

Seasonality, sex, and acute malnutrition in Chad's Sila Province

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The Sustainable Development Goals (SDGs) set to eliminate all forms of malnutrition by 2030. However, since the adoption of the SDGs, progress on child wasting has been slow. Recently, there have been renewed efforts towards a greater understanding of the seasonality, or within year changes, of wasting, or low weight for height,¹ with seasonality identified as the “missing link”² or major gap in wasting prevention. Importantly, a recent paper that adapts UNICEF’s (1990) conceptual framework on the causes of malnutrition to the context of Africa’s drylands reemphasizes the critical role of seasonality and environment as a critical trigger of the underlying and immediate drivers of acute malnutrition, mediated through livelihoods and institutions.³

There is a wealth of recent research that shows that wasting and stunting affects boys more than girls. Even if the reasons for the disparity remain unknown, the available evidence and expert advice points to a need to revise the common perception that it is girls, rather than boys, who are more vulnerable to malnutrition.⁴

In this briefing paper we discuss four key findings from research conducted in the Sila Province in eastern Chad that underscore a need for the design and evaluation of programs aimed at preventing wasting to account for seasonality and sex.

1. There is much more to the concept of seasonality than the existence of wet and dry seasons. A full understanding of its complexities requires a

variety of approaches, including drawing on local perspectives and data gathered systematically over an extended period (longitudinal data).

2. Data on wasting prevalence indicates there are two peaks every year: a primary and larger peak during the start of the rains, and a secondary and smaller peak prior to the harvest period. Each peak likely has a different set of contributing factors, or drivers.
3. Boys are more susceptible to this seasonal variability in wasting than girls, who fare better. These seasonal gender disparities are likely linked to social norms and values and are reversed with increasing age.
4. Different care practices for boys and girls could be driving seasonal differences in wasting, not least because of the potential role of water contamination.

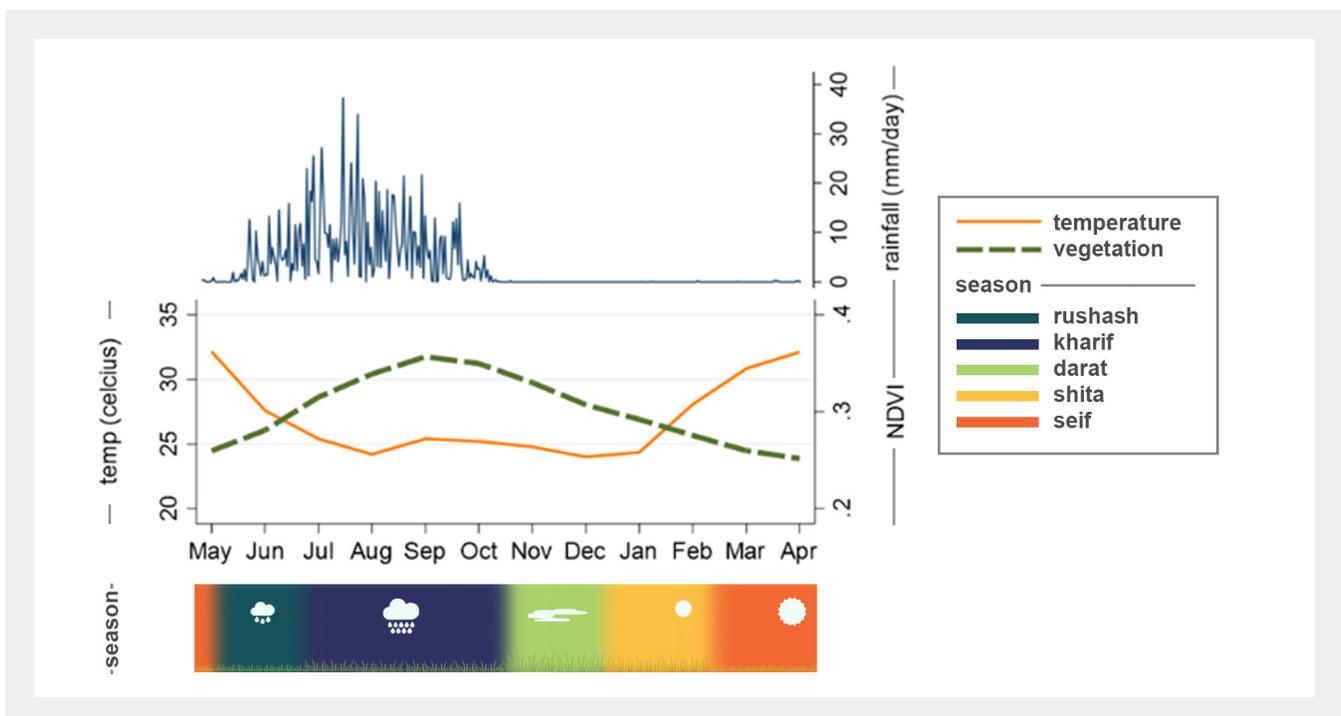
This research was undertaken in collaboration between Tufts University and Concern Worldwide. The data described in this brief comes from a mixed methods study, using both qualitative interviews and quantitative longitudinal data collection. Concern collected data on children aged 6-59 months across 89 households for 23 months (May 2018 – March 2020) in the Sila Province of Chad with in-depth qualitative work carried out in August 2018 and May/June 2019. For the full report, detailed methodology, and instrument please see <https://fic.tufts.edu/research-item/seasonality-of-malnutrition-in-eastern-chad/>.

Seasonality is more complex than rainy vs dry seasons

Dryland contexts such as Chad (and much of the rest of the Sahel) are characterized by their climatic variability between and within years. While standardized annual surveys provide a snapshot of nutrition outcomes from year to year, our understanding of *seasonal* changes is often limited by our incomplete knowledge of the seasons themselves. In dryland contexts, these are frequently described as either “dry” or “wet/rainy”, or as either “pre-harvest” or “post-harvest”. However, local perspectives point to a much more complex understanding of seasonality, one that encompasses the relationships between, on the one hand, changes in rainfall, temperature, and vegetation and, on the other, human factors and activities that, directly or indirectly, contribute to acute malnutrition. These drivers of acute malnutrition can be grouped into those that are underlying (such as food security, care practices, hygiene environment, and access to health care) and those that are more immediate (such as food intake and disease).

As illustrated in Figure 1, communities in Chad distinguish between multiple seasons, beginning with *rushash*, the first weeks of intermittent rainfall. *Rushash* is an extremely short season, usually lasting three to five weeks sometime between late April and early June. *Rushash* is followed by the rainy season *kharif*. During *kharif*, the temperature drops and rainfall increases, usually lasting through the end of September. As the rains subside after *kharif*, comes another short season—*darat*—when seasonal rivers are full but begin to dry out, and vegetation has reached its peak. *Darat* is followed by *shita*, the cool, dry season usually around January and February. As temperatures begin to climb, access to surface water declines, and vegetation is at its lowest. This is the period of *seif*, the hot dry season. *Seif* is then interrupted by the start of the rains and we are back at *rushash*. It is worth noting that while calendar months are often assigned to these seasons, the precise dates are extremely variable. What is far more important than the calendar month is the corresponding changes in precipitation, temperature, and vegetation.

Figure 1: Seasons and average rainfall, temperature, and vegetation⁵ (May 2018-April 2020) in Chad’s Sila Province



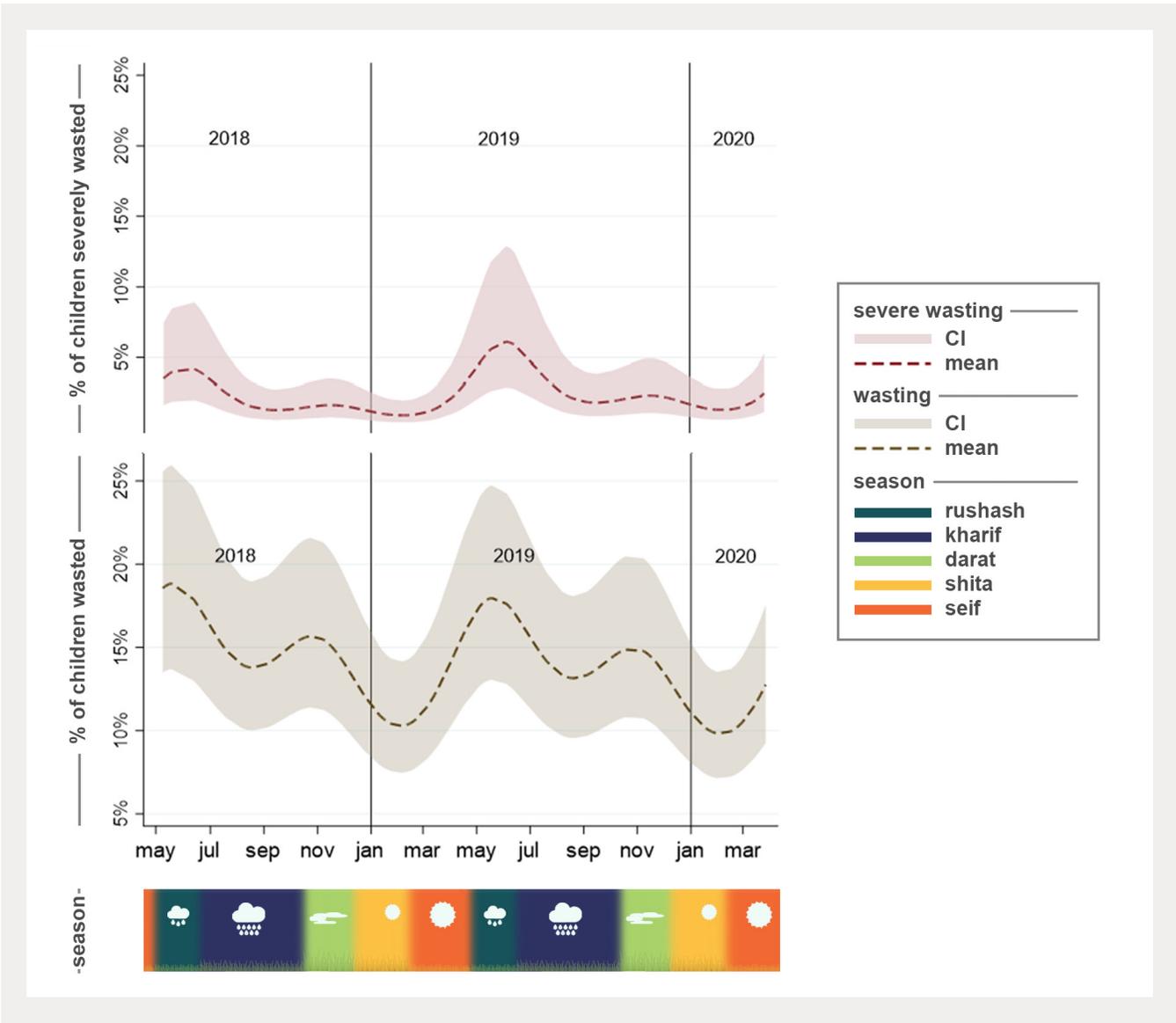
Two peaks of wasting with different drivers

As illustrated in Figure 2, we found two annual peaks of wasting and severe wasting. The highest peak was in *rushash* (which during the period of our research fell in May) and the secondary peak was at the end of *kharif*/beginning of *darat* (October), with a decline in wasting prevalence during *kharif* (June through September). The lowest level of wasting occurred during *shita* (January and February). While a recent study identified a similar seasonal pattern across the Sahel more broadly, likely indicating that this pattern

is not just specific to communities in Sila, Chad,⁶ the twin peaks phenomenon has not been widely recorded.

Despite a lack of solid documented evidence, there is a widespread *assumption* that wasting in dryland contexts peaks just once a year, during the rainy season (which is also called the “hunger gap” or “lean season” due to a combination of increased food insecurity and disease burden, particularly malaria).

Figure 2: Predicted prevalence of severe wasting (top) and wasting (bottom) in Chad’s Sila Province⁷ (n=2,558)



Our data from Sila Province—which can likely be safely extrapolated to the wider Sahel region—shows this assumption to be inaccurate. Moreover, while the secondary wasting peak occurs during a time of high food insecurity and risk of malaria, both the presence of the first peak and the improvement in wasting that occurs during *kharif* (June through September) indicate that food security and malaria

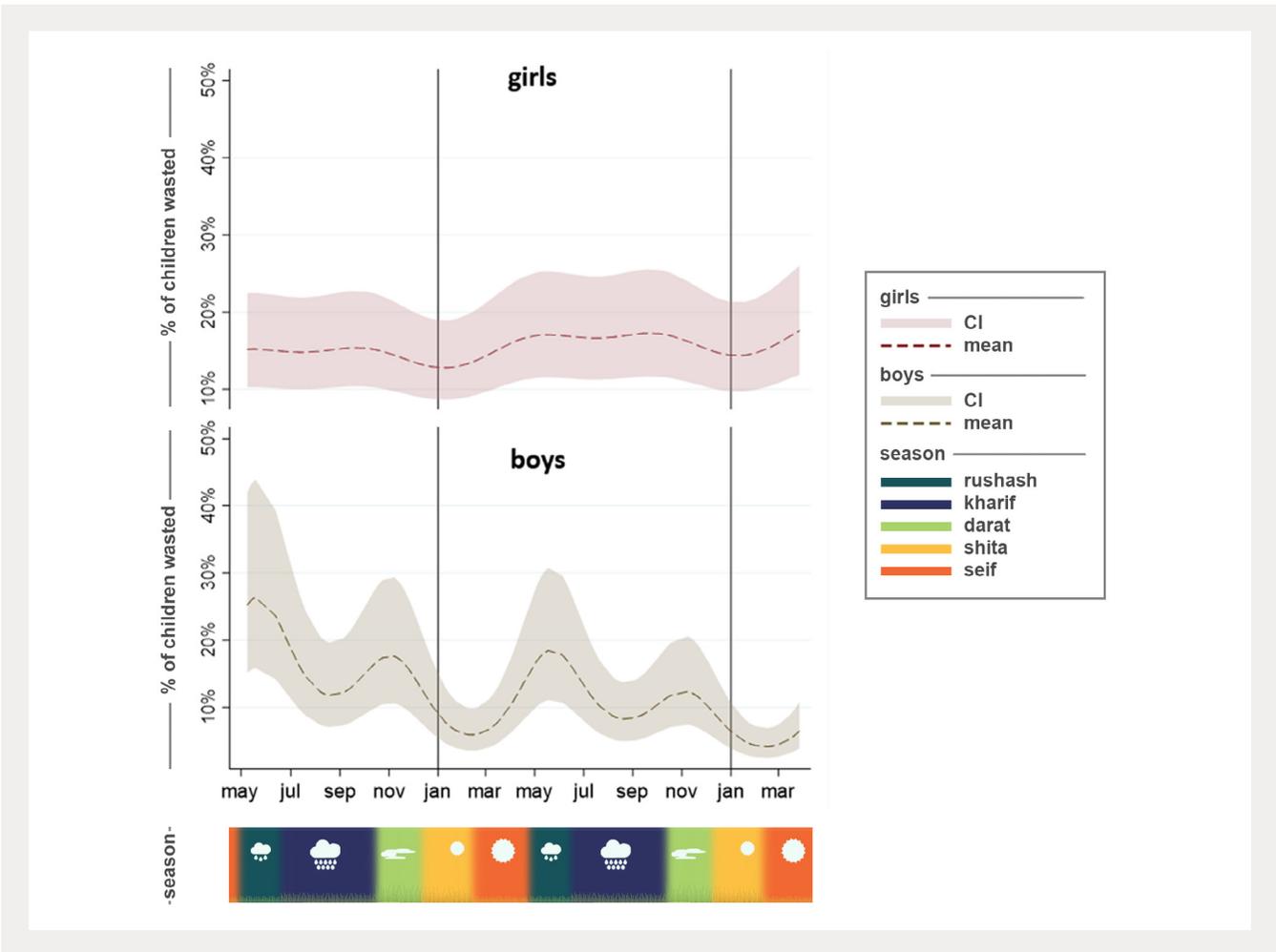
cannot be the main drivers of the primary *rushash* wasting peak. Instead, our research—and previous work in Chad—⁸points strongly to the role of water contamination by livestock as a critical driver of wasting during *rushash*. Unfortunately, the “lean season” assumption is so strong in the literature that it is more often assumed than documented.

Seasonal wasting variations are far more pronounced among boys than girls

While we see two peaks of wasting across our whole sample, there are important distinctions between boys and girls. For boys, wasting prevalence varies dramatically throughout the year, while for girls it stays generally high, but stable, as illustrated in

Figure 3. There is some documented evidence that this pattern is not unique to Chad’s Sila Province: similar seasonal variability by sex have been observed in Mali and Gambia.⁹

Figure 3: Wasting prevalence for boys and girls by month and season in Chad’s Sila Province (n=2558)



Unlike other studies that have found boys to have worse nutritional outcomes than girls, our sample showed no such significant gender differences in the *overall annual* prevalence of wasting. While this lack of observed disparity could be a product of our relatively small sample size, the gender differences reported elsewhere might be a result of timing: if

nutrition surveys are carried out during the periods of greater seasonal malnutrition disparity between boys and girls (such as *rushash* or prior to *darat*) then boys might *appear* more nutritionally vulnerable, even though that might not be the case through the year.¹⁰

Different care practices for boys and girls could be driving seasonal differences in wasting

Considering that globally, girls and women fare worse than boys and men on almost all metrics—such as school attendance, job security, food security, decision-making etc.—girls' better nutrition outcomes compared to boys is quite surprising, particularly in the Sahel, where societies tend to be highly patriarchal. Our research findings indicate different care practices for boys and girls under the age of five in Chad's Sila Province may play a role in making boys more likely to be wasted than girls at certain times of the year. Typical interviewee comments that illustrate these differences include:

"Girls should learn early how to be a good wife by staying close and imitating their mothers, while boys should learn how to be men from their older brothers and father."

"Mothers have to be ruder with their boys, to encourage them to leave their sides, otherwise they'll start acting like women."

"If a boy is too pampered by his mother, he will become a worthless man, he will not have strength and courage, he will always be dependent on his mother."

"Girls have two intestines while boys have only one, which explains why it is normal for girls to eat more than boys."

"Boys prefer porridge and soup rather than [breast] milk."

These comments illustrate how mothers keep their daughters close to them and their sons at more of a distance, both emotionally and physically. Boys tend to be weaned earlier, not just off breastmilk, but also physical maternal attention. So as to not "tempt" the boy being weaned, he is entrusted to a grandmother

or an older sibling. Instead of breastmilk, the child is fed the family meal of porridge, or *boule*, regardless of his age, even if he is only a few months' old.

Interviewees also spoke about how fear of social stigma drives the gendered care practice differences:

"Boys should not be too close to their mothers, as they will become a chamorokha, a thing between woman and man. Everybody will mock him and his family."

"If our child is sick, it's a misfortune, whereas if they become a chamorokha, the whole community will mock and accuse the parents, especially the mother."

While respondents acknowledged that there were differences between the health of boys and girls, they did not attribute these differences to their own varying care and breastfeeding practices but rather saw them as factors beyond their control, or just the way things are:

"Boys are sicker than girls."

"Girls grow up healthier."

"The girl is more resistant to illness."

"That's the way it's supposed to be, girls and boys are different."

The early weaning of boys may cause boys to suffer worse nutritional status than girls at the end of *seif* and in *rushash* because without breastmilk boys are likely to consume more contaminated water than girls. Water sources are most likely to be contaminated at the end of *seif* due to the scarcity of water and increased sharing with animals, and during *rushash* due to the fecal matter being

washed into the water sources by the first rains. Thousands of livestock return from medium- and long-distance migration during this period, which, according to our data, is when humans and animals are most likely to share a water source. Cattle are a particular risk factor, given that they can be a source of *Cryptosporidium parvum*, which has been linked to environmental enteropathy (an intestinal disease) in children. Statistical analysis of our data showed there was a stronger correlation between water contamination (coliform) levels and wasting in boys than in girls.

Thus, paradoxically, the care practices designed to turn boys into strong men, might in fact result

in their worse nutrition outcomes while benefiting girls. A similar explanation was provided by research in Zinder, Niger.¹¹ Qualitative interviews about traditional knowledge and practice related to childcare and feeding revealed that boys are weaned earlier because it is believed that breastmilk will make the child stupid. Thus, it is possible that the differences in wasting prevalence by sex, and across the Sahel, reflect the cumulative effects of gendered beliefs and practices. However, these benefits for girls are short lived. Preferential treatment of boys eventually translates into detrimental effects for women, with lower education attainment, food security, income, decision making, health care access, etc.

Recommendations for programming and messaging

Our research indicates a nuanced and complex pattern of the seasonality of child wasting, with differences in patterns and drivers by sex. An improved understanding of seasonality, rooted in local knowledge and longitudinal data collection, disaggregated by sex and season, could go a long way in improving program impact and the ability to measure progress. The implications of our findings suggest the following recommendations for program design and evaluation:

Invest in formative research with an eye towards seasonality and sex-based differences

Where programs in dryland contexts aim to have a longer-term sustainable impact, it is essential to initially invest in formative research¹² to identify seasonal patterns of wasting and associated drivers. Seasonal changes in environmental variables can trigger both the underlying and the immediate drivers of acute malnutrition.¹³ It is therefore critical that researchers and organizations capture this seasonality through participatory qualitative methods and multiple quantitative observations made over the course of one year (longitudinal data) that is grounded in local understanding. To reduce levels of attrition (participants dropping out of the research) and improve interpretation of findings,

dissemination of research findings and community feedback should be built into the longitudinal design. Once an evidence-based understanding of seasonality as it relates to people's activities and to the drivers of acute malnutrition is developed, programs, monitoring, and evaluation can be appropriately designed and targeted.

Tailor programs and messaging to season and sex

Programs aimed at preventing acute malnutrition need to be multi-sectoral, acknowledging the many underlying and immediate drivers of acute malnutrition and addressing the appropriate driver at the right time, differentiated by sex. Such an approach is already common in agricultural programming, such as climate-smart activities or the prepositioning of seeds and tools in advance of the planting and harvesting seasons. A seasonal mindset is far less common for other sectors, such as water, hygiene, and sanitation; gender; and health and nutrition. While the pre-*darat* peak of wasting prevalence, which occurs shortly before harvest, may correspond to the period of highest food insecurity and greater burden of malaria, the *rushash* peak could indicate a larger role for infectious disease and potentially water contamination as a key driver, particularly for boys. Programs that address water

contamination and hygiene during *rushash* might therefore be far more effective in reducing wasting than if they were implemented at other times of the year. By the same token, programs addressing food security could be most effective if implemented prior to the harvest.

Given the differences between the ways boys and girls are cared for in the community, it is likely that seasonal drivers of acute malnutrition also vary by sex. The goal of our own sex-disaggregated observations and analysis is not to identify one group as more vulnerable than the other, but rather to show that programs and messaging should take these differences into account. For example, programs aimed at ensuring boys and girls receive the same level of care (such as with regard to exclusive breastfeeding) might, given how engrained gender roles are in the Sahel, be more effective if they avoided emphasizing a need for gender “equality” and focused instead on demonstrating how behavior changes could *enhance* the qualities that are so valued in each sex: strength and independence for boys, dutifulness and wifeliness for girls. Messaging could aim to make having a healthy child be seen as an indicator of social status, something that households, and most importantly males, would want to invest in.

Monitor and evaluate key outcomes by sex and season

All data collection should be designed and analyzed with a view to sex- and season-disaggregation. While this necessitates larger sample sizes (precisely double the sample size that a non sex-stratified evaluation would need) and more frequent data collection, the result would be a more accurate understanding of what programs work (or don't work) and for whom. Unless program impact is measured at the right time and disaggregated by sex, there is a risk of benefits being under- or even over-estimated.

Once the timing of the peaks of key nutrition outcomes and seasonal drivers are identified, data collection for monitoring purposes can be organized accordingly, thereby reducing the total amount of data that needs to be collected. For example, nutrition outcome data for the population in Chad's

Sila Province should only be collected during *rushash* and *darat* in order to monitor progress. Data collection on other key outcomes that serve as drivers of wasting should be similarly restricted to the season when they are most relevant. For example, programs should measure adherence to exclusive breastfeeding during *rushash*, and measure food security outcomes in *darat*. For programs that aim to prevent acute malnutrition, collecting information on these outcomes and drivers during the periods of the year when they are less likely to contribute to poor nutrition would be less efficient and informative. Therefore, collecting the right information at the right time should streamline the amount of data being collected throughout the year.

- 1 The threshold for wasting is that a child's weight-for-height z-score is at least two standard deviations below (WHZ<-2) the median of the World Health Organization's Child Growth Standards. Severe wasting occurs when weight-for-height z-scores fall below three standard deviations.
- 2 K. Baye, and K. Hirvonen. 2020. "Seasonality: a missing link in preventing undernutrition." *The Lancet Child & Adolescent Health* 4(1).
- 3 H. Young. 2020. *Nutrition in Africa's drylands: A conceptual framework for addressing acute malnutrition*. Feinstein International Center, Tufts University.
- 4 Wasting-Stunting Technical Interest Group. 2017. "Child wasting and stunting: time to overcome the separation. A briefing note for policy makers and programme implementers." ENN.
- 5 Expressed here using the normalized difference vegetation index (NDVI), which uses remote sensing data to show whether an observed area contains live green vegetation as well as the health of that vegetation. The spectrum of NDVIs ranges from -1.0 to +1.0, with dense vegetation generating positive values.
- 6 FAO and Tufts University. 2019. "Twin peaks: the seasonality of acute malnutrition, conflict, and environmental factors in Chad, South Sudan, and the Sudan."
- 7 These predictions are based on a regression analysis of the collected data. "CI" refers to the confidence interval, which indicates a 95% probability that the true value will fall within this interval. The CI illustrates the degree of uncertainty associated with the mean.
- 8 See A. Marshak, H. Young, E. N. Bontrager, and E. M. Boyd. 2017. "The Relationship Between Acute Malnutrition, Hygiene Practices, Water and Livestock, and Their Program Implications in Eastern Chad." *Food Nutrition Bulletin* 38(1): 115-127; A. Marshak, H. Young and A. Radday. 2016. "Water, Livestock, and Malnutrition. Findings from an Impact Assessment of Community Resilience to Acute Malnutrition Programming in the Dar Sila Region of Eastern Chad, 2012-2015." Feinstein International Center, Tufts University.
- 9 A. M. Adams. 1994. "Seasonal variations in nutritional risk among children in central Mali." *Ecology of Food and Nutrition* 33 (1-2): 93-106; S. M. Schoenbuchner et al. 2019. "The relationship between wasting and stunting: a retrospective cohort analysis of longitudinal data in Gambian children from 1976 to 2016." *American Journal of Clinical Nutrition*. 110 (2): 498-507.
- 10 For example, the 2018 standardized monitoring and assessment of relief and transitions (SMART) nutrition survey that found 14.7 percent of boys and 12.2 percent of girls to be wasted was conducted – like all SMART surveys in Chad – in September, just before the *darat* season.
- 11 C.P. Howson, P. F. Harrison and M. Law .1996. *In her lifetime: female morbidity and mortality in Sub-Saharan Africa*. Washington D.C.: National Academy Press.
- 12 The US Centers for Disease Control and Prevention defines formative research as "the process by which researchers or public health practitioners define a community of interest, determine how to access that community, and describe the attributes of the community that are relevant to a specific public health issue."
- 13 For a more detailed analysis, see <https://fic.tufts.edu/research-item/seasonality-of-malnutrition-in-eastern-chad/>. 2020. "Seasonality Matters for Acute Malnutrition." Feinstein International Center, Tufts University.

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