Final report

Food security and child malnutrition in India

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Abstract

The National Food Security Act (NFSA) in India was passed in 2013 to remove hunger and reduce malnutrition. The Act provides 75% of the rural population and 50% of the urban population with a minimum entitlement of 5 kilograms of grain per person per month. This paper explores the likely effects of the Act on food security and malnutrition. We use data from nationally representative household surveys to examine whether the presence of malnourished children is correlated with household calorie intakes. We find rates of stunting and wasting are only weakly related to calorie consumption. Household and village amenities and parental education are more important predictors of these nutritional indicators. We also find that the NFSA grain entitlements are below the current consumption levels of most households and are therefore unlikely to alter consumption by much. A fully implemented NFSA can still benefit the poor through the income transfers implicit in food subsidies. These transfers are likely to be more progressive than under the current Public Distribution System, because the NFSA stipulates individual rather than household entitlements and poor households are larger than average.

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1 Introduction

The Food Security Act (NFSA) in India was passed in August 2013 as a response to India's persistently high malnutrition rates despite decades of economic growth. The Act has many components, including for example, meals and nutritional supplements at child care centers and schools. We focus here on studying the likely effects of one important component of the Act, namely a targeted public distribution system for foodgrains that provides 75% of the rural population and 50% of the urban population 5 kilograms of subsidized grain per person per month.[1]

The Act has not yet been fully rolled out and nor do we have a large-scale household consumption survey since 2013 which can be used to directly evaluate its impact. This paper therefore predicts the likely effects of a well-implemented NFSA using existing secondary data sets on malnutrition, calorie intakes and food transfers under the current Public Distribution System (PDS) which the Act was designed to replace. The extent to which the Act will be able to reduce malnutrition depends on whether poor nutritional outcomes are related to levels of calorie intakes and also on the extent to which the subsidies implicit in the new entitlements target poor households.

We rely on secondary data from three sources. We use the National Family Health Survey (NFHS) for estimates of malnutrition rates at the state and national level. According to the NFHS survey of 2005-06, almost half of Indian children under 5 are too short for their age (stunted) and 20% are underweight (wasted). The NFHS does not record either household consumption or nutritional intakes. The National Sample Survey (NSS) is the standard source for consumption data, but does not record anthropometrics and cannot therefore be used to link calories to physical attributes for children. Most of our analysis relies on combing the NSS with the Indian Human Development Survey (Desai *et al.*, 2009, 2015). The IHDS is a nationally representative survey, conducted in 2004-05 and again in 2011-12. Both survey rounds cover about 40,000 Indian households and include detailed information on child anthropometry as well

[1] See dfpd.nic.in/nfsa-act.htm for details of the NFSA.

as household consumption.[2]

We begin by showing that per capita calorie intakes and rates of malnutrition at the state level are largely uncorrelated. At the household level, families with at least one child who is stunted or wasted are significantly poorer than other families in almost every dimension. They consume fewer calories per member and have lower rates of participation in the public distribution system. They also have more limited access to household amenities such as piped water, toilets and electricity, and to government schools and health clinics within their village. In our preferred empirical specification we find that household calorie intakes are negatively associated with malnutrition rates, but that the magnitude of the effect is small. Household and village amenities and parental education more strongly predict lower probabilities of malnourished children.

We compare coverage and purchases under the PDS system with those stipulated under the NFSA. We find PDS access to be lower than NFSA targets for coverage but the amounts purchased conditional on access are not very different. Among rural households, 50% purchased PDS grains in 2011-2012 and the per capita average consumption level is almost 5 kg. In urban areas coverage was 31% and average consumption was 4.2 kg. The targeted coverage under the NFSA is 75% and 50% for rural and urban areas respectively.

We next examine the distribution of total per capita grain consumption using data from several NSS survey rounds. We find that the average per capita grain consumption has been above 5 kg. for all expenditure deciles since the early nineties. In the last two rounds (2009-10 and 2011-2012), it has been about 10 kg. per capita for all expenditure deciles. Since NFSA entitlements are only half of this level, it is unlikely that they would raise grain consumption by very much. In 2011-12, only 5% of households in the poorest decile consumed less than the NFSA entitlement.

The NFSA does however have the potential to improve welfare of the poor through implicit income transfers. The subsidies proposed by the NFSA are much larger than under the previous PDS system. We compute median unit values paid for PDS rice and wheat for each state from the NSS survey of 2011-12. The population-weighted average of these values for PDS purchases

[2]The survey is a household panel but we do not exploit the panel dimension in the present analysis.

of rice and wheat are 6.2 and 6.7 rupees per kg. respectively. The stipulated NFSA prices are much lower at Rs. 3 for rice and Rs. 2 for wheat.

We estimate the implicit income transfers under the PDS in 2011-2012 by multiplying the difference between market and PDS prices by the quantity purchased under the PDS. For both of these, we use median prices paid by households in the NSS data, separately for each state and for rural and urban sectors. This approach is similar to that used by others (Khera, 2011; Radharkrishna and Subbarao, 1997; Dreze and Khera, 2013). To estimate the income transfer implicit in a well implemented NFSA, we replace PDS prices and quantities by the stipulated NFSA prices of Rs. 3 and 2, and the 5 kg. per capita grain entitlement under the Act.

After arriving at a distribution of transfers implicit in the PDS and the NFSA, we compare these by state and expenditure decile. There is currently substantial variation in both prices and quantities consumed of subsidized grains because some states (Chhattisgarh, Jharkhand and Tamil Nadu) have been topping up the grains received from the Centre, and also because the distribution system functions poorly in others (Bihar, Haryana and Uttar Pradesh). The difference between status quo and a well implemented NFSA therefore differs significantly by state. Some are already providing larger implicit transfers than those implied by the NFSA, while others are well below. Although many of the poor states have made substantial improvements in their distribution system in recent years (Dreze and Khera, 2013), our estimates still indicate that the largest changes brought about by the NFSA will be in the poorest states. We also show that the NFSA is likely to better target the poor within states because they live in larger families and the current PDS has household entitlements while the NFSA has individual entitlements.

To summarize, our analysis suggests only small changes in malnutrition if the poor increase their calorie intakes. Many other forms of public spending may be more effective in improving nutritional outcomes. Moreover, given current grain purchases, the NFSA is unlikely to greatly affect food consumption. The Act will still benefit the poor by increasing their share of the total transfers implicit in food subsidies. We have of course focussed on average effects. The NFSA may help particularly vulnerable households through difficult times. Our data sets are too small

to be able to look at these populations carefully.

The rest of the paper is organized as follows. In Section 2 we explore the relationship between child malnutrition and calorie consumption, using state-level correlations and regression analysis with household data from the IHDS. In Section 3 we discuss whether the NFSA is likely to induce people to consume more food. Concluding remarks are in Section 4.

2 Malnutrition and calorie intakes

2.1 State-level averages and correlations

State-wise malnutrition rates from the NFHS for children under 5 in 2005-06 are in Table 1. Stunting and wasting are defined as two standard deviations below the WHO global standards. Malnutrition is more severe in rural than in urban India. About half of rural children are too short for their age (stunting) and 21% have low weight for height (wasting). The corresponding urban fractions are 40% and 17%. There are high rates of stunting even in relatively rich states such as Punjab and Haryana.

Figure 1 relates these malnutrition rates to average per capita calorie intakes from the 61st round of the National Sample Survey (NSS), conducted in 2004-05. We see little correlation between these two series at the state level. However state averages tell us little about the distribution of calories. We now turn to the IHDS data for a households level analysis.

2.2 Predictors of household malnutrition

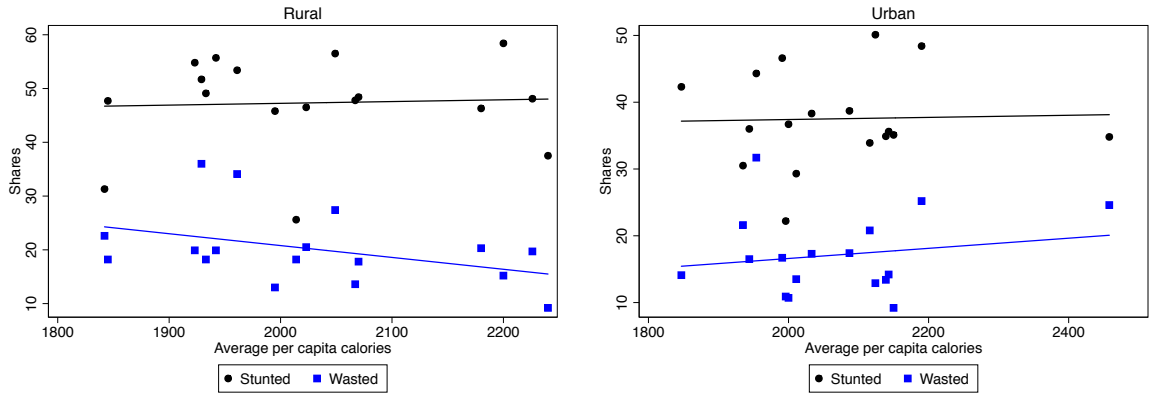
The IHDS is a nationally representative panel survey, conducted in 2004-05 and again in 2011-12. Each round covers about 40,000 Indian households. The data set includes child anthropometrics in addition to many household and individual variables. The consumption module in the IHDS is not as detailed as the one used in the NSS so we cannot directly use the NSS calorie factors

TABLE 1: Child malnutrition rates, NFHS III.

	Stunted		**Wasted**	
	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)
Andhra Pradesh	46	37	13	11
Assam	48	36	14	14
Bihar	56	48	27	25
Chhattisgarh	56	39	20	17
Gujarat	55	47	20	17
Haryana	48	38	20	17
Jharkhand	53	35	34	25
Karnataka	48	36	18	16
Kerala	26	22	18	11
Madhya Pradesh	52	44	36	32
Maharashtra	49	42	18	14
Odisha	46	35	20	13
Punjab	38	35	9	9
Rajasthan	46	34	20	21
Tamil Nadu	31	30	23	22
Uttar Pradesh	58	50	15	13
West Bengal	48	29	18	14
All-India	51	40	21	17

Note: The table displays percentages of children under 5 who are 2 standard deviations below the WHO International Reference Population median.

FIGURE 1: Malnutrition and average per capita calorie intakes



Note: We show only the major Indian states. Calorie intakes are from the 61st NSS consumer expenditure survey and malnutrition rates are from the NFHS-III.

to obtain nutritional intakes. The consumption categories are still fine enough to impute calorie intakes based on the information in the NSS. We do this using the following procedure.

As a first step, we aggregate NSS data to obtain the same consumption groups as in the IHDS. We then use the NSS data for the same years as the IHDS data to compute average calories per rupee spent on each consumption group. This involves summing calorie intakes for all items in a group and dividing by the total amount spent on the consumption group. We do this separately for each expenditure decile because the composition of consumption even within groups may vary by the economic standing of the household. This procedure gives us a measure of "calories per rupee" for each consumption group and expenditure decile. We then simply apply these to the expenditures reported in the IHDS. For individual items that are reported in both the NSS and the IHDS, such as rice and wheat, we directly use the calorie factors in the NSS.

Tables A1 and A2 in the Appendix compare average daily calorie intakes in the IHDS and the NSS data by state. We find that our strategy seems to work well for rural areas—average intakes and state-wise patterns are reasonably similar across the two data sets. The urban figures are not as close, possibly because of the greater variety of consumption goods in cities or because the urban IHDS sample is quite small. We therefore focus on rural families in our analysis. Tables A3 and A4 show the percentages of children that are stunted or wasted in the two IHDS rounds. These are again very similar to the corresponding numbers in the NFHS presented in Table 1, despite the smaller sample size of the IHDS.[3] These comparisons make us confident in using IHDS data to study our questions.

Table 2 uses the subsample of households that have at least one child under 5 and summarizes household characteristics by the nutritional status of these children. We construct four groups of families as those with (i) at least one child stunted (ii) at least one child wasted (iii) both stunted and wasted children (iv) no malnourished children. Families with malnourished children are worse-off on multiple dimensions. They have lower per capita expenditure, less education, fewer household amenities (piped water, toilets and electricity), consume fewer calories and have

[3]The correlation between the state-wise averages for 2004-05 is more than 0.6 for rural areas.

more limited access to the PDS and to government schools and health facilities.

TABLE 2: Household characteristics, by malnutrition status (2004-05 and 2011-12 combined). Reported figures are percentages unless otherwise stated

	Stunted	Wasted	Stunted & Wasted	None
	(1)	(2)	(3)	(4)
Per capita calories per day (#)	1919.3	1895.2	1839.8	1933.1
	(639.2)	(618.1)	(646.8)	(678.3)
Any PDS grain consumption	30.6	35.0	33.9	38.2
	(46.1)	(47.7)	(47.3)	(48.6)
Monthly per capita expenditure (constant rupees)	580.2	576.4	519.1	653.1
	(421.6)	(390.9)	(357.2)	(519.3)
Housesize (#)	7.2	7.8	8.0	7.5
	(3.0)	(3.7)	(3.9)	(3.3)
Highest education level, adult males (grades)	6.3	6.6	6.2	7.2
	(4.8)	(4.9)	(4.8)	(4.9)
Highest education level, adult females (grades)	3.6	3.8	3.4	4.5
	(4.4)	(4.6)	(4.3)	(4.8)
Piped water	16.4	21.9	15.4	23.3
	(37.0)	(41.3)	(36.1)	(42.3)
Toilet	55.4	57.8	51.0	63.9
	(49.7)	(49.4)	(50.0)	(48.0)
Electricity	60.2	63.8	55.3	67.6
	(48.9)	(48.0)	(49.7)	(46.8)
Main income from cultivation	37.1	42.8	39.9	39.2
	(48.3)	(49.5)	(49.0)	(48.8)
Main income from agriculture labour	16.4	16.2	15.4	14.4
	(37.1)	(36.9)	(36.1)	(35.1)
Government middle school in village	63.9	60.2	59.5	66.9
	(48.0)	(48.9)	(49.1)	(47.0)
Government secondary school in village	24.3	26.2	24.4	29.2
	(42.9)	(44.0)	(43.0)	(45.5)
Government sub-PHC in village	41.7	46.6	44.0	46.7
	(49.3)	(49.9)	(49.6)	(49.9)
Government PHC in village	14.1	14.2	13.8	14.6
	(34.8)	(34.9)	(34.5)	(35.3)
Private clinic in village	23.0	25.5	22.0	25.5
	(42.1)	(43.6)	(41.4)	(43.6)
Observations	6515	1242	1479	10167

Note: Standard deviations are in parentheses. The sample is restricted to households with at least one child under the age of 5.

We next estimate the relationship between household calorie consumption and malnutrition using multivariate regression models. Results are in Table 3. We use three different binary dependent variables corresponding to our three categories of households with malnourished children. In Panel A it is at least one child being stunted, in Panel B it is at least one child being wasted, and in Panel C, it is at least one child being stunted or wasted. For each of these, the first

column uses the logarithm of per capita calorie consumption as the only explanatory variable. The last column gives estimates from a model that includes a range of available explanatory variables and state-fixed effects. This is our preferred specification.

We find systematic effects of calories on stunting but essentially no effects on wasting. Even with stunting, effect sizes are small. The median per capita calorie intake is about 1800 calories. Even if we increase this by 25%, which would bring it close to recommended calorie norms for adults, the probability of stunting goes down by less than one percentage point. Consistent with previous research, we find that other factors, such as parental education and the availability of toilet facilities are more important influences on child malnutrition rates.

3 Implicit transfers under the PDS and NFSA

In this section we compare likely transfers under the NFSA with transfers under PDS which it replaced. All our secondary data sets pertain to this pre-NFSA period. We use NSS data collected between 1993 and 2012 to document trends in the consumption of food grains and the prices paid for them. We begin with a brief historical description of the PDS.

3.1 The Public Distribution System or PDS

The PDS has a long tradition. It began in inter-war period to provide food security and protect urban consumers from the upward pressure in food prices. It has existed in some form or another since then. The program was designed to be universal but provision remained limited because of leakages through corruption and high distribution costs. In 1997 the eligibility for PDS subsidies was restricted to poor households and it officially became a targeted program.[4] Under the targeted PDS, household entitlements and prices were based on the type of ration card they possesed. The main categories are APL and BPL (above and below the poverty line). APL households received grains at roughly market prices. In 2004 the Antyodaya Anna Yojana

[4]Tamil Nadu kept the program universal throughout.

TABLE 3: Determinants of child malnutrition, regression estimates

	(1)	(2)	(3)	(4)
Panel A. Dependent variable: at least one child being stunted (1=yes, 0=no)				
Log per capita calories per day	-0.0264**	-0.0001	-0.0490***	-0.0345**
	(0.0122)	(0.0001)	(0.0124)	(0.0154)
Log monthly per capita expenditure		-0.0427***		-0.0229**
		(0.0097)		(0.0101)
PDS grain consumption (1=yes, 0=no)		-0.0597***		-0.0281***
		(0.0091)		(0.0095)
Highest education level, adult males		-0.0010		-0.0018*
		(0.0010)		(0.0010)
Highest education level, adult females		-0.0050***		-0.0042***
		(0.0011)		(0.0011)
Any type of toilet (1=yes, 0=no)		-0.0661***		-0.0567***
		(0.0144)		(0.0144)
Observations	19390	18198	19390	18198
R^2	0.004	0.029	0.035	0.045
Panel B. Dependent variable: at least one child being wasted (1=yes, 0=no)				
Log per capita calories per day	-0.0226***	-0.0039	-0.0157**	0.0021
	(0.0077)	(0.0095)	(0.0078)	(0.0097)
Log monthly per capita expenditure		-0.0020***		-0.0114*
		(0.0066)		(0.0068)
PDS grain consumption (1=yes, 0=no)		-0.0063		-0.0079
		(0.0067)		(0.0073)
Highest education level, adult males		-0.0005		-0.0011
		(0.0007)		(0.0007)
Highest education level, adult females		-0.0014*		-0.0016**
		(0.0007)		(0.0008)
Any type of toilet (1=yes, 0=no)		-0.0151		-0.0115
		(0.0109)		(0.0106)
Observations	19390	18198	19390	18198
R^2	0.001	0.004	0.011	0.013
Panel C. Dependent variable: at least one child being stunted or wasted (1=yes, 0=no)				
Log per capita calories per day	-0.0304**	0.0003	-0.0476***	-0.0297*
	(0.0124)	(0.0149)	(0.0125)	(0.0158)
Log monthly per capita expenditure		-0.0452***		-0.0207**
		(0.0099)		(0.0105)
PDS grain consumption (1=yes, 0=no)		-0.0546***		-0.0255***
		(0.0093)		(0.0095)
Highest education level, adult males		-0.0017*		-0.0027***
		(0.0010)		(0.0010)
Highest education level, adult females		-0.0046***		-0.0041***
		(0.0011)		(0.0011)
Any type of toilet (1=yes, 0=no)		-0.0645***		-0.0541***
		(0.0151)		(0.0155)
Observations	19390	18198	19390	18198
R^2	0.004	0.025	0.033	0.041
Controls	no	yes	no	yes
State FEs	no	no	yes	yes
Year FEs	yes	yes	yes	yes

Note: Robust standard errors clustered at the village-level are shown the parentheses. The controls consist of all the variables listed in Table 2. We report only selected coefficients of interest. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

was launched to provide larger entitlements at lower prices to the ultra poor. Although the state governments have been responsible for the implementation of the PDS, funding has been provided largely by the central government. Allocations of rice and wheat to state governments are based on their official poverty estimates. Some states supplement these with their own resources in order to expand outreach or lower prices.

The first and the third column of Table 4 show the share of all households with any consumption from the PDS. The second and fourth column show the average per capita consumption in kilograms, conditional on consumption. Several patterns are apparent. First, the PDS no longer exhibits a clear urban bias; a larger fraction of rural households benefit from the program than do urban households. Second, the fraction of households consuming PDS grains has doubled from 2004–05 to 2011–12. Third, the average quantities consumed (conditional on access) have also increased substantially.

TABLE 4: PDS access and quantities purchased (rice and wheat combined)

	Rural		**Urban**	
	Share	Quantity	Share	Quantity
	(1)	(2)	(3)	(4)
1993–94	25.6	3.4	32.1	3.5
1999–00	32.4	3.1	26.9	3.6
2004–05	24.8	4.6	15.4	4.5
2009–10	43.3	4.7	28.2	4.2
2011–12	50.0	4.9	30.6	4.2

Note: All numbers in the table are population-weighted. Column (1) and (3) show the fraction of households with consumption of food grains through the PDS, while Columns (2) and (4) show the per capita average amounts consumed (in kg), conditional on any consumption through the PDS.

Table 5 displays unit values for rice and wheat. The NSS surveys provide information on quantities and expenditures for various consumption goods. Unit values are simply total expenditure divided by the quantity for a particular good. The figures in the table are obtained by first computing the median unit value in each state, and then taking the population-weighted average of these medians.

From 1993–94 to 2004–05, the difference between PDS and market prices was quite small. In contrast, from 2004–05 to 2011–12, market prices of both rice and wheat almost doubled, while the PDS prices changed little and even fell in some states. Combined with the increase in coverage, these trends imply higher implicit transfers through the PDS over time. It is no surprise then that the program has grown in popularity among politicians and the electorate.

TABLE 5: Unit values

	Rice		**Wheat**	
	PDS	Market	PDS	Market
	(1)	(2)	(3)	(4)
1993–94	5.2	6.8	3.8	5.0
1999–00	5.3	10.9	4.6	8.9
2004–05	5.7	10.7	5.2	9.4
2009–10	5.3	18.1	5.9	15.5
2011–12	6.2	20.2	6.7	16.2

Note: The table shows population-weighted averages of within state median unit values for rice and wheat.

The two-layer setup of the PDS—where the center funds and the states implement—has led to variation in its size and effectiveness across states. The system has traditionally worked well in many of the southern states, especially Tamil Nadu, and been dysfunctional in the northern heartland. In recent years, however, there are clear signs of a revival among many of the poor performers, such as Chhattisgarh, Odisha and Jharkhand (Dreze and Khera, 2013).

Table 6 shows state-wise patterns in PDS implementation. These figures are computed from the latest NSS expenditure survey of 2011–12. In the first and fourth column we show access for rural and urban households. The percentage of households who access the system ranges from 8 per cent in urban Gujarat to 95 per cent in rural Tamil Nadu. The second and the fifth column show the average grain consumption in kilograms, conditional on PDS consumption.

The third and the sixth column show the average per capita transfer implicit in the grain subsidies. We compute these implicit transfers by multiplying the difference between the PDS and market prices for rice and wheat by the PDS quantity consumed. We are therefore evaluating the benefit from the PDS as an income transfer (see also Khera, 2011; Radharkrishna and

Subbarao, 1997; Dreze and Khera, 2013). For household h, the transfer could be written as:

$$T^h \equiv Q^h(P_{market} - P^h_{pds}), \tag{1}$$

where Q_h is the PDS quantity consumed of either rice or wheat, P_{market} is the market price, and P^h_{pds} is the subsidized price under the PDS paid by household h. Various ways of computing the market prices have been put forward, but here we simply calculate the market prices as the median unit value within each state and sector.[5]

The average per capita transfer for rural areas as a whole is about 32 rupees, or 3.5 per cent of the poverty line. In urban areas the average transfer is around 21 rupees, which is about 2.5 per cent of the urban poverty line. The size of these transfers varies enormously by state. Rural households in Tamil Nadu are the largest beneficiaries and receive an average of 84 rupees per month.

[5]Himanshu and Sen (2013) use the actual price paid for each household with consumption from the regular market, and the average unit value within the FSU (first stage unit) for households without market purchases. Dreze and Khera (2013) use the median unit value within in state and sector, as we do, but experiment by using the 25th percentile of the unit value distribution instead of the median, and find very similar results.

TABLE 6: State-wise implementation of the PDS, 2011-12

	Rural			Urban		
	Share	Quantity	Transfer	Share	Quantity	Transfer
	(1)	(2)	(3)	(4)	(5)	(6)
Andhra Pradesh	89.3	4.0	66.0	49.0	3.8	43.7
Assam	55.2	5.1	30.8	31.4	4.5	16.0
Bihar	44.9	5.3	24.5	22.5	4.5	11.1
Chhattisgarh	61.9	6.8	54.1	41.6	6.6	40.9
Gujarat	32.5	2.5	11.1	8.4	3.1	3.2
Haryana	18.4	6.1	8.2	11.0	6.3	6.4
Jharkhand	34.9	6.1	35.0	9.4	5.5	9.3
Karnataka	76.1	3.8	48.7	40.4	3.8	32.1
Kerala	85.0	3.6	60.5	72.9	3.2	45.6
Madhya Pradesh	40.0	5.3	21.6	26.5	4.9	12.1
Maharashtra	48.1	5.3	28.9	15.2	3.9	8.0
Odisha	68.2	5.9	55.6	35.8	4.7	28.0
Punjab	25.2	4.7	9.1	10.4	4.8	4.7
Rajasthan	27.7	4.9	12.6	18.1	3.6	5.6
Tamil Nadu	94.7	5.2	84.1	77.6	4.6	65.8
Uttar Pradesh	27.0	5.7	12.5	19.7	3.6	5.7
West Bengal	51.2	3.2	24.1	26.5	2.9	12.5
All-India	50.0	4.9	31.7	30.6	4.2	20.5

Note: All numbers in the table are population-weighted. (1) and (4) show the fraction of households with consumption of food grains through the PDS, while Column (2) and (5) show the per capita average amounts consumed (in kg), conditional on any consumption through the PDS. Column (3) and (6) display the average per capita implicit transfer from the PDS on a monthly basis.

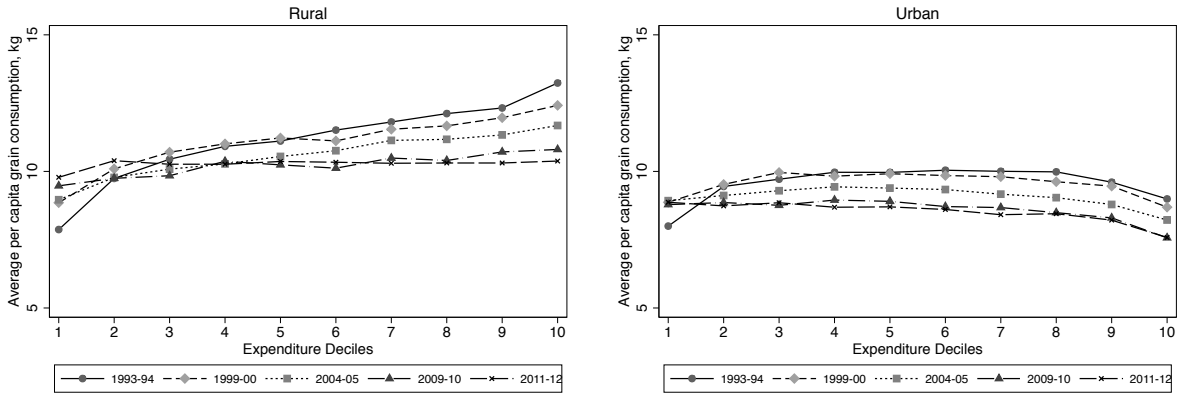
3.2 Entitlements relative to household consumption

The NFSA intends to provide 75% of the rural population and 50% of the urban population with a minimum entitlement of 5 kilograms of grains per month. This is more likely to increase overall calorie intakes if households are currently consuming less than this amount. Figure 2 plots grain consumption by expenditure decile for different years.

From 1993-94 to 2004-05 grain consumption increased with total household expenditure. However, for the two later survey rounds we find average consumption to be about 10 kg. per month across the expenditure distribution. Urban consumption is lower for all deciles. Figure 3 shows the fraction of households that consumed less than the NFSA entitlement of 5 kg. per person. In 1993-94, the shares of families in the lowest rural and urban deciles consuming less than this amount were 28% and 22% respectively. These shares have fallen over the years, and in 2009-10 and 2011-12 we find little variation by the expenditure deciles.

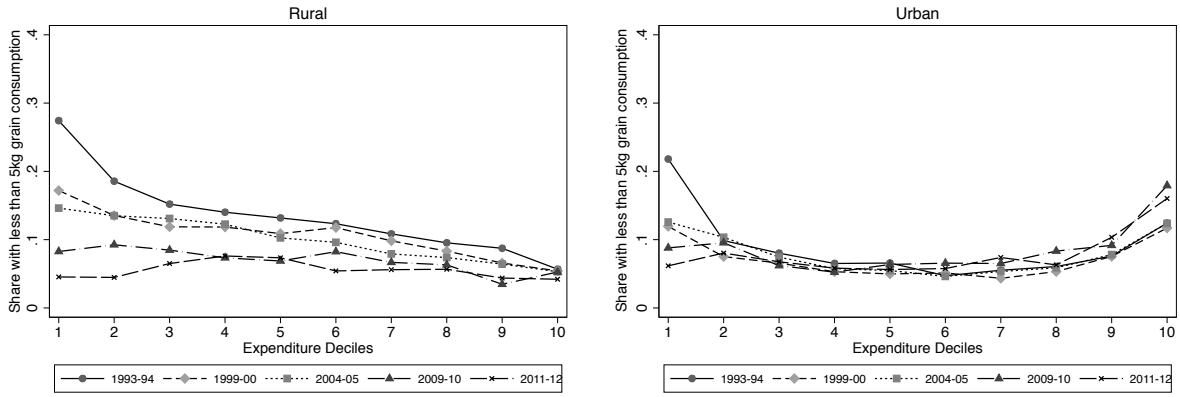
Since most households already consume much more than the NFSA entitlements, and consumption seems largely uncorrelated with total expenditures, it is unlikely that the NFSA will increase food grain consumption by much. The implicit income transfers provided by the grain subsidies may still be sizable. We now compare these transfers under the current PDS and a well-implemented NFSA.

FIGURE 2: Average per capita food grain consumption (kg.)



Note: The figures show the average per capita grain consumption by expenditure deciles. All numbers are population-weighted.

FIGURE 3: Population shares consuming less than 5 kg. per capita food grains



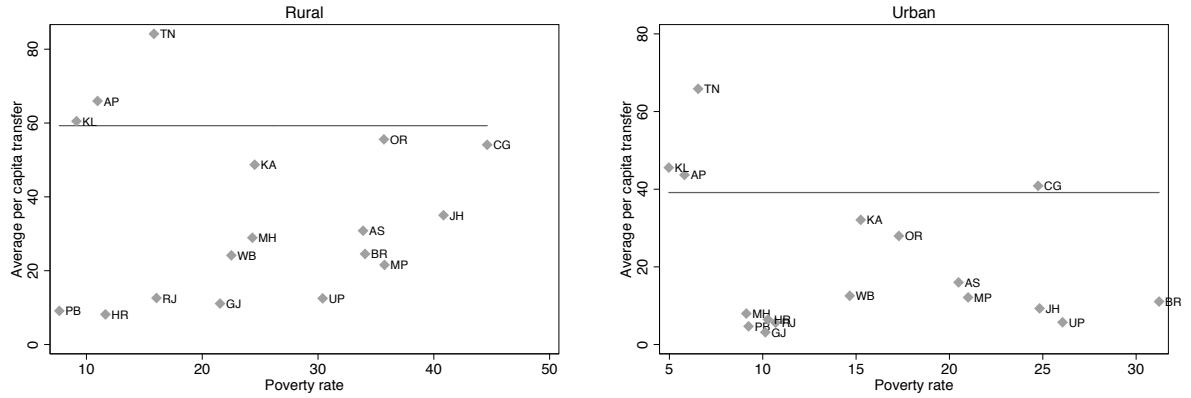
Note: The figures show the share of households that consume less than 5 kg. of food grains per month, by expenditure deciles. All numbers are population-weighted.

3.3 Implicit transfers: PDS vs. NFSA

We compute transfers using the most recent large round of the NSS expenditure survey from 2011-12. For the PDS, we use the formula in Equation (1) above. For the NFHS, we use the entitlement of 5 kg. and the stipulated prices of 3 rupees per kg. of rice and 2 rupees per kg. of wheat. We weight the two prices using the relative consumption of rice and wheat under the current PDS. This assumes a perfect implementation of the Act and is therefore an upper bound on the transfers that will eventually occur.

Figure 4 plots state-wise average transfers under the two schemes against poverty rates, separately for rural and urban populations.[6] The horizontal line in each of the two graphs roughly indicates implicit transfers implied by the NFSA. Some states already provide larger implicit transfers than those mandated by NFSA, while others are well below. The graphs reveal that the NFSA has the potential to increase transfers in many of the poorest states in India and we know that these are also states with high levels of malnutrition.[7]

FIGURE 4: Current PDS transfers versus poverty rates



Note: The dots in the graphs show state-wise average per capita transfers from PDS grains. The poverty rates are the current official poverty rates, as suggested by the Tendulkar Expert Group. The horizontal lines are estimates on the size of the implied transfers under the NFSA. All numbers are population-weighted.

Figure 5 shows within-state transfers. The bars show average per capita transfers from the PDS.

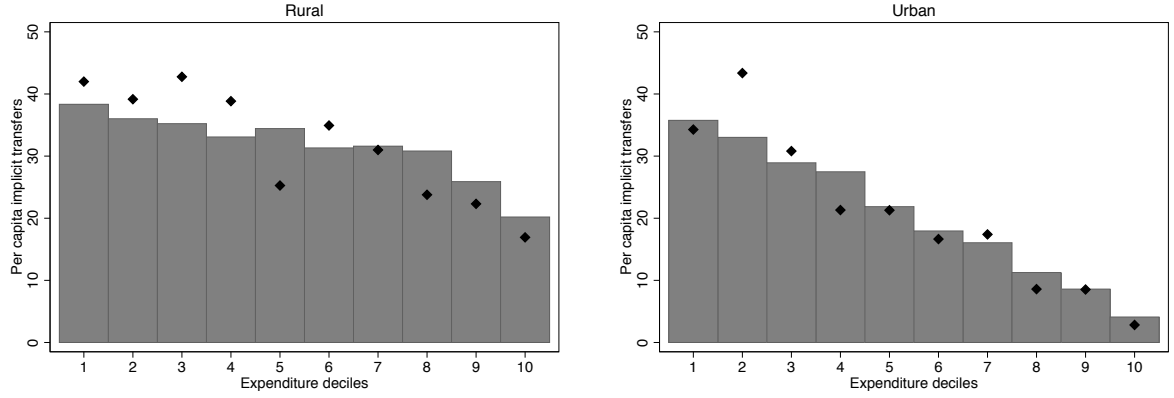
[6] We use current official poverty rates which are based on recommendations of the Tendulkar Expert Group (Government of India, 2013).

[7] These NFSA line is also approximate because it does not account for Antodaya households who will receive the same entitlements of 35 kg. that they receive under the current PDS. These households are included in PDS transfer computations.

We compute expenditure deciles within each state and then calculate the population-weighted average transfer for each decile.[8] Average transfers decline quite sharply with expenditure in urban areas, but only modestly for rural areas. Given the poor targeting of current transfers, there's clearly potential for the NFSA to improve progressivity in the systeem.

The switch from household-specific entitlements in the current PDS to individual-specific entitlements in the NFSA is also likely to shift the distribution in favor of the poor. To show this explicitly we adjust the average transfers for household demographics. The per capita numbers shown by the bars in Figure 5 are derived by dividing the total household transfers by the actual number of members in each household. The dots in the figure, in contrast, present the household level transfers, normalized by the overall average household size. The differences between the bars and the dots indicate how much household demographics contribute to the current distribution of transfers—if the dot is above the bar it means that households in this decile are larger than the overall average. Poorer families tend to be larger than average so the shift to individual-specific entitlements is a pro-poor policy change. Demographic variation in household size is less important in urban areas.

FIGURE 5: Within-state distribution of transfers and adjustment for household size



Note: The bars display the average per capita transfer from PDS grains by within-state expenditure deciles. The dots show adjusted values based on the overall average household size, and not actually household sizes. All numbers are population-weighted.

[8] We exclude all expenses on rice and wheat when computing the expenditure deciles.

4 Conclusion

Our main findings can be summarized as follows. Based on an analysis of household data from the Indian Human Development Survey, we find that higher calorie intakes among the poor are accompanied by lower rates of malnutrition but the size of these effects are small. Other factors such as parental education and access to public services and household amenities appear more important in explaining the geographical variation in the number of malnourished children. Using multiple rounds of the NSS, we find that the NFSA entitlements are likely to be too small to affect food consumption by much. The NFSA is most likely to benefit the poor by providing large implicit income transfers. The distribution of these is likely to be more progressive than under the current PDS partly because of bad targeting in the current systems, and also because the NFSA moves the system from household entitlements to individual entitlements and poor families tend to be larger.

We have considered only one important component of the NFSA. The programs that specifically target vulnerable populations may have more direct effects on malnutrition. Even within the system of food distribution, we have focussed on average effects. The higher coverage of the NFSA may allow some very poor households who were neglected by the PDS to receive adequate food.

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A Statistical appendix

TABLE A1: Average per capita calorie intake per day, 2004-05

	Rural		Urban	
	NSS	IHDS	NSS	IHDS
	(1)	(2)	(3)	(4)
Andhra Pradesh	1995	1983	2000	2072
Assam	2067	2000	2143	2363
Bihar	2049	2561	2190	2134
Chhattisgarh	1942	1836	2087	2108
Gujarat	1923	1932	1991	1980
Haryana	2226	2349	2033	2536
Jharkhand	1961	1622	2458	1874
Karnataka	1845	2026	1944	2100
Kerala	2014	1666	1996	1650
Madhya Pradesh	1929	1997	1954	1970
Maharashtra	1933	1816	1847	1786
Odisha	2023	1818	2139	2010
Punjab	2240	2352	2150	2422
Rajasthan	2180	2102	2116	1913
Tamil Nadu	1842	1775	1935	1716
Uttar Pradesh	2200	2230	2124	2049
West Bengal	2070	2144	2011	2037

Note: The table shows average per capita calories intakes per day from the NSS and IHDS. All numbers in the table are population-weighted.

TABLE A2: Average per capita calorie intake per day, 2011-12

	Rural		Urban	
	NSS	IHDS	NSS	IHDS
	(1)	(2)	(3)	(4)
Andhra Pradesh	2186	2308	2150	2140
Assam	2170	2357	2038	2685
Bihar	2057	2292	2080	2041
Chhattisgarh	2037	2030	2072	2388
Gujarat	1915	2167	2070	2102
Haryana	2254	2264	2165	2301
Jharkhand	2042	1925	2101	2012
Karnataka	2003	2225	2007	2094
Kerala	1975	1863	2030	1646
Madhya Pradesh	2110	2221	2029	2052
Maharashtra	2103	1891	2039	1987
Odisha	2116	2056	2094	2234
Punjab	2328	2336	2172	2309
Rajasthan	2263	2160	2151	2113
Tamil Nadu	1926	2103	1975	1983
Uttar Pradesh	2436	2165	2379	2090
West Bengal	2092	2240	2026	2231

Note: The table shows average per capita calories intakes per day from the NSS and IHDS. All numbers in the table are population-weighted.

TABLE A3: Child malnutritition 2004-05 (IHDS)

	Stunted		Wasted	
	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)
Andhra Pradesh	57	53	16	14
Assam	40	37	45	33
Bihar	57	55	16	17
Chhattisgarh	62	44	15	20
Gujarat	53	47	30	20
Haryana	47	53	10	18
Jharkhand	54	49	21	10
Karnataka	59	45	17	16
Kerala	45	43	12	12
Madhya Pradesh	63	55	14	14
Maharashtra	49	46	19	19
Odisha	68	49	9	12
Punjab	49	55	6	3
Rajasthan	62	55	11	12
Tamil Nadu	32	34	19	15
Uttar Pradesh	68	54	16	8
West Bengal	64	49	14	16
All-India	59	49	16	15

Note: The table shows malnutrition rates for children below 5 years of age, calculated from the IHDS. All numbers in the table are population-weighted.

TABLE A4: Child malnutritition 2011-12 (IHDS)

	Stunted		**Wasted**	
	Rural	Urban	Rural	Urban
	(1)	(2)	(3)	(4)
Andhra Pradesh	48	57	22	15
Assam	36	62	9	12
Bihar	58	59	10	6
Chhattisgarh	46	34	24	10
Gujarat	65	47	21	19
Haryana	42	27	13	18
Jharkhand	57	55	21	22
Karnataka	45	41	22	15
Kerala	40	31	8	17
Madhya Pradesh	55	51	26	20
Maharashtra	55	39	26	29
Odisha	58	47	19	10
Punjab	37	38	7	16
Rajasthan	62	47	11	9
Tamil Nadu	49	33	10	15
Uttar Pradesh	65	49	12	10
West Bengal	54	45	15	12
All-India	57	45	15	15

Note: The table shows malnutrition rates for children below 5 years of age, calculated from the IHDS. All numbers in the table are population-weighted.

TABLE A5: Entitlements and uptakes by states (2011-12)

	BPL		**AAY**	
	Ent.	Full	Ent.	Full
	(1)	(2)	(3)	(4)
Andhra Pradesh	13	77	35	56
Assam	35	12	35	33
Bihar	25	69	35	51
Chhattisgarh	35	81	35	86
Gujarat	20	11	35	1
Haryana	35	50	35	45
Jharkhand	35	43	35	35
Karnataka	17	43	35	4
Kerala	25	46	35	24
Madhya Pradesh	20	3.3	35	42
Maharashtra	35	24	35	27
Odisha	25	91	35	83
Punjab	35	8	35	14
Rajasthan	25	77	35	53
Tamil Nadu	18	65	35	48
Uttar Pradesh	35	47	35	63
West Bengal	20	26	35	2

Note: Column (1) and (3) show the household level entitlements for BPL and AAY card holders. Column (2) and (4) display the fraction of the households holding these cards that consume at least their entitled amounts of PDS grains. All numbers are population-weighted.

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