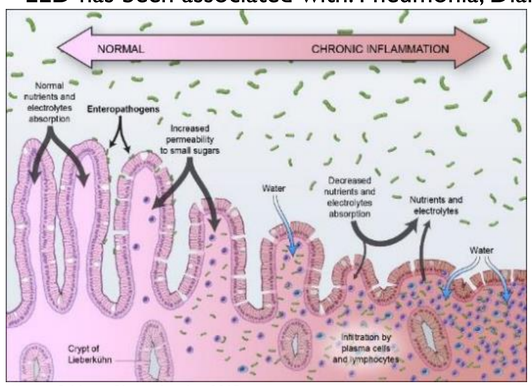
Impact of Water, Sanitation, and Hygiene Interventions on Environmental Enteric Dysfunction in Children in Developing Countries: A Systematic Literature Review

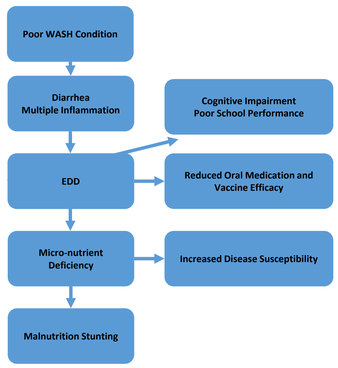
THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

Abdoulaye Bangoura; Dr. Susan Anenberg
Department of Environmental and Occupational Health, Milken Institute School of Public Health

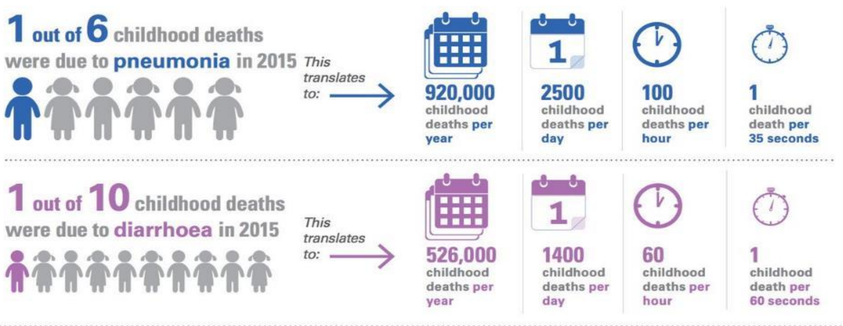
INTRODUCTION

- Environmental Enteric Dysfunction (EED) refers to an incompletely defined syndrome of inflammation, reduced absorptive capacity, and reduced barrier function in the small intestine.
- It is widespread among children and adults in low- and middle-income countries.
- EED is asymptomatic.
- There is no known treatment for EED.
- EED has been associated with: Pneumonia; Diarrhea; Undernutrition.





Harder & Muller Biomedical Art, 2015



UNICEF, 2016

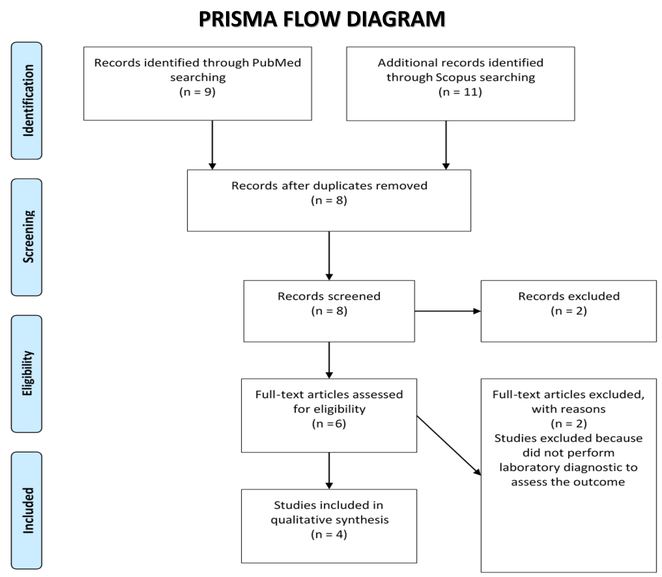
OBJECTIVE

The objective of this systematic literature review is to evaluate the impact of Water, Sanitation, and Hygiene (WASH) interventions on EED on children in developing countries.

METHODS

- **Database searched:** Scopus, PubMed, and the reference lists of included studies were searched for all studies published in English.
- **Study Selection:**
- Included studies that used laboratory methods to diagnose EED,
- focused on children aged from 0 to 18 years,
- Had a WASH interventions and conducted in in low- and middle-income countries.

PICO	
Population	Children aged from 0 to 18 years old in developing countries
Interventions	WASH improvement programs (handwashing, clean water, safe baby feces disposal, improved sanitation…)
Control	Children living in setting with improved WASH conditions
Outcome	Laboratory diagnosed Environmental Enteric Dysfunction (EED)



RESULTS

Study references	EED Assessment	Main findings
Marie George et al. 2016	Stool sample. EED status was determined by using the fecal myeloperoxidase, alpha-1-antitrypsin, and neopterin calculation.	Children in households where caregivers reported safe child feces disposal had significantly lower environmental enteropathy scores (0.82-point difference, 95%CI 0.11-1.53)
Lin et al. 2013	Urine collection and intestinal permeability assay	Children living in clean household environments had lower L:M ratios (improved gut function) than children from contaminated households (−0.32 SDs lower; 95% CI = −0.72, 0.08)
Berendes et al. 2017	Stool sample, EED was assess with Polymerase Chain Reaction (PCR) test	Children in households with a toilet that contained excreta in a tank onsite had 55% lower prevalence of enteric infection com- pared with the rest of the study area.
Yakubu et al. 2017	Stool sample, EED was assess with Polymerase Chain Reaction (PCR) test	The presence of a household toilet was associated with lower risks of enteric infection (RR: 0.91, 95% CI: 0.79–1.06)

The four studies found a benefit of WASH intervention for reduced EED

- Safe child fecal disposal reduce the risk of EED -Marie George et al.
- Clean household environment is associated to a lower EED Prevalence- Lin et al
- Improved Fecal Sludge Management is associated to a lower risk of EED- Berendes et al.
- Having a toilet is associated to a lower risk of enteric infection - Yakubu et al.

CONCLUSIONS


Guinea, 2014

- According to the finding of this review WASH interventions could be a part of the solution.
- Additional studies are needed to determine which intervention could prevent EED in the most effective manner.


Lillie Foulematou Bangoura (2016)