sustainable sanitation alliance

SuSanA Factsheet

WASH in NUTRITION

December 2014

1. Summary

This document is a compilation of main facts, existing evidence and remaining research gaps regarding the link between inadequate sanitary conditions and its underestimated impact on undernutrition and stunting, particularly for children under five years of age. It is a clear plea for more rigorous research, policy coherence and cooperation between Health and Nutrition, WASH, Mental Health, Care Practices and Food Security sectors, and the need to adequately address and consider WASH[1] as an integral part of nutrition interventions. It particularly highlights the impact of WASH interventions on mothers and children's (under five years of age) nutritional and health status. An estimated 30% of all children in low-income countries suffer from undernourishment[2] and WASH services can help to alleviate this:

"*More than 3.5 million mothers and children under five die unnecessarily each year due to the underlying causes of undernutrition, and millions more children are permanently disabled by the physical and mental effects of a poor dietary intake in the earliest months of life.*"[3]

"Child health, nutrition, growth, and development are interlinked, and are influenced by the hygiene of the immediate environment in which the baby begins to explore the world. In addition to expanding the scope of interventions, it is also important to broaden the conceptual structure of WASH as an aspect of child nutrition and development interventions, and not simply as the sum of toilets, caregiver hand washing, and water purification. WASH should be defined holistically as broadly encompassing the hygiene-related aspects of the physical and behavioral environment in which children are being raised." [4]

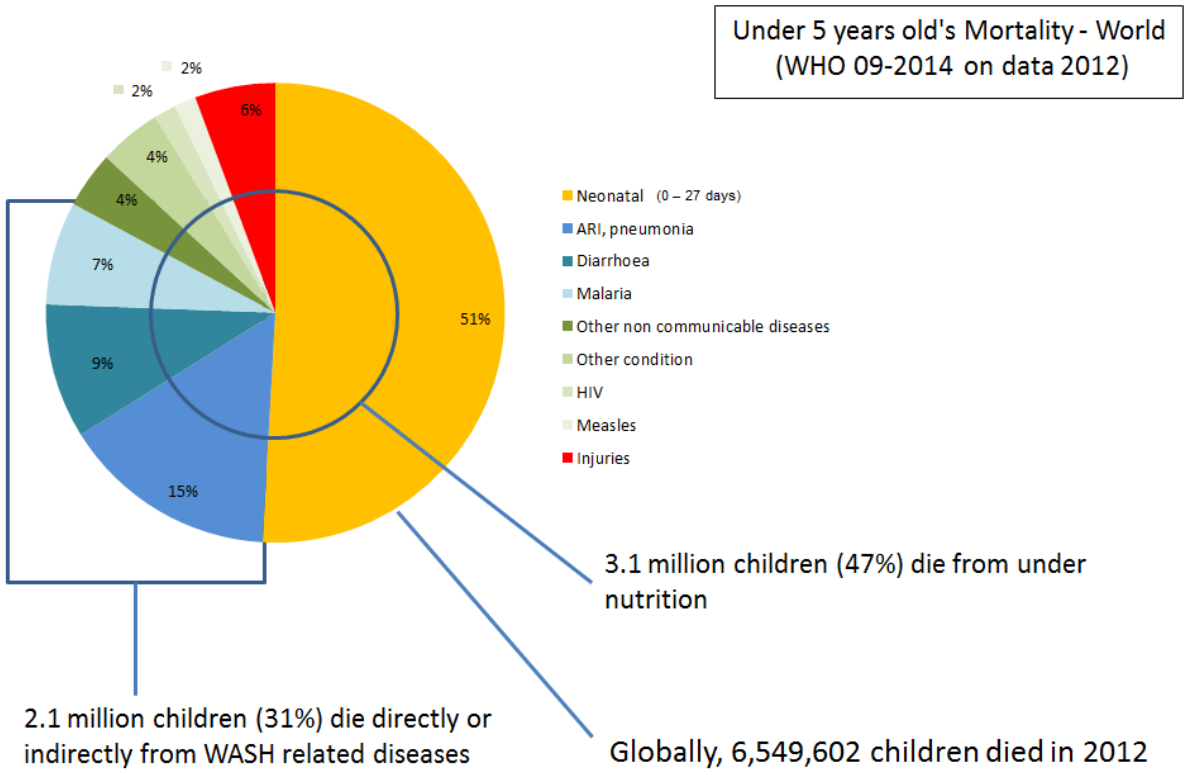
The aim of this fact sheet is to offer a compilation of relevant studies showing evidence on the link between sectors and to lobby for more cooperation between them.

2. Key Facts about WASH in Nutrition

Overview on the Health Status of Children under 5 years of age (WHO, 2014)

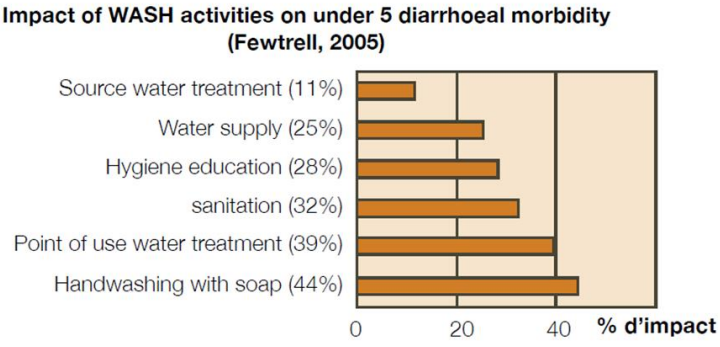
- Globally, there are 1.7 billion cases of diarrheal disease annually, resulting in 628,500 (9.5%) of children deaths.
- 60% of children's deaths from diarrhea are caused by unsafe water, pathogen-contaminated foods, lack of sanitation, and poor hygiene practices, and are therefore preventable.
- Malaria results in 476,192 children deaths, which is 7% of the annual children death toll.
- Pneumonia and Acute Respiratory Infections (ARI), strongly related to an improper environment, accounts for 996,520 (15%) of children death toll.
- 47% of children deaths are estimated to be linked with undernutrition, accounting for 3.1 million per year.
- 161 million (24.5%) children are affected by stunting (low height for age).
- 51 million (8%) by wasting (low weight for height).
- 99 million (15%) by underweight (low weight for age).

[1] Water, Sanitation and Hygiene
[2] World Health Organization, 2014.
[3] The Lancet's Series on Maternal and Child Undernutrition, 2013.
[4] Ngure et al., WASH and ECD: Making the Links, 2014. Ann. N.Y. Acad. Sci. 1308 (2014) 118–128 C 2014 New York Academy of Sciences

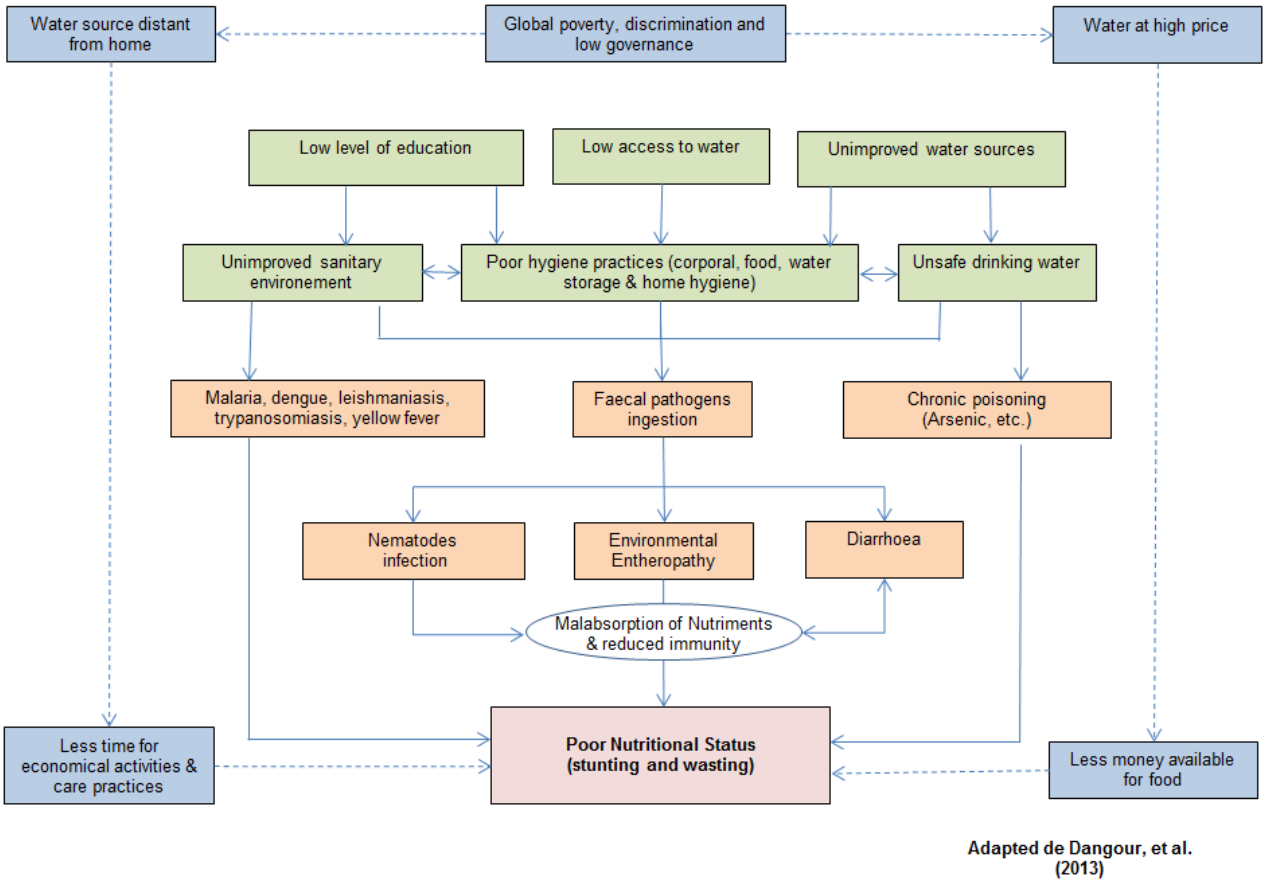


WASH Interventions' Impact on Children's Nutritional & Health Status

- WASH interventions can impact positively on stunting incidence rates *(Cochrane, 2013).*
- WASH intervention effect is an equivalent to a reduction of 15% in global prevalence of stunting *(Cochrane, 2013).*
- There is a significant impact of sanitation on stunting *(Spears & Hammer, 2013).*
- Growth faltering is strongly associated with diarrheal disease cases *(Weitz, 2011).*
- There is strong evidence of a positive impact of WASH interventions on child infections *(Fewtrell Review , 2005).*
- Improved WASH conditions can reduce parasitic intestinal infections such as worm infestation that impacts nutritional status *(Pruss-Ustun, 2006).*
- Symptoms from nematode parasites (such as hookworm) include loss of blood and consequently increased anemia prevalence leading to chronic fatigue and stunting *(Black, 2013).*
- High pathogen environments induce recurring infections in the gut that limit proper absorption of nutrients, known as Environmental Enteropathy *(Humphrey, 2009).*
- Children younger than 5 years old in households that received plain soap and handwashing promotion had a 50% lower incidence of pneumonia than in control groups *(Luby, 2005).*



What are the main WASH routes to Undernutrition?



The **5 A's** is a new framework of analysis for undernutrition[5]:

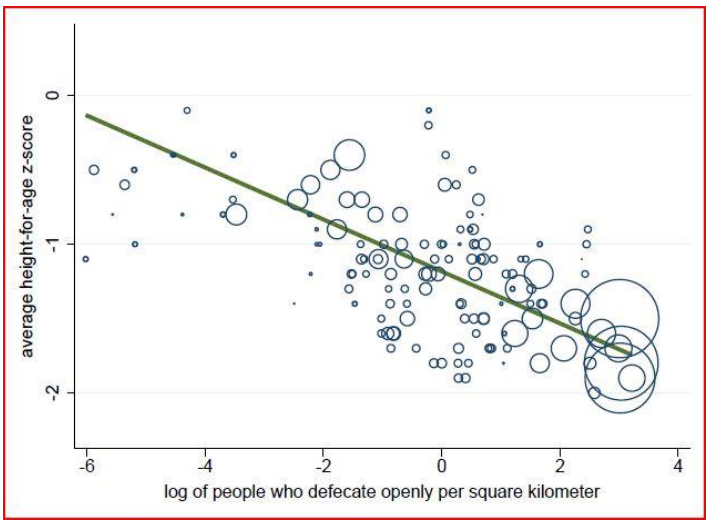
- **Availability:** Nutritious food should be readily available and sufficient.
- **Access**: People must be able to obtain food.
- **Absorption**: Much of food that is ingested is not absorbed due to infections that cause damage to small intestine leading to reduced capacity to absorb nutrients. Diarrhea cases dehydrate and evacuate nutrients unabsorbed.
- **Antibodies**: Producing antibodies to fight infections diverts nutritional energy from growth to defense.
- **Allopathogens**: Numerous other FTIs[6] take their toll, including Hepatitis A, B and E, typhoid fever, etc.

The last three "A's" can be impacted positively by improved WASH facilities and services. Nutrition interventions typically focus on quantity and quality of food, feeding programs, and issues of governance and rights. This new framework of 5 A's presents a more comprehensive analysis of undernutrition with attention to the role of fecal-transmitted infections (FTI) represented in the last 3 A's. Among FTIs, diarrhea incidences received the most attention, but environmental enteropathy (damage of small intestine wall due to ingestion of fecal bacteria) is also nutritionally very significant. Recent research establishes the direct link with undernutrition and open defecation (OD) as well as its associated unhygienic conditions and practices.[7]

[5] Adapted from "Sanitation and Stunting in India, Undernutrition's Blind Spot", Robert Chambers & Gregor von Medeazza, 2013.
6 FTI : Faecal Transmitted Infections
[7] IDS working paper Volume 2014, no 450, Robert Chambers & Gregor von Medeazza, p. 10.

The Link between Sanitation and Child Height (Stunting)[8]

"A child's height is one of the most important indicators of her well-being. Height reflects the accumulated total of early-life health, net nutrition, and disease. Because problems that prevent children from growing tall also prevent them from growing into healthy, productive, and smart adults. Child height is strongly associated with the average number of people per square kilometer in a country who practice open defecation. The density of open defecation per square kilometer, in this simple linear graph, can account for 64% of international variation in child height."[9]



WASH in Nutrition Strategy: The Five Main Axes

1. Ensure **geographical / programatic integration** of WASH and Nutrition projects by focusing WASH projects in high undernutrition prevalence areas
2. Prioritize the **'mother / child'** unit
3. Ensure a **WASH minimum package** (kit, messages & standards) both in health & nutrition centers and at the household level
4. Place emphasis on **behavior change**
5. Ensure that both **coordination** bodies (WASH and Nutrition) include representation from the other sector

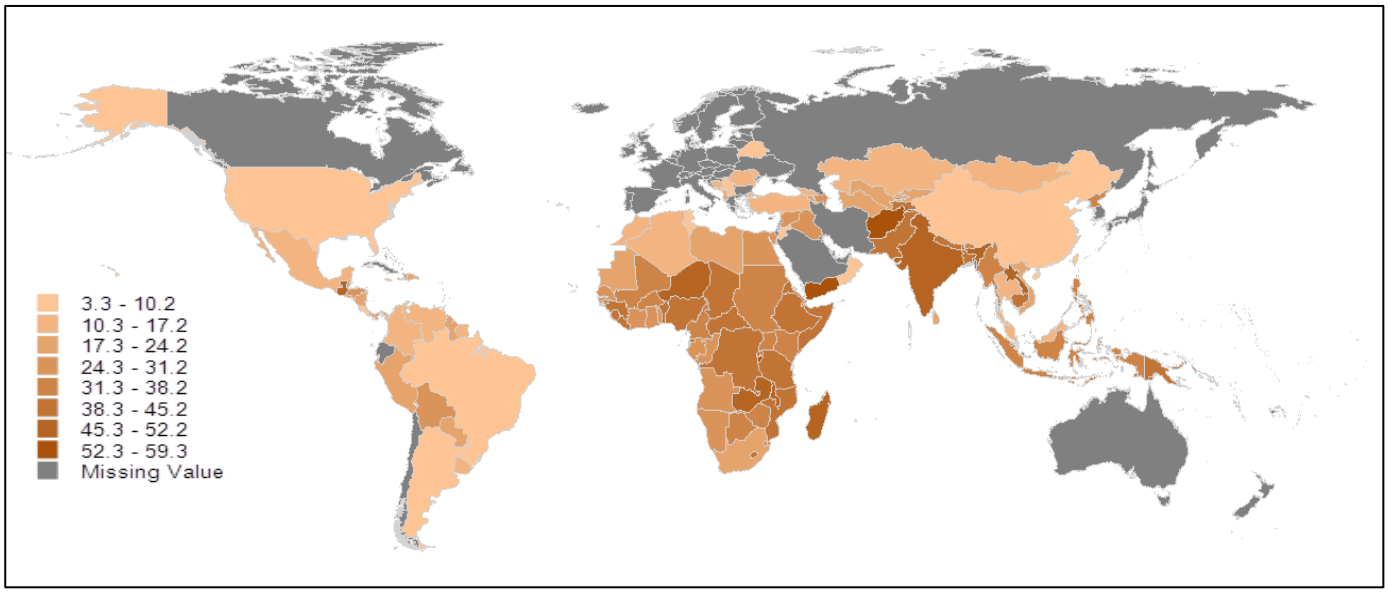
Remaining Key Questions

- Does a safe WASH environment at household- or community-level have an impact upon the prevalence of Global Acute Undernutrition?
- Can a short-term WASH intervention have an effect upon Global Acute Undernutrition incidence rates?
- Does a WASH intervention, implemented during the treatment of a Severe Acute Malnourished (SAM) child, improve effectiveness and efficiency of the treatment (time and cost reduction) and reduce risks of post-recovery relapse?
- What is the impact of the "quantity of water available at household level" indicator on undernutrition?

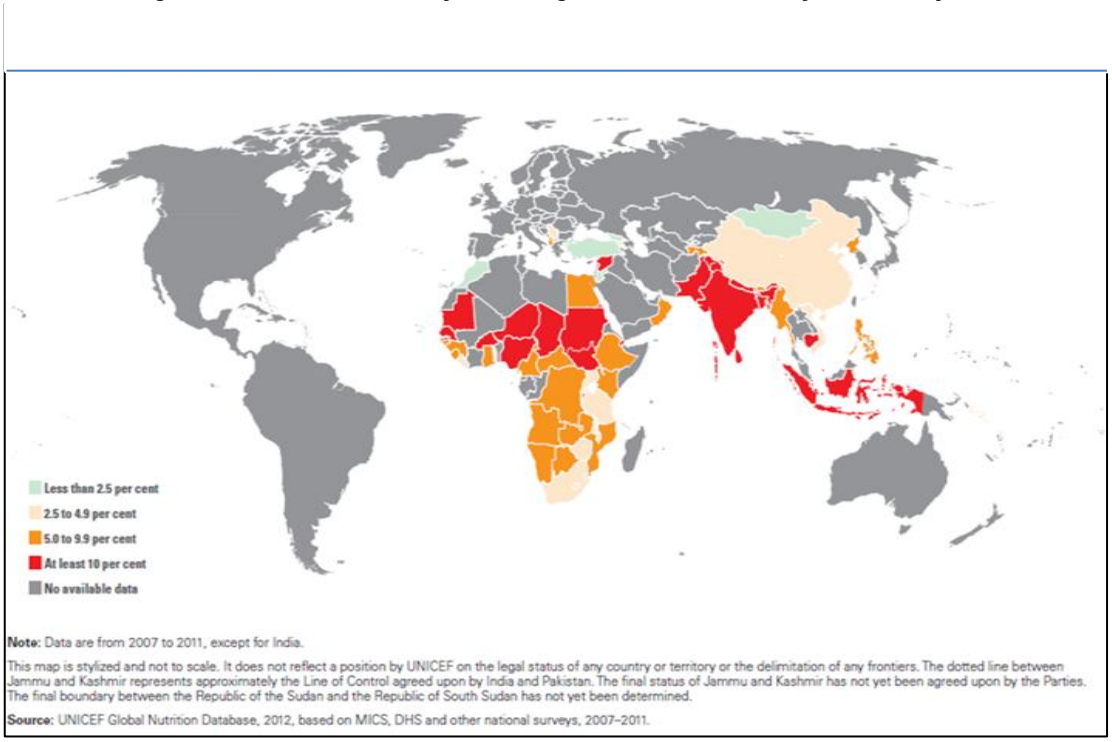
[8] There is indeed less scientific evidence available on the link between WASH and child wasting. However, some studies can be consulted on this topic such as this study carried out in Ethiopia, where safe drinking water was related to reducing underweight and wasting and that handwashing with soap (at critical times) could help reduce accute malnutrition. Here is the link : http://www.susana.org/_resources/documents/default/2-1818-impacts-of-wash-on-community-managed-acute-child-malnutrition-in-ethiopia.pdf

[9] Dean Spears (2013): http://blogs.worldbank.org/impactevaluations/the-toilet-gap-how-much-of-differences-across-developing-countries-in-child-height-can-sanitation-ex

3. Maps related to WASH and Nutrition

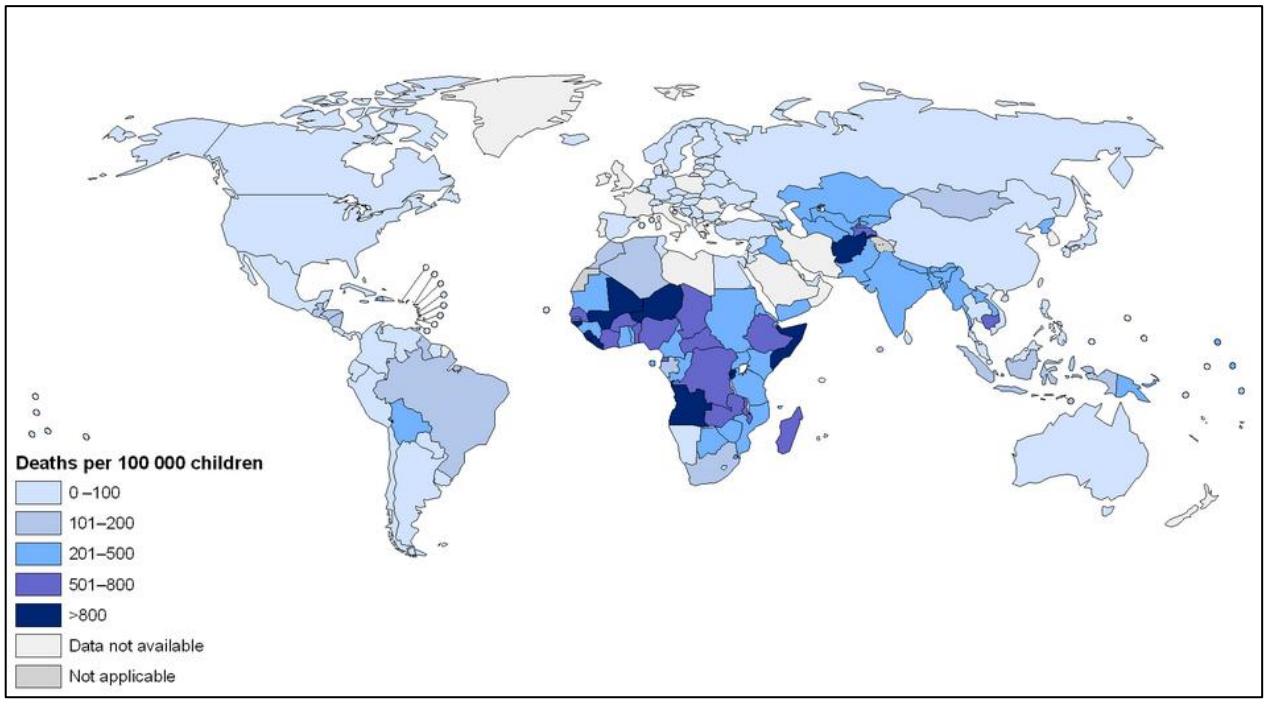


Percentage of Children under five years of age who are moderately or severely stunted[10]



Prevalence of Wasting – Percentage of severely or moderately wasted children (UNICEF 2007-2011)

[10] UNICEF global databases, 2012. Based on Multiple Indicator Cluster Surveys, Demographic and Health Surveys, and national surveys. Data refer to the most recent year available for each country.



Diarrhea – Children's (under five years of age) Mortality Rate (UNICEF 2014)

4. Main Studies on WASH in Nutrition and Key Results

AUTHOR	YEAR	COUNTRY	RESULTS
Hassan, et al.	1985	Bangladesh	Hand-pumps, latrines and hygiene promotion reduce diarrhea incidence by 25%.
Hassan, et al.	1985	Bangladesh	There is no significant impact of these interventions on children`s nutritional status. Very general statement, would leave this one out as it is not so clear what the interventions were.
Esrey	1996	Multicountry	40% reduced diarrhea prevalence between an optimal sanitation and less optimal sanitation when both groups have unimproved water (urban context).
Esrey	1996	Multicountry	13% reduced diarrhea prevalence between an optimal sanitation and less optimal sanitation when both groups have intermediate water (urban context).
Esrey	1996	Multicountry	19% reduced diarrhea prevalence between an optimal sanitation and less optimal sanitation when both groups have optimal water (urban context).
Esrey	1996	Multicountry	Improvements on sanitation have no effects on diarrhea prevalence in rural context.
Esrey	1996	Multicountry	Improvements between weak sanitation to an intermediate sanitation increase height between 0,8 - 1,1 cm of 18-month old babies.

Esrey	1996	Multicountry	Improvements between weak sanitation to an optimal sanitation increase height between 1.5 - 1.9 cm on 18-month old babies.
Esrey	1996	Multicountry	Improvements on sanitation lead to a reduction of growth deficit between 22% - 53% in urban context.
Esrey	1996	Multicountry	Improvements on sanitation lead to a reduction of growth deficit between 4% - 37% in rural context.
Esrey	1996	Multicountry	Improvements on sanitation lead to a reduction of weight deficit between 11% - 41% in urban context.
Esrey	1996	Multicountry	Improvements on sanitation lead to a reduction of weight deficit between 5% - 35% in rural context.
Alam, Marcks, Baqul, Yunus y Fuchs	2000	Bangladesh	Dysentery is associated with an annual loss of 0.5kg and 1.15 cm on children under 5 years old.
Checkley, et al.	2004	Perú	24-month old babies living in the worst WASH conditions are 1 cm shorter than those living in the best WASH conditions.
Checkley, et al.	2004	Perú	24-month old babies living in the worst WASH conditions have 54% more diarrhea episodes than those living in the best WASH conditions.
Checkley, et al.	2004	Perú	24-month old babies with smaller storage containers have 28% more diarrhea episodes than those with bigger storage containers.
Checkley, et al.	2004	Perú	Lack of sewage disposal explains 0.9cm of deficit growth of 24-month old babies.
Checkley, et al.	2004	Perú	Children who live in households with water connection, but without adequate sewage disposal and small storage containers, are 1.8 cm shorter than those who live in households with adequate sewage disposal and storage containers.
Luby, et al.	2006	Pakistán	55% reduced diarrhea prevalence with bleach and storage container interventions.
Luby, et al.	2006	Pakistán	51% reduced diarrhea prevalence with hand-washing with soap interventions.
Luby, et al.	2006	Pakistán	64% reduced diarrhea prevalence with disinfectant interventions.
Luby, et al.	2006	Pakistán	55% reduced diarrhea prevalence with disinfectant and hand-washing with soap interventions.
Bhutta, et al.	2008	Multicountry	30% reduced diarrhea incidence with hygiene practice promotion.
Bhutta, et al.	2008	Multicountry	Each diarrhea episode increases by 4% the possibility of suffering stunting.
Bhutta, et al.	2008	Multicountry	Hygiene coverage of 99% reduces stunting prevalence by 2.4% in under 36- month old children.
Langfor, Lunn y Panter-Brick	2011	Nepal	41% reduced diarrhea morbidity with hand-washing interventions.
Langfor, Lunn y Panter-Brick	2011	Nepal	Hand-washing interventions do not reduce gut mucosal damage or immune stimulation.

Langfor, Lunn y Panter-Brick	2011	Nepal	Hand-washing interventions do not reduce growth deficit.
Dangour, et al.	2013	Multicountry	Solar disinfection of water, provision of soap and improvement of water quality slightly improve height growth on children under 5 years old.
Kosek, et al.	2013	Multicountry	Children with maximum punctuation on Environment Enteropathy outcome grow 1.08cm less, in six months, than those with the minimum punctuation.
Lin, et al.	2013	Bangladesh	22% reduced stunting prevalence on children when living in heathy and clean environments, compares to those living in contaminated environments.

5. References

Action contre la Faim, 2014. N*utrition security policy. A common multisectoral understanding and approach to address undernutrition*. http://www.actioncontrelafaim.org/sites/default/files/publications/fichiers/acf_2014_nutrition_security_policy_es.pdf

Alam, D. S., Marks, G. C., Baqui, A. H., Yunus, M. & Fuchs, G. J. (2000). Association between clinical type of diarrhea and growth of children under 5 years in rural Bangladesh. *International Journal of Epidemiology, 29*(5), 916-921. doi: 10.1093/ije/29.5.916

Bhutta Z. A., Ahmed, T., Black, R. E., Cousens, S., Dewey, K. Giugliani, E., . . . Shekar, M. (2008) What works? Interventions for maternal and child undernutrition and survival. *The Lancet, 371*(9610), 417-440. doi: 10.1016/S0140-6736(07)61693-6

Cairncross, S., & Kinnear, J. (1992). Elasticity of demand for water in Khartoum, Sudan [Abstract]. *Social Science & Medicine*, *34*(2), 183-189. doi: 10.1016/0277-9536(92)90095-8

Cairncross, S., Cumming, O., Jeandron, A., Rheingans, R., Ensink, J., Brown, J., . . . Woolnough, D. (2013) *Water, sanitation and hygiene: Evidence paper.* http://r4d.dfid.gov.uk/pdf/ outputs/sanitation/WASH-evidence-paper-april2013.pdf

Chambers, R. & Von Medeazza, G. (2013) Sanitation and Stunting in India. Undernutrition`s Blind Spot. *Economic & Political Weekly, 48*(25), 15-17. Retrieved from http://www.communityledtotalsanitation.org/sites/ communityledtotalsanitation.org/files/EPW_Chambers_vonMedeazza_Sanitation_and_Stunting_in_India.pdf

Checkley, W., Gilman, R. H., Black, R. E., Epstein, L. D., Cabrera, L., Sterling, C. R. & Moulton, L. H. (2004) Effect of water and sanitation on childhood health in a poor Peruvian peri-urban community. *The Lancet, 363*(9403), 112-118. doi: 10.1016/S0140-6736(03)15261-0

Dangour, A. D., Watson, L., Cumming, O., Boisson, S., Che, Y., Vellman, Y., . . . Uauy, R. (2013) Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutritional status children (Review). *Cochrane Database Syst Rev*, 8. doi: 10.1002/14651858.CD009382.pub2

Esrey, S. A. (1996) Water, waste, and well-being: A multicountry study. *American Journal of Epidemiology, 143*(6), 608-623. Retrieved from http://aje.oxfordjournals.org/content /143/6/608

Evans, B., Bond, M., Cousineau, D., Daniels, G., Hyslop, A., Howard, M., Nicholson, K., Powell, B., Willetts, J. & Velleman, Y. (2014) *WASH for everyone everywhere* [Conference report] Conference conducted at the meeting International Water Center, Brisbane, Australia. Retrieved from http://www.watercentre.org/services/events/wash-2014-conference /wash-2014/wash-2014/attachments/wash-conference-synthesis-report

Hasan, Z., Briend, A., Aziz, K. M. A., Hoque, B. A., Patwary, M. Y. & Huttly, S. R. A. (1989) Lack of impact of a water and sanitation intervention on the nutritional status of children in rural Bangladesh. *European Journal of Clinical Nutrition, 43*(12), 837-843. Retrieved from http://europepmc.org/abstract/MED/2627930

Howard, G., & Bartram, J. (2003) *Domestic water quantity, service level, and health*. http://cdrwww.who.int/water_sanitation_health/diseases/WSH 03.02.pdf.

Humphrey, J. H. (2009) Child undernutrition, tropical enteropathy, toilets and handwashing. *The Lancet, 374*(9694), 1032-1035. doi: 10.1016/S0140-6736(09)60950-8

Hutton, G. (2012) *Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage*. http://www.who.int/water_sanitation_health/publications/2012/globalcosts.pdf

Keene, B. (n.d) Wash*, food security and the environment: making the links* [Discussion paper]. Retrieved from: http://www.washplus.org/sites/default /files/wash_foodsecurity-keene .pdf

Kosek, M., Haque, R., Lima, A., Babji S., Shrestha, S., Qureshi, S., . . . Gottlieb, M. (2013) Fecal markers of intestinal inflammation and permeability associated with the subsequent acquisition of linear growth deficits in infants. *The American Journal of Tropical Medicine and Hygiene, 88*(2), 390-396. doi:10.4269/ajtmh.2012.12-0549

Langford, R., Lunn, P. & Panter-Brick, C. (2011) Hand-washing, subclinical infections, and growth: A longitudinal evaluation of an intervention in Nepali slums [Abstract]. *American Journal of Human Biology, 23*(5), 621-629. doi: 10.1002/ajhb.21189

Lin, A., Arnold, B. F., Afreen, S., Goto, R., Huda, T. M. N., Haque, R., . . . & Luby, S. P. (2013). Household environmental conditions are associated with enteropathy and impaired growth in rural Bangladesh. *The American journal of tropical medicine and hygiene*, *89*(1), 130-137.

Liu, L., Johnson, H. L., Cousens, S., Perin, J., Scott, S., Lawn, J. E., . . . & Black, R. E. (2012). Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *The Lancet, 379*(9832), 2151-2161. doi: 10.1016/S0140-6736(12)60560-1

Luby, S. P., Agboatwalla, M., Painter, J., Altaf, A., Billhimer, W., Keswick, B. & Hoekstra, R. M. (2006) Combining drinking water treatment and hand washing for diarrhoea prevention, a cluster randomised controlled trial. *Tropical Medicine and International Health, 11*(4), 479–489. doi: 10.1111/j.1365-3156.2006.01592.x

Ngure, F. M., Reid, B. M., Humphrey, J. H., Mbuya, M. N., Pelto, G. & Stoltzfus, R. J. (2014) Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. *Annals of the New York Academy of Sciences, 1308,* 118-128. doi: 10.1111/nyas.12330

Prüss-Üstün, A., Bos, R., Gore, F. & Bartram, J. (2008) *Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health*. http://whqlibdoc.who.int/publications/2008/9789241596435_eng. pdf

Ruel, M. T., & Alderman, H. (2013) Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?. *The Lancet*, *382*(9891), 536-551. doi: 10.1016/S0140-6736(13)60843-0

Schmidt, W-P (2014) The elusive effect of water and sanitation on the global burden disease. *Topical Medicine and International Health*, *19*(5), 522-527. doi: 10.1111/tmi.12286

Spears, D. (2013) *The nutritional value of toilets: How much international variation height can sanitation explain?*. Princeton University. Retrieved from http://riceinstitute.org/wordpress/wp-content/uploads/downloads/ 2013/07/Spears-height-and-sanitation-6-2013.pdf

Teague, J., Johnston, E. A., & Graham, J. P. (2014). Water, sanitation, hygiene, and nutrition: successes, challenges, and implications for integration. *International Journal of Public Health,* 1-9. doi: 10.1007/s00038-014-0580-8

Unicef (1992) *Strategy for improved nutrition of children and women in developing countries*. http://www.ceecis.org/iodine/01_global/01_pl/ 01_01_other_1992_unicef.pdf

World Health Organization (2012) E*liminating soil-transmitted helminthiases as a public health problem in children: Progress report 2001-2010 and strategic plan 2011-2020*. http://whqlibdoc.who.int/publications/2012/9789241503 129_eng.pdf

World Health Organization & Unicef (2014) *Progress on sanitation and drinking water –2014 update*. http://apps.who.int/iris/bitstream/10665/112727/1/ 9789241507240_eng.pdf

6. Authors

Jean Lapegue, Action contre la Faim-France, jlapegue@actioncontrelafaim.org

Rachel Lozano, Action contre la Faim-France, rlozano@actioncontrelafaim.org

Karl Lellouche, Action contre la Faim-France, klellouche@actioncontrelafaim.org

Julián Ibargüen Onsurbe, Accion contra el Hambre, palcalde@actioncontraelhambre.org

Arno Coerver, Malteser International, arno.coerver@malteser-international.org

Stephan Simon, Deutsche Welthungerhilfe e.V., stephan.simon@welthungerhilfe.de

Robert Gensch, German Toilet Organization e.V., robert.gensch@germantoilet.org

Anja Schmidt, Technische Universität Dresden