The impact of an Adult Literacy Program on the Next Generation: Evidence from Rural India

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October 19, 2018

Abstract

About 40 percent of adult female in India are illiterate. We use a randomized controlled trial to evaluate the impacts of a computer-based adult literacy program, targeting women in rural North India, on a broad range of outcomes seven months after the program had completed. We show that the program had significant impacts on multiple aspects of the women's lives and noted improvements in the women's health and hygiene practices and increased involvement in their children's education. In terms of mechanisms, we note that not only did the women demonstrate higher levels of literacy and numeracy, but also, and perhaps relatedly, the women have become more knowledgeable, report to feel more confident in dealing with people outside their family, enjoy a higher mobility outside their house and demonstrate increased bargaining power within their family. We did not observe any statistical significant impacts,however, on the overall decision-making ability of the women using traditional measures (especially in extended families) and noted no differences in terms of morbidity and the use of medical services.

1 Introduction

Literacy refers to an individual's ability to communicate through reading and writing. According to UNESCO, there are 771 million illiterate adults in the world. Nearly half of these live in South Asia, where illiteracy is still largely a female phenomenon. In India, the country in which this study is set, the adult female literacy rate (over 15 years) is 59 percent versus 79 percent for men (WDI, data from 2011). While literacy can promote self-worth and personal development, literacy, and in particular, female literacy, also has an instrumental value. There are two tools to impart literacy skills: school education and adult education, i.e. adult literacy programs. While the effects of formal, i.e., school, education have been well studied (we review some of this literature below), we know less about the impacts of adult education. What exactly happens when illiterate adults, particularly women, acquire functional literacy? And, if they benefit, do these benefits extend to their families, and in particular the health and education of their children?

An extensive literature on the role of education outlines the possibilities (for an introduction and overview, see among others, Schultz 1988, Rosenzweig 1995 , Rosenzweig and Kochar 2004 , Alderman and Heady 2017). Behrman et al. (1999), using panel data from a nationally representative survey of rural India (ARIS/REDS) collected in the mid 1970 to early 1980s, note a significant and large effect of maternal literacy on children's schooling, an effect they attribute, among others, to the productivity effect of female literacy on home teaching. Note that this study was set during the Green Revolution, and the value of education could be seen as one of an increased "ability to deal with disequilibria", specifically, to "in response to changing opportunities [. . .] to perceive, to interpret correctly and to undertake actions that will appropriately reallocate [. . .] resources" (cited from Schultz 1975, see also Foster and Rosenzweig 1996). Home teaching can be important in developing countries, where the quality of school education is often low (Glewwe and Kremer 2006). Effective home teaching can display itself in increased efficiency, or in a change in time allocation as mothers spend more time with their children doing homework (as in, Andrabi et al. 2014) and might result in improved performance in school (Paxson and Schady 2007, for instance, report an association between mothers' level of education and child test scores in Ecuador). Similarly, educated mothers might increase investments in the health of their children. Aslam and Kingdon (2012) show that educated mothers in Pakistan are more likely to immunize their children, and perhaps as a result, observe improved anthropometric child indicators (similar results are found by Handa 1999 in Jamaica).

The bulk of this literature focuses on mothers (or parents) who acquired varying levels of education during their childhood, i.e., on the effect of school education of parents. There is

a small body of literature that focuses on the impact of adult education, and in particular, adult literacy programs. Blunch (2017) summarizes the evidence. [1] He notes that even though most adult literacy programs show limited impacts on literacy and numeracy, the literacy impacts can be higher, especially if modern technologies are utilized. For instance, Aker et al. (2012) allocated mobile phones to a (randomized) subset of a traditional adult literacy program and found substantial impacts on writing and numeracy skills. Ghana's National Functional Literacy Program is another example of a relatively successful approach, lasting longer, 21 months, and classes meeting more frequently than most literacy programs, and resulting in substantial increases in reading outcomes, in particular (see Aoki 2005) - although it should be noted that some of the effects reported here might be attributed to program selection effects. Banerji et al. (2017) conducted a randomized controlled trial in India, avoiding much of the program selection effects, and noted modest but significant impacts on women's test scores in language and math.

While there is some evidence with respect to the stated ex-ante effects of adult literacy programs, viz., of increased literacy and numeracy, there is less evidence on possible effects on socioeconomic outcomes and in particular on health and education of children. Banerji et al. (2017) report only modest impacts on children's test scores, even when the intervention is combined (cross randomized) with explicit guidance for home teaching. Blunch reports effects on labor market participation, child mortality and household expenditure of the Ghanian National Functional Literacy Program (in Blunch 2009, 2013 and Blunch and Portner 2011). Sandiford et al. (1995) report that adult literacy participants in Nicaragua are more likely to send their children to school and keep them there, have fewer children and there is reduced child mortality.

So while we have significant evidence on the important role that female school education plays in improving educational and health outcomes of the next generation, we have less evidence on the role of literacy per se. This distinction is important. Returning to Berhman et al. (1999), it is important to note that the effects of female education on children's schooling outcomes can be highly non-linear in nature. In effect, in their study, children of mothers who are literate and have completed primary schooling study no more hours than the children whose mothers are literate but are not graduates of primary school. While this study was set during the Green Revolution, and results might be very different now, the main question remains. Is there a minimum amount of parental (maternal) education necessary before it can have a manifest impact on the health/educational outcomes of the next generation? And relatedly, does it matter as to when these skills are acquired, i.e. does imparting literacy during childhood have the same long-term effect as imparting literacy

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[1]See also Abadzi (2003) for an overview.

through adult education programs?

In this study we ask how a discrete change starting at zero - going from no formal education to (more or less) functional literacy through an adult education program impacts the participants and their families. We worked together with an NGO, Development Alternatives. They developed an innovative adult literacy (and numeracy) program, called Tara Akshar+ (TA+), in which computer-aided instructors teach in an interactive manner to groups of 10 women for a period of 3 months.The program builds on insights from cognitive psychology and uses memory tricks to teach the alphabet. We visited 10 villages in India in the north Indian state of Uttar Pradesh, and invited all adult illiterate women to participate in this program: 391 women signed up.

Through a public lottery, we randomly divided this group into a treatment group and a control group. The treatment group participated in the TA+ program that year, while the control group were enrolled after a one year lag. We collected baseline data prior to the randomization and endline data seven months after the treatment group participated in the program and, before the control group was enrolled. We also conducted a midline survey immediately after the program was completed by the treatment group. The data collection included geographical information on the household members, household assets, and detailed information on child educational and health investments, as well as outcomes. We note that the two groups of women were balanced at baseline on a range of characteristics.

Comparing the women at endline, roughly a year after the baseline, we find that participation in the program had positive effects that go beyond the immediate effects of acquiring greater literacy and numeracy skills. Women who participated in the program made significantly more investments in the education and health of their family. Specifically, we find that women practiced improved hygiene (wash hands more often, cover water vessels), and were more involved in the education of their children, in particular by assisting the children with their homework and reminding them to complete it. We do not document any significant impacts on school enrollment, attendance or child test scores. Nor do we document any significant impacts on child morbidity, or visits to health clinics.

In addition to collecting data on educational and health investments and outcomes, we also collected data which allow us to say something more about the mechanisms of these effects, or lack thereof. As Blunch (2013) notes - it is often unclear as to which part of the programs work and which ones do not. For instance, in the Ghana National Functional Literacy Program, we do not see any drastic impacts on the literacy and numeracy skill set of the participants, but do observe significant impacts on the women's lives. This suggests that the latter impacts might be due to network effects, or an increase in income-generating activities, perhaps as a result of increased bargaining power or other non literacy/numeracy

skills. Understanding why a program works, or relatedly, why certain components work and others do not work is of utmost importance from a policy perspective, as one might need to complement the adult literacy program with other investments to achieve the desired results.

First, we performed tests of cognitive ability and extensively tested the women's literacy and numeracy skills. Second, we collected detailed data on the women's knowledge of health and educational matters, self-reported confidence, mobility, assets, the position of the woman in the household and the woman's decision-making ability. An innovative feature of our data collection include two bargaining experiments in which we asked a woman and her spouse to negotiate over the value of water tablets, and the woman and her extended family to negotiate over the value of a children's book. By comparing the woman's valuation of the water tablet/book, with her husband's (and the rest of the family) and their joint valuation, we are able to determine her bargaining position. A unique feature of our experimental design is that, in addition to simply capturing preferences, we also record the process by which the nuclear wife-husband unit and extended family unit came to a decision.

These data not only allow us to shed light on the mechanisms through which the observed impacts might have taken place, but also to speculate, as to what the longer term effects could be. In Deshpande et al. (2017), we document the positive effects of the program in terms of literacy and numeracy. This increased skill set, together increased exposure to discussion on a wide variety of topics, might result in increased knowledge of health and educational matters (which we know, matters, see for instance, Glewwe (1999)). Consistent with this, we show large, significant impacts on health and educational knowledge (our results are comparable to Aslan and Kingdon, 2012). The program might also have changed the woman's position in the household. While we do not find any significant effect on aspects regarding the status of the woman, as measured, for instance, by having a bank account, wearing a veil, or owning a mobile phone, we admit that these measures might be a little crude to pick up any effects.

Our qualitative interviews suggest changes in the women's status, albeit more nuanced. In effect, we document changes in the woman's mobility, as measured by whether or not she has visited locations outside of the village and whether she needs permission to visit these. Somewhat relatedly, we find that the women display an increased (self-reported) confidence in talking to outsiders. This increase in mobility or confidence and increase in knowledge might in effect be related. An increase in mobility and confidence might allow the women to, for instance, have a chat with the local nurse. In effect, we report an increase in number of times the women approached the local nurse (refer also to Thomas et al. 1991).

In addition, we document small, but not non-significant changes in the woman's bargaining position in the household. While we cannot find any significant effect on whether or not

the woman is the main (or any of the) decision-maker(s) in the household regarding, day-to-day, health and educational matters, most women (both control and treatment) report to have a say in these matters. However, when we present the woman and her spouse, with a specific decision-making problem in which the woman and her spouse need to divide Rs.30 (about 0.8 USD) between rice and water tablets, we note an increase in her say, and that her husband is be more likely to actively seek her opinion. However, we find no such effect when we present the woman with a decision-making problem within the setting of her extended family, possibly pointing towards the stickiness of power relations within these institutions. A change in bargaining power, or more general, position of the woman in the household, or gender-related social norms, even if small, is likely to have significant impacts in the future.

Finally, we do not document any changes in labor participation or assets. Hence any changes we do observe in terms of outcomes would be due to redirecting time and attention towards the education and health of children, possibly because of increased knowledge and increased bargaining power.

The rest of the paper is organized as follows. Section 2 explains the specifics of the TA+ program. Section 3 explains the sample, randomization and data collection. Section 4 explains the estimation methodology and results. Section 5 offers concluding comments.

2   Intervention Description

The intervention, Tara Akshar Plus (TA+) is implemented by a social enterprise named Development Alternatives (DA). One of the focuses of DA is to empower communities through strengthening people's institutions and facilitating their basic needs. It's under this mandate to empower communities that DA developed the TA+ program to impart functional literacy in rural and urban spaces.

TA+ is designed as a 56 day curriculum to provide literacy solutions to empower lives. It was referred to as the fastest literacy program in the world by Wall Street Journal in 2011.[2] It is a computer-based program which imparts functional literacy in Hindi (the local language) and basic arithmetic. It functions via highly comprehensive software developed through stages of intensive grassroots level research and study of best practices globally. The specially designed classes are conducted by locally trained instructors in the women's own communities. The women are taught to recognize the sound of letters, syllables, numbers and form words and sentences using the Memory Hook technique embedded in animated movies and exercises. An example of memory hook technique would be how Hindi alphabets

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[2]The article can be accessed at https://blogs.wsj.com/indiarealtime/2011/05/18/india-literacy-program-may-be-worlds-fastest/

are taught explaining their link with objects that start with that particular alphabet. An illustrative English example would be to show the letter S as a snake curled in an S shape. In this way, one gets reminded of the letter S every time one sees a snake-like shape. Beyond the structured curriculum, instructors and supervisory staff also hold discussions on general topics which affect the women's daily lives. A few examples of the topics covered include child nutrition, breast-feeding, Indian history and heritage, usage of mobile phones, hygiene practices etc. There is also a follow-up program named Gyan Choupali after the 56-day TA+ curriculum.[3] However, our study is focused on evaluating the impact of only the TA+ component.

TA+ runs for 56 days, six days a week, two hours per day. It is conducted in TA+ centers made temporarily available for the program within each hamlet (village subdivisions). TA+ is divided into two components: 37 days of the literacy component named 'Tara Akshar' and 19 days of the numeracy component named 'Tara Ganit'. The 37 days of Tara Akshar is further divided into 26 days of computer-based instruction at a rate of 100 minute[4] per day followed by 20 minutes of clearing doubts, checking notes, dictating homework etc., 10 days of practice sessions and an exam day where all women were assessed on their ability to recognize Hindi characters, write words, write phrases and sentences and apply reading and writing skills beyond the program coverage. Similarly, the 19 days of Tara Ganit had 18 days of instructional sessions, each lasting for 105 minutes[5] and an exam day where the women were assessed on their numeracy skills.

We had set out a theory of change after understanding the structure of the program and after extensive formative research in the sample location. Since the TA+ program was primarily aimed at imparting literacy and numeracy skills, we expected these skills to have

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[3]Gyan Choupali(GC) lasts for 6 months and is aimed to impart comprehensive information, general knowledge and to strengthen the literacy base of the women. It compiles a plethora of components into an all-inclusive package to weave in the application part of literacy to their lives. Apart from reading and writing practice, other forms of educative and informative sessions are held by guest speakers in GC sessions.

[4]Each 100 minute instructional session of Tara Akshar involved the following activities: a) 4 minutes of a video, b) 12 minutes of work with big flash cards with letters, characters, syllables or words, c) 20 minutes of writing practice, d) 20 minutes of work with small flash cards to facilitate recall of letters, characters, syllables or words introduced, d) 10 minutes of identification of the letters, characters, syllables or words by the women on the computer software, e) another 20 minutes of writing practice, f) 10 minutes of quizzes and practice through peer learning and g) 4 minutes of a follow up video.

[5]Each 105 minute instructional session of Tara Ganit involved the following activities:a) 13 minutes on a story, b) 10 minutes of work with big flash cards, c) 12 minutes of writing practice, d) 10 minutes of work with small flash cards recalling numbers introduced, e) 10 minutes of identification of the numbers by the learner on the computer software, f) 10 minutes of teaching learners on how to write numbers alphabetically, g) 10 minutes of repeating the digits taught and h) 30 minutes of writing practice.

improved for the women who participated in TA+. We tested and reported on these effects in Deshpande et al. (2017) and hence does not fall in the scope of this paper. In this paper, we aim to assess and understand the impacts of TA+ beyond the immediate effects on literacy and numeracy.

The interaction of women that TA+ caters to, were mostly confined within their families. TA+ may be the first opportunity for most of them to interact with other women without any inhibitions of being watched by older or male family members. One of our primary hypotheses was that this would lead to improvements in women's confidence to interact with people outside the family. We also expected that the women would have improved their self-efficacy since they go to the TA+ classes, unaccompanied by family members and in addition to that, the family members too would begin to acknowledge the increased self-efficacy of the women.

In addition, we expected the TA+ women to have increased general knowledge due, first, their increased ability to process such information, and second, the complementary discussions held on varied topics in the TA+ classes. Combining the hypotheses that the women would have increased skill set, confidence and that the rest of their family acknowledging it, we expected that the program would affect the status of the women in their households, and their bargaining position.

Finally, while we do not have any convincing measures of preferences, it should be noted that attending the TA+ program might have also changed the women's preferences, and perhaps aspirations for themselves and their children; possibly attributing more value to education than previously.

While self-esteem and improved knowledge, are valuable in and by itself, we focus on its instrumental value, in that increased knowledge, and an improved bargaining position may affect the choices of the woman, and the families. In the rest of the paper, we refer to the outcomes mentioned above as 'mechanisms'. We also made several hypotheses regarding final outcomes. Since the women acquired literacy and numeracy skills, they may have found it useful. They would have thus realized the value of education even more and hence we expected higher investments by the women in their children's education. Since a lot of TA+ discussions focused on personal hygiene and health, we also expected the women to have improved hygiene practices and to be more vigilant about their children's health.

In these final outcomes, however, we did not expect to see impacts of large magnitude given that we tested for these within a short span of time after the TA+ intervention (about one year).

3 Research Design

3.1 Sampling and randomization

TA+ is implemented by DA in eight states in the northern part of India. Our study was confined to the state of Uttar Pradesh across two of the three tehsils, namely Bhadohi Tehsil and Gyanpur Tehsil, of Sant Ravidas Nagar District[6] where DA had planned to launch the TA+ program in June, 2014. The maps showing the location of our study are in Appendix Figure1 and Appendix Figure 2.

Sampling was done within nineteen hamlets across ten villages. The number of hamlets in each village ranges from one to three. These hamlets were chosen by DA and the research team since they were large enough to support a treatment assignment lottery with desired numbers in both groups. The hamlets in our study are caste-specific settlements. The societal norms impose severe restrictions on inter-caste interactions in the villages of our study. This necessitated the need for separate TA+ classes in each of the hamlets. The hamlets were thus the units of randomization. Although there were multiple hamlets in the same village with close proximity geographically, we expected very limited spill overs due to the social isolation of each of the castes.

In each of the nineteen hamlets which form part of our study, DA compiled a list of all women between 15 and 45 years who were illiterate, had at least one child, and agreed to participate in the intervention, regardless of the time of implementation.

The desirable number of women for a TA+ class is ten. Thus, we required at least 20 women from each hamlet to be assigned to the treatment and control groups. DA insisted in over enrolling women in the treatment group to take care of any potential dropouts by the time TA+ classes began. Hence our treatment sample is larger than the control sample.

The baseline survey was conducted in April-May, 2014 with all the women on the list. After completion of the baseline survey in all the hamlets, the women were requested to assemble at a central location to participate in the public lottery. Every woman was allotted a numeric identification number. These identification numbers were written on pieces of paper and put in a bowl. Children assembled were requested to pick a piece of paper, one at a time. The first half of the numbers picked were assigned the treatment status. The women with the treatment status were to attend TA+ classes in June-August, 2014. The remaining numbers picked were assigned control status. The control women were to attend TA+ classes in May-July, 2015. The randomization process thus yielded thirteen women in

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[6]Districts are administrative divisions of a state and Tehsils are administrative sub-divisions within a district.

the treatment group and ten in the control group, on average, in every hamlet.

Table 1 presents our sample divided between the treatment and control groups. These include 391 women from 331 households who were available during our endline survey. We also conducted literacy, numeracy and cognitive tests with a randomly selected child, within the age group of 6-10 years, of each woman. We thus have test results of 172 children as well.[7]

3.2   Data collection

The baseline survey was done in April-May, 2014. We administered a household questionnaire among household heads and a women's questionnaire among all the women in the treatment and control groups. We also conducted tests of numeracy, literacy and cognitive ability among the women. The treatment women participated in TA+ classes in June-August, 2014. We administered a midline women's questionnaire and tests (including a knowledge test) to all the women, immediately after the intervention in August-September, 2014. The endline survey was administered seven months after the completion of the TA+ classes in March-April, 2015. The endline survey included the women's questionnaires and the bargaining experiments. In addition to this, a randomly selected child of every woman was administered a literacy, numeracy and cognitive tests during endline. The control women participated in TA+ classes in May-July, 2015. In December, 2016, we did qualitative interviews with a selected treatment women to strengthen our understanding of the mechanisms. The survey instruments used across the multiple waves of surveys are detailed below.Figure 1 presents an overview of the timeline.

3.2.1   Household questionnaire

The household questionnaire administered during baseline was aimed to capture the women's household structure and assets, and include the age, marital status, education and occupation of the various household members, the acreage of land owned, whether the household had access to electricity, caste status etc. The household characteristics, thus elicited form part of the covariates which we later establish as balanced between the treatment and control groups.

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[7]We have baseline data on 372 women and a midline knowledge test results of 325 women
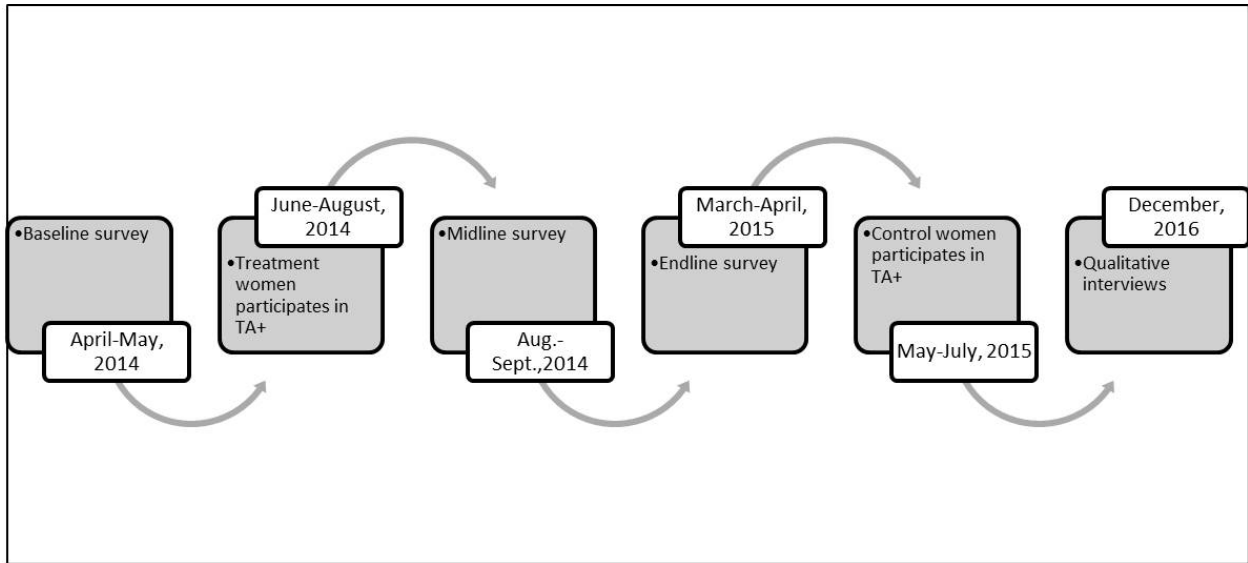
Figure 1: Data Collection time-line

3.2.2 Women's questionnaire

The women's questionnaire had components to understand the women's time use, the women's health and hygiene practices, the women's participation in their children's health and education, the women's confidence in dealing with people, the women's mobility status and the women's role in family decision making.

Time use, health and hygiene practices: The baseline and endline women's questionnaires captured whether the women spent time to remind their children of homework, to help their children with homework, to talk to their children's teacher at school and to consult with the health care worker at the primary health center. In addition to this, the endline women's questionnaire captured the women's health and hygiene practices. A few examples of the variables collected include whether the women covered vessel in which drinking water was stored, whether water was treated before drinking, whether the women washed hands after using toilet, whether the women talked to their children about the necessity of washing hands, whether the women used any contraceptives etc.

Investment in children's health and education: The baseline and endline women's questionnaire captured information on the women's children's education and health status and the women's involvement in the same. A few examples of the education variables on which data was collected include whether the children were enrolled at school, whether the children were absent from school on any of the days in the week preceding the survey, whether

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the women accompanied their children to school, whether the women inquired about their children's homework, whether the women helped their children with homework, whether the children spent at least one hour studying at home, whether the children received help with homework from any other household member etc.

A few examples of the health variables on which data was collected include whether the women's children fell ill anytime in the one month preceding the survey, whether the children received any medical treatment, whether the medical treatment received was within or outside the village and whether the women was present while their children were being treated.

Confidence, mobility and decision making: In the base and endline women's questionnaires, we had questions to capture the women's self-reported confidence in dealing with people outside their families. We identified nine different people which the women would potentially have to deal with namely, male and female shopkeeper, contractor, Asha worker (always female)[8], Anganwadi worker (local health care provider, always female), village head, bank employee and male and female doctor or nurse. The women were asked how confident they felt in dealing with each of the nine different people listed above. As response to this, the women had to choose between the following options, namely 'cannot even imagine dealing with the person', 'will never deal with the person', 'not confident in dealing with the person', 'somewhat confident in dealing with the person' or 'very confident in dealing with the person'. We assigned scores ranging from 0 to 4 for different levels of self-reported confidence. A score of 0 was assigned for the lowest level of confidence when the women expressed that she could not even imagine dealing with the person. The highest score of 4 was similarly assigned when the women expressed that she was very confident in dealing with the person. The confidence score for each woman was calculated as the summation of these scores across the nine different people. The maximum value which the confidence score could take was 36.

The baseline and endline women's questionnaires captured whether the women were ever engaged in a few listed mobility related activities and whether they required permission to do each of them. The listed activities include leaving the house, going to a shop within the village, going to a shop outside the village, visiting a primary health care center, visiting natal family, making phone calls to natal family, joining community groups and/or going for cinema or other entertainment events.

The baseline and endline women's questionnaires captured whether the women had to

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[8]ASHA is an acronym for Accredited Social Health Activist, who is an accredited social health worker, appointed by the Ministry of Health and Family Welfare, as a part of the National Rural Health Mission.

follow restrictive practices at home like wearing a veil, whether she could keep her jewelry with herself, whether she had a personal mobile phone, whether she used a vehicle and whether she had a personal bank account. We also asked if the women were consulted and whether they had a say in matters like what to cook, what to shop, what needs to be done when her child falls sick, child's school enrollment decisions and whether the child should attend school one day.

3.2.3 Tests

We administered two tests of cognitive ability during baseline to the women. The first test was the Forward Digit Span (FDS) test. In this test, we orally provided the women with random sequences of digits and asked respondents to recall them in the same order as they had received them. The length of the sequences increased gradually. The administration of this test stopped when the respondent obtained two scores of zero over two consecutive items. This test provided a measure of short-term phonological memory, which typically served as a useful predictor of reading outcomes. The maximum score one could attain in the FDS test was 16.The second test administered was the Rapid Automatic Naming with Colors (RAN) test. It was a test for measuring lexical access speed and engagement-disengagement dynamics. In this test, the respondents were shown 6 rows of four squares colored Blue, Red, Yellow and Green. They were then asked to name the colors of each square as quickly as they could. Learners could even use local names for the colors. The task involved 4 primary colors and the color squares were randomly arranged in a matrix on the page. This test was administered twice with different random matrix arrangements in order to estimate the reliability of the measure (so a total of 24 * 2 squares). RAN test is assumed to tap people's lexical access speed and measure their ability to quickly engage and disengage this attention on visual targets. The time taken by the women to complete the test was captured as well as the number of errors they made. The results of the FDS and RAN tests also form part of the covariates which we later establish as balanced between the treatment and control groups. The RAN test was also administered to a randomly selected child within the age group of 6-10 years of each woman during endline.

We administered a battery of literacy and numeracy tests to a randomly selected child within the age group of 6-10 years of each woman during endline. The literacy tests were developed, tried, and tested by Pratham[9], based on the model used in the DIBELS (Dynamic Indicators of Basic Early Literacy Skills) tests (Good et al., 2001). The literacy tests were timed tasks. The children were given one minute to read 52 letters (Task 1), 63 syllables

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[9]http://www.asercentre.org

(Task 2), 52 words (Task 3), 48 non-words (Task 4), and a 64-word Grade 1 level paragraph (Task 5) and a 94 word Grade 2-level paragraph (Task 6). On Task 5, examiners marked as correct/wrong only those words read within a minute, but they allowed the children to complete the paragraph after the first minute so that they could answer the comprehension questions. The test also included a number of discontinuation rules[10] so the test would not progress to more difficult tasks if the children could not achieve a minimum level on an earlier task.

The numeracy tests were not timed. Children were asked to complete eight tasks namely count three objects orally, recognize single-digit numbers ranging from 0 to 9, recognize 10 randomly selected two-digit numbers, count objects and circle the correct written number, count objects and write the correct number, fill in the missing digit in two series, add two to three one- and two-digit numbers and subtract one- and two-digit numbers. Based on the results of these eight tasks, we created an overall math score.

During midline, a knowledge test was administered which had eight factual questions and four cognitive ones. Two examples of the factual ones include the name of the country's Prime Minister and the legal minimum marriageable age for women. Two examples of the cognitive questions include the number of mangoes each child would get if twenty mangoes were to be equally divided among five children and the name of the fourth son of Manoj's dad whose three sons are named Ram, Laxman and Shatrughana. All the questions of this test can be found in Appendix 3.

3.2.4 Bargaining experiments

We conducted two experiments to investigate the woman's influence over the household decision-making process. In each one of these, we first asked each participant in the experiment to make a decision individually; after which we brought the various participants together and asked them to revisit their original decision and come to a joint conclusion. This approach is similar to the one implemented by Palma et al. (2011), Carlsson et al. (2013) and Braaten and Martinsson (2015) - in which relative bargaining power is determined by examining the influence of individual preferences on a couple's joint preferences, and inferred from the difference between decisions made individually and jointly by a husband and wife.

Our approach presents two innovations. The first one is that we observed the process by which the joint decision was made. The second one is that we conducted one experiment

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[10]The specific discontinuation rule was as follows: if a child could not read more than three letters in a minute, the reading test was stopped at Task 1. If the child could not read a single word in a minute, the reading test was stopped at Task 3. If the learner could not read more than three sentences without any time restrictions, the reading test was stopped at Task 5.

with the entire household, and not just the spousal unit. As many households in this area are extended households[11], i.e., in which three generations or married siblings live and eat together, understanding how the woman's bargaining position changes vis-a-vis the other adult members, and not just her spouse, is important.

Both bargaining experiments were conducted after the surveys and tests concluded. For the first experiment, we gathered the woman and her spouse.[12] After agreeing to participate, we read the following instructions to them:

> I am going to play a simple game with the two of you. It doesn't matter if you are literate or illiterate to play this game. We shall give you a few gifts for your time, at the end of the game. Imagine you have got just Rs.30 with you, with which you go to the market. There are only two things available in the particular shop you go-rice (show them the rice) and chlorine tablets which are used to clean water (show them the chlorine tablets). You may be used to drinking water from hand pumps or wells. But that water may have a lot of bacteria which you cannot see with your naked eyes, which is the primary cause of many diseases like diarrhea, cholera etc. This chlorine tablet (show them the tablet again) can purify two full buckets or 20 liters of water. The price of one chlorine tablet is Re.1 and this rice costs Rs.30 per kilogram. You have to exhaust the entire Rs.30 at this shop itself. You can't save anything out of this Rs.30. How will you spend the Rs.30 between rice and tablets? You don't have to tell your decision now. I will ask you both separately.

Prior to conducting the experiment, we had extensively field tested this protocol. We found that rice performed a similar role as cash since it can be easily bought and sold in the village and is valued by both husband and wife. As the NGO and local government officials were not keen on us using cash in the villages, we opted for rice as a substitute for cash. Consistent with this reasoning, we priced the rice at the average village market price. Water tablets were a less familiar commodity. In effect, only 8 percent of the women had heard about them versus 20 percent of men (see Appendix Table 3). It has to be noted that TA+ discussions had shown charts on the use of chlorine tablets and had also uploaded a video on its use on the TA+ women's phones.(Previous research suggested that preferences for health

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[11]We define a household as members who eat together on a daily basis.

[12]For almost half of the women (46 percent) we were unable to conduct this experiment as the spouse was not present at the time of the interview. Whether or not the spouse was present does not correlate with the treatment status, but appears to be largely determined by the spouse's migration status and the woman's age (Results are available on request).

goods might differ by gender, and hence the combined features of unfamiliarity yet likely differential preferences made water tablets a good choice for this experiment.

Once we read out the instructions, and allowed for questions, we separated the two participants to ensure they could not hear or see each other's choices. We asked each participant how they would like to split Rs.30 (about 0.8 USD) between the rice and the water tablets, emphasizing that there is no right or wrong answer. We recorded their answer and then brought them together. The enumerator continued reading from the script:

> Imagine both of you go to the market together with just Rs.30, which has to be exhausted on rice and water tablets. You already know the price of each which is Re.1 for 1 tablet and Rs.30 for a kilogram of rice. Now tell me how will you split the Rs.30 between rice and tablets, if you were to do it together? You may want to consult each other before sharing your final decision.

Following this statement, the participants were allowed to discuss and convey a mutually agreed upon manner to split the money. In addition to recording the independent and collective decisions, the process of discussion was captured as well. We collected information on who spoke first, what the content of this first statement was (in particular, whether this first statement dictated the valuation, sought the valuation of the other person, or suggested who should decide) and who spoke last. Once the joint decision was made, we paid out the participants in rice and water tablets as per joint decision.

The second experiment was conducted with the entire household, and only in households where there were children present between the ages of 2 and 14 years (the reason for this restriction will soon become clear). We invited all adult members (above the age of 18 years and who were non-migrants) to participate, but capped the total number participants at 6. If there were more than 6 eligible members, we invited the woman and her husband, and then randomly selected the others. As with the other experiment, conducting the experiment at a time when eligible members could participate was crucial, and we often returned up to three times to the household to ensure as many selected members as possible could participate.[13]

In this case, we asked the members to divide Rs.40 (recall, 1 USD) between rice (again valued at Rs.30 per kg) and a book for children. The book was selected as such that it would be appropriate for the age group of the children in the household. Again, while households were familiar, of course, with books, the majority of households do not have reading material in the house. The local village market does not sell them, and participants had likely little

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[13]For about 60 percent of the games, all eligible participants were present. But only 40 percent of possible games were played. Whether or not a game was played does not correlate with the treatment status. (Results are available on request)

idea of the market price. We had procured the books in Delhi, and ensured that the value of the different books were similar, but all would be valued by households with school-going children.

In a first step, we again isolated the individuals from one another and asked them to provide us with their willingness-to-pay (WTP) for the book. We made it clear that what was not spend on the book could be taken up in rice (our cash equivalent). Unlike the water tablets, a household would not likely consider purchasing more than one book. Hence, we opted for the WTP formulation instead of eliciting quantity. While the quantity formulation appeared easier to implement, as it more closely mimics the marketing decision, the WTP formulation was feasible,as long as we emphasized the meaning of WTP. We explained to them that if the price exceeds the WTP, they would not get the book and if the price is below the WTP, they would get the book. Thus, the WTP could be seen as their personal valuation of the book.

In a second step, we brought the individuals together, and asked them to discuss their WTP and come to a joint decision. It was the joint decision which was implemented: The household received the book if the joint WTP exceeded the book's price.

3.3   Descriptive statistics

The process of selecting participants in the treatment group through a lottery was meant to create two groups with very similar observable and unobservable characteristics. A standard check to determine whether the randomization procedure was conducted properly involves investigating whether these two groups have similar observable characteristics at baseline. If one lottery had been held for all potential participants across all villages, then a simple t-test would have been appropriate. However, as Duflo, Glennerster, and Kremer (2007) note, one should include subgroup indicators (called strata) in the regression in this case [14] This is also true for baseline balance tests. In our case, the strata fixed effects indicate the hamlet where the respondent lived or attended class.

Table 2 reports the summary statistics of individual- and household-level characteristics of the women in the treatment and control groups at baseline, as well as whether the difference between the two groups is significant.

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[14]Technically speaking, whether it is necessary or simply advisable to include strata fixed effects depends on whether the same proportion of participants is chosen in each lottery. Imbens, King, McKenzie, and Ridder (2009) showed that including strata fixed effects for different lotteries generally lowers the estimated standard errors for the estimated coefficients and is thus advisable. When the lottery is conducted for separate subgroups separately and the number of participants chosen for the program as a proportion of all possible participants differs by subgroup, it is necessary to include strata fixed effects to avoid biased results

The average age of the women was 35 years. The average FDS test score of the women was 5.6 out of a maximum possible score of 16. The average time taken by women for the RAN test was 82 seconds and the women made 2 errors on average. The women, on average, had 3 kids. Each woman's household, on average, had a holding of 0.5 acres of land. There were 11 members in every household, on average with an average number of 5 adult members. 16 percent of the households had access to electricity. Given that TA+ program targeted disadvantaged groups, it is no surprise that 50 percent of the households belonged to Other Backward Classes (OBCs) and the remaining 50 percent of the households belonged to Scheduled Castes (SCs)[15]. Column (8) of Table 2 which reports the P-value of a regression of the variable of interest on the treatment dummy indicates that the treatment and control groups are balanced on almost all characteristics of women. The only exception is the woman's age where the women in the control group is 1.6 years older than the women in the treatment group, on average, a difference which is statistically significant at the 10-percent level. This would not affect the results since the regression specification controls for all the characteristics of Table 2.

Table 3 reports the summary statistics of characteristics of all the children of the sample women. Table 3 also reports whether the difference between the children's characteristics of women from the two groups is significant.

The average age of the women's child was 9 years. Half of the children were girls. The children had 3 years of education on average. 93 percent of the children tested were enrolled in school at the time of baseline survey. 53 percent of the enrolled children attended school on all seven working days preceding the day of the baseline survey. Only 4 percent of the children are dropped by their mothers at school. Mothers of 72 percent of the children used to inquire about school homework. 58 percent of the children spent at least one hour on homework daily. Mothers of only 0.3 percent of the children helped the children with their homework. 8 percent of the children received help from some other educated member of the family, which usually was a sibling or a cousin. Column (8) of Table 3 which reports the P-value of a regression of the variable of interest on the treatment variable indicates that the treatment and control groups are balanced on every single characteristic of the children.

A few of the characteristics in Table 3 namely child age, birth order, child gender and an interaction term between child gender and age have been controlled for, in our later analyses

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[15]There are more than 6000 caste (jati) groups in existence. The constitution of India proclaims it as a "caste-less" society, and legally, caste is recognized as a category only for the purposes of affirmative action, namely, the most disadvantaged castes, are identified for quotas in state-run educational institutions, government employment and at all levels of election. These castes are listed in a government schedule, and hence called Scheduled Castes.

on the impact of TA+ on child test scores and on women's investments in children's health and educational outcomes. Table 3 has baseline values of some of final outcome variables, related to children. Since we did not find any difference in the results when we controlled for them in our initial analyses, we do not have them as controls in the analyses reported in this paper.

Appendix Table 1 reports the summary statistics of all the outcome variables at baseline and also whether any difference between the treatment and control groups along these baseline outcomes is significant.

Of all the women in our sample, 31 percent used a vehicle, 46 percent used a personal mobile phone, 46 percent had a personal bank account, 76 percent kept their jewelry with themselves and 97 percent wore a veil to cover their face. All these outcomes are balanced across the two groups.

The two groups are also balanced in the proportion of women who were consulted for specific household decisions. 94 percent of the women reported that they were being consulted on what to cook on a daily basis, 92 percent reported that they were being consulted on what and how much to purchase from the local market, 89 percent of the women were consulted on what and how much to purchase from the market outside the village, 92 percent of the women were consulted as to what had to be done when their children fell ill, 84 percent were consulted their children's school enrollment decisions and 79 percent were consulted on decisions of whether their children should take a leave from school on a particular day.

The two groups are also balanced in the proportion of women who reported that their opinions mattered in the above listed specific household decisions. 61 percent of the women reported that they had a say on what to cook on a daily basis, 49 percent of the women reported that they had a say in what and how much to purchase from the local market, 46 percent reported that they had a say in what and how much to purchase from the market outside the village, 56 percent of the women reported that they had a say on what had to be done when their children fell ill, 53 percent of the women reported that they had a say in their children's school enrollment decisions and 56 percent of the women reported that they had a say in deciding their children should take a leave from school on a particular day.

The two groups are balanced on all mobility related outcomes except three. 74 percent of the women reported that they had moved outside their house and 21 percent of them did not have to seek permission from any other household member to do so. 46 percent of the women had visited the local market within the village and 84 percent of them did not have to seek permission to do so. 33 percent of the women had visited a market outside the village and 46 percent of them did not have to seek permission to do so.74 percent of the women had visited the primary health care center within the village and 22 percent of them

did not have to seek permission to do so.98 percent of the women had visited their natal family and 16 percent of them did not have to seek permission to do so. 93 percent of the women had made phone calls to their natal family and 46 percent of them did not have to seek permission to do so.12 percent of the women had joined some form of community groups and 64 percent of them did not have to seek permission to do so. 65 percent of the women had gone for some cinema or other entertainment events and 17 percent of them did not have to seek permission to do so. The only outcomes on which there is statistically significant differences between the two groups include the proportion of women having visited a market outside the village, the proportion of women having joined some kind of community groups and the proportion of women having gone for some cinema or other entertainment events. In all these three outcomes, the proportion is higher in the control group.

As with baseline values of outcome variables related to children, we did control for these baseline outcome variables as well in our initial analyses. In comparison with the results of analyses which do not control for these variables, we find no difference. Hence for the results reported in this paper, none of the regressions have controlled for baseline outcome variables listed in Appendix Table 1.

4 Analysis and Results

This section describes the methodology and presents the main results.

4.1 Regression methodology

In the previous section, we showed that the covariates are balanced for both treatment and control groups. We now estimate a simple treatment effect model before implementing instrumental variables. We first estimate the following regression, where y_{ij} denotes the variable of interest of woman i located in hamlet j:

$$y_{ij} = \alpha + \beta_{ITT} ITT_{ij} + \mu_j + \epsilon_{ij} \tag{1}$$

ITT_{ij} is an indicator variable that takes a value of 1 if the woman was assigned to the treatment group and a value of 0 otherwise. Because all the women did not necessarily comply with this assignment, the variable β_{ITT} captures the intent-to-treat effect, that is, the effect of being assigned to treatment. The variable μ_j is the specific hamlet part of the error term and ϵ_{ij} is the individual-specific part of the error term.

Next, we include a set of individual- and household-specific control variables that convert Equation (1) into the following regression equation:

$$y_{ij} = \alpha + \beta_{ITTC}ITT_{ij} + \gamma X_i + \mu_j + \epsilon_{ij} \tag{2}$$

The variable β_{ITTC} captures the intent-to-treat effect for control variables. These control variables include the women's age, the women's baseline FDS test score, the women's baseline RAN time, the women's baseline RAN error, the women's number of kids, whether the women belongs to Other Backward Castes or Scheduled Castes,land owned by women's households, number of members in the women's households, number of adult members in the women's households and whether the household has access to electricity,

There wasn't full compliance to our treatment assignment. 38 percent of the women assigned to the treatment status did not participate in the program and 0.04 percent of the women assigned to the control status, ended up participating in the program as is evident from Table 1. Therefore, intent-to-treat will be an underestimate of the program for those who participated in the treatment. Hence, we implement an instrumental variables strategy in which participation in TA+ is instrumented by assignment to the treatment group. In the first stage, we regress participation in TA+ on assignment to the treatment group and the other control variables already mentioned.

$$TA_{ij} = \alpha + \beta_{Stage1}ITT_{ij} + \gamma_{Stage1}X_i + \mu_j + \epsilon_{ij} \tag{3}$$

The instrumental variables (IV) approach then uses the predicted values instead of treatment assignment as an independent variable in the second stage.

$$y_{ij} = \alpha_{IV} + \beta_{IV}\hat{TA}_{ij} + \gamma_{IV}X_i + \mu_j + \epsilon_{ij} \tag{4}$$

The coefficient β_{IV} captures the local average treatment effect, which is the effect of TA+ among the women who complies to the treatment assignment. This is our preferred specification. All the regressions incorporated strata fixed effects and are run with robust standard errors.

4.2   Results

TA+ seemed to have had impacts over a wide range of outcomes including health and hygiene practices of women, their time use, investment in children's health and educational outcomes, women's position in the households, their knowledge, their confidence in dealing with people outside their families and their bargaining power within their families as detailed below.

4.2.1   Health, hygiene and time use

Table 4 presents the effect of TA+ on the women's health and hygiene practices and their time use. Among hygiene practices, we see significant impacts on two of them in particular. TA+ participation increased the probability of women covering vessels, in which drinking water is stored, by 18 percentage points. This is significant at the 1 percent level of significance. TA+ participation also increased the probability of women washing hands with soap after using toilet, by 14 percentage points. This is significant at the 5 percent level of significance. Although not statistically significant, TA+ participation does improve the probability of women treating water before drinking and telling children to wash hands after defecating These positive effects are expected since the topics discussed in the TA+ sessions included hygiene practices. We expected to see an impact on fertility decisions. But there was no impact on the use of contraceptives due to TA+ participation. There were no explicit discussions in any of the TA+ classes on this topic.

TA+ participation increased the probability of women spending time in helping their children with homework by 11 percentage points. This is significant at 5 percent level of significance. The probability of women spending time to remind their children about homework and to talk to the children's teachers have increased as well due to TA+ participation, although these are not statistically significant. This is in line with how almost all the women in our qualitative surveys expressed that after attending TA+ classes, they realized the importance of educating their children.

TA+ participation increased the probability of women spending time to talk to health care worker or doctor or nurse by 14 percentage points. This is significant at the 10 percent level of significance. This is expected since the TA+ discussions focused on the need to monitor one's own health and the role of health workers.

4.2.2   Children's educational and health investments and test scores

Table 5 presents the effect of TA+ on children's educational investments and outcomes, by women. TA+ participation increased the probability of women asking their children about homework in a week, by 19 percentage points. This is significant at the 1 percent level of significance. TA+ participation reduced the probability of women dropping their children at school, in a week, by 3 percentage points. This is significant at the 10 percent level of significance. TA+ participation reduced the probability that the women's child spends at least one hour a day on homework by 11 percentage points. This is significant at the 5 percent level of significance. Our qualitative survey revealed that the women enjoyed studying along with their children after TA+ participation. This justifies the increased involvement of the

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women with their children's homework.

One interpretation could be that the women who participated in TA+ realized the need to improve the self-efficacy of their children. This could be the reason why the women did not accompany the children to school. The result that TA+ participation reduced the probability that the women's child spends at least one hour a day on homework is indicative of possible Hawthorne effects in the responses of the women in the control group. The control group women might have over reported the hours their children spent on homework daily.

TA+ participation did not have any impact on the women's investment in their children's health outcomes. There was no change in the probability of the children falling sick, in the probability of the children receiving medical treatment and in the probability of women being present when their children were treated. In the sample villages, the women were comfortable to take their children to primary health centers located within the village which provide free medical services. This was thus not a relevant margin to base our analysis. None of the children in our sample had to be treated outside the village and hence we are unable to test the impact on health investments if the children had to be treated outside the village.

Appendix Table 2 shows that TA+ participation did not have any significant impact on the literacy, numeracy or cognitive test results of the women's children. This is not surprising given that we would expect some impact on these outcomes only in the longer run and not within seven months after the TA+ participation, when the endline tests were administered on the children.

4.2.3   Woman's position in the household

Columns (1) through (8) of Table 6 presents the impact of TA+ participation on whether the women were exempted from seeking permission to perform a range of daily activities, conditional on the fact that the women have engaged in those activities earlier. TA+ participation increased the probability of women not having to seek permission to make phone calls to natal family by 21 percentage points. This was significant at the 1 percent level of significance. TA+ participation increased the probability of women not having to seek permission to go to the local shop by 18 percentage points. This was significant at the 10 percent level of significance.

Many of the women, during our qualitative surveys, mentioned how TA+ participation improved their self-esteem and that they were taken more seriously by other family members. One of the women mentioned how after having participated in TA+, her husband has stopped calling her 'crazy'. These are indicative of the improved position of the women in the

household as a result of their family members' acknowledging their increased self-esteem.

TA+ participation increased the probability of having to seek permission to join community groups but this is not a statistically significant result. One possible explanation would be that the women in the treatment group could relate to the question more since they did join TA+ which is a form of community group and they could respond realistically, unlike the women in the control group.

TA+ participation did not have any impact on status variables like woman having to wear a veil, whether the woman could keep her jewelry with herself, whether the woman had a personal mobile phone, whether the woman used a vehicle and whether the woman had a personal bank account. TA+ participation did not have any impact on whether the women were consulted and whether they had a say in matters like what to cook, what to shop, what needs to be done when her child falls sick, child's school enrollment decisions and whether the child should attend school one day. The role of the decision maker in the household was not affected by TA+ participation.

Table 7 shows the results of the spousal bargaining game. Appendix Table 3 presents all descriptive statistics corresponding to Table 7. Before interpreting these results, note that the spousal bargaining game in essence allows us to compare the individual preferences with the joint preferences, by applying a Nash Bargaining model, and allocating a Nash bargaining weight of λ to the woman, as below:

$$\lambda U_F + (1 - \lambda)U_M = U_J \tag{5}$$

where U_F denotes the preferences of the woman, which in this case is her choice of number of water tablets, and U_M denotes the preferences of her spouse, i.e., his choice of the number of water tablets to purchase. The bargaining weight of the woman, λ, can be obtained via:

$$\lambda = \frac{(U_J - U_M)}{(U_F - U_M)} \tag{6}$$

Note that $0 \leq \lambda \leq 1$, with $\lambda = 0$ indicates that the woman has no bargaining power, and $\lambda = 1$ represents a situation in which it is the woman who has all the bargaining power. Before we proceed, consider the distribution of λ in Appendix Table 4. Note that for 23 percent of the couples, we recorded the same preferences, hence this λ cannot be computed in these cases. For about 14 percent of the couples, the λ was outside the acceptable range $[0, 1]$. If taken at face value, this would imply that the process of negotiation itself might have changed individual preferences, i.e. persuasion has taken place. More likely perhaps, the experiment might not have been understood by these participants. Notably, for the couples who have a λ within the acceptable range, the large majority reports $\lambda = 0$ or $\lambda = 1$. While

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this might suggest extreme levels of bargaining power, to us, this more likely suggests that experiments such as these one, only measure one dimension, and is unlikely to represent a comprehensive assessment. We return to the limitations of this exercise in the conclusion.

Moving onto the results presented in Table 7, we note while that the TA+ program did not impact the preferences of the woman and her husband (in Columns (1) and (2), respectively), the discrepancy between their preferences might have decreased, as measured in Columns (3) - while not statistically significant, the P value is 0.13 and the magnitude of the coefficient is not small: 5 percent. We restricted the sample to the couples with λ within the acceptable range of $[0, 1]$ for Columns (4) and (5) but do not note a statistically significant impact on either the value of λ or the discrete counterpart. We do, however observe a change in the decision-making process. While, in most cases, the spouse speaks both first and last (see Appendix Table 3), and this is not something which appears to have been altered by the TA+ program. The first speaker is now 20 percentage points more likely (P-value 0.7-08) to seek the other person's valuation rather than to dictate a valuation.

Finally, and perhaps somewhat odd, while TA+ program did not affect the probability that the woman had heard about water tablets, the spouses seem to have an increased knowledge due to the TA+ program. We are yet to attribute an explanation to this - it might suggest social learning within the family - or perhaps an inclined tendency to more carefully listen to what the spouse, i.e. the woman, has to say after she returns from the TA+ classes each day.

We did not include the results of the family bargaining game in the set of results' tables. Note that, in this case, there is no straightforward manner to capture the bargaining position of one individual. When we repeat the previous analysis, we see no statistically significant effects. The effects on the preferences of the participants, the difference in preferences, or the decision-making process is quite imprecise. Given the significant attrition issues in this game, we opted not to include the results in this paper.

One needs to keep in mind the complexities of capturing decision making processes in extended family setting within the context of our study location. Within extended families, the division of labor is clearly defined and is impossible to change. The main decision-making roles are usually adorned by the oldest members of the household. It doesn't usually get transferred to others unless the said person(s) become incapable of taking decisions which is usually when the person gets too old.

4.2.4 Factual and applied knowledge

Columns (9), (10) and (11) of Table 6 presents the impact of TA+ participation on knowledge test scores of the women. More than 50 percent of the women could correctly answer 6 factual questions. Of the two remaining factual questions, one was correctly answered by 40 percent of the women and the other by 23 percent. Among the four cognitive questions, one was correctly answered by 55 percent of the women, the second one was correctly answered by 44 percent of the women, the third one by 8 percent and the last one by 11 percent.

TA+ participation increased the overall knowledge test score by 2.8 points which corresponds to a 23 percent increase. This is significant at the 1 percent level of significance. TA+ participation increased the factual knowledge score by 2.3 points which corresponds to a 29 percent increase. This is significant at the 1 percent level of significance, as well. TA+ participation increased the cognitive test score by 0.5 points which corresponds to a 13 percent increase. This is also significant at the 1 percent level of significance. The larger impact on factual questions, highlights the effectiveness of the TA+ discussions on varied factual topics. The factual questions, thus seemed to be a direct application of what the women were exposed to in their classes.

4.2.5 Confidence in dealing with people outside the family

Column (12) of Table 6 presents the impact of TA+ participation on the women's confidence in dealing with people outside their families. The proportion of women who claimed to be 'very confident in dealing with' was highest when the person in question was a female doctor/nurse, an Anganwadi or ASHA worker (who are always female) or a female shopkeeper. For the remaining five listed people, namely male shopkeeper, contractor, village head, bank employee and male doctor or nurse, the highest proportion of response was that the women are 'somewhat confident in dealing with'.

The TA+ participation increased the confidence score by 2.2 points which corresponds to a 6 percent increase. During our qualitative survey, women reported that before TA+ participation, they used to seek the help of their older children or nephews to accompany them when they took their younger children to the health center. Since TA+ participation, as the TA+ instructors kept encouraging them to interact with health workers on their own, the women have gained confidence to go on their own.

5 Conclusion

Given that 37 percent of illiterate adults are in India (UNESCO, 2014), the evidence from India is critical in terms of our understanding of the broader, intergenerational impacts of adult female literacy. As mentioned earlier in the paper, although evaluations of adult literacy programs do exist, the body of rigorous evidence is small. Our paper directly contributes to this small body of literature by evaluating the impact of an innovative computer based adult literacy program named Tara Akshar+ (TA+) over a wide range of outcomes and the mechanisms which underlie the theory of change.

TA+, implemented by the NGO Development Alternatives (DA), has a 56 day curriculum focusing on imparting basic literacy and numeracy skills to its participants. With such a short program, it would be hard to imagine that the participants would have gained anything beyond basic literacy and numeracy skills. But our results show that TA+ does have impacts beyond these basic skills. We document an improvement in women's health and hygiene practices and an increased involvement of the women in their children's education. We find little effects, however, on other health investments and more traditional measures of educational investment, such as school enrollment and attendance.

TA+ participation does result in significant impacts on the mechanisms which underlie the theory of change. The women have increased general knowledge of health and educational matters, increased confidence in dealing with people outside their families and increased self-efficacy. Within the households, the women now were more likely to be exempted from seeking permission to leave the house. While making decisions with their spouse, there was an increased probability that the women would be consulted and not dictated. We attribute these impacts to primarily two aspects of TA+. TA+ enabled the women to move out of the house to assemble at a central location to attend the classes and to interact for a longer time with people outside their family. A more important aspect of the TA+ is the complementary discussions on a wide variety of topics which have proved extremely influential on the women. As a policy recommendation, it would be important to have these two aspects in place for any adult literacy programs, complementing the literacy and numeracy components, to see similar results on mechanisms.

Keeping in mind the short duration of the evaluation (less than one year), and the fact that we found strong, significant impacts on knowledge formation, confidence and self-esteem as well as the status of the women in their households, these results are encouraging and allow us to speculate that an evaluation, if it were done in ten years, would show more significant impacts on the next generation. In addition to a longer-term analysis, a more complete analysis would also need to consider spill-overs.

Our results reveal one instance of spillover of what the women were exposed to in TA+ classes to other family members. In the bargaining experiment results, we note that the spouses of women who participated in TA+ were more likely to be aware of the use of water purification tablets. There were discussions on water purification tablets in the TA+ classes. While we are limited by data constraints, we intend to analyze spillover effects within families, within hamlets and within villages in future research.

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Table 1: Treatment assignment and participation status

	Participated in TA+		
	No	Yes	Total
Treatment			
Control	171	7	178
Treated	80	133	213
Total	251	140	391

Table 2: Descriptive statistics at baseline (women)

Variable	Obs	Full Mean	Full St. Dev.	Control Mean	Control St. Dev.	Treatment Mean	Treatment St. Dev.	P-values
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age of woman (years)	359	35.231	10.106	36.025	9.428	34.571	10.616	0.092*
FDS total	361	5.676	1.579	5.555	1.583	5.777	1.572	0.250
RAN time	358	81.679	28.751	81.841	30.757	81.541	27.020	0.814
RAN error	359	2.092	4.503	2.232	4.596	1.974	4.432	0.789
Number of children	361	2.947	1.402	3.079	1.457	2.838	1.349	0.135
Acreage land owned	361	0.519	0.995	0.459	0.732	0.569	1.170	0.621
Members in the household	359	10.663	7.186	10.877	7.411	10.487	7.010	0.308
Adult members in the household	359	5.251	4.041	5.302	4.218	5.208	3.901	0.455
Whether the house has	359	0.156	0.363	0.185	0.390	0.132	0.339	0.175
Belong to OBC	359	0.496	0.501	0.457	0.500	0.528	0.500	0.232
Belong to SC	359	0.471	0.500	0.512	0.501	0.437	0.497	0.323

Notes: This table presents the descriptive statistics and the results of a balance test. Column (1) presents the sample size. Columns (2) and (3), respectively, present the mean and standard deviation for the full sample. Columns (4) and (5), respectively, present the mean and standard deviation for the control sample. Columns (6) and (7), respectively, present the mean and standard deviatio for the treatment sample. Column (8) presents the P-value of a regression of the variable of interest on the treatment variable. This regression includes hamlet (strata) fixed effects and robust standard errors.***, **, * denote statistical significance at the 1, 5, 10 percent levels, respectively.

Table 3: Descriptive statistics at baseline (children)

Variable	Obs.	Full Mean	Std. Dev.	Control Mean	St. Dev.	Treatment Mean	St. Dev.	P-values
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Child age (years)	1,056	8.775	4.617	8.917	4.680	8.651	4.562	0.244
Gender (1=female; 0=male)	1,049	0.505	0.500	0.506	0.500	0.504	0.500	0.627
Birthorder	1,056	2.324	1.318	2.389	1.386	2.266	1.254	0.149
Educational investments and outcomes								
Education (in years)	1,049	3.217	3.295	3.253	3.322	3.186	3.273	0.473
Currently enrolled in school (1=yes; 0=no)	789	0.934	0.248	0.924	0.265	0.943	0.232	0.456
No absence from school in last 7 days (1=yes; 0=no)	734	0.534	0.499	0.541	0.499	0.528	0.500	0.176
Mother drops of child at school (1=yes; 0=no)	734	0.044	0.204	0.053	0.224	0.036	0.185	0.509
Mother asks child about homework (1=yes; 0=no)	734	0.718	0.450	0.694	0.461	0.739	0.440	0.408
Child spends at least 1 hour on homework daily (1=yes; 0=no)	734	0.576	0.494	0.597	0.491	0.558	0.497	0.167
Mother helps with homework (1=yes; 0=no)	732	0.003	0.052	0.000	0.000	0.005	0.071	0.180
Child receives any help with homework (1=yes; 0=no)	735	0.075	0.263	0.074	0.261	0.076	0.265	0.765

Notes:This table presents the descriptive statistics and the results of a balance test. Column (1) presents the sample size. Columns (2) and (3), respectively, present the mean and standard deviation for the full sample. Columns (4) and (5), respectively, presents the mean and standard deviation for the control sample. Columns (6) and (7), respectively, present the mean and standard deviatio for the treatment sample. Column (8) presents the P-value of a regression of the variable of interset on the treatment variable. This regression includes hamlet (strata) fixed effects and robust standard errors.***, **, * denote statistical significance at the 1, 5, 10 percent levels, respectively. For the educational outcomes only children between the ages of 5 and 16 are included. Rows after 'currently enrolled' are conditional on the child currently enrolled in school.

Table 4: The Effect of TA+ on women's health and hygiene practices and time use

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Cover water vessel (1)	Treat drinking water (2)	Wash hands with soap after using toilet (3)	Talk to children about handwashing (4)	Woman spends time to help children with homework (5)	Woman spends time to remind children of homework (6)	Woman spends time to talk to teacher at school (7)	Woman spends time to consult with the nurse at health care center (8)
Participated (1=yes;0=no)	0.181***	0.011	0.136**	0.008	0.107**	0.118	0.039	0.142*
	(0.068)	(0.047)	(0.064)	(0.035)	(0.046)	(0.079)	(0.076)	(0.081)
F-statistic (of the first-stage)	271	271	271	271	233	238	231	271
Observations	385	385	385	385	344	343	343	385
R-squared	0.137	0.136	0.213	0.115	0.183	0.193	0.112	0.066

Notes: This table shows the results of a linear (probability) instrumental variable regression of the various woman-level health investment variables using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 5: The Effect of the TA+ on children's educational investments and outcomes

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Currently enrolled in school (1)	No absence from school in last 7 days (2)	Mother drops of child at school (3)	Mother asks child about homework (4)	Child spends at least 1 hour on homework daily (5)	Mother helps with homework (6)	Child receives any help with homework (7)
Participated (1=yes;0=no)	0.007	-0.063	-0.031*	0.189***	-0.106**	0.007	-0.005
	(0.028)	(0.052)	(0.018)	(0.054)	(0.050)	(0.009)	(0.026)
Child age (years)	0.004	-0.000	-0.004	-0.014	0.001	-0.001	0.011**
	(0.005)	(0.009)	(0.003)	(0.009)	(0.008)	(0.002)	(0.004)
Gender (1=female; 0=male)	0.274***	-0.280**	-0.039	-0.050	-0.252**	0.009	0.129**
	(0.081)	(0.134)	(0.042)	(0.139)	(0.127)	(0.029)	(0.064)
Gender * Age	-0.026***	0.024**	0.004	0.006	0.018	-0.001	-0.015***
	(0.007)	(0.011)	(0.004)	(0.012)	(0.011)	(0.002)	(0.006)
Birthorder child	-0.012	0.020	-0.005	0.003	-0.009	-0.007	0.001
	(0.010)	(0.018)	(0.007)	(0.020)	(0.018)	(0.005)	(0.008)
F-statistic (of the first stage)	604	535	535	535	535	535	535
Observations	722	674	674	674	674	674	674
R-squared	0.115	0.186	0.073	0.246	0.219	0.081	0.170

Notes: This table shows the results of a linear probability model instrumental variable regression of the various child-level educational investment and outcome variables using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Columns (2) to (7) are conditional on the child being currently enrolled in school as per Column (1). Only children between the ages of 5 and 16 are included. Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 6: The Effect of TA+ on women's mobility, factual and applied knowledge and confidence in dealing with people

Linear and Linear Probability Model Instrumental Variable Regressions with the following dependent variable:

The women does not need permission to do the following activity, conditional on having done this before												
	Leaving the house	Going to a local shop/market (kirana)	Going to a market/shop outside of the village	Visiting a primary health care center	Visiting natal family	Making calls to the natal family	Joining any community groups (e.g. a Self Help group)	Going for cinema or entertainment events	Knowledge score (out of 12)	Knowledge score (factual) (out of 8)	Knowledge score (cognitive) (out of 4)	Confidence score (out of 36)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Participated (1=yes;0=no)	0.033	0.181*	0.039	0.080	0.008	0.213***	-0.043	0.023	2.829***	2.317***	0.512***	2.156***
	(0.071)	(0.099)	(0.114)	(0.072)	(0.048)	(0.069)	(0.295)	(0.073)	(0.394)	(0.307)	(0.150)	(0.763)
F-statistic (of the first-stage)	203	143	118.	220	267	272	10	191	356	274	274	270
Observations	315	233	201	347	376	357	34	263	356	356	356	384
R-squared	0.125	0.163	0.184	0.106	0.069	0.178	0.765	0.154	0.356	0.368	0.204	0.210

Notes: This table shows the results of a instrumental variable linear (probability) regression of the various woman-level mobility, confidence and knowledge variables using the invitation to participate as an instrument for the participation status. Columns (1) through (8) are conditional on having done this activity before (note that in Column (7) only 34 women reported to have done this activity - these results need to be interpreted carefully). Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 7: The Effect of TA+ on women's bargaining power in the Bargaining Experiment

Linear and Linear Probability Model Instrumental Variable Regressions with the following dependent variable:

	Rs. spent on water tablets by woman	Rs. spent on water tables by husband	Absolute difference between (1) and (2)	Lambda	Dummy variable if Gamma=1	Woman speaks first in negotiation	Woman speaks last in negotiation	First speaker suggest decider	First speaker inquires about preferences of other	First speaker dictates division	Woman has heard about water tablets	Husband has heard about water tablets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Participated (1=yes;0=no)	-1.242	-1.338	-1.826	0.083	0.080	-0.011	0.109	-0.004	0.224*	-0.220*	0.023	0.163
	(1.591)	(1.405)	(1.235)	(0.128)	(0.134)	(0.130)	(0.135)	(0.076)	(0.123)	(0.128)	(0.071)	(0.116)
F-statistic (of the first-stage)	68.5034	68.5034	68.5034	58.3785	58.3785	68.5034	68.5034	68.5034	68.5034	68.5034	68.5034	68.5034
Observations	181	181	181	113	113	181	181	181	181	181	181	181
R-squared	0.193	0.272	0.161	0.328	0.321	0.198	0.127	0.077	0.192	0.196	0.242	0.178

Notes: This table shows the results of a linear instrumental variable regression of the various bargaining variables using the invitation to participate as an instrument for the participation status. Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Appendix Figure 1 - Map of Uttar Pradesh showing the location of our study

MAP OF UTTAR PRADESH SHOWING THE LOCATION OF STUDY

SANT RAVIDAS NAGAR DISTRICT

Source: https://en.wikipedia.org/wiki/Bhadohi_district

Appendix Figure 2 - Map of Sant Ravidas Nagar district with the three different tehsils
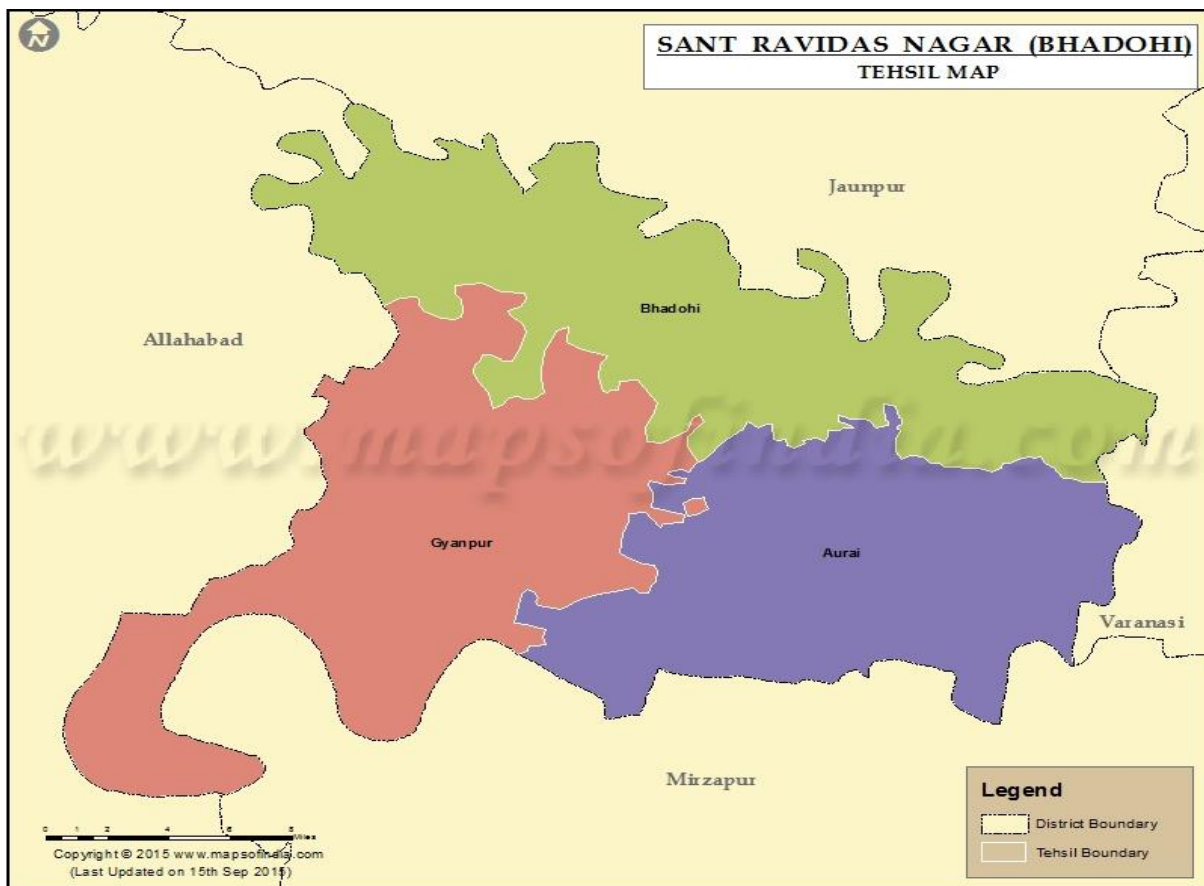
Note: Our study was confined to Gyanpur and Bhadohi tehsils
Source: https://www.mapsofindia.com/maps/uttarpradesh/tehsil/sant-ravidas-nagar.html

Appendix 3: Midline Knowledge test questions

1. What's the name of your state? (Right answer: Uttar Pradesh/U.P)

2. You have got Rs.25 to buy onions and tomatoes. You have bought onions for Rs.13. How much money is left with you to buy tomatoes? (Right answer: Rs.12)

3. Who is the Prime Minister of India? (Right answer: Narendra Modi/Modi)

4. If 20 mangoes have to be equally divided among 5 children, how many will each one get? (Right answer: 4)

5. Manoj's dad has four sons. If the three sons are named Ram, Laxman and Shatrughana, what is the name of the fourth son? (Right answer: Manoj)

6. When is the next Panchayat election in your village scheduled? (Right answer: 1 year from now)

7. Imagine I walk to store, and I first walk 2 miles East, then 2 miles North, then 2 miles West and then 1 Mile South. How far am I from my original starting position? (Right answer: 1 mile)

(In this question, you may show gestures with your hands to make the respondent understand the four directions)

8. What is the main cause for Diarrhea? a) Mosquito Bite b) Drinking dirty water c) Drinking excess water d) Not eating green vegetables (Right answer: b)

9. For how many months should a child receive only breastfeeding? (Right answer: 6 months)

10. What is the capital of India? (Right answer: Delhi)

11. What is the minimum marriageable age for girls by law? (Right answer: 18)

12. Which disease is caused due to iodine (which is found in salt) deficiency? a) Polio b) Malaria c) Goitre   d) TB (Right answer: c)

Note:The ones in italics are the cognitive questions and the remaining are factual ones.

Appendix Table 1: Descriptive statistics of outcome variables at baseline

Variable	Full			Control			Treatment			P - values
	Obs.	Mean	St. Dev.	Obs.	Mean	St. Dev.	Obs.	Mean	St. Dev.	
	(1)	(2)	(3)	(7)	(4)	(5)	(4)	(5)	(6)	(8)
Use vehicle	360	0.31	0.46	162	0.33	0.47	197	0.29	0.46	0.679
Personal mobile	360	0.46	0.50	162	0.45	0.50	197	0.47	0.50	0.953
Personal bank account	360	0.46	0.50	162	0.46	0.50	197	0.46	0.50	0.726
Keep jewellery with yourself	360	0.76	0.43	162	0.82	0.39	197	0.73	0.45	0.108
Use veil	358	0.97	0.17	162	0.99	0.11	195	0.96	0.20	0.125
Are you being consulted regarding:										
What to cook on a daily basis?	360	0.94	0.24	162	0.96	0.20	197	0.92	0.27	0.161
What and how much to purchase at the local shop/market?	360	0.92	0.27	162	0.93	0.25	197	0.91	0.28	0.454
What and how much to purchase at the market outside the village?	360	0.89	0.32	162	0.88	0.33	197	0.89	0.31	0.861
What to do when your child falls ill?	360	0.92	0.27	162	0.92	0.27	197	0.92	0.27	0.893
Whether your child is enrolled in school a particular year?	360	0.84	0.36	162	0.86	0.35	197	0.84	0.37	0.834
Whether your child attends school a particular day?	360	0.79	0.41	162	0.80	0.40	197	0.80	0.40	0.817

Do you have a say in the following decision:

What to cook on a daily basis?	360	0.61	0.49	162	0.60	0.49	197	0.61	0.49	0.908
What and how much to purchase at the local shop/market?	360	0.49	0.50	162	0.48	0.50	197	0.49	0.50	0.962
What and how much to purchase at the market outside the village?	360	0.46	0.50	162	0.49	0.50	197	0.44	0.50	0.499
What to do when your child falls ill?	360	0.56	0.50	162	0.57	0.50	197	0.54	0.50	0.422
Whether your child is enrolled in school a particular year?	360	0.53	0.50	162	0.55	0.50	197	0.51	0.50	0.354
Whether your child attends school a particular day?	360	0.56	0.50	162	0.56	0.50	197	0.56	0.50	0.988

Have you ever done the following activity:

Leaving the house	360	0.74	0.44	162	0.76	0.43	197	0.72	0.45	0.595
Going to a local shop/market (kirana)	360	0.46	0.50	162	0.49	0.50	197	0.45	0.50	0.387
Going to a market/shop outside of the village	360	0.33	0.47	162	0.40	0.49	197	0.28	0.45	0.025**
Visiting a primary health care center	360	0.74	0.44	162	0.78	0.42	197	0.72	0.45	0.212
Visiting natal family	360	0.98	0.16	162	0.99	0.11	197	0.96	0.19	0.965
Making calls to the natal family	360	0.93	0.26	162	0.93	0.25	197	0.92	0.27	0.202
Joining any community groups	360	0.12	0.33	162	0.17	0.37	197	0.08	0.27	0.034**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Going for cinema or entertainment event	360	0.65	0.48	162	0.74	0.44	197	0.59	0.49	0.012**

Do you not need permission for the following activity:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Leaving the house	237	0.21	0.41	109	0.19	0.40	128	0.23	0.43	0.635
Going to a local shop/market (kirana)	56	0.84	0.37	22	0.82	0.40	34	0.85	0.36	0.335
Going to a market/shop outside of the village	90	0.46	0.50	47	0.43	0.50	43	0.49	0.51	0.313
Visiting a primary health care center	223	0.22	0.42	100	0.19	0.39	121	0.25	0.43	0.235
Visiting natal family	319	0.16	0.36	145	0.17	0.38	173	0.15	0.36	0.722
Making calls to the natal family	33	0.46	0.51	11	0.36	0.51	22	0.50	0.51	0.688
Joining any community groups	53	0.64	0.48	31	0.65	0.49	22	0.64	0.49	0.375
Going for cinema or entertainment event	240	0.17	0.37	122	0.14	0.35	118	0.20	0.40	0.225

Notes: This table presents the descriptive statistics and the results of a balance test. The variables under 'Do you not need permission to do the following activity' are conditional on having done the activity earlier. Column (1) presents the sample size. Columns (2) and (3), respectively, present the mean and standard deviation for the full sample. Columns (4) and (5), respectively, present the mean and standard deviation for the control sample. Columns (6) and (7), respectively, present the mean and standard deviation for the treatment sample. Column (8) presents the P-value of a regression of the variable of interest on the treatment variable. This regression includes hamlet (strata) fixed effects and robust standard errors.***, **, * denote statistical significance at the 1, 5, 10 percent levels, respectively.

Appendix Table 2: The Effect of the TA+ on child literacy, numeracy and cognitive tests

Linear Model Instrumental Variable Regressions with the following dependent variables:

	Letters per minute	Syllables per minute	Words per minute	Non words per minute	Words per minute - Grade 1 level	Words per minute - Grade 2 level	Counting objects (out of 3)	Number identification - one digit (out of 10)	Number identification - two digits (out of 10)	Count objects - circle a number (out of 2)	Count objects - write number (out of 2)	Find the missing number (out of 2)	Addition problems (out of 4)	Subtraction problems (out of 2)	Total Math score (out of 35)	RAN error	RAN time
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Participated (1=yes;0=no)	1.697	-4.314	-2.446	-1.505	-2.910	-3.759	0.087	0.794	1.050	0.010	0.321	0.258	0.192	0.176	2.887	-1.703	-7.416
	(5.412)	(5.737)	(4.757)	(3.076)	(7.002)	(6.246)	(0.149)	(0.941)	(0.885)	(0.197)	(0.217)	(0.224)	(0.388)	(0.164)	(2.633)	(1.238)	(6.370)
Child age (years)	5.467**	3.221	3.969*	2.560	6.356*	4.920*	0.095	0.637	0.885**	0.086	0.083	0.153	0.521***	0.213**	2.674**	-0.695	1.216
	(2.356)	(2.587)	(2.305)	(1.645)	(3.365)	(2.768)	(0.091)	(0.437)	(0.376)	(0.092)	(0.088)	(0.089)	(0.174)	(0.086)	(1.263)	(0.534)	(3.642)
Gender (1=female; 0=male)	34.459	11.375	27.233	15.988	38.570	23.693	0.262	-0.422	1.680	-0.180	0.012	0.339	2.125	0.612	4.428	-6.949	-35.091
	(22.687)	(23.739)	(20.393)	(15.020)	(29.079)	(25.961)	(0.819)	(4.850)	(3.931)	(0.997)	(0.969)	(1.040)	(1.815)	(0.784)	(12.973)	(6.398)	(35.554)
Gender * Age	-5.232*	-1.811	-4.168	-2.407	-5.968	-3.827	-0.025	0.014	-0.414	0.010	-0.039	-0.096	-0.359	-0.125	-1.035	0.920	4.960
	(3.073)	(3.218)	(2.774)	(2.052)	(3.966)	(3.556)	(0.112)	(0.645)	(0.531)	(0.133)	(0.130)	(0.140)	(0.246)	(0.108)	(1.739)	(0.862)	(4.815)
Birthorder child	-4.829***	-2.849	-2.684*	-1.331	-2.492	-2.696	-0.079	-0.358	-0.567**	-0.034	-0.104	-0.075	-0.236*	-0.039	-1.493*	-0.061	1.397
	(1.622)	(1.734)	(1.404)	(0.925)	(2.092)	(1.845)	(0.056)	(0.318)	(0.275)	(0.066)	(0.068)	(0.066)	(0.121)	(0.056)	(0.885)	(0.417)	(2.154)
Observations	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172
R-squared	0.404	0.419	0.424	0.401	0.421	0.408	0.179	0.156	0.350	0.149	0.236	0.274	0.359	0.359	0.258	0.186	0.141

Notes: This table shows the results of a linear model instrumental variable regression of the results of literacy, numeracy and RAN tests by a randomly selected child (aged 6-10 years) of each woman using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates.   *** p<0.01; ** p<0.5; * p<0.1.

Appendix Table 3: Descriptive Statistics of the Spousal Bargaining Game

	Variable	Obs	Mean	St.Dev.
(1)	Rs spend on water tablets by woman	183	6.57	5.64
(2)	Rs spend on water tables by husband	183	6.07	5.83
(3)	Absolute difference between (1) and (2)	183	4.16	4.34
(4)	Lambda (Decision-making weight of the woman)	114	0.31	0.45
(5)	Woman speaks first in negotiation	183	0.41	0.49
(6)	Woman speaks last in negotiation	183	0.33	0.47
(7)	First speaker suggest decider	183	0.10	0.31
(8)	First speaker dictates division	183	0.31	0.46
(9)	First speaker inquires about preferences of other	183	0.59	0.49
(10)	Woman has heard about water tablets	183	0.08	0.27
(11)	Husband has heard about water tablets	183	0.21	0.41

This table presents the descriptive statistics of the spousal bargaining game at endline.

Appendix Table 4: Distribution of Lambda

	Percentage of couples
Less than 0	10
0	41
Between 0 and 1	2
1	18
More than 1	4
Same preferences	23
Appendix Table 2 presents the distribution of the lambda computed from the spousal bargaining game as per formula: (tab_joint-tab_hus)/(tab_learner-tab_hus) (Recall this assumes a Nash Bargaining Game). N=183	