Pharmacy Proximity and Period Poverty: Assessing the Impact of Subsidized Menstrual Product Availability on Menstrual Management and Educational Outcomes[*]

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June 8, 2024

Abstract

This study investigates the impact of providing subsidized sanitary napkins through a nationwide network of generic pharmacies on menstrual hygiene in India. We conduct a difference-in-differences analysis using administrative data, health and education surveys, village infrastructure surveys, and spatial API data. Our results show that subsidized sanitary napkin provision increases usage by 15%, extends schooling years by 6%, and improves learning outcomes by 2%. We highlight the importance of waste management for transitioning from cloth to disposable products, the greater need for these products among women lacking privacy, and the lower adoption rates among women lacking travel autonomy. Moreover, proximity to healthcare or shopping facilities increases adoption, indicating spatial complementarities and emphasizing affordability over mere access.

Keywords: Public health intervention, Women's Health, Women's Education

JEL Codes: I18, I25, J16

1 Introduction

Period poverty is a global issue affecting approximately 500 million women worldwide who lack access to the necessary resources to manage their period effectively (World Bank, 2022). The consequences of period poverty extend beyond personal discomfort and hygiene concerns. It can significantly affect women's health, education, and labor outcomes.

Women in India, in particular, face multiple challenges in managing their menstrual period. With seventy million individuals living on less than two dollars per day, the average monthly cost of sanitary napkins, around four dollars, poses a significant financial burden (The Borgen Project, 2022). The evidence on intra-household poverty suggests that women often bear the brunt of economic disadvantages within the household (Calvi and Keskar, 2021). Consequently, families may not prioritize purchasing sanitary napkins even when the household budget allows it. As a result, many women resort to traditional methods such as using cloth. Due to the prevailing social stigma, women carry out the process of changing, washing, and drying cloth in secrecy. Moreover, managing cloth pads is time-consuming, requiring extra laundry time, and can be particularly distressing for women who lack privacy. It often leads to discomfort and reduced mobility (Oster and Thornton, 2012). The cumulative effect of these factors is that women withdraw from education and the workforce during their period, further exacerbating their isolation and limiting their opportunities for personal and economic growth.

In recent years, policymakers in India have increasingly recognized the pertinence of addressing period poverty, leading to the implementation of initiatives aimed at educating individuals about appropriate menstrual management and providing subsidized menstrual health products. These programs aim to tackle vital factors contributing to period poverty in India, such as limited awareness, unavailability of suitable products, and high cost. The most large-scale intervention is the distribution of heavily subsidized sanitary napkins (called the *Suvidha* pads) by the Government of India since 2018 through a nationwide network of generic pharmacies as part of the *Pradhan Mantri Bhartiya Janaushadhi Pariyojana* program. These products are available at one rupee (approximately one cent) per napkin. This program is the first initiative by the government at this scale that aims to benefit all menstruating individuals, irrespective of their age, school enrollment status, and whether they reside in urban or rural settings. Additionally, it does not rely on the existing overworked healthcare infrastructure or school administrations to distribute health products.

In this paper, we investigate whether the provision of subsidized sanitary napkins through generic pharmacies can effectively alleviate period poverty. We compile a novel dataset by spatially linking multiple data sources. First, we obtain administrative data on the date and location of the establishment of a nationwide network of generic pharmacies offering subsidized sanitary nap-

kins. Second, the National Family Health Surveys (NFHS) provides comprehensive nationwide, geo-coded health surveys detailing how women manage their period. Third, the *Mission Antyodaya* surveys, derived from nationwide village infrastructure surveys, offer information on the waste disposal infrastructure. Fourth, using spatial API data, we identify nearby amenities such as hospitals and markets for each generic pharmacy. Finally, the Annual Status of Education Report (ASER) surveys, comprising repeated cross-sections of household surveys on education outcomes of children, provide data on their school enrollment status and learning outcomes.

To estimate the treatment effect of exposure to generic pharmacies offering subsidized sanitary napkins, we employ the doubly-robust difference-in-differences estimator, proposed by Sant'Anna and Zhao (2020). Our model estimation reveals that women exposed to the availability of subsidized sanitary napkins are eight percentage points more likely to adopt sanitary napkins compared to those without such exposure, constituting an increase of about fifteen percent. Additionally, they are one percentage point more likely to transition from cloth to sanitary napkins completely. While this represents a smaller increase of four percent, highlighting that the demand for subsidized sanitary napkins may still need to be fully met, hindering a complete transition away from cloth, it still underscores the program's positive impact on promoting hygienic menstrual practices.

Furthermore, our analysis indicates that if subsidized sanitary napkins become available at a generic pharmacy near a girl before menarche, she is likely to stay in school longer by about eight months, indicating an increase of about six percent in school enrollment. While these outcomes rely on the NFHS data, which is a rich source of information about the health outcomes of the surveyed individuals, we additionally conduct an analysis using the ASER data, which provides more detailed information about the educational outcomes of children in surveyed households. We find a three percent decrease in the school dropout rate of girl children and a two percent increase in their learning outcomes.

We also investigate the role of several mediating factors influencing the adoption of hygienic menstrual management. First, the absence of adequate waste disposal facilities may impede women from adopting sanitary napkins as an alternative to cloth. Due to social stigma, sanitary napkin disposal is often shrouded in silence. Many women in rural areas lack access to proper disposal systems, resulting in practices such as burning or burying sanitary napkins in community pits, throwing them into water bodies, or flushing them down toilets (Mahon and Fernandes, 2010; Elledge et al., 2018; Bhor and Ponkshe, 2018). The lack of waste management discourage the adoption of sanitary napkins instead of cloth that can be washed and reused. Recognizing this challenge, the Government of India has started to address menstrual hygiene within the waste management framework of the *Swachh Bharat Mission* (Press Information Bureau, 2022). Additionally, the PMBJP program has recently expanded its inventory to include menstrual cups, which do not have the same disposal issue as sanitary napkins. However, this recent change falls outside our analysis'

timeframe, (Jan Aushadhi, 2022).

Second, women lacking access to a private toilet may find greater motivation to use disposable products like sanitary napkins, as cloth-based methods require frequent washing and may be more challenging to manage without privacy. Subsidized sanitary napkins can be particularly beneficial for women living in crowded spaces in urban slums where they often have to share toilets with individuals other than their family members (Chakravarthy, Rajagopal, and Joshi, 2019). It is worthwhile to prioritize neighborhoods lacking private toilets as the government continues to expand the program (Garg et al., 2012; The Print, 2019; Rao, 2020; The Wire, 2022).

Third, our analysis reveals that women with the autonomy to go out alone are likelier to adopt sanitary napkins, underscoring the need to address cultural norms and safety concerns. Policymakers should implement interventions focused on educating families about the significance of women having the freedom to access healthcare. Additionally, efforts to reduce the embarrassment surrounding sanitary napkins are essential, enabling family members to access these products comfortably. Exploring initiatives like door-to-door delivery of health products in neighborhoods where women may feel unsafe going out could further enhance accessibility. Furthermore, the difference in outcomes by travel autonomy is evident solely in adopting sanitary napkins rather than reducing cloth reliance. This highlights that facilitating a complete shift away from cloth may necessitate interventions beyond cultural considerations.

Finally, we note that spatial targeting is essential. Adopting sanitary napkins is higher when a generic pharmacy opens near a hospital, supermarket, or another non-generic pharmacy, suggesting greater visibility in areas with higher footfall. This finding also highlights that it's not solely access but also the affordability of generic pharmacies that contributes to increased sanitary napkin usage. Concurrently, when generic pharmacies open away from healthcare or shopping facilities, the reduction in reliance on cloth is more prominent compared to pharmacy sites near such facilities, implying potential excess demand. Overall, by strategically placing generic pharmacies in high-traffic zones, the government can improve the convenience of accessing subsidized products and leverage existing patterns of public movement and activities. However, it is crucial to recognize that areas with established healthcare or shopping facilities may have higher demand, and the supply chain needs to be prioritized accordingly.

This study contributes to two strands of literature. First, it examines the impact of public health programs on health behaviors, specifically focusing on the provision of subsidized sanitary napkins and their implications for menstrual management. Second, it investigates the effect of healthcare provision on human capital outcomes, specifically looking at the impact of subsidized sanitary napkins on school enrollment and learning outcomes.

While existing literature has explored the impact of healthcare provision on improved health behaviors, such as the provision of contraception, smoking cessation medication, and vaccination

([Maclean, Pesko, and Hill](), [2017](); [Bailey and Lindo](), [2017](); [Brownstein, Cantor, Rader, Simon, and]() [Whaley](), [2022]()), there is limited empirical evidence on the impact of public provision of subsidized menstrual products on their adoption for menstrual management. Notably, [Oster and Thornton]() ([2012]()) conducted an RCT of menstrual cup provision to schoolgirls in Nepal and found high adoption rates. Our study provides crucial evidence that public provision of subsidized menstrual products can increase their use and reduce reliance on traditional methods like cloth. We also highlight the importance of complementarities among different policies to ensure the success of public health interventions ([Dupas](), [2011]()).

Similarly, while some studies have shown the positive impact of healthcare provision on human capital outcomes ([Cohodes, Grossman, Kleiner, and Lovenheim](), [2016](); [Stephens, Toohey, et al.](), [2018]()), little is known about the effects of subsidized menstrual health products specifically. Notable studies include an RCT of sanitary products provision to girls in Nepal by [Oster and Thornton]() ([2011]()), who find no impact on girls' school attendance, and [Macours, Rueda, and Webb]() ([2024]()), who show improvements in learning outcomes in schools in Madagascar following a bundle of interventions including menstrual products provision. However, our study differs in two key aspects. First, we analyze a nationwide quasi-experimental intervention providing subsidized menstrual products to individuals regardless of age or school enrollment status. Second, we focus on the impact of this provision on both school enrollment and learning outcomes, finding improvements in both areas.

The remainder of this paper is organized as follows. Section 2 provides an overview of the institutional background and data. Section 3 presents the estimation methodology, while Section 4 presents the results. Section 5 concludes.

2   Background and Data

This section provides an overview of the government intervention in India aimed at providing subsidized sanitary napkins through generic pharmacies, which have proliferated nationwide in recent years. Subsequently, it outlines the data sources used in our analysis.

2.1   Institutional Background

Despite the various government initiatives addressing the issue of period poverty in India, menstrual hygiene management continues to pose significant challenges for women. The Government of India launched several programs starting in 2011 to increase awareness about menstrual hygiene and provide subsidized sanitary napkins to adolescent girls. However, the implementation of these programs has been mired with shortcomings hindering their success, primarily their overre-

liance on the already overworked health infrastructure and school administrators and their narrow targeting of school-going girls.

In 2011, the Ministry of Health and Family Welfare (MoHFW) took an essential step in bringing menstrual hygiene to the policy forefront by launching the Menstrual Hygiene Scheme (MHS) (National Health Mission, 2011). This program had two main objectives: firstly, to increase awareness about menstrual hygiene, eliminate taboos, and promote safe disposal practices through education; and secondly, to distribute subsidized packs of six sanitary napkins to rural adolescent girls at the price of 6 rupees (about 6 cents) each. Initially implemented in 107 districts across 17 states, the MHS aimed to reach out to girls in rural areas who lacked access to affordable sanitary napkins. In 2014, the central government began allocating funds to states and union territories for the decentralized procurement of sanitary napkins, ensuring a more widespread distribution and availability.

MoHFW assigned the responsibility of implementing the objectives of MHS to Accredited Social Health Activists (ASHAs). In exchange for carrying out the goals of the MHS, MoHFW provided ASHA workers with a monthly pack of free sanitary napkins. ASHA workers play a crucial role in India's rural health infrastructure but often face significant challenges. They are burdened with numerous family health-related tasks, ranging from maternal care to vaccination campaigns and even COVID-19 contact tracing, requiring them to provide door-to-door services. Despite their extensive workload, ASHA workers are typically underpaid, with an average monthly wage of around fifty dollars. Their compensation is primarily based on task-based payments, such as receiving 10 cents for each child immunized or eight dollars for assisting a pregnant woman during childbirth. Given the demanding nature of their work and limited financial incentives, providing a monthly pack of free sanitary napkins under the MHS may have been perceived as insufficient compensation for their efforts.

In 2014, the MoHFW launched the Rashtriya Kishor Swasthya Karyakram (RKSK) program, which aimed to address various aspects of adolescent health, including menstrual hygiene (National Health Mission, 2014). Unlike the MHS, which primarily focused on distributing sanitary napkins, RKSK took a more comprehensive approach by targeting adolescents in schools, families, and communities. At the village level, RKSK incorporated the training and identification of Peer Educators, also known as *Saathiyas*, to disseminate information on adolescent health issues. While RKSK primarily focused on health education, it also included the procurement of sanitary napkins as one of the sub-components of the MHS. Furthermore, health and nutrition programs under the Ministry of Women and Child Development (MWCD) and sanitation programs under the Ministry of Drinking Water and Sanitation's *Swachh Bharat Abhiyan* incorporated menstrual hygiene into their objectives.

Despite concerted government efforts, policies addressing menstrual hygiene in India remain

fragmented, leaving many women reliant on unsafe alternatives. Knowledge dissemination and sanitary napkin distribution under these programs are sporadic and of poor quality (Desai, 2017; US AID, 2022). Quality and supply chain issues lead to inadequate availability and accessibility for women in need. Moreover, these initiatives primarily target adolescent girls, neglecting other women facing menstrual hygiene challenges. Distribution through schools excludes marginalized populations not enrolled or lacking school-going family members. Reliance on overburdened and underpaid ASHA workers for distribution and education exacerbates the issue. Furthermore, urban slum women lack similar support, as frontline health workers are less prevalent in urban areas.

2.2 Generic Pharmacies

In 2008, the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India inaugurated the *Pradhan Mantri Bhartiya Janaushadhi Pariyojana* (PMBJP) program to make affordable, high-quality generic pharmaceutical drugs and surgical instruments accessible to the public. Starting in 2018, generic pharmacies offered *Jan Aushadhi Suvidha* sanitary napkins at highly subsidized prices.

TABLE I: Menstrual Products available at Generic Pharmacies

| Drug Code	Generic Name	Unit Size	Retail Price
8140	Regular Size with Wings	Pack of 4	4.00
8141	Large Size with Wings	Pack of 4	12.00
8142	Extra Large Size with Wings	Pack of 4	15.00
8145	Regular Size with Wings	Pack of 10	10.00

Note: This table presents information about the menstrual health products available at generic pharmacies.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India

The *Suvidha* sanitary napkins are priced as low as 1 rupee per unit (Press Information Bureau, 2020). This pricing represents approximately one-eighth of the average market price for similar products (Kumar, 2023). Table I summarizes the range of sanitary napkin options available at generic pharmacies. To ensure the quality of the products offered at the generic pharmacies, the Department of Pharmaceuticals relies on laboratories approved by the National Accreditation Board for Testing and Calibration Laboratories.

The year 2018 was pivotal not only because the *Suvidha* sanitary napkins became available in this year but also because the number of generic pharmacies remained relatively low until 2016, but from 2018 onwards, the program gained momentum, with over 1,000 pharmacies opening each year. Initially, the goal was to establish at least one generic pharmacy in each of the 630 districts of the country, with further expansion to sub-district levels, major towns, and villages by 2012. However, the program faced challenges, and by December 2012, only 157 stores were operational,

subsequently decreasing to 99 (Roy and Rana, 2018). These patterns are summarized in Figure I (a).

FIGURE I: Establishment Year of Generic Pharmacies

(b) Establishment Location

(a) Establishment Year
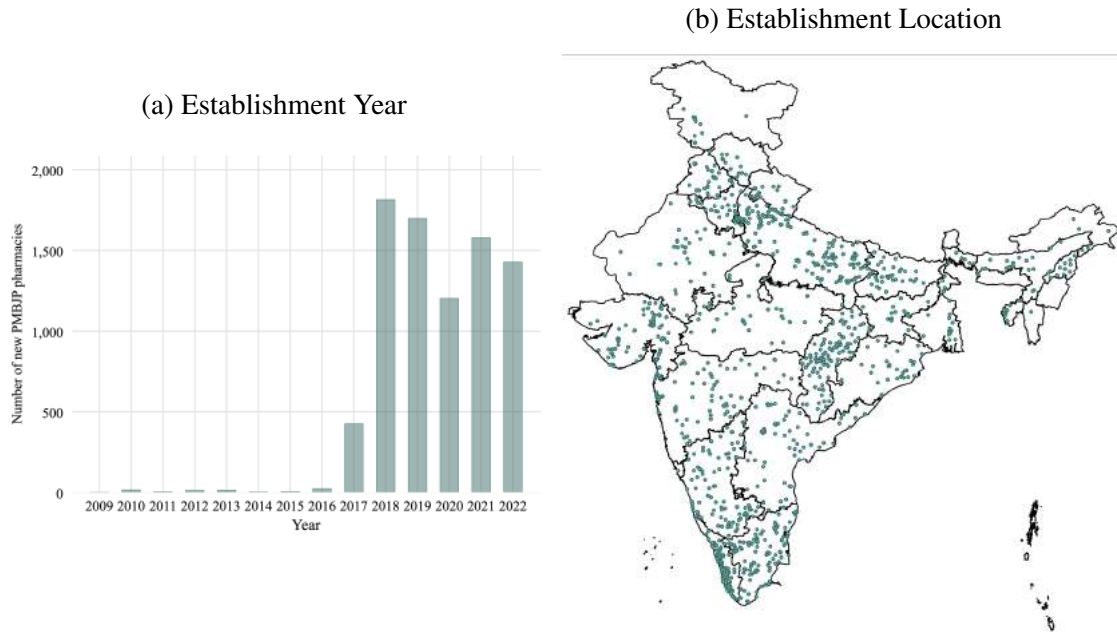
Note: Figure (a) presents the number of generic pharmacies that open in a given year, and Figure (b) presents the geographical locations of generic pharmacies that have opened by the year 2018.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India

The establishment of these generic pharmacies follows a distance guideline. In districts with a population equal to or exceeding one million, two pharmacies must be at least one kilometer apart. For other districts, the minimum distance between two pharmacies should be one and a half kilometers. Figure I (b) illustrates the geographical locations of the generic pharmacies that opened by 2018.

What sets this policy intervention apart in the landscape of addressing menstrual hygiene is its independence from school administrators or existing health infrastructure for the provision of sanitary napkins. The Department of Pharmaceuticals invites applications from individuals or organizations to establish these generic pharmacies and manage daily operations, while overseeing drug procurement. Applicants must be qualified pharmacists or employ them. They arrange space for pharmacy operations and earn a 20% margin on drug prices. Additional support is provided for women, disabled individuals, and entrepreneurs in marginalized areas.

Some recent studies have highlighted the positive impact of these generic pharmacies on healthcare access and utilization. People are aware of and trust generic medicines available at generic pharmacies, leading to increased utilization of these facilities (Bai et al., 2021; Manesh Palav,

Jadhav, Havale, Patil, and Naikwade, 2022). Evidence suggests that a nearby generic pharmacy improves access to essential generic drugs (Chaudhary, Philip, Santhosh, Karoli, Bhandari, and Ganachari, 2021; Sheikh, Donage, Donga, Benny, Majjigeri, Spoorthi, Bhandari, Ganachari, et al., 2022).

2.3 Data

This study utilizes five data sources: administrative records on generic implementation, health surveys, village infrastructure surveys, spatial API data, and education surveys. We spatially link these datasets using the Socioeconomic High-resolution Rural-Urban Geographic Platform for India (SHRUG) data (Asher et al., 2021).

Administrative Data: We obtain administrative records on the date and location of the establishment of generic pharmacies from the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India. Figure I illustrates the spatial and temporal variations in establishing these pharmacies.

Health Surveys: We use the National Family Health Survey (NFHS) (International Institute for Population Sciences and ICF, 2017, 2021), which is conducted by the Ministry of Health and Family Welfare, Government of India. We use NFHS-4, conducted between January 2015 and December 2016, and NFHS-5, conducted between June 2019 and May 2021. The surveys ask women aged 15 to 24 about their menstrual hygiene management practices, including using cloth, sanitary napkins, locally-produced pads, tampons, or menstrual cups. Women often report using multiple methods simultaneously. Table III summarizes the responses. In NFHS-4, over 65% of women used cloth, and 42% used sanitary napkins, whereas, in NFHS-5, 52% used cloth, and 63% used sanitary napkins.

The NFHS surveys also include other information such as the woman's religion, caste, household wealth, urban residency, access to a private toilet, and autonomy in going out alone. Combining data from NFHS-4 and NFHS-5, our sample comprises 475,413 women, detailed in Table II. NFHS also shares the geographical coordinates of the survey clusters. However, the geographical coordinates are randomly adjusted within the sub-district to ensure that the points remain within the subdistrict while safeguarding respondent confidentiality (The DHS Program, 2023). Due to the limitations of geographical data accuracy, we define proximity to a generic pharmacy at the sub-district level. In other words, we define a woman as residing near a generic pharmacy if she lives in a sub-district where such a pharmacy is present. NFHS asks women aged 15-24 how they manage their period, i.e., whether they use cloth, locally prepared pads, or sanitary napkins. These

TABLE II: Descriptive Statistics: NFHS

	(1)	(2)	(3)		
	Mean	S.D.	Conditional probability of using only pad		
			No	Yes	Difference
Religion					
Hindu	0.74	0.44	0.39	0.38	−0.01***
Muslim	0.15	0.35	0.39	0.30	−0.09***
Other	0.11	0.31	0.36	0.50	0.14***
Caste					
Scheduled Caste	0.20	0.40	0.38	0.37	−0.01***
Scheduled Tribe	0.18	0.39	0.39	0.34	−0.05***
Other Backward Caste	0.40	0.49	0.39	0.37	−0.02***
General Caste	0.22	0.42	0.36	0.45	0.09***
Education					
No education	0.09	0.28	0.40	0.11	−0.29***
Primary education	0.08	0.27	0.40	0.17	−0.23***
Secondary education	0.68	0.47	0.36	0.39	0.03***
Higher education	0.15	0.36	0.34	0.60	0.26***
Wealth					
Poorest	0.21	0.41	0.44	0.16	−0.28***
Poorer	0.24	0.42	0.41	0.27	−0.15***
Middle	0.22	0.41	0.37	0.40	0.03***
Richer	0.19	0.39	0.35	0.52	0.17***
Richest	0.15	0.35	0.33	0.66	0.33***
Neighborhood					
Urban	0.24	0.43	0.33	0.55	0.22***
Sanitation					
Access to private toilet	0.60	0.49	0.25	0.46	0.21***
Autonomy					
Can go alone to market	0.42	0.49	0.34	0.45	0.12***
Can go alone to health facility	0.35	0.48	0.35	0.46	0.11***
Can go alone outside village	0.36	0.48	0.35	0.44	0.08***
NFHS					
Round 2	0.49	0.50	0.31	0.45	0.14***
PMBJP					
PMBJP Pharmacy in subdistrict	0.48	0.50	0.34	0.42	0.07***
Observations					475,413

Note: This table presents the mean and standard deviations of binary indicators characterizing individual, household, and neighborhood information of women aged 15-24 for both rounds of NFHS. Columns (4) and (5) showcase the mean share of women exclusively using sanitary napkins, conditional on the particular variable being equal to one and zero, respectively. For example, the first row provides the means based on whether the woman is Hindu. Column (6) presents the difference between these means and their statistical significance. Significance levels: $^{*}p <0.1$; $^{**}p <0.05$; $^{***}p <0.01$.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development Ministry of Rural Development, Government of India

TABLE III: Menstruation Management Methods

	NFHS-4	NFHS-5
Cloth	0.665	0.529
	(0.472)	(0.499)
Locally prepared napkins	0.151	0.148
	(0.358)	(0.355)
Sanitary napkins	0.412	0.625
	(0.492)	(0.484)
Other	0.026	0.025
	(0.159)	(0.155)
Observations	241,871	233,542

Note: This table presents the mean and standard deviations of using each menstruation management method among women aged 15-24 for both rounds of NFHS.
Data source: National Family Health Survey Rounds 4 and 5

are not mutually exclusive responses, i.e., women report using multiple methods simultaneously. Table III summarizes these responses separately for NFHS-4 and NFHS-5. NFHS also includes the age at menarche, which indicates when a woman first experiences her menstrual period. Figure II shows that, on average, women reach menarche by age 13. NFHS employed a two-stage sample

FIGURE II: Distribution of Age at Menarche
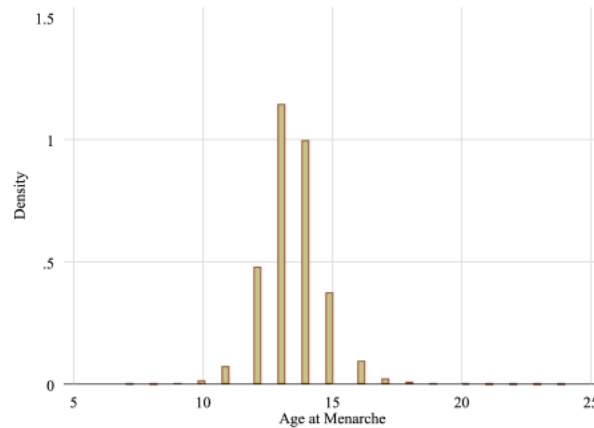
Note: This figure presents the distribution of the age at which a woman first gets her menstrual period.
Data source: National Family Health Survey Rounds 4 and 5

design, selecting villages as primary sampling units (PSUs) in rural areas and Census Enumeration Blocks in urban areas. The first stage involved selecting PSUs with probability proportional to size, followed by a random selection of 22 households in each PSU in the second stage. In urban

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and rural areas, households were chosen after a comprehensive mapping and household listing operation in the selected first-stage units. NFHS recommends the variable PSU to account for sample design clustering on standard error estimates.

Village Infrastructure: We use data from the *Mission Antyodaya* surveys conducted by the Ministry of Rural Development (Ministry of Rural Development, 2020). These surveys offer details on development indicators, such as the existence of public transportation, health facilities, and educational institutions. Additionally, the data provides geographical coordinates for each village, facilitating the linkage of village-level characteristics with NFHS data.

We link NFHS data with *Mission Antyodaya* by spatially matching the geographical coordinates of NFHS survey clusters with those of *Mission Antyodaya* villages within a 5-kilometer radius. We include only individuals residing in rural areas with at least one matched *Mission Antyodaya* village, resulting in 44,080 survey clusters. Descriptive statistics for these survey clusters are presented in Table IV.

TABLE IV: Descriptive statistics

|	Mean	SD	Min	Max
Health				
Anganwadi	0.26	0.44	0.00	1.00
Primary Health Center	0.31	0.46	0.00	1.00
Community Health Center	0.23	0.42	0.00	1.00
Empanelled Hospital	0.20	0.40	0.00	1.00
PMBJP Pharmacy	0.42	0.49	0.00	1.00
Education				
Primary School	0.29	0.45	0.00	1.00
Middle School	0.33	0.47	0.00	1.00
High School	0.27	0.44	0.00	1.00
Senior Secondary School	0.22	0.41	0.00	1.00
Sanitation				
Waste Disposal System	0.58	0.49	0.00	1.00
Closed Drainage System	0.33	0.47	0.00	1.00
Observations				44,080

Significance level: $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development Ministry of Rural Development, Government of India

Spatial API: We utilize the Geoapify Places API[1] to collect amenity data for each generic pharmacy. We identify the number of hospitals, pharmacies, and supermarkets within a 5-minute driv-

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[1] https://www.geoapify.com/places-api

FIGURE III: Spatial Distribution of Amenities around Generic Pharmacies

(a) Supermarkets

(b) Hospitals

(c) Non-Generic Pharmacies
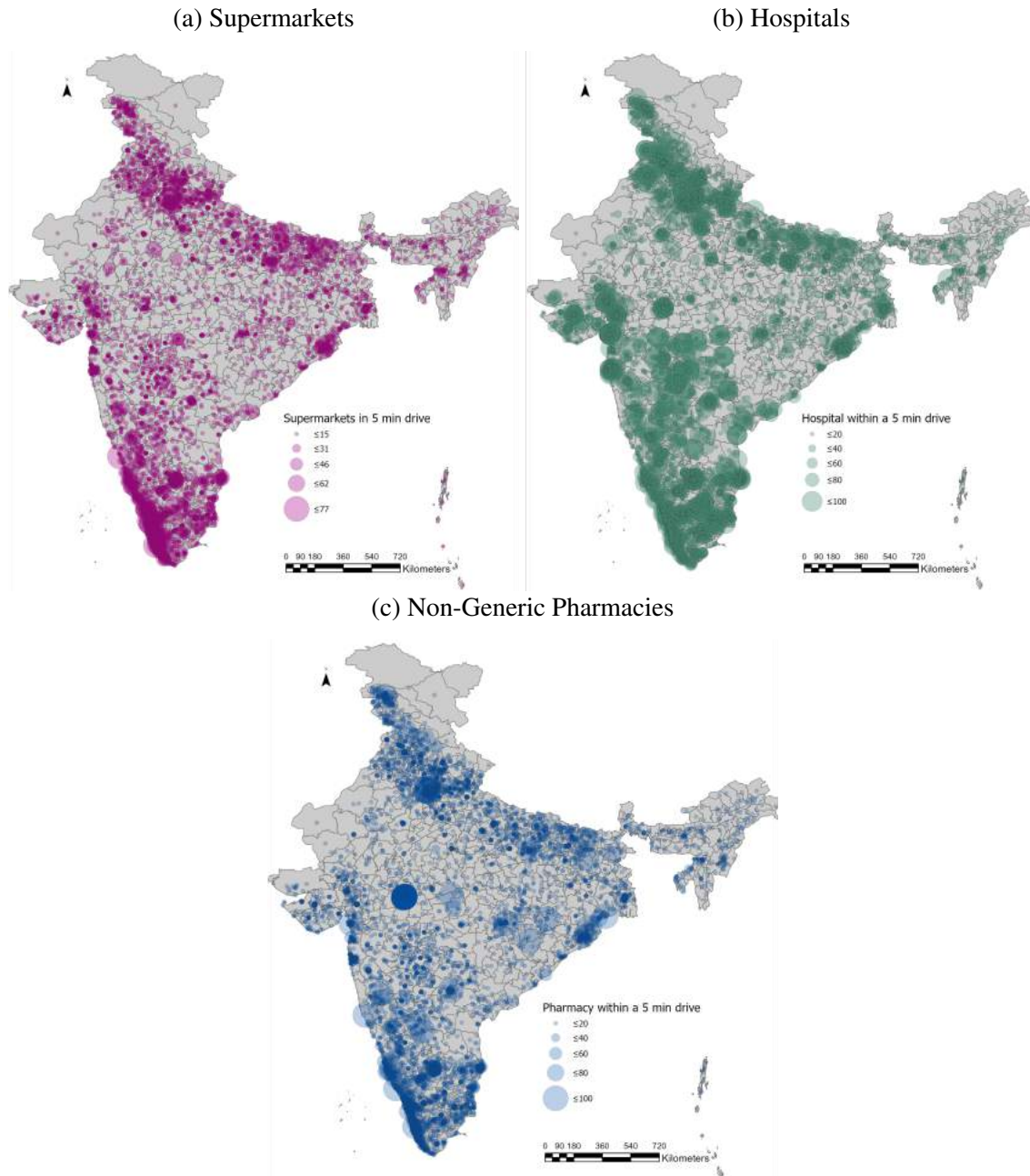
Note: These figures visualize the locations of generic pharmacies, with marker size indicating the number of surrounding amenities.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India and Geoapify Places API.

ing distance of each generic pharmacy using the geographical coordinates of each generic pharmacy. Figure III provides visual representations of the distribution of supermarkets, hospitals, and non-generic pharmacies around each generic pharmacy, respectively. Each figure illustrates the

count of amenities within a 5-minute driving distance, categorized into groups such as up to 20, up to 40, and so forth.

TABLE V: Descriptive Statistics: ASER

	Mean	SD	Min	Max
Child				
Age	14.37	1.09	13.00	16.00
Girl	0.48	0.50	0.00	1.00
Grade level	8.47	1.74	1.00	12.00
Dropped out of school	0.08	0.26	0.00	1.00
Parents				
Mother's educational attainment	3.69	4.33	0.00	20.00
Father's educational attainment	6.27	4.79	0.00	20.00
Mother's age	37.20	6.55	17.00	80.00
Father's age	42.60	7.18	17.00	85.00
House Assets				
Pucca House	0.36	0.48	0.00	1.00
Toilet	0.54	0.50	0.00	1.00
TV	0.55	0.50	0.00	1.00
Electricity	0.80	0.40	0.00	1.00
Phone	0.75	0.43	0.00	1.00
Learning Outcomes				
Math	3.26	0.98	0.00	4.00
Reading	3.59	0.89	0.00	4.00
Observations				1,568,356

Note: This table presents the means and standard deviations for various child, parent, and household characteristics available in the ASER data.
Data source: Annual Status of Education Report, 2008-2022, ASER Centre.

Education surveys: We use data from the Annual Status of Education Report (ASER), coordinated by the ASER Centre and facilitated by the Pratham network (Centre, 2022). This annual household-based survey tracks enrollment for children aged 3-16 and assesses basic reading and arithmetic skills for children aged 5-16. It covers nearly all rural districts in India.

Each year, 30 villages are sampled from each rural district's most recent Census village directory. Within each village, 20 randomly selected households are surveyed, generating data from 600 households per district, or about 300,000 households nationwide. The survey collects information on the schooling status of all children aged 3-16 in the sampled households. For children aged 5-16, basic reading and arithmetic skills are tested, with the reading test being a Grade 2-level text and the arithmetic test being a 3-digit by 1-digit division problem, typically taught in Grade 3 or 4. Additionally, basic household information, such as household assets and parents' age and education, is collected annually.

We pool data from the ASER surveys conducted between 2008 and 2022, excluding the years

2019, 2020, and 2021 when the surveys were not conducted. We then restrict the sample to children who were at least 13 years old at the time of the survey and were enrolled in school at least until age 10. This results in approximately 1.6 million observations. The average age of this sample is 14.4 years, with 48% being girls, an average grade level of 8.5, and about 8% reporting having dropped out of school by the time they were surveyed, as shown in Table V.

The average educational attainment of mothers in the sample is approximately 3.7 years, while that of fathers is about 6.3 years. On average, mothers are 37.2 years old, and fathers are about 42.6 years old. About 36% of the respondents reside in a pucca house, 54% own a toilet, 55% own a TV, 80% have electricity, and 75% own a phone. On a scale of 0 to 4, the average math level is 3.3, and the average reading level is 3.6.

3   Estimation Strategy

This section outlines our approach to investigating the impact of exposure to generic pharmacies offering subsidized sanitary napkins on women's menstrual management and educational outcomes. First, we describe our analysis using the NFHS data to investigate menstrual management. Then, we detail our methodology for examining educational attainment using NFHS data. Finally, we discuss our approach to analyzing school dropout and learning outcomes using the ASER data.

Impact on Menstrual Management: To estimate the impact of proximity to a generic pharmacy on menstrual management, we employ Sant'Anna and Zhao's (2020) doubly-robust difference-in-differences estimator. Generic pharmacies began offering subsidized sanitary napkins in 2018. Let $T_i = 0$ indicate that woman i is surveyed before 2018, and $T_i = 1$, otherwise. Let $D_i \in \{0,1\}$ denote whether she resides in a subdistrict where a generic pharmacy opens. Her demographic information is denoted by X_i, and $Y_i \in \{0,1\}$ denotes whether she uses sanitary napkins.

Our objective is to estimate the average treatment effect on the treated (ATT), which represents the average effect of residing in a subdistrict where a generic pharmacy opened on sanitary napkin usage among women who reside in such subdistricts. We denote $Y_{i1}(1)$ as whether woman i surveyed after 2018 and living in a subdistrict with a generic pharmacy use sanitary napkins, and $Y_{i1}(0)$ as whether she uses sanitary napkins if a generic pharmacy does not open in her subdistrict. The ATT is expressed as:

$$\tau = \mathbb{E}\left[Y_{i1}(1) - Y_{i1}(0) \mid D_i = 1\right]$$
$$= \mathbb{E}\left[Y_i \mid D_i = 1, T_i = 1\right] - \mathbb{E}\left[Y_i(0) \mid D_i = 1, T_i = 1\right] \tag{1}$$

Here, $Y_i(0)$ represents the counterfactual scenario of the sanitary napkin usage for woman i if

a generic pharmacy had not opened in her subdistrict. We use a logistic regression model to estimate the probability of a generic pharmacy opening in the women's subdistrict to account for the selection of pharmacy locations. This model, denoted by $\Pr(D_i = 1 \mid X_i)$, considers the woman's characteristics and is expressed as:

$$\Pr(D_i = 1 \mid X_i; \gamma) \equiv \pi(X_i; \gamma) = \frac{\exp\left(X_i'\gamma\right)}{1 + \exp\left(X_i'\gamma\right)}. \tag{2}$$

To estimate the logistic regression parameters (γ), we rely on the inverse probability tilting estimator proposed by Graham, de Xavier Pinto, and Egel (2012):

$$\widehat{\gamma} = \arg\max_{\gamma} \mathbb{E}_n \left[DX'\gamma - (1-D)\exp\left(X'\gamma\right)\right]. \tag{3}$$

We only have repeated cross-sectional data, so we model outcome regressions for each time and treatment group. These outcome regressions, denoted by $m_{d,t}(x)$, represent the expected usage of sanitary napkins given the treatment status ($D_i = d$), survey period ($T_i = t$), and the woman's characteristics ($X_i = x$). We assume a parametric model $\mu_{d,t}\left(X_i; \beta_{d,t}\right) \equiv X_i\beta_{d,t}$ for $m_{d,t}$, where $\beta_{1,t}$ is estimated using ordinary least squares and $\beta_{0,t}$ is estimated using weighted least squares:

$$\begin{aligned}
\widehat{\beta}_{1,t}^{ols} &= \arg\min_{b \in \Theta} \mathbb{E}_n \left[\left(Y - X'b\right)^2 \mid D = 1, T = t\right] \\
\widehat{\beta}_{0,t}^{wls} &= \arg\min_{b \in \Theta} \mathbb{E}_n \left[\pi(x; \widehat{\gamma})\left(Y - X'b\right)^2 \mid D = 0, T = t\right]
\end{aligned} \tag{4}$$

Finally, we compute the doubly robust estimator for τ using a combination of the estimated probabilities and regression coefficients. The estimator involves weighted averages of differences between observed and counterfactual outcomes:

$$\begin{aligned}
\widehat{\tau} = &\frac{1}{n}\sum_i \left[\left(\widehat{w}_1(D_i, T_i) - \widehat{w}_0\left(D_i, T_i, X_i; \widehat{\gamma}\right)\right)\left(Y_i - \mu_{0,\Delta}\left(X_i; \widehat{\beta}_{0,1}^{wls}, \widehat{\beta}_{0,0}^{wls}\right)\right)\right] \\
&+ \left(\frac{1}{n}\sum_i \left[\left(\frac{D_i}{\frac{1}{n}\sum_i D_i} - \widehat{w}_{1,1}(D_i, T_i)\right)\left(\mu_{1,1}\left(X_i; \widehat{\beta}_{1,1}^{ols}\right) - \mu_{0,1}\left(X_i; \widehat{\beta}_{0,1}^{wls}\right)\right)\right]\right) \\
&- \left(\frac{1}{n}\sum_i \left[\left(\frac{D_i}{\frac{1}{n}\sum_i D_i} - \widehat{w}_{1,0}(D_i, T_i)\right)\left(\mu_{1,0}\left(X_i; \widehat{\beta}_{1,0}^{ols}\right) - \mu_{0,0}\left(X_i; \widehat{\beta}_{0,0}^{wls}\right)\right)\right]\right)
\end{aligned} \tag{5}$$

where we derive the weights used in the estimation from the estimated probabilities and the treat-

ment group proportions:

$$w_1(D,T) = w_{1,1}(D,T) - w_{1,0}(D,T),$$
$$w_0(D,T,X;\gamma) = w_{0,1}(D,T,X;\gamma) - w_{0,0}(D,T,X;\gamma)$$
$$w_{1,t}(D,T) = \frac{D \cdot 1\{T=t\}}{\mathbb{E}[D \cdot 1\{T=t\}]}, \tag{6}$$
$$w_{0,t}(D,T,X;\widehat{\gamma}) = \frac{\frac{\pi(x;\widehat{\gamma})(1-D) \cdot 1\{T=t\}}{1-\pi(x;\widehat{\gamma})}}{\mathbb{E}\left[\frac{\pi(x;\widehat{\gamma})(1-D) \cdot 1\{T=t\}}{1-\pi(x;\widehat{\gamma})}\right]}.$$

Impact on Educational Attainment (using NFHS): We are also interested in looking at the effect of the presence of a generic pharmacy on women's educational attainment for which we employ Callaway and Sant'Anna's (2021) difference-in-differences estimator. Let $D_{it} = 1$ denote if a generic pharmacy opens in woman i's subdistrict in year t and the woman gets menarche after year t, and $D_{it} = 0$ otherwise. Define G_i as the year when a generic pharmacy first opens in woman i's subdistrict. Let $G_{ig} = 1$ denote if a generic pharmacy first opens in woman i's subdistrict in year g, and G_{ig} otherwise. Define C_i to be a binary variable that is equal to one for women in whose subdistrict a generic pharmacy never opens.

We aim to estimate the ATT representing the average effect of a generic pharmacy opening in a woman's subdistrict before she gets menarche on her educational attainment. Let $Y_{it}(g)$ denote woman i's potential educational attainment in year t if a generic pharmacy were to first open in her subdistrict in year g and $Y_{it}(0)$ denote woman i's educational attainment in year t if a generic pharmacy were to never open in her subdistrict. The ATT of a generic pharmacy first opening in year t for women in whose subdistrict a generic pharmacy first opens in year g is denoted by:

$$\tau_{gt} = ATT(g,t) = \mathbb{E}(Y_{it}(g) - Y_{it}(0) \mid G_{ig} = 1) \tag{7}$$

We keep only the sample of women who were enrolled in school at least till the time of getting menarche. The estimator for the ATT is:

$$\hat{\tau}_{gt} = \mathbb{E}\left[\left(\frac{G_g}{\mathbb{E}[G_g]} - \frac{\frac{p_g(X)C}{1-p_g(X)}}{\mathbb{E}\left[\frac{p_g(X)C}{1-p_x(X)}\right]}\right)(Y_t - Y_{g-1} - m_{g,t}(X))\right] \tag{8}$$

where $m_{g,t}(X) = \mathbb{E}[Y_t - Y_{g-1} \mid X, C = 1]$ and $p_g(X) = P(G_g = 1 \mid X, G_g + C = 1; \gamma)$ denotes the probability of generic pharmacy first opening in year g conditional on covariates and either pharmacy first opening in the woman's subdistrict in year g or a generic pharmacy never opening in the woman's subdistrict. We rely on Sant'Anna and Zhao's (2020) parametric estimators for $m_{g,t}(X)$

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and $p_g(X)$ described in Equations (3) and (4), respectively.

Impact on Educational Attainment (using ASER): A second source of data on educational outcomes is the ASER data. This is a repeated cross-section of household-level data in which each school-age child's enrollment status and learning outcomes are recorded. This survey is a rich source of such educational information. However, the most notable limitation of our analysis is that ASER only allows geographical identification within the district level. Additionally, we do not know the age at which a surveyed girl first experiences menarche.

To address these limitations, we construct a panel of district-level data and conduct a synthetic difference-in-differences analysis (Arkhangelsky, Athey, Hirshberg, Imbens, and Wager, 2021). As summarized in Figure II using data from NFHS, the age window for menarche appears to begin at age 10, so we use the age of 10 as the youngest age girls enter the age of being vulnerable to dropping out of school due to period poverty. We also observe that the median age of menarche is 13. Thus, we first restrict the sample to girl children who have stayed enrolled in school until age ten and are at least 13 years old at the time of their survey. Our primary outcome of interest is whether the child drops out of school by the time she turns 13. Other outcomes of interest include math and reading levels. We construct district-level averages of these outcome variables as well as of the household-level covariates.

Let N denote the number of districts and T the number of years where the outcome for district i in year t is denoted by Y_{it} and exposure to a generic pharmacy is denoted by W_{it}. Let $\hat{\omega}$ denote the weights that align pre-exposure trends in the outcome of unexposed districts with those for the unexposed districts, and let $\hat{\lambda}$ denote the weights that balance pre-exposure years with post-exposure ones. Also, let X_{it} denote a vector of covariates at the district-year level. Then, the ATT (τ) is given by using these weights in a basic two-way fixed effects regression:

$$(\hat{\tau}, \hat{\mu}, \hat{\alpha}, \hat{\beta}, \hat{\rho}) = \arg \min_{\tau, \mu, \alpha, \beta, \rho} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} (Y_{it} - \mu - \alpha_i - \beta_t X_{it} \rho - W_{it} \tau)^2 \hat{\omega}_i \hat{\lambda}_t \right\} \quad (9)$$

4   Results

This section presents key findings on the impact of the provision of subsidized sanitary napkins through generic pharmacies on menstrual health management and education outcomes. We also examine how cultural barriers, sanitation infrastructure, and the presence of amenities mediate the effects.

We first present the logistic regression results in Equation 2 in Table VI, representing the probability of a generic pharmacy opening in an individual's subdistrict based on their observed characteristics. The regression includes indicators for religion, caste, wealth, urban/rural residence, and

district fixed effects, with standard errors clustered at the primary sampling unit level. The results show that women of scheduled tribes are less likely to have a generic pharmacy in their subdistrict. Higher wealth index and urban residence are positively associated with the likelihood of having a generic pharmacy.

TABLE VI: First-Stage Logistic Regression

	Estimate (s.e.)
Religion: Hindu	0.06
	(0.041)
Religion: Muslim	-0.01
	(0.051)
Caste: SC	-0.02
	(0.023)
Caste: ST	-0.15***
	(0.033)
Caste: OBC	-0.03
	(0.021)
Wealth Index	0.01***
	(0.001)
Neighborhood: Urban	1.37***
	(0.033)
Wald	9136.73
Obs	390,240

Note: Table VI presents the results of the logistic regression in Equation 2. Outcome variable is whether a generic pharmacy opens in the individual's subdistrict. District fixed effects are included, and standard errors are clustered at the primary sampling unit level.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development Ministry of Rural Development, Government of India

4.1 Effect on Menstrual Health Management

Table VII presents the ATT of the provision of subsidized sanitary napkins on menstrual health management, as estimated by Equation (5), based on difference-in-differences estimator by Sant'Anna and Zhao (2020). This analysis controls for religion, caste, wealth index, urban/rural residence indicators, and district fixed effects, with standard errors clustered at the primary sampling unit level.

Women exposed to the provision of subsidized sanitary napkins through a generic pharmacy in their subdistrict are more likely to use sanitary napkins and abandon cloth completely by eight percentage points and one percentage point, respectively. These represent fifteen percent and four

percent increases over the baseline averages of 0.5 and 0.3, respectively.

As a robustness check, we repeat this analysis using a restricted sample that excludes the "never treated" individuals, i.e., those residing in subdistricts where a generic pharmacy never opened. The results from this restricted sample are consistent with our main findings and are detailed in the Online Appendix B. In Figure IV, we present the event study plot, illustrating the difference

TABLE VII: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty

	(1)
Panel A: MHM method is *Pad*	
$\hat{\tau}$	0.082
	(0.003)
Mean	0.542
Panel B: MHM method is *Only Pad*	
$\hat{\tau}$	0.012
	(0.004)
Mean	0.311
Obs	475,413

Panels A and B estimates are based on Sant'Anna and Zhao's (2020) DiD analysis, and Panel C is based on Callaway and Sant'Anna's (2021)'s DiD analysis. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. Standard errors, clustered at the PSU level, are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

between the survey year and the inauguration year of the provision of subsidized sanitary napkins through generic pharmacies in the individual's subdistrict on the x-axis. Since we have only one pre-policy wave of the (geo-coded) NFHS surveys, we leverage the variation in the years the surveys were conducted. The y-axis represents the average treatment effect on menstrual pad adoption, calculated using the difference-in-differences estimator by Callaway and Sant'Anna (2021). Notably, no positive average treatment effect is observed before subsidized sanitary napkins become available at a generic pharmacy.

### 4.1.1 Waste Disposal, Private Toilet, and Travel Autonomy

The analysis in Table VIII investigates how the effectiveness of the provision of subsidized sanitary napkins through generic pharmacies varies by whether the individual has access to waste disposal,

access to a private toilet, and is allowed to go out alone.

Waste Disposal: Columns (1) and (2) of Table VIII analyze women living in rural neighborhoods, for whom we matched their village to the Mission Antyodaya data. Section 2 provides sample creation and descriptive statistics details.

In Column (1) of Table VIII, our analysis shows that among women with access to waste disposal, those in subdistricts where subsidized sanitary napkins are available through generic pharmacies are 10 percentage points more likely to use sanitary napkins to manage their menstrual period. In Column (2), among women without waste disposal access, those in such subdistricts are seven percentage points more likely to use sanitary napkins. The t statistic for this difference is 3.8, indicating that the increase in sanitary napkin usage is statistically significantly higher among women with waste disposal access than those without. Panel (B) of Table VIII presents the analysis

FIGURE IV: Event Study Plot: Menstrual Health Management
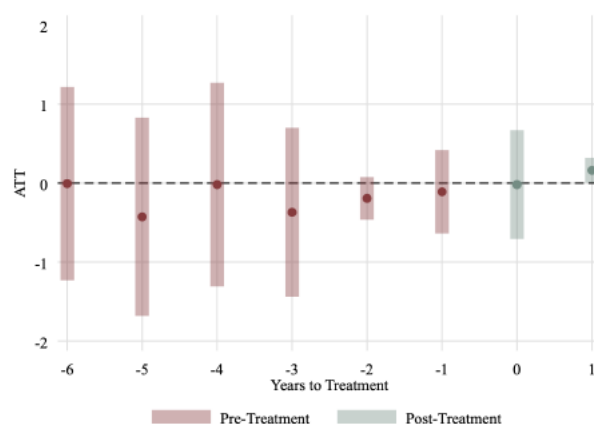
Note: This is the event study plot for the ATT of a generic pharmacy on adopting sanitary napkins, constructed using the difference-in-differences estimator by Callaway and Sant'Anna (2021). The x-axis depicts the difference between the survey year and the inauguration of a generic pharmacy in the individual's subdistrict. The analysis includes religion, caste, wealth index, urban residence indicators, and district fixed effects.

Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

for the exclusive use of sanitary napkins. Among women with access to waste disposal, the effect of providing subsidized sanitary napkins through generic pharmacies on exclusive sanitary napkin use is 18 percentage points. In contrast, it is around two percentage points without waste disposal access. The t statistic of 14.7 indicates a statistically significant difference.

Moreover, the second difference is relatively larger, given the baseline averages. While the difference in treatment effect on the use of sanitary napkins is 4 percentage points (20 percent increase for women with waste disposal access vs. 16 percent increase for women without), there is a 59 percentage points difference in the exclusive use of sanitary napkins (68 percent increase for women with waste disposal access vs. 9 percent increase for women without). This finding underscores the importance of waste infrastructure in facilitating the complete transition from cloth to sanitary napkins. Cloth can be washed and reused, but the disposal of sanitary napkins requires

TABLE VIII: Treatment Effect of the Provision of Sanitary Napkins by Waste Disposal Access, Private Toilet Owneship, and Travel Autonomy

	(1)	(2)	(3)	(4)	(5)	(6)
	Waste Disposal		Private Toilet		Travel Autonomy	
	Yes	No	Yes	No	Yes	No
Panel A: MHM method is *Pad*						
$\hat{\tau}$	0.100	0.069	0.080	0.103	0.190	0.131
	(0.008)	(0.008)	(0.006)	(0.007)	(0.013)	(0.012)
t		−2.741		2.526		−3.347
Mean	0.493	0.431	0.691	0.397	0.653	0.501
Panel B: MHM method is *Only Pad*						
$\hat{\tau}$	0.182	0.018	−0.004	0.052	0.049	0.034
	(0.008)	(0.008)	(0.006)	(0.006)	(0.014)	(0.011)
t		−14.693		6.216		−0.828
Mean	0.269	0.201	0.424	0.201	0.412	0.274
Obs	148,995	137,672	285,959	189,454	32,019	44,779

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. Columns (1), (2), and (3) present the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for the entire sample, a sample of women who have access to a private toilet, and a sample of women who do not have access to a private toilet, respectively. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. Standard errors are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

adequate waste infrastructure, which needs to be improved in many regions of India. Without such infrastructure, women resort to flushing, burning, or burying menstrual products, leading to further infrastructural and environmental issues (Mahon and Fernandes, 2010; Elledge et al., 2018; Bhor and Ponkshe, 2018).

The Government of India has started to address menstrual hygiene within the waste management framework of the *Swachh Bharat Mission* (Press Information Bureau, 2022). Additionally,

the generic program has recently expanded its inventory to include menstrual cups that do not have the same disposal issue as sanitary napkins. This development falls outside the timeframe that our analysis covers (Jan Aushadhi, 2022).

Research has shown enthusiasm for menstrual cups in South Asian contexts, alleviating concerns about their adoption in the region (Oster and Thornton, 2011, 2012). There is merit in exploring reusable menstrual products like the menstrual cup, which can significantly address waste management challenges and improve menstrual hygiene practices.

Private Toilet: Columns (3) and (4) of Table VIII examine the impact of providing subsidized sanitary napkins, varying by whether the woman has access to a toilet exclusively for their family's use.

Among women with private toilet access, those residing in a subdistrict with subsidized sanitary napkins available at generic pharmacies are eight percentage points more likely to use sanitary napkins than those without such provision (Column 5). Conversely, among shared toilet users, there is a ten percentage point increase in sanitary napkin usage due to exposure to the availability of subsidized sanitary napkins (Column 6). This difference is statistically significant, as highlighted by a *t* statistic of 2.5.

Panel B indicates that among private toilet users, those in subdistricts with subsidized sanitary napkin provision are 0.4 percentage points less likely to use sanitary napkins exclusively, but this effect is not statistically significant. However, for those without private toilet access, there is a four percentage point increase in the likelihood of using sanitary napkins exclusively when exposed to this provision, and this effect is statistically significant.

Overall, there is a relatively higher increase in the use of sanitary napkins and a decrease in the use of cloth due to exposure to subsidized sanitary napkins through generic pharmacies among women without access to a private toilet compared to women who have this access. This could be because women who share a toilet with people other than their family members often reside in urban slums with crowded housing (Chakravarthy, Rajagopal, and Joshi, 2019). These women may find it more embarrassing or uncomfortable to manage their period with cloth that requires frequent washing and drying. Therefore, they may have a higher incentive to adopt sanitary napkins.

Autonomy: Columns (5) and (6) examine the role of women's autonomy in mediating the effectiveness of providing subsidized sanitary napkins through generic pharmacies. The analysis is based on a smaller sample of women who were asked autonomy questions. Further details on this smaller sample are provided in the Online Appendix A.

In Column (5), among women who are allowed to go alone to the market, those residing in a subdistrict with the availability of subsidized sanitary napkins at generic pharmacies are 19 per-

centage points more likely to use sanitary napkins than their counterparts without access to such provision. In contrast, in Column (6), among women who are not allowed to go outside alone, the effect is 13 percentage points. The *t* statistic is 3.3.

In Panel B, among women with travel autonomy, the provision of subsidized sanitary napkins results in a five percentage point increase in exclusive sanitary napkin use. For those without travel autonomy, the increase is three percentage points. However, the difference in these effects is not statistically significant.

TABLE IX: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty by Amenities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Hospital		Supermarket		Pharmacy		Anganwadi		School	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Panel A: MHM method is *Pad*										
$\hat{\tau}$	0.098	0.073	0.098	0.071	0.163	0.073	0.089	0.081	0.061	0.135
	(0.006)	(0.007)	(0.008)	(0.005)	(0.009)	(0.005)	(0.011)	(0.007)	(0.009)	(0.008)
t		−2.851		−8.185		−8.390		−0.590		6.171
Mean	0.617	0.533	0.592	0.575	0.569	0.588	0.446	0.470	0.465	0.462
Panel B: MHM method is *Only Pad*										
$\hat{\tau}$	−0.006	0.025	−0.006	0.020	−0.002	0.014	−0.060	0.045	−0.011	0.133
	(0.006)	(0.006)	(0.008)	(0.005)	(0.010)	(0.005)	(0.011)	(0.006)	(0.008)	(0.007)
t		3.747		1.768		1.484		8.378		13.147
Mean	0.374	0.290	0.364	0.322	0.342	0.337	0.212	0.246	0.234	0.238
Obs	397,139	323,813	312,969	407,983	291,059	429,893	79,282	207,385	118,121	168,546

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. This table presents the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for women in subdistricts where a generic pharmacy either did not open or opened near specific amenities within a 5-minute driving distance. Column (1) compares outcomes when a generic pharmacy did not open or open near a hospital, and Column (2) compares outcomes when a generic pharmacy did not open or open in an area with no hospital. Similarly, Columns (3) and (4) present the results for a supermarket, and Columns (5) and (6) for a non-generic pharmacy. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. Standard errors, clustered at the PSU level, are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India. Geoapify Places API.

Overall, the finding that the increase in sanitary napkin use due to the proliferation of generic pharmacies is statistically significantly lower among women who lack the autonomy to go out alone than women who have this autonomy suggests the importance of travel autonomy for the adoption of sanitary napkins, possibly due to higher freedom to access these products. However, the finding that there is no such difference in the abandonment of cloth between women with and without travel autonomy indicates that more than travel autonomy is needed to facilitate the complete transition from cloth to sanitary napkins. While overcoming cultural and safety barriers can facilitate the adoption of sanitary napkins, reducing reliance on cloth will likely require better infrastructural support.

Online Appendix A contains further analysis where we construct an autonomy index based on whether the woman can go alone to the market, health facility, and outside the village. We find similar results when using this autonomy index.

4.1.2 Location Complementarities

The analysis presented in Table IX examines how the presence of amenities such as hospitals, supermarkets, and non-generic pharmacies mediates the effect of the provision of sanitary napkins through generic pharmacies program on menstrual health management.

Columns (1) and (2) focus on the presence of hospitals near generic pharmacies. Women living in a subdistrict where subsidized sanitary napkins are provided through generic pharmacies near a hospital are ten percentage points more likely to use sanitary napkins compared to those in a subdistrict without such provision. In contrast, women are seven percentage points more likely to use sanitary napkins when a generic pharmacy opens in an area without a hospital than those living in a subdistrict without such a pharmacy. The difference is statistically significant, as highlighted by a t statistic of 2.9. In contrast, Panel B shows that the effect of the provision of

TABLE X: Treatment Effect of the Provision of Sanitary Napkins on Educational Attainment

	(1)
	Years of Schooling
$\hat{\tau}$	0.63
	(0.110)
Mean	10.76
Obs	113,396

Panels A and B estimates are based on Sant'Anna and Zhao's (2020) DiD analysis, and Panel C is based on Callaway and Sant'Anna's (2021)'s DiD analysis. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. Standard errors, clustered at the PSU level, are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

subsidized sanitary napkins is not statistically significant on exclusive sanitary napkin usage when a generic pharmacy opens near a hospital. However, women are 2.5 percentage points more likely

to exclusively use sanitary napkins when a generic pharmacy opens in an area without a hospital, compared to those living in a subdistrict without such a pharmacy. This difference is statistically significant ($t = 3.7$).

In Columns (3) to (6), we observe similar patterns in the effectiveness of the provision of subsidized sanitary napkins through generic pharmacies relative to the presence of a supermarket or a non-generic pharmacy – indicating spatial complementarities. It is possible that people frequent a hospital, non-generic pharmacy, or supermarket for their routine healthcare or shopping needs, and they may come across subsidized sanitary napkins if a generic pharmacy is located nearby, therefore adopting these products to manage their period.

Panel B, Columns (3) to (6) show similar patterns in the exclusive use of sanitary napkins as well, i.e., the increase in the exclusive use of sanitary napkins is higher when the generic pharmacy established in an area without a supermarket or non-generic pharmacy nearby. This indicates a possible excess demand in healthcare or shopping areas, which has yet to be met with the current supply chain of subsidized sanitary napkins.

FIGURE V: Event Study Plot: Educational Attainment
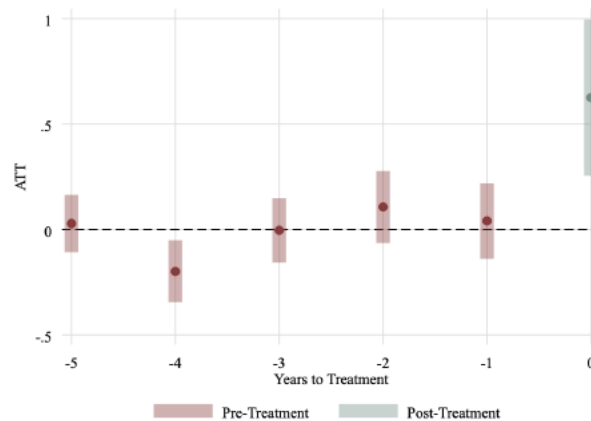
Note: This is the event study plot for the ATT of a generic pharmacy on years of education, constructed using the difference-in-differences estimator by Callaway and Sant'Anna (2021). The x-axis depicts the difference between the year of menarche and the inauguration of a generic pharmacy in the individual's subdistrict. The analysis includes religion, caste, wealth index, urban residence indicators, and district fixed effects.

Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

4.2 Effect on Educational Outcomes

This section examines the educational outcomes, specifically years of schooling and learning achievements. We begin by analyzing the NFHS data to assess the impact of a woman's exposure to a generic pharmacy before menarche on her educational attainment. Subsequently, we analyze the ASER data to evaluate how exposure to a generic pharmacy before age 10 affects a woman's likelihood of remaining enrolled in school until at least age 13 and her math and reading proficiency levels.

4.2.1 Effect on Educational Attainment (NFHS)

Table X presents the ATT of providing subsidized sanitary napkins on educational attainment, as specified in Equation (8) using NFHS data. This analysis controls for religion, caste, wealth index, urban/rural residence indicators, and district fixed effects, with standard errors clustered at the primary sampling unit level. Women in subdistricts where subsidized sanitary napkins were available at a generic pharmacy before menarche stayed in school 0.63 years longer on average. This represents a 6 percent increase over the average of 11 years of schooling among women who were never exposed to subsidized sanitary napkins through generic pharmacies. The analysis includes women enrolled in school at least until they reached menarche.

Figure V displays the corresponding event study plot. The x-axis depicts the difference between the year of menarche and the inauguration year of the provision of subsidized sanitary napkins through a generic pharmacy in the individual's subdistrict. The y-axis illustrates the ATT of exposure to this provision on years of schooling, calculated using the difference-in-differences estimator by Callaway and Sant'Anna (2021).

4.2.2 Effect on School Dropout and Learning Outcomes (ASER)

For this analysis, we use the ASER data, focusing on girls who were at least 13 years old at the time of the survey and were enrolled in school until age 10. The outcome variable is defined as dropping out of school by age 13. We examine math and reading levels for learning outcomes, measured on a scale from 1 to 5. The covariates include indicators of household assets (such as toilet, electricity, TV, phone, and house type) and parents' educational attainment. The treatment variable is the presence of subsidized sanitary napkins at a generic pharmacy within the district. Due to ASER data constraints, we can only identify geographic locations within the district level.

Table XI presents the results of a synthetic differences-in-differences analysis for 580 districts observed over a panel of 10 years to analyze the impact of the provision of subsidized sanitary napkins through generic pharmacies on educational outcomes of girls and boys. The Online Appendix C presents the corresponding trend plots.

Panel A of Table XI shows that girls exposed to the provision of subsidized sanitary napkins through a generic pharmacy in their district before they turn 10 are one percentage point less likely to drop out of school before the age of 13, which translates to about a 3 percent decrease in the dropout rate. Additionally, their math and reading levels are higher by 0.05 and 0.06 units on a scale of 0 to 4, respectively. These improvements represent approximately 2 percent increases in both math and reading levels.

Panel B of Table XI presents the analysis for boys' outcomes. The findings indicate no statistically significant effect on the dropout rates or math levels of boys exposed to the provision of subsidized sanitary napkins through a generic pharmacy in their district before they turn 10. However, we find a 0.04 increase in reading levels on a scale of 0 to 4, corresponding to a 1 percent increase.

TABLE XI: Treatment Effect of the Provision of Sanitary Napkins on School Dropout and Learning Outcomes

	(1)	(2)	(3)
	Dropout	Math	Reading
Panel A: Girls's Educational Outcomes			
ATT	-0.01**	0.05*	0.05**
	(0.00)	(0.03)	(0.02)
Mean	0.037	3.040	3.551
Panel B: Boys' Educational Outcomes			
ATT	0.00	0.02	0.04*
	(0.00)	(0.02)	(0.02)
Mean	0.032	3.128	3.534
Obs	558	558	558

Note: The estimates are based on Arkhangelsky et al.'s (2021) synthetic differences-in-differences. Covariates include district-level averages of household assets and parents' education. Standard errors are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; Annual Status of Education Report, 2008-2022, ASER Centre.

This improvement in boys' reading levels may result from positive spillover effects due to reduced female dropout rates and higher reading levels. This is consistent with literature on the positive peer effects of girls on boys' outcomes. For instance, Lavy and Schlosser (2011) find that increasing the proportion of girls in classrooms improves cognitive outcomes for both boys and girls. These academic gains are attributed to lower classroom disruption and violence levels, better inter-student and student-teacher relationships, and reduced teacher fatigue. Similarly, Dewan et al. (2024) find that a higher proportion of female classmates in a cohort significantly boosts test scores

for both male and female students in India. They also note that the positive gender peer effects are primarily driven by an improved classroom environment rather than direct achievement spillovers.

Summary of Results: The provision of subsidized sanitary napkins through generic pharmacies increases their usage and reduces reliance on cloth for menstrual management, though the reduction in cloth usage is less pronounced. Access to waste disposal is crucial for adopting sanitary napkins and facilitating a complete transition from cloth to alternatives that require proper disposal infrastructure. Comprehensive sanitation policies are necessary to ensure coordination between menstrual hygiene and waste management, and reusable options like menstrual cups should be promoted.

Women without private toilets may need sanitary napkins as managing cloth in shared facilities can be embarrassing. Prioritizing neighborhoods with crowded housing for subsidized sanitary napkins is beneficial. Women lacking the autonomy to go out alone are less likely to adopt sanitary napkins, highlighting cultural or safety barriers. Customized targeting, such as reducing the stigma around purchasing sanitary napkins by family members and providing door-to-door deliveries, could help these communities.

When generic pharmacies are located near healthcare or shopping facilities, the adoption of sanitary napkins is higher, indicating that routine visits to these areas may increase awareness of subsidized menstrual products. This suggests that better affordability, not just better access, drives the increase in sanitary napkin adoption, as these areas already have high access to sanitary napkins at market prices. However, the dependence on cloth increases less when generic pharmacies provide subsidized sanitary napkins near healthcare or shopping facilities, possibly due to supply bottlenecks. High-demand areas may need prioritization to address this issue.

Lastly, our analysis of education outcomes highlights that girls are likelier to stay in school longer and achieve higher learning outcomes when they have access to subsidized sanitary napkins at an age when they are most vulnerable to dropping out of school or falling behind due to inadequate menstrual management resources.

5 Conclusion

Our study provides detailed insights into the impact of the availability of subsidized sanitary napkins on their adoption, specifically through the *Pradhan Mantri Bhartiya Janaushadhi Pariyojana* (PMBJP) program in India. This is a nationwide generic pharmacy program rolled out temporally and spatially staggered to provide subsidized generic health products. For our analysis, we use administrative data on the location and date of establishment of the generic pharmacies, individual health and education surveys, village infrastructure surveys, and spatial API data to gather com-

pelling evidence on the program's effectiveness in promoting sanitary napkins among women. Using a robust difference-in-differences estimation strategy, we find that women exposed to generic pharmacies are more likely to embrace subsidized sanitary napkins than those without access to such pharmacies. Moreover, these women are more likely to transition from cloth to sanitary napkins. We also find that girls exposed to a generic pharmacy will likely stay in school longer and have higher learning outcomes.

Furthermore, we investigate the role of various demand-side factors that can either enhance or hinder the treatment effect. Women with access to waste disposal infrastructure are more likely to adopt sanitary napkins. Without waste disposal, women have resorted to burning, burying, or disposing of used sanitary napkins in water bodies, as the disposal of sanitary napkins is often associated with social stigma and embarrassment. In contrast, cloth can be washed and reused. This finding highlights the importance of waste management in facilitating the switch to disposable menstrual products and the need for more holistic policymaking, akin to the inclusion of menstrual health management under the umbrella of the *Swachh Bharat Mission*, and the promotion of reusable alternatives such as the menstrual cup.

Conversely, women lacking access to private toilets demonstrate a stronger inclination towards transitioning to sanitary napkins, as they offer a convenient solution for managing periods without requiring frequent washing, like cloth-based methods. Using cloth as a menstrual management method requires a private space, which can be challenging for women living in crowded housing where multiple families share a single toilet. Therefore, the availability of subsidized sanitary napkins in such neighborhoods would be a welcome change. As plans are made to expand the network of pharmacies offering subsidized sanitary napkins, careful consideration should be given to prioritizing neighborhoods based on their specific needs, considering potential supply chain issues and limited stock availability.

Women not permitted to go out alone face barriers in accessing sanitary napkins, impacting their adoption of hygienic methods. Even when subsidized sanitary napkins are available, women may be unable to access them due to societal restrictions or safety concerns restricting their movement outside the home. Additionally, purchasing these products may be associated with embarrassment, making it difficult for women to have them procured on their behalf by men. Policymakers should target such neighborhoods with specific interventions, including initiatives to eliminate the stigma surrounding sanitary napkins, emphasize the importance of women's access to healthcare, and facilitate the door-to-door delivery of these products.

The disparity in adoption rates between women with and without waste disposal access is more prominent in transitioning from cloth to sanitary napkins than in the initial adoption of sanitary napkins. In contrast, the difference in adoption rates between women with and without autonomy is more noticeable in sanitary napkin adoption than in cloth abandonment. Cultural norms and

safety concerns influence sanitary napkin adoption, whereas infrastructural support is crucial for transitioning from cloth to disposable products.

The treatment effect is more pronounced when generic pharmacies open near established hospitals, supermarkets, or non-generic pharmacies, potentially due to higher foot traffic in these neighborhoods. Individuals engaged in routine activities, such as shopping or medical visits, are more likely to encounter generic pharmacies and discover subsidized products, increasing sanitary napkin adoption. In contrast, the impact on cloth abandonment is more prominent when generic pharmacies open in healthcare deserts compared to areas near existing healthcare facilities. This difference may arise from neighborhoods with healthcare facilities already having a higher demand for hygienic menstrual products, driven by better-informed individuals and higher footfall. This underscores the importance of tailoring supply chain strategies to match demand variations in different community contexts. While this suggests potential supply chain challenges in meeting excess demand near healthcare facilities, the more substantial effect on cloth abandonment in healthcare deserts highlights the program's efficacy in addressing menstrual hygiene gaps in underserved areas.

In conclusion, our study has significant implications for policymakers and stakeholders in promoting menstrual hygiene in India and similar contexts. It highlights the need for a comprehensive policy approach that addresses the availability of affordable menstrual products and complementary policies that facilitate the higher adoption of these products. The PMBJP program is relatively recent, but its long-term impact on women's health, education, and labor outcomes remains to be determined. Future research endeavors could explore the sustained effects of the availability of affordable sanitary napkins on these outcomes.

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Online Appendix

Pharmacy Proximity and Period Poverty: Assessing the Impact of Subsidized Sanitary Napkin Availability on Menstrual Management

A. Travel Autonomy

B. Excluding "Never Treated" Individuals

C. Trend Plots

A   Travel Autonomy

NFHS asked women about their autonomy to go alone to the market, healthcare facility, and outside the village, with response options including "yes," "with someone else," and "not at all." It is important to note that not all women were posed this question, resulting in a smaller sample size. Descriptive statistics, akin to those in Table II, are provided for this subsample in Table A.1.

In addition to examining the impact of the generic pharmacy program on menstrual management based on whether women are allowed to go to the market alone, we explore these effects through an autonomy index. This index shows whether the woman can go alone to the market, healthcare facility, and outside the village. The autonomy index distinguishes between three levels of autonomy: "not at all," "only with someone else," and "alone." The analysis stratifies the effects for women above and below the median of the autonomy index. Table A.2 presents the results, highlighting the influence of exposure to a generic pharmacy on sanitary napkin adoption and cloth abandonment based on whether a woman's autonomy is above or below the median of the autonomy index.

TABLE A.1: Descriptive statistics

	(1)	(2)	(3)	(4)	(5)
	Mean	S.D.	Conditional probability of using only pad
			No	Yes	Difference
Religion					
Hindu	0.73	0.44	0.40	0.38	−0.02***
Muslim	0.16	0.36	0.40	0.32	−0.08***
Other	0.11	0.31	0.37	0.51	0.14***
Caste					
Scheduled Caste	0.19	0.39	0.39	0.37	−0.02***
Scheduled Tribe	0.18	0.39	0.39	0.34	−0.05***
Other Backward Caste	0.40	0.49	0.39	0.37	−0.02***
General Caste	0.23	0.42	0.36	0.45	0.09***
Education					
No education	0.09	0.28	0.41	0.12	−0.29***
Primary education	0.07	0.26	0.40	0.17	−0.23***
Secondary education	0.68	0.47	0.37	0.39	0.02***
Higher education	0.16	0.36	0.34	0.60	0.26***
Wealth					
Poorest	0.20	0.40	0.44	0.16	−0.28***
Poorer	0.23	0.42	0.42	0.27	−0.15***
Middle	0.22	0.41	0.38	0.40	0.02***
Richer	0.19	0.40	0.35	0.51	0.16***
Richest	0.15	0.36	0.33	0.67	0.33***
Neighborhood					
Urban	0.25	0.43	0.33	0.55	0.22***
Sanitation					
Access to private toilet	0.60	0.49	0.26	0.47	0.22***
Autonomy					
Can go alone to market	0.42	0.49	0.34	0.45	0.12***
Can go alone to health facility	0.35	0.48	0.35	0.46	0.11***
Can go alone outside village	0.36	0.48	0.35	0.44	0.08***
NFHS					
Round 2	0.46	0.50	0.33	0.45	0.12***
PMBJP					
PMBJP Pharmacy in subdistrict	0.49	0.50	0.35	0.42	0.06***
Observations					76,798

Note: This table presents the mean and standard deviations of binary indicators characterizing individual, household, and neighborhood information of women aged 15-24 who were asked autonomy questions in both rounds of NFHS. Columns (4) and (5) showcase the mean share of women exclusively using sanitary napkins, conditional on the particular variable being equal to one and zero, respectively. For example, the first row provides the means based on whether the woman is Hindu. Column (6) presents the difference between these means and their statistical significance. Significance levels: $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development Ministry of Rural Development, Government of India

TABLE A.2: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty by Woman's Autonomy

	(1)	(2)	(3)
	Entire Sample	Above-average autonomy	
		Yes	No
Panel A: MHM method is *Pad*			
$\hat{\tau}$	0.162	0.192	0.121
	(0.008)	(0.011)	(0.011)
t			-4.405
Mean	0.561	0.634	0.503
Panel B: MHM method is *Only Pad*			
$\hat{\tau}$	0.063	0.058	−0.006
	(0.009)	(0.013)	(0.012)
t			-3.758
Mean	0.329	0.393	0.277
Obs	76,798	35,676	41,122

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. Columns (1), (2), and (3) present the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for the entire sample of were asked autonomy questions, a sample of women who are above the median of the autonomy index and sample of women who are below the median of the autonomy index, respectively. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. Standard errors are presented in parentheses.

Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

B   Excluding "Never Treated" Individuals

We narrow our focus to women residing in subdistricts where generic pharmacies *ever* opened, classifying the "early treated" individuals as "treated" and "late treated" individuals as the "control" group, thereby excluding those in subdistricts where generic pharmacies never opened. Table ?? presents the baseline specification, illustrating the effect of a generic pharmacy on adopting sanitary napkins and abandoning cloth.

TABLE B.1: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty by Access to Waste Disposal

	(1)	(2)	(3)
	Entire Sample	Has access to waste disposal	
		Yes	No
Panel A: MHM method is *Pad*			
$\hat{\tau}$	0.238	0.320	0.197
	(0.009)	(0.011)	(0.014)
t			-6.893
Mean	0.499	0.520	0.474
Panel B: MHM method is *Only Pad*			
$\hat{\tau}$	0.111	0.587	0.045
	(0.009)	(0.011)	(0.013)
t			-30.706
Mean	0.259	0.286	0.225
Obs	152,942	83,920	69,022

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. Columns (1), (2), and (3) present the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for the entire sample, a sample of women in neighborhoods with waste disposal systems, and a sample of women in neighborhoods without waste disposal systems, respectively.

Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. The control group consists of women residing in subdistricts where a generic pharmacy opened after NFHS-5; women in subdistricts where a generic pharmacy never opened are excluded. Standard errors are presented in parentheses. *Data source*: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India. Mission Antyodaya, Ministry of Rural Development, Government of India.

TABLE B.2: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty by Access to Private Toilet

	(1)	(2)	(3)
	Entire Sample	Access to private toilet	
		Yes	No
Panel A: MHM method is *Pad*			
τ̂	0.204	0.158	0.184
	(0.007)	(0.009)	(0.011)
t			1.836
Mean	0.593	0.720	0.443
Panel B: MHM method is *Only Pad*			
τ̂	0.045	−0.009	0.042
	(0.007)	(0.010)	(0.011)
t			3.452
Mean	0.349	0.451	0.229
Obs	283,451	181,360	102,091

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. Columns (1), (2), and (3) present the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for the entire sample, a sample of women who have access to a private toilet, and a sample of women who do not have access to a private toilet, respectively. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. The control group consists of women residing in subdistricts where a generic pharmacy opened after NFHS-5; women in subdistricts where a generic pharmacy never opened are excluded. Standard errors are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

TABLE B.3: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty by Woman's Autonomy

|	(1)	(2)	(3)
	Entire Sample	Can go to market alone	
		Yes	No
Panel A: MHM method is *Pad*			
$\hat{\tau}$	0.350	0.315	0.346
	(0.016)	(0.023)	(0.021)
t			0.968
Mean	0.610	0.698	0.552
Panel B: MHM method is *Only Pad*			
$\hat{\tau}$	0.162	0.095	0.164
	(0.017)	(0.026)	(0.021)
t			2.077
Mean	0.365	0.452	0.307
Obs	46,578	19,473	27,105

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. Columns (1), (2), and (3) present the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for the entire sample who were asked autonomy questions, a sample of women who have the freedom to go alone to the market, and a sample of women who are not allowed to go alone to the market, respectively. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. The control group consists of women residing in subdistricts where a generic pharmacy opened after NFHS-5; women in subdistricts where a generic pharmacy never opened are excluded. Standard errors are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India.

TABLE B.4: Treatment Effect of the Provision of Sanitary Napkins on Period Poverty by Amenities

	(1)	(2)	(3)	(4)	(5)	(6)
	Hospital		Supermarket		Pharmacy	
	Yes	No	Yes	No	Yes	No
Panel A: MHM method is *Pad*						
$\hat{\tau}$	0.175	0.290	0.153	0.251	0.155	0.226
	(0.007)	(0.007)	(0.009)	(0.007)	(0.010)	(0.007)
t		10.947		8.618		5.877
Mean	0.699	0.595	0.721	0.630	0.707	0.644
Panel B: MHM method is *Only Pad*						
$\hat{\tau}$	0.021	0.082	−0.012	0.071	−0.019	0.058
	(0.008)	(0.007)	(0.010)	(0.007)	(0.012)	(0.007)
t		5.585		6.615		5.717
Mean	0.439	0.325	0.477	0.357	0.461	0.375
Obs	205,177	131,851	121,007	216,021	99,097	237,931

Panel A: Outcome variable - Indicator for using sanitary napkins (including cloth). Panel B: Outcome variable - Indicator for using sanitary napkins exclusively. This table presents the doubly robust DiD estimates by Sant'Anna and Zhao (2020) for women in sub-districts where a generic pharmacy either did not open or opened near specific amenities within a 5-minute driving distance. Column (1) compares outcomes when a generic pharmacy did not open or open near a hospital, and Column (2) compares outcomes when a generic pharmacy did not open or open in an area with no hospital. Similarly, Columns (3) and (4) present the results for a supermarket, and Columns (5) and (6) for a non-generic pharmacy. Covariates include caste indicators, religion indicators, wealth index, urban residence indicators, and district fixed effects. The control group consists of women residing in subdistricts where a generic pharmacy opened after NFHS-5; women in subdistricts where a generic pharmacy never opened are excluded. Standard errors are presented in parentheses.
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; National Family Health Survey Rounds 4 and 5; Department of Rural Development, Ministry of Rural Development, Government of India. Geoapify Places API.

C Trend Plots

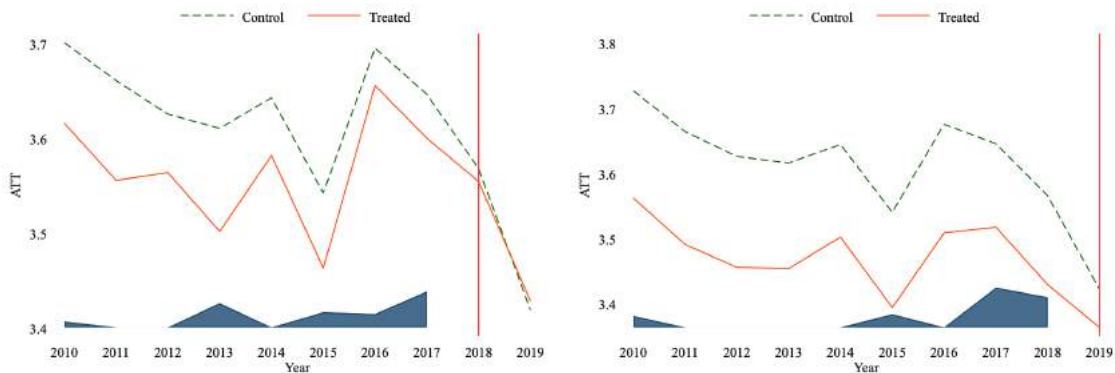FIGURE C.1: Trends in Educational Outcomes of Girls by Exposure to Generic Pharmacies
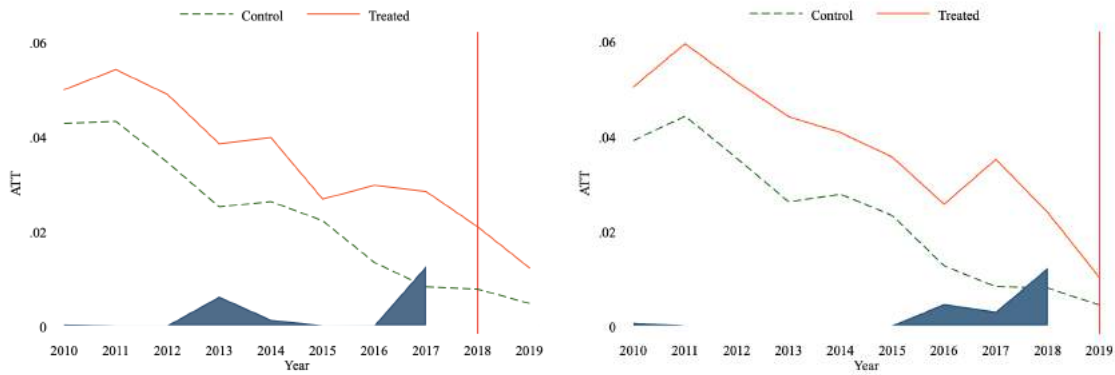
(a) Dropout
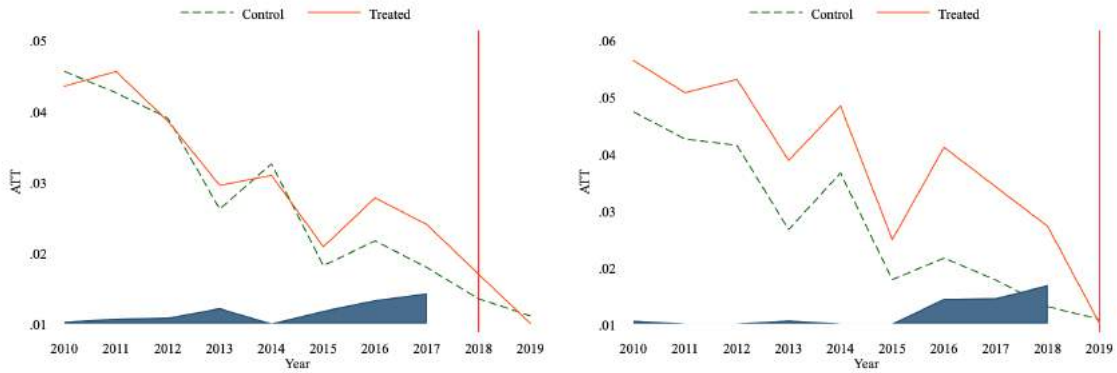

(b) Math Level

(c) Reading Level

Note: Figures present the trends in girls' educational outcomes (dropout, math level, and reading level) for control and treated districts.
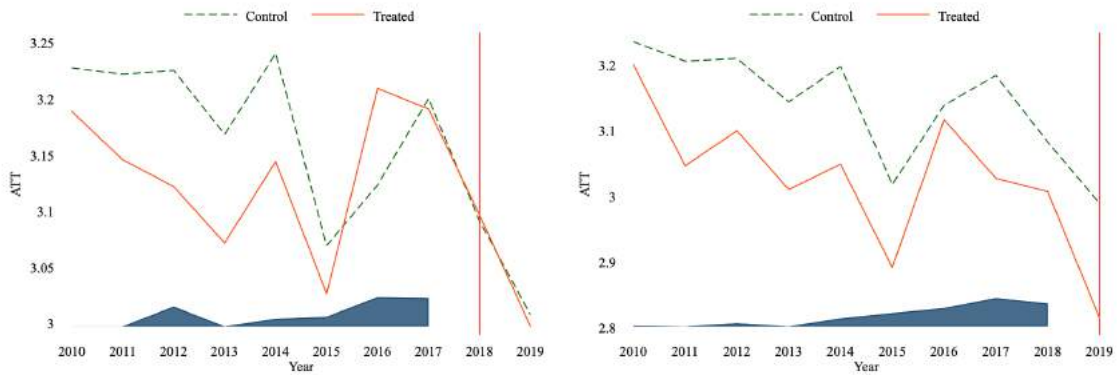
Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; Annual Status of Education Report, 2008-2022, ASER Centre.

FIGURE C.2: Trends in Educational Outcomes of Boys by Exposure to Generic Pharmacies
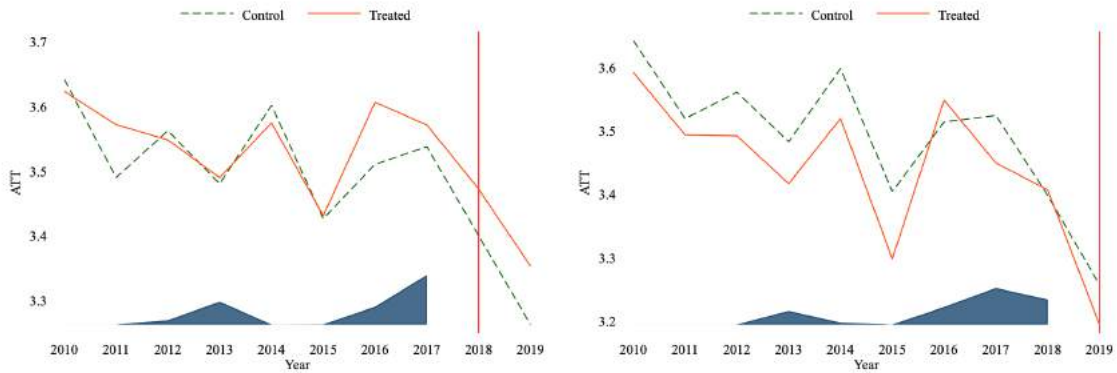
(a) Dropout

(b) Math Level

(c) Reading Level

Note: Figures present the trends in boys' educational outcomes (dropout, math level, and reading level) for control and treated districts.

Data source: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Government of India; Annual Status of Education Report, 2008-2022, ASER Centre.