Beyond a Free Lunch: Evaluating the Trade-Offs of an Out-of-School Nutrition Program on Adolescent Girls' Human Capital *

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Abstract

This study assesses the impacts of two iterations of a large-scale nutritional intervention aimed at adolescent girls in India. Using a difference-in-differences strategy, we find that the first iteration reduced anemia by 2.4% but inadvertently increased school dropout rates by 7-8.5% and widened the gender gap in dropout rates between boys and girls. These adverse effects were linked to a component that conditioned additional supplements on being out of school. Heterogeneity analysis indicates that these effects were driven by families residing in villages without secondary schools and with low levels of maternal education. The second iteration's updates mitigated these issues, showing no significant impact on dropout rates.

Keywords: adolescent girls, school dropout, women's health, India

JEL codes: : I24, J16, I20, I28

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1 Introduction

The fifth United Nations Sustainable Development Goal (SDG) aims to achieve gender equality and empower all women and girls. The United Nations Children's Fund (UNICEF) reports that adolescent girls, defined as individuals aged between 10 and 19, constitute approximately 8% of the global population. Notably, India is home to over 18% of the world's adolescent girls, amounting to more than 100 million. Consequently, enhancing the welfare of adolescent girls in India is crucial for achieving the SDG targets.

An important policy to improve children's schooling and health outcomes is a school-feeding program, which provides meals to school-going kids *in-school*. School feeding initiatives can be considered redistributive efforts that offer a social security framework and aid in fostering investments in human capital (Alderman and Bundy, 2012). In India, the flagship Midday Meal Scheme, an in-school feeding program, has been shown to improve children's learning outcomes (Chakraborty and Jayaraman, 2019) and health outcomes (Singh, Park, and Dercon, 2014). A common strategy to expand in-school nutrition programs to include out-of-school children is to provide take-home rations, where families receive a set quantity of food supplies. However, the effects of take-home ration programs on children's human capital outcomes remain ambiguous.

In this paper, we study the effects of a flagship government of India scheme, the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (henceforth, SABLA), on the welfare of adolescent girls. The SABLA program was launched in 2011 in 205 districts across India.[1] The scheme aims to provide nutritional support and vocational training to girls aged 11-18, along with informational and educational components designed to empower them and elevate their aspirations. The program's multifaceted approach caters to two distinct groups of adolescent girls: out-of-school girls aged 11-14 and girls aged 15-18, regardless of their school enrollment status. Girls aged 11-14 *and* out of school were provided hot cooked meals and take-home ration. The vocational training aspect of the SABLA program is aimed at providing informal education to out-of-school girls aged 15-18. In 2017, the scheme was expanded to 303 districts (henceforth, SABLA 2.0) and extended to the entire country in 2018.

We begin by examining the impact of an out-of-school feeding policy on children's schooling

[1]Districts were selected based on a weighted composite index, which included school dropout rate (50%), female literacy rate (20%), child marriage rate (20%), and female labor force participation rate (10%). These districts were then divided into terciles, and the scheme was launched to cover an approximately equal number of districts in each tercile.

outcomes using a parental decision-making model based on the framework of Todd and Wolpin (2006); Wolpin (2013). The model shows how an out-of-school feeding program increases the opportunity cost of schooling, potentially leading to higher dropout rates. Additionally, the model generates testable implications regarding the heterogeneous effects of the policy, particularly concerning demographic characteristics such as the mother's education.

We leverage exogenous exposure to the program by year of birth, district, and gender in a difference-in-differences and a triple difference-in-differences framework to identify the intent-to-treat (ITT) effect of the SABLA policy on schooling and health outcomes. We test the validity of the parallel trends identification assumption using the imputation estimator developed by Borusyak, Jaravel, and Spiess (2024) as well as the robustness of our analysis against potential violations of the parallel trends assumption using the methodology proposed by Rambachan and Roth (2023). We use the 2009-2016 waves of the Annual Status of Education Report (ASER), which collects data on children aged 5-16 in rural India, for schooling outcomes, and the 2019-2021 wave of the National Family Health Survey (NFHS-5) for health and marriage outcomes.

Our main finding indicates that the first iteration of the SABLA policy, launched in 2011, unintentionally increased school dropout rates among adolescent girls aged 11-14 by 7-8.5% when out-of-school meals were provided. Additionally, it widened the gender gap in school dropout rates between girls and boys by 6-7.5%.[2] However, the policy did not significantly impact mathematics and reading learning outcomes.[3]

On the positive side, regarding health outcomes, we find a decrease in the prevalence of anemia by 3.2%. Anemia is a condition characterized by insufficient red blood cells or reduced capacity of these cells to carry oxygen. Numerous studies have demonstrated that anemia is associated with an increased risk of mortality. Research shows that anemia can lead to a higher risk of death, particularly among older adults and individuals with chronic conditions (Penninx, Pahor, Woodman, and Guralnik, 2006). A policy that has significantly reduced childhood iron-deficiency anemia is the provision of salt fortified with iron and iodine, called double-fortified salt. Krämer, Kumar, and Vollmer (2021) find that providing double-fortified salt through a school lunch program can

[2]We find no effect of the SABLA policy on the age of marriage, given that schooling and marriage are joint decisions in the household optimization problem of Indian parents with an adolescent girl (Andrew and Adams, 2022), consistent with Chatterjee and Poddar (2024). We want to emphasize that Chatterjee and Poddar (2024) is the first paper to study the impact of the SABLA policy, focusing on women's post-marital well-being, particularly on the prevalence of intimate partner violence (IPV), in Section 2 and Section 7, we detail the differences in our analysis.

[3]This result is based on the intent-to-treat (ITT) parameter. The effects on learning outcomes conditional on dropping out of school are not identified. See Section 7 for details.

successfully reduce anemia, and in a four-year follow-up, these effects persist (von Grafenstein, Kumar, Kumar, and Vollmer, 2021). However, consistent distribution is crucial for the long-term efficacy of such programs. Berry, Mehta, Mukherjee, Ruebeck, and Shastry (2020) highlight the importance of steady distribution in their analysis of a national school-based iron supplementation program in India. Our results on anemia contribute to the literature by showing the persistent long-run effects in anemia reduction in adulthood of providing out-of-school meals.

Next, we use the 2011 Census data from the Socioeconomic high-resolution rural-urban geographic dataset (SHRUG) (Asher, Lunt, Matsuura, and Novosad, 2021) to study the heterogeneity of our results concerning several demographic characteristics. Our findings reveal that the unintended increase in school dropouts was driven by families in which mothers had no formal education and was more pronounced in districts characterized by higher existing rates of female dropout and higher levels of female labor force participation. At the village level, our analysis indicates that girls residing in villages without secondary schools (schools with grades up to 10) were at a higher risk of dropping out.

Lastly, we expand our analysis to evaluate the impact of the second iteration of the SABLA program (henceforth, SABLA 2.0), which emphasized returning to school through increased home visits by community workers (*anganwadi* workers) and enhanced community involvement. We find no negative unintended effect of the expanded policy on school dropout rates.

As far as we know, our paper is one of the few that have evaluated the effects of out-of-school feeding programs on the schooling outcomes of adolescent girls. The results highlight the importance of *in-school feeding programs* in boosting school attendance (Adelman, Gilligan, and Lehrer, 2008; Afridi, 2011; Vermeersch and Kremer, 2005). The heterogeneous results across health and educational outcomes demonstrate the multidimensional impact of the program and underscore that well-intentioned policies can potentially have unintended consequences (Bharadwaj, Lakdawala, and Li, 2020; Calvi and Keskar, 2023).

The remainder of this paper is organized as follows. Section 2 reviews the existing literature. Section 3 provides an overview of the institutional background. Section 4 sets up the model. Section 5 and Section 6 describe the data employed in the study and present the empirical strategy, respectively. Section 7 presents the results and robustness checks. Section 8 concludes.

2 Literature Review

Our study contributes to the literature on the effectiveness of feeding programs in improving educational outcomes. Additionally, it examines gender-focused policy interventions to enhance girls' schooling outcomes.

The first set of policies to improve girls' nutritional and educational status involves providing conditional cash transfers (CCTs) contingent upon school enrollment and remaining unmarried. Schultz (2004) evaluates the impact of Progresa, a well-known school subsidy program in Mexico, and finds an increase in school enrollment rates of approximately 15 percentage points for girls and six percentage points for boys. Todd and Wolpin (2006) demonstrate that their structural model's predicted impacts align closely with the experimental results without using the post-program data. Progresa is a clear example of how reducing the opportunity cost of schooling can significantly boost children's enrollment. Evaluating the Kanyashree Prakalpa (KP) program in West Bengal, India, Das and Sarkhel (2023) find positive impacts on school enrollment and learning outcomes. Still, these do not extend to increases in secondary school completion rates. In a recent paper, Buchmann, Field, Glennerster, Nazneen, and Wang (2023) found that a financial incentive to delay marriage, combined with a girls' empowerment program in Bangladesh, reduced the prevalence of underage marriage by 19%.

A second set of policies to improve girls' educational outcomes involves providing in-kind transfers. In a seminal paper, Muralidharan and Prakash (2017) evaluates a program in the Indian state of Bihar aimed at reducing the gender gap in secondary school enrollment by providing bicycles to girls who continued to secondary school, thereby improving their access to education. The program increased girls' secondary school enrollment by 32% and reduced the gender gap by 40%. Bicycles enhance the schooling of adolescent girls by decreasing the time and safety costs (Borker, 2021) associated with school attendance. This paper highlights the importance of the opportunity cost of education, demonstrating that the SABLA policy inadvertently increased these costs, leading to higher school dropout rates. Similarly, Evans, Kremer, and Ngatia (2008) find that the provision of uniforms in Kenya reduced school absenteeism by 44% for the average student and 62% for students who previously did not own a uniform. Lastly, Adukia (2017) evaluates the Indian national school latrine-construction initiative and finds that it improves school attainment for both boys and girls.

The last set of interventions that have addressed the issue of student attendance involves a reduction in teacher absenteeism (Kremer, Chaudhury, Rogers, Muralidharan, and Hammer, 2005) and improvements in parental education, as highlighted by Duflo, Hanna, and Ryan (2012); Banerji, Berry, and Shotland (2017).

A substantial body of literature has highlighted the importance of *in-school* feeding programs in improving children's schooling outcomes in developing countries.[4] Afridi (2011) examines the transition from a monthly distribution of free food grains to a daily provision of free cooked meals for school children. She finds that this policy improved girls' attendance in grade one by more than 12 percentage points. In an important study, Chakraborty and Jayaraman (2019) evaluates the impact of the Indian government's flagship school feeding program, the Mid Day Meal Scheme, on children's learning outcomes. The study finds that prolonged exposure to the program improved primary school-aged children's math and reading test scores. In a related paper, Alderman, Gilligan, and Lehrer (2012) evaluate how food for education (FFE) programs affect schooling outcomes. Using a randomized controlled trial in North Uganda, the study compares an in-school feeding program (SFP) with a take-home rations (THR) program *conditional* on school attendance. Results indicate that the in-school meals program increased enrollment for children who reached the recommended school entry age but were not enrolled at baseline; for several schooling outcomes, the effect of SFP and THR is equivalent. Our results show that removing the school attendance conditionality in THR programs can potentially lead to unintended increases in school dropout. Aurino, Gelli, Adamba, Osei-Akoto, and Alderman (2023) evaluate a randomized trial of the government of Ghana's school feeding program and find that two years after the program, learning outcomes measured in terms of math literacy scores improved in the treated communities, with larger effects on girls and disadvantaged children. Vermeersch and Kremer (2005) evaluate the impact of subsidized school meals on school participation and educational achievement among preschool children in Kenya through a randomized controlled trial. The study finds that children in the treatment group had 30% higher school attendance than the control group. However, improvements in learning outcomes were only observed in schools with an experienced teacher, aligning with the broader school feeding literature, which suggests that increased enrollment does not necessarily translate to improved learning outcomes. Lastly, He (2009) found no

[4]There is also extensive literature from the United States examining the effects of universal free school breakfast on students' schooling outcomes (Leos-Urbel, Schwartz, Weinstein, and Corcoran, 2013; Imberman and Kugler, 2014; Hinrichs, 2010).

effects of a school feeding program on enrollment in Sri Lanka, and McEwan (2013) found that higher-calorie meals targeted at relatively poor schools had no impact on enrollment in Chile.

The SABLA program, initially implemented in a few districts, has now expanded nationwide but remains relatively understudied. To the best of our knowledge, the study conducted by Chatterjee and Poddar (2024) is the first to evaluate the program, focusing on women's post-marital outcomes, particularly the prevalence of intimate partner violence (IPV). They find that the program decreased the prevalence of IPV, primarily physical and sexual violence among married women. We now outline the two key differences between our study and theirs.

First, unlike Chatterjee and Poddar (2024), the primary focus of our paper is to evaluate the SABLA program component that provides out-of-school meals to adolescent girls aged 11-14, assessing its impact on school enrollment and learning outcomes. For this purpose, we leverage the 2009-2016 wave of the Annual Status of Education Report (ASER). This repeated cross-sectional dataset contains detailed information on the schooling outcomes of over 780,000 adolescents in the relevant age group. The variations in the cohort, district of residence, and gender allow us to identify the policy impact using a difference-in-differences (DiD) and a triple difference (DDD) framework.[5] In Section 7, we discuss in detail the limitation of the National Family Health Survey (NFHS) data in identifying the effects of the out-of-school meal component of the SABLA program on education outcomes. Second, Chatterjee and Poddar (2024) use the fourth wave of NFHS data conducted in 2015-16, four years after the initial implementation of the program, to assess the program's impact on IPV. In contrast, we use the more recent fifth wave of NFHS data conducted in 2019-21, eight years after the program's implementation, to study its effects on health and marital outcomes. This allows us to have a larger sample of women treated by the policy in the 11-14 age range.[6]

3 Background: The SABLA Program

The Rajiv Gandhi Scheme for Empowerment of Adolescent Girls, also known as SABLA (meaning empowered), is a female adolescent empowerment program initiated in 2011 across 205 districts

[5] In Section 5 we describe the data in detail.

[6] Another potential limitation of using NFHS data to study the effect of the SABLA program is that most married women in India reside in their husbands' natal homes. This creates the possibility of mislabeling treatment indicators if women have moved across districts post-marriage and have been surveyed post-marriage, as is the case for most women in NFHS. Empirically, about a quarter of women do not reside in the same district where they were born (Calvi, Beauchamp, and Fulford, 2022). This issue is mitigated with ASER data, which tracks children residing in their natal homes.

in India under the Ministry of Women and Child Development. It targets adolescent girls aged 11-18, particularly those out of school. Leveraging the infrastructure of the Integrated Child Development Services (ICDS), the SABLA program is a centrally-sponsored scheme implemented by state governments and union territories. The total annual expenditure on the SABLA scheme is approximately $40.71 million (1832 crores INR) (Ministry of Women and Child Development , 2011). The SABLA program's primary objectives include improving adolescent girls' health and nutrition status by raising awareness about health, hygiene, nutrition, and reproductive and sexual health. The program also seeks to develop their home-based, life, and vocational skills. Additionally, it aims to reintegrate out-of-school adolescent girls into formal and non-formal education systems.

The program offers nutritional support to girls aged 11 to 18, providing 600 calories and 18-20 grams of protein through a hot cooked meal or take-home ration, and iron and folic acid supplementation from the *anganwadi* centers. For girls aged 11 to 14, this provision is *contingent* upon them being out of school. Moreover, the program offers comprehensive health education, checkups, counseling on family welfare, and information on reproductive and sexual health to all girls, irrespective of their school enrollment status. Additionally, girls aged 15 to 18 are provided vocational training under the National Skill Development Program.

The selection of districts for the program was conducted across all States and Union Territories using a composite weighted index based on indicators relevant to the condition of adolescent girls in the country. These indicators and their corresponding weights are: female school dropout rate (50%), female literacy rate (20%), female child marriage rate (20%), and female work participation rate (10%). Based on this comprehensive index, the chosen districts represent a diverse mix of well-performing, moderately performing, and poorly performing districts nationwide.

An early administrative study of the SABLA program, as reported in the Ministry of Women and Child Development (2013), revealed two concerning findings. Firstly, efforts to reintegrate out-of-school girls into formal education were ineffective. Secondly, the take-home ration was preferred over the hot cooked meal. Over half of the out-of-school girls reported sharing the take-home ration with their families. Many parents and officials indicated that the take-home ration served as a critical incentive for parents to send their daughters to the *anganwadi* centers.

The first finding raises questions about whether the program inadvertently incentivized families to keep girls out of school, given that meal provision was contingent on the girls being out of school. The second finding suggests that the program may have been used to obtain rations for the family instead of directly benefiting the participating girls, contradicting the program's aim of improving girls' nutritional status through their personal consumption of the provided nutritional package.

3.1 SABLA 2.0

From 2017 onwards, the program underwent significant expansion and several modifications. Renamed as the Scheme for Adolescent Girls (SAG) in 2017, we henceforth refer to it as SABLA 2.0. By 2018, SABLA 2.0 had expanded to encompass every district in the country.

In addition to its geographical expansion, SABLA 2.0 emphasized integrating out-of-school girls into formal education, addressing the challenges highlighted in evaluating the program's initial phase (Ministry of Women and Child Development, 2013). Some initiatives included enhancing home visits by *anganwadi* workers and engaging various community members and authorities to motivate the reintegration of girls into formal education. Lastly, restructuring of the SABLA program also involved discontinuing the Kishori Shakti Yojana (KSY), an initiative dedicated to improving the socio-economic conditions of adolescent girls through a focus on nutrition, health and hygiene, and life skills education in selected districts and integrating it into the broader framework of the SABLA program to avoid overlap and ensure more streamlined service delivery.

4 Model

In this section, we develop a parental decision-making model regarding child schooling to illustrate the impact of the SABLA policy on children's education along the lines of Todd and Wolpin (2006) and Wolpin (2013).

Consider a representative household with a single child in primary school and facing the decision to either send them to school or the labor market. The family has an exogenous income of Y. The household solves the following optimization problem:

$$\max_{c,s} \quad \log(c)+\gamma s$$
$$\text{subject to} \quad c \leq Y + s\,(R-k) + (1-s)\tau,$$

where $U(c,s) = \log(c)+\gamma s$ is the household utility function, c is the individual's consumption, γ is a parameter representing additional utility from schooling, and s is a binary decision variable that denotes whether the household sends their child to school ($s = 1$) or to the labor market ($s = 0$). Households are heterogeneous in γ. In particular, $\gamma = \gamma(X_h, X_c, X_v; I)$, where X_h, X_c and X_v & I denote the vector of household-level, child-level, and village-level characteristics, and parent's information set that affect parent's utility from their child's schooling.[7] The household budget constraint is $c \leq Y + s(R-k) + (1-s)\tau$, where k is the total cost of schooling, τ is the opportunity cost of schooling; this can take the form wages that the child earns through child labor in the labor market if they do not go to school or their contribution in home production and R, represents returns to schooling in the labor market. We now solve for the household's optimal decision.

Solution and Model Predictions

The household aims to maximize $\log(c)+\gamma s$ subject to $c \leq Y + s(R-k) + (1-s)\tau$. Since consumption is continuous, we can replace $c \leq Y + s(R-k) + (1-s)\tau$ with $c = Y + s(R-k) + (1-s)\tau$. Substituting for c in the maximand, the household decides to send their child to school if $\log(Y+\tau) \leq \log(Y+R-k)+\gamma$. This allows us to define a threshold cost K^* such that if the cost of schooling k is less than K^*, the household will send their child to school. The threshold cost K^* is given by:

$$K^* = Y + R - e^{-\gamma} \cdot (Y+\tau) \tag{1}$$

Consider an environment where children receive meals *in-school*, as in India, where children in the age group of six to fourteen years studying in grades one to eight enroll and attend the school are provided meals according to specified nutritional standards (Chakraborty and Jayaraman, 2019).

In this environment, consider the effect of the SABLA policy, which provided meals to out-

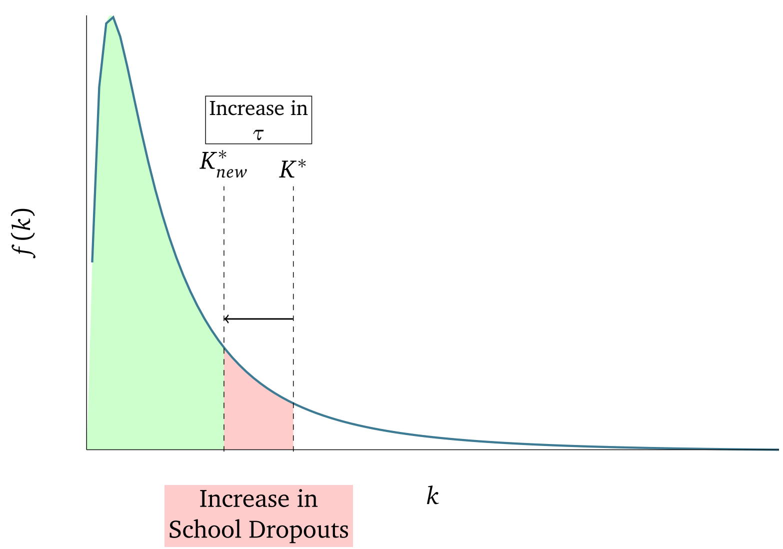
[7]Note that γ can be positive or negative; therefore, γ can be interpreted as the utility or disutility of schooling.

of-school adolescent girls in the 11-14 age range. The scheme can be thought of as *reducing the opportunity cost of not attending school* as girls are no longer required to attend school to receive the meals. The model captures this by an increase in τ. Taking the partial derivative of K^* with respect to τ we get:

$$\frac{\partial K^*}{\partial \tau} = -e\left(^{-\gamma}\right) \leq 0, \tag{2}$$

Therefore, increasing the opportunity cost of schooling will reduce the threshold cost and lower the likelihood that the household will send their child to school. Figure 1 shows a simple graphical illustration of the model. An increase in the threshold cost of schooling from K^* to K^*_{new} increases the proportion of students dropping out by the shaded area in red.

Figure 1: Effect of SABLA policy



Note: The figure illustrates the effect of the SABLA policy on school dropout rates. Due to an increase in the opportunity cost of schooling (τ), the threshold cost K^*, below which parents decide to send their children to school, decreases. Consequently, the school dropout rate increases, as indicated by the area in red.

The model presented in the previous section can be utilized to examine the heterogeneous impact of the SABLA policy based on demographic characteristics. Recall that $\gamma \equiv \gamma(X_h, X_c, X_v; I)$, meaning that the relative utility of schooling, γ, varies between households depending on demographic factors. We will now demonstrate how the SABLA policy can have varying effects across different households.

First, consider the mother's education, X_m, as one of the components of the household characteristics vector X_h. Under the assumption $\frac{\partial \gamma}{\partial X_m} \geq 0$ (Barcellos, Carvalho, and Lleras-Muney, 2014), from equation 2, we can show that the decrease in the opportunity cost of schooling is smaller in households with more educated mothers. Consequently, the threshold cost K^* is lower, leading to a smaller likelihood of school dropout.

Second, consider the presence of a government secondary school up to grade 10, X_s, as one of the components of the village characteristics vector X_v. Under the assumption $\frac{\partial \gamma}{\partial X_v} \geq 0$, from equation 2, we can show that the decrease in the opportunity cost of schooling is smaller for households that live in a village with a secondary school. Therefore, the threshold cost K^* is lower, leading to a smaller probability of school dropout for these families.

5 Data and Measurement

Table 1: Summary Statistics

	Observations	Mean	St.Dev.	Minimum	Maximum
Dropped Out	780794	0.067	0.250	0.000	1.000
High Reading Level	668512	0.804	0.397	0.000	1.000
High Math Level	666886	0.599	0.490	0.000	1.000
Girl Child	773841	0.470	0.499	0.000	1.000
Child Age	780794	14.906	0.810	14.000	16.000
Child Dropout Age	67147	13.341	1.388	11.000	16.000
Mother's Education	756723	0.472	0.499	0.000	1.000
Father's Education	725720	0.713	0.452	0.000	1.000
Mother's Age	752343	37.815	6.833	17.000	80.000
Father's Age	727305	43.215	7.318	17.000	85.000
Wealth Index	780794	0.618	0.320	0.000	1.000
Government Secondary School in Village	735217	0.242	0.428	0.000	1.000
Observations	780794				

Notes: Mother's (Father's) education is a dummy variable, which takes a value of 1 if the mother(father) went to school. The wealth index is constructed using principal component analysis of the following household-level variables: house material type, a dummy variable for television, phone, and electricity. Child dropout age is defined conditional on the child dropping out of school. A high reading level is defined as the child being able to read a paragraph or story. A high math level is defined as the child being able to perform subtraction or division.

The analysis utilizes two data sources: the Annual Status of Education Report (ASER) to assess educational outcomes and the 2019-21 National Family Health Survey (NFHS-5) to examine health outcomes.

ASER survey is a nationally representative dataset that evaluates the schooling outcomes of rural Indian children, focusing on fundamental literacy and numeracy outcomes. ASER differs from most large-scale assessments as it is conducted in households, not schools. This approach allows it to include all children—those not enrolled in any school, dropouts, students from various educational institutions, including government, private, and religious schools, and those absent on assessment day. Comprehensive data on the schooling status of all children in selected households are collected, and assessments in reading and mathematics are administered to all children aged 5 to 16.

We use seven waves of ASER data from 2009, 2010, 2011, 2012, 2013, 2014, and 2016 for our primary analysis.[8] Our sample selection criteria are as follows: First, for each wave of the ASER, we include children aged 14 years and older who have completed primary education, defined as remaining in school until at least age 11.[9] This criterion aligns with the target demographic of the SABLA scheme, which provides out-of-school meals to girls in the 11-14 age range. Girls aged 11 and younger in 2011 in the treated districts when the program was launched were fully exposed to the program, and girls aged 12 to 14 in 2011 in the treated districts were partially exposed to the program. Second, ASER assesses children up to the age of 16; therefore, our final sample consists of children born between 1993 and 2002 aged 14 to 16 during the survey year. Table A1 in the Appendix shows the selected sample of girls from the seven ASER waves. The treated cohort includes girls born from 1997 to 2002, as they were 14 years old or younger when the SABLA policy was launched in 2011. The non-treated cohort consists of girls born between 1993 and 1996, who were too old to be treated by the SABLA program in the 11-14 age range.

In 2017, the SABLA scheme expanded to more districts and became available nationwide by 2018. For our secondary analysis, we use data from the 2018 and 2022 ASER waves to examine the impact of this expansion on schooling outcomes.

Table 1 presents the summary statistics for our sample, comprising approximately 780,000 students aged 14-16 who have completed primary education. The average dropout rate within this group is 6.7%. The dropout variable is constructed using responses from the ASER household questionnaire, categorizing children aged 3 to 16 as either in-school or out-of-school. For children identified as out of school, follow-up questions capture the grade level at which the child discontinued schooling and the specific year of dropout. The question sequence distinguishes children who were never enrolled and those who dropped out after initial enrollment. Specifically, for dropouts, the questionnaire asks: *Which standard (grade) were you in when you left school?* and *Which year did you drop out?* This information is used to construct a binary dropout indicator variable, and the corresponding age at which the child dropped out is derived based on the dropout year. Among those who dropped out, the median age at dropout is 13 years, typically around the eighth grade.

Regarding literacy and numeracy skills, 80% of children can read a paragraph or a story, and 60% can perform mathematical operations such as subtraction or division. In terms of parental ed-

[8]Data for 2015 is unavailable as the survey was only conducted in Punjab and Maharashtra. Details can be found at https://asercentre.org/wp-content/uploads/2022/12/2.-frequentlyaskedquestionsaboutaser-2.pdf

[9]Robustness check detailed in Section 6 confirms that the SABLA scheme does not influence primary school dropout rates.

ucation, 47% of children have mothers, and 71% have fathers who attended school. Lastly, 24.2% of children live in villages with a government-run secondary school offering education beyond the eighth grade.

Lastly, we use data from the fifth wave of the National Family Health Survey (NFHS-5), conducted between 2019 and 2021, to examine the impact of the SABLA program's initial implementation in 2011 and its expansion in 2017 on women's health, particularly anemia and marital outcomes.

6 Empirical Strategy

Our empirical analysis focuses on studying the effect of the SABLA policy, introduced in 2011, on the schooling outcomes of adolescent girls in the 11-14 age range. We exploit variation across districts and birth years to identify the impact of the SABLA policy on educational attainment, utilizing a difference-in-differences framework to assess the policy's effects. The baseline specification is as follows:

$$y_i = \beta_0 + \beta_1 \text{Post}_i \times \text{SABLA-District}_i + \beta_2 \text{Post}_i + \beta_3 \text{SABLA-District}_i + \alpha_c + \alpha_d + \epsilon_i, \quad (3)$$

Here, y_i denotes the educational outcome of interest for girl i. The variable Post_i is an indicator that equals one if she was 14 or younger in 2011. The SABLA-District_i variable indicates individuals born in districts where the SABLA policy was implemented in 2011. α_c and α_d represent fixed effects for cohort (year of birth) and district, respectively, controlling for unobserved heterogeneity across time and location that could influence schooling outcomes independently of the program. β_1 is the parameter of interest and captures the intent-to-treat effect of the first iteration of the SABLA policy initiated in 2011 on adolescent girls in the 11-14 age range.

In alternative specifications, we include a vector (X_i) of exogenous controls at the household and village levels, as well as survey year fixed effects. The household-level controls include indicators for parental education (whether each parent attended school), parents' ages, and a household wealth index, constructed using the first principal component from a principal component analysis of variables related to household construction materials and amenities. The village-level controls include infrastructure variables, specifically indicators for the presence of a secondary school within the village and the existence of a tarred metal road. Additionally, we consider a specification in which we divide our treated cohort into two groups: 1) a fully treated cohort consisting of girls aged 11 or younger in 2011, who were potentially fully treated by the SABLA policy in the 11-14 age range, and 2) a partially treated cohort consisting of girls aged 12-14 in 2011.

We further analyze the impact of the SABLA policy on the 11-14 age range using a triple difference-in-differences framework, incorporating gender variation as the scheme was exclusively targeted at girls and unavailable to boys. The specification is as follows:

$$\begin{aligned} y_i = \gamma_0 + \gamma_1 \text{Post}_i \times \text{SABLA-District}_i \times \text{Girl}_i + \gamma_2 \text{Post}_i \times \text{Girl}_i + \\ \gamma_3 \text{SABLA-District}_i \times \text{Girl}_i + \gamma_4 \text{Post}_i \times \text{SABLA-District}_i + \gamma_5 \text{Girl}_i + \\ \gamma_6 \text{SABLA-District}_i + \gamma_7 \text{Post}_i + \alpha_c + \alpha_d + \epsilon_i, \end{aligned} \tag{4}$$

Here, γ_1 is the parameter of interest and captures the intent-to-treat effect of the first iteration of the SABLA policy initiated in 2011 on adolescent girls in the 11-14 age range compared to adolescent boys.

7 Results

Table 2: Dropout Rates: Girls

	(1) Dropped Out	(2) Dropped Out	(3) Dropped Out	(4) Dropped Out	(5) Dropped Out	(6) Dropped Out
SABLA District × Treated Cohort	0.005***	0.004**	0.005**	0.005**		
	(0.002)	(0.002)	(0.002)	(0.002)		
SABLA District × Fully Treated Cohort					0.005*	
					(0.003)	
SABLA District × Partially Treated Cohort					0.006**	
					(0.002)	
τ						0.006***
						(0.002)
Household Covariates	No	Yes	Yes	Yes	No	No
Village Covariates	No	No	Yes	Yes	No	No
Survey Year Fixed Effect	No	No	No	Yes	No	No
Imputation Estimator (Borusyak et al. (2024))	No	No	No	No	No	Yes
Observations	364,030	324,585	304,621	304,621	364,030	364,030
Control Mean	0.071	0.071	0.071	0.071	0.071	0.071

Notes: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. * significant at 10%; ** significant at 5%; *** significant at 1%. τ estimate is obtained from the imputation estimator in Borusyak et al. (2024). In columns (1) - (4) and (6), the treated cohort is defined as children aged 14 and below in 2011. In column (5), the fully treated cohort includes children aged less than or equal to 11 in 2011, and the partially treated cohort includes children aged 12-14 in 2011. The control mean is the average school dropout rate for girls in the non-treated districts.

We now present our empirical findings regarding the impact of the SABLA policy on children's human capital outcomes. First, we explore the policy's effects on educational outcomes, specifically examining school dropout rates and learning outcomes. We explain our results in the context of the simple model outlined in Section 4. Second, we document important heterogeneities in the intent-to-treat (ITT) effect across various household and village characteristics. Finally, we assess the policy's influence on health metrics, focusing on the prevalence of anemia.

Dropout Rates: Table 2 shows the estimated intent-to-treat (ITT) effect of the SABLA program for girls exposed to the policy in the 11-14 age range using the specification in equation (3); as previously mentioned, this is the age range when the policy provided out-of-school meals to the adolescent girls in the treated districts. From Table 2, column (1), the school dropout rates increased by 0.005 percentage points (p-value < 0.01), which corresponds to a 7% increase in the school dropout rate among adolescent girls affected by the SABLA policy in 2011 in the 11-14 age range compared to adolescent girls in the non-treated districts. These results remain qualitatively unchanged after controlling for household-level demographic variables (Table 2, Column (2)), controlling for village-level variables (Table 2, Column (3)), and with the inclusion of survey year fixed effects (Table 2, Column (4)). In Table 2, Column (5), we categorize the treated cohort into two groups. The first group, the fully treated cohort, comprises adolescent girls who were 11 years old or younger when the SABLA policy was introduced in 2011. These individuals were exposed to the program throughout the entire 11-14 age range. The second group, the partially treated cohort, includes girls in the 12-14 age range at the policy's inception. The results remain qualitatively unchanged, and we find an increase in the school dropout rate for both groups. Lastly, Column (6) of Table 2 presents the intent-to-treat (ITT) estimate computed using the imputation estimator developed by Borusyak et al. (2024), denoted by τ as per their terminology. According to this approach, the dropout rates for girls in the 11-14 age range increased by 0.006 percentage points (p-value < 0.01), translating to an 8.45% rise in the school dropout rate.

Table 3: Dropout Rates: Boys

	(1) Dropped Out	(2) Dropped Out	(3) Dropped Out	(4) Dropped Out	(5) Dropped Out	(6) Dropped Out
SABLA District × Treated Cohort	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)	0.001 (0.002)		
SABLA District × Fully Treated Cohort					0.001 (0.003)	
SABLA District × Partially Treated Cohort					0.002 (0.002)	
τ						0.002 (0.002)
Household Covariates	No	Yes	Yes	Yes	No	No
Village Covariates	No	No	Yes	Yes	No	No
Survey Year Fixed Effect	No	No	No	Yes	No	No
Imputation Estimator (Borusyak et al. (2024))	No	No	No	No	No	Yes
Observations	409,811	366,939	343,872	343,872	409,811	409,811
Control Mean	0.063	0.063	0.063	0.063	0.063	0.063

Notes: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. * significant at 10%; ** significant at 5%; *** significant at 1%. τ estimate is obtained from the imputation estimator in Borusyak et al. (2024). In columns (1) - (4) and (6), the treated cohort is defined as children aged 14 and below in 2011. In column (5), the fully treated cohort includes children aged less than or equal to 11 in 2011, and the partially treated cohort includes children aged 12-14 in 2011. The control mean is the average school dropout rate for boys in the non-treated districts.

Table 3 shows the intent-to-treat (ITT) estimates for boys within the 11-14 age range, employing the model outlined in equation (3). Given that the SABLA policy was exclusively targeted toward adolescent girls, the inclusion of boys serves as a placebo test, as in Duflo (2001).[10] The results are robust to including household-level covariates, village-level covariates, and survey year fixed effects (see Table 3, columns (2) - (5)). This is further corroborated by employing the imputation estimator developed by Borusyak et al. (2024), which also indicates no impact of the policy on boys.

Table 4: Dropout Rates: Girls Relative to Boys

	(1) Dropped Out	(2) Dropped Out	(3) Dropped Out	(4) Dropped Out
SABLA District × Treated Cohort × Girl Child	0.004* (0.003)	0.004* (0.003)	0.005* (0.003)	0.005* (0.003)
Household Covariates	No	Yes	Yes	Yes
Village Covariates	No	No	Yes	Yes
Survey Year Fixed Effect	No	No	No	Yes
Observations	773,841	691,524	648,493	648,493
Control Mean	0.067	0.067	0.067	0.067

Notes: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. * significant at 10%; ** significant at 5%; *** significant at 1%. The control mean is the average school dropout rate in the non-treated districts.

Given that the SABLA policy had no impact on the placebo group of boys, we will next assess

[10] The potential impact of the SABLA policy on boys, although not directly targeted by the program, may manifest through peer effects, as suggested in Lavy and Schlosser (2011).

the robustness of our results and examine the SABLA policy's effect on school dropout rates through a triple difference-in-differences (DDD) framework. Figure A1 in the Appendix provides an event study for the dropout rates of girls relative to boys. The joint F-test of the pre-trends gives an F-statistic of 0.77 (p-value = 0.51); therefore, we cannot reject the null hypothesis of pre-trends. Table 4 details the Intent-to-Treat (ITT) parameter estimated using equation (4). This analysis reveals that the initial rollout of the SABLA policy in 2011 led to an increase in the gender gap in school dropout rates between boys and girls aged 11-14. Specifically, the relative school dropout rate for girls compared to boys increased by 0.004-0.005 percentage points (p-value < 0.1), corresponding to a 6-7.5% increase in the relative dropout rate. The results are robust to the inclusion of household-level and village-level covariates, as well as survey year fixed effects (Table 4, columns (2)-(4)). This finding highlights a significant gender-specific impact of the policy on educational discontinuation rates.

Taken together, these results demonstrate that the initial implementation of the SABLA policy led to an increase in the school dropout rate among adolescent girls aged 11-14 by 6-8%. Furthermore, it exacerbated the gender gap in school dropout rates, with girls experiencing a relative increase compared to boys. Regarding the magnitude of the effect, our results align with some of the existing results in the literature studying the impact of providing *in-school* meals on school attendance and enrollment. For instance, Jayaraman and Simroth (2015) report a 13% increase in primary school enrollment attributed to midday meals served within the school setting, an effect primarily driven by grade 1 enrollment, with a baseline enrollment rate of 84%. Alderman et al. (2012) found that a school feeding program in Uganda, which included both a mid-morning snack and lunch, did not increase overall enrollment but did lead to a 9% increase in the share of children aged 6–13 years who started school, with an initial enrollment share of 68.6%. On the other hand, specific *in-school* feeding programs in Sri Lanka and Chile have found no effects on school enrollment (He, 2009; McEwan, 2013).

Table 5: Learning Outcomes for Girls: Reading and Math Skills

	(1) High Reading Level	(2) High Reading Level	(3) High Reading Level	(4) High Math Level	(5) High Math Level	(6) High Math Level
SABLA District × Treated Cohort	-0.003	-0.004	-0.004	-0.006	-0.005	-0.004
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Household Covariates	No	Yes	Yes	No	Yes	Yes
Village Covariates	No	No	Yes	No	No	Yes
Observations	318,078	284,868	267,239	317,289	284,210	266,657
Control Mean	0.805	0.805	0.805	0.566	0.566	0.566

Notes: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. * significant at 10%; ** significant at 5%; *** significant at 1%. A high reading level is the ability to read a paragraph or a story. A high math level is the ability to perform subtraction or division. The control mean is the likelihood of girls having a high reading or math level in the non-treated districts.

Learning Outcomes: Next, we assess the impact of the SABLA policy on learning outcomes, specifically focusing on language and mathematics proficiency. It's important to note that the estimated ITT parameter captures the effect on *all* children treated by the policy, and the effect on the dropped-out children is not identified. For the students who dropped out, we might expect learning outcomes to decrease due to a reduction in school resources; however, for the students who choose not to drop out, the learning outcomes can improve due to a reduction in negative peer effects if low-ability children dropped out, or decrease due to a reduction in positive peer effects if high-ability children dropped out.[11]

Table 5 indicates that although there was an increase in dropout rates, the SABLA policy did not significantly influence language or mathematics learning outcomes for adolescent girls in the 11-14 age range. The findings are consistent and robust across various specifications. Table 3 in the Appendix presents the SABLA policy's effect on adolescent boys' learning outcomes. Our analysis shows no significant effect on learning outcomes for boys overall; however, in two specifications that exclude village-level exogenous controls, we observe a minor negative impact on mathematics outcomes. This effect diminishes upon including village-level control variables. Additionally, Table A5 reveals no significant differences in learning outcomes for girls relative to boys when employing the triple difference-in-differences approach outlined in equation (4) across various specifications.[12]

The impact of feeding programs on learning outcomes remains uncertain. Educational in-

[11] The seminal paper by Kremer and Miguel (2004) on the effects of a deworming program on schooling outcomes finds a substantial reduction in school absenteeism by improving health but no discernible impact on learning outcomes for similar reasons.

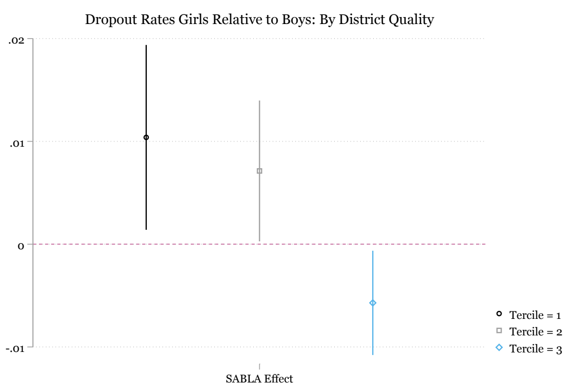
[12] Another potential explanation for the null results concerning the impact of the SABLA policy on learning outcomes is that the reading and mathematics assessments used in the ASER survey may not be sufficiently advanced for the age group affected by the policy, leading to ceiling effects. Evidence supporting this view is presented in Table 1, which shows that 80% of the sample already exhibits a high reading level, defined as the ability to read a paragraph or a story. However, since this metric represents the only measure of learning outcomes available in our dataset, it limits our capacity to determine whether the SABLA policy impacted more advanced competencies with the data at hand.

terventions, especially those not directly integrated with pedagogical strategies, frequently face challenges in significantly influencing learning outcomes. This is primarily because they fail to address a critical barrier to learning: the misalignment between the level of classroom instruction and the student's actual learning levels (Glewwe and Muralidharan, 2016; Muralidharan, Singh, and Ganimian, 2019).

Vermeersch and Kremer (2005) investigate the effects of a fully subsidized in-school breakfast program for preschool children in Western Kenya on school attendance and learning outcomes through a randomized controlled trial. Their results indicate a 30% higher school participation rate in the treatment group compared to the control group. However, improvements in learning outcomes were observed only in schools where the teacher was relatively experienced before the program's implementation. Similarly, Jomaa, McDonnell, and Probart (2011) and Gelli, Meir, and Espejo (2014) report that school feeding programs improve school attendance but show inconsistent effects on academic achievement. An important exception is the study by Chakraborty and Jayaraman (2019), which evaluated the popular Mid-day Meals program in India and found positive effects on learning outcomes. Notably, all these programs provided meals *in-school*, whereas the SABLA program is an out-of-school feeding initiative.

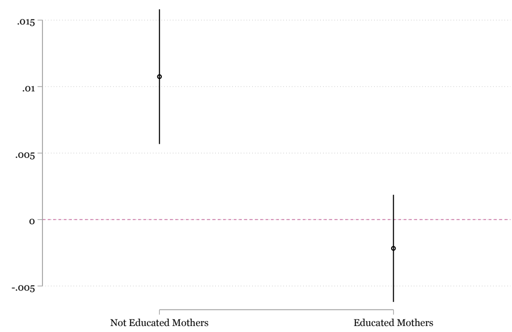
7.1 Heterogeneity Analysis

Figure 2: Dropout Rates Girls Relative to Boys: Heterogeneity by District Quality

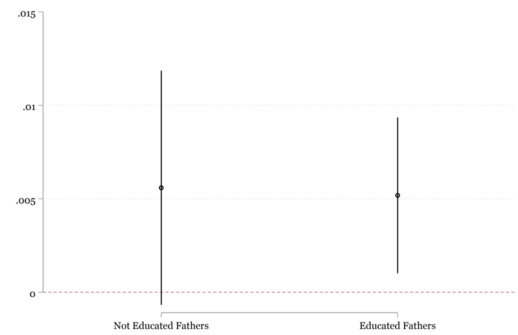


Note: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER) merged with the Socioeconomic High-resolution Rural-Urban Geographic Dataset (SHRUG) (Asher et al., 2021). Districts are divided into terciles based on female dropout rates, literacy rates, and labor force participation.

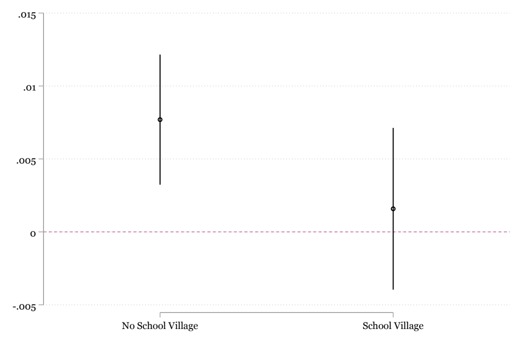
Figure 3: Dropout Rates Girls Relative to Boys: Heterogeneity Results



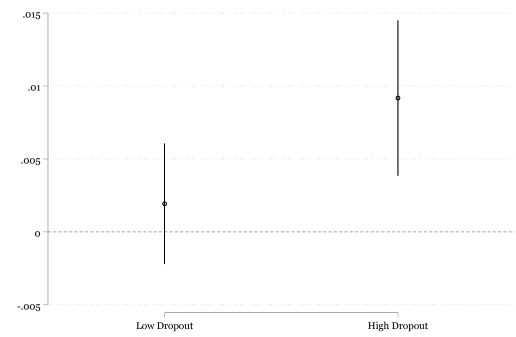
(A) Mother's Education



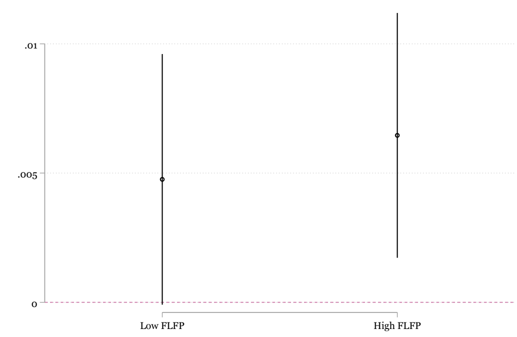
(B) Father's Education



(C) Village Secondary School



(D) District Dropout Rate



(E) Female Labor Force Participation

Note: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER) merged with the Socioeconomic High-resolution Rural-Urban Geographic Dataset (SHRUG) (Asher et al., 2021).

The previous analysis revealed our principal finding: the initial implementation of the SABLA policy led to an increase in the school dropout rate among adolescent girls aged 11-14. We now analyze the heterogeneity of this result to examine how different subgroups within our study population were affected. This involves examining the school dropout rates of girls relative to boys and analyzing variations across household-level and village-level covariates. To perform the heterogeneity analysis, we merged the Socioeconomic High-resolution Rural-Urban Geographic Dataset (SHRUG) (Asher et al., 2021) with the ASER data at the district level.

Leveraging the SHRUG dataset, we categorized districts based on the following baseline metrics: 1) female dropout rates, 2) literacy rates, and 3) labor force participation. To systematically assess the impact of the SABLA program, we created an index to classify districts into three performance categories, defined by terciles: the bottom tercile represents districts with poor performance, the middle tercile includes districts with medium performance, and the top tercile encompasses districts with good performance.[13] This categorization allows us to assess the heterogeneous impact of the SABLA program by district quality. Figure 2 shows that the increase in dropout rates is primarily driven by the poorly performing districts in the lower terciles of the index, further exacerbating the dropout rate gap between districts.

Figure 3, panel (A), shows that the increase in dropout rates for adolescent girls relative to boys in the 11-14 age range is driven by households in which their mothers did not attend school. This result is in line with the comparative statics outlined in Section 4, which shows that under the assumption that the utility received by households from their daughter's education is increasing with the mother's education, the effect of the SABLA policy on adolescent girls' dropout rates will be higher in households with lower levels of maternal education. On the other hand, the difference in dropout rates between households where the father attended school and those where he did not is statistically insignificant (Figure 3, panel (B)).

Figure 3, panel (C), shows that the villages driving the increase in school dropouts are those without a government secondary school (schools with grades up to 10). This highlights the importance of school infrastructure at the village level (Muralidharan and Prakash, 2017). Furthermore, this result is consistent with the model assumption in Section 4, which posits that if households in villages with a secondary school receive higher utility from their daughter's education compared to those in villages without a secondary school, then the effect of the SABLA policy on the school dropout rate will be larger for households in villages lacking a secondary school.

Figure 3, panel (D), shows that the policy effect is driven by districts with previously high female school dropout rates, and Figure 3, panel (E), reveals that the dropout rates are higher in districts with high levels of female labor force participation (FLFP).

Although we do not observe FLFP by sector, women in India tend to disproportionately work in the informal sector (Bonnet, Vanek, Chen et al., 2019). This sector tends to employ women with lower education attainment. Generally, women with very low levels of education are more likely to be in the labor force. Moreover, lower FLFP in a region may indicate fewer acceptable opportunities for higher educated women (Fletcher, Pande, and Moore, 2017). Similarly, Azam

[13] The official categorization of districts for the SABLA program is not publicly accessible; therefore, we created an index using specified weights used for the selection of SABLA districts. This index includes the female school dropout rate, female literacy rate, and female work participation rate. The female child marriage rate was not included due to unavailable data.

(2012) and Afridi, Dinkelman, and Mahajan (2018) note that the market return to obtaining only a primary school level of education has not seen much growth for women. These findings in the literature may help explain why dropout rates are higher in districts with high FLFP. High-FLFP districts likely offer more opportunities for securing jobs that require lower levels of formal education. Consequently, dropping out of school to take advantage of the program benefits might seem more attractive for adolescent girls in these areas.

7.2 Parallel Trends, Robustness Checks, and Treatment Effect Heterogeneity

The validity of our results relies on the parallel trends assumption. This assumption requires that, in the absence of the SABLA policy introduced in 2011, the evolution of school dropout rates for adolescent girls in SABLA and non-SABLA districts would have followed the same trajectory. We implement multiple analyses to substantiate our identification assumption.

First, we show that all our results are robust to including household-level and village-level covariates, as well as survey-year fixed effects. Second, we perform a falsification test as in Duflo (2001), and show that the SABLA policy targeted adolescent girls in the 11-14 age range did not affect adolescent boys. We estimate equation (3) for the sub-sample of boys and fail to reject the null hypothesis that $\beta_1 = 0$.

Third, we perform another falsification test in the Appendix Table A2. In this test, we replace the variable Post_i with a variable equal to one if the individual was born between 1995 and 1996 and zero if they were born between 1993 and 1994. If there were differences in trends between the gender gap in school dropout rates between boys and girls in SABLA and non-SABLA districts, we would find a statistically significant coefficient on the newly defined interaction term. We do not see this for our outcome of interest.

Fourth, since the SABLA scheme targeted adolescent girls aged eleven years and above, it should not affect the primary school completion rate (grade 5 completion rate). In Appendix Table A3, we show that the SABLA policy did not affect adolescent girls' primary school completion relative to boys, using a triple difference-in-differences framework as in Equation 4.

Fifth, recent literature on difference-in-differences suggests that estimates from equation (3) may be biased if treatment effects vary across groups or periods (Goodman-Bacon, 2021; Callaway and Sant'Anna, 2021). To evaluate the robustness of our estimates in light of this concern, we apply the imputation estimator developed by Borusyak et al. (2024), which accounts for heterogeneity in treatment effects. Appendix Figure A2, panels (A) and (C) show the event study results of the SABLA policy's impact on girls and boys, respectively. Conveniently, this method facilitates testing the identifying assumptions of parallel trends and the absence of anticipation effects using only observations from untreated groups. We fail to reject the null hypothesis using an F-test that jointly tests whether the lead coefficients differ from zero, commonly interpreted as pre-trends for both girls (p-value $= 0.17$) and boys (p-value $= 0.32$).

Lastly, we test the robustness of our analysis against potential violations of the parallel trends assumption using the methodology proposed by Rambachan and Roth (2023) in Appendix Figure A2, panels (B) and (D). The panels present the original Ordinary Least Squares (OLS) confidence intervals averaged over all post-treatment periods (depicted in red) alongside the robust confidence sets (in black), calculated using the methodology by Rambachan and Roth (2023). This approach accounts for possible differences in long-term secular trends between adolescents in districts with and without the SABLA policy. Specifically, we allow for variation in linear trends between these groups and assess how significant departures from linearity would need to be to invalidate our findings. We explore the sensitivity of our results concerning the 2011 SABLA policy's impact on school dropout rates by limiting how much the trend differences between the two district types can vary between consecutive periods, and construct credible confidence intervals for the average treatment effect on the treated, ensuring these are uniformly valid under our specified constraints. The robustness of these results is evaluated across a spectrum of values for M, where $M = 0$ indicates a scenario allowing for a linear trend in the outcome variable to differ between individuals in districts with and without SABLA. In contrast, higher values of M permit deviations from linearity in trends between consecutive periods. The analysis reveals that the statistically significant effect observed for girls is robust to linear, but not to non-linear, violations of the parallel trends assumption. Conversely, the estimates are not robust to linear or non-linear deviations from the assumption of parallel trends for boys.

7.3 Expanded SABLA (SABLA 2.0)

Table 6: Dropout Rates: Expanded SABLA

	(1) Dropped Out	(2) Dropped Out	(3) Dropped Out	(4) Dropped Out	(5) Dropped Out	(6) Dropped Out
SABLA District × Treated Cohort	0.006***	0.005**	0.005**	0.002	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
SABLA Expanded District × Treated Cohort	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Household Covariates	No	Yes	Yes	No	Yes	Yes
Village Covariates	No	No	Yes	No	No	Yes
Observations	459,721	411,381	390,193	502,256	451,313	426,985
Control Mean	0.068	0.068	0.068	0.060	0.060	0.060
Gender	Girls	Girls	Girls	Boys	Boys	Boys

Notes: The sample is drawn from the 2009 to 2022 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. * significant at 10%; ** significant at 5%; *** significant at 1%. Columns (1)-(3) shows the results for girls, and columns (4)-(6) shows the results for boys. SABLA districts include those initial districts where the program was rolled out in 2011. SABLA expanded districts include those districts where the program was expanded in 2017. The control mean is the average school dropout rate for girls in the non-treated districts for Columns (1)-(3), and for boys in Columns (4)-(6).

The initial implementation of the SABLA program introduced conditionality linked to out-of-school nutrition, which inadvertently led to increased dropout rates among adolescent girls. In response to these challenges, SABLA 2.0 was strategically redesigned. The expanded program, launched in 2017 across an additional 303 previously untreated districts, focused on reintegrating out-of-school girls back into formal education. While the nutrition benefits remained conditioned on girls being out of school, the program encouraged their return to education through increased home visits by *anganwadi* workers and enhanced community involvement.[14] Eventually, the program was expanded across the entire country in 2018.

We now evaluate the effect of the first expansion of the SABLA program in 2017 on the school dropout rates of adolescent girls aged 11-14. To do this, we append our dataset with the 2018 and 2022 waves of the ASER data.[15] Table 6 examines the estimated intent-to-treat (ITT) effect of the initial SABLA policy along with the expanded SABLA policy (SABLA 2.0) for adolescent girls in the 11-14 age range, using the specification in equation (3).

From Table 6, column (1), we see that the effect of the initial SABLA policy remains almost identical, with an increase in the school dropout rate for adolescent girls of 0.006 percentage points (p-value < 0.01), which translates to an approximately 9% rise in the school dropout rate. The results are robust to the addition of household-level and village-level covariates. Furthermore,

[14]The Government of India's Integrated Child Development Services (ICDS) serves over 36 million 3-to-6-year-olds and 46 million children in the 0-3 age range, offering early childhood health, nutrition, and preschool education services delivered by *Anganwadi* workers at *Anganwadi* centers (Ganimian, Muralidharan, and Walters, 2024).

[15]Due to data limitations, we cannot identify the effect of the nationwide expansion of the SABLA program in 2018. Therefore, we only assess the impact of the 2017 expansion.

columns (4) - (6) show no effect of the policy on the dropout rate of adolescent boys.

The expansion of the SABLA policy in 2017 did not significantly affect the dropout rates of adolescent girls. This conclusion remains robust after accounting for household-level demographic variables and village-level characteristics, as demonstrated in columns (2) and (3). Moreover, the expanded policy also showed no significant impact on the dropout rates of boys. These findings suggest that the initial increase in dropout rates may have been mitigated during this period due to a heightened focus on reintegrating out-of-school girls into the education system.

Our results suggest that modifications in the expanded scheme contributed to reducing unintended effects. Specifically, the expanded scheme emphasized transitioning out-of-school girls into the education system. This effort included deploying frontline workers, such as *anganwadi* workers, to conduct home visits to out-of-school girls. During these visits, they counseled families on the importance of education. Additionally, the expanded scheme incorporated various informational interventions, such as providing details on the procedures for re-entering school, motivating girls to return to school, and using female role models to inspire out-of-school girls.

Our findings align with the predictions of our model presented in Section 4. The informational interventions effectively increased households' perceived utility of schooling by highlighting the benefits of education through role models or frontline health workers. This underscores the potential of information as a valuable policy lever, particularly in contexts where unintended incentives may exist.

7.4 Health and Marriage Outcomes

Table 7: Health and Marriage Outcomes

	(1) Anemic	(2) Moderate or Severe Anemia	(3) Underweight	(4) Low Height	(5) Age at Marriage
2011 SABLA Full Cohort × Treated Districts	-0.017**	0.000	-0.004	0.004	-0.023
	(0.007)	(0.007)	(0.006)	(0.007)	(0.048)
2011 SABLA Older Cohort × Treated Districts	-0.005	0.001	-0.007*	0.002	-0.058
	(0.006)	(0.006)	(0.004)	(0.006)	(0.043)
Observations	300,791	300,791	291,380	291,760	241,320
Mean of Dep. Variable	0.538	0.294	0.175	0.480	18.998

Notes: The sample consists of women surveyed during the fifth wave of the National Family Health Survey (NFHS-5), conducted between 2019 and 2021, aged 11 to 25 when the SABLA policy was introduced in 2011. All regressions include a vector of exogenous controls, including the family wealth index, constructed as the first principal component from a principal component analysis of family assets, an indicator variable for rural residence, and an indicator variable for belonging to a Scheduled Caste (SC), Scheduled Tribe (ST), or Other Backward Caste (OBC). Additionally, all regressions include fixed effects for year of birth and district of residence. Standard errors are clustered at the DHS sampling cluster level.

We now evaluate the effect of the policy on health and marital outcomes using the fifth wave of the National Family Health Survey (NFHS-5) conducted between 2019 and 2021, eight years after the initial implementation of the SABLA program in 2011. The program's nutritional support included a meal of 600 calories and 18-20 grams of protein, as well as iron and folic acid supplementation. Recall that the SABLA policy targeted adolescent girls in the 11-18 age range. In the previous sections, the ASER data allowed us to evaluate the effect of the policy in the 11-14 age range when out-of-school nutrition was provided. However, since NFHS-5 was conducted eight years after the initial implementation, we can only evaluate the effect for girls treated during the *entire* adolescent duration of 11-18, making it impossible to isolate the effect of the out-of-school nutrition program on health and marital outcomes.

We divide the treated cohorts into those fully treated by the SABLA policy in the 11-14 and 15-18 age ranges (called the SABLA Full cohort) and those treated only in the 15-18 age range (called the SABLA Older cohort). Table 7 shows health and marital outcomes results.

From Table 7, column (1), we find that the prevalence of anemia decreased by 1.7 percentage points (p-value < 0.05), translating to a decrease of approximately 3.2%. However, we find no effect on the prevalence of anemia for the cohorts treated only in the 15-18 age range. Column (2) of Table 7 shows that this decrease is driven by a reduction in mild or severe anemia, not moderate or severe.[16] To compare the magnitude of our estimates, Calvi (2020) finds that the

[16]The Demographic and Health Survey (DHS) defines any anemia as Hemoglobin $<$ 12.0 g/dL (non-pregnant) or $<$ 11.0 g/dL (pregnant).

Hindu Succession Act (HSA) and its amendments, which established equal inheritance rights for sons and daughters, reduced severe anemia among women by 1 percentage point and moderate anemia by 3 percentage points. Lastly, Table 7, columns (3) and (4) of Table 7 shows that the policy had no substantial impact on the prevalence of below-average height or the prevalence of being underweight (defined as having a body mass index below 18.5).

It is well known that a daughter's schooling and marriage are joint decisions in an Indian household (Adams and Andrew, 2019). Given that the initial implementation of the policy affected the decision to continue schooling for adolescent girls in the 11-14 age range, we evaluate the impact of the SABLA program on age at marriage. From Table 7, column (5), in line with the finding of Chatterjee and Poddar (2024), we find no effect of the policy on age at marriage for both cohorts treated between the ages of 11-18 and those treated only during the older ages of 15-18.[17]

Finally, we compare our findings with those of Chatterjee and Poddar (2024) and discuss the similarities and differences in the analysis. Chatterjee and Poddar (2024) evaluate the effect of the SABLA policy on post-marital outcomes, focusing on the prevalence of domestic violence and women's intrahousehold bargaining power, using data from the fourth wave of the National Family Health Survey (NFHS-4) conducted in 2015-2016, four years after the initial implementation of the SABLA program in 2011. Consequently, their dataset includes a few adolescent girls treated by the policy in the 11-14 age range when the program included the out-of-school meal component. In contrast, the fifth wave of the NFHS (NFHS-5) includes more girls treated by the policy during the 11-14 age range. Specifically, the NFHS-5 dataset contains data on 61,195 girls treated by the SABLA program during this period.

As previously noted, unlike ASER, NFHS-4 or NFHS-5 cannot be used to study the impact of the policy on school dropout as you observe women *cumulatively* treated by the SABLA program in the 11-14 as well as the 15-18 age range, and as a result the adolescent girls who continue schooling beyond the age of 14 is a *selected* sample of girls, who have chosen not to dropout of school.

Mild anemia as Hemoglobin 11.0-11.9 g/dL (non-pregnant) or 10.0-10.9 g/dL (pregnant). Moderate anemia as Hemoglobin 8.0-10.9 g/dL (non-pregnant) or 7.0-9.9 g/dL (pregnant). Severe anemia as Hemoglobin < 8.0 g/dL (non-pregnant) or < 7.0 g/dL (pregnant).

[17] We are unable to evaluate health outcomes for adolescent girls treated by the expanded SABLA program (SABLA 2.0) due to the limited number of observations from this cohort.

8 Conclusion

We evaluate the impact of two iterations of the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (SABLA) policy on the schooling and health outcomes of adolescent girls in India, with a particular focus on the component of providing out-of-school meals to girls aged 11-14. Our findings indicate that the program's first iteration inadvertently increased the opportunity cost of schooling, resulting in higher dropout rates among adolescent girls in this age group. This underscores the critical role of *in-school meals* in promoting school attendance (Adelman, Gilligan, and Lehrer, 2008; Afridi, 2011). On a positive note, the policy did enhance health outcomes for adolescent girls, mainly by reducing the prevalence of anemia. The program's second iteration successfully addressed the issue of increased school dropouts, showing no adverse effect on the dropout rate of adolescent girls.

Our paper highlights a trade-off in policy implementation. The multi-dimensional and interconnected nature of social welfare implies that incentives designed to improve one aspect can either enhance or undermine other aspects. For instance, while the SABLA scheme aimed at better reintegration for out-of-school girls, it inadvertently altered the incentives for girls already in school. These findings underscore the necessity of careful policy design and implementation, illustrating how well-intentioned policies can sometimes yield unintended consequences (Bharadwaj, Lakdawala, and Li, 2020). Additionally, our results demonstrate that information can serve as an effective policy lever to mitigate unintended spillover effects, as evidenced by the outcomes of the expanded scheme. Future research should assess the long-term impacts of policy interventions targeting adolescent girls. While numerous studies have examined the long-term effects of early childhood interventions, policymakers are increasingly interested in targeting adolescents. This trend raises important questions about the efficacy and efficiency of such schemes, warranting further investigation.

9 Declaration of generative AI in scientific writing statement

This Declaration of generative AI in scientific writing is regarding our paper "Beyond a Free Lunch: Evaluating the Trade-Offs of an Out-of-School Nutrition Program on Adolescent Girls' Human Capital." While preparing this work, the authors used ChatGPT to improve the manuscript's readability and language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the article's content.

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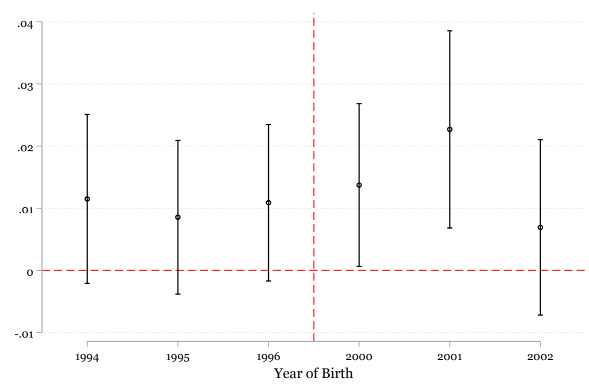
A Additional Tables and Figures

Table A1: Cohorts by ASER Survey Year and Child Birth Year (Girls)

	Child Birth Year										
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Total**
Treated Cohort = 0											
ASER Survey Year											
2009	14,987	17,610	20,585								53,182
2010		14,529	16,923	19,801							51,253
2011			15,100	18,029							33,129
2012				14,557							14,557
Total	14,987	32,139	52,608	52,387							152,121
Treated Cohort = 1											
ASER Survey Year											
2011					19,971						19,971
2012					17,327	19,497					36,824
2013					14,311	17,244	18,800				50,355
2014						14,142	17,377	21,316			52,835
2016								15,413	17,308	19,203	51,924
Total					51,609	50,883	36,177	36,729	17,308	19,203	211,909
Overall Total	14,987	32,139	52,608	52,387	51,609	50,883	36,177	36,729	17,308	19,203	364,030

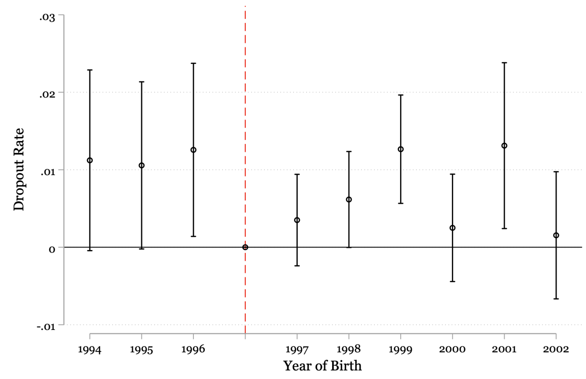
Note: The table shows the cohort of girls drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER).

Figure A1: Dropout Rates Girls Relative to Boys: Event Study

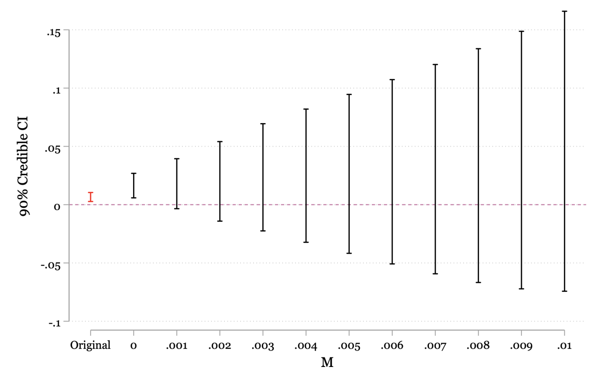


Note: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). The analysis estimates the relative dropout rates of girls compared to boys using a triple difference-in-difference (DDD) specification. The treated cohorts include adolescent children fully treated by the SABLA program in the 11-14 age group, specifically those who were 11 years old or younger in 2011. Household-level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component based on the materials used to construct the respondent's house and whether the household has a television, phone, and electricity. Village-level covariates include the presence of a government school and a road. Standard errors are clustered at the village level.

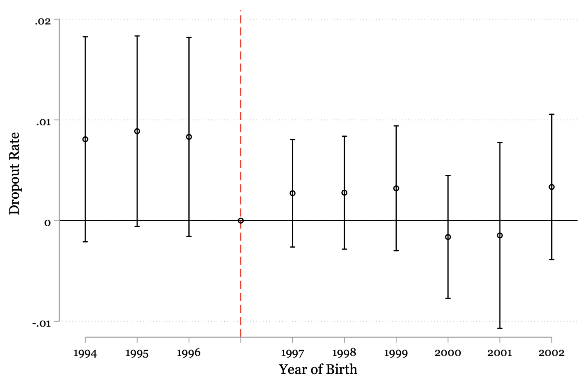
Figure A2: Dropout Rates: Event Study



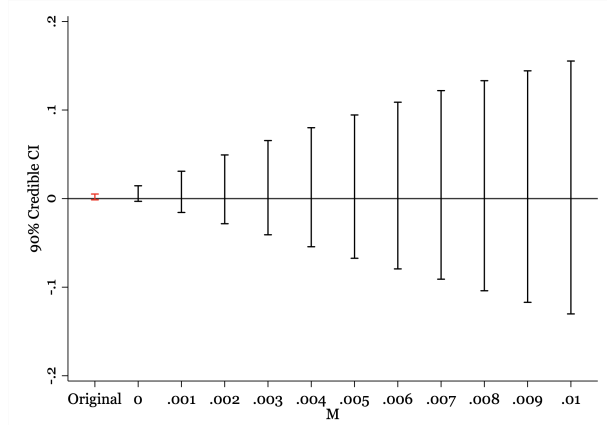
(A) Event Study: Girls



(B) Credible Confidence Set under Departure from Parallel Trends: Girls



(C) Event Study: Boys



(D) Credible Confidence Set under Departure from Parallel Trends: Boys

Note: Event Study plotted using the imputation approach in Borusyak et al. (2024). We fail to reject the null hypothesis using an F-test that jointly tests whether the lead coefficients differ from zero for both girls (p-value = 0.17) and boys (p-value = 0.32). Deviations from parallel trends tested using Rambachan and Roth (2023). Parallel trend violations between two consecutive periods are constrained using a smoothness restriction, with $M = 0$ allowing only for linear violations of parallel trends and larger values of M allowing for larger deviations from linearity.

Table A2: Placebo Test (Pre-treatment Period)

	(1) Dropped Out
Treat × Post × Girl Child	-0.000
	(0.004)
Observations	337,328

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Placebo-treated cohorts are children born after 1994. The placebo sample is restricted to children born before 1997.

Table A3: Placebo Test (Primary School Dropouts)

	(1) Dropped Out
Treat × Post × Girlchild	-0.001
	(0.001)
Observations	1,801,165

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The placebo sample is restricted to children who dropped out before reaching 11 years of age.

Table A4: Learning Outcomes: Boys

	(1) High Reading Level	(2) High Reading Level	(3) High Reading Level	(4) High Math Level	(5) High Math Level	(6) High Math Level
SABLA District × Treated Cohort	-0.003	-0.002	-0.001	-0.011**	-0.009**	-0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Household Covariates	No	Yes	Yes	No	Yes	Yes
Village Covariates	No	No	Yes	No	No	Yes
Observations	344,240	310,004	290,097	343,438	309,327	289,488
Control Mean	0.810	0.810	0.810	0.636	0.636	0.636

Notes: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. A high reading level is defined as the ability to read a paragraph or a story. A high math level is defined as the ability to perform subtraction or division. The control mean is the likelihood of boys having a high reading or math level in the non-treated districts.

Table A5: Relative Learning Outcomes

	(1) High Reading Level	(2) High Math Level	(3) High Reading Level	(4) High Math Level	(5) High Reading Level	(6) High Math Level
SABLA District × Treated Cohort × Girl Child	-0.002	0.005	-0.004	0.004	-0.005	0.001
	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Household Covariates	No	No	Yes	Yes	Yes	Yes
Village Covariates	No	No	No	No	Yes	Yes
Observations	662,318	660,727	594,872	593,537	557,336	556,145
Control Mean	0.808	0.603	0.808	0.603	0.808	0.603

Notes: The sample is drawn from the 2009 to 2016 waves of the Annual Status of Education Report (ASER). Household level covariates include the mother's age, the father's age, an indicator variable for whether the mother attended school, an indicator variable for whether the father attended school, and the family's wealth index, calculated as the first principal component using the material the respondent's house is constructed and whether the household has television, phone, and electricity. Village level covariates include the presence of government school and road. All regressions include the child's birth year and district-level fixed effects. Standard errors are clustered at the village level. A high reading level is defined as the ability to read a paragraph or a story. A high math level is defined as the ability to perform subtraction or division. The control mean is the likelihood of having a high reading or math level in the non-treated districts.

Table A6: Program Components by Age Group and School Enrollment Status

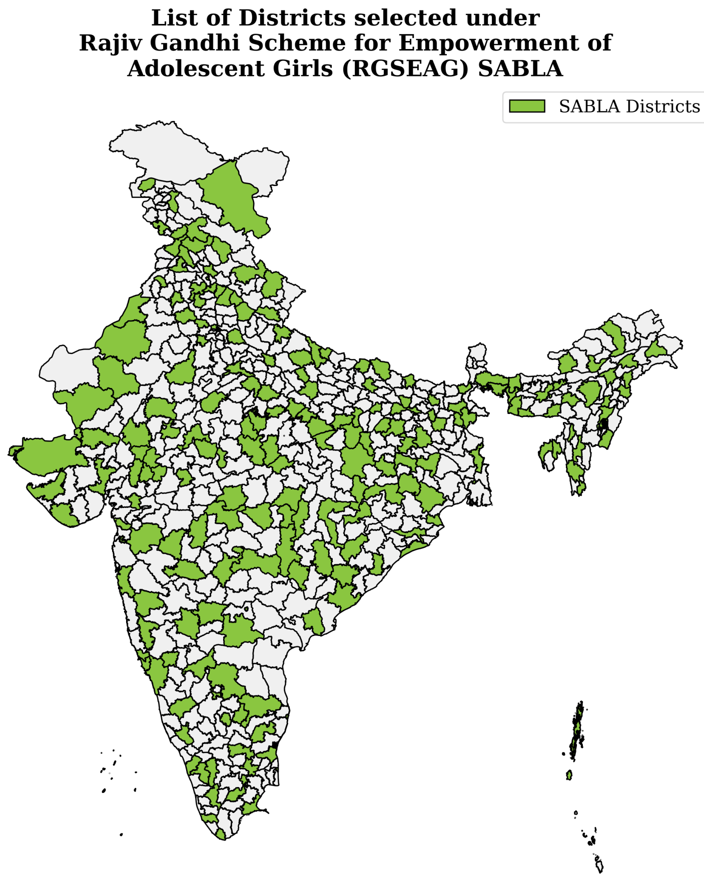
Age Group	**11-14**		**15-18**	
	Out of school girls	**In-school girls**	**Out of school girls**	**In-school girls**
Take home ration or hot cooked meal (at least 600 calories and 18 gms protein)	✓		✓	✓
Iron Folic Acid Supplements	✓		✓	
Vocational Training			✓	
Nutrition and Health Education	✓	✓	✓	✓
Health Check-up	✓		✓	
Counseling on family welfare, reproductive and sexual health, and child care practices	✓	✓	✓	✓
Life Skill Education	✓	✓	✓	✓

Table A7: Consumption Pattern of Take Home Rations

Consumption Pattern of Take Home Rations	Percent
Shared with Family	57.30%
Consumed by the beneficiary	42.40%
Shared with Friends & Others	0.30%

Data Source: Ministry of Women and Child Development, ASCI Survey, 2013

Figure A3: SABLA Districts



Data Source: Ministry of Women and Child Development