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


- 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

<table>
<thead>
<tr>
<th>Measure</th>
<th>6-23 months</th>
<th>24-59 months</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary Diversity among</td>
<td></td>
<td></td>
<td>2.8</td>
</tr>
<tr>
<td>Minimum dietary diversity</td>
<td></td>
<td></td>
<td>27.3</td>
</tr>
<tr>
<td>Height for Age Z score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-23 months</td>
<td></td>
<td></td>
<td>-1.45</td>
</tr>
<tr>
<td>24-59 months</td>
<td></td>
<td></td>
<td>-1.82</td>
</tr>
<tr>
<td>Stunting</td>
<td></td>
<td></td>
<td>44.2</td>
</tr>
<tr>
<td>6-23 months</td>
<td></td>
<td></td>
<td>44.8</td>
</tr>
<tr>
<td>24-59 months</td>
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<tr>
<td>Weight for Height Z score</td>
<td></td>
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<td>0.45</td>
</tr>
<tr>
<td>6-23 months</td>
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<td></td>
<td>0.35</td>
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<tr>
<td>24-59 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wasting</td>
<td></td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>6-23 months</td>
<td></td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>24-59 months</td>
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</table>
## Agricultural Activities

<table>
<thead>
<tr>
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<th>Mean</th>
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</thead>
<tbody>
<tr>
<td>Fraction of households cultivate field crop</td>
<td>0.87</td>
</tr>
<tr>
<td>Fraction households cultivate vegetables</td>
<td>0.31</td>
</tr>
<tr>
<td>Fraction households own any livestock</td>
<td>0.99</td>
</tr>
<tr>
<td>Fraction households produce animal products</td>
<td>0.68</td>
</tr>
<tr>
<td>Number of field crops and vegetables cultivated</td>
<td>2.47</td>
</tr>
<tr>
<td>Number of agricultural activities</td>
<td>2.6</td>
</tr>
<tr>
<td>Production diversity (7 food groups)</td>
<td>2.5</td>
</tr>
</tbody>
</table>
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”
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 undernutrition 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