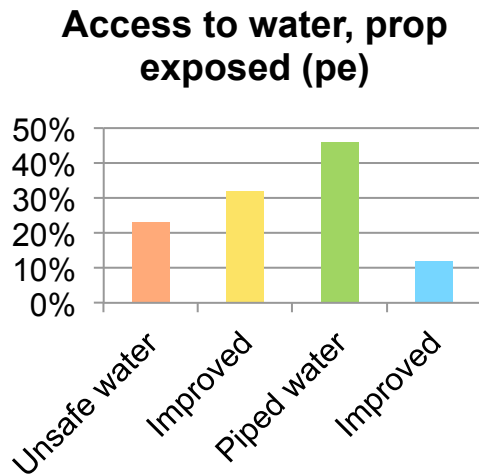## process and lessons learned

Annette Prüss-Ustün

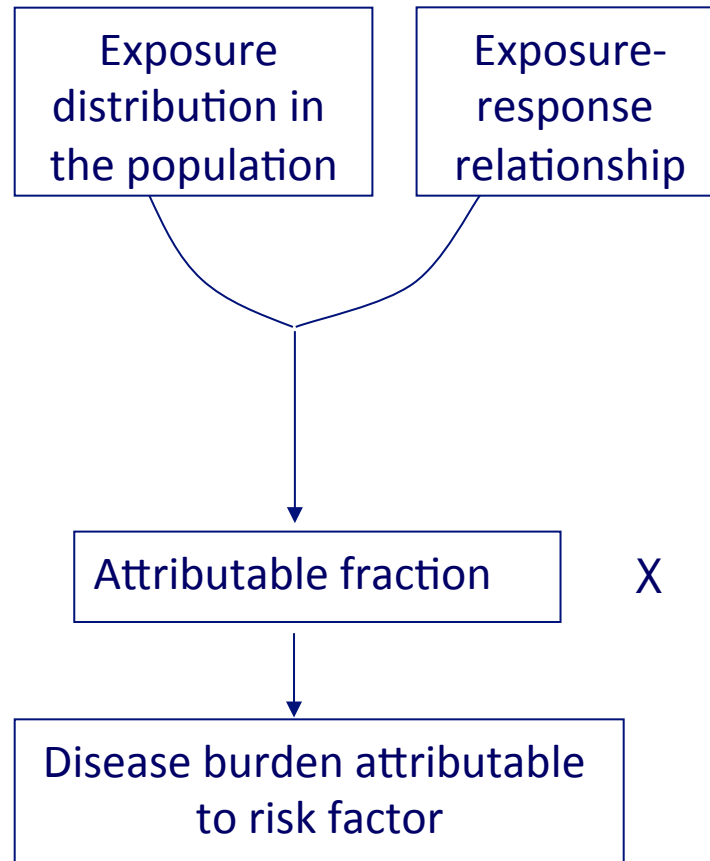World Health Organization

Why estimate EBD?

Useful for :

- Awareness raising

- Communicating

- Provide rational basis for prioritizing public health actions

- Basis for economic evaluation
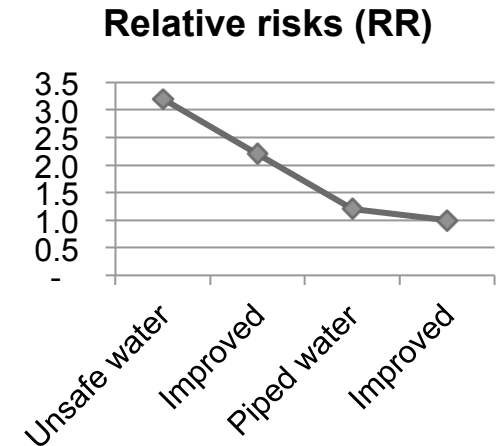
- Engaging other sectors

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Comparative risk assessment for estimating disease attributable burden

Access to water, prop exposed (pe)

Exposure distribution in the population

Exposure-response relationship

Relative risks (RR)

$$AF = \frac{\sum(Pe_x \bullet RR_x) \, - \, 1}{\sum(Pe_x \bullet RR_x)}$$

Attributable fraction

X

Disease burden estimates per disease, or epidemiological data

Incidence, mortality, DALYs

Disease burden attributable to risk factor

Attributable incidence, mortality, DALYs

World Health Organization
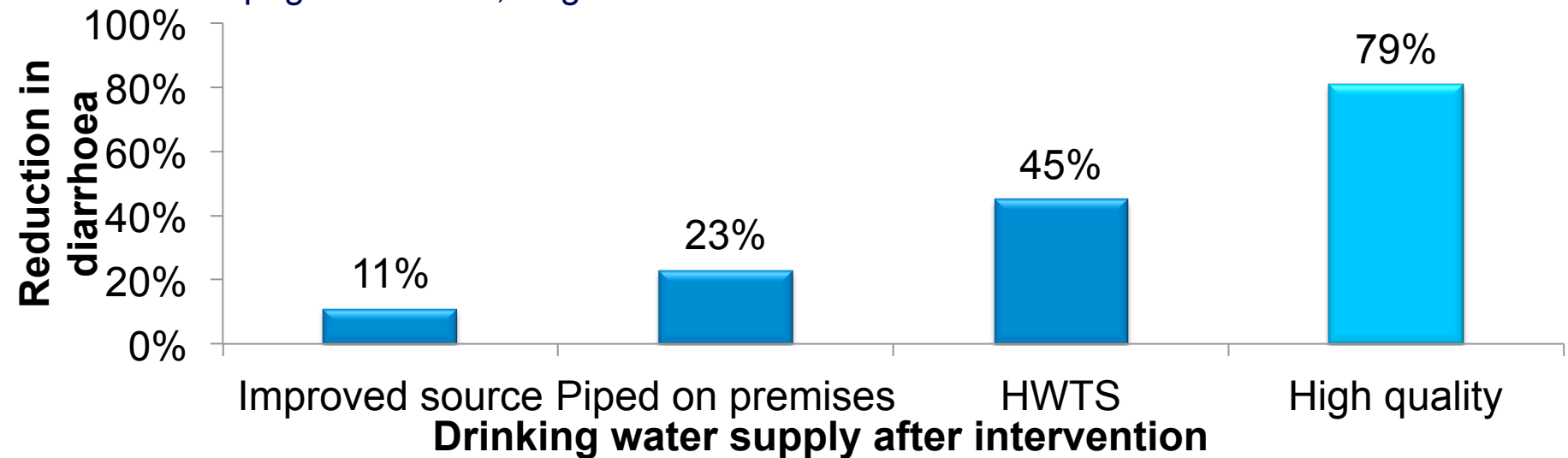
Process –
1. Exposure response for drinking water and diarrhoea

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

Systematic review: Assessing the impact of drinking water and sanitation on diarrhoeal disease in low- and middle-income settings: systematic review and meta-regression, Tropical Medicine & International Health, Volume 19, Issue 8, pages 928–942, August 2014
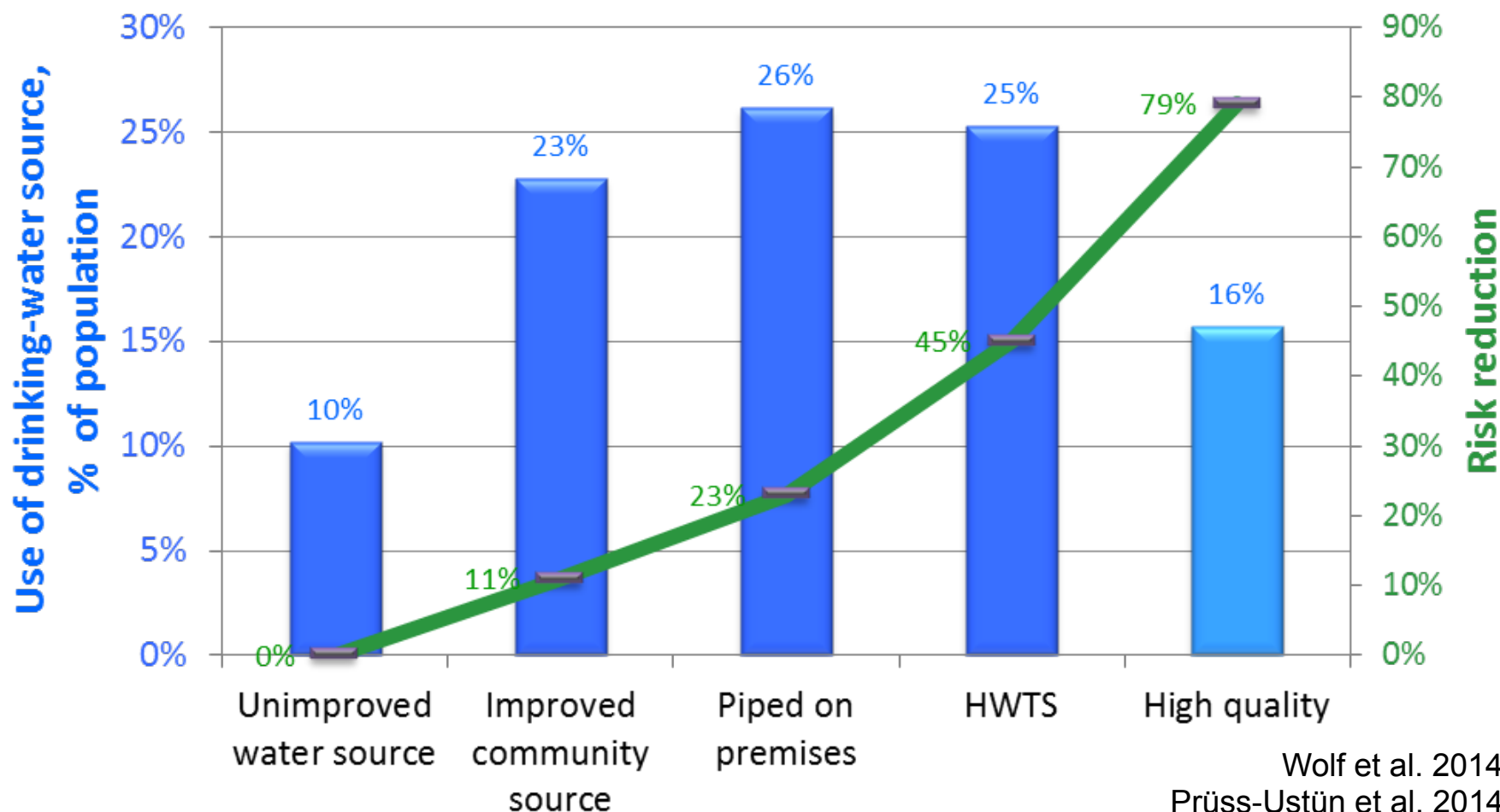
Process –
2. Exposure synthesis matching the exposure response curve

- Retrieve data from the WHO/UNICEF Joint Monitoring Programme

- Complete with data from DHS on household water treatment practices

- Model exposure to current year

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World's use of drinking-water sources, and associated risk reductions

Wolf et al. 2014
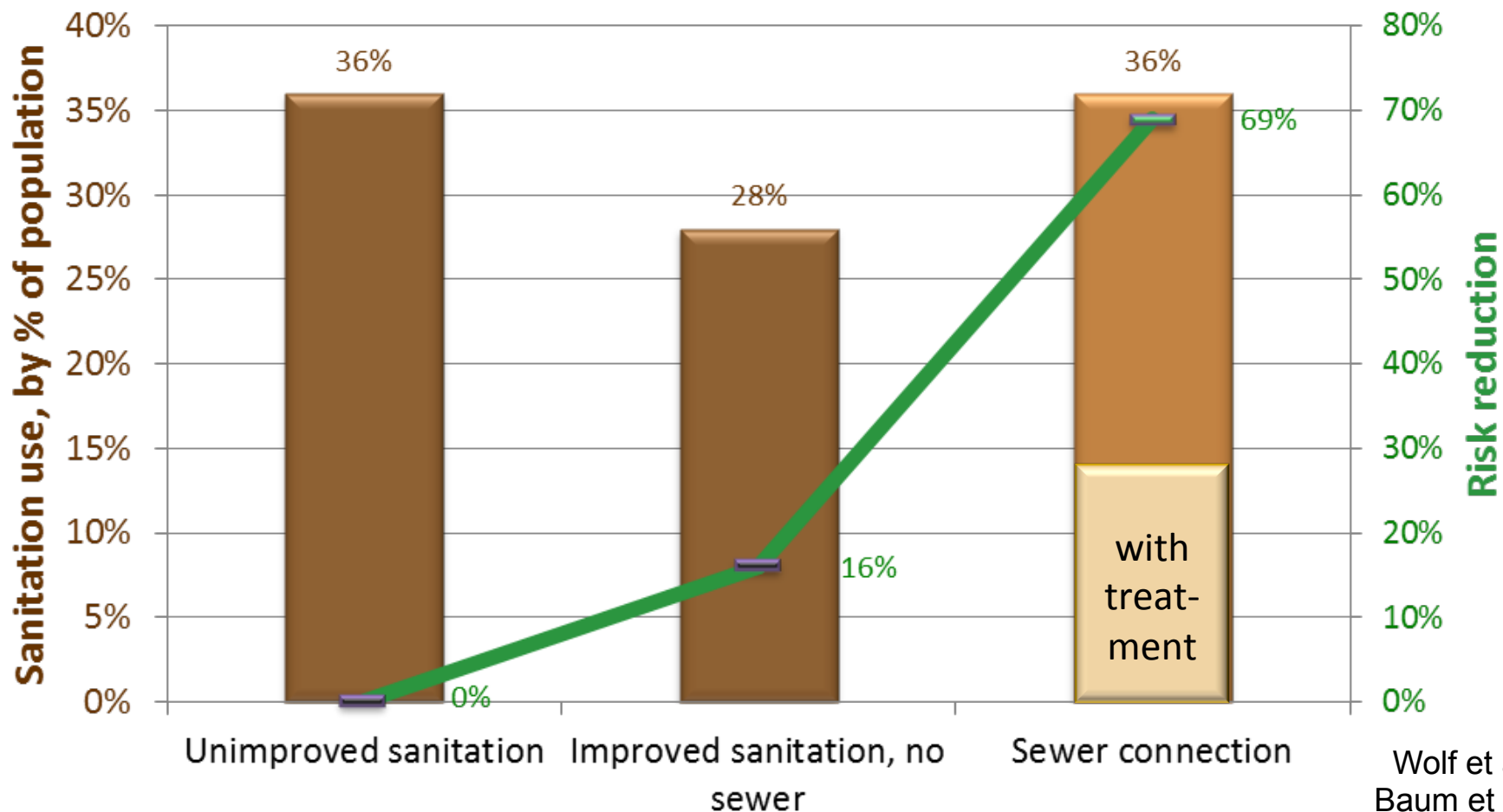Prüss-Ustün et al. 2014

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Process –
3. Estimate PAF and multiply with disease statistics

● Calculate the PAF

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

● 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

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World's use of sanitation facilities, and associated risk reductions

Sanitation use, by % of population

Risk reduction

- Unimproved sanitation: 36%, 0%
- Improved sanitation, no sewer: 28%, 16%
- Sewer connection: 36%, 69% (with treat-ment)

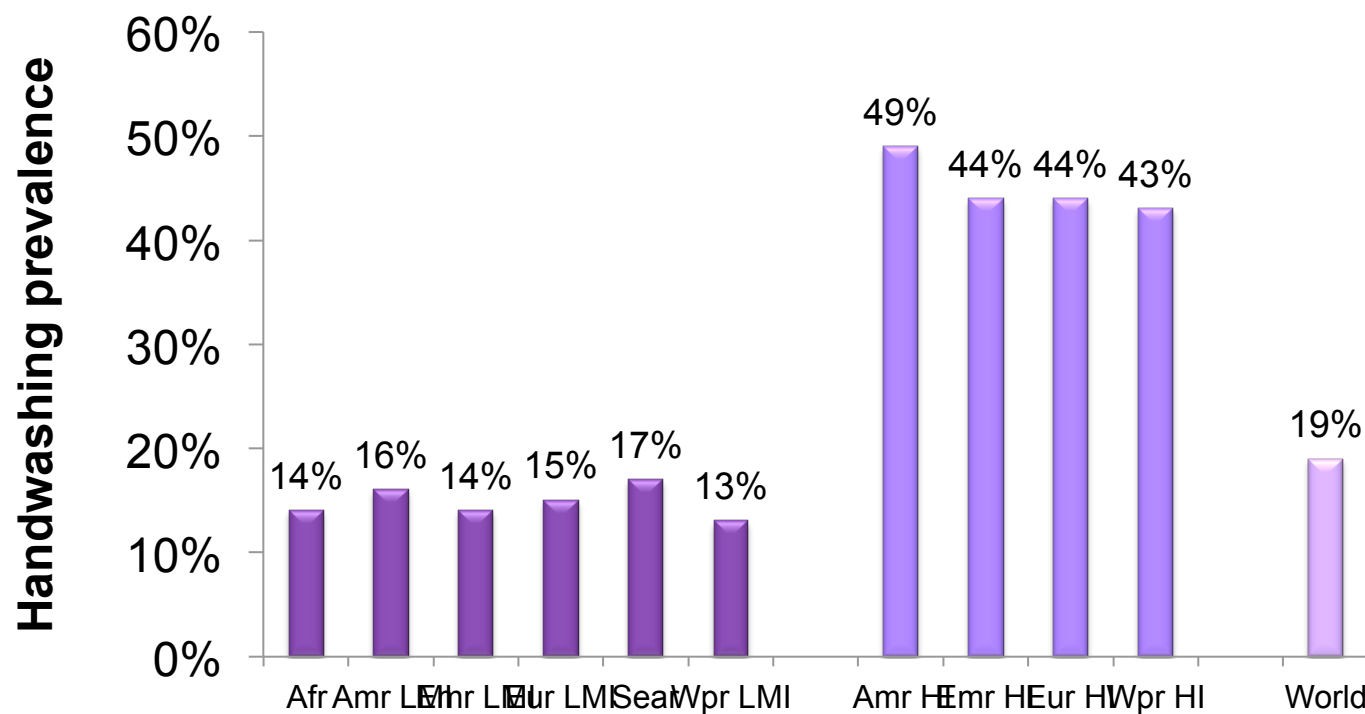Wolf et al. 2014
Baum et al. 2013
Prüss-Ustün et al. 2014

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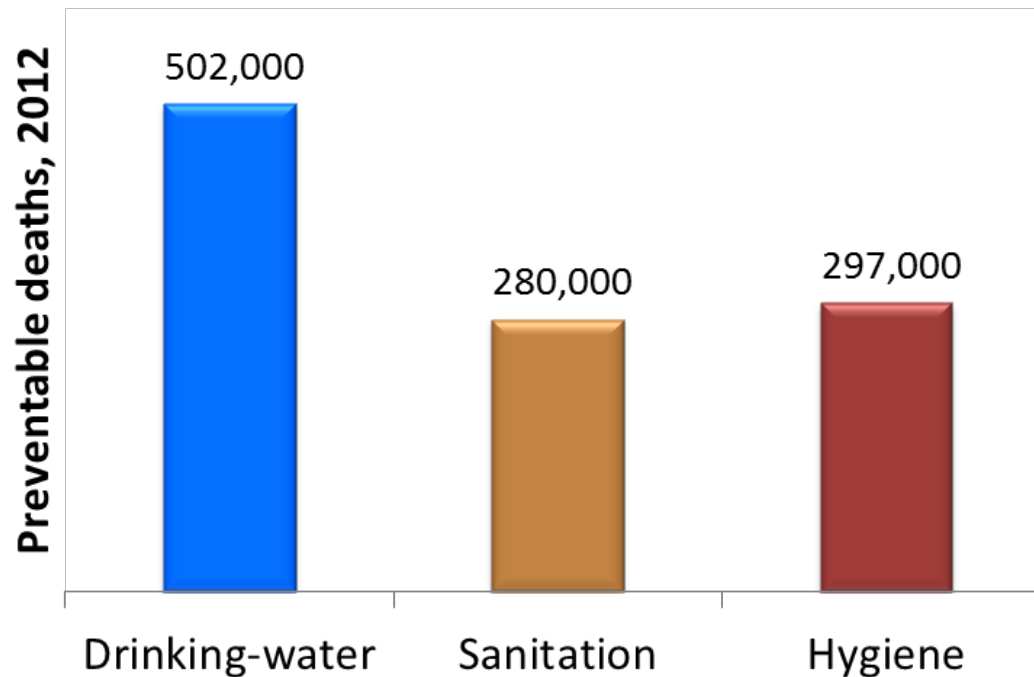

Freeman et al. 2014

World Health Organization
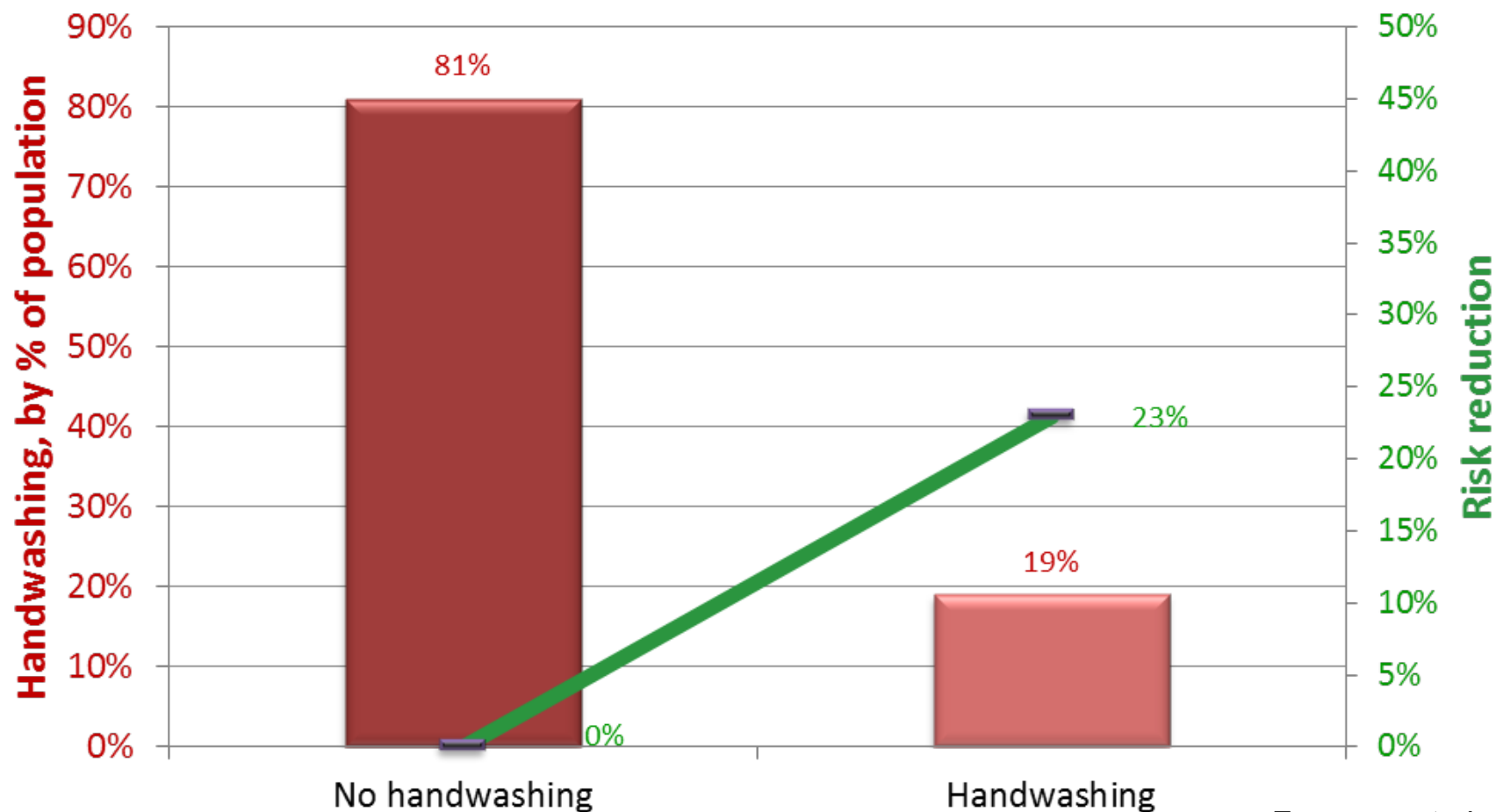
Handwashing after toilet use

Freeman et al. 2014

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Diarrhoea burden from WASH

- 842 000 diarrhoea deaths
- 362 000 child deaths

- 58% of diarrhoeal disease
- 1.5% of all deaths

Präss-Ustün et al. 2014

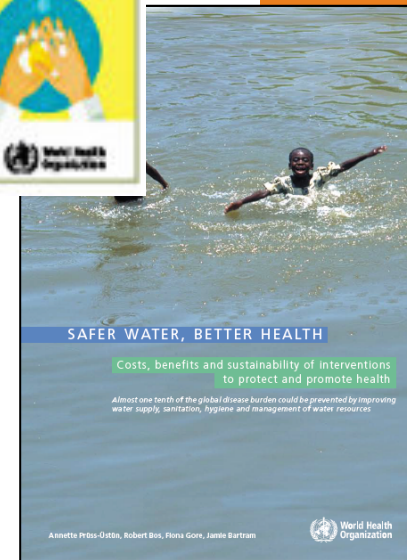**World Health Organization**

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

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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.

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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

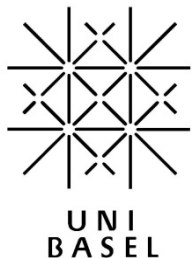- Updates on other WASH-related diseases in preparation

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A team effort