

39th WEDC International Conference, Kumasi, Ghana, 2016

**ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT
OF WATER AND SANITATION FOR ALL**

**A participatory nutrition causal analysis and operational
research on WASH and nutrition interaction**

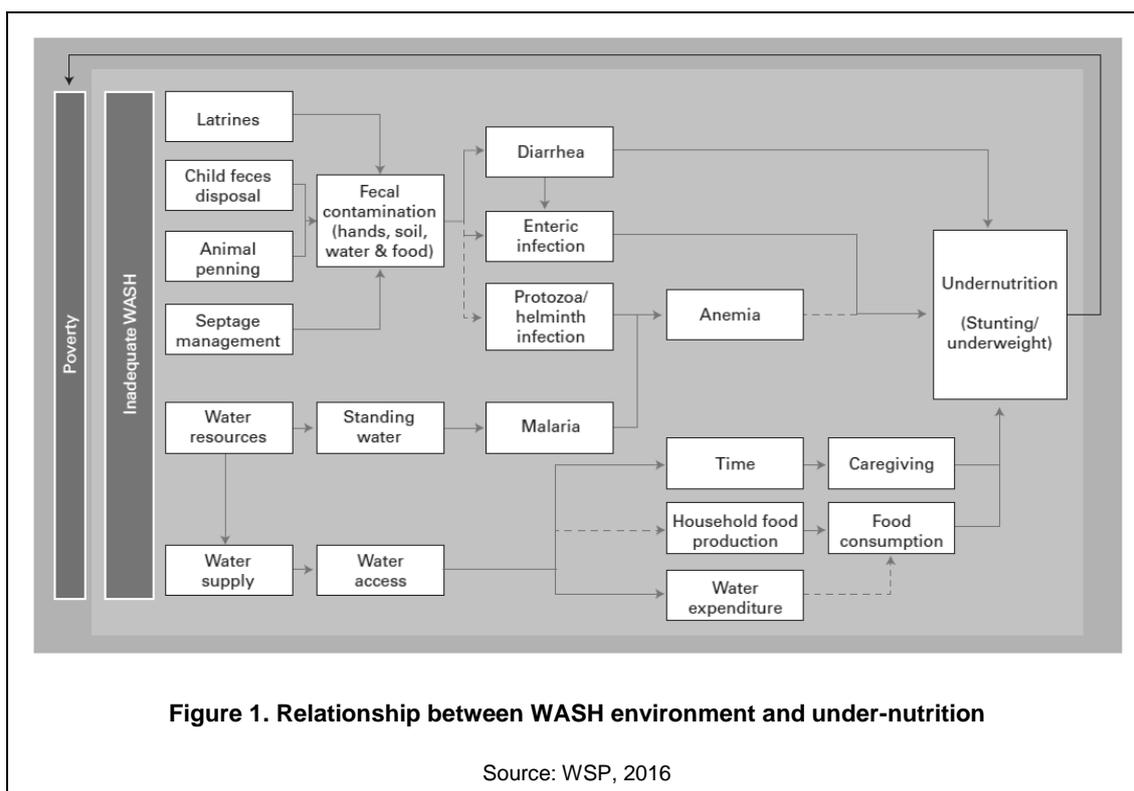
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BRIEFING PAPER 2409

Defined by UNICEF as “the outcome of insufficient food intake and repeated infectious diseases“ under-nutrition is one of the world’s most serious problems with direct short and long-term health effects. A growing base of evidence showing the links between water, sanitation and hygiene conditions and health indicate that WASH¹ environment can be critical in shaping children’s nutritional outcomes. The evidence regarding the consequences of poor WASH conditions (especially exposure to poor sanitation) on low height for age- stunting is particularly strong, whereas the effects of WASH interventions on low weight for height – wasting, together with the impact of Environmental Enteric Dysfunction² on under-nutrition are still to be explored. By conducting series of studies and research projects, ACF (1) is playing an active role in narrowing down the existing knowledge and evidence gap on WASH and nutrition interaction. ACF also promotes a Link-NCA³ methodology, used to analyze the complex, dynamic, locally-specific causes of under-nutrition, including WASH related one.

Introduction: linking WASH environment with nutritional outcomes

Poor WASH conditions are associated with almost 10% of the global burden of disease and disability, and 1.4 million child deaths annually due to diarrhea, subsequent malnutrition, and their consequences. Most of this disease burden falls on children in low-income countries (Pruss-Ustun et al., 2008). The three main underlying causes of under-nutrition, namely unsuitable or insufficient food intake, poor care practices and disease, are directly or indirectly related to inadequate access to water, sanitation and hygiene (ACF, 2011). Figure 1 illustrates multiple pathways, both **direct and indirect**, through which fecal pathogens come into contact with humans and demonstrates dependence of nutritional status on WASH environment. Poor WASH conditions facilitate ingestion of fecal pathogens which leads to diarrhea, intestinal worms and environmental enteric dysfunction (EED), previously known as environmental enteropathy. This directly relates to body’s ability to resist and respond to sickness by affecting the absorption of nutrients and decreasing body’s immunity (Dangour et al., 2013). Other water and sanitation-related illnesses such as malaria, dengue, leishmaniasis, trypanosomiasis, yellow fever, together with chronic poisoning due to poor chemical quality of water also contribute to the deterioration of the nutritional status (ACF, 2011). Indirect pathways and links are related to the broader WASH environment, referring primarily to access and affordability of water, sanitation and hygiene services, distance from household to water points, education and poverty. For example, a lack of safe water close to home has many indirect effects on nutrition. People are often left with no choice but to drink unsafe water from unprotected sources. The time wasted collecting water, predominantly affecting women and children, or suffering from water-related illnesses, prevents young people from getting an education and has a significant impact on their health and wellbeing (ACF, 2011).



Link-NCA methodology and global findings

Developed by ACF in 2010 with a scientific committee, the Link-NCA is a mixed method used to analyze the complex, dynamic, locally-specific causes of under-nutrition. Based on the UNICEF nutritional causal framework it aims at improving nutrition security programming by offering the opportunity to a local representative group (doctors, pregnant women, health workers, community leaders, religious leaders, etc) to identify and share their perceptions of the most relevant risk factors leading to under-nutrition in a local context. Besides engaging the key stakeholders early in the process through a community level qualitative enquiry, the Link-NCA study provides operational multisectoral (WASH, health, food security and livelihoods, mental health and care practices – MHCP) recommendations for nutrition-specific and nutrition-sensitive interventions. Being an inclusive approach, not limited to public health specialists, the method increases the chances of appropriation of recommendations and sustaining positive behavior changes within the community.

Since 2010, ACF produced 17 Link -NCA studies all around the world and 5 are currently on-going. In the last two years, ACF run 8 Link-NCA studies in the following countries: Bangladesh, Philippines, India and Afghanistan as well as Ethiopia (two studies), Democratic Republic of Congo (DRC) and Kenya. For each of those studies⁴ the risk factors of under-nutrition have been listed and ranked by the practitioners as major, important and minor. For the WASH sector, factors were disaggregated into water, sanitation and hygiene.

Table 1 presents the occurrence of factors identified as the “major risks” by the representative groups in each country and shows their percentage breakdown for each sector. This enables better understanding of the perception of the problem by the group. Please note that Link-NCA standard method highlights major, important and minor factors, as well as their relations with each other.

As it could be seen from the specific analysis presented in Table 1 water, sanitation and hygiene issues constantly appear as a major risk factor of under-nutrition, both in Asia (29%) and Africa (32%)⁵. The occurrence of WASH related risk factors identified as “major” by Link-NCA studies is higher than for other sectors, except for India where MHCP are dominant and Ethiopia 1 where food security related risk factors revealed to be more dominant. Note that WASH related risk factors are also included in health (e.g. malaria control), food security (irrigation) and MHCP (child care practices).

Table 1. Major risk factors contributing to under-nutrition								
NCA 2014-2015	# of major criteria	Factors of under nutrition: risk factor relation (%of times ranked major)						
		Food security	Mental health and care practices	WASH (global)	Water	Sanitation	Hygiene	Health (global)
Bangladesh 2014	7	14	29	29	14	14	0	29
Philippines 2015	8	38	0	38	13	25	0	25
India 2014	9	22	44	11	11	0	0	22
Afghanistan 2015	5	0	20	40	20	0	20	40
Sub-total Asia	29	19	23	29	14	10	5	29
Ethiopia – ACF 2014	13	31	23	23	8	8	8	23
Ethiopia – OCHA 2014	9	11	22	33	11	11	11	33
RDC 2014	7	0	29	43	14	14	14	29
Kenya 2015	7	43	14	29	14	0	14	14
Sub-total Africa	36	21	22	32	12	8	12	25
TOTAL	65	20	23	31	13	9	8	27

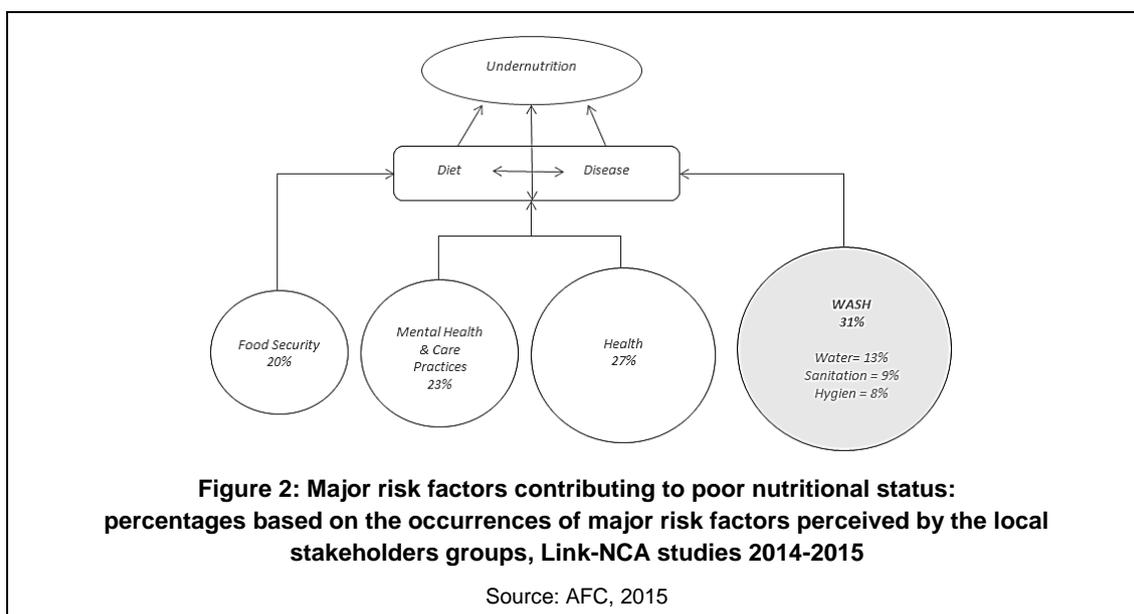
Source: Link-NCA studies 2014-2015 (ACF, 2015)

Looking at the WASH components separately, the occurrence of risk factors related to water (quality) is higher (13%) than to sanitation (9%) and hygiene (8%), which rank similarly. Looking at different regions, hygiene as a risk factor seems to be greater concern in Africa than in Asia, where the occurrence of water and sanitation risk factors is higher. Finally, two studies from Ethiopia show the differences within the country which points out the significance of a local context in each conducted study. It also affirms that Link-NCA method is a suitable tool for identifying local specific underlying determinants of under-nutrition.

Case study: The Philippines

In September 2014, ACF implemented the Link-NCA study in Masbate Province, the Philippines, in order to identify the main causes of wasting and stunting, better understand local seasonal and historical pathways to under-nutrition and inform WASH and nutrition policies and strategies about appropriate preventive measures. Following detailed qualitative and quantitative analysis, the final stakeholder workshop ranked the identified factors according to their contribution to poor nutritional status (from minor to major). Out of 8 major risk factors, 3 were related to WASH conditions, 3 to food security, 2 to health and none to MHCP (ACF, 2015). Main WASH concern was about sanitation. The unhealthy environment in which the community lives was evident through observation. Study results showed that community members are aware of the relationship between inadequate sanitation and disease prevalence. Most of them adopt correct behaviours by trying to go further from their village for open defecation and by using soap to wash their hands. The health risks associated to the presence of children's faeces in the surrounding were not well understood and the knowledge about the importance of hygienic environment proved to be weak. Water management and water safety practices were found to be unsatisfactory with the absence of a proper water treatment (ACF, 2015). Link-NCA findings from this study pointed out that poor sanitation and inadequate

animal waste management, in particular poultry faeces, are among the major contributors to child under-nutrition. Hygiene was quoted as an important, but not the major risk factor.



ACF's operational research on the links between WASH and nutrition

To bridge the existing evidence gap of direct links between WASH and wasting, the acute form of under-nutrition, ACF is conducting a series of research projects in Chad and Pakistan, and completed one in Democratic Republic of Congo. The aim of these studies is to demonstrate the effect of adding different WASH components (household water treatment, soap provision, basic hygiene sensitization) to a regular treatment of SAM⁶ children between 6 and 59 months of age. ACF research teams are looking at various outcomes such as the length of stay in the treatment program, weight gain and the risk of relapse.

“PUR ” Democratic Republic of Congo, 2013-2014

This comparative study assessed whether the addition of point-of-use water treatment product at the household level to the standard treatment of SAM children has positive effects on the nutritional recuperation. The main hypotheses was that SAM cases consuming Read-to-use-Food (RUTF) and using water treatment product P&G Purifier of Water (PUR) would have a lower prevalence of waterborne diseases (primarily diarrhoea) during the treatment compared to SAM cases who use RUTF only. This would consequently translate into shorter treatment duration and an increase in weight gain. A total of 207 children were enrolled in the trial. The results indicate that, as compared to the control group, children in the intervention group had a shorter mean length of stay in the treatment program, though borderline statistically significant (26.4 days versus 30.4 days, $p=0.06$). Average daily weight gain was also higher among the intervention group, at 7.3g/kg/day and 6.6g/kg/day respectively, however this difference was not statistically significant ($p=0.13$). Researchers also estimated that 4 days reduction in treatment duration would be able to cover approximately 90% of supplementary cost of adding water purifier.

“Introducing safe drinking water into the treatment of severe acute malnutrition” Pakistan, 2015 and on-going

Following up on the results and recommendations from the PUR research project in DRC, ACF is currently conducting a study in the District of Dadu in Sindh Province in southeastern Pakistan. A four group randomized control trial is used to evaluate the effectiveness of safe drinking water in SAM treatment protocols. The control group will represent the conventional CMAM (Community based Management of Acute Malnutrition) program and enable comparison with the other study arms: with flocculent-disinfectant (P&G Purifier of Water®); with chlorine disinfectant (Aquatab); and with water filter. The intervention groups will be compared on 5 primary outcome variables: 1) average weight gain (g/kg/day), 2) mean length of stay in the program, 3) recovery rate, 4) diarrhea incidence and prevalence, and 5) intervention cost. The planned sample included 200 children per group (800 in total) to account for loss to follow up. The research

will inform and determine the impact of diarrhea prevention - including point-of-use water treatment technologies and hygiene education - in parallel with SAM treatment in areas with limited access to safe drinking water and within the context of community nutrition programs and/or the treatment of children with SAM.

“Quadinut” Chad, 2015 and on-going

Built up on the previous nutrition projects implemented in Kanem region, the ongoing operational research project called: *“Benefits of a household WASH package to Community Management of Acute Malnutrition (CMAM) program, Chad”* aims at determining whether improving water quality and hygiene-related care practices at household level can improve nutritional outcomes of children admitted in the outpatient therapeutic program (OTP). The objective of the research is to demonstrate in a robust way a better in-treatment performance (reduction in WASH-related infections and better weight gain), shorter treatment duration and reduction in post-recovery relapse rates due to the WASH intervention. This will be tested through a matched-pairs cluster randomized control trial conducted by ACF and the partners as presented here beneath:

- Control group: outpatient therapeutic program for children diagnosed with severe acute malnutrition (OTP only)
- Intervention group: outpatient therapeutic program for children diagnosed with severe acute malnutrition + “household WASH package”

The WASH intervention or “household WASH package” consists of several components: 1) provision of a hygiene & water treatment kit to each malnourished child and his/her mother/caretaker included in the OTP program in the health centers targeted by the intervention; 2) weekly hygiene promotion sessions organized in the health centers with the mothers/caretakers; 3) household visit conducted by village’s community health volunteers and ACF staff during the treatment, to provide refresher training on the hygiene messages and use of the kit. With 10 clusters in the intervention and 10 in the control group, 2.013 cases will be included in the study in order to verify the main research hypothesis and detect expected differences in the evaluation outcomes: proportion of relapse cases, length of stay in the OTP, average weight gain (g/kg/day), diarrhea incidence and anthropometric measurements.

Recommendations for future research endowers

During the 2015 World Water Week in Stockholm, ACF France in collaboration with German WASH Network and other partners organized the event “WASH and nutrition: strategic and operational solutions to fight under-nutrition”. Among other outcomes of the session, a set of recommendations for future research projects in the field of WASH and nutrition has been produced, as a joint effort of event participants engaged in academia/research:

- Explore further which WASH interventions are cost-effective in order to provide the evidence what to focus on and at what scale; more research is needed on the magnitude of the effect of WASH interventions on acute malnutrition.
- Research further how to measure nutrition and WASH: whether focus should be placed on measuring health outcomes, behaviours or parasitic prevalence; stronger consistency in measurement tools is needed.
- Shed more light on the enabling factors that make WASH interventions work in practice; better dissemination of findings to policy and operations is necessary so as to facilitate adoption and practical application.
- Apply robust quantitative analysis to confirm Link-NCA findings (e. g. stool analysis surveys to quantify the prevalence of diarrhoea and validate the Link-NCA perception findings).

In addition to these recommendations, ACF experience from the previous research projects suggest that it is yet to be explored if safe WASH environment at the household and/or community level has an impact on the prevalence of Global Acute Malnutrition (GAM)⁷ and if short-term WASH interventions have an effect on GAM incidence rates (ACF, 2014).

Conclusions

A growing base of evidence showing the links between water, sanitation and hygiene conditions and health indicate that WASH environment can be critical in shaping children’s nutritional outcomes. ACF ongoing research projects can potentially contribute to bridging the existing knowledge gaps by validating if WASH interventions, implemented during the treatment of SAM children, could improve effectiveness of the treatment and reduce the risk of post-recovery relapse. In spite of existing uncertainties, the authors’ views

rest on the assumption that the evidence base is sufficient for field practitioners to work on improving WASH environment in the settings where exposure to fecal pathogens is an important threat to children's nutritional outcomes.

Acknowledgements

The author would like to extend sincerest thanks to ACF- France Expertise & Advocacy Department for the research opportunity.

References

- ACF (2011) "Water, Sanitation and Hygiene Policy Paper" [Online], Available from: http://www.actioncontrelafaim.org/sites/default/files/publications/fichiers/exe_bd_wash_policy_-_eng.pdf
- ACF (2013) "A comparative study on the effects of Ready to Use Therapeutic Food + PUR in the management of severe acute under nutrition in children under 5 years" [Online], Available from: www.actionagainsthunger.org
- ACF (2013) "Benefits of a household WASH package to CMAM program in Chad" research protocol, Expertise and Advocacy Department, Paris, France
- ACF (2014) "Greater Investment in Water, Sanitation and Hygiene is key to the fight against under nutrition" [Online], Available from: <http://www.coalition-eau.org/wp-content/uploads/WASH-Advocacy-En.pdf>
- ACF (2014) "Nutritional Causal Analysis, East Hararghe Zone, Fedis and Kersa Woredas, Ethiopia. August, 2014. Final Report" [Online], Available from: <http://www.linknca.org/>
- ACF (2015) "Nutrition Causal Analysis. Municipalities of Aroroy, Cawayan, Milagros and Monreal. Masbate Province, Region V. Philippines.,2015. Final Report" [Online], Available from: <http://www.linknca.org/>
- BLACK et al (2008) "Maternal and child undernutrition: global and regional exposures and health consequences" [Online], The Lancet, Available at: <http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2807%2961690-0/abstract>
- CHECKLEY, W., R.H. Gilman, R.E. Black, et al (2004) "Effect of water and sanitation on childhood health in a poor Peruvian periurban community" [Online], PubMed, Available from: <http://www.ncbi.nlm.nih.gov/pubmed/1472616>
- DANGOUR et al (2013) "Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutrition status of children (Review)" [Online], The Cochrane Collaboration, Available at: <http://www.sswm.info/sites>

Notes

(1): Action Against Hunger or Action Contre la Faim – ACF

¹ Water, Sanitation and Hygiene, the standard acronym of the sector

² Chronic infection of the small intestine caused by extended exposure to fecal pathogens

³ Nutrition Causal Analysis

⁴ Accessible on line, please consult the webpage : <http://www.linknca.org/>

⁵ Sectors' figures are more balanced when considering both major and important risk factors together.

⁶ Severe acute malnutrition, defined by a very low weight for height

⁷ The sum of the prevalence of severe acute malnutrition and moderate acute malnutrition at a population level

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