# Evaluation Design Plan

The proposed evaluation is a randomized controlled trial including100 schools and 2500 households in Rajasthan, India. The primary randomization will enable the comparison of 50 schools in which the Girls' Education Program is newly introduced (25 receiving the program for the first time in 2016 and 25 for the first time in 2017) with 50 schools that do not receive the program.

We first describe the intervention and the theory of change. Next, we will describe the RCT design, including sampling, power calculations and minimum detectable effects, replacement protocols, data quality assurances, and a framework for the protection of human subjects. Finally, we will describe our proposal for data analysis.

## A. Intervention and theory of change

The goal of Room to Read's Girls' Education Program (GEP) is to increase secondary school completion and build life skills among disadvantaged adolescent girls. GEP began in 2004 in India, and this proposed evaluation comes at a time when Room to Read is both refining the program and anticipating a scaling up of the program to other areas in India.

GEP provides mentors called "social mobilizers" to lower and upper secondary schools. Mobilizers provide mentoring and life skills training to girls as well as targeted psychosocial support for girls at risk of dropout. While early versions of GEP targeted a subset of girls within the school, the program now targets full cohorts of girls, and as of 2015 Room to Read will be rolling out a refined curriculum of life skills training.

The primary objective of moving to a cohort-based model was to increase the participation of school teachers and administrators, community members, and family members in the program, and to stimulate changes in the school environment that make it easier for girls to attain their academic goals. Specifically, social mobilizers are engaged to consult with school, staff and parents, hold school-level events, and regularly visit both the school and parents' homes. They also work directly with the female students by conducting weekly or fortnightly life skills sessions, and providing mentoring or intervention as needed to girls who are identified to be at high risk of dropout.

Social mobilizers themselves are secondary school graduates recruited from the community they serve. The objective is for these mentors to act both as role models for the female secondary school students and credible interlocutors in the broader community around questions of girls' education. Room to Read recruits the social mobilizers and provides them with initial and ongoing training, supervision, and support.

The program timeline in a particular school entails the phase-in of new cohorts who are entering lower secondary school; these cohorts then receive services through the remainder of their secondary school career (six years). The number of hours of life skills, club activities and meetings/workshops increases gradually year by year, and the social mobilizers receive refresher training each year. The ultimate objective is to transition program leadership away from Room to Read, into the hand of local parent committees, life skills clubs, and designated teacher resource people.

Room to Read's theory of change is based on the mutually reinforcing relationships between life skills mentoring and engagement activities with family, school and community – all primarily provided by social mobilizers who serve as agents of change in these communities. The short-term objective of these programs is to ensure that girls develop life skills that allow them to negotiate key life decisions, with a particular focus on prioritizing education and allocating time so as to maximize the probability of advancement in school. In addition, the program activities are targeted to increase individual and community support for girls' education.

The intermediate outcome targeted by the program is an increased school progression or decreased dropout by girls, a variable that should be highly correlated with reduced child labor. In the long term, the program is targeted to enhance life skills that will facilitate better decision-making, increase secondary school completion and reduce the risk of child labor. The theory of change is outlined schematically in the  logic model found below.

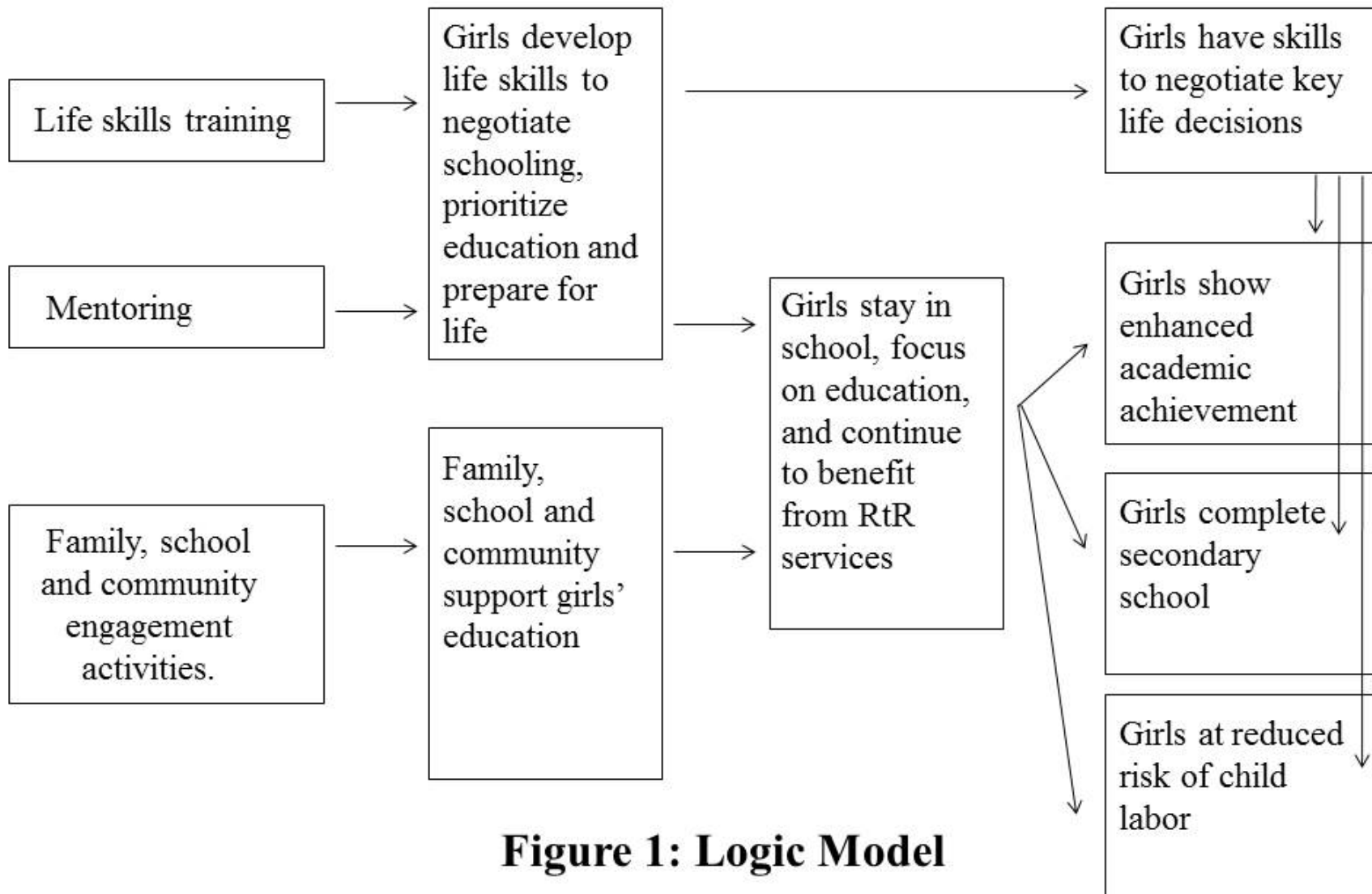| ACTIVITIES | OUTPUTS (Timeline: Year 1) | OUTCOMES AND IMPACTS (Timeline: Year 1-2) |
|---|---|---|
| Life skills training | Girls develop life skills to negotiate schooling, prioritize education and prepare for life | Girls have skills to negotiate key life decisions |
| Mentoring | | Girls show enhanced academic achievement |
| Family, school and community engagement activities. | Family, school and community support girls' education | Girls stay in school, focus on education, and continue to benefit from RtR services → Girls complete secondary school |
| | | Girls at reduced risk of child labor |

**Figure 1: Logic Model**

## B. RCT design

The proposed evaluation is a randomized controlled trial including 100 schools and 2500 students. Randomization will occur at the level of the school. In what follows, we will first discuss the sampling protocol and planned data collection. Second, we will discuss the evaluation's power and minimum detectable effects. Third, we will discuss replacement protocols, data quality assurances and ongoing monitoring.

### 1) Evaluation design and data collection

The proposed setting for this evaluation is Rajasthan state in India. Rajasthan is one of the principal states of operation of Room to Read in India, and is also characterized by one of the country's highest gender gaps in school enrollment. Girls are half as likely as boys to be enrolled in secondary school in Rajasthan, a pattern comparable only to Bihar.[1] The estimated prevalence of child labor in Rajasthan for children age 6-16 is also around 11%, comparable to the national average in India.[2]

Given that Room to Read's programs are targeted to a particular school, an individual-level randomization would clearly not be appropriate; hence, we will randomize at the level of the school. The evaluation will include 100 schools, of which 50 will be randomly assigned to the control arm. Fifty schools will receive the Girls' Education Program for the first time, among which 25 will have the program rolled out in 2016 and 25 in 2017. In the subsequent analysis, we will test whether we can detect statistically different effects of the one-year and two-year interventions. In addition, if we do observe a statistically different effect, we will test and report whether the program is more effective after one or two years.

While Room to Read's programming may reach between 50 and 100 girls in each school depending on its characteristics, our evaluation will randomly sample 25 girls in each school to be included in the baseline survey. We thus estimate a total baseline sample of 2500 households. Each household will be visited and surveys will be administered to both the head of household and the girl herself. Again, key topics of interest will include household composition, socioeconomic status, expenditure on education and health, attitudinal questions around education, time allocation inside and outside the household, child participation in work, and simple cognitive / achievement tests administered to the girl. The baseline survey will be completed *prior* to the initiation of any programmatic activities by Room to Read in the schools of interest; rollout of programmatic activities in the first schools is scheduled for June 2016, the commencement of the 2016–17 school year.

Following the baseline survey, each one of the 2500 households will be revisited for a tracking survey every six months until endline (commenting in October 2016, June 2017, and October 2017). The tracking survey will entail a brief set of questions for the head of household, focusing

[1] Kingdon, Geeta. "The progress of school education in India." *Oxford Review of Economic Policy* 23:2 (2007): 168-195.

[2] Cigno, Alessandro, Furio Camillo Rosati and Zafiris Tzannatos. 2001. "Child labor, nutrition and education in rural India: An economic analysis of parental choice and policy options." World Bank Social Protection Discussion Paper Series.

on changes in household structure or occupation, the female child's current enrollment status, and the female child's current participation in various forms of work.

This will be followed by an endline survey conducted between March and June 2018. At endline, half the intervention schools will have received Room to Read programming for one academic year, and half for two academic years. The endline survey will be parallel to the baseline survey and will again include modules administered to both the parent and the girl.

In addition, qualitative data collection will be conducted at baseline, midline and endline. This will entail work in six schools served by Room to Read and the associated communities. Three schools will be selected in which girls' attendance and achievement is above average, and three in which it is below average relative to the mean for program schools. In each school/community, qualitative data collectors will conduct ten in-depth interviews with girls included in Room to Read programming, as well as three in-depth interviews with social mobilizers, teachers, or parents.

The objective of the qualitative data collection is to understand better the channels through which the Girls' Education Program changes attitudes, perceptions and decision-making processes for girls, teachers, parents and other stakeholders. Qualitative data collection will be collected by staff members trained in in-depth interview techniques and will include the transcription, translation and coding of the resulting data.

2) Principal investigator supervision

During the period of data collection, PIs will provide regular supervision via field visits. This includes an initial field visit planned for June 2015 to supervise the pilot data collection and conduct an initial kick-off meeting with Room to Read and other stakeholders. In addition, further PI visits will coincide with baseline training, baseline surveying and follow-up data collection. The qualitative data collection will be supervised in the field by collaborator Joan DeJaeghere and/or doctoral students under her supervision.

Further updates about the timing and agenda of principal investigator field visits will be provided in subsequent technical progress reports.

3) **Power and minimum detectable effect sizes**

Power calculations for the full evaluation can be constructed using data on school achievement and child labor in Rajasthan as a whole. The formulas employed are laid out in Hayes and Bennett, "Simple sample-size calculations for cluster-randomized trials", a reference article for calculating power in cluster-randomized trials.[3] The formula employed for calculating the number of clustered required is as follows, where c is the number of clusters, n is the number of individuals sampled per cluster, k is the intracluster correlation coefficient, and $\pi_1$ and $\pi_0$ are the population indicators in the presence and absence of the intervention, respectively. $z_{\alpha/2}$ and $z_{\beta}$

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[3] Hayes, R.J. and S. Bennett. 1999. "Simple sample size calculations for cluster-randomized trials." *International Journal of Epidemiology* 28: 319-326.

are standard normal distribution values corresponding to upper tail probabilities of α/2 and β, and the sample size provides a power of 100(1- β)% of observing an effect significant at the level α.

$$c = 1 + (z_{\alpha/2} + z_{\beta})^2 [\pi_0 (1- \pi_0)/n + \pi_1 (1- \pi_1)/n + k^{2 (}\pi_0^2 + \pi_1^{2})]/( \pi_0 - \pi_1)^{\wedge 2}$$

The baseline enrollment rate of girls in secondary school is 29%. The planned evaluation size (50 schools each in treatment and control arm) can detect an increase in this enrollment rate to 35%, a proportional increase of 20%; the minimum detectable effect size is thus 20%. Given an estimated participation rate of girls in child labor of 13%, the planned evaluation would allow us to detect a decline in this participation rate to 9%, a proportional decrease of 28%.[4] The minimum detectable effect size for child labor is thus 28%.

Further discussion of how standard errors will be estimated given the target number of clusters can be found in in section 4.C.

Up to this point, Room to Read has not defined any target or expected effect sizes for its project. Accordingly, we cannot benchmark these effect sizes against any previous targets. However, in joint discussions Room to Read has concurred that the evaluation has adequate power. In addition, we believe the magnitude of the effects we can detect compare favorably to the magnitudes detected by other randomized controlled trials of educational interventions in the developing world.

While there is no baseline data available for life skills, data is available on some correlated welfare measures; for example, 40% of girls in Rajasthan marry before age 18.[5] In this case, our proposed sample size would allow us to detect a relative decrease in this prevalence rate of 16%, to 34%. The minimum detectable effect size is thus 16%.

The preceding calculations are based on an estimated intracluster correlation of .2, consistent with estimates that have been used in the literature on randomized controlled trials in the educational sector (Hedges and Hedberg 2002). However, even if a higher estimated ICC is employed (e.g., .3), the evaluation still has the power to detect 25-30% increases (decreases) in girls' enrollment and child labor respectively.

Relative to the existing literature on evaluation of educational programs, these minimum detectable sizes are comparable or lower to the effects observed, suggesting that evaluation is adequately powered. A recent RCT evaluating the effect of educational subsidies on girls' school attendance in Kenya found a 18% decline in dropout.[6] Another quasi-experimental analysis of a program that provided bicycles to girls in the Indian state of Bihar – a state that is comparable to Rajasthan in the observed level of girls' schooling- in an attempt to increase school attendance found that cohorts exposed to the program showed increases in age-

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[4] Cigno et al. (2001) report some state-level data on the prevalence of child labor in India, as well as the prevalence of child labor for girls and boys nationally. This rate of 13% participation in child labor for girls in Rajasthan is calculated by adjusting the national prevalence of child labor for girls by the difference between the provincial and national prevalence rates.

[5] District Level Household and Facility Survey 2008

[6] Duflo, Esther, Pascaline Dupas and Michael Kremer. 2012. Education, HIV, and Early Fertility: Experimental Evidence from Kenya

appropriate enrollment of secondary school of 30%.[7]   Accordingly, a minimum detectable effect of around 20% seems to be plausible.

### 4) Replacement protocols and data quality assurances

Given that this is a randomized controlled trial that will be evaluated using an intent-to-treat design, there will be no replacement of subjects.  All subjects will be randomly selected from rosters of those female students eligible for enrollment in the 100 schools that Room to Read has identified.  These students will be surveyed at baseline and again every six months until the conclusion of the study, independent of their subsequent enrollment status.

It is our objective to minimize attrition from this sample to no more than 10%.  Strategies to achieve this goal include the collection of household contact information at baseline and the administration of six-month tracking surveys.  If necessary and feasible, girls and their parents can be tracked to new residences in the follow-up survey.  Should significant migration be observed in the sample, intense tracking of a subsample of the attrited girls may also be implemented.

The investigators in conjunction with J-PAL South Asia will also implement strict protocols to assure data quality.  This includes extensive piloting of the surveys prior to any large-scale data collection; careful training of enumerators and supervisors, including field practice; the implementation of backcheck surveys to check data consistency; regular observation of enumerators; and refresher training prior to each round of follow-up data collection.

Data will be collected electronically to enable close tracking and immediate feedback by supervisors and investigators.  Ongoing monitoring of data quality and the performance of the evaluation will be conducted by the research assistant managing field operations, as well as by the principal investigators.

### 5) Protection of human subjects

The principal investigators and the major partners on this project, Room to Read and J-PAL South Asia, are committed to protecting human subjects and safeguarding personally identifiable information of respondents as part of this research. First, this evaluation will be reviewed by multiple Institutional Review Boards and will receive approval from the IRB at Williams College, IFMR-J-PAL South Asia, and MIT.  IFMR approval has been received; Williams and MIT approval are pending, and will be secured before the initiation of fieldwork.

Recruitment of subjects and all data collection procedures will be consistent with human subjects principles. Subjects who have been sampled to participate in this study will be visited at their home. The purpose and procedures of the study will be explained carefully in person to each participant, and the participant will be given the option to sign a consent form if they agree to participate in the study, or to refuse to participate. The consent shall be sought under

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[7] Muralidharan, Karthik and Nishith Prakash.  "Cycling to School: Increasing Secondary School Enrollment for Girls in India."

circumstances that provide the prospective subject with sufficient opportunity to consider whether or not to participate. Informed consent will also be sought from a parent or legal guardian for all participants who are minors at the time of the survey.

The confidentiality of the information collected in all surveys will be paramount. Data collectors and supervisors will be carefully trained on the importance of confidentiality. All quantitative data will be collected in electronic format and will be password-protected. Qualitative data may be collected using hard copy transcription in addition. In this case, all transcripts will be stored in a locked office, and will be destroyed five years after the completion of the study.

In order to enable the tracking of respondents between baseline and endline data collection, data will contain personal identifiers. However, during the baseline survey, each respondent will also be assigned a numeric study identifier. A master list linking the names of the individuals to the numeric study identifiers will be kept in an encrypted file in a password-protected computer. During the analysis stage, identifying information will be removed from the file, and individuals will be identified in the survey only by a unique ID number. The de-identified data will be used by the principal and associate investigators on the study as well as any research assistants. Following the conclusion of the research, a dataset excluding all personally identifiable information will be used for analysis and made available for public use.

Both the intervention and the data collection are presumed to entail only minimal risk for the respondents. The respondents do not risk any physical or legal harm by participating in the survey. They may risk social harm, if sensitive information is disclosed. However, this risk will be minimized using the procedures described above to preserve confidentiality.

### C. Data analysis

Following the completion of the data collection, all survey data will be merged longitudinally and cleaned using Stata. The primary analysis will evaluate the impact of the intervention on the outcomes of interest in an intent-to-treat framework. There are four primary outcomes of interest, detailed below. In addition, an appendix to this evaluation design plan outlines how each set of outcomes will be measured in our survey.

#### 1) School progression and completion

Secondary outcomes of interest here include school enrollment at each level of secondary school, and the probability of progression from each level to the next; school attendance; temporary disruption of schooling; repetition of grades; and secondary school completion.

#### 2) Life skills

Secondary outcomes of interest will be refined further in piloting, but may include decision-making and problem-solving, risk perception and management, and other related skills.

#### 3) Child labor

Secondary outcomes of interest include participation in illegal child labor, economic activity both inside and outside the home, and unpaid household services as well as detailed information on time allocation in economic and non-economic activities as well as schooling. Data will be

collected to permit the identification of forced labor, bonded labor, and human trafficking, but we do not expect prevalence rates that would permit further analysis.

### 4) Cognitive and academic achievement

Secondary outcomes of interest include measures of achievement in reading and mathematics; performance in school; and entry into tertiary schooling, if any.

The primary specification of interest will analyze the impact of the interventions on outcomes at the girl or household level in an intent-to-treat framework. The following equation will be estimated, where $Y_{is}$ denotes an outcome for girl i in school s, and $D_{is}$ is a dummy variable equal to one if a school was assigned to receive the intervention from Room to Read. The equation will be estimated with and without controls for baseline characteristics $\lambda_i$, and standard errors will be clustered at the level of the school.

$$Y_{is} = \alpha_1 + \beta_1 D_{is} + \lambda_i + \varepsilon_{ivg}$$

Given the planned sample size, the analysis will include 100 clusters. This is well above the threshold at which small-sample bias for a small number of clusters is considered to be problematic; recent research in econometrics has analyzed small-sample bias in standard errors only for cases where the number of clusters ranges between three and 30. Standard errors estimated in Stata, the statistical package that will be employed for analysis, will automatically adjust for the finite number of clusters.[8]

Given the existence of a large number of outcomes of potential interest, all variables to be examined will be defined ex ante in a pre-analysis plan. In addition, the effect will also be estimated for families of outcomes corresponding to the four primary outcomes denoted above. A more detailed pre-analysis plan will be submitted with the baseline questionnaires as noted in our work plan.

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[8] Cameron, A. Colin, Jonah Gelbach, and Douglas Miller. 2008. "Bootstrap-based improvements for inference with clustered errors." *Review of Economics and Statistics* 90(3): 414-427.

Appendix:  **ORGANIZATION OF SURVEY INSTRUMENTS**

Our quantitative survey work will include two surveys.  The household survey collects information on all household members as well as household characteristics.  The child survey collects information on the child within the household that is the subject of our study, eligible to be randomized into a treatment or control population.  We have omitted codebooks with relevant response codes to limit the volume we are sending, but they are available if you would like to see them.

These two documents are slight modifications to questionnaires used by Edmonds in other USDOL funded projects.  The household survey contains information on shocks that have not be included in previous Edmonds surveys for USDOL as well as consumption module used in the Indian National Sample Survey.  The child survey contains life skills questions that have not been used in previous USDOL funded surveys to our knowledge.

*Household Survey*

- Section 0:  General information on the household, its location, and interview time.  GPS coordinates will be collected but not made available in the public release.
- Section 1:  Respondent information (targeted at parent of child that is the subject for the treatment).  Collects information on best respondent for remainder of household survey.  Collects information on local and household shocks that might have substantive impact on how households are impacted by treatment.
- Section 2:  A household roster that collects information on demographics, schooling, and time allocation for every member of the household.
- Section 3:  Migrant information.  Collects information on location and activities of all children of household members that are not co-resident.
- Section 4:  Household consumption.  Identical to consumption module in employment modules of the Indian National Sample Survey
- Section 5:  Reserved for future use
- Section 6:  Recontact information.
- Section 7:  Enumerator post survey information.  Mapping of roster ids to child identifiers and distance to schools.

*Child Survey*

- Administered to children above the age of 10 that are candidates for the study (will be randomized into treatment and control locations).
- Section 0:  Interview Information
- Section 1:  Schooling and demographic information on the child.  Collects birth order information that we believe to be important in heterogeneity in impact of treatment.  Collects information on parents living elsewhere.  Collects information on school attendance and enrollment.
- Section 2:  Time allocation in last 12 months and 7 days.  Standard labor force survey module with additional questions to identify key outcomes.

- Section 3:  Life Skills questions.  Questions 301 – 325 measure strengths and difficulties. Questions 326- 3439 measure delaying gratification skills.  Questions 340-347 measure impulsivity.  Questions 348-357 measure perceived stress.  Questions 358--367 measure self-efficacy.  Questions 368-377 measure classroom engagement and learning motivation.
- Section 4: Reserved for Life Skills Learning Goals (specific concepts from life skills curriculum)
- Section 5:  Cognitive Skills.  Reserved.  Questions will be included to gauge literacy, numeracy, and grade-level performance.
- Section 6:  End of interview.

## CHILD LABOR DEFINITIONS FOR THE ROOM TO READ IMPACT EVALUATION IN RAJASTHAN

*Legal Context*

Our study will take place entirely in the Indian state of Rajasthan.  Rajasthan is India's largest state by area and home to some 69 million people.  Rajasthan's child labor laws reflect Indian national laws with the exception that an administrative directive redefines the definition of a child from under 14 as in the Child Labor Prohibition and Regulation Act to under 18 as in the Juvenile Justice Act.

All child employment is prohibited for children under age 18 except for family help in fields, home-based work, or forest gathering.  In all the definitions below, a child is defined as a person below the age of 18.

The following definitions will be used in the construction of key outcomes for OCFT are:

*Working Children*

- Children who have worked in the family based work in the last 12 months
- Children engaged in child labor

*Children Engaged in Child Labor*

- Children working outside of family based work in the last 12 months
- Children economically active for 20 or more hours in the last week.
- Children participating in unpaid household services for 20 or more hours in the last week
- Children engaged in hazardous child labor

- Children engaged in other worst forms of child labor

*Children Engaged in Hazardous Child Labor*

- Children in an occupation listed in Appendix One.
- Children participating in any of the processes listed in Appendix Two.
- Children working in an economic activity in the last 12 months that is hazardous by its nature or circumstance (based on self-reported job characteristics).

*Children Engaged in Other Worst Forms of Child Labor*

- Children (potentially) in debt bondage (reports working for a debt and being unable to leave)
- (Potentially) Trafficked Children (reports coming from a different community with a trip organized by a non-parent or with other working children and being unable to leave).
- Child (potentially) in forced labor (reports being forced to work and unable to leave)

**Appendix One:  Banned Occupations for Children Below the Age of 18, 1986 Child Labor Act including all subsequent amendments**

(1) Transport of passengers, goods or mails by railway;

(2) Cinder picking, clearing of an ash pit or building operation in the railway premises;

(3) Work in a catering establishment at a railway station, involving the movement of a vendor or any other employee of the establishment from one platform to another or into or out of a moving train;

(4) Work relating to the construction of a railway station or with any other work where such work is done in close proximity to or between the railway lines;

(5) A port authority within the limits of any port;

(6) Work relating to selling of crackers and fireworks in shops with temporary licences;

(7) Abattoirs/slaughter Houses;

(8) Automobile workshop and garages;

(9) Foundries;

(10) Handling of toxic or inflammable substances or explosives;

(11) Handloom and powerloom industry;

(12) Mines (underground and underwater) and collieries;

(13) Plastic units and fibreglass workshops;

(14) Employment of children as domestic workers or servants;

(15) Employment of children in dhabas (road side eateries), restaurants, hotels, motels, tea shops, resorts, spas or other recreational centres;

(16) Diving.

**Appendix Two: Banned Processes for Children Below the Age of 18, 1986 Child Labor Act including all subsequent amendments**

(1) Bidi-making.

(2) Carpet-weaving including preparatory and incidental process thereof.

(3) Cement manufacture, including bagging of cement.

(4) Cloth printing, dyeing and weaving including processes, preparatory and incidental thereto.

(5) Manufacture of matches, explosives and fire-works.

(6) Mica-cutting and splitting.

(7) Shellac manufacture.

(8) Soap manufacture.

(9) Tanning.

(10) Wool-cleaning.

(11) Building and construction industry including processing and polishing of granite stones.

(12) Manufacture of slate pencils (including packing).

(13) Manufacture of products from agate.

(14) Manufacturing processes using toxic metals and substances such as lead, mercury, manganese, chromium, cadmium, benzene, pesticides and asbestos.

(15) 'Hazardous process' as defined in section 2 (cb) and 'dangerous operation' as notified in rules under section 87 of the Factories Act, 1948 (63 of 1948).

1. Ferrous Metallurgical Industries

    - Integrated Iron and Steel
    - Ferrow-alloys
    - Special Steels

2. Non-ferrous metallurgical Industries

    - Primary Metallurgical Industries, namely, zinc, lead, copper, manganese and aluminium

3. Foundries (ferrous and non-ferrous)

    - Castings and forging including cleaning or smootherning/roughening by sand and shot blasting

4. Coal (including coke) industries

    - Coal , Lignite, Coke, etc.
    - Fuel Gases (including Coal Gas, Producer Gas, Water Gas)

5. Power Generating Industries

6. Pulp and paper (including paper products) industries

7. Fertiliser Industries

    - Nitrogenous
    - Phosphatic
    - Mixed

8. Cement Industries

    - Portland Cement (including slag cement, puzzolona cement and their products)

9. Petroleum Industries

- Oil Refining
- Lubricating Oils and Greases

10. Petro-chemical Industries

11. Drugs and Pharmaceutical Industries

- Narcotics, Drugs and Pharmaceuticals

12. Fermentation Industries (Distilleries and Breweries)

13. Rubber (Synthetic) Industries

14. Paints and Pigment Industries

15. Leather Tanning Industries

16. Electro-plating Industries

17. Chemical Industries

- Coke Oven by-products and Coaltar Distillation products
- Industrial Gases (nitrogen, oxygen, acetylene, argon, carbon dioxide, hydrogen, sulphur dioxide, nitrous oxide, halogenated hydrocarbon, ozone, etc.)
- Industrial Carbon
- Alkalies and Acids
- Chromates and dichromates
- Leads and its compounds
- Electrochemicals (metallic sodium, potassium and magnesium, chlorates, perchlorates and peroxides)
- Electrothermal produces (artificial abrasive, calcium carbide)
- Nitrogenous compounds (cyanides, cyanamides and other nitrogenous compounds)
- Phosphorous and its compounds
- Halogens and Halogenated compounds (Chlorine, Flourine, Bromine and Iodine
- Explosives (including industrial explosives and detonators and fuses)

18. Insecticides, Fungicides, Herbicides and other Pesticides Industries

19. Synthetic Resin and plastics

20. Man-made Fibre (Cellulosic and non-cellulosic) Industry

21. Manufacture and repair of electrical accumulators

22. Glass and Ceramics

23. Grinding or glaxing of metals

24. Manufacture, handling and processing of asbestos and its products

25. Extraction of oils and fats from vegetable and animal sources

26. Manufacture, handling and use of benzene and substances containing benzene

27. Manufacturing processes and operations involving carbon disulphide

28. Dyes and Dyestuff including their intermediates

29. Highly flammable liquids and gases


(16) Printing as defined in section 2(k) (iv) of the Factories Act, 1948 (63 of 1948).

(17) Cashew and cashewnut descaling and processing.

(18) Soldering processes in electronics industries.

(19) 'Aggarbatti' manufacturing.

(20) Automobile repairs and maintenance including processes incidental thereto, namely, welding, lathe work, dent beating and painting.

(21) Brick kilns and roof titles units.

(22) Cotton ginning and processing and production of hosiery goods.

(23) Detergent manufacturing.

(24) Fabrication workshops (ferrous and non-ferrous).

(25) Gem cutting and polishing.

(26) Handling of chromite and managanese ores.

(27) Jute textile manufacture and coir making.

(28) Lime kilns and manufacture of lime.

(29) Lock making.

(30) Manufacturing processes having exposure to lead such as primary and secondary smelting, welding and cutting of lead-painted metal constructions, welding of galvanized or zinc silicate, polyvinyl chloride, mixing (by hand) of crystal glass mass, sanding or scrapping of lead paint, burning of lead in enamelling workshops, lead mining, plumbing, cable making, wire patenting, lead casting, type founding in printing shops. Store type setting, assembling of cars, shot making and lead glass blowing.

(31) Manufacture of cement pipes, cement products and other related work.

(32) Manufacturing of glass, glassware including bangles, flourescent tubes, bulbs and other similar glass products.

(33) Manufacture of dyes and dye stuff.

(34) Manufacturing or handling of pesticides and insecticides.

(35) Manufacturing or processing and handling of corrosive and toxic substances, metal cleaning and photo engraving and soldering processes in electronic industry.

(36) Manufacturing of burning coal and coal briquettes.

(37) Manufacturing of sports goods involving exposure to synthetic materials, chemicals and leather.

(38) Moulding and processing of fibreglass and plastic.

(39) Oil expelling and refinery.

(40) Paper making.

(41) Potteries and ceramic industry.

(42) Polishing, moulding, cutting, welding and manufacture of brass goods in all forms.

(43) Process in agriculture where tractors, threshing and harvesting machines are used and chaff cutting.

(44) Saw mill—all processes.

(45) Sericulture processing.

(46) Skinning, dyeing and processes for manufacturing of leather and leather products.

(47) Stone breaking and stone crushing.

(48) Tobacco processing including manufacturing of tobacco, tobacco paste and handling of tobacco in any form.

(49) Tyre making, repairing, re-treading and graphite benefication.

(50) Utensils making, polishing and metal buffing.

(51) 'Zari' making (all processes).

(52) Electroplating.

(53) Graphite powdering and incidental processing.

(54) Grinding of glazing of metals.

(55) Diamond cutting and polishing.

(56) Extraction of slate from mines.

(57) Rag picking and scavenging.

(58) Processes involving exposure to excessive heat (e.g. working near furnace) and cold.

(59) Mechanised fishing.

(60) Food processing.

(61) Beverage industry.

(62) Timber handling and loading.

(63) Mechanical Lumbering.

(64) Warehousing.

(65) Processes involving exposure to free silica such as slate, pencil industry, stone grinding, slate stone mining, stone quarries, agate industry.