Malnutrition in Ecuador: differentiating the impact of several interventions

JUAN PONCE AND DEBORAH HINES

Abstract

This paper analyzes the impact of several interventions on malnutrition in Ecuador using an experimental design. Food vouchers, voucher plus mother training in health and nutrition issues, and voucher plus training and water purification system are compared with a control group.

We evaluated the impact of these interventions on several outcome variables: consumption, dietary diversity, chronic malnutrition, and anemia.

We do not find any significant impact of intervention arms on consumption, chronic malnutrition and anemia.

We do find a significant and positive impact of vouchers on dietary diversity. No differentiated effect was found for training and water purification intervention, leading us to conclude that the most cost effective intervention to improve dietary diversity is the voucher.

Literature review

Gertler (2004) evaluates the impact of PROGRESA on children stunting and anemia. Using a subsample of the 505 villages randomly assigned to treatment (320 communities) and to control (185 communities), finds no significant impact on stunned. However the treatment group has 1cm taller than the control group.

Behrman and John Hoddinot (2005) using the original randomization find no or even negative impact on nutritional indicators. However, not all children designed to receive nutritional supplements actually did so. In this regard, by correcting this potential selection bias using child fixed effects, for children aged between 12 to 36 months the impact is of around 1 cm.

Literature review

Maluccio and Flores (2004) evaluate the impact of the Nicaraguan CCT (Red de Protection Social) program on nutrition indicators. Using an experimental design that assigned 21 communities to the treatment group and 21 communities to the control group, they find a significant and positive impact of the program of 5.3 percentage points in the reduction of stunting, and 6.0 percentage points in the reduction of underweight among children aged under 5 years. No significant impact is found on anemia.

Morris, Flores et al. (2004) find positive impact on the demand for preventive care on Honduras PRAF, but no significant impact on children's nutritional status.

Literature review

Attanasio et al. (2005) evaluate the impact of the Colombian CCT on nutritional indicators. By using a propensity score matching and a difference in difference approach, the paper finds a positive and significant impact on chronic malnutrition of around -6.9 percentage points for those aged 24 months and less. One important point of this paper is that the authors find a positive impact on dietary diversity.

Morris et al. (2004) evaluate the impact of the Brazilian program (Bolsa Alimentación). The paper finds that six months after families began to receive the health-linked benefit, children in beneficiary households were 0.13 Z-scores less heavy (weight-for-age) than children in excluded households.

Literature review

Paxon and Schady (2010) evaluate the impact of the Ecuadorian CCT program (Bono de Desarrollo Humano) on nutritional indicators among children from 3-7 years. By using an experimental design in six provinces (3 coastal and 3 of sierra) with 378 parishes; 51 rural and 28 urban for treatment, and 26 rural and 13 urban for control the authors find no significant effects on children malnutrition, but a positive and significant effect on elevation-adjusted hemoglobin (29% of a standard deviation).

Hidrobo et al. (2014) that evaluate the impacts and cost-effectiveness different interventions: cash, food vouchers, and food transfers. All three modalities significantly improve the quantity and quality of food consumed. However, differences emerge in the type of food consumed with food transfers leading to significantly larger increases in calories consumed and vouchers leading to significantly larger increase in dietary-diversity. Food is the least cost effective and vouchers are the most cost effective.

Paper contribution

The contribution of our paper is that we differentiate the effect of several components of nutritional programs by using an experimental design. In our study we randomly assigned household to one of the following four groups: a) food voucher, b) voucher plus training in health and nutrition, c) voucher, plus training, and water purification system, and d) control group. In this regard we can differentiate the effect of each component of the different interventions.

The experiment

Four groups of households were randomly created.

First, households (T1) assigned to receive a monthly food voucher of around 40 US$ dollar.

Second, households (T2) assigned to receive, in addition to the voucher, training on health and nutrition issues.

Third, households (T3) that will receive voucher, training, and in addition, a system of water purification.

Finally, the fourth group (C) was used as control group and will receive neither intervention.

Sample size and power

The sample was constructed from three provinces (two from the Sierra and one from the Costa).

Power estimates as well as sample size were computed using the optimal design software. Because of budget limitations we decided to work with a power of 80% percent, at 5% percent of significance, and with a minimum detectable effect of around 0.25 (standard deviations).

The sample size computed, using two surveys (baseline and follow up), is of around 200 households per group. The following groups were randomly created.

Outcome variables

1.- Per capita caloric consumption at household level.

2.- Dietary diversity. We use the Food Consumption Score (FCS).

3.- Chronic malnutrition for children from six months to three years old.

4.- Hemoglobin concentration in d/dlL for children from six months to three years old.

Impacts

With the four groups we can evaluate the following impacts.

T1-C= the impact of food voucher.

T2-C= the impact of food voucher and training.

T3-C= the impact of food voucher, training and water purification system.

T2-T1 (T4)= the impact of training.

T3-T1 (T5)= the impact of training plus water purification.

T3-T2(T6)= the impact water purification.

Data and Methodology

The baseline survey was taken between September and November of 2013, and the follow up survey one year later.

$$Y_{i1} = \propto + X'_{i0}\beta_0 + \beta_1 T_i + \beta_2 Y_{i0} + \varepsilon_i$$

Baseline Characteristics

	Means				P-value of difference					
Variable	Control	T1	T2	T3	T1-C	T2-C	T3-C	T1-T2	T1-T3	T2-T3
Household Head Characteristics										
Years of Schooling	7.48	7.66	7.69	7.69	0.58	0.55	0.52	0.95	0.94	0.99
Female	0.16	0.19	0.20	0.13	0.52	0.28	0.40	0.66	0.14	0.06
Age	33.27	32.79	34.33	34.34	0.71	0.41	0.42	0.25	0.25	0.99
Mestizo	0.80	0.76	0.81	0.82	0.26	0.95	0.69	0.24	0.13	0.74
Household Characteristics										
Number of children 0-5	1.50	1.51	1.57	1.58	0.85	0.34	0.22	0.49	0.37	0.85
Number of members 6-14	0.76	0.86	0.82	0.68	0.38	0.55	0.46	0.77	0.13	0.20
Number of members 15-44	2.09	2.39	2.24	2.24	0.01	0.15	0.12	0.23	0.17	0.96
Number of members 45-64	0.26	0.19	0.35	0.28	0.22	0.16	0.70	0.01	0.12	0.32
Number of members >64	0.06	0.07	0.03	0.07	0.63	0.15	0.83	0.06	0.83	0.16
Index	38.31	38.14	37.09	37.54	0.86	0.22	0.44	0.33	0.58	0.68
Number of cases (households)	204	193	191	183						
Outcome variables										
Household caloric intake (daily)	7708	7703	7343	7325	0.99	0.35	0.37	0.38	0.39	0.97
Per capita caloric intake (daily)	1755	1652	1577	1576	0.25	0.04	0.06	0.37	0.41	0.99
Dietary diversity index	5.86	5.92	5.89	5.86	0.65	0.84	0.97	0.81	0.64	0.82
Children stunted	0.49	0.50	0.41	0.50	0.82	0.10	0.90	0.06	0.92	0.08
Children underweight	0.12	0.06	0.11	0.08	0.03	0.66	0.13	0.08	0.50	0.28
Hemoglobin	10.18	10.54	10.37	10.32	0.01	0.15	0.33	0.21	0.12	0.71
Number of children (six m to 3 y)	221	205	209	201						

Results: Consumption

	Per capita			Household level		
	Specif 1	Specif 2	Specif 3	Specif 1	Specif 2	Specif 3
T1						
Coefficient	-0.007	0.009	0.014	0.037	0.034	0.045
Standard error	0.074	0.068	0.068	0.072	0.068	0.066
Number of cases	336	336	336	336	336	336
T2						
Coefficient	0.078	0.081	0.089	0.132***	0.116***	0.116***
Standard error	0.076	0.071	0.071	0.075	0.071	0.07
Number of cases	338	338	338	338	338	338
T3						
Coefficient	0.026	0.077	0.070	0.055	0.091	0.064
Standard error	0.073	0.066	0.066	0.072	0.066	0.064
Number of cases	327	327	327	327	327	327
T4						
Coefficient	0.070	0.059	0.056	0.071	0.061	0.04
Standard error	0.073	0.069	0.069	0.073	0.07	0.068
Number of cases	328	328	328	328	328	328
T5						
Coefficient	0.025	0.055	0.050	0.01	0.048	0.008
Standard error	0.070	0.065	0.066	0.071	0.065	0.063
Number of cases	319	319	319	319	319	319
T6						
Coefficient	-0.041	-0.008	-0.007	-0.061	-0.019	-0.045
Standard error	0.071	0.067	0.067	0.073	0.068	0.067
Number of cases	321	321	321	321	321	321
T0						
Coefficient	0.029	0.046	0.049	0.075	0.074	0.065
Standard error	0.060	0.056	0.056	0.059	0.056	0.055
Number of cases	697	697	697	697	697	697

Dietary Diversity

	Specif 1	Specif 2	Specif 3
T1			
Coefficient	0.437*	0.43*	0.426*
Standard error	0.114	0.111	0.11
Number of cases	363	363	363
T2			
Coefficient	0.53*	0.541*	0.518*
Standard error	0.114	0.11	0.11
Number of cases	360	360	360
T3			
Coefficient	0.494*	0.501*	0.502*
Standard error	0.113	0.109	0.109
Number of cases	355	355	355
T4			
Coefficient	0.101	0.109	0.089
Standard error	0.1	0.098	0.098
Number of cases	342	342	342
T5			
Coefficient	0.072	0.077	0.094
Standard error	0.099	0.098	0.097
Number of cases	338	338	338
T6			
Coefficient	-0.045	-0.037	-0.013
Standard error	0.092	0.09	0.09
Number of cases	339	339	339
T0			
Coefficient	0.47*	0.471*	0.462*
Standard error	0.085	0.083	0.083
Number of cases	716	716	716

Chronic Malnutrition

	Specif 1	Specif 2	Specif 3
T1			
Coefficient	0.045	-0.01	0.021
Standard error	0.101	0.075	0.073
Number of cases	378	378	378
T2			
Coefficient	0.122	0.037	0.069
Standard error	0.107	0.072	0.066
Number of cases	383	383	383
T3			
Coefficient	0.002	-0.01	0.005
Standard error	0.109	0.084	0.078
Number of cases	377	377	377
T4			
Coefficient	0.07	0.054	0.043
Standard error	0.111	0.085	0.082
Number of cases	360	360	360
T5			
Coefficient	-0.072	-0.054	-0.069
Standard error	0.129	0.111	0.11
Number of cases	352	352	352
T6			
Coefficient	-0.155	-0.072	-0.096
Standard error	0.117	0.091	0.085
Number of cases	356	356	356
T0			
Coefficient	0.032	-0.009	0.013
Standard error	0.091	0.073	0.07
Number of cases	745	745	745

Anemia

	Specif 1	Specif 2	Specif 3
T1			
Coefficient	-0.062	-0.124	-0.077
Standard error	0.125	0.123	0.124
Number of cases	378	378	378
T2			
Coefficient	0.008	-0.011	0.029
Standard error	0.125	0.122	0.121
Number of cases	383	383	383
T3			
Coefficient	-0.067	-0.081	-0.068
Standard error	0.123	0.122	0.121
Number of cases	377	377	377
T4			
Coefficient	0.087	0.141	0.109
Standard error	0.14	0.134	0.133
Number of cases	360	360	360
T5			
Coefficient	0.005	0.044	0.021
Standard error	0.134	0.131	0.13
Number of cases	352	352	352
T6			
Coefficient	-0.093	-0.081	-0.108
Standard error	0.13	0.127	0.125
Number of cases	356	356	356
T0			
Coefficient	-0.037	-0.071	-0.039
Standard error	0.101	0.099	0.098
Number of cases	745	745	745

Conclusions

In this paper we evaluate the separated impact of different type of interventions on nutrition in Ecuador. By using an experimental design, we can differentiate the impact of a food voucher program, voucher plus a training program, and a voucher plus training and water purification system.

We evaluated the impact of these interventions on several outcome variables: consumption, dietary diversity, chronic malnutrition, and anemia.

We do not find any significant impact of intervention arms on consumption, chronic malnutrition and anemia. However, results do show that the food voucher program has a positive impact on dietary diversity. Impacts of the same magnitude are found for the training and the water purification program. The previous means no systematic differences between the three interventions, leading us to conclude that the most cost effective intervention is the voucher program.