



# EVIDENCE BOOSTER ON WASTING PREVENTION:

Risk factors, research results  
and integrated packages

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# Introduction and Objectives

Global efforts to care for child wasting have predominantly focused on treating the condition<sup>1</sup>. To reduce the number of children becoming wasted, increasing the coverage of life-saving treatment programs needs to occur alongside preventive efforts. To accomplish this, a shift is required in how child undernutrition is understood and managed in tandem with increased operational efforts to drive substantial improvements in services to successfully prevent and treat child undernutrition<sup>2</sup>.

The terminology for referring to child wasting is multifarious. The current glossary, inclusive of terms such as “GAM, MAM, SAM, Kwashiorkor, Marasmus, MUAC and WHZ”, is well-known to public health nutritionists as well as research and academic institutions, but at the global level, it is a terminology that is very hard to grasp and ultimately take action to address. In addition, many stakeholders separate child wasting from child stunting. In reality, children are at risk of both conditions (wasting and stunting), might be born with both, pass from one state to the other over time and accumulate risks to their health and life through their combined efforts<sup>3</sup>. Furthermore, it is suggested that repeated episodes of wasting negatively affects linear growth and, therefore, compromises child growth and development<sup>4</sup>. This multifarious terminology and global lack of mutual understanding has stalled collective efforts surrounding policy, guidance, program interventions and financing in the effort to combat all forms of malnutrition and saving millions of lives each year.

Indeed, the past decade has witnessed negligible change in the actual global rates of child wasting. It’s essential that the upcoming decade gains ground on the achievement of reduction in child wasting, as well as other forms of malnutrition, to meet the SDG objectives. Although there has been a lack of advancement in the rates of wasting, an impressive amount of knowledge and insight has been gained in tandem to the work that has been spearheaded on how to tackle this problem. In turn, there needs to be a transfer of learning applied to both policy and practice, coupled with consideration of contextual realities surrounding financing. At this time, the needs are greater than the availability of resources

as it is estimated that 1.8 billion USD is required to achieve the WHA targets of < 5 percent children wasted by 2025 but only one-quarter of that total amount (450 million USD) is available<sup>5</sup>.

Shifting approaches to deal with undernutrition, which aim to tackle both prevention and treatment simultaneously highlights the necessity to address how respective programming can best address the underlying diverse causes and biological processes. To realize this global shift, it is suggested that nutrition-specific interventions, targeting both mothers and their offspring in populations at risk, need to be designed, coordinated and implemented alongside nutrition-sensitive approaches that address broader underlying factors of child undernutrition such as women’s empowerment, food systems, socio-economic factors and disease prevention<sup>6</sup>. The identification of context-specific risk factors is a newly reinforced element of this overall process. These identified risk factors must push the implementation process forward for effective nutrition interventions. Altogether, the limitation facing efforts on wasting prevention is that although it may be known what is required to achieve reductions in child wasting and other forms of undernutrition, there’s lack of robust evidence for evidence-based strategies that integrate treatment and prevention at scale.

This paper sets out to take stock of the current evidence on what works to prevent wasting by looking at published and grey literature, as well as existing practice in the West and Central Africa Region (WCAR). Its purpose is three-fold:

- ▶ To summarize the key context specific risk factors for wasting, as well as additional risk factors that have been hypothesized to be considered for WCAR
- ▶ To summarize the latest evidence on wasting prevention
- ▶ To summarize multi-sectoral packages that integrate prevention and treatment from countries in the WCAR region

This review leads on from the work of MQ-SUN, and further details of the linkages can be found in subsequent sections.

1. Shekar, M. et al. (2017) An Investment Framework for Nutrition: Reaching the Global Targets for Stunting, Anemia, Breastfeeding, and Wasting. The World Bank. doi: 10.1596/978-1-4648-1010-7 - 2. Young, H. and Marshak, A. (2017) Persistent Global Wasting A discussion paper on the scope of the problem, its drivers, and strategies for moving forward for policy, practice, and research. Boston. Available at: [http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition\\_web\\_2.26s.pdf](http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition_web_2.26s.pdf). - 3. Young, H. and Marshak, A. (2017) Persistent Global Wasting A discussion paper on the scope of the problem, its drivers, and strategies for moving forward for policy, practice, and research. Boston. - Available at: [http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition\\_web\\_2.26s.pdf](http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition_web_2.26s.pdf). - 4. Young, H. and Marshak, A. (2017) Persistent Global Wasting A discussion paper on the scope of the problem, its drivers, and strategies for moving forward for policy, practice, and research. Boston. Available at: [http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition\\_web\\_2.26s.pdf](http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition_web_2.26s.pdf). - 5. Tufts Webinar (Oct 17, 2019). Renewing the framework on the drivers of malnutrition. <https://fic.tufts.edu/event/webinar-renewing-the-framework-on-the-drivers-of-malnutrition/>

# Context Specific Risk factors of Wasting

One of the main reasons that there is insufficient evidence on effective approaches to prevent wasting is because the context specific pathways leading to wasting are poorly understood<sup>1</sup>. Wasting has tended to be associated with high levels of food insecurity or emergency contexts, limiting in depth reflection on contextual variations and stages of development. Whilst these factors undoubtedly play a role in the prevalence and recurrence of wasting, further research is needed to understand how and why wasting occurs.

For this report the term “risk factors” is used rather than the term “causes” when considering how and why wasting occurs because of the myriad of factors that contribute to this phenomenon. Also, the way they relate to one another and interact as part of the causal pathways may be more important than the individual risk factors themselves<sup>2</sup>. Altogether, assumptions cannot be made about a single factor because there often appears to be a limited or nonexistent association between the many factors of some contexts (e.g., food insecurity) and indicators of child wasting<sup>3</sup>. The follow chapter explores different approaches to understanding the risk factors which lead to wasting.

## UNICEF Framework

Since its publication in the 1990s, the UNICEF framework for malnutrition has been widely accepted and used for the design of nutrition interventions. The immediate drivers are identified as inadequacy of dietary intake and/

or burden of disease. The underlying drivers of malnutrition are linked to household food security, care practices, health services and healthy environment (food, care, wash and health). All are necessary conditions for adequate nutrition, but none of them are sufficient alone. For example, one study found that care practices were indirectly associated with wasting, with little correlation to food insecurity. This may be the case if, for example, the man controls the family food production and sells more than what is needed for covering the family’s own needs. It was also found that care is strongly linked to gender issues of protection, empowerment of women, maternal nutrition, women’s workload and women’s limited access to services (not only health but also education, childcare facilities, microfinancing)<sup>4</sup>. In a recent interpretation of the UNICEF framework by Tufts University, the basic (root) causes of wasting were consolidated into four overlapping perspectives (figure 1). They are all socially and politically constructed, and they include (1) protracted war conflict and insecurity; (2) inequalities and poverty; (3) governance of natural resources, particularly in the context of demographic and climate pressures; and (4) migration and displacement. Seasonality, gender and livelihoods are part of the basic causes and they were reinforced as explicit within the reviewed and renewed UNICEF framework<sup>5</sup> but maternal nutrition as well as infancy components were not included.

1. Shekar, M. et al. (2017) An Investment Framework for Nutrition: Reaching the Global Targets for Stunting, Anemia, Breastfeeding, and Wasting. The World Bank. doi: 10.1596/978-1-4648-1010-7  
 2. Young, H. and Marshak, A. (2017) Persistent Global Wasting A discussion paper on the scope of the problem, its drivers, and strategies for moving forward for policy, practice, and research. Boston. Available at: [http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition\\_web\\_2.26s.pdf](http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition_web_2.26s.pdf).  
 3. Young, H. and Marshak, A. (2017) Persistent Global Wasting A discussion paper on the scope of the problem, its drivers, and strategies for moving forward for policy, practice, and research. Boston. Available at: [http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition\\_web\\_2.26s.pdf](http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition_web_2.26s.pdf).  
 4. Young, H. and Marshak, A. (2017) Persistent Global Wasting A discussion paper on the scope of the problem, its drivers, and strategies for moving forward for policy, practice, and research. Boston. Available at: [http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition\\_web\\_2.26s.pdf](http://fic.tufts.edu/assets/FIC-Publication-Persistent-Global-Acute-Malnutrition_web_2.26s.pdf).  
 5. Tufts Webinar (Oct 17, 2019). Renewing the framework on the drivers of malnutrition. <https://fic.tufts.edu/event/webinar-renewing-the-framework-on-the-drivers-of-malnutrition/>



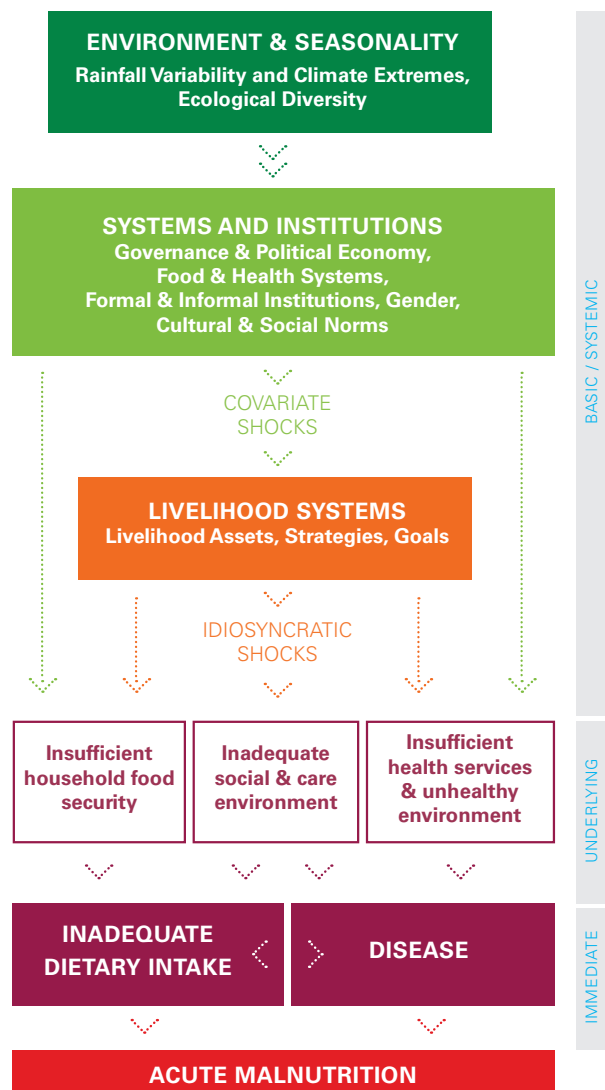


**Figure 1 shows** the reviewed and renewed look of the original UNICEF conceptual framework. This version includes further encapsulating the basic and more systemic drivers of wasting in the drylands while also considering the mechanisms through which they drive the underlying causes of wasting.

As contexts, particularly those within the Sahel region, become more complex with concurrent issues such as conflict, climate events and economic decline (where one is reinforcing the other and aggravating the situation), there is a greater need for a deeper analysis in the specific risk factors of wasting. For example, the Twin Peaks study<sup>6</sup> (See Figure 2) revealed, once again, the necessity of challenging any assumptions about risk factors and causal pathways. In this study (inclusive of Chad from the Sahel region), new findings on how livelihood patterns in countries struggling with or seeking recovery from climate, conflict or other disaster affect rates of malnutrition. The findings challenged the long-held assumption that there's only one peak of wasting at the end of the lean season when, in fact, there are really two peaks of wasting. The first and larger peak occurs at the end of the dry season and the second, but smaller peak occurs after the lean season. Following community assessments, it was revealed that there are seasonality of livelihood systems linked with environmental variability and these are the crucial determinants of the twin peaks, through its effects on food security, care and health<sup>7</sup>. The

findings from this study have direct implications towards effective program planning and policy considerations.

**Figure 1: Revised UNICEF conceptual framework**

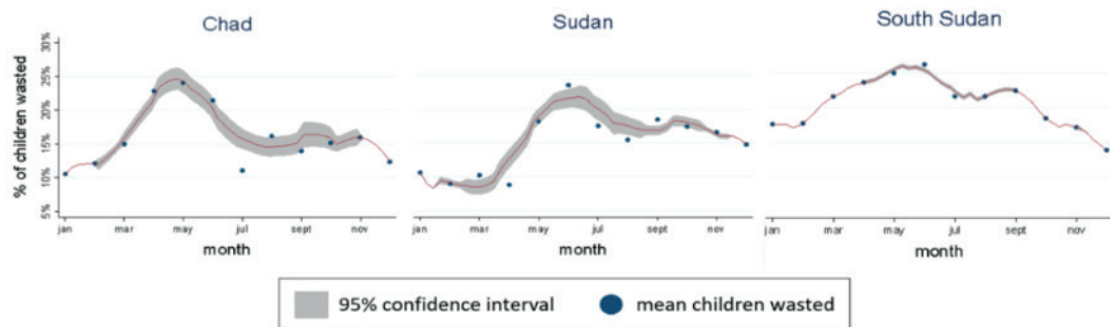


6. FAO (2019). Twin Peaks: the seasonality of wasting, conflict and environmental factors. Tufts University: Friedman school of nutrition science and policy.  
7. Carr, S. and DeBoni, D. (2019). Humanitarian Response to Nutrition in the Sahel: Options Paper. MQSUN+ Report.

**Figure 2** shows the new finding on the seasonal patterns of child malnutrition and their links to climate variability, conflict and livelihood systems in Chad, Sudan and South Sudan. The data shows

two peaks of wasting: the first and larger peak occurs at the end of the dry season and the second, smaller peak occurs after the lean season.

**Figure 1: Revised UNICEF conceptual framework**



Based on the UNICEF framework, nutrition specific interventions tend to focus on the immediate (e.g., dietary intake and disease) and underlying drivers (e.g., household food security) of malnutrition. This habitual focus inadvertently fosters an assumption that the risk factors for wasting are the same everywhere (e.g., undernutrition is associated with poor hygiene, food insecurity, poor IYCF practices, etc.) and, in turn, there is sufficient knowledge on how to design programmatic interventions. The Twin Peaks study is just one example that negates this assumption and reinforces the importance of gaining a deeper context specific understanding of the risk factors of wasting when designing programs.

### LinkNCA

In addition to long-held assumptions regarding seasonality, Action Contre la Faim's Link-NCA (Nutrition Causal Analysis) de-bunks any other assumptions regarding the different drivers included in the UNICEF framework. To date, there have been 30 Link-NCAs conducted in a range of contexts. This analysis unpacks the complex and locally specific causes of wasting and the findings reveal and reinforce the fact that contexts and communities are different and a "one size fits all" approach to the implementation of nutrition interventions is ineffective<sup>8</sup>.

For purposes of this report, the 10 foci countries'

NCAs conducted by ACF<sup>9</sup> using this methodology were consolidated and grouped – by causal factor (E.g., disease, caring practices, food security, livelihoods, health care, WASH, gender) – according to the UNICEF framework. Some notable findings included the fact that majority (nine out of the ten) of the countries identified caring practices and WASH as contributing causes to malnutrition in their countries. For caring practices, the difficulties identified were associated with breastfeeding (e.g., nonoptimal feeding practices, juggling workloads and undernourished mothers) and, for WASH, the issues included limited access to water, insufficient hygiene practices, unhealthy environment and high vulnerability to waterborne illnesses.

Another interesting finding in the NCAs revealed that only two of the ten countries identified a high prevalence of childhood illness (diarrhoea, acute respiratory infection and malaria) and disease as a driver of malnutrition whereas eight of the ten countries identified issues related to health care (e.g., barriers to access to care, service quality and preference for traditional therapies) as one of the causes contributing to malnutrition. Furthermore, issues associated with food security, livelihoods and gender were also identified by approximately half the countries. Altogether, this collective information is helpful for informing context specific program designs and policy decisions that are aligned with respective context specific risk factors.

<sup>8</sup> Carr, S. and DeBani, D. (2019). Humanitarian Response to Nutrition in the Sahel: Options Paper. MQSUN+ Report.

<sup>9</sup> Action Contre la Faim (2017) Linknca nutrition causal analysis. Available at: <http://linknca.org/> (Accessed: 31 January 2019).

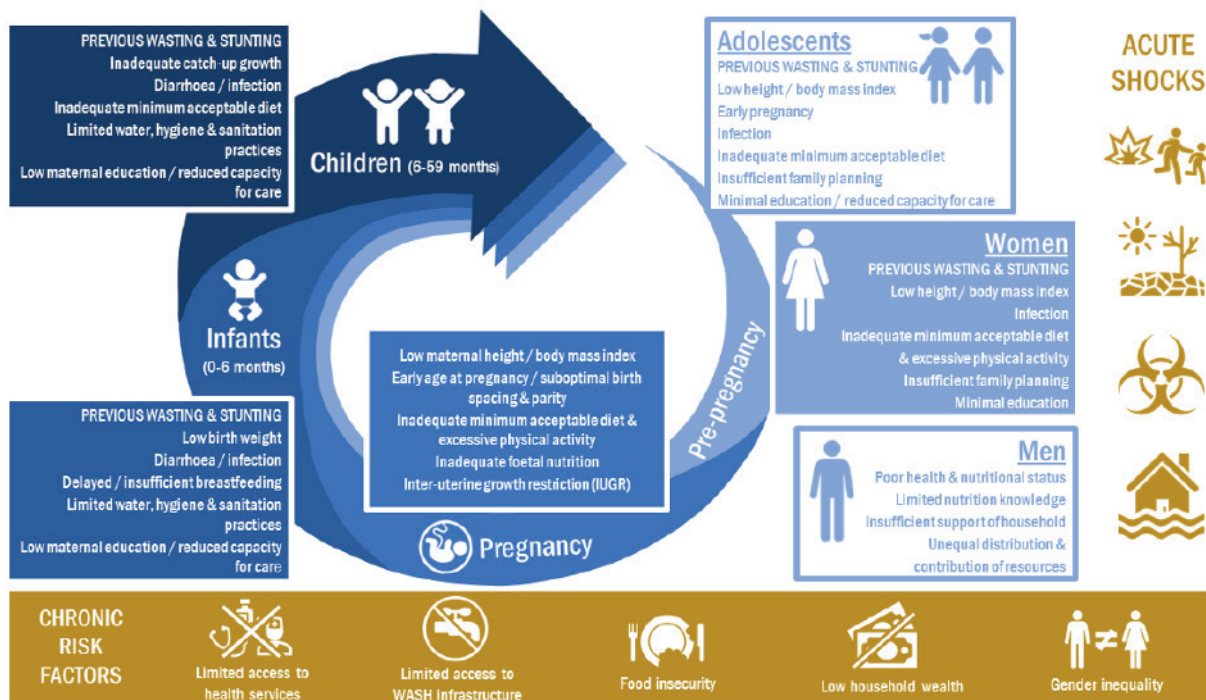


# Life Cycle Approach

An alternative approach to the risk factors of wasting has been proposed by MQ-SUN whereby a life-cycle approach is adopted to assess risk over time. This model acknowledges the environmental chronic risk factors as well as taking account of the possibility of acute shocks. Taking a life cycle approach to the risk factors

of wasting may be very pertinent since there is reason to believe that wasting has its origins in pregnancy and infancy. This approach therefore highlights what other frameworks might miss, in terms of the importance of intervening early to prevent wasting.

Figure 3: MQ-SUN Life Cycle Approach to Wasting



## Pre-pregnancy & Pregnancy

### Young Maternal Age:

Indirectly, young maternal age can have implications on wasting outcomes due to the potential of compromised lactation and breastfeeding infants. It is well known that exclusive breastfeeding during the first 6 months of life reduces an infant's risk of diarrhea, pneumonia, and mortality from other causes<sup>10</sup>. Evidence also reveals that it has an important role as a protective factor, but further studies are required to demonstrate its impact on their prevention of wasting (see section entitled

Breastfeeding promotion and support below). However, for adolescent mothers, they are competing with their own growth and development needs due to the additional energy intake required to meet a lactating mother's nutritional needs and to support breast milk production with optimal nutrient concentrations. This puts adolescents and young mothers at a disadvantage because if young mothers aren't well nourished throughout the course of their pregnancy and lactation, the nutrition concentrations of their breast milk will

10. Black, R.E., L.H. Allen, Z.A. Bhutta, et al. 2008. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet* 371: 243–260.

be compromised<sup>11</sup>. This could lead to jeopardized growth outcomes for their infants. Although indirect, the evidence is still strong in supporting the need for sufficient and healthy diets for all ages of pregnant and lactating women, especially adolescents and young women.

Pregnancy in early adolescence can adversely affect fetal development, leading to low birth weight and preterm birth, and it negatively impacts a woman's development if she becomes pregnant before she is fully grown. This includes outcomes of low body weight in relation to height<sup>12</sup>. Although data is limited for linking maternal age specifically to wasting outcomes, there was one study that plotted data from 118 DHS surveys with prevalence of child wasting against the age of the mother at the first birth. The conclusions of the study stated that first born children of women less than 27 years in low- to middle-income countries are not at a higher risk of wasting but the plotted trend indicates a decrease in the prevalence of wasting as the mother gets older (up to 27 years)<sup>13</sup>. A second study revealed the risk of stunting was highest for maternal ages under 18 years with declines in risk up to 27 years<sup>14</sup>, but wasting outcomes were not included in the study. Conversely, a third study examined the prevalence and risk of wasting by gestational age in newborns at different altitudes and found that advanced maternal age was more strongly associated with underweight than stunting or wasting at high altitudes<sup>15</sup>. Altogether, and in recognition of the fact that Sahel isn't at high altitude, it is probable that increasing the age of mothers at first birth in developing countries may have large benefits in terms of child undernutrition, including stunting outcomes, but further studies are required to disentangle the weak evidence surrounding wasting.

### **Mother's Education:**

The importance of mother's education for child health and nutrition outcomes, including wasting, has been well demonstrated but the results have been mixed. The earliest study argued that the education of the mother plays an important role in determining child survival even after controlling for household socioeconomic characteristics<sup>16</sup>. Other studies showed an inconsistent relationship between mother's education and nutrition<sup>17</sup>, as well as a significant association but only for wealthier households<sup>18</sup>. With reference to the relationship of mother's education specifically to wasting, one study found that maternal education is inversely related, but the results were only significant at high levels of education<sup>19</sup>. Also, a systematic review undertaken in Sub-Saharan Africa revealed that the most consistent factors associated with childhood wasting included low mother's education<sup>20</sup>. Finally, a study that explored factors associated with malnutrition in Pakistani children found that children whose mothers had no education were more likely to be wasted<sup>21</sup>. Altogether, the results suggest that maternal education plays a significant role specifically around the protection against child wasting.

### **Mother's mental health:**

Maternal psychosocial health has also been linked with child undernutrition. One study, that didn't measure wasting outcomes, showed that children of mothers with depressive symptoms were more likely to be underweight or stunted<sup>22</sup>. More recently, a study was conducted in a nutrition rehabilitation unit and it showed that maternal depression was significantly associated with severe wasting<sup>23</sup>. In contrast, an exploration into the maternal and infant health, psychosocial and environmental factors that are associated with severe wasting in Gambian infants revealed

11. Allen, L.H. 2012. B vitamins in breast milk: relative importance of maternal status and intake, and effects on infant status and function. *Adv. Nutr.* 3: 362–369. - 12. Alam N. Teenage motherhood and infant mortality in Bangladesh: maternal age-dependent effect of parity one. *J Biosoc Sci* 2000;32:229e36. - 13. Finlay JE, Ozaltin E, Canning D (2011) The association of maternal age with infant mortality, child anthropometric failure, diarrhoea and anaemia for first births: evidence from 55 low- and middle-income countries. *BMJ Open* - 14. Fink G, Sudfeld CR, Danaei G, Ezzati M, Fawzi WW (2014) Scaling-Up Access to Family Planning May Improve Linear Growth and Child Development in Low and Middle Income Countries. *PLoS ONE* 9(7): e102391. - 15. Martínez JI, Román EM, Alfaro EL, Grandi C, Dipierri JE. Geographic altitude and prevalence of underweight, stunting and wasting in newborns with the INTERGROWTH-21st standard. *J Pediatr (Rio J)*. 2019;95(3):366–373. doi:10.1016/j.jped.2018.03.007 - 16. Caldwell, J.C. 1979. "Education as a Factor in Mortality Decline: An Examination of Nigerian Data." *Population Studies* 33(3): 395-413. - 17. Desai, S., and S. Alva. 1998. "Maternal Education and Child Health: Is There a Strong Causal Relationship?" *Demography* 35(1): 71-81. - 18. Solon, F.S., R. Florentino, and J.C. Arnold. 1985. "The Bulacan Nutrition and Health Study: Part 1. Baseline Socioeconomic and Related Characteristics of Subject Families and Their Impact on the Nutritional Health of Infants." *Ecology Food Nutr* 16: 299-315. - 19. Makoka, D. (2013). The Impact of Maternal Education on Child Nutrition: Evidence from Malawi, Tanzania, and Zimbabwe. - 20. Akombi BJ, Agho KE, Hall JJ, Wali N, Renzaho AMN, Merom D. Stunting, Wasting and Underweight in Sub-Saharan Africa: A Systematic Review. *Int J Environ Res Public Health*. 2017;14(8):863. Published 2017 Aug 1. - 21. Khan S, Zaheer S, Safdar NF. Determinants of stunting, underweight and wasting among children <5 years of age: evidence from 2012-2013 Pakistan demographic and health survey. *BMC Public Health*. 2019;19(1):358. Published 2019 Apr 1. - 22. Surkan PJ, Kennedy CE, Hurley KM, Black MM. Maternal depression and early childhood growth in developing countries: systematic review and metaanalysis. *Bull World Health Organ*. 2011;89(8):608–15.



that maternal depressive symptoms were not significantly associated with severe wasting in infants<sup>24</sup>. In fact, maternal depression was heavily influenced by her social support network (most importantly her husband), infant feeding difficulties and maternal psychosocial stressors (e.g., ill health of child, death, lack of autonomy in child spacing). As such, depending on the context, future implementation strategies that prevent severe wasting in infants in low resource settings should consider incorporating interventions that promote maternal mental health and resilience, inclusive of gender empowerment, maternal psychosocial support, and involving fathers in infant and child health and nutrition promotion<sup>25</sup>.

#### **Low Maternal Body Mass Index (BMI):**

Maternal nutritional status and undernutrition among children are associated with one another. In a recent MICS report for West and Central Africa, the evidence revealed that low maternal BMI is strongly associated with child wasting. More specifically, children of mothers whose BMIs are below 18.5 are 10.4 percent more likely to be wasted<sup>26</sup>. Another study conducted in India<sup>27</sup> reported that severe wasting in children was also associated with mothers' low BMI. Finally, a South Asian study that utilized national survey data from 5 different countries found that younger children whose mother had a low BMI (<18.5) had greater odd of being wasted in all countries<sup>28</sup>. Altogether, the association is clear and strong meaning that modifying this risk factor should be considered in any wasting prevention strategies.

## **Infancy (0 to 6 months)**

#### **Low Birth Weight:**

Any infant who is born at a low birth weight (LBW) due to poor maternal nutrition can start life disadvantageously children and they have an increased risk of being wasted. In one study, it was found that infants who are born to mothers who are short, thin or anaemic are more likely to experience intrauterine growth restriction (IUGR), preterm delivery and LBW<sup>29</sup>. Another study examined predictors of wasting and severe wasting using pooled national survey data from 6 South Asian countries. It found that children with reported LBW are significantly more likely to be wasted and severely wasted than non-LBW children. Also, LBW was found to be a predictor of WaSt<sup>30</sup>. Altogether, the evidence is strong to suggest that improving a women's nutritional status through the provision of both nutrition specific and nutrition sensitive actions will decrease the prevalence of LBW and ultimately protect against incidence of wasting.

Infancy has traditionally been largely overlooked in the context of wasting. As a result, the literature is lagging despite how important this population group is. Historically, clinicians, nutritionists and policy makers recognized the importance of managing infants under 6 months of age but knew that little could be offered. In turn, they found it ethically questionable to identify malnourished infants without having a follow up treatment option. To mitigate against mortality and adverse health and development outcomes (such as wasting) for infants in the short and long-term, respectively<sup>31</sup>, the management of this population group under 6 months of age needs to be included in future research, policy and programming interventions. Reflecting this recognition, more and more key stakeholders are prioritising the role of infancy in wasting<sup>32</sup>.

23. Ashaba S, Rukundo GZ, Beinempaka F, Ntaro M, LeBlanc JC. Maternal depression and malnutrition in children in southwest Uganda: a case control study. *BMC Public Health*. 2015;15:1303. - 24. Nabwera, Helen & Moore, Sophie & Mwangome, Martha & Molyneux, Sassy & Darboe, Momodou & Camara-Trawally, Nyima & Sonko, Bakary & Darboe, Alhagie & Singhateh, Seedy & Fulford, Anthony & Mulberg, Andrew. (2018). The influence of maternal psychosocial circumstances and physical environment on the risk of severe wasting in rural Gambian infants: a mixed methods approach. *BMC Public Health*. - 25. Nabwera, Helen & Moore, Sophie & Mwangome, Martha & Molyneux, Sassy & Darboe, Momodou & Camara-Trawally, Nyima & Sonko, Bakary & Darboe, Alhagie & Singhateh, Seedy & Fulford, Anthony & Mulberg, Andrew. (2018). The influence of maternal psychosocial circumstances and physical environment on the risk of severe wasting in rural Gambian infants: a mixed methods approach. *BMC Public Health*. - 26. MICS (2018). Predictors of Maternal and Child Mal- and Undernutrition in West and Central Africa. - 27. Pushpa, LT and Sen, J. (2016). Maternal Body Mass Index Is Strongly Associated with Children Z-Scores for Height and BMI. *Journal of Anthropology*. Volume 2016. Article ID 6538235, 10 pages. - 28. Harding KL, Aguayo VM, Webb P. Factors associated with wasting among children under five years old in South Asia: Implications for action. *PLoS One*. 2018;13(7):e0198749. Published 2018 Jul 3. doi:10.1371/journal.pone.0198749 - 29. Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., ... the Maternal and Child Nutrition Study Group (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*, 382(9890), 427–451. - 30. Harding, K. L., Aguayo, V. M., & Webb, P. (2018). Birthweight and feeding practices are associated with child growth outcomes in South Asia. *Maternal & Child Nutrition*, 14(Suppl 4), e12650. <https://doi.org/10.1111/mcn.12650> - 31. Kerac M, Frison S, Connell N, Page B, McGrath M. 2019. Informing the management of wasting in infants aged under 6 months (MAMI): risk factor analysis using nationally-representative demographic & health survey secondary data. *PeerJ* 6:e5848 DOI 10.7717/peerj.5848 - 32. No Wasted Lives. 2018. No Wasted Lives. Available at <https://www.nowastedlives.org/> (accessed 23 February 2018).

To assist with informing future research, policy and programming, a recent study<sup>33</sup> identified the risk factors associated with wasting in infants under 6 months of age. The risk factors that were statistically associated with wasting include:

- ▶ Delayed start to breastfeeding
- ▶ Diarrhea/infection
- ▶ Pre-lacteal feed
- ▶ Low maternal BMI
- ▶ Small infant size at birth
- ▶ Mother disempowerment
- ▶ Poverty

Future research should be followed closely to ensure the operational application of evidence-based approaches.

## Children (6 to 59 months)

### Diarrhea/Infection:

The cyclical interaction between infection and malnutrition is well documented for children 6 to 59 months. Poor nutrition leaves children underweight, weakened and vulnerable to infections<sup>34</sup>. Additionally, children with infections are more susceptible to malnutrition. Furthermore, diarrhea is one out of five infections that is accountable for more than one-half of all deaths in children under-five years<sup>35</sup>. Diarrhea morbidity has also been associated with wasting in children 6 to 59 months<sup>36</sup>. Overall WASH practices and levels of access to WASH services can also be a contributing factor through links with worms, anemia, and time spent to access clean water.

### Inadequate minimal acceptable diet:

The UNICEF framework has long identified inadequate dietary intake as one of the immediate causes of undernutrition in children under-five years. Undernutrition is a composite index of both wasting and stunting as a measure of nutritional status<sup>37</sup>.

### Inadequate catch up growth:

When children lose weight due to acute illness or dietary deficiency, their linear growth may slow down or stop altogether until the weight is recovered<sup>38</sup>. Catch up growth may occur if the child regains the weight and the linear growth continues, ultimately allowing children to return to their original growth trajectory<sup>39</sup>. However, if the child does not regain the weight and the catch-up growth is inadequate, there are persistent height deficits, and this can lead to a reduced weight-for-height in children under-five years.

### Sex:

Research reveals that boys are significantly more likely than girls to be wasted<sup>40, 41</sup>.

## Concluding Points on Risk Factors

In concluding, wasting is a complex and multifactorial problem. Although the UNICEF framework provides an excellent foundational model for depicting the causal factors at the immediate, underlying and systemic levels, it may be too general to effectively identify the context specific pathways of wasting at a local level. The life cycle model provides a useful additional framework that depicts the relevant population groups over time and the different risk factors associated with wasting that accompany each stage of life cycle. As the evidence base for this association grows, it is important to take stock of the chronic risk factors in tandem with what is available in the literature. Special consideration should be provided to population groups that are not systematically included in policy and programming initiatives in the past (e.g., infants) and both frameworks should be used as complementary to one another for laying the groundwork for effective policy and program planning.

33. Kerac M, Frison S, Connell N, Page B, McGrath M. 2019. Informing the management of wasting in infants aged under 6 months (MAMI): risk factor analysis using nationally-representative demographic & health survey secondary data. PeerJ 6:e5848 DOI 10.7717/peerj.5848 - 34. Katona P, Katona-Apte J. The interaction between nutrition and infection. Clin Infect Dis. 2008;46(10):1582–1588. doi:10.1086/587658 - 35. UNICEF Statistics. Progress for children: a child survival report card. 2006. Available at: <http://www.cdc.gov/malaria/impact/index.htm>. Accessed 31, 2008. - 36. Tufa EG, Dake SK, Bekru ET, et al. Magnitude of wasting and underweight among children 6-59 months of age in Sodo Zuria District, South Ethiopia: a community based cross-sectional study. BMC Res Notes. 2018;11(1):790. Published 2018 Nov 3. doi:10.1186/s13104-018-3880-x. 37. WHO. Global database on Child Growth and Malnutrition: Descriptions. Available in <http://www.who.int/nutgrowthdb/about/introduction/en/index2.html> accessed 14 Sept 2015. - 38. Ashworth A. Growth rates in children recovering from protein-calorie malnutrition. Br J Nutr. 1969; 23:835-45 - 39. Walker SP, Grantham-McGregor SM, Himes JH, Powell CA. Relationships between wasting and linear growth in stunted children. Acta Paediatr. 1996;85:666-9 - 40. Khara T, Mwangome M, Ngari M, Dolan C. Children concurrently wasted and stunted: a meta-analysis of prevalence data of children 6–59 months from 84 countries. Matern Child Nutr. 2018;14(2):e12516 doi: 10.1111/mcn.12516. Epub 2017 Sep 25.2017. - 41. Harding KL, Aguayo VM, Webb P. Factors associated with wasting among children under five years old in South Asia: Implications for action. PLoS One. 2018;13(7):e0198749. Published 2018 Jul 3.



# Scientific Evidence on Wasting Prevention

The following chapter attempts to summarize available evidence on wasting prevention interventions, using the Global Action Plan Framework which focusses on the following components;

- 1. Primary health care and water, hygiene and sanitation**
- 2. Maternal Nutrition**
- 3. Children's diets and feeding & care practices**

This paper looks in to universal and targeted prevention interventions. Tertiary prevention (i.e. treatment of wasting) has not been included as the focus of this paper has been to better understand evidence and practice on reducing the incidence and/or prevalence of child wasting.

The search for papers was conducted through a database search as well as a review of the grey literature. The main search engines used were PubMed and Google Scholar. The terms used for the PubMed and Google Scholar searches related to the interventions that prevent wasting included "wasting" and "prevention" in tandem with relevant search terms that were aligned with the 4 layers of wasting prevention fundamentals outlined in UNICEF's new 2020 strategy below. For example, these included terms such as "vaccination", "water", "supplementation", "gender equality", "breastfeeding", "complementary feeding", "agriculture", "cash transfer", etc. In addition to the academic journals, different grey literature sources were used to complete this literature review. These included different reports (e.g., technical), viewpoints (e.g., Wasting-Stunting Technical Interest Group) and policy briefs (e.g., WHO and ENN).

The revealed and relevant articles built upon the detailed examination of the evidence related to wasting prevention conducted by the MQSUN+ team between December 2017 and February 2018. Although the MQSUN+ review included materials published from January 1, 1990 to January 15, 2018, it was not an exhaustive review of all of the intervention types that prevent wasting. Additional intervention types included in this review were iodine supplementation, balanced protein energy supplementation, safe disposal of child feces, psychosocial stimulation as well as treatment of wasting. As such, this review filled the gaps with key findings from February 2018 to January 2020 for interventions included in the MQSUN+ review in addition to adding new interventions that weren't included in the MQSUN+ report. The different interventions that were associated with the prevention of wasting were consolidated and presented based on the 3 components previously mentioned.

## Primary health care and water, hygiene & sanitation (WASH)

### Primary health care

Only a few well-designed studies are associated with health care interventions having a (small) impact on wasting reduction<sup>42</sup>. The following health care interventions have been associated to wasting: de-worming, incomplete immunisation, lack of family planning, insufficient antenatal visits and delivery outside of the hospital<sup>43</sup>. Evidence has shown that deworming<sup>44</sup> can decrease wasting but some studies have also revealed inconclusive results<sup>45</sup>. Vaccination status has also been associated with wasting<sup>46</sup> but only one study links measles with wasting and mortality<sup>47</sup>.

42. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 43. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention

44. Frozanfar, M. K. et al. (2016) 'Wasting among under-five children in Faryab, Afghanistan: prevalence and causes', *Nagoya Journal of Medical Science*, 78(1), pp. 41–53. - 45. Taylor-Robinson, D. C. et al. (2015) 'Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin, and school performance', *The Cochrane Database of Systematic Reviews*, (7), p. CD000371. doi: 10.1002/14651858.CD000371.pub6. - 46. Altare, C., Delbiso, T. D. and Guha-Sapir, D. (2016) 'Child Wasting in Emergency Pockets: A Meta-Analysis of Small-Scale Surveys from Ethiopia', *International Journal of Environmental Research and Public Health*, 13(2), p. 178. doi: 10.3390/ijerph13020178. - 47. Grais, R. F. et al. (2011) 'Measles vaccination in humanitarian emergencies: a review of recent practice', *Conflict and Health*, 5(1), p. 21. doi: 10.1186/1752-1505-5-21. - 48. Myrto Schäfer et al. (2014) 'Delivery of preventive paediatric health care improves wasting, stunting and vaccination coverage in a cohort of children 6-24 months of age in Konséguela, Mali'.

Studies have also revealed that sleeping under ITNs as well as receiving paediatric care that is inclusive of malaria prevention support can prevent wasting<sup>48</sup>.

### **Water, Sanitation and Hygiene (WASH)**

WASH practices, including improved access to safe drinking water and access to improved sanitation facilities and hygiene practices, may be significantly associated with wasting but there is conflicting evidence. Although there is a large body of evidence that suggests malnutrition (e.g., improved linear growth) is linked with poor WASH practices, there is no conclusive evidence to date that shows that the integration of WASH with nutrition has an impact on the prevalence of wasting<sup>49</sup>.

Single interventions such as handwashing with soap are not always effective to promote nutrition status. Handwashing significantly reduces the incidence of diarrhoea, which is prevalent in poor WASH conditions. It is also known that a high incidence of diarrhoea can lead to a vicious cycle of repeated infections, reduced immunity and a deteriorating nutritional status but the evidence of this intervention implemented alone does not show impactful results on child wasting<sup>50</sup>. This indirect association could lead to the prevention of wasting outcomes.

Unsafe child feces disposal is another single intervention that does show associations with environmental enteropathy and impaired growth<sup>51</sup>. The results of one study showed that the odds of wasting were significantly higher for children in households where caregivers practiced unsafe child feces disposal. Furthermore, there was an increase in the environmental enteropathy activity scores in this same group of children. As such, this individual practice puts susceptible pediatric populations at risk for environmental enteropathy and impaired growth. Interventions such access

to latrines (disposal of feces in an enclosed space) will protect the health of susceptibility of children and improve child growth<sup>52</sup>.

Stronger evidence is revealed through a combination of WASH interventions which have been more effective in improving nutritional status than individual interventions. The combination of interventions is justified based on the fact that the exposures to faecal-oral pathogens through drinking water, sanitation or hygiene, which is the mediating pathway to WASH and nutrition is complex. Handwashing or treatment to drinking water or food safety or sanitation alone cannot prevent the occurrence of faecal-oral diseases<sup>53</sup>. Examples of combined WASH intervention studies include the Community Resilience to Wasting program in Chad. It shows that a combination of elements (WASH promotion, food income and markets, nutrition and health, early warning) is reducing the risk of child wasting<sup>54</sup>. More specifically, this Chadian study suggested that differences in child nutrition outcomes were related to the hygiene practices along the water supply chain and not just necessarily access to clean water. The water was being contaminated by the cattle due to livestock management practices and this was impacting child wasting. A second study that took place in Mali looked at the impact of mobilizing communities to build their own toilets and stop open defecation. In villages that received a behavioral sanitation intervention with no monetary subsidies, diarrheal prevalence remained similar to control villages. However, access to toilets substantially increased and child growth improved, particularly in children <2 years. CLTS might have prevented growth faltering through pathways other than reducing diarrhea. A third study that also took place in Chad looked at the effectiveness of a household WASH package on program performance for noncomplicated SAM. The results revealed that an integrated “WASH

49. Luby, S. P. et al. (2018) '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*. doi: 10.1016/S2214-109X(17)30490-4. - 50. Gizaw Z, Worku A. Effects of single and combined water, sanitation and hygiene (WASH) interventions on nutritional status of children: a systematic review and meta-analysis. *Ital J Pediatr*. 2019;45(1):77. Published 2019 Jul 4. doi:10.1186/s13052-019-0666-2 - 51. George CM, Oldja L, Biswas S, et al. Unsafe Child Feces Disposal is Associated with Environmental Enteropathy and Impaired Growth. *J Pediatr*. 2016;176:43–49. - 52. Pickering AJ, Djebbari H, Lopez C, Coulibaly M, Alzua ML. Effect of a community-led sanitation intervention on child diarrhoea and child growth in rural Mali: a cluster-randomised controlled trial. *Lancet Glob Health*. 2015;3(11):e701–e711. doi:10.1016/S2214-109X(15)00144-8 - 53. Gizaw Z, Worku A. Effects of single and combined water, sanitation and hygiene (WASH) interventions on nutritional status of children: a systematic review and meta-analysis. *Ital J Pediatr*. 2019;45(1):77. Published 2019 Jul 4. doi:10.1186/s13052-019-0666-2 - 54. Marshak, A., Young, H. and Radday, A. (2016) 'Water, Livestock, and Malnutrition Findings from an Impact Assessment of "Community Resilience to Wasting" Programming in the Dar Sila Region of Eastern Chad, 2012–2015'. Feinstein International Center, Tufts University. - 55. Altmann M, Altare C, van der Spek N, et al. Effectiveness of a Household Water, Sanitation and Hygiene Package on an Outpatient Program for Severe Wasting: A Pragmatic Cluster-Randomized Controlled Trial in Chad. *Am J Trop Med Hyg*. 2018;98(4):1005–1012. doi:10.4269/ajtmh.17-0699

in Nut” approach (e.g., provision of safe drinking water, storage container with lid, chlorine tablets, soap for handwashing, plastic cup with handle, leaflet with hygiene messages) had the potential to increase program performance because it increased the recovery rate of SAM children being treated<sup>55</sup>. All in all, studies continue to conclude that improvements in WASH should remain an integral component of wasting prevention efforts, to address all relevant context specific risks to reduce the contamination of the environment in which the child and their family lives,<sup>56</sup> despite the limited evidence that is currently available on its effectiveness to prevent wasting.

## Maternal nutrition

### Supplementation

The efficacy of supplementation interventions such as healthy, nutrient-rich diets, food supplements, and multivitamin-mineral supplements during the pre-conceptional period are poorly understood. It is known that maternal undernutrition leads to IUGR and consequent LBW, stunting, wasting, underweight and other micronutrient deficiencies along with conditions predisposing to mortality. As there are no effective therapies to reverse IUGR, preventive strategies such as caloric and micronutrient supplementation before and during pregnancy, coupled with supportive strategies for improving nutrition are suggested as being effective in protecting against IUGR and consequent wasting. Below are 3 examples of 3 different interventions (balanced energy/protein, iron folic acid and iodine supplementation) where evidence is inconclusive but encouraging in supporting linkages between supplementation and protection against consequent child wasting.

Balanced protein energy supplementation has a positive impact on both maternal and perinatal birth outcomes. In one Cochrane review that looked at reported data, it was found that balanced energy/

protein supplementation improves fetal growth and may reduce the risk of fetal and neonatal death. High-protein or balanced-protein supplementation alone is not beneficial and may be harmful to the fetus<sup>57</sup>. A more recent meta-analysis deemed balanced energy/protein supplementation (25% of the total energy supplement as protein) an important intervention for prevention of perinatal outcomes in malnourished women. The data showed that balanced energy supplementation increased birthweight by 73g and reduced risk of small-for-gestational-age (SGA) by 34%, with a more pronounced effect in malnourished women.<sup>58</sup> Finally, a recent study showed that locally produced food-based balanced energy/protein supplementation in undernourished pregnant women in northern Bangladesh resulted in larger MUAC in infants at 6 months<sup>59</sup>. As MUAC tapes are used to identify wasting in children, this indicates that the balanced energy/protein supplementation positively impacted consequent screening for wasting. Altogether, balanced energy/protein supplementation could have benefits on child wasting outcomes, but further research is required to confirm the role of supplementation for pregnant women on weight and linear growth in newborns and infants.

WHO recommends daily iron supplementation during pregnancy as part of the standard care in populations at risk of iron deficiency<sup>60</sup>. Anemic women are more likely to experience IUGR<sup>61</sup> and LBW of their newborns. As mentioned above, there is significant evidence linking LBW to wasting outcomes. A review<sup>62</sup> of folic acid supplementation during pregnancy showed that folic acid supplementation improved mean birthweight and reduced the incidence of megaloblastic anemia by 79%. A Cochrane review<sup>63</sup> of daily iron supplementation to women during pregnancy reported a 70% reduction in anemia at term, a 67% reduction in iron deficiency anemia and 19% reduction in the incidence of

56. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 57. Kramer MS, Kakuma R: Energy and protein intake in pregnancy. *Cochrane Database Syst Rev* 2003, , 4: CD000032. - 58. Imdad A, Bhutta ZA. Maternal nutrition and birth outcomes: effect of balanced protein-energy supplementation. *Paediatr Perinat Epidemiol* 2012; 26 (suppl 1): 178–90. - 59. Stevens B, Watt K, Brimbecombe J, Clough A, Judd JA, Lindsay D. A village-matched evaluation of providing a local supplemental food during pregnancy in rural Bangladesh: a preliminary study. *BMC Pregnancy Childbirth*. 2018;18(1):286. Published 2018 Jul 4. - 60. WHO. Guideline: daily iron and folic acid supplementation in pregnant women. Geneva: World Health Organization, 2012. - 61. Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., ... the Maternal and Child Nutrition Study Group (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*, 382(9890), 427–451. - 62. Lassi ZS, Salam RA, Haider BA, Bhutta ZA. Folic acid supplementation during pregnancy for maternal health and pregnancy outcomes. *Cochrane Database Syst Rev* 2013; 3: CD006896. - 63. Pena-Rosas JP, De-Regil LM, Dowswell T, Viteri FE. Daily oral iron supplementation during pregnancy. *Cochrane Database Syst Rev* 2012; 12: CD004736.



LBW. Although there is very little evidence regarding the effects of prenatal nutrition supplementation specifically for pregnant adolescents, a recent four armed effectiveness trial study that showed prenatal LNS-SQ did not lead to significant reductions in LBW, SGA or preterm birth but it had marginally significant effect on newborn wasting in comparison to the IFA supplementation<sup>64</sup>. In concluding, evidence suggests that iron or iron folic acid supplementation positively impacts birth outcomes, but further evidence is required to examine the impact of this supplementation, including LNS-SQ for adolescents, on consequent wasting.

In addition to iron, iodine is also an important micronutrient that is essential for normal growth and development. Iodine requirements increase substantially during pregnancy and breastfeeding and if requirements are not met, the production of thyroid hormones may decrease and be inadequate for maternal, fetal and infant needs<sup>65</sup>. In one systematic review of randomized control trials that looked at the effect of iodine supplementation in pregnancy on child development outcomes found that only 2 out of 8 trials reported clinical outcomes for growth and, in the end, there were no growth outcome differences between placebo and iodine groups in regions of severe iodine deficiency in these 2 studies<sup>66</sup>. A Cochrane review also found limitations in the availability of data as they did not identify any trials that reported on growth<sup>67</sup>. However, another multi-country review conducted in Asia<sup>68</sup> found that there was an association between iodized salt consumption and MUAC. More specifically, households that consumed iodized salt corresponded to a lower prevalence of low MUAC. Within the same study, it was revealed that the association of WFH and iodine was more significant in 2 Asian countries in comparison to WFA or HFA and iodine. As such, although there's a lack of high-quality evidence available that links iodine in pregnancy with

growth outcomes, this significant association suggests that iodine affects postnatal growth of soft tissue and prevents wasting.

### Gender equality

Gender equality initiatives as interventions contribute to improved child nutrition outcomes. A Gambian study has shown that interventions related to gender relations that are connected to decision-making about child nutrition, access to economic resources and family planning have demonstrated impact on child wasting outcomes<sup>69</sup>. Another study in India looked at the impact of multiple dimensions of maternal autonomy on nutrition outcomes and it was suggested that individual domains of autonomy could influence child growth. For example, mothers with higher levels of financial autonomy were more likely to exclusively breastfeed. Also, a mother's autonomy surrounding household decision making was positively associated with infant WFH and mothers who participated in household decision making had infants with better WFH in comparison to mothers of infants with less decision making<sup>70</sup>. Although gender equality goes beyond maternal autonomy, this evidence sheds light on the importance of the role of gender equality and child health outcomes. A third study in Senegal showed a decrease in the number of incident cases of wasting following the inclusion of "Husband Education Schools" in a multi-sectoral nutrition program. On a monthly basis, the husbands met and were trained on malnutrition to discuss and learn about different themes related to nutrition. The rationale was that their improved knowledge would positively impact decision-making regarding household resource expenditure as well as caring practices for children due to the power they hold in the household. The results revealed that the number of new cases (incidence) of wasting reduced in one-year (see Table 1).

64. Dewey KG, Matias SL, Mridha MK, Arnold CD. Nutrient supplementation during the first 1000 days and growth of infants born to pregnant adolescents [published online ahead of print, 2019 Aug 4]. *Ann N Y Acad Sci.* 2019;10.1111/myas.14191. - 65. Harding KB, Peña-Rosas JP, Webster AC, et al. Iodine supplementation for women during the preconception, pregnancy and postpartum period. *Cochrane Database Syst Rev.* 2017;3(3):CD011761. Published 2017 Mar 5. - 66. Zhou SJ, Anderson AJ, Gibson RA, Makrides M. Effect of iodine supplementation in pregnancy on child development and other clinical outcomes: a systematic review of randomized controlled trials. *Am J Clin Nutr.* 2013;98(5):1241–1254. - 67. Harding KB, Peña-Rosas JP, Webster AC, et al. Iodine supplementation for women during the preconception, pregnancy and postpartum period. *Cochrane Database Syst Rev.* 2017;3(3):CD011761. Published 2017 Mar 5. - 68. Mason JB, Deitchler M, Gilman A, et al. Iodine fortification is related to increased weight-for-age and birthweight in children in Asia. *Food Nutr Bull.* 2002;23(3):292–308. - 69. Mwangome M, Prentice A, Plugge E, Nweneke C. Determinants of appropriate child health and nutrition practices among women in rural Gambia. *J Health Popul Nutr.* 2010;28(2):167–172. - 70. Schroff, M.R. et al. (2011) Does maternal autonomy influence feeding practices and infant growth in rural India? *Social Science and Medicine*, 73(3) pp. 447-455.

## Children's diets and feeding & care practices

### Breastfeeding promotion and support

The evidence associated with interventions promoting exclusive and continued breastfeeding and its impact on wasting prevention is seen as inconclusive<sup>71</sup>. Furthermore, the available evidence is either modest or difficult to attribute to breastfeeding promotion alone. For example, the Lancet 2008 series<sup>72</sup> states that 10 per cent of the overall burden for wasting is attributable to suboptimal breastfeeding practices, particularly the lack of exclusive breastfeeding between birth and six months of age. However, a subsequent 2015 review and meta-analysis found different results based on the income status of countries. This review revealed that the promotion of breastfeeding alone or in combination with other strategies may be associated with a small but significant decrease in WHZ scores in children in low-income countries<sup>73</sup>.

There is one South Asian study<sup>74</sup> that found that children are less likely to be wasted if they were breastfed within the first hour of birth, were not given any pre-lacteal foods and were exclusively breastfed. Also, the rapid fall in the prevalence of wasting during the first few months of life in several South Asian countries suggest that early and exclusive breastfeeding may be a mediator to LBW and it is known that there is significant evidence linking LBW to wasting outcomes. Overall, there is consensus on the important role of breastfeeding as a protective factor, but further studies are required to demonstrate its impact on the prevention of wasting.

### Complementary food

Complementary foods are essential for healthy growth and as such, the potential benefits of

complementary foods for wasting prevention are clear though concrete evidence regarding wasting is limited. For example, there is evidence that shows significant impact of complementary feeding with a food component on weight gain as well as weight-for-length, particularly in food insecure contexts<sup>75</sup>. Also, one systematic review revealed that some authors argued that complementary feeding interventions can prevent wasting, but other authors found no evidence of an effect on mean WHZ<sup>76</sup>. Another study demonstrated that when meat is consumed as part of the complementary feeding period, a reduction in both wasting and stunting has been demonstrated<sup>77</sup>. Finally, a contrasting study in Bhutan found that complementary feeding practices are not associated with stunting or wasting, possibly because the prevalence of anthropometric failure is relatively low in this population<sup>78</sup>. Altogether, further research needs to disentangle the role of complementary feeding on child wasting outcomes.

### Nutrition counselling and nutrition education

Nutrition counselling and nutrition education are two different strategies used to improve the diets of children U5. They are unique in their delivery and target group(s) but the commonality of both includes the transfer of knowledge. Nutrition counselling refers to individual sessions with the caretaker to identify and negotiate how to address specific issues whereas nutrition education activities usually target larger groups with broader messages using a range of different media.

Both nutrition counselling and nutrition education show evidence of a significant positive association with wasting reduction. For example, a positive deviance approach in Vietnam<sup>79</sup>, nutrition education coupled with cooking demonstrations<sup>80</sup> as well as improved knowledge

71. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 72. Bhutta, Z. A. et al. (2008) 'What works? Interventions for maternal and child undernutrition and survival', *The Lancet*, 371(9610), pp. 417–440. doi: 10.1016/S0140-6736(07)61693-6. - 73. Giugliani, E. R. J. et al. (2015) 'Effect of breastfeeding promotion interventions on child growth: a systematic review and meta-analysis', *Acta Paediatrica* (Oslo, Norway: 1992), 104(467), pp. 20–29. doi: 10.1111/apa.13160. - 74. Harding, K. L., Aguayo, V. M., & Webb, P. (2018). Birthweight and feeding practices are associated with child growth outcomes in South Asia. *Maternal & Child Nutrition*, 14(Suppl 4), e12650. <https://doi.org/10.1111/mcn.12650>. - 75. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 76. Kristjansson, E. et al. (2015) 'Food supplementation for improving the physical and psychosocial health of socio-economically disadvantaged children aged three months to five years', *The Cochrane Database of Systematic Reviews*, (3), p. CD009924. doi: 10.1002/14651858.CD009924.pub2. - 77. Krebs, N. F. et al. (2011) 'Meat consumption is associated with less stunting among toddlers in four diverse low-income settings', *Food and Nutrition Bulletin*, 32(3), pp. 185–191. doi: 10.1177/156482651103200301. - 78. Campbell, R. K., Aguayo, V. M., Kang, Y., Dzed, L., Joshi, V., Waid, J., ...West, Jr., K. P. (2018b). Infant and young child feeding practices and nutritional status in Bhutan. *Maternal & Child Nutrition*, 14(Suppl 4), e12762. <https://doi.org/10.1111/mcn.12762>. - 79. Mackintosh, U., Marsh, D. and Schroeder, D. (2002) 'Sustained Positive Deviant Child Care Practices and Their Effects on Child Growth in Viet Nam', *Food and Nutrition Bulletin*, 23(4\_suppl2), pp. 18–27. doi: 10.1177/15648265020234S204. - 80. Majamanda, J. et al. (2014) 'The Effectiveness of Community-Based Nutrition Education on the Nutrition Status of Under-five Children in Developing Countries. A Systematic Review', *Malawi Medical Journal: The Journal of Medical Association of Malawi*, 26(4), pp. 115–118.

on key (nutrition) issues<sup>81</sup> were associated with improved WHZ scores or reductions in child wasting. Also, evidence is accumulating for an association between the delivery of quality nutrition counselling and achievements in weight and length for both malnutrition rehabilitative and preventive programming<sup>82</sup>.

Despite the growing evidence base of the positive associations between nutrition education and nutrition counselling and wasting reduction, there are still a couple of trials that did not show significant positive effects<sup>83</sup>. In one study, the reasons for the lack of impact included constraints surrounding existing health services and the availability of a functional network of skilled frontline workers. As such, this was not the intervention itself that contributed to the limitations of the study outcomes but more so the health delivery systems and availability of personnel.

### Psychosocial stimulation

Psychosocial stimulation is an early childhood development intervention that includes physical, sensory and/or emotional inputs. The absence of this type of engagement at a young age inhibits children from achieving their full intellectual and physical potential. Although the evidence of an association between psychosocial stimulation and the prevention of wasting is of very low quality and limited, there was one Indonesian study<sup>84</sup> that linked psychosocial care to nutrition status of children aged 6 to 36 months. Results revealed that well-nourished children (inclusive of wasting anthropometric measurements) scored higher on the tool that assessed psychosocial care in the home although there was no significant association.

To highlight the importance of psychosocial stimulation in early childhood development and

its potential role in the prevention of wasting, it is insightful to examine the evidence of psychosocial stimulation on children already suffering from SAM. These children are at an exceptionally high risk of poor growth outcomes and are also thought to be at high risk for motor and cognitive delays, as brain development is further inhibited with increasing severity of malnutrition<sup>85</sup>. In recognition of this, WHO included emotional and physical stimulation for children suffering from SAM in their 1999 manual for the management of SAM<sup>86</sup>. This was echoed again in the 2003 WHO guidelines<sup>87</sup> for the inpatient treatment of SAM but it was not included in the guidelines for the IMAM approach<sup>88</sup>. Altogether, this lack of inclusion could have contributed to the stalling of the evidence base related to psychosocial stimulation and its role in improving child growth outcomes as well as potentially preventing wasting in the same children that have suffered from SAM.

There is weak evidence to support an association between psychosocial stimulation and growth outcomes in children already suffering from SAM. One study<sup>89</sup> that did show significant increases in WAZ between the intervention group (receiving psychosocial stimulation) and the control group six months after the hospital stay. A second study<sup>90</sup> did not show any changes in growth outcomes as a result of a psychosocial stimulation intervention. Additional progress in child development indicators such as cognitive development as well as gross and fine motor skills showed mixed results within both studies. Altogether, although the availability of studies and results are sparse, they are still promising and indicative of the need for higher quality studies to build the case of how child psychosocial stimulation can impact growth outcomes, including whether or not this intervention is impactful on the prevention of wasting.

81. Mukunya, D. et al. (2014) 'Knowledge of integrated management of childhood illnesses community and family practices (C-IMCI) and association with child undernutrition in Northern Uganda: a cross-sectional study'. BMC public health, 14, p. 976. doi: 10.1186/1471-2458-14-976. - 82. Ashworth, A. and Ferguson, E. (2009) 'Dietary counseling in the management of moderate malnourishment in children', Food and Nutrition Bulletin, 30(3 Suppl), pp. S405-433. doi: 10.1177/15648265090303S304. - 83. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 84. Februhartanty J, Usfar AA, Dianawati E, Fransisca DO, Roshita A, Fahmida U. Psychosocial care and nutritional status of children aged 6-36 months among patrilineal (Karo) and matrilineal (Minangkabau) households in Jakarta. Asia Pac J Clin Nutr. 2007;16(2):293-300. - 85. Lenters LM, Wazny K, Webb P, Ahmed T, Bhutta ZA. Treatment of severe and moderate wasting in low- and middle-income settings: a systematic review, meta-analysis and Delphi process. BMC Public Health. 2013;13 Suppl3:S23. - 86. World Health Organization. Management of severe malnutrition: a manual for physicians and other senior health workers. Geneva: World Health Organization; 1999. - 87. Ashworth A, Khanum S, Jackson A, Schofield C. Guidelines for the inpatient treatment of severely malnourished children. 2003. - 88. Kerac M, Mcgrath M, Grijalva-Eternod C, Bizouerne C, Saxton J, Bailey H, et al. Management of Wasting in Infants (MAMI) Project Technical Review: Current evidence, policies, practices & programme outcomes. 2010. - 89. Nahar B, Hamadani J, Ahmed T, Tofail F, Rahman A, Huda S, et al. Effects of psychosocial stimulation on growth and development of severely malnourished children in a nutrition unit in Bangladesh. Eur J Clin Nutr. 2009;63:725-31. - 90. Grantham-McGregor S, Schofield W, Haggard D. Maternal-child interaction in survivors of severe malnutrition who received psychosocial stimulation. Eur J Clin Nutr. 1989;43:45-52.



### Agriculture and livelihoods

Agriculture and livelihood interventions can impact children under-five's (U5) diets via several pathways. These pathways include improving the availability and access to diverse foods based on market prices and the empowerment of women. They could also include microcredit activities or the provision of credit for agricultural inputs. Although each activity has been identified with the potential of having an impact on preventing wasting, only limited effects on wasting have been observed with each.

Studies associated with agriculture projects such as home gardening, aquaculture interventions, poultry as small business for egg production and women's empowerment in agriculture have seen mixed results with regards to preventing wasting. Although home gardening projects have the potential to increase children's nutrient intake, only a few studies have demonstrated an association with wasting<sup>91</sup>. An aquaculture intervention did not show a positive association with nutrition status<sup>92</sup>, but a poultry business revealed improvements in children's egg consumption as well as improvements in weight-for-height z-score (WHZ) and body mass index (BMI)<sup>93</sup>. A study that looked at women's empowerment in agriculture was not significantly associated with weight-for-length (WFL). However, within the same study, it was found that lack of maternal education perpetuates inter-generational transmission of poor nutrition even though a mother's level of education provides only limited and indirect information regarding an individual's autonomy, control or power<sup>94</sup>.

Studies with livelihood interventions have not revealed robust evidence relating to any impact on wasting. For example, microcredit and nutrition education interventions have demonstrated impact on stunting, underweight and BMI for age but no impact for wasting<sup>95</sup>. Also, another

livelihood study revealed that WFH improvements may not be due to livelihoods or income but instead associated with more meat consumption<sup>96</sup>. However, this could also be interpreted by the fact that it was the livelihood activities that enabled greater access and consumption of meat. If this is true, complementary interventions such as behaviour change communication activities conducted alongside livelihood activities could improve nutrition outcomes, such as wasting.

Altogether, there is a general scarcity of studies measuring wasting outcomes related to agriculture and livelihoods. More needs to be done to adequately design, monitor and evaluate interventions to enable documentation of any links between improved agricultural production and/or income with child nutritional status<sup>97</sup>.

### Cash and Voucher Assistance (CVA)

Types of Cash and Voucher Assistance (CVA) are heterogeneous in design and they do impact children U5's diets and wasting outcomes. In general, CVA can be classified as conditional (where recipients must fulfil prerequisite activities or obligations in order to receive assistance), unconditional (without the recipient having to do anything in order to receive the assistance, other than meet the intervention's targeting criteria), restricted (typically commodity vouchers for fresh food) or unrestricted (grant that recipients can use on whatever they want)<sup>98</sup>. A distinction is also made between the classification of emergency CVA and safety nets because the CVA evidence in humanitarian and development settings differ from one another. Although a 2013 study revealed that conditional CVA accomplish similar impacts to those of unconditional CVA<sup>99</sup>, there is further evidence revealing that conditions (e.g., attending sensitization sessions, essential family practice) combined with CVA is more effective than without. This remains true only when the conditions are "soft" (recipients are not excluded

91. Schipani, S. et al. (2002) 'Dietary Intake and Nutritional Status of Young Children in Families Practicing Mixed Home Gardening in Northeast Thailand', *Food and Nutrition Bulletin*, 23(2), pp. 175–180. doi: 10.1177/156482650202300206. - 92. Aiga, H. et al. (2009) 'Malnutrition among children in rural Malawian fish-farming households', *Transactions of The Royal Society of Tropical Medicine and Hygiene*, 103(8), pp. 827–833. doi: 10.1016/j.trstmh.2009.03.028. - 93. Marquis, G. S. et al. (2017) 'Improving Children's Diet And Nutritional Status Through An Agriculture Intervention With Nutrition Education In Upper Manya Krobo District Of Ghana', *The FASEB Journal*, 31(1 Supplement), p. 455.8-455.8. - 94. Cunningham, K. et al. (2015) 'Women's empowerment in agriculture and child nutritional status in rural Nepal', *Public Health Nutrition*, 18(17), pp. 3134–3145. doi: 10.1017/S1368980015000683. - 95. Marquis, G. S. et al. (2015) 'An integrated microcredit, entrepreneurial training, and nutrition education intervention is associated with better growth among preschool-aged children in rural Ghana', *The Journal of Nutrition*, 145(2), pp. 335–343. doi: 10.3945/jn.114.194498. - 96. Rawlins, R. et al. (2014) 'Got milk? The impact of Heifer International's livestock donation programs in Rwanda on nutritional outcomes', *Food Policy*, 44, pp. 202–213. doi: 10.1016/j.foodpol.2013.12.003. - 97. MQSUN+ Final Report. (2018). *The Current State of Evidence and Thinking on Wasting Prevention*. - 98. <http://www.cashlearning.org/downloads/calp-updated-glossaryfinal-august-2017update.pdf>. - 99. Manley, J., Gitter, S. and Slavchevska, V. (2013) 'How Effective are Cash Transfers at Improving Nutritional Status?', *World Development*, 48, pp. 133–155. doi: 10.1016/j.worlddev.2013.03.010.

from the program if they don't attend) as "hard" conditions have been deemed counterproductive for program acceptance in addition to their costly monitoring.

CVA may produce small but significant effects on wasting. Positive results that impact wasting have been revealed through interventions such as the delivery of cash payments<sup>100</sup>. Other CVA interventions have also positively impacted severe wasting<sup>101</sup>, WHZ and MUAC scores<sup>102</sup>. A recent study conducted in Niger where program beneficiaries received three CVA (totalling approximately 65% of Niger's gross national per capita income) coupled with mothers attending mandatory sessions on IYCF revealed promising results. It found that the odds of having wasting at the end of the intervention was 25X higher among children in the comparison group versus those in the households receiving cash<sup>103</sup>. Also, different variations of CVA such as those coupled with food rations<sup>104</sup> have shown positive impacts on wasting. As a collective, these studies have contributed to the large body of evidence surrounding combinations of interventions that can supplement and intensify their impact. By combining supplementary foods or sensitization messages with CVA demonstrate a better preventive effect on MAM and SAM than strategies relying on CVA or supplementary food alone<sup>105</sup>.

Conversely, some of the studies did not show any impact on wasting or they had mixed results<sup>106</sup>. For example, a recent robust randomized control trial where multiannual seasonal unconditional CVA were provided did not show any impact of preventing wasting in young children<sup>107</sup>. Reasons for this lack of impact could have been due to the small sample size in the study design but there were other plausible reasons. These included

the possibility that the total value of the CVA may have not been enough to cater for both the child's specific needs and the household's needs altogether, the diet quality improvements (e.g., increased meat consumption) may have been too small and/or a high frequency of illness could have impacted nutrition status.

Altogether, CVA studies are rarely designed to achieve impact on nutrition outcomes, resulting in limited evidence of this potential association. It is imperative that future studies are designed and implemented with CVA fit for nutrition purpose. If studies continue to be designed independent of a focus on nutrition outcomes, the evidence will continue to be very mixed and unreliable for informing future programming.

### **General food distribution and food-for-work**

General food distributions as well as food-for-work interventions have demonstrated a positive impact on children U5's diets as well as wasting. Two studies have shown a post-disaster reduction in the prevalence of child wasting in children receiving food aid<sup>108</sup>. Furthermore, food-for-work has shown positive WHZ impacts for children U5 in low asset households<sup>109</sup>. Altogether, despite the demonstrated positive impact, it is difficult to attribute these results to a general food aid distribution or food-for-work intervention alone<sup>110</sup> and more studies are required to disentangle the impact of these individual interventions.

### **Supplementation with specialised foods**

Specialised foods exist in a variety of different compositions of raw ingredients. Fortified blended foods (FBF) such as Corn-Soya Blend (CSB) are foods fortified with vitamins and minerals and lipid nutrient supplements (LNS) provide a range of vitamins and minerals, but unlike most other micronutrient supplements, LNS also provides

100. Renzaho, A. M. N. et al. (2017) 'The Synergetic Effect of Cash Transfers for Families, Child Sensitive Social Protection Programs, and Capacity Building for Effective Social Protection on Children's Nutritional Status in Nepal', *International Journal of Environmental Research and Public Health*, 14(12). doi: 10.3390/ijerph14121502. - 101. Gilligan, D. et al. (2013) 'Impact evaluation of cash and food transfers at early childhood development centers in Karamoja, Uganda', IFPRI: Washington, DC. - 102. Fenn, B. et al. (2015) 'The role of unconditional cash transfers during a nutritional emergency in Maradi region, Niger: a pre-post intervention observational study', *Public Health Nutrition*, 18(2), pp. 343–351. doi: 10.1017/S136898014000378. - 103. Bliss, J. et al. (2016) 'Factors Associated With the Risk of Wasting Among Children Aged 6 to 36 Months in Households Targeted by an Emergency Cash Transfer Program', *Food and Nutrition Bulletin*. doi: 10.1177/0379572116654772. - 104. Pega, F. et al. (2015) 'Unconditional cash transfers for assistance in humanitarian disasters: effect on use of health services and health outcomes in low- and middle-income countries', *The Cochrane Database of Systematic Reviews*, (9), p. CD011247. doi: 10.1002/14651858.CD011247.pub2. - 105. MQSUN+ Final Report. (2018). *The Current State of Evidence and Thinking on Wasting Prevention* - 106. MQSUN+ Final Report. (2018). *The Current State of Evidence and Thinking on Wasting Prevention* - 107. Houngebe, F. et al. (2017) 'Unconditional Cash Transfers Do Not Prevent Children's Undernutrition in the Moderate Wasting Out (MAM'Out) Cluster-Randomized Controlled Trial in Rural Burkina Faso', *The Journal of Nutrition*, 147(7), pp. 1410–1417. doi: 10.3945/jn.117.247858. - 108. Quisumbing, A. R. (2003) 'Food aid and child nutrition in rural Ethiopia', *World Development*, 31(7), pp. 1309–1324. Available at: [https://doi.org/10.1016/S0305-750X\(03\)00067-6](https://doi.org/10.1016/S0305-750X(03)00067-6); Hossain, S. M. M., Maggio, D. M. and Sullivan, K. M. (2009) 'Relationship between food aid and wasting following an earthquake', *Food and Nutrition Bulletin*, 30(4), pp. 336–339. doi: 10.1177/156482650903000404. - 109. Quisumbing, A. R. (2003) 'Food aid and child nutrition in rural Ethiopia', *World Development*, 31(7), pp. 1309–1324. Available at: [https://doi.org/10.1016/S0305-750X\(03\)00067-6](https://doi.org/10.1016/S0305-750X(03)00067-6) - 110. MQSUN+ Final Report. (2018). *The Current State of Evidence and Thinking on Wasting Prevention*

energy, protein and essential fatty acids. There are 3 different categories of LNS: LNS of large quantity (LNS-LQ) or ready-to-use-therapeutic foods (RUTF), LNS of medium quantity (LNS-MQ) or ready-to-use-supplementary foods (RUSF) and LNS of small quantity (LNS-SQ). The use of each type of specialised food impacts wasting prevention differently.

LNS-LQ or RUTF ranges from 500 to 1500 kcal and it is primarily used and supported for the treatment of SAM. Its use in prevention as a widespread blanket distribution approach to all children in a defined age group has been reported as controversial<sup>111</sup>. However, the use of RUTF in a blanket feeding cluster randomized trial study, where intervention groups received 1 sachet of RUTF per day for 3 months preceding the annual harvest, showed reductions of 36% and 58% in the incidence of wasting and severe wasting<sup>112</sup>, respectively. When compared with FBF, RUTF was found to be superior as it promoted better growth in children at risk of wasting and led to the successful recovery of at-risk children<sup>113</sup>.

LNS-MQ or RUSF ranges from 250 to 500kcal and is often used for the treatment or prevention of moderate wasting. It has also been used for widespread blanket distribution and a study has found that children aged 6 to 36 months had a reduced incidence of severe wasting as measured by MUAC<sup>114</sup>. When RUSF was compared with CSB, there were mixed results. One study revealed that there was no statistical difference<sup>115</sup> between the two products but a recent 2019 Cochrane review<sup>116</sup> using limited LNS-MQ studies revealed that the LNS was more effective than the FBF (e.g., CSB).

LNS-SQ ranges from 110 to 130kcal and they are often used as a lipid based fortified micronutrient spread that provides calories and facilitates the absorption of fat-soluble vitamins. Despite having a low caloric content, they have shown significant benefits on iron status and linear growth<sup>117</sup>. Studies have revealed better weight and/or length gains in children receiving LNS-SQ. For example, one study revealed that children receiving LNS-SQ had significantly lower prevalence of wasting than non-intervention children<sup>118</sup>. Altogether, LNS-SQ supplementation is very effective but it also comes with a high cost and this raises questions regarding its sustainability.

Studies continue to be ongoing for the use of specialised foods as it is a very popular current intervention and the evidence is growing quickly<sup>119</sup>. The 2019 Cochrane review<sup>120</sup> assessed the effects of LNS (mostly LNS-SQ) for the prevention of malnutrition when given to children aged 6 to 23 months in addition to complementary foods. It also assessed whether or not LNS is more effective than other foods (e.g., FBF or MNP). The pooled results, specifically for wasting, revealed that compared to no intervention, LNS plus complementary feeding reduced the prevalence of moderate wasting by 17%. There was no effect on the prevalence of severe wasting. Apparently, the LNS was more effective when the duration of the intervention was longer than 12 months but a subgroup analyses of the energy content did not show clinical significance due to the limited number of studies in each subgroup. When compared to FBF, LNS plus complementary feeding significantly reduced the prevalence of moderate wasting. There was no difference between LNS plus complementary feeding and FBF for severe wasting. Lastly, there was no

**111.** Neufeld, L. M. (2009) 'Ready-to-use therapeutic food for the prevention of wasting in children', *JAMA*, 301(3), pp. 327–328. doi: 10.1001/jama.2008.1023 - **112.** Isanaka, S. et al. (2009) 'Effect of Preventive Supplementation With Ready-to-Use Therapeutic Food on the Nutritional Status, Mortality, and Morbidity of Children Aged 6 to 60 Months in Niger', *JAMA. American Medical Association*, 301(3), p. 277. doi: 10.1001/jama.2008.1018 - **113.** Sayad-Neerkorn, J. et al. (2015) 'Preventive effects of long-term supplementation with 2 nutritious food supplements in young children in Niger', *The Journal of nutrition*, 145(11), pp. 2596–2603. - **114.** Defourmy, I. et al. (2009) 'A Large-Scale Distribution of Milk-Based Fortified Spreads: Evidence for a New Approach in Regions with High Burden of Wasting', *PLoS ONE*. Edited by D. Tomé, 4(5), p. e5455. doi: 10.1371/journal.pone.0005455. - **115.** Thakwalakwa, C. M. et al. (2012) 'An effectiveness trial showed lipid-based nutrient supplementation, but not corn-soya blend offered a modest benefit in weight gain among 6- to 18-month-old underweight children in rural Malawi', *Public Health Nutrition*, 15(9), pp. 1755–1762. doi: 10.1017/S1368980012003023. - **116.** Das JK, Salam RA, Hadi YB, et al. Preventive lipid-based nutrient supplements given with complementary foods to infants and young children 6 to 23 months of age for health, nutrition, and developmental outcomes. *Cochrane Database Syst Rev*. 2019;5(5):CD012611. Published 2019 May 2. doi:10.1002/14651858.CD012611.pub3 - **117.** Bhutta, Z. A. et al. (2013) 'Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?', *The Lancet*, 382(9890), pp. 452–477. doi: 10.1016/S0140-6736(13)60996-4. - **118.** Hess, S. Y. et al. (2015) 'Small-quantity lipid-based nutrient supplements, regardless of their zinc content, increase growth and reduce the prevalence of stunting and wasting in young Burkinabe children: a cluster-randomized trial', *PLOS ONE*, 10(3), p. e0122242. - **119.** MQSUN+ Final Report. (2018). *The Current State of Evidence and Thinking on Wasting Prevention* - **120.** Das JK, Salam RA, Hadi YB, et al. Preventive lipid-based nutrient supplements given with complementary foods to infants and young children 6 to 23 months of age for health, nutrition, and developmental outcomes. *Cochrane Database Syst Rev*. 2019;5(5):CD012611. Published 2019 May 2. doi:10.1002/14651858.CD012611.pub3



difference between LNS plus complementary feeding and MNP on the prevalence of moderate wasting. In concluding, the evidence suggests that LNS plus complementary feeding is effective in improving wasting outcomes among children aged 6 to 23 months compared to complementary feeding alone.

### **Micronutrient supplementation**

Micronutrient supplements have the potential to improve child growth as several micronutrients are insufficiently available for children U5 as well as pregnant and lactating women in certain

contexts. However, despite the high-quality systematic reviews that were conducted to examine the relationship between micronutrient supplementation and the prevention of wasting, there were no significant effects<sup>121</sup> revealed. Most studies reported a decrease in mortality, diarrhea, pneumonia, LBW, anemia and other morbidities. However, one meta-analysis revealed a small effect on wasting or linear growth when using preventive Zn supplements or a multiple micronutrient supplement as well as fortified foods<sup>122</sup>.

## **Integrated intervention packages showing success in reducing wasting**

Integrated intervention packages are inclusive of a series of activities, interventions and/or programs that aim to tackle child undernutrition. With reference to the UNICEF framework, many of the chosen components of integrated packages are multi-sectoral as they target the basic, underlying causes of malnutrition. A common and logical perception is that certain combinations of different interventions can supplement and intensify their impact<sup>123</sup>. Altogether, there's an increased number of programming packages that aim to treat and/or prevent wasting and this evolving trend aligns with the global priorities of improving child undernutrition, inclusive of a reduction in rates of wasting. This trend also supports the recent MQSUN+ report findings in which the majority of consulted stakeholders preferred a holistic and comprehensive approach comprising a package of actions to prevent undernutrition in all its forms (stunting, wasting, nutritional oedema and micronutrient deficiencies)<sup>124</sup>.



121. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 122. Ramakrishnan, U., Nguyen, P. and Martorell, R. (2009) 'Effects of micronutrients on growth of children under 5 y of age: meta-analyses of single and multiple nutrient interventions', *The American Journal of Clinical Nutrition*, 89(1), pp. 191–203. doi: 10.3945/ajcn.2008.26862. - 123. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention - 124. MQSUN+ Final Report. (2018). The Current State of Evidence and Thinking on Wasting Prevention

**Table 1** provides examples of integrated nutrition packages that have impacted rates of wasting in the WCAR region. The interventions have varied based on the program and context but as a collective they offer insight into what is impactful as it pertains to wasting reduction.

STUDY LOCATION AND NAME	INTERVENTIONS	CONTEXT	RESULT	LESSONS LEARNED	STUDY LIMITATIONS
<b>BURKINA FASO: Creating homestead agriculture for nutrition and gender equity (CHANGE) in Burkina Faso</b> <sup>125</sup> (2016)	<ul style="list-style-type: none"> <li>▶ Village model farms established for teaching purposes</li> <li>▶ Inputs provided: seeds, seedlings and small tools</li> <li>▶ BCC strategy used to increase health and nutrition-related knowledge</li> </ul>	<ul style="list-style-type: none"> <li>▶ High rates of U5 anemia</li> <li>▶ Rates of wasting, stunting and underweight are high</li> </ul>	<ul style="list-style-type: none"> <li>▶ Study finished in 2016 but no results published online</li> </ul>	<ul style="list-style-type: none"> <li>▶ The vegetables produced were new to many farmers in Burkina Faso.</li> <li>▶ Growing traditional African vegetables (TAVs) can improve nutrition and resilience</li> <li>▶ Farmers may hesitate to adopt unfamiliar crops like TAVs</li> <li>▶ In marginal environments, there is little scope for replanting if a crop fails, so many farmers are averse to risks</li> </ul>	<ul style="list-style-type: none"> <li>▶ Data unavailable</li> </ul>
<b>BURKINA FASO: "LRRD" program to strengthen the resilience of communities vulnerable to food and nutritional insecurity in northern border areas of Burkina Faso</b> <sup>126</sup> (2019)	<ul style="list-style-type: none"> <li>▶ Targeting poor rural households. These households receive a combination of four interventions:</li> <li>▶ Cash Grant</li> <li>▶ Cash Grant + Asset</li> <li>▶ Cash grant + asset + nutrition (fortified food)</li> <li>▶ Community-based intervention</li> <li>▶ 168 villages randomly assigned to comparison (community-based component only) or participation (randomly assigned to different intervention groupings) group</li> </ul>	<ul style="list-style-type: none"> <li>▶ More than 40% of people in Burkina Faso live on less than \$1.90/day (International benchmark for extreme poverty)</li> <li>▶ Seasonal agriculture employs 80% of active labor market (leaves many parts of country vulnerable during lean season)</li> <li>▶ 21% of U5 suffer from chronic malnutrition, 10% of U% suffer from wasting</li> <li>▶ Child mortality was more than double the global average</li> </ul>	<ul style="list-style-type: none"> <li>▶ Preliminary results include:</li> <li>▶ Wasting decreased with an average statistical difference only in the cash + livestock + flour group</li> <li>▶ Household food consumption increased by 54,000 FCFA/year (representing 80% of transfers made)</li> <li>▶ Improvement in household food diversity (vs. control group) is statistically significant in the Cash Grant group</li> </ul>	<ul style="list-style-type: none"> <li>▶ The multi-sectoral nature of this project results in significant reductions in severe food insecurity, wasting and stunting</li> <li>▶ The research protocol is generally followed by the implementing partners</li> <li>▶ The program has the most impact on populations most at risk</li> </ul>	<ul style="list-style-type: none"> <li>▶ Data unavailable</li> </ul>
<b>CHAD: Water, livestock, and malnutrition findings from an impact assessment of Community Resilience to Wasting program in Chad</b> <sup>127</sup> (2017)	<ul style="list-style-type: none"> <li>▶ Nutrition</li> <li>▶ Health</li> <li>▶ WASH</li> <li>▶ Food, income and markets (FIM)</li> </ul>	<ul style="list-style-type: none"> <li>▶ Dar Sila Region of Eastern Chad:</li> <li>▶ Highly variable rainfall</li> <li>▶ Seasonal food insecurity</li> <li>▶ High prevalence of wasting</li> </ul>	<ul style="list-style-type: none"> <li>▶ CRAM children performed significantly better than non-intervention group:</li> <li>▶ Lower prevalence of wasting</li> <li>▶ Higher WHZ</li> <li>▶ Lower prevalence of chronic malnutrition (stunting)</li> <li>▶ Higher height-for age z-scores (HAZ)</li> <li>▶ Lower prevalence of illness</li> <li>▶ Positive WASH indicator outcomes</li> </ul>	<ul style="list-style-type: none"> <li>▶ Continuing high rates of wasting, and the increases seen in the non-intervention settlements, are causes for concern and indicative of the extreme vulnerability of these communities as they emerge from more than a decade of protracted crises</li> <li>▶ Possible source of water contamination is the concentration of cattle in a village. The association between village cattle density and child nutritional status is a possible explanation of contamination</li> </ul>	<ul style="list-style-type: none"> <li>▶ Study did not follow the same children</li> <li>▶ Timing of the survey needs improvement - it was assumed that the peak for malnutrition was at the very end of the hunger gap but, in fact, a peak might occur preceding the hunger gap</li> <li>▶ Sampling strategy used impacts interpretation of findings - inclusion of only the lowest wealth ranking might make it appear as if malnutrition rates are significantly higher than what is found in more representative surveys</li> </ul>

125. IFPRI and Helen Keller International (2016). Creating Homestead Agriculture for Nutrition and Gender Equity (CHANGE) in Burkina Faso. <https://clinicaltrials.gov/ct2/show/record/NCT02236468?view=record>

126. [https://ec.europa.eu/trustfundforafrica/region/sahel-lake-chad/burkina-faso/programme-lrrd-de-renforcement-de-la-resilience-des-communautés\\_en](https://ec.europa.eu/trustfundforafrica/region/sahel-lake-chad/burkina-faso/programme-lrrd-de-renforcement-de-la-resilience-des-communautés_en)

127. Marshak, A., Young, H., and Radday, A. (2017). Water, livestock and malnutrition findings from an impact assessment of Community Resilience to Wasting program in Chad.

STUDY LOCATION AND NAME	INTERVENTIONS	CONTEXT	RESULT	LESSONS LEARNED	STUDY LIMITATIONS
<b>DRC:</b> <b>Undernutrition prevention approaches: A case study in Bunyakiri, South Kivu Province, DRC<sup>128</sup> (2019)</b>	<ul style="list-style-type: none"> <li>▶ WASH</li> <li>▶ Local agricultural production and food security</li> <li>▶ Maternal supplementation</li> <li>▶ Early detection and treatment of wasting</li> </ul>	<ul style="list-style-type: none"> <li>▶ Stunting 71.1%</li> <li>▶ Low coverage of basic social services</li> <li>▶ Food insecurity</li> <li>▶ Low access to land (land conflict), insecurity, poor road conditions</li> <li>▶ Inappropriate cultural behaviors</li> </ul>	<ul style="list-style-type: none"> <li>▶ Wasting reduced from 7.5% to 4.6% in one year</li> </ul>	<ul style="list-style-type: none"> <li>▶ Multi-stakeholder and multi-sectoral response improved program uptake and impact</li> <li>▶ Stakeholder coordination and information management improved efficiency and sustainability</li> <li>▶ Community ownership facilitated a greater stakeholder commitment to the program</li> </ul>	<ul style="list-style-type: none"> <li>▶ Data unavailable</li> </ul>
<b>MALI:</b> <b>Incorporating prevention into CMAM (PROMIS project): Insights from Mali and Burkina Faso<sup>129</sup>(2019)</b>	<ul style="list-style-type: none"> <li>▶ BCC</li> <li>▶ SQ-LNS</li> <li>▶ Treatment of SAM</li> </ul>	<ul style="list-style-type: none"> <li>▶ Both health districts have one urban HC; the other HCs are situated in semi-urban or rural settings.</li> <li>▶ the prevalence of Wasting was 12.9%</li> <li>▶ the prevalence of SAM is 3.5% (one of highest in Mali)</li> </ul>	<ul style="list-style-type: none"> <li>▶ Number of new cases of wasting reduced in Mali by 29%</li> <li>▶ Coverage for screening for wasting increased by 20 and 40 percentage points, reaching 48% in Burkina Faso and 63% in Mali</li> </ul>	<ul style="list-style-type: none"> <li>▶ LNS-SQ was a strong incentive for caregivers to visit screenings platforms, increasing program coverage</li> <li>▶ There is still lack of availability of treatment programs for wasting, creating barriers for children to access care</li> <li>▶ Community vs. health facility delivery platforms offer different benefits</li> <li>▶ Further research needs to be conducted to test the operational feasibility and effectiveness of a community-based model</li> </ul>	<ul style="list-style-type: none"> <li>▶ The referral of AM cases by research team (for ethical reasons) during monthly measurements in the longitudinal study might have interfered with usual CMAM activities</li> <li>▶ The outcomes presented by child age also reflect seasonal variations because of the closed cohort design</li> </ul>
<b>MAURITANIA:</b> <b>Effect of joint CMAM/ IYCF implementation on the reduction of wasting in Mauritania<sup>130</sup> (2019)</b>	<ul style="list-style-type: none"> <li>▶ Care groups</li> <li>▶ Local agricultural production</li> <li>▶ Enriching of local flours</li> <li>▶ Community screening</li> <li>▶ Treatment of SAM</li> </ul>	<ul style="list-style-type: none"> <li>▶ Government adopted 2016 multi-sectoral nutrition plan</li> <li>▶ Peaks in wasting happen during lean seasons</li> <li>▶ Poor IYCF practice</li> </ul>	<ul style="list-style-type: none"> <li>▶ Wasting reduced from 16.4% to 13.1%</li> </ul>	<ul style="list-style-type: none"> <li>▶ Ongoing scale up of joint IMAM/IYCF interventions + WASH reduces levels of wasting in children U5</li> <li>▶ Scaling up to national levels has the potential to sustainably reduce wasting in Mauritania</li> </ul>	<ul style="list-style-type: none"> <li>▶ Data unavailable</li> </ul>
<b>NIGER:</b> <b>Effect of Preventive Supplementation with Ready-to-Use Therapeutic Food on the Nutritional Status, Mortality, and Morbidity of Children Aged 6 to 60 Months in Niger -A Cluster Randomized Trial<sup>131</sup> (2009)</b>	<ul style="list-style-type: none"> <li>▶ RUTF Blanket distribution for 3 months (1 sachet/day): August to October</li> <li>▶ Outpatient Therapeutic Program</li> <li>▶ Stabilization Centre</li> <li>▶ Health care (e.g., treatment for malaria and non-complicated diarrheal diseases)</li> </ul>	<ul style="list-style-type: none"> <li>▶ Maradi has some of the highest rates of malnutrition in the country</li> <li>▶ Decrease in food quantity and quality in the months preceding the harvest (August to October)</li> <li>▶ Household food production is linked to rain-fed agriculture</li> </ul>	<ul style="list-style-type: none"> <li>▶ 36% reduction in the incidence of wasting</li> <li>▶ 58% reduction in the incidence of severe wasting</li> <li>▶ No reduction in mortality</li> </ul>	<ul style="list-style-type: none"> <li>▶ Results are applicable to other settings of acute food insecurity, where access to food is limited due to emergency or seasonal conditions and where short-term food supplementation is required for the prevention of wasting</li> </ul>	<ul style="list-style-type: none"> <li>▶ Small number of clusters may have limited the benefits of randomization resulting in unmeasured confounding</li> <li>▶ Study was unblinded with respect to intervention assignment</li> <li>▶ Study not able to collect complete response data on all children</li> <li>▶ Study unable to measure dietary intakes at recruitment or during the intervention</li> </ul>
<b>NIGER:</b> <b>Preventing Wasting Among Young Children in Crises: A Prospective Intervention Study in Niger<sup>132</sup> (2014)</b>	<ul style="list-style-type: none"> <li>▶ LNS-HQ or LNS-MQ or Super Cereal Plus (SC+) with cash</li> <li>▶ SC+ and family food ration</li> <li>▶ LNS-HQ or SC+ only</li> <li>▶ Cash only</li> </ul>	<ul style="list-style-type: none"> <li>▶ High burden of malnutrition</li> <li>▶ Regularly experience a "hunger gap" in the months before the annual harvest</li> <li>▶ Timing and duration of hunger gap is dependent on timing and duration of annual rains</li> <li>▶ Children are vulnerable to malnutrition during hunger gap</li> </ul>	<ul style="list-style-type: none"> <li>▶ Incidence of MAM was twice lower in the strategies receiving a food supplement combined with cash compared with the cash only strategy or with the supplementary food only groups</li> <li>▶ Incidence of SAM was three times lower in the SC+ and cash group compared with the SC+ only group</li> </ul>	<ul style="list-style-type: none"> <li>▶ Preventive distributions combining a supplementary food and cash transfer had a better preventive effect on MAM and SAM than strategies relying on cash transfer or supplementary food alone</li> </ul>	<ul style="list-style-type: none"> <li>▶ Data not collected on all possible factors that could have influenced the incidence of malnutrition and mortality</li> <li>▶ Procedures were implemented to reduce measurement bias</li> <li>▶ Individual or village randomization would have been ideal</li> <li>▶ 4-month follow up of study was too short</li> <li>▶ Study period did not overlap with hunger gap in study area</li> </ul>

128. UNICEF, (2019). Undernutrition prevention approaches: A Case Study of Bunyakiri, South Kivu province, DRC - 129. IFPRI and Helen Keller International. (2019). Incorporating prevention into community-based management of wasting (PROMIS project): Insights from Mali to Burkina Faso. - 130. UNICEF et Ministère de la sante Mauritanie. (2019). Effet de la mise en oeuvre conjointe PCIMA/ANJE sur la reduction de la malnutrition aigue en Mauritanie.

131. Isanaka S, Nombela N, Djibo A, et al. Effect of preventive supplementation with ready-to-use therapeutic food on the nutritional status, mortality, and morbidity of children aged 6 to 60 months in Niger: a cluster randomized trial. JAMA. 2009;301(3):277–285. doi:10.1001/jama.2008.1018 - 132. Langendorf C, Roederer T, de Pee S, et al. Preventing wasting among young children in crises: a prospective intervention study in Niger. PLoS Med. 2014;11(9):e1001714. Published 2014 Sep 2. doi:10.1371/journal.pmed.1001714 -





STUDY LOCATION AND NAME	INTERVENTIONS	CONTEXT	RESULT	LESSONS LEARNED	STUDY LIMITATIONS
<p><b>NIGER:</b> Identification of growth trajectories by latent class model from birth to 24 months in the 1,000 days program, an interventional cohort in rural Niger <sup>133</sup> (2019)</p>	<ul style="list-style-type: none"> <li>▶ First 1,000 days approach (ANC, maternal supplementation, immunization, SMC, SQ-LNS)</li> </ul>	<ul style="list-style-type: none"> <li>▶ Fragile health care system</li> <li>▶ Wasting 19.2%</li> <li>▶ Stunting 63%</li> <li>▶ Infant mortality 60/1,000 live births</li> </ul>	<ul style="list-style-type: none"> <li>▶ Wasting prevalence remained below the national average</li> </ul>	<ul style="list-style-type: none"> <li>▶ Weight trajectory is associated with the amount of SQ-LNS ration received</li> <li>▶ High participation rate and high vaccination ration during the 2-year follow up; SQ-LNS may serve as an incentive for program adherence and vaccination coverage</li> <li>▶ Programs combining preventive and curative interventions need further study to determine the most cost-effective approach</li> </ul>	<ul style="list-style-type: none"> <li>▶ No control group was used due to previous research in similar region of Niger showing malnutrition prevention from routine provision of LNS</li> </ul>
<p><b>NIGER:</b> Sprout – a prototype to prevent post-harvest loss and SAM for subsistence farming families <sup>134</sup> (2019)</p>	<ul style="list-style-type: none"> <li>▶ 3 approaches tested:</li> <li>▶ Unconditional cash nudges</li> <li>▶ Trusted mobilizers to promote positive practices</li> <li>▶ A communal warehouse</li> </ul>	<ul style="list-style-type: none"> <li>▶ Rodents, insects and/or fungus contribute to post-harvest losses in storage facilities</li> <li>▶ Financially unstable subsistence farmers</li> <li>▶ Lack of knowledge on caregiving practices that reduce SAM</li> </ul>	<ul style="list-style-type: none"> <li>▶ SAM prevalence (3-36 months old) reduced from 3.5% to 1.75%</li> <li>▶ SAM and MAM prevalence in participants decreased whereas SAM and MAM prevalence increased in non-participants</li> </ul>	<ul style="list-style-type: none"> <li>▶ High degree of interest in the warehouse among farmers</li> <li>▶ Further research could help understand whether interest for similar warehouse can be sustained</li> <li>▶ Continue using a payment model to ensure the service is useful and interesting for farmers</li> <li>▶ Linking SAM prevention and post-harvest loss reduction are not necessarily the right fit</li> </ul>	<ul style="list-style-type: none"> <li>▶ Small number of participants</li> <li>▶ Lack of randomization</li> </ul>
<p><b>SENEGAL:</b> Health and nutrition activities in a rural health zone in Senegal <sup>135</sup> (2019)</p>	<ul style="list-style-type: none"> <li>▶ Grandmother approach</li> <li>▶ Father/husband education clubs</li> <li>▶ WASH activities</li> <li>▶ Screening and treating malnourished children</li> <li>▶ Savings groups</li> </ul>	<ul style="list-style-type: none"> <li>▶ Grandmothers have strong/influential role regarding caregiving practices in the household</li> <li>▶ Husbands have economic and decision-making power in the household</li> </ul>	<ul style="list-style-type: none"> <li>▶ Number of new cases (incidence) of wasting reduced in one-year</li> </ul>	<ul style="list-style-type: none"> <li>▶ Integration of the interventions is considered most effective</li> <li>▶ Integration of the interventions is also considered more difficult</li> </ul>	<ul style="list-style-type: none"> <li>▶ Data unavailable</li> </ul>

133. Saillet, Laure et al. (2019). Identification of growth trajectories by latent class model from birth to 24 months in the 1,000 days program, an interventional cohort in rural Niger.

134. IRC. (2019). SPROUT Summary Report. A prototype to prevent post-harvest loss and severe wasting for subsistence farming families.

135. Catholic Relief Services. (2019). Activite Sante et Nutrition en zone rurale du Senegal.



# Case Studies: Preventive and Curative Care Interventions

To improve child undernutrition indicators, integrated programs were rolled out in Mali, Niger and DRC. Their results were very promising as a combined presentation of interventions for preventive and curative care. The following offer insight into new approaches to prevent and treat acute malnutrition:

## Case Study from Mali: The PROMIS project

### Context

Globally, there are 52 million children under 5 years suffering from wasting. In Mali, the prevalence of wasting is 12.9%. In the Segou region, the rate of severe wasting is one of the highest in the country at 3.5%. To mitigate this very high burden of children requiring nutrition support for wasting, attention has primarily focused on the treatment of severe wasting due to its associated high risk of mortality. This includes the adoption of the WHO endorsed community-based management of acute malnutrition (CMAM) model for the treatment of wasting. CMAM includes first-line screening in the community followed by the referral of identified cases to a health facility for the enrollment in treatment. For children presenting with severe wasting without medical complications, the treatment includes RUTF products delivered through an outpatient treatment program. One of the key barriers impacting the delivery of effective CMAM programs includes the low number of caregivers that take their children to the screening sessions and the low number of children enrolled in the CMAM program.

### Activities and Delivery Channels

In 48 health center catchment areas, at the village level, CHVs organized monthly meetings for screening children (6 to 23 months) for acute malnutrition and conducted group behavior change

communication (BCC) on child nutrition, health, sanitation and hygiene. In 24 health centers, there was an intervention of LNS-SQ provided to incentivize caregivers to attend monthly meetings as well as increase the consumption of energy and essential micronutrients in children. The remaining 24 health centers were identified as a comparison group and they did not receive the LNS-SQ.

### Outcomes

The evaluation included baseline (2015) and endline (2017) surveys conducted in the same calendar months to reduce the effect of seasonality. The study provided data on wasting incidence, screening coverage and treatment coverage. Secondary data was also provided on duration of wasting episodes as well as the rate of recovery and relapse. Results showed that the intervention led to significantly more children being screened for wasting (40 percentage points more than the comparison arm) but this result did not lead to more children being treated for wasting. The intervention was effective in preventing wasting, lowering the risk of developing wasting by almost a third.

### Key Lessons

The provision of LNS-SQ via a community delivery platform was key to the success of this study. It was considered crucial as well as a strong incentive for caregivers to bring their children to the screening platforms at the village level. The led to an increase in screening coverage. Although there was no impact on treatment coverage or the prevalence of wasting, it could be in part due to the continued lack of availability of treatment programs for wasting. However, there was a 30% reduction in the incidence of wasting and this is important to highlight despite this limitation. A reduction in incidence can have significant effects on the prevalence of wasting and, in turn, the associated public health burden.

## Case Study from Niger: The 1,000 days program – A Package of Preventive and Curative Care

### Context

The first 1,000 days of a child's life (conception to 2 years of age) offer tremendous opportunities for tackling malnutrition in the short and long term. This timeframe is a decisive period for a child's physical health, cognitive development and life expectancy. Poor nutrition, inadequate access to health care and recurrent infections in the first 1,000 days can lead to irreversible stunted growth, reduced performance at school and work, as well as a heightened risk of mortality. In Niger, evidence shows that mothers and children, especially in rural areas like Zinder, face daunting challenges during the crucial 1,000 Days period.

### Activities and Delivery Channels

In 3 health centers and 13 decentralized health posts in Mirriah District in Niger's Zinder region, there were packages of preventive and curative health care interventions provided to pregnant women and children under 2 years. These care packages included routine activities embedded in Niger's current care (e.g. staffing at health centers, costs of medicines for and consumables for ANC visits, childhood vaccinations, childhood malaria chemoprevention, malnutrition treatment, etc.), activities that are part of national protocols and/or plans but are not routinely implemented due to lack of means (e.g. some staff at health centers, full staffing at health posts, health post rehabilitation and functionality, complicated deliveries in hospital, etc.), and activities that were newly introduced as part of the 1,000 Days program (e.g. calcium for women at risk of pre-eclampsia, provision of Safe Birth kits, routine food supplementation for pregnant/lactating women and children 6 to 23 months). The newest activity was the routine provision of LNS-SQ to all children 6 to 23 months. This activity was identified as 'crucial' because there is a growing

evidence showing that supplementation with child-appropriate foods improved growth, and reduced anemia and moderate wasting<sup>136, 137</sup>. A more recent study demonstrated that providing LNS reduced all-cause mortality by 27%<sup>138</sup>, while another showed a 37% reduction in the incidence of severe acute malnutrition with LNS-SQ<sup>139</sup>.

### Outcomes

A prospective cohort study that followed >1,700 pregnant mothers and children up to 2 years was embedded in the program from April 2014 to December 2018. (Because previous research in a similar region of Niger had shown reduced incidence of acute malnutrition from routine provision of LNS, no control group was used in either the overall 1000 Days program or the smaller study cohort (Isanaka et al, 2009); Isanaka et al, 2010; Langendorf et al, 2014.) Initial results revealed data on vaccination coverage was > 90% for all antigens. Data on weight gain in children was based on a latent class model constitution 4 classes of weight (middle, low, evolutive and high). Altogether, children receiving more LNS-SQ rations did not have precipitous weight loss. Finally, initial results identified maternal risk factors for perinatal mortality. These risk factors included 1) fewer than 4 antenatal care visits, 2) primiparity, 3) positive malaria test, and 4) severe anemia.

### Key Lessons

Based on the high participation rate and high vaccination rates during the follow up, it was proposed that the provision of LNS-SQ serves as an incentive for program adherence and increased vaccination coverage. However, due to the cost of LNS-SQ (\$31 USD per child per year) and the inability of a resource-poor country like Niger to afford it, external, predictable, and long term financing mechanisms – as exist for childhood vaccinations or diseases like HIV/AIDS – will be necessary. Future programs that combine preventive and curative interventions need further study to determine the most cost-effective approach.

136. Das JK, Salam RA, Hadi YB, et al. Preventive lipid-based nutrient supplements given with complementary foods to infants and young children 6 to 23 months of age for health, nutrition, and developmental outcomes. *Cochrane Database of Systematic Reviews* 2019, Issue 5. Art. No.: CD012611. - 137. Hess SY, Abbeddou S, Jimenez EY, Somé JW, Vosti SA, Quédrago ZP, et al. (2015) Small-Quantity Lipid-Based Nutrient Supplements, Regardless of Their Zinc Content, Increase Growth and Reduce the Prevalence of Stunting and Wasting in Young Burkinabe Children: A Cluster-Randomized Trial. *PLoS ONE* 10(3): e0122242. doi:10.1371/journal.pone.0122242 - 138. Stewart CP, Wessells KR, Arnold CD, Huybregts L, Ashorn P, Becquey E, Humphrey JH, Dewey KG. Lipid-based nutrient supplements and all-cause mortality in children 6–24 months of age: a meta-analysis of randomized controlled trials. *Am J Clin Nutr* 2019;00:1–12. - 139. Huybregts L, Le Port A, Becquey E, Zongrone A, Barba FM, Rawat R, et al. (2019) Impact on child acute malnutrition of integrating small-quantity lipid-based nutrient supplements into community-level screening for acute malnutrition: A cluster-randomized controlled trial in Mali. *PLoS Med* 16(8): e1002892.

## Case Study from DRC: Integrated approach in South Kivu

### Context

The Democratic Republic of Congo ranks as eighth highest in the world for stunting. Nationally, 42% of children under 5 years are stunted and in the fragile context of South Kivu, rates as high as 53%. The national rate of wasting is 7%. In addition to very high rates of malnutrition, the Bunyakiri district within South Kivu reveals major multi-sectoral shortfalls in factors that impact the nutrition status of children. These include a low coverage of basic social services, food insecurity, low access to land due to land conflict, poor road conditions and insecurity. There are also reported cultural behaviors which have been labelled as inappropriate and “resistant to change” for improving health outcomes.

### Activities and Delivery Channels

In the Bunyakiri health district, a multi-sectoral (Nutrition, Food Security, WASH) and integrated approach was rolled out to contribute to the reduction of stunting in children in South Kivu. A total of 26,607 households were targeted and within these households, there were 2,700 children between 6 to 23 months. The households were also inclusive of 10,000 pregnant and lactating women and 9,500 children aged 6 to 23 months. The response included nutrition specific interventions (early detection and treatment of wasting, maternal supplementation), the improvement of agricultural production and food security, multi-sectoral coordination and a WASH package.

### Outcomes

The evaluation included baseline (2016) and endline (2017) surveys conducted to measure nutritional status of children under 5 years, WASH indicators, food score consumption figures and coverage of basic services. Notable findings included the reduction of wasting from 7.5% to 4.6% in one year. Also, an acceptable food score consumption value increased from 9.39 to 29.1. Finally, in absolute terms, 192,000 people had access to WASH through a national program on health schools and health villages, 2,700 households had access to agricultural production, 11,000 pregnant and lactating women had access to services as well as nutritious foods, 2,626 children under 5 years were treated for severe wasting and 25,000 children under 5 years had access to services and nutritious foods.

### Key Lessons

This multi-sectoral response improved the demand and delivery of nutrition and integrated services. It was delivered in an efficient and sustainable manner due to the coordination of stakeholders and local/community authorities. It also strengthened community dynamics due to the increased uptake of services and the development of local initiatives. Altogether, there was an improved commitment from the community, as well as ownership. Finally, the coordination of information management was identified as a success factor as long as it is sustained.

## Discussion

Although there is an ever-growing number of intervention packages that are implemented for treating and preventing wasting, there are still some outstanding gaps in evidence and knowledge. Wasting continues to be a neglected outcome indicator in undernutrition interventions, particularly in the framework of research. This is a missed opportunity to gain an understanding of the linkages between stunting reduction interventions and their impact on wasting. These conditions are linked, and action on stunting will likely have some effect of wasting, and versa. However, as long as the conditions continue to be dealt with separately, evidence and knowledge will remain limited. Based on the literature regarding risk-factors, additional interventions have been hypothesized to be impactful towards child wasting outcomes, but they are currently absent from the evidence base. One of the most prominent gaps in the literature in the context of WCA are maternal nutrition interventions for decreased wasting. Maternal nutrition interventions (pre and post conception) for adolescent girls and women and their impact on child wasting outcomes warrant further exploration for longer term improved outcomes considering the strong link between maternal BMI, low birth weight and wasting. Furthermore, a greater focus needs to be placed on understanding what happens when children suffer concurrently from wasting and stunting (commonly referred to as WaSt), how to screen for WaSt, different prevention and treatment interventions that will impact WaSt and undernutrition in all its forms, as well as its longer-term health impacts. Lastly, further understanding of family planning interventions integrated into

nutrition programming and their respective impact on child wasting outcomes is necessary in the WCAR context as population growth is one of the fastest in the world today and this greatly impacts absolute numbers of wasted children.

The existing interventions have demonstrated some promising results that need to be considered for future research, policy and programming. The 1,000 days study can act a foundational time-bound framework for identifying the different evidence-based treatment and prevention interventions that are known to impact wasting outcomes throughout the life cycle. In addition to treatment efforts, this includes nutrition specific and sensitive interventions that align with the UNICEF framework such as health care, caring practices, WASH as well as food security. Food based prevention with specialized foods (SQ-LNS) has a strong evidence base and whilst costs may be high the impact on wasting reduction is also high. More needs to be done to understand the scale, scope, targeting and length of these interventions to ensure cost-effectiveness and impact. Furthermore, international and local options should be considered where possible. Finally, the very promising results revealed with CTs needs to be explored further based on the context and, as mentioned, further studies looking into the role of livelihoods and seasonality impacting child wasting outcomes need to be realized. Gender equality initiatives should be embedded in all program designs, especially as it pertains to fatherhood and caregiving, women's autonomy and decision-making power.



## Conclusions

In concluding, it is safe to say that wasting throughout the life cycle is complex as well as multi-faceted. There is not a silver bullet solution for combatting wasting. From pre-pregnancy to pregnancy to newborn, infancy and childhood, followed by adolescence and adulthood, there are time-bound risk factors associated with wasting that repeat themselves at each stage of this life cycle. The UNICEF framework is a common tool used to identify the different risk factors and then, in turn, used to design and develop multi-sectoral programs that combat wasting. The Link-NCA tool is another useful tool in understanding the contextual differences linked to different risk factors. Although the current state of the evidence for wasting prevention is weak, the body of literature continues to grow and strengthen. This evolving data will serve as building blocks and it will continue to be useful for informing and improving the design and targeting of programming and policy based on the context-specific risk factors

of wasting. Integrated programs inclusive of a combination of interventions that are tailored to the WCAR context are measuring impactful outcomes on wasting but multi-country studies are still needed to strengthen the evidence-base for decision-making. Overall, despite the lack of evidence available, it is crucial to harness and work with the promising individual and combination of approaches that currently exist. This coupled with complementary frameworks and tools will pave the way for guidance and success in delivering impactful programs as well as achieving the SDGs by 2030.

As concluded by the MQ-SUN reports, there is a need for a multisectoral approach to prevention, to prevent all forms of undernutrition, including wasting. Improving existing nutrition services is an essential part of this process of prevention of wasting, and local capacities should be built as part of this approach.

