UNIVERSITY OF CALIFORNIA
RIVERSIDE

Evaluating the Benefits of Integrated Child Development Program in Rural India

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Economics

by

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September 2012

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Acknowledgments

This thesis is a culmination, and in some sense a beginning of intellectual journey. In this long and at times very bumpy travel, several people have touched my life, heart and mind in various significant ways. It is difficult to express my deep gratitude and appreciation to all of them, but I will try.

To my supervisor, Prof Anil B. Deolalikar, for supporting my research agenda, which was generally considered "undoable," for sharing his expertise, and for encouraging timely completion of my thesis. For his help in finding research opportunities, to strengthen my skills and exposure. To him and his family for their timely and critical support during my long and serious illness.

To my supervisor, Prof Adriana LLeras-Muney, for going several extra miles for me, and for generously and patiently giving me her time and expertise. For constantly encouraging and inspiring me to think outside the box, and setting the scholarship bar so high that the only way for me was up. For her amazing ability of making numbers talk, turn and twist, without which my thesis would not be what it is. For her immense confidence in me, wanting the best for me and working hard towards it. For her deep compassion, for just talking to me when I needed it the most, even at odd hours, irrespective of her other engagements.

To my committee member and teacher, Prof Aman Ullah, for his encouraging words, deep knowledge, thoughtful criticism, and time and attention, despite his extremely busy schedule. To my committee member, Prof Jorge M. Aguero, for his thoughtful comments.

To my professors, especially Profs Prasanta K. Pattanaik, Gloria Gonzalez-Rivera and Gary A. Dymski, for showing me by example, how to think and teach and encourage others to do the same, and for being the people they are.

To Prof Robert Jensen, for his time, expertise and interest in my research work, and for all the encouragement and critical support beyond it. To my previous professors and mentors, Profs Jean Dreze, Stephen Howes and J. V. Meenakshi for their passion and inspiration for development work, and for their demonstration that social change in central to intellectual work. And for their time, attention and support at various stages.

To the William and Flora Hewlett Foundation, for IIE/Hewlett Dissertation Fellowship in Population, Reproductive Health and Economic Development. And to the UCLA Institute, for Research on Labor and Employment (IRLE) for the Grad Student Mini-Grant.

To the administrative staff and academic advisors, Amanda J. Labagnara, Karen Ward, Tanya Wine, and Damaris Carlos, for their excellent support and advice on innumerable matters.

To my mother for her immense love, care and support, and to my father who would have loved to call me "Dr Jain." To my sister for standing with me at all times.

And to my friends, especially Reena Uppal and L. Vijaykrishna, for being there, listening to me, entertaining me, and helping me to keep perspective on what is important in life.

ABSTRACT OF THE DISSERTATION

Evaluating the Benefits of Integrated Child Development Program in Rural India

by

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Doctor of Philosophy, Graduate Program in Economics
University of California, Riverside, September 2012
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India suffers from widespread child malnutrition, childcare constraints on maternal employment, and gender education gap. In my dissertation I examine the impact of India's biggest child development program - Integrated Child Development Scheme (ICDS) - on each of these aspects. The program provides various services to children below six years, including supplementary nutrition, preschooling, immunization and health check-ups. In the first paper I look at the "direct" program impact on nutritional status of young children, and in the second and third, I analyze the "indirect" program impact on maternal employment and education of older siblings respectively. For all three papers I use data from recent demographic health survey 2005-6 for India, and for two I also substantiate my results with time use information of mothers and older siblings from another dataset.

In my first paper, using matching and difference-in-difference estimators, I find that girls 0-2 years old receiving supplementary feeding intensely are at least 1cm (0.4 z-score) taller than those not receiving it in rural India. The estimates are similar for

boys 0-2 but less robust. Although the program's focus is on children ages 3-5, I find no positive effect on their growth. In the second paper, using probit, covariate matching and conditional logit (village fixed-effects), I find that the mother, whose child is receiving highly correlated services of regular preschooling or daily supplementary feeding, is 12% more likely to work in rural India. Using similar estimation strategy (including mother fixed-effects), in my third paper I find that the girl 6-14 years, having a younger sibling below 5 years receiving any of the ICDS services intensely, is at least 9% more likely to be in school in rural India. The effect on boys 6-14 years is positive, but not robust. Because of various program services, the "indirect" benefits can accrue through several pathways: time saving because of release from child supervision, improvement in health of young children and implicit income subsidy. For maternal employment it seems that the effect seems to be driven mainly by the daycare implicit in preschooling, and for the girl's education by health benefits of vaccinations of younger children.

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Chapter 1

India's struggle against malnutrition - Is the ICDS program the answer?

1.1 Abstract

Almost half of India's children are stunted endangering their human capital formation significantly. India's only national program for combating widespread child malnutrition is Integrated Child Development Scheme (ICDS). Using recent demographic health survey's 2005-6 data on child level participation in ICDS, I assess the impact of its flagship supplementary nutrition program on children's physical growth. Using matching and difference-in-difference estimators, I find that girls 0-2 years old receiving supplementary feeding intensely are at least 1cm (0.4 z-score) taller than those not receiving it in rural India. The estimates are similar for boys aged 0-2 but less robust. Given that these height differentials are most likely irreversible, supplementary nutrition could potentially bridge the height gap between the richest and poorest girls by at least 28%, and for boys by 19%, at adulthood. Although the program's focus has been on children ages 3-5, I find no positive effect on their growth.

1.2 Introduction

In spite of impressive economic growth, India experiences pervasive and persistent child malnutrition. By latest estimates around 48%[1] of India's children aged 0-5 years are stunted making up almost half of world's stunted children. The only national program to directly address this huge problem is Integrated Child Development Scheme (ICDS), launched in 1975. While the ICDS seeks to provide various services to children 0-6 years old, including health care and pre-school education, the main focus of the program is on the provision of supplementary nutrition. Recognizing the complementarity of health and nutrition for a child and her mother, the program also extends to adolescent girls, pregnant women, and nursing mothers. Mostly because of lack of data, assessments of ICDS so far have only been able to evaluate the impact of the presence of an ICDS center in a village on the child's anthropometric outcome (Deolalikar (2005), Lokshin et al. (2005), Kandpal (2011)). They find limited evidence of its benefit.

In this paper I go beyond the village level effects to look at the benefits of the program on the children who actually receive the supplementary nutrition. To do this I take advantage of the detailed information in the most recent demographic health survey data for India - National Family Health Survey (NFHS-3) 2005-6 - on supplementary feeding at the *child* level. Instead of assuming that every child in the village with an ICDS center received supplementary nutrition as in earlier studies, I know exactly which child received supplementary feeding. Moreover, I also know how intensely the child received supplementary nutrition: daily, weekly, monthly, or less. The child-specific age and gender information also enables me to evaluate the program impact for two different age-groups, 0-2 years

[1] 42.5% children below 5 years are underweight as reported in NFHS-3 (2007) for 2005-6.

and 3-5 years,[2] for boys and girls separately. It is important to analyze the children by different age-groups because the early years of life, say the first two to three years, are considered the "critical window" in the development of the child. After a child reaches two, it is very difficult to reverse any stunting that has occurred earlier (Martorell et al. (1994)). Poor nutrition in the formative years, has short-run deleterious effects not only on physical growth of children, but also leads to significant morbidity and mortality and delayed mental and motor development.[3] In the long run, it has been linked to significant impairments in intellectual capacity, educational achievement, income, work capacity, and reproductive outcomes.[4]

Along with richer information, I use several techniques to evaluate the program benefits. Since I use non-experimental survey data, the children who are receiving supplementary feeding through ICDS have not been selected randomly. Therefore, to "identify" the effects of supplementary nutrition, I need to take account of observable differences between the children who are receiving supplementary nutrition and those who are not. To do this I start with OLS with controls. To minimize the selection bias on observables that may remain with simple technique like OLS, because of misspecification in functional form (Imbens, 2007), I then use advanced estimation techniques, including propensity score matching and covariate matching. These techniques also help me to can better balance on unobservables to the extent that they are correlated with observables. To further address the problem of unobservables, I take advantage of the evidence from nutrition studies indicating that supplementary nutrition does not effect the growth of children beyond age three, which I show here to be the case. I use this information to utilize children aged 3-5 years as a comparison group in difference-in-difference analysis to control for unobservables, such as

[2] *0-2 years* signify children aged 0-24 months and *3-5 years* signify children aged 25-59 months.

[3] Grantham-McGregor (1995), Martorell (1999), Nandy et al. (2005), Pelletier et al. (1995).

[4] Alderman et al. (2006), Birch (1972), Case and Paxson (2008), Coutinho et al. (1997), Glewwe et al. (2001), Grantham-McGregor (1995), Haas et al. (1995), Haddad and Bouis (1991), Ramakrishnan et al. (1999), Satyanarayana et al. (1979).

mother's motivation, to identify the effect of supplementary nutrition on the 0-2 age-group children.

I focus on the rural areas because the ICDS program is concentrated there: 91.5% of rural villages have an ICDS center. Despite widespread ICDS presence, though, only 35% of children reportedly receive some benefit from the program. When it comes to supplementary nutrition, only 6% of children 0-2 are receiving supplementary nutrition *daily*. This group of children receiving supplementary nutrition intensely is the focus of my analysis and forms my measure of program participation.

I find that girls 0-2 years who receive supplementary feeding are at least 1 cm taller (around 0.4 standard deviation) than similar girls who did not receive it. The estimates are the same for boys 0-2 years, but less robust to different specifications. I find these effects for only the girls and boys who are receiving the supplementary nutrition intensely - the children who are receiving the benefits less often than daily are not better anthropometrically than those who did not receive any supplementation. Moreover, I find that these benefits seem to be driven exclusively by supplementary nutrition and not by other services, like immunization, which are also provided by the program. My results are consistent with a recent meta-analysis (Bhutta et al., 2008) which concluded that the provision of complementary food in food insecure populations led to around a 0.41 increase in the age-adjusted height z-score for children between the ages of 6 and 36 months. Also the results of two recent randomized controlled experiments in India (Bhandari et al., 2001) and Malawi (Kuusipalo et al., 2006) indicate that providing 220-260 kcal of food supplements led to an increase in height in the range of 0-4-0.9 cm for children in the 4-17 months age-group. Given that these height differentials are most likely irreversible, supplementary nutrition potentially could bridge the height gap between the richest and poorest girls by at least 28%, and for boys by 19%, at adulthood.

For children ages 3-5 around 14.5% report receiving supplementary feeding *daily*.

However, these children are not anthropometrically better than those who did not receive it. Again, the results are consistent with the recent meta-analysis of nutrition interventions which asserts that supplementary feeding interventions beyond 36 months of age probably would not reduce stunting and might be inadvisable, because rapid weight gain in later childhood is associated with adverse long-term outcomes (Bhutta et al., 2008).

I also investigate why my results differ from previous research (Deolalikar (2005), Lokshin et al. (2005), Kandpal (2011)). If I used the presence of an ICDS center as the measure of program participation as in previous evaluations, I would find no overall impact of the program, which is largely consistent with results of previous studies.

The remainder of the paper is organized as follows. Section 1.3 provides a short description of the ICDS program and its previous evaluations. Section 1.4 discusses the empirical strategy. Section 1.5 describes the data used in my analysis. Section 1.6 discusses the empirical results, and Section 1.7 concludes.

1.3 Integrated Child Development Scheme (ICDS): what we know

Since its launch in 1975, the ICDS program has expanded and matured from 33 blocks to 6,284 blocks in India and now has more than one million centers. In 2009-10 the ICDS program was allocated a budget of 1.5 billion USD (Rs 6.7 billion). The program offers various services, from supplementary nutrition to health check-ups to preschooling, as detailed in Appendix Table 3.A.1. These services are supposed to be delivered in an integrated manner at the anganwadi, or childcare center, located within the village itself. Each center is run by an anganwadi worker (AWW) and one helper (AWH), who undergo three months of institutional training and four months of community-based training.

ICDS supplementary feeding is supposed to provide support to *all* children 0-6 years old for 300 days in a year (25 days a month). Tables 1.A.2, 1.A.3, and 1.A.4 in the Appendix show that the ICDS supplementary nutrition program provides 300 calories and 8-10 gms of protein for all children from 0-72 months (below age six). For children 6-23 months of age, this covers 50-150% of the required complementary energy needs[5] and 70-100% of the recommended protein needs. For children above age two, it is supposed to fulfil 20-30% of the energy requirements of children and 50-70% of their recommended protein needs.

Under ICDS supplementary food arrangements are generally different for children above and below the age of three. Children ages 3-6 are generally fed "on site" at the anganwadi, while children below age three receive "take home rations" that last for a week or a month depending on the frequency of distribution. There are two broad types of on-site feeding arrangements for children ages 3-6: cooked food and "ready-to-eat" items such as *panjiri* or *murmura* (details on selected states are presented in table 1.A.5 in the Appendix). Take-home rations also vary across states: some states like Tamil Nadu and Maharashtra provide fortified baby mixtures; others like Uttar Pradesh provide ready-to-eat panjiri; states like Chattisgarh provide simple wheat *dalia* with *gur* and oil.

Formal evaluations of ICDS so far have found little positive impact of the program. Deolalikar (2005) used survey data from NFHS-1 (1992-3) and found that the presence of an ICDS center was associated with a 5% reduction in the probability of being underweight for boys 0-3, but not for girls. Lokshin et al. (2005) assessed the program's outcomes using NFHS-1 and NFHS-2 data and found little evidence of program impact on child's nutrition status in villages with ICDS centers. The only significant positive effect of the program was for boys stunting in the data from the 1992-3 survey (ages 0-4), but not in 1998-9 (ages 0-

[5]The figures for total energy requirements of healthy, breast fed infants have been taken from Dewey et al. (2003). Energy needs from complementary foods are estimated by subtracting average breast milk energy intake (Brown et al. (1998)) from total energy requirements at each age.

3). For girls, no significant effect was found. Instead of using all-India data, Bredenkamp and Akin (2004) studied a sub-group of states and found similar results: that the presence of an ICDS center has no significant effect on the nutritional status of children. Kandpal (2011) using the recent demographic health survey (NFHS-3) data found limited positive impact on boys living in villages/urban blocks with ICDS centers and no significant effect on girls overall.

Previous literature is limited by either absence or use of child level data on access, and also possibly by non-random location of centers and of recipients.[6] In my data (NFHS-3) the coverage of the ICDS program is almost universal: 91.5% villages had an ICDS center in 2005-6. Thus, in my study I aim to go beyond the ICDS center effects to look at the program's impact on children receiving supplementary feeding intensely through the ICDS program. I use the empirical strategy given below to address the selection bias.

1.4 Empirical Strategy

I estimate the following regression equation

$$h_i = \beta Dailyfd_i + \gamma X_i + \alpha_i + u_i \tag{1.1}$$

where h_i is the child's nutritional status indicator: height (weight) for age, z-score of height (standard deviation from the reference median height) (weight). $Dailyfd_i$ is the dummy variable with the value one for a child who received supplementary nutrition through ICDS *daily*. $\boldsymbol{X_i}$ is a vector of control variables composed of the *child specific characteristics*: age in months, birth order, birth interval; *mother specific characteristics*, or mother's education in highest number of years of completed education, mother's

[6] Some of the recent studies have used techniques like propensity score matching to address such selection bias.

age, mother's body mass index (BMI); *spouse specific characteristics*, that is spouse's age, spouse's education; *household head specific characteristics*, or household head's age and household head's education; *household specific characteristics*, that is caste, religion, wealth index; and *environmental factors* like water source, toilet facility, cooking fuel. α_i captures unobservable or observable but unaccounted state-specific fixed effects. u_i is an error term. β is the parameter of interest.

I use non-experimental survey data in which the children who are receiving daily supplementary feeding through ICDS have not been selected randomly. Therefore, to "identify" the effect of daily supplementary feeding on the nutritional status of children, I cannot simply take the average difference between the nutritional status of those who received daily supplementary feeding and those who did not. I need to take account of the observable differences between the two groups of children in order to get to the pure effect of supplementary feeding on children. With OLS methodology, I can control for observable characteristics of children with the addition of control variables X_i.

There also might be some unobserved factors (unobserved heterogeneity), or observed but unaccounted factors at the state level, like higher political commitment and/or better administrative structure, which would result in better provision of ICDS services and hence greater use of those services. Or, there might be income shocks at the state level that affect the number of women who go to the ICDS center. In such cases, the OLS regression probably suffers from omitted variable bias. To account for within-state differences, I use state fixed-effects model which adds α_i in the equation above.

With OLS we assume that the distribution of observed Xs will be the same for those who receive daily supplementary feeding and those who do not. Imbens (2007) cautions that in the presence of unbalanced covariates one should be wary of OLS estimates because they are very sensitive to the exact functional form of OLS. With propensity scores[7] (PSM)

[7]The propensity score is the probability that an individual receives the treatment.

one seeks to better "balance out" the groups being compared in terms of their covariates. Also, if the observables are correlated with the unobservables, then I may be able to balance out the latter by doing a better job of balancing the former. Thus, I use propensity score matching to minimize the selection bias on observables.

With PSM with stratification I can get the point estimates, but I cannot get standard errors because bootstrapping does not work. In a recent paper, Abadie and Imbens (2008) show that even in the simple case of matching on a single continuous covariate (when the estimator is root-N consistent and asymptotically normally distributed with zero asymptotic bias), the bootstrap does not provide standard errors with correct coverage. This is because of the extreme non-smoothness of nearest neighbor matching, which leads the bootstrap variance to diverge from the actual variance.

Covariate matching (CVM) is an alternative to PSM[8] where measures like the Mahalanobis distance are used to calculate the similarity of two individuals in terms of covariate values and the matching is done on these distances. This method, developed by Abadie and Imbens (2006), adjusts for bias when matching is not perfect, makes no assumption about functional form, and more importantly provides the standard errors for matching estimators.

Matching methods can help to reduce large biases, but significant biases may remain because matching only controls for observed variables, to the extent that they are perfectly measured (Shadish et al., 2002). There may still be left-over unobserved factors that are correlated with the child getting daily supplementary feeding and her nutritional status. To take care of the resulting omitted variable bias,[9] I take advantage of the evidence from

[8]Propensity score method is simply a covariate matching method that uses estimated propensity score as a sufficient statistic for the vector of observables.

[9]To address the omitted variable bias I also attempted the instrumental variable method but I failed to find a good instrument. Given the limited information available in NFHS-3 on ICDS program, it was very difficult to find good IVs to control for unobservables. I used having a sibling $\geq$36 months (and $\geq$48 months) going to preschool regularly at ICDS center as IV. This gave consistent results for boys but not for girls. My IV failed the exogeneity condition, although it was highly correlated with program participation of the younger

the nutrition literature suggesting that supplementary feeding does not affect the growth of children beyond 3 years of age. Therefore, if I do find differences between those receiving daily supplementary feeding and those not receiving it among children 3-5 years, those differences most likely are because of unobservables, such as motivation of mothers, and not feeding. Such differences between the two groups caused by unobservables, which are common between the children of age groups 0-2 and 3-5, could be "differenced-out." I use the difference-in-difference technique, taking the children ages 3-5 as the comparison group, to identify the effect of daily supplementary feeding for boys and girls aged 0-2. I estimate the following equation:

$$h_i = \beta Dailyfd_i + \delta I(\leq 2yr) + \lambda Dailyfd * I(\leq 2yr) + \gamma X_i + \alpha_i + u_i \qquad (1.2)$$

where $I(\leq 2yr)$ is the dummy variable equal to one if the child belongs to the 0-2 age-group. The coefficient λ on the interaction term between *Dailyfd* and $I(\leq 2yr)$ represents the difference-in-difference estimate. All of the covariates are fully interacted with the dummy variable for 0-2 age group.

The above difference-in-difference method uses the *full* sample of children receiving daily supplementary feeding and those not receiving daily supplementary feeding. I also select *sub-sample* of children for the age-groups 0-2 and 3-5 using CVM, and take the difference in estimates of effect of daily supplementary feeding provided by CVM for these two age-groups, to obtain alternative estimates of difference-in-difference.

To summarize, I present four sets of estimates, starting with OLS with state fixed effects to take care of selection on observables and unobservables at the state level. To account for selection bias in OLS estimates arising from an unbalanced distribution of observable

sibling.

covariates, I then use propensity score matching. To get the standard errors on matching estimates, I use the covariate matching method, which also adjusts for bias when matches are not exact and does not require any assumption on functional form. These three techniques take care of selection bias on observables, and unobservables to the extent that they are correlated with observables. To further take care of unobservables common between children aged 0-2 and 3-5, I do the difference-in-difference analysis on the full sample, and on the sub-sample selected using covariate matching method.

1.5 Data

My data comes from the National Family Health Survey (NFHS), a nationwide cross-section demographic health survey for India. So far three rounds have been conducted in the years 1992-3, 1998-9, and 2005-6. For this paper, I used the third round covering 2005-6, which provides rich information on fertility, mortality, and important aspects of nutrition, health, and health care, especially for children aged 0-5 years. The distinctive feature of this survey is the collection of anthropometric measurements of height and weight for children 0-5 and women 15-49. It also provides information on utilization of various services of the ICDS program by women and children aged 0-5 in the household.

My main indicators of children's nutritional status are four indices based on anthropometric measures: height measured in centimeters, weight measured in kilograms, and two indices expressed in standard deviation units (z-scores) from the median for height and weight for the latest international reference population released by WHO in 2006 (De Onis et al. (2006)).[10] Each index provides different information about growth and body compo-

[10]Until 2006 the most commonly used reference population in NFHS-1 and NFHS-2 was the U.S. National Center for Health Statistics (NCHS) standard. The use of this reference group was based on the empirical finding that well-nourished children in all population groups for which data exist follow very similar growth patterns (Martorell and Habicht (1986)). Both WHO (Dibley et al. (1987a), Dibley et al. (1987b)) and the Nutrition Foundation of India (Agarwal et al. (1991)) concluded that it was generally applicable to Indian

sition. The height-for-age index is an indicator of linear growth retardation and cumulative growth deficits that reflects chronic malnutrition and morbidity. Weight-for-age takes into account both acute and chronic malnutrition and morbidity. Children whose height-for-age (weight) z-score is less than -2 SD from the median of the reference population are considered stunted (underweight); those below -3 SD are considered to be severely stunted (severely underweight).

A total of 109,041 households and 124,385 women were interviewed in NFHS-3 survey. There were 51,555 children in the 0-5 age-group, but height and weight was reported only for 43,940 children at the all-India level, of whom 27,737 resided in rural areas. The ICDS program has been mainly concentrated in rural India, where about 91.5% of the surveyed villages were covered by an ICDS center. Around 35% of rural children receive some benefit from the ICDS program, with 10% receiving supplementary nutrition daily in the year before the survey. However, the percentage receiving supplementary nutrition daily varies widely among states, from 3% in big states like Uttar Pradesh to almost 40% in states like Maharashtra. As far as the urban areas are concerned, only 50% were covered by an ICDS center and around 6% of the urban children received supplementary nutrition daily. My analysis is focused on rural areas because they are the areas of ICDS program concentration, both in terms of policy and practice. Henceforth, all of this analysis pertains to rural areas unless stated otherwise.

The proportion of children receiving supplementary feeding from ICDS centers differs with age in rural India. While 6% of the children 0-2 are receiving supplementary feeding daily, the proportion for 3-5 year-olds is much higher, at 14.5%. The proportion does not differ by gender in the younger group but does for 3-5 year-olds: more girls (15.6%) are getting supplementary feeding daily than boys (13.4%).

children at that time. However, estimates now are based on a new international reference population released by WHO in April 2006 which has been accepted by the Government of India.

The summary statistics in Table 1.1 show that the average boy aged 0-2 in rural India is almost "stunted" while the average girl that age is just slightly better off.[11] Compared to a boy (girl) not getting daily supplementary feeding, one who does receive it is typically older, lower in birth order, has a mother who is better educated but has a lower BMI, is more likely to belong to a scheduled caste, has piped water at home where the cooking fuel is wood, and is more likely to come from states like West Bengal, Maharashtra, and Tamil Nadu but less likely to come from states like Uttar Pradesh and Bihar. These statistics indicate selection on observables like age of the child, mother's education, caste, religion, source of drinking water, and geographical location. The selection problem is further confirmed by the probit regression estimates in Table 1.2: for both boys and girls aged 0-2, the likelihood of receiving daily supplementary feeding depends on different observables, like age of child, mother's characteristics, household head characteristics, geographic location, etc.

1.6 Empirical results

1.6.1 Ordinary Least Squares (OLS) with state fixed effects

Table 1.3 presents the OLS estimates. Specifications with different control groups were estimated to see how sensitive the point estimates are to the inclusion of additional control variables. Row A of table 1.3 indicates that the estimates with no controls are high and statistically significant for both boys and girls 0-2 years and for both height and weight estimates in levels. However, for boys 0-2 with addition of child specific controls (row B) the estimates become insignificant, both economically and statistically. Also, the co-

[11] There are no significant *unconditional* mean differences in height or weight z-scores between boys (girls) who are getting daily supplementary feeding and those who are not. However, because of significant differences in characteristics between the two groups of children, such as their caste, once these characteristics are controlled for, using OLS the *conditional* mean differences are significant for girls.

efficients fluctuate on adding subsequent controls for maternal characteristics, household characteristics, etc. On the other hand, for girls 0-2 the estimates do decrease after adding child specific controls (row B) but remain significant, both economically and statistically. The estimates also remain robust to additional subsequent controls. From the estimates it seems that much more selection is going on in terms of observable characteristics for boys than for girls.

Row F of Table 1.3 corresponding to full controls model, indicates that while boys 0-2[12] who receive supplementary feeding daily seem on average to be 0.4 cm (around 0.2 z-score) taller than boys who do not receive it, the effect is statistically insignificant. But girls 0-2 receiving supplementary feeding daily are around 1 cm taller (0.4 z-score increase) and weigh 140 gms[13] more (around 0.2 z-score), and the estimates are significant at the minimum 5% level of significance. For the 3-5 age group, daily supplementary feeding does not seem to make any significant difference in height and weight of either boys or girls.[14]

1.6.2 Matching methods - propensity score matching and covariate matching

The propensity score matching (PSM) with stratification was performed manually. Children with similar propensity scores were allocated mostly to stratums with a 0.1 range. I experimented with various specifications with higher order covariates and interactive terms to achieve a balance of around 90% or more covariates in each stratum. Once that was achieved, I estimated the difference between average outcomes[15] for the two groups of

[12]Using the F-statistic the pooling of boys' and girls' models is rejected at 1% level of significance for most models of weight and height (both absolute values and z-score) for children 0-2 years and 3-5 years.

[13]Not statistically significant.

[14]For the 3-5 age group, the OLS regression results are summarized in Table 1.8 and reported in detail in the Appendix Table 1.A.6.

[15]Averages were calculated using sampling weights.

children. Then I computed a weighted average of stratum-wise differences in average outcomes with the proportion of children receiving daily supplementary feeding in the stratum used as the weights to get the overall estimate. With this method, I find (Tables 1.4 and 1.5) that boys 0-2 receiving daily supplementary feeding are around 1 cm taller than boys who are not receiving it, and the girls are 1.2 cm taller. The OLS estimates seem to be underestimated for height and weight in levels for both boys and girls. However, with PSM the effect size is close to zero for height and weight z-scores for boys 0-2 years, which is much lower than the OLS point estimates. On the other hand, for girls the PSM estimates for z-scores are quite similar to the OLS estimates. It is noteworthy that the propensity score method with stratification is also subject to biases for various reasons, including choice of stratum, misspecification in probit, and choice of weighting scheme. Thus, it would not be surprising if the results are sometimes unexpected.

I use the simple 0.1 rule where I drop observations with the propensity score outside of the interval [0.1, 0.9] following Imbens (2007). Then I get higher estimates for z-scores for boys 0-2 years which are closer to the OLS estimates (Table 1.6). The height estimates in cms for boys still remain higher than the OLS estimates, at 0.63 cm. I also calculate stratum-wise OLS and a weighted average of the estimates for boys and girls, after dropping those with propensity scores below 0.1 for the sake of comparison. I find that for girls, the estimates are quite similar to the OLS estimates shown in Table 1.3. For boys, the OLS estimates for this subset of the sample are higher than both the OLS estimates in Table 1.3 and the PSM estimates, and are quite similar to those of girls.

Next, in the covariate matching (CVM) estimation I allow for bias adjustment when matches are not exact and for heteroscedasticity-consistent standard errors. I also allow for five matches because that has the advantage of not relying on too little information without also incorporating observations that are not sufficiently similar. Besides five matches, I also do the estimation using one match and three matches. While the standard errors ei-

ther remain the same or decrease a little with an increase in the number of matches, the point estimates more or less decrease with an increase in the number of matches and some substantially.

The results in Table 1.7 show that with the CVM method (*with five matches*), boys 0-2 receiving supplementary feeding daily seem to be 1 cm taller (0.4 z-score) and weigh around 175 gms[16] (0.2 z-score) more than the boys not receiving it. As for the girls that age, the estimates also indicate the difference to be 1 cm for height (0.4 z-score) and around 125 gm for weight (0.15 z-score). The CVM estimates for height in cms for boys and girls are significant at the 10% level of significance but the height z-scores for boys and girls are all significant at the 5% significance level at least. The weight indices are mostly insignificant for girls but are significant for boys at the 5% significance level at least. The results for boys for height and weight in levels are quite similar to the PSM estimates and more than double the OLS point estimates. The results for boys are also similar to those for girls.[17] For girls the CVM estimates are similar to the OLS and the PSM estimates. The difference between estimates for 5 matches, 3 matches, and one match for boys' height in cms lies in the difference in point estimates, which are decreasing with the increase in the number of matches. The standard errors are by and large the same. Abadie et al. (2004) point out that it is not clear which estimate is more reliable in these cases. I choose to go with five matches estimates for both boys and girls because I am using more information, even though its significance level is lower.

I estimate similar regressions using the CVM method for boys and girls 3-5 years old (Table 1.8). The CVM point estimates with one match indicate effects that are close to zero

[16]The raw height and weight measures are not standardized by age.

[17]It is noteworthy that girls who are receiving daily supplementary feeding do not seem to be different from boys who are receiving daily supplementary feeding. If one looks at the determinants of a girl child getting daily supplementary feeding (compared to boys) in Table 1.A.7 in Appendix, one sees no significant variable except for some state dummies. The Wald chi-square statistic of 40 with a p-value of 0.74 indicates that the model as a whole is statistically insignificant; that is, a model with no predictors is better.

and are insignificant, which are quite similar to the OLS estimates. When I increase the number of matches, the estimates for boys are still economically and statistically insignificant for both height and weight. The case for weight indices for girls is similar. However, the height measures for girls have a magnitude of around -0.85 cm (-0.2 z-score) and are statistically significant at the 10% level of significance. Because 15% of the 3-5 year-old girls are receiving supplementary feeding, an increase in the number of matches makes it possible that more and more dissimilar girls are being matched.[18] It is also possible that there is negative selection bias for girls 3-5, based on unobservables.

To summarize, using matching methods I find that both boys and girls 0-2 years old receiving daily supplementary feeding are 1cm taller (0.4 SD), and the estimates are statistically significant. However, the estimates for boys 0-2 years are less robust.[19] For the 3-5 age group boys, matching methods like OLS show an economically and statistically insignificant effect of daily supplementary feeding. For girls 3-5, there is some negative effect on height with more matches, which might be caused by dissimilar matches or negative selection bias.

1.6.3 Difference-in-Difference

With both the OLS and matching methods, I control for selection on observables and unobservables, to the extent that they are correlated with observables. To further control for unobservables, I conduct the difference-in-difference analysis for boys and girls ages 0-2

[18]The CVM sample becomes more unbalanced as I increase the number of matches for 3-5 year-old girls.

[19]With village fixed-effects model, the magnitude of effect on boys 0-2 is 1.3cm (0.5 SD) and it is statistically significant. For girls 0-2 the magnitude goes down to 0.6cm (0.25 SD) and it is not statistically significant. Further investigation indicates that within villages, the boys and girls from the poorest social groups - scheduled caste and scheduled tribes - are more likely to receive feeding. Given the high sensitivity of the estimates to child specific characteristics (Table 1.3), and the likelihood of the non-treated children (not receiving daily supplementary feeding) within the village to be from relatively richer households, it is not clear if they are the best comparison group for those who are receiving treatment (daily supplementary feeding).

with those aged 3-5 as the comparison group. I find that for both boys and girls 0-2, the difference-in-difference estimates using OLS (Table 1.7) are pretty similar to the simple OLS estimates in both magnitude and statistical significance. The story is similar when I take the differences in CVM point estimates for the 0-2 age-group and the 3-5 age-group for boys. For girls, however, the difference-in-difference estimates with CVM are higher than those with the OLS. The results suggest that either there is no selection on unobservables or, if there is, then it is negative selection for girls. This indicates that the estimates for girls 0-2 might be underestimated. To calculate standard errors for difference-in-difference estimates with CVM, I use the square root of the sum of the variance of coefficients for both age-groups. Because the covariance between the two age-groups is most likely to be positive, the estimated standard errors are probably overestimates.

1.6.4 Comparison with earlier evaluations

Deolalikar (2005) and Lokshin et al. (2005) used the first and second rounds of the NFHS survey to evaluate the impact of having an ICDS center on the nutritional status of children. In the first NFHS round, one-third of the villages had an ICDS center. In the second round, one-half had one. Kandpal (2011) uses the data from the latest round (NFHS-3) to analyze the impact of having an ICDS center in both rural villages and urban blocks on the nutritional status of children. In this round 91.5% of the rural villages and 50% of urban blocks had an ICDS center. I analyze the effect of the presence of an ICDS center on the nutritional status of children using both OLS and CVM and find no impact on the growth of boys and girls 0-2[20] (Table 1.9). Similarly, if I take the age-groups that were used in the previous evaluations, that is 0-3 years and 0-4 years, and again use OLS I find no significant

[20]Unlike my estimates which are only for rural areas, Kandpal (2011) combines children from urban and rural areas together and using propensity score matching finds that 0-2 and 0-3 boys are 0.09 and 0.08 SD taller respectively in ICDS center villages/urban blocks but finds no significant effect on girls overall.

effect of the ICDS center on the anthropometric status of either boys or girls. These results are in line with Deolalikar (2005), Lokshin et al. (2005) and Kandpal (2011) who all find very limited impact of the program.[21]

1.6.5 Heterogeneous effects of daily supplementary feeding

It is possible that the effect of supplementary nutrition may be higher for boys and girls 0-2 in poorer households, where food might be insufficient and additional food through the ICDS might benefit them more. Similar argument holds for children in larger households. Likewise, the effect on children with more educated mothers may be higher, because the more educated mothers might make a greater effort of ensuring that food is properly prepared and the child eats the food. Also, children with lower birth weight might be benefitting from the program, because they have much more potential for catch-up growth. Similarly, the children exposed to longer duration of feeding might be benefitting more. To test these differential effects of daily supplementary feeding on boys and girls 0-2, I estimate an extended OLS regression model (equation 1) with interactions between the *Dailyfd* dummy and various socio-economic indicators: household wealth index, household size, education of mothers and birth weight; as well as years of ICDS operation (as a proxy for years of feeding).

Table 1.10 shows that boys 0-2 who are receiving daily feeding and come from poorer households, or have more educated mothers, are significantly taller. Also, the effect of longer duration of feeding on boys 0-2 seem to be statistically significant, though economically insignificant. For girls 0-2, only the effect on those who come from smaller households is statically significant, but even this is economically insignificant. The direc-

[21]Deolalikar (2005) found 0-3 year old boys to be 5% less likely to be underweight in 1992-3 using a probit regression. Lokshin et al. (2005) using the propensity score matching method found 0-4 year old boys to be 0.15 SD taller in 1992-3 but no impact in 1998-99 (boys ages 0-3). They found no impact on girls whatsoever.

tion of the results is pretty much the same whether I use the full sample of children or a sub-sample of only those for whom birth weight[22] is reported. It is likely that the statistical insignificance of coefficients on interactive terms is because of small sample size. However, the estimates may be unbiased and hence its interesting to look at the direction and magnitude of effects.

1.6.6 Impact of other components of the program and/or other health indicators

Is it the supplementary feeding or other program components that are driving the results?

It is possible that the effect of daily supplementary feeding on the nutritional status of girls actually comes from other components of the ICDS program, like monthly health check-ups, immunization, and regular early child care. To check this hypothesis, I estimate the OLS regressions including these components. The results in Table 1.11 show that other components have an insignificant and mostly negative effect on the anthropometrics of children. The coefficients on daily supplementary feeding actually increase a little for both boys and girls, and those for weight of girls become significant.

Effects of supplementary feeding during mother's pregnancy and maternal nutrition counseling on boys and girls 0-2 years

The ICDS program provides supplementary nutrition not only to the child but also to the mother during her pregnancy. Feeding intervention review studies like, Bhutta et al. (2008), recommend focusing on interventions during pregnancy and in young children. Therefore, it is worthwhile to see if there is any effect of this part of the program on the growth of

[22]Birth weight is available only for 25% of the rural sample children.

children.

Information on supplementary feeding during pregnancy from ICDS is collected twice in the survey. While in the ICDS section it is collected on all children under five, in the woman's section it is collected for the last birth. While in the ICDS section I only know whether or not the woman got supplementary feeding from the ICDS program, in the question for last birth, there is added information on whether the woman was able to receive supplementary nutrition from the anganwadi center when she wanted it. Of the women who reported receiving supplementary nutrition from the ICDS center, only 67% reported receiving it when they wanted it.

Using this additional information and looking at the effect of inutero supplementary feeding, there is no effect on girls below the age of two years, either interactively or independently. However, for boys below the age of two it seems to have a significant[23] negative effect on weight in kilograms, even after controlling for prenatal care.[24]

Studies like Ghosh et al. (2002) and Roy et al. (2005) have shown that in depth and repeated nutrition education has improved the nutrition of young children, with or without supplementary feeding. Since one of the ICDS objectives is to provide nutrition counseling at every stage of a child's growth, I also analyze its effect on the nutritional status of children. I find that there is no effect of health and nutrition education during pregnancy or breastfeeding, either independently or in interaction with daily feeding, in all groups of age-gender combinations. Similarly, nutrition counseling after weighing the child has little effect on the nutritional status of children, except for a negative effect on weight (in kgs) for girls 0-2.[25]

[23] At 5% level of significance

[24] Variable used for prenatal care is number of ante-natal care visits during pregnancy.

[25] Estimates might reflect negative selection bias.

Effect of supplementary feeding on the incidence and severity of morbidity for boys and girls 0-2 years and 3-5 years

Because of supplementary nutrition, ICDS may be helpful in controlling the incidence and severity of morbidity among children. However, I do not find any effect of daily supplementary feeding on the incidence of diarrhea, cough, or fever for children 0-2[26] (Appendix Table 1.A.8).

For children 3-5 also, reported in Appendix Table 1.A.8, there is no positive effect of daily supplementary feeding on the incidence of diarrhea, cough, or fever. In fact, the results show that the child receiving daily supplementary feeding is 2% more likely to have fever. Higher fever incidence may be due to exposure of children coming to the ICDS center to other children in the center. It also should be noted that some clinical trials in Africa (Einterz and Bates (1997), Whybrew et al. (1998)) have shown that reporting of fever based on the patient's or caregivers assessment (by touch) without a thermometer is a highly unreliable measure and, as a screening procedure, will seriously overestimate the incidence of fever.

As for the severity of diseases, the only way one could measure the severity of diarrhea is through the presence of blood in stools. The number of children suffering from this condition is very small - only 1% of the total sample - although around 11% suffered from diarrhea. I find that children 3-5 receiving daily supplementary feeding are less likely to suffer from blood in stools, although this effect is economically insignificant. For 0-2 age-group, daily feeding does not have any significant effect on the severity of diarrhea. Severity of cough only can be measured by accompaniment of cough with short rapid breaths. I do not find any effect of daily supplementary feeding on severity of cough for either age-group.

[26]The analysis on morbidity was not broken down by gender because cross-tabulations were yielding very small sizes for some cells.

1.6.7 Robustness checks

Controlling for motivation of mothers and fair treatment of girls

I further test for bias in my estimates due to unobserved factors, like motivation of mothers or fair treatment of girls. For example, receiving daily feeding may be highly correlated with motivation of mothers: more motivated mothers may make sure that their children receive the supplementary feeding. However, because I see no positive effect of supplementary feeding on children aged 3-5 for either gender, this argument is hard to sustain.

I also proxy for mother's motivation with a dummy variable identifying mothers who have lost a child. The argument is that, having lost a child, these mothers may be much more proactive in taking care of their remaining children. Similarly, it is possible that the families who treat their girls fairly, or have a preference for girls, make sure that girls get supplementary feeding from the ICDS center and take better care of these girls. In this scenario, any effect I see on girls is not really due to supplementary feeding but rather to the better care they receive in households where they are treated fairly. To check for this omitted variable I take information from the woman's questionnaire about her ideal number of children and the sex composition of the ideal family. I then can identify the mothers who indicate a preference for girls, or who value girls and boys equally or have no gender preference. Appendix Table 1.A.9 shows that the addition of a proxy for either motivation of mothers or fair treatment of girls does not change the OLS coefficients on the daily feeding variable or their significance level much, for either boys or girls 0-2 years of age.

Effect of infant mortality

Rural India suffers from high child mortality. Among children in the 0-5 age-group who have died, 97% died in the first two years of their life. Around 16% of children in the

0-2 age group have died. Because of the high attrition in my sample of children who died between the ages of 0 and 2, it is important to analyze how this affects my estimates. I construct bounds on the estimates due to mortality. The children who died are assigned to the two feeding groups in three ways: 1) All of them assigned to the group receiving daily supplementary feeding; 2) All of them assigned to the group *not* receiving daily supplementary feeding; 3) All those for whom probability of receiving daily supplementary feeding was more than 0.1 assigned to the group receiving it. In each case, I estimate lower and upper bounds[27] using 10th or 90th percentile of age-specific anthropometric measures. Appendix Table 1.A.10 shows that the bounds for boys include zero for height and weight measures in all cases, except when the children who have died are assigned to the group not receiving daily supplementary feeding (case 2). For girls on the other hand, the bounds remain in the positive range for height measures, irrespective of the method of assignment to the two feeding groups. These estimates suggest that my results are more robust for girls 0-2 than for boys 0-2.

Taking only Major States

More than half of the children receiving daily supplementary feeding come from five states in India: West Bengal, Maharashtra, Tamil Nadu, Himachal Pradesh, and Mizoram. In those states, at least 15% of the 0-2 age group receive daily supplementary feeding. Analyzing the effect of daily supplementary feeding for just this subset of states, and using OLS, I show in Appendix Table 1.A.11 that the point estimates for boys are higher than when the whole sample is included. With CVM, the estimates are much higher, almost double. The OLS estimates are statistically insignificant but the CVM estimates are statistically significant for almost all measures of height and weight for boys. For girls, the OLS

[27]Information on birth interval is missing for a large number of children who have died. Therefore, the bounds are calculated without this covariate. It should be noted that the OLS estimates for living children without the birth interval are pretty similar to the estimates with the birth interval as the covariate.

estimates are lower than the estimates for the whole sample and are statistically insignificant. However, the CVM estimates for height are higher (around 50% higher) and closer to those for boys and statistically significant. Therefore, if I restrict my sample to only the home states of the majority of the children receiving daily supplementary feeding, I find using CVM that both boys and girls are much taller than those in the full sample and these results are statistically significant. The higher estimates are likely due to the serious efforts made by these states to "make the ICDS work" (FOCUS (2006)[28]).

Changing program participation measure

I also use information on children who are receiving supplementary feeding at different frequencies (other than daily). I identify the boys and girls who receive supplementary feeding daily, weekly, and monthly, and I combine them into boys and girls who receive "some feeding." I then analyze the impact of "some feeding" on nutritional status for boys and girls 0-2 (Appendix Table 1.A.12). I find no statistically significant impact. In addition, I examine whether weekly feeding effects the growth of children, over and above daily feeding for boys and girls 0-2. I find no significant impact for boys and a negative impact of weekly feeding on weight measures (-0.2 SD) for girls (Appendix Table 1.A.12).[29] These results suggest that the only frequency of supplementary feeding that makes a positive difference in the height of boys and girls 0-2 is daily feeding.

[28]This report was based on a field survey conducted in May-June 2004 to analyze the performance of ICDS on the ground in six states in India. Three of the five states mentioned above were part of the survey, namely Maharashtra, Tamil Nadu and Himachal Pradesh. It was found that these states performed relatively better on many indicators of the quality of ICDS services.

[29]Estimates might reflect negative selection bias.

Taking >36-59 months boys and girls as comparison group for difference-in-difference analysis

The nutrition studies find that the supplementary nutrition could contribute to the growth of children up to 3 years (36 months). In my analysis I do not find any robust positive effect of supplementary nutrition on the growth of children ages 3-5 years (25-59 months) or even on those ages 25-36 months taken separately.[30] One could still argue that the comparison group for the difference-in-difference analysis should be the children above 3 years (36 months) because of the potential positive benefit of supplementary nutrition on the growth of the children ages 25-36 months. The comparison age-group 3-5 years used for difference-in-difference analysis in section 1.6.3 includes the children in the age-group 25-36 months. Therefore, I redo the difference-in-difference analysis using the children >36-59 months as the comparison group. The results in Appendix Table 1.A.13 indicate that my difference-in-difference estimates for children aged 0-2 in section 1.6.3 remain robust even when I use the children above 36 months as the comparison group. The estimates for boys are largely similar in magnitude to the difference-in-difference estimates in section 1.6.3 and those for girls are higher in magnitude.

Excluding outliers

The above estimates include all boys and girls aged 0-5 with extreme anthropometric measurements: height z-scores below -6 SD and above +6 SD and weight z-scores below -6 SD and above +5 SD of the reference median. These children form 7-8% of the sample for boys and girls 0-2.[31] The extremes are much more prevalent for height than for weight and a large proportion of them lie in the lower tail of the sample distribution. It is not clear if

[30]The results for boys and girls ages 25-36 months are not presented in the paper but are available on request.

[31]For children aged 3-5 outliers form 3% of the sample.

these extremely low values are because of measurement error or extremely poor nutritional status of children in rural areas, where the mean height is significantly below the reference median and the standard deviation is very high for both boys and girls 0-2 (Table 1.1). I estimate the effect of daily supplementary feeding without the outliers, using both OLS and CVM, for boys and girls 0-2. The results in Appendix Table 1.A.14 show that the the height estimates for boys 0-2 are substantially lower in magnitude and no longer statistically significant with either OLS or CVM. For girls 0-2, the estimates are a little lower in magnitude but statistically significant. These results suggest that while the estimates for girls 0-2 are robust to exclusion of outliers, those for boys 0-2 are not.

1.7 Conclusion

Child malnutrition is a huge problem in India, affecting more than 80 million children. The only national program to address it is the Integrated Child Development Scheme (ICDS), whose flagship component is provision of supplementary nutrition to children aged 0-6, pregnant and lactating women, and adolescent girls. The government of India has put huge resources into this program and seems determined to continue to do so. According to the latest round of the India Demographic Health Survey 2005-6 (NFHS-3), it seems that the program has wide coverage in rural areas, with about 91.5% of rural villages reporting the presence of an ICDS center through which the various program services are delivered. Given the importance of early child development in future well-being - physically, socially and economically - it is important to study how programs like ICDS affect the nutritional status of young children. But while program evaluation is necessary, it is a challenge because randomized evaluation was not built into the program's design. Also, because of the lack of relevant and useful panel surveys, our only option is to analyze the program's impact through cross-sectional surveys, which is difficult in the face of missing unobservables.

This paper uses the most recent cross-sectional NFHS-3 survey data, which has a component on *child level* ICDS service utilization, to analyze the impact of supplementary nutrition on children aged 0-5. The survey statistics show that while the program has a wide physical presence in the rural areas, only about 35% of rural children receive some kind of benefit from these ICDS centers. Moreover, only around 6% of children 0-2 received supplementary nutrition *daily* in the last year, while 14.5% of children 3-5 received it (with wide variation across states).

I evaluate the effect of supplementary nutrition on this group of rural children who receive it intensely, i.e. daily. Following the evidence in the nutrition literature on irreversible and differing growth faltering patterns by age and gender, I analyze boys and girls separately, and in two age groups: 0-2 and 3-5. The significant differences in covariates between the boys (girls) 0-2 receiving daily supplementary feeding and those not receiving it indicate a selection problem. They are manifested in the OLS estimates for boys 0-2 being underestimated. I take care of selection on observables, and on unobservables to the extent that they are correlated with observables, through two matching methods: propensity score matching with stratification and covariate matching. To further control for the unobservables for the children aged 0-2, I carry out the difference-in-difference analysis with children ages 3-5 as the comparison group. With all of these methods, height estimates in cms for boys receiving daily supplementary feeding are more than double the OLS estimates and are consistent with what I find for girls. The height estimates in z-scores are less robust across different specifications for boys 0-2. For boys and girls 3-5, covariate matching method yields estimates that are generally similar to the OLS estimates.

Overall picture that emerges from the analysis is that the ICDS program seems to be making a positive and significant difference for the nutritional status of both boys and girls 0-2 years in rural India. Both boys and girls who received supplementary feeding *daily* in the last year seem to be at least 1 cm (0.4 z-score) taller than those who did not receive

it. However, the estimates for boys are less robust. As for the children aged 3-5, the ICDS program does not seem to be making any significant positive difference for height or weight. I find a significant negative effect of feeding on the height of girls 3-5 in some cases, which might be caused by dissimilar matches and/or negative selection bias.

These results are remarkably consistent with a recent meta-analysis (Bhutta et al., 2008) which concluded that provision of food supplements (with or without education) in food-insecure populations led to around a 0.41 increase in age-adjusted height z-score for children between 6 and 36 months. Bhutta et al. (2008) also asserts that supplementary feeding interventions beyond 36 months of age would probably not reduce stunting and might be inadvisable, because rapid weight gain in later childhood is associated with adverse long-term outcomes. The results of two recent randomized controlled experiments in India (Bhandari et al., 2001) and Malawi (Kuusipalo et al., 2006) further indicate that provision of 220-260 kcal of food supplements led to an increase in height in the range of 0.4-0.9 cm for children in the age-group 4-17 months.

My results could be quite significant economically because the differential growth of 1cm in the first two years of life for girls is most likely to carry over to adulthood. There is a high correlation between child height and adult height (Case and Paxson (2008)[32]), and children are highly unlikely to recover their "lost" growth from childhood (Martorell et al. (1994)). Among adult women in rural India, the difference in height between women belonging to the poorest and the richest economic group is around 3.5 cm according to the NFHS-3 data. Therefore, girls 0-2 who are receiving supplementary nutrition daily are likely to make-up 28% of this differential in female height by adulthood. Similarly, the height differential for men is around 5.3 cm. This would amount to around a 19% catch-up for boys 0-2 in the height gap by adulthood.

[32]They indicate that there is a correlation of 0.7 between child height and adult height for both men and women. Taller children are most likely to become taller adults.

In 2005-6, the norms for expenditure on supplementary nutrition were Rs 2 per child. In one year, that norm provides supplementation for 300 days, at a cost of Rs 600 (around USD 13) per child. This expenditure results in a catch-up of 1 cm in the height differential for girls on average and around 1.5 cm for the girls in states where ICDS's performance is relatively better. If all of the 3.5 cm height differential for girls is made up through ICDS's supplementary nutrition, then it would take Rs 2100 (USD 47).

What does a 3.5 cm height increase get an Indian child? For Zimbabwe, Alderman et al. (2006) found that a child 3.4 centimeters taller would have completed an additional 0.85 grades of schooling and would have begun school six months earlier. Using figures from Alderman et al. (2006) together with estimates for the returns to education for men and women in rural India in 1993-4 from Duraisamy (2002),[33] the loss of 0.85 years of schooling translates into a 3% to 6% loss in wages, depending upon the level of schooling, whether primary or middle, and gender. Loss of schooling resulting from malnutrition for an adult man employed as casual laborer means earning Rs 1000 (USD 22)[34] less in rural India in 2005-6; and for an adult woman it means earning Rs 530 (USD 12) less.[35] This simple back of the envelope calculation indicates that if the ICDS program is targeted at children aged 0-2 and *daily* supplementary feeding is ensured, then it pays for itself in two years time for boys and in four years time for girls.

Although, I see no effect on nutritional status for children 3-5 years, it does not necessarily mean that supplementary nutrition should be stopped for this age-group. First of all, I do not know whether there is no effect on these children because the supplementation is inadequate,[36] or whether by this age genetics take over and nutrition supplementation

[33]The estimates taken from Table 6 of Duraisamy (2002).

[34]Figures for wage rates are from the 62nd round survey of National Sample Survey Organization for casual worker in rural India for men and women in 2005-6.

[35]Because the wage rates are among the lowest for casual workers, the calculated figures are a lower bound

[36]Currently, ICDS provides 20-30% of energy requirements for 3-5 year old children.

has little effect. In addition, it is possible that supplementary nutrition might be helping to keep morbidity down. While that is not borne out by the data, it may be because of poor quality of the data on morbidity. Also, supplementary nutrition might help to maintain energy levels for children, so that they can engage in physical activity which is important for the maintenance of good health, social and psychological well-being, and perhaps even cognitive development. Moreover, since ICDS is providing only 20-30% of the energy requirements of these children, I do not expect to see rapid weight gain because of that intervention in a predominantly food-insecure environment.

My results seem credible because they lie well within the biological range of the experimental complementary feeding interventions in populations with insufficient food. They may be quite significant economically because these height differentials are most likely irreversible, and for the children 0-2 years receiving complementary feeding regularly through ICDS could mean significant catching-up in height in adulthood to the men and women belonging to the richest economic group. My simple back of the envelope calculations indicate large long-run economic benefits of the program for boys and girls 0-2 years. However, all of these benefits are achievable only if the program is targeted towards children 0-2 and if supplementary feeding is delivered regularly, which does not seem to be the case right now. The results suggest absence of positive effect of having an ICDS center in the village, possibly due to poor delivery of ICDS benefits. But this absence of ICDS center effect should not lead us to falsely conclude that feeding interventions do not make a difference in growth of children. If the ICDS fails its not because feeding interventions do not work, but likely due to poor delivery of the program benefits.

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Glossary

Anganwadi	Centers in villages and urban areas through which the program benefits are distributed
Chana	Chickpeas
Dalia	Porridge
Ghee	Clarified butter
Gur	Jaggery
Kheer	Sweet dish usually made of rice, milk and sugar
Khichdi	A dish of rice and lentils
ICDS	Integrated Child Development Scheme
Murmura	Puffed rice
NFHS	National Family Health Survey
Panjiri	A snack made of whole wheat flour, sugar and clarified butter
Puri	Fried wheat bread
Halwa	Sweet dish prepared with cereals/vegetables and sugar

Table 1.1: Summary statistics for boys and girls 0-2 years in rural India

	Boys 0-2 years							Girls 0-2 years						
	Daily feeding			No daily feeding				Daily feeding			No daily feeding			
Variables	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	p-value	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	p-value
Height (cms)	348	72.2	8.8	5563	69.8	9.7	(0.000)**	327	71.3	7.7	5193	67.5	9.5	(0.000)**
Weight (kgs)	348	8.1	1.8	5590	7.5	2.0	(0.000)**	329	7.6	1.7	5223	6.9	2.3	(0.000)**
Height-for-Age Z-score	348	-1.9	2.5	5563	-1.8	2.7	(0.42)	327	-1.5	2.2	5193	-1.7	2.4	(0.27)
Weight-for-Age Z-score	348	-1.8	1.4	5590	-1.8	1.5	(0.94)	329	-1.6	1.3	5223	-1.8	1.7	(0.13)
Age in months	348	14.0	6.5	5591	12.1	7.0	(0.000)**	329	14.0	6.2	5225	11.6	7.0	(0.000)**
Birth Interval (months)	348	25.1	23.6	5591	25.9	23.4	(0.60)	329	25.0	23.3	5225	25.5	23.5	(0.76)
Birth order	348	2.5	1.6	5591	2.8	2.0	(0.000)**	329	2.5	1.5	5225	2.8	1.9	(0.004)**
Mother's age (years)	348	24.4	4.8	5591	24.9	5.4	(0.10)	329	24.6	4.6	5225	24.7	5.3	(0.67)
Mother's edu (years)	348	4.3	4.3	5591	3.5	4.5	(0.002)**	329	4.4	4.3	5225	3.3	4.3	(0.000)**
Mother's BMI	348	18.9	2.5	5572	19.4	2.7	(0.003)**	329	18.8	2.4	5200	19.3	2.5	(0.008)**
Spouse's age (years)	343	30.3	6.0	5518	30.3	6.4	(0.91)	320	29.9	5.1	5154	30.0	6.4	(0.70)
Spouse's edu (years)	347	5.6	4.6	5563	6.0	5.0	(0.15)	328	5.7	4.7	5198	5.8	4.9	(0.79)
Hh head age	348	41.4	14.5	5590	43.9	15.3	(0.009)**	329	42.0	14.8	5224	43.5	15.1	(0.12)
Hh head edu	347	3.9	4.1	5577	4.0	4.5	(0.69)	329	3.9	4.2	5211	3.9	4.5	(0.83)
Wealth index	348	-0.7	0.6	5591	-0.7	0.7	(0.35)	329	-0.7	0.6	5225	-0.7	0.7	(0.92)
Caste - Sch caste / tribe	346	0.44	0.5	5537	0.32	0.5	(0.000)**	328	0.45	0.5	5187	0.33	0.5	(0.000)**
Caste - OBC	346	0.30	0.5	5537	0.43	0.5	(0.000)**	328	0.26	0.4	5187	0.42	0.5	(0.000)**
Caste - Others	346	0.26	0.4	5537	0.25	0.4	(0.66)	328	0.29	0.5	5187	0.25	0.4	(0.22)
Religion - Hindu	347	0.81	0.4	5572	0.80	0.4	(0.47)	329	0.77	0.4	5207	0.81	0.4	(0.13)
Religion - Muslim	347	0.12	0.3	5572	0.16	0.4	(0.11)	329	0.16	0.4	5207	0.15	0.4	(0.78)
Religion - Others	347	0.06	0.2	5572	0.05	0.2	(0.24)	329	0.08	0.3	5207	0.04	0.2	(0.025)*
Water - Piped Water	348	0.36	0.5	5591	0.19	0.4	(0.000)**	329	0.33	0.5	5224	0.18	0.4	(0.000)**
Water - tubewell	348	0.43	0.5	5591	0.63	0.5	(0.000)**	329	0.49	0.5	5224	0.62	0.5	(0.000)**
Water - Others	348	0.21	0.4	5591	0.18	0.4	(0.30)	329	0.18	0.4	5224	0.20	0.4	(0.48)
Toilet - Flush toilet	347	0.17	0.4	5585	0.18	0.4	(0.83)	328	0.19	0.4	5220	0.16	0.4	(0.30)
Toilet - Others	347	0.04	0.2	5585	0.06	0.2	(0.13)	328	0.09	0.3	5220	0.06	0.2	(0.07)
Toilet - No facility	347	0.79	0.4	5585	0.76	0.4	(0.34)	328	0.72	0.5	5220	0.78	0.4	(0.037)*
Cooking fuel - Wood	348	0.69	0.5	5590	0.57	0.5	(0.000)**	329	0.70	0.5	5224	0.59	0.5	(0.000)**
Cooking fuel - Others	348	0.31	0.5	5590	0.43	0.5	(0.000)**	329	0.30	0.5	5224	0.41	0.5	(0.000)**
Years of ICDS operation	322	13.25	7.4	4883	11.36	7.1	(0.000)**	305	13.29	7.1	4588	11.07	7.0	(0.000)**
Birth Weight	177	2.72	0.7	1762	2.83	0.7	(0.056)*	161	2.81	0.8	1487	2.71	0.7	(0.20)
Household size	348	6.34	2.8	5591	7.33	3.5	(0.000)**	329	6.51	2.8	5225	7.16	3.2	(0.001)**

* significant at 5%; ** significant at 1%; F-statistic for test of joint significance of regressors is 7.86 for boys and 6.83 for girls and corresponding p-value=0.000 for both boys and girls; State specific statistics not presented.

Table 1.2: PROBIT - Determinants of receiving daily supplementary feeding

	Boys 0-2 years		**Girls 0-2 years**	
Regressors	**Coef**	**SE**	**Coef**	SE
Age in months	0.012***	(0.00)	0.011**	(0.00)
Birth Interval (months)	0.073	(0.11)	0.121	(0.12)
Birth order	-0.263	(1.83)	-1.127	(2.06)
Mother's age (years)	-0.360	(0.84)	0.843	(0.88)
Mother's edu (years)	0.891	(0.73)	2.477***	(0.92)
Mother's BMI	-1.156	(0.87)	-2.068**	(1.01)
Spouse's age (years)	0.505	(0.58)	-0.441	(0.62)
Spouse's edu (years)	-0.263	(0.70)	-0.744	(0.82)
Hh head age	-0.315*	(0.17)	-0.287	(0.20)
Hh head edu	-1.223*	(0.74)	-0.415	(0.81)
Wealth index	-1.879	(5.08)	-3.567	(5.78)
Caste - Sch caste / tribe	0.011	(0.01)	0.020**	(0.01)
Caste - OBC	0.002	(0.01)	0.003	(0.01)
Religion - Hindu	-0.008	(0.01)	-0.031*	(0.02)
Religion - Muslim	-0.013	(0.01)	-0.019**	(0.01)
Water - Piped Water	0.001	(0.01)	0.005	(0.01)
Water - tubewell	0.003	(0.01)	0.006	(0.01)
Toilet - Others	0.003	(0.01)	0.048**	(0.02)
Toilet - No facility	0.004	(0.01)	0.002	(0.01)
Cooking fuel - Wood	0.005	(0.01)	0.014**	(0.01)
Observations	5728		5365	
Pseudo R-Square	0.18		0.18	
Mean Y	6%		6%	

* significant at 10%; ** significant at 5%, *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parenthesis; Covariates like birth interval, birth order, mother's age, mother's education, mother's BMI, spouse's age, spouse's education, household head's age and household head's education have been rescaled by multiplying with 10^{-3} to obtain non-zero marginal effects; The estimates indicate marginal probabilities. For example, for girls 0-2 years the regression coefficient is 0.014 on "cooking fuel - wood" which indicates that a girl in a household where wood is used as cooking fuel is 1.4% more likely to receive supplementary feeding than a girl in a household where other sources of cooking fuel (the base group for "cooking fuel") are used; State specific coefficients not presented.

Table 1.3: OLS: Effect of daily supplementary feeding on anthropometric measures of children 0-2 years by gender

		Boys 0-2 years								**Girls 0-2 years**							
		Height in cms		**Height Z-score**		**Weight in kgs**		**Weight Z-score**		**Height in cms**		**Height Z-score**		**Weight in kgs**		**Weight Z-score**	
	Specification	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2
A	No control	2.34	0.00	-0.12	0.00	0.54	0.00	-0.02	0.00	3.76	0.01	0.21	0.00	0.75	0.01	0.16	0.00
		*(0.59)***		*(0.16)*		*(0.12)***		*(0.09)*		*(0.53)***		*(0.15)*		*(0.12)***		*(0.09)*	
B	+Child	0.04	0.60	0.01	0.07	0.03	0.61	0.03	0.05	0.94	0.63	0.38	0.07	0.16	0.45	0.21	0.04
		(0.38)		*(0.17)*		*(0.08)*		*(0.09)*		*(0.37)**		*(0.14)***		*(0.09)*		*(0.09)**	
C	+MothSES	0.23	0.61	0.09	0.09	0.10	0.65	0.11	0.14	0.82	0.64	0.34	0.08	0.16	0.47	0.21	0.09
		(0.39)		*(0.17)*		*(0.08)*		*(0.09)*		*(0.38)**		*(0.14)**		*(0.09)*		*(0.09)**	
D	+Environ	0.23	0.61	0.09	0.09	0.09	0.65	0.10	0.15	0.87	0.64	0.35	0.09	0.14	0.47	0.19	0.09
		(0.39)		*(0.17)*		*(0.08)*		*(0.09)*		*(0.38)**		*(0.15)**		*(0.09)*		*(0.09)**	
E	+SpHhead	0.27	0.61	0.11	0.09	0.10	0.66	0.11	0.15	0.88	0.64	0.36	0.09	0.15	0.47	0.20	0.09
		(0.39)		*(0.17)*		*(0.08)*		*(0.09)*		*(0.38)**		*(0.14)**		*(0.09)*		*(0.09)**	
F	+State / All controls	0.39	0.61	0.17	0.10	0.08	0.66	0.10	0.17	0.96	0.65	0.40	0.10	0.14	0.48	0.18	0.11
		(0.40)		*(0.18)*		*(0.08)*		*(0.09)*		*(0.40)**		*(0.15)***		*(0.09)*		*(0.09)**	
G	*Cluster(state) SEs*	*(0.30)*		*(0.11)*		*(0.07)*		*(0.07)*		*(0.61)*		*(0.23)*		*(0.11)*		*(0.12)*	
H	*Cluster(village) SEs*	*(0.38)*		*(0.16)*		*(0.08)*		*(0.09)*		*(0.43)**		*(0.17)**		*(0.10)*		*(0.11)*	
	Observations	5702		5702		5727		5727		5333		5333		5364		5364	

Robust standard errors in parentheses * significant at 5%; ** significant at 1%; Each coefficient is from a separate regression; Each of the specification terms specifies the following controls: *Child* - age of child in months, age square, age cube, birth interval, birth order; *MothSES* - mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion; *Environ* - source of drinking water, toilet facility, cooking fuel; *Sphhead* - spouse's age, spouse's education, household head's age, household head's education; *State* - state dummies; *All controls* - all the controls together. Each specification contains the controls that it specifies plus all the controls above it. For eg. *MothSES* would contain the controls it signifies plus the controls specified in *Child*; *Cluster(state) SEs* indicate standard errors with clustering at state level; *Cluster(village) SEs* indicate standard errors with clustering at village level.

Table 1.4: Propensity Score estimates[1] using stratification: Effect of daily supplementary feeding on anthropometric status of children 0-2 years

Boys 0-2 Years

			% covariates balanced (% with p-value<0.05)			Height in cms			Height Z-score		
Stratum	P-score	Dailyfd Obs	Total	Balanced[3]	%	Dailyfd	Nodlyfd	Difference	Dailyfd	Nodlyfd	Difference
10	0.0 - 0.1	193	34	31	91	70.94	69.57	1.37	-1.89	-1.75	-0.15
20	0.1 - 0.2	93	34	33	97	72.45	73.01	-0.56	-1.97	-1.80	-0.17
30	0.2 - 0.3	42	33	31	94	74.38	71.04	3.34	-1.66	-2.69	1.03
40	0.3 - 0.4	9	31	30	97	76.18	75.27	0.92	-2.02	-2.26	0.24
50	0.4 - 0.5	1	19	15	79	76.50	82.05	-5.55	-3.49	-1.62	-1.87
Total		338									
Wt avg								1.05			0.00

Girls 0-2 years

			% covariates balanced (% with p-value<0.05)			Height in cms			Height Z-score		
Stratum	P-score	Dailyfd Obs	Total	Balanced[3]	%	Dailyfd	Nodlyfd	Difference	Dailyfd	Nodlyfd	Difference
11[2]	0.0 - 0.05	81	31	28	90	67.02	65.79	1.24	-0.97	-1.51	0.55
12	0.05 - 0.1	86	31	29	94	72.49	70.44	2.06	-1.64	-1.78	0.14
20	0.1 - 0.2	93	31	30	97	72.04	70.08	1.96	-1.44	-1.99	0.55
30	0.2 - 0.3	38	31	30	97	70.93	71.27	-0.35	-2.04	-2.16	0.12
40	0.3 - 0.4	12	30	27	90	72.43	75.85	-3.42	-1.16	-0.89	-0.28
50	0.4 - 0.5	8	28	25	89	73.65	74.79	-1.14	-0.47	-1.81	1.34
Total		318									
Wt avg								1.24			0.37

Dailyfd indicates children receiving daily supplementary feeding; *Nodlyfd* indicates children not receiving daily supplementary feeding; [1]29 states of India were grouped into 7 regions mostly on the basis of similar % of stunted children in that state for rural children below 0-2 years and as far as possible geographically contiguous areas were kept together. For boys and girls same regional classification was used;

Table 1.5: Propensity Score estimates using stratification: Effect of daily supplementary feeding on anthropometric status of children 0-2 years cont...

Boys 0-2 years			Weight in kgs			Weight Z-score		
Stratum	P-score	Dailyfd Obs	Dailyfd	Nodlyfd	Difference	Dailyfd	Nodlyfd	Difference
10	0.0 - 0.1	193	7.78	7.49	0.287	-1.93	-1.83	-0.10
20	0.1 - 0.2	93	8.35	8.25	0.094	-1.67	-1.79	0.12
30	0.2 - 0.3	42	8.41	7.97	0.438	-1.87	-2.16	0.29
40	0.3 - 0.4	9	8.87	9.00	-0.132	-1.91	-1.67	-0.24
50	0.4 - 0.5	1	8.90	9.47	-0.569	-2.60	-2.04	-0.56
Total		338						
Weighted average					0.239			0.01

Girls 0-2 years			Weight in kgs			Weight Z-score		
tratum	P-score	Dailyfd Obs	Dailyfd	Nodlyfd	Difference	Dailyfd	Nodlyfd	Difference
11	0.0 - 0.05	90	6.53	6.52	0.007	-1.63	-1.73	0.10
12	0.05 - 0.1	78	7.79	7.42	0.370	-1.82	-1.85	0.02
20	0.1 - 0.2	85	8.00	7.47	0.535	-1.37	-1.84	0.47
30	0.2 - 0.3	41	7.62	7.74	-0.123	-1.88	-1.93	0.05
40	0.3 - 0.4	12	7.72	8.04	-0.319	-1.59	-1.77	0.18
50	0.4 - 0.5	12	8.06	8.81	-0.752	-1.15	-1.38	0.24
Total		318						
Weighted average					0.213			0.19

Table 1.6: OLS vs PSM: Effect of supplementary feeding daily on anthropometric status of children 0-2 years

Boys 0-2 years				Height in cms		Height Z-score		Weight in kgs		Weight Z-score	
Stratum	P-score	Dfd Obs	% Blcd	OLS	PSM	OLS	PSM	OLS	PSM	OLS	PSM
10	0.0 - 0.1	193	91	0.18	1.37	0.03	-0.15	0.015	0.287	-0.02	-0.10
20	0.1 - 0.2	93	97	-0.36	-0.56	-0.11	-0.17	0.140	0.094	0.18	0.12
30	0.2 - 0.3	42	94	3.31	3.34	1.39	1.03	0.570	0.438	0.62	0.29
40	0.3 - 0.4	9	97	4.64	0.92	2.27	0.24	-0.615	-0.132	-0.69	-0.24
50	0.4 - 0.5	1	79		-5.55		-1.87		-0.569		-0.56
		338									
Wt avg				0.54	1.05	0.22	0.00	0.102	0.239	0.10	0.01
PSM & OLS[†]				1.02	0.63	0.48	0.19	0.218	0.175	0.25	0.14
Simple OLS[§]				0.40		0.18		0.080		0.10	
Girls 0-2 years				Height in cms		Height Z-score		Weight in kgs		Weight Z-score	
Stratum	P-score	Dfd Obs	% Blcd	OLS	PSM	OLS	PSM	OLS	PSM	OLS	PSM
11	0.0 - 0.05	81	90	0.95	1.24	0.40	0.55	0.051	0.007	0.11	0.10
12	0.05 - 0.1	86	94	0.99	2.06	0.35	0.14	0.209	0.370	0.17	0.02
20	0.1 - 0.2	93	97	1.37	1.96	0.55	0.55	0.445	0.535	0.50	0.47
30	0.2 - 0.3	38	97	-0.40	-0.35	-0.08	0.12	-0.197	-0.123	-0.03	0.05
40	0.3 - 0.4	12	90	-7.80	-3.42	-2.52	-0.28	-0.464	-0.319	-0.18	0.18
50	0.4 - 0.5	8	89	15.23	-1.14	5.25	1.34	0.776	-0.752	0.73	0.24
		318									
Wt avg				0.95	1.24	0.38	0.37	0.178	0.213	0.23	0.19
PSM & OLS[†]				0.93	0.79	0.40	0.42	0.229	0.233	0.21	0.33
Simple OLS[§]				0.97		0.40		0.140		0.19	

Dfd - Dailyfd; Blcd - Balanced; [†]Weighted average when p<0.1 not included; [§]From table 1.3

Table 1.7: Summary table - Effect of daily supplementary feeding on anthropometric status of children 0-2 years (0-24 months)

						Difference-in Difference			
Boys 0-2 years	**OLS**	**PSM**	**Covariate Matching**			**OLS**	**Covariate Matching**		
		Strf	**5 matches**	**3 matches**	**1 match**		**5 matches**	**3 matches**	**1 match**
Height in cms	0.39	1.05	1.03	1.28	1.79	0.34	0.93	1.16	1.62
	(0.40)		*(0.58)**	*(0.59)***	*(0.58)****	*(0.47)*	*(0.69)*	*(0.70)*	*(0.70)*
Height Z-score	0.17	0.00	0.41	0.55	0.73	0.16	0.38	0.51	0.67
	(0.18)		*(0.20)***	*(0.20)****	*(0.20)****	*(0.19)*	*(0.21)*	*(0.22)*	*(0.22)*
Weight in kgs	0.083	0.239	0.175	0.236	0.380	0.036	0.066	0.135	0.345
	(0.08)		*(0.12)*	*(0.12)***	*(0.12)****	*(0.10)*	*(0.15)*	*(0.15)*	*(0.16)*
Weight Z-score	0.10	0.01	0.20	0.27	0.43	0.05	0.11	0.19	0.38
	(0.09)		*(0.10)***	*(0.10)****	*(0.11)****	*(0.10)*	*(0.11)*	*(0.12)*	*(0.13)*

						Difference-in Difference			
Girls 0-2 years	**OLS**	**PSM**	**Covariate Matching**			**OLS**	**Covariate Matching**		
		Strf	**5 matches**	**3 matches**	**1 match**		**5 matches**	**3 matches**	**1 match**
Height in cms	0.96	1.24	1.03	1.15	1.21	1.02	1.84	2.08	1.51
	*(0.40)***		*(0.60)**	*(0.62)**	*(0.65)**	*(0.49)***	*(0.75)*	*(0.81)*	*(0.77)*
Height Z-score	0.40	0.37	0.44	0.46	0.49	0.40	0.63	0.68	0.56
	*(0.15)****		*(0.17)****	*(0.17)****	*(0.18)****	*(0.17)***	*(0.20)*	*(0.21)*	*(0.20)*
Weight in kgs	0.141	0.213	0.125	0.155	0.151	0.225	0.180	0.221	0.247
	(0.09)		*(0.12)*	*(0.12)*	*(0.13)*	*(0.12)*	*(0.15)*	*(0.15)*	*(0.16)*
Weight Z-score	0.18	0.19	0.15	0.18	0.17	0.21	0.17	0.21	0.23
	*(0.09)***		*(0.09)*	*(0.10)**	*(0.11)*	*(0.10)***	*(0.11)*	*(0.11)*	*(0.12)*

* significant at 10%; ** significant at 5%. *** significant at 1%; Robust standard errors in parentheses; PSM Strf is propensity score matching with stratification; For difference-in-difference estimates using covariate matching method the standard errors have been calculated using square root of sum of variance of beta coefficients for 0-2 and 3-5 age-groups, and they are not marked by asterisk.

Table 1.8: Summary table - Effect of daily supplementary feeding on anthropometric status of children 3-5 years (25-59 months)

		Covariate Matching		
Boys 3-5 years	**OLS**	**1 match**	**3 matches**	**5 matches**
Height in cms	0.05	0.17	0.12	0.10
	(0.25)	*(0.40)*	*(0.38)*	*(0.38)*
Height Z-score	0.01	0.06	0.04	0.03
	(0.06)	*(0.10)*	*(0.09)*	*(0.08)*
Weight in kgs	0.05	0.04	0.10	0.11
	(0.07)	*(0.11)*	*(0.10)*	*(0.10)*
Weight Z-score	0.05	0.05	0.08	0.09
	(0.04)	*(0.06)*	*(0.06)*	*(0.06)*
Girls 3-5 years		Covariate Matching		
		1 match	**3 matches**	**5 matches**
Height in cms	-0.06	-0.30	-0.93	-0.81
	(0.30)	*(0.41)*	*(0.53)**	*(0.46)**
Height Z-score	0.00	-0.07	-0.22	-0.19
	(0.07)	*(0.09)*	*(0.12)**	*(0.10)**
Weight in kgs	-0.08	-0.10	-0.07	-0.06
	(0.07)	*(0.10)*	*(0.09)*	*(0.09)*
Weight Z-score	-0.03	-0.06	-0.03	-0.02
	(0.05)	*(0.06)*	*(0.05)*	*(0.05)*

* significant at 10%; ** significant at 5%. *** significant at 1%; Robust standard errors in parentheses;

Table 1.9: OLS and CVM: Comparison with earlier evaluations - Effect of ICDS program - changing the measure of program participation or age-groups

	Boys 0-2 yrs				**Boys**			
	OLS		CVM		0 - 3 years		0 - 4 years	
	Dailyfd	ICDSctr	Dailyfd	ICDSctr	Dailyfd	ICDSctr	Dailyfd	ICDSctr
Height in cms	0.39	-0.12	1.03	-0.18	0.48	-0.21	0.41	-0.16
	(0.40)	*(0.31)*	*(0.58)**	*(0.58)*	*(0.29)*	*(0.27)*	*(0.24)*	*(0.24)*
Obs	5702	5724	5702	5724	8461	8497	11212	11256
Height Z-score	0.17	-0.06	0.41	-0.06	0.10	0.05	0.13	-0.05
	(0.18)	*(0.13)*	*(0.20)***	*(0.16)*	*(0.07)*	*(0.06)*	*(0.08)*	*(0.08)*
Obs	5702	5724	5702	5724	8461	8497	11212	11256
Weight in kgs	0.08	0.05	0.18	-0.03	0.17	-0.07	0.09	0.11
	(0.08)	*(0.07)*	*(0.12)*	*(0.14)*	*(0.11)*	*(0.10)*	*(0.06)*	*(0.06)*
Obs	5727	5749	5727	5749	8493	8529	11248	11292
Weight Z-score	0.10	0.07	0.20	0.02	0.09	0.07	0.07	0.10
	(0.09)	*(0.08)*	*(0.10)***	*(0.10)*	*(0.06)*	*(0.06)*	*(0.05)*	*(0.05)*
Obs	5727	5749	5727	5749	8493	8529	11248	11292
	Girls 0-2 yrs				**Girls**			
	OLS		CVM		0 - 3 years		0 - 4 years	
	Dailyfd	ICDSctr	Dailyfd	ICDSctr	Dailyfd	ICDSctr	Dailyfd	ICDSctr
Height in cms	0.96	0.23	1.03	0.34	0.87	0.31	0.90	0.12
	*(0.40)***	*(0.36)*	*(0.60)**	*(0.89)*	*(0.31)***	*(0.30)*	*(0.27)***	*(0.26)*
Obs	5333	5360	5,333	5,360	7907	7943	10467	10514
Height Z-score	0.40	0.09	0.44	0.24	0.31	0.10	0.28	0.07
	*(0.15)****	*(0.15)*	*(0.17)****	*(0.22)*	*(0.10)***	*(0.11)*	*(0.08)***	*(0.09)*
Obs	5333	5360	5,333	5,360	7907	7943	10467	10514
Weight in kgs	0.14	0.04	0.13	-0.08	0.07	0.02	0.08	0.06
	(0.09)	*(0.08)*	*(0.12)*	*(0.14)*	*(0.08)*	*(0.07)*	*(0.07)*	*(0.06)*
Obs	5364	5391	5,364	5,391	7951	7987	10522	10569
Weight Z-score	0.18	0.03	0.15	-0.06	0.09	0.01	0.07	0.04
	*(0.09)***	*(0.09)*	*(0.09)*	*(0.08)*	*(0.07)*	*(0.07)*	*(0.05)*	*(0.06)*
Obs	5364	5391	5,364	5,391	7951	7987	10522	10569

* significant at 10%. ** significant at 5%, *** significant at 1%; Robust standard errors in parentheses; *Dailyfd* indicates that child receives supplementary feeding daily; *ICDSctr* indicates presence of ICDS center in the village; *CVM* indicates covariate matching method;

Table 1.10: OLS: Heterogeneity in effect of daily feeding on anthropometric measures of children 0-2 years

	All children (birth weight not included)				Only children with birth weight[1]			
Boys 0-2 years	**Ht (cms)**	**HAZ**	**Wt (kgs)**	**WAZ**	**Ht (cms)**	**HAZ**	**Wt (kgs)**	**WAZ**
Daily supplementary feeding	-1.51	-0.79	-0.04	-0.12	-0.91	-0.53	-0.71	-0.66
	(1.61)	*(0.71)*	*(0.28)*	*(0.31)*	*(2.44)*	*(1.06)*	*(0.57)*	*(0.64)*
Dailyfd x Household Size	-0.07	-0.02	-0.04	-0.05	0.24	0.11	0.01	0.01
	(0.13)	*(0.05)*	*(0.03)*	*(0.03)*	*(0.16)*	*(0.07)*	*(0.03)*	*(0.04)*
Dailyfd x Wealth Score	-1.96	-0.86	-0.08	-0.10	-2.19	-1.03	-0.02	-0.08
	*(0.70)***	*(0.31)***	*(0.13)*	*(0.14)*	*(1.04)**	*(0.46)**	*(0.17)*	*(0.18)*
Dailyfd x Mother's Education	0.23	0.11	0.02	0.03	0.28	0.13	0.01	0.02
	*(0.12)**	*(0.04)**	*(0.02)*	*(0.02)*	*(0.15)*	*(0.06)**	*(0.03)*	*(0.03)*
Dailyfd x Yrs of ICDS operation	0.01	0.01	0.02	0.03	-0.05	-0.02	0.02	0.03
	(0.05)	*(0.02)*	*(0.01)**	*(0.01)**	*(0.07)*	*(0.03)*	*(0.01)*	*(0.01)**
Dailyfd x Birth Weight					-0.92	-0.38	0.09	0.05
					(0.56)	*(0.22)*	*(0.15)*	*(0.17)*
Observations	5007	5007	5027	5027	1676	1676	1681	1681
R-squared	0.61	0.11	0.66	0.17	0.58	0.10	0.71	0.24
F test: dailyfd=dailyfd*X=0	2.48	2.60	1.91	2.61	1.29	1.42	0.74	1.04
Prob > F	0.03	0.02	0.09	0.02	0.26	0.20	0.62	0.40

	All children (birth weight not included)				Only children with birth weight[1]			
Girls 0-2 years	**Ht (cms)**	**HAZ**	**Wt (kgs)**	**WAZ**	**Ht (cms)**	**HAZ**	**Wt (kgs)**	**WAZ**
Daily supplementary feeding	1.65	0.60	0.81	0.79	-1.26	-0.64	0.37	0.45
	(2.02)	*(0.76)*	*(0.34*)*	*(0.35)**	*(3.88)*	*(1.48)*	*(0.60)*	*(0.61)*
Dailyfd x Household Size	-0.04	-0.02	-0.06	-0.06	0.31	0.11	0.00	0.00
	(0.15)	*(0.06)*	*(0.03)**	*(0.03)**	*(0.25)*	*(0.10)*	*(0.03)*	*(0.04)*
Dailyfd x Wealth Score	-0.40	-0.17	0.13	0.12	-1.33	-0.63	0.16	0.12
	(0.76)	*(0.30)*	*(0.15)*	*(0.15)*	*(1.08)*	*(0.43)*	*(0.18)*	*(0.19)*
Dailyfd x Mother's Education	0.05	0.02	0.01	0.02	0.17	0.09	0.01	0.03
	(0.11)	*(0.04)*	*(0.02)*	*(0.02)*	*(0.16)*	*(0.06)*	*(0.03)*	*(0.03)*
Dailyfd x Yrs of ICDS operation	-0.06	-0.02	-0.02	-0.01	-0.09	-0.03	0.01	0.02
	(0.05)	*(0.02)*	*(0.01)*	*(0.01)*	*(0.08)*	*(0.03)*	*(0.02)*	*(0.02)*
Dailyfd x Birth Weight					-0.03	-0.01	-0.18	-0.28
					(0.70)	*(0.27)*	*(0.17)*	*(0.17)*
Observations	4696	4696	4725	4725	1429	1429	1438	1438
R-squared	0.65	0.11	0.47	0.11	0.68	0.13	0.70	0.19
F test: dailyfd=dailyfd*X=0	1.75	1.89	2.62	3.33	2.30	2.24	0.56	1.18
Prob > F	0.12	0.09	0.02	0.01	0.03	0.04	0.77	0.32

Robust standard errors in parentheses; * significant at 5%; ** significant at 1%; Each column is a separate regression; *Dailyfd* signifies daily supplementary feeding; Prob > F is the p-value of the F-test: Dailyfd=Dailyfd*X=0 where X is each of the interacted regressors; [1]Birth weight is available only for 25% of the rural sample children and the model has been estimated only for children for whom birth weight is reported;

Table 1.11: OLS: Effect of various components of ICDS program on nutritional status of children 0-2 years

Boys 0-2 years	Height in cms		Height Z-score		Weight in kgs		Weight Z-score	
Daily supplementary feeding	0.39	0.56	0.17	0.24	0.08	0.14	0.10	0.16
	(0.40)	*(0.46)*	*(0.18)*	*(0.20)*	*(0.08)*	*(0.09)*	*(0.09)*	*(0.10)*
Monthly health check-up		-0.23		-0.07		-0.09		-0.08
		(0.44)		*(0.19)*		*(0.07)*		*(0.08)*
Immunisation received		-0.17		-0.09		-0.01		-0.04
		(0.31)		*(0.13)*		*(0.06)*		*(0.07)*
Regular early child-care		0.02		0.07		-0.06		0.01
		(0.70)		*(0.27)*		*(0.15)*		*(0.17)*
Observations	5702	5615	5702	5615	5727	5639	5727	5639
R-squared	0.61	0.61	0.10	0.11	0.66	0.66	0.17	0.17

Girls 0-2 years	Height in cms		Height Z-score		Weight in kgs		Weight Z-score	
Daily supplementary feeding	0.96	1.10	0.40	0.45	0.14	0.20	0.18	0.22
	*(0.40)**	*(0.44)**	*(0.15)***	*(0.17)***	*(0.09)*	*(0.09)**	*(0.09)**	*(0.10)**
Monthly health check-up		-0.08		-0.02		-0.04		-0.01
		(0.34)		*(0.14)*		*(0.07)*		*(0.08)*
Immunisation received		0.02		-0.02		-0.04		-0.05
		(0.26)		*(0.11)*		*(0.06)*		*(0.06)*
Regular early child-care		-0.13		-0.06		0.02		0.03
		(0.62)		*(0.23)*		*(0.18)*		*(0.19)*
Observations	5333	5245	5333	5245	5364	5276	5364	5276
R-squared	0.65	0.65	0.10	0.10	0.48	0.48	0.11	0.11

Robust standard errors in parentheses * significant at 5%; ** significant at 1%; Each column is a separate regression; Each of the specification contains the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

1.A Appendix

Table 1.A.1: Types of services provided by the ICDS program

ICDS Services	**Target Group**	**Service Providers**
Supplementary Nutrition	Children <6yrs, Pregnant and lactating mothers (PLM)	Anganwadi Workers (AWW) and Anganwadi Helper (AWH)
Immunization*	Children <6yrs, PLM	Auxilary Nurse Midwife (ANM)/ Medical Officer (MO)
Health Check-ups*	Children <6yrs, PLM	ANM/MO/AWW
Referral	Children <6yrs, PLM	AWW/ANM/MO
Pre-School Education	Children 3-6 years	AWW
Nutrition and Health Education	Women (15-45 years)	AWW/ANM/MO

Source: Ministry of Woman and Child Development, Government of India; * AWW assists ANM in identifying and mobilizing the target group;

Table 1.A.2: Daily energy requirement in Kcal/d and provision by ICDS for children below 2 years

Months	Calorie requirements	Average breastmilk energy intake	Energy requirements from complementary foods	K cal/d provided by ICDS	Percentage provided by ICDS
6-8	615	413	200	300	150%
9-11	686	379	300	300	100%
12-23	894	346	550	300	55%

Source: The figures for total energy requirements of healthy, breastfed infants have been taken from Dewey et al. (2003) and for average breast milk energy intake have been taken from Brown et al. (1998).

Table 1.A.3: Daily energy requirement in Kcal/d and provision by ICDS for children above 2 years

Years	Kcal/d provision by ICDS	Boys		Girls	
		Energy requirements	Percentage provided by ICDS	Energy requirements	Percentage provided by ICDS
2-3	300	1125	27%	1050	29%
3-4	300	1250	24%	1150	26%
4-5	300	1350	22%	1250	24%
5-6	300	1475	20%	1325	23%

Source: Information on daily energy requirements has been taken from *FAO Food and Nutrition Technical Report Series 1, 2001: Human Energy Requirements*.

Table 1.A.4: Daily recommended intake of protein and provision through ICDS

Age	Recommended Protein (grams/day)	ICDS provision	Percentage provided by ICDS
0-6 months	9.1	8-10	99%
7-12 months	13.5	8-10	67%
1-3 years	13	8-10	69%
4-6 years	19	8-10	47%

Source for recommended protein intake - *http://www.dietaryfiberfood.com/protein-requirement.php* - last accessed on July 15, 2011

Table 1.A.5: Types of supplementary foods given to children under ICDS

State	**6-35 months**	**3-6 years**
Uttar Pradesh	Take-home Supplements: Panjiri/Weaning Food (wheat, soya and rice flour, sugar).	Ready-to-Eat: AREF/ Panjiri/ Murmura (wheat flour, soya flour, malt ragi flour, sugar, vitamin and proteins pre-mix).
Rajasthan	Take-home Supplements: Baby Mix (wheat, soya, sugar, edible oil, rice, vitamin and minerals pre-mix).	Ready-to-Eat: Murmura (wheat flour, soya flour, edible oil, vitamin and minerals pre-mix) sweet or salty in alternate months.
Maharashtra	Take-home Supplements: Sanjeevani Powder (soyabean powder, wheat, soya milk).	Cooked meal: Khichdi/ dalia/ chana on alternate days.
Chhattisgarh	Take-home Rations: Wheat dalia, salt, oil, gur.	Cooked meal: Dalia (wheat soya blend); puris or halwa on special occasions.
Himachal Pradesh	Take-home Rations: Rice, moong dal and ghee for khichdi; chana, whole milk powder, sugar and dalia.	Cooked meal: Khichdi/ dalia/ chana (or sprouted grams) on alternate days. Kheer on special occasions.
Tamil Nadu	Take-home Rations: Sattu (fortified health powder containing ragi, wheat, jaggery, bengal gram and groundnut).	Cooked meal: Rice with dal and vegetables every day, and an egg once a week.

Source: FOCUS (2006) Report

Table 1.A.6: OLS: Effect of daily supplementary feeding on anthropometric measures of children 3-5 years by gender

		Boys 3-5 years								Girls 3-5 years							
		Height in cms		**Height Z-score**		**Weight in kgs**		**Weight Z-score**		**Height in cms**		**Height Z-score**		**Weight in kgs**		**Weight Z-score**	
	Specification	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2	Coeff	R2
A	No control	1.52	0.00	0.15	0.00	0.34	0.00	0.10	0.00	1.35	0.00	0.16	0.00	0.19	0.00	0.05	0.00
		*(0.31)***		*(0.05)**		*(0.09)***		*(0.04)**		*(0.33)***		*(0.07)**		*(0.08)**		*(0.05)*	
B	+Child	0.30	0.42	0.08	0.02	0.05	0.27	0.06	0.02	0.42	0.37	0.11	0.02	-0.02	0.21	0.02	0.02
		(0.23)		*(0.06)*		*(0.07)*		*(0.04)*		*(0.26)*		*(0.07)*		*(0.07)*		*(0.04)*	
C	+MothSES	0.20	0.45	0.05	0.07	0.02	0.31	0.04	0.09	0.37	0.39	0.10	0.06	-0.03	0.25	0.01	0.08
		(0.22)		*(0.06)*		*(0.07)*		*(0.04)*		*(0.26)*		*(0.06)*		*(0.07)*		*(0.04)*	
D	+Environ	0.13	0.45	0.03	0.07	0.03	0.31	0.04	0.09	0.24	0.39	0.06	0.07	-0.06	0.25	-0.01	0.09
		(0.23)		*(0.06)*		*(0.07)*		*(0.04)*		*(0.27)*		*(0.07)*		*(0.07)*		*(0.04)*	
E	+SpHhead	0.13	0.45	0.03	0.07	0.03	0.31	0.04	0.09	0.21	0.39	0.06	0.07	-0.06	0.25	-0.01	0.09
		(0.23)		*(0.06)*		*(0.07)*		*(0.04)*		*(0.27)*		*(0.07)*		*(0.07)*		*(0.04)*	
F	+State / All controls	0.05	0.46	0.01	0.09	0.05	0.33	0.05	0.12	-0.06	0.41	0.00	0.09	-0.08	0.26	-0.03	0.11
		(0.25)		*(0.06)*		*(0.07)*		*(0.04)*		*(0.30)*		*(0.07)*		*(0.07)*		*(0.05)*	
G	*Cluster(state) SEs*	*(0.30)*		*(0.08)*		*(0.09)*		*(0.06)*		*(0.19)*		*(0.05)*		*(0.07)*		*(0.04)*	
H	*Cluster(village) SEs*	*(0.25)*		*(0.06)*		*(0.07)*		*(0.04)*		*(0.30)*		*(0.07)*		*(0.07)*		*(0.05)*	
	Observations	8014		8014		8028		8028		7373		7373		7399		7399	

Robust standard errors in parentheses * significant at 5%; ** significant at 1%; Each coefficient is from a separate regression; Each of the specification terms specifies the following controls: *Child* - age of child in months, age square, age cube, birth interval, birth order; *MothSES* - mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion; *Environ* - source of drinking water, toilet facility, cooking fuel; *Sphhead* - spouse's age, spouse's education, household head's age, household head's education; *State* - state dummies; *All controls* - all the controls together. Each specification contains the controls that it specifies plus all the controls above it. For eg. *MothSES* would contain the controls it signifies plus the controls specified in *Child*; *Cluster(state) SEs* indicate standard errors with clustering at state level; *Cluster(village) SEs* indicate standard errors with clustering at village level.

Table 1.A.7: PROBIT: Determinants of Girl 0-2 years getting daily supplementary feeding. Base - only children receiving daily supplementary feeding

Regressors	**Coef**	**SE**
Age in months	-0.05	(0.05)
Birth Interval (months)	0.01	(1.27)
Birth order	-11.68	(22.69)
Mother's age (years)	15.07	(9.11)
Mother's edu (years)	5.20	(7.81)
Mother's BMI	-4.50	(9.99)
Spouse's age (years)	-10.85	(6.55)
Spouse's edu (years)	-1.48	(8.84)
Hh head age	1.24	(2.02)
Hh head edu	4.37	(8.51)
Wealth index	-2.04	(59.53)
Caste - Sch caste / tribe	0.04	(0.07)
Caste - OBC	0.03	(0.08)
Religion - Hindu	-0.09	(0.11)
Religion - Muslim	-0.05	(0.14)
Water - Piped water	0.03	(0.08)
Water - tubewell	0.01	(0.07)
Toilet - Others	0.18	(0.11)
Toilet - No facility	-0.02	(0.08)
Cooking fuel - Wood	0.11	(0.06)
Observations	656	
Pseudo R-squared	0.05	
Wald chi2(46)	40	
Prob $>$ chi2	0.74	

Robust standard errors in parentheses * significant at 5%; ** significant at 1%; State coefficients not presented here; Coefficients indicate marginal effects; Covariates like birth interval, birth order, mother's age, mother's education, mother's BMI, spouse's age, spouse's education, household head's age and household head's education have been rescaled by multiplying with 10^{-3} to obtain non-zero marginal effects.

Table 1.A.8: Probit: Effect of daily supplementary feeding on incidence and severity of morbidity

Disease	**0-2 years**	**3-5 years**
Diarrhea	0.018	-0.003
	(0.02)	*(0.01)*
Obs	*11088*	*15415*
Fever	0.014	0.023
	(0.02)	*(0.01)**
Obs	*11089*	*15411*
Cough	0.031	0.021
	(0.02)	*(0.01)*
Obs	*11090*	*15405*
Severe diarrhea	0.001	-0.004
	(0.00)	*(0.001)**
Obs	*11087*	*15412*
Severe cough	0.014	0.007
	(0.02)	*(0.01)*
Obs	*11065*	*15405*

Robust standard errors in parentheses * significant at 5%; ** significant at 1%; Coefficients indicate marginal effects; Each of the specification contains the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies. For incidence of severe diarrhea and severe cough states were grouped into regions.

Table 1.A.9: OLS: Effect of supplementary feeding daily on anthropometric status of 0-2 age children controlling for unobservables like mother's motivation and fair treatment of girls

	Boys 0-2 years			Girls 0-2 years		
	Simple OLS	Effect of dead child	Fair treatment	Simple OLS	Effect of dead child	Fair treatment
Height in cms	0.39	0.39	0.48	0.96	0.98	0.97
	(0.40)	*(0.40)*	*(0.41)*	*(0.40)**	*(0.40)**	*(0.40)**
Height Z-score	0.17	0.17	0.21	0.40	0.40	0.40
	(0.18)	*(0.18)*	*(0.18)*	*(0.15)***	*(0.15)***	*(0.15)***
Weight in kgs	0.08	0.08	0.09	0.14	0.14	0.13
	(0.08)	*(0.08)*	*(0.08)*	*(0.09)*	*(0.09)*	*(0.09)*
Weight Z-score	0.10	0.10	0.10	0.18	0.18	0.17
	(0.09)	*(0.09)*	*(0.09)*	*(0.09)**	*(0.09)**	*(0.09)*

Robust standard errors in parentheses * significant at 5%; ** significant at 1%; Each coefficient is from a separate regression; Each of the specification contains the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 1.A.10: OLS: Bounds on effect of daily supplementary feeding on boys and girls 0-2 years due to infant mortality

		All dead rcvg dailyfd[1]		All dead not recvg dailyfd[2]		Assign with probit reg[3]	
Boys 0-2 years	Simple OLS	Lower	Upper	Lower	Upper	Lower	Upper
Height in cms	0.39	-5.09	4.26	0.06	0.61	-0.37	1.73
	(0.40)						
Height Z-score	0.17	-2.59	1.87	0.03	0.26	-0.13	0.74
	(0.18)						
Weight in kgs	0.08	-0.61	0.86	0.00	0.14	-0.09	0.38
	(0.08)						
Weight Z-score	0.10	-1.03	1.06	0.00	0.16	-0.08	0.43
	(0.09)						
		All dead rcvg dailyfd[1]		All dead not recvg dailyfd[2]		Assign with probit reg[3]	
Girls 0-2 years	Simple OLS	Lower	Upper	Lower	Upper	Lower	Upper
Height in cms	0.97	1.38	5.30	0.64	1.23	0.25	2.04
	*(0.40)**						
Height Z-score	0.40	1.11	2.67	0.27	0.49	0.15	0.84
	*(0.15)***						
Weight in kgs	0.14	-0.22	0.68	0.06	0.21	-0.05	0.36
	(0.09)						
Weight Z-score	0.18	-0.01	1.07	0.09	0.26	-0.03	0.43
	*(0.09)**						

Robust z-statistics in parentheses * significant at 5%; ** significant at 1%; [1]*All dead rcvg dailyfd* - indicate that all children who have died are assigned to group receiving daily supplementary feeding; [2]*All dead not recvg dailyfd* - indicate that all children who have died are assigned to group not receiving daily supplementary feeding; [3]*Assign with probit reg* - indicate that the children who have died are assigned into group receiving daily supplementary feeding if the estimated probability of receiving it was above 0.1 using probit regression; Each of the specification contains the following controls: age of child in months, age square, age cube, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 1.A.11: OLS and CVM: Effect of daily supplementary feeding on boys and girls 0-2 years in major states

Boys 0-2 years	OLS	Covariate Matching			
		One match	Three match	Five match	Total Obs
Height in cms	0.91	2.25	2.10	1.99	820
	(0.67)	*(0.83)***	*(0.99)**	*(0.98)**	
Height Z-score	0.40	1.01	0.92	0.86	820
	(0.30)	*(0.27)***	*(0.35)***	*(0.35)***	
Weight in kgs	0.15	0.44	0.35	0.29	824
	(0.11)	*(0.17)**	*(0.18)**	*(0.18)*	
Weight Z-score	0.19	0.50	0.41	0.35	824
	(0.13)	*(0.16)***	*(0.15)***	*(0.15)**	
Girls 0-2 years	OLS	Covariate Matching			
		One match	Three match	Five match	Total Obs
Height in cms	0.61	1.72	1.58	1.52	763
	(0.67)	*(1.03)**	*(0.94)**	*(0.92)**	
Height Z-score	0.28	0.74	0.65	0.63	763
	(0.27)	*(0.29)**	*(0.27)**	*(0.27)**	
Weight in kgs	0.06	0.11	0.15	0.14	769
	(0.12)	*(0.19)*	*(0.18)*	*(0.18)*	
Weight Z-score	0.10	0.17	0.21	0.20	769
	(0.13)	*(0.15)*	*(0.14)*	*(0.14)*	

Robust standard errors in parentheses * significant at 5%; ** significant at 1%.; Major states are those in which 15% or more children 0-2 years receive daily supplementary feeding - Himachal Pradesh, Mizoram, West Bengal, Maharashtra, Tamil Nadu; Each of the specification contains the following controls: age of child in months, age square, age cube, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 1.A.12: OLS: Changing program participation measure

	Boys 0-2 yrs			***Girls 0-2 yrs***		
	Dailyfd	Somefd	Wklyfd	Dailyfd	Somefd	Wklyfd
Height in cms	0.39	0.26	0.66	0.96	0.16	0.07
	(0.40)	*(0.27)*	*(0.40)*	*(0.40)**	*(0.24)*	*(0.35)*
Obs	5702	5702	5702	5333	5333	5333
Height Z-score	0.17	0.10	0.26	0.40	0.07	0.02
	(0.18)	*(0.11)*	*(0.16)*	*(0.15)***	*(0.10)*	*(0.14)*
Obs	5702	5702	5702	5333	5333	5333
Weight in kgs	0.08	0.01	0.13	0.14	-0.08	-0.20
	(0.08)	*(0.05)*	*(0.08)*	*(0.09)*	*(0.06)*	*(0.08)**
Obs	5727	5727	5727	5364	5364	5364
Weight Z-score	0.10	0.02	0.11	0.18	-0.07	-0.19
	(0.09)	*(0.05)*	*(0.09)*	*(0.09)**	*(0.06)*	*(0.09)**
Obs	5727	5727	5727	5364	5364	5364

Robust standard errors in parentheses * significant at 5%; ** significant at 1%.; *dailyfd* indicates a specification in which dummy variable is equal to one when a child receives daily supplementary feeding; *Somefd* indicates a specification in which the dummy variable is equal to one when a child receives daily, weekly or monthly feeding; *Wklyfd* indicates coefficient on the dummy variable equal to one when a child receives weekly feeding. In this specification there is a separate dummy variable for children receiving daily supplementary feeding; Each of the specification contains the following controls: age of child in months, age square, age cube, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 1.A.13: Difference-in-Difference with children aged $>$ 36 to 59 months as comparison group

		Covariate Matching		
Boys 0-2 years	**OLS**	**5 match**	**3 matches**	**1 matches**
Height in cms	0.43	0.88	1.33	2.03
	(0.51)	*(0.71)*	*(0.72)*	*(0.72)*
Height Z-score	0.18	0.38	0.56	0.78
	(0.19)	*(0.21)*	*(0.22)*	*(0.22)*
Weight in kgs	0.04	0.08	0.20	0.46
	(0.11)	*(0.16)*	*(0.16)*	*(0.17)*
Weight Z-score	0.05	0.13	0.23	0.44
	(0.10)	*(0.11)*	*(0.12)*	*(0.13)*
Girls 0-2 years		Covariate Matching		
		5 match	**3 matches**	**1 matches**
Height in cms	1.35	2.42	2.58	2.60
	*(0.54)**	*(0.77)*	*(0.81)*	*(0.80)*
Height Z-score	0.48	0.77	0.81	0.82
	*(0.18**)*	*(0.20)*	*(0.21)*	*(0.21)*
Weight in kgs	0.25	0.27	0.27	0.29
	*(0.13)**	*(0.16)*	*(0.16)*	*(0.17)*
Weight Z-score	0.23	0.22	0.24	0.25
	*(0.11)**	*(0.11)*	*(0.11)*	*(0.12)*

* significant at 5 %; ** significant at 1%; Robust standard errors in parentheses; For difference-in-difference estimates using covariate matching method the standard errors have been calculated using square root of sum of variance of beta coefficients for 0-2 and 4-5 (¿36-59 months) age-groups

Table 1.A.14: OLS and CVM: Effect of daily supplementary feeding on boys and girls 0-2 years - excluding outliers

		Covariate Matching	
Boys 0-2 years	**OLS**	**1 match**	**3 matches**
Height in cms	0.16	0.41	0.10
	(0.28)	*(0.43)*	*(0.46)*
Height Z-score	0.03	0.14	0.02
	(0.11)	*(0.13)*	*(0.13)*
Weight in kgs	0.01	0.15	0.05
	(0.08)	*(0.11)*	*(0.11)*
Weight Z-score	-0.01	0.15	0.04
	(0.08)	*(0.10)*	*(0.09)*

		Covariate Matching	
Girls 0-2 years	**OLS**	**1 match**	**3 matches**
Height in cms	0.73	1.17	0.79
	*(0.32)***	*(0.52)***	*(0.55)*
Height Z-score	0.27	0.42	0.29
	*(0.12)***	*(0.14)****	*(0.13)***
Weight in kgs	0.15	0.24	0.15
	(0.09)	*(0.12)***	*(0.13)*
Weight Z-score	0.15	0.24	0.15
	(0.09)	*(0.09)***	*(0.09)*

* significant at 10%; ** significant at 5%. *** significant at 1%; Robust standard errors in parentheses; Each of the specification contains the following controls: age of child in months, age square, age cube, birth order, mother's education in years, mother's age in years, mother's BMI, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Chapter 2

Public preschooling and maternal labor force participation in rural India

2.1 Abstract

Mothers from poor families in India have a compelling need to work, but childcare for their young children is a constraint. This paper examines how far the public daycare helps in loosening this constraint. To do this, I look at the effect on maternal labor force participation, of daycare implicit in the preschooling provided to young children, through India's largest child development program - Integrated Child Development Scheme (ICDS). Besides preschooling, the ICDS program provides a whole package of other services, including supplementary feeding and immunization. Because of these services, I examine the various pathways through which the benefits on maternal employment can accrue: release of mother's time from child supervision, improvement in health of young children and implicit income subsidy. For the analysis, I primarily use data from the recent demographic health survey data for 2005-6, which for the first time collected information on child level usage of ICDS services. Using probit, covariate matching and conditional logit (village-

fixed effects), I find that the mother, whose child is receiving highly correlated services of regular preschooling or daily supplementary feeding, is 12% more likely to work in rural India. This effect is being driven mainly by the rural Central, where such mothers are 25% more likely to work. There is some evidence of positive effect in the rural South also. The investigation of mechanisms provides no support for those related to health benefits of daily supplementary feeding, or its implicit income subsidy. It seems that the effect is being driven mainly by daycare implicit in preschooling. There is also some evidence of health benefit mechanism through immunization received at the ICDS center. Further examination suggests lack of support for self-selection by mother into daycare, because the children receiving regular feeding (highly correlated with daycare) are not anthropometrically better, and there is evidence of possible caste based discrimination against children from scheduled castes families in access to preschooling.

2.2 Introduction

National policy for empowerment of women (2001) and National plan for children (2005) in India emphasize the importance of childcare facilities for effective participation of women in the development process and for essential care and protection of children while mothers work. Moreover, for mothers belonging to poor families, child care support is more of a necessity to cope with multiple activities within and outside home. Recognizing this critical need, the Act for India's biggest job guarantee program for poor rural families (National Rural Employment Guarantee Scheme (NREGA)) stipulates to provide basic facilities such as crèche for women workers at the work site (GOI (2006)). Recently government of India has decided to construct NREGA crèche facilities with the Anganwadi centers in India.

Anganwadi centers are the main platform of delivery of services for India's biggest early childhood development program called the Integrated Child Development Scheme (ICDS). While the program provides various services, an important part of the program is provision of non-formal preschool education to children ages 3-6 years at the Anganwadi centers free of charge. There are currently more than one million such centers where the children are supposed to come for around three hours of daily activity, thereby releasing mothers from supervision time to engage in other activities. In this paper I look at the "indirect" or "unintended" benefits of the daycare implicit in preschooling provided by the ICDS program on the maternal labor force participation in rural India.

To my knowledge this is the first study which looks at the impact of fully subsidized public preschooling on the maternal labor force participation in India, and one of the few which focuses on developing countries. There are two big challenges for this study. Firstly, the program not only provides preschooling, but also a whole package of other services including supplementary nutrition, immunization and health check-ups. This makes it difficult to disentangle the effect of preschooling alone. Secondly, only non-experimental data is available for the analysis, with inherent difficulty in controlling for selection on unobservables. For the main analysis I use the latest round of demographic health survey data for India - National Family Health Survey3 for 2005-6 - which for the first time collected information on utilization of the ICDS program services at the child level. I further substantiate my findings with another data set - Time Use Survey 1998-99 - which has detailed time use information of women through 24 hour recall.

In non-experimental survey data, the children who are receiving various ICDS services have not been selected randomly. To "identify" the effect of preschooling, observable differences between the women, whose child is receiving preschooling and those whose child is not, need to be accounted for. To do this I start with probit with controls. To minimize the selection bias on observables that may remain with simple technique like probit, because

of misspecification in functional form, I then use matching technique like covariate matching. This technique also helps in better balance of unobservables to the extent that they are correlated with observables. To further control for unobservables, like the local market conditions and village infrastructure such as roads, village-fixed effects using conditional logit is estimated. To disentangle the effect of preschooling from other ICDS services, the highly collinear preschooling and supplementary feeding components are combined and so are less frequent services like immunization and health check-ups. I also bundle up the whole package of ICDS services together to examine their combined effect on maternal employment. The whole analysis is carried out for rural India and five rural regions, formed from a combination of geographically contiguous states and similar maternal employment rates.

The results indicate that having a child below 5 years, who is receiving either regular preschooling or daily supplementary feeding, increases maternal labor supply by 4 percentage points in rural India which is a 12% increase from the base level. The effect seems to be driven by the rural Central, comprising of Rajasthan, Chattisgarh and Madhya Pradesh. In this region, the estimates indicate an increase of maternal employment by 12 percentage points (a 25% increase over the base level). There is some evidence of positive effect in the rural South also. For the mothers, whose child receives any of the ICDS services intensely, have a 6 percentage points higher employment (a 17% increase over the base) in rural India. These results seem to be driven by the rural East, where there is a 8 percentage points increase in maternal employment (a 29% increase over the base).

The impact that I find is consistent with evidence from developed countries that maternal employment is largely responsive to provision of subsidized daycare or reduction in child care costs. However, unlike the evidence from developed countries, the effect is not bigger for regions with lower maternal employment. The only region for which the impact is robust is the rural Central, which has the highest maternal employment of 48%

in rural India and is also among the poorest.[1] The low elasticity of female labor supply to economic growth or income in India is well documented (Bhalla and Kaur (2011), Mukhopadhyay and Tendulkar (2006), Srivastava and Srivastava (2010)). In India the labor supply is highest for the poorest women, especially those from the most marginalized sections like scheduled castes and scheduled tribes, for whom work is a compulsion and not a choice. On the other hand, the women from the higher caste or richer economic groups are significantly less likely to work (Eswaran et al. (2009)), especially in rural areas.

I further examine the mechanisms responsible for these effects: improved health of the children because of immunization and supplementary feeing, income subsidy implicit in supplementary feeding and daycare releasing mothers from child supervision to engage in other activities. I find support for health benefit of immunization and for potential positive daycare effect, but no support for health benefit mechanism of daily supplementary feeding or implicit income subsidy.

The results indicate that in the rural East, where the effect of immunization is significant, children aged 3-5 years who are fully immunized and received most vaccinations at the ICDS center are 29% less likely to have diarrhea. In my previous paper (Jain, 2012) I find that daily supplementary feeding effects positively only the height of children in the age-group 0-2 years and not of those ages 3-5. If the effect of having a child receiving daily supplementary feeding on maternal employment runs through the health benefits of supplementary feeding, then I should find positive effects for mothers whose youngest child is below 2 years, but not for those whose youngest child is 3-5 years. However, I do not find this to be the case, and in fact the opposite, suggesting positive effect of daycare. Moreover, my calculations indicate that the income subsidy through daily supplementary feeding is too small in magnitude to have a significant effect on maternal employment.

[1] In 2004-05 in rural Chattisgarh, Madhya Pradesh and Rajasthan, 40.8%, 36.9% and 18.7% population respectively was below poverty line (GoI (2007)).

There is further evidence in support of potential positive daycare effect. Findings from time-use of mothers indicate that mothers of children below 5 years on average spend around 2 hours on childcare, and working mothers spend around 30 minutes less than non-working mothers. Two main components of childcare are physical care of children (bathing, dressing and feeding) and their supervision, which could be substituted by day-care to a certain extent. And with that time the mothers could potentially earn around 72% of average monthly expenditure on one household member, which is a significant amount, especially for those from poor families.

Further, there is evidence against endogeneity of participation or self-selection by mothers. Children above 2 years of age (mostly preschool age children), who are receiving daily supplementary feeding from the ICDS centers, are not anthropometrically healthier than those who are not (Jain, 2012). As the receipt of regular feeding is highly correlated with regular preschooling, it does not seem as if more motivated mothers are accessing daycare. Moreover, it seems that there is caste based discrimination in access to preschooling. A scheduled caste child is more likely to receive various ICDS services, but not preschooling, which puts children from different caste groups in close proximity of each other for an extended period of time. This finding is consistent with recent evidence (Shah, 2006) which indicates that the ancient practice of untouchability, in which physical contact with the scheduled castes is prohibited, continues to be practiced in some form or other in 80% of rural Indian villages and extends to all spheres of life, including access to public services.

I also find no evidence of selection bias with placebo test of impact of ICDS services on the height of mothers.

The remainder of the paper is organized as follows. Section 2.3 briefly summarizes the literature on daycare and labor supply of women. Section 2.4 gives a description of the ICDS program and the potential mechanisms of reduction in child care costs. Section 2.5 discusses the empirical strategy. Section 2.6 describes the data used in the analysis. Section

2.7 presents the empirical results, Section 2.8 summarizes and discusses the results, and Section 2.9 concludes.

2.3 Evidence on daycare and labor supply of women

The literature related to the effects of subsidized child care on female labor supply is mainly focused on developed countries, including US, Sweden and Canada (Heckman (1974), Blau and Robins (1988), Gustafsson and Stafford (1992), Gelbach (2002), Baker et al. (2008), Cascio (2009) and Fitzpatrick (2010)). Most studies find a significant positive maternal labor supply response to reduction in child care prices. However, the effects are not uniform across mother characteristics, location and time. Gelbach (2002) using quarter of birth as an instrument for enrollment in kindergarten in 1980 in US, found that single mothers of five-year olds enrolled into free public schooling, increased their labor supply measures by between 6-24%, and for married mothers of five-year olds between 6-15%. Cascio (2009) using the timing of large increases in public funding of kindergartens in US (which largely occurred in the 1960s and 1970s), found a 12% increase in the employment of single mothers, but not of married mothers. Fitzpatrick (2010) using regression discontinuity, with US Decennial Census 2000 data, found no robust impact of universal pre-kindergarten availability on maternal labor supply. She explains that her results are consistent with recent findings that female labor supply elasticities have declined over time (Blau and Kahn (2007)). She notes that the reason may be the change in the population of women working over time. The baseline rates of maternal employment have changed from between 17% and 55% (20 to 40 years ago) in the previous US literature to 77% in her study. Baker et al. (2008) studies impact of "$5 per day childcare" program introduced in the late 1990s for all children under 5 years of age in Quebec, Canada. Using difference-in-difference approach across Canadian provinces before and after the program began, they find a statis-

tically significant and sizable increase in employment of married mothers by 7.7 percentage points.

For developing countries the literature on effect of subsidized daycare on maternal employment is pretty limited. Most daycare programs are typically part of the early child development programs, like in the case of India. Few evaluations which are available, mainly focus on the impact of such programs on the health of child (Attanasio and Vera-Hernández (2004), Behrman et al. (2004)), and a few on the impact on maternal labor supply. Attanasio and Vera-Hernández (2004) analyzed a child care program, Hogares Comunitarios de Bienestar Familiar, in rural Colombia, for poor households. Using distance of the household from the program center as IV, they find that for the women, whose children participated in the program, increased their employment by 12-37 percentage points. Other studies in this area have mainly looked at the effect of childcare costs on maternal employment and they found a negative effect for Kenya (Lokshin et al. (2004)) and Romania[2] (Lokshin and Fong (2006)). For Guatemala urban slums, Hallman et al. (2005) found that child care costs did not effect mother's labor force participation rate, but hours decreased with higher formal day care prices. Quisumbing et al. (2007) found for urban areas in Greater Accra (Ghana) and Guatemala city, that distance to daycare centers and its fee do not significantly affect earnings of mothers.

For developed countries it seems that maternal employment is largely responsive to reduction in daycare prices, though its becoming less responsive in recent times because of high baseline maternal employment rates. For developing countries also, the limited evidence indicates generally the same pattern, but less so in urban areas. Besides the Colombia study, there are almost no evaluations of effect of public daycare or subsidized daycare on maternal labor supply for developing countries, and this study aims to alleviate this gap.

[2]Romania is a developing upper-middle income country.

2.4 The ICDS program services and their impact on child care costs

The ICDS program was launched in 1975, and since then it has expanded and matured from 33 blocks to 6,284 blocks in India and now has more than one million centers. In 2009-10 the ICDS program was allocated a budget of 1.5 billion USD (Rs 6.7 billion). The program offers various services, from supplementary nutrition to health check-ups to preschooling to immunization, as detailed in Appendix Table 3.A.1. These services are supposed to be delivered in an integrated manner at the anganwadi, or childcare center, located within the village itself. Each center is run by an anganwadi worker (AWW) and one helper (AWH), who undergo three months of institutional training and four months of community-based training.

While the flagship component of the ICDS program is provision of supplementary nutrition to children 0-6, the preschooling component is also important. The preschooling is provided at the Anganwadi itself along with supplementary nutrition to children ages 3-6 years.[3] It is supposed to be provided for 28 days in a month for a duration of around three hours daily. While the supplementary nutrition and preschooling components are the core services provided exclusively through the ICDS program, the immunization, health check-up and referral services are delivered in collaboration with the public health officials. The Anganwadi worker helps the public health officials in identification and mobilization of the target group of children and mothers for immunization and health check-up.

As the ICDS program provides various services, the program can reduce child care costs through several mechanisms and their combinations:

1. Increase in household resources because of implicit income subsidy through supple-

[3]Children below age three receive "take home rations" that last for a week or a month depending on the frequency of distribution.

mentary nutrition.

2. Provision of supplementary nutrition and immunization is likely to have positive health benefits on children, which can reduce morbidity and mortality, leading to reduction in resources and time required for child care. Healthier young children can also have positive externalities on the health of older children, further reducing child care costs.

3. Time spent in Anganwadis for preschooling releases the mothers from supervision duties and allows them to engage in other activities.

Because of the above mechanisms, I would be analyzing the impact of all ICDS services directly provided to the young children.

2.5 Empirical Strategy

To analyze the impact of each of the ICDS services received by the children below 5 years on maternal employment, I estimate the following probit regression equation for married women who have at least one child below 5 years:

$$lfp_i = \alpha Presch_i + \beta Dailyfd_i + \gamma Mhcheck_i + \delta Immun_i + \eta X_i + \lambda_i + u_i \qquad (2.1)$$

where lfp_i is a dummy variable with value one for a woman who reports working in the last seven days. $Presch_i$ is a dummy variable with the value one for a woman with at least one child who received *regular* preschooling/early childhood care through ICDS. $Dailyfd_i$ is a dummy variable with the value one for a woman with at least one child who received *daily* supplementary nutrition through ICDS. $Mhcheck_i$ is a dummy variable with the value one for a woman with at least one child who received *monthly* health check-up

through ICDS. $Immun_i$ is a dummy variable with the value one for a woman with at least one child who received most vaccinations at the ICDS center. X_i is a vector of control variables composed of the *children characteristics*: age of the youngest child in years, age-square, age-cube, number of below 5 years children, fraction of below 5 years children who are stunted, number of children 6-18 years, number of children above 18 years;[4] *mother specific characteristics*: mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage; *spouse specific characteristics*, that is spouse's age, spouse's education; *household head specific characteristics*, or household head's age and household head's education; *socio-economic characteristics,*[5] that is caste, religion; and *environmental factors* like water source, toilet facility, cooking fuel. α_i captures unobservable or observable but unaccounted state-specific[6] or village-specific fixed effects. u_i is an error term. α is the parameter of interest.

The above specification estimates the impact of each ICDS service controlling for receipt of other ICDS services by children below 5 years. However, because of likely collinearity between the receipt of various ICDS services, estimates can have lower precision. Therefore, to assess the impact of each ICDS service individually with higher precision, other specifications are also estimated in which the impact of each ICDS services is examined independently of other services. In another specification highly collinear services or similar frequency services are bundled together to improve precision of estimates. Also, to examine the impact of the package of ICDS services put together, another specification is estimated in which the mothers whose children are receiving different ICDS

[4]Separate information is provided in the survey on the children who stay at home and those who stay away from home. Therefore, separate variables were used to distinguish these two category children above 5 years of age.

[5]The information on religion and caste was collected both for household head and the woman herself. Mostly the two were equivalent. For the regressions I have used the information pertaining to the woman.

[6]For rural India as a whole some states were combined into two regions because of small sample size. One region contained Jammu&Kashmir, Himachal Pradesh, Uttaranchal, Delhi and Goa. Another region contained Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya.

benefits intensely are combined into one single variable called "Any ICDS intensely." This dummy variable takes the value one for the mother whose child received any of the following benefits: regular preschooling/early childhood care or monthly supplementary feeding or monthly health check-up or most vaccinations at the ICDS center; and zero otherwise.

I use non-experimental survey data in which the children who are receiving different ICDS services have not been selected randomly. Therefore, to "identify" the effect of ICDS services on maternal employment, I need to take account of the observable differences between the two groups of mothers, in order to get to the pure effect of ICDS services on likelihood of mother's employment. With probit, I can control for observable characteristics related to children and women with the addition of control variables X_i.

There also might be some unobserved factors (unobserved heterogeneity), or observed but unaccounted factors at the state level, like higher political commitment and/or better administrative structure, which could result in better provision of ICDS services and hence greater use of those services. Or, there might be income shocks at the state level that affect the number of women who go to the ICDS center. In such cases, the probit regression probably suffers from omitted variable bias. To account for within-state differences, I use state fixed-effects model which adds λ_i in the equation above. Similar rationale holds for carrying out village fixed-effects, which controls for village level unobservables such as local labor market conditions, or village infrastructure such as roads. In this case the λ_i in the equation accounts for village fixed-effects, which is estimated using conditional logit regression.

Unbalanced distribution of covariates could yield biased probit estimates because of their sensitivity to functional form. With covariate matching one seeks to better "balance out" the groups being compared in terms of their covariates. Also, if the observables are correlated with the unobservables, then one may be able to balance out the latter by doing a better job of balancing the former. Thus, I use covariate matching (CVM) to minimize the

selection bias on observables. In CVM, measures like the Mahalanobis distance are used to calculate the similarity of two women in terms of covariate values and the matching is done on these distances. This method, developed by Abadie and Imbens (2006), adjusts for bias when matching is not perfect, makes no assumption about functional form, and provides the standard errors for matching estimators.

2.6 Data

The data come from the National Family Health Survey (NFHS), a nationwide cross-section demographic health survey for India. So far three rounds have been conducted in the years 1992-3, 1998-9, and 2005-6. For this paper, I use the third round covering 2005-6, which provides detailed information for women ages 15-49, including their demographic characteristics, work status, reproductive behavior, and important aspects of nutrition and health care, including for children aged 0-5 years. It also collects the anthropometric measurements of height and weight for children 0-5 and women 15-49.

The sample size of women ages 15-49 is 124,385 out of which 67% reside in the rural areas, making up a rural women sample of 67,424. Currently married women[7] with at least one child 0-5[8] are the focus of the analysis with a sample size of 21,169.

The indicator for labor force participation status is whether or not the woman reports working in the last 7 days (including those on leave).[9] Around 34% rural women with at least one child below 5 years report currently working,[10] and there is variation across economic groups: the women from poorer families are more likely to work than those

[7] Women who are widows, divorced or separated form only 4% of the rural women sample

[8] 98% of the women with at least one child below 5 years are currently married.

[9] If the woman responded negatively to working in the last 7 days, they were probed if they worked for cash or kind for selling things, have a small business or worked on the family farm or in the family business in the last 7 days.

[10] Another 10% report working in the past 12 months but not currently.

from richer families (Figure 2.1). There is also wide inter-state variation in work force participation rates from 12% in Punjab to 54% in Chhatisgarh (Figure 2.2). Because of this wide variation in maternal employment, along with evidence of differences in performance of the ICDS across states (FOCUS (2006)), I also do the analysis at the regional level. Mostly on the basis of geographical contiguity and partly on the basis of percentage of women working with at least one below 5 years child, the states have been grouped into five rural regions: South&West, North, East, Northeast and Central (Table 3.A.2). The main limitation of the work related data is lack of information on wages or working hours of women, which precludes richer analysis.

One of the distinctive feature of the latest round of NFHS survey is the collection of information on utilization of various services of the ICDS program by women and children 0-5 in the household. For services which are directly benefiting the children below 5 years, the information on intensity of usage is also collected.[11] Among all these different ICDS services, immunization is the most accessible- 19% of children report receiving most of the vaccinations at the ICDS center (Figure 3.2).[12] The percentage is relatively similar across different age-groups. The percentage of young children receiving monthly health check-up through the ICDS is also high, and it increases with age of children, though rather slowly. For supplementary feeding and preschooling/early childhood care, the access is relatively lower and it picks up for older children, especially from 2 years onwards. In the NFHS-3 questionnaire the information on access and intensity of preschooling is collected with that on early childhood care. The preschooling component of ICDS is officially only for children from 3-6 years. It seems from the data that the question is most likely picking up

[11]For immunization of children, the information on "most vaccinations at the ICDS center" (the measure of intensity of immunization used in this paper) is collected in the section under vaccination of children. Therefore, unlike other ICDS services, the reference period for this information is not "last 12 months," but age of the child.

[12]The information in the figure is based on the youngest child. However, the overall trends and figures remain similar even if all the children in the various age-groups are taken.

information on preschooling as very low percentage of children below 2 years are going to ICDS center regularly for either "early childhood care (ECC)" or "preschooling." Significant regular ICDS attendance of children for either of these services is seen only starting at age of 24 months or 2 years and then it picks up substantially from 3 year onwards (Figure 3.2).

Summary statistics in Table 2.2 show that there are significant unconditional mean differences between characteristics of married women with at least one child below 5 years, who is going to the ICDS center regularly for preschooling/ECC, from those whose child is not. Compared to the woman with none of her children going to ICDS center regularly for preschooling/ECC, the one who does have such a child, is more likely to have her youngest child older in age, to be more educated, is taller, to have got married later, to be a Hindu and from schedule caste/tribe, to have drinking water coming from piped water and to be using wood as cooking fuel and living in states like West Bengal, Gujarat, Maharashtra or Karnataka. Similar differences in characteristics are also present between the women with and without at least one child who is receiving "Any ICDS intensely." In addition to these differences, those whose child is receiving "Any ICDS intensely," are also more likely to come from poorer households.

Additional dataset used in the paper is Time Use Survey (TUS) Data. This survey was canvassed during July 1998 to June 1999 with a sample size of 18600 households spread over six states namely, Haryana, Madhya Pradesh, Gujarat, Orissa, Tamil Nadu and Meghalaya. The survey estimates are representative at national and state level. Out of the total households interviewed, 12,750 were from rural areas with 53,981 respondents in total and 3675 women[13] with a child below 5 years. The TUS asked about the time use of all household members above 5 years during the previous 24 hours. Description of activities

[13]There are 4633 women with a child below 5 years, but only 3675 report spending positive time on childcare.

in the time diary section was open-ended and so was the time allocated to them, allowing for reporting of multiple (simultaneous) activities. I analyze time use of data corresponding to "normal" days only (excluding, for example, holidays).[14]

The main variable of interest is the amount of time spent on childcare by mothers 15-50 years with children below 5 years. I combine the time spent on all activities classified as childcare: physical care of children (washing, dressing, feeding); teaching, training and instruction of own children; accompanying children to places (schools, sports, lessons, doctor); supervising children needing care; and travel related to care of children. Some of the limitations of the data are that it is not possible to identify families or the child/children who are being taken care of in the data, and there is age and household expenditure heaping. To identify families, I use the information only on "children" of the household head; "grandchildren" if there is only one daughter/daughter-in-law; and children below 5 years categorized as "other relative" if there is only one adult women also categorized as "other relative." There is age heaping for adult women in the multiples of five. As for monthly per capita household expenditure (in rupees), there is heaping on multiple of 100s, especially in the range of 300-600.

2.7 Empirical Results

2.7.1 Probit and Conditional Logit

Table 2.3 presents specifications in which the different control variables are added cumulatively using probit regression for two types of women: those having at least one child below 5 years going to preschool and those whose child is receiving at least one of the

[14]Time-use information is collected on three type of days: normal, abnormal and weekly. Saturday and Sunday are generally reported as "weekly variant," and festival days or when someone is sick are "abnormal" days. All household members are interviewed for at least one normal day.

ICDS services intensely. These specifications are estimated to see how sensitive the point estimates are to the inclusion of different control variables. Figure 2.4 and Row A in Table 2.3 indicate that for women whose child is going for regular preschooling/ECC or receiving any of the ICDS services intensely, have a higher *unconditional* likelihood of working. For regular preschooing/ECC the coefficients reduce in magnitude on addition of maternal characteristics, environmental factors, state dummies and age of the youngest child. For "Any ICDS intensely" the magnitude is also sensitive to all these controls, except age of the youngest child. There is no change in statistical significance of estimates with addition of controls.

Table 2.4 provides the impact of having a child below 5 years receiving different ICDS services on maternal employment using the probit regression. The analysis has been carried out for rural India and the five rural regions: South&West, North, East, Northeast and Central (Table 3.A.2). Columns A, E and K present estimates for all the ICDS services taken together in one regression. Columns B, G and L shows impact of regular preschooling/ECC exclusively. Similarly Columns C, H and M provide estimates for daily supplementary feeding exclusively and Columns D, I and N for most vaccinations at the ICDS center. Results for "Any ICDS intensely" are provided in Columns E, J and O.

When taken exclusively, a child receiving regular preschooling/ECC (Columns B, G and L) has a positive significant[15] effect on likelihood of mother's employment in rural India and rural Central regions, but the impact goes down and becomes statistically insignificant when other ICDS services are also considered (Columns A, E and K). Although, the impact remains jointly significant with daily supplementary feeding. A child receiving daily supplementary feeding (Columns C, H and M) has a positive effect on maternal employment in most regions, except the rural North and the rural East, when taken exclusively. Again the magnitude and statistical significance goes down when other ICDS services are

[15]Significant at 1% or 5% level of significance, unless mentioned otherwise.

taken into account, but still remains significant for rural India, rural Northeast and rural Central regions. A child receiving most vaccinations at the ICDS center (Columns D, I and N) has a significant positive impact on maternal employment for rural India, rural North and rural East regions. The impact goes down in magnitude when other ICDS services are also considered, but remains statistically significant for rural India and the rural East.

Because of high collinearity between receipt of daily supplementary feeding and regular preschooling components (Figure 3.2) it is difficult to separately identify the effect of each one of them. Hence, another specification is estimated which combines these two services. The dummy variable for this combination takes the value one if the mother has at least one child below 5 years who receives either regular preschooling/ECC or daily supplementary feeding. Most vaccinations at the ICDS center and monthly health check-up are also combined in this specification to improve precision of estimates. These two services are combined because they involve infrequent visits to the ICDS center. The dummy variable for this combination takes value one if the woman has a child below 5 years who receives either most vaccinations at the ICDS center or monthly health check-up. For this specification, the estimates in Table 2.5 (Columns A, E and I) indicate positive significant effect of having a child, receiving regular preschooling or daily supplementary feeding, on maternal employment for rural India, rural Northeast and rural Central regions. The estimates suggest that having a child receiving either of these services can lead to 4 percentage points more maternal employment, which is a 12% increase from the base level. The effect for the rural Central is big - 12 percentage points more maternal employment - a 25% increase from the base level. For the rural Northeast also the effect is big indicating 9 percentage points more maternal employment, which is a 39% increase from the base level.

Having a child receiving either most vaccinations at ICDS center or monthly health check-up, also has a positive significant effect of 5 and 8 percentage points increase in maternal labor supply in rural India, and the rural East respectively. If the impact of the

whole package of ICDS services is considered together, then the estimates in Table 2.5 (Columns D, H and L) for "Any ICDS intensely" indicate that having a child receiving any of the ICDS benefits intensely, has a positive significant effect on maternal employment for rural India and all regions, except the rural South&West and the rural Central. The magnitude is of the order of 6 percentage points for rural India indicating a 17% increase over the base level. For the regions it is in the range of 4-8 percentage points which converts into an increase in the range of 17-29% over the base level.

Table 2.6 presents the results with village fixed effects, which indicate that impact of having a child, receiving either regular preschooling/ECC or daily supplementary feeding, on maternal employment (Columns A, E and I) remains robust to controls for village level unobservables for rural India and the rural Central, but not for the rural Northeast. The magnitudes are not directly comparable to the estimates reported above. However, a comparison with the estimates from simple logit specification (without village fixed-effects) in Appendix Table 2.A.2, indicates that the estimates for rural India increase in magnitude with village-level effects, and decrease somewhat for the rural Central. The impact of having a child, receiving either most vaccinations at the ICDS center or monthly health check-up, is not robust to controls for village-level unobservables. However, the impact is strongly significant for rural India and the rural East when taken exclusively (Column C), and weakly significant when taken in combination with other services (Column A). There is a substantial decrease in magnitude in both the cases. The impact of receiving the whole package of ICDS services together (Columns D, H and L) is robust only for rural India and the rural East. The magnitude decreases substantially for both of them.

2.7.2 Covariate Matching

In the covariate matching (CVM) estimation in Table 2.7, I allow for bias adjustment when matches are not exact and for heteroscedasticity-consistent standard errors. I start with one match and then increase the number of matches to two to take advantage of more information, without also incorporating observations that are not sufficiently similar. Both the magnitude and precision of estimates remain largely similar between the one and two matches.[16] As it is not possible to take more than one treatment variable in CVM, I restrict the analysis to examining the impact of "regular Preschooling/ECC" (Rows A and D), regular preschooling/ECC in combination with daily supplementary feeding (Rows B and E), and that of the whole package of ICDS services bundled into "Any ICDS intensely" (Rows C and F). For rural India and the rural Central, the impact of having a child receiving regular preschooling or daily supplementary feeding, remains robust to better control for selection on observables, and on unobservables to the extent they are correlated with observables. In comparison to the probit estimates (Table 2.5, Columns B and J), the magnitude of CVM estimates is lower for rural India and similar for the rural Central. The impact on maternal employment, of having a child receiving any of the ICDS services intensely, also remains robust to better control on observables for rural India and the rural East. The magnitude of effect with CVM is slightly lower than the probit for rural India, and same for the rural East.

[16] I also carried out three matches for rural India for regular preschooling/ECC and "Any ICDS intensely". The results do not change much in magnitude (0.04 for both) and significance.

2.7.3 Impact on some Southern States separately from those of the Western States

Besides the regions mentioned above, the rural South&West is separated into two sub-regions: the South and the West. The rural South comprises of Tamil Nadu, Kerala, Karnataka and Goa (Table 3.A.2). The results for this region are in the Appendix Table 2.A.3. The results suggest positive significant impact of having a child receiving regular preschooling or daily supplementary feeding, on maternal employment in this region. This is true for all specifications, except with village-fixed effects. It is possible that the estimates for this specification are unbiased, but insignificant due to small sample size. The magnitude of effect suggests an increase in maternal employment by 6 percentage points in this region, which is a 19% increase from the base level. For the rural West the impact is insignificant, both statistically and economically.

2.8 Summary and Discussion of Results

To summarize, the results indicate that the mother whose child is receiving daily supplementary feeding or preschooling, is more likely to work in rural India, and this effect seems to be driven mainly by the rural Central, and possibly by the rural South. The effect remains robust to controls for village level unobservables and better control for selection on observables through covariate matching (Table 2.8). In addition, there is a weak significant effect of having a child receiving most vaccinations at the ICDS center or monthly health check-up, on mother's employment in rural India. This effect seems to be driven mainly by the rural East (Table 2.8). For the mother whose child is receiving any of the ICDS services intensely, is also more likely to work in rural India, and this effect seems to be driven by the rural East.

2.8.1 Do the weak impact related to immunization of children indicates health benefits?

The results indicate weak positive effect of having a child receiving most vaccinations at the ICDS center on maternal labor force participation in rural India, and the rural East. If the immunization is having a positive impact on maternal employment, then it has to run through the health benefits that the children receive from getting immunized. A fully immunized child is less likely to fall sick, which releases the mother's time from taking care of sick children to engage in other activities. Results in Table 3.8 indicate that immunization through the ICDS centers has a positive significant effect on boys and girls 10-59 months getting full immunization[17] for rural India, and the rural East. However, for rural India I do not find that the children who are fully vaccinated and have received most vaccinations at the ICDS center, have lower disease incidence or severity (Table 2.10) for children ages 0-2 or 3-5 years. On the other hand, for the rural East I do find that the children 3-5, who are fully immunized and are receiving most vaccinations at the ICDS center, are 29% less likely to have diarrhea (Table 2.11). Thus, it seems that there are health benefits of immunization, which might be having a positive impact on maternal employment.

2.8.2 How important is daily supplementary feeding service for maternal employment?

In my earlier paper Jain (2012) I find that daily supplementary feeding has a positive impact on the height of the children in the age-group 0-2 years but no impact on those ages 3-5.

[17] According to the guidelines developed by the World Health Organization, children are considered fully vaccinated when they have received a vaccination against tuberculosis (BCG), three doses of the diphtheria, whooping cough (pertussis), and tetanus (DPT) vaccine; three doses of the poliomyelitis (polio) vaccine; and one dose of the measles vaccine by the age of 12 months. BCG should be given at birth or at first clinical contact, DPT and polio require three vaccinations at approximately 4, 8, and 12 weeks of age, and measles should be given at or soon after reaching 9 months of age.

Less malnourished children are less likely to be sick, thereby requiring less child care time which helps mother redirect their time and energy to other activities. If the health benefits of daily supplementary feeding were driving the impacts on maternal employment, then I should see the impact on the mothers with the youngest child in the 0-2 age-group children, rather than those whose youngest child is above 2 years of age. To check this hypothesis, I separate the women whose youngest child is 0-23 months old from those of 24-59 months. I take 24 months children in the older group because the percentage of children reporting regular preschooling/ECC increases substantially for children starting from 24 months of age (Figure 3.A.1). Even if 24 months children are taken along with 0-23 months children, the results remain largely similar.

Estimates in Tables 2.12 and 2.13 suggest that it is not the health benefits of daily supplementary feeding which is driving the impact on maternal employment, because I do not find significant positive effect of daily supplementary feeding whether taken exclusively or with other ICDS services for 0-23 months children. On the other hand, for the 24-59 months children, it is positive and statistically significant whether taken separately or together with other ICDS services, indicating positive effect of daycare implicit in preschooling.

What about the income effect of transfer of resources to the household through daily supplementary feeding? Economic theory predicts that if leisure is normal good, then increase in income should increase consumption of leisure and decrease labor supply. Thus, with increase in transfer of resources one would expect the labor supply of women to decrease rather than increase. Also, in comparison to the wages of casual female laborer in rural areas, the transfer of resources is too small to have any significant effect on maternal employment - daily supplementary nutrition transfer for a month is equivalent to only a little more than one day wage of female casual laborer wage.[18] Thus, it seems that the

[18]In 2005-6, the norm for expenditure on supplementary nutrition was Rs 2 per child. If the program is performing well and the normative expenditure is fully transferred to the household, then the maximum amount the household would receive it Rs 50 (USD 1) per month (for 25 days per month). In 2005-06, the

benefits on maternal employment are not driven by health benefits of daily supplementary feeding or implicit income subsidy.

2.8.3 How important is preschooling/ECC service for maternal employment?

How much could mother potentially earn when the child goes to daycare and how significant it is?

In 2005-06, the female casual laborer earned Rs 38 in a day (USD 0.8). Average work time per day of casual wage laborers is roughly 390 minutes.[19] The children are supposed to spend around 3 hours in the daycare. If the mothers can find work for this duration, pro rata average wage earned would be Rs 18 as casual wage laborer. If they work for 25 days in a month, they could earn Rs 450 (USD 9) per month. Average monthly per capita consumer expenditure in 2005-06 was Rs 625 (USD 12.5) in rural India (NSSO (2008)). Thus, the woman could potentially earn around 72% of average monthly expenditure on one household member, which is a significant amount, especially for poor households.[20]

How far daycare can substitute mother's childcare time?

TUS data indicates that the mothers on average spend around 2 hours on childcare. The time differs by work status of mothers, and working mothers spend less time on childcare across all consumption expenditure quintiles than the non-working mothers (Figure 2.6). There is an average difference of about 30 minutes and it differs by state (Figure 2.7) rang-

female casual laborer earned around Rs 38 in a day (USD 0.8). Thus, monthly daily supplementary nutrition transfer is equivalent to 1.3 times daily female casual laborer wage.

[19]Calculated using Time Use Survey 1998-99 survey data for women who reported their main occupation as casual wage laborers, and time they spent in doing major agricultural operations. The average work time including travel time is 435 minutes.

[20]In 2005-06, nearly 19% of the Indian rural population belonged to households with monthly per capita consumption expenditure less than the rural poverty line expenditure of Rs 365 (USD 7.3) (NSSO (2008).

ing from 45 minutes in rural Gujarat to 17 minutes in rural Madhya Pradesh. Among the states, Haryana is the only one which has negligible difference of -2 minutes, along with somewhat negligible maternal employment of 2% in 1998-99. Also, the most important components of childcare on which a large proportion of women report spending time on are a) physical care of children: washing, dressing and feeding; and b) supervising children needing care. 94% and 22% non-working mothers report spending on the two categories respectively. The percentage for working mothers is a little less at 92% and 20%, respectively. The difference in time spent between non-working and working mothers for each category is around 23-24 minutes (Figure 2.8). What part of the mother's childcare time can be substituted by daycare? The feeding portion of the physical care component and supervision of children can be substituted by the daycare to a certain extent. The ICDS centers are supposed to provide feeding to the children when they come for preschooling. Supervision of children by Anganwadi workers is implicit during preschooling time.

The above analysis indicates that mothers can potentially significantly benefit from working when the child is in daycare, the working mothers are likely to have a higher demand for non-parental childcare, and the mother's childcare time can be substituted by the daycare to a certain extent. Thus, the impact on maternal employment could be in principle be driven by having a child going to regular preschooling/ECC.

Do mother self-select into preschooling / daycare?

One could argue that the motivated mothers are more likely to work and also more likely to send their children to the ICDS centers. Therefore, the impact that I find of having a child going to daycare on mother's employment is not due to the program benefit but it reflects the higher motivation level of the mothers. If this is true, then motivated mother are also more likely to take better care of their children. Thus, the children who go to daycare are more likely to be healthier. But in my previous paper (Jain (2012)) I do not find that the

children in the age-group 3-5 years who are going to ICDS centers for daily supplementary feeding (along with daycare) to be anthropometrically better than those who are not.[21]

Moreover, results from determinants of various ICDS services (Table 2.14) indicate that the children from scheduled castes households are more likely to receive various ICDS benefits, but not preschooling. For preschooling either the scheduled castes children ages 3-5 years are significantly less likely to receive it, or the likelihood is zero in magnitude and statistical significance.[22] This is particularly striking in comparison to receipt of supplementary feeding by children aged 3-5 years. The children 3-5 from the scheduled castes are more likely to receive "any" or "daily" supplementary feeding, whether it is in comparison to all children or those receiving some benefit from the ICDS center. There do not seem to be striking systematic difference in characteristics of scheduled caste children 24-59 months or 36-59 months, besides age, between those who are receiving regular preschooling and those who are not, among the children receiving daily supplementary feeding (Appendix Table 2.A.4). These results can be indicative of presence of discrimination against this caste group children to be in ICDS centers, because of the practice of untouchability, in which physical contact with scheduled caste people is prohibited. In a recent study (Shah (2006)) based on a field survey carried out in 2001-2 in 560 villages in eleven states in India, it was found that untouchability is practised in one form or another in almost 80 per cent of the villages surveyed. The study found that it extends to all spheres of life, including the public sphere such as entry into primary health centers, sitting arrangements in primary schools, access to drinking water supply, and interaction with high caste teachers and students. Therefore, it is highly likely that this malpractice also extends to preschooling service at the Anganwadi centers, where children from various

[21]Though the official prescribed age-group for preschool/ECC is 3-6 years children, I find that significant proportion of children start going to ICDS centers regularly from 24 months onwards.

[22]For the 0-5 age-group as a whole, scheduled caste children are 1.4% more likely (significant at 10%) to receive any preschooling among all the children, but 5.3% less likely (significant at 5%) to receive it among those who are receiving some ICDS benefit.

socio-economic backgrounds have to sit in close quarters for extended period of time.

I also do a placebo test of impact of ICDS services on height of mothers, to test for direction of selection bias. Results in Appendix Table 2.A.5 indicate that there is no positive or negative selection bias, so far as height of mother is concerned.

2.9 Conclusion

For poor mothers in India working is not a choice, but a compulsion. The difference in time spent on childcare between working and non-working mothers from TUS data, indicates that the mothers who are in the labor force are likely to have a greater demand for non-parental child care. This suggests that the lack of affordable child-care alternatives can limit how mothers use their time. It can also force those, who are compelled to work, to leave their young children in care of older siblings and relatives, and sometimes even unattended (Narayanan (2008)). This has implications for psychological health of women, well-being of young children and education of older siblings.

The ICDS program is stipulated to provide preschooling to children in the 3-6 year age-group for about half a day. Only 14% children[23] in these ages seem to be receiving regular preschooling. Anecdotal evidence[24] and social audits (Narayanan (2008)) indicate that wherever the ICDS centers works well and is accessible, working women are likely to use the preschooling facilities for daycare.

The results in this paper suggest that the public daycare enables the women to work in rural India, and the results seem to be mainly driven by those in the rural Central, who are among the poorest in rural India. There is some evidence of positive impact in the rural South also. It seems that for evaluating the benefits of such programs, these "unintended"

[23] Another 8% children in the age-group 24-35 months seem to receiving regular preschooling

[24] http://www.economist.com/node/18485871 - last accessed June 6, 2012.

benefits, which go beyond the stipulated provision of education to children, should be taken into consideration. The preliminary results also suggest caste based discrimination in access of preschooling. This issue needs to be explored in greater depth as this has important policy implication for access to public services by the most marginalized sections of Indian society.

Considering maternal work force participation rates differ considerably among regions, even for those at similar poverty levels, it would be important to understand the determinants of this differential. This would help in assessing the demand and broader benefits of public preschooling services. Although, regional analysis is imperative, the current sample size limits the exercise. With the small sample sizes, it is hard to distinguish if the non-significance of estimates for some regions, like the rural South, is really due to "non-significance" or because of large standard errors.

The Baker et al. (2008) study of low-income couples in Canada found that, although availability of child care subsidy increased maternal labor supply, the psychological and health status of children worsened. The effect of child care subsidy on well-being of children, and also of mothers, has not been covered in this study, but needs attention in the future.

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Figure 2.1: Percentage of married women currently working by economic status - Rural India (Base: Married women with children below 5 years)

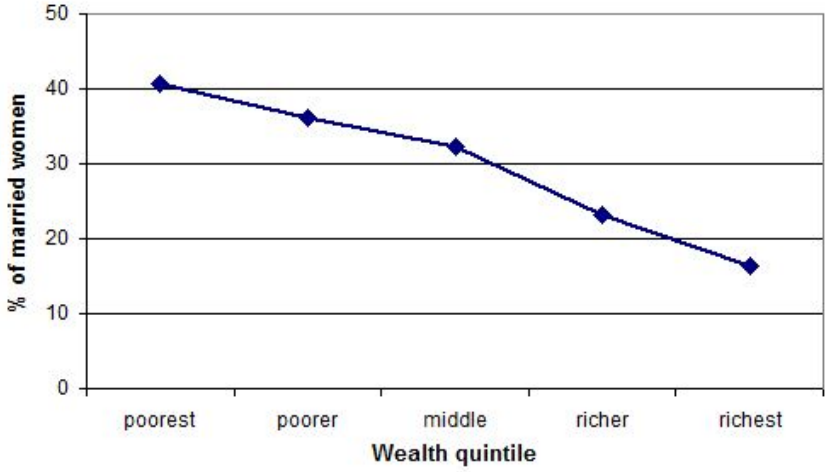


Figure 2.2: Percentage of married women currently working (base: Married women with at least one child below 5 years) - by State in Rural India

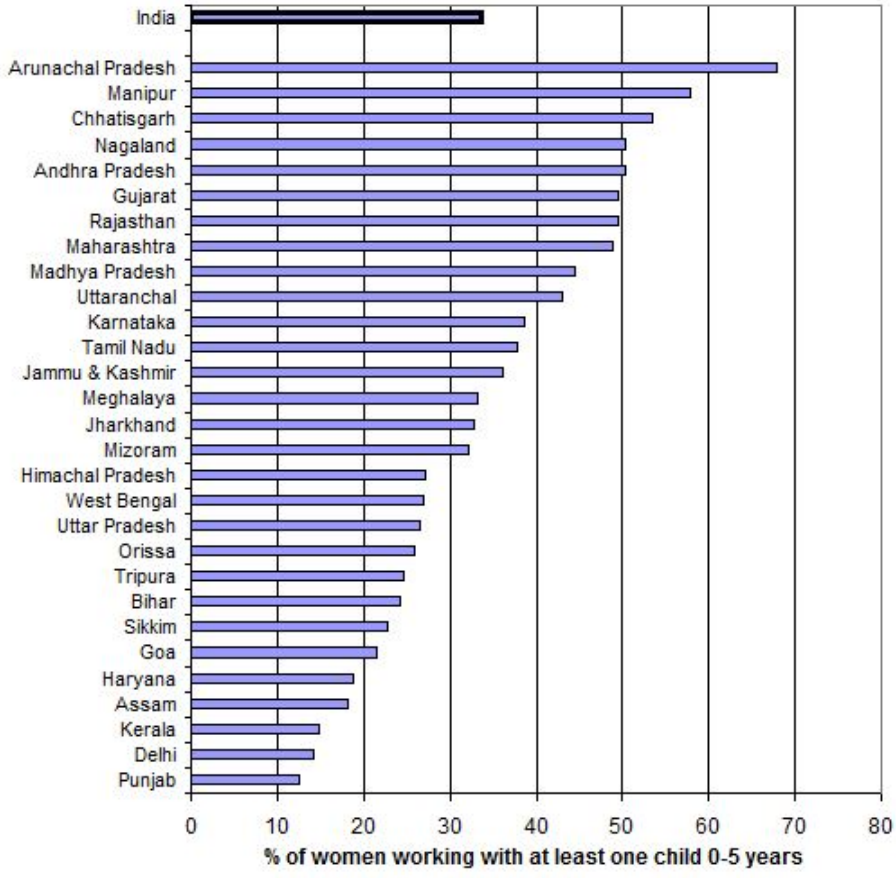
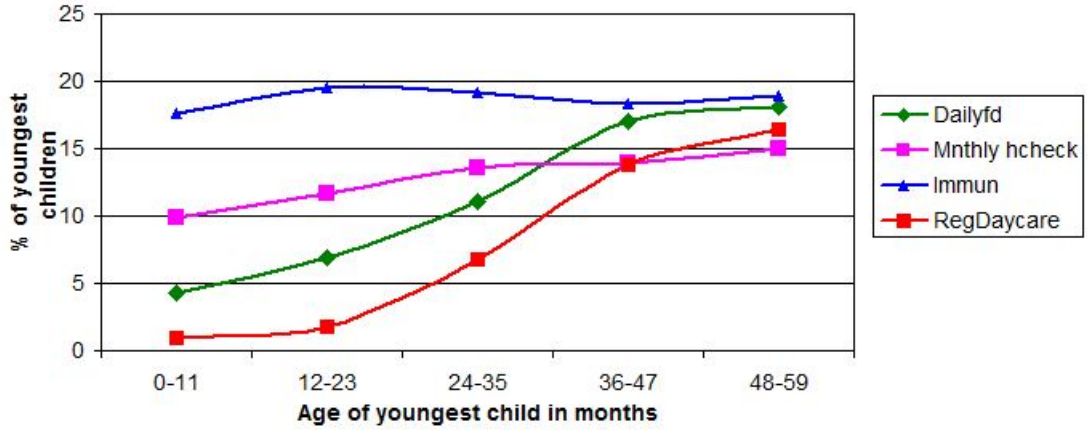


Table 2.1: Regional grouping of states on basis of geographical contiguity

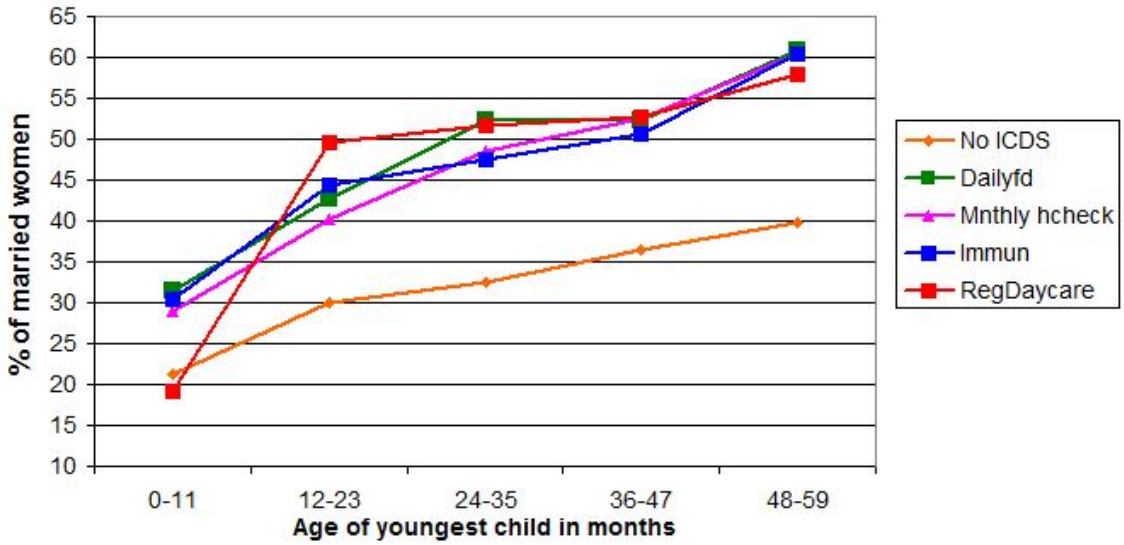
Region	**States**	**% of married women currently working (base: with at least one child below 5 year child)**
South&West	Gujarat, Maharasthra, Goa, Andhra Pradesh, Karnataka, Kerala & Tamil Nadu	15-50
North	Jammu&Kashmir, Himachal Pradesh, Uttaranchal, Punjab, Haryana, Delhi & Uttar Pradesh	12-43
East	Bihar, West Bengal, Jharkhand & Orissa	24-33
Northeast	Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya & Assam	18-68
Central	Rajastan, Chattisgarh & Madhya Pradesh	44-54
South	Goa, Karnataka, Kerala & Tamil Nadu	15-39
West	Gujarat, Maharasthra & Andhra Pradesh	49-50

Figure 2.3: Percentage of youngest children below 5 years receiving different ICDS benefits intensely - Rural India



Dailyfd - Daily supplementary feeding; Mnthly hcheck - Monthly health check-up; Immun - Most vaccinations at ICDS center; RegDaycare - Regular Daycare/ECC

Figure 2.4: Percentage of married women currently working whose youngest child below 5 years receives different ICDS benefits intensely - Rural India



No ICDS - No ICDS intensely or none at all; Dailyfd - Daily supplementary feeding; Mnthly hcheck - Monthly health check-up; Immun - Most vaccinations at ICDS center; RegDaycare - Regular DaycareECC

Table 2.2: Summary statistics; Base: Married Women with at least one child below 5 years

	Regular Preschool/ECC		No regular Preschool/ECC			Any ICDS intensely†		No ICDS intensely		
Variables	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**p-value**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**p-value**
Women currently working	0.47	0.50	0.32	0.47	(0.000)**	0.42	0.49	0.30	0.46	(0.000)**
Age of the youngest child (yrs)	2.1	1.4	1.5	1.3	(0.000)**	1.6	1.4	1.5	1.3	(0.000)**
Number of <5 yrs children	1.5	0.6	1.4	0.6	(0.000)**	1.4	0.6	1.4	0.6	(0.000)**
Fraction of <5 yrs stunted children	0.5	0.4	0.5	0.5	(0.36)	0.5	0.5	0.5	0.5	(0.53)
Number of 6-18 yrs children	1.2	1.3	1.3	1.5	(0.13)	1.2	1.4	1.3	1.5	(0.000)**
Number of above 18 yrs children	0.0	0.2	0.1	0.3	(0.000)**	0.0	0.2	0.1	0.3	(0.000)**
Age of woman in years	26.6	4.9	26.3	5.8	(0.036)*	26.1	5.3	26.4	5.9	(0.001)**
Education of woman in years	4.0	4.2	3.4	4.4	(0.000)**	3.6	4.2	3.4	4.4	(0.001)**
Height of woman in cms	151.8	5.7	151.4	5.8	(0.036)*	151.6	5.7	151.4	5.8	(0.016)*
Age of woman at marriage in years	16.3	3.5	15.9	3.7	(0.000)**	16.1	3.5	15.8	3.8	(0.000)**
Spouse's age in years	32.6	6.0	31.7	6.8	(0.000)**	31.8	6.4	31.8	6.9	(0.83)
Spouse's education in years	5.7	4.7	5.9	5.0	(0.18)	5.6	4.8	6.0	5.0	(0.000)**
Household head's age in years	41.8	14.9	43.2	14.8	(0.001)**	42.1	14.6	43.5	14.8	(0.000)**
Household head's education in years	4.3	4.3	4.1	4.6	(0.027)*	4.1	4.4	4.1	4.7	(0.57)
Wealth score	-0.7	0.6	-0.7	0.7	(0.69)	-0.8	0.7	-0.7	0.8	(0.000)**
Agricultural land in acres	4.6	51.4	4.1	44.6	(0.76)	3.4	37.1	4.5	49.1	(0.15)
Religion - Hindu	0.84	0.36	0.81	0.39	(0.000)**	0.86	0.35	0.79	0.41	(0.000)**
Religion - Muslim	0.11	0.31	0.15	0.36	(0.000)**	0.10	0.29	0.17	0.38	(0.000)**
Religion - Christian	0.02	0.15	0.02	0.13	(0.15)	0.02	0.13	0.02	0.13	(0.42)
Religion - Others	0.03	0.16	0.03	0.16	(0.95)	0.03	0.17	0.02	0.15	(0.012)*
Caste - Scheduled caste	0.23	0.42	0.21	0.41	(0.029)*	0.23	0.42	0.20	0.40	(0.000)**
Caste - Scheduled tribe	0.13	0.34	0.11	0.32	(0.033)*	0.17	0.38	0.09	0.28	(0.000)**
Caste - Other backward cste	0.38	0.48	0.42	0.49	(0.003)**	0.37	0.48	0.43	0.50	(0.000)**
Caste - Others	0.26	0.44	0.26	0.44	(0.65)	0.23	0.42	0.28	0.45	(0.000)**
Water - Piped	0.36	0.48	0.19	0.40	(0.000)**	0.28	0.45	0.18	0.38	(0.000)**
Water - Tubewell	0.45	0.50	0.61	0.49	(0.000)**	0.50	0.50	0.65	0.48	(0.000)**
Water - Unprotected well, etc.	0.16	0.36	0.16	0.37	(0.56)	0.20	0.40	0.15	0.35	(0.000)**
Toilet - Flush	0.17	0.38	0.18	0.38	(0.43)	0.15	0.36	0.19	0.39	(0.000)**
Toilet - No facility	0.77	0.42	0.76	0.43	(0.35)	0.80	0.40	0.74	0.44	(0.000)**
Cooking fuel - Electricity / Kerosene	0.06	0.24	0.07	0.26	(0.08)	0.05	0.22	0.08	0.27	(0.000)**
Cooking fuel - Wood	0.69	0.46	0.58	0.49	(0.000)**	0.71	0.46	0.54	0.50	(0.000)**
Cooking fuel - Others	0.25	0.43	0.35	0.48	(0.000)**	0.24	0.43	0.39	0.49	(0.000)**
State - Uttar Pradesh	0.07	0.25	0.22	0.41	(0.000)**	0.07	0.26	0.26	0.44	(0.000)**
State - West Bengal	0.16	0.36	0.08	0.27	(0.000)**	0.10	0.30	0.08	0.27	(0.000)**
State - Madhya Pradesh	0.06	0.24	0.07	0.25	(0.10)	0.12	0.32	0.05	0.21	(0.000)**
State - Gujarat	0.09	0.28	0.03	0.18	(0.000)**	0.06	0.24	0.03	0.17	(0.000)**
State - Maharashtra	0.16	0.37	0.05	0.22	(0.000)**	0.13	0.33	0.03	0.17	(0.000)**
State - Karnataka	0.09	0.29	0.03	0.18	(0.000)**	0.06	0.24	0.03	0.16	(0.000)**
Observations	**1792**		**18104**			**6128**			**13893**	

* significant at 5%; ** significant at 1%; ECC - early childhood care; State specific statistics are presented for only those states which contribute 5% or more women with children aged 0-5 years receiving regular daycare; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center).

Table 2.3: Probit: Cumulative addition of controls; Dependent variable - current work status of married women with at least one child below 5 years

		Regular preschool / ECC	Any ICDS intensely[†]
A	No controls	0.14	0.12
		(0.01)***	(0.01)***
B	+ Woman	0.16	0.13
		(0.01)***	(0.01)***
C	+ SES	0.15	0.12
		(0.01)***	(0.01)***
D	+ Spouse/head	0.15	0.12
		(0.01)***	(0.01)***
E	+ Environ	0.13	0.10
		(0.01)***	(0.01)***
F	+ State	0.08	0.06
		(0.01)***	(0.01)***
G	+ Fraction Stunted <5 yrs	0.08	0.06
		(0.01)***	(0.01)***
H	+ Number of children	0.08	0.06
		(0.01)***	(0.01)***
I	+ Age of youngest child / All controls	0.06	0.06
		(0.01)***	(0.01)***
	Observations	19896	20021
	MeanY	0.34	0.34

* significant at 10%; ** significant at 5%. *** significant at 1%; Robust standard errors in parentheses; ECC - early childhood care; [†] "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); Each cell is a separate regression and the estimates indicate marginal effects; Each of the specification terms specifies the following controls: *Woman* - mother's age in years, mother's highest number of years of completed education, mother's height in cms; *SES* - mother's age at first marriage, caste, religion; *Spouse/head* - spouse's age, spouse's education, household head's age, household head's education; *Environ* - source of drinking water, toilet facility, cooking fuel; *State* - state dummies; *Fraction stunted <5 yrs* - fraction of <5 yrs children who are stunted; *Number of children* - number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs; *Age of youngest child* - age of youngest child in yrs, age square, age cube; Each specification contains the controls that it specifies plus all the controls above it. For eg. *SES* would contain the controls it signifies plus the controls specified in *Woman*.

Table 2.4: Probit: Effect of different ICDS services on current work status of married women with at least one child below 5 years

	Rural India					**Rural South&West**					**Rural North**				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)
Regular preschool / ECC	0.02	0.06				0.02	0.05				-0.01	0.01			
	(0.02)	(0.01)***				(0.03)	(0.02)*				(0.04)	(0.03)			
Daily supplementary feeding	0.04		0.06			0.02		0.04			0.02		0.02		
	(0.01)**		(0.01)***			(0.03)		(0.02)**			(0.04)		(0.03)		
Monthly health check-up	0.01					-0.01					0.03				
	(0.01)					(0.03)					(0.04)				
Most vaccinations at ICDS	0.05			0.05		0.03			0.03		0.05			0.05	
	(0.01)***			(0.01)***		(0.02)			(0.02)		(0.02)*			(0.02)**	
Any ICDS intensely†					0.06					0.04					0.04
					(0.00)***					(0.01)*					(0.01)**
Observations	19659	19896	19950	20017	20021	4045	4130	4143	4177	4179	5422	5484	5502	5513	5513
MeanY	0.33	0.34	0.34	0.34	0.34	0.43	0.43	0.43	0.43	0.43	0.26	0.26	0.26	0.26	0.26
P-value: all ICDS components=0	0.00					0.30					0.27				
P-value: Preschool=Feeding=0	0.00					0.30					0.90				
	Rural East					**Rural Northeast**					**Rural Central**				
Regular preschool / ECC	0.03	0.05				0.02	0.05				0.03	0.10			
	(0.03)	(0.03)*				(0.05)	(0.05)				(0.05)	(0.04)**			
Daily supplementary feeding	0.02		0.05			0.16		0.15			0.15		0.14		
	(0.03)		(0.02)*			(0.06)**		(0.05)***			(0.04)***		(0.03)***		
Monthly health check-up	0.03					-0.03					-0.01				
	(0.03)					(0.06)					(0.03)				
Most vaccinations at ICDS	0.10			0.10		0.03			0.05		-0.01			0.01	
	(0.02)***			(0.02)***		(0.05)			(0.05)		(0.02)			(0.02)	
Any ICDS intensely†					0.08					0.07					0.03
					(0.01)***					(0.03)**					(0.02)
Observations	3483	3511	3515	3519	3519	3969	3990	3994	4004	4004	2739	2780	2795	2803	2805
MeanY	0.26	0.26	0.26	0.26	0.26	0.23	0.23	0.23	0.23	0.23	0.48	0.48	0.48	0.48	0.48
P-value: all ICDS components=0	0.00					0.01					0.00				
P-value: Preschool=Feeding=0	0.41					0.01					0.00				

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.5: Probit: Effect of *combination* of ICDS services on the current work status of married women with at least one child below 5 years

	Rural India				**Rural South&West**				**Rural North**			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Regular preschool/ECC or Daily supplementary feeding	0.04 (0.01)***	0.06 (0.01)***			0.02 (0.02)	0.03 (0.02)			0.02 (0.03)	0.03 (0.03)		
Most vaccinations at ICDS or Monthly health check-up	0.05 (0.01)***		0.06 (0.01)***		0.02 (0.02)		0.03 (0.02)		0.04 (0.02)*		0.05 (0.02)**	
Any ICDS intensely†				0.06 (0.00)***				0.04 (0.01)*				0.04 (0.01)**
Observations	19969	19971	20019	20021	4147	4149	4177	4179	5508	5508	5513	5513
MeanY	0.34	0.34	0.34	0.34	0.43	0.43	0.43	0.43	0.26	0.26	0.26	0.26
	Rural East				**Rural Northeast**				**Rural Central**			
Regular preschool/ECC or Daily supplementary feeding	0.03 (0.02)	0.06 (0.02)**			0.09 (0.04)**	0.10 (0.04)**			0.12 (0.03)***	0.12 (0.03)***		
Most vaccinations at ICDS or Monthly health check-up	0.08 (0.02)***		0.09 (0.02)***		0.02 (0.04)		0.04 (0.04)		0.00 (0.02)		0.02 (0.02)	
Any ICDS intensely†				0.08 (0.01)***				0.07 (0.03)**				0.03 (0.02)
Observations	3515	3515	3519	3519	3997	3997	4004	4004	2801	2801	2805	2805
MeanY	0.26	0.26	0.26	0.26	0.23	0.23	0.23	0.23	0.48	0.48	0.48	0.48

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.6: Conditional Logit: Effect of *combination* of ICDS services on the current work status of married women with at least one child below 5 years - Village Fixed Effects

	Rural India				**Rural South&West**				**Rural North**			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Regular preschool/ECC or Daily supplementary feeding	1.34 (3.96)***	1.39 (4.54)***			1.22 (1.69)*	1.24 (1.99)**			1.24 (1.09)	1.27 (1.20)		
Most vaccinations at ICDS or Monthly health check-up	1.12 (1.69)*		1.20 (2.76)***		1.06 (0.49)		1.11 (0.97)		1.15 (0.75)		1.20 (0.97)	
Any ICDS intensely†				1.21 (3.13)***				1.11 (0.98)				1.17 (0.97)
Observations	16840	16842	16884	16886	3531	3533	3557	3559	4413	4413	4416	4416
	Rural East				**Rural Northeast**				**Rural Central**			
Regular preschool/ECC or Daily supplementary feeding	1.37 (1.75)*	1.48 (2.28)**			1.48 (1.41)	1.53 (1.53)			1.59 (2.77)***	1.58 (2.75)***		
Most vaccinations at ICDS or Monthly health check-up	1.30 (1.84)*		1.40 (2.49)**		1.39 (1.10)		1.44 (1.19)		0.97 (0.23)		1.04 (0.26)	
Any ICDS intensely†				1.38 (2.55)**				1.41 (1.35)				1.12 (0.86)
Observations	3048	3048	3052	3052	3133	3133	3140	3140	2715	2715	2719	2719

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratio; Robust z statistics in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.7: Probit & CVM: Effect of different ICDS services on the current work status of married women with at least one child below 5 years

		Rural India			**Rural South&West**			**Rural North**		
		Probit	Covariate Matching		Probit	Covariate Matching		Probit	Covariate Matching	
			1 match	2 matches		1 match	2 matches		1 match	2 matches
A	Regular preschool/ECC	0.06	0.04	0.05	0.05	0.04	0.04	0.01	0.06	0.07
		(0.01)***	(0.02)***	(0.02)***	(0.02)*	(0.02)*	(0.02)*	-0.03	(0.04)*	(0.04)*
	Obs	19896	19896	19896	4130	4130	4130	5484	5484	5484
B	Regular preschool/ECC or Daily	0.06	0.03	0.04	0.03	-0.01	-0.01	0.03	0.07	0.08
	supplementary feeding	(0.01)***	(0.01)**	(0.01)***	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)**	(0.03)**
	Obs	19971	19971	19971	4149	4149	4149	5508	5508	5508
C	Any ICDS intensely†	0.06	0.05	0.05	0.04	0.00	0.01	0.04	0.06	0.06
		(0.00)***	(0.01)***	(0.01)***	(0.01)*	(0.02)	(0.02)	(0.01)**	(0.02)***	(0.02)***
	Obs	20021	19987	19987	4179	4179	4179	5513	5513	5513
		Rural East			**Rural Northeast**			**Rural Central**		
		Probit	Covariate Matching		Probit	Covariate Matching		Probit	Covariate Matching	
			1 match	2 matches		1 match	2 matches		1 match	2 matches
D	Regular preschool/ECC	0.05	0.02	0.02	0.05	0.04	0.03	0.10	0.14	0.09
		(0.03)*	(0.03)	(0.03)	(0.05)	(0.06)	(0.05)	(0.04)**	(0.05)***	(0.04)**
	Obs	3511	3511	3511	3990	3990	3990	2780	2781	2781
E	Regular preschool/ECC or Daily	0.06	0.04	0.04	0.10	0.07	0.07	0.11	0.13	0.11
	supplementary feeding	(0.02)**	(0.03)	(0.03)	(0.04)**	(0.06)	(0.05)	(0.03)***	(0.04)***	(0.03)***
	Obs	3515	3515	3515	3997	3997	3997	2797	2802	2802
F	Any ICDS intensely†	0.08	0.08	0.08	0.07	0.07	0.08	0.03	0.05	0.05
		(0.01)***	(0.02)***	(0.02)***	(0.03)**	(0.04)	(0.03)**	(0.02)	(0.02)**	(0.02)**
	Obs	3519	3519	3519	4004	3997	3997	2805	2806	2806

* significant at 10%; ** significant at 5%. *** significant at 1%; CVM - Covariate Matching; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.8: Summary Table: Effect of different ICDS services on the current work status of married women with at least one child below 5 years

	Probit		Covariate Matching		Logit	Conditional Logit - VFE	Logit - VFE sample
			1 match	2 matches			
Rural India							
Regular preschool/ECC or Daily	0.04	0.06	0.03	0.04	1.20	1.34	1.24
supplementary feeding	(0.01)***	(0.01)***	(0.01)**	(0.01)***	(3.07)***	(3.96)***	(3.48)***
Most vaccinations at ICDS or	0.05				1.23	1.12	1.22
Monthly health check-up	(0.01)***				(4.19)***	(1.69)*	(3.77)***
Observations	19969	19971	19971	19971	19969	16840	16840
MeanY	0.34						
Rural Central							
Regular preschool/ECC or Daily	0.12	0.12	0.13	0.11	1.66	1.59	1.63
supplementary feeding	(0.03)***	(0.03)***	(0.04)***	(0.03)***	(3.59)***	(2.77)***	(3.47)***
Most vaccinations at ICDS or	0.00				0.99	0.97	1.01
Monthly health check-up	(0.02)				(0.14)	(0.23)	(0.11)
Observations	2801	2801	2802	2802	2801	2715	2714
MeanY	0.48						
Rural East							
Regular preschool/ECC or Daily	0.03				1.16	1.37	1.27
supplementary feeding	(0.02)				(1.15)	(1.75)*	(1.73)*
Most vaccinations at ICDS or	0.08	0.09	0.10	0.10	1.54	1.30	1.50
Monthly health check-up	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(3.90)***	(1.84)*	(3.44)***
Observations	3515	3519	3,519	3,519	3515	3048	3048
MeanY	0.26						

* significant at 10%; ** significant at 5%. *** significant at 1%; VFE - Village fixed-effects; Coefficients indicate marginal effects for probit & covariate matching and odds ratio for logit & conditional logit; In parentheses robust standard errors for probit & covariate matching and robust z statistics for logit and conditional logit ; ECC - early childhood care; For regional classification of states see Table 3.A.2. For each region each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies (except for conditional logit).

Table 2.9: Probit: Effect of different ICDS services on the full immunization of boys and girls 10-59 months

	Rural India		**Rural South&West**		**Rural North**		**Rural East**		**Rural Northeast**		**Rural Central**	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Regular preschool / ECC	0.05	0.09	0.05	0.10	0.05	0.02	0.02	0.10	-0.10	0.04	0.17	0.13
	(0.03)	(0.02)**	(0.04)	(0.04)*	(0.08)	(0.06)	(0.06)	(0.06)	(0.06)	(0.09)	(0.07)*	(0.06)*
Daily supplementary feeding	0.03	0.00	0.03	0.01	0.03	-0.04	0.08	0.08	0.04	0.06	0.01	-0.06
	(0.03)	(0.03)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)	(0.05)	(0.08)	(0.08)	(0.05)	(0.05)
Monthly health check-up	0.09	0.16	0.07	0.11	0.04	0.14	0.04	0.08	0.33	0.15	0.19	0.23
	(0.02)**	(0.02)**	(0.03)*	(0.03)**	(0.05)	(0.07)	(0.04)	(0.04)	(0.12)*	(0.13)	(0.04)**	(0.03)**
Most vaccinations at ICDS	0.09	0.13	-0.01	0.00	0.11	0.09	0.11	0.20	-0.03	0.06	0.18	0.25
	(0.01)**	(0.01)**	(0.03)	(0.03)	(0.04)**	(0.04)*	(0.03)**	(0.04)**	(0.07)	(0.08)	(0.03)**	(0.03)**
Observations	11248	10251	2174	1901	3254	2762	1986	1906	2228	2177	1602	1495
MeanY	0.40	0.39	0.55	0.54	0.33	0.30	0.42	0.41	0.31	0.33	0.32	0.32

* significant at 5%. ** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's height in cms, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.10: Probit: Effect of different ICDS services on the incidence and severity of diseases and weight-for-age among boys and girls below 5 years

	Children 0-2 years						**Children 3-5 years**					
	Diarrhea	Fever	Cough	Bld stools	Rap brthg	Weight	Diarrhea	Fever	Cough	Bld stools	Rap brthg	Weight
	A	B	C	D	E	F	G	H	I	J	K	L
Regular preschool / ECC	0.001	-0.011	-0.031	-0.001	-0.022	0.01	0.001	0.000	0.016	0.000	0.009	0.05
	(0.03)	(0.03)	(0.04)	(0.00)	(0.03)	(0.11)	(0.01)	(0.01)	(0.02)	(0.00)	(0.01)	(0.07)
Daily supplementary feeding	0.001	0.018	0.028	0.004	0.008	0.12	-0.001	0.028	0.020	-0.003	0.006	-0.03
	(0.02)	(0.02)	(0.02)	(0.00)	(0.02)	(0.06)*	(0.01)	(0.01)*	(0.02)	(0.00)	(0.01)	(0.07)
Monthly health check-up	0.033	0.001	0.019	-0.004	0.027	-0.09	0.001	-0.009	-0.004	-0.001	-0.001	-0.05
	(0.01)**	(0.02)	(0.02)	(0.00)**	(0.01)**	(0.04)**	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.07)
Full immunization & ICDS†	-0.023	0.002	0.008	0.002	-0.013	0.06	-0.010	0.002	-0.007	0.002	-0.003	0.00
	(0.01)	(0.02)	(0.02)	(0.00)	(0.02)	(0.06)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.06)
Full immunization & nonICDS§	0.001	0.011	0.019	-0.002	-0.005	0.18	0.011	0.012	0.004	0.005	-0.008	-0.04
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.04)***	(0.00)*	(0.01)	(0.01)	(0.00)***	(0.01)	(0.05)
Observations	10938	10939	10940	10937	10916	10941	15040	15036	15030	15037	15029	15050
Mean Y	0.14	0.19	0.22	0.01	0.12		0.06	0.14	0.17	0.01	0.09	

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; Bld Stools - Blood in Stools; Rap brthg - Rapid Breathing; Weight - Weight-for-age; ECC - early childhood care; †Full immunization & ICDS indicates that the child has received full immunization and received most vaccinations at ICDS center; §Full immunization & nonICDS indicates that the child has received full immunization and received most vaccinations at other place; For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of child in months, age square, age cube, gender, birth interval, birth order, mother's education in years, mother's age in years, mother's height in cms, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies. For incidence of severe diarrhea and severe cough states were grouped into regions.

Table 2.11: Probit: Effect of different ICDS services on the incidence of diseases and weight-for-age among boys and girls below 5 years - Rural East

	Children 0-2 years					Children 3-5 years				
Rural East	Diarrhea	Fever	Cough	Rapid brthg	Weight	Diarrhea	Fever	Cough	Rapid brthg	Weight
Regular preschool / ECC	-0.044	0.054	0.013	-0.027	-0.027	0.036	-0.056	-0.005	-0.005	0.166
	(0.05)	(0.09)	(0.09)	(0.06)	(0.19)	(0.03)	(0.02)**	(0.03)	(0.02)	(0.13)
Daily supplementary feeding	-0.004	-0.028	-0.042	-0.010	-0.033	-0.033	0.052	0.029	0.029	0.093
	(0.04)	(0.05)	(0.04)	(0.04)	(0.12)	(0.01)**	(0.04)	(0.04)	(0.03)	(0.12)
Monthly health check-up	0.015	0.027	0.054	0.045	-0.015	0.000	-0.037	0.019	-0.007	-0.155
	(0.03)	(0.04)	(0.04)	(0.03)	(0.08)	(0.02)	(0.02)*	(0.03)	(0.02)	(0.10)
Full immunization & ICDS[†]	-0.027	0.011	0.048	0.003	0.085	-0.020	0.020	0.009	-0.002	-0.074
	(0.03)	(0.04)	(0.05)	(0.04)	(0.10)	(0.01)**	(0.03)	(0.03)	(0.02)	(0.12)
Full immunization & nonICDS[§]	0.018	-0.018	0.007	-0.025	0.108	-0.005	-0.014	-0.031	-0.028	0.000
	(0.03)	(0.03)	(0.03)	(0.02)	(0.08)	(0.01)	(0.02)	(0.02)	(0.01)*	(0.08)
Observations	1976	1979	1976	1971	1980	2747	2747	2746	2747	2748
MeanY	0.15	0.23	0.27	0.17		0.07	0.17	0.2	0.12	

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; Weight - Weight-for-age; ECC - early childhood care; [†]Full immunization & ICDS indicates that the child has received full immunization and received most vaccinations at ICDS center; [§]Full immunization & nonICDS indicates that the child has received full immunization and received most vaccinations at other place; For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's height in cms, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.12: Probit: Effect of different ICDS services on the current work status of married women with the youngest child 0-23 months vs with those in the age-group 24-59 months

	Youngest child 0-23 months					**Youngest child 24-59 months**				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Regular preschool / ECC	0.01	0.02				0.02	0.07			
	(0.03)	(0.02)				(0.03)	(0.02)***			
Daily supplementary feeding	0.01		0.02			0.06		0.09		
	(0.02)		(0.02)			(0.02)**		(0.01)***		
Monthly health check-up	-0.02					0.03				
	(0.02)					(0.02)				
Most vaccinations at ICDS	0.05			0.05		0.04			0.06	
	(0.01)***			(0.01)***		(0.01)**			(0.01)***	
Any ICDS intensely†					0.04					0.08
					(0.01)***					(0.01)***
Observations	10644	10717	10750	10788	10789	9015	9179	9200	9229	9232
MeanY	0.28	0.28	0.28	0.28	0.28	0.40	0.40	0.40	0.40	0.40

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center). Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.13: Probit: Effect of *combination* of ICDS services on the current work status of married women with the youngest child 0-23 months vs with those in the age-group 24-59 months

	Youngest child 0-23 months			**Youngest child 24-59 months**		
	(A)	(B)	(C)	(D)	(E)	(F)
Regular preschool/ECC or Daily	0.01	0.02		0.06	0.08	
supplementary feeding	(0.02)	(0.02)		(0.01)***	(0.01)***	
Most vaccinations at ICDS or Monthly	0.03		0.04	0.06		0.07
health check-up	(0.01)**		(0.01)***	(0.01)***		(0.01)***
Observations	10760	10760	10789	9209	9211	9230
MeanY	0.28	0.28	0.28	0.40	0.40	0.40

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.14: Probit: Relative likelihood of different caste groups receiving various ICDS services in comparison to the control group - "Other Caste"

	Any ICDS		**Any supplementary feeding**				**Any preschool / ECC**			
	0-2 yrs	3-5 yrs	0-2 yrs		3-5 yrs		0-2 yrs		3-5 yrs	
	All[§]	All[§]	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Caste - Sch caste	0.07	0.08	0.08	0.07	0.09	0.06	0.01	-0.01	0.02	-0.07
	(0.019)***	(0.016)***	(0.016)***	(0.029)**	(0.015)***	(0.015)***	(0.01)	(0.02)	(0.01)	(0.028)***
Caste - Sch tribe	0.05	0.03	0.08	0.12	0.05	0.05	0.01	0.01	-0.01	-0.08
	(0.022)**	(0.02)	(0.019)***	(0.029)***	(0.018)***	(0.016)***	(0.01)	(0.03)	(0.01)	(0.032)***
Caste - OBC	0.03	0.03	0.00	-0.02	0.03	0.02	0.00	-0.01	0.00	-0.05
	(0.016)*	(0.014)**	(0.01)	(0.03)	(0.013)**	(0.02)	(0.01)	(0.02)	(0.01)	(0.026)**
Observations	11133	15472	11102	3783	15441	5813	11018	3789	15377	5840

	Any ICDS intensely)				**Daily supplementary feeding**				**Regular preschool / ECC**			
	0-2 yrs		3-5 yrs		0-2 yrs		3-5 yrs		0-2 yrs		3-5 yrs	
	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$
	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	(T)	(U)	(V)
Caste - Sch caste	0.07	0.02	0.08	0.04	0.02	0.05	0.04	0.07	0.00	0.00	0.01	-0.03
	(0.018)***	(0.02)	(0.016)***	(0.017)**	(0.007)***	(0.027)*	(0.011)***	(0.029)**	(0.00)	(0.01)	(0.01)	(0.03)
Caste - Sch tribe	0.04	0.02	0.04	0.02	0.01	0.03	0.01	0.00	0.00	0.01	-0.01	-0.06
	(0.020)**	(0.02)	(0.018)*	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)	(0.00)	(0.01)	(0.01)	(0.028)**
Caste - OBC	0.04	0.03	0.04	0.04	0.00	0.00	0.02	0.03	0.00	-0.01	0.01	-0.01
	(0.015)***	(0.020)*	(0.013)***	(0.016)**	(0.01)	(0.02)	(0.009)**	(0.03)	(0.00)	(0.01)	(0.01)	(0.02)
Observations	11133	3875	15472	5935	11102	3844	15441	5904	11018	3789	15377	5840

* significant at 10%; ** significant at 5%. *** significant at 1%; The estimates indicate marginal effects; Robust standard errors in parentheses; OBC - Other Backward Castes; [§] Sample includes all children in the age-group; $^{\wp}$ Sample includes only those children who report receiving some benefit from the ICDS program in that age-group; ECC - early childhood care; [†] "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/any immunization); The regression also includes the following covariates: child's age, birth interval, birth order, mother's age, mother's education, mother's height, spouse's age, spouse's education, household head's age, household head's education, wealth index, religion, water, toilet, cooking fuel, state dummies;

Figure 2.5: Percentage of children below 5 years receiving regular preschooling/early childhood care by 3 months age intervals - Rural India

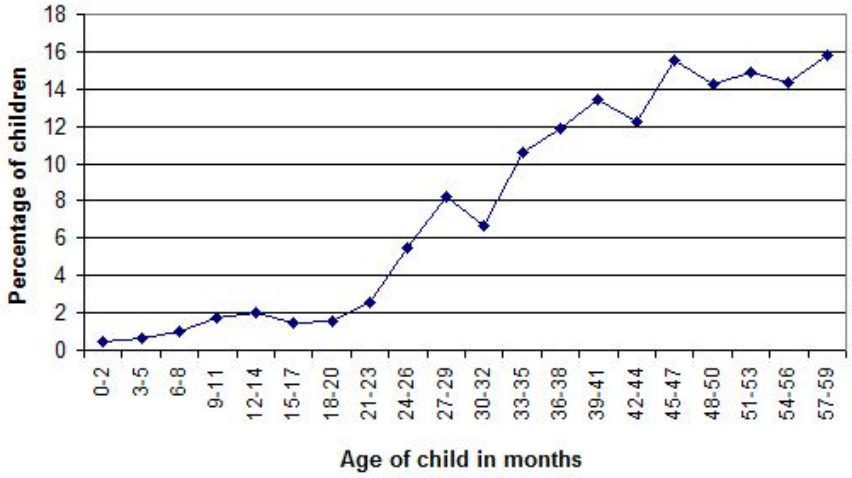
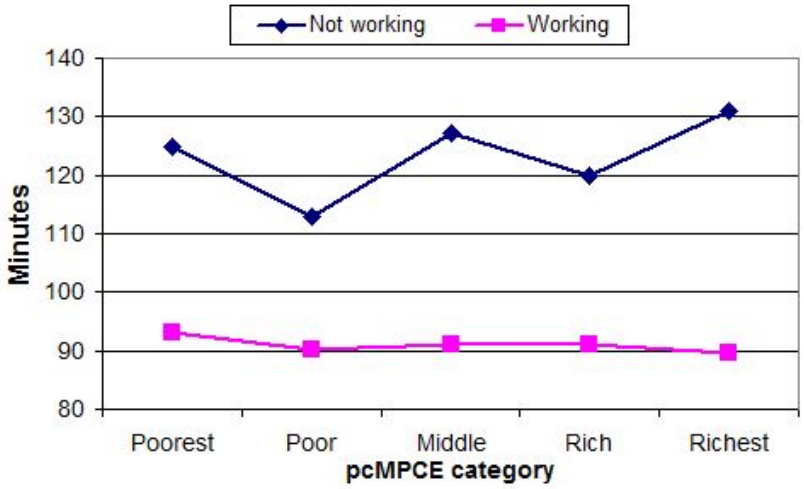


Figure 2.6: Minutes spent on childcare by working and non-working mothers by consumption expenditure quintile - Rural India (Base: Women with children below 5 years spending non-zero time on childcare)



pcMPCE - per capita monthly household consumption expenditure

Figure 2.7: Difference in time spent on childcare (in minutes) between non-working and working mothers - by State (Base: Women with children below 5 years spending non-zero time on childcare)

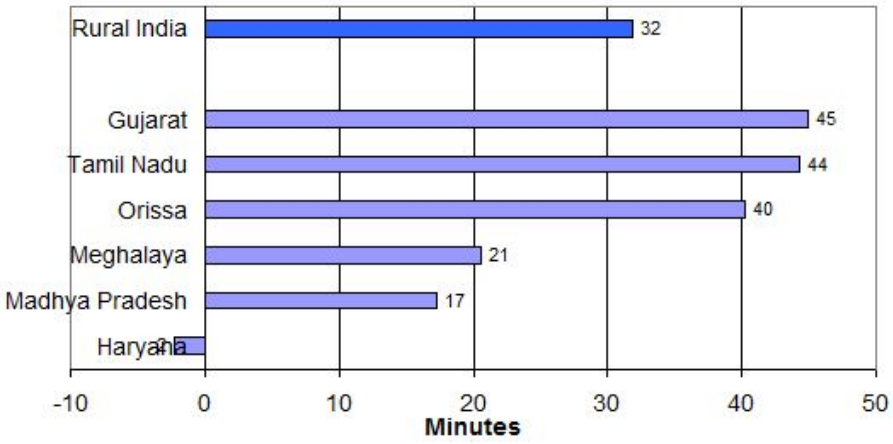
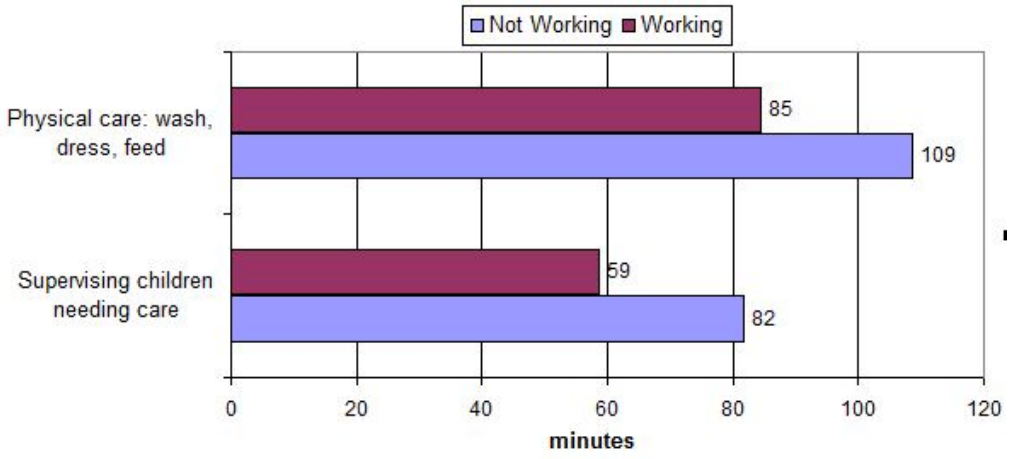


Figure 2.8: Difference in time spent on childcare (in minutes) between non-working and working mothers - by type of care in rural India (Base: Women with children below 5 years spending non-zero time on the specific type of care)



2.A Appendix

Table 2.A.1: Types of services provided by the ICDS program

ICDS Services	**Target Group**	**Service Providers**
Supplementary Nutrition	Children <6yrs, Pregnant and lactating mothers (PLM)	Anganwadi Workers (AWW) and Anganwadi Helper (AWH)
Immunization*	Children <6yrs, PLM	Auxilary Nurse Midwife (ANM)/ Medical Officer (MO)
Health Check-ups*	Children <6yrs, PLM	ANM/MO/AWW
Referral	Children <6yrs, PLM	AWW/ANM/MO
Pre-School Education	Children 3-6 years	AWW
Nutrition and Health Education	Women (15-45 years)	AWW/ANM/MO

Source: Ministry of Woman and Child Development, Government of India; * AWW assists ANM in identifying and mobilizing the target group;

Table 2.A.2: Logit: Effect of *combination* of ICDS services on the current work status of married women with at least one child below 5 years

	Rural India				**Rural South&West**				**Rural North**			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Regular preschool/ECC or Daily supplementary feeding	1.20 (3.07)***	1.30 (4.63)***			1.08 (0.82)	1.13 (1.42)			1.12 (0.76)	1.18 (1.14)		
Most vaccinations at ICDS or Monthly health check-up	1.23 (4.19)***		1.29 (5.36)***		1.11 (1.13)		1.13 (1.54)		1.27 (2.04)**		1.30 (2.22)**	
Any ICDS intensely†				1.30 (5.74)***				1.17 (1.98)**				1.26 (2.27)**
Observations	19969	19971	20019	20021	4147	4149	4177	4179	5508	5508	5513	5513
	Rural East				**Rural Northeast**				**Rural Central**			
Regular preschool/ECC or Daily supplementary feeding	1.16 (1.15)	1.36 (2.42)**			1.69 (2.24)**	1.73 (2.45)**			1.66 (3.59)***	1.65 (3.66)***		
Most vaccinations at ICDS or Monthly health check-up	1.54 (3.90)***		1.60 (4.40)***		1.16 (0.58)		1.27 (0.98)		0.99 (0.14)		1.08 (0.85)	
Any ICDS intensely†				1.50 (3.99)***				1.50 (2.17)**				1.13 (1.34)
Observations	3515	3515	3519	3519	3997	3997	4004	4004	2801	2801	2805	2805

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratio; Robust z statistics in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 2.A.3: Summary Table: Effect of different ICDS services on the current work status of married women with at least one child below 5 years - rural South (Tamil Nadu, Kerala, Karnataka, Goa)

	Probit		Covariate Matching		Logit	Conditional Logit - VFE	Logit - VFE sample
			1 match	2 matches			
Rural South							
Regular preschool/ECC or	0.06	0.09	0.06	0.08	1.33	1.27	1.37
Daily supplementary feeding	(0.02)**	(0.02)***	(0.03)**	(0.03)***	(2.11)**	(1.43)	(2.22)**
Most vaccinations at ICDS or	0.05				1.29	1.08	1.23
Monthly health check-up	(0.02)**				(2.02)**	(0.49)	(1.60)
Observations	2277	2279	2,279	2,279	2277	1838	1838
MeanY	0.33						

* significant at 10%; ** significant at 5%. *** significant at 1%; VFE - Village fixed-effects; Coefficients indicate marginal effects for probit & covariate matching and odds ratio for logit & conditional logit; In parentheses robust standard errors for probit & covariate matching and robust z statistics for logit and conditional logit ; ECC - early childhood care; For regional classification of states see Table 3.A.2. For each region each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies (except for conditional logit).

Table 2.A.4: Difference in characteristics of scheduled caste children between those receiving regular preschooling/ECC and those not receiving it (Base: Scheduled caste children receiving daily supplementary feeding)

	24-59 months			**36-59 months**		
	RegPresch	No RegPresch		RegPresch	No RegPresch	
	Mean	Mean	P-value	Mean	Mean	
Age in months	44.5	39.0	(0.000)**	48.2	45.8	(0.005)**
Birth Interval (months)	25.1	25.2	(0.99)	24.7	25.4	(0.84)
Birth order	2.3	2.6	(0.039)*	2.3	2.8	(0.018)*
Mother's age (years)	25.7	26.2	(0.36)	26.1	26.8	(0.26)
Mother's edu (years)	3.2	3.5	(0.42)	3.0	3.2	(0.73)
Mother's height in cms	150.9	150.5	(0.55)	150.9	151.1	(0.84)
Spouse's age (years)	32.0	32.2	(0.68)	32.4	32.8	(0.64)
Spouse's edu (years)	5.4	5.7	(0.48)	5.3	5.6	(0.61)
Hh head age (years)	38.7	38.5	(0.87)	38.9	38.3	(0.69)
Hh head edu (years)	3.9	4.2	(0.53)	3.9	4.3	(0.49)
Wealth index	-0.8	-0.8	(0.96)	-0.9	-0.9	(0.93)
Religion - Hindu	0.86	0.84	(0.61)	0.88	0.86	(0.68)
Religion - Muslim	0.00	0.01	(0.49)	0.00	0.01	(0.44)
Religion - Others	0.14	0.15	(0.69)	0.12	0.13	(0.83)
Water - Piped Water	0.43	0.32	(0.028)*	0.40	0.33	(0.20)
Water - Tubewell	0.44	0.52	(0.13)	0.45	0.50	(0.45)
Water - Others	0.13	0.16	(0.40)	0.15	0.18	(0.54)
Toilet - Fllush	0.17	0.13	(0.29)	0.18	0.11	(0.11)
Toilet - Others	0.83	0.87	(0.29)	0.83	0.89	(0.11)
Cooking fuel - Wood	0.69	0.66	(0.56)	0.68	0.69	(0.92)
Cooking fuel - Others	0.31	0.34	(0.56)	0.32	0.31	(0.92)
Observations	291	201		232	115	

* significant at 5%. ** significant at 1%; ECC - early childhood care; RegPresch - Receiving regular preschooling/ECC; No RegPresch - Receiving no regular preschooling/ECC or no preschooling/ECC at all; Estimates for state dummies not presented.

Table 2.A.5: OLS: Effect of different ICDS services on the height of married women with at least one child below 5 years

	Rural India					**Rural South&West**					**Rural North**				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)
Regular preschool / ECC	0.04	0.12				-0.22	0.07				0.32	0.16			
	(0.20)	(0.16)				(0.34)	(0.26)				(0.49)	(0.38)			
Daily supplementary feeding	0.11		0.12			0.28		0.26			-0.16		-0.06		
	(0.19)		(0.15)			(0.32)		(0.23)			(0.48)		(0.35)		
Monthly health check-up	-0.08					0.00					-0.15				
	(0.16)					(0.27)					(0.45)				
Most vaccinations at ICDS	0.16			0.11		0.24			0.18		-0.20			-0.21	
	(0.13)			(0.13)		(0.23)			(0.23)		(0.28)			(0.28)	
Any ICDS intensely†					0.03					-0.11					-0.03
					(0.11)					(0.20)					(0.23)
Observations	19696	19934	19989	20057	20061	4055	4141	4154	4189	4191	5439	5501	5520	5531	5531
F test: all ICDS components=0	0.54					0.56					0.28				
Prob > F	0.71					0.69					0.89				
	Rural East					**Rural Northeast**					**Rural Central**				
Regular preschool / ECC	0.14	0.24				0.01	0.03				0.68	0.71			
	(0.41)	(0.31)				(0.64)	(0.58)				(0.48)	(0.44)			
Daily supplementary feeding	0.07		0.14			-0.21		-0.09			0.07		0.29		
	(0.41)		(0.32)			(0.52)		(0.42)			(0.42)		(0.38)		
Monthly health check-up	0.20					0.49					-0.30				
	(0.31)					(0.54)					(0.31)				
Most vaccinations at ICDS	0.18			0.23		-0.06			-0.11		0.37			0.28	
	(0.27)			(0.26)		(0.74)			(0.70)		(0.27)			(0.25)	
Any ICDS intensely†					0.34					0.09					0.09
					(0.22)					(0.42)					(0.25)
Observations	3487	3515	3519	3523	3523	3975	3996	4000	4010	4010	2740	2781	2796	2804	2806
F test: all ICDS components=0	0.47					0.23					1.17				
Prob > F	0.76					0.92					0.32				

* significant at 10%; ** significant at 5%. *** significant at 1%; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates women with at least one child aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); For regional classification of states see Table 3.A.2. Each column is a separate regression with the following controls: age of youngest child in yrs, age square, age cube, number of children below 5 yrs, number of children 6-18 yrs, number of children above 18 yrs, fraction of below 5 yrs stunted children, mother's age in years, mother's highest number of years of completed education, mother's height in cms, mother's age at first marriage, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Chapter 3

A vaccination for education - the ICDS and the education of older girls in rural India

3.1 Abstract

Gender education gap is pervasive across developing countries, including India. In this paper I examine how far India's largest child development program - Integrated Child Development Scheme (ICDS) - can reduce this gap. I primarily use the recent demographic health survey data for 2005-6, which for the first time collected information on child level usage of ICDS services. I further substantiate my findings with information from another dataset on time use of older siblings. The ICDS program provides a whole package of services from preschooling to supplementary feeding to immunization. Because of these services, I examine the various mechanisms through which the benefits on education of older siblings can accrue: implicit income subsidy, improvement in health of young children and release from child supervision time. Using probit, covariate matching and conditional logit

(village and mother fixed-effects), I find that the girl 6-14 years, having a younger sibling below 5 years receiving any of the ICDS services intensely, is at least 9% more likely to be in school (6 percentage points increase) in rural India. The effect on boys 6-14 years is positive, but not robust. Further evidence suggests that younger age girls seem to be benefiting relatively more, and the effect is driven mainly by positive health benefits of vaccinations of younger children, and perhaps of supplementary feeding. The bigger and more robust effect on girls seems to be consistent with evidence from time-use of children 6-14. In comparison to boys, relatively many more girls spend time on childcare and significantly lesser number combine childcare and education.

3.2 Introduction

Primary education gender gap exists across many developing countries, including India, even though it is declining over time (Dreze and Kingdon (2001), Alderman et al. (1996)). Research indicates that older siblings, especially girls, provide child care in developing countries (Pitt and Rosenzweig (1990), Connelly et al. (1996)). Research also indicates that part of the gender gap in education is driven by differentials in child care responsibilites between girls and boys (Lincove (2009), Lokshin et al. (2004)). In this paper I analyze if the reduction in the child care costs can reduce the gender gap in primary school attendance in rural India. I study the reduction in child care costs through the "indirect" or "unintended" benefits of India's biggest early childhood development program - the Integrated Child Development Scheme (ICDS). The ICDS program provides various services from non-formal preschool education to supplementary feeding to vaccinations to health check-ups to children below six years. To my knowledge, there is no study which has looked at the impact of an integrated child development program for children ages 0-6 years, on the

education of their older siblings. Lokshin et al. (2004) study for Kenya is similar, but unlike the ICDS, the Kenyan child development program's targeted age-group is older (3-7 years) and provides for only daycare and preschooling.

There are two big challenges for this study. Firstly, because of the package of services provided by the ICDS, it is difficult to disentangle the effect of individual components. Secondly, only non-experimental data is available for the analysis, with inherent difficulty in controlling for selection on unobservables. For the main analysis, I use the latest round of demographic health survey data for India - National Family Health Survey3 for 2005-6 - which for the first time collected information on utilization of the ICDS program services at the child level. I further substantiate my findings with another data set - Time Use Survey 1998-99 - which has detailed time use information of children above 5 years old through 24 hour recall.

In non-experimental survey data, the children who are receiving various ICDS services have not been selected randomly. To "identify" the effect of any of the ICDS services, observable differences between the girls (boys) aged 6-14 years, whose younger sibling below 5 years is receiving them and those whose sibling is not, need to be accounted for. To do this I start with probit with controls. To minimize the selection bias on observables that may remain with simple technique like probit, because of misspecification in functional form, I then use matching technique like covariate matching. This technique also helps in better balance of unobservables to the extent that they are correlated with observables. To further control for unobservables, like the local access to schools, village-fixed effects using conditional logit is estimated. In addition, to control for mother specific unobservables, like her motivation level, mother fixed-effects model is estimated. To disentangle the effect of preschooling from other ICDS services, the highly collinear preschooling and supplementary feeding components are combined and so are less frequent services like immunization and health check-ups. I also bundle up the whole package of ICDS services

together to examine their combined effect on schooling of older siblings.

The results indicate that the girls 6-14, whose sibling is receiving any of the ICDS services intensely, is at least 9% more likely to have attended school (6 percentage points increase) in rural India. The effect seems to be driven mainly by those, whose younger sibling is receiving most vaccinations at the ICDS center. The effect remains robust to better control for selection on observables (using covariate matching) and on unobservables at the village level and mother-level (using village fixed-effects and mother fixed-effects). In addition, it seems that the effect is concentrated among younger age girls, and they are less likely to dropout, but more likely to repeat grade. It seems that the boys are also benefiting from having a sibling receiving similar services, but the effect is smaller and not robust across different specifications. Like girls, the younger age boys seem to be benefiting more, and are more likely to repeat a grade. Evidence also suggests that there is a weak positive impact of the combination of daily supplementary feeding and preschooling/ECC on schooling of girls 6-14, which seems to be driven by the health benefits of daily supplementary feeding, and not by the daycare implicit in regular preschooling/ECC or implicit income subsidy.

Further examination reveals that the robust significant effect on girls 6-14, is coming from the three rural regions - the rural North, the rural East and the rural Central. In these regions girls are less likely to be in school than boys. Also, in these regions, receiving most vaccinations at the ICDS center is positively and significantly associated with children aged 10-59 months receiving full immunization. Moreover, in the rural East and the rural Central, receiving most vaccinations at the ICDS center and being fully immunized, seems to be having a positive health effect on children below 5 years. The children of ages 3-5 in the rural East are 29% less likely to suffer from diarrhea, and the percentage for those ages 0-2 in the rural Central is 35%. In the rural Central there is also some evidence of lower incidence of fever among those of ages 0-2, and increase in weight of those 3-5. For the

rural North similar positive health benefits are not visible.

Analysis of determinants of receiving most vaccinations at the ICDS center by children 0-2 and 3-5 suggests, that the poorer children in these regions are more likely to receive this service. In addition, the girls 6-14 with younger siblings receiving this service, do not seem to be systematically different from similar boys 6-14.

Overall, the results suggest that the benefits on education of older girls, seem to be driven by improvement in health of younger children because of vaccinations, and perhaps because of supplementary feeding. The benefits could also be driven by their positive externalities on health of older children (Miguel and Kremer (2004)). The bigger and more robust effect on girls seems to be consistent with evidence from time-use of children 6-14. I find that in comparison to boys, relatively many more girls spend time on childcare and significantly lesser number combine childcare and education. Because of this difference, the reduction in child care cost can potentially benefit the schooling of girls more than that of the boys. The results also seem to be consistent with the findings from the scant literature on relationship between childcare and education of older siblings. Mostly the findings suggest that the presence of younger sibling has a negative effect on education of older girl siblings.

The remainder of the paper is organized as follows. Section 3.3 briefly summarizes the literature on childcare and education of older siblings. Section 3.4 gives a description of the ICDS program and the potential mechanisms of reduction in child care costs. Section 3.5 discusses the empirical strategy. Section 3.6 describes the data used in the analysis. Section 3.7 presents the evidence from time use survey. Section 3.8 presents empirical results, Section 3.9 summarizes and discusses the empirical results, and Section 3.10 concludes.

3.3 Child Care and Education of Older Siblings

There is a scant literature on the effect of child care duties on the education of older siblings and the findings generally indicate a significant negative effect, especially for girls. Lincove (2009) found that girls in Nigeria are less likely to attend school if there are infants at home, and Psacharopoulos and Arriagada (1989) found a significant negative effect of presence of younger siblings, on school attendance of older children aged 7-14 years in Brazilian households. Similarly, Deolalikar (1998) found that the presence of a child below three years had a significantly negative effect on primary and secondary school enrolment of girls, but not of boys in Kenya. In another study on relationship between child care costs and schooling in Kenya, Lokshin et al. (2004) found that higher price of child care had no significant effect on schooling of boys but significantly decreased the probability of girls being at school.

To my knowledge, there is no study which looks at the effect of an integrated child development program for younger children, on education of their older siblings, and my study aims to do this. Lokshin et al. (2004) study for Kenya is similar, but unlike the ICDS, the Kenyan child development program's targeted age-group is older (3-7 years) and provides for only daycare and preschooling.

3.4 The ICDS program services and their impact on child care costs

The ICDS program was launched in 1975, and since then it has expanded and matured from 33 blocks to 6,284 blocks in India and now has more than one million centers. In 2009-10 the ICDS program was allocated a budget of 1.5 billion USD (Rs 6.7 billion). The program offers various services, from supplementary nutrition to health check-ups to preschooling

to immunization, as detailed in Appendix Table 3.A.1. These services are supposed to be delivered in an integrated manner at the anganwadi, or childcare center, located within the village itself. Each center is run by an anganwadi worker (AWW) and one helper (AWH), who undergo three months of institutional training and four months of community-based training.

The services provided directly and exclusively through the ICDS program to children below 6 years are: supplementary nutrition to children 0-6[1] for 25 days in a month, and preschooling to children ages 3-6 years for about 3 hours daily for 28 days in a month. Besides these services, children also receive immunization, health check-up and referral services through the ICDS, which are delivered in collaboration with the public health officials. The Anganwadi worker helps the public health officials in identification and mobilization of the target group of children and mothers for immunization and health check-up.

As the ICDS program provides various services, the program can reduce child care costs through several mechanisms and their combinations:

1. Increase in household resources because of implicit income subsidy through supplementary nutrition.

2. Provision of supplementary nutrition and immunization is likely to have positive health benefits on children, which is likely to lead to reduce morbidity and mortality, leading to reduction in resources and time required for child care. Healthier young children can also have positive externalities on the health of older children, further reducing child care costs.

3. Time spent in Anganwadis for preschooling releases the older siblings, especially girls, from supervision duties and allows them to engage in other activities.

[1]Children below age three receive "take home rations" that last for a week or a month depending on the frequency of distribution. Children 3-6 receive feeding at the center itself.

Because of the above mechanisms, I would be analyzing the impact of all ICDS services directly provided to the young children.

3.5 Empirical Strategy

To analyze the impact of each of the ICDS services received by the children below 5 years on education of older siblings, I estimate the following probit/logit regression equation for boys and girls 6-14 years old who have at least one younger sibling below 5 years:

$$AtnSch_i = \alpha Presch_i + \beta Dailyfd_i + \gamma Mhcheck_i + \delta Immun_i + \eta X_i + \lambda_i + u_i \quad (3.1)$$

where $AtnSch_i$ is a dummy variable with value one for a child who has attended school in the current academic year. $Presch_i$ is a dummy variable with the value one for a child, who has at least one younger sibling who received preschooling/early child care through ICDS *regularly*. $Dailyfd_i$ is a dummy variable with the value one for a child, who has at least one younger sibling who received supplementary nutrition through ICDS *daily*. $Mhcheck_i$ is a dummy variable with the value one for a child, who has at least one younger sibling who received health check-up through ICDS *monthly*. $Immun_i$ is a dummy variable with the value one for a child, who has at least one younger sibling who received most vaccinations at the ICDS center. X_i is a vector of control variables composed of the *children characteristics*: age of the child in years, age-square, age-cube; *mother specific characteristics*: mother's age in years, mother's highest number of years of completed education, mother's height in cms; *spouse specific characteristics*, that is spouse's age, spouse's education; *household head specific characteristics*, or household head's age and household head's education; *socio-economic characteristics* like caste, religion, wealth score; and *environmental factors* like water source, toilet facility, cooking fuel. λ_i captures unobservable

or observable but unaccounted state-specific[2] or village-specific fixed effects. u_i is an error term. α is the parameter of interest.

The above specification estimates the impact of each ICDS service controlling for receipt of other ICDS services by children below 5 years. However, because of likely collinearity between the receipt of various ICDS services, estimates can have lower precision. Therefore, to assess the impact of each ICDS service individually with higher precision, other specifications are also estimated in which the impact of each ICDS services is examined independently of other services. In another specification highly collinear services or similar frequency services are bundled together to improve precision of estimates. Also, to examine the impact of the package of ICDS services put together, another specification is estimated in which the girls and boys 6-14, whose sibling below 5 years is receiving different ICDS benefits intensely are combined into one single variable called "Any ICDS intensely." This dummy variable takes the value one for boys and girls 6-14, having at least one sibling below 5 years receiving any of the following benefits: regular preschooling/early childhood care or monthly supplementary feeding or monthly health check-up or most vaccinations at the ICDS center; and zero otherwise.

I use non-experimental survey data in which the children who are receiving different ICDS services have not been selected randomly. Therefore, to "identify" the effect of ICDS services on schooling of older siblings, I need to take account of the observable differences between the two groups of children in order to get to the pure effect of ICDS services on their schooling. With probit, I can control for observable characteristics related to children 6-14 with the addition of control variables X_i.

There also might be some unobserved factors (unobserved heterogeneity), or observed but unaccounted factors at the state level, like higher political commitment and/or better

[2]For rural India as a whole some states were combined into two regions because of small sample size. One region contained Jammu&Kashmir, Himachal Pradesh, Punjab, Uttaranchal, Delhi and Goa. Another region contained Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and Assam.

administrative structure, which could result in better provision of ICDS services and hence greater use of those services. Or, there might be income shocks at the state level that affect the number of women who go to the ICDS center. In such cases, the probit regression probably suffers from omitted variable bias. To account for within-state differences, I use state fixed-effects model which adds λ_i in the equation above. Similar rationale holds for carrying out village fixed-effects, which controls for village level unobservables such as local access to schools. In this case the λ_i in the equation accounts for village fixed-effects, which is estimated using conditional logit regression. Further to control for mother level unobservables, such as her motivation level, I carry out mother fixed-effects, using conditional logit regression. I estimate the following equation for mother fixed-effects:

$$AtnSch_i = \alpha ICDS_i * Girl_i + \beta Girl_i + \gamma Age_i + \delta Age_i * Girl_i + u_i \qquad (3.2)$$

where $AtnSch_i$ is a dummy variable with value one for a child who has attended school in the current academic year. $ICDS_i$ is a dummy variable with the value one for a child 6-14, who has at least one younger sibling below 5 years receiving most vaccinations at the ICDS center ("Any ICDS intensely"); $Girl_i$ is a dummy variable with the value one for a girl 6-14; Age_i is the age in years of child 6-14; u_i is an error term; α is the parameter of interest.

Unbalanced distribution of covariates could yield biased probit estimates because of their sensitivity to functional form. With covariate matching one seeks to better "balance out" the groups being compared in terms of their covariates. Also, if the observables are correlated with the unobservables, then one may be able to balance out the latter by doing a better job of balancing the former. Thus, I use covariate matching (CVM) to minimize the selection bias on observables. In CVM, measures like the Mahalanobis distance are used to calculate the similarity of two girls (boys) in terms of covariate values and the matching

is done on these distances. This method, developed by Abadie and Imbens (2006), adjusts for bias when matching is not perfect, makes no assumption about functional form, and provides the standard errors for matching estimators.

3.6 Data

The data come from the National Family Health Survey (NFHS), a nationwide cross-section demographic health survey for India. So far three rounds have been conducted in the years 1992-3, 1998-9, and 2005-6. For this paper, I use the third round covering 2005-6, which provides information on demographics and education of children 5-14 years;, demographic characteristics, work status, and reproductive behavior of women ages 15-49; and important aspects of nutrition and health care of children aged 0-5 years. It also provides the anthropometric measurements of height and weight for children 0-5 and women 15-49.

In NFHS-3, there are 19,665 children in the age-group 6-14 years with at least one sibling below 5 years. Out of these 46% are boys and 54% are girls. The percentage of children in the sample declines with age. In this paper a boy or girl having attended school[3] in the current academic year includes the following cases: children who are enrolled into school currently but not in the previous year; have advanced to a higher level; are repeaters. Using this definition, around 69% boys and 66% girls aged 6-14 years, with sibling below 5 years, attended school in 2005-06. The percentage is lowest for those from the poorest families and it increases with wealth quintile (Figure 3.1). There is a difference of around 25 percentage points in school attendance of both girls and boys between those from the poorest and the richest quintile. Compared to boys, a lower percentage of girls attended school in the poorest quintiles: 8% less among the "poorest" quintile, and 5% less among

[3]The question asks if the child attended school at any time during the present and previous academic year.

those in the "poorer". This differential disappears for those in the middle quintile and above. In fact in the topmost wealth quintiles, a higher percentage of girls attended school (Figure 3.1) than boys.

One of the distinctive feature of the latest round of NFHS survey is the collection of information on utilization of various services of the ICDS program by women and children 0-5 in the household. For services which are directly benefiting the children below 5 years, the information on intensity of usage is also collected.[4] Among all these different ICDS services, immunization is the most accessible: 19% of children received most of their vaccinations at the ICDS center (Figure 3.2). The percentage is relatively similar across different age-groups. The percentage of young children receiving monthly health check-up through the ICDS is also high, and it increases with age of children, though rather slowly. For supplementary feeding and preschooling/early childhood care, the access is relatively lower and it picks up for older children , especially from 2 years onwards. In the NFHS-3 questionnaire the information on access and intensity of preschooling is collected with that on early childhood care. The preschooling component of ICDS is officially only for children from 3-6 years. It seems from the data that the question is most likely picking up information on preschooling as very low percentage of children below 2 years are going to ICDS center regularly for either "early childhood care (ECC)" or "preschooling." Significant regular ICDS attendance of children for either of these services is seen only starting at age of 24 months or 2 years and then it picks up substantially from 3 year onwards (Figure 3.2).

Summary statistics in Table 3.1 show that there are significant unconditional mean differences between characteristics of girls (boys) with at least one sibling below 5 years, who

[4]For immunization of children, the information on "most vaccinations at the ICDS center" (the measure of intensity of immunization used in this paper) is collected in the section under vaccination of children. Therefore, unlike other ICDS services, the reference period for this information is not "last 12 months," but age of the child.

is receiving any of the ICDS services intensely, from those whose sibling is not. Compared to the girl with none of her younger siblings receiving any of the ICDS services intensely, the one who does have such a sibling, is more likely to be younger in age, has a mother younger in age, more educated and taller, to be a Hindu and from schedule caste/tribe, to have drinking water coming from piped water and wood being used as cooking fuel and living in states like Haryana, West Bengal, Jharkhand, Orissa, Gujarat or Maharashtra. The patterns are mostly similar for boys 6-14.

Additional dataset used in the paper is Time Use Survey (TUS) Data. This survey was canvassed during July 1998 to June 1999 with a sample size of 18600 households spread over six states namely, Haryana, Madhya Pradesh, Gujarat, Orissa, Tamil Nadu and Meghalaya. The survey estimates are representative at national and state level. Out of the total households interviewed, 12,750 were from rural areas with 53,981 respondents in total, and there are 1308 boys and 1317 girls in the age-group 6-14 years with a sibling below 5 years. The TUS asked about the time use of all household members above 5 years during the previous 24 hours. Description of activities in the time diary section was open-ended and so was the time allocated to them, allowing for reporting of multiple (simultaneous) activities. I analyze time use of data corresponding to "normal" days only (excluding, for example, holidays).[5]

The main variables of interest are the amount of time spent on childcare and study by girls and boys 6-14 years, with siblings below 5 years. I combine the time spent on all activities classified as childcare: physical care of children (washing, dressing, feeding); teaching, training and instruction of own children;[6] accompanying children to places (schools, sports, lessons, doctor); supervising children needing care; and travel related to

[5]Time-use information is collected on three type of days: normal, abnormal and weekly. Saturday and Sunday are generally reported as "weekly variant," and festival days or when someone is sick are "abnormal" days. All household members are interviewed for at least one normal day.

[6]A few children report spending time on this activity.

care of children. To calculate study time I combine the following activities classified under "learning": general education - school/university/other educational institutions attendance; studies, homework and course review related to general education; additional study, non-formal education under adult education programmes; non-formal education of children; other training/education; learning not classified elsewhere; and travel related to learning. Some of the limitations of the data are that it is not possible to identify families or the child/children who are being taken care of in the data and there is age heaping. To identify families, I use the information only on "children" of the household head; "grandchildren" if there is only one daughter/daughter-in-law; and children below 5 years categorized as "other relative" if there is only one adult women also categorized as "other relative." There is age heaping on even numbers for boys and girls 6-16 years.

3.7 Evidence on time spent on childcare and study by boys and girls 6-14 years from Time-Use Survey

Among girls 6-14, with a younger sibling below 5 years, 22% report spending time on childcare, while only 9% boys do so. The percentage remains largely similar across different ages of boys, but for girls it increases with age (Figure 3.3). Both boys and girls report spending about two hours on average on childcare, though it differs with age. For girls, it jumps from 55 minutes per day for six year old girls to 136 minutes for 7-8 year old girls, and then it does not change much (Figure 3.4). For boys on the other hand, 6 year old boys also spend an average of 55 minutes on childcare, and it increases more or less steadily with age.

The two most important components of childcare on which about half (on each) the girls report spending time are a) physical care of children: washing, dressing and feeding; and

b) supervising children needing care. Among boys also these two activities are important (about 40% boys spend time on each of these activities), but there is an additional important component: accompanying children to places (schools, sports, lessons, doctor) - about 20% boys[7] report spending time on it, and a larger proportion of older boys do so.

Among the boys who spend time on childcare, 60% also report spending time on education. On the other hand, only 40% girls report spending time studying along with childcare. There is a negative relationship between studytime and childcare time (Figure 3.5), and it is sharper for boys than girls.[8]

To summarize, both boys and girls 6-14 spend time on childcare. However, relatively many more girls spend time on childcare, and significantly lesser number combine childcare and education. Because of this difference, the reduction in child care cost can potentially benefit the schooling of girls more than that of the boys.

3.8 Empirical Results

Figure 3.6 indicates that for girls 6-14, whose younger sibling is not receiving any ICDS service or not receiving it intensely, have a lower unconditional likelihood of school attendance at all ages. For boys, the pattern is similar for those at younger ages, although difference is smaller in magnitude, and disappears for those who are older (Figure 3.7).

Using the probit regression, Table 3.2 provides the impact of having a younger sibling below 5 years receiving different ICDS services, on education of older boys and girls 6-14. Columns A and G present estimates for all the ICDS services taken together in one regression. Columns B and H shows impact of regular preschooling/ECC exclusively. Similarly columns C and I provide estimates for daily supplementary feeding exclusively; columns

[7] 6% girls report spending time on this activity.

[8] Because of small sample size, the graph combines boys and girls of all ages. The graphs largely remain the same for age-groups 6-10 and 11-14 taken separately.

D and J for monthly health check-up; and columns E and K for most vaccinations at the ICDS center. Results for "Any ICDS intensely" are provided in columns F and L.

The results indicate that the girls 6-14 years, who have a sibling receiving any of the ICDS services intensely, and exclusively, are more likely to have attended school. For boys 6-14, the direction of effects is similar to girls, but the magnitudes are lower and the effect is generally weaker in statistical significance. When all the ICDS services are taken together, the effect is statistically significant for daily supplementary feeding and most vaccinations at the ICDS center for girls. For boys the effect of monthly health check-up and most vaccinations at the ICDS center is statistically significant.

Because of the collinearity between various ICDS services (Figure 3.2), another specification is estimated with a combination of ICDS services. One of the two dummy variables takes value one if the boys and girls 6-14 have at least one younger sibling below 5 years, who receives either regular preschooling/ECC or daily supplementary feeding. The other dummy variables takes a value one for those who have a younger sibling, receiving either most vaccinations at the ICDS center or monthly health check-up. For this specification, the estimates in Table 3.3 (column F) indicate that the girls 6-14 having a younger sibling receiving either regular preschooling/ECC or daily supplementary feeding, are around 8% more likely to have attended school (5 percentage points increase). Similar effects for boys are insignificant. In addition, for girls the effect of having a younger sibling receiving either immunization or monthly health check-up, is significant and positive and indicates a 12% increase in schooling likelihood (8 percentage points increase). For boys also this effect is significant, but lower in magnitude indicating a 6 percentage point increase in schooling likelihood.

Controlling for village level unobservables (village fixed-effects), such as local access to schools, the effect of having a younger sibling receiving daily supplementary feeding or regular preschooling, on schooling of girls 6-14, remains statistically significant when

taken exclusively (Table 3.4, Column F), but becomes insignificant when taken in combination with other services (Column E). On the other hand, the effect of most vaccinations at the ICDS center or monthly health check-up remains statistically significant for them in either case. For boys the effect of all services, whether taken exclusively or in combination with other services, is insignificant.

Significance of positive effects on girls schooling of having a younger sibling receiving most vaccinations at the ICDS center or any of the ICDS services intensely, remain robust to controls for mother level unobservables (mother fixed-effects), such as her motivation level (Table 3.5, Column E and Rows III and VI respectively).

In the covariate matching (CVM) estimation I allow for bias adjustment when matches are not exact and for heteroscedasticity-consistent standard errors. I start with one match and then increase the number of matches to three to take advantage of more information without also incorporating observations that are not sufficiently similar. The precision of estimates remain largely similar between the one and three matches, but the magnitude changes. Abadie et al. (2004) point out that it is not clear which estimate is more reliable in these cases. I choose to go with three matches estimates for both boys and girls because I am using more information. For children who have a younger sibling receiving most vaccinations at the ICDS center, the results (Table 3.2, Columns E and K) indicate that the CVM estimates increase somewhat for boys and decrease somewhat for girls, suggesting that there is not much selection on observables, over and above as accounted by probit regression. For those who have a sibling receiving any of the ICDS services intensely, for girls estimates decrease substantially (from 10 to 6 percentage points), for boys the estimates are the same (Table 3.2, Columns F and L).

The age-specific marginal effects (probit) for girls and boys in Figure 3.8 suggest that in comparison to 6 year old girls, the effect increases for those who are older till age 9, and then decreases, becoming negative after age 11. The pattern is similar for boys, although

unlike girls where the effect is positive for ages 7-10, it is positive only for ages 9-10. The age-specific heterogeneous effects, of having at least one younger sibling receiving most vaccinations at the ICDS center or monthly health check-up, suggest that for both boys and girls 6-14 there is a decrease[9] in impact on schooling with age (Table 3.3, Columns E and J). These results suggest that the effect is relatively larger on the schooling of girls and boys who are younger in age.

Also, I examine the effect of ICDS services on grade repetition, drop-outs and being in the right grade-for-age. I find that boys and girls, having a sibling receiving any of the ICDS services intensely, are 50% more likely to repeat a grade (Table 3.6). In addition, there is weak evidence that girls are 25% less likely to drop-out. I find no significant effect of ICDS services on right grade-for-age.[10]

3.9 Summary and Discussion of Empirical Results

To summarize, I find significant positive effect on schooling of girls 6-14, who have a younger sibling receiving most vaccinations at the ICDS center or any of the ICDS services intensely (at least 6 percentage points more). The effect remains robust to better control for selection on observables (using covariate matching) and on unobservables at the village level and mother-level (using village fixed-effects and mother fixed-effects). In addition, it seems that the effect is concentrated among younger age girls, and they are less likely to dropout, but more likely to repeat grade. It seems that the boys are also benefiting from having a sibling receiving similar services, but the effect is smaller and not robust across different specifications. Like girls, the younger age boys seem to be benefiting more, and are more likely to repeat a grade.

[9]The magnitudes are small, but coefficients are jointly significant.

[10]Results not presented.

Results in Table 3.7 (Row D) indicate that the impact of most vaccinations at the ICDS center is coming from the rural North, the rural East and the Rural Central.[11] In each of these regions girls are less likely to be in school than boys (Table 3.7, Row E). And, in each of these regions the effect of having at least one sibling below 5 years receiving most vaccinations at the ICDS center, has a positive significant effect on schooling of girls. For boys the effect is significant and positive only for the rural Central. For the other two regions, the effect is not significant, although it is positive in magnitude.

These are the only regions where most vaccinations at the ICDS center has a positive significant effect on likelihood of children 10-59 months receiving full immunization[12] (Table 3.8). In addition, for the rural East and the rural Central, most vaccinations at the ICDS center seem to be having a positive effect on health of the children. In the rural East (Table 3.9, Column J), the children aged 3-5 years who are receiving most vaccinations at the ICDS center and are fully immunized, are 29% less likely to have diarrhea. Similarly, in the rural Central (Table 3.10, Column D), the children aged 0-2 years who are receiving most vaccinations at the ICDS center and are fully immunized are 35% less likely to have diarrhea. There is also a positive weaker effect on fever incidence among children 0-2 years (29% less likely) and weight of those 3-5 (weigh about 190 gms more) in this region. For the rural North, similar positive effects are not visible (Table 3.9, Column D).

Examination of determinants of receiving most vaccinations at the ICDS center by children 0-2 and 3-5 indicates, that the poorer children are more likely to receive this service (Tables 3.11 and 3.12) in each of the three regions and rural India. Further, I do not find girls 6-14, having at least one sibling below 5 years receiving most vaccinations at the

[11] For regional classification of states see Appendix Table 3.A.2.

[12] According to the guidelines developed by the World Health Organization, children are considered fully vaccinated when they have received a vaccination against tuberculosis (BCG), three doses of the diphtheria, whooping cough (pertussis), and tetanus (DPT) vaccine; three doses of the poliomyelitis (polio) vaccine; and one dose of the measles vaccine by the age of 12 months. BCG should be given at birth or at first clinical contact, DPT and polio require three vaccinations at approximately 4, 8, and 12 weeks of age, and measles should be given at or soon after reaching 9 months of age.

ICDS center, to be systematically significantly different from similar boys 6-14 in any of the regions or in rural India (Appendix Table 3.A.3).

3.9.1 How important is daily supplementary feeding and preschooling/ECC service?

I find positive significant impact of the combination of daily supplementary feeding and regular preschooling/ECC on schooling of girls 6-14, although it is not robust across different specifications. I analyze over here the possible mechanisms of this impact.

In my earlier paper Jain (2012) I find that daily supplementary feeding has a positive impact on the height of the children in the age-group 0-2 years but no impact on those ages 3-5. Less malnourished children are less likely to be sick, thereby requiring less child care time which helps older siblings redirect their time and energy to other activities. If the health benefits of daily supplementary feeding were driving the impacts on education of older siblings, then I should see the impact on the children with the youngest sibling in the 0-2 age-group children, rather than those whose youngest sibling is above 2 years of age. To check this hypothesis, I separate the girls and boys 6-14 whose youngest sibling is 0-23 months old from those of 24-59 months.[13]

Estimates in Tables 3.13 and 3.14 suggest that the health benefits of daily supplementary feeding might be driving the impact on schooling of girls 6-14. I find significant positive effect of daily supplementary feeding, whether taken exclusively or with other ICDS services, for those having the youngest sibling 0-23 months old. For boys having a youngest sibling 0-23 months receiving this service, I find no significant effect. Moreover, my calculations indicate that the income subsidy through daily supplementary feeding is

[13]I take 24 months children in the older group because the percentage of children reporting regular preschooling/ECC increases substantially for children starting from 24 months of age (Appendix Figure 3.A.1).

too small in magnitude to have a significant effect - daily supplementary nutrition transfer for a month is equivalent to only a little more than one day wage of female casual laborer wage.[14]

Given that I find weak significant impact on schooling of girls 6-14, having youngest sibling 24-59 months old receiving daily supplementary feeding or regular preschooling (Table 3.14), it seems that the impact is not coming from either of these services to this age-group children.

To summarize, the results suggest that the positive impact of the combination of daily supplementary feeding or preschooling/ECC, seems to be driven by the health benefits of daily supplementary feeding, and not by the regular preschooling/ECC or implicit income subsidy.

3.10 Conclusion

Girls are less likely to attend school than boys in developing countries. Various public policies have been formulated to bring the girls to school, including increase in construction of schools, provision of mid-day meals and free uniforms, conditional cash transfers and adult literacy campaigns. This paper analyzes the impact of a child development program (ICDS) for children below 5 years on the schooling of older girls.

One of the important inhibiting factor in girls education is the household work responsibilities, including care of younger siblings. This paper finds that receiving any of the ICDS services intensely by younger sibling, can have significant positive effects on education of older girl sibling in rural India. The effect seems to be driven mainly by those

[14]In 2005-6, the norm for expenditure on supplementary nutrition was Rs 2 per child. If the program is performing well and the normative expenditure is fully transferred to the household, then the maximum amount the household would receive it Rs 50 (USD 1) per month (for 25 days per month). In 2005-06, the female casual laborer earned around Rs 38 in a day (USD 0.8). Thus, monthly daily supplementary nutrition transfer is equivalent to 1.3 times daily female casual laborer wage.

receiving most vaccinations at the ICDS center. The results suggest that public programs such as immunization of children could have "unintended" positive effects, which need to be accounted for in evaluation of benefits of such programs.

One of the mechanism, which I could not explore in this study because of lack of data, is positive externalities of improvement in health of younger children, on health of older children. Miguel and Kremer (2004) found positive externalities of deworming on school participation of untreated children in primary schools. It is possible that the time spent on child care is a lesser inhibiting factor in a girl's education, than the negative health externalities of taking care of the younger sibling who is constantly sick. This is an important area of future research, which can have important policy implications for public policies on girls education.

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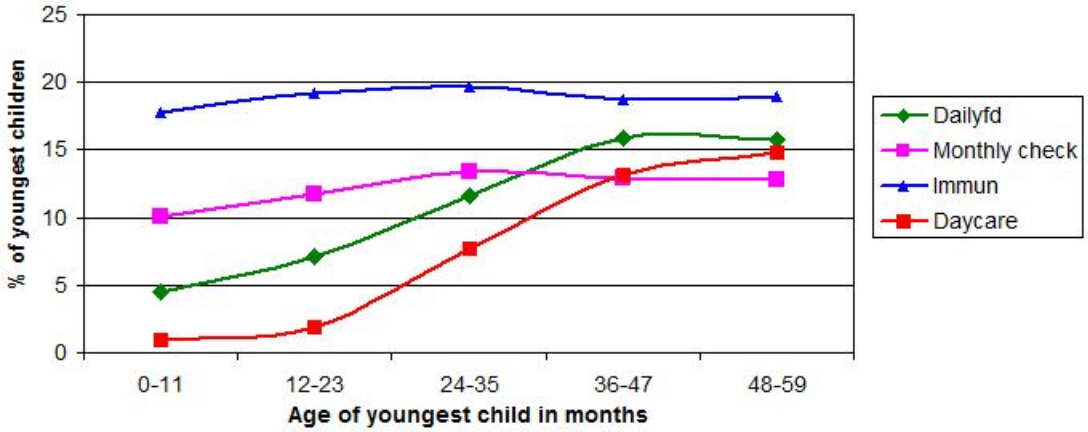
Figure 3.1: Percentage of boys and girls 6-14 years currently in school by wealth quintile - Rural India (Base - with at least one sibling below 5 years)

Figure 3.2: Percentage of children below 5 years receiving different ICDS benefits intensely - Rural India



Dailyfd - Daily supplementary feeding; Mnthly hcheck - Monthly health check-up; Immun - Most vaccinations at ICDS center; RegDaycare - Regular Daycare/ECC

Table 3.1: Summary statistics; Base - with at least one sibling below 5 years

	Boys 6-14 years					Girls 6-14 years				
	Any ICDS intensely†		No ICDS intensely			Any ICDS intensely†		No ICDS intensely		
	Mean	Std. Dev.	Mean	Std. Dev.	p-value	Mean	Std. Dev.	Mean	Std. Dev.	p-value
% attending school	0.74	0.44	0.68	0.47	(0.000)**	0.75	0.44	0.62	0.48	(0.000)**
Age in years	8.5	2.3	8.8	2.4	(0.000)**	8.7	2.3	8.9	2.4	(0.003)**
Mother's age in years	30.4	5.1	31.4	5.3	(0.000)**	30.6	4.8	31.4	5.2	(0.000)**
Mother's education in years	1.8	3.2	1.5	3.2	(0.013)*	1.9	3.3	1.7	3.3	(0.010)*
Mother's height in cms	151.3	5.5	151.3	5.7	(0.63)	151.6	5.8	151.3	5.8	(0.037)*
Spouse's age	36.0	6.2	37.0	6.5	(0.000)**	36.3	6.1	36.9	6.2	(0.000)**
Spouse's education in years	4.1	4.4	4.3	4.7	(0.34)	4.4	4.5	4.6	4.8	(0.09)
Household head's age	40.7	12.0	41.3	12.0	(0.10)	40.9	11.9	41.4	12.4	(0.10)
Household head's education in years	3.3	4.0	3.4	4.4	(0.27)	3.6	4.2	3.6	4.5	(0.95)
Wealth score	-1.0	0.6	-0.9	0.6	(0.000)**	-0.9	0.6	-0.9	0.7	(0.000)**
Caste - Scheduled caste	0.23	0.42	0.22	0.41	(0.27)	0.23	0.42	0.21	0.41	(0.016)*
Caste - Scheduled tribe	0.21	0.41	0.10	0.31	(0.000)**	0.19	0.39	0.10	0.30	(0.000)**
Caste - Other backward cste	0.36	0.48	0.44	0.50	(0.000)**	0.37	0.48	0.45	0.50	(0.000)**
Caste - Others	0.17	0.38	0.21	0.41	(0.001)**	0.17	0.38	0.21	0.41	(0.001)**
Religion - Hindu	0.80	0.40	0.73	0.45	(0.000)**	0.83	0.38	0.75	0.43	(0.000)**
Religion - Muslim	0.16	0.36	0.24	0.43	(0.000)**	0.13	0.34	0.21	0.41	(0.000)**
Religion - Christian	0.02	0.13	0.02	0.13	(0.37)	0.01	0.11	0.02	0.12	(0.24)
Religion - Sikh/Budd/Jain/Parsi	0.01	0.09	0.01	0.09	(0.83)	0.02	0.13	0.01	0.11	(0.13)
Water - Piped	0.19	0.39	0.10	0.30	(0.000)**	0.24	0.43	0.12	0.33	(0.000)**
Water - Tubewell	0.59	0.49	0.72	0.45	(0.000)**	0.52	0.50	0.70	0.46	(0.000)**
Water - Unprotected well, etc.	0.20	0.40	0.15	0.36	(0.000)**	0.21	0.41	0.15	0.36	(0.000)**
Toilet - Flush	0.08	0.27	0.11	0.31	(0.001)**	0.10	0.30	0.13	0.34	(0.000)**
Toilet - Pit latrine & others	0.04	0.20	0.05	0.22	(0.07)	0.04	0.20	0.05	0.22	(0.046)*
Toilet - No facility	0.87	0.34	0.82	0.38	(0.000)**	0.86	0.35	0.80	0.40	(0.000)**
Cooking fuel - Wood	0.70	0.46	0.52	0.50	(0.000)**	0.71	0.45	0.54	0.50	(0.000)**
Cooking fuel - Others	0.28	0.45	0.44	0.50	(0.000)**	0.26	0.44	0.42	0.49	(0.000)**
State - Haryana	0.02	0.14	0.01	0.11	(0.005)**	0.03	0.18	0.01	0.12	(0.000)**
State - Rajasthan	0.04	0.20	0.10	0.30	(0.000)**	0.05	0.22	0.10	0.30	(0.000)**
State - Uttar Pradesh	0.13	0.34	0.35	0.48	(0.000)**	0.09	0.29	0.32	0.46	(0.000)**
State - Bihar	0.08	0.27	0.20	0.40	(0.000)**	0.06	0.24	0.19	0.39	(0.000)**
State - West Bengal	0.10	0.29	0.05	0.23	(0.000)**	0.09	0.28	0.06	0.24	(0.000)**
State - Jharkhand	0.07	0.25	0.03	0.18	(0.000)**	0.06	0.24	0.03	0.18	(0.000)**
State - Orissa	0.07	0.26	0.02	0.13	(0.000)**	0.07	0.25	0.02	0.13	(0.000)**
State - Chhatisgarh	0.07	0.25	0.01	0.10	(0.000)**	0.06	0.24	0.01	0.10	(0.000)**
State - Madhya Pradesh	0.12	0.33	0.05	0.22	(0.000)**	0.15	0.36	0.06	0.24	(0.000)**
Observations	2331		6014			3061		6882		

* significant at 5%; ** significant at 1%; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS center); State specific statistics are presented only for some states

Figure 3.3: Percentage of boys and girls 6-14 years spending time on childcare - by Age (Base - with at least one sibling below 5 years)

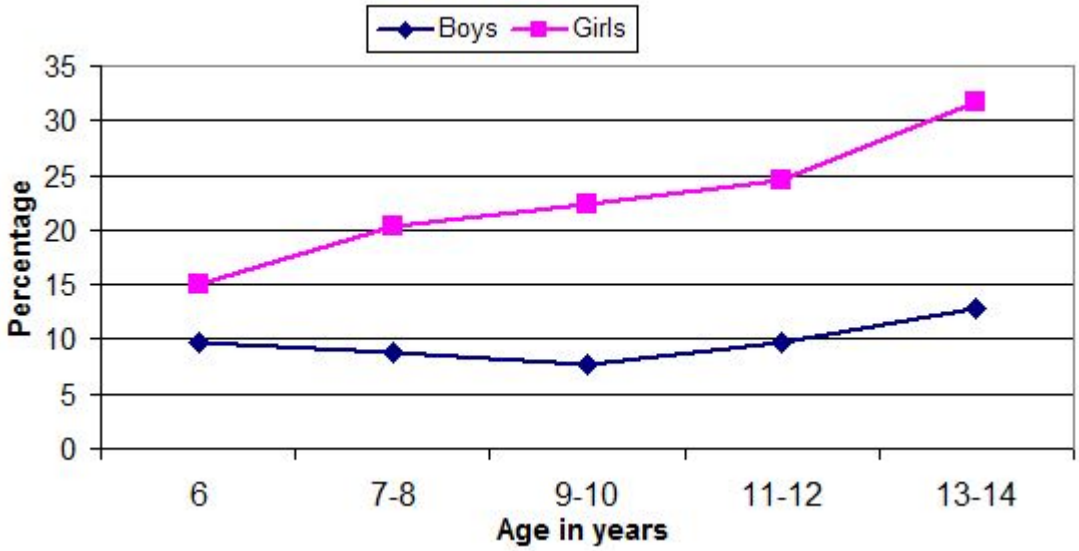


Figure 3.4: Average time spent on childcare (in minutes) by boys and girls 6-14 years - by Age (Base - with at least one sibling below 5 years and spending positive childcare time)

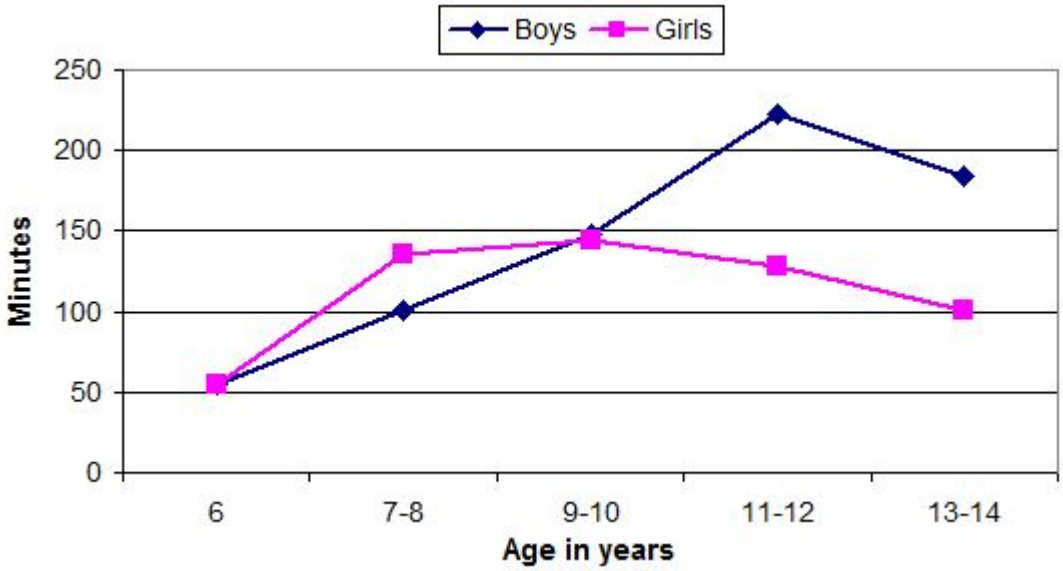


Figure 3.5: Relationship between childcare time and study time for boys and girls 6-14 years (Base - with at least one sibling below 5 years and reporting positive childcare time and study time)

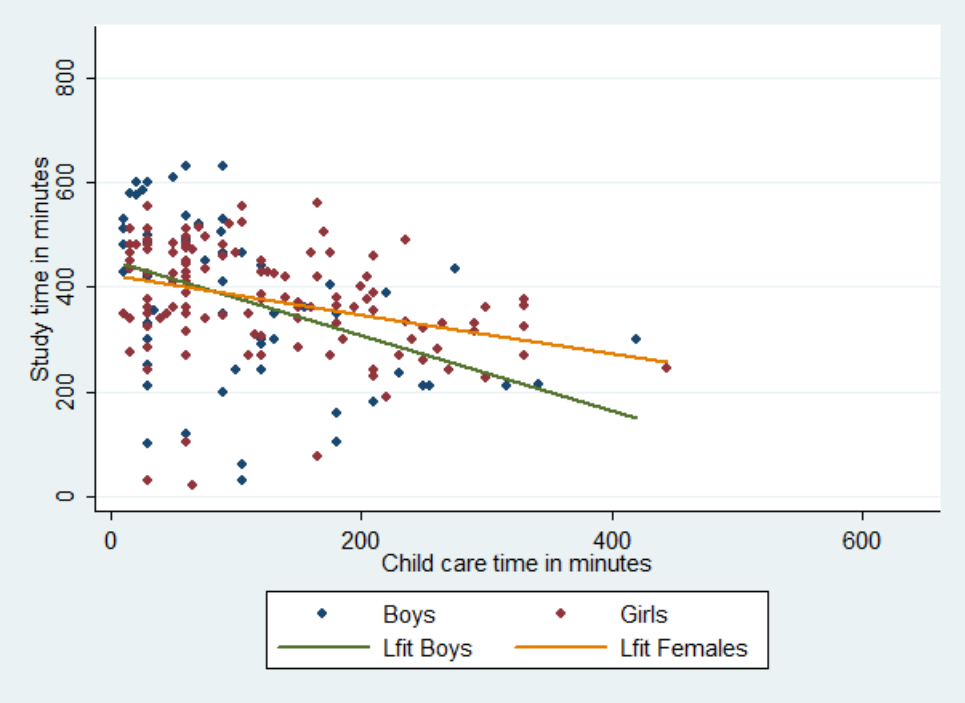


Figure 3.6: Percentage of girls 6-14 years currently in school having a younger sibling below 5 years receiving different ICDS services - Rural India

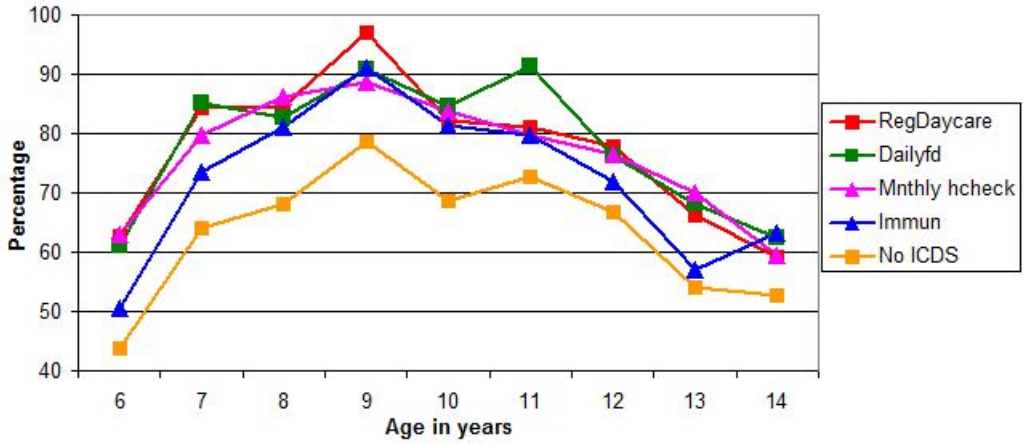
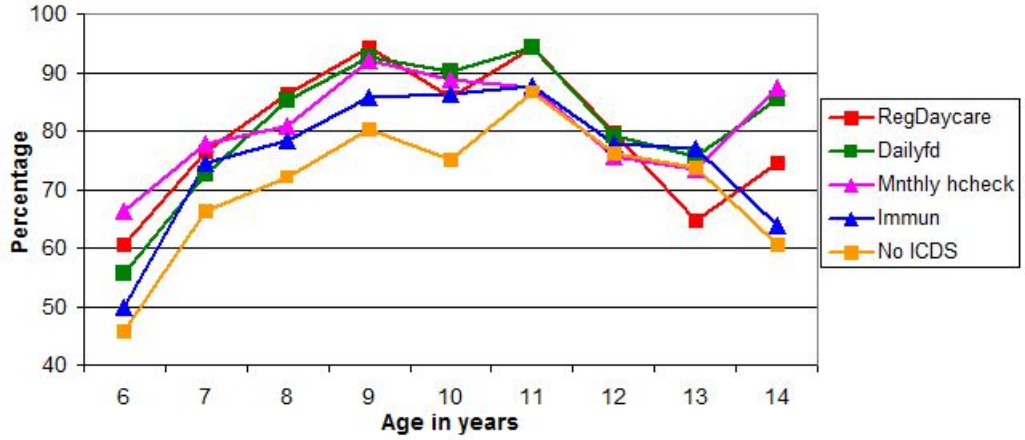


Figure 3.7: Percentage of boys 6-14 years currently in school having a younger sibling below 5 years receiving different ICDS services - Rural India



RegDaycare - Regular Daycare/ECC; Dailyfd - Daily supplementary feeding; Mnthly hcheck - Monthly health check-up; Immun - Most vaccinations at ICDS center; No ICDS - No ICDS intensely or none at all;

Table 3.2: Probit & CVM: Effect of different ICDS services on current schooling of children 6-14 years (Base: with at least one sibling below 5 years)

	Boys 6-14 years						Girls 6-14 years					
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Regular preschool / ECC	0.01	0.04					0.03	0.08				
	(0.03)	(0.02)*					(0.03)	(0.01)***				
Daily supplementary feeding	0.02		0.05				0.06		0.08			
	(0.03)		(0.02)**				(0.02)**		(0.01)***			
Monthly health check-up	0.05			0.07			0.03			0.08		
	(0.02)**			(0.02)***			(0.02)			(0.01)***		
Most vaccinations at ICDS	0.04				0.05		0.06				0.08	
	(0.01)**				(0.01)***		(0.01)***				(0.01)***	
Any ICDS intensely†						0.06						0.10
						(0.01)***						(0.01)***
Observations	8166	8297	8321	8204	8341	8345	9723	9889	9917	9762	9938	9943
MeanY	0.69	0.69	0.69	0.69	0.69	0.69	0.66	0.66	0.66	0.66	0.66	0.66
P-value: all ICDS components=0	0						0.00					
P-value: Preschool=Feeding=0.00	0.52						0.00					
Covariate Matching - Effect of most vaccinations at ICDS												
Three matches					0.07						0.06	
					(0.02)***						(0.02)***	
One match					0.06						0.06	
					(0.02)***						(0.02)***	
Observations					8,341						9,938	
Covariate Matching - Effect of Any ICDS intensely†												
Three matches						0.06						0.06
						(0.02)***						(0.01)***
One match						0.08						0.06
						(0.02)***						(0.01)***
Observations						8,345						9,943

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); Each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies; Under covariate matching (CVM) each cell is a separate regression with the above mentioned controls.

Table 3.3: Probit: Effect of combination of ICDS services on current schooling of children 6-14 years (Base: with at least one sibling below 5 years)

	Boys 6-14 years					Girls 6-14 years				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Regular preschool/ECC or	0.02	0.04			0.03	0.05	0.08			0.12
Daily supplementary feeding	(0.02)	(0.01)**			(0.07)	(0.01)***	(0.01)***			(0.05)**
Most vaccinations at ICDS or Monthly health check-up	0.06		0.06		0.06	0.08		0.09		0.08
	(0.01)***		(0.01)***		(0.01)***	(0.01)***		(0.01)***		(0.01)***
Any ICDS intensely†				0.06					0.10	
				(0.01)***					(0.01)***	
Age * MostVacc/Health check					0.00					0.003
					(0.01)					(0.01)
Observations	8328	8331	8342	8345	8328	9927	9929	9941	9943	9927
MeanY	0.69	0.69	0.69	0.69	0.69	0.66	0.66	0.66	0.66	0.66
$\mathrm{P-value}^{\wp}$					0.00					0.00

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; $^{\wp}$P-value: MostVacc/healthchk=Age*MostVacc/Healthchk=0; ECC - early childhood care; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); Each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies.

Table 3.4: Logit & Clogit: Effect of combination of ICDS services on current schooling of children 6-14 years - with and without village fixed-effects (Base: with at least one sibling below 5 years)

	No village fixed-effects							
	Boys 6-14 years				Girls 6-14 years			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Regular preschool/ECC or Daily supplementary feeding	1.13 (1.08)	1.24 (1.98)**			1.32 (2.93)***	1.52 (4.54)***		
Most vaccinations at ICDS or Monthly health check-up	1.38 (3.57)***		1.42 (3.96)***		1.51 (5.36)***		1.62 (6.42)***	
Any ICDS intensely†				1.35 (3.67)***				1.63 (6.86)***
Observations	8328	8331	8342	8345	9927	9929	9941	9943
	Village fixed effects (VFE)							
	Boys 6-14 years - VFE				Girls 6-14 years - VFE			
Regular preschool/ECC or Daily supplementary feeding	1.12 (0.70)	1.16 (0.95)			1.24 (1.58)	1.32 (2.12)**		
Most vaccinations at ICDS or Monthly health check-up	1.25 (1.43)		1.28 (1.55)		1.39 (2.58)***		1.44 (2.93)***	
Any ICDS intensely†				1.23 (1.50)				1.44 (3.12)***
Observations	5856	5861	5870	5875	7162	7164	7165	7167

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratio; Robust z-statistics in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); Each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies.

Table 3.5: Probit/Logit/Clogit: Effect of most vaccinations at the ICDS center and "Any ICDS intensely" on current schooling of children 6-14 years in pooled sample (Base: with at least one sibling below 5 years)

	Estimation method	Probit	Logit	Conditional logit	Logit	Conditional logit	Logit
	Sample	Pooled	Pooled	Pooled - VFE	VFE sample	Pooled - MFE	MFE sample
		(A)	(B)	(C)	(D)	(E)	(F)
I	Most vaccinations at ICDS	0.05	1.29	1.22	1.32		0.78
		(0.01)***	(2.72)***	(1.58)	(2.86)***		(1.62)
II	Girl	-0.59	0.03	0.01	0.02	2.34	0.00
		(0.46)	(0.98)	(1.18)	(1.13)	(2.77)***	(1.88)*
III	**Girl * Most Vaccinations at ICDS**	0.03	1.15	1.24	1.18	1.48	1.67
		(0.02)	(1.16)	(1.64)	(1.28)	(2.41)**	(2.57)**
	Observations	18279	18279	15092	15092	6242	5851
	MeanY	0.68					
	P-value: Immun=Girl*Immun=0	0.00	0.00	0.00	0.00		0.03
IV	Any ICDS intensely†	0.06	1.35	1.10	1.26		0.81
		(0.01)***	(3.67)***	(0.93)	(2.70)***		(1.57)
V	Girl	-0.59	0.03	0.01	0.02	2.14	0.00
		(0.46)	(0.99)	(1.21)	(1.13)	(2.48)**	(1.83)*
VI	**Girl * Any ICDS** intensely†	0.04	1.21	1.39	1.24	1.65	1.41
		(0.02)*	(1.72)*	(2.90)***	(1.86)*	(3.42)***	(1.94)*
	Observations	18288	18288	15109	15109	6249	5851
	MeanY	0.68					
	P-value: AnyICDS=Girl*AnyICDS=0	0.00	0.00	0.00	0.00		0.15

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects for probit and odds ratio for simple/conditional logit models; Robust standard errors in parentheses for probit, and robust z-stats for simple/conditional logit; VFE - Village fixed effects; MFE - Mother fixed effects; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); Each column corresponding to rows I-III and IV-VI is a separate regression with the following controls (and interactions between controls and girl): age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Figure 3.8: Marginal effect (from probit) of most vaccinations at the ICDS center or monthly health check-up on schooling of older children 6-14 years by age - Rural India (Control group - Age 6 boys and girls)

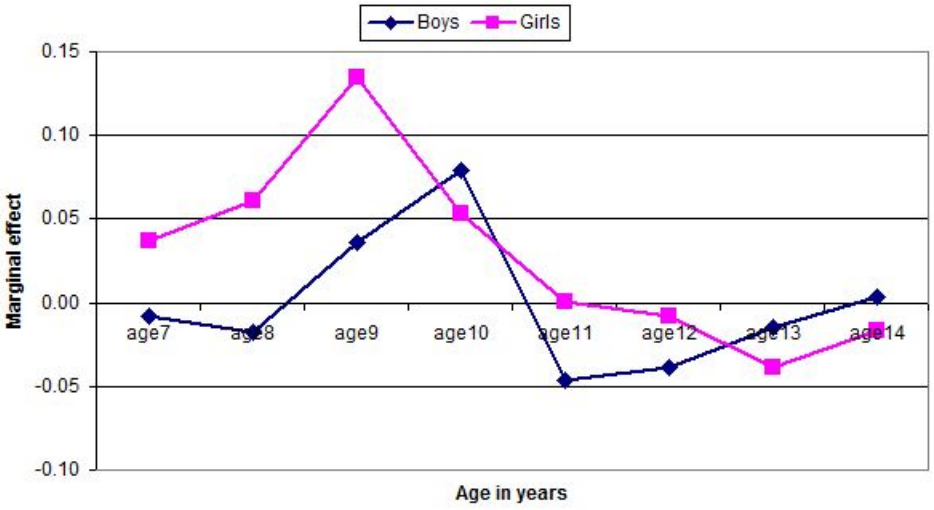


Table 3.6: Probit: Effect of combination of ICDS services on grade repetition and drop-out among children 6-14 years (Base: with at least one sibling below 5 years)

	Boys 6-14 years				Girls 6-14 years			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Dependent variable - Grade Repetition								
Regular preschool/ECC or Daily	0.02	0.02			0.01	0.01		
supplementary feeding	(0.01)**	(0.01)**			(0.01)	(0.01)**		
Most vaccinations at ICDS or	0.00		0.00		0.01		0.01	
Monthly health check-up	(0.00)		(0.00)		(0.004)*		(0.003)***	
Any ICDS intensely†				0.01				0.01
				(0.004)**				(0.003)***
Observations	8319	8331	8326	8338	9914	9929	9917	9932
MeanY	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Dependent variable - Dropout								
Regular preschool/ECC or Daily	0.00	0.00			-0.01	-0.01		
supplementary feeding	(0.01)	(0.01)			(0.00)	(0.00)		
Most vaccinations at ICDS or	0.00		0.00		0.00		-0.01	
Monthly health check-up	(0.01)		(0.00)		(0.00)		(0.00)	
Any ICDS intensely†				0.00				-0.01
				(0.00)				(0.003)*
Observations	8319	8331	8326	8338	9914	9929	9917	9932
MeanY	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); For grade repetition and dropout sections - each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies.

Table 3.7: Probit: Effect of different ICDS services on current schooling of children 6-14 years in pooled sample - by Region (Base: with at least one sibling below 5 years)

	Rural India		Rural South&West		Rural North		Rural East		Rural Northeast		Rural Central	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
A Regular preschool / ECC	0.01	0.03	0.07	0.03	-0.05	0.04	0.03	-0.01	-0.08	0.01	0.02	0.04
	(0.03)	(0.03)	(0.03)*	(0.03)	(0.06)	(0.06)	(0.08)	(0.07)	(0.09)	(0.06)	(0.06)	(0.05)
B Daily supplementary feeding	0.02	0.06	-0.02	0.01	0.05	0.09	0.05	0.12	0.06	0.00	-0.01	0.02
	(0.03)	(0.02)**	(0.05)	(0.03)	(0.05)	(0.05)	(0.06)	(0.05)**	(0.05)	(0.05)	(0.06)	(0.05)
C Monthly health check-up	0.05	0.03	0.03	0.04	0.00	-0.12	0.10	0.12	-0.11	0.07	0.02	0.02
	(0.02)**	(0.02)	(0.04)	(0.03)	(0.06)	(0.05)**	(0.05)*	(0.04)**	(0.12)	(0.04)*	(0.04)	(0.04)
D **Most vaccinations at ICDS**	0.04	0.06	-0.02	0.00	0.04	0.06	0.06	0.11	0.03	-0.09	0.08	0.11
	(0.01)**	(0.01)***	(0.03)	(0.02)	(0.03)	(0.03)**	(0.04)	(0.03)***	(0.07)	(0.07)	(0.03)**	(0.03)***
Observations	8166	9723	936	1339	2570	2978	1526	1743	1882	2013	1247	1650
E MeanY	0.69	0.66	0.79	0.79	0.75	0.70	0.58	0.54	0.76	0.77	0.70	0.65
P-value:Each ICDS service=0	0.00	0.00	0.23	0.10	0.59	0.04	0.06	0.00	0.68	0.38	0.09	0.00
P-value:Presch=Feeding=0	0.52	0.00	0.28	0.31	0.56	0.07	0.53	0.05	0.45	0.98	0.94	0.65

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratio; Robust z-statistics in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); For regional classification of states see Appendix Table 3.A.2; Each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies.

Table 3.8: Probit: Effect of different ICDS services on the full immunization of boys and girls 10-59 months

	Rural India		**Rural South&West**		**Rural North**		**Rural East**		**Rural Northeast**		**Rural Central**	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Regular preschool / ECC	0.05	0.09	0.05	0.10	0.05	0.02	0.02	0.10	-0.10	0.04	0.17	0.13
	(0.03)	(0.02)**	(0.04)	(0.04)*	(0.08)	(0.06)	(0.06)	(0.06)	(0.06)	(0.09)	(0.07)*	(0.06)*
Daily supplementary feeding	0.03	0.00	0.03	0.01	0.03	-0.04	0.08	0.08	0.04	0.06	0.01	-0.06
	(0.03)	(0.03)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)	(0.05)	(0.08)	(0.08)	(0.05)	(0.05)
Monthly health check-up	0.09	0.16	0.07	0.11	0.04	0.14	0.04	0.08	0.33	0.15	0.19	0.23
	(0.02)**	(0.02)**	(0.03)*	(0.03)**	(0.05)	(0.07)	(0.04)	(0.04)	(0.12)*	(0.13)	(0.04)**	(0.03)**
Most vaccinations at ICDS	0.09	0.13	-0.01	0.00	0.11	0.09	0.11	0.20	-0.03	0.06	0.18	0.25
	(0.01)**	(0.01)**	(0.03)	(0.03)	(0.04)**	(0.04)*	(0.03)**	(0.04)**	(0.07)	(0.08)	(0.03)**	(0.03)**
Observations	11248	10251	2174	1901	3254	2762	1986	1906	2228	2177	1602	1495
MeanY	0.40	0.39	0.55	0.54	0.33	0.30	0.42	0.41	0.31	0.33	0.32	0.32

* significant at 5%. ** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; For regional classification of states see Appendix Table 3.A.2; Each column is a separate regression with the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's height in cms, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies.

Table 3.9: Probit: Effect of different ICDS services on the incidence of diseases and weight-for-age among boys and girls below 5 years - Rural North and Rural East

	Children 0-2 years					Children 3-5 years				
Rural North	Diarrhea	Fever	Cough	Rapid brthg	Weight	Diarrhea	Fever	Cough	Rapid brthg	Weight
A Regular preschool / ECC		0.038	-0.074	-0.007	0.251	-0.023	0.038	0.112	0.072	0.193
		(0.10)	(0.08)	(0.08)	(0.17)	(0.02)	(0.04)	(0.05)**	(0.05)	(0.19)
B Daily supplementary feeding	-0.062	0.036	0.073	0.037	0.025	0.062	0.008	-0.018	-0.032	-0.221
	(0.03)*	(0.06)	(0.07)	(0.05)	(0.14)	(0.03)*	(0.04)	(0.04)	(0.02)	(0.18)
C Monthly health check-up	-0.002	-0.017	-0.041	-0.011	0.016	-0.029	-0.086	-0.070	-0.031	-0.268
	(0.03)	(0.04)	(0.04)	(0.04)	(0.12)	(0.00)***	(0.01)***	(0.02)**	(0.01)*	(0.18)
E **Full immunization &** ICDS[†]	0.005	0.136	0.108	-0.006	0.151	0.041	0.063	0.018	0.020	0.034
	(0.04)	(0.06)**	(0.07)	(0.05)	(0.17)	(0.03)	(0.04)	(0.04)	(0.03)	(0.16)
F Full immunization & nonICDS[§]	0.035	0.070	0.071	0.033	0.314	0.026	0.061	0.049	0.004	-0.075
	(0.02)	(0.02)***	(0.02)**	(0.02)	(0.08)***	(0.01)**	(0.01)***	(0.01)***	(0.01)	(0.10)
Observations	3068	3108	3108	3107	3111	4190	4192	4192	4186	4200
MeanY	0.13	0.18	0.21	0.12		0.06	0.14	0.17	0.08	
Rural East										
G Regular preschool / ECC	-0.044	0.054	0.013	-0.027	-0.027	0.036	-0.056	-0.005	-0.005	0.166
	(0.05)	(0.09)	(0.09)	(0.06)	(0.19)	(0.03)	(0.02)**	(0.03)	(0.02)	(0.13)
H Daily supplementary feeding	-0.004	-0.028	-0.042	-0.010	-0.033	-0.033	0.052	0.029	0.029	0.093
	(0.04)	(0.05)	(0.04)	(0.04)	(0.12)	(0.01)**	(0.04)	(0.04)	(0.03)	(0.12)
I Monthly health check-up	0.015	0.027	0.054	0.045	-0.015	0.000	-0.037	0.019	-0.007	-0.155
	(0.03)	(0.04)	(0.04)	(0.03)	(0.08)	(0.02)	(0.02)*	(0.03)	(0.02)	(0.10)
J **Full immunization &** ICDS[†]	-0.027	0.011	0.048	0.003	0.085	-0.020	0.020	0.009	-0.002	-0.074
	(0.03)	(0.04)	(0.05)	(0.04)	(0.10)	(0.01)**	(0.03)	(0.03)	(0.02)	(0.12)
K Full immunization & nonICDS[§]	0.018	-0.018	0.007	-0.025	0.108	-0.005	-0.014	-0.031	-0.028	0.000
	(0.03)	(0.03)	(0.03)	(0.02)	(0.08)	(0.01)	(0.02)	(0.02)	(0.01)*	(0.08)
Observations	1976	1979	1976	1971	1980	2747	2747	2746	2747	2748
MeanY	0.15	0.23	0.27	0.17		0.07	0.17	0.2	0.12	

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; Weight - Weight-for-age; ECC - early childhood care; [†]Full immunization & ICDS indicates that the child has received full immunization and received most vaccinations at ICDS center; [§]Full immunization & nonICDS indicates that the child has received full immunization and received most vaccinations at other place; For regional classification of states see Appendix Table 3.A.2; For each region each column is a separate regression with the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's height in cms, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies; A blank indicates no variation in treatment variable.

Table 3.10: Probit: Effect of different ICDS services on the incidence of diseases and weight-for-age among boys and girls below 5 years - Rural Central

	Children 0-2 years					Children 3-5 years				
Rural Central	Diarrhea	Fever	Cough	Rapid brthg	Weight	Diarrhea	Fever	Cough	Rapid brthg	Weight
A Regular preschool / ECC	0.092	-0.084	-0.022		0.292	0.013	0.000	0.011	-0.007	-0.024
	(0.10)	(0.04)**	(0.08)		(0.27)	(0.02)	(0.03)	(0.03)	(0.02)	(0.16)
B Daily supplementary feeding	0.004	-0.042	-0.020	-0.062	0.010	0.019	-0.026	-0.014	-0.020	-0.155
	(0.04)	(0.03)	(0.04)	(0.01)***	(0.12)	(0.02)	(0.02)	(0.03)	(0.02)	(0.15)
C Monthly health check-up	0.031	0.019	0.064	0.067	-0.082	-0.013	0.004	-0.004	-0.013	-0.023
	(0.03)	(0.03)	(0.03)**	(0.02)***	(0.08)	(0.01)	(0.02)	(0.02)	(0.01)	(0.11)
D **Full immunization &** ICDS[†]	-0.056	-0.043	-0.032	-0.030	0.075	-0.004	0.006	0.000	0.030	0.194
	(0.02)**	(0.02)*	(0.03)	(0.02)	(0.11)	(0.01)	(0.02)	(0.02)	(0.02)	(0.10)*
E Full immunization & nonICDS[§]	-0.074	0.003	0.012	-0.020	0.137	0.025	0.017	-0.007	0.017	-0.095
	(0.02)***	(0.03)	(0.04)	(0.02)	(0.14)	(0.01)*	(0.02)	(0.02)	(0.02)	(0.12)
Observations	1585	1581	1585	1562	1586	2208	2209	2207	2211	2215
MeanY	0.16	0.15	0.21	0.11		0.05	0.1	0.13	0.07	

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; Weight - Weight-for-age; ECC - early childhood care; [†]Full immunization & ICDS indicates that the child has received full immunization and received most vaccinations at ICDS center; [§]Full immunization & nonICDS indicates that the child has received full immunization and received most vaccinations at other place; For regional classification of states see Appendix Table 3.A.2; For each region each column is a separate regression with the following controls: age of child in months, age square, age cube, birth interval, birth order, mother's education in years, mother's age in years, mother's height in cms, wealth score, caste, religion, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state dummies; A blank indicates no variation in treatment variable.

Table 3.11: Probit: Determinants of receiving most vaccinations at the ICDS center by children in age-groups 0-2 and 3-5 years - Rural India and Rural North

	Rural India				**Rural North**			
	0-2 yrs		3-5 yrs		0-2 yrs		3-5 yrs	
	All[§]	ICDS = 1[℘]	All[§]	ICDS = 1[℘]	All[§]	ICDS = 1[℘]	All[§]	ICDS = 1[℘]
Age in months	0.033	0.04	-0.022	-0.044	0.014	0.005	0.028	0.041
	(0.007)***	(0.020)**	(0.03)	(0.07)	(0.007)*	(0.03)	(0.03)	(0.11)
Birth Interval (months)	0.009	-0.08	-0.047	0.481	-0.083	0.524	-0.102	-0.459
	(0.23)	(0.63)	(0.21)	(0.57)	(0.28)	(1.20)	(0.22)	(0.92)
Birth order	-2.806	1.64	-3.587	-4.644	2.249	7.551	4.95	19.583
	(3.85)	(10.04)	(3.17)	(8.33)	(4.29)	(16.49)	(3.27)	(13.21)
Mother's age (years)	0.01	-2.879	0.704	-0.522	-0.677	-7.524	0.388	3.042
	(1.65)	(4.37)	(1.42)	(3.52)	(2.00)	(8.53)	(1.65)	(6.58)
Mother's edu (years)	2.013	-1.04	-0.346	-6.47	1.07	0.758	-1.756	-6.873
	(1.59)	(3.98)	(1.35)	(3.369)*	(1.58)	(6.32)	(1.28)	(5.01)
Mother's Height in cms	0.905	4.691	0.5	1.538	0.674	3.399	-0.988	-1.793
	(0.79)	(2.235)**	(0.68)	(1.83)	(0.83)	(4.08)	(0.67)	(3.07)
Spouse's age (years)	1.238	2.772	0.061	-3.159	0.588	4.685	-1.949	-9.015
	(1.26)	(3.15)	(0.97)	(2.32)	(1.45)	(6.94)	(1.26)	(5.291)*
Spouse's edu (years)	0.707	1.066	1.209	0.073	0.312	-2.545	0.056	-2.607
	(1.53)	(4.04)	(1.26)	(3.47)	(1.60)	(6.31)	(1.20)	(5.04)
Hh head age (years)	-0.266	0.333	-0.479	-0.548	-0.029	0.352	-0.082	0.262
	(0.33)	(0.95)	(0.30)	(0.83)	(0.37)	(1.55)	(0.32)	(1.29)
Hh head edu (years)	-0.832	0.481	0.881	3.724	-0.811	-0.979	1.983	7.662
	(1.45)	(4.02)	(1.23)	(3.40)	(1.39)	(5.82)	(1.116)*	(4.72)
Wealth index	-33.647	-108.013	-40.769	-71.145	-9.337	-42.222	-24.02	-115.554
	(10.717)***	(29.540)***	(8.975)***	(25.250)***	(10.70)	(47.89)	(8.491)***	(39.005)***
Caste - Sch caste	0.052	0.014	0.031	0.015	0.021	-0.026	-0.004	-0.083
	(0.017)***	(0.04)	(0.014)**	(0.03)	(0.02)	(0.06)	(0.01)	(0.045)*
Caste - Sch tribe	0.017	-0.006	0.03	0.052	0.071	0.172	0.009	0.247
	(0.02)	(0.05)	(0.016)*	(0.04)	(0.05)	(0.15)	(0.03)	(0.150)*
Caste - OBC	0.009	0.008	0.028	0.068	-0.007	-0.08	0.003	-0.003
	(0.01)	(0.04)	(0.012)**	(0.033)**	(0.01)	(0.06)	(0.01)	(0.05)
Religion - Hindu	-0.148	-0.196	-0.072	-0.074	0.027	0.097	0.029	0.14
	(0.041)***	(0.057)***	(0.026)***	(0.06)	(0.03)	(0.12)	(0.016)*	(0.069)**
Religion - Muslim	-0.103	-0.225	-0.075	-0.109	-0.044	-0.13	-0.014	0.063
	(0.018)***	(0.067)***	(0.017)***	(0.063)*	(0.025)*	(0.13)	(0.02)	(0.11)
Water - Piped Water	0.029	0.129	0.061	0.062	0.032	0.142	0.02	0.058
	(0.02)	(0.044)***	(0.018)***	(0.04)	(0.02)	(0.079)*	(0.02)	(0.06)
Water - tubewell	0.013	0.067	0.012	0.012	0.011	0.057	0.001	0.028
	(0.01)	(0.028)**	(0.01)	(0.03)	(0.02)	(0.07)	(0.01)	(0.06)
Toilet - Others	-0.074	-0.187	-0.025	-0.003	-0.041	-0.172	-0.046	-0.194
	(0.020)***	(0.081)**	(0.02)	(0.06)	(0.015)***	(0.079)**	(0.009)***	(0.044)***
Toilet - No facility	0.002	-0.061	-0.011	-0.01	0.017	-0.015	-0.016	-0.081
	(0.02)	(0.05)	(0.02)	(0.04)	(0.02)	(0.07)	(0.01)	(0.06)
Cooking fuel - Wood	-0.002	-0.005	0.029	0.066	0.014	0.05	0.016	0.041
	(0.01)	(0.03)	(0.009)***	(0.024)***	(0.01)	(0.04)	(0.008)*	(0.04)
Observations	11115	4333	15496	6836	3135	895	4322	1329

* significant at 10%; ** significant at 5%. *** significant at 1%; The estimates indicate marginal effects; Robust standard errors in parentheses; [§] Sample includes all children in the age-group; [℘] Sample includes only those children who report receiving some benefit from the ICDS program in that age-group; For regional classification of states see Appendix Table 3.A.2; Estimates for state dummies not presented; Covariates like birth interval, birth order, mother's age, mother's education, mother's height, spouse's age, spouse's education, household head's age and household head's education have been rescaled by multiplying with 10^{-3} to obtain non-zero marginal effects;

Table 3.12: Probit: Determinants of receiving most vaccinations at the ICDS center by children in age-groups 0-2 and 3-5 years - Rural East and Rural Central

	Rural East				**Rural Central**			
	0-2 yrs		3-5 yrs		0-2 yrs		3-5 yrs	
	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$	All[§]	ICDS $= 1^{\wp}$
Age in months	0.018	-0.007	-0.082	-0.109	0.091	0.095	0	-0.031
	(0.01)	(0.03)	(0.040)**	(0.10)	(0.017)***	(0.027)***	(0.07)	(0.09)
Birth Interval (months)	-0.372	-1.486	0.356	1.534	0.944	1.025	-0.922	-0.121
	(0.33)	(0.98)	(0.32)	(0.834)*	(0.68)	(0.95)	(0.60)	(0.82)
Birth order	0.025	6.787	-10.523	-28.939	-25.651	-18.444	-6.068	5.384
	(5.95)	(17.63)	(5.023)**	(13.243)**	(10.260)**	(15.17)	(8.58)	(11.49)
Mother's age (years)	2.665	-2.331	4.442	8.714	-5.007	0.766	-9.504	-15.415
	(2.38)	(6.71)	(2.128)**	(5.136)*	(4.66)	(6.75)	(4.012)**	(5.268)***
Mother's edu (years)	0.94	-3.621	0.455	-9.151	4.865	-4.313	2.6	-2.852
	(2.86)	(7.22)	(2.29)	(5.80)	(4.57)	(6.06)	(4.13)	(5.07)
Mother's Height in cms	1.654	8.886	2.02	3.447	0.601	1.52	1.279	1.788
	(1.34)	(3.924)**	(1.102)*	(2.96)	(2.09)	(3.14)	(1.89)	(2.46)
Spouse's age (years)	-0.1	1.455	-0.507	-3.561	6.549	2.912	6.563	2.076
	(1.92)	(4.81)	(1.47)	(3.61)	(3.284)**	(4.46)	(2.650)**	(3.06)
Spouse's edu (years)	-0.195	-2.603	3.267	8.197	-0.915	5.492	-3.538	-5.573
	(2.51)	(7.80)	(1.99)	(6.00)	(4.28)	(6.10)	(3.93)	(5.20)
Hh head age (years)	-0.311	0.286	-1.405	-2.3	-0.27	0.922	1.036	1.024
	(0.51)	(1.65)	(0.449)***	(1.323)*	(0.96)	(1.42)	(0.92)	(1.30)
Hh head edu (years)	1.371	8.094	-1.991	-7.373	-2.986	-3.342	4.237	9.421
	(2.49)	(7.84)	(2.02)	(6.08)	(4.36)	(6.41)	(4.00)	(5.244)*
Wealth index	-67.527	-168.868	-39.696	19.896	-20.88	-99.144	-68.585	-106.5
	(19.037)***	(52.972)***	(15.509)**	(41.14)	(30.37)	(46.067)**	(26.905)**	(37.537)***
Caste - Sch caste	0.018	-0.013	0.017	0.045	0.293	0.131	0.199	0.109
	(0.03)	(0.07)	(0.02)	(0.05)	(0.058)***	(0.062)**	(0.053)***	(0.057)*
Caste - Sch tribe	0.043	0.032	0.05	0.096	0.122	0.062	0.131	0.105
	(0.03)	(0.07)	(0.026)*	(0.055)*	(0.053)**	(0.07)	(0.049)***	(0.058)*
Caste - OBC	-0.003	0.008	0.026	0.097	0.164	0.14	0.142	0.126
	(0.02)	(0.06)	(0.02)	(0.049)*	(0.044)***	(0.063)**	(0.043)***	(0.058)**
Religion - Hindu	-0.195	-0.33	-0.109	-0.162	-0.103	0.053	-0.082	0.043
	(0.055)***	(0.075)***	(0.036)***	(0.073)**	(0.19)	(0.18)	(0.16)	(0.21)
Religion - Muslim	-0.099	-0.282	-0.086	-0.166	-0.012	0.157	-0.073	0.109
	(0.023)***	(0.085)***	(0.021)***	(0.073)**	(0.18)	(0.13)	(0.14)	(0.17)
Water - Piped Water	-0.023	-0.041	-0.019	-0.114	0	0.106	0.103	0.065
	(0.04)	(0.14)	(0.05)	(0.12)	(0.04)	(0.053)**	(0.040)**	(0.05)
Water - tubewell	0.058	0.169	0.046	0.069	-0.062	0.003	-0.035	-0.044
	(0.011)***	(0.042)***	(0.011)***	(0.035)**	(0.028)**	(0.04)	(0.02)	(0.03)
Toilet - Others	-0.053	-0.164	0.048	0.105	-0.214	-0.236	-0.144	-0.047
	(0.027)**	(0.11)	(0.04)	(0.09)	(0.052)***	(0.21)	(0.074)*	(0.14)
Toilet - No facility	-0.04	-0.166	0.021	0.083	-0.053	-0.069	-0.13	-0.092
	(0.03)	(0.089)*	(0.02)	(0.06)	(0.06)	(0.07)	(0.057)**	(0.06)
Cooking fuel - Wood	-0.012	-0.038	0.02	0.061	-0.011	-0.037	0.084	0.059
	(0.02)	(0.05)	(0.01)	(0.037)*	(0.03)	(0.04)	(0.027)***	(0.04)
Observations	2001	871	2800	1380	1640	860	2291	1215

* significant at 10%; ** significant at 5%. *** significant at 1%; The estimates indicate marginal effects; Robust standard errors in parentheses; [§] Sample includes all children in the age-group; $^{\wp}$ Sample includes only those children who report receiving some benefit from the ICDS program in that age-group; For regional classification of states see Appendix Table 3.A.2; Estimates for state dummies not presented; Covariates like birth interval, birth order, mother's age, mother's education, mother's height, spouse's age, spouse's education, household head's age and household head's education have been rescaled by multiplying with 10^{-3} to obtain non-zero marginal effects;

Table 3.13: Probit: Effect of different ICDS services on current schooling of children 6-14 years with the youngest sibling 0-23 months vs with those in the age-group 24-59 months (Base: with at least one sibling below 5 years)

	Boys 6-14 years with 0-23 months sibling						Boys 6-14 years with 24-59 months sibling					
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Regular preschool / ECC	0.00	0.00					0.00	0.04				
	(0.06)	(0.05)					(0.04)	(0.03)				
Daily supplementary feeding	-0.01		0.00				0.02		0.06			
	(0.06)		(0.05)				(0.03)		(0.02)***			
Monthly health check-up	-0.01			0.02			0.08			0.09		
	(0.04)			(0.04)			(0.02)***			(0.02)***		
Most vaccinations at ICDS	0.07				0.07		0.03				0.03	
	(0.03)**				(0.03)**		(0.02)				(0.01)*	
Any ICDS intensely†						0.06						0.06
						(0.02)**						(0.01)***
Observations	3111	3127	3135	3125	3144	3144	5055	5170	5186	5079	5197	5201
MeanY	0.64	0.64	0.64	0.64	0.64	0.64	0.72	0.73	0.73	0.73	0.73	0.73
P-value: all ICDS components=0	0.26						0.01					
P-value: Preschool=Feeding=0	0.98						0.66					
	Girls 6-14 years with 0-23 months sibling						Girls 6-14 years with 24-59 months sibling					
Regular preschool / ECC	0.05	0.12					0.01	0.06				
	(0.05)	(0.03)***					(0.03)	(0.02)***				
Daily supplementary feeding	0.08		0.13				0.05		0.07			
	(0.04)*		(0.03)***				(0.02)*		(0.02)***			
Monthly health check-up	0.03			0.11			0.03			0.07		
	(0.04)			(0.02)***			(0.02)			(0.02)***		
Most vaccinations at ICDS	0.11				0.12		0.04				0.05	
	(0.02)***				(0.02)***		(0.01)*				(0.01)***	
Any ICDS intensely†						0.14						0.07
						(0.02)***						(0.01)***
Observations	3834	3866	3881	3855	3893	3895	5889	6023	6036	5907	6045	6048
MeanY	0.60	0.60	0.60	0.60	0.60	0.60	0.70	0.70	0.70	0.70	0.70	0.70
P-value: all ICDS components=0	0.00						0.00					
P-value: Preschool=Feeding=0	0.03						0.07					

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); Each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies.

Table 3.14: Probit: Effect of combination of ICDS services on currently schooling of children 6-14 years with the youngest sibling 0-23 months vs with those in the age-group 24-59 months (Base: with at least one sibling below 5 years)

	Boys 6-14 years with 0-23 months sibling				Boys 6-14 years with 24-59 months sibling			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Regular preschool/ECC or	-0.01	0.00			0.02	0.04		
Daily supplementary feeding	(0.04)	(0.04)			(0.02)	(0.02)**		
Most vaccinations at ICDS or Monthly health check-up	0.06		0.07		0.06		0.06	
	(0.02)**		(0.02)**		(0.01)***		(0.01)***	
Any ICDS intensely†				0.06				0.06
				(0.02)**				(0.01)***
Observations	3137	3137	3144	3144	5191	5194	5198	5201
MeanY	0.64	0.64	0.64	0.64	0.73	0.73	0.73	0.73
	Girls 6-14 years with 0-23 months sibling				Girls 6-14 years with 24-59 months sibling			
Regular preschool/ECC or	0.09	0.12			0.04	0.06		
Daily supplementary feeding	(0.03)***	(0.03)***			(0.02)*	(0.01)***		
Most vaccinations at ICDS or Monthly health check-up	0.10		0.12		0.07		0.08	
	(0.02)***		(0.02)***		(0.01)***		(0.01)***	
Any ICDS intensely†				0.14				0.07
				(0.02)***				(0.01)***
Observations	3885	3885	3895	3895	6042	6044	6046	6048
MeanY	0.60	0.60	0.60	0.60	0.70	0.70	0.70	0.70

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate marginal effects; Robust standard errors in parentheses; ECC - early childhood care; † "Any ICDS intensely" indicates a child 6-14 years with at least one sibling aged 0-5 years receiving any of the ICDS benefits intensely (regular preschooling or early childhood care/monthly supplementary feeding/monthly health check-up/most vaccinations at ICDS); Each column is a separate regression with the following controls: age of child in years, age square, age cube, mother's age in years, mother's highest number of years of completed education, mother's height in cms, caste, religion, wealth score, source of drinking water, toilet facility, cooking fuel, spouse's age, spouse's education, household head's age, household head's education and state/region dummies.

3.A Appendix

Table 3.A.1: Types of services provided by the ICDS program

ICDS Services	**Target Group**	**Service Providers**
Supplementary Nutrition	Children <6yrs, Pregnant and lactating mothers (PLM)	Anganwadi Workers (AWW) and Anganwadi Helper (AWH)
Immunization*	Children <6yrs, PLM	Auxilary Nurse Midwife (ANM)/ Medical Officer (MO)
Health Check-ups*	Children <6yrs, PLM	ANM/MO/AWW
Referral	Children <6yrs, PLM	AWW/ANM/MO
Pre-School Education	Children 3-6 years	AWW
Nutrition and Health Education	Women (15-45 years)	AWW/ANM/MO

Source: Ministry of Woman and Child Development, Government of India; * AWW assists ANM in identifying and mobilizing the target group;

Table 3.A.2: Regional grouping of states on basis of geographical contiguity

Region	**States**
South&West	Gujarat, Maharasthra, Goa, Andhra Pradesh, Karnataka, Kerala & Tamil Nadu
North	Jammu&Kashmir, Himachal Pradesh, Uttaranchal, Punjab, Haryana, Delhi & Uttar Pradesh
East	Bihar, West Bengal, Jharkhand & Orissa
Northeast	Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya & Assam
Central	Rajastan, Chattisgarh & Madhya Pradesh

Table 3.A.3: Probit: Determinants of receiving most vaccinations at the ICDS center by girls 6-14 years (Base - Only those children 6-14 years receiving most vaccinations at the ICDS center)

	Rural India	**Rural North**	**Rural East**	**Rural Central**
Age in years	-0.12	-0.35	-0.57	-0.35
	(0.23)	(0.61)	(0.47)	(0.38)
Mother's age in years	0.00	-0.01	-0.01	0.00
	(0.00)	(0.01)	(0.01)	(0.00)
Mother's education in years	0.00	0.01	0.00	-0.02
	(0.00)	(0.01)	(0.01)	(0.00)**
Mother's height in cms	0.00	0.01	0.00	0.00
	(0.00)	(0.00)*	(0.00)	(0.00)
Spouse's age	0.00	0.00	0.01	0.00
	(0.00)	(0.01)	(0.01)	(0.00)
Spouse's education in years	0.00	0.00	0.01	0.00
	(0.00)	(0.01)	(0.01)	(0.01)
Household head's age	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)**
Household head's education in years	0.00	0.00	-0.01	0.01
	(0.00)	(0.01)	(0.01)	(0.01)
Wealth score	0.01	-0.02	-0.03	0.03
	(0.03)	(0.06)	(0.06)	(0.05)
Caste - Scheduled caste	-0.05	-0.01	-0.13	0.00
	(0.04)	(0.07)	(0.07)*	(0.09)
Caste - Scheduled tribe	-0.07	-0.18	-0.06	-0.05
	(0.03)*	(0.14)	(0.08)	(0.09)
Caste - Other backward cste	-0.04	-0.05	-0.05	-0.05
	(0.03)	(0.07)	(0.07)	(0.09)
Religion - Hindu	-0.03	-0.08	0.17	0.07
	(0.05)	(0.11)	(0.07)**	(0.10)
Religion - Muslim	-0.06	-0.09	0.04	
	(0.06)	(0.13)	(0.10)	
Water - Piped	0.04	-0.09		0.06
	(0.03)	(0.09)		(0.06)
Water - Tubewell	-0.01	-0.20	-0.01	0.01
	(0.02)	(0.07)***	(0.05)	(0.03)
Toilet - Others	0.09	-0.12	0.18	0.04
	(0.08)	(0.18)	(0.18)	(0.26)
Toilet - No facility	-0.03	-0.11	-0.07	-0.07
	(0.04)	(0.08)	(0.12)	(0.08)
Cooking fuel - Wood	-0.02	0.04	0.04	-0.02
	(0.03)	(0.05)	(0.05)	(0.05)
State - Haryana	0.14	0.05		
	(0.04)***	(0.16)		
State - Rajasthan	0.15			
	(0.05)***			
State - Madhya Pradesh	0.14			0.01
	(0.04)***			(0.06)
State - Gujarat	0.14			
	(0.05)***			
State - Maharashtra	0.12			
	(0.05)**			
Observations	3445	601	793	1102

* significant at 10%; ** significant at 5%. *** significant at 1%; The estimates indicate marginal effects; Robust standard errors in parentheses; For regional classification of states see Appendix Table 3.A.2; The estimates for some state dummies not presented.

Figure 3.A.1: Percentage of children below 5 years receiving regular preschooling/early childhood care by 3 months age intervals - Rural India