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

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Abstract

Girls lag behind boys in education in India. They also appear to provide significant amount of childcare at home. In this paper I investigate if provision of childcare services by India's largest child development program - Integrated Child Development Scheme (ICDS) - helps to reduce gender education gap by releasing girls from home responsibilities. There are several mechanisms by which the ICDS provides childcare directly and could reduce its cost. Using logit, covariate matching and conditional logit (village and mother fixed-effects), I find that in rural India the girls 6-14 years, whose younger sibling below 5 years is receiving any of the ICDS services intensely, have 44% higher odds of schooling, than those whose sibling is either receiving no ICDS service or none intensely. 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, especially those with very young siblings of ages 0-23 months, and significantly lesser number combine childcare and education.

Keywords: child development program, education of girls.

1 Introduction

Primary education gender gap exists across many developing countries, including India, even though it is declining over time (Dreze & Kingdon (2001), Alderman *et al.* (1996)). Research indicates that older siblings, especially girls, provide child care in developing countries (Pitt & Rosenzweig (1990), Connelly *et al.* (1996)). Research also indicates that part of the gender gap in education is driven by differentials in child care responsibilities 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

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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 0-6 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.

I use the latest round of demographic health survey data for India - National Family Health Survey3 (NFHS3) 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. The NFHS3 data indicate that only a small proportion of children are receiving the ICDS services. These children are concentrated in some villages and in some states, but there are differences in areas of concentration by service. For instance, states with high proportions of children receiving most vaccinations at the ICDS center are different from those for daily supplementary feeding. Within the villages, the children who are receiving the services are more likely to be poorer and belong to scheduled caste/tribe, the weakest socio-economic group in India.

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. To address this I estimate various specifications - from bundling up all the ICDS services together, to combining the highly collinear and less frequent services, to taking each of the services separately and in combination with others.

Secondly, NFHS3 data is non-experimental, with inherent difficulty in controlling for selection on unobservables. The children who are receiving various ICDS services have not been selected randomly. For example, children from poorer families are more likely to use the ICDS services and less likely to go to school. Therefore, to “identify” the effect of any of the ICDS services, observable differences between the girls (boys) aged 6-14 years, whose younger sibling 0-5 years is receiving them intensely and those whose sibling is not, need to be accounted for. To do this I start with logit with controls. To minimize the selection bias on observables that may remain with simple technique like logit, 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 and health services, 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.

The results indicate that in rural India the girls 6-14, whose younger sibling is receiving any of the ICDS services intensely, have 44% higher odds of attending school, than those whose sibling is either receiving no ICDS service or none intensely. 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). The effect seems to be driven mainly by those, whose younger sibling is receiving most vaccinations at the ICDS center. Evidence also suggests that there is a weak positive impact of the combination of daily supplementary feeding and preschooling 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 or implicit income subsidy. It seems that the effect is concentrated among younger age girls, and they are 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.

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 & 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, especially those with very young siblings of ages 0-23 months, and significantly lesser number combine childcare and education. 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 2 briefly summarizes the literature on childcare and education of older siblings. Section 3 gives a description of the ICDS program, areas of concentration and the potential mechanisms of reduction in child care costs. Section 4 discusses the empirical strategy. Section 5 describes the data used in the analysis. Section 6 presents empirical results, Section 7 summarizes and discusses the empirical results, including those from the Time-Use Survey, and Section 8 concludes.

2 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 & 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 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 now has more than one million centers covering 91.5% of Indian villages. 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 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 0 to 6 years of

age are: supplementary nutrition to children 0-6¹ 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. 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 time and monetary costs.
2. Time spent in Anganwadis for preschooling releases the older siblings, especially girls, from supervision duties and allows them to engage in other activities.
3. Increase in household resources because of implicit income subsidy through supplementary nutrition.

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

Figure 2 indicates that despite widespread ICDS presence, only a small proportion of children are receiving the ICDS services intensely. For instance, only 10% children report receiving the flagship ICDS service - supplementary feeding intensely (daily). The service with most uptake is immunization, but even then only 16% children report receiving most vaccinations at the ICDS center. The children who are receiving these services are concentrated in some villages and in some states, but there are differences in areas of concentration by service. For instance, the children receiving daily supplementary feeding are living in 19% of Indian villages (Figure 3) and the states with high concentrations of such children are Maharashtra, West Bengal and Tamil Nadu.² The children receiving most vaccinations at the ICDS center are located in relatively higher proportion of Indian villages at 40%. Also, states with high concentration of such children are different from those for daily supplementary feeding. They are Chattisgarh, Orissa, Madhya Pradesh, Jharkhand and Haryana.³ For either of these services, the children who are receiving these services within the villages, are more likely to be older in age, poorer, scheduled caste or scheduled tribe (weakest socio-economic group in India), and not a Muslim (Columns B and D in Table 1).

4 Empirical Strategy

For all the empirical analysis the sample contains *only* those boys and girls 6-14 years old, who have at least one younger sibling below 5 years. To examine the impact of the package of ICDS services put together, I estimate the following logit specification.

$$AtnSch_i = \alpha AnyICDS_i + \eta X_i + \lambda_i + u_i \quad (1)$$

where $AtnSch_i$ is a dummy variable with value of one for a 6-14 years old girl (boy) who has attended school in the current academic year. $AnyICDS_i$ is a dummy variable which takes the value of one for

¹Children 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.

²In these states more than 20% children report receiving supplementary feeding daily.

³In these states more than 30% report receiving most of their vaccinations at the ICDS center.

boys and girls 6-14, whose younger sibling below 5 years is 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. 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* (caste, religion, wealth score); and *environmental factors* (water source, toilet facility, cooking fuel). λ_i captures unobservable or observable but unaccounted state-specific⁴ or village-specific fixed effects. u_i is an error term. α , is the parameter of interest and captures the effect of younger sibling receiving any of the four ICDS services intensely.

To understand the relative significance of each of the ICDS services, I also estimate the following logit regression equation:

$$AtnSch_i = \alpha Presch_i + \beta Dailyfd_i + \gamma Mhcheck_i + \delta Immun_i + \eta X_i + \lambda_i + u_i \quad (2)$$

where $Presch_i$ is a dummy variable with the value of one for a girl (boy) 6-14, whose younger sibling is receiving preschooling/early child care through ICDS *regularly*. $Dailyfd_i$ is a dummy variable with the value of one for a girl (boy) 6-14, whose younger sibling is receiving receiving supplementary nutrition through ICDS *daily*. $Mhcheck_i$ is a dummy variable with the value of one for a girl (boy) 6-14, whose younger sibling is receiving receiving health check-up through ICDS *monthly*. $Immun_i$ is a dummy variable with the value of one for a girl (boy) 6-14, whose younger sibling is receiving receiving most vaccinations at the ICDS center. α , β , γ and δ are the parameters of interest and capture the effect of younger sibling receiving the various ICDS services.

The above specification estimates the impact of each ICDS service controlling for receipt of other ICDS services by siblings 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:

$$AtnSch_i = \alpha FdSch_i + \beta ImmunHck_i + \eta X_i + \lambda_i + u_i \quad (3)$$

where $FdSch_i$ is a dummy variable with the value of one for a girl (boy) 6-14, whose younger sibling is receiving receiving highly collinear services - regular preschooling/early childhood care or daily supplementary feeding (Appendix Table A.2). $ImmunHck_i$ is a dummy variable with the value of one for a girl (boy) 6-14, whose younger sibling is receiving receiving less frequent services, i.e. either most vaccinations at the ICDS center or monthly health check-up.

I use non-experimental survey data in which the children who are receiving different ICDS services have not been selected randomly. For example, children from poorer families are more likely to use the ICDS services and less likely to go to school. 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, like their economic status, in order to get to the pure effect of ICDS services on their schooling. With logit, I can control for observable characteristics related to children 6-14 with the addition of control variables X_i .

⁴For 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.

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 logit 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:

$$AtnSch_i = \alpha AnyICDS_i * Girl_i + \beta Girl_i + \gamma Age_i + \delta Age_i * Girl_i + u_i \quad (4)$$

where $AtnSch_i$ is a dummy variable with value of one for a girl (boy) 6-14 who has attended school in the current academic year. $AnyICDS_i$ is a dummy variable which takes the value of one for boys and girls 6-14, whose younger sibling below 5 years is receiving any of the four ICDS services intensely; $Girl_i$ is a dummy variable with the value of 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 logit 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, and on unobservables to the extent they are correlated with 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 & Imbens (2006), adjusts for bias when matching is not perfect, makes no assumption about functional form, and provides the heteroscedasticity consistent standard errors for matching estimators.

5 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 because this is the only one with detailed information on usage of ICDS services. It also provides information on demographics and education of children 5-14 years, and covers important aspects of nutrition and health care of children aged 0-5 years 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 school⁵ 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 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,

⁵The question asks if the child attended school at any time during the present and previous academic year.

and 5% less among 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 1) than boys.

NFHS survey collects information on utilization of various ICDS services by women and children 0-5 in the household. For the ICDS services which are directly benefiting the children below 5 years, the information on intensity of usage is also collected.⁶ Among all these different ICDS services, immunization has the highest uptake: 16% of children received most of their vaccinations at the ICDS center (Figure 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 uptake is relatively lower and it picks up for older children, especially from 2 years onwards. In the NFHS-3 questionnaire the information on uptake 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 2).

Summary statistics in Table 2 show that there are significant unconditional mean differences between characteristics of girls (boys) whose sibling 0-5 years is receiving any of the ICDS services intensely, from those whose sibling is not. Compared to the girl whose sibling receives either no ICDS service or none intensely, the one who does have such a sibling, is more likely to be younger in age, has a mother younger in age, slightly more educated and taller, to be poorer, from schedule caste/tribe, to be a hindu, 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 are 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).⁷

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;⁸ accompanying children to places (schools, sports, lessons, doctor); supervising children needing care; and travel related to care of children. To calculate study time I combine the following activities classified under “learning”: general education - school/university/other educational institutions attendance; studies, home-

⁶For 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.

⁷Time-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.

⁸A few children report spending time on this activity.

work 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.

Summary statistics in Table 3 compare the characteristics of boys and girls 6-14 years with at least one younger sibling 0-5 years between TUS and NFHS surveys. Mother and household head’s characteristics seem to be similar in the two surveys, however, the TUS sample has relatively more children from schedule tribes and hindus.

6 Empirical Results

Figure 4 indicates that for girls 6-14, whose younger sibling is receiving no ICDS service or none 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 5).

Table 4 provides the conditional impact of a younger sibling 0-5 receiving any of the ICDS services intensely, on the schooling of girls and boys 6-14 years old (Equation 1).⁹ The comparison group is those girls and boys 6-14 years whose younger sibling is either receiving no ICDS service or none intensely. Columns C and D provide the logit estimates, with marginal effects and odds ratio, respectively. Columns A and B provide the estimates using covariate matching with one match and three matches, respectively. Each of these estimates indicate that having a sibling receiving any of the ICDS services intensely, has a positive effect on schooling of both girls and boys. The estimates are not very sensitive to sequential addition of control variables, except for state controls for girls and age controls for boys (Appendix Table A.3).

The estimates for girls 6-14 years remain robust to controls for village level unobservables, such as local access to schools and health services, with village fixed-effects specification (Column F)). They indicate that girls whose sibling is receiving any of the ICDS services intensely have 44% higher odds of attending school. These estimates also remain robust to both between and within village variation in this village fixed-effects sample (Column E). The large drop in village fixed-effects sample (compared to Column D sample) is due to the fact that in a large number of villages all boys and girls 6-14 years are attending school. The estimates for boys are not robust to this specification.

Positive effect on girls schooling remain robust to further controls for mother level unobservables, such as her motivation level, in the mother fixed-effects specification (Column H). The girls in this sample, in comparison to rest of the girls in the general sample (Column D), are relatively younger in age, have a mother and father who is less educated, come from a poorer family, be a Christian, and have no toilet facility (Appendix Table A.4). Allowing for both across and within mother variation, estimates in Column I indicate that the impact on girls’ schooling is positive, but weakly significant.

To understand the relative significance of each of the ICDS services, I estimate different specifications using logit. Columns A and F in Table 5 present estimates of impact of all the ICDS services taken together in one regression, on education of older boys and girls 6-14 (Equation 2). Columns B and G shows impact

⁹Using the chi-square statistic the pooling of girls and boys models is rejected at 1% level of significance for all specifications.

of regular preschooling/ECC exclusively. Similarly columns C and H provide estimates for daily supplementary feeding exclusively; columns D and I for monthly health check-up; and columns E and J for most vaccinations at the ICDS center.

The results indicate that 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. 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.

I estimate another logit specification with a combination of ICDS services (Equation 3). For this specification, the estimates in Table 6 (Column A) indicate a positive and significant impact on schooling of girls 6-14 whose younger sibling is receiving either regular preschooling/ECC or daily supplementary feeding, but not on boys' schooling. In addition, for girls the effect of having a younger sibling receiving either immunization or monthly health check-up, is significant and positive. For boys also this effect is significant, but lower in magnitude.

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, becomes insignificant (Table 6, Column B).¹⁰ On the other hand, the effect of most vaccinations at the ICDS center or monthly health check-up remains statistically significant. For boys the effect is insignificant in either case. The results remain mostly similar even with logit estimation on the village-fixed effects sample (Column C) allowing for both within and across village variation.

The age-specific marginal effects for girls and boys in Figure 6 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 decrease¹¹ in impact on schooling with age. 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 more likely to repeat a grade (Table 7). I find no significant effect of ICDS services on drop-out (Table 7) or right grade-for-age.¹²

7 Summary and Discussion of Empirical Results

To summarize, I find significant positive effect on schooling of girls 6-14, whose younger sibling is receiving any of the ICDS services intensely. 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 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.

¹⁰The huge drop in sample size in village fixed-effects regression is due to the fact that in a large number of villages all boys and girls 6-14 years are attending school.

¹¹The magnitudes are small, but coefficients are jointly significant. Results not presented but are available.

¹²Results not presented.

7.1 Do girls take care of their younger siblings more than boys - evidence from Time-Use Survey

The bigger and more robust impact of ICDS services on schooling of girls than boys, is plausible if the girls play a more significant role in taking care of their younger siblings at home. I look at the time use pattern of girls and boys 6-14 years using Time-Use Survey data to examine this.

Among girls 6-14, with a younger sibling below 5 years, 22% report spending time on childcare, while only 9% boys do so (Figure 7). This proportion increases for those with very young siblings of ages 0-23 months: 13% of boys and 34% of girls spend time on childcare (Figure 8).¹³ The percentage remains largely similar across different ages of boys, but for girls it generally increases with age .

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 9). 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 time spent does not seem to differ much by age of the youngest sibling for either girls or boys (Figure 10).

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% boys¹⁴ 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 11), and it is sharper for boys than girls.¹⁵

To summarize, both boys and girls 6-14 spend time on childcare, and significantly more so if their youngest sibling is 0-23 months old. However, relatively many more girls spend time on childcare, and significantly lesser number combine childcare and education.

7.2 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 (2013), 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.¹⁶

¹³In comparison 7% of boys and 19% of girls with a sibling in the age-group 24-59 months spend time on childcare.

¹⁴6% girls report spending time on this activity.

¹⁵Because 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.

¹⁶I 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 A.1).

Estimates in Tables 8 and 9 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. The positive significant effect on girls is unlikely due to preschooling/ECC service as very low percentage of their very young siblings of ages 0-23 months are receiving it regularly (Appendix Figure A.1). Also, my calculations indicate that the income subsidy through daily supplementary feeding is 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.¹⁷

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 9), it seems that the impact is not coming from either of these services to this age-group children. The bigger and significant impact on the girls with very young siblings of ages 0-23 months is consistent with the evidence from the TUS, which shows that a much higher proportion of such girls spend time on childcare, in comparison to girls with older siblings of ages 24-59 months.

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.

8 Conclusion

Girls are less likely to attend school than boys in India. Various public policies have been formulated to bring the girls to school, including increase in construction of schools, provision of mid-day meals, free books and free uniforms, 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 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 & 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.

¹⁷In 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.

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Figure 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)

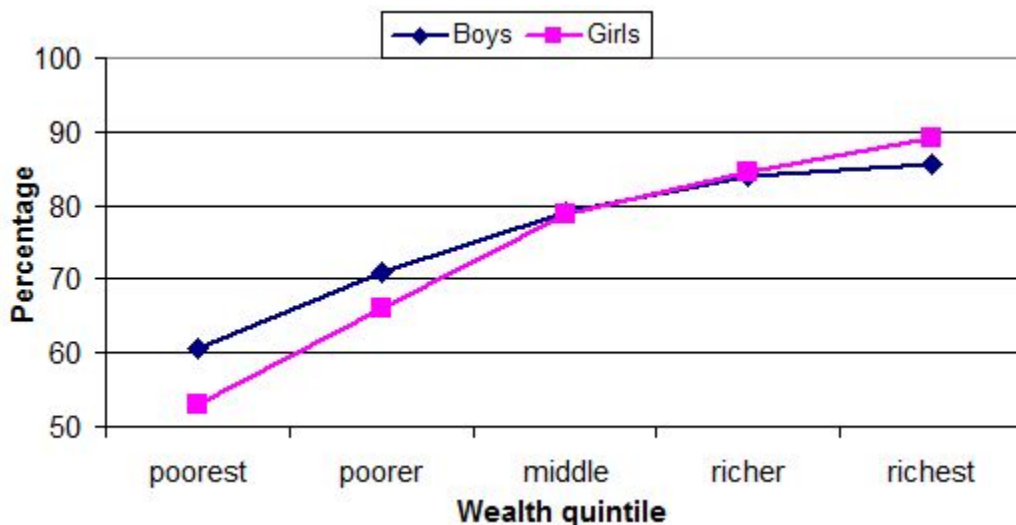
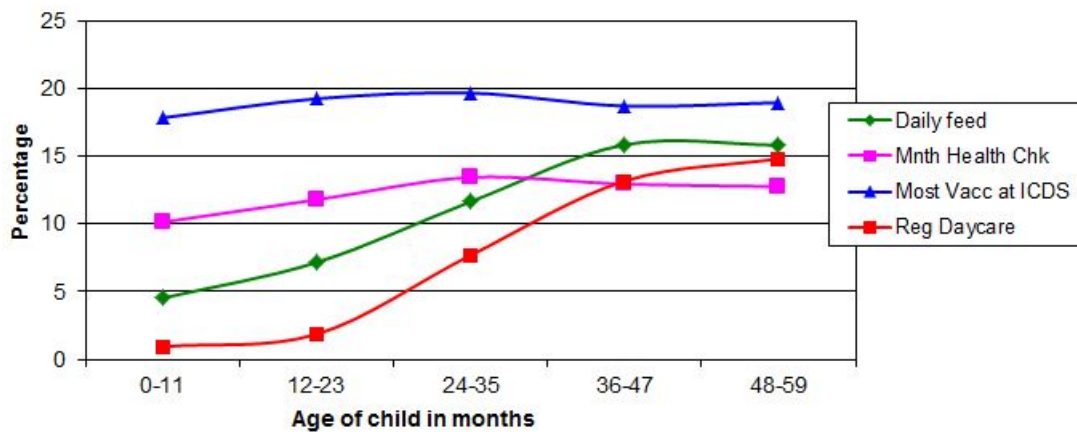


Figure 2: Percentage of children below 5 years receiving different ICDS benefits intensely - Rural India



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

Figure 3: Percentage of villages with at least one child 0-5 yrs reporting receiving the ICDS service

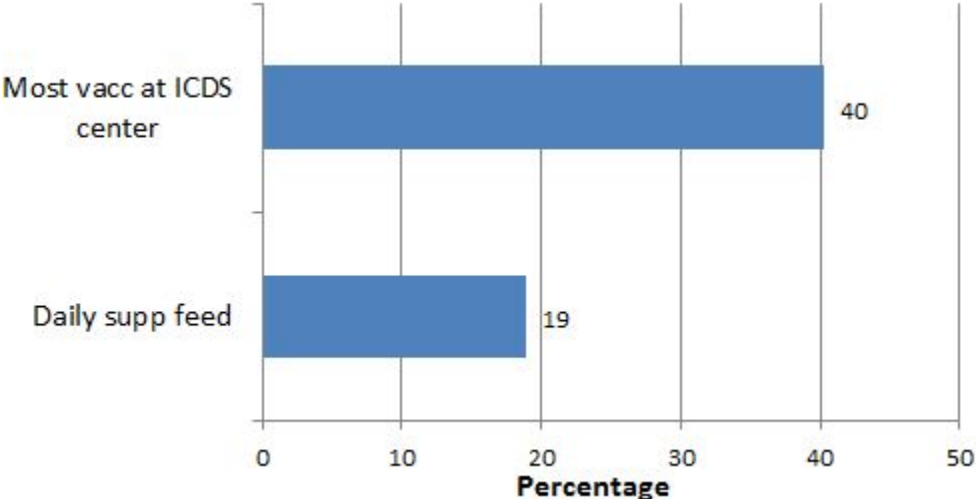


Table 1: Logit/clogit: Determinants of 0-5 yrs Children Receiving ICDS Services

	Most Vaccinations at ICDS Center				Daily Supplementary Feeding			
	Odds-ratio (A)	Z-stats	Vill FE		Odds-ratio (C)	Z-stats	Vill FE	
			Odds-ratio (B)	Z-stats			Odds-ratio (D)	Z-stats
Child's age (mnths)	1.07	(5.28)***	1.10	(5.36)***	1.07	(3.68)***	1.07	(3.64)***
Child's birth interval	1.00	(1.38)	1.00	(1.32)	1.00	(1.40)	1.00	(0.19)
Child's birth order	1.01	(0.35)	1.01	(0.33)	1.00	(0.06)	1.01	(0.36)
Mother's age	1.00	(0.19)	1.00	(0.30)	0.99	(1.20)	1.00	(0.17)
Mother's edu	1.00	(0.40)	0.99	(1.03)	1.02	(2.72)***	1.02	(1.25)
Mother's BMI	0.98	(2.95)***	0.98	(1.67)*	1.00	(0.38)	0.99	(0.64)
Hh head age	1.00	(0.44)	1.00	(0.46)	1.00	(1.71)*	1.00	(1.03)
Hh head edu	1.01	(0.96)	1.00	(0.42)	1.01	(0.60)	1.00	(0.31)
Wealth index	0.75	(6.03)***	0.86	(1.78)*	0.84	(2.86)***	0.81	(2.27)**
Sch caste / tribe	1.20	(2.78)***	1.31	(2.21)**	1.36	(4.07)***	1.47	(3.08)***
Oth backward caste	1.16	(2.33)**	1.20	(1.52)	1.15	(1.87)*	1.27	(1.93)*
Hindu	0.76	(2.48)**	0.89	(0.48)	0.77	(2.07)**	0.79	(1.38)
Muslim	0.54	(4.64)***	0.55	(1.97)**	0.56	(3.83)***	0.83	(0.79)
Piped water	1.06	(0.86)	1.37	(2.10)**	1.36	(3.81)***	1.29	(1.72)*
Tubewell water	1.09	(1.75)*	1.18	(1.52)	1.21	(2.37)**	1.19	(1.23)
Other latrine	0.85	(1.26)	0.94	(0.22)	1.58	(3.45)***	1.36	(1.61)
No toilet facility	1.14	(1.72)*	0.90	(0.77)	1.20	(1.96)**	1.18	(1.23)
Ckg fuel - wood	1.23	(3.96)***	1.17	(1.68)*	1.32	(4.31)***	1.14	(1.29)
Observations	26620		11680		26523		12131	

* significant at 10%; ** significant at 5%. *** significant at 1%; Columns A and C are without village fixed-effects; Columns B and D are with village fixed-effects; State specific coefficients are not presented.

Table 2: Summary statistics NFHS; Base - Girls and boys 6-14 years with at least one sibling below 5 years

	Girls 6-14 years					Boys 6-14 years				
	Any ICDS intensely [†]		No ICDS intensely		p-value	Any ICDS intensely [†]		No ICDS intensely		p-value
	Mean	Std. Dev.	Mean	Std. Dev.		Mean	Std. Dev.	Mean	Std. Dev.	
% attending school	0.75	0.44	0.62	0.48	(0.000)***	0.74	0.44	0.68	0.47	(0.000)***
Age in years	8.7	2.3	8.9	2.4	(0.003)***	8.5	2.3	8.8	2.4	(0.000)***
Mother's age in years	30.6	4.8	31.4	5.2	(0.000)***	30.4	5.1	31.4	5.3	(0.000)***
Mother's education in years	1.9	3.3	1.7	3.3	(0.010)**	1.8	3.2	1.5	3.2	(0.013)**
Mother's height in cms	151.6	5.8	151.3	5.8	(0.037)**	151.3	5.5	151.3	5.7	(0.63)
Spouse's age	36.3	6.1	36.9	6.2	(0.000)***	36.0	6.2	37.0	6.5	(0.000)***
Spouse's education in years	4.4	4.5	4.6	4.8	(0.09)	4.1	4.4	4.3	4.7	(0.34)
Household head's age	40.9	11.9	41.4	12.4	(0.10)	40.7	12.0	41.3	12.0	(0.10)
Household head's education in years	3.6	4.2	3.6	4.5	(0.95)	3.3	4.0	3.4	4.4	(0.27)
Wealth score	-0.93	0.6	-0.87	0.7	(0.000)***	-0.99	0.6	-0.93	0.6	(0.000)***
Caste - Scheduled caste	0.23	0.42	0.21	0.41	(0.016)**	0.23	0.42	0.22	0.41	(0.27)
Caste - Scheduled tribe	0.19	0.39	0.10	0.30	(0.000)***	0.21	0.41	0.10	0.31	(0.000)***
Caste - Other backward cste	0.37	0.48	0.45	0.50	(0.000)***	0.36	0.48	0.44	0.50	(0.000)***
Caste - Others	0.17	0.38	0.21	0.41	(0.001)***	0.17	0.38	0.21	0.41	(0.000)***
Religion - Hindu	0.83	0.38	0.75	0.43	(0.000)***	0.80	0.40	0.73	0.45	(0.000)***
Religion - Muslim	0.13	0.34	0.21	0.41	(0.000)***	0.16	0.36	0.24	0.43	(0.000)***
Religion - Christian	0.01	0.11	0.02	0.12	(0.24)	0.02	0.13	0.02	0.13	(0.37)
Religion - Sikh/Budd/Jain/Parsi	0.02	0.13	0.01	0.11	(0.13)	0.01	0.09	0.01	0.09	(0.83)
Water - Piped	0.24	0.43	0.12	0.33	(0.000)***	0.19	0.39	0.10	0.30	(0.000)***
Water - Tubewell	0.52	0.50	0.70	0.46	(0.000)***	0.59	0.49	0.72	0.45	(0.000)***
Water - Unprotected well, etc.	0.21	0.41	0.15	0.36	(0.000)***	0.20	0.40	0.15	0.36	(0.000)***
Toilet - Flush	0.10	0.30	0.13	0.34	(0.000)***	0.08	0.27	0.11	0.31	(0.001)***
Toilet - Pit latrine & others	0.04	0.20	0.05	0.22	(0.046)**	0.04	0.20	0.05	0.22	(0.07)
Toilet - No facility	0.86	0.35	0.80	0.40	(0.000)***	0.87	0.34	0.82	0.38	(0.000)***
Cooking fuel - Wood	0.71	0.45	0.54	0.50	(0.000)***	0.70	0.46	0.52	0.50	(0.000)***
Cooking fuel - Others	0.26	0.44	0.42	0.49	(0.000)***	0.28	0.45	0.44	0.50	(0.000)***
State - Haryana	0.03	0.18	0.01	0.12	(0.000)***	0.02	0.14	0.01	0.11	(0.000)***
State - Rajasthan	0.05	0.22	0.10	0.30	(0.000)***	0.04	0.20	0.10	0.30	(0.000)***
State - Uttar Pradesh	0.09	0.29	0.32	0.46	(0.000)***	0.13	0.34	0.35	0.48	(0.000)***
State - Bihar	0.06	0.24	0.19	0.39	(0.000)***	0.08	0.27	0.20	0.40	(0.000)***
State - West Bengal	0.09	0.28	0.06	0.24	(0.000)***	0.10	0.29	0.05	0.23	(0.000)***
State - Jharkhand	0.06	0.24	0.03	0.18	(0.000)***	0.07	0.25	0.03	0.18	(0.000)***
State - Orissa	0.07	0.25	0.02	0.13	(0.000)***	0.07	0.26	0.02	0.13	(0.000)***
State - Chhatisgarh	0.06	0.24	0.01	0.10	(0.000)***	0.07	0.25	0.01	0.10	(0.000)***
State - Madhya Pradesh	0.15	0.36	0.06	0.24	(0.000)***	0.12	0.33	0.05	0.22	(0.000)***
Observations	3061		6882			2331		6014		

* significant at 10%; ** significant at 5%. *** significant at 1%; NFHS - National Family Health Survey; [†] "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.

Table 3: Summary statistics TUS & NFHS; Base - Girls and boys 6-14 years with at least one sibling below 5 years

	TUS		NFHS	
	Girls	Boys	Girls	Boys
Mother's age in years	32	32	31	31
TUS - Mother not literate (%) / NFHS - Mother cannot read at all (%)	68	72	76	78
Household head age in years	39	39	41	41
TUS - HH head not literate (%) / NFHS - HH head never attended school (%)	37	45	51	54
Caste - Scheduled Caste (%)	21	19	22	22
Caste - Scheduled Tribe (%)	21	22	13	13
Religion - Hindu (%)	92	91	78	75
Religion - Muslim (%)	5	6	19	22
Religion - Christian (%)	2	1	2	2

TUS - Time Use Survey; NFHS - National Family Health Survey; HH - Household.

Figure 4: Percentage of girls 6-14 years currently in school having a younger sibling below 5 years receiving different ICDS services - Rural India

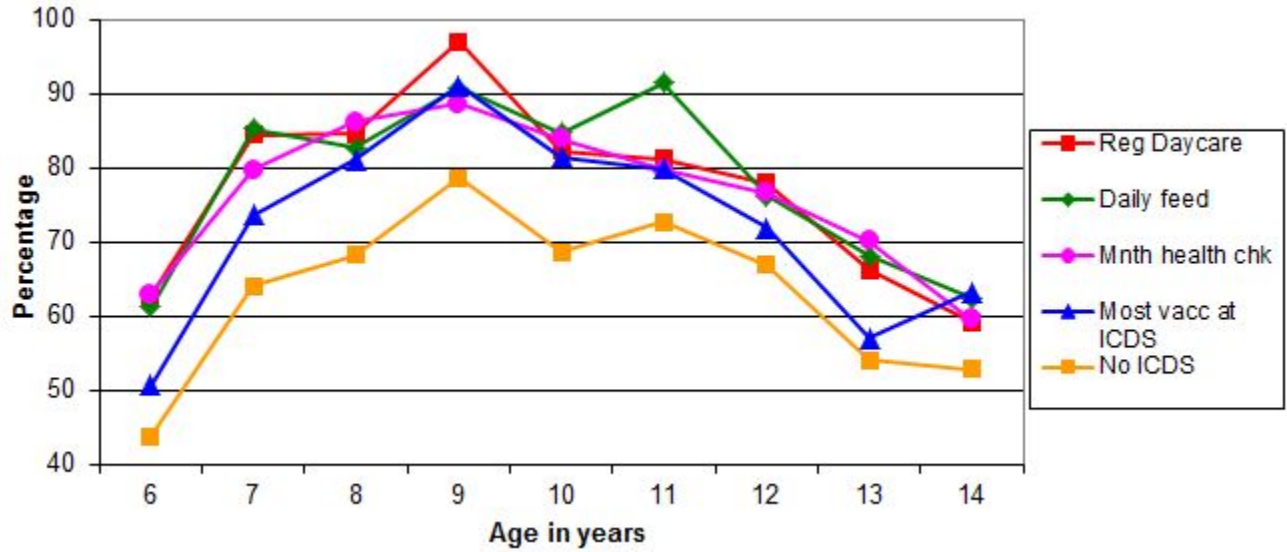
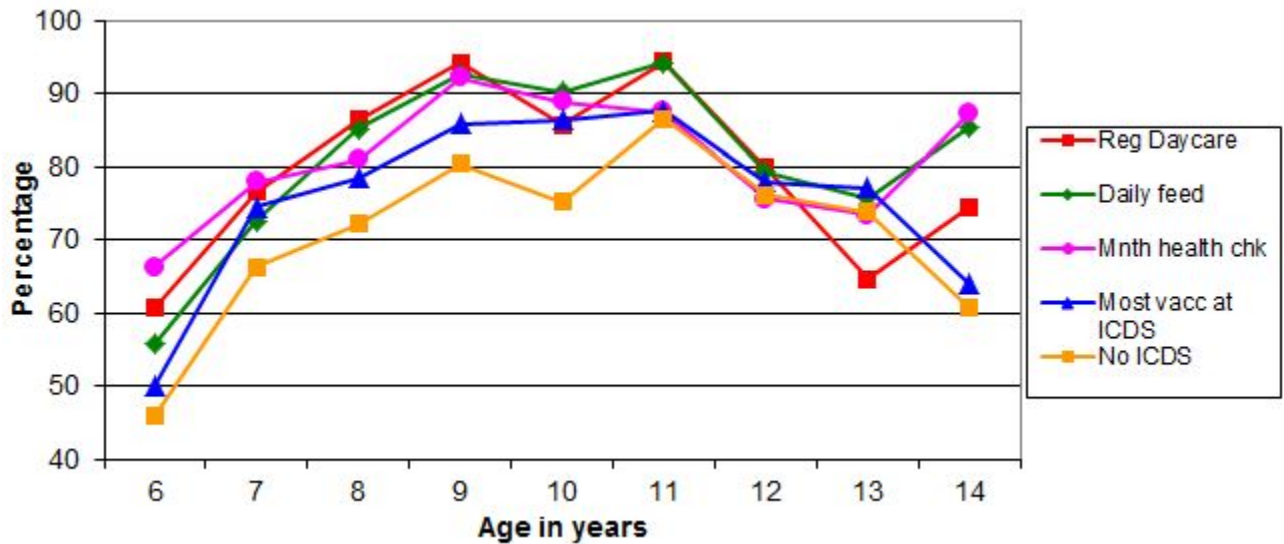


Figure 5: Percentage of boys 6-14 years currently in school having a younger sibling below 5 years receiving different ICDS services - Rural India



Reg Daycare - Regular Daycare/ECC; Daily feed - Daily supplementary feeding; Mnth health chk - Monthly health check-up; Most vacc at ICDS - Most vaccinations at ICDS center; No ICDS - no ICDS service or none intensely.

Table 4: Effect of any ICDS intensely on current schooling of children 6-14 years (Base: with at least one sibling below 5 years)

Estimation Method	Covariate Matching		Logit		Logit	Clogit	Logit	Clogit
	1 match	3 match	(C)	(D)	(E)	(F)	(G)	(H)
Girls 6-14 yrs	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Any ICDS intensely [†]	0.06 (0.01)***	0.06 (0.01)***	0.08 (0.01)***	1.63 (6.86)***	1.51 (5.32)***	1.44 (3.12)***	1.41 (1.94)*	1.58 (3.04)***
Village FE	No	No	No	No	No	Yes		
Mother FE	No	No	No	No	No	No	No	Yes
Observations	9943	9943	9943	9943	7167	7167	5858	5858
Boys 6-14 yrs								
Any ICDS intensely [†]	0.08 (0.02)***	0.06 (0.02)***	0.05 (0.01)***	1.35 (3.67)***	1.19 (1.96)*	1.23 (1.50)		
Village FE	No	No	No	No	No	Yes		
Observations	8345	8345	8345	8345	5875	5875		

* significant at 10%; ** significant at 5%. *** significant at 1%; Columns A, B and C indicate marginal effects and robust standard errors in parenthesis; Rest of the columns contain odds ratios and robust z-statistics in parentheses; clogit indicates conditional logit; [†] “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 5: Logit: Effect of different ICDS services on current schooling of children 6-14 years (Base: with at least one sibling below 5 years)

	Girls 6-14 years					Boys 6-14 years				
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Regular preschool / ECC	1.14 (0.95)	1.52 (3.86)***				1.07 (0.43)	1.25 (1.74)*			
Daily supplementary feeding	1.35 (2.31)**		1.56 (4.38)***			1.10 (0.63)		1.31 (2.24)**		
Monthly health check-up	1.16 (1.39)			1.50 (4.19)***		1.30 (1.90)*			1.47 (3.06)***	
Most vaccinations at ICDS	1.37 (3.84)***				1.48 (5.00)***	1.26 (2.37)**				1.29 (2.72)***
Observations	9723	9889	9917	9762	9938	8166	8297	8321	8204	8341
MeanY	0.66	0.66	0.66	0.66	0.66	0.69	0.69	0.69	0.69	0.69
P-value: all ICDS components=0	0.00					0.00				
P-value: Dailyfd=Preschool=0	0.00					0.53				

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratios; Robust z-statistics in parentheses; ECC - early childhood care; 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 6: 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)

	Girls 6-14 years		
	(A)	(B)	(C)
Regular preschool/ECC or Daily supp feeding	1.32 (2.93)***	1.24 (1.58)	1.25 (2.12)**
Most vaccinations at ICDS or Monthly health check-up	1.51 (5.36)***	1.39 (2.58)***	1.47 (4.54)***
Village FE	No	Yes	No
Observations	9927	7162	7162
	Boys 6-14 years		
Regular preschool/ECC or Daily supp feeding	1.13 (1.08)	1.12 (0.70)	1.04 (0.32)
Most vaccinations at ICDS or Monthly health check-up	1.38 (3.57)***	1.25 (1.43)	1.21 (1.87)*
Village FE	No	Yes	No
Observations	8328	5856	5856

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratio; Robust z-statistics in parentheses; clogit indicates conditional logit; 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.

Figure 6: 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)

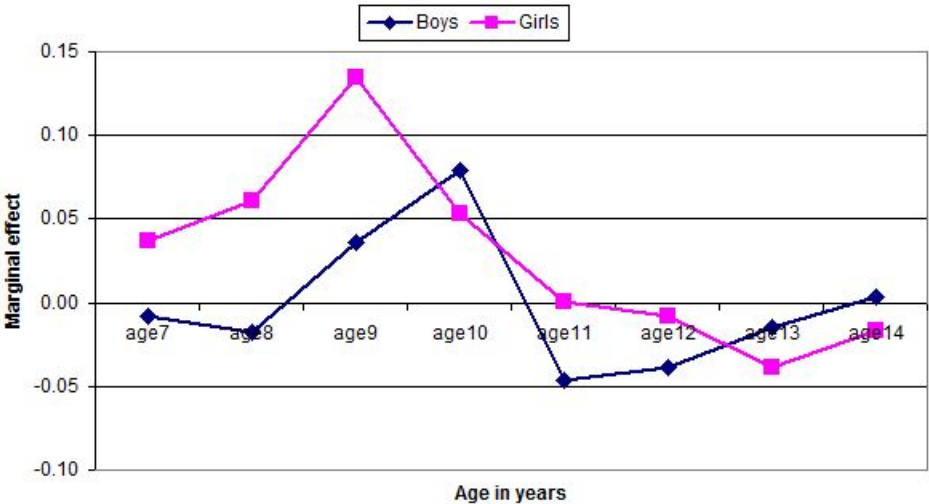


Table 7: Logit: Effect of combination of ICDS services on grade repetition and drop-out among children 6-14 years (Base: with at least one sibling below 5 years)

	Girls 6-14 years				Boys 6-14 years			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Dependent variable - Grade Repetition								
Regular preschool/ECC or Daily supp feeding	1.50 (1.60)	1.80 (2.68)***			2.01 (2.77)***	1.91 (3.00)***		
Most vaccinations at ICDS or Monthly health check-up	1.46 (1.81)*		1.69 (2.96)***		0.86 (0.66)		1.12 (0.57)	
Any ICDS intensely				1.82 (3.46)***				1.46 (2.18)**
Observations	9914	9929	9917	9932	8319	8331	8326	8338
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 supp feeding	0.86 (0.77)	0.80 (1.18)			0.98 (0.07)	1.03 (0.11)		
Most vaccinations at ICDS or Monthly health check-up	0.90 (0.70)		0.85 (1.12)		1.12 (0.62)		1.11 (0.61)	
Any ICDS intensely				0.84 (1.25)				1.11 (0.66)
Observations	9914	9929	9917	9932	8319	8331	8326	8338
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 odds ratios; Robust z-statistics 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.

Figure 7: Percentage of boys and girls 6-14 years spending time on childcare - by Age (Base - with at least one sibling below 5 years)

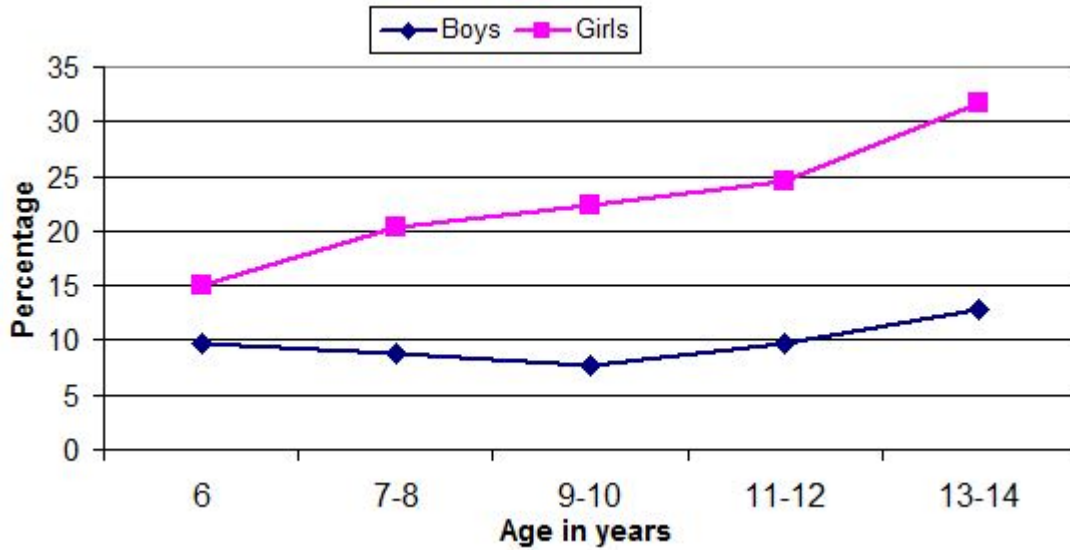
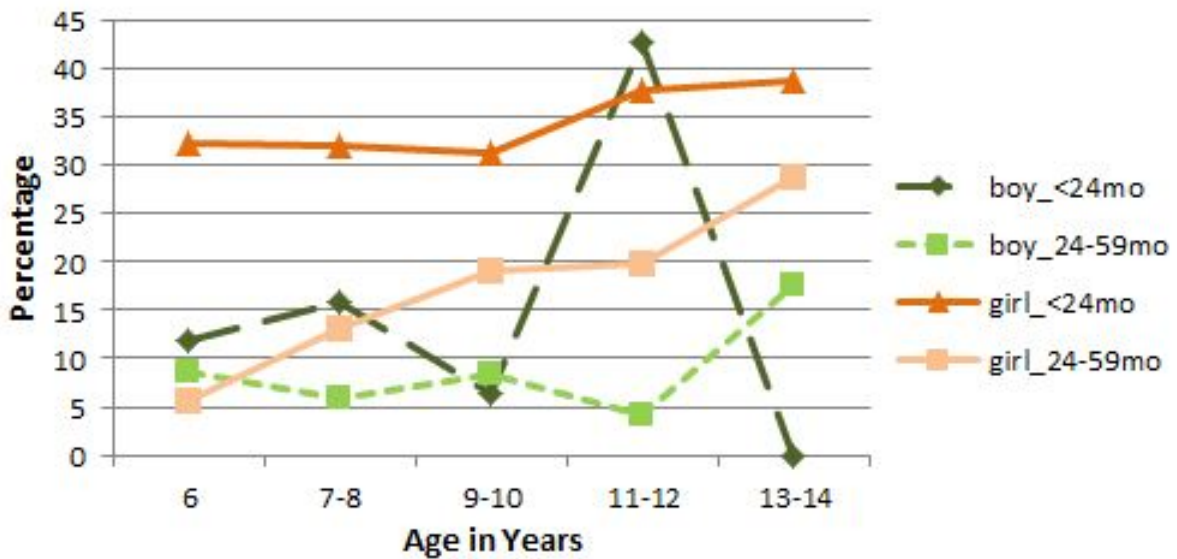


Figure 8: Percentage of boys and girls 6-14 years spending time on childcare - by Age of Youngest Sibling (Base - with at least one sibling below 5 years)



boy < 24mo refers to boy 6-14 years with youngest sibling 0-23 months; *boy24 – 59mo* refers to boy 6-14 years with youngest sibling 24-59 months. Similar labeling holds for girls.

Figure 9: 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)

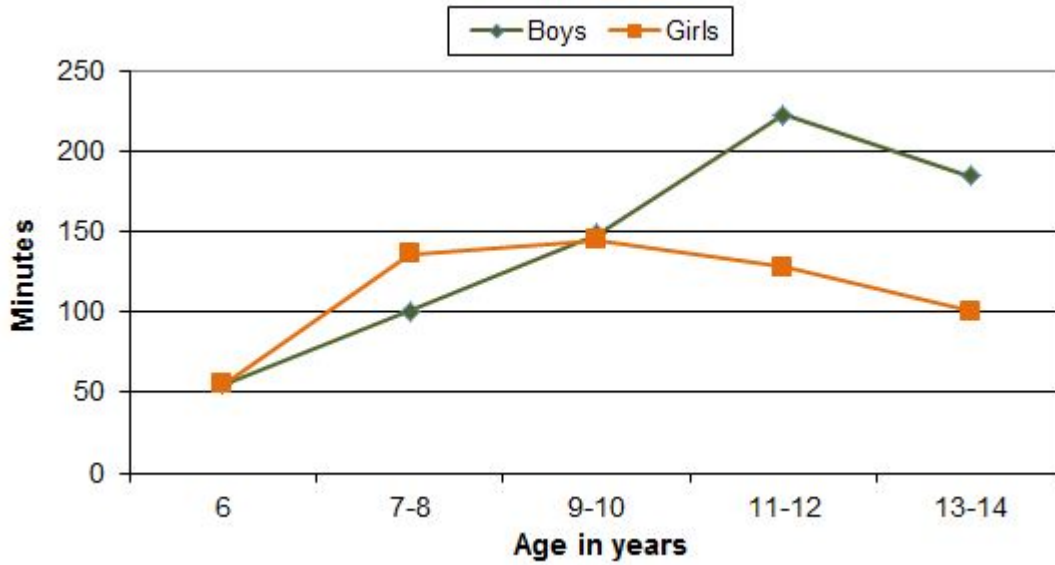
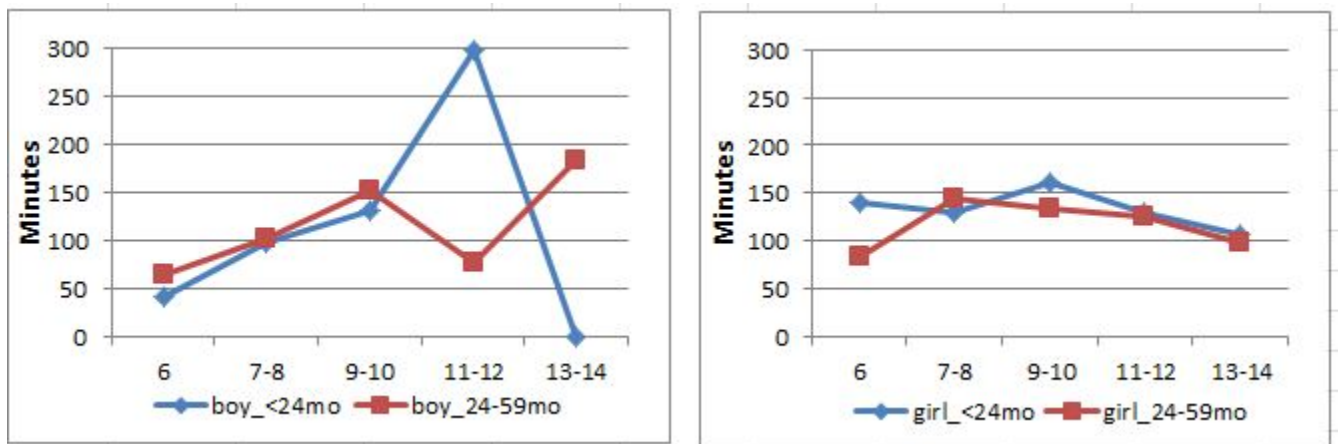


Figure 10: Average time spent on childcare (in minutes) by boys and girls 6-14 years - by Age of Youngest Sibling (Base - with at least one sibling below 5 years and spending positive childcare time)



boy < 24mo refers to boy 6-14 years with youngest sibling 0-23 months; *boy24 – 59mo* refers to boy 6-14 years with youngest sibling 24-59 months. Similar labeling holds for girls.

Figure 11: 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)

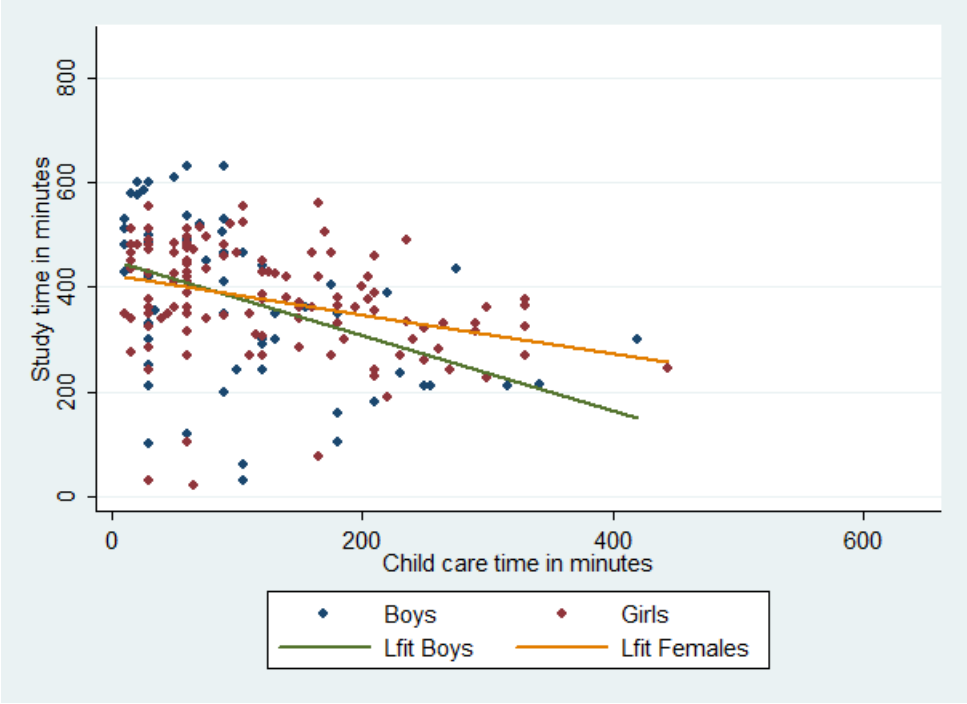


Table 8: Logit: Effect of different ICDS services on current schooling of children 6-14 years with the youngest sibling 0-23 months vs with those in the age-group 24-59 months (Base: with at least one sibling below 5 years)

	Girls 6-14 years with 0-23 months sibling						Girls 6-14 years with 24-59 months sibling					
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Regular preschool / ECC	1.22 (0.87)	1.73 (2.91)***					1.07 (0.40)	1.42 (2.65)***				
Daily supplementary feeding	1.46 (1.75)*		1.82 (3.31)***				1.34 (1.75)*		1.47 (3.07)***			
Monthly health check-up	1.14 (0.82)			1.63 (3.25)***			1.21 (1.32)			1.48 (3.06)***		
Immunization	1.64 (3.90)***				1.78 (4.79)***		1.23 (1.88)*				1.33 (2.71)***	
Any ICDS intensely [†]						1.91 (5.68)***						1.51 (4.37)***
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: Dailyfd=Preschool=0	0.03						0.06					
	Boys 6-14 years with 0-23 months sibling						Boys 6-14 years with 24-59 months sibling					
Regular preschool / ECC	1.03 (0.09)	1.00 (0.01)					0.99 (0.03)	1.27 (1.53)				
Daily supplementary feeding	0.93 (0.26)		0.97 (0.15)				1.16 (0.79)		1.40 (2.35)**			
Monthly health check-up	0.96 (0.21)			1.09 (0.46)			1.61 (2.52)**			1.74 (3.24)***		
Immunization	1.44 (2.29)**				1.44 (2.38)**		1.18 (1.34)				1.23 (1.70)*	
Any ICDS intensely [†]						1.30 (1.94)*						1.38 (3.00)***
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	0.25						0.01					
P-value: Dailyfd=Preschool=0	0.97						0.66					

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratios; 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 9: Logit: 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)

	Girls 6-14 years with 0-23 months sibling				Girls 6-14 years with 24-59 months sibling			
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Regular preschool/ECC or Daily supp feeding	1.49 (2.44)**	1.76 (3.58)***			1.26 (1.92)*	1.44 (3.15)***		
Most vaccinations at ICDS or Monthly health check-up	1.61 (3.93)***		1.76 (4.83)***		1.49 (3.82)***		1.57 (4.55)***	
Any ICDS intensely [†]				1.91 (5.68)***				1.51 (4.37)***
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
	Boys 6-14 years with 0-23 months sibling				Boys 6-14 years with 24-59 months sibling			
Regular preschool/ECC or Daily supp feeding	0.94 (0.33)	1.01 (0.06)			1.15 (1.01)	1.29 (1.89)*		
Most vaccinations at ICDS or Monthly health check-up	1.36 (2.11)**		1.38 (2.19)**		1.43 (2.99)***		1.47 (3.33)***	
Any ICDS intensely [†]				1.30 (1.94)*				1.38 (3.00)***
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

* significant at 10%; ** significant at 5%. *** significant at 1%; Coefficients indicate odds ratios; 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.

A APPENDIX

Table 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	Auxiliary 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 A.2: Correlation between receiving various ICDS services (Base - boys and girls 6-14 years with at least one sibling below 5 years)

	Reg Daycare	Daily feed	Mnth health chk	Most vacc at ICDS
Reg Daycare	1.0			
Daily feed	0.6	1.0		
Mnth health chk	0.4	0.4	1.0	
Most vacc at ICDS	0.1	0.1	0.3	1.0

Reg Daycare - Regular Daycare/ECC; Daily feed - Daily supplementary feeding; Mnth health chk - Monthly health check-up; Most vacc at ICDS - Most vaccinations at ICDS center.

Table A.3: Logit: Adding controls sequentially - Effect of any ICDS intensely on current schooling of children 6-14 years (Base: with at least one sibling below 5 years)

	Girls 6-14 yrs		Boys 6-14 yrs	
	Odds-Ratio	Z-stats	Odds-Ratio	Z-stats
No controls	1.78	(10.02)***	1.38	(4.83)***
+ Age, age2, age3	1.81	(10.15)***	1.48	(5.75)***
+ Mother's age, height and edu	1.76	(9.38)***	1.42	(5.02)***
+ Religion, Caste, Wealth Index	1.86	(9.98)***	1.43	(4.97)***
+ Spouse & hh head age and edu	1.90	(10.23)***	1.44	(5.05)***
+ Water, toilet, cooking fuel	1.83	(9.48)***	1.36	(4.13)***
+ State dummies	1.63	(6.86)***	1.35	(3.67)***

* significant at 10%; ** significant at 5%. *** significant at 1%; Each specification contains the controls that it specifies plus all the controls above it.

Table A.4: Logit: Characteristics of girls 6-14 years in mother fixed-effects sample in comparison to other girls in the general sample

	Odds-Ratio	Z-stats
Age in years	0.12	(3.91)***
Mother's age in years	1.06	(9.47)***
Mother's education in years	0.92	(9.06)***
Mother's height in cms	1.01	(2.56)**
Spouse's age	1.01	(1.46)
Spouse's education in years	0.97	(2.69)***
Household head's age	1.00	(1.05)
Household head's education in years	1.01	(0.89)
Wealth score	0.73	(5.17)***
Caste - Scheduled caste	1.25	(1.46)
Caste - Scheduled tribe	1.27	(1.57)
Caste - Other backward cste	1.17	(1.09)
Religion - Hindu	1.01	(0.05)
Religion - Muslim	1.31	(1.38)
Religion - Christian	1.76	(2.96)***
Religion - Sikh/Budd/Jain/Parsi	1.20	(0.73)
Water - Piped	1.00	(0.03)
Water - Tubewell	0.90	(0.90)
Water - Unprotected well, etc.	1.12	(1.00)
Toilet - Flush	0.77	(1.50)
Toilet - Pit latrine & others	0.71	(1.98)**
Toilet - No facility	0.72	(2.06)**
Cooking fuel - Wood	1.04	(0.31)
Cooking fuel - Others	1.06	(0.41)
Observations	9943	

* significant at 10%; ** significant at 5%. *** significant at 1%; State specific estimates are not presented in the table.

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

