Experimental Evidence of Nutrition Interventions in Northern Ghana

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INTRODUCTION

Background:

- Improving the nutritional status of women and children in northern Ghana is a key objective of the US government's food security initiative, Feed the Future (FTF).
- FTF seeks to achieve its objective by improving access to diverse and quality foods, improving nutrition-related behaviors, and improving utilization of maternal and child health and nutrition services.
- In 2012, USAID|Ghana funded a population-based baseline survey in northern Ghana to track and evaluate population level changes between the pre- and post-intervention periods.
- Three years later, in 2015, a midterm population-based survey was conducted from representative households in the same regions in northern Ghana as surveyed in the 2012 population-based survey.
- A number of Implementing Partners are managing development projects in the program area to improve women's and children's health and nutrition.
- Analysis of nutrition related outcomes from the two rounds of surveys using standard before-after mean-comparison t-tests indicate positive responses to the FTF program activities and other implementing partners' projects.
- The nutrition related outcomes of interest are:
  - **Children Nutritional Outcomes -** dietary diversity, exclusive breastfeeding, minimum acceptable diet, the levels of wasting, stunting, and underweight among children aged 0-5years
  - **Women Nutritional Outcomes -** prevalence of underweight and dietary diversity among women of reproductive age; and the overall household level poverty.

Problem statement:

- Donor agencies and governments are increasingly seeking for evidence based policy planning to enhance the effectiveness of development interventions.
- However, standard before-after mean-comparison t-tests do not account other household, women, and children's characteristics, and may confound the impact of FTF program activities and other Implementing Partners' projects.
- This study attempts to assess the causal effect of the FTF program activities on women and children nutritional outcomes while taking into account the impact of other household, women, and children's characteristics.

METHODOLOGY

- To estimate the enhancement in nutrition related indicators attributable to the FTF program activities, ordinary least squares and probit models are specified based on the difference-in-differences model in Meyer (1995) and (Duflo et al. 2008).
- A difference-in-difference experimental design is proposed because, its framework: (1) controls for the time effect common to both control and experimental groups, (2) controls for the experimental group specific effect (average permanent differences between the experimental and control group); and (3) estimates the true effect of the intervention after controlling for the time and experimental group specific effects.

Difference-in-Difference Specification (Meyer 1995):

$$Y_{c1} = \alpha_0 + \alpha_1 T_t + \alpha_2 G + \beta_0 P_t + \boldsymbol{\delta_1 C_t} + \boldsymbol{\delta_2 M_t} + \boldsymbol{\delta_3 H_t} + \boldsymbol{\delta_4 L_t} + e_t \quad (1)$$

$$Y_{c2} = \alpha_0 + \alpha_1 T_t + \alpha_2 G + \beta_0 P_t + \boldsymbol{\delta_1 C_t} + \boldsymbol{\delta_2 M_t} + \boldsymbol{\delta_3 H_t} + \boldsymbol{\delta_4 L_t} + e_t \quad (2)$$

$$Y_{w1} = \alpha_0 + \alpha_1 T_t + \alpha_2 G + \beta_0 P_t + \boldsymbol{\delta_1 W_t} + \boldsymbol{\delta_3 H_t} + \boldsymbol{\delta_4 L_t} + e_t \quad (3)$$

$$Y_{w2} = \alpha_0 + \alpha_1 T_t + \alpha_2 G + \beta_0 P_t + \boldsymbol{\delta_1 W_t} + \boldsymbol{\delta_3 H_t} + \boldsymbol{\delta_4 L_t} + e_t \quad (4)$$

$$Y_h = \alpha_0 + \alpha_1 T_t + \alpha_2 G + \beta_0 P_t + \boldsymbol{\delta_1 W_t} + \boldsymbol{\delta_3 H_t} + \boldsymbol{\delta_4 L_t} + e_t \quad (5)$$

- Equations (1) and (2) are estimated by probit and equation (3), (4) , and (5) are estimated by (OLS) regressions.

RESULTS

Table 1: Descriptive statistics

Variable	Before	After	Difference
Underweight (yes=1)	0.18 (0.39)	0.13 (0.34)	-0.05 [0.01]***
Stunting (yes=1)	0.38 (0.48)	0.22 (0.41)	-0.16 [0.01]***
Wasting (yes=1)	0.13 (0.33)	0.11 (0.31)	-0.02 [0.01]**
Exclusive Breastfeeding (yes=1)	0.59 (0.49)	0.58 (0.49)	-0.01 [0.04]
Minimum Acceptable Diet (yes=1)	0.43 (0.49)	0.42 (0.49)	-0.00 [0.03]
Women' BMI	22.06 (3.04)	22.31 (3.36)	0.25 [0.08]***
Women's diet diversity score	4.56 (1.59)	3.39 (1.81)	-1.17 [0.04]***
Monetary food shortfall (%)	0.38 (0.30)	0.14 (0.23)	-0.23 [0.01]***

Significance levels - *p<0.1 ** p<0.05, ***p<0.01
Standard deviation and standard errors are in parenthesis and brackets, respectively
Difference = After mean less before mean.

Fig 1: Effect of interventions on child anthropometric indicators

Fig 2: Effect of interventions on child nutrition

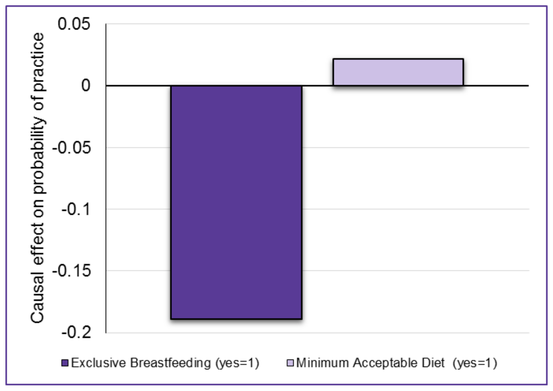


Fig 3: Effect of interventions on women's nutrition

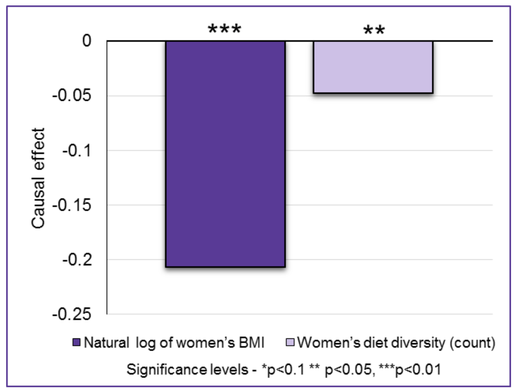
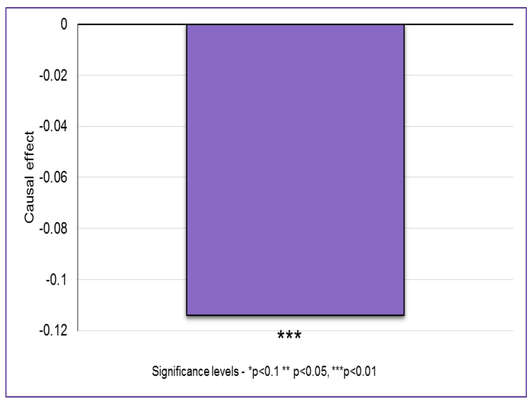


Fig 4: Effect of interventions on household nutrition



DISCUSSION

Preliminary results from the analysis indicate that:

- No significant change in children's stunting and underweight rates, but wasting rate appears to have increased (Fig. 1).
- No significant reduction in exclusive breastfeeding and minimum acceptable diet (Fig. 2).
- Women's BMI scores seem to have improved while their dietary diversity score seems to have declined (Fig. 3).
- Household level food poverty shortfall seems to have improved (Fig. 4)

RECOMMENDATIONS

- The time period between the baseline and the first interim indicator assessment may not be enough to establish causal effect on the nutrition indicators.
- Analysis should be repeated when enough time has passed and/or when the interventions comes to an end.
- The current analysis could be corroborated with further detailed data from Implementing Partners on the exact coverage of activities in the field.
- With the availability of disaggregated data, other methods of analysis, e.g., Propensity Score Matching, could be used in addition to the current analysis for more robust conclusions.
- In the future, with more data available, further re-analysis on the causal effects of the nutrition interventions on the current outcome indicators as well as other indicators, e.g. poverty rates, could be done.

Variable Interpretation
Y_{c1}: Anthropometric indicators for children (Stunting, Underweight, and Stunting)
Y_{c2}: Children nutrition indicators (exclusive breastfeeding, and minimum acceptable diet)
Y_{w1}: Women's BMI
Y_{w2}: Women's diet diversity
Y_h: Household Nutrition indictors (food poverty)
T: Period indicator (pre-intervention period=0)
G: Experimental and control group indicator (control group=0)
P: Causal effect indicator (where T=1 and G =1)
C: Child's demographics (age, gender, etc.)
M: Caretaker of child demographics (age, gender, etc.)
H: Household demographics (age, gender, etc.)
L: Location fixed effect for community and locale
W: Women's demographics (age, gender, etc.)

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