Revisiting the determinants of Child Anthropometric Indicators Across Indian States

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Child Health

- Different from Adult health.

- Alma Atta Declaration, 1978 – primary health care.

- ICDS (1975), Declaration of child rights, Population policies, National policies on Women (1989).

- From 20th century, childhood was seen as worthy of special attention and many laws were passed to safeguard the children.

- The focus on child health was strengthened by the introduction of MDG's.

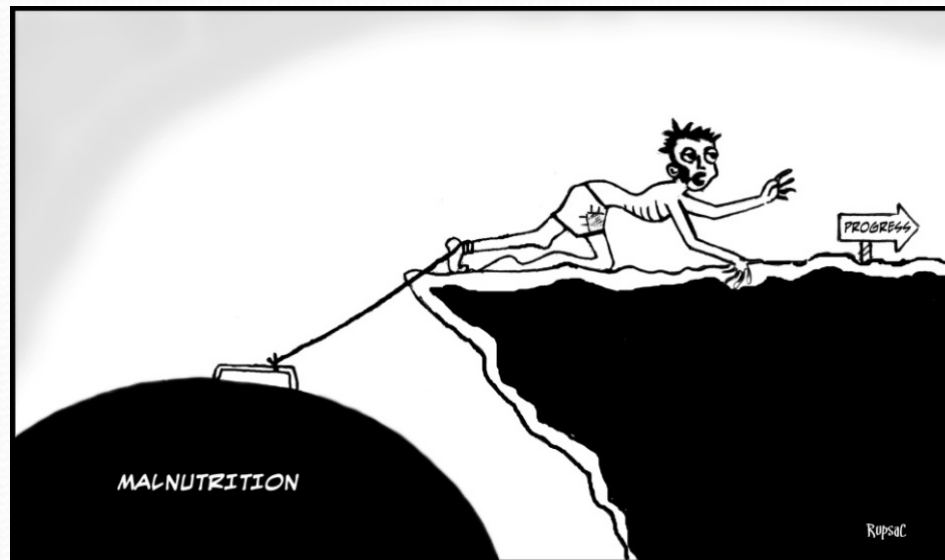- Several of the 8 goals are related to child health and education.

Trends

Current Status: India

% of undernourished : 53.5(1990) to 46%(2006);Expected to reach 40% (2015). Stunted(39%), Wasted(15%),Underweight(29.4%)

Target 28.6% (below)

Inter-regional paradoxes

- Each region varies in the performance of child health nutritional indicators because of different factors.

- South Asia moderate and severe stunting – 18% & Latin America it is 6% (GHI, 2015)

- Approximately 6.6 million children under 5 years of age died in 2012, mostly from preventable causes(SWOC, 2013).

- Uttar Pradesh has highest level of stunting- 50.2% and Jharkhand has highest level of underweight – 43% (RSOC, 2015).

Objectives

- The primary objective is to identify the predictors of child under nutrition indicators, *viz*., Stunting, Underweight and Wasting using a systems approach (Seemingly Unrelated Regression).

- In particular to understand the differences in the impact on the three indicators due to,

  a). Inter-generational transmission

  b). Feeding and care practices

  c). Interventions-Food Supplementation.

Conceptual Framework:

- Health is a choice variable and it determines the income levels and economic growth of the country.

- The common model of child health is that health is produced by family using health inputs where families try to maximize their utility function subject to the production function, prices, and budget constraints.

- For this study framework is drawn from Rosenzweig and Schultz(1983) & Mosley and Chen(1984).

- Rosenzweig and Schultz (1983) consider health as a consumption, which enters directly into utility function,–With three inputs such as

  - goods that affect both health and utility directly,

  - goods that affects only health and unobservable health endowments along with the given income and budget constraints,

  - the household production function with maximized utility can be brought into reduced form equations.

Conceptual Framework

- Specific health outcome equation for indicators- health production function and demand for health inputs and access to public resources (ICDS).

$ANTHRO_{ij} = f(X_{ij}\beta) + \varepsilon_{ij}$.................$i=1, 2,3$, $j=1,2....n$ Where

Where, $i=1=HAZ$, $i=2=WAZ$ and $i=3=WHZ$; f is a linear function;

X is the set of proximate and distal determinants of child growth which will be identified based on the data used for empirical evidence for this study;

beta is the set of coefficient estimates obtained from estimating the econometric model using the sample of (n) children in the database and ε_{ij} is the random error term.

These three equations are estimated through SUR techniques.

Data

NFHS-3 (2005-06) data of children 0-59 months was used.

Sample size- 38%- urban households and 67%- rural households.

As per WHO standards, Z-scores were calculated and adjusted for gender and age.

STATA 13 was used.

Methodology

- Seemingly Unrelated Regression is used

$$Y = X\beta + U$$

where, Y is a vector of y_1 is height-for-age (HAZ); y_2 is weight-for-age (WAZ); y_3 is weight-for-height (WHZ).

- Independent Variables – X consists of the vector of variables such as (Mosley and Chen framework),

  - Child variables - age, agesquare, gender, birth size, birth order, vaccination, short term morbidity, breastfeeding practices and types of food given to children.

  - Household variables - wealth, sanitation, religion, caste, occupation, quality of water, clean fuel, gender of the household head, rural/urban.

  - Mother characteristics - mother height, bmi, anemia, education, lost child/not, working/not, age of mother at first birth, women autonomy.

Preliminary Data Analysis

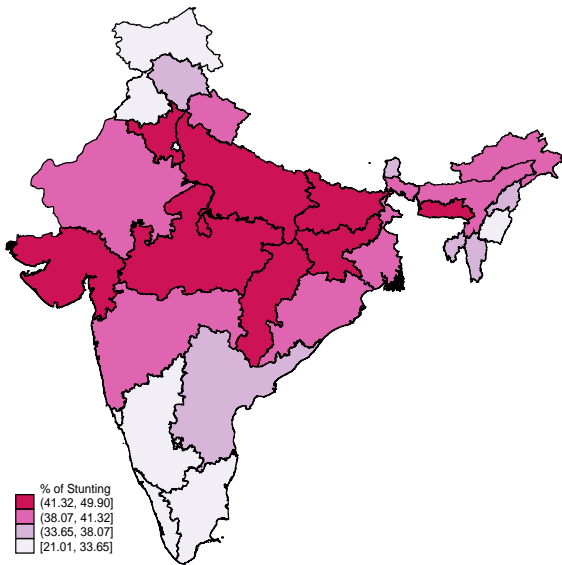**CDF of HAZ, Waz and WHZ**
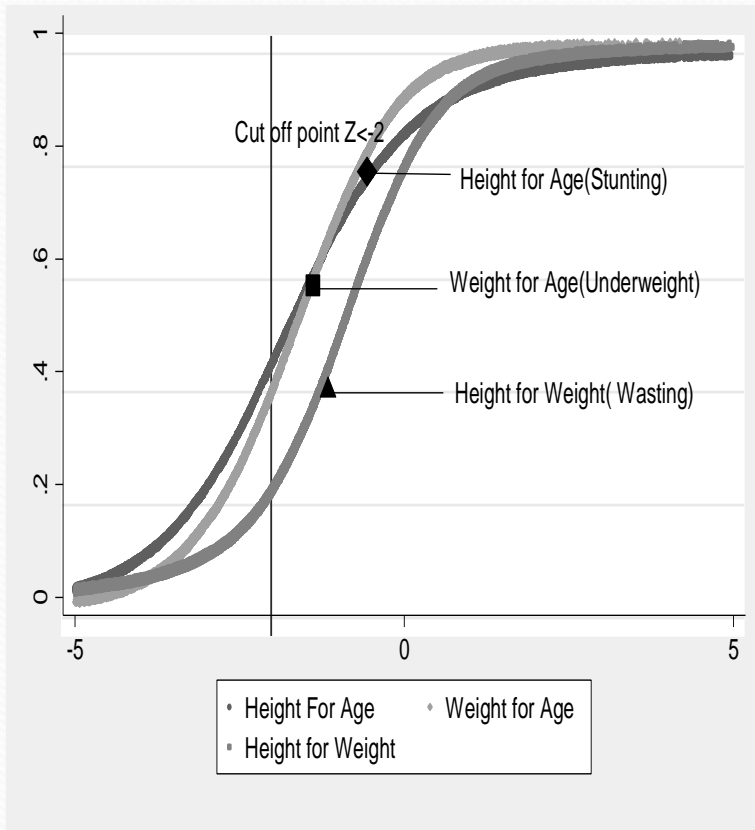
CDF of HAZ for Quantiles of Mother's Height
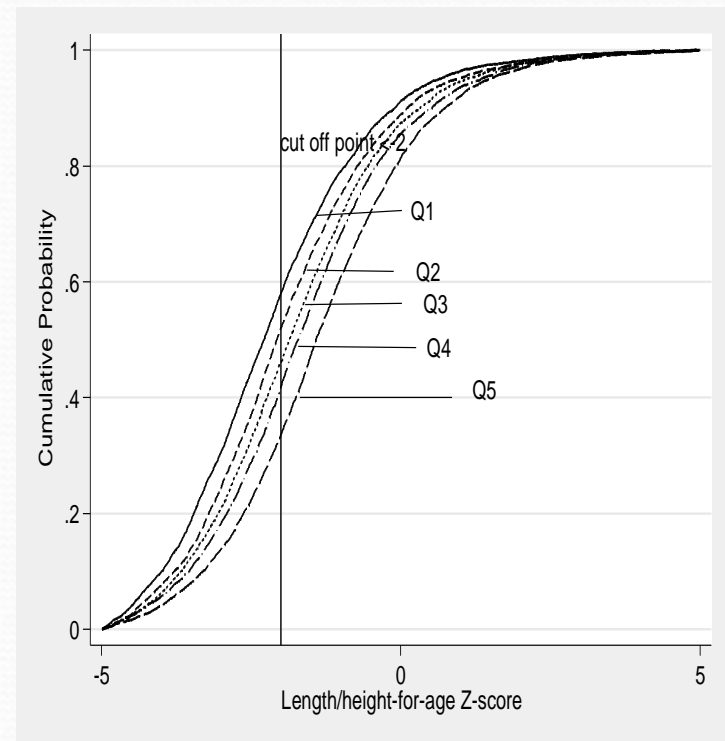
Preliminary Data Analysis

Inter-State Comparisons
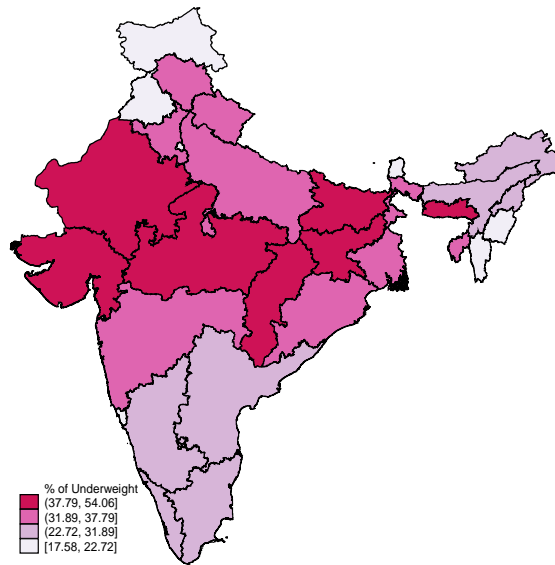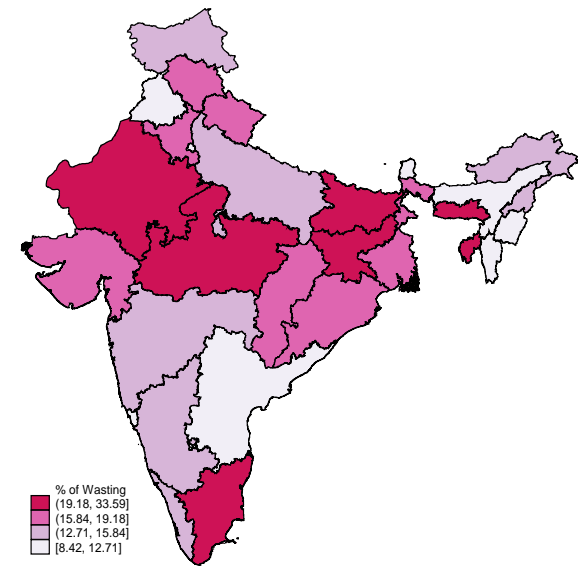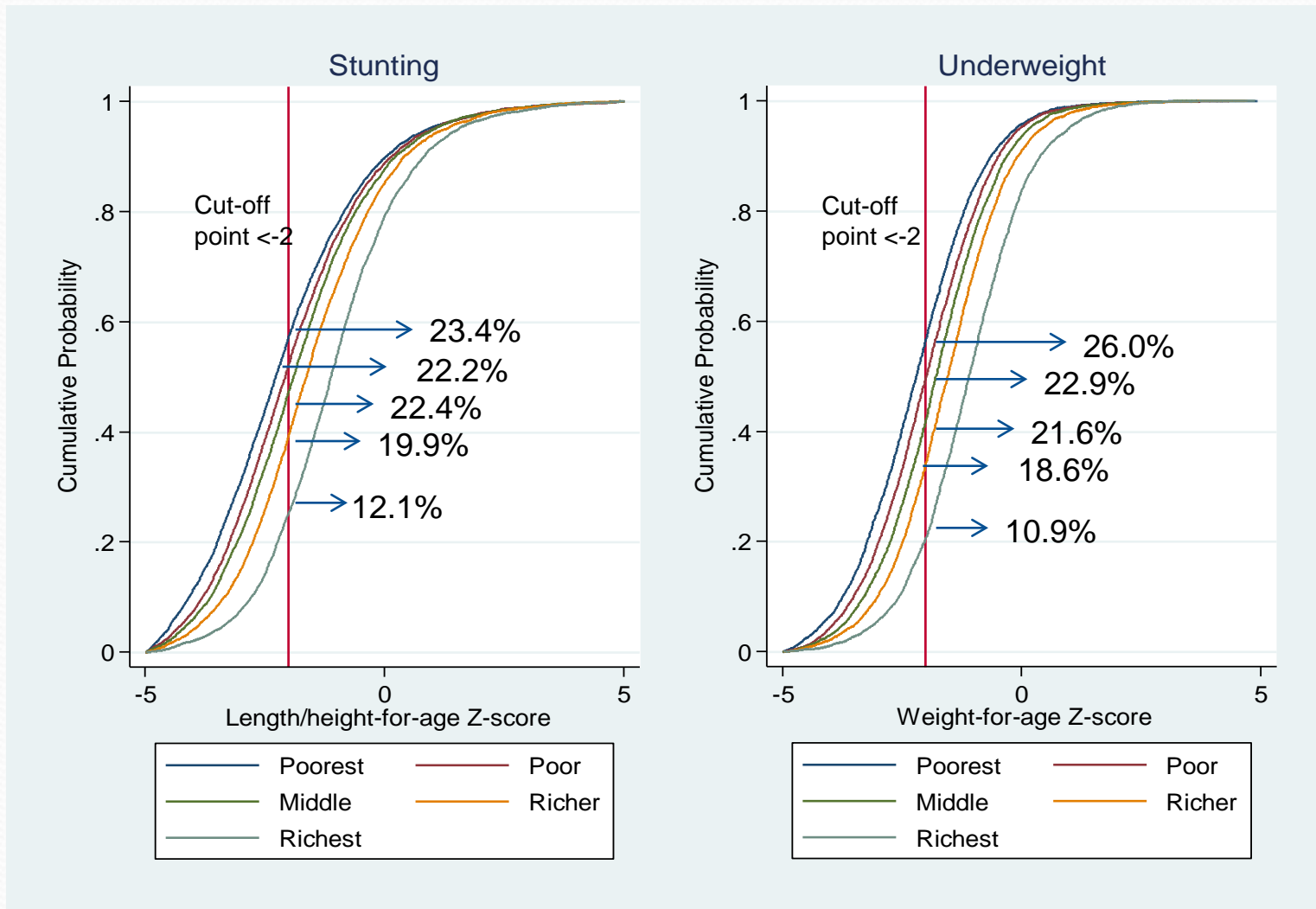

Stunting & Underweight (High)	Stunting , Underweight & wasting (High)
Gujarat, MP, UP, Chhatishgarh, Bihar, Jharkhand	Maharashtra, Bihar and Jharkhand.

Preliminary Data Analysis
Comparison across wealth groups

Intergenerational Transmission

Existing Literature:

- With data from Vietnam, for boys(60%larger than girls) maternal height is strongly correlated with child height after controlling for parental and socio-economic characteristics(Venkataramani, 2010)

- Another study in Bolivia shows that mother's height is important for child height rather than weight (Morales, 2005).

Key points of the results from my study:

- Compared to a child whose mother in 3rd quintile of height, the improvement in z-score is of the order of 0.3 for a mother in top most quintile.

- There is a significant jump in the HAZ coefficient once the mother's height crosses 160 cm.

- The large difference between the coefficients from Q4 to Q5 suggests an improvement in the z- scores of the children.

- Alternatively, the negative signs of Q1 reflect that those mothers are very shorter and difference between Q1 and Q2 for example in stunting (-0.3 to -0.1) affects the child nutritional status largely.

Results

Variables	Mother Characteristics		
	Height for Age	Weight for Age	Height for Weight
Mother Height Q3: ref			
Q1	-0.384***	-0.300***	-0.104***
Q2	-0.147***	-0.116***	-0.033***
Q4	0.109***	0.075***	0.022***
Q5	0.330***	0.243***	0.089***
Mother BMI 18.5-24.9: ref			
<18.5	-0.140***	-0.289***	-0.307***
25-29.9	0.114***	0.227***	0.242***
>30	0.203**	0.307***	0.268***
Age of mother at first child 11-14yrs: ref			
15-19	0.080*		0.006
19 & Above	0.133***		0.132**
Mother Education illiterate: ref			
Primary	0.122***	0.081***	0.023***
Secondary	0.148***	0.159***	0.103***
Higher	0.343***	0.343***	0.222***
Mother Occupation not working: ref			
Working	0.122***		
Mother Occupation not working: ref			
Self employed in agriculture		0.074**	0.129*
self employed in non agriculture		0.01	0.051
wage labour in agriculture		0.059*	0.104**
wage labour in non agriculture		0.026	0.04
Professional & Others		0.071**	0.092**
Mother Anaemic Severe: ref			
Moderate	-0.021	0.042	0.085
Mild	0.052	0.131*	0.166**
Not Anaemic	0.160***	0.174***	0.132**

Feeding & Care Practices

Existing Literature:

- A cohort study in Brazil found that children who are breastfed for more than 12 months are able to earn 1/3rd of additional education and income (Victoria, et.al, 2005).

- With composite feeding index, association between feeding practices and child nutrition was established for Latin American countries(Ruel and Menon, 2002, 2004).

- The striking work by Pande and Jayachandran(2000) points that if the first child is a boy, then the chances of children born later being undernourished are high due to minimal investment of time and care by parents by comparing India and Africa.

Key points of the results:

- ➢ Children who are exclusively breastfed for 0-6 months are well nourished, it has a huge impact on stunting (0.55) and if the breastfeeding started within 1 hour that also decreases the undernutrition rates.

Contd

- In the instance where mother's food frequency reflects mainly plant source food even though the child is reported to consume animal source food there is no differential impact compared to a household where there is a preference mainly for plant source food. This could be because in such households (second category) we find that animal source food is largely from egg consumption and lacks diversity in animal source food consisting of egg, fish, chicken and meat.

- These results only indicate that when plant sourced food may not be adequate in quantity and quality, animal based foods are good supplements and child growth would not be affected. This should not lead us to conclude that children who consume animal source food are more prone to undernourishment.
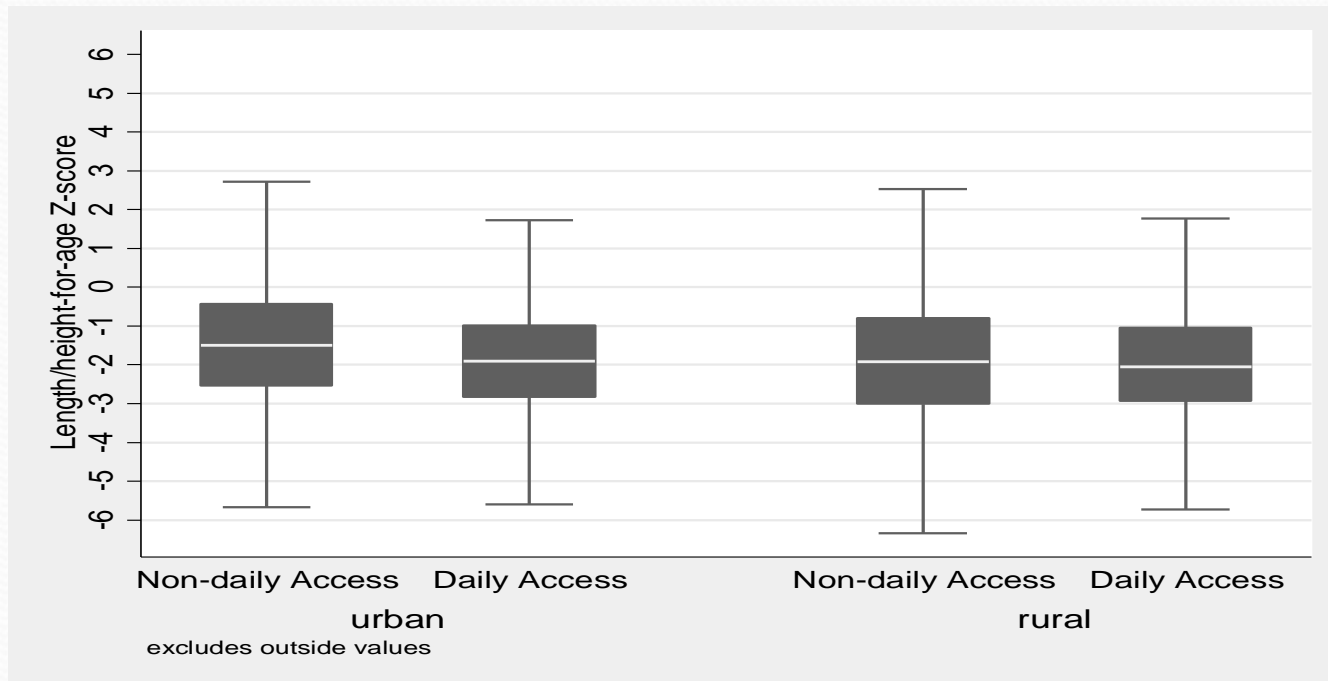
Results

Variables	Height For Age	Weight for Height
Age	-0.088***	-0.160***
Age square	0.001***	-0.001***
Gender of the child Male: ref		
Female Child	0.033*	0.068***
Birth size Very Large: ref		
Larger than average	-0.154***	-0.194***
Average	-0.182***	-0.181***
Smaller than average	-0.388***	-0.408***
Very small	-0.473***	-0.471***
Birth Order >=3 child: ref		
One child	0.070***	0.112***
Two children	0.042*	0.044*
Vaccination Zero: ref		
One Vaccination	-0.053	0.055
At least Two	-0.102*	0.04
Fever/Cough No: ref		
Govt. Hospitals	0.072	-0.078
Private Hospitals	-0.025	-0.084***
Others	0.122	-0.248
No treatment	-0.023	-0.043
Diarrhoea No: ref		
Govt. Hospitals	-0.097	-0.081
Private Hospitals	-0.077	-0.065
Others	-0.395*	-0.225
Oral Rehydration	-0.207***	0.019
No treatment	-0.111**	-0.054
Initiation Later 1 hr: ref		
Within 1 hour	0.042**	0.013
Exclusive breastfeed No: ref		
Yes	0.555***	0.041
*Mother *Child Food (Plant Source: ref)*		
MPs * CAs	0.107(0.733)	-0.002(0.994)
MAs*CPs	0.161**(0.023)	-0.023(0.734)
MAs*CAs	0.220***(0.005)	0.018(0.809)

ICDS Intervention

Existing Literature:

- Introduced in 1975 with objective to reduce malnourishment levels among 0-6 children and also pregnant and lactating mothers.

- Gap of 29.3% in coverage(PEO, 2011).

- Service delivery for the most of the young children are neglected and the States which remains poor in the performance of nutrition levels still have low funding and coverage (Gragnolati, et al., 2006).

- Jain (2014) focused on the utilization of ICDS program by taking into account the daily supplementary nutrition feeding component. Since the supplementary feeding for this age group (0- 2) is intense they focused on this age group and finds that girls of 0-2 years of age are at least 1.2 cm taller and boys 1cm taller than those who are not accessing it, but does not have any significant impact on morbidity or underweight.

Results

Daily Access to variable was interacted with rural areas and it was found significant for stunting with the coefficient 0.099.

Other Key Results

- Morbidity and treatment variables were interacted and for diarrohea ORS is significant than to other modes of treatments. In case of fever/cough, the impact is more visible for weight measures.

- Regarding household characteristics, sanitation variable (flush) compared with open defecation highly explains the correlation for height(0.09) & weight(0.07). This coefficients were increased after controlling for mother height, weight, education and occupation which shows that even though the prevalence of open defecation is high, other characteristics outweigh this.

- Other key variables like caste, religion, family size, vaccination are all significant.

Results

	Household Characteristics		
Variables	Height for Age	Weight for Age	Height for Weigh
Family Size Large family: ref			
Small Family	0.004	0.015	0.006
Caste SC: ref			
ST	0.002	–0.116***	–0.157***
OBC	0.046*	0.056***	0.045*
Others	0.137***	0.109***	0.037
Residence Rural: ref			
Urban	0.060**	0.050*	0.004
Wealth Poorest: ref			
Poor	0.177***	0.088***	–0.032
Middle	0.251***	0.171***	0.028
Richer	0356***	0.254***	0.042
Richest	0.601***	0.419***	0.066
Father Occupation Professional & Others: ref			
Self employed in agriculture	–0.081*	–0.058**	–0.015
Self employed in non agriculture	–0.094***	–0.058*	–0.033
Wage labour in agriculture	–0.116***	–0.086***	–0.027
Wage labour in non agriculture	–0.098***	–0.085***	–0.046*
Quality of water untreated: ref			
Treated Water	0.036	0.031*	
Sanitation Open Def: ref			
Flush	0.097***	0.078***	0.041
Pit	–0.013	0.015	0.029
Others	–0.025	0.064	0.092
Cooking fuel Dirty fuel: ref			
Clean Fuel	0.04	0.022	0.085**
Rural residents with daily access to ICDS	0.099***	0.032	–0.037
Constant	–0.503***	–1.276***	–1.290***

Summary of the results

- Age, birth order, birth size and gender are significant for all three indicators.

- The turning points for stunting is 44 months, for underweight it is 14 months and wasting it is 80 months where all three indicators increases, decreases and then stabilize at these months respectively.

- Vaccination is significant for wasting.

- Usage of clean fuel and quality of water is significant for underweight and stunting.

- Mother height and education is significant for stunting and underweight.

- Mother BMI is highly significant for all three indicators.

Policy Implications

- There should be long, medium and short term policies. For example open defecation cannot be eliminated immediately. But other practices such as hand wash, proper dietary habits, mother education, empowerment can be strengthened.

- Focus should be more on short and medium term policies so that the immediate problems will be solved

- ICDS penetration has to be increased.

- Both clinical and non-clinical intervention policies has to be properly devised and implemented.

Some People feel the rain; others just get wet.

Thank you.