A cluster-randomized home gardening program improves dietary diversity and food security among rural Tanzanian women

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Outline

• Introduction
  • Diet and nutrition in Tanzania
  • Homestead food production (HFP)

• Methods
  • Study design
  • Statistical analysis

• Results

• Discussion
Introduction

Tanzania experiences high levels of hunger, Pwani region among the hardest affected

Hunger across the African continent

Tanzanian total per capita daily caloric intake

FAO, 2015

Van Wesenbeeck, 2012
Homestead Agriculture and Nutrition Initiative (HANU)

- Cluster-randomized trial of homestead food production in Rufiji, Tanzania
- Main household eligibility criteria:
  - Woman of reproductive age and one child under 36 months
  - Access to plot of land or containers for growing vegetables
- Goals:
  - Enhance production of nutrient-dense vegetables
  - Provide messages on nutrition and health
    → Improve nutrition and health of participating households
Research questions

Primary:
1. Does homestead food production improve dietary diversity among participating women?

Secondary:
1. Does homestead food production improve consumption of nutrient-rich food groups among participating women?
2. Does homestead food production reduce food insecurity among participating women?
Methods: study design

- Pair-matched cluster-randomized trial in 10 villages (n=1,006)
- The intervention included:
  - Provision of small agricultural inputs and garden training support, delivered by AEWs
    - Seeds: African eggplant, amaranth, spinach, tomato, okra, and Chinese cabbage (x 3)
  - Nutrition and health counseling, provided by CHWs
  - Delivered via home visits and farmer field schools every 2 weeks
- Control villages received standard of care
- Data collection: 0, 12 months (and 36 months)
Methods: outcomes of interest

• Women’s dietary diversity (DD):
  • DD Score: Number out of ten food groups consumed at least once per day
  • MDD-W: proportion of women consuming at least 5 out of 10 food groups every day

• Household Food Insecurity Access Scale (HFIAS):
  • HFIAS score: Severity of food insecurity across nine domains on a scale from 0-27
  • HFIAS categories: none, mild, moderate, severe FI
Methods: statistical analysis

- Linear regression and probability models
- Baseline covariate imbalance
  - Inverse probability of intervention weights
- Differential loss to follow-up
  - Inverse probability of censoring weights
- 16 hypotheses tested
  - Bonferroni p-value: 0.0003
Results: baseline household characteristics

- Total enrolment: 1,006 caregiver-infant pairs
- 58% of women received primary education
- Majority of income from informal employment activities
- Women spend 1300 TSH (0.57 USD) per person/day on food
- Women consumed 3 food groups/day
  - Ugali, fried fish, okra, fresh fish, and rice most common
- On average, households grow about three crops
  - Maize, rice, sesame, cassava, and cashews most common
Table 1: Differences in dietary diversity score and household food insecurity scores between intervention and control households after 12 months of follow-up

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Unadjusted</th>
<th></th>
<th></th>
<th>Adjusted with intervention and censoring weights</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean difference</td>
<td>95% CI</td>
<td>P-value</td>
<td>Mean difference</td>
<td>95% CI</td>
<td>P-value</td>
</tr>
<tr>
<td>Dietary diversity score</td>
<td>0.53</td>
<td>0.33, 0.74</td>
<td>&lt;0.001</td>
<td>0.73</td>
<td>0.41, 1.05</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Household food insecurity</td>
<td>-0.39</td>
<td>-1.14, 0.37</td>
<td>0.312</td>
<td>-1.92</td>
<td>-3.05, -0.78</td>
<td>0.001</td>
</tr>
<tr>
<td>access scale</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Table 2: Risk differences between intervention and control households after 12 months of follow-up

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Unadjusted</th>
<th>Adjusted with intervention and censoring weights</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Risk difference</td>
<td>Risk among control</td>
</tr>
<tr>
<td>Moderate food insecurity</td>
<td>-0.03</td>
<td>0.06</td>
</tr>
<tr>
<td>Severe food insecurity</td>
<td>-0.04</td>
<td>0.15</td>
</tr>
<tr>
<td>Minimum dietary diversity</td>
<td>0.14</td>
<td>0.29</td>
</tr>
<tr>
<td>Outcome</td>
<td>Unadjusted</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>Risk difference</td>
<td>Risk among control</td>
</tr>
<tr>
<td>Beans and peas</td>
<td>0.12</td>
<td>0.17</td>
</tr>
<tr>
<td>Dairy</td>
<td>0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>Eggs</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>Flesh foods</td>
<td>0.06</td>
<td>0.75</td>
</tr>
<tr>
<td>Nuts and seeds</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Other fruits</td>
<td>0.10</td>
<td>0.40</td>
</tr>
<tr>
<td>Dark green vitamin A-rich vegetables</td>
<td>0.13</td>
<td>0.29</td>
</tr>
<tr>
<td>Other vitamin A rich vegetables &amp; fruits</td>
<td>0.07</td>
<td>0.08</td>
</tr>
</tbody>
</table>

*Bonferroni corrected critical p-value is 0.003
Discussion

- We found large improvements in dietary diversity and food security
- Quasi-experimental on HFP
  - HKI in Bangladesh, Cambodia, Nepal and Philippines (Talukder, 2010)
  - Bangladesh (Schreinemachers, 2014 and 2016)
- RCTs on HFP
  - Burkina Faso (Olney, 2015)
    - Increased consumption of certain food groups, marginal effect on dietary diversity scores
  - Nepal (Osei, 2015 and 2017), Zambia (Kumar, 2017)
    - Mixed results on child anthropometry
    - Reduction in anemia
Strengths and limitations

• Strengths:
  • Rigorous methodology: cluster RCT
  • Conservative analysis and estimates

• Limitations:
  • Covariate imbalance from small number of clusters
  • Seasonal patterns not assessed
Next steps

• Endline at 36 months of follow-up

• Longitudinal assessment for both women and children:
  • Dietary diversity
  • Anthropometry
  • Anemia

• Potential mediators:
  • Role of income, water access, and women’s empowerment
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