IF THEY GROW IT, WILL THEY EAT AND GROW? EVIDENCE FROM ZAMBIA ON AGRICULTURAL DIVERSITY AND CHILD UNDERNUTRITION

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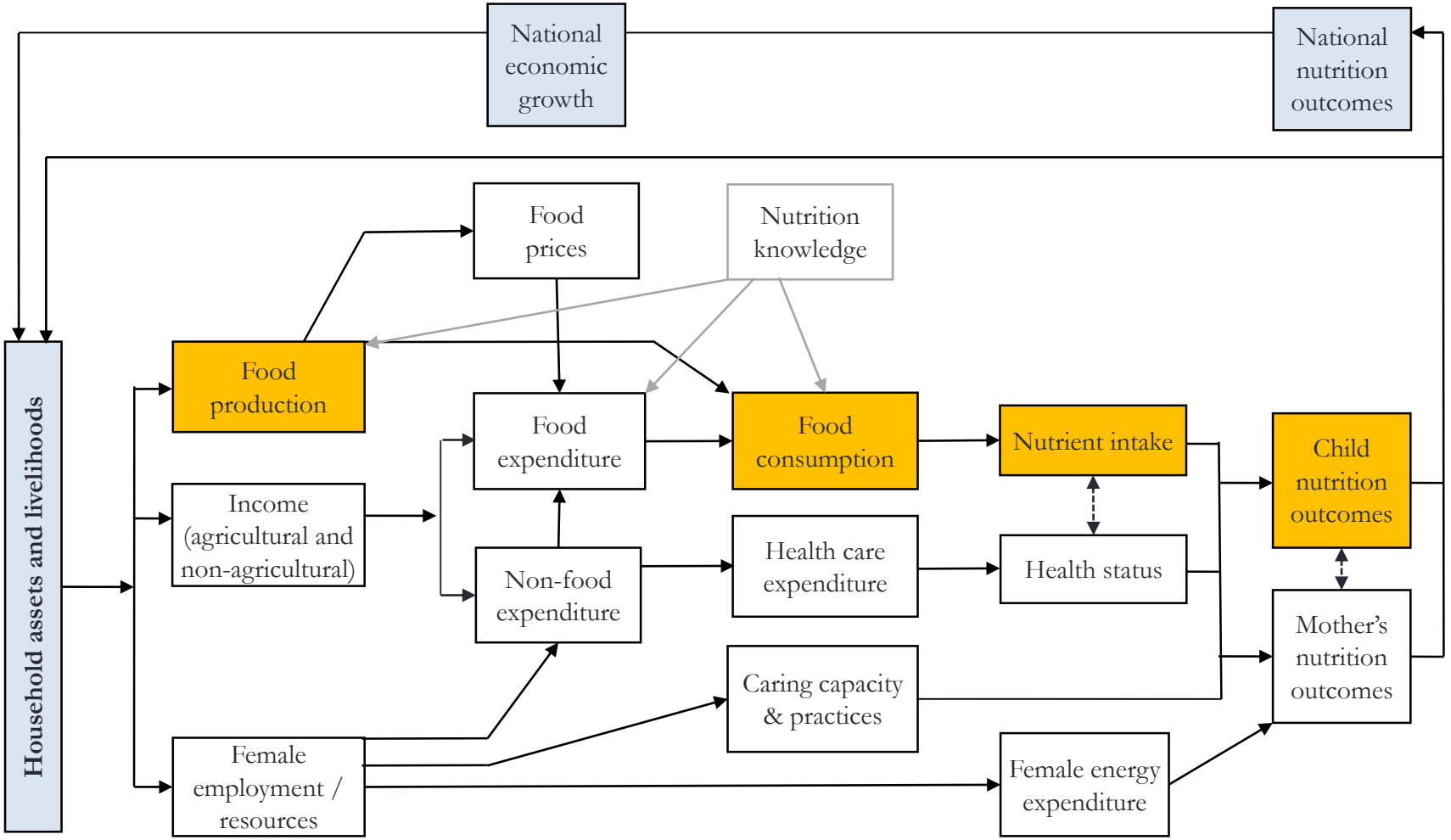
Rationale

- Undernutrition in children complex
- Nutrition policy has largely been aligned with the health sector
- However, addressing the food link requires aligning with the agriculture sector
  - Agriculture policy has focused more on the quantity of production rather than its quality



Own production → food consumption pathway

Source: Adapted from Gillespie, Harris and Kadiyala, 2012

Research Questions

- Examine the **relationship between household agricultural diversity and dietary diversity among children aged 6-23 months**, controlling for various socioeconomic, demographic and health characteristics

- Examine the **relationship between household agricultural diversity and child nutritional status**, among younger (**6-23 months**) and older children aged (**24-59 months**), controlling as above.

Why Dietary Diversity?

- Dietary diversity (DD) is an important dimension of diet quality
- DD is consistently associated with micronutrient density of the diet among infants, and micronutrient adequacy among women
- DD is associated with height for age (cross sectional studies) (Arimond & Ruel 2004; Sawadogo et al 2006, Moursi et al. 2009; Marriot et al 2012, Menon et al 2013)
- Relatively simple to measure and relevant across various cultural dietary patterns

Context

- Almost half of Zambia's children suffer from undernutrition
  - 45% children <5 years are stunted
- Challenges for addressing this high undernutrition
  - Limited infrastructure and poor access to markets
  - 75% of rural poor are small scale farmers relying on subsistence agriculture
  - Agriculture revolves around a few staple crops- maize (predominantly)
  - Agriculture policy revolves around increasing maize production almost exclusively
- Rural Zambian diets are monotonous and lacking the diversity required for good nutrition

Data

- Realigning Agriculture for Improved Nutrition (RAIN) intervention in Mumbwa district in Zambia
  - aimed at increasing year-round availability of and access to nutrient rich foods at the household level
  - Accompanied with promotion of optimal health, nutrition and care-seeking behavior through social behavior change communication
- RAIN Baseline data
  - 3040 households in 6 wards
  - 3040 children 24-29 months old, 1566 children 6-23 months
- Variables
  - Nutritional status: Anthropometry
    - HAZ, WHZ, stunting, wasting (WHO 2006)
  - Child dietary diversity: IDDS
    - 7 food groups (WHO 2010)- grains; roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin A rich fruits and vegetables, and; other fruits and vegetables.

Data

- Variables contd.
  - Production diversity:
    - # field crops and vegetables
    - Agricultural activities (cultivate field crops, cultivate vegetables, rear animals, produce animal products)
    - Food groups produced (7 groups corresponding to the groups in DD)
  - Child characteristics (age, age squared, gender, morbidity index)
  - Maternal characteristics (height, empowerment, education, income earner, age)
  - Household characteristics (head's characteristics, size, SES, cultivated land, food expenditure on 12 food groups, receipt of agricultural training)

Descriptive Statistics: Dietary Diversity and Anthropometric Status

	Mean
Dietary Diversity among, 6-23 months (7 food groups)	2.8
Minimum dietary diversity, 6-23 months (>=4 food groups)	27.3
Height for Age Z score	
6-23 months	-1.45
24-59 months	-1.82
Stunting	
6-23 months	44.2
24-59 months	44.8
Weight for Height Z score	
6-23 months	0.45
24-59 months	0.35
Wasting	
6-23 months	4.7
24-59 months	2.5

Agricultural Activities

	Mean
Fraction of households cultivate field crop	0.87
Fraction households cultivate vegetables	0.31
Fraction households own any livestock	0.99
Fraction households produce animal products	0.68
Number of field crops and vegetables cultivated	2.47
Number of agricultural activities	2.6
Production diversity (7 food groups)	2.5

Empirical Strategy

- We estimate:

$$N_{ih} = \alpha + \beta PD_h + \gamma C_{ih} + \varphi HH_h + \varepsilon_{ih}$$

where

N_{ih} is the dietary diversity/nutritional status for child *i* in household *h*

PD_h is the agricultural diversity in household *h*

C_{ih} are characteristics of child *i* in household *h*

HH_h characteristics for household *h*

- We estimate these using Ordered Logit for the DD (7 food groups), dprobit for Minimum diversity, stunting and wasting and OLS for HAZ and WHZ
- Production diversity may be endogenous→ estimate a few extensions of the base model

Production Diversity and Dietary Diversity

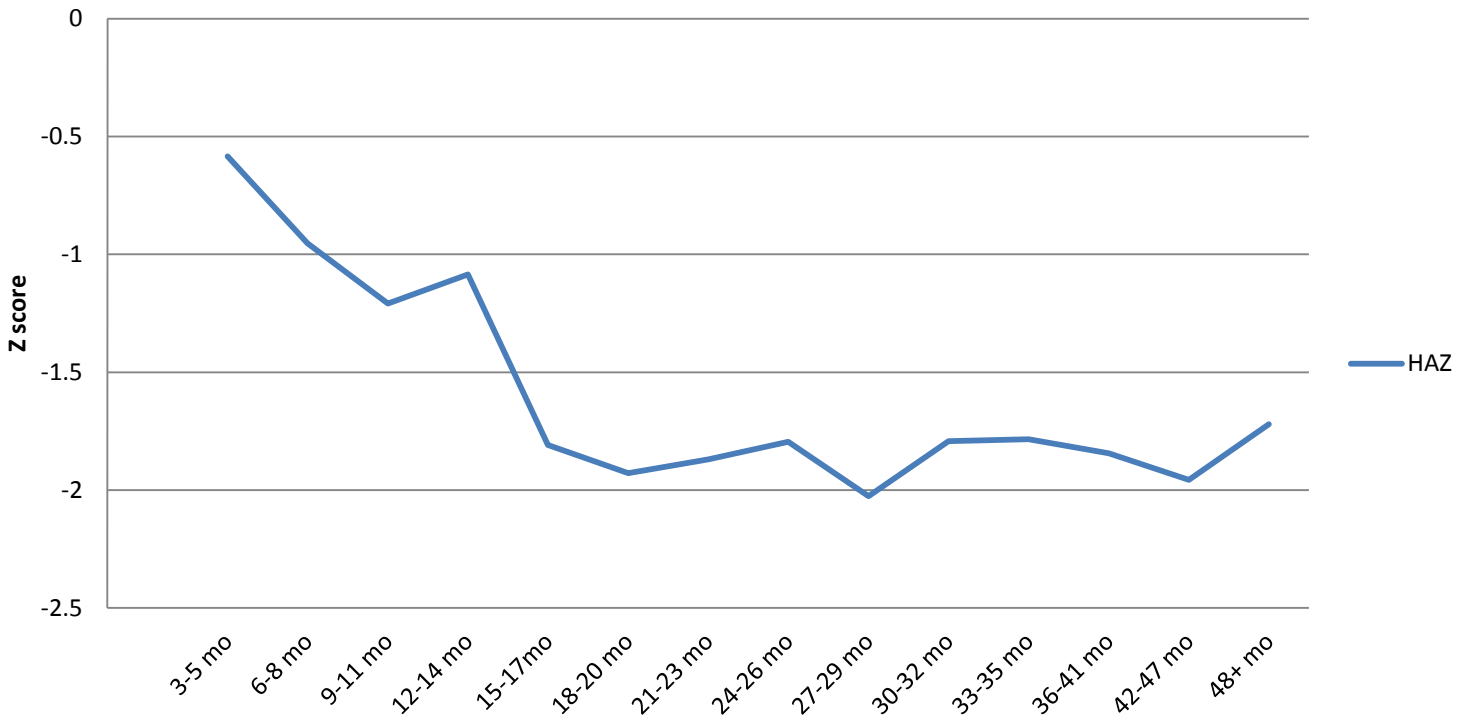
- Household dietary diversity and household production diversity are positively associated.
  - Expected in the context where markets do not function well and households rely on own production
- Among young children (6-23 months), dietary diversity is positively associated with household production diversity.
- Dietary diversity among young children is also positively associated with total agricultural production and agricultural income.
- Diversity in production is more strongly associated with dietary diversity than the total amount of agriculture production and the income derived from this production.

Production Diversity and Anthropometric Status

- There is no discernible pattern of association between production diversity and nutritional status among the young children (6-23 months)
  - Negative relation between HAZ scores and production diversity though no significant association between stunting and production diversity – driven primarily by children with high HAZ scores
  - Weak negative association between production diversity and wasting but no significant relation with WHZ scores.
- Among the older children (24-59 months) the pattern of relationship between production diversity and linear growth is more consistent
  - a positive association with HAZ scores – driven primarily by children that are severely stunted
  - an inverse relation with stunting prevalence
  - no significant relation with WHZ score or wasting

Explanation for results

- Why do we observe a significant association between the diversity of agricultural production with linear growth in older children but not in younger children?
  - Young children – eat very small quantities of family foods and rely more on nutrients in breast milk.
  - Linear growth patterns are different at these different ages
  - It is possible that accrued benefits of household production diversity do not manifest until after children have been exposed to diverse diets during the critical 1000 day “window of opportunity”


0
-0.5
-1
-1.5
-2
-2.5
Z score
3-5 mo
6-8 mo
9-11 mo
12-14 mo
15-17mo
18-20 mo
21-23 mo
24-26 mo
27-29 mo
30-32 mo
33-35 mo
36-41 mo
42-47 mo
48+ mo
HAZ

Conclusions

- Diversity of agricultural production can be an important predictor in subsistence households of:
  - dietary diversity in young children
  - subsequently nutritional status (stunting) as these children age

- Agricultural programs and policies aiming to have impacts on child undernutiriton should promote diversity in agricultural production, rather than only increasing total quantity produced of select crops
  - Maize is Zambia's principle food staple, accounting for 60% of national calorie consumption and serves as the dietary mainstay in adults and children.
  - Large-scale government maize procurement through Food Reserve Agency provides little incentive for farmers to diversify production