MERIAM
Modelling Early Risk Indicators
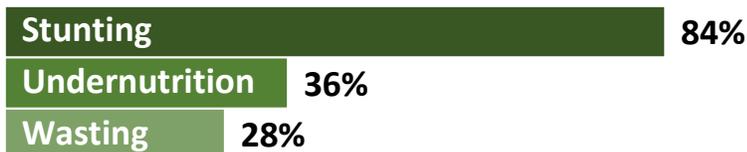to Anticipate Malnutrition

State of Research on Factors for Wasting

Wasting is understudied

Analyses often focus on stunting (height-for-age). More attention is also paid to undernutrition (weight-for-age) than wasting (weight-for-height).

Stunting	84%
Undernutrition	36%
Wasting	28%

Only select factors exhibit consistent associations with wasting

A large array of factors has been evaluated in relation to wasting. Many of the findings are unstable or yet to be validated in multiple studies.

- 71 factors evaluated
- 44 evaluated in single studies
- 27 evaluated in multiple studies
- 17 inconclusive findings
- 10 consistent findings

Climate shocks are among the most robust risk factors for wasting

Severe deviations in vegetation below averages, excess rainfall, and temperature shocks have each been associated with wasting in multiple studies.

Conflict may also be a risk factor for wasting, but the evidence is limited

Armed conflict fatalities and terrorist events are associated with wasting, but only in single studies.

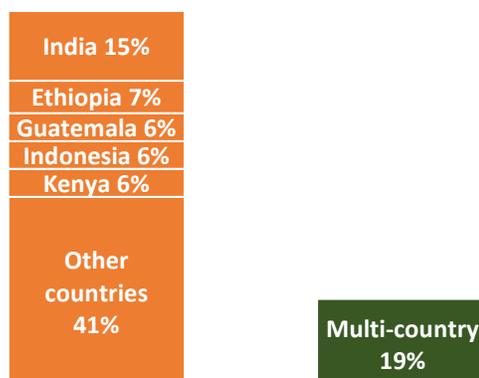| 4 Risk Factors	6 Mitigating Factors
Diarrhea (recent)	Born in medical facility
Negative vegetation shock	Mother's education
Excess rainfall	Household wealth/income
Temperature shock	Toilet/sanitation quality
	Water quality
	Altitude

Time-series analysis of panel data on child undernutrition is uncommon

Most studies rely on cross-sectional analysis, even when repeated measures are available.

Cross-Sectional	80%
Panel	20%

Cross-national analysis of factors for child undernutrition is the exception

Most studies focus on just one country – or even certain regions within a country.

- India 15%
- Ethiopia 7%
- Guatemala 6%
- Indonesia 6%
- Kenya 6%
- Other countries 41%
- Multi-country 19%

This MERIAM Fact Sheet is based on a systematic literature review, which identified 77 relevant studies.
For details, see *Factors Associated with Child Undernutrition Outcomes: A Review of Quantitative Empirical Studies*.

Leading Indicators of Prevalence of Acute Undernutrition

Starting point is a practical use case derived from needs of professionals who are active in the field

An analyst has responsibilities for early warning, seeks to generate sub-national forecasts about expected future risks of acute undernutrition, and has access to data at the level of Kenyan counties.

> Can reliable predictions of the prevalence rates of wasted children be produced at the county level?

> In the process, can leading indicators be identified?

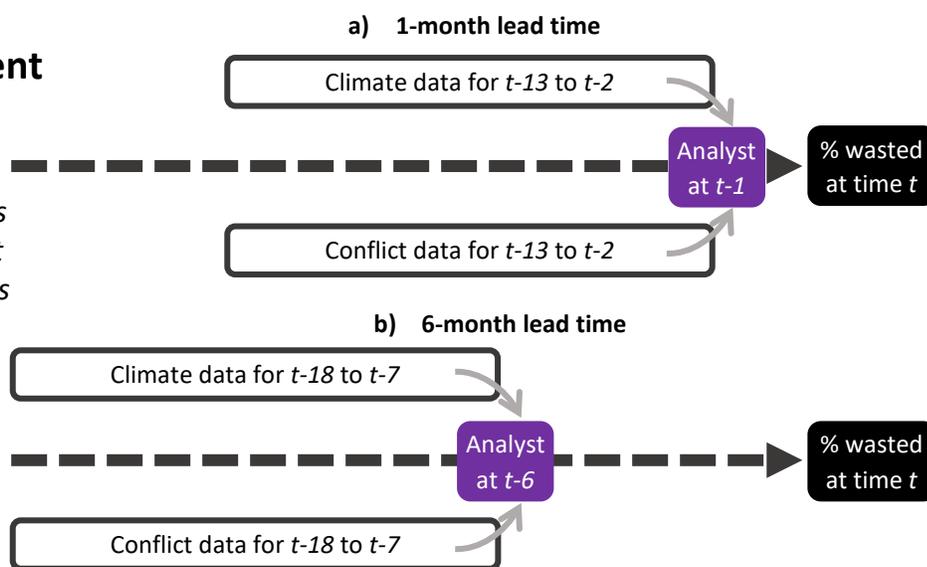> Can risks be predicted months in advance to facilitate interventions?

> What relationships do climate and conflict conditions have with the prevalence rates of wasted children?

Statistical modeling designed to reflect data available to study relationship at different vantage points in time

With shorter lead times, the analyst can study more data, covering periods extending closer to the outcome point that is being forecast. The drawback is less advance warning of risks.

With longer lead times, the analyst has less data to study, using only what is known as of months prior to the outcome point. The benefit is more advance warning of risks.

Figure 1: Specifying Use Cases with Varying Lead Times

a) 1-month lead time

Climate data for *t-13* to *t-2* → Analyst at *t-1* → % wasted at time *t*

Conflict data for *t-13* to *t-2* →

b) 6-month lead time

Climate data for *t-18* to *t-7* → Analyst at *t-6* → % wasted at time *t*

Conflict data for *t-18* to *t-7* →

Preliminary results indicate that climate and conflict conditions can serve as leading indicators to predict significant shifts in prevalence of wasted children

From a 1-month vantage point, both a large decline in precipitation over the past year and a period of severe violence several months ago are associated with markedly higher rates of wasted children.

From a 6-month vantage point, a large decline in precipitation is associated with a substantially higher rate of wasted children.

Precipitation | 3 rainiest consecutive months in last year
Data: CHIRPS
Kenya

44% lower rainfall last year →
+4.1% wasted prevalence
(on average)

Negative precipitation shock (1 std dev)
implies a 4.06% pt. increase in wasting

Cumulative violence, 5-7 months before survey
Kenya

9 added recent violent events →
+2.2% wasted prevalence
(on average)

Severe violence shock (2 std dev)
implies a 2.32% pt. increase in wasting

Precipitation | 3 rainiest consecutive months in last year
Data: CHIRPS
Kenya

44% lower rainfall last year →
+5.8% wasted prevalence
(on average)

Negative precipitation shock (1 std dev)
implies a 5.76% pt. increase in wasting

This MERIAM Fact Sheet reports analysis using nutritional outcome data from 3 DHS, 1 MICS, and 23 SMART surveys.