Can the Major Public Works Policy Buffer Negative Shocks in Early Childhood?
Evidence from Andhra Pradesh, India

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December, 2012

Abstract

The study examines the role of the largest public works program in the world-the National Rural Employment Guarantee Scheme (NREGS) - in buffering the negative effects of early childhood exposure to rainfall shocks on long-term health outcomes. Exploiting the spatial and temporal variation in NREGS coverage, the study estimates the extent to which nutritional insults in early childhood can be offset in the presence of the policy. The study employs a unique identification strategy by integrating detailed administrative records of drought shock and phase-wise roll-out information of NREGS with a household level panel data-the Young Lives survey- conducted over three waves (2002, 2006-07 and 2009-10) in the state of Andhra Pradesh, India. Using child fixed effects estimation the study finds that while the policy does not help correct long term past health deficiencies it is useful in buffering recent drought shocks, which varies by policy relevant sub-groups.

JEL Classification: I18, J13, O22

Keywords: Child malnutrition, Drought, Height-for-age, NREGS, Catch-up

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I. Introduction

Exposure to negative shocks in early childhood is known to significantly affect the health and educational outcomes of the population, more so in developing countries. Increased climatic variability over time poses special challenges for child nutrition especially among subsistence farmers depending on rain-fed agriculture. Additionally, there is no operational practice to forecast drought (Gore et al., 2010) where such an event may often lead to adverse outcomes of loss of land rights against debt and declining nutrition levels for the poorer majority of population. In developing countries market imperfections prevent households from smoothing their consumption over time that can often compromise caloric intake affecting child growth. With a large proportion of households depending on agriculture -a highly volatile source of subsistence- the effects may be worse for the rural poor who often lack formal credit markets to smooth consumption. In such a setup, rainfall shocks can lead to substantial reduction in household income, which can significantly reduce investments in children often compromising their calorie intake. This is a serious concern as the investments in early childhood can have significant impact on the human capital attainments and achievements as adults (Hoddinott and Kinsey (2001); Maccini and Yang (2009)). While the long term consequences of malnutrition during childhood are well established in the literature little is known about the extent to which individuals are able to mitigate some of the deficits in health outcomes under the availability of social protection schemes.

Although stunting might be permanent when nutritional deficits begin early, nutritional remediation can still take place as long as the critical period for growth remains open. Therefore, it is important to study the vulnerability that a child faces when exposed to shocks that risks child nutrition and health by a decline in household income/food availability. Further it would be very important to identify the extent to which individuals are able to compensate and offset these negative effects when a social safety net is in place and examine additionally whether the mitigation varies by policy-relevant demographic subgroups.

Employment generating programs are expected to support vulnerable households assuring nutrition security during such downturns. While there exists a body of literature exploring the effects of early childhood shock on human capital outcomes, the issue of its potential mitigation under a public intervention is relatively under studied. Furthermore in the context of the major public-works policy in India, studies have mainly focused on targeting of the scheme and labor market impacts as opposed to examining its role in social protection. In this study we examine the effects of negative rainfall shocks on children's long-term health outcome in rural Andhra Pradesh, India and shed light on the impact of the access to the National Rural Employment Guarantee Scheme (NREGS). Using panel data from the Young Lives Survey following children over eight years and linking them with very detailed administrative records of both rainfall shocks and the policy availability, the estimates indicate that while drought has significant and strong negative impact on height-for-age of the children, the availability of this program proves significant in mitigating the negative impacts from the very recent drought shocks but are unable to correct for longer-term past deficiencies.

This paper contributes to the existing literature on a number of aspects. First, utilizing a rich set of detailed data on weather shocks and policy coverage the study is one of the first few ones to examine causal impacts of a policy in being able to correct for past deficiencies relevant to child health in the long-run. While there exists a body of literature exploring the effects of early childhood shock on human capital outcomes, the issue of how its effect can be mitigated under a public intervention is relatively under studied. Examining this mitigating effect on child growth requires sufficiently integrated data sets to deal with the methodological difficulties in addressing the bias from self selection into the program. Unlike past studies, I collected[2] and used very detailed information at the mandal-level (sub-district level) for rainfall shocks, program availability, and community level measures of health-infrastructure that varies with time. This enabled to control for a host of factors that influence child health independently, thus accounting for any unobservable inherent differences in families who participate and reducing the selection problem. Second, the existing literature for developing countries has mostly focused on a rather extreme health outcome - child mortality, while we are able to focus on malnutrition/child-stunting among survivors. Furthermore, we are able to use anthropometric measures of the same child at different ages and control for inherent healthiness as opposed to using self-reported health outcomes. Third, while existing studies on the major public-works policy in India mainly focused on targeting of the scheme this paper is one of the very first few ones to examine its causal impact on catch-up growth in children, following them over eight years. Finally, we are able to comment on the differential impact of the mitigation across the demographic features of the child like age, gender, caste, her mother's education, which again is crucial for policy insights.

In the next section, we discuss the background and implementation of the NREGS in India. In section III we lay out the conceptual framework for the study and discuss our estimation strategy to find how long-term health evolves under shocks and its potential mitigation under social protection policy. In section IV we lay out the empirical specification, section V

[2] I collected and complied the mandal-level information of rainfall and health facility over time from various years of Handbook of Statistics for each sample district in Andhra Pradesh by visiting the Directorate of Economics and Statistics, Government of Andhra Pradesh in Hyderabad.

describes the datasets we use and provides the relevant descriptive statistics. Section VI presents the main empirical results along and brief discusses the policy insights.

II. The Program: National Rural Employment Guarantee Scheme (NREGS)[3]

The National Rural Employment Guarantee Scheme (NREGS), which is now the largest public works program in the world, came into force in February 2006 under the legislative framework of the National Rural Employment Guarantee Act (2005). It provides a legal guarantee for 100 days of employment in every financial year to adult members of any rural household willing to do unskilled manual work at the statutory minimum wage of Rs.120[4] (US$2.64) per day in 2009 prices. Employment is given within fifteen days of application for work, if it is not then daily unemployment allowance is paid (GOI, 2008). Wages are required to be disbursed generally on a weekly basis but it cannot be beyond a fortnight[5] after the work has taken place. By 2010, the National Rural Employment Guarantee Act (NREGA) reached 52 million households across the country, making it by far the largest social protection program in the world (Vij, 2010). During 2010–11 Andhra Pradesh provided 274.8 million person days of employment (Galab et al. 2011). We discuss several important features of the policy important for our empirical strategy.

(i) Public-works as a safety net

NREGS was introduced in India with an aim of improving the purchasing power of the rural people, primarily providing semi or unskilled work to people living in rural India, whether or not they are below the poverty line. The purpose of this scheme is to create strong social safety

[3] NREGA is now known as MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act)
[4] In comparison, farm wage typically hovers around of 100-150 rupees depending on agricultural season.
[5] Although according to the PACS-CSO survey(2007) , the majority of workers received their wages within 30 days for the aggregate sample of Indian state

net for the vulnerable groups, increase female labor-force participation, create durable and productive assets[6] in rural areas that encourage sustainable development and reduce rural-urban migration. The evaluation report from Ministry of Rural Development (2011) finds the policy resulted in reduction in the distress-migration of labor and a rise in expenditure on food and non-food items, which again can have strong associations with child growth.

In India, for the case of the major public works policy in India, Zimmerman (2012) finds NREGS has led to a substantial increase in the private-sector casual wage for women, the effects being concentrated in the main agricultural season. A number of studies point that women's independent income benefits household nutrition and child health, both through increase in household income as well as through an increase in women's status, autonomy and decision-making power specially those relating to nutrition, immunization and feeding practices(Smith, 2001). Uppal (2009) reports positively about the self-targeting mechanism under the NREGS and notes that poorer and 'lower' caste households are more likely to register for this work which had significantly reduced the likelihood of children in the household being required to work.

While there have been some recent studies on NREGS reflecting on issues of its targeting, increased participation benefits accruing to women (Khera et al. 2009, Azam 2011), or to scheduled caste (SC) and scheduled tribe (ST) households (Drèze et al. 2009), there has been little empirical evidence exploring its potential role in serving as buffer against negative shocks. Most of the existing literature on workfare schemes evaluate targeting outcomes in terms of average incidence across income sub-groups. Specifically, this paper extends this current debate

[6] However as have pointed out by the recent World Bank report (2011) the objective of asset creation runs a very distant second to the primary objective of employment generation, it has been the case that the policy has only been successful in generating employment but not so in terms of asset creation.

in India on the role of NREGS as a safety net and finds causal evidence that supports preliminary findings of positive benefits of NREGS on households.

(ii) Gender-sensitive component of NREGS

The scheme promotes women's participation in the labor force through a one-third quota for women in each state and also guarantees equal wages to both men and women workers. According to the official records for NREGS, the share of women workers was found to be greater in Andhra Pradesh than nationally in 2011(National average share for women being 50.1 %, while in Andhra Pradesh it is 57.5 %). Since the prospects are typically worse for women in private casual wage work in India the provision of equal wages should have positive impacts on female participation. As argued by Azam (2011) and Imbert et al. (2011) , using NREGS has a sharper impact on female labor force participation[7] than that of males. In order to encourage participation from mothers with very young children, the program makes the presence of child care facilities mandatory[8] at all sites where more than five children under the age of six are present.

(iii) Implementation of NREGS

The Government has implemented the scheme in phase-wise manner making use of a 'backwardness index' -comprising agricultural productivity per worker, agricultural wage rate, and Scheduled Caste/Scheduled Tribe population, developed by the Planning Commission. Figure 1 illustrates the phase-wise[9]rollout of NREGS in the state of Andhra Pradesh.

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[7] Khera et al(2009) points that NREGA wages implied a substantial jump in the earning potential for women at the national level.

[8] In spite of this provision the program has only 8.74% of registered respondents reporting the availability of on-site child-care center (Galab, 2008).

The first phase of the scheme was rolled out in 200 districts of the country from February 2006. In phase two, additional 130 districts were included from April 2007 (total 330 districts). From April 2008, in phase three, it has been universalized and extended to all 596 rural districts in the country. For Andhra Pradesh the program roll out expansion across all its districts is shown in Table 1- first of all to 13 districts in 2005, then to a further six districts in 2007 and three more districts in 2008, to cover all 22 districts in the state. Two out of six rural districts covered by Young Lives fell within the second and third phases, and in these two districts a large proportion of the Scheduled Tribe households are covered. Importantly for our identification strategy, four of the Young Lives sample districts (comprising of 11 mandal sites) were covered by the NREGS in the first phase of implementation in 2005-06 (Anantapur, Mahaboobnagar, Cuddapah, Karimnagar), with the addition of one more sample district(comprising of 4 mandal sites) –Srikakulam- in 2007, coinciding with second phase of implementation, and lastly the district of West Godavari(two mandal sites)was included in 2008- coinciding with phase three of the program expansion.

III. Conceptual Framework: Shocks, Child Vulnerability and Remediation

In order to discuss the potential impacts of the employment guarantee scheme on child outcomes in a simple analytical framework, the underlying hypothesis examined in this study is that direct positive income from wages earned from public work can feed into child investments in an otherwise situation of crises protecting the long-term health status. This is expected to be even more beneficial in a situation of drought in a rural setting with very limited outside opportunities to fall back on.

'Drought' in most cases refers to receiving lower than long-term average rainfall extending over weeks, months or even years. The Indian Meteorological Department declares rainfall as 'deficient' if the rainfall is 20% below its long-term average (IMD, 2002). In 2009, around half of the districts were declared to be drought affected in Andhra Pradesh[10], the state -where over 80 per cent of the population depends on agriculture. Stunting[11], or low height-for-age, is a measure of chronic malnutrition and is generally considered a long-term indicator for health status. Earlier studies have pointed that stunting might be permanent when nutritional deficits begin early and are prolonged. Hoddinott and Kinsey (2001) find that droughts in rural Zimbabwe occurring between the ages of 0 and 12 months lead to reductions in child height when measured 12 months later. Maccini and Yang (2009) find a strong relationship between rainfall in the birth year and adults' health and socio-economic outcomes for women but not for men in Indonesia. Almond et al.(2011) points that even relatively mild prenatal exposures can result in lower birth weights, which can have persistent effects.

However, the medical literature evidence points that there exists biological potential for catch-up in response to clinical interventions, which is explored in some studies focusing on catch-up growth (Deolalikar, 1996; Fedorov and Sahn, 2005; Alderman et al, 2006; Mani, 2008). Martorell et al. (1994) survey evidence from medical literature and find evidence of catch up growth when living conditions are improved, especially for younger children. Outes et al.(2012) point that nutritional remediation can take place and catch up growth can be achieved as long as

[10] Andhra Pradesh is the fifth largest state in India, with a total population of 84.66 million – 73 % of whom live in rural areas (Census 2011).

[11] The rate of stunting is severely high in developing countries including India -having the highest number of stunted children below the age of 5 in the world (Unicef 2009). In Andhra Pradesh, according to National Family Health Survey (NFHS-3, 2006) prevalence of malnutrition among children (0-59 months) is very high (32.5% underweight 42.7 % stunted and 12.2% wasted).

the critical period for growth remains open. Few studies in this regard point the potential for early nutritional intervention in accelerating growth. Schroeder et al. (1995) find that nutritional supplementation has a significant impact on growth for kids under 3 year olds in Guatemala. Yamano et al. (2005) emphasize in the context of rural Ethiopia, that food aid can compensate the negative effects of early shocks, but that inflexible targeting, endemic poverty and low maternal education often keep stunting at high levels despite such interventions. In Mexico, it was found that conditional cash transfer protects education, particularly that of girls, and thus fosters the formation of human capital, offsetting shocks such as parental unemployment or illness (de Janvry et al., 2006).In terms of the evidence base of social protection policies, a recent systematic review of Hagen-Zanker, et al. (2011) points out that there are significantly more studies available on cash transfers than employment guarantee programs, indicating further need for more studies on the impacts of the later.

In this context, it is immensely important to see to what extent the recent large scale public-works intervention in India- in the form of provision of an employment guarantee scheme for rural households in India- is enabling the individuals to buffer negative shocks and correct nutritional deficiencies in early childhood.

IV. Empirical Specification and Identification

The outcome variable in our current analysis is Height-for-age z-score[12] which is a standardized measure of health status and is a well established long run indicator of individual health status

[12] This analysis uses height-for-age z-score as an indicator of catch-up growth following the rationale pointed by Cameron, Preece and Cole (2005). First, they note the correlation between baseline and follow-up height is dependent on the ratio of height standard deviations of the two measurements, which in contrast, z-scores are not subject to, as they already take into consideration reference groups of equal age and sex. The second justification is that demonstration of catch-up growth needs to be compared with growth in a control group, which z-score measurement fulfills but a single height measurement does not. Third, the authors note that by using z-score measurements, catch-up growth may be separated from correlations predicted by regression to the mean.

especially among children (Martorell, 1999). It shows the height of the child relative to an international reference group of healthy children. Since height is a stock variable that reflects all past inputs into child health including the impact from past shocks and effect of the child level unobservables, it gives a cumulative picture of the child's overall growth status.

We mainly define drought shocks in two ways: first capturing a cumulative measure for past rainfall shocks by the fraction of years where rainfall is below 20% [13] of the long-term average at mandal level (cumulated from birth year till the point in survey). Second, we have a drought measure capturing recent shock: receiving lower rainfall than long term average for a mandal in the previous year to the survey.

Since the policy is first targeted to the poorer districts and also involves voluntary participation from households, there can be potential selection bias in estimates arising from individual specific unobservables influencing both the outcome variable and treatment. By including child fixed effects we could reasonably reduce these individual-specific but time invariant unobservable heterogeneities and address the selection bias. Besides genetic factors, the fixed effects approach helps explore the dynamics related to the persistence of shocks across individuals controlling unobserved heterogeneity between families that influences height. Thus we model the determinants of long-term child health as reflected by height-for-age z-scores status as follows:

(1) $H_{it} = \beta_1 \text{ Drought}_{it} + \beta_2 \text{ Coverage}_{it} + \beta_3 (\text{Drought}_{it} * \text{Coverage}_{it}) + \Sigma \beta_j X_{jit} + \alpha_{it} + \varepsilon_{it}$

where t=survey rounds 1,2,3; i= 1,..,N

H_{it} is the child's height-for-age z-score measured at time t(survey rounds). Drought $_{it}$ represents the rainfall shocks affecting the location of the i^{th} child. Coverage is access to NREGS. While

[13] The Indian Meteorological Department declares rainfall as 'deficient' if it is 20% below its long-term average

we do not focus on the independent impact of coverage on households, the key variable in our analysis is the interaction term which permits us to analyze how effective is the program in protecting child health during shocks. Thus the parameter of interest is β_3. Precisely, a positive and significant β_3 would indicate that the negative effect of drought exposure on child health status is mitigated by the policy access. We saturate the regression equation (1) with all the relevant controls which can change over time and have independent influence on health status like receiving external food supplement and community health infrastructure. X_j's are time-varying regressors which include age of the child, health inputs, community resources. α_{it} represents the child fixed effects. The time-invariant regressors like sex of the child, mother's schooling, ethnicity of the household gets washed away in the child fixed effects specification. While there is agreement that the make-up of health is highest in early childhood, estimates of mitigation can differ widely by a number of factors, such as severity, duration of the shock exposure, stage of development of the child at the start of malnutrition, gender of the child, household level demographics like education of the mother/caregiver, caste of the household. Thus we separately explore whether the program has differential impacts by the policy-relevant population sub-groups.

In estimating the effect of employment scheme in buffering health outcomes there can be a potential serious problem of selection that arises at two levels, first from the targeted roll-out of the program and secondly from the self-selection mechanism[14] by which the scheme operates giving rise to potential econometric issues. The issue of self-selection cannot be simply done away by using administrative records of roll-out as the roll-out phases were determined

[14] Uppal (2009) finds that households hit by drought are 10.7% more likely to register for the NREGS than other households.

according to the backwardness index of the district. Also, within a particular mandal if the most poor households self-select into the scheme, then simple regression estimates without the individual fixed-effects might give under-biased estimates. In contrast if the more informed and well-connected households (among the poor households who are aware of the scheme) take advantage of the scheme first then estimates without fixed effects might over-bias the impacts of the scheme. Investment decisions about the amount of inputs to use depend on, among other things, the health endowment of the child. It might be that a weak child may attract more attention and inputs from parents in an attempt to ensure his or her survival. Additionally, the overall level and mix of inputs depends on the parental preferences for health, which if not controlled can result in biased estimates. By using child-fixed effects estimation we could reasonably reduce these individual-specific but time invariant unobservable heterogeneities. Besides genetic factors, the fixed effects approach also neutralizes additive effects of other unobserved heterogeneity between families, like heterogeneity in terms of location, family structure, traditions, values norms, habits, wealth and household practices that influences height. However accounting for time varying characteristics across households would be more challenging.

Here since we are identifying coverage from administrative records rather than self-reported measures of participation, the analysis is based on the treatment that the households were intended to receive and not on actual participation. Thus, based on the intent to treat approach and not the household choice to take up this opportunity, we evaluate our research questions. Moreover by identifying drought at the mandal level (rather than measuring the intensity of the drought reported at the household-level), we have mitigated the reporting bias and some selection bias(from family-specific unobservables related with exposure variables) but have also introduced a source of measurement error and caused a potential attenuation bias in the estimates. Even though droughts are categorized as covariate shocks which simultaneously affect households over large geographical areas (and in spite of the fact that we do have very detailed mandal-level rainfall data), they are unlikely to affect all households equally in a given community. Precisely the household-level impact of a drought will depend on the occupation type among household members, availability of alternative irrigation sources, availability of alternative livelihood, access to safety nets, etc.

V. Data and Descriptive Statistics

The current study uses a unique household panel data set: Young Lives Survey from Andhra Pradesh, India- which is a longitudinal data set collected through household surveys conducted over three waves (2002, 2007 and 2009-10). For our study we use the longitudinal information of children who were aged 6 to 18 months in 2002. The sample comprises of 20 sub-districts or mandals from seven districts spread across the state. The sampling strategy was based on randomly selecting 150 children within 20 clusters or mandals spread across Andhra Pradesh[15]. The sample consists of 7 districts (including 103 villages) from the state to represent the different regions[16] and income levels within the state. Overall attrition by the third round was 2.2%[17] (with attrition rate of 2.3 per cent for the younger cohort) over the eight-year period. The information on coverage of the scheme is obtained again from the administrative database,

[15] Andhra Pradesh is divided into 23 administrative districts that are further subdivided into 1,125 mandals and 27,000 villages.

[16] Andhra Pradesh has three distinct agro-climatic regions: Coastal Andhra, Rayalseema and Telangana. The sampling scheme adopted for Young Lives was designed to identify inter-regional variations with a uniform distribution of sample districts across the three regions to ensure full representation.

[17] Attrition in the Young Lives sample is low in the international comparison with other longitudinal study (Outes and Dercon, 2008)

which has a detailed information of the NREG scheme expansion (month-wise mandal-wise records of the average number of days of employment provided, projects undertaken, percentage of women participation, number of years the program has been running in that administrative division etc). We construct a variable 'Coverage' which measures the average number of work days under NREGS per household for a particular mandal. We also have self-reported measures of program participation and use that to create a finer measure for program coverage .We refine our coverage variable(average number of days provided under NREGS per household in a mandal) using information on actual participation from the household survey data and construct variable 'NREGS'. We declare it to be zero where participation from a mandal is less than 5 percent.

Four of the Young Lives sample districts comprising of 11 sub-districts/mandal sites were covered by NREGS in the first phase of implementation in 2005-06, with the addition of four mandal sites in 2007, coinciding with second phase of implementation, and lastly with two more mandal sites were included in 2008- coinciding with phase-III of the program expansion. So, essentially in round two of the survey only phase-I districts were 'treated' while both phase-II and III were not covered. By the third round, all the sample districts were covered, although there remains variation in the number of employment days available by mandal. We restrict the sample to 4289 observations keeping households that are present in all the survey rounds and complete information on all control variables and excluding potential outlier cases with Height-for-age z score beyond the [−5, +5] range. Since, the employment guarantee policy is only relevant for the rural sector we focus on rural sample comprising 17 mandals and use the urban sample for robustness check.

We saturate the regression equation (1) with all the relevant controls which can change over time and have independent influence on health status like external food supplement (Food), community health infrastructure(Health Facilities). We include the following time varying observables that can be controlled- the exact age of the child at the time of interview, number of health care units in the community (mandal-level), whether child has been a part of supplemental food program in ICDS[18] centre/mid-day meal[19]. Both of these food supplement programs were universalized across the country much ahead of the NREGS policy implementation and are not associated with the availability of the employment guarantee scheme in a mandal. For household education we construct the variable 'Primary' measuring whether the caregiver has completed primary school. The 'Food Supplement' is a binary variable constructed from self-reported measures that takes value 1 if the child received food under the ICDS[20] scheme between round 1 and round 2 or if the child availed mid-day meal[21] scheme between round 2 and round 3 (i.e. when the kids are school going age). There exists variation in terms of health infrastructure across communities which might be related with health outcomes of child. We therefore control for the community health infrastructure which we proxy by the number of health facilities (both government and private hospitals) present in the mandal. This information on health facilities is obtained from the administrative records of Directorate of Economics and Statistics, Government of Andhra Pradesh. This information was

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[18] Launched in year 1975, Integrated Child Development Scheme (ICDS) supplementary feeding is supposed to provide support to all children 0-6 years old for 300 days in a year (25 days a month).

[19] The Midday Meal Scheme is a school meal program in India which started in the 1960s was universalized by 2002. It involves provision of lunch free of cost to school-children

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collected and complied from handbook of statistics for different districts in Andhra Pradesh for different years.

We show the descriptive statistics in Table 1 by phase-wise sites (phase II and III have been clubbed together as none of these received the program by the second round and can be treated as controls). We use annual rainfall data from the administrative records and health facilities disaggregated at the mandal level obtained from the Directorate of Economics and Statistics, Government of Andhra Pradesh.

Table1. Descriptive Statistics

Variable	Phase I		Phase II and III	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Outcome Variables				
Height-for-age	-1.62	1.24	-1.63	1.09
Stunting	0.38	0.12	0.36	0.10
Program Variable/Shocks				
Coverage (Average Days)	26.77	22.41	13.99	20.92
Participation Percent	0.44	0.33	0.22	0.31
NREGS	26.77	22.41	13.26	21.04
Drought	0.56	0.50	0.67	0.47
Severe Drought	0.39	0.49	0.20	0.40
Cumulated Drought	0.45	0.25	0.65	0.17
Cumulated Severe Drought	0.30	0.22	0.25	0.17
Child Level Variables				
Food Supplement	0.43	0.49	0.62	0.49
Age	4.82	2.88	4.84	2.90
Male	0.53	0.50	0.52	0.50
Household Characteristics				
Primary Education of Household Head	0.25	0.43	0.54	0.49
Caste	0.16	0.37	0.10	0.30
Community Characteristics				
Health Facilities	1.88	1.18	3.63	1.23
Observations N=4289	**2831**		**1458**	

We find that the anthropometric status of children – as measured by height-for-age – deteriorates between the time of birth (round1) and 5 years of age (round 2) for all phases-wise locations(Figure2,3,4). We have 66 % of our total rural sample from the phase I locations. As discussed earlier, the phase I mandals got access to coverage by April 2006, phase II mandals by April 2007, and Phase III mandals by April 2008.

In round 1 of the survey the average height-for-age z-score in phase I mandals was -1.20, which substantially went down to -1.84 in round 2 and recovered slightly to -1.81 in the third round. It should be noted that the urban locations from all the districts were dropped from the current analysis, however the calculation of backwardness index on the basis of which coverage was rolled out in a particular district included these locations. Thus, it is not surprising, in spite of being slightly higher in rank in the backwardness index as a district, for the remaining rural sample locations under phase II, the average height-for age was slightly worse off than that of phase-I. However, for phase-II, the mean height-for-age z score went down from -1.50 to -1.70, which again went up to -1.66 in the third round. Unlike the other two phases, for Phase III, the mean height-for-age z score went down for all the rounds from -1.55 to -1.74 between the first two rounds and then to -1.84 in the third round. We present briefly the discussion of the findings in the following section.

VI. Discussion of the Findings and Policy Insights

All regression specifications with height-for-age as outcome variable includes child fixed effects, and regressions with average stunting percent at the mandal level include mandal fixed effects. Table 2.1 shows the regression estimates of cumulative drought shock, program availability and their interaction on Height-for-Age for child-fixed effects specifications. In both specifications (1) and (2) we include cumulated past drought shocks, with different degree of severity. We find that regardless of how we specify severity of drought, it has significantly strong negative effect on height-for-age. In both specifications we control for child age, supplementary food intake and community health facility. We use robust boot strapped standard errors clustered at the level of treatment -here at the level of mandal. The interaction term of program and drought although positive (suggestive of mitigation) is not significant in either model (1) or (2). However, we find the food supplement variable to have a positive and significant effect on height-for-age in both the specifications, reiterating the importance of nutrition. In Table 2.2 we include the recent exposure to drought [22]to examine whether the policy is at least able to serve as buffer in this case. We find that while even recent exposure of mild drought significantly affects the height-for-age around .4 standard deviations, the program serves as a significant buffer against these shocks, increasing the height-for-age z-score by around .26 standard deviations for those who suffered from the shock, thereby mitigating some of its negative impact. We use the refined measure 'NREGS' (corrected for low participation) and find similar impacts as specification (1). As a further robustness check we repeat specification (1) for urban sites (the idea being that the availability of the program will not be affecting the urban households) in specification (3) and find no buffering effect of program availability as per our expectation.

In Table 2.3 we carry out a similar exercise with the outcome variable of average stunting[23] defined at the mandal level to see the impact of cumulative shocks and recent shocks and the program mitigation. Specification (1) and (2) include cumulative drought shocks and specification (3) includes recent drought. We find similar results compared to that of height-for-

[22] Drought is receiving less than the long term average rainfall at mandal in the year prior to survey
[23] Stunting is a dummy variable with Height-for-age less than -2 standard deviations

age. We find the level of stunting increases by around 8% with exposure to even recent mild drought. We run a robustness check for the main findings on stunting level in Table 2.4. We find program access leads to .3 standard deviation improvement in stunting for locations suffering from drought last year.

In Table 2.5 while there is similar impact of drought and program impact by gender, we find food supplement although positive for both, is highly significant for female children with a .17 increase in standard deviation for height-for-age significant at 1%.

In Table 2.6 we examine the impacts by caste groups. While there is a greater negative impact of drought exposure for the backward caste children we find the availability of program is significant in serving as buffer for these groups. Also, notable is the fact that food supplement is positive and significant for lower caste children as per our expectation. In Table 2.7 disaggregating the results by education level of the caregiver we find that drought has a strong significant negative impact of drought exposure on children with caregiver's education level is below primary level. Also, notable is the fact that it is only for the this group that the food supplement variable is significant as well. The impact of drought although negative is not found to be significant for those kids where caregivers have higher than primary education. However there seems to be similar impact of program availability across these groups.

In general we find the access to program per se is not significant across specifications, but significant for those with drought, as per our expectation. However, although insignificant but negative coefficient of program variable indicates the possibility of negative selection for participation in the program. It may be possible that people who lost jobs/ had a decline in household income joined the program. Also, notable is the fact that when we exclude the fixed effects the OLS results (not reported here) understates the impact of both drought and the interaction. Although, we find the health facility to be positive and significant in the OLS specifications, we find it insignificant with the fixed effects. The estimated coefficient on 'Age' is always negative and significant across all specifications in rural sites signifying worsening of z-score with the age. A one year increase in age decreases height-for-age z-scores by 0.09 standard deviations in the fixed effects estimation. Food supplement is found to be positive and significant for all rural specification highlighting the beneficial impact of supplementary nutrition on health outcome. However, we find the estimated coefficient on the food variable to be positive and significant in almost all specifications confirming our prior expectation about the role of nutrition in child health.

Thus to summarize our results for policy insights we find while there is long-run impact of early-life conditions on health several years later, access to coverage helps tackle only for recent shocks but not correct for longer-term past deficiencies. Thus access to coverage seems to help compensate poor child nutrition and growth, thus helping poor vulnerable individuals to cope with immediate drought shocks. However, it is important to note here that social safety nets available later on life cannot mitigate past deficiencies that carry forward later on life. Further, the analysis underscores the importance of food supplement in this whole set up, especially pronounced for female children, children from backward castes and for households with lower education level. The analysis underscores the vulnerability that these households face in the face of increasing climatic variability. Hence this calls for policy dialogue on focusing more on the timely delivery of wages and focusing on the nutritional aspect of the policy so that it can serve as an effective safety-net. Hence there is a substantial scope that the policy can address if it helps the vulnerable households to achieve food security.

Table 2.1

Dependent Variable :Height For Age

	(1)	(2)
Drought_Cumulated	-0.975***	
	(0.323)	
Coverage	-0.00700	-0.00505
	(0.0113)	(0.00725)
DroughtC*Coverage	0.0118	
	(0.0208)	
Food Supplement	0.0953**	0.0862*
	(0.0391)	(0.0471)
Health Facility	0.00765	0.0141
	(0.159)	(0.165)
Age	-0.0627***	-0.0530**
	(0.0224)	(0.0243)
Severe Drought_Cumulated		-1.071**
		(0.512)
Severe DroughtC*Coverage		0.0132
		(0.0211)
Observations	4289	4289

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses
Note:* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
a) HAZ indicates Height for Age, adjusted for both Age and Sex
b) Coverage is Average number of Days available under NREGA in the mandal
c) DroughtC is a fraction of years having low drought less than the long term average rainfall at mandal cumulated from birthyear defined at mandal level
d) Severe DroughtC is a fraction of years having less than 20% rainfall from the long term average at mandal cumulated from birthyear
e) Specifications include child fixed effects

Table 2.2

Dependent Variable: Height For Age

	(1) Rural	(2) Rural	(3) Urban
Drought	-0.403***	-0.399***	0.0322
	(0.139)	(0.142)	(0.257)
Coverage	-0.00727		-0.00613
	(0.00586)		(0.00887)
Drought*Coverage	**0.0127***		**0.00489**
	(0.00467)		(0.00782)
Food Supplement	0.134***	0.134***	0.0751
	(0.0432)	(0.0454)	(0.0480)
Health Facility	0.0692	0.0686	0.106
	(0.0873)	(0.117)	(0.154)
Age	-0.0851***	-0.0876***	-0.0201
	(0.0255)	(0.0312)	(0.0306)
NREGS		-0.00671	
		(0.00444)	
Drought*NREGS		**0.0124***	
		(0.00412)	
Observations	4289	4289	1376

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses
Note:* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
a) HAZ indicates Height for Age, adjusted for both Age and Sex
b) Coverage is Average number of Days available under NREGA in the mandal
c) Drought is receiving less than the long term average rainfall at mandal in the year prior to survey
d) Specifications include child fixed effects
e) NREGS is Coverage (Average days per household under the program)corrected for participation

Table 2.3

Dependent Variable : Stunting

	(1)	(2)	(3)
Drought_Cumulated	0.246***		
	(0.0775)		
Coverage	0.00243	0.00158	0.00235**
	(0.00216)	(0.00192)	(0.000969)
DroughtC*Coverage	-0.00422		
	(0.00430)		
Food Supplement	-0.0103**	-0.00828*	-0.0144***
	(0.00428)	(0.00482)	(0.00409)
Health Facility	0.00236	-0.000529	-0.0114
	(0.0410)	(0.0341)	(0.0251)
Age	0.0131***	0.0109*	0.0158***
	(0.00476)	(0.00624)	(0.00609)
Severe Drought_Cumulated		0.270**	
		(0.123)	
Severe DroughtC*Coverage		-0.00437	
		(0.00489)	
Drought			0.0780**
			(0.0319)
Drought*Coverage			**-0.00325*** **
			(0.000913)
Observations	4289	4289	4289

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses:
* p < 0.10, ** p < 0.05, *** p < 0.01
a) Dependent variable stunting is dummy variable, takes 1 if Height-for-age < -2
b) Coverage is Average number of Days available under NREGA in the mandal
c) Drought is receiving less than the long term average rainfall at mandal in the year prior to survey
d) DroughtC is a fraction of years receiving less than the long term average rainfall at mandal cumulated from birth
e) Severe DroughtC is a fraction of years receiving less than 20% rainfall below the long term average at mandal

Table 2.4

Dependent Variable: Stunting

	(1) Rural	(2) Rural	(3) Urban
Drought	0.0821**	0.0785**	-0.0292
	(0.0349)	(0.0352)	(0.0439)
Coverage	0.00238**		0.000236
	(0.00117)		(0.00155)
Drought*Coverage	**-0.00341*** **		**0.0000705**
	(0.000843)		(0.00128)
Food Supplement	-0.0217***	-0.0219***	-0.00195
	(0.00794)	(0.00816)	(0.00148)
Health Facility	-0.0116	-0.0113	-0.0222
	(0.0284)	(0.0315)	(0.0258)
Age	0.0166**	0.0166**	0.00546
	(0.00777)	(0.00697)	(0.00714)
NREGS		0.00233**	
		(0.000921)	
Drought*NREGS		-0.00333***	
		(0.000810)	
Observations	4289	4289	1376

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses:
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
a) Dependent variable stunting is dummy variable, takes 1 if Height-for-age < -2
b) Coverage is Average number of Days available under NREGA in the mandal
c) Drought is receiving less than the long term average rainfall at mandal in the year prior to survey
d)Specifications include mandal(sub-district) fixed effects
e) NREGS is Coverage (Average days per household under the program)corrected for participation

Table 2.5

Dependent Variable: Height For Age (Results by Gender)

	(1) Male	(2) Female
Drought	-0.401***	-0.401***
	(0.137)	(0.121)
NREGS	-0.00876*	-0.00428
	(0.00453)	(0.00368)
Drought*NREGS	0.0133***	0.0114***
	(0.00358)	(0.00382)
Food Supplement	0.0957	0.178***
	(0.0613)	(0.0463)
Health Facility	0.0707	0.0689
	(0.115)	(0.0928)
Age	-0.0807***	-0.0969***
	(0.0297)	(0.0233)
Observations	2272	2017

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses
Note:* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
a) HAZ indicates Height for Age, adjusted for both Age and Sex
b) Coverage is Average number of Days available under NREGA in the mandal
c) Drought is receiving less than the long term average rainfall at mandal in the year prior to survey
d) Specifications include child fixed effects
e) NREGS is Coverage (Average days per household under the program)corrected for participation

Table 2.6

Dependent Variable: Height For Age (Results by Caste)

	(1) General Caste	(2) Backward Caste
Drought	-0.300*	-0.413***
	(0.156)	(0.145)
NREGS	-0.00517	-0.00679
	(0.00790)	(0.00519)
Drought*NREGS	0.00960	0.0127***
	(0.00639)	(0.00390)
Food Supplement	0.187	0.126***
	(0.137)	(0.0454)
Health Facility	0.126	0.0678
	(0.148)	(0.0692)
Age	-0.0957***	-0.0871***
	(0.0336)	(0.0250)
Observations	600	3689

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses
Note:* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
a) HAZ indicates Height for Age, adjusted for both Age and Sex
b) Coverage is Average number of Days available under NREGA in the mandal
c) Drought is receiving less than the long term average rainfall at mandal in the year prior to survey
d) Specifications include child fixed effects
e) NREGS is Coverage (Average days per household under the program)corrected for participation

Table 2.7

Dependent Variable :Height For Age (Results by Caregiver's Education Level)

	(1) Primary	(2) Below Primary
Drought	-0.385	-0.412***
	(0.252)	(0.132)
Coverage	-0.0118	-0.00566
	(0.00808)	(0.00510)
Drought*Coverage	0.0177**	0.0110***
	(0.00726)	(0.00350)
Food Supplement	0.0799	0.164***
	(0.0649)	(0.0545)
Health Facility	0.0434	0.0863
	(0.114)	(0.0940)
Age	-0.0756**	-0.0911***
	(0.0368)	(0.0274)
Observations	1229	3057

Robust boot-strapped Standard errors (clustered at the mandal) in parentheses

Note:* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

a) HAZ indicates Height for Age, adjusted for both Age and Sex

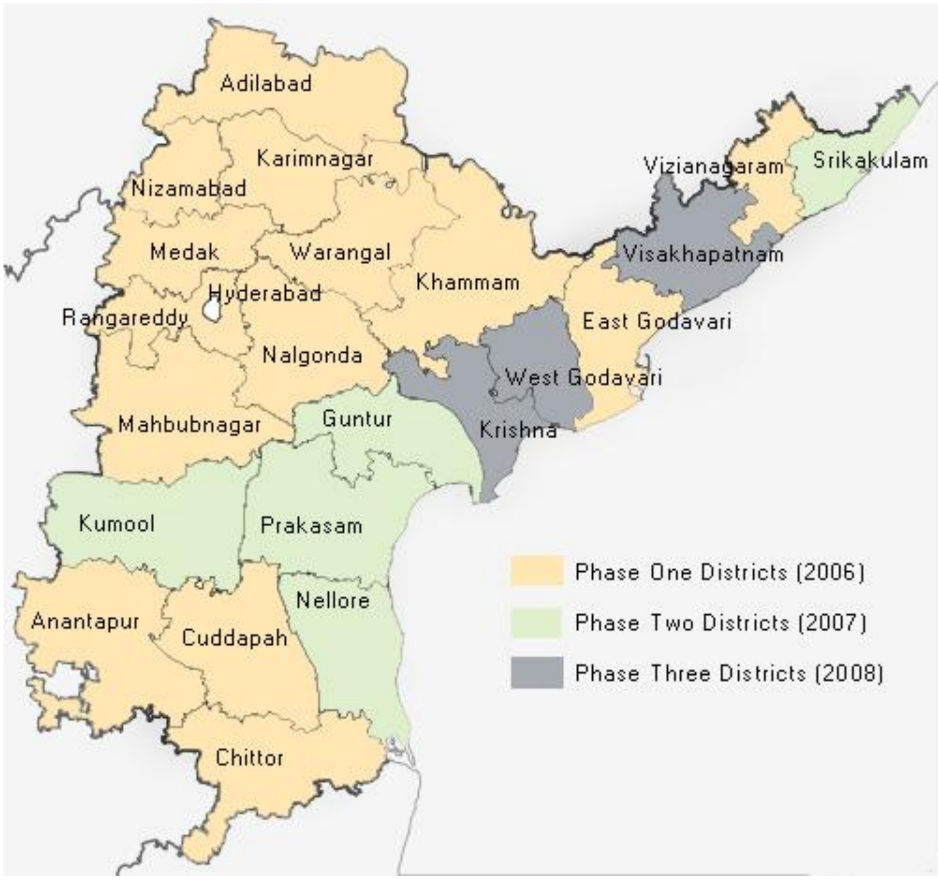
b) Coverage is Average number of Days available under NREGA in the mandal

c) Drought is receiving less than the long term average rainfall at mandal in the year prior to survey

d) Specifications include child fixed effects

e) NREGS is Coverage (Average days per household under the program)corrected for participation

Figure 1: Map of phase-wise expansion of NREGS across Young Lives Sample



Phase-wise Coverage across districts in Andhra Pradesh

Phase - I	Phase - II	Phase – III
VIZIANAGRAM	EAST GODAVARI	WEST GODAVARI
CHITTOOR	GUNTUR	KRISHNA
CUDAPPAH	KURNOOL	VISHAKHAPATNAM
ANANTPUR	NELLORE	
MAHBUBNAGAR	PRAKASAM	
MEDAK	SRIKAKULAM	
RANGA REDDY		
NIZAMABAD		
WARRANGAL		
ADILABAD		
KARIMNAGAR		
KHAMMAM		
NALGONDA		

*The colored districts imply the sample ones from the survey.

Figure 2: Mean Height-for-Age by Survey Rounds

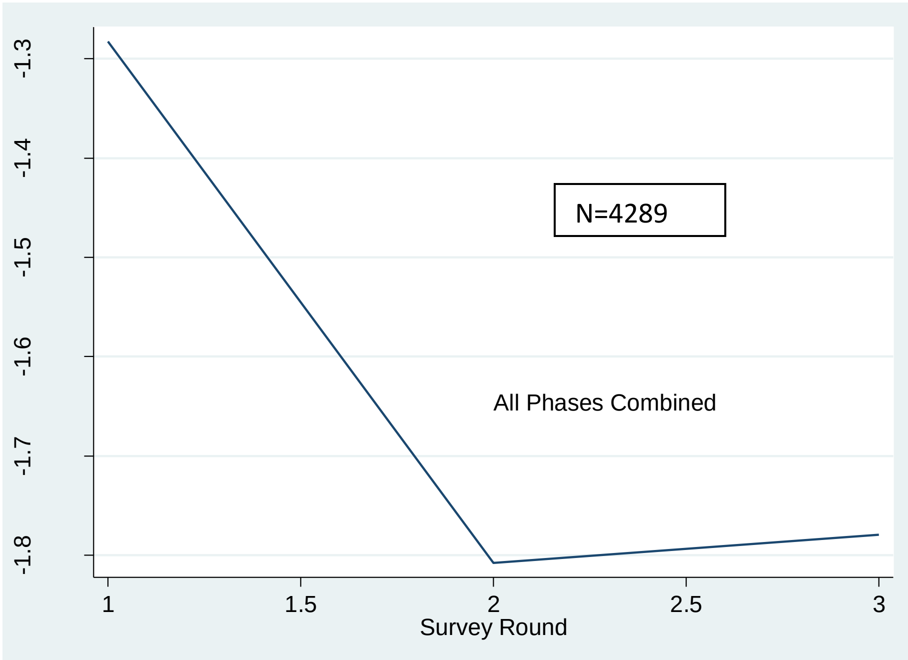


Figure 3: Mean Height-for-Age by Rounds and Phases

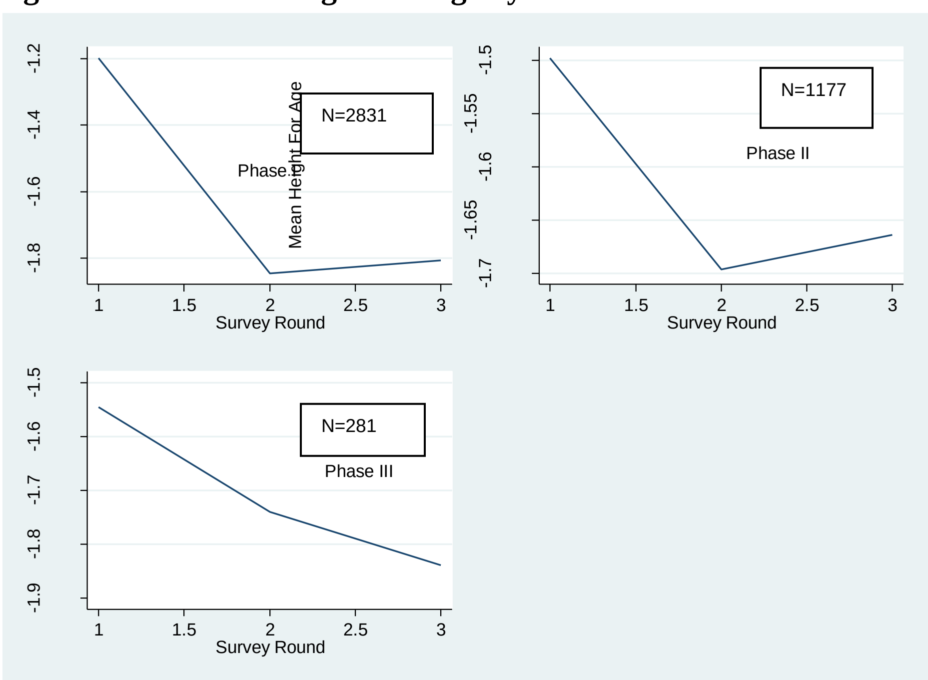


Figure 4: Mean Height-for-Age by Caregiver's Education

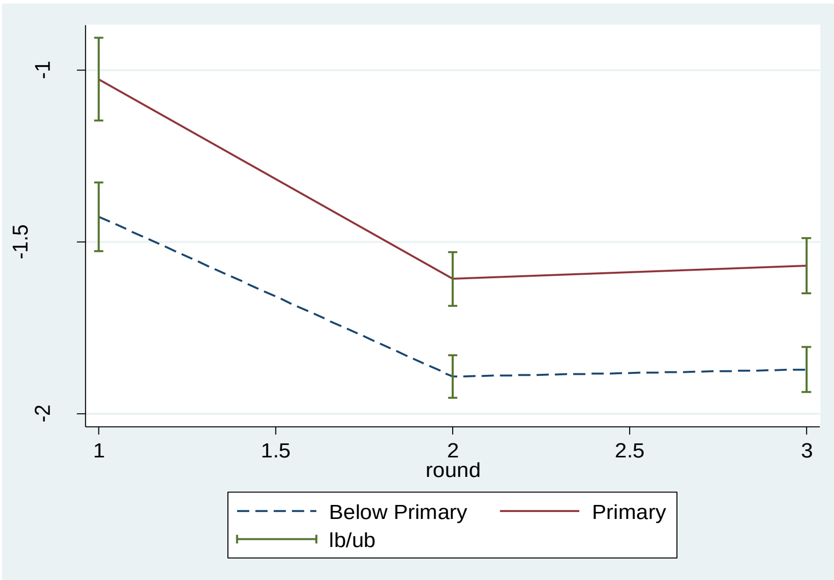


Figure 5: Mean Height-for-Age by Gender

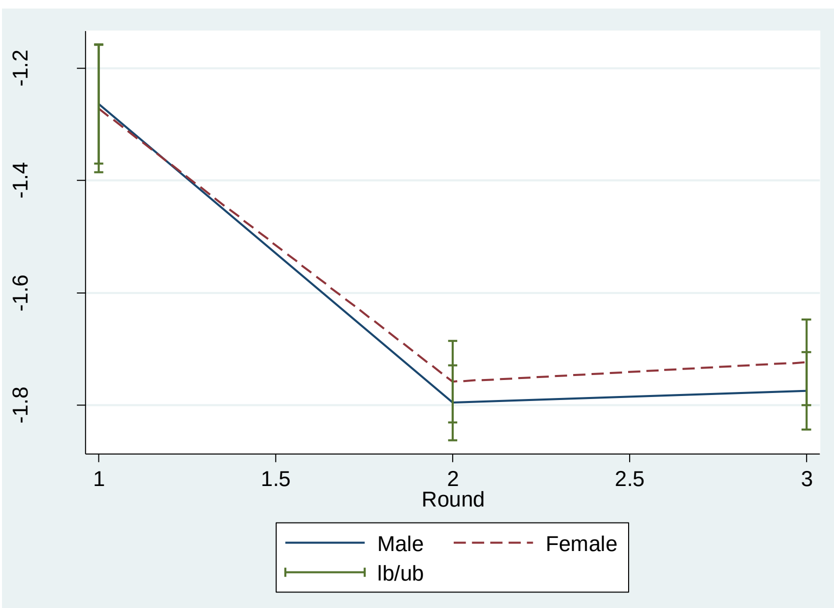
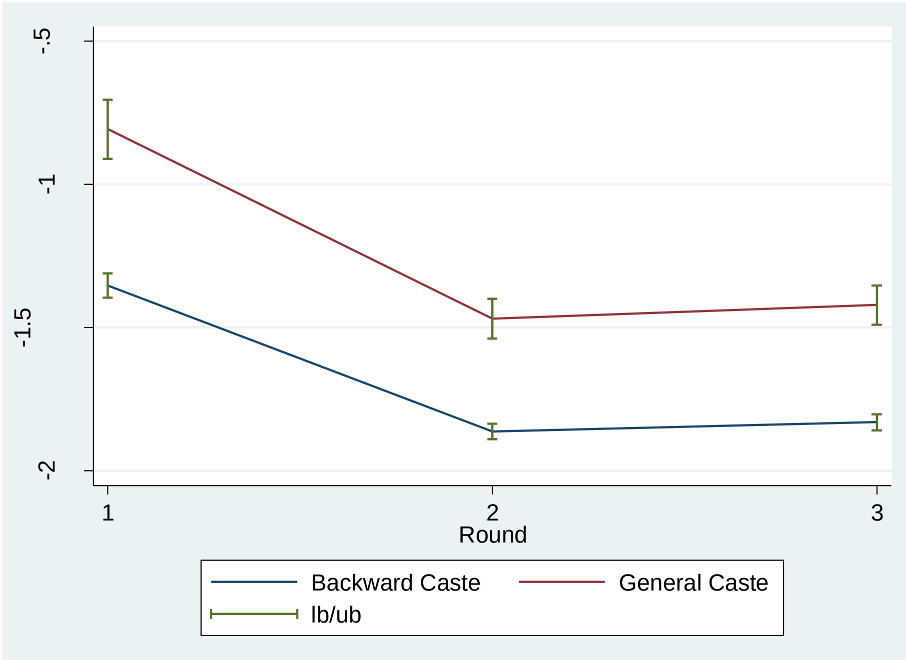


Figure 6: Mean Height-for-Age by Caste



References

Alderman, H., J. Hoddinott and B. Kinsey (2006) “Long-term Consequences of Early Childhood Malnutrition”, *Oxford Economic Papers*, 58.3: 450-74.

Alderman, H., (2010). Safety nets can help address the risks to nutrition from increasing climate variability. *Journal of Nutrition* 140 (1S-II), 148S–152S.

Almond, Douglas and Janet Currie (2011) “Killing Me Softly: The Fetal Orgins Hypothesis”, *Journal of Economic Perspectives*, 25 (3):153–172.

Azam, Mehtabul (2011): “The Impact of Indian Job Guarantee Scheme on Labor Market Outcomes: Evidence from a Natural Experiment”, Working paper

Behrman, Jere R., John Hoddinott, John A. Maluccio, Erica Soler-Hampejsek, Emily L.Braun, J Von, T Teklu and P Webb (1992) “Labour-intensive public works for food security in Africa: Past experience and future potential” *International Labour Review*. Vol 131 No.1.

Brown, Lynn R., Yisehac Yohannes and Patrick Webb (1994) “Rural Labor-Intensive Public Works: Impacts of Participation on Preschooler Nutrition: Evidence from Niger”,*American Journal of Agricultural Economics*, Vol. 76, No. 5, Proceedings Issue , 1213-1218.

Carter, M. and J. Maluccio (2003) “Social Capital and Coping with Economic Shocks: An Analysis of Stunting of South African Children”, *World Development* 31 (7): 1147–1163.

Cunha, Flavio and James Heckman (2008) “Formulating, Identifying and estimating the Technology of Cognitive and Non-Cognitive Skill Formation”, *Journal of Human Resource s*43.4: 739-82.

Currie, J and E Moretti (2007) “Biology as Destiny? Short-and Long-Run Determinants of Intergenerational Transmission of Birth Weight”, *Journal of Labor Economics* UChicago Press.

De Janvry, A., E. Sadoulet, P. Solomon, and R. Vakis (2006) “Uninsured Risk and Asset Protection: Can Conditional Cash Transfer Programs Serve as Safety Nets” Social Protection Discussion Paper Series, No. 0604. The World Bank, Washington, D.C

Deolalikar, A. B., (1996) Child nutritional status and child growth in Kenya: Socioeconomic determinants. *Journal of International Development* 8(3): 375-393.

Dreze, Jean and Reetika Khera (2009) “The battle for employment guarantee”, *Frontline* Volume 26 Issue.

Dutta, P., R. Murgai, M. Ravallion, D. van de Walle (2012) ‘Does India’s Employment Guarantee Scheme Guarantee Employment?’ World Bank Policy Research Working Paper No. 6003, March.

Fakuda-Parr, Sakiko, Lawson-Remer, Terra and Randolph, Susan (2009) “An Index of Social Rights Fulfillment: Concept and Methodology” *Journal of Human Rights* Vol 8, no. 3 , 195-221.

Elbers, C., J. W. Gunning and B. Kinsey (2007) “Growth and Risk: Methodology and Micro Evidence”, *World Bank Economic Review* 21: 1-20.

Fedorov, L., Sahn, D. E. (2005) Socioeconomic Determinants of Children's Health in Russia: A Longitudinal Study. *Economic Development and Cultural Change*, Vol. 53, No. 2, pp. 479-500

Galab, S., P.P. Reddy and Rozana Himaz (2008) “Young Lives Round 2 Survey Report Initial Findings: Andhra Pradesh, India”, Oxford: Young Lives.

Galab, S.,S.Vijay Kumar,P.P.Reddy,Renu Singh and Uma Vennam (2011) ,“The Impact of Growth on Childhood Poverty in Andhra Pradesh: Initial Findings from India Round 3 Survey”.

Gennetian,L,Heather Hill, Andrew London,Leonard Lopoo (2010) “Maternal employment and the health of low-income young children” *Journal of Health Economics***,** Volume 29, Issue 3, May 2010, 353–363.

Gilligan and Hoddinott (2006) “Is There Persistence in the Impact of Emergency Food Aid? Evidence 15 on Consumption, Food Security, and Assets in Rural Ethiopia” *FCND Discussion Paper 209*. IFPRI.

Gore, P.G.,Thakur Prasad,H.R.Hatwar (2010) “Mapping of Drought Areas Over India” ,NCC Research Report of IMD,Pune.

Government of India (2008) “The National Employment Guarantee Act 2005. Operational Guidelines”, Ministry of Rural Development.

Government of India (2011) ‘Census of India: Provisional Population Tables 2011’, New Delhi: Ministry of Home Affairs

Government of India (2012) "MGNREGA Outcomes for 2010 - 2011." Net nrega http://164.100.12.7/Netnrega/mpr_ht/nregampr_dmu.aspx?flag=1&page1=S& Ministry of Rural Development.

Government of India (2012) Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) 2005, Report to the People, 2nd February 2012, Ministry of Rural Development, Department of Rural Development, Government of India, New Delhi

Hagen-Zanker, Jessica, Ann McCord and Rebecca Holmes with Francesca Booker and Elizabeth Molinari (2011) “Systematic Review of the Impact of Employment Guarantee Schemes and Cash Transfers on the Poor” ODI, London.

Handa, S and A. Peterman(2012) "Is there Catch-Up Growth? Evidence from Three Continents." Working Paper.

Hoddinott, J. and B. Kinsey (2001) "Child Growth in the Time of Drought." *Oxford Bulletin of Economics and Statistics* 63(3): 409-36.

Hoddinott, J., J. Behrman, R. Flores, and R. Martorell (2008) "The Impact of Nutrition During Early Childhood on Income, Hours Worked, and Wages of Guatemalan Adults", *The Lancet* 371.1: 411-16.

Imbert, C and J Papp (2012): "Equilibrium Distributional Impacts of Government. Employment Programs: Evidence from India's Employment Guarantee", Paris School of Economics, Working Paper

Indian Meteorological Department (2002) "South-West Monsoon 2002: End-of-Season Report New Delhi: Government of India"

Jacoby, H. G. and Skoufias, E. (1997) "Risk, Financial Markets, and Human Capital in a Developing Country." *Review of Economic Studies*, vol. 64, no. 3, 311-335.

Johnson,R, M.E. Corcoran(2003) "The road to economic self-sufficiency: job quality and job transition patterns after welfare reform" *Journal of Policy Analysis and Management*, 22 (4), 615–539.

Khera, Reetika and Nandini Nayak (2009) "Women workers and perceptions of the National Rural Employment Guarantee Act in India" Paper presented at the FAO-IFAD-ILO Workshop on Gaps, trends and current research in gender dimensions of agricultural and rural employment.

Kumar, R.H. et al. (2005) "Diet and nutritional status of the population in the severely drought affected areas of Gujarat" *Journal of Human Ecology*. 18(4), 319–326.

Lanjouw, Peter and Martin Ravallion (1999) "Benefit Incidence and the Timing of Program Capture". *World Bank Economic Review* Vol 13 No. 2 ,257-274.

Maccini, Sharon and Dean Yang, (2009), Under the Weather: Health, Schooling and Economic Consequences of Early-Life Rainfall, American Economic Review, 99(3), 1006-1026.

Mani, S., (2008). Is there Complete, Partial, or No Recovery from Childhood Malnutrition? Empirical Evidence from Indonesia, Fordham Economics Discussion Paper Series dp2008-19, Fordham University, Department of Economics.

Martorell, R., Khan, L. K., Schroeder, D. G.(1994) Reversibility of stunting: epidemiological findings in children from developing countries. European journal of clinical nutrition;48 Suppl 1:S45-57.

Martorell**,** R**.** (1999) “The nature of child malnutrition and it's long-term implications”, *Food and Nutrition Bulletin*, 20(3): 288-292.

National Family Health Survey-NFHS(2006), http://www.nfhsindia.org/nfhs3_national_report.

Outes-Leon, I. and Dercon, S., (2008) Survey Attrition and Attrition Bias in Young Lives, Young Lives Technical Note 5, Oxford: Young Lives

PACS-CSO (Poorest Area Civil Society – Civil Society Organization)(2007) Status of NREGA implementation: Grassroots learning and ways forward. 2nd monitoring report (April 2006 to March 2007). Delhi, India: Poorest Area Civil Society (PACS) Program.

Rao.P (2008) “Climate change and agriculture over India”, AICRP on *Agrometeorology,*116.

Ravallion, M (1991) “Reaching the Poor through Rural Public Employment: Arguments,Evidence and Lessons from South Asia”, *The World Bank Research Observer*.

Ravallion, M,Datt and Chaudhuri (1993) “Does Maharashtra's Employment Guarantee Scheme Guarantee Employment? Effects of the 1988 Wage Increase.” *Economic Development and Cultural Change*, Vol. 41, No. 2, (Jan., 1993), 251-275.

Reddy, D.N., Rukmini Tankha, C. Upendranadh and Alakh N. Sharma (2010). “National Rural Employment Guarantee as Social Protection”. *IDS Bulletin* Volume 41 Number 4 July 2010, 63-76.

Sainath, P. (2007) “Nearly 1.5 lakh Suicides in 1997-2005”, *The Hindu*, 11 November.

Scott,E, K. Edin, A.S. London, R.J. Kissane (2004) “Unstable work, unstable income: Implications for family well-being in the era of time-limited welfare” *Journal of Poverty*, 8 (1) (2004), 61–88.

Schroeder D.G., Martorell R., Rivera J.A., Ruel, M.T., Habicht J-P.,(1995) Age differences in the impact of nutritional supplementation on growth. *Journal of Nutrition* 1995;125(4 suppl):1051S1051

Strauss, J., and Thomas, D. (2008) “Health over the life course”, in T.P. Schultz and J.Strauss (eds.), *Handbook of Development Economics*, Volume 4, Amsterdam: North Holland Press.

Smith, L., Ramakrishnan, U., Haddad, L., Martorell, R., & Ndiaye, A. (2001) “The importance of women's status for child nutrition in developing countries” Policy Report. Washington, DC: International Food Policy Research Institute.

Unicef (2009) Tracking progress of child and maternal nutrition: A survival development priority

Uppal V. (2009) "Is the NREGS a Safety Net for Children?" *Young Lives Student Paper*.

van den Berg, G., M. Lindeboom, and F. Portrait (2007). "Long-run Longevity Effects of a Nutritional Shock Early in Life: The Dutch Potato Famine of 1984-1847." Unpublished manuscript, IZA Discussion Paper 3123.

Vij, N.(2011) "Collaborative Governance: Analysing Social Audits in MGNREGA in India" *IDS Bulletin*, 42: 28–34. doi: 10.1111/j.1759-5436.2011.00269.x

World Bank (2011) "Social Protection for a changing India" Washington DC, USA, World Bank, http://documents.worldbank.org/curated/en/2011/01/14087371/social-protection-changing-india-vol-1-2-executive-summary

Yamano T., H. Alderman and L. Christiaensen (2005) "Child Growth, Shocks, and Food Aid in Rural Ethiopia", *American Journal of Agricultural Economics* 87(2): 273-288. 17

Zimmerman L. (2012) "Labor market impacts for a large scale public works program: Evidence for the Indian Employment Guarantee Scheme", IZA Discussion paper No. 6858.