



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

New Directions in Nutrition

Feed the Future Innovation Lab for Nutrition

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FROM THE AMERICAN PEOPLE



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BY THE NUMBERS

10% OF THE
WORLD'S POPULATION
795 MILLION
PEOPLE
SUFFER FROM CHRONIC HUNGER

IN 2017
128.6 MILLION
PEOPLE
WILL NEED
HUMANITARIAN AID

MORE THAN
150 MILLION
CHILDREN
 ARE 
STUNTED
[DUE TO MALNUTRITION]

IN 2016 **100** MILLION
PEOPLE
RECEIVED
FOOD AID

EACH YEAR
NEARLY **HALF** **3** MILLION
DEATHS
OF ALL DEATHS OF CHILDREN UNDER 5
ARE CAUSED BY MALNUTRITION



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FOUR TOPIC AREAS

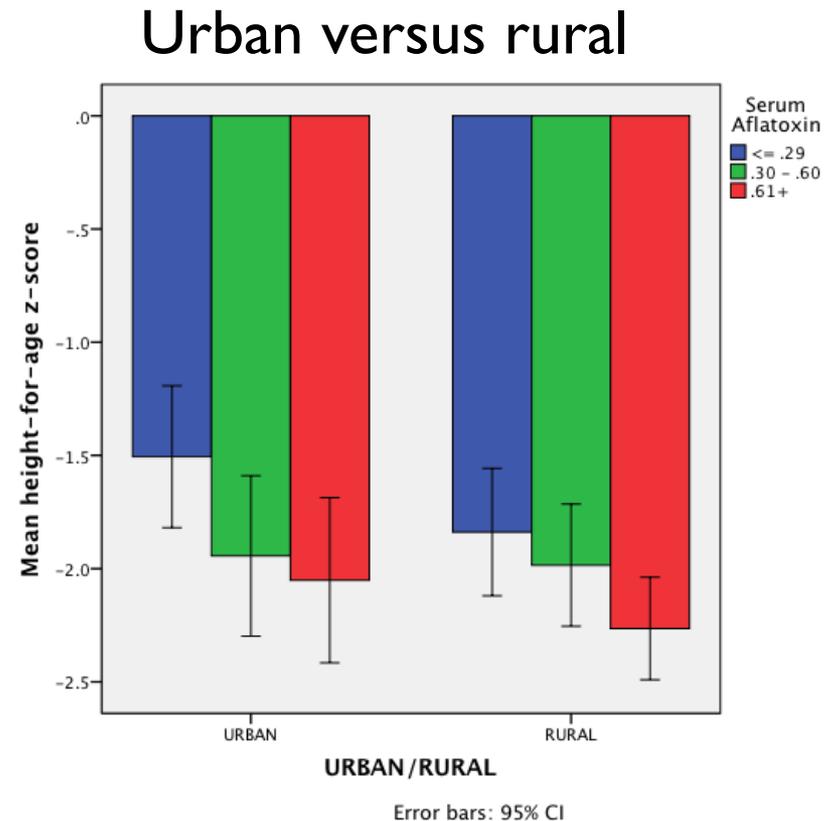
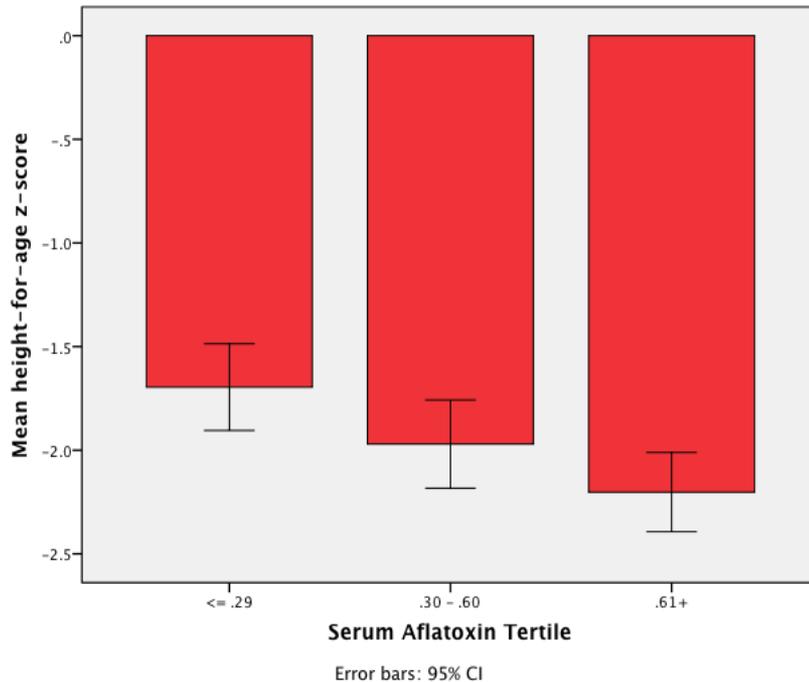
1. **Mycotoxins** – the ‘missing link’ in nutrition?
2. **Environmental Enteropathy (EED)** – why WASH?
3. **Diet-based delivery of nutrients** – silver bullet?
4. **Better measures of nutrition** – cognition, full recovery, long-bones, beyond Diet Diversity (DD)?





AFLATOXIN = MALNUTRITION?

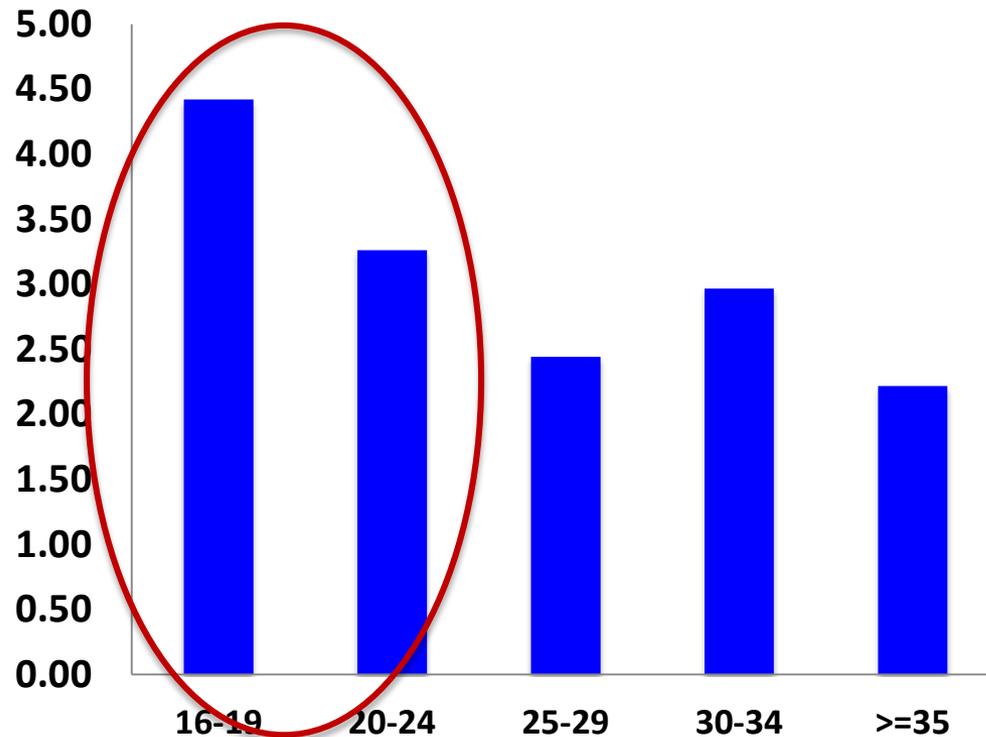
Stunting by aflatoxin levels (Timor Leste 2013)





AF IN PREGNANT WOMEN, NEPAL

Mean AFBI by age (N=1646)

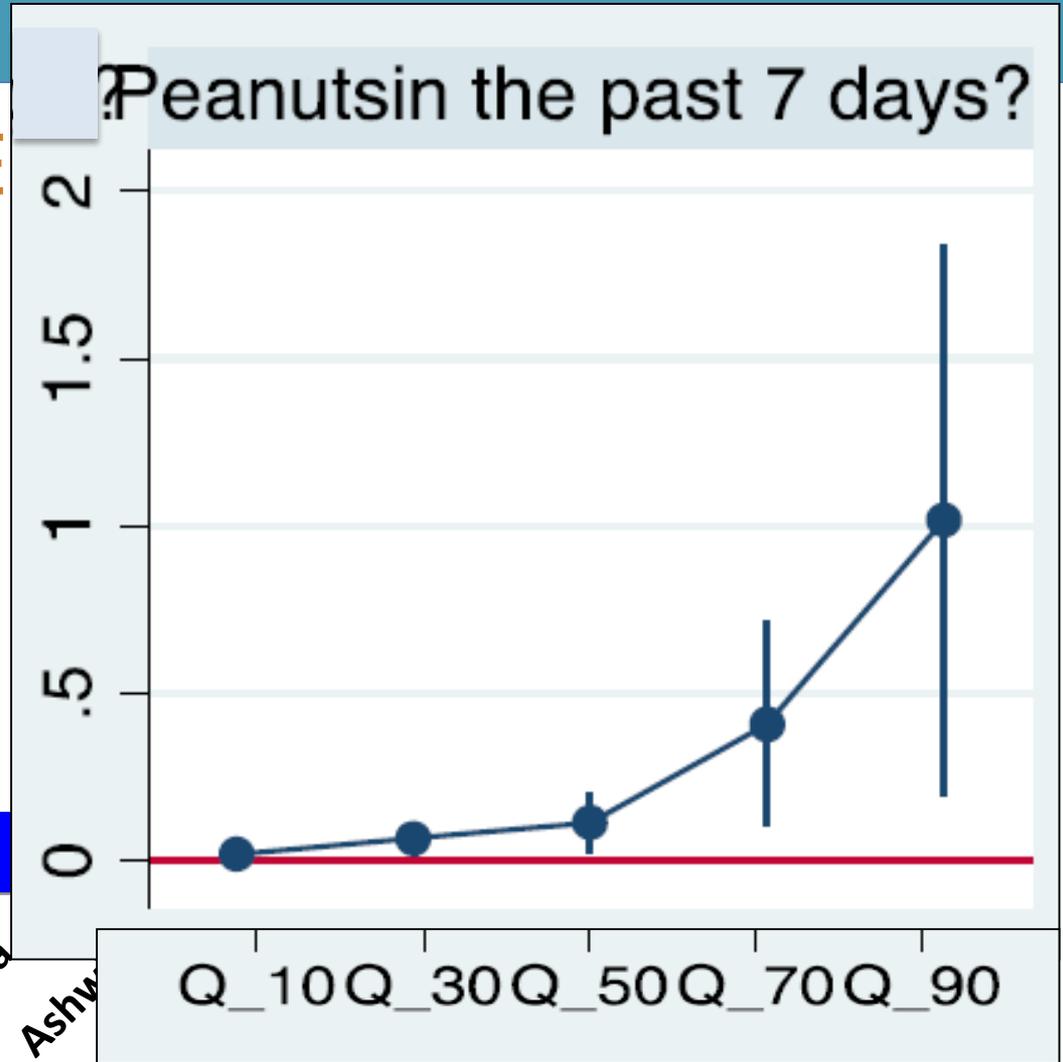
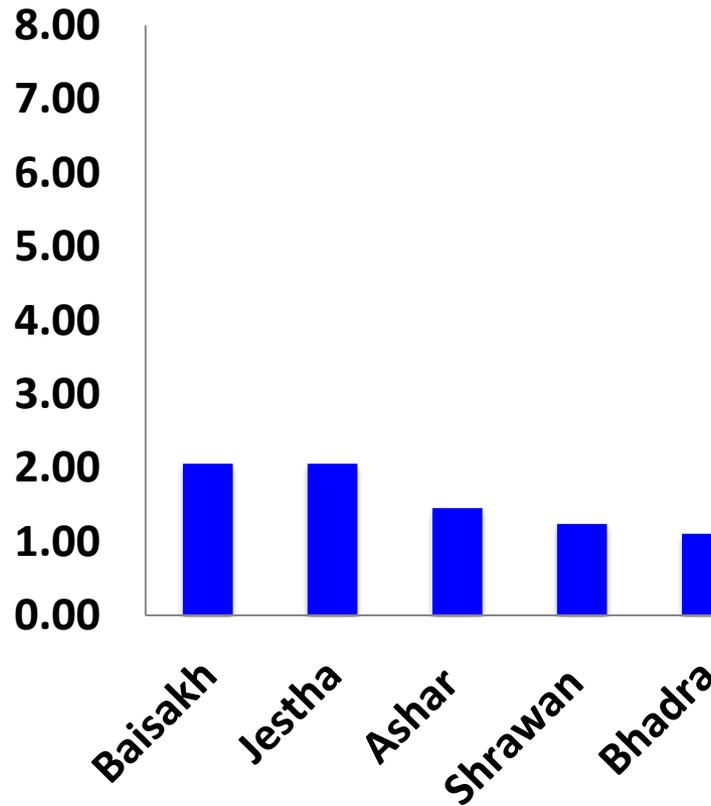




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MEAN AF LEVEL



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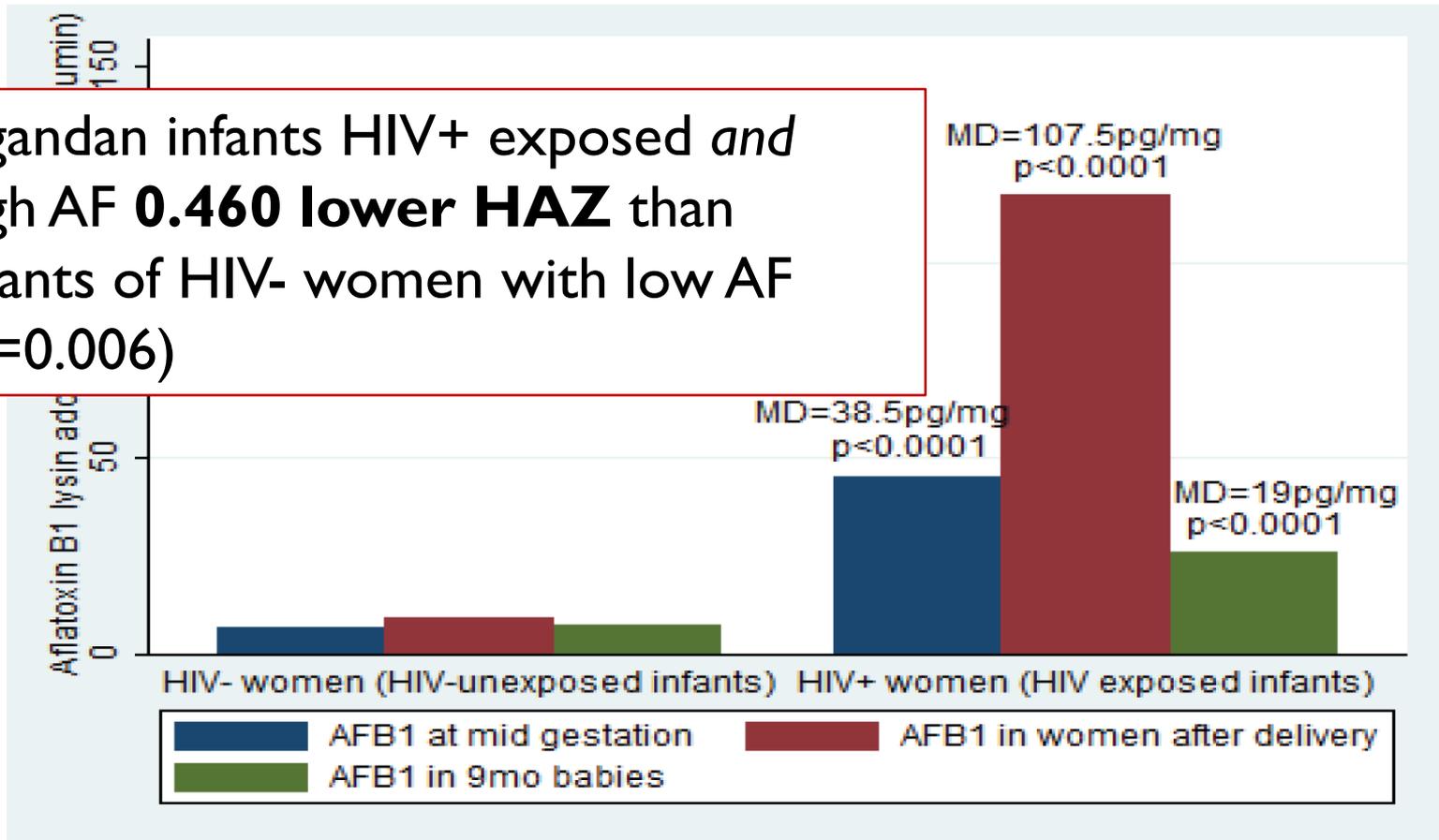


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AFLATOXIN LEVELS HIGHER IN HIV (+) WOMEN AND THEIR INFANTS

Ugandan infants HIV+ exposed *and* high AF **0.460** lower **HAZ** than infants of HIV- women with low AF ($p=0.006$)





ENVIRONMENTAL ENTEROPATHY (EED)

- Pathogens shared in gut microbiome between livestock and human owners may contribute to chronic inflammation, loss of nutrients, suboptimal vaccine effect? DNA needed.
- “Leaky gut” leads to inflammation and loss of nutrients.
 - EED testing in Uganda (lactulose:mannitol): **385 children 12-16 m.**
 - Median L:M score 0.27: 21% no EED, **58% moderate, 22% severe.**
 - Infants with **clean water** better L:M scores ($P < 0.050$).
 - If **goats/sheep inside home**, significantly worse L:M ($P < 0.050$).
 - **L:M significantly higher if infants stunted or wasted at 6-9m** (i.e. prior to L:M test).





FOOD-BASED NUTRITION SOLUTIONS

Necessary but not always sufficient.

- **Bangladesh:** Low rates of anemia among women with diets poor in iron-rich foods. Groundwater?
- **Nepal:**
 - 300+ mother-infant pairs followed up 5 years later. **Low B12** as infant = poorer cognitive outcomes at older ages.
 - Children **eating no ASF** ten times more likely to have low cognitive test scores compared with ASF 3-4 times in past 24hrs.
- **Uganda:** Home production of fruit/veg raises consumption of both, but effect on hemoglobin cancelled out by malaria.



MEANINGFUL METRICS

- **Head circumference** and **long bone growth** may be key to determining early nutrition insults and a) cognitive outcomes at school age, and b) linear growth (sensitivity).
- **Diet diversity** scores are blunt instruments where consumption of processed and packaged foods rising fast.
- More specificity needed in dose-response of 'good' foods (**type/amount of ASFs**, fruits separate from veg., nuts/seeds).
- **Inflammation and other biomarkers** may prove to be critical (urine, blood, fecal samples not easy to work with).



TAKE AWAY MESSAGES

1. AF *may* be linked to child growth (much through birth outcome, SGA); but, too soon to tell; season of birth?; interaction with other mycotoxins?; immune system effect?
2. Need more on EED to determine effects of interventions.
3. Promotion of quality diets and key foods helps, but confounders lurk around every corner. Integrated programming!
4. “Nutrition” involves much more than height or anemia. Sound physiology and cognition are key to thriving. New metrics needed.



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