Effect of water, sanitation, and hygiene interventions on detection of enteropathogens and host-specific fecal markers in the environment: an individual-participant data meta-analysis

Andrew Mertens, Benjamin F. Arnold, Jade Benjamin-Chung, Alexandria Boehm, Joe Brown, Drew Capone, Thomas Clasen, Erica Fuhrmeister, Jessica Grembi, David Holcomb, Jackie Knee, Laura Kwong, Audrie Lin, Stephen P. Luby, Rassul Nala, Kara Nelson, Sammy Njenga, Clair Null, Amy J. Pickering, Mahbubur Rahman, Heather Reese, Lauren Steinbaum, Jill Stewart, Ruwan Thilakaratne, Oliver Cumming, John M. Colford Jr., Ayse Ercumen

## Table S4. Risk of bias based on modified Newcastle-Ottawa scale

| **Reference** | **Selection bias** | **Response bias** | **Follow-up bias** | **Misclassification bias** | **Outcome assessment** | **Outcome measurement** | **Bias in analysis** | **Total** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Is there evidence of selection bias, which refers to systematic differences between baseline characteristics of the groups that are compared?a | Is there evidence of response bias?b | Is there evidence of bias due to missing follow-up data?c | Is there risk of households not receiving the intervention being misclassified as having received it, or vice versa?d | Is there evidence of bias arising from how the outcome was assessed?e | Is there evidence of ascertainment bias?f | Is there evidence that analysis was not appropriately adjusted for clustering and/or confounding, if appropriate?g | Total number of stars (x/9 possible stars). |
| Clasen T, et al. Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. Lancet Glob Health. 2014. | \* | \* no, laboratory assessed and blinded | possible (86% of possible weeks are reported weeks) | \* household-level interventions | \*\* | \* | \*\* adjusted for clustering | 8 |
| Luby, S.P. et al.. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: a cluster randomised controlled trial. The Lancet Global Health 2018 | \* | \* no, laboratory assessed and blinded | \* 94% complete FU | \* household-level interventions | \*\* | \* | \*\* | 9 |
| Null, C. et al., Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Kenya: a cluster-randomised controlled trial. The Lancet Global Health 2018 | \* | \* no, laboratory assessed and blinded | \* <1% loss to FU | \* household-level interventions | \*\* | \* | \*\* | 9 |
| Reese, H. et al. Assessing longer-term effectiveness of a combined household-level piped water and sanitation intervention on child diarrhoea, acute respiratory infection, soil-transmitted helminth infection and nutritional status: a matched cohort study in rural Odisha, India. International journal of epidemiology 2019 | selection bias is possible, as the study is not randomized and there are some baseline differences between intervention and control group | \* no, laboratory assessed and blinded | substantial loss to FU | \* household-level interventions | \*\* | \* | \*\* | 7 |
| Knee, J. et al. Effects of an urban sanitation intervention on childhood enteric infection and diarrhea in Maputo, Mozambique: A controlled before-and-after trial. eLife 2011 | selection bias is possible, as the study is not randomized, but intervention and control groups were mostly balanced at baseline. Control households were more likely to have covered floors and higher quality walls and intervention groups had more people per household. | \* no, laboratory assessed and blinded | substantial loss to FU | \* household-level interventions | \*\* | \* | \*\* | 7 |

a RCTs receive 1 star, unless evidence of selection bias (e.g. randomisation procedures not followed). Meaningful differences between groups at baseline in (c)RCTs receive 0 stars. Rates of declining to participate >10% receive 0 stars. Non- or quasi-randomised studies receive 0 stars.

b If intervention recipient was not blinded to intervention status, 0 stars.

c <10% receives 1 star, ???10% receives 0 stars.

d Interventions delivered at the household/individual level receive 1 star. Interventions delivered at the community level that missed a substantial, i.e. ???10%, proportion of the target population receive 0 stars, including when there is insufficient information to verify whether this is the case. Interventions with substantial risk of contamination (control households receiving intervention) receive 0 stars.

e Parent / person recall (=0 stars). Fieldworker assessed (=1 star). Physician / microbiologically assessed (=2 stars)

f If outcome measurement staff were not blinded to intervention status, 0 stars.

g Scoring is based on losing stars (max. 2). Individual RCTs with baseline balance on covariates are unlikely to require adjustment (=2 stars). Cluster-RCTs and non-randomised trials may require adjustment for clustering (-1 star if not done). RCTs or cRCTs may require adjustment for covariates, with justification (-1 star if not done). Non-randomised studies require adjustment for covariates (-1 star if not done), but also adequate justification for covariate selection (-1 star if not included) - nb. there can be “too few” or “too many” covariates.