

The Impact of Public Transfers on Intra Household Resource Allocation: Evidence from a Supplementary School Feeding Program

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Abstract

Can public transfers targeted towards individuals improve their welfare or do they crowd out household resources allocated to that individual and nullify the expected gains to the intended beneficiary? This paper draws upon a unique non experimental survey data to test the implication of the theory of altruism on intra household resource allocation by analyzing the impact of a school feeding program on a child's daily nutrient intake in rural India. The results suggest that the school meal scheme raises nutrient consumption by a fraction of the transfer. To the extent that the nutrient intake of the child rises by less than the full amount of the transfer obtained from the school meal, the results provide evidence of reallocation of resources by the household to consumption of other members or goods. This result is robust to changes in specification of the empirical model which correct for possible endogeneity of program participation at the individual, school and community level.

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1 Introduction

The improvement of individual well being is one of the primary objectives of most welfare programs. Several policy initiatives in developing countries, in particular, aim to address the challenge posed by low levels of education and health among the more vulnerable sections of the population, namely women and children. The relevant policy question is to what extent the intended beneficiary of such public transfer programs benefits from the policy initiatives. The standard unitary models of household behavior (Becker, 1974) suggest that as long as the household is the final decision making unit, transfers to an individual member would be equivalent to an increase in total household resources. Since households pool their income and redistribute it among the members, intra household resource reallocation in response to an individual welfare scheme can nullify any expected gains to the recipient of the transfer. In this paper I test this implication of the theory of altruism through the analysis of the impact of a supplementary school feeding program on a child's daily nutrient intake in India. While doing so, I also investigate the factors that determine the magnitude of reallocation of household resources, if any, away from the child in reaction to the government transfer.

Supplementary feeding programs could be an effective policy tool to directly improve child nutrition as well as influence a variety of other non health outcomes of the target population¹. Surprisingly, though school meal programs are being increasingly advocated in developing countries as an instrument for reducing hunger and malnourishment, little evidence exists about the effectiveness of such a program in attaining this goal. Besides evaluating the efficacy of individual welfare programs in general, the estimation of the magnitude of the impact of school meal schemes on child nutrition is a goal in itself. South Asia accounts for the largest proportion of pre school children suffering from stunting and wasting in the world, 40% of whom come from India². Stunting in early childhood is linked to low levels of mental development and increased susceptibility to diseases in later stages of life. Policy interventions which promote catch-up growth could lead to improvement in mental and physical well being of school age children.

I address the research question by drawing upon a unique primary survey data, collected by the author in the central Indian state of Madhya Pradesh. There are several advantages of using this data set. First, I use individual consumption data on nutrient intake of the child based on a 24 hour recall survey. This measure enables me to directly evaluate the magnitude of the transfer through the

¹ A review of experimental and survey research by Behrman (1993) concludes that most studies have found evidence of a positive relationship between children's nutritional status, their cognitive achievement and school participation rates.

² Report of the Commission on Nutrition Challenges in the 21st Century, (UNICEF, 2000). Moderate to severe wasting is defined as below -2 standard deviations from median weight for height of reference population and stunting is defined as below -2 standard deviations from median height for age of reference population.

meal program and its effect on the child's total nutrient consumption during a day. Research on public transfers to children have been limited to estimating indirect outcomes of these schemes, such as, impact on cognitive ability, school participation rates or anthropometric outcomes particularly because data on individual consumption is more difficult and expensive to collect in terms of both time and other resources. Aggregate household nutrient consumption, long term health outcomes or test scores may not account fully for the redistribution of resources within the household³.

Second, the survey was conducted in an area with near uniformity in the type and the quality of the school meals and universal program eligibility of all enrolled children. In addition, an exogenous variation in the quality of the meal resulting from a change in government allows for evaluating the relative effectiveness of the initial bland porridge meal with the supposedly tastier meal of wheat bread and vegetables or lentils introduced by the new policy.

Third, a comparison of the daily nutrient intake of program participants and non participants could give erroneous results if there is self selection into the scheme. The custom designed survey data provides an exogenous determinant of daily individual participation in the program. The empirical analysis utilizes a difference in differences approach by comparing the total nutrient intake of attendees and non attendees across schools with and without the meal scheme. For some randomly selected children in the sample the diet recall survey was for a school day while for others it was a school holiday. Since school attendance may be determined by unobservable individual or household characteristics, the empirical strategy exploits this randomness in the child's reference day to instrument for attendance and thereby participation in the meal program.

Finally, in addition to the cross sectional analysis, a sub sample of the survey data provides an experimental study which comes close to a natural test of the effectiveness of government transfer

³ There exists a large research literature on public interventions in child health and education. Hoddinott et al. (2000), find that a Mexican cash grant program (PROGRESA) conditional on school attendance of the child increased total household consumption of nutrients. However, Schultz (2000) does not find a significant impact of this program on school attendance though the enrollment of students increased by more than three percentage points. Kremer et al. (2002) find that dropout rates fell considerably in schools which provided free uniforms and textbooks compared to the schools in the control group. Some of the experimental studies, however, are based on small and at times selective samples and may not account for possible reallocation of resources within households which may affect outcomes. On the other hand, survey studies such as Dreze and Kingdon's (2000) analysis of school participation in rural north India show that the presence of a school meal program has a positive effect on school enrollment. Ravallion and Wodon (1999) find that an enrollment subsidy in Bangladesh, offering raw food grains less than the mean child wage, led to a rise in enrollment and a reduction in child labor. These survey studies, however, suffer from sample selectivity and endogenous program participation.

Research on impact of food supplements to children has been fewer. Vermeersch (2003) finds no increase in height or weight of pre school children in Kenya who were administered school meals on site using a randomized experimental study. Chavez and Martinez (1986) followed 34 rural Mexican children from birth to age 9, found that those who received food supplements performed much better on school tests. In another study Martorell (1993) found that Guatemalan children who were administered food supplements during 1969-77 scored higher on intelligence tests in 1987-88. Experimental studies in India and Indonesia found significant improvement in cognitive ability of children who were initially deficient in iron on being administered iron supplements (Sheshadri and Gopaldas, 1989; Soemantri, 1989). A study conducted by Miguel and Kremer (2001) evaluating a randomized school-based deworming project in Kenya found that the program reduced school absenteeism and also created substantial health externality among untreated children. However, they found no evidence of improvement in test scores

schemes on individual well being. The data includes an individual level panel of a randomly chosen sub sample of children whose dietary recall data was collected on two consecutive days – on a day they were provided a supplementary meal, a school day and a day on which they received no food transfer, a non school day.

To give a brief preview of the results, the school meal scheme raises the total daily calorie consumption of participants in the program by a fraction of the program transfer. To the extent that the calorie intake of the child rises by less than the full amount of the transfer obtained from the school meal, the results provide evidence of intra household reallocation of resources away from the child. It is possible that households perceive meals at school as a substitute for consumption of food or other goods the child has at home and as a result, reallocates resources at home from the participating child to other household members. Analysis of daily intake of other essential nutrients reveals that the program has a significant effect on raising the consumption of carbohydrates but impact on the intake of nutrients the population is particularly deficient in, namely proteins, iron, calcium and vitamin A is less robust to specification changes⁴.

The paper is organized as follows. The existing literature, the analytical framework and the historical background of the school meal scheme in India is discussed in section 2. The details of the design and implementation of the survey and the data is presented in section 3 along with the empirical strategy. The empirical results are presented in section 4 while section 5 discusses the policy implications of the results and concludes.

2 Background

2.1 Existing Literature

Extensive evidence exists on inequality in allocation of resources within a household on the basis of gender, earnings capacity and other individual characteristics (Pitt, Rosenzweig, and Hassan, 1990; Behrman 1988; Rosenzweig and Schultz, 1982). However, studies on the implication of this literature for the magnitude and determinants of intra household resource allocation to individual recipients of government transfer programs have been few though there are several studies providing evidence of crowding out of private transfers due to public welfare programs. The motivation for research on altruism within the family stems from the work of Becker (1974) and Barro (1974) which predicts that private intra household transfers can undo public transfers. For instance, Jensen (2002) finds that one rand of public pension to the elderly in South Africa resulted in a 0.25 to 0.30 rand

⁴ Diet survey data in India indicate that protein-energy malnutrition, vitamin A, iron, calcium and riboflavin deficiency in children is the highest (Gopalan, Sastri and Balasubramaniam, 2004).

reduction in transfers from non co-residential children. Rosenzweig and Wolpin (1994) find that an increase in AFDC benefit to daughters reduces in kind transfers in the form of shared housing as well as direct financial transfers from parents. On the other hand, if parents make transfers to children in exchange for their services rather than due to altruism motive empirical evidence suggests (Cox, 1987; Altonji et al., 1997) that public transfers will not neutralize parental transfers.

The advantage of analyzing the impact of public transfers on allocation of resources within the household through an in kind transfer program lies in the ease of gathering data on individual consumption of the subsidized good with greater precision compared to the difficulty of obtaining individual expenditure data for the analysis of cash transfers. On site supplementary meal schemes, therefore, provide a good experiment for studying the household dynamics particularly since it is difficult to control for the final recipient of transfers through a take home supplementary meal program.

The evaluation of the impact of the school lunch and breakfast program in the U.S. (Akin, Guilkey and Popkin, 1983; Devaney and Fraker 1989) finds small benefits of the program on the 24 hour intake of nutrients for participating children. But these studies do not account for sample selection either at the individual or school level. Gleason and Sutor (2003) using an experimental difference-in-difference approach, compare the difference in mean nutrient intake of participants on a school day with the difference on a non school day to find positive effect of the NSLP on daily nutrient intake. However, none of these studies quantify the nutrient transfer through the school meals. For developing countries, evidence on impact of on site school feeding programs on individual daily intake is inadequate (Beaton and Ghassemi, 1982; Jacoby et al., 1996). A recent study by Jacoby (2002), however, finds no reallocation of calories away from the child within the household in response to the feeding program. The total daily calorie intake of the child rises by almost one for one with the school meal calories.

Though there exists a general consensus in India on the potential benefits of the school meal program among academics as well as administrators, there have been few well-designed, scientific studies directly assessing the Indian experience with school meal programs. One of the possible reasons is that there exists no secondary source of disaggregated data on the individual food intake. A holistic evaluation of the program requires detailed household, school and community data. In addition, lack of transparency in the implementation of government schemes in most developing countries requires careful checks and balances in the data collection process and the design of the survey.

2.1 Analytical Framework

It is reasonable to assume that during early childhood the consumption of a child residing within a household is almost completely within the control of parents. We can, then, analyze the impact of a public transfer to the child within the unitary framework of the household⁵. Consider a two member household consisting of parent i and child j . The household maximizes its utility over two goods, total daily nutrient intake of j , C^j and a vector of other goods X , which includes total daily nutrient intake of i , and all other goods consumed by both i and j , such as leisure. The quantity of C^j and X consumed is a function of the individual characteristics of the household member, μ^k (such as age and gender), η^h is a vector of household characteristics (such as, demographic composition of the family, religion and caste) and η^c representing community characteristics. The household's utility maximization problem is,

$$(1) \quad \text{Max.} \quad U = U(C^j, X ; \mu^k, \eta^h, \eta^c) \quad k = i, j$$

subject to the household budget constraint,

$$(2) \quad X + p_c C^j \leq Y$$

where, p_c is the price of C^j relative to price of X and Y is the total, pooled household income. For simplicity, I assume that prices of both C^j and X are exogenous to the household. The first order condition with respect to C^j and X , leads to the condition,

$$(3) \quad \frac{MU(C^j)}{MU(X)} = p_c$$

Equation (3) is the usual utility maximization condition which states that the household will equate the marginal rate of substitution between C^j and X to the ratio of the prices of the two goods. The household's utility optimization generates the following optimal demand functions for C^j and X ,

⁵ The income pooling models, however, contrast sharply with the bargaining literature which suggests that resource allocation within households is determined through a process of bargaining between individual members. Thus a government transfer program to a particular household member could potentially increase his or her bargaining power resulting in an allocation of household resources closer to the preferences of the recipient of the transfer (Lundberg, Pollak and Wales, 1997; Duflo, 2000; Martinelli and Parker, 2003; Aromolaran, 2004).

$$(4) \quad C^j * = C(p_c, Y, \mu^k, \eta^h, \eta^c)$$

$$(5) \quad X * = X(p_c, Y, \mu^k, \eta^h, \eta^c)$$

On a school day, the child receives an in-kind transfer through the school meal program. I assume that the meal program does not affect the relative prices of the two goods p_c , but only has a general income effect. Keeping the right hand side of equation (3) constant and given the neo-classical properties of the utility function, the household will increase the allocation of resources to X in order to correct the imbalance in the equality resulting from an increase in C^j from the consumption of meals at school.

Figure 1 depicts graphically the implications of this simple model. Suppose the initial allocation of daily nutrients from food between the child and consumption of other goods is at point A. With the introduction of the school feeding program, the household budget constraint shifts out to the thick line which is kinked at point C. On a school day, if the household does not reallocate food, the child's nutrient consumption would increase by the full amount of the transfer to point B. But, as suggested by the model, the household can reallocate resources away from the child to other goods to the kink at point C. Therefore, the consumption of both C^j and X rises due to the income effect, but the child's intake of nutrients increases by less than the full amount of the transfer, AB.

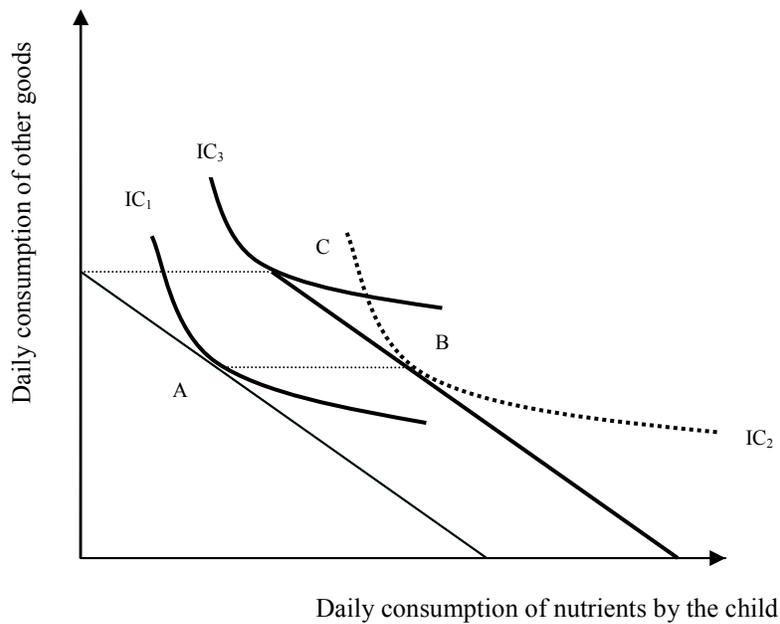


Figure 1: Intra household Resource Allocation

Now suppose we have data on the nutrient intake of children in two groups- those whose school is providing meals and others whose school is not. Within each group, some children are randomly interviewed on a school day and others on a non school day. If the participation of the school in the program is random and the only difference in nutrient intake between school and non school days is due to the meal program, then the difference in difference between the nutrient consumption of school attendees and non attendees in the two types of school would give us the impact of the meal program on daily nutrient consumption.

However, this experiment hinges on two critical assumptions. First, nutrients obtained from the school meal should be fungible only within a day and not between a school and a non school day. In India, a school week consists of six days, from Monday through Saturday. It is plausible to assume that household would smooth the child's consumption over a day rather than tax her consumption only on a school holiday. Since each individual has a certain minimum requirement of food representing a minimum level of daily utility from nutrient consumption, parents would reduce food consumption of the child only to the minimum required level on a particular day.

Second, there should no difference in nutrient requirements between a school day and a holiday. In agricultural economies children may contribute by working on the family farm or other perform household chores. If a child from a poorer family is more likely to participate in the school meal scheme and also work on school holidays then, her energy requirement on holidays would be higher. If she consumes more calories on holidays then the difference between calorie intake of attendees and non attendees in communities offering the program would be small. This would bias the program effect downwards. One of the strengths of the data is that we can directly measure the time utilization pattern of the child on a school day and on a holiday. In addition, a community fixed effects model can reduce any bias in the observed coefficient.

2.2 The School Feeding Program in India

I now turn to explaining the nature of the school meal program in India in order to understand the empirical strategy adopted in the next section. The federal government of India launched the National Program of Nutritional Support to Primary Education in August 1995. Under the program, cooked meals were to be introduced in all government, local body and government aided primary schools across all states in the country within two years. In most Indian states primary school consists of grades 1 to 5 with a few exceptions, in which case primary school is only up to grade 4. All enrolled children in these schools were to be provided with a free 'nutritious' meal equivalent to 100 grams of calorific value per school day. The federal government was to provide raw food grains

(either wheat or rice, depending on whether it is a wheat or rice eating area) free of cost to the state governments. The cost of converting raw food grains in to cooked meals was to be borne by the state governments. States were given an interim period to raise resources to implement the program. In the meantime, they were allowed to distribute free grain rations to all enrolled children at 3 kilos per month for a 10 month academic year subject to a minimum monthly attendance of 80% per student. A supreme court of India judgment in November 2001 directed all state governments which were yet to implement the program to provide cooked meals in all targeted schools within the state in six months⁶.

2.2.1 The School Feeding Program in the Survey Region

This survey was conducted in one of the largest states of India, Madhya Pradesh, located in the central part of the country. It has a population of more than 60 million according to the 2001 census, with a significant tribal population⁷. The tribal population is notably more backward in terms of ownership of productive assets, literacy levels and health status⁸. According to the National Family Health Survey (NFHS), 1998-99, more than 50% of children in Madhya Pradesh are underweight, higher than the national average of 47%⁹.

Madhya Pradesh was one of the earliest states to implement the school meal program. In October, 1995 the program was initiated in the government and government aided primary schools (grades 1 to 5) in 174 tribal and 123 non tribal blocks of the state on a pilot basis. However, in 1997, the state government discontinued provision of cooked meals in the relatively less backward non tribal blocks, and instead directed them to distribute raw food grains every month, due to lack of resources to implement the program. After the Supreme Court judgment, the state government directed that cooked meals be provided in all government and government aided primary schools from February 2002, across the state. Specific guidelines for implementing the program were provided by the state government in June 2003. In November, 2003 a new government was elected in

⁶ Quoting the Supreme Court order; “We direct state governments/union territories to implement the mid-day meal scheme by providing every child in every government and government assisted primary school with a prepared mid-day meal with a minimum content of 300 calories and 8-12 grams of protein each day of school for a minimum of 200 days. Those governments providing dry rations instead of cooked meals must, within three months, start providing cooked meals in all government and government assisted schools in half the districts of the state (in order of poverty), and must within a further period of three months extend the provision of cooked meals to the remaining parts of the state.”

⁷ 20% of the state’s population is tribal according to the 2001 census of India.

⁸ Each state in India consists of several districts. A district consists of several census blocks. A census block with more than 50% tribal population (listed in the schedule of tribal castes in the constitution and therefore referred to as scheduled tribe) is designated a tribal block in Madhya Pradesh.

⁹ Percentage of children below -2 standard deviations from the International Reference Population Median for weight-for-age, recommended by the WHO.

Madhya Pradesh which initiated an improved school meal program on a pilot basis in identified backward census blocks in the state from 1st February, 2004¹⁰.

The school meal survey was conducted from January through February 2004, in Chindwara district of Madhya Pradesh. The surveyed district is located in South Central Madhya Pradesh and is one of the largest in the state with a population of more than 1 million in 2001. It is subdivided into 11 census blocks, 4 of which are officially designated tribal blocks. Agriculture is the main economic activity in this region. Nearly 60% of children in this part of the state are undernourished according to the NFHS (1998-99)¹¹. The school meal program is, thus, of considerable significance for this region, particularly for its tribal population which has the lowest socio-economic indicators compared to other castes.

The survey was conducted in one of the non tribal blocks of the district with approximately 39% tribal population according to the 1991 census. Schools were providing raw food grains at 2 kilos per month to all enrolled students equivalent to 100 grams of raw food grains provided under the cooked meal program for 200 school days before the new academic year beginning in July 2003¹². The cooked meal program was initiated in 2003 in all the non-tribal blocks of the district, presenting a good case for studying the immediate impact of the program on the target population. This is also one of the 120 backward blocks in which the new meal program was introduced on a pilot basis in February 2004. Thus, an exogenous variation in meal quality was introduced in the program, besides giving an opportunity to compare efficacy of the new scheme with the old one.

2.2.2 *Institutional and Financial Structure of the Program in the Survey Area*

A directly elected village or gram panchayat (GP) is the administrative body at the village which has the primary administrative and financial responsibility of implementing the school meal program in all the public primary schools within its purview. Each GP represents at least a 1,000 people, typically consisting of residents in one to three villages. All the members of the GP must be residents of the villages represented by it. The sarpanch (president) of the GP who is directly elected is primarily responsible for all decisions made by the GP. Thus, due to the democratic nature of the

¹⁰ Under the initial school feeding program, schools were to provide 100 grams of wheat porridge (either sweet or salty) such that a total of 413.80 kcal and 8.20 grams of protein are provided per student per school day. With the initiation of the new pilot program in February, the targeted schools were to provide all enrolled children with 100 gm of wheat bread (roti) along with either 60 grams of vegetables or 20 grams of pulses per child per school day. See appendix for history of program implementation in Madhya Pradesh.

¹¹ Percent of children who are below -2 standard deviations from the International Reference Population Median for weight-for-age, recommended by the WHO.

¹² The school academic year in the sampled district is for 10 months from July to April. Each school month consists of approximately 20 school days, constituting a total of 200 school days in a year.

program enforcing body, the implementation of the school meal scheme may be endogenous to that particular village or community.

Until 1997, Rs. 0.75 per student per school day was provided directly to the GPs for conversion of raw grains into cooked meals in both tribal and non-tribal blocks¹³. Since then the state has been providing earmarked funds for the school meal program only to the GPs in the tribal blocks. In the non tribal blocks, the cost of converting the raw food grains is met by the annual untied grants released by the state finance commission to the GPs for general village development work supplemented by federal government grants¹⁴. It is important to note, therefore, that the financial resources and the political will of the non tribal GP determine whether the school meal scheme is implemented.

Guidelines provided by the state government in 2003, instructed the GPs in the non-tribal blocks to spend at most Rs. 0.60 per child per school day, which included the cost of ingredients, fuel and the cook's salary¹⁵. Under this old program schools were serving wheat porridge on all school days. Under the new school meal program, the GPs in the targeted blocks were to spend one-third of their untied grants at the rate of Rs. 1.25 to Rs. 1.30 per student per school day on the new scheme. Under this program schools were to introduce more variety in the meals and serve wheat bread with either vegetables or pulses.

3 Data and Empirical Strategy

3.1 Survey Data

Within the selected non tribal census block, 41 villages were chosen randomly for a survey on an exogenously determined interview date. Within each village, 15 households were surveyed through systematic random sampling. First, information was gathered on the total number of households residing in the village and then an interval was calculated for systematic random sampling of households. For instance, if in a village there were 120 households, every 8th household in the village was sampled. Second, the selected household was interviewed only if a child in the age group

¹³ The current exchange rate is approximately \$1= Rupees (Rs.) 46

¹⁴ The Central or Federal government reimburses the cost of transportation of food grains to the schools at the rate of Rs. 54 per quintal directly to the GPs for rural areas. There are two main annual sources of funds for meeting the cost of converting the raw food grains into cooked meals for the GPs: grants tied to Federal government schemes and untied grants released by the state government, the former being the largest source of funds. The GP can raise its own resources through local tax revenue but this constitutes a negligible amount. Allocation of both tied and untied funds is in proportion to the total population and the percentage of backward and tribal population of the GP. In Madhya Pradesh, the GPs have the freedom to use the untied grants on projects identified as essential and urgent by them. It is widely perceived that accountability of the GP to its electorate is very low and there is widespread corruption in the utilization of the funds. See appendix for schematic presentation of program administration.

¹⁵ See appendix for guidelines issued by the state government for expenditure on the old and new school meal scheme.

of 5-12 resided in it, including any child more than 12 years of age currently enrolled in primary school¹⁶. Though, officially primary school going age is 6-10 years, because there could be early enrollment or repetition of grades, I chose a broader age group. If no child in this range of age resided in the household, it was replaced by the household immediately in front, if the target population resided in it, otherwise, the household immediately behind was sampled, and so on¹⁷.

In each household all children in the target age-group were administered a food consumption and activity recall survey for the last 24 hours. The consumption survey was designed by professional nutritionists at the University of Delhi who also trained the field workers for conducting the survey. Using standardized household utensils, children were asked what and how much food they consumed from the moment they woke up the previous morning to the time they went to bed the previous night¹⁸. Interviews were conducted in the presence of the child's mother. If the interview day fell on a school day, both mother and child were interviewed either during the school lunch break or after school at the child's home. All the sampled children in a particular village were interviewed on the same day. In some villages, the previous day was a school day while for others it was a school holiday. Thus, children in some villages recalled their consumption on a school day while those in other villages recalled their diet on a holiday. The activity recall survey recorded the hours spent by the child on household chores, farm and non-farm activities on the previous day. Detailed data on household income and assets, monthly food consumption and expenditure and access to public utilities was also gathered.

Since non-enrolled children can have significantly different observable and non-observable characteristics from enrolled children, in order to control for possible selection bias, children from the randomly sampled household were linked to schools they were enrolled in rather than linking a school based sample to households. Thus, within each village all the public and private primary schools were surveyed including any primary school outside the village boundary in which a significant number of village children were enrolled. A third questionnaire on the socio-economic characteristics of the village and expenditure on the feeding program was administered to the GPs. A total of 615 households, 74 primary schools (both public and private) and 41 villages were surveyed. A sub sample of 12 villages was revisited to collect the dietary recall data of the same child on a school and non-school day. These were the villages for which a holiday either followed or preceded a school day and which were currently serving meals in the public primary schools.

Taking into account the extreme political sensitivity of the issue the villages were surveyed on randomly chosen dates. Which village was to be visited on a particular day was communicated just before the departure of the survey team for the field. This was crucial to ensure that no prior

¹⁶ Approximately 2% of the sample consists of children who are in the age group 13-14 and enrolled in a primary school.

¹⁷ See appendix for an explanation of the sampling methodology used in the survey.

¹⁸ See appendix for the design and details on the consumption survey.

intimation was sent to either the GP authorities or the school officials about the visit. The data collected was, therefore, based on the ground realities of the schools and the villages.

From the total sample of 615 households, 1096 children's dietary data is available. The summary statistics for this sample are presented in Table 1. The average age of the sampled children is 8.5 years. Of the enrolled children, the average current grade is approximately 3¹⁹. 95% of the currently enrolled were attending a public school while the remaining were in private primary schools or higher secondary private schools with a primary school section. Of the enrolled, 68% attended school on the reference day. About 38% of non attendance was due to reasons other than a school holiday. 48% of those who attended were offered a school meal and the take up was almost universal with 46% of enrollees consuming a meal at school. Literacy rate of mothers is extremely low at merely 17% while 50% of fathers are literate. More than half the population is scheduled tribe and almost all households are male headed. The annual household income from all sources is approximately Rs. 22,000²⁰. The population is on an average poor, with more than 50% of the households included in the district administration's list of below poverty line households²¹.

In table 2, the entire sample of 1096 children whose daily consumption data is available, are classified in terms of their attendance status on the reference day and the participation of their school in the cooked school meal program. Table 3 breaks down this sample, further, by the type of school the child is currently enrolled in, program participation by the public primary schools and the child's attendance on the reference day. Table 4 shows the consumption of six nutrients by children who ate a school meal on the reference day. Except for vitamin A, which provides only 5% of their daily intake, the meal program provides a significant proportion of the daily intake of the other five nutrients. For instance, school meals provided 263 kcal of daily calorie intake which constitutes more than 19% of the total daily calorie intake of the participants on the reference day.

Table 5 describes the household, school and village characteristics by participation in the meal program in the last seven days prior to the survey interview for all children enrolled in a public primary school. Of the total number of children enrolled in public primary school, 51% were being served wheat porridge under the old scheme, 30% were participating in the new meal program, 8% were getting a monthly ration of raw food grains and 11% had not been served meals in the previous week nor were they receiving dry rations. The total daily intake of participants in the new meal program is the highest. The four groups are comparable in terms of gender composition and age but

¹⁹ The grade of children enrolled in kindergarten has been coded as zero.

²⁰ Annual income includes value of agricultural output (either for sale or self consumption), wage income, salary income, self employment income, cash or in kind transfers, sale of forest produce and sale or rent from other mobile and fixed assets.

²¹ The state government carries out a household survey in order to classify households as above or below poverty line. Below poverty line households are given a ration card for purchasing food grains at subsidized prices from government outlets.

the children currently participating in the cooked meal program are more likely to belong to a below poverty line household with lower ownership of arable land.

It is interesting to note, that the children who were currently not being provided with either cooked meals or raw food grains, had been served cooked meals for at least half of the previous school month. They had also been served school meals during four months since the beginning of the academic year in July. These schools were more irregular in providing meals than the current participants in the program. Based on my survey experience, the reasons for irregularity of the scheme could be as diverse as the cook being on a holiday, grain stocks having run out for the month or the grains having not been milled due to electric outage.

On an average, villages which were currently providing cooked meals had a larger population and were more likely to have a scheduled tribe GP president. These villages had larger tribal population compared to villages in which children were not receiving meals or food grains. On the whole, the participants in the old and new meal scheme do not differ significantly in their observable characteristics. However, it may be erroneous to draw conclusions about the observable characteristics of the non participants because of their small sample size.

Figure 1 shows the distribution of the sample in terms of the average total daily calorie intake of participants and non participants in the cooked meal program on the reference day. Non participation in the program may have arisen either due to non attendance or non provision of a school meal. Figure 2 compares the daily calorie intake of children who participated in the new cooked meal program on the reference day and those who participated in the old meal scheme. The distribution functions suggest that the program is effective in raising the daily intake of children attending school. The participants in the new school meal program have higher calorie intake compared to the children being provided with wheat porridge at school. Though these conclusions may be premature because of the several observable and unobservable differences between participants and non participants, they are indicative of the relative consumption status of the different sample groups.

The summary statistics for the school level data is presented in table 6. The school survey collected information on the implementation of the old meal program in the first six months of the academic year, the previous month and the last seven days before the interview. More than 56% of the schools implemented the school meal program between July and December. 44% of the schools did not change their implementation status during this period. This includes schools which implemented the program in July itself and those which did not implement the program at all. The latter group includes all private primary schools and six public primary schools. On the whole, both participation and intensity of the program improved between July and December, 2003. Of the schools surveyed in February, 75% of the schools which changed their implementation status between

July and December had implemented the new meal program compared to 60% of schools which did not change their status. The increase in attendance rates during the first six months of the academic year was greatest in private primary schools. Students were more likely to drop out of public primary schools than private primary schools which may imply that households which want better and higher quality education are more likely to enroll their children in private schools and lay greater stress on their schooling and/or they belong to a relatively higher income group.

3.2 *Empirical Strategy*

The focus of the analysis is food consumption by the child on the reference day. Total daily nutrient consumption is expressed as a function of the total nutrients consumed from a school meal and other individual and household characteristics. Thus, our baseline consumption function is given by

$$(1) \quad C_i^T = \alpha_0 + \alpha_1 C_i^M + \alpha_2' X_i + \mu_i$$

C_i^T is total nutrient intake of child i , C_i^M is nutrient consumed from a school meal (including 0 calories) and X_i is a vector of demographic and other household characteristics that may influence nutrient consumption. It includes household composition which may affect the allocation of food within the family, depending on the age and sex composition of the members. Total annual household income, including current cash value of in-kind wages and transfers, agricultural output and forest produce, may influence the quantity as well as quality of food intake. In an agrarian economy wide fluctuations in current income are likely to arise due to vagaries of nature, particularly if sources of irrigation are limited and crop cultivation is mostly dependent on rainfall. Agricultural land ownership is, therefore, included as a measure of wealth or permanent income of the household. Households are also classified as below or above poverty line by including a dummy variable for the type of ration card provided to them by the GP to purchase food grains from the government ration shops. The caste and sex of the household head is included to capture the economic status of the household since female headed and lower caste households are likely to be more deprived. Since mother's education might be an important determinant of the nutritional well-being of the child, it is also included as a control.

The consumption of a meal at school depends on whether the child attended school, and if so was offered a meal at school, and consumed it²². In an ideal experiment in which children are randomly assigned to schools which are serving meals and those which are not and there is universal and uniform take up of the school meals by children assigned to participating schools, α_1 would be an unbiased and consistent estimate of program participation. However, unobservable characteristics of the child might influence program participation as well as total nutrient intake. For instance, children who are often ill are less likely to attend school and participate in the program and therefore more likely to consume lower (or zero) school meals as well as total nutrient.

I propose the following estimation strategies to address the endogeneity of C_i^M :

a. Cross sectional analysis: In the survey data there are some villages whose children were served school meals on the reference day while children in other villages were not served school meals either because it was a school holiday or the community was not participating in the program currently. Assuming that community participation in the meal program is randomly distributed on a particular day, and non attendance arises mostly due to school holidays, I estimate the impact of the program by comparing the total nutrient intake of attendees and non-attendees across the two types of communities or schools. I difference the total intake of attendees and non attendees in communities which did not serve school meals on the reference day from the difference for communities which served school meals on the reference day. In equation 2, δ_2 is the effect of attending and participating in the school meal program while δ_1 is an estimate of effect of school attendance of daily nutrient intake.

$$(2) \quad C_{is}^T = \delta_0 + \delta_1 D_{is}^A + \delta_2 D_{is}^A * C_{is}^M + \delta_3' X_{is} + \mu_{is}$$

According to the program guidelines, all attending students are offered a uniform quantity of cooked meal equivalent to 100 grams of raw food grains, irrespective of grade, age or gender. However, it is possible that hungrier students ask and get additional helpings, students who don't like

²² Since the sample of children is household rather than school based, 11% of children in the sample are currently not enrolled in a school. Among the several likely causes for non enrollment, the main concern in the economic literature has been that in poor developing countries the demand for child labor (wage and non wage) could be the primary reason for being out of school. These out of school children would have consumed zero school calories and if due to some unobservable characteristics they also have lower calorie intake at home, then α_1 would be inconsistent and biased upwards. But child labor is negligible in the sampled region. Using data gathered on economic activity during the last 12 months for this restricted sample, I find that less than 2% of the children worked on the family farm the year round. Work for wages is almost absent for both farm and non-farm activity. The official age for entering grade 1 in primary school in India is 6 years. However, it is quite likely that enrollment is either early or delayed. Of the non-enrolled, 66% are between ages 5-6. So the most likely reason for non-enrollment is delay. Enrollment is near universal if the sample is restricted to above 6 years of age for (more than 95% of the sample is currently enrolled). In the empirical analysis, the sample is restricted to the currently enrolled.

the taste of the meal eat smaller quantities of the meal and throw the rest away. Thus, individual tastes or preferences might simultaneously affect the consumption of school meal and total daily intake²³. The average school nutrient consumed by all the students who ate the school meal is a good determinant of the actual school nutrient consumed by an individual student. I, therefore, use the average school meal nutrient consumed by students who ate the school meal as an instrument for individual school meal consumption. Another valid instrument for actual nutrient intake is the policy change which introduced the improved meal program in February. I check the robustness of δ_2 , further, by using the month of interview as an instrument.

Since school attendance may not be an exogenous decision, particularly if the meal program itself impacts attendance rates, I use the randomness in whether the reference day was a school or non school day to instrument for school attendance. Most of the school holidays were due to a Sunday or a public holiday. Whether or not the school opened on the reference day should be an exogenous determinant of the child's decision to attend. However, daily food consumption requirement should not vary systematically between school holidays and school days for it to be a valid instrument. As discussed earlier, in the surveyed community there is negligible participation by children in household and farm activities. Total nutrient requirement on school and non school days are unlikely to be systematically different from each other²⁴. This assumption is held up by comparison of the activities of children in the sample on these two days shown in table 7. Instrumenting for school meal intake and attendance, the first stage regressions are,

$$(3) \quad C_{is}^M = \beta_0 + \beta_1 \bar{C}_s^M + \beta_2' X_{is} + v_{is}$$

$$(4) \quad D_{is}^A = \gamma_0 + \gamma_1 D_s^o + \gamma_2' X_{is} + \eta_{is}$$

\bar{C}_s^M is the average quantity of nutrient consumed by children in a school s , D_{is}^A is a dummy variable for whether child i attended school on the reference day and D_s^o is a dummy variable for whether the school was open on the reference day.

²³ Endogeneity of school calorie intake can arise through another conduit-not all students who are offered the school meal take-up the meal. In this model, I assume universal take-up of the program which is held up by the data. Only 4% of the school children who were offered a meal at school refused to eat it, a negligible proportion of the sample. This is understandable considering the fact that the sampled region is backward and poor and the majority of the school children came from families on or below the poverty line.

²⁴ Holidays were not due to festivals during which food consumption is expected to be significantly higher neither was entertainment of guests on holidays very frequent in this region. However, even if intake is higher on holidays due to festivals or entertainment of guests, it will not be a source of bias in the difference in difference estimate if the magnitude of the effect is the same for both implementing and non implementing communities.

$$(5) \quad C_{is}^T = \delta_0 + \delta_1 \hat{D}_{is}^A + \delta_2 \hat{D}_{is}^A * \hat{C}_{is}^M + \delta_3' X_{is} + \mu_{is}$$

where, \hat{C}_{is}^M is the predicted value of actual school meal intake using average school meal consumption as an instrument and \hat{D}_{is}^A is the predicted attendance from the first stage regression.

b. Community fixed effects: If the implementation of the program across the communities is not random as presumed in our previous model, then δ_2 would be biased and inconsistent²⁵. Differences between attendees and non-attendees within a community would remove any unobservable community characteristics which influence the nature of the school meal scheme as well as the total nutrient consumption of the respondents.

$$(6) \quad C_{isv}^T = \delta_0 + \delta_1 D_{isv}^A + \delta_2 \hat{D}_{isv}^A * \hat{C}_{isv}^M + \delta_3' X_{isv} + D_v + \mu_{isv}$$

Equation 5 is augmented by including D_v as the dummy for the GP or village the child resides in. Though all children in a particular village were interviewed on the same day, I am able to instrument for attendance decision by comparing attendees and non attendees across villages within a GP. Out of the sample of 35 GPs, there were 5 GPs for whom data had been gathered on at least two villages belonging to it, resulting from the random selection of villages. Since the implementing agency is the GP and the characteristics of villages within a GP are likely to be homogenous, a difference in differences estimate of the total calorie intake of attendees and non attendees should give an unbiased and consistent estimate of the program effect.

²⁵ Self-selection by households or individuals into the school meal program is not a concern in the survey area. The survey was conducted in a rural area where subsistence farming is the primary occupation. Typically, a village would consist of a cluster of huts surrounded by the agricultural fields belonging to its occupants. Arable agricultural land is a fixed and immovable asset. Children mostly enroll in primary schools closest to their hamlet. To support my argument, I matched the 1991 village census code of the residence of the child with the 1991 village census code in which the school is located for all children currently enrolled in a public primary school. 96.9% of the sample is enrolled in a public primary school in their residing village. Second, presuming parental mobility is more restricted because they are tied to their land, if the children relocate (for instance, reside with relatives in another village) on the basis of expectations of which school would provide school meals then it would show up in the data on the number of months each member resided with the household in the last 12 months. 97.8% of all children currently enrolled in a public primary school had resided with the same household for all of the previous 12 months. Lastly, parents were asked how much they expect the total expenditure in the current academic year to be on schooling for each student in the household. One of the categories of expenditure was 'Other (including transportation costs)'. 99% of the respondents expected zero 'Other' costs for children enrolled in a public primary school.

These survey findings are supported by district level migration data from the 1991 census. According to the census, of the total rural population of the survey district, 70.4% of the population was born at the place of enumeration. Of the total number of migrants in rural areas of the district, less than 1% had resided for a year or less at the place of enumeration. Most of this short duration migration is for employment reasons and seasonal in nature. At the all India level, the primary motive for migration is employment for males and marriage for females. Merely 5% of males and less than 1% of females cited education as the reason for migration. This figure is likely to be even more negligible for rural India.

c. Individual Fixed Effects: The robustness of the results obtained from the cross sectional data analysis is checked by using the individual panel data. Survey data was obtained on the 24 hour recall of food consumption for the same child on both school and non-school day in a sub sample of 12 villages whose public primary schools had offered school meals on the last school day. An individual fixed effects model differences out the unobservable individual characteristics which may cause C_i^M to be endogenous. The panel data reduces the difference in differences estimation model to equation 7.

$$(7) \quad C_i^T = \delta_0 + \delta_1 D_i^A + \delta_2 D_i^A * C_i^M + \delta_3' X_i + D_i + \mu_i$$

δ_2 is the impact of child's nutrient intake on a day she attended school and participated in the feeding program compared to the nutrient intake on a school holiday. This estimator gives the impact of the program by differencing fixed, unobservable individual characteristics that could be correlated with program participation status as well as total daily intake.

4 Results

4.1 Impact of the School Feeding Program on Total Daily Nutrient Intake

4.1.1 Cross Sectional Analysis

Table 8 presents the results of the baseline OLS regression of participation in the school meal program on total daily consumption of six nutrients using four specifications. Participation in the program is represented by a dummy for whether the child ate a school meal on the reference day or not. In column 1, the sample includes all children for whom consumption data is available, including the non-enrolled, with only age and gender as control variables. The coefficient for the school meal consumption dummy is positive and significant for all nutrients except calcium and vitamin A. In column 2, I augment the model by including the child's household characteristics as additional controls. The magnitude or significance of the coefficient of participation in the meal scheme is not affected much for any nutrient. In specifications 3 and 4, children enrolled in private schools and the non enrolled are dropped from the sample. The coefficient of the dummy for program participation is slightly larger in magnitude in both column 3 and 4 compared to the estimates obtained from the inclusion of the entire sample.

The estimates in table 8, however, do not quantify the magnitude of the transfer through the scheme in order to assess the impact on resource distribution within the household. In addition, their unbiasedness and consistency is suspect due to possible endogeneity of program participation. Table 9, therefore, presents the results of the difference in differences estimation strategy described in the previous section. All the specifications include individual and household characteristics which may affect daily nutrient consumption. The exogeneity assumption for school calorie intake and attendance is relaxed progressively in each model.

Specifications 1-4 model the impact of the meal program between attendees and non attendees across participating and non participating communities. The sample is restricted to children enrolled in public primary schools. Specification 1 presumes that school calorie intake and attendance are exogenously determined. A 1 kcal transfer from the school meal program raises the daily calorie intake by 0.51 kcal. For carbohydrates, proteins and iron too, the daily intake rises by a fraction of the program transfer. The program has no impact on daily calcium and vitamin A intake, as in the analysis presented in table 8. In specification 2, the exogeneity assumption of school calorie intake is relaxed by using average school calories consumed interacted with the reference day as an instrument. The coefficients are similar to those obtained from specification 1.

Specifications 3-4 treat both actual calorie intake and attendance as endogenous. The randomness in whether the reference day was a school or a non school day is used as an instrument for school attendance in both models. Though average school calorie intake takes into account the unobservable individual heterogeneity in meal consumption, the quality of the program at the community level may not be exogenous. In order to address the potential endogeneity of program quality at the community level, I use the policy change in February, 2004 which introduced the ‘improved’ meal scheme across villages as a source of exogenous variation in specification 4. Children whose interview date fell in February were more likely to have consumed higher calories of school meal compared to children interviewed in January. Using the month of interview as an instrument for individual school calorie intake in specification 4, I find that children who were interviewed in the second month of the survey and had participated in the program have higher daily of calories, carbohydrates and proteins than children who are more likely to have participated in the old meal scheme. The magnitude and significance of the coefficients for these three nutrients is close across all the four specifications but the coefficient for iron intake is insignificant in specification 4. This may be because the proportion of iron in the new meal program was not significantly higher than in the old meal scheme compared to calories, carbohydrates and proteins. To sum up, the empirical results hold up the theoretical postulate that the households may allocate resources away from the child to other goods or members in response to the public transfer.

A concern with this analysis, however, is that if the characteristics of attendees in the participating and non participating communities differ in ways correlated with their daily nutrient intake then the difference in difference estimate would be biased. Results of the analysis of the impact of this program on school participation rates suggest that the attendance of children in lower grades and girls increases with the implementation of the school meal scheme²⁶. Since younger kids and girls have a lower RDA and total daily intake, δ_2 may be biased downwards.

4.1.2 *Community Fixed Effects*

The analysis in specifications 1-4 presumes that community participation in the meal program is determined randomly. Since this assumption may not be true, as suggested by the description of the nature of the program in section 2, specifications 5 and 6 analyze the impact of the program within communities. This would difference out any unobserved heterogeneity in community characteristics which determine the implementation of the program. However, the date of interview does not vary within villages since all children in a particular village were interviewed on the same day, nor is there significant variation in average school calories since the administrative entity is the GP and not the village. Hence, I am unable to instrument for attendance and actual meal intake without losing identification in a within village analysis. Nevertheless, I compare enrolled attendees and non attendees within villages whose school functioned on the reference day. The coefficient for the impact of the transfer of calories, carbohydrates, proteins and iron through the school feeding program on daily intake is larger in magnitude compared to the cross sectional analysis in specification 5. This holds up the earlier assertion that the coefficients from the cross sectional study may be downwards biased. However, the estimates continue to suggest that only a fraction of the transfer through the program sticks to the child.

Specification 5, however, does not correct for individual self selection into the program or unobservable heterogeneity in the quantity of school meal consumption. In specification 6, therefore, I restrict the sample to five GPs with a total of eleven villages within their purview. For each of these GPs, data is available for at least two villages administered by it. Within each of these GPs there is random variation in the date of village survey interview. I instrument for nutrient intake and attendance using the variation in month of interview and the reference day being a school or non school day. The estimates of the coefficients for calorie and carbohydrates are surprisingly close to that obtained from the within village analysis in specification 5. But the coefficients for protein and iron consumption are no longer significant.

²⁶ Afridi (2005), Dreze and Kingdon (2002)

4.1.3 Individual Fixed Effects

Results from the data on two intake days covering both a school and non school day for the same child are reported in specifications 7 and 8 to check the robustness of the estimates from the cross sectional and community fixed effects analysis. This is a random sample restricted to children whose schools were offering cooked meals on school days. An individual fixed effects model would remove any unobservable individual characteristics which might be correlated with participation in the program, the quantity of school meal consumed and the total daily nutrient consumption. In the previous section I gave evidence in support of the claim that nutrient requirement on school and non school day is not systematically different from each other and that parents would substitute nutrients within a day and not across days. Then, higher daily intake of a child on a day she participated in the program compared to a non school day can be attributed to the consumption of the school meal.

I difference the total nutrient intake of a child who participated in the meal program on a school day with her intake on non school day. The treated children are compared to a control group who did not eat a school meal on either day. These children were either non enrolled or enrolled in private primary schools or middle schools or did not attend their public primary school on both days. In specification 7, I use the entire sample whose consumption data is available on both days, including the non-enrolled. Consuming 100 kcal from the school meal program raises total daily intake by 75 kcal. The result is unchanged when the sample is restricted to only enrolled children in specification 8. This estimate is very close to that obtained from the within GP analysis in specification 6. However, the coefficient is not significant for the other nutrients. It is important to note that the coefficient of school nutrient intake for each nutrient is not strictly comparable across the different models since the sample and the methodology varies across them.

The main concern with the results obtained from all the models is that they may be attributable to measurement error in the calculation of nutrient intake. In the nutrition literature misreporting of food intake is well documented but there is a relative paucity of evidence for developing countries. However, in a difference in difference approach, the consumption recall of the treatment and comparison groups has to be systematically different in order to bias the coefficient of interest. There is no reason to believe that this may be the case. Further, using the average school calorie intake as an instrument for the actual calories consumed at school reduces any measurement error biases.

4.2 Impact of School Meal Program on Leisure

The results presented in the previous section provide conclusive evidence that the daily consumption of nutrients by program participants does not increase by the full amount of the

government transfer, implying crowding out of household resources allocated to the child. I cannot determine to which member of the household or goods the resources are being redistributed to because of data limitations. But there is information available on the time utilization pattern of the children in the survey which I can utilize to explore the impact of the meal program on the consumption of leisure by the child. Since the public transfer induces an implicit increase in household income, one would expect to see a decrease in work hours or an increase in leisure enjoyed by the child, which would provide evidence that the household is indeed redistributing resources to other goods.

I classify the daily work hours of the child on the reference day into – household chores (cooking, cleaning, sibling care, water and fuel collection and livestock care which includes grazing and fodder collection), non wage work on the family farm and other non wage non farm work²⁷. Total daily work hour is defined as the sum of hours spent on household chores, family farm and non farm work. The regression results reported in table 10 include the mean adult male and female daily wages in the village and a quadratic of child age in addition to the controls used in the analysis of nutrient intake. I exclude total household income as an explanatory variable in the regressions due to its potential endogeneity. The specification numbers correspond to those in table 9. For instance, column 1 for household chores corresponds to specification 2 in table 9.

The cross sectional regressions in specification 2 and 3 suggest a small but significant reduction in hours spent by a child consuming calories from the school meal program on household chores. Thus, a 100 kcal transfer from the feeding program reduces time spent on household chores by 0.08 to 0.10 hours. School attendance has no significant effect on time spent on household chores. This validates my earlier assertion that school and non school days are not systematically different in terms of energy expenditure by the child. Interestingly, a male child does more than an hour less of household chores than a female child. The results are not robust to change in specification and samples in specification 6 (GP fixed effects) and specification 7 (individual fixed effects). Similar results hold for total work hours. This may be due to a lack of variation in the restricted samples in these two specifications. However, note that in all the models there is no impact of school attendance on work hours, except in specification 2 for total work hours.

4.3 Determinants of Intra Household Reallocation

The intra household resource allocation literature suggests that individual characteristics may be important determinants of how the household distributes its income among its members. In table 11, I interact the coefficient of the calorie intake from the school meal with child sex, age, household

²⁷ Less than 1% of the sample is engaged in farm or non farm work for wages.

size and annual household income to assess whether these characteristics have any influence on the magnitude of the resource reallocation in response to the government transfer program. The model corresponds to specification 3 in table 9. In column 1, the estimates are reported for separate regressions for each interaction term while in column 2 all the interactions are included in a single regression.

I find no significant effect of gender, age or annual household income on the magnitude of the impact of the calorie transfer on total daily calorie intake in both columns 1 and 2. Surprisingly, however, the coefficient of the interaction of family size with the calorie transfer is positive and significant. This implies that the larger the household size, the lower is the redistribution away from her in response to the transfer. The small quantity of transfer through the feeding program could be a possible explanation for this result.

In columns 3 and 4 the dependent variable is the total daily hours of work of the child on the reference day. Interestingly, the gender of a child has a significant effect on the magnitude of the impact of school calorie consumption on work hours. A male child experiences a small reduction in his total work hours compared to a female child. As noted in the analysis presented in table 10, girls spend more of their time on household chores which forms the largest proportion of total work hours. The transfer program has a larger income effect on the consumption of leisure of girls. Since I characterize time spent in learning at home or at school as leisure, this result implies that girls may be able to allocate more of their time to educational attainment.

5 Conclusion

In this paper I test the implication of public transfer programs, aimed at improving the welfare of individuals residing within households, on intra household resource distribution. I do so through the case study of a supplementary school feeding program in India. The empirical results show that the daily nutrient consumption of program participants rises by less than the full amount of the nutrient transfer through the school meal. Thus, households may be perceiving nutrients consumed at school as substitute to nutrients or other goods the child consumes at home. This result varies for different nutrients with the proportion of the transfer which sticks to the child being robust across different specifications for daily consumption of calories and to a lesser extent, carbohydrates. Though the results do not conform to the strict interpretation of complete crowd out implied by the theory of altruism, there is indeed a redistribution of intra household resources which reduces the magnitude of the expected welfare gain to the individual.

The theory and the conclusions from the empirical analysis about the magnitude of the program's impact on daily nutrient intake suggest that the household would reallocate resources to goods which are close substitutes to nutrient consumption. I find evidence of a reduction in the labor supply of the child or an increase in the consumption of leisure though this result is not robust in a community and individual fixed effects model probably due to low variation in the data when it is restricted to smaller samples in these two specifications. Interestingly, I find that girls participating in the program have a larger reduction in their daily work hours compared to boys.

The estimates obtained from the analysis are in keeping with earlier research which suggests that public transfers crowd out private transfers if driven by the motive of altruism. However, Jacoby's (2002) results for Philippines do not show any redistribution of resources away from a child participating in a school meal program though he does find that poorer households are more likely to tax the child's calorie intake compared to richer families. I do not find any variation in the magnitude of the transfer that sticks to the child by household income. But since a large proportion of my sample belongs to households which are below the poverty line, variation in income may not be large enough to identify an effect of household income.

The results of the paper imply that there may be positive externalities generated by individual welfare programs if they affect household resource distribution to other goods or members. Data on daily food intake of non program participants within the household would be very useful in determining the magnitude of these effects. In addition it would be useful to know whether the impact of such public transfers is permanent or transitory. A longer panel data on food consumption of participants and non participants on both school and non school days could provide conclusive evidence on the permanency of the transfer benefits.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Male	1096	0.51	0.50	0	1
Age	1096	8.55	2.33	4	14
Currently enrolled	1096	0.89	0.31	0	1
Grade enrolled in	976	2.96	1.55	0	7
School attendance on reference day	976	0.68	0.47	0	1
School meal offered on reference day	976	0.48	0.50	0	1
School meal consumed on reference day	976	0.46	0.50	0	1
Total daily calorie intake on reference day	1096	1312.21	450.53	197	3204.49
Mother literate	1062	0.17	0.38	0	1
Father literate	1042	0.50	0.50	0	1
Head of household literate	1096	0.46	0.50	0	1
Male head of household	1096	0.98	0.15	0	1
Head of household scheduled tribe	1096	0.54	0.49	0	1
Number of household members	1096	6.58	2.04	2	18
0-4 year old male members	1096	0.42	0.65	0	5
0-4 year old female members	1096	0.37	0.61	0	3
5-14 year old male members	1096	1.20	0.87	0	5
5-14 year old female members	1096	1.31	1.06	0	5
15-60 year old male members	1096	1.48	0.79	0	6
15-60 year old female members	1096	1.58	0.78	0	5
60+ year old male members	1096	0.09	0.30	0	2
60+ year old female members	1096	0.12	0.33	0	2
Total annual household income (Rs.)	1096	21807.56	19207.00	2913	211777.7
Below poverty line	1096	0.50	0.50	0	1
Arable land ownership (acre)	1096	4.35	6.79	0	70

Table 2: School Attendance and Program Participation Status

School Participation in Cooked Meal Program	Attendees	Non Attendees
Yes	527	206
No	133	230*

Note: * includes 120 currently non enrolled children. Children whose schools were not participating in the program were either being provided raw food grains or nothing while the remaining belonged to private primary schools or government middle schools.

Table 3: School Attendance by Type of School and Meal Program

Type of School	Attendees	Non Attendees
<i>Public Primary schools</i>	605	297
Type of meal program:		
None	16	80
Raw Food Grains	64	12
Old Meal program	324	133
New meal program	203	73
<i>Private Primary Schools</i>	30	15
<i>Public Middle Schools</i>	23	3
<i>Non Enrolled</i>	-	120

Table 4: Mean Nutrient Consumption of Program Participants on Reference Day

Nutrient (N=448)	Total Daily Consumption	Consumption from School Meal
Calories (kcal)	1379.21 (440.50)	263.06 (128.22)
Carbohydrates (g)	261.10 (83.15)	48.66 (25.77)
Protein (g)	42.44 (14.33)	8.27 (4.60)
Calcium (mg)	145.78 (113.89)	32.74 (19.87)
Iron (mg)	13.04 (6.21)	3.46 (1.78)
Vitamin A (µg)	174.85 (259.92)	9.34 (5.62)

Note: Standard deviations in parentheses.

Table 5: Mean Characteristics by Type of Meal Program in Public Primary Schools in the Seven Days Prior to the Survey

	No Program	Raw Food Grains	Old Meal Program	New Meal Program
Number of households	57	45	268	174
Total daily calorie intake (kcal)	1273.73 (42.86)	1206.19 (39.43)	1316.77 (20.32)	1416.44 (28.39)
Male child	0.52 (0.05)	0.53 (0.06)	0.48 (0.02)	0.56 (0.03)
Age	8.48 (0.22)	8.79 (0.23)	8.69 (0.10)	8.99 (0.14)
Mother literate	0.12 (0.03)	0.25 (0.05)	0.14 (0.02)	0.16 (0.02)
Father literate	0.46 (0.05)	0.55 (0.06)	0.52 (0.02)	0.40 (0.03)
Number of household members	7.32 (0.34)	6.30 (0.16)	6.57 (0.08)	6.33 (0.12)
Male household head	1.00 (0.00)	0.99 (0.01)	0.97 (0.01)	0.98 (0.01)
Age of head	41.93 (1.28)	41.01 (1.10)	38.36 (0.42)	41.18 (0.65)
Scheduled tribe head of household	0.40 (0.05)	0.63 (0.06)	0.56 (0.02)	0.53 (0.03)
Annual household income (Rs.)	20072.58 (1455.28)	20929.12 (1905.18)	19862.95 (687.33)	22792.04 (1327.68)
Arable land ownership (acres)	4.39 (0.74)	4.65 (0.85)	3.62 (0.23)	3.67 (0.31)
Below poverty line	0.36 (0.05)	0.47 (0.06)	0.53 (0.02)	0.50 (0.03)
School Characteristics				
Number of schools	7	4	32	21
Number of months in which cooked meals served since July	4.14 (0.25)	0.79 (0.10)	5.05 (0.06)	5.52 (0.08)
Proportion of school days in which meals served in previous month*	2.76 (0.15)	5.00 (0.00)	1.79 (0.06)	1.43 (0.05)
Proportion of school days in which meals served in previous week	0.00 (0.00)	0.00 (0.00)	0.89 (0.01)	0.86 (0.02)
Teacher student ratio	0.02 (0.00)	0.02 (0.00)	0.02 (0.00)	0.02 (0.00)
Village characteristics				
Village population	689.78 (19.45)	518.45 (20.59)	758.76 (16.55)	999.00 (27.19)
Percentage of tribal population (1991 census)	39.72 (3.05)	66.47 (2.10)	56.89 (1.30)	48.51 (1.99)
Proportion of irrigated arable land	0.13 (0.01)	0.14 (0.01)	0.15 (0.00)	0.19 (0.01)
Distance from all weather road (kms.)	4.86 (0.31)	6.27 (0.61)	5.04 (0.19)	5.51 (0.30)
Age of GP president	35.07 (0.45)	38.23 (0.72)	42.81 (0.39)	44.66 (0.49)
Male GP president	0.69 (0.05)	0.13 (0.04)	0.65 (0.02)	0.55 (0.03)
Scheduled tribe GP president	0.68 (0.05)	0.24 (0.05)	0.70 (0.02)	0.73 (0.03)
No. of years GP president in office	4.00 (0.00)	4.00 (0.00)	4.83 (0.13)	4.92 (0.14)

Note: Standard errors in parentheses.

* Responses coded as: (1) all school days (2) more than half school month (3) half school month (4) less than half school month (5) none of the school days

Figure 1: Distribution of Total Daily Calorie Intake

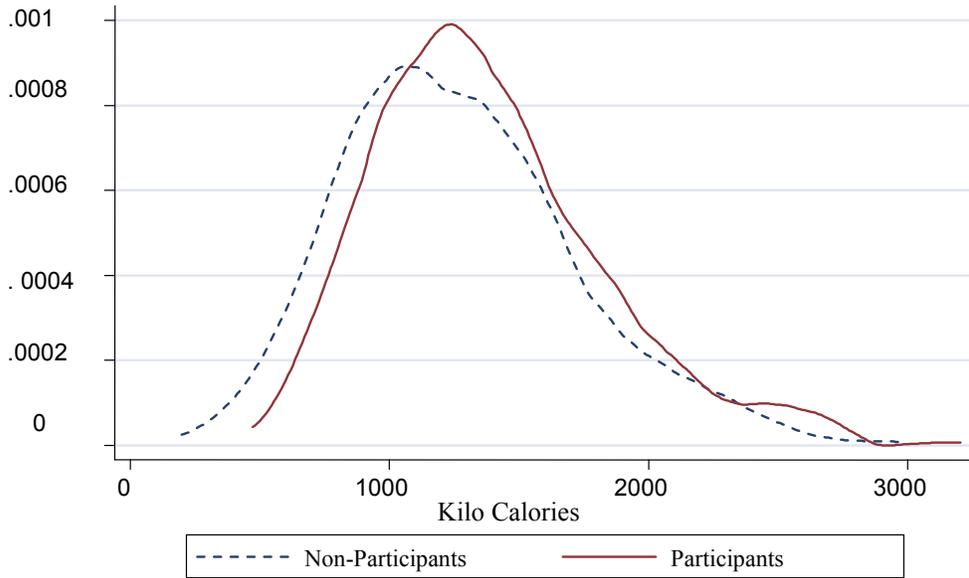


Figure 2: Distribution of Total Daily Calorie Intake by Type of Meal Program

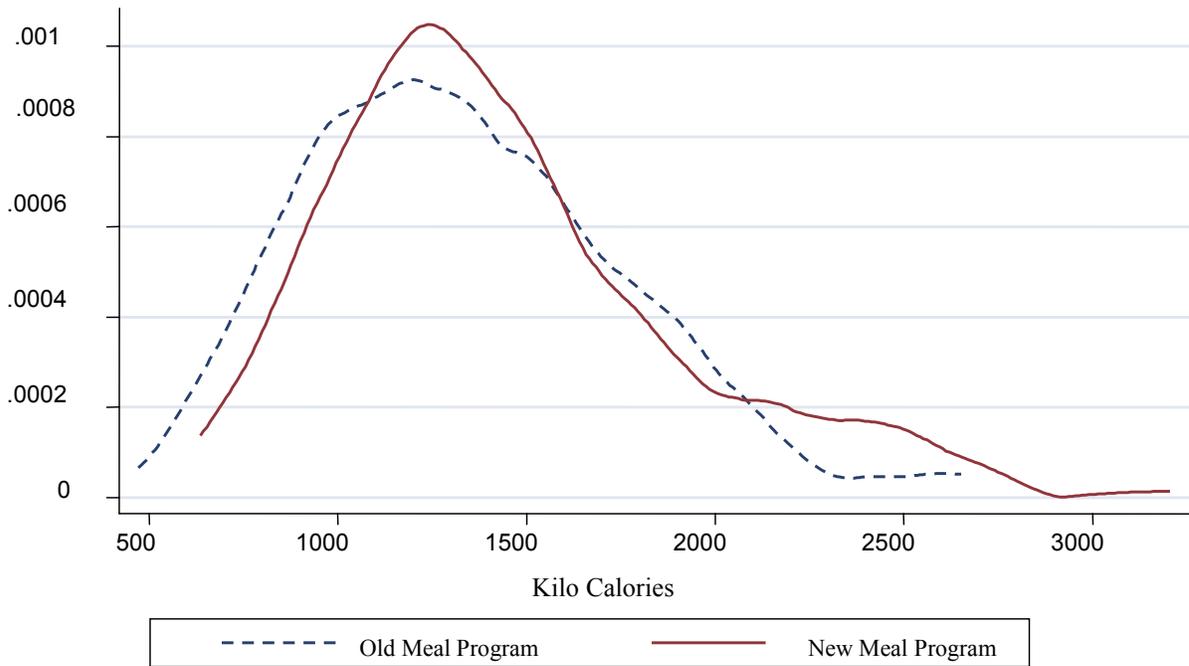


Table 6: Mean School Characteristics (July-December, 2003)

	Change in Program Participation Status		No Change in Program Participation Status	
	Implementation of Scheme Between July and December	Implementation of Scheme in both July and December	Public Primary Schools	Private Primary Schools
Number of Schools	41	17	6	10
Regularity of Cooked Meal Program in July ^a	-	0.75 (0.06)	-	-
Regularity of Cooked Meal Program in December ^a	0.92 (0.02)	0.96 (0.02)	-	-
Total Fees for Five Years of Primary Schooling (Rs.)	131.09 (59.93)	62.32 (9.84)	74.67 (6.06)	1347.20 (308.23)
Teacher-Student Ratio	0.03 (0.01)	0.02 (0.00)	0.03 (0.00)	0.07 (0.01)
Blackboards Per Grade	0.61 (0.04)	0.52 (0.05)	0.47 (0.12)	1.25 (0.24)
Drinking Water on School Premises	0.43 (0.08)	0.53 (0.12)	0.50 (0.22)	0.30 (0.15)
Toilet Facility on School Premises	0.12 (0.04)	0.06 (0.06)	0.00 (0.00)	0.30 (0.15)
School Playground	0.57 (0.08)	0.53 (0.12)	0.67 (0.21)	0.30 (0.15)
Schools with new meal program (if surveyed in February)	0.75 (0.09)	0.60 (0.13)	-	-
Change in attendance rates between July and December	0.02 (0.02)	0.02 (0.02)	-0.02 (0.02)	0.08 (0.03)
Change in enrollment rates between July and December	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.01 (0.04)

Note: ^a proportion of school days meals were served in the month. Standard errors in parentheses

Table 7: Activity Recall Data for School and Non School Day (hours per day)

Activity	Mean	Std. Dev.	Min.	Max.
<i>School Day</i> (N=780)				
cooking	0.15	0.41	0	3
cleaning	0.30	0.47	0	4
sibling care	0.23	0.52	0	4
livestock care	0.35	0.86	0	8
collecting water and firewood	0.47	0.56	0	4
<i>Non School Day</i> (N=195)				
in cooking	0.18	0.48	0	3
cleaning	0.28	0.46	0	3
sibling care	0.25	0.49	0	2
livestock care	0.46	0.99	0	5
water and firewood	0.46	0.87	0	10

Table 8: Initial OLS Regressions for the Impact of School Meal Nutrient Intake on Total Daily Nutrient Intake

Nutrients	Coefficient of Dummy for Consuming School Meal			
	(1)	(2)	(3)	(4)
Calories	78.13** (32.466)	78.60** (32.826)	82.52** (34.816)	85.54** (35.109)
Carbohydrates	15.53** (6.072)	15.62** (6.115)	16.04** (6.509)	16.53** (6.554)
Protein	2.78*** (1.049)	2.69** (1.069)	2.87** (1.126)	2.89** (1.444)
Calcium	9.10 (9.669)	10.69 (9.690)	10.77 (10.647)	11.39 (10.651)
Iron	1.59*** (0.566)	1.69*** (0.531)	1.53** (0.599)	1.70** (0.558)
Vitamin A	-25.79 (22.532)	-27.49 (24.148)	-18.42 (21.284)	-17.66 (22.691)
N	1096	1062	931	901

Notes: Robust standard errors corrected for clustering on the household, reported in parentheses.

(1) Sample includes all children for whom consumption data is available with only child's age and sex as control variables.

(2) Sample includes all children for whom consumption data is available with child's age, sex, current grade, log annual household income, household's agricultural land ownership, caste and sex of head of household, mother's literacy status, whether the household has a below poverty ration card and eight household composition variables as controls.

(3) Sample includes children enrolled in public schools only with child's age and sex as control variables.

(4) Sample includes children enrolled in public schools only with child's age, sex, current grade, log annual household income, household's agricultural land ownership, caste and sex of head of household, mother's literacy status, whether the household has a below poverty ration card and eight household composition variables as controls.

* Significant at 10%, ** 5% and *** 1%

Table 9: Impact of School Meal Nutrient Intake on Total Daily Nutrient Intake

Specifications	Coefficient of Actual Nutrient Intake from School Meal						N
	Calories	Carbohydrates	Protein	Calcium	Iron	Vitamin A	
<i>Cross Sectional Analysis</i>							
(1) OLS	0.51*** (0.122)	0.52*** (0.119)	0.54*** (0.124)	0.47 (0.274)	0.68*** (0.142)	0.13 (2.228)	901
(2) 2SLS	0.49*** (0.136)	0.51*** (0.131)	0.54*** (0.139)	0.48 (0.340)	0.74*** (0.141)	1.78 (2.187)	898
(3) 2SLS	0.52*** (0.147)	0.54*** (0.141)	0.57*** (0.150)	0.46 (0.359)	0.76*** (0.159)	3.11 (2.401)	898
(4) 2SLS	0.44* (0.243)	0.49** (0.222)	0.51** (0.217)	-0.39 (0.452)	0.28 (0.274)	-7.46 (7.197)	901
<i>Community Fixed Effects</i>							
(5) OLS	0.65*** (0.199)	0.64*** (0.200)	0.60*** (0.211)	0.26 (0.473)	0.75*** (0.239)	-2.32 (3.052)	722
(6) 2SLS	0.72* (0.400)	0.84** (0.379)	0.51 (0.477)	-2.63 (1.630)	-0.50 (0.529)	-0.48 (4.819)	243
<i>Panel Data</i>							
(7) Individual fixed effects	0.75* (0.444)	0.65 (0.422)	0.54 (0.465)	-0.11 (1.119)	0.39 (0.632)	-12.67 (8.144)	622
(8) Individual fixed effects	0.75* (0.445)	0.65 (0.423)	0.54 (0.465)	-0.11 (1.119)	0.39 (0.632)	-12.67 (8.144)	546

Notes: The coefficients are reported for the actual amount of nutrient consumed from the school meal. All the models include school attendance on reference day, child's age, sex, current grade, log annual household income, household's agricultural land ownership, caste and sex of head of household, mother's literacy status, whether the household has a below poverty ration card and eight household composition variables. The sample for specifications (1) - (6) excludes those enrolled in private schools and the currently non enrolled.

(2) Actual school calorie consumed instrumented by average school meal consumed*attended on reference day.

(3) Actual school calorie consumed instrumented by average school meal consumed* school functioned on the reference day and school attendance on reference day instrumented by dummy for school functioned on the reference day.

(4) Actual school calorie consumed instrumented by month of interview* school functioned on the reference day and school attendance on reference day instrumented by dummy for school functioned on the reference day.

(5) Model includes village dummies

(6) GP fixed effects and actual school calorie consumed instrumented by month of interview* school functioned on the reference day and school attendance on reference day instrumented by dummy for school functioned on the reference day.

(7) Includes non enrolled children

(8) Excludes non enrolled children

Robust standard errors corrected for clustering on the household, reported in parentheses.

* Significant at 10%, ** 5% and ***1%

Table 10: Impact of Calorie Intake from School Meal Program on Daily Leisure Hours

Coefficients	Daily Household Chore Hours			Total Daily Work Hours			
	(2)	(3)	(6)	(2)	(3)	(6)	(7)
Calorie Intake from School Meal	-0.0008** (.0003)	-0.0010** (0.005)	0.0003 (0.0012)	-0.0008** (0.0004)	-0.0012*** (0.0004)	0.0002 (0.0013)	0.0008 (0.0022)
School Attendance	-0.177 (0.145)	-0.052 (0.191)	-0.507 (0.478)	-0.288* (0.154)	-0.037 (0.199)	-0.474 (0.516)	-0.715 (0.461)
Male	-1.028*** (0.108)	-1.027*** (0.108)	-1.03*** (0.222)	-0.991*** (0.112)	-0.990*** (0.112)	-0.981*** (0.236)	
Age	0.701*** (0.155)	0.698*** (0.155)	0.949*** (0.343)	0.659*** (0.174)	0.634*** (0.175)	1.046*** (0.362)	
Age squared	-0.024*** (0.001)	-0.023*** (0.009)	-0.035* (0.019)	-0.019* (0.010)	-0.018* (0.10)	0.039* (0.020)	
N	897	897	253	897	897	253	622

Notes: The coefficients are reported for the actual amount of nutrient consumed from the school meal. All the models include school attendance on reference day, child's age, age squared, sex, current grade, household's agricultural land ownership, caste and sex of head of household, mother's literacy status, whether the household has a below poverty ration card and eight household composition variables and the mean daily wage for male labor and female labor in the village. The specification numbers correspond to those in table 9.

(2) Actual school calorie consumed instrumented by average school meal consumed*attended on reference day.

(3) Actual school calorie consumed instrumented by average school meal consumed* school functioned on the reference day and school attendance on reference day instrumented by dummy for school functioned on the reference day.

(6) GP fixed effects and actual school calorie consumed instrumented by month of interview* school functioned on the reference day and school attendance on reference day instrumented by dummy for school functioned on the reference day.

(7) Includes non enrolled children

Robust standard errors corrected for clustering on the household, reported in parentheses.

* Significant at 10%, ** 5% and ***1%

Table 11: Determinants of Intra Household Reallocation of Resources

Interaction Coefficients	Total Daily Calorie Intake		Total Daily Work Hours	
	(1)	(2)	(3)	(4)
Male child	-0.08 (0.236)	-0.04 (0.244)	0.0015* (0.0008)	0.0016* (0.0008)
Age	-0.01 (0.051)	-0.01 (0.051)	0.0001 (0.0002)	0.0001 (0.0002)
Household Size	0.10* (0.057)	0.11* (0.063)	0.0003 (0.0002)	0.0003 (0.0002)
Household Income	0.15 (0.227)	-0.02 (0.246)		
N	898	898	897	897

Notes: The coefficients are reported for the interaction of actual amount of nutrient consumed from the school meal with the variables listed. The model corresponds to specification 3 in table 9 for total daily calorie intake and specification 3 in table 10 for total work hours. In columns 1 and 3, results are reported for separate regressions for each interaction term. In columns 2 and 4 all the interaction terms are included in the same regression.

Robust standard errors corrected for clustering on the household, reported in parentheses.
 * Significant at 10%, ** 5% and *** 1%

Figure A2: Time Line of Program Implementation in the Survey District

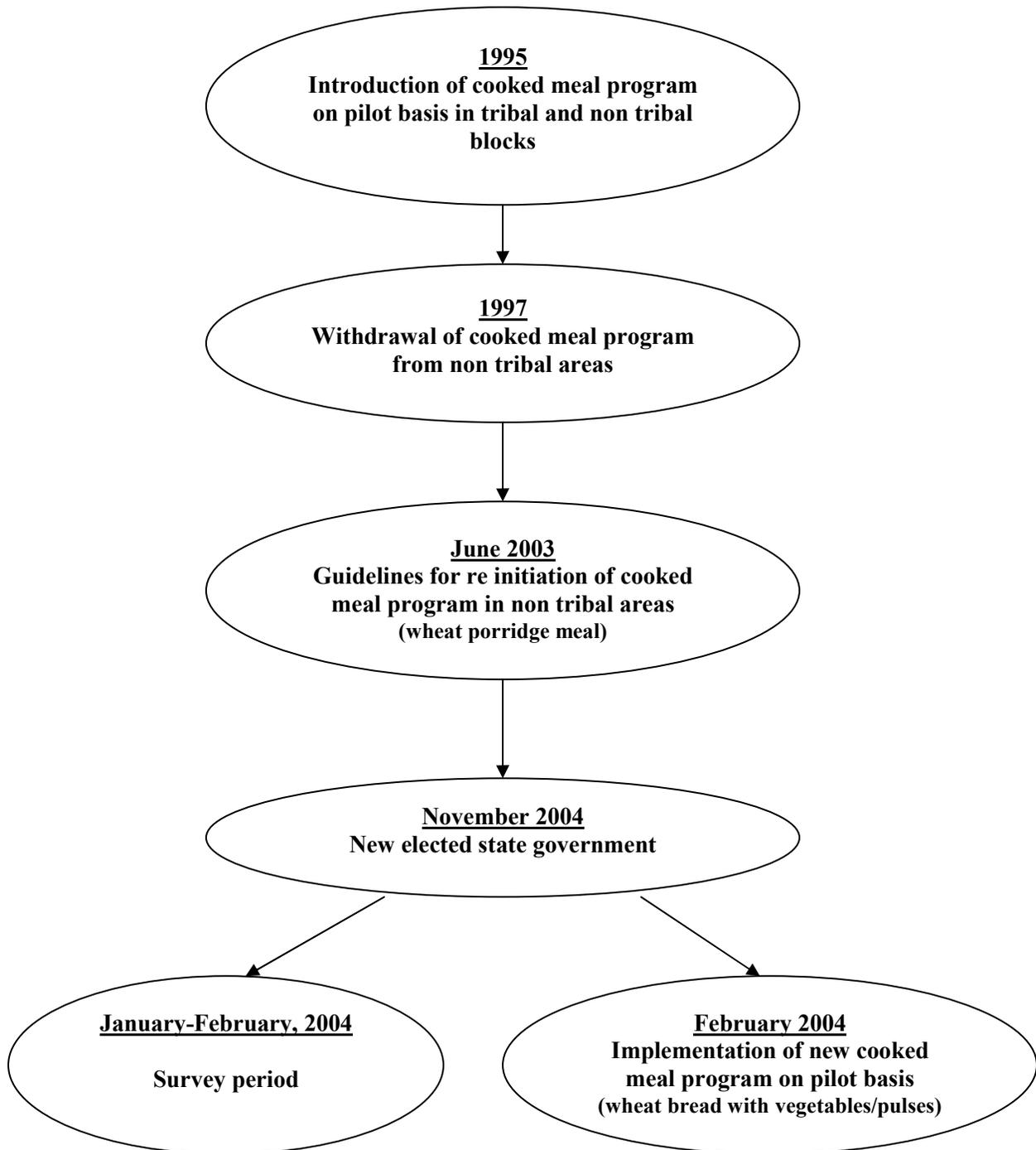
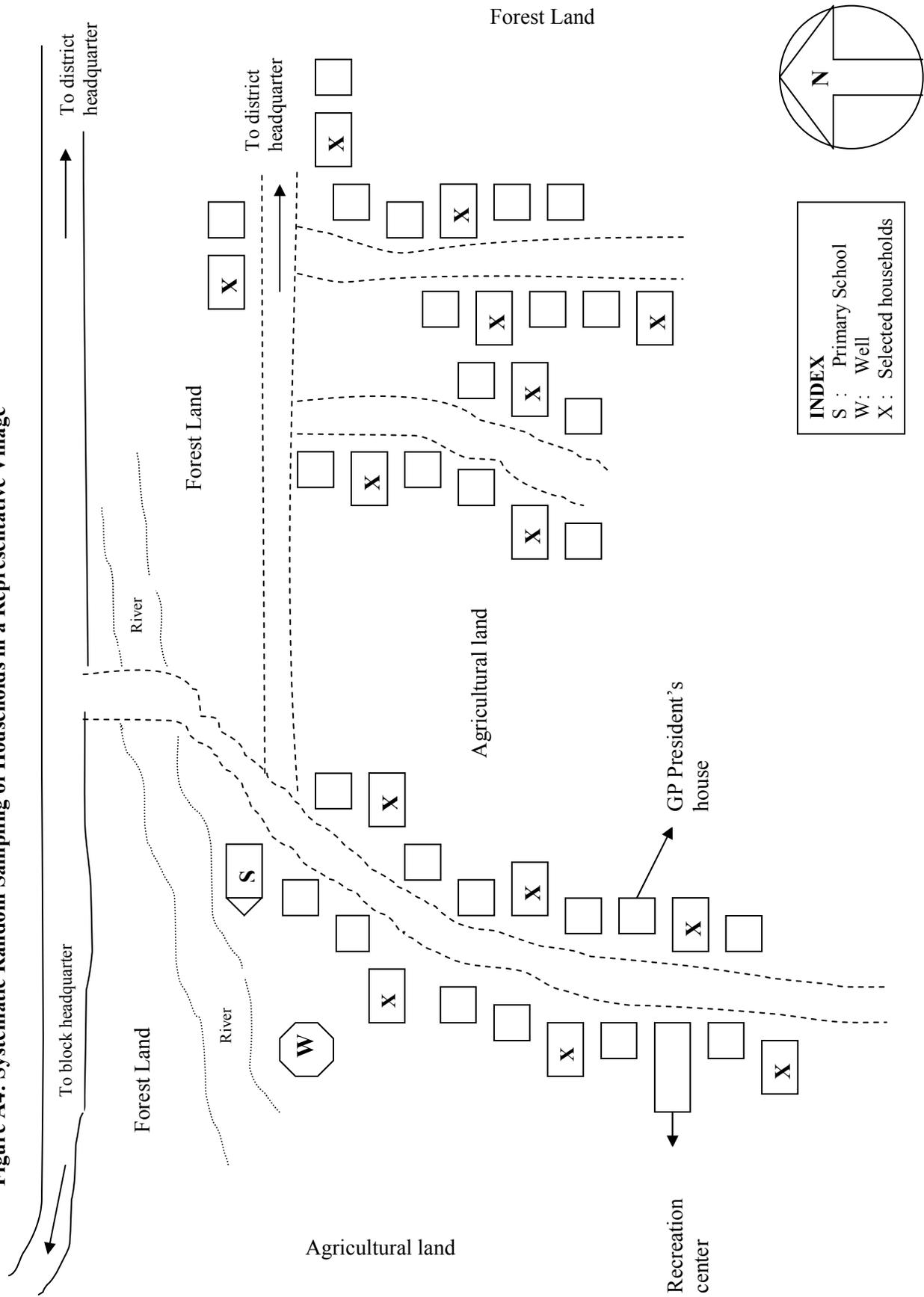


Table A3: Official Guideline for Expenditure on Mid Day Meal Program in Survey Area (Rs. per 100 students per day)

Expenditure Category	Mid Day Meal Program		
	Old Program	New Program	
		Menu 1	Menu 2
1 Milling of wheat	9.50	10	10
2 Pulses	0	50	0
3 Oil	11	5	15
4 Sugar	13	0	0
5 Milk	0	0	0
6 Vegetables	0	0	30
7 Salt and Spices	1.50	15	20
Total Cost of Ingredients	35	70	75
8 Fuel	8	10	10
9 Cook's Salary	15	40	40
Total Cost	58	130	125

Source: Department of Panchayat and Rural Development, Government of Madhya Pradesh.

Figure A4: Systematic Random Sampling of Households in a Representative Village



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