School Meals and Student Participation in Urban India

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November, 2010

Abstract

In November 2001, the Supreme Court of India directed all Indian states to provide cooked meals to children in public primary schools. Following this, in 2003, the municipality of Delhi switched from providing packaged snacks to freshly cooked meals during school hours. We use the phased implementation of the program to identify the effects of these meals on student attendance and enrollment. Controlling for unobservable student characteristics, we find the new program resulted in a 5 percentage point increase in attendance. These attendance effects are larger for boys and for younger children. We find no systematic effects of the program on student enrollment.

JEL Classification: I21, I28, I38

Key Words: school meals, attendance, enrollment

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1. Introduction

School nutrition programs have been in place in many countries for over a century. While there are several studies of their effects on student health and academic performance, there is less evidence on how their availability has influenced parent and child incentives to attend school. This relationship has been difficult to establish empirically in part because the effective enforcement of compulsory attendance laws in most of Western Europe and North America ensured that children were attending school regularly well before school lunch programs began.[1] As a result, the early debates over school meals centered on whether hungry children can benefit from education and whether these are effective means of transferring resources to poor families and later on the nutritive content of these meals.[2]

In many parts of the developing world, however, low school enrolment, irregular school attendance and malnutrition persist. The countries classified as low income by the World Bank have nearly 30 per cent of children under five malnourished and only 65 per cent completing

[1] Laws granting universal access to primary education were enacted in most countries in the 19th century. The Education (Provision of Meals) Act was passed in England in 1905 and the National School Lunch Act was passed in the United States in 1946. Gunderson (2003) describes the historical evolution of such programs in multiple countries.

[2] In the United States, this is evident in the testimonies to the Congress (United States Congress House Committee on Education and Labor 1968) and to state governments following cuts in federal support to school nutrition programs in the United States (New Jersey Commission on Hunger 1985). Early evidence on the effects of school nutrition on student learning among some native American communities in the western United States are presented in Pijoan (1943). More recent studies include Bhattacharya et al. (2006) and Figlio and Winicki (2005).

primary school at the appropriate age.[3] In a cross-country comparison of data from demographic health surveys between 2003 and 2007 for 41 countries, India, Bangladesh and Nepal have the worst anthropometric outcomes for children. In India, 48% of the under five age-group is underweight. This figure is nearly twice the average for the set of countries in sub-Saharan Africa with comparable data (Arnold et al. 2009). In 2005 only one quarter of Indian primary school aged children actually attended school.[4]

Given the poor state of health and educational outcomes of children, the National Program of Nutritional Support to Primary Education (NP-NSPE) or the Mid-Day Meal Scheme (MDM henceforth), was launched by the federal government of India in August 1995 with the aim of "universalization of primary education by increasing enrolment, retention and attendance simultaneously impacting nutrition of students at primary classes". The program mandates the provision of cooked meals to all students of public primary schools on school days. In 2005-06, more than 119 million children were benefitting from the program (Ministry of Human Resource Development (MHRD), Status of Implementation of MDM, 2005-06) making it one of the largest public transfer programs in the world.

In this paper, we examine whether transfers to households in the form of school meals can increase school participation rates. Specifically, we use data on children enrolled in public primary schools in the municipality of Delhi in India to ask whether a court-mandated change from packaged foods to more nutritive cooked meals increased daily attendance and enrollments. The transition to cooked meals was staggered and we use the differences in timing of the meal

[3] World Development Report 2009, Table 2.

[4] These figures are based on the National Family Health Survey 2005-2006 (Section 2.3, International Institute for Population Sciences (2007)).

across schools in our sample to identify the impact of the program. Using multiple observations on each student to control for unobservable individual characteristics, we find that on average, the cooked meal program resulted in a 5 percentage point increase in attendance. The program effects were most systematic for boys and largest for younger children in lower grades.

One of the key reasons cited for low levels of school participation in India and other developing countries is the cost of education (NFHS, 2005-06) - overhead costs of books, uniforms, transportation and opportunity costs - even though tuition in public schools is usually negligible ((PROBE) Team, 1999). A slew of both survey and experimental studies suggest that programs which reduce the cost of schooling can be effective means of improving participation rates in developing countries (*conditional cash transfer programs*: Behrman et al. (2001), Dubois et al. (2003), Schultz (2004) and Coady (2003); *free uniforms and textbooks*: Kremer et al. (2002); *scholarships or fee exemptions*: Kremer et. al (2004), Deininger (2003), Grogan (2009); *raw food grains program*: Ravallion and Wodon (2000)).

Although several existing studies have found positive effects of school transfer programs on school enrollments (viz. Schultz (2004)) very few of them can adequately estimate the effects of transfers on *daily* attendance (*conditional cash transfer programs*: Levy and Ohls (2007), Pianto and Soares (2004)) because transfers in these programs either did not systematically vary with daily attendance (viz. free uniforms and textbooks) or because attendance was already high prior to program implementation. Rawlings and Rubio (2005) consider conditional cash transfer programs that simultaneously address health and education concerns in six countries. The well-known Mexican Progresa program is one example. It provides sizable cash transfers to households if their children attend school for a minimum of 85% of school days. The program has resulted in substantial changes in middle school enrollments and calorie intakes (Schultz

2004; Coady 2003) but insignificant change in the attendance of already enrolled students (Schultz 2000). While not all such programs have been this successful, most require pre-determined levels of minimum attendance and do not therefore allow us to learn much about whether those transfers would encourage already enrolled students to attend school more regularly.

Proponents of on-site school meal programs, therefore, argue that such a program is more likely to improve *daily* school participation and learning while reducing costs of schooling in poor regions with low initial student participation rates. However, only a few studies have rigorously estimated the impact of on-site school meal programs on enrollment *and* attendance to find significant benefits (Ahmed, 2004; Vermeersch and Kremer, 2005). In the Indian context, lax enforcement of a monthly school attendance requirement for receiving free foodgrains was exploited by Afridi (2010) to show that transitioning from this program to serving cooked meals daily on school premises significantly raised the attendance rates of girls in grade 1 in a rural area of India.[5] However, the analysis was unable to account for unobserved individual heterogeneity that simultaneously impact program and school participation.

In the Delhi case, it is striking that the new program increased the nutritive content of meals and brought about attendance gains at very low cost. Payments made for cooked meal contracts were the same as those formerly made for packaged foods and the only additional expense was that of food grains which were made available free of charge to providers from government warehouses. The cooked meal program did require the provision of a "minimum

[5] Vermeersch and Kremer's (2005) is an experimental study of a *pre*-school meal program implemented by an NGO in Kenya. Afridi (2010) and Ahmed (2004) are the only two studies that evaluate a large, publicly provided school meal program's impact on *daily* participation.

content of 300 calories and 8-12 grams of protein" each day. The changes observed seem to illustrate that greater attention to the design of transfer programs can yield high returns within constrained budgets.

The remainder of the paper is organized as follows. A short theoretical framework for understanding the effect of school meals on participation is presented in Section 2. The institutional background on the school meal program in India and in Delhi is discussed in Section 3. Section 4 describes the data and the estimation methodology. Section 5 discussed the results while section 6 concludes.

2. Theoretical Framework

We model a unitary household and abstract from intra-household decisions and interrelationships across children in the benefits from schooling. We assume that the perceived benefit for a child from attending school depends on child, household and school characteristics. Children are indexed by *c*, households by *h*, schools by *k* and time (day) by *t*. Benefits from attending school on a day *t* are given by,

$$b_{chst} = \alpha_i + X_h \beta + Z_s \gamma + \delta g_c + \mu m_s + \varepsilon_{chst} \quad (1)$$

where X_h is a vector of household characteristics, Z_s a vector of school characteristics and g_c is the grade the child is in. The indicator variable m_s represents the presence of a cooked school meal is assumed to generate a benefit μ.

At each time *t*, children with a positive expected benefit from schooling over future periods are enrolled in school. Once enrollment takes place, a child attends school on day *t* if the value of ε_{chst} is such as to make the benefit on that day positive.

The introduction of the meal program is assumed to shift the mean of the benefit distribution for each child by μ. The increase in attendance following this change depends on the

child- specific distribution of benefits. Suppose, for example, the distribution is hump-shaped with a mean small and positive before the introduction of the meal plan. The program will cause the density to shift by μ and the number of days for which benefits are positive will increase substantially. In contrast, the pre-program mean is high and all but the tail of the distribution is positive, we would expect small effects on attendance.

3. Background

The Mid-day Meal Scheme in India

The National Program of Nutritional Support to Primary Education initiated by the federal government of India in August 1995 (Government of India, 1995) is federally funded. The federal government provides grain (wheat and rice) free of cost at a rate of 100 grams per child. The cost of transporting the grains from the nearest Food Corporation of India (FCI) depot to the schools is also subsidized. The cost of all other ingredients, fuel and labor required to convert food grains into cooked meals are borne by the state governments including any infrastructure such as kitchens, water supply and cooking devices. At the time of the program's initiation in 1995, most states faced financial difficulties in meeting these costs and, therefore, provided 3 kgs. of dry ration per month to children enrolled in primary schools provided they had at least 80% attendance in that month (Guidelines of National Program of Nutritional Support to Primary Education, 1995).

In November 2001, in response to public interest litigation initiated by the People's Union for Civil Liberties (PUCL, Rajasthan) the Supreme Court of India, directed all state governments to "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". Though the initial deadline for implementation of this order was February 2002, this was extended to September 2004 by the Supreme Court. Thus every child enrolled in grades one to five was to be served a uniform quantity of meal cooked from 100 grams of raw wheat or rice on the school premises during the school hours irrespective of gender or health status.

The Mid-Day Meal Scheme in Delhi

This paper is based on individual level panel data on students in public primary schools in Delhi. Although Delhi is primarily urban, the overall proportion of malnourished children (below -2 S.D. of height for age) was high at more than 40% in 2005-06, but lower than the average of almost 50% for the country. In addition, 80% of the population in the age group of 6-17 years in Delhi's urban areas were enrolled in school in 2005-06 (NFHS, 2005-06), compared to 77% for the entire urban India. These figures indicate the potential impact school subsidy programs can have on participation even in relatively more developed, urban regions of the country.

Primary education in Delhi falls under the purview of three departments: Municipal Corporation of Delhi (MCD), the New Delhi Municipal Corporation (NDMC) and the Directorate of Education of Government of Delhi (DOE). Nearly 80% of government primary schools are MCD primary schools. In 2006-07, there were 1862 MCD primary schools spread over 12 MCD zones in Delhi. In this study we focus on the MDM program in the MCD schools, which on average enroll more children from relatively economically disadvantaged backgrounds and slum dwellings, compared to NDMC or DOE schools.

Prior to the academic year 2003-04, schools were providing ready-to-eat food items like fruit buns, wheat puffs, roasted gram and biscuits in grades 1 to 5 since 1997-98. A report by the Planning Department of the Government of Delhi (2000) on the ready-to-eat program suggests

that students were most often receiving only fruit buns. The provision of these items was generally irregular and served for approximately 50 days of the year as against the 200 mandated days (Planning Department, Government of Delhi, 2000; Nutrition Foundation of India Report, 2006). The cooked meal scheme was started in the MCD primary schools (grades 1 to 5) of Delhi in July 2003. At the time of its initiation, in keeping with the Guidelines of the NP-NSPE 1995, the requirement was to provide 180 grams of food (100 grams of rice/wheat and 80 grams of other items like vegetables) to meet the norm of 300 calories and 8-12 grams of protein. The cooked menu at that time consisted mainly of wheat porridge, *khichdi* or rice cooked with lentils and vegetables among other items. At the time of the scheme's initiation, the meals were being provided by local NGOs and private agents operating from small kitchens. Meal providers were assigned schools on the basis of proximity to schools and the availability of infrastructure such as kitchen building, utensils and cooking equipments.

While the foodgrains for the MCD's MDM program were provided by the Food Corporation of India (FCI), for all other costs such as expenses on vegetables, spices, fuel and wages, providers were reimbursed at a rate of Rs 2 per child by the MCD itself in 2003-04. The average cost of foodgrains, both rice and wheat, was approximately Re. 1 per child in 2003-04 prices (Ministry of Consumer Affairs, Food and Public Distribution, 2003-04). Under the ready-to-eat MDM, as well, the expenditure per child by the MCD was Rs. 2 per child for 200 school days (Planning Department, Government of Delhi, 2000). Thus the transition to cooked meals implied a 50% increase in cost per child.

Under the new scheme the mid-day meal cell of the MCD manages a meal supply card system in which of the number of meals distributed, the menu item served, total enrolment and daily attendance are recorded and reported by each school. The responsibility of maintaining all

records pertaining to the MDM scheme is allotted to one teacher in the school. The schools prepare the meal supply cards in triplicate – the original is maintained by the school authorities, and one copy, each, is provided to the meal provider and the MCD. The providers are reimbursed by the MCD on the basis of these records on number of students served every fortnight in the schools within their purview. A committee comprising of the head-teacher, Parent-Teacher Association (PTA) representatives, the school teacher responsible for monitoring and maintaining MDM records and mothers of two students enrolled in the school is formed to ensure that the meals are cooked hygienically and served regularly. The daily distribution of meals is overseen by the MDM in-charge of the school but the distributors are appointed and paid by the providers themselves.

4. Data and Methodology

Survey Design

Between January and December 2008 two types of current and retrospective data were collected by the authors:

1) *School-level data* on implementation of the MDM scheme and other school characteristics such as infrastructure facilities in a survey of 26 randomly selected schools out of the 165 primary schools in one of the 12 zones of the MCD, the Central zone.

2) *Individual-level data* on monthly attendance level and other individual and family characteristics of students in the above surveyed schools for the years 2001-2007 was collected from school records.

Almost all MCD schools hold classes in two shifts. The morning shift (7.30 A.M to 12.30 A.M) is held only for girls and the evening shift (1.00 P.M to 5.00 P.M) is held only for boys.

For co-educational schools there is usually only one morning shift of classes. In our data we classify a shift as one school because although the school infrastructure remains the same in both the shifts, the staff and student characteristics change. In order to capture gender differences within a school, the evening shift (boys) of one school per provider was surveyed.

Unannounced visits to schools were made by investigators with no particular order in choice of randomly sampled schools visited. If any school refused or could not provide the relevant information the most closely located school in the list of sampled schools was surveyed. If none of the schools in the list were located close to the original school, any MCD school that was geographically the closest to the originally sampled school was surveyed. This procedure was followed in order to reach the schools early enough to observe the distribution of meals in schools. Our assumption is that schools located close to each other are likely to be similar in characteristics.

In order to gather the retrospective individual level data all 26 schools were revisited between September and December 2008 to collect the second dataset listed above - administrative records related to the MDM scheme, attendance and background information of students:

1) *Mid-day Meal Records*: Each school is expected to maintain a register that records information on the menu item served and the grade-wise enrolment, attendance and total number of meals distributed on each school day. This information was also maintained during the ready to eat regime of the MDM program. We used retrospective mid-day meal records to determine when the school transitioned to cooked meals from packaged snacks. Some schools, however, maintained separate records for mid-day meals and grade-wise enrolment and attendance. The MDM register in these schools was a daily list of food-items

and total number of meals served under the mid-day meal. For these schools, the grade-wise enrolment and attendance were obtained from another register called the Daily Attendance Register.

2) *Attendance Registers*: Attendance data of children were obtained from the Attendance Registers which are maintained separately by grade and section in the schools. The attendance records of students in one randomly chosen section for each grade (1 to 5) were collected and followed up for subsequent academic years, beginning with the academic year 2000-01 until academic year 2007-08.[6] The academic session in MCD schools starts in April and ends in March of the following year. For the academic years 2000-01, 2002-03 and 2005-2008, the monthly attendance for April, July, September and February was collected. For the academic years 2003-04 and 2004-05 attendance was collected for all 10 months of the academic year. In MCD schools, attendance is marked twice a day- once before recess and once after. The number of days that a child attends school in a month is, therefore, half of her total attendance for the month.

3) *Admission Registers*: The admission registers containing background information on students like father's name, father's occupation, caste, religion, date of birth and date of admission in the school were used to obtain data for each enrolled student. [7]

[6] If a grade broke into a new section or merged into another, the main section was selected, not the branch. In most schools the main section is section A. We were, in this way, able to trace the same set of students over the years as they progressed through grades.

[7] The admission registers also provide the enrollment status of students—whether they are still in school, passed grade 5, dropped out or taken transfer along with the reasons for doing so. The reliability of the reason, as recorded in the admission registers, for striking a child's name from

Of the 26 originally sampled schools, 22 could provide us with records of individual participation. We believe that there were no characteristics, correlated with program transition timing and participation rates that systematically differed between the 22 schools for which we were able to obtain records and the 4 schools that could not provide them.[8]

We linked students in the admission and attendance registers using a unique enrolment number. Every student who enrolls in an MCD primary school is given an enrolment number at the time of admission. This number remains the unique identifier for the student throughout her tenure in that school. On moving to a different school she is given a new enrolment number. This unique identifier is recorded in both the attendance and admission registers and was used to match student characteristics with the attendance records. Around 3% of students could not be matched to their admission details as enrolment numbers were missing for these students. Enrolment numbers could be missing if the student was a new admission because such students

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school or dropping out is questionable. While some schools claimed that all efforts are made to verify the reason for dropping out, anecdotal evidence suggests that these reasons are often made up. A survey conducted among all MCD primary schools of a ward (cited in PROBE Report, 1999) found that close to 60% of students for whom the reason for being struck off from the school rolls was entered as having permanently moved back to their native villages were residing in their homes in Delhi.

[8] The reasons for the 4 schools not providing student-level data varied. Sanjay Colony Girls was being relocated. In Meethapur Girls, the sections of students changed every year which made tracking each child over the years difficult. Authorities in Aali Village Girls were not willing to share records and Masihgarh could not be visited as there were exams going on in this school.

are allotted an enrolment number a month after admission or enrolment numbers could be missing if school records had not been computerized. Often older attendance and admission records were in poor condition and the enrolment numbers were not legible.[9] Older admission registers were also not standardized across schools. While some schools maintained more detailed information on students like grade of admission, reason of withdrawal others maintained only the basic information like date of birth, father's name and occupation and caste.[10] Thus individual and households level information may be missing for some students.

From the 22 schools for which records are available, we have attendance data for 13,675 children for academic years 2001-02 to 2007-08. Basic data on household characteristics that were recorded during admission were available for 13,549 students. This was a loss of 0.9% of the data. However, data are not available for all grades for all the year-months. Table A1 in the Appendix shows the availability of individual level data for each grade in each school in our sample. Since schools are expected to maintain records for the previous five years, records from 2003 onwards were available in most schools (data collection began in 2008) but were sparse for years prior to 2003. We, therefore, restrict our sample to the academic years 2002-03 and 2003-04.

[9] There is also a possibility that enrolment numbers are wrongly entered or not entered at all in the attendance registers. Investigators identified the enrolment numbers from the student names and their father's name in this case.

[10] Some other errors in school records were- dates of birth are later than dates of admission, dates of withdrawal are before dates of admission, dates of withdrawal are missing.

Methodology

The implementation of cooked meals in MCD schools in Delhi was staggered over time. While some schools implemented cooked meals in July-August, 2003 others did so in October-November, 2003. Table 1 shows that almost 50% of the sampled schools implemented MDM program before September 2003 and the other half, after September 2003.

Our strategy is to compare student participation in September, 2002 and in September, 2003. Schools which implemented MDM before September 2003 (in July or August) form our treatment group while those which implemented it after September 2003 (in October or November) form our control group. We use a difference-in-difference approach, differencing the difference in participation rates in September, 2002 (no MDM in both treatment and control groups) and September, 2003 (MDM only in treatment group) in treatment schools from that of control schools. Therefore, our baseline estimating equation is:

$$P_{ijt} = \alpha + \beta_0 T_{ij} + \beta_1 t + \beta_2 (T_{ij} * t) + \gamma \mathbf{X}_{ij} + \mu_j + \varepsilon_{ijt} \quad (1)$$

P_{ijt} is the participation outcome if individual *i* in school *j* at time *t*. T_{ij} equals 1 if individual i's school *j* transitioned to cooked meals before September, 2003 and 0 if it transitioned after September, 2003. t equals 1 if the observation is recorded for September, 2003 and 0 if it is for September, 2002. $\mathbf{X}_{ij}$ is a vector of individual characteristics including gender, age, current grade, religion, caste and father's profession. μ_j is unobservable, time-invariant school characteristics and ε_{ijt} is the idiosyncratic error term. Our main coefficient of interest is β_2 which gives us the difference-in-difference estimate of the impact of transition from providing packaged food to cooked meals during school hours.

In order to account for unobservable student characteristics which may be correlated with participation rates as well the timing of program transition, we specify our estimating equation

more strictly by including individual fixed effects, as shown in equation 2 below, where δ_i is unobservable individual characteristics.

$$P_{ijt} = \alpha + \beta_0 T_{ij} + \beta_1 t + \beta_2 (T_{ij} * t) + \delta_i + \varepsilon_{ijt} \quad (2)$$

We define participation in terms of both enrollment and daily attendance. The enrollment level is obtained by counting the total number of students listed in the school register in a grade by gender in that month. The average monthly attendance rate was calculated by dividing the total number of classes attended by a student with the total number of classes that the student could have potentially attended. The denominator could, thus, vary if the child enrolled late. This number was calculated at the individual level and by grade and gender at the school level to give us the attendance rate.

In order to conduct the analysis for grades 1 to 5, separately, we use equation (2) but define treatment differently due to the sparseness of grade level data prior to academic year 2003 (see Table A1 in the appendix) and in order to keep grade constant for a student. We compare an individual student's monthly attendance rate in April, 2003 with her attendance rate in September, 2003. Thus, T_{ij}=0 in equation 2 for all schools in our sample in April, 2003 and =1 for those schools which transitioned to cooked meals before September, 2003 and 0 otherwise.

There are two concerns regarding the validity of the outlined empirical strategy. First, the source of variation in the implementation of the cooked school meal program must be independent of time trends in participation for our empirical strategy to be valid. MCD documents claim that in the first phase of program transition the allocation of schools to providers was based on 'Expressions of Interest' by the service providers. These applications were invited zone-wise and the allotment of schools to providers was a decentralized decision. In the first phase, there were only a few service-providers who were selected on the basis of (i) the

availability of infrastructure such as kitchen building, utensils, cooking equipments and vehicles and (ii) distance from schools (Brief Note on MDM in Delhi, Directorate of Education). Schools which were closer to providers' kitchens received cooked meals first. Hence, schools had little leverage in influencing the decision as to whether they would get the meal in the first or the second phase. All 12 MCD Zones followed the phased manner of implementing the cooked meal scheme with schools closer to selected kitchens receiving meals in Phase-I while the rest were covered in Phase-II. This would suggest that timing of program transition was not correlated with school characteristics, other than its location relative to a provider's kitchen.

To further, validate our strategy, in Table 2 we compare observable school and individual characteristics of students in the control and treatment group of schools in April 2003. In terms of basic school infrastructure, there is no statistically significant difference between treatment and control group of schools. Attendance is higher in control schools though this difference is not significant, except for Class 2. In Table 3, we compare the individual characteristics of students who were enrolled in April 2003. Here we find some significant differences between treatment and control schools. There were more girls' schools in treatment schools. The proportion of students who did not belong to socio-economically disadvantaged groups (General category of caste) was also higher in the treatment schools. Looking at father's occupation, we find that the proportion of students whose father's were unskilled workers was lower in treatment schools than control schools and most of them were children of employees in the private sector or small entrepreneurs. Thus, overall we may conclude that, on average, students in the treatment group of schools were from a better socio-economic background than students in the control group. This suggests that our estimation of program impact may be biased downwards. However, we will control for both observable and unobservable individual characteristics in our analyses.

Next, we check for the comparability of trends in participation between these two groups of schools. It is well accepted that there exist seasonal variations in student participation rates, particularly in rural areas due to seasonality in agricultural activity. Since a significant number of students in MCD schools may belong to migrant families who might move to their villages during peak harvesting or sowing seasons thereby leading to seasonal variation in attendance rates, we hold the month constant between 2002 and 2003. We also expect enrollments and attendance rates to have stabilized by this month since almost all new students are enrolled by 30th September in an academic year. In Figure 1 we show the trends in participation rates between treatment and control schools in the year 2002-03 to see whether there are any systematic differences between them at the baseline. We include only those schools- 19 out of 22- for which attendance data are available for the year 2002-03. We find that attendance level of students in the treatment group was lower than students in the control group in the pre-program period but the trends in participation are similar across the two groups. Attendance is usually low in the months of April and July, peaks in September and drops again in February in both groups.

Our second concern is regarding the reliability of school records. In developing countries public school records of enrollment and attendance are often suspected of being inflated. What is not clear, however, is whether this exaggeration is at the school level or at a higher level of aggregation. Aggregate enrolment and attendance for a school was collected from Daily Attendance Registers. Whenever a school could not provide the Daily Attendance Register, enrolment and attendance were taken from the Mid-day Meal (MDM) Register. Of the 22 schools, 16 could provide class-wise enrolment and attendance. It is possible that there is an incentive for teachers to inflate the total number of students present in the MDM registers, so checks were made by matching these numbers with the entries in the Daily Attendance Registers

where available. 10 schools could provide both MDM and Daily Attendance Registers. We found that enrolments matched in 82% of the cases and attendance in 77% of the cases. The low match for attendance can be explained by the fact that MDM registers record the number of students who ate MDM, not the number of students who were present. Hence, the number available from MDM register was *lower* than that in the Daily Attendance Register. Therefore, even at the school level there does not seem to be much inflation of attendance data. Further, we base our analysis on individual level data whereas the exaggeration was more likely to occur in the aggregate data used for reimbursement of costs of foodgrain conversion.

Even if participation figures are inflated at the school level, the validity of our empirical strategy is threatened only if the incentives to inflate figures varied systematically between the treatment and control group of schools. We do not think that there were systematically different incentives for fudging data between treatment and control groups since the amount reimbursed per student was the same in both the cooked meals and ready to eat regimes and was based on the attendance rates.[11]

[11] Packets of packaged snacks were procured from designated stores by schools every 15 days on the basis of expected attendance. The packets of food were stored in the school itself and were distributed on the basis of attendance. Each child was given one packet. If stocks were over before 15 days, there was no distribution. The price of each such packet was roughly Rs. 2. Stores were reimbursed on the basis of number of packets lifted (@ Rs. 2 per packet) every 15 days. This was recorded in the MDM registers maintained by schools. To check if attendance was inflated in MDM registers *before* the cooked meal program, we compared the attendance of schools that recorded attendance in MDM registers to attendance of schools that recorded attendance in daily registers. We find that there is no significant difference in enrolment,

Before presenting the results of our empirical model, in Table 4 we show the average monthly school attendance rates for the same sample of schools in September 2002, 2003 and in April 2003. We find that attendance rate in treatment schools was lower, but not significantly different from control schools in the pre-program period (September 2002 and April 2003). In the post program period (September 2003), the attendance rate of Class 3-5 in the treatment schools is higher than the control schools, but the difference is not significant. Overall, the attendance rate in September 2002 is significantly lower for treatment schools but in September 2003, this gap narrows down and the attendance rates of the two groups become comparable. These figures are only suggestive of a positive impact of program transition, since we do not control for school and student characteristics that might influence participation outcomes and could be correlated with the timing of program transition.

5. Results

We begin our analyses by showing the results for a school-level analysis of the effect of cooked meals on attendance rates in Table 5. We start with a naïve pooled OLS model, assuming that there is no unobservable, time invariant, school or individual characteristics that affect both our outcome of interest and are correlated with the timing of program transition. In column 1, the negative coefficient on treatment suggests that schools which transitioned earlier to MDM had lower attendance than schools which started serving cooked meals later in the academic year.

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attendance or attendance rates between the schools for which MDM register was used and those for which daily attendance register was used. See Appendix A5 for details.

There is a significant annual trend in the overall attendance rate as indicated by the significant negative coefficient on Year. Our main coefficient of interest, the interaction of year dummy with treatment, shows that the attendance rate of all students was significantly higher by 5.5 percentage points in September, 2003 compared to September, 2002 between the treatment and control groups of schools. When we conduct the analysis by gender in the next two columns, we find that there was a higher, though insignificant, effect of cooked school meals on boys' (7.7 percentage points increase) attendance and an insignificant effect on girls as shown by the coefficient on the year and treatment interaction term. To address the possibility that unobservable school characteristics may bias our results, in the next three columns we conduct the analysis within schools. The results are remarkably similar to our pooled OLS analysis. The coefficient in row 3 for all students suggests a 5.6 percentage point difference-in-difference affect on attendance rates. The impact by gender is again insignificant, though it is higher for boys (6.9 percentage points).

Looking at the other coefficients, we find systematic difference in attendance rates across grades as suggested by coefficients on the dummies for grades 2 to 5 (with reference to grade 1)- attendance increases for higher grades. Girls typically have higher, albeit insignificant, attendance rate compared to boys as indicated by the coefficient on female. Muslim students have lower overall attendance compared to general category students. Father's occupation category does not show any significant effect on attendance. Our results are qualitatively the same when we conduct similar analyses in an unbalanced school panel data (see Appendix A2 for details). However, the coefficient of the interaction of treatment with year dummy is significant and positive for boys.

The individual level data analysis is presented next in Table 6. The first three columns show the results from the pooled OLS analysis and suggest that the overall attendance rate rose by 4.3 percentage points due to the cooked meals program. The next column indicates that there was a positive effect on boys of 10 percentage points but an insignificant effect on girls. These results are remarkably consistent across both the school fixed effects and the child fixed effects models. The coefficient on females suggests that girls have significantly higher attendance rate than boys. The positive coefficient on age indicates that attendance rates rise for older children but at a diminishing rate, given the significant negative coefficient on the square of age. The father's profession does not seem have to any systematic effect on school participation rates, relative to the unskilled, as indicated by the insignificant coefficients on almost all occupation categories across all the empirical models. The results are qualitatively similar when we conduct these analyses in an unbalanced student-level panel data (Appendix A3)

In Table 7 we show results by religion and caste using the individual level data to assess heterogeneity of program transition effects by socio-economic groups. We include only those schools which have at least 10% of all socio-economic and religious categories of enrolled students. We find that neither Muslim nor SC/ST, OBC students gained significantly due to the program transition. The socio-economically privileged groups were the main beneficiaries of the program as indicated by the significant coefficient on the interaction of treatment with the year dummy for 'General' category students and for 'Non-muslim.'

Next, in order to assess the impact of cooked meals by grade, we estimate equation 2 with our sample restricted to enrolled students in April, 2003 and September, 2003. Schools which transitioned to cooked meals before September, 2003 form our treatment group and schools which transitioned after September, 2003 are our control group. Thus our difference-in-

difference effect is given by the coefficient on the interaction of the September dummy with treatment. In Table 8 we show the results of individual fixed effect estimation separately for each grade. The coefficient on the interaction term is positive and significant for all grades except grade 5. The point estimate is largest for the interaction term for grade 1, suggesting that attendance rates were higher by more than 12 percentage points in treatment schools due to program transition compared to the control group of schools.

We now turn to our results for enrollments. In Table 9, we show the results of the school-fixed effect of the meal program on enrolment. We compare class-sizes in April 2003 and September 2003 using the unbalanced school panel. The positive coefficient on September in column 1 suggests that enrolments were higher in September but the meal program had no significant impact on enrolment as shown by the insignificant coefficient of the interaction of the treatment dummy with the September dummy. When we conduct the analysis by gender, in the next two columns, our results remain unchanged. We do not find a significant effect on enrollments for either boys or girls. The story is consistent when the analysis is done by grade, as well, as indicated by the insignificant coefficient on the interaction term for grades 1 to 5. We, therefore, conclude that there was the transition in program characteristic did not provide any additional incentives for enrollments to rise.

6. Conclusion

This paper analyzes the effects of cooked school meals on daily attendance and enrollment in municipal schools in Delhi. We use individual level panel data obtained from school records during the academic years 2002-03 and 2003-04 to implement a difference-in-differences strategy for program evaluation. Controlling for unobservable individual characteristics, the

results suggest that there was a significant improvement in daily attendance, particularly of boys and more for lower grades, in schools which transitioned from distributing packaged meals to cooked meals. There was no significant effect on enrollment levels.

We conclude that individuals with low initial participation rates benefitted from the program while the transition in program characteristic did not provide any additional incentives for enrollments to rise. In particular, children in grade 1, who had the lowest attendance rates relative to other grades saw the biggest gain in daily attendance. Although gender disparity in schooling continues to exist in rural India, there does not seem to be a significant difference on enrollment rates for girls and boys in urban areas (NFHS, 2005-06). In Delhi the proportion of 6-17 year old girls enrolled in a school in 2005-06 was almost 4 percentage points higher than for boys in its urban areas (NFHS, 2005-06). Further, the percentage of underweight boys was higher than the percentage of underweight girls in both 1992 and 1998 in Delhi (NFHS, 1992-93 and 1998-99). These statistics and our data on household characteristics of enrolled children validate our conclusion that boys gained more relative to girls because of their initial lower educational outcomes.

To the best of our knowledge, this paper provides the most rigorous evidence of the effectiveness of school meals on participation in India by conducting the analyses at the individual level and by controlling for seasonal variations in participations rates. The study by Afridi (2010) also found a significant effect on grade one girls' attendance rates in rural Madhya Pradesh but no effect for boys or on enrollments. However, that study used aggregate school level panel data from 64 schools and could not, therefore, account for individual level heterogeneity in unobservable characteristics that could be correlated with timing of program transition and the participation outcomes. Our results here should, therefore, be more robust.

There are two main policy implications of the results in the paper. First, school subsidies can be an important policy instrument for making *regular* schooling more desirable for children of resource poor households. Second, our findings illustrate the need for greater attention to the design of transfer programs in order to yield high returns within constrained budgets.

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Table 1: Month of implementation of MDM in academic year 2003-2004

Month	No. of schools	Proportion of Sampled schools
July	9	40.90
August	1	4.56
October	9	40.90
November	3	13.64

Table 2: Summary statistics in April 2003:

School Characteristic	Control Schools (N=12)	Treatment Schools (N=10)	Difference
School has computer room	0.55	0.3	0.25
	(0.366)	(0.153)	(0.411)
School has drinking water	0.91	1.00	-0.091
	(0.091)	(0.000)	(0.096)
School has library	0.90	0.80	0.10
	(0.100)	(0.133)	(0.167)
School has playground	1.00	1.00	0.00
	(0.000)	(0.000)	(0.000)
School has boys' toilet	0.10	0.20	-0.10
	(0.100)	(0.133)	(0.167)
School has girls' toilet	0.10	0.20	-0.10
	(0.100)	(0.133)	(0.167)
Number of permanent teachers	11.30	0.56	0.74
	(1.972)	(1.668)	(2.614)
Number of temporary teachers	0.10	1.89	-1.79
	(0.100)	(1.160)	(1.102)
Pupil-teacher ratio	20.28	22.25	-1.98
	(4.141)	(5.603)	(6.872)
Attendance Rate of Grade 1	0.63	0.50	-0.13
	(0.050)	(0.040)	(-0.070)
Attendance Rate of Grade 2	0.85	0.75	-0.10
	(0.040)	(0.030)	(0.050)**
Attendance Rate of Grade 3	0.81	0.78	-0.03
	(0.020)	(0.020)	(0.030)
Attendance Rate of Grade 4	0.83	0.81	-0.02
	(0.030)	(0.030)	(0.040)
Attendance Rate of Grade 5	0.77	0.80	0.03
	(0.040)	(0.030)	(0.050)

Standard errors in parenthesis. *significant at 5% **significant at 1%

Table 3: Individual characteristics of students enrolled in April 2003:

	Control Schools N=17,96	Treatment Schools N=14,66	Difference
Female	0.52	0.65	0.12
	(0.010)	(0.010)	(0.017)**
Muslim	0.44	0.14	-0.30
	(0.010)	(0.010)	(0.015)**
General	0.41	0.55	0.14
	(0.020)	(0.010)	(0.020)**
SC/ST	0.43	0.27	-0.16
	(0.020)	(0.010)	(0.020)**
OBC	0.16	0.18	0.02
	(0.010)	(0.010)	(0.020)
Skilled workers	0.30	0.15	-0.15
	(0.010)	(0.010)	(0.015)**
Unskilled workers	0.38	0.18	-0.20
	(0.010)	(0.010)	(0.016)**
Pvt. Jobs and small shops	0.27	0.62	0.35
	(0.010)	(0.010)	(0.020)**
Govt. employees and professionals	0.03	0.03	0.01
	(0.000)	(0.000)	(0.010)

Standard errors in parenthesis. *significant at 5% **significant at 1%

Figure 1: Attendance rate in treatment and control school in year 2002-03 (school balanced panel, number of schools=19)

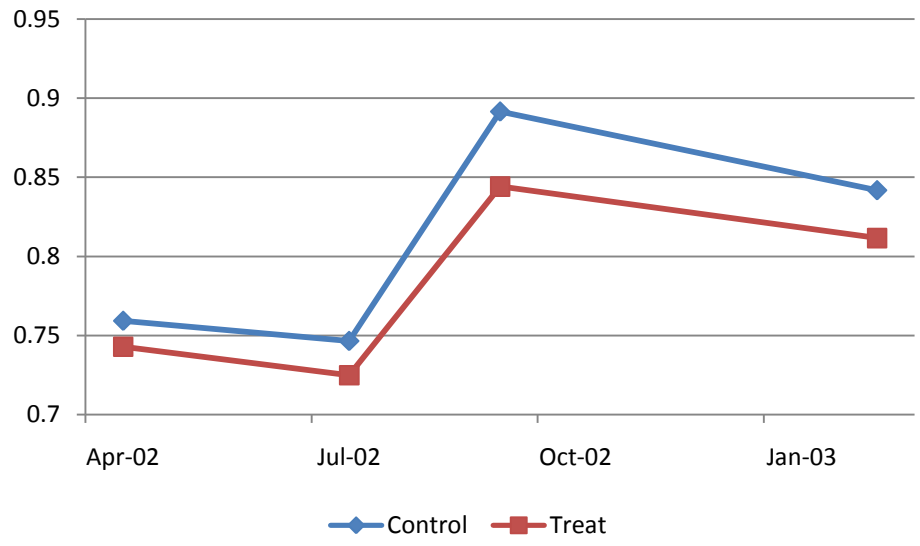

Table 4: Attendance rate by grade (balanced school panel data, N=19)

	September 2002			April 2003			September 2003		
Grade	Control	Treatment	Difference	Control	Treatment	Difference	Control	Treatment	Difference
1	0.81	0.77	-0.04	0.53	0.30	-0.24	0.79	0.72	-0.07
	(0.04)	(0.02)	(0.04)	(0.04)	(0.02)	(0.05)**	(0.04)	(0.05)	(0.07)
2	0.90	0.83	-0.06	0.78	0.71	-0.07	0.89	0.84	-0.05
	(0.02)	(0.03)	(0.04)	(0.06)	(0.03)	(0.06)	(0.02)	(0.02)	(0.03)**
3	0.91	0.87	-0.03	0.78	0.76	-0.02	0.86	0.87	0.01
	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.05)	(0.03)	(0.01)	(0.03)
4	0.90	0.84	-0.06	0.79	0.78	-0.01	0.79	0.89	0.10
	(0.02)	(0.03)	(0.04)	(0.05)	(0.04)	(0.07)	(0.07)	(0.01)	(0.06)
5	0.90	0.87	-0.03	0.74	0.76	0.02	0.89	0.92	0.03
	(0.01)	(0.02)	(0.01)	(0.03)	(0.06)	(0.06)	(0.03)	(0.02)	(0.04)
Total	0.89	0.84	-0.05	0.75	0.72	-0.02	0.85	0.86	0.01
	(0.01)	(0.01)	(0.02)**	(0.02)	(0.03)	(0.04)	(0.02)	0.01)	(0.02)

* significant at 5% ** significant at 1%

Standard errors in parenthesis

Table 5: Effect of school meals on student attendance, 2002-2003 (balanced school panel data)

	POOLED OLS			SCHOOL-FIXED EFFECTS		
	ALL	BOYS	GIRLS	ALL	BOYS	GIRLS
Treat	-0.061	-0.116	-0.043			
	(0.021)**	(0.042)**	(0.023)			
Year=2003	-0.041	-0.083	0.026	-0.041	-0.085	0.033
	(0.017)*	(0.028)**	(0.021)	(0.017)**	(0.029)**	(0.019)*
Treat* Year 2003	0.055	0.077	-0.007	0.056	0.069	-0.011
	(0.023)*	(0.042)	(0.026)	(0.023)**	(0.044)	(0.024)
Grade2	0.066	0.057	0.051	0.045	0.056	0.036
	(0.021)**	(0.039)	(0.025)*	(0.024)*	(0.05)	(0.023)
Grade3	0.086	0.088	0.073	0.076	0.088	0.064
	(0.022)**	(0.036)*	(0.026)**	(0.024)**	(0.047)*	(0.025)**
Grade4	0.079	0.065	0.07	0.059	0.06	0.056
	(0.022)**	(0.034)	(0.026)**	(0.025)**	(0.046)	(0.024)*
Grade5	0.096	0.119	0.064	0.095	0.127	0.061
	(0.023)**	(0.042)**	(0.026)*	(0.026)**	(0.052)**	(0.025)**
Female	0.020			-0.003		
	(0.013)			(0.027)		
SC/ST	-0.081	-0.086	-0.135	-0.049	-0.063	-0.103
	(0.064)	(0.187)	(0.058)*	(0.081)	(0.214)	(0.079)
OBC	-0.034	-0.294	-0.073	-0.018	-0.255	0.052
	(0.078)	(0.189)	(0.084)	(0.118)	(0.25)	(0.116)
Muslim	-0.134	-0.25	-0.082	-0.226	-0.419	0.012
	(0.054)*	(0.133)	(0.075)	(0.113)*	(0.247)*	(0.113)
Skilled workers	0.108	0.115	0.038	0.067	0.009	-0.019
	(0.069)	(0.131)	(0.083)	(0.102)	(0.168)	(0.118)
Pvt. Jobs and small shop owners	-0.025	-0.035	0.010	0.065	0.003	0.080
	(0.049)	(0.117)	(0.054)	(0.07)	(0.165)	(0.069)
Govt. employees and professionals	0.154	0.414	0.011	0.058	0.287	0.051
	(0.123)	(0.259)	(0.121)	(0.152)	(0.323)	(0.146)
Others	-0.105	-0.308	-0.16	-0.207	-0.309	-0.269
	(0.22)	(0.747)	(0.191)	(0.287)	(0.968)	(0.233)
Constant	83.565	167.991	-51.198	83.204	170.313	-65.69
	(35.007)*	(55.091)**	(41.291)	(34.850)**	(57.686)**	(38.819)*
Observations	120	52	68	120	52	68
R-squared	0.39	0.59	0.38	0.33	0.40	0.37

Standard errors in parentheses. *significant at 5% **significant at 1%

Table 6: Effect of school meals on student attendance, 2002-2003 (balanced individual level data)

	POOLED OLS			SCHOOL-FIXED EFFECTS			CHILD-FIXED EFFECTS		
	ALL	BOYS	GIRLS	ALL	BOYS	GIRLS	ALL	BOYS	GIRLS
Treat	-0.054	-0.084	-0.03						
	(0.008)**	(0.015)**	(0.010)**						
Year = 2003	-0.045	-0.074	-0.008	-0.044	-0.074	-0.006	-0.028	-0.065	0.015
	(0.009)**	(0.014)**	(0.012)	(0.009)**	(0.014)**	(0.012)	(0.007)**	(0.012)**	(0.009)
Treat * Year 2003	0.043	0.100	-0.006	0.044	0.102	-0.006	0.05	0.11	-0.005
	(0.011)**	(0.019)**	(0.014)	(0.011)**	(0.019)**	(0.013)	(0.010)**	(0.018)**	(0.012)
Female	0.028			0.046					
	(0.006)**			(0.017)**					
Age	0.038	-0.003	0.073	0.049	0.009	0.076			
	(0.020)	(0.035)	(0.024)**	(0.020)**	(0.036)	(0.023)**			
Age-squared	-0.003	0.000	-0.005	-0.003	-0.001	-0.005			
	(0.001)*	(0.002)	(0.001)**	(0.001)**	(0.002)	(0.001)**			
Grade2	0.045	0.017	0.057	0.035	0.005	0.049			
	(0.012)**	(0.022)	(0.014)**	(0.013)**	(0.022)	(0.015)**			
Grade3	0.088	0.072	0.094	0.078	0.065	0.08			
	(0.014)**	(0.025)**	(0.017)**	(0.015)**	(0.026)**	(0.018)**			
Grade4	0.073	0.046	0.094	0.065	0.040	0.083			
	(0.016)**	(0.029)	(0.019)**	(0.017)**	(0.03)	(0.020)**			
Grade5	0.102	0.084	0.107	0.092	0.075	0.095			
	(0.020)**	(0.036)*	(0.023)**	(0.021)**	(0.037)*	(0.025)**			
SC/ST	-0.006	0.004	-0.013	-0.005	-0.002	-0.008			
	(0.007)	(0.012)	(0.008)	(0.007)	(0.012)	(0.009)			
OBC	0.002	0.021	-0.007	0.008	0.018	0.001			
	(0.009)	(0.017)	(0.01)	(0.009)	(0.017)	(0.01)			
Muslim	-0.011	-0.017	-0.001	0.001	-0.002	0.002			
	(0.008)	(0.013)	(0.01)	(0.008)	(0.014)	(0.010)			

Skilled workers	0.017	0.020	0.016	0.012	0.01	0.016			
	(0.008)*	(0.013)	(0.010)	(0.008)	(0.013)	(0.010)			
Pvt. Jobs and small shop owners	0.002	0.010	-0.004	0.006	0.014	0.001			
	(0.007)	(0.012)	(0.008)	(0.007)	(0.012)	(0.008)			
Govt. employees and Professionals	0.027	0.049	0.016	0.014	0.029	0.01			
	(0.015)	(0.029)	(0.017)	(0.015)	(0.029)	(0.017)			
Others	0.075	0.094	0.057	0.064	0.081	0.055			
	(0.039)	(0.062)	(0.050)	(0.039)*	(0.061)	(0.050)			
Constant	90.022	149.284	15.94	88.434	149.357	11.565	56.297	130.851	-28.181
	(17.916)**	(28.033)**	(23.436)	(17.942)**	(27.942)**	(23.53)	(14.913)**	(23.347)**	(-18.544)
Observations	2398	1040	1358	2398	1040	1358	2480	1072	1408
R-squared	0.07	0.08	0.09	0.09	0.10	0.11	0.15	0.09	0.25

Standard errors in parentheses. *significant at 5% **significant at 1%

Table 7: Effect of school meals on student attendance by social groups, 2002-2003 (balanced individual level data, schools with at least 10% of each social group)

	SCHOOL-FIXED EFFECT				
	NON-MUSLIM	MUSLIM	SC/ST	GENERAL	OBC
Year 2003	-0.039	0.005	-0.024	-0.058	-0.023
	(0.011)**	(0.016)	(0.017)	(0.012)**	(0.026)
Treat* Year 2003	0.032	0.032	0.01	0.065	0.026
	(0.013)**	(0.023)	(0.022)	(0.014)**	(0.029)
Age	0.054	0.052	0.062	0.054	0.028
	(0.025)*	(0.040)	(0.036)*	(0.028)*	(0.055)
Age-squared	-0.004	-0.003	-0.004	-0.004	-0.002
	(0.001)**	(0.002)	(0.002)*	(0.002)*	(0.003)
Grade2	0.038	-0.002	0.04	0.038	-0.001
	(0.015)**	(0.029)	(0.023)*	(0.017)*	(0.034)
Grade3	0.084	0.005	0.076	0.086	0.021
	(0.018)**	(0.033)	(0.029)**	(0.020)**	(0.042)
Grade4	0.086	-0.030	0.091	0.058	0.043
	(0.021)**	(0.037)	(0.034)**	(0.023)**	(0.049)
Grade5	0.107	-0.022	0.098	0.102	0.044
	(0.026)**	(0.043)	(0.043)*	(0.028)**	(0.059)
Female	0.042	0.102	-0.001	0.076	0.031
	(0.019)*	(0.068)	(0.034)	(0.022)**	(0.067)
SC/ST	-0.008				
	(0.008)				
OBC	0.012				
	(0.01)				
Skilled workers	0.008	0.027	0.014	0.014	0.014
	(0.010)	(0.014)*	(0.016)	(0.010)	(0.024)
Pvt. Jobs and small shop owners	-0.003	0.012	-0.006	0.012	0.012
	(0.008)	(0.015)	(0.013)	(0.009)	(0.018)
Govt. employees and Professionals	0.006	0.034	-0.005	0.023	0.033
	(0.016)	(0.038)	(0.032)	(0.02)	(0.038)
Others	0.069	0.081	0.071	0.063	0.075
	(0.054)	(0.089)	(0.102)	(0.055)	(0.067)
Constant	78.966	-9.554	49.012	116.378	46.108
	(22.207)**	(31.428)	(34.364)	(23.240)**	(52.49)
Observations	1590	474	700	1386	312
R-squared	0.10	0.09	0.07	0.12	0.04

Standard errors in parentheses. *significant at 5% **significant at 1%

Table 8: Effect of school meals on student attendance, 2003 (balanced individual level data):

	INDIVIDUAL FIXED EFFECT				
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
September	0.259	0.04	0.069	0.023	0.132
	(0.023)**	(0.015)**	(0.013)**	(0.015)	(0.013)**
Treat*September	0.121	0.075	0.039	0.095	-0.001
	(0.031)**	(0.021)**	(0.018)*	(0.021)**	(0.022)
Constant	0.532	0.797	0.803	0.821	0.782
	(0.011)**	(0.007)**	(0.006)**	(0.007)**	(0.007)**
Observations	1528	1367	1507	1362	1341
R-squared	0.40	0.25	0.22	0.10	0.26

Standard errors in parentheses. *significant at 5% **significant at 1%

Table 9: Effect of school meals on student enrollment, 2003

	SCHOOL-FIXED EFFECT							
	ALL	BOYS	GIRLS	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
September	5.039	8.38	2.187	15.644	-0.697	3.621	4.042	1.582
	(2.512)*	(4.163)*	(3.006)	(7.915)*	(2.668)	(1.381)**	(2.961)	(2.176)
Treat*September	-0.892	-8.544	3.136	-5.037	5.491	-3.478	-5.283	-1.661
	(3.402)	(6.074)	(3.915)	(11.519)	(3.663)	(2.166)	(3.783)	(4.188)
Grade2	1.271	-3.352	1.493					
	(3.017)	(6.005)	(3.595)					
Grade3	0.115	-4.334	0.212					
	(2.84)	(5.787)	(3.109)					
Grade4	-2.051	-5.892	-2.438					
	(2.892)	(6.371)	(3.233)					
Grade5	-3.997	-13.851	-2.069					
	(2.954)	(5.799)**	(3.369)					
Female	-2.681			8.048	-17.786	-7.816	-17.382	0.08
	(3.869)			(17.196)	(15.974)	(9.082)	(8.604)*	(8.731)
SC/ST	-6.339	9.935	3.01	99.326	93.703	-49.879	-51.703	-55.822
	(12.143)	(29.606)	(14.622)	(86.271)	(48.275)*	(38.543)	(58.546)	(38.394)
OBC	-35.975	-82.541	-8.591	-126.04	-141.864	113.847	109.386	-62.074
	(18.600)*	(32.982)**	(24.1)	(101.242)	(70.877)*	(59.493)*	(62.885)*	(31.281)*
Muslim	25.058	-21.141	63.103	55.007	43.541	23.994	56	-8.405
	(15.718)	(26.447)	(20.409)**	(105.69)	(63.958)	(68.74)	(61.739)	(49.028)
Skilled workers	12.557	21.741	13.341	107.262	-23.655	27.407	38.697	19.817
	(12.983)	(30.77)	(13.449)	(85.987)	(44.162)	(39.293)	(64.979)	(21.886)
Pvt. jobs and small shop owners	6.798	46.61	-3.809	-17.602	54.53	2.082	21.635	10.019
	(9.461)	(21.837)*	(10.197)	(45.486)	(42.674)	(31.57)	(52.817)	(42.839)
Govt. employees and professionals	7.778	4.591	-3.514	89.834	-11.385	168.189	156.747	-179.571

	(23.046)	(60.47)	(25.189)	(162.929)	(100.843)	(100.242)*	(105.531)	(135.792)
Others	50.817	87.256	17.15	271.839	287.78	-9.585	-1.643	110.431
	(34.431)	(77.669)	(38.26)	(142.078)*	(209.047)	(100.606)	(109.25)	(79.939)
Constant	28.93	32.102	14.912	-28.195	9.588	19.913	3.492	53.398
	(10.049)**	(17.162)*	(12.197)	(62.733)	(32.892)	(38.418)	(45.138)	(29.028)*
Observations	198	76	122	38	36	42	40	42
R-squared	0.47	0.46	0.52	0.53	0.89	0.93	0.89	0.94

Standard errors in parentheses. *significant at 5% **significant at 1%

Appendix

Appendix A1: Grade-wise availability of individual level data for September 2002 and September 2003:

	Sep-02					Sep-03				
School ID	Grade1	Grade2	Grade3	Grade4	Grade5	Grade1	Grade2	Grade3	Grade4	Grade5
1						45	41	37	34	25
2		48	29			54	55	40	28	35
3	51	52	47	40		48	40	46	36	49
4			27		28	20		35	30	41
5		30	29	55	29			33	34	43
6		39	40		31	42	43	38	37	30
7	54	59			48	50	41	44	44	37
8						62				
9			56		30		45	57	72	42
10		43	53	36		89	46	51	46	36
11	18					51				
12		44	46	40		43	38	48	43	84
13					45	62	58	53		49
14	55	45	40	36	36	47	46	38	36	33
15		32	34	34		66	35	72	32	36
16	43	41	41			48	32	47	40	54
17	60	32	36	44	45	64	54	34	37	
18	61		42		46	50	66		29	
19				42	36	44		50	44	34
20		48		33	35	47	39	47	34	28
21		50	56	43	104	50	64	42	85	51
22						66		14	21	

Note: Number of observations in each cell. Blank cell implies data not available.

Appendix A2: Effect of school meals by gender (school unbalanced panel):

	POOLED OLS			SCHOOL-FIXED EEFECTS		
	ALL	BOYS	GIRLS	ALL	BOYS	GIRLS
Treat	-0.031	-0.071	-0.019			
	(0.015)*	(0.030)*	(0.019)			
Year= 2003	-0.013	-0.037	0.008	-0.013	-0.037	0.019
	(0.013)	(-0.02)	(0.016)	(0.013)	(0.020)*	(0.016)
Treat* Year 2003	0.041	0.065	0.015	0.036	0.067	0.001
	(0.017)*	(0.028)*	(0.021)	(0.017)*	(0.030)*	(0.02)
Grade2	0.047	0.059	0.033	0.038	0.06	0.034
	(0.014)**	(0.022)**	(0.016)*	(0.014)**	(0.025)**	(0.015)*
Grade3	0.059	0.093	0.035	0.051	0.083	0.032
	(0.013)**	(0.022)**	(0.016)*	(0.013)**	(0.025)**	(0.014)*
Grade4	0.066	0.09	0.049	0.054	0.073	0.042
	(0.013)**	(0.023)**	(0.016)**	(0.014)**	(0.026)**	(0.015)**
Grade5	0.072	0.102	0.049	0.062	0.09	0.045
	(0.013)**	(0.023)**	(0.016)**	(0.014)**	(0.025)**	(0.015)**
Female	0.026			0.021		
	(0.009)**			(0.019)		
SC/ST	-0.067	-0.076	-0.071	-0.032	0.051	-0.097
	(0.042)	(0.094)	(0.045)	(0.055)	(0.125)	(0.062)
OBC	-0.027	-0.167	-0.057	0.002	-0.222	0.045
	(0.056)	(0.124)	(0.067)	(0.085)	(0.167)	(0.097)
Muslim	-0.053	-0.149	-0.021	-0.014	-0.049	-0.016
	(0.032)	(0.068)*	(0.035)	(0.073)	(0.134)	(0.084)
Skilled workers	0.097	0.084	0.09	0.07	0.063	0.085
	(0.048)*	(0.086)	(0.063)	(0.067)	(0.115)	(0.083)
Pvt. Jobs and small shop owners	-0.062	-0.087	-0.015	0.01	-0.056	0.054
	(0.034)	(0.066)	(0.042)	(0.046)	(0.085)	(0.053)
Govt. Jobs and Professionals	0.126	0.28	0.115	0.087	0.295	0.133
	(0.084)	(0.168)	(0.095)	(0.098)	(0.213)	(0.112)
Others	-0.005	-0.154	-0.027	-0.003	0.149	-0.086
	(0.144)	(0.312)	(0.158)	(0.178)	(0.397)	(0.183)
Constant	26.001	75.179	-15.489	27.499	74.424	-36.699
	(25.416)	(39.078)	(32.815)	(25.279)	(40.747)*	(31.599)
Observations	166	67	99	166	67	99
R-squared	0.38	0.56	0.3	0.38	0.41	0.36

Standard errors in parenthesis. * significant at 5% **significant at 1%

Appendix A3: Effect of school meal program (individual unbalanced panel):

	POOLED OLS			SCHOOL-FIXED EFFECTS			CHILD-FIXED EFFECTS		
	ALL	BOYS	GIRLS	ALL	BOYS	GIRLS	ALL	BOYS	GIRLS
Treat	-0.062	-0.095	-0.033						
	(0.007)**	(0.012)**	(0.009)**						
Year = 2003	-0.025	-0.046	0.003	-0.021	-0.044	0.008	-0.028	-0.065	0.015
	(0.006)**	(0.010)**	(0.008)	(0.007)**	(0.010)**	(0.009)	(0.007)**	(0.012)**	(0.009)
Treat * Year 2003	0.05	0.075	0.018	0.034	0.061	0.004	0.05	0.11	-0.005
	(0.009)**	(0.015)**	(0.011)	(0.009)**	(0.015)**	(0.011)	(0.010)**	(0.018)**	(0.012)
Female	0.028			0.024					
	(0.004)**			(0.013)*					
Age	-0.01	-0.035	0.014	-0.002	-0.028	0.019			
	(0.008)	(0.013)**	(0.01)	(0.008)	(0.013)*	(0.010)*			
Age-squared	0	0.001	-0.001	0	0.001	-0.001			
	0	(0.001)*	(0.001)*	0	(0.001)	(0.001)**			
Grade2	0.055	0.085	0.029	0.047	0.074	0.027			
	(0.007)**	(0.012)**	(0.009)**	(0.007)**	(0.012)**	(0.009)**			
Grade3	0.084	0.127	0.044	0.071	0.117	0.033			
	(0.008)**	(0.013)**	(0.010)**	(0.009)**	(0.014)**	(0.010)**			
Grade4	0.082	0.102	0.062	0.066	0.093	0.046			
	(0.010)**	(0.016)**	(0.012)**	(0.010)**	(0.017)**	(0.012)**			
Grade5	0.106	0.141	0.075	0.093	0.132	0.065			
	(0.010)**	(0.017)**	(0.013)**	(0.011)**	(0.018)**	(0.013)**			
SC/ST	-0.008	-0.002	-0.012	-0.006	-0.001	-0.01			
	(0.006)	(0.01)	(0.007)	(0.006)	(0.01)	(0.007)			
OBC	-0.003	-0.014	0.001	0	-0.012	0.008			
	(0.007)	(0.012)	(0.008)	(0.007)	(0.012)	(0.008)			
Muslim	-0.006	-0.022	0.002	-0.013	-0.008	-0.017			

	(0.006)	(0.009)*	(0.007)	(0.006)*	(0.011)	(0.008)*			
Agriculturists and skilled workers	0.016	0.021	0.012	0.012	0.015	0.01			
	(0.006)**	(0.010)*	(0.007)	(0.006)*	(0.01)	(0.007)			
Pvt. Jobs and small shop owners	0.005	0.011	0.004	0.015	0.021	0.011			
	(0.005)	(0.009)	(0.006)	(0.005)**	(0.009)*	(0.006)*			
Govt. employees and Professionals	0.029	0.044	0.019	0.016	0.028	0.01			
	(0.012)*	(0.021)*	(0.014)	(0.012)	(0.021)	(0.014)			
Others	0.028	0.102	-0.026	0.024	0.098	-0.033			
	(0.027)	(0.044)*	(0.033)	(0.027)	(0.044)*	(0.033)			
Constant	51.583	93.628	-5.58	42.843	88.938	-14.753	56.286	130.841	-28.194
	(12.884)**	(20.078)**	(16.895)	(13.083)**	(20.146)**	(17.395)	(14.913)**	(23.348)**	(18.54)
Observations	5920	2496	3424	5920	2496	3424	6122	2579	3543
R-squared	0.05	0.09	0.03	0.08	0.1	0.07	0.39	0.35	0.46

Standard errors in parentheses

* significant at 5% level; ** significant at 1% level

Appendix A4: Effect of school meal program by social groups (individual unbalanced panel):

	SCHOOL FIXED EFFECT				
	NON-MUSLIM	MUSLIM	SC/ST	GENERAL	OBC
Year 2003	-0.022	-0.018	-0.016	-0.022	-0.023
	(0.007)**	(0.012)	(-0.012)	(0.009)**	(-0.019)
Treat* Year 2003	0.021	0.046	0.03	0.034	0.051
	(0.011)*	(0.024)*	(0.017)*	(0.012)**	(0.023)*
Age	-0.003	0.061	0.013	0	-0.031
	(0.009)	(0.023)**	(0.016)	(0.01)	(0.024)
Age-squared		-0.004	-0.001	0	0.001
		(0.001)**	(0.001)	(0.001)	(0.001)
Grade2	0.038	0.037	0.043	0.046	0.07
	(0.009)**	(0.019)*	(0.014)**	(0.010)**	(0.020)**
Grade3	0.066	0.025	0.068	0.074	0.082
	(0.011)**	(0.022)	(0.017)**	(0.011)**	(0.023)**
Grade4	0.067	-0.03	0.084	0.054	0.085
	(0.013)**	(0.025)	(0.020)**	(0.013)**	(0.027)**
Grade5	0.09	0.043	0.103	0.086	0.111
	(0.014)**	(0.027)	(0.022)**	(0.014)**	(0.029)**
Female	0.034	-0.048	-0.003	0.03	0.067
	(0.013)**	(0.04)	(0.025)	(0.016)*	(0.045)
SC/ST	-0.007				
	(0.006)				
OBC	-0.002				
	(0.008)				
Agriculturists and skilled workers	0.007	0.009	0.017	0.012	-0.018
	(0.007)	(0.011)	(0.012)	(0.008)	(0.018)
Pvt Jobs and small shop owners	0.011	0.015	0.003	0.022	0.01
	(0.006)*	(0.013)	(0.01)	(0.007)**	(0.014)
Govt employees and Professionals	0.011	0.024	0.024	0.012	0.027
	(-0.013)	(0.031)	(0.023)	(0.016)	(0.036)
Others	0.081	-0.141	0.061	-0.003	0.095
	(0.036)*	(0.071)*	(0.064)	(0.038)	(0.054)*
Constant	44.135	36.314	33.19	45.694	47.877
	(14.965)**	(24.896)	(24.194)	(17.445)**	(38.097)
Observations	3218	1177	1496	3346	745
R-squared	0.063	0.071	0.077	0.075	0.109

Standard errors in parenthesis. * significant at 5% ** significant at 1%

Table A5: Reliability of school records

	MDM Register	Daily Register	Difference
Enrolment (pre-program)	6549.75	6493.71	56.04 (1272.17)
Attendance level (pre-program)	5202.87	5449.07	-246.83 (1046.4)
Attendance rate (pre-program)	.81	.83	-.019 (.035)
Enrolment (post-program)	10251.89	7890.25	2361.639 (2557.96)
Attendance level (post-program)	7553.44	6664	889.44 (1854.80)
Attendance rate (post-program)	.76	.84	-.08 (.038)*

Standard errors in parentheses.