

# Economic Inequality induced Pre-natal Poverty and Learning Outcomes in Rural India: An Empirical Speculation

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## Abstract

Learning outcomes evaluation has been far and few in between in India. Other than the Annual Status of Education (ASER) reports there is hardly any credible nationwide survey reporting learning outcomes. ASER reports are more than a decade old now, so we have a way of looking at the trends nationwide and across states concerning the learning outcomes of school children in rural areas. One of the most disturbing features that come across over the last decade of reports is the fact that learning outcomes have been very low across the country, barring a few states, and this low attainment is also progressively dwindling year after year. The conventional explanations abound but we have taken an unconventional route of explaining it through the mechanism of pre-natal poverty affliction mediated by adverse nutrition shocks during the gestation period of these poorly learning school children. To do that we have traced back the per capita food grain availability to the relevant years of gestation period of these poorly learning school children. Interestingly, we found that poverty in the 'nutrition space' during the pre-natal stage could indeed be the dominant explanation for both the low and dwindling learning outcomes of school children in rural India.

**Keywords:** Learning outcomes, gestation period, nutrition, poverty, Economic Inequality

**JEL:** I14, I24, I32, J13

## 1 Introduction

*"The most valuable of all capital is that invested in human beings, and of that capital the most precious*

*part is the result of the care and influence of the mother"- Alfred Marshall*

'Fetal origins hypothesis' although originated in the bio-medical discipline has interesting implications for development studies. It at once brings out the not-so-obvious fact of trans-generational effects of poverty but also elucidates an important mechanism of the 'poverty trap'. There is extensive literature on what and how the fetal environment impacts capabilities in later life. We would survey some of them in the literature review section ahead. One of the adverse outcomes of pre-natal poverty is in terms of a child's mental development which has important implications later in life and reverberates lifelong. But first, we will take a detour on the concept of poverty in general and pre-natal poverty in particular. The concept of poverty has been long straitjacketed since the days of Rowntree in 'income space'. Although a lot of critique of this approach

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is extant in the literature, the sheer size of 'operationalizing' challenges to the academics and the appeal of simplicity to the policy circles have perpetuated the orthodoxy in the approach. Needless to say, the successes in the field of poverty alleviation, armed with the extant approach, are at best a mixed bag the world over. The logical inference that ensues therefrom is that poverty in income space is symptomatic of a larger malaise somewhere upstream. In the literature, these malaises are generically clubbed together as 'vulnerabilities'. Poverty however defined is always mediated through vulnerabilities that in turn are engendered by inequality-enhancing growth processes. In a stylized way, poverty is an ex-post concept whereas vulnerability is an ex-ante one (Chaudhuri, 2003). Therefore, all the anti-poverty measures which are based on the professed intent of alleviating the official income (expenditure) based poverty ratio are, in a sense, reactive at best. Moreover, not all the income-enhancing anti-poverty measures are necessarily vulnerability and, for that matter, inequality reducing. Thus, we may reach 'zero poverty' but we sure will not stay there for long. This paper intends to look at whether an important reason for consistently dwindling learning outcomes among primary school children in rural India can be traced back to nutrition shocks during their in-utero stage by collating data on learning outcomes of the rural school children as compiled by Annual Status of Education Report (ASER) reports with data on daily per capita food grain availability and mean daily per capita calorie intake. We will also look at some other important manifestations of pre-natal poverty proxied by anthropometric indicators. We know from elementary human biology that a rapidly developing fetus needs both macro-nutrients (calories) and micro-nutrients for fuller development. Food grain entitlement during pregnancy can be a good proxy for the calorific nourishment of the fetus. But when the per capita food grain availability figures are so low to begin with (Patnaik, 2007) & (Patnaik, 2007), and which is further declining with a near consistency for the last more than 2 decades, the situation of the micro-nutrient challenge is anybody's guess. In this regard the theme of the Global Hunger Index (GHI) 2014, 'Hidden Hunger', is apt and opportune; 'Hidden Hunger' meaning hunger with respect to vital micro-nutrients. To the extent that food grains are not a primary source of vital micro-nutrients, our findings in this paper understate the true size of the impact and serve as a lower bound.

## **2 Related literature**

The anecdotal narrative is abounding of the adverse fetal environment having long-term manifestations in the later life of an individual. Low birth weight almost always leads to physiological and pathological complications is folklore. These rich repositories of anecdotal knowledge have been affirmed by an extensive and emergent paediatrics literature spawned by the pioneering work of Barker in 1989. Epidemiological evidence suggests that low birth weight is associated with an increased risk of cardiovascular, metabolic and neuroendocrine disorders in adult life (Seckl, 2004). Studies on the famous 'Dutch Famine' has found many interesting, sometimes conflicting, results on the implications of nutrition shock during the gestation period on an individual's later life. One such study found that exposure to nutrition shock in the womb not only has

adverse health outcomes in later life but the adverse effect persists trans-generationally too (Painter, et al., 2008). (Johnson & Schoeni, 2007) Suggests that the seeds of vulnerability to chronic health conditions are planted early in life, possibly in utero. Miller & Wherry (2014) found those whose mothers gained eligibility for prenatal coverage under Medicaid have lower rates of obesity and lower body mass indices as adults. Almost any mother would dread the reality of a low birth weight child. But the worries, more often than not, are centred around health-related 'clinical' outcomes of the child and not so much on the 'subclinical' aspects of a child's learning outcomes. This concern is yet to become a stylized fact in folklore so far. But there is a growing undercurrent of this realization, evidenced by a growing chorus of studies linking fetal under-nutrition and cognitive skills in the later life of the child. One such study (Martyn, Gale, Sayer, & Fall, 1996) found that the score on the intelligence test (AH4 intelligence quotient (IQ) test) was higher in people who had a large biparietal head diameter at birth. A more direct and conclusive study shows an unambiguous influence on cognitive function in offspring of maternal vitamin B<sub>12</sub> status in pregnancy (Bhate, et al., 2008). However, the cognitive function being a composite of many different types of functions, the findings of a study would be dependent on which strand of cognitive function is being focused on. This may be a plausible reason for some of the studies finding no conclusive linkages between fetal undernutrition and cognitive functions in children. The study by Bhate, et al. (2008) conducted different types of cognitive tests to better capture the various strands of the composite cognitive function and they found that the tests of sustained-attention task and executive task are significantly influenced by fetal under-nutrition in terms of vitamin B<sub>12</sub>. This is buttressed by further studies done on natural experiments of Ramadan fasting among Muslim women. Majid (2012), using the Indonesian Family Life Survey (IFLS), found children aged 7-15 score 5.9% lower on Raven's Colored Progressive Matrices assessment and 7.8% lower on math test scores. A similar but expanded study found that 7-year-old Muslims whose pregnancies overlapped with Ramadan perform worse in math, reading and writing than otherwise comparable Muslim children born to mothers where Ramadan fell soon after birth in the UK (Almond, Mazumder, & Ewijk, 2012).

### 3 Discussion

Necessitated by the nature of both our data and analysis, we would be making a few assumptions as we go by. Foremost of our assumptions is the premise that pre-natal under-nutrition has an impact on the analytic & executive cognition skills and not so much on the visual cognition skill. This may not be such an unrealistic assumption as paediatrics literature has found this to be rather true in one of the longitudinal cohorts (Bhate, et al., 2008). Hence, we would only look at the arithmetic performance of the children from the ASER reports. ASER checks this performance at two levels; one is at standard III and the other one is at the standard V of the primary school. Normally a child would be of 8 and 10 years of age at these standard levels; adding the gestation period of 9 months on these would give us the trace-back period of 9 and 11 years for standard III and V respectively. First, we will look at the all-India trend and then we will

look at two states broadly representing poorer states and the richer states. We will also look at the curious case of Bihar subsequently.

The learning outcomes are secularly declining. Every year more and more Government (Govt.) school students are failing to learn. This is true at both test levels. From Chart 1a in the annexure we find that more than 80% of the standard III students in Govt. schools cannot even do a simple arithmetic task of subtraction and about 80% of standard V students in Govt. schools cannot do a simple arithmetic division. This is doubly worrisome because not only the proportion of adverse learning outcomes is increasing but the absolute number is also shooting up as the enrollment ratio has been steadily increasing in the Govt. schools due to various public initiatives and interventions. The national enrollment ratio of children aged between 6-14 years in rural areas has consistently increased from 93.4 per cent in 2006 to 96.7 per cent in 2014 (see ASER Report, 2015). Our immediate and impulsive diagnosis would be inclined to blame the outdated pedagogy, dilapidated and crowded classrooms and disaffected teachers in the Govt. schools. While these may have some role in the deplorable outcomes of Govt. schools (this seems to be the case in Bihar which we will analyze a little later ahead), these simplistic explanations may not be the whole story. This is precisely what the performance data of the private schools strongly suggests. Although a larger proportion of the private schools children are learning better, the overall trend is the same. Had the reasons for Govt. schools' progressively poor outcomes been systemic, we would, at the very least, expect a different learning trajectory for private schools. So how do we explain this sad predicament of the learning trajectory of our children? Well, if we trace our steps back and look at what nutrition entitlements they had when they were in the fetal stage, we may have an interesting correlation if not strict causation. We are plotting the per capita availability of food grains for the period when these children were supposedly in gestation.

Per capita food grain availability has been declining consistently in every triennium of the reform period (Patnaik, 2007). What is more disturbing is the fact that the per capita availability figure was very meagre, to begin with. The comparable figures for some of the developing countries are markedly different. For example, China has 890 gm. per capita per day. The comparable figure for the USA is 2328 gm per capita per year in the 1990s (Patnaik, 2007). Juxtaposing the trend in learning outcomes of the children with their gestation period per capita food grain availability exhibits an instructive correlation. Chart 1b (see annexure) depicts the per capita food grain availability in years when these poorly learning school children were assumed to be in gestation. Although there is hardly any point-to-point correspondence between the decline in the per capita food grain availability and declining learning outcomes, two things have to be taken note of; first, the overall trend of per capita food grain availability is unmistakably declining; two, the absolute amount of food grain availability per capita is very measly. That the per capita food grain availability is measly and insufficient is quite evident from trends in the mean per capita calorie intake over these same years. Deaton & Dreze (2009) have calculated the mean per capita calorie intake from various 'thick' and 'thin' rounds of NSSO surveys. Although they seem to

argue that this declining trend has more to do with relatively less strenuous workload over time. They even referred to the increasing ownership of effort-saving durables in rural areas as a supporting correlation. Well, even if it is true, it would be true for a very minuscule proportion of the rural people. Declining consumption of calories does not seem to be an act of volition, it rather seems a forced shrinkage. This is because whatever meagre average calorie is consumed is the maximum that can be harnessed from the per capita food grain availability, given the measly availability amount.

A pregnant woman needs both macro-nutrients (calories) and micro-nutrient in a larger quantity than a normal woman. Given the intra-household inequity in terms of resource share between male and female members (see Chart 2a in annexure), especially when the resource pool is so meagre, it is not difficult to infer an adverse fetal environment made worse. In addition to these deplorable statistics, Chart 1e & 1f (see Annexure) present some maternal and child anthropometric indicators which are suggestive of extreme deprivation that potential maternal population cohort and preschool children are mired in.

Of course, there are so many other factors that have explanatory power when it comes to the learning outcome of a child like post-natal environment, infrastructure, pedagogical variations, teacher quality, etc. So, a precise and robust study would take an econometric approach. But the object of the current paper is not so much to specify but rather to speculate a causal plausibility. Nonetheless, the fact that even the private school children's learning outcomes have a declining trend, although they have a better outcome in terms of proportion, points towards the plausibility of pre-natal nutrition poverty rather than infrastructure, teaching and teacher quality as the de-facto explanatory variable. The story repeats with surprising regularity across the spectrum of poor and non-poor states of the country. Let's look at trends in the state of Uttar Pradesh, one of the poorer states of India:

### **3.1 Uttar Pradesh**

Uttar Pradesh is the largest state of India in terms of population, a large proportion of them officially poor. Not surprisingly it is doing worse than the national average at both the test levels. The situation is grim, to say the least. Around 94 per cent of the Govt. school children in standard III cannot do a simple arithmetic task of subtraction and around 88 per cent of standard V children in Govt. schools cannot do simple division tasks (see Chart 2 in Annexure). Unlike the national trajectory which is practically declining throughout Uttar Pradesh has few years in between when the learning outcome has nominally increased before eventually heading downhill. These fluctuations need not be a blindspot in our argument because the base proportions are in themselves too small in the first place to be of any meaningful critique. The fact that private schools are not doing any markedly better than Govt. schools reinforces the 'fetal origins hypothesis'. The overall learning trajectory fits the narrative of the pre-natal poverty afflicted state.

### 3.2 Himachal Pradesh

Let's look at Himachal Pradesh, the new poster child of welfare states. As expected, the absolute proportion is much better than the All-India average. There is no perceptible undercurrent of mass deprivation in terms of learning outcomes among school children in the Govt. schools, let alone the private schools. The proportion of Govt. school children with positive learning outcomes is way above 40% (see Chart 3 in Annexure) and doesn't go down much lower than that except in recent years. Children from the private schools are doing much better, never below 61% of proportion with a positive outcome. The story is almost repeated in terms of the outcomes vis-a-vis at the standard V level. This accords well with the record of the state in terms of human development indicators which in turn are a reflection of a well-to-do populace of the state. On the whole, Himachal Pradesh doesn't seem to have the affliction of mass pre-natal poverty.

### 3.3 Curious case of Bihar:

Bihar is an interesting case. Unlike the other poorer states there is no clear-cut concurrence between nutrition deprivation, proxied by food grain availability, and deterioration in learning outcomes. Nevertheless, the learning outcomes at both levels deteriorate for Govt. schools (see Chart 4 in Annexure). But juxtaposing private schools' outcomes, it does seem to imply that the deterioration, even if partly, in Govt. schools is due to pedagogy and teacher quality, given the fact that the private schools are improving their learning outcomes. But this in itself doesn't negate the adverse impact of pre-natal poverty as evident from the lowly learning outcomes of the govt. schools since 2010.

## 4 Conclusion

We find a broadly predictive power exuding from the data on per capita food grain availability on the learning outcomes of the school children, albeit a correlative analysis. The study lends more credence to the oft-repeated claim that poverty perpetuates across generations. It also lays bare one of the subtle mechanisms of this perpetuation. A more effective way to fight poverty, then, would be to devote more and more resources to pregnant women in particular and mothers in general. We also need to embark on mass educative campaigns to rectify the subtle bias against women in intra-household resource distribution. The abhorring irony is that the odds are heavily stacked against the children conceived in the womb of the poor woman. They would be, more likely than not, impelled to a life of morbidity and deprivation for none of their active makings. This brings forth the issue of social equity. Those who are fortunate to be conceived in the womb of non-poor women would be having a head-start when they enter this world. In a nutshell, there would be two broad groups of children; one among them would be at a disadvantage in the pursuit of capabilities to function and even capabilities to just merely being. This has considerable implications for long-term social harmony. As far as improving learning outcomes are concerned, we would need a two-pronged strategy, one; implementing innovative and imaginative school interventions like Nali-Kali programs in Karnataka and remedial classes conducted by Pratham in

some of the states, and two; increasing access to enough nutrition to all the children who are biding their time in the womb of their mother to come out into the world. As prevention is better than cure, targeting interventions during the in-utero period may be particularly wiser on the grounds of economic efficiency too.

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