The effect of supply-side conditional cash transfers on healthcare outcomes for women and children

Abstract

This study concludes that supply-side conditional cash transfers (SS-CCTs) significantly improve short-term healthcare outcomes for women and children in Afghanistan. Through a combination of randomized field experiments and observational data, the research identifies substantial increases in healthcare service utilization, especially among educated women and wealthier households. However, these benefits are not sustained in the long term, as healthcare quality and availability decline after the program ends. The findings highlight the critical need for sustainable program designs that maintain and extend these positive impacts to ensure lasting improvements in health outcomes for vulnerable populations.

Keywords: Supply-side conditional cash transfer; women's health; children's health; two-stage least squares; correlated random effects

***JEL* codes**: C10, C18, I10, I12

1. Introduction

Conditional cash transfer (CCT) schemes are social welfare programs offering incentive payments to individuals or households, contingent upon meeting specific predetermined conditions or criteria (Cahyadi *et al*., 2020). These programs address both demand- and supply-side issues, targeting various aspects of poverty and development. Implemented in over 60 developing and developed countries, CCTs aim to alleviate poverty and enhance social indicators such as education, health, and nutrition through investments in human capital accumulation (Parker & Todd, 2017). Particularly, CCTs have become increasingly prevalent in the health systems of low-income countries, where national health spending outcomes are poor and public sector resource allocation for health is often fragile and suboptimal (Van de Poel *et al*., 2016).

Afghanistan, a low-income country plagued by decades of conflict and political instability, exhibits some of the poorest national health indicators (Witvorapong & Foshanji, 2016). Its maternal mortality ratio (MMR) is the highest globally, reaching 620 deaths per 100,000 live births (Rahut et al., 2024), with many fatalities stemming from pregnancy-related conditions such as eclampsia, preeclampsia, bleeding, and lack of institutional delivery. The country also faces a high infant mortality ratio (IMR) of 36 deaths per 1,000 live births (Naziri *et al*., 2018).

However, between 2003 and 2017, Afghanistan made significant progress in reducing maternal and infant health mortalities with direct support from international funding agencies (e.g., the World Bank, European Commission, United States Agency for International Development) and national health system reforms. These efforts expanded healthcare coverage and improved population access to healthcare services in both rural and deeply rural areas. Yet, despite relative improvements in children and women's health indicators, over half of children aged 12–23 months remain unvaccinated and suffer from stunting, while only half of pregnant women give birth in institutional settings (Aalemi *et al*., 2020). Additionally, the utilization of other healthcare resources, such as modern contraceptive methods and childhood vaccinations, lags significantly behind regional and global standards (Hameed *et al*., 2023).

This study investigates the causal effects of supply-side CCTs (SS-CCTs) on women and children's healthcare outcomes, utilizing datasets generated from randomized field experiments and observational household surveys in Afghanistan. It contributes to the literature on CCT effects on maternal and child development and health-related human capital outcomes (Cahyadi *et al.*, 2020; De Brauw & Hoddinott, 2011; De Janvry & Sadoulet, 2006; Galiani & McEwan, 2013;

Millán *et al*., 2020). Specifically, this study advances the literature in three ways. First, it provides both short- and long-term causal effects of SS-CCTs on healthcare outcomes based on individual-level data, a departure from previous studies focused on short-term effects at the health-facility level (Osmani, 2021). Second, it contributes to the growing literature demonstrating the importance of bias-corrected estimates in experimental studies, presenting bias-corrected causal estimates using a two-stage least squares (2SLS) empirical model estimation method in the presence of imperfect compliance. Finally, understanding the mechanisms underlying the success and limitations of SS-CCT programs can inform more effective future interventions. Consequently, this study strives to identify the heterogenous effects of SS-CCTs and underlying mechanisms in directing the impact of SS-CCTs for the long-term.

The key findings reveal two broad effects of the SS-CCT scheme on women and children's healthcare outcomes. First, the program improved short-term healthcare outcomes. However, these effects diminished in the long term after program discontinuance. Second, the effects of SS-CCTs vary based on household wealth quantiles and women's educational status, with higher education and greater household economic resources significantly increasing healthcare service access and utilization.

The remainder of this paper is structured as follows: Section 2 focuses on the data and methods, while Section 3 presents empirical results and discussion. Section 4 presents estimates based on heterogeneity analysis, and Section 5 concludes the study with implications for policy.

2. Material and Methods

2.1. Data

The empirical analysis utilized three distinct datasets. First, data from a controlled randomized experiment were employed to assess the impact of SS-CCTs in Afghanistan. The SS-CCT program provided conditional cash incentives for healthcare workers (e.g., physicians, nurses, and midwives) at the health facility level. The program was supported by the Health Results Innovation Trust Fund—established to provide technical and financial support for interventions associated with reducing maternal and child mortality in low-income countries—managed by the World Bank (Naimoli, 2009). The impact evaluation study was jointly conducted by Johns Hopkins University (JHU) and the Indian Institute of Health Management Research (IIHMR) under a contract with the

Ministry of Public Health (MoPH) in Afghanistan, as part of efforts to strengthen health activities for poor rural projects.

To evaluate the effects of SS-CCTs, a field experiment was conducted before and after the program's implementation. The study sample comprised 430 clusters (villages or semi-urban areas) across the country, with 10 clusters per province. Households in each cluster were enumerated using data from the National Statistics and Information Authority of Afghanistan, and a random sample of households was selected for the survey. Each household was visited and information was collected using a household questionnaire. Ever-married women aged 12-49 and unmarried primary caretakers aged at least 18 with children between 0-59 months, whose mothers were deceased or no longer living in the household, were interviewed using a child health questionnaire. Randomization occurred at three levels: households, healthcare facilities, and villages. Key factors determining the sample size included the number of surveyors, security issues, and geographic distribution of the population. The final sample included 5,564 households, 140 health facilities, and 278 villages across nine provinces. Each province had eight control and eight treatment health facilities, totaling 374 health facilities in the nine provinces where SS-CCTs were implemented. These facilities were grouped by province and matched based on similarity. Facilities with high similarity were paired with each other, with one designated as control and the other as treatment, ensuring comparability. For the impact evaluation, each province included 16 health facilities (8 control and 8 treatment), 2 villages per facility (16 control and 16 treatment), and 20 households per village (320 control and 320 treatment). Appendix Table A1 summarizes the experimental data. Among the randomized households, 872 did not comply with the study framework due to factors such as internal migration, lack of education, and unavailability of healthcare services when needed. The experimental data was collected in accordance with the ethical standards established by the Afghan MoPH Institutional Review Board (IRB). Prior to initiating the impact evaluations, the IRB reviewed and approved the research protocol to protect the rights and welfare of participants.

Field monitoring teams conducted post-monitoring on 10% of the surveyed households to ensure data quality. The program manager and survey officer randomly selected households in a cluster in Kabul for post-monitoring. Additionally, field monitors revisited and reinterviewed households where the survey supervisor found discrepancies during the review of completed forms or re-interviews. To maintain the independence of the post-monitoring process, field monitors did not communicate directly with the field survey teams. Instead, the survey supervisor communicated findings and unreachable households to the survey officer at the central office of the SS-CCT program. The survey officer then created an assignment sheet for the field monitor team, including three types of households: (i) randomly selected households, (ii) households with discrepancies found by supervisors, and (iii) households or individuals needing callbacks. During active monitoring, monitors performed spot checks, observed interviews to ensure proper completion of questionnaires, and addressed queries from the data collection teams. They also confirmed that the proper listing process was followed and reported any observed discrepancies to the survey officer.

For the empirical analysis, we supplemented data from the randomized experiments by constructing unbalanced panel data using three waves (2012, 2015, and 2018) of the Afghanistan Health Survey (AHS). The AHS data enabled us to study the long-term effects of SS-CCTs on healthcare utilization for women and children after the program ended in 2013. The AHS waves of 2015 and 2018 were conducted by the KIT Royal Tropical Institute, while the 2012 wave was carried out by JHU and IIHMR as independent third parties. Each round collected nationally representative samples from each of Afghanistan's thirty-four provinces using a two-stage selection design. In the first stage, enumeration areas (EAs)[1] were chosen with probability proportional to size, and household listing activities were conducted for the selected EAs. In the second stage, a fixed number of households were randomly selected in each cluster through equal-probability systematic sampling based on the updated household listing. The sampling framework for both the SS-CCT program and the AHS was the household listing frame provided by the National Statistics and Information Authority. This framework identified the baseline and endline households that participated in the SS-CCT program and merged them with the experimental datasets. Table A2 shows the AHS data coverage for all provinces and those specifically covered by the SS-CCT program. Various healthcare outcomes for women and children were evaluated, detailed in Table A4 of the Appendix.

Additionally, we used the Balanced Scorecard, a strategic planning and management tool, to align the organizational activities of Afghanistan's MoPH with its vision and mission. This tool, applied to the Basic Package of Health Services (BPHS) in Afghanistan, assesses the performance

[1] An EA is a geographic area consisting of several dwelling units which serve as counting units for population census enumeration purposes. The EAs are relatively homogeneous in size, with an average of 159 households per EA.

and effectiveness of the BPHS in domains such as human resources, client and community, physical capacity, quality of services, and management. Specifically, we utilized healthcare worker motivation and quality of care index scores to investigate the underlying mechanisms associated with the long-term effects of SS-CCTs.

2.2. Econometric Models

Randomized experiments in empirical economics are considered the "gold standard" for evaluating the impacts of specific policies or programs, such as pay-for-performance and CCTs (Angrist *et al*., 2010, 1996). In these studies, subjects are randomly assigned to either a treatment or control group at baseline. Assuming perfect compliance, the estimating equation for obtaining the average treatment effects on the treated (ATET) at endline is:

$$Y_{ijk} = \beta_0 + \beta_1 T_j + \beta_2 X_{ij} + \varepsilon_{ijk}, \tag{1}$$

where Y_{ijk} is the outcome of interest for woman or child i, in household j, and village k. T_j is a binary variable indicating whether the household is assigned to the treatment group; X_{ij} represents the observable characteristics; and ε_{ijk} captures the model's residual term. Random assignment assumes that women and children are equivalent in both observed and unobserved characteristics at baseline, thus any differences in outcomes at endline can be attributed to the treatment effects.

If the perfect compliance assumption is violated, the estimated coefficient (β_1) comparing the average outcomes of the treatment group (ATET) and the control group could be biased. A potential solution to address imperfect compliance is to estimate the intention-to-treat (ITT) effect through a reduced-form equation by regressing the outcome variable on the treatment assignment rather than on actual treatment uptake (Angrist, 2006). The ITT effect reflects the impact of treatment assignment, regardless of whether the treatment is actually received. From a policy perspective, understanding the causal effects of SS-CCTs on those who comply with treatment assignment (actual take-up) is crucial (Heckman, 1995). Given the imperfect compliance in this study's experimental design, an instrumental variable (IV) estimation was used to recover the treatment effect for compliers. An IV affects the measured outcome indirectly through the treatment assignment variable. In a randomized experimental setting, treatment assignment serves as the IV that encourages participants to undergo treatment, thereby influencing the measured outcomes. Empirically, IV effects are estimated using a 2SLS regression approach:

$$T_j = \alpha_0 + \alpha_1 Z_j + \alpha_2 X_i + \kappa_j \tag{2}$$

$$Y_i = \delta_0 + \delta_1 \hat{T}_j + \delta_2 X_i + \zeta_i. \tag{3}$$

Equations (2) and (3) represent the first and second stages of the 2SLS estimation framework. The instrumental variable Z_i represents the random assignment of the intended treatment status. Given the heterogeneous treatment effects on the study population, the IV estimates represent the average causal effects for a subset of treated individuals, known as the local average treatment effects (LATE) (Angrist *et al*., 1996). There are three key assumptions for the validity of the IV in the 2SLS framework. First, the exclusion restriction assumption implies that the IV should not directly affect the outcome of interest. This holds in a randomized experimental setting, as individuals are randomly assigned to control and treatment groups. Second, the relevance assumption requires that the treatment status must affect the outcome of interest (e.g., receipt of immunization services) among compliers. Since the SS-CCT program in Afghanistan aims to increase healthcare utilization, this assumption is satisfied. Finally, the exogeneity condition is met because the treatment status was randomly assigned to women and children, ensuring the validity of the IV approach (Hoderlein & Mammen, 2007). The estimated coefficients in Equations (1) and (3) are presented in the empirical results section for comparison with the main results.

Using the AHS 2013-2018 observational data, we investigated the post-program termination effects of the SS-CCT program based on the history of control and treatment assignments. Although households were initially randomly assigned to treatment and control groups, the termination of the SS-CCT program in early 2013 did not ensure continued randomization. Consequently, unobservable factors could affect both the health-seeking behaviors of households and their utilization outcomes. To address potential self-selection bias, we used a three-period correlated random effects (CRE) model (Cabanillas *et al*., 2018; Osmani & Okunade, 2019) to estimate the post-termination effects of SS-CCTs:

$$y_{it} = \alpha_0 + \alpha_1(H_{it} - \bar{H}_{i(t-1)}) + \alpha_3(X_{it} - \bar{X}_{i(t-1)}) + (\upsilon_{it} - \bar{\upsilon}_{i(t-1)}) \quad (4)$$

where y_{it} is the outcome of interest for woman or child i at time t. H_{it} is a binary variable indicating whether the household was initially assigned to the treatment or control group, and $\bar{H}_i$ is the mean value of assignment across individuals. The model includes individual observable characteristics X_{it} and the error term υ_{it}.[2] Both fixed and random components are maintained, with between-effects added to account for the correlation of the variables of interest and controls with their mean values. The CRE model is an extension of the Mundlak regression (Wooldridge, 2019) that accommodates an endogenous variable correlated with the time averages of time-varying covariates. Additionally, the CRE model is advantageous for extracting unit-specific trends from covariates. The coefficient of interest, α_1, captures the causal effects of assignment status for the post-policy program termination periods.

3. Empirical results and discussion

3.1. Baseline and endline estimates

Table 1 presents the ordinary least squares (OLS) estimation results for the healthcare outcomes of women and children during the pre- (baseline) and post-intervention (endline) periods based on the experimental datasets. Columns (1) and (2) show the average values for the control and treatment groups, respectively, while Column (3) displays the differences between the treatment and control groups in the pre-intervention period. These estimates are not statistically significant, indicating minimal changes in mean values across samples. The lack of significant differences likely reflects the similarities between the control and treatment samples. In the post-intervention period, Columns (4) and (5) show the average values for the control and treatment groups, respectively, with Column (6) presenting the mean differences. Some outcomes, such as institutional delivery and BCG and Penta vaccine uptake, show statistically significant differences for both women and children. However, these post-intervention differences should be interpreted with caution, as the OLS estimates in Table 1 may be biased if compliance is imperfect (Jiang *et*

[2] Analytics of the CRE model are presented in Cabanillas et al. (2018) and Osmani and Okunade (2019).

al., 2024). Therefore, Tables 2 and 3 present the bias-corrected LATE on the treated for the impact of SS-CCTs on health outcomes for women and children based on 2SLS estimation.

Table 1. Means of the outcome variables for women and children at pre- and post- intervention and the mean differences[a] across treatment and control groups based on experimental data

	Baseline			Endline		
Women and children's health outcomes	Control Average (1)	Treatment Average (2)	Difference (Standard error) (3)	Control Average (4)	Treatment Average (5)	Difference (Standard error) (6)
Use of contraceptives	10.315	9.913	-0.402 (0.721)	12.212	13.791	1.579 (1.431)
Antenatal visit	56.895	56.991	0.096 (0.165)	56.672	57.219	0.547 (0.431)
Institutional delivery	26.517	27.325	0.808 (0.945)	28.541	30.917	2.376 (1.795)
Postnatal visits	25.147	26.398	1.251 (0.927)	30.309	32.264	1.955 (1.531)
OPD[c] at Health facility	64.931	63.013	-1.918 (1.541)	61.173	58.911	-2.262 (1.748)
BCG[c] Vaccine	73.212	73.921	0.709 (0.571)	76.456	80.411	3.955*** (1.441)
OPV[c]	55.173	56.011	0.838 (0.733)	56.183	58.515	2.332 (1.914)
Penta Vaccine	52.161	50.672	-1.489 (1.257)	55.553	51.917	-3.636*** (1.521)
Measles Vaccine	74.177	73.153	-1.024 (0.892)	76.291	74.668	-1.623 (1.515)

[a]The differences in columns (3) and (6) are estimated using equation (1) with standard errors clustered at the village level.

[b]Statistical significance at the 0.01, 0.05, and 0.10 levels are indicated by ***, **, and *, respectively.

[c]OPD = Outpatient Department, BCG = Bacille Calmette-Guérin TB vaccine, and OPV = Oral Polio Vaccine.

3.2. Short-term effects of SS-CCTs on women's healthcare outcomes

Table 2 presents the point estimates from the second stage of the 2SLS empirical models, quantifying the short-term effects of SS-CCTs on women's healthcare outcomes. Both OLS and 2SLS estimates are included for comparison. The OLS estimates are not significantly different from zero across specifications, likely due to selection bias in the treatment group and imperfect compliance. The point estimates in Column (2) show that SS-CCTs are causally associated with a 1.25 percentage point increase in contraceptive use, statistically significant at the 0.05 level. This effect represents a 12.6% increase relative to the treatment sample mean in the baseline pre-intervention period. Columns (4) and (6) show the causal effects on antenatal visits and institutional deliveries, respectively. The coefficient estimates for these outcomes are statistically significant at the 0.01 and 0.05 levels, indicating increases of 1.141 and 2.26 percentage points, respectively. These effects translate to increases of 2% and 8.27% compared to the baseline treatment sample mean.

Additionally, SS-CCTs are significantly associated with a 2.8 percentage point increase in postnatal visits. These results suggest that SS-CCTs significantly improve healthcare utilization among women in the postnatal period in the short term. The magnitude of the estimated coefficients in this study is slightly higher than those reported in previous studies conducted in other countries (Gertler & Vermeersch, 2013; Powell-Jackson & Hanson, 2012). This suggests that the IV method effectively captures the variation in endogenous variables, thereby correcting endogeneity bias.

Table 2. Effects of SS-CCTs on women's healthcare outcomes based on the experimental data[a]

Women's health outcomes	Use of contraceptives		Antenatal visits		Institutional delivery		Postnatal visits	
Empirical model	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)
Treatment	1.579 (1.431)	1.251** (0.521)	0.547 (0.431)	1.141** (0.481)	2.376 (1.795)	2.263** (1.161)	1.955 (1.531)	2.804* (1.595)
Number of observations	8,174	8,174	8,174	8,174	8,174	8,174	8,174	8,174
Socio-economic controls included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[a]Women's age and education status, household size, and wealth quantiles are included as controls. Standard errors are clustered at the village level.

[b]Statistical significance at the 0.01, 0.05, and 0.10 levels are indicated by ***, **, and *, respectively.

3.3. Short-term effects of SS-CCTs on children's healthcare outcomes

Table 3 presents the OLS (even columns) and 2SLS (odd columns) estimation results for comparison. The results generally show positive effects of SS-CCTs on women and children's healthcare outcomes, although they are insignificant for the oral polio vaccine (OPV) and measles vaccine. The number of outpatient department (OPD) visits to health facilities increases by 2.89 percentage points, corresponding to a 4.59% increase from the treatment sample mean at baseline. The 2SLS model estimates also reveal a statistically significant causal relationship between SS-CCTs and BCG vaccination uptake. Compared to control-group children in the post-intervention period, BCG vaccine uptake increases by 1.28 percentage points, a 1.73% rise from the treatment sample mean at baseline. The estimated effects of SS-CCTs on children's healthcare outcomes align with findings from previous studies (Barham & Maluccio, 2009; Gertler, 2004). However, the program's ineffectiveness in increasing the uptake of OPV3 and the measles vaccine may be due to misinformation and rumors leading to vaccine hesitancy, as well as cultural or religious beliefs contributing to vaccine refusal (Carrieri *et al.*, 2019). Additionally, decades-long military conflict and Afghanistan's long-standing instability have made it challenging for healthcare workers to safely reach and vaccinate children in some regions (Kremer & Glennerster, 2011).

Table 3. Effects of SS-CCTs on children's healthcare outcomes based on experimental data[a]

Children's health outcomes	OPD[b] at HF		BCG[b] Vaccine		OPV[b]		Penta Vaccine		Measles Vaccine	
Empirical model	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)	OLS (7)	2SLS (8)	OLS (9)	2SLS (10)
Treatment	-2.262 (1.748)	2.893**[c] (1.403)	3.955*** (1.441)	1.277** (0.613)	2.332 (1.914)	1.931 (2.131)	-3.636*** (1.521)	2.721* (1.616)	-1.623 (1.515)	0.921 (1.731)
Number of observations	7,806	7,806	7,806	7,806	7,806	7,806	7,806	7,806	7,806	7,806
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[a]Mother's age, education status, household size, household wealth quantiles, and infant's gender are included as control variables.
[b]OPD = Outpatient Department, HF = Healthcare facility, BCG = Bacille Calmette-Guérin Vaccine for Tuberculosis, and OPV = Oral Polio Vaccine.

[c]Standard errors are clustered at the village level. Statistical significance at the 0.01, 0.05, and 0.10 levels are indicated by ***, **, and *, respectively.

3.4. Long-term effects of SS-CCTs on women and children's healthcare outcomes

The parameter estimates of the CRE models in Table 4 were used to evaluate the long-term outcomes of SS-CCTs, defined as the years from 2013 to 2018, following the program's termination. The key variable of interest was the history of household assignment to control and treatment groups during the SS-CCT implementation phase. Contrary to the positive short-term effects of SS-CCTs on women and children, the long-term effects were mainly negative, except for institutional delivery. Contraceptive use and antenatal visits (Columns 1 and 2) declined by 0.91 and 4.76 percentage points, respectively, corresponding to reductions of 7.17% and 8.21% in the AHS sample mean for these outcomes. However, the long-term effects on institutional delivery (Column 3) remained positive, with an increase of 2.96 percentage points, or a 9.83% improvement from the sample mean.

The CRE model coefficients for children's healthcare outcomes (Columns 5-9) were also negative. OPD visits to health facilities decreased by 0.18 percentage points, a 0.29% reduction from the sample mean. The long-term reductions in children's immunization rates were all statistically significant. The uptake of the BCG vaccine and OPV decreased by 0.21 percentage points (0.27%) and 0.39 percentage points (0.67%), respectively. Vaccination rates for Penta and measles fell significantly by 1.75 percentage points (3.2%) and 1.15 percentage points (1.52%), respectively. These reductions were expected because children in the treatment group during the SS-CCT implementation phase were not age-eligible in the long run (i.e., during the 2013-2015 post-implementation years). In other words, the children included in the estimation sample were likely the second or third oldest children in the control and treatment families.

Table 4. Effects of SS-CCTs on women and children's healthcare outcomes based on observational data[a]

	Women's healthcare outcomes				Children's healthcare outcomes				
	Use of contraceptives (1)	Antenatal visits (2)	Institutional delivery (3)	Postnatal visits (4)	OPD at HF (5)	BCG vaccine (6)	OPV3 (7)	Penta vaccine (8)	Measles vaccine (9)
Assignment status	-0.912***[b] (0.353)	-4.760*** (0.629)	2.958*** (0.721)	-0.033** (0.013)	-0.178* (0.097)	0.210** (0.016)	-0.394** (0.183)	-1.751*** (0.288)	-1.145*** (0.305)
Number of observations	16,144	16,144	16,144	16,144	5,123	3,570	3,570	3,570	3,570
Mean of DV	12.7	58	30.1	33.7	61.2	77.9	58.2	54.7	75.3
Socio-economic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

controls and their means

[a]The key controls in these estimated models are: women and children's age, residence (urban vs rural), region (central, central highlands, east, North, Northeast, south, west), education (none, primary, secondary, or higher), exposure to media, wealth categories (poorest, second, third, fourth and richest), and parity status. The balanced repeated replication technique is used to adjust for the AHS survey design. OPD = Outpatient Department, HF = Healthcare facility, BCG = Bacille Calmette-Guérin Vaccine for Tuberculosis, and OPV = Oral Polio Vaccine. Standard errors are clustered at the village level.

[b]Statistical significance at the 0.01, 0.05, and 0.10 levels are indicated by ***, **, and *, respectively.

Several factors plausibly explain the long-term weakening of SS-CCTs' effects on the healthcare outcomes of both women and children. First, healthcare providers depended on the program's financial incentives, which are unsustainable in the long term. Without these incentives, providers likely reduced the availability and quality of services, limiting access to healthcare. Additionally, SS-CCTs influenced patient behavior. When patients perceived a decline in care quality or encountered access barriers due to changes in provider behavior, they became less inclined to seek medical care, leading to reduced long-term service utilization. Using a balanced scorecard, we empirically tested these mechanisms. Table A4 shows the estimated effects of healthcare quality and provider motivation indices by interacting them with the assignment status using the CRE model (Balli & Sørensen, 2013). Higher index values at treated facilities significantly increased healthcare services for women and children, while the main effects of assignment status and indices were zero and positive, respectively, at conventional statistical significance levels.

To assess the robustness of the findings, we re-estimated the CRE model using data from non-SS-CCT provinces. Table A5 presents the results, which test whether the findings were driven by the long-term effects of SS-CCTs or other factors. Most coefficient estimates are positive or statistically insignificant at conventional levels, confirming the reliability of our primary findings.

4. Heterogeneous analysis

We conducted a heterogeneous analysis to examine how the impact of SS-CCTs on the healthcare outcomes of women and children varies based on women's education status and wealth quintiles.

4.1. Short-term effects of SS-CCTs on women and children's healthcare outcomes by education status

Table 5 presents the causal effects of SS-CCTs on women's healthcare outcomes by educational status. Similar to the main results in Table 2, we observe positive and statistically significant estimated coefficients for all healthcare outcomes. However, the magnitudes of these estimates differ notably between uneducated and educated women. The effectiveness of SS-CCTs appears to be significantly higher for educated women compared to those who never attended school. Existing literature consistently highlights a strong association between healthcare outcomes and education (Becker, 2017; Cutler & Lleras-Muney, 2006; Eide & Showalter, 2011). Individuals with higher levels of education tend to lead longer and healthier lives compared to those with lower levels of education. This association extends across various health outcomes, including life expectancy, chronic disease prevalence, maternal and infant health, and overall well-being (Arendt *et a*l., 2021).

Table 5. Effects of SS-CCTs on women's healthcare outcomes by women's education based on experimental data[a]

	Never-attended school				Has attended some school			
	Use of contraceptives (1)	Antenatal visits (2)	Institutional delivery (3)	Postnatal visits (4)	Use of contraceptives (5)	Antenatal visits (6)	Institutional delivery (7)	Postnatal visits (8)
Treatment	1.191***[b]	0.847*	2.263**	2.804*	1.893***	2.176***	3.681***	3.413***
	(0.311)	(0.504)	(1.161)	(1.595)	(0.445)	(0.503)	(1.232)	(1.066)
Number of observations	7515	7515	7515	7515	659	659	659	659
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[a]2SLS regression estimates. Standard errors are clustered at the village level. Women's age, household size, and wealth quantiles are included as controls.

b. Statistical significance at the 0.01, 0.05, and 0.10 levels are indicated by ***, **, and *, respectively.

Table 6 displays the results for the short-term effects of SS-CCTs on children's healthcare outcomes by mother's education status. Columns 1-5 present the treatment effects for children whose mothers never attended school, while Columns 6-10 provide the estimated coefficients for children with educated mothers. These findings align closely with those in Table 5. All outcomes show positive effects of SS-CCTs for children with educated mothers, with these effects more pronounced compared to those in Table 5 and the estimated effects for children whose mothers never attended school. The spillover effects of maternal education on children's healthcare outcomes are well-documented in economics literature (Barrera, 1990; Cleland & Van Ginneken, 1988; Glewwe, 1999; Kemptner & Marcus, 2013). Maternal education enhances children's health outcomes through increased health knowledge, better hygiene practices, and improved access to quality healthcare services. Highly educated mothers are more likely to understand the importance of preventive care, including timely immunizations and nutritious diets, leading to improved health outcomes for children. Moreover, educated mothers are better equipped to navigate healthcare systems, understand health-related information, and advocate for healthcare access and the needs of their children.

Table 6. Effects of SS-CCTs on children's healthcare outcomes by mother's education status based on experimental data[a]

	Never-attended school					Attended some school				
	OPD at HF (1)	BCG vaccine (2)	OPV (3)	Penta vaccine (4)	Measles vaccine (5)	OPD at HF (6)	BCG vaccine (7)	OPV3 (8)	Penta vaccine (9)	Measles vaccine (10)
Treatment	2.123*** (0.513)	1.211** (0.542)	1.391 (1.524)	1.832** (0.716)	0.681** (0.286)	3.447*** (1.023)	2.642** (1.227)	0.851*** (0.230)	1.974* (0.949)	1.163*** (0.331)
Number of observations	7,262	7,262	7,262	7,262	7,262	538	538	538	538	538
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[a] 2SLS regression model estimates with controls for women and children's age, household size, and wealth quantiles. Standard errors are clustered at the village level.

[b] OPD = Outpatient Department, HF = Healthcare facility, BCG = Bacille Calmette-Guérin Vaccine for Tuberculosis, and OPV = Oral Polio Vaccine.

[c] Statistical significance at the 0.01, 0.05, and o.10 percent levels are indicated by ***, **, and *, respectively.

4.2. *Short-term effects of SS-CCTs on healthcare outcomes for women and children across household wealth quintiles*

Figures 1 and 2 illustrate the trend of the estimated 2SLS model effects of SS-CCTs on healthcare outcomes for women and children across five wealth quintiles (poorest, second, third, fourth, and most economically secure) of households. The estimated coefficients can be found in Tables A6 and A7.

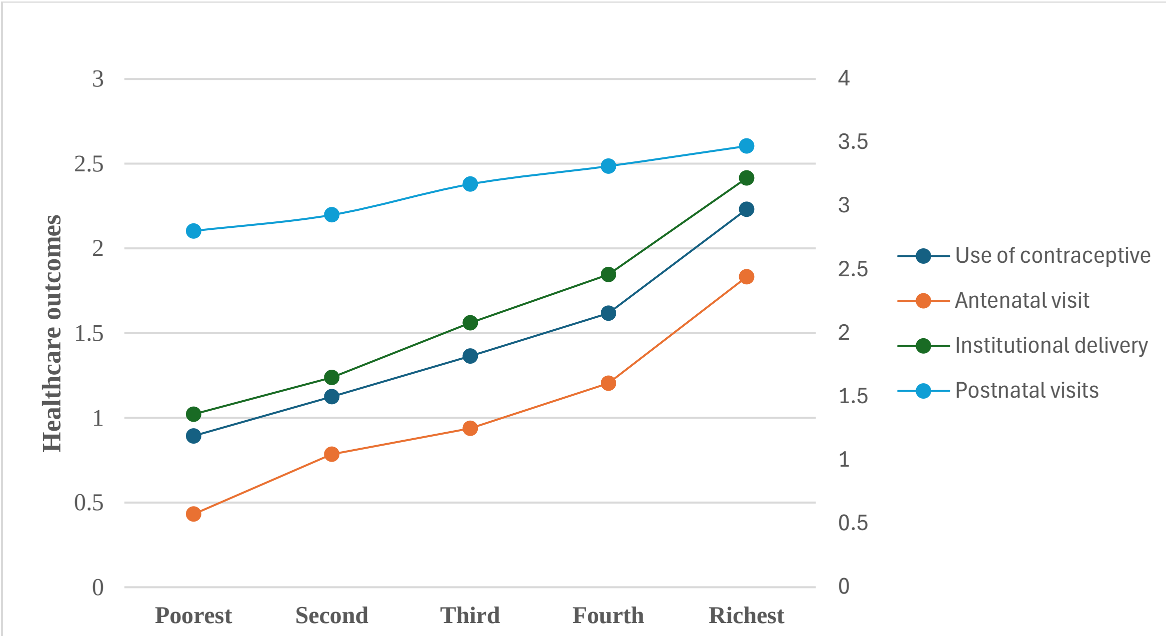

Figure 1. Effects of SS-CCTs on women's healthcare outcomes across household wealth quintiles

The effects of SS-CCTs on the healthcare outcomes of both women and children show an increasing rate of improvement with higher household economic resources, ranging from the poorest to the richest quintile. These findings align with existing literature on the impact of wealth on healthcare outcomes for women and children in developing countries. For instance, Arthur (2012) concluded that wealth significantly enhanced the utilization of antenatal care in Ghana. Similarly, Pathak and Singh (2011) observed that child malnutrition disproportionately affected households in the poorer wealth quintiles in India, regardless of their region of residence. One possible explanation for the correlation between higher household economic resources and improved health outcomes is the increased access to transportation to healthcare facilities, better education, and timely access to information on health-promoting behaviors such as vaccinations, prenatal and postnatal visits, and hygiene practices. As a result, women and children in more economically secure households are more likely to adopt healthier behaviors, ultimately leading to better health outcomes.

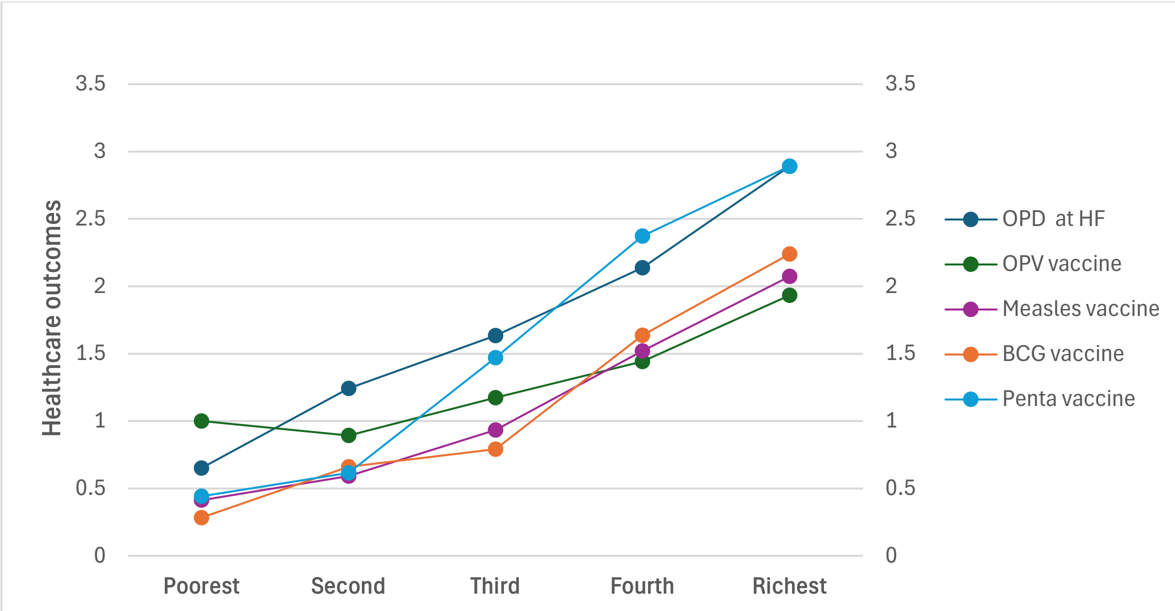

Figure 2. Effects of SS-CCTs on children's healthcare outcomes across household wealth quintiles

5. Conclusion

Developing countries continue to face significant health challenges stemming from limited access to essential healthcare services, poor infrastructure, constrained domestic resources, cultural norms, and low literacy rates (Kremer & Glennerster, 2011). Women and children face particularly complex health issues in these settings due to inadequate access to skilled birth attendants, emergency obstetric care, essential maternal and child healthcare services, and sporadic availability of age-appropriate immunizations. These challenges often result in life-threatening complications during childbirth and the early years of childhood.

This study utilized data from nationally representative controlled randomized experiments and observational health surveys to investigate the short- and long-term effects of a SS-CCT program on healthcare outcomes for women and children in Afghanistan. The bias-corrected 2SLS empirical model estimates revealed that SS-CCTs significantly enhanced healthcare utilization in the short term for women and children. However, following program termination, the impact of SS-CCTs on most outcomes reversed. This study shed light on a potential mechanism underlying the long-term negative relationship between SS-CCTs and healthcare outcomes. The diminished quality of healthcare services and lack of motivation among providers in treatment-group health centers substantially reduced the long-term effectiveness of SS-CCTs for the years following program discontinuance. Furthermore, this study investigated the causal effects of SS-CCTs on women and children's healthcare outcomes based on household wealth quintiles and women's educational status. Consistent with existing literature, higher levels of economic resources and women's education significantly enhanced healthcare utilization in the treatment group.

Given the significant short-term improvements in healthcare utilization for women and children, a viable policy avenue could be implementing SS-CCT programs to address immediate health needs and enhance access to essential healthcare services. To prevent the reversal of positive outcomes, securing sustainable funding and planning for the long-term continuation of SS-CCTs are crucial. Exploring diverse funding sources, including international aid, government budgets, and public-private partnerships, is essential. This study underscores the importance of maintaining high-quality healthcare services and motivated providers. Continuous training, proper remuneration, and support for healthcare workers are vital to sustaining the long-term positive effects of SS-CCTs. Additionally, SS-CCT programs should be tailored to address disparities in healthcare access based on household economic resources and educational status. By designing targeted interventions, funding agencies can ensure that the benefits of SS-CCTs effectively reach the most vulnerable populations.

The policy implications of SS-CCTs depend significantly on program design, implementation, long-term sustainability, provider commitment, and the socioeconomic factors of beneficiaries. When carefully crafted and effectively implemented, these programs can address challenges related to the quality and accessibility of healthcare services for women and children. Policymakers should be mindful of potential pitfalls and trade-offs to maximize the social welfare impacts and sustainability of SS-CCTs in both the short and long terms.

Despite the insights derived from this study, it has some limitations that must be acknowledged. As with many observational studies, the long-term effects of SS-CCTs on healthcare outcomes may be constrained by potential missing variables in the empirical analysis. These omitted variables could influence both the exposure and the outcomes, potentially leading to biased relationships. Furthermore, policies and economic conditions evolve over time, impacting both the long-term effects of SS-CCTs and healthcare outcomes. Additionally, the accuracy of data collected over extended periods can vary, and self-reported data are susceptible to recall bias.

Acknowledgements:

References

Aalemi, A. K., Shahpar, K., & Mubarak, M. Y. (2020). Factors influencing vaccination coverage among children age 12–23 months in Afghanistan: Analysis of the 2015 Demographic and Health Survey. *PLOS ONE*, *15*(8), e0236955. https://doi.org/10.1371/journal.pone.0236955.

Angrist, J. D. (2006). Instrumental variables methods in experimental criminological research: What, why and how. *Journal of Experimental Criminology*, *2*(1), 23–44. https://doi.org/10.1007/s11292-005-5126-x.

Angrist, J. D., Dynarski, S. M., Kane, T. J., Pathak, P. A., & Walters, C. R. (2010). Inputs and impacts in charter schools: KIPP Lynn. *American Economic Review*, *100*(2), 239–243. https://doi.org/10.1257/aer.100.2.239.

Angrist, J. D., Imbens, G. W., & Rubin, D. B. (1996). Identification of causal effects using instrumental variables. *Journal of the American Statistical Association*, *91*(434), 444–455. https://doi.org/10.1080/01621459.1996.10476902.

Arendt, J. N., Christensen, M. L., & Hjorth-Trolle, A. (2021). Maternal education and child health: Causal evidence from Denmark. *Journal of Health Economics*, *80*, 102552. https://doi.org/10.1016/j.jhealeco.2021.102552.

Arthur, E. (2012). Wealth and antenatal care use: Implications for maternal health care utilisation in Ghana. *Health Economics Review*, *2*(1), 14. https://doi.org/10.1186/2191-1991-2-14.

Balli, H. O., & Sørensen, B. E. (2013). Interaction effects in econometrics. *Empirical Economics*, *45*(1), 583–603. https://doi.org/10.1007/s00181-012-0604-2.

Barham, T., & Maluccio, J. A. (2009). Eradicating diseases: The effect of conditional cash transfers on vaccination coverage in rural Nicaragua. *Journal of Health Economics*, *28*(3), 611–621. https://doi.org/10.1016/j.jhealeco.2008.12.010.

Barrera, A. (1990). The role of maternal schooling and its interaction with public health programs in child health production. *Journal of Development Economics*, *32*(1), 69–91. https://doi.org/10.1016/0304-3878(90)90052-D.

Becker, G. (2017). *Economic theory*. Routledge.

Cabanillas, O. B., Michler, J. D., Michuda, A., & Tjernström, E. (2018). Fitting and interpreting correlated random-coefficient models using Stata. *STATA Journal: Promoting Communications on Statistics and Stata*, *18*(1), 159–173. https://doi.org/10.1177/1536867X1801800109.

Cahyadi, N., Hanna, R., Olken, B. A., Prima, R. A., Satriawan, E., & Syamsulhakim, E. (2020). Cumulative impacts of conditional cash transfer programs: Experimental evidence from Indonesia. *American Economic Journal: Economic Policy*, *12*(4), 88–110. https://doi.org/10.1257/pol.20190245.

Carrieri, V., Madio, L., & Principe, F. (2019). Vaccine hesitancy and (fake) news: Quasi-experimental evidence from Italy. *Health Economics*, *28*(11), 1377–1382. https://doi.org/10.1002/hec.3937.

Cleland, J. G., & Van Ginneken, J. K. (1988). Maternal education and child survival in developing countries: The search for pathways of influence. *Social Science and Medicine*, *27*(12), 1357–1368. https://doi.org/10.1016/0277-9536(88)90201-8.

Cutler, D. M., & Lleras-Muney, A. (2006). Education and health: Evaluating theories and evidence. In National Bureau of Economic Research.

De Brauw, A., & Hoddinott, J. (2011). Must conditional cash transfer programs be conditioned to be effective? The impact of conditioning transfers on school enrollment in Mexico. *Journal of Development Economics*, *96*(2), 359–370. https://doi.org/10.1016/j.jdeveco.2010.08.014.

De Janvry, A., & Sadoulet, E. (2006). Making conditional cash transfer programs more efficient: Designing for maximum effect of the conditionality. *World Bank Economic Review*, *20*(1), 1–29. https://doi.org/10.1093/wber/lhj002.

Eide, E. R., & Showalter, M. H. (2011). Estimating the relation between health and education: What do we know and what do we need to know? *Economics of Education Review*, *30*(5), 778–791. https://doi.org/10.1016/j.econedurev.2011.03.009.

Galiani, S., & McEwan, P. J. (2013). The heterogeneous impact of conditional cash transfers. *Journal of Public Economics*, *103*, 85–96. https://doi.org/10.1016/j.jpubeco.2013.04.004.

Gertler, P. (2004). Do conditional cash transfers improve child health? Evidence from PROGRESA's control randomized experiment. *American Economic Review*, *94*(2), 336–341. https://doi.org/10.1257/0002828041302109.

Gertler, P., & Vermeersch, C. (2013). *Using performance incentives to improve medical care productivity and health outcomes*.

Glewwe, P. (1999). Why does mother's schooling raise child health in developing countries? Evidence from morocco. *Journal of Human Resources*, 34(1), 124–159. https://doi.org/10.2307/146305.

Hameed, M. A., Rahman, M. M., & Khanam, R. (2023). The health consequences of civil wars: Evidence from Afghanistan. *BMC Public Health*, *23*(1), 154. https://doi.org/10.1186/s12889-022-14720-6.

Heckman, J. J. (1995). Randomization as an instrumental variable. In National Bureau of Economic Research.

Hoderlein, S., & Mammen, E. (2007). Identification of marginal effects in nonseparable models without monotonicity. *Econometrica*, *75*(5), 1513–1518. https://doi.org/10.1111/j.1468-0262.2007.00801.x.

Jiang, L., Linton, O. B., Tang, H., & Zhang, Y. (2024). Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance. *Review of Economics and Statistics*, 1–45. https://doi.org/10.1162/rest_a_01417.

Kemptner, D., & Marcus, J. (2013). Spillover effects of maternal education on child's health and health behavior. *Review of Economics of the Household*, *11*(1), 29–52. https://doi.org/10.1007/s11150-012-9161-x.

Kremer, M., & Glennerster, R. (2011). Improving health in developing countries. In *Handbook of Health Economics*. Elsevier, *2*. https://doi.org/10.1016/B978-0-444-53592-4.00004-9.

Molina Millán, T. M., Macours, K., Maluccio, J. A., & Tejerina, L. (2020). Experimental long-term effects of early-childhood and school-age exposure to a conditional cash transfer program. *Journal of Development Economics*, *143*, 102385. https://doi.org/10.1016/j.jdeveco.2019.102385.

Naimoli, J. (2009). Contributing to global learning about results-based financing (RBF): The health results innovation trust fund. *Health*. *RBF*, (1–3).

Naziri, M., Higgins-Steele, A., Anwari, Z., Yousufi, K., Fossand, K., Amin, S. S., Hipgrave, D. B., & Varkey, S. (2018). Scaling up newborn care in Afghanistan: Opportunities and challenges for the health sector. *Health Policy and Planning*, *33*(2), 271–282. https://doi.org/10.1093/heapol/czx136.

Osmani, A. R. (2021). Conditional cash incentive and use of health care services: New evidence from a household experiment. *Journal of Family and Economic Issues*, *42*(3), 518–532. https://doi.org/10.1007/s10834-020-09740-6.

Osmani, A. R., & Okunade, A. A. (2019). Cancer survivors in the labor market: Evidence from recent US micro-panel data. *Economic Modelling*, *80*, 202–221. https://doi.org/10.1016/j.econmod.2018.11.008.

Parker, S. W., & Todd, P. E. (2017). Conditional cash transfers: The case of Progresa/Oportunidades. *Journal of Economic Literature*, *55*(3), 866–915. https://doi.org/10.1257/jel.20151233.

Pathak, P. K., & Singh, A. (2011). Trends in malnutrition among children in India: Growing inequalities across different economic groups. *Social Science and Medicine*, *73*(4), 576–585. https://doi.org/10.1016/j.socscimed.2011.06.024.

Powell-Jackson, T., & Hanson, K. (2012). Financial incentives for maternal health: Impact of a national programme in Nepal. *Journal of Health Economics*, *31*(1), 271–284. https://doi.org/10.1016/j.jhealeco.2011.10.010.

Rahut, D. B., Singh, A., & Sonobe, T. (2024). Continuum of maternal and new-natal health care: Empirical evidence from 10 developing countries in South and South East Asia. *Journal of Population Research*, *41*(2), 11. https://doi.org/10.1007/s12546-024-09327-0.

Van de Poel, E., Flores, G., Ir, P., & O'Donnell, O. (2016). Impact of performance-based financing in a low-resource setting: A decade of experience in Cambodia. *Health Economics*, *25*(6), 688–705. https://doi.org/10.1002/hec.3219.

Witvorapong, N., & Foshanji, A. I. (2016). The impact of a conditional cash transfer program on the utilization of non-targeted services: Evidence from Afghanistan. *Social Science and Medicine*, *152*, 87–95. https://doi.org/10.1016/j.socscimed.2016.01.043.

Wooldridge, J. M. (2019). Correlated random effects models with unbalanced panels. *Journal of Econometrics*, *211*(1), 137–150. https://doi.org/10.1016/j.jeconom.2018.12.010.

Appendix

Table A1. Estimation sample size and coverage for control and treatment groups

	Pre-Intervention, 2010			Post-Intervention, 2013		
	Control	Treatment	Total	Control	Treatment	Total
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Health Facilities						
Identified	102	113	215	102	113	215
Randomized	72	72	144	71	72	143
Panel B. Villages (Clusters)						
Identified	204	226	430	204	226	430
Randomized	144	144	288	142	144	286
Panel C. Households						
Identified	4,080	4,520	8,600	4,080	4,520	8,600
Randomized	3,443	3,341	6,786	3,427	3,421	6,848
Panel D. Women aged 15-49 years						
Identified	3,866	3,931	7,797	4,079	4,166	8,245
Surveyed	3,865	3,929	7,794	4,042	4,132	8,174
Panel E. Children under 5 years						
Identified	4,397	4,590	8,687	3,895	3,898	7,793
Surveyed (Mothers responded)	4,355	4,525	8,880	3,911	3,895	7,806

Table A2. Estimation sample size and data coverage for the Afghanistan Health Surveys (AHS)

	AHS 2013	AHS 2013-SS-CCTs provinces	AHS 2015	AHS 2015-SS-CCTs provinces	AHS 2018	AHS 2018-SS-CCTs Provinces
Households						
Identified	12,345	3,267	23,137	7,218	20,884	5,528
Interviewed	12,137	3,212	23,118	7,122	19,607	5,190
Women (12-49 years)						
Identified	14,711	3,894	25,907	6,857	22,250	5,889
Interviewed	14,551	3,851	25,317	6,701	21,128	5,592
Children (under age 5 years)						
Identified	14,625	3,871	25,926	6,862	24,347	6,444
Interviewed	14,432	3,820	25,684	6,798	23,166	6,132

Table A3. Descriptions of key outcome variables

Outcome variable	Descriptions	Comments
Use of contraceptives	The percentage of married women aged 12 to 49 who are currently using at least one method of modern contraception. These methods include female sterilization, intra-uterine devices (IUD), oral hormonal pills, injections, and condoms.	Some of these methods are provided for free at health facility levels.
Antenatal visits (ANC)	The proportion of ever-married women aged 12 to 49 who had a live birth in the past 24 months that received at least one antenatal care visit from a skilled healthcare provider (this includes doctors, nurses, midwives, and community health workers).	
Institutional delivery	The proportion of ever-married women aged 12 to 49 who had a live birth in the past 24 months that delivered with a skilled health provider.	
Postnatal visits (PNC)	The proportion of ever-married women aged 12 to 49 who had a live birth in the past 24 months that received skilled postnatal care within 42 days of delivery.	
Penta vaccine	The proportion of children aged 12 to 23 months who received at least three doses of the Pentavalent vaccine before their first birthday.	
OPV	The Oral Polio Vaccine (OPV) is used to protect against poliomyelitis, commonly known as polio. OPV is administered orally, typically as drops in the mouth.	First Dose: The first dose of OPV is often given to infants at around 6 to 8 weeks of age. Second Dose: The second dose is usually administered at 10 to 12 weeks of age. Third Dose: The third dose is typically given when the infant is 14 to 16 weeks old. Booster Dose: A booster dose of OPV is often recommended between 4 to 6 years of age to reinforce immunity.

BCG vaccine	The Bacillus Calmette-Guérin (BCG) vaccine is primarily used to prevent tuberculosis (TB).	the BCG vaccine is given to newborns shortly after birth, usually within the first few days or weeks of life.
Measles Vaccine (MMR)	The most common measles vaccine is the, measles, mumps, and rubella (MMR) vaccine. It contains weakened forms of these viruses.	It is typically administered in two doses, usually given at around 12 to 15 months of age and again at 4 to 6 years of age.
OPD visits	Outpatient Department (OPD) refers to the part of a hospital or medical facility where patients receive diagnosis, treatment, and care without being admitted for an overnight stay. OPD visits for children are common for various reasons, including routine check-ups, vaccinations, illness management, and monitoring of developmental milestones.	

Table A4. Effects of SS-CCTs on women and children's healthcare outcomes using observational data

	Women's healthcare outcomes				Children's healthcare outcomes				
	Use of contraceptives (1)	Antenatal visits (2)	Institutional delivery (3)	Postnatal visits (4)	OPD at HF (5)	BCG vaccine (6)	OPV3 (7)	Penta vaccine (8)	Measles vaccine (9)
Assignment status	-1.326 (1.153)	2.095 (1.983)	1.751** (0.721)	-1.028 (0.882)	-6.921 (7.541)	-1.341 (1.561)	-3.129 (5.282)	-6.571 (5.341)	5.194 (4.891)
Health Worker Motivation Index (HWMI)	4.173*** (1.302)	1.641* (0.821)	3.415 (3.616)	0.812*** (0.212)	1.723*** (0.312)	1.021* (0.571)	0.391* (0.220)	1.161*** (0.084)	2.004 (1.228)
Perceived Quality of Care Index (PQCI)	2.341** (0.891)	2.273* (1.209)	2.882*** (0.541)	3.561*** (0.915)	6.273*** (1.331)	1.566*** (0.231)	1.651*** (0.331)	1.549*** (0.441)	2.017*** (0.351)
Assignment status *x* HWM I *x* PQCI	1.318*** (0.021)	2.215*** (0.451)	0.791*** (0.213)	2.773* (1.451)	3.591*** (1.023)	0.931* (0.471)	3.651 (3.213)	1.881*** (0.501)	2.675*** (0.491)
Number of observations	16,144	16,144	16,144	16,144	5,123	3,570	3,570	3,570	3,570
Mean of DV	12.7	58	30.1	33.7	61.2	77.9	58.2	54.7	75.3
Socio-economic controls and their means	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Women and children's age, residence (urban v/s rural), region (central, central highlands, east, North, Northeast, south, west), education (none, primary, secondary, or higher), exposure to media, wealth categories (Poorest, second, third, fourth, and richest), parity status are the key controls in the estimated models. Standard errors are clustered at the village level. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively. The balanced repeated replication technique is used to adjust for the AHS survey design. OPD = outpatient department, HF = Healthcare facility, BCG = Bacille Calmette-Guérin Vaccine for Tuberculosis, and OPV = oral polio vaccine.

Table A5. Estimated coefficients of the CRE model using data from non-SS-CCTs provinces

	Women's healthcare outcomes				**Children's healthcare outcomes**				
	Use of contraceptives (1)	Antenatal visits (2)	Institutional delivery (3)	Postnatal visits (4)	OPD at HF (5)	BCG vaccine (6)	OPV3 (7)	Penta vaccine (8)	Measles vaccine (9)
Health facility									
District Hospitals	-0.237 (0.190)	-2.361 (1.892)	1.285*** (0.221)	-3.128 (3.297)	0.178* (0.091)	0.731*** (0.221)	-0.511 (0.553)	0.034** (0.015)	0.026** (0.013)
Comprehensive Health Center	-0.012 (0.072)	1.814*** (0.271)	-0.077*** (0.028)	-2.445 (2.125)	0.671* (0.335)	1.032*** (0.007)	-0.193 (0.213)	0.046*** (0.001)	0.031** (0.016)
Basic Health Center	0.831 (0.629)	2.281** (1.011)	0.0681*** (0.023)	1.658*** (0.451)	0.181*** (0.041)	0.173* (0.106)	0.126** (0.054)	-0.031 (0.029)	0.019** (0.009)
Sub center	-0.107 (0.071)	0.897*** (0.341)	0.117*** (0.039)	1.561 (1.636)	0.471* (0.216)	0.226*** (0.061)	0.157** (0.073)	-0.118 (0.109)	-0.016 (0.015)
Number of health facilities	2910	2910	2910	2910	2910	210	2910	2910	2910
Socio-economic controls and their means	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Women and children's age, residence (urban vs rural), region (central, central highlands, east, North, Northeast, south, west), education (none, primary, secondary, or higher), exposure to media, wealth categories (Poorest, second, third, fourth and richest), parity status are the key controls in the estimated models. Standard errors are clustered at the village level. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively. The balanced repeated replication technique is used to adjust for the AHS survey design. OPD = outpatient department, HF = Healthcare facility, BCG = Bacille Calmette-Guérin Vaccine for Tuberculosis, and OPV = Oral Polio Vaccine.

Table A6. Effects of SS-CCTs on women's healthcare outcomes across household wealth quantiles using experimental data

	Poorest				Second				Third				Fourth				Richest			
	Use of contraceptives (1)	Antenatal visits (2)	Institutional delivery (3)	Postnatal visits (4)	Use of contraceptives (5)	Antenatal visits (6)	Institutional delivery (7)	Postnatal visits (8)	Use of contraceptives (9)	Antenatal visits (10)	Institutional delivery (11)	Postnatal visits (12)	Use of contraceptives (13)	Antenatal visits (14)	Institutional delivery (15)	Postnatal visits (16)	Use of contraceptives (17)	Antenatal visits (18)	Institutional delivery (19)	Postnatal visits (20)
Treatment	0.893*** (0.123)	0.431 (0.311)	1.021 (0.931)	2.804* (1.595)	1.124*** (0.017)	0.785*** (0.211)	1.237** (0.512)	2.930** (1.210)	1.365*** (0.217)	0.937** (0.419)	1.561** (0.728)	3.172* (1.551)	1.618*** (0.401)	1.204** (0.532)	1.846** (0.851)	3.314** (1.426)	2.231*** (0.732)	1.832*** (0.581)	2.415* (1.117)	3.472** (1.588)
Number of observations	1,302	1,302	1,302	1,302	1,817	1,817	1,817	1,817	1,933	1,933	1,933	1,933	1,625	1,625	1,625	1,625	1,497	1,497	1,497	1,497
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Women's age and education status and household size are included as controls. Standard errors are clustered at the village level. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively.

Table A7. Effects of SS-CCTs on children's healthcare outcomes across household wealth quantiles using experimental data

	Poorest					Second					Third					Fourth					Richest				
	OPD at HF (1)	BCG vaccine (2)	OPV (3)	Penta vaccine (4)	Measles vaccine (5)	OPD at HF (6)	BCG vaccine (7)	OPV (8)	Penta vaccine (9)	Measles vaccine (10)	OPD at HF (1)	BCG vaccine (12)	OPV (13)	Penta vaccine (14)	Measles vaccine (15)	OPD at HF (16)	BCG vaccine (17)	OPV (18)	Penta vaccine (19)	Measles vaccine (20)	OPD at HF (21)	BCG vaccine (22)	OPV (23)	Penta vaccine (24)	Measles vaccine (25)
Treatment	0.652*** (0.112)	0.284 (0.331)	1.001 (1.232)	0.442*** (0.121)	0.413 (0.381)	1.242*** (0.426)	0.662** (0.271)	0.893* (0.451)	0.616*** (0.173)	0.593*** (0.091)	1.634*** (0.514)	0.791** (0.359)	1.173** (0.527)	1.471*** (0.429)	0.935*** (0.219)	2.137*** (0.492)	1.636*** (0.441)	1.441* (0.720)	2.372*** (0.661)	1.521*** (0.428)	2.891*** (0.795)	2.239*** (0.601)	1.933*** (0.515)	2.891*** (0.821)	2.073*** (0.611)
Number of observations	1245	1245	1245	1245	1245	1735	1735	1735	1735	1735	1856	1856	1856	1856	1856	1616	1616	1616	1616	1616	1354	1354	1354	1354	1354
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Women's age and education status and household size are included as controls. Standard errors are clustered at the village level. Statistical significance at the 1, 5, and 10 percent levels is indicated by ***, **, and *, respectively.