

Does local democracy improve public health interventions? Evidence from India

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Abstract

Health care decisions in many low-income countries often require a close political agency relationship between healthcare decision makers and constituents. This is especially the case for maternal and child care as well as preventative interventions when resources are scarce. This article examines the effect of the introduction of the National Rural Health Mission in India, introducing Village Health, Sanitation and Nutrition Committees (VHSNC), a self-governance mechanism to strengthen the political agency in village health care decision making. We study the effect of exposure to VHSNC on both maternal and preventative child health care. We find that exposure to VHSNC's increase the utilization of several maternal health care services, but does not systematically increase the uptake of preventive health care. The effect of VHSNC is more intense in larger villages and areas closer to district headquarters, and is driven by an increase in the utilization of the public healthcare network.

1 | INTRODUCTION

Strengthening the agency relationship between health decision makers and local constituents can influence the type of services different communities prioritize. This is especially important when electoral processes aggregate preferences in a very crude way, and are insensitive to the

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preferences of minorities and neglected groups (Chaudhury et al., 2006; Dullneck & Kerschbamer, 2006, 2020). Local level interventions can help identifying ways of incentivizing the uptake of beneficial treatments when resources are scarce (Mehrortra, 2006). This article attempts to contribute to the study of the effects of local decision making on the use of health care programs in lower income countries, and more specifically in India. We distinguish between *preventative services* such as childhood immunizations, which produce long-term health effects and require long-term planning, and *curative services*, such as maternal care, which require more immediate attention and action.

India is a paradigmatic country to examine the effects of local health care decision making as health care decentralisation coexists with privatisation. Indeed, India's healthcare system is one of the worlds most privatized. About 70% of households visit and pay private providers out of pocket (Gupta & Bhatia, 2017). Although the average electoral turn out in most elections is well over 60%, it is significantly lower among less educated users, and members of scheduled tribe constituencies who live in rural areas (Diwakar, 2008).¹ In 1992, the 74th Amendments to the Constitution was meant for institutionalizing local governments, self-governance agencies at the local level. One of their main activities include organizing village meetings. The Village Panchayat (VP)—including 1 to 5 villages—discuss resource allocation decisions including healthcare in village meetings (Gram Sabhas). Furthermore, membership of VP has quotas for women and minority groups. However, we know little about the effects on the use of health care services.²

This article studies the effect of the exposure to the Village Health and Sanitation Committees (redefined later as the Village Health, Sanitation and Nutrition Committees, VHSNCs), which provide voice to local health care needs, on the use of maternal and preventive health care. VHSNCs were incepted in 2005 in the context of the National Rural Health Mission (NRHM) to play a critical role in implementing and overseeing health care activities at the local level. Our contribution is as follows:

First, we contribute by testing whether the introduction of VHSNCs managed to increase the use of maternal health care and childhood vaccinations. So far, a preliminary evaluation of the functioning of the NRHM (Bajpai et al., 2009) has been mainly descriptive and, for the most part, it has focused on a handful of healthcare outcomes.

Second, given that the individual measure of exposure to VHSNCs is unlikely to be as good as random, uncorrected statistical estimates of the effects of exposure to VHSNCs are likely to be biased, and more specifically, will underestimate the effect of VHSNC on utilization (as discussed below). To address this concern, we draw on an instrument variable strategy that adjusts for the non-random introduction of VHSNCs and allow for a causal identification.³ Our empirical identification comes from pre-program information on Gram Sabha meetings which is employed as an instrument to explain exposure to a VHSNC, and it is unlikely to directly influence health care use.⁴

Finally, we further examine the performance of VHSNCs by investigating whether the VHSNCs develop village health plans, which can in turn alter resource allocation and coordination. We contribute to the still growing literature examining the role played by local preferences in the definition of health care priorities. Unlike previous studies, we exploit the variability in the adoption of VHSNCs and, in the different timing of births and service use. Compared to other studies we examine a more comprehensive set of outcomes—maternal and child services—for all the representative samples of Indian states covered by the District Level Household Surveys (DLHS), which is a large sample of 202,000 individual respondents.

The organization of the article is as follows: Section 2 describes the study background, and more specifically we locate our contribution into the wider literature, and more specifically, on

the role of local democracy in the performance of health care services. Section 3 is devoted to the data and describes the empirical strategy as well as its limitations. Finally, Section 4 reports the results, and Section 5 concludes.

2 | BACKGROUND

2.1 | Political agency and coordination of health services

Strengthening local democracy can increase the responsiveness of decision makers to local needs (Besley, Pande, & Rao, 2005; Costa-Font & Pons, 2007). Azfar et al. (2000) surveyed the preferences of individuals (constituents) and bureaucrats at different levels of government in the Philippines; they found evidence of a positive correlation between constituents' and bureaucrats' preferences at the local level, but no correlation at higher levels of government. Similarly, in Bolivia, investments in social services in the most deprived areas increased after municipalities took control of social services (Faguet, 2004). This evidence is relevant in India where local and state governments are perceived as more effective than the central government (Mitra & Singh, 1999). However, the precise mechanisms underpinning such effects are still unclear.

Nonetheless, identifying the effect of local democracy on health care activity is far from trivial. It is not infrequent in low-income settings that minority groups lose interest in village meetings, or see themselves as ineffective, which might consolidate the ruling elite (Bardhan, 2002). In the absence of political participation, the traditional prescriptions of the fiscal federalism literature,⁵ might not work well insofar as governments might not be accountable enough, and instead different forms of local capture can emerge (Bardhan, 2002). The latter can give rise to what some call “decentralized despotism” (Mumdani, 1996). Hence, we can conclude that there is nothing automatic about the effect of local democracy on improving the quality of social services, as evidence from a number of developing countries suggests (UNDP, 2003). A recent study in Congo shows evidence that the election of the chief does not improve health outcomes (van der Windt & Vandoros, 2017). This is because, social services, and health care in particular, are subject to important information asymmetries, and hence improvement in government accountability might not always translate immediately into better outcomes.

A question that has received limited attention so far is whether local democracy does manage to change the use of health care services, and specifically, whether it exerts different effects across types of health care services. One of the obvious aspects to focus on refers to the temporal effects of a program. That is, the immediate effects of curative services (maternal health care), compare to the long term effects of preventative programs (e.g., immunizations). Furthermore, curative services are more visible to the population, and hence an unsatisfied demand for health care is more likely to raise concerns. Finally, and in contrast to preventative care, maternal health care is perceived to have large immediate stakes. Related interventions include the cooperative program that increased local decision making in the Brazilian state of Ceara, which is found to have tripled the vaccination rate of measles and polio, and managed to reduce child mortality (Mehrortra, 2006). Similarly, the so-called Bamako initiative (BI) in 1987 that made health care providers accountable to the community, it is found to have increased vaccination rates, and reduced premature mortality (Mehrortra, 2006). However, it is unclear how local democracy affects the use of health care, and especially curative services alongside preventative care.

So far, it is possible to identify other differences in the use of health care resources. In India, Betancourt and Gleason (2000) document that while a higher voter turnout in a district increases the allocation of nurses to rural areas of the district, it has no effect on the allocation of doctors. Consistent with this view, Mobarak et al. (2011) using data from Brazil find that the number of public clinics and consultation rooms—the visible public goods—are positively related to voter turnout, but not to the number of doctors and nurses.

2.2 | Health system and local decision making in India

The Indian health system was initially designed as a publicly funded system that would provide healthcare free of charge. In principle, health care at government facilities is free of charge, but out of pocket health care expenses account for 70% of total health care expenses (Reddy, 2015)—80% of outpatient (60% inpatient) care is delivered by the private sector and less than 20% of the population is covered by any form of health insurance (Gupta & Bhatia, 2017). Policy reform has emphasized primary health care and, has focused on maternal and child health, infectious diseases, and family planning. That said, India still has some of the highest rates of maternal and infant mortality, partly because of low utilization of maternal and child health services especially in the rural areas. There are several reasons for this including poor quality of care (Balarajan et al., 2011). With only 2%–4% of GDP spent on health, the health system is severely under-funded. It is not uncommon that public health facilities are understaffed due to absenteeism and that drugs and equipment are missing or in short supply (Gupta & Bhatia, 2017).

The NRHM was launched to bring about “necessary architectural correction” in the basic public healthcare delivery system, with the goal of improving the availability of public health services in rural areas. It includes multiple, interlinked components aimed at increasing decentralization of decision making and management of public health programs. The VHSNCs are given a critical role of implementing and overseeing NRHM activities at the local level, and are allocated a fund of Rs. 10,000 per annum to facilitate this. VHSNCs membership reflected this as well, which includes members of the VP (with priority given to elected, women VP members), local social service staff and community health volunteers. Further, 50% of the VHSNC members must be women, and minorities, (Scheduled Castes (SCs) and Scheduled Tribes (STs), must be adequately represented as per their population in the village (GoI, 2005). Specifically, VHSNCs are given the responsibility for developing village health plans, monitoring local public health services and organizing collective action for promoting health including mobilizing pregnant women to access maternal health services such as antenatal care, delivery in public health facilities and postnatal care, and promoting childhood vaccinations. They are therefore central to “local-level community action” and to fostering decentralized health planning. Finally, an important indirect effect of VHSNC is that it brings together different types of workers such as Integrated Child Development Service workers, Anganwadi Workers and other Community Health Workers in one platform at the village level. Therefore, the impact on health services results as a side effect of local democracy, namely better coordination at the village level between these workers.

3 | DATA AND METHODS

3.1 | The data

We use the Indian District Level Household and Facility Survey (DLHS) Round 3 to study the effect of the NRHM, via VHSNCs. The DLHS-3, administered during 2007 and 2008, is one of the largest health surveys carried out in India, with a sample size of about seven million households, covering all states of the country except Nagaland. This survey was designed to capture the impact of NRHM on maternal and child health (MCH) outcomes, family planning, and other reproductive health indicators. Unlike the previous two waves, DLHS-3 interviewed both married (aged 15–49) and unmarried women (aged 15–24). We combine unit record data on use of health services by children and mothers with village-level information on existence and functioning of VHSNCs to test any causal impacts. We report a number of suitable specifications—primarily through the use of instrumental variables—to account for potential non-random program placement e.g., existence of VHSNC across the villages, which might be correlated with unobserved characteristics that also influence the health outcomes considered.

The DLHS-3 MCH information was collected from 1,245,590 women (451,951 households) across India. Women were specifically asked about their use of maternal health services (antenatal care (ANC), delivery at a health facility, and postnatal care (PNC)) for the most recent birth in the last 5 years; and vaccination information was collected for the youngest two surviving children born during this time. We, therefore, use data pertaining to the youngest child born during 2004–08 (169,672 children) to study the use of maternal health services, and we use data pertaining to the youngest two children born during 2004–08 (211,964 children) to explore vaccination uptake.

The village data⁶ in DLHS-3 allows us to identify the presence of a VHSNCs in the village, and our estimates are clustered at the village level following Abadie et al. (2017). It further allows us to assess the performance of these committees, for example by examining whether the VHSNCs develop health plans. The DLHS-3 data pertain to 22,508 communities spread across 592 districts and 34 states. After the launch of the NRHM, 28.9% of the villages set up a VHSNCs (see Table A1 for details). Further, 61.2% of the VHSNCs developed village health plans and 44.8% managed an untied fund of Rs. 10,000. By examining the use of MCH services we can compare the effects of the introduction of VHSNCs on the probability of using MCH services, before and after the introduction of the NRHM. Importantly, information of VHSNCs was not self-reported information but filled by village civil servants irrespective of the constitution of a VHSNC in the village.

Figure 1 reports evidence of vaccination uptake before and after the NRHM in villages with and without VHSNC. Importantly, we find a slight increase in the share of vaccinations in villages with VHSNC. Similarly, Figure 2 reports the effects of NRHM in public health care and material care use. Importantly, the figures show that whilst areas without VHSNC exhibit barely any change in the use of maternal health care, those with VHSNC exhibit a large change in maternal health care use, especially antenatal care and postnatal care.

3.2 | Empirical strategy

We focus on outcomes that can be measured for the period before and after the introduction of the NRHM reform. Given that it does not seem reasonable to assume that the VHSNCs were set

up at random, we draw upon regression analysis that examines variation in exposure to VHSNCs and health care use. This already provides some evidence on the association between VHSNCs and health care use. However, the effects might be potentially affected by confounders, namely unobservable variables driving the effect, which mean that the association suffer from endogeneity. In the presence of omitted variables, estimates are potentially biased and a common empirical strategy to correct for omitted variable bias is the use of instrumental variables. Indeed, we employ an instrumental variable (IV) strategy, using information on frequency of Gram Sabhas (village meetings) before the NRHM reform, which are unrelated to the MCH outcomes examined in this study. MCH outcomes are observed as births taking place before and after the NRHM reform; and we use the following regression equation:

$$Y_{it} = \gamma_0 + \gamma_1 \text{Head}_{itg} + \gamma_2 \text{VHSNC}_{itg} + \gamma_3 X_{itg} + \mu_g + \delta_t + \varepsilon_{it} \quad (1)$$

Y_{it} refers to the use of MCH services (ANC, public facility delivery, PNC, and childhood vaccinations). Our regression on health care utilization and exposure to VHSNCs allows identification of political externalities, as in Besley et al. (2005), and i refers to individuals, g refers to the village, and t refers to time. Our parameter of interest is γ_2 , which identifies the changes in health care utilization after the exposure to VHSNCs, over and above the effect of time trends (δ_t) and state fixed effects (μ_g) and alongside several controls for confounding effects (X_{itg}).

Our variable of interest refers to being exposed to a VHSNCs. We control for contextual effects such as the characteristics of the household head, mother and child. We include a control variable “head,” which controls for the fact that the head of the Village Panchayat lives in the village (as villages where the head stays might exhibit systematically better infrastructure and outcomes) and is measured in the regression by the variable Head_{itg} . We further control for the simultaneous effects of a conditional cash transfer scheme, Janani Suraksha Yojana (JSY), available to mothers for delivering in health facilities. The eligibility for the JSY depends on the economic and social status of the mother and the state where the delivery took place (Powell-Jackson et al., 2013). We use a linear model as fixed effects probit estimates are inconsistent in short panels (Nickell, 1981). Standard errors are robust to arbitrary forms of heteroscedasticity and clustered at the village levels. The identifying assumption is that the timing of policy change is not correlated with the trends in health care use. Treated cohorts are born after 2005, while control cohorts are born before, and we take advantage of this variation in birth dates.

In our data, we can clearly identify the use of healthcare services and whether the village has a VHSNCs (see Table A2 in the Appendix). However, in the presence of common unobservables that may drive both the introduction of VHSNCs and health care use, we have chosen to follow an IV strategy. As explained earlier, an IV strategy is grounded on the identification of a source of variation (an instrument) which influences the intervention (in our case, exposure to a VHSNCs) but is only related to our dependent variables (e.g., MCH service use) through its effect on the intervention (which is commonly known as the exclusion restriction). In addition it is key to test whether the instrument is statistically valid. This condition is examined by testing the significance of the instrument in explaining the treatment variable, in our case, exposure to VHSNCs conditional on relevant covariates.

To discriminate between strong and weak instruments, it is conventional to expect a strong instrument to deliver an F -test that exceeds a common cut-off point (Staiger & Stock, 1997). Finally, an IV strategy should meet the monotonicity condition, namely that the instrument always varies with the exposure to VHSNCs in our case. This condition is harder to establish given that we employ a continuous instrument. Yet, focusing on weak monotonicity, De

FIGURE 1 Vaccination uptake, pre- and post-NRHM period in villages with village health, sanitation and nutrition committees (VHSNC) and without. BCG, Bacillus Calmette-Guérin; DTP, Diphtheria, Pertussis, and Tetanus.
Source: Indian District Level Household surveys, all waves

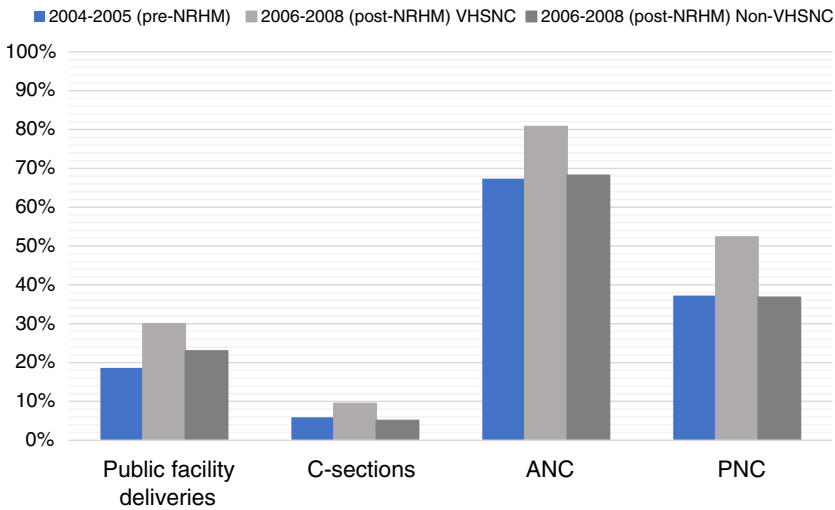
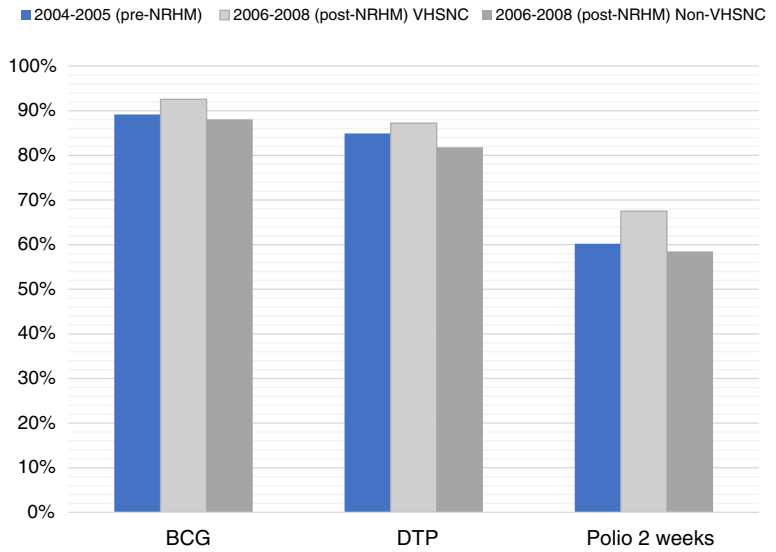


FIGURE 2 Maternal health care use, pre- and post-NRHM in villages with village health, sanitation and nutrition committees (VHSNC) and without. C-Sections, cesarean sections; ANC, Antenatal Care; PNC, Postnatal care.

Source: Indian District Level Household surveys, all waves

Chaisemartin (2017) finds that the monotonicity condition holds if there are more “compliers” than “defiers” in the data. This condition appears to be satisfied in our data as we show that an increase number of Gran Sabha meetings in almost all cases is associated with an increase in the exposure to a VHSNC. Hence, we estimate the following:

$$VHSNC_{it} = \vartheta_0 + \vartheta_1 GSmet_{it} + \vartheta_2 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \tag{2}$$

The logic of our instrument is that the number of times the Gram Sabha (e.g., village meetings) were held in the previous year, tends to be driven by some level of inertia, following the steps of

previous meetings. However, the functioning of a VHSNCs should not influence health care use through any other mechanism but through VHSNCs. Next, we examine its statistical validity by estimating the value of the F -test, and confirming that the instrument is significantly different from zero. Consistently, the coefficient of the instrument is as expected, significant and positively associated with the exposure to a VHSNC. Further, using the instrument described produces the value of the F -test of 23, suggesting that the instrument is unlikely to be weak.

Finally, it is worth noting that although our data contains information on the exposure of VHSNC, it does not include information on the year of the constitution of the VHSNCs. Hence, drawing parallels with the causal (or randomized control trial) jargon, our estimates are intention-to-treat estimates, as opposed to treatment effects on the treated.

3.3 | Identification threads

A threat to the specification lies in the presence of district-year varying changes in other determinants, which we address by controlling for unobservable trends. In the specification illustrated above, we control for state-specific trends, and in extensions of this, we demonstrate robustness to district-specific trends and district by mother-cohort effects. We also control for time effects that control for the effect of time-specific covariates. Our estimates include the date of data collection (month and year), year of birth and year fixed effects. In addition, we run different specifications (OLS and IV), and we employ different treatment variables. The appendix (Tables A3 and A4) contains estimates using standard probit models given that the dependent variable is dichotomic, though they provide comparable results.

3.4 | Falsification and robustness checks

Next, we examine the effects of VHSNCs on the use of MCH services before the NRHM for a subsample of states, to confirm that we are identifying the effect of the program (which we do not report here). In addition, we measure the effect on home deliveries and the use of private health facilities for deliveries to test whether the effects we are identifying are the intended outcomes, as the creation of the VHSNCs should encourage the use of only public health facilities and consequently should reduce deliveries at home and/or in the private health facilities.

3.5 | Descriptive tests

Table 1 reports the main dependent variables of the study, consisting of measures of the use of maternal and child health services. Maternal health services include deliveries in a public health facility, use of antenatal care and postnatal care and deliveries by caesarean section. The second set of variables include childhood vaccinations, including vaccination against tuberculosis (*Bacillus Calmette-Guérin* vaccine, BCG), diphtheria, pertussis, and tetanus (DTP), and polio. We report the results of a simple pre-post t -test empirically testing the hypothesis of the equality of health care use, which suggest that unadjusted variation in the use of several health care services differs before and after the introduction of the NRHM (although the difference is not always significant), except for DTP where there is a negligible variation (even though the

TABLE 1 Use of maternal health care and vaccination uptake, pre and post-NRHM

Variables	Pre-NRHM	Post-NRHM	Difference
Public facility delivery	0.186	0.248	0.061***
Cesarean delivery	0.059	0.062	0.003
Antenatal care	0.673	0.713	0.040
Postnatal care	0.372	0.404	0.031***
BCG vaccines	0.881	0.896	0.015***
Polio vaccine	0.588	0.614	0.027***
DTP vaccine	0.837	0.832	−0.005**

Abbreviations: BCG, Bacillus Calmette-Guérin; DTP, Diphtheria, Pertussis, and Tetanus.

** $p < .05$; *** $p < .01$.

difference is significant). However, such effects might result from compositional effects that need to be controlled for. This is the purpose of the empirical analysis that follows.

4 | RESULTS

4.1 | Effect of VHSNCs on maternal health care use

Next, we report the main results of the regression analysis described in (1). Results are retrieved in Table 2, and OLS and IV estimates indicate that exposure to VHSNCs exerts a significant increase in the average probability of a delivery in a public facility (0.16 pp), as well as in the probability of accessing antenatal (0.47 pp) and postnatal (0.23 pp) care. As expected, uncorrected (OLS) estimates underestimate the effect when significant. However, the exception is the effect on the use of cesarean section which is not significant. This result is explained by the fact that cesarean sections require substantial investment in staff and infrastructure, in addition to VHSNC involvement. Overall, these results are consistent with the idea suggested in the article, that the strengthening of political agency is linked to an expansion of the use of public (maternal) healthcare. Importantly, these effects produce immediate effects, and are visible to the community.

4.2 | Effects of VHSNCs on childhood vaccinations

Table 3 reports both the OLS and IV estimates of the effect of VHSNCs exposure on vaccinations. As in Table 2, the OLS estimates underestimate the effect when significant, but in contrast to Table 2, the results do not reveal a robust effect on preventive care across the board, except for BCG—where we find a positive and significant effect (0.18 pp). This is because BCG is usually given at the time of birth; hence this effect is consistent with the increase in public maternal facility deliveries. In contrast, no effect is found for polio vaccine, and only a weak effect is discernible for the DTP vaccine, which are given after birth. Hence, we can conclude that exposure to VHSNCs has a mixed, and non-robust effects in improving vaccinations.

TABLE 2 Effect of village health, sanitation and nutrition committees (VHSNC) on maternal care use

Variables	(1) OLS-1	(2) OLS-2	(3) OLS-3	(4) IV-1	(5) IV-2	(6) IV-3
<i>Public health facility for deliveries (Public)</i>						
VHSNC	0.086*** (0.003)	0.051*** (0.003)	0.010*** (0.003)	0.135*** (0.022)	0.156*** (0.026)	0.135* (0.070)
Constant	0.214*** (0.001)	0.050*** (0.007)	0.354*** (0.011)	0.206*** (0.004)	0.057*** (0.008)	0.400*** (0.033)
R ²	0.006	0.183	0.244	0.004	0.175	0.234
First-stage F-test				818.06***	664.56***	189.69***
Endogeneity test				5.020**	15.927***	—
Observations	169,572	168,316	168,316	169,572	168,316	168,316
<i>Caesarean deliveries (C-Section)</i>						
VHSNC	0.041*** (0.002)	0.040*** (0.002)	0.011*** (0.002)	-0.027** (0.011)	-0.062*** (0.014)	-0.026 (0.037)
Constant	0.054*** (0.001)	0.071*** (0.005)	0.132*** (0.007)	0.066*** (0.002)	0.064*** (0.005)	0.179*** (0.024)
R ²	0.004	0.012	0.058	-0.007	-0.011	0.055
First-stage F-test				818.16***	664.67***	189.87***
Endogeneity test				41.322***	57.484***	—
Observations	169,553	168,302	168,302	169,553	168,302	168,302
<i>Antenatal care (ANC) use</i>						
VHSNC	0.129*** (0.003)	0.113*** (0.003)	0.039*** (0.003)	0.199*** (0.022)	0.293*** (0.028)	0.469*** (0.081)
Constant	0.679*** (0.001)	0.466*** (0.009)	1.091*** (0.011)	0.667*** (0.004)	0.477*** (0.009)	0.528*** (0.023)
R ²	0.011	0.055	0.144	0.008	0.036	0.049

TABLE 2 (Continued)

Variables	(1) OLS-1	(2) OLS-2	(3) OLS-3	(4) IV-1	(5) IV-2	(6) IV-3
First-stage <i>F</i> -test				817.06***	663.60***	189.45***
Endogeneity test				10.071***	41.158***	—
Observations	169,567	168,308	168,308	169,567	168,308	168,308
<i>Postnatal care (PNC) use</i>						
VHSNC	0.154*** (0.003)	0.129*** (0.003)	0.019*** (0.003)	0.173*** (0.031)	0.044 (0.042)	0.196** (0.100)
Constant	0.370*** (0.001)	0.344*** (0.009)	0.471*** (0.013)	0.367*** (0.005)	0.345*** (0.009)	0.721*** (0.027)
<i>R</i> ²	0.013	0.069	0.179	0.013	0.065	0.165
First-stage <i>F</i> -test				688.51***	495.73***	148.32***
Endogeneity test				0.385	4.145***	—
Observations	162,319	161,132	161,132	162,319	161,132	161,132

Note: Models 1 (col 1 & col 4) do not include any controls. Models 2 (col 2 & 5) include controls and time effects (date of birth, month of birth and year FE). Models 3 (col 3 & col 6) include controls, time effects, state FE, and state linear trends. Controls are: whether the head of the panchayat lives in the village, caste of household head, household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Robust standard errors in parentheses.

p* < .1; *p* < .05; ****p* < .01.

TABLE 3 Effect of Village Health, Sanitation and Nutrition Committees (VHSNC) on childhood vaccination

Variables	(1) OLS-1	(2) OLS-2	(3) OLS-3	(4) IV-1	(5) IV-2	(6) IV-3
<i>BCG vaccine uptake</i>						
VHSNC	0.042*** (0.002)	0.033*** (0.002)	-0.001 (0.002)	0.139*** (0.019)	0.209*** (0.025)	0.183*** (0.071)
Constant	0.884*** (0.001)	0.681*** (0.006)	1.017*** (0.007)	0.870*** (0.003)	0.691*** (0.006)	0.913*** (0.015)
R ²	0.002	0.031	0.109	-0.010	-0.003	0.077
First-stage F-test				650.01***	546.01***	149.30***
Endogeneity test				25.618***	52.888***	—
Observations	191,952	190,483	190,483	191,952	190,483	190,483
<i>Polio vaccine uptake</i>						
VHSNC	0.084*** (0.004)	0.070*** (0.005)	-0.005 (0.005)	0.149*** (0.053)	-0.024 (0.066)	-0.094 (0.165)
Constant	0.591*** (0.002)	0.726*** (0.012)	1.103*** (0.057)	0.583*** (0.007)	0.702*** (0.013)	0.963*** (0.037)
R ²	0.003	0.010	0.093	0.001	0.012	0.091
First-stage F-test				327.11***	284.11***	93.99***
Endogeneity test				1.492	1.860	0.301
Observations	108,054	107,370	107,335	108,054	107,335	107,335
<i>DTP vaccine uptake</i>						
VHSNC	0.045*** (0.002)	0.047*** (0.002)	0.013*** (0.003)	0.101*** (0.023)	0.179*** (0.029)	0.138* (0.081)
Constant	0.828***	0.519***	1.000***	0.819***	0.526***	0.718***

TABLE 3 (Continued)

Variables	(1) OLS-1	(2) OLS-2	(3) OLS-3	(4) IV-1	(5) IV-2	(6) IV-3
R^2	(0.001)	(0.007)	(0.031)	(0.004)	(0.007)	(0.020)
First-stage F -test	0.002	0.050	0.123	-0.001	0.037	0.113
Endogeneity test			626.04***	6.129**	529.44***	145.75***
Observations	186,682	185,271	185,271	186,682	185,271	185,271

Note: Models 1 (col 1 & col 4) do not include any controls. Models 2 (col 2 & 5) include controls and time effects (date of birth, month of birth and year FE). Models 3 (col 3 & col 6) include controls, time effects, state FE, and state linear trends. Controls are: whether the head of the panchayat lives in the village, caste of household head, household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Robust standard errors in parentheses.

Abbreviations: BCG, Bacillus Calmette-Guérin; DTP, Diphtheria, Pertussis, and Tetanus.

* $p < .1$. ** $p < .05$. *** $p < .01$.

TABLE 4 Effect of performance of Village Health, Sanitation and Nutrition Committees (VHSNC) drafting a village health plan on maternal health care use and childhood vaccinations

Variables	(1) Public	(2) C-Section	(3) ANC	(4) PNC	(5) BCG	(6) Polio	(7) DTP
VHSNC	0.16** (0.08)	-0.030 (0.043)	0.540*** (0.092)	0.270** (0.14)	0.164*** (0.063)	-0.081 (0.141)	0.126* (0.074)
Constant	0.362*** (0.035)	0.186*** (0.025)	0.397*** (0.028)	0.662*** (0.035)	0.868*** (0.019)	0.987*** (0.036)	0.685*** (0.023)
R ²	0.235	0.054	0.026	0.162	0.086	0.091	0.116
Observations	168,316	168,302	168,308	161,132	190,483	107,335	185,271

Note: All models include controls, time effects (date of birth, month of birth and year FE), state FE, and state linear trends. Controls are: whether the head of the panchayat lives in the village, caste of household head, household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Robust standard errors in parentheses.

Abbreviations: ANC, Antenatal Care; BCG, Bacillus Calmette-Guérin; DTP, Diphtheria, Pertussis, and Tetanus; PNC, Postnatal Care.

* $p < .1$; ** $p < .05$; *** $p < .01$.

TABLE 5 Robustness checks

Variables	(1) Public	(2) C-section	(3) ANC	(4) PNC	(5) BCG	(6) Polio	(7) DTP
<i>Panel 1: High versus low SC/ST villages</i>							
High SCST × VHSNC	-0.019 (0.041)	0.028 (0.021)	-0.033 (0.044)	-0.047 (0.060)	-0.066* (0.038)	0.048 (0.104)	-0.077* (0.043)
VHSNC	0.150** (0.07)	-0.033 (0.038)	0.496*** (0.084)	0.223** (0.112)	0.214*** (0.077)	-0.113 (0.174)	0.172** (0.087)
highSCST	0.008 (0.007)	-0.002 (0.004)	0.008 (0.008)	0.010 (0.010)	0.015** (0.006)	0.002 (0.014)	0.020*** (0.007)
Observations	168,316	168,302	168,308	161,132	190,483	107,335	185,271
R ²	0.233	0.053	0.040	0.158	0.076	0.090	0.112
<i>Panel 2: Larger versus smaller villages</i>							
Large Village × VHSNC	-0.006 (0.048)	-0.007 (0.025)	-0.045 (0.054)	0.198** (0.081)	-0.008 (0.049)	-0.202 (0.125)	-0.017 (0.056)
VHSNC	0.143** (0.071)	-0.027 (0.037)	0.488*** (0.079)	0.133 (0.103)	0.192*** (0.066)	-0.045 (0.161)	0.154** (0.077)
BigVillage	0.000 (0.009)	0.011** (0.005)	0.015 (0.011)	-0.004 (0.015)	-0.002 (0.009)	0.034* (0.019)	-0.004 (0.010)
Observations	168,316	168,302	168,308	161,132	190,483	107,335	185,271
R ²	0.233	0.052	0.047	0.146	0.075	0.080	0.112
<i>Panel 3: Villages closer and farther to towns</i>							
Near TownxVHSNC	-0.167*** (0.046)	-0.040* (0.024)	-0.132** (0.052)	-0.179** (0.074)	-0.023 (0.042)	-0.078 (0.118)	-0.069 (0.050)
VHSNC	0.221*** (0.074)	-0.001 (0.038)	0.550*** (0.087)	0.301*** (0.112)	0.200*** (0.077)	-0.051 (0.180)	0.177** (0.085)
Near Town	0.066***	0.015***	0.063***	0.062***	0.023***	0.028*	0.035***

(Continues)

TABLE 5 (Continued)

Variables	(1) Public	(2) C-section	(3) ANC	(4) PNC	(5) BCG	(6) Polio	(7) DTP
Observations	(0.008) 168,316	(0.004) 168,302	(0.009) 168,308	(0.012) 161,132	(0.006) 190,483	(0.015) 107,335	(0.007) 185,271
R ²	0.228	0.052	0.034	0.152	0.075	0.090	0.112
<i>Panel 4: Villages closer and farther to district headquarters (HQ)</i>							
Near HQ × VHSNC	-0.104** (0.044)	-0.066*** (0.023)	-0.220*** (0.050)	-0.171** (0.070)	-0.068 (0.042)	0.003 (0.115)	-0.071 (0.049)
VHSNC	0.194** (0.079)	0.013 (0.040)	0.594*** (0.090)	0.302** (0.127)	0.222*** (0.078)	-0.096 (0.184)	0.180** (0.090)
Near HQ	0.056*** (0.008)	0.024*** (0.004)	0.086*** (0.009)	0.076*** (0.011)	0.034*** (0.006)	0.039*** (0.014)	0.041*** (0.007)
Observations	168,316	168,302	168,308	161,132	190,483	107,335	185,271
R ²	0.232	0.051	0.032	0.154	0.075	0.092	0.112

Note: All models include controls, time effects, state FE, and state linear trends. Controls are: whether the head of the panchayat lives in the village, caste of household head (except in Panel 1), household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Robust standard errors in parentheses.

Abbreviations: BCG, Bacillus Calmette-Guérin; DTP, Diphtheria, Pertussis, and Tetanus; SC, Scheduled Castes; ST, Scheduled Tribes; VHSNC, Village Health Sanitation and Nutrition Committee.

* $p < .1$; ** $p < .05$; *** $p < .01$.

TABLE 6 Effect of VHSNC on the place of deliveries—Private health facilities and home

Variables	(1) OLS-1	(2) OLS-2	(3) OLS-3	(4) IV-1	(5) IV-2	(6) IV-3
<i>Deliveries in private facilities</i>						
VHSNC	0.089*** (0.003)	0.085*** (0.003)	0.016*** (0.003)	0.065*** (0.016)	-0.020 (0.020)	-0.047 (0.054)
Constant	0.126*** (0.001)	0.178*** (0.007)	0.167*** (0.008)	0.130*** (0.003)	0.171*** (0.007)	0.321*** (0.029)
R ²	0.009	0.046	0.139	0.009	0.034	0.135
Observations	169,572	168,316	168,316	169,572	168,316	168,316
<i>Deliveries at home</i>						
VHSNC	-0.175*** (0.003)	-0.136*** (0.003)	-0.025*** (0.003)	-0.196*** (0.025)	-0.132*** (0.030)	-0.083 (0.081)
Constant	0.657*** (0.001)	0.770*** (0.009)	0.472*** (0.012)	0.661*** (0.004)	0.770*** (0.009)	0.260*** (0.025)
R ²	0.019	0.144	0.251	0.018	0.144	0.249
Observations	169,572	168,316	168,316	169,572	168,316	168,316

Note: Models 1 (col 1 & col 4) do not include any controls. Models 2 (col 2 & 5) include controls and time effects (date of birth, month of birth and year FE). Models 3 (col 3 & col 6) include controls, time effects, state FE, and state linear trends. Controls are: whether the head of the panchayat lives in the village, caste of household head, household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Robust standard errors in parentheses.

Abbreviation: VHSNC, Village Health Sanitation and Nutrition Committee.

***p < .01.

4.3 | Performance of VHSNCs

Next, in order to examine the main driver of these estimates, we specifically are able to identify in our dataset whether VHSNCs have drafted village health plans, which would impact on the use of maternal healthcare services and childhood vaccinations. These results are reported in Table 4, and broadly suggest an effect size that is consistent with estimates reported in Tables 2 and 3. That is, that villages that have drafted village health plans drive the effect. Indeed, VHSNCs that draft health plans increase the use of both maternal health care services (deliveries in public health facilities by 16 pp, ANC by 54 pp and PNC by 26 pp) as well as childhood vaccinations (BCG by 16.4 pp and DTP by 13 pp, yet the latter estimates are less precise). As before, the results are not significant for caesarean sections.

4.4 | Heterogeneous effects and falsification test

Finally, we examine whether previous effects of VHSNCs were different by village characteristics. Specifically, Table 5 (panel 1) examines whether the effect is heterogeneous across villages with a high concentration of SC/ST populations. Our estimates suggest that it is unlikely that the effect is the result of the involvement of SC/ST populations. Importantly, we do not find an effect on use of maternal health care and our results show that the effect is independent of the SC/ST status. We find, however, a weak and imprecisely estimated negative effect on vaccination uptake (BCG and DTP at 10% significance) for SC/ST.

Similarly, we then examine whether the VHSNCs effect on health care use is heterogeneous across large and small villages (panel 2). Now, we do find some evidence of heterogeneity. The effect of exposure to VHSNCs is stronger in larger villages for postnatal care (PNC) but not for other care examined. This is because large size municipalities can benefit more from larger networks in postnatal care. Similarly, we then examine whether being closer or further from towns exerts a differential effect (panel 3), and we find that most of our effect comes from people that live far from towns, in which case the effect sizes increase significantly for almost all health care examined whether maternal and preventive care. This may be because towns have more alternatives including private health facilities. There is no differential effect on childhood vaccinations. Finally, we study whether being closer to district headquarters exerts a difference in our estimates (panel 4), and we find similar results to that of town interactions, namely that people closer to district headquarters have lower probability of accessing maternal care services in public facilities, while there is no difference on childhood vaccinations. Importantly, in villages further from district headquarters we find a significant positive effect of VHSNCs in all types of health care examined.

Finally, one of the potential mechanisms driving our results comes from the effects of VHSNCs in modifying the place of the delivery, whether at home or in private facilities. Table 6 shows imprecise evidence that VHSNCs might have reduced the deliveries at home, yet we find no robust effect on deliveries in the private health facilities. The reduction in home deliveries is found to be statistically significant for households belonging to SC/STs households, poor households, larger households, and for male children. This implies a change in preference from deliveries at home, compared to deliveries in the public health facilities. Given the high costs of private health care, this is not surprising especially since this behavioural change is driven by the most disadvantageous households (minority castes and low income).

5 | CONCLUSION

Exposure to local democracy can influence health care decision making, and especially the prioritisation of certain health care programs, both curative and preventative. This paper examines the effects of the introduction of the Village Health, Sanitation and Nutrition Committees (VHSNCs) in India in 2005 on the use of maternal health care and childhood vaccinations. The importance of distinguishing between curative and preventative programs lies in that childhood vaccinations exert long term effect (preventative), whilst maternal health care produce more immediate (curative) effects. Specifically, we test the effect of exposure to VHSNCs on the use of several maternal health care services (such as antenatal care, postnatal care, caesarean deliveries), as well as immunizations (a number of childhood vaccinations). Finally, we examine the effect of VHSNC on the use of both public and private health facilities for deliveries, which acts as a mechanism explaining the effect. This is important given that in rural contexts many individuals cannot afford the use of private health care.

The causal effects of the introduction of VHSNCs can be identified using a credible instrumental variable (IV) strategy that exploits the committee activity previous to the introduction of VHSNCs. Our results suggest that the implementation of VHSNCs increased the probability of maternal health care utilization, which is driven by an improved use of public health facilities for deliveries, antenatal care, and postnatal care. However, we do not find robust evidence of VHSNCs increasing the use of preventive care (childhood vaccinations). Specifically, we only find evidence that VHSNCs improved uptake of one childhood vaccination—BCG, given that is linked to maternal health care as it is given immediately after delivery. In contrast, we find only weak evidence of VHSNCs increasing uptake of DTP and no effect of VHSNC on polio vaccinations; both these vaccines are given post-birth.

Importantly, our estimates show that part of the effect lies in the increasing probability of using the public health network, which is rather underused in India. Importantly, it should be noted that our data measures short-term effects of the VHSNC, when most states started preparing their annual Program Implementation Plans (PIPs) in 2007–08.⁷

These findings suggest that strengthening the local political agency in the design and implementation of health care programs, can increase the use of curative public healthcare services such as maternal health services that exert more immediate effects to communities. This is especially the case for the use of (underused) public health facilities in deprived areas. However, we do not find similar evidence on the use of preventive care, the effects of which are not experienced at the time of delivery. These results suggest that the promotion of preventative programs require additional financial incentives (federal or state level subsidies), and large-scale programs that coordinate interventions at different levels of government.

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DATA AVAILABILITY STATEMENT

Data set is publicly available and we are happy to share coding upon request.

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ENDNOTES

- ¹ The electoral system is bicameral. The lower chamber elections are based on universal suffrage; proportional representation (PR) and legislative assemblies elect the upper chamber.
- ² The exception is Besley et al. (2005) who show an effect of VP on the selection of beneficial welfare programs for disadvantaged groups.
- ³ Namely, the adoption of VHSNCs results from some common unobservable factors such as the performance of village panchayats, which we observe by examining how regularly village panchayats consult the people.
- ⁴ This is a relevant instrument, insofar as local democracy builds on some pre-existing institutional arrangements. Furthermore, the instrument is theoretically valid as the quality of local decision making previous to the introduction of the NRHM, is likely to influence the exposure to the VHSNCs. Our estimates include controls for both time (survey interview date) and state-specific effects (given that health care is organized at the state level in India).
- ⁵ Traditional fiscal federalist literature envisages decentralization reforms as resulting from a trade-off between the costs associated with the presence of spill overs and economies of scale versus heterogeneity costs
- ⁶ In the survey, this refers to the PSU (primary sampling units), which could be a single village or a group of smaller villages. Sometimes larger villages were also split into two or more PSUs.
- ⁷ DLHS-3 was conducted in 2007–2008 and the NRHM although formally launched in 2005, the actual implementation of different components of the program, namely the appointment of ASHA workers, providing untied funds to primary level health facilities and the constitution and functioning of different stakeholder committees (including the VHSNCs) was at a varied pace across the country

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TABLE A1 Variable definitions and description

Variable	Definition	Mean (SD) or percentage
<i>Dependent variables</i>		
Public	Delivery in a public health facility = 1; 0 otherwise	23%
Caesarean	Caesarean delivery = 1; 0 otherwise	6%
ANC	Had at least one antenatal care visit = 1; 0 otherwise	70%
PNC	Received postnatal care within 2 weeks of birth = 1; 0 otherwise	39%
BCG	Child had Bacillus Calmette-Guérin (BCG) vaccine = 1; 0 otherwise	89%
Polio	Child had polio vaccine within 2 weeks of birth = 1; 0 otherwise	60%
DTP	Child had at least one dose of Diphtheria, Pertussis, and Tetanus (DTP) vaccine = 1; 0 otherwise	83%
<i>Independent variables—decentralization</i>		
VHSNC	Village had a Village Health Sanitation and Nutrition Committee (VHSNC) = 1; 0 otherwise	15%
Health plan	VHSNC developed village health plans = 1; 0 otherwise	14%
<i>Independent variables—other variables</i>		
Head	Panchayat head lives in the village = 1; 0 otherwise	59%
SC/ST	Household belongs to Scheduled Caste (SC) or Scheduled Tribe (ST) = 1; 0 otherwise	40%
BPL	Household belongs to the Below Poverty Line (BPL) group = 1; 0 otherwise	34%
Size	Number of family members in the household	7 (3)
JSY	Mother received financial assistance under JSY	11%
Age	Mother's age at the time of delivery <20 years = Age < 20	15%
	Mother's age at the time of delivery 20–29 years = Age 20–29	68%
	Mother's age at the time of delivery 30–39 years = Age 30–39	16%
	Mother's age at the time of delivery ≥40 years = Age ≥ 40	1%
Boy	Child is a boy = 1; 0 if a girl	52%

TABLE A2 Villages that had a Village Health, Sanitation and Nutrition Committees (VHSNC) in 2008

State	Villages with a VHSNC	Percentage	Total number of villages
Jammu and Kashmir	40	6.78	590
Himachal Pradesh	81	14.75	549
Punjab	179	22.57	793
Chandigarh	2	50.00	4
Uttarakhand	64	11.35	564
Haryana	145	17.68	820
Delhi	7	21.88	32
Rajasthan	126	9.43	1336
Uttar Pradesh	714	20.68	3452
Bihar	29	1.71	1694
Sikkim	64	28.44	225
Arunachal Pradesh	12	2.48	483
Manipur	88	21.62	407
Mizoram	205	52.16	393
Tripura	80	37.04	216
Meghalaya	79	22.57	350
Assam	123	10.52	1169
West Bengal	125	16.03	780
Jharkhand	72	7.36	978
Orissa	41	3.56	1153
Chhattisgarh	139	18.83	738
Madhya Pradesh	613	28.33	2164
Gujarat	324	29.86	1085
Daman and Diu	16	36.36	44
Dadra and Nagar Haveli	8	18.18	44
Maharashtra	825	46.56	1772
Andhra Pradesh	527	50.10	1052
Karnataka	466	37.92	1229
Goa	3	6.82	44
Lakshadweep	9	29.03	31
Kerala	466	71.47	652
Tamil Nadu	615	53.62	1147
Pondicherry	16	28.57	56
Andaman and Nicobar	22	28.57	77
<i>Total (average for percentage)</i>	<i>6325</i>	<i>24.21</i>	<i>26,123</i>

Note: The average percentage is computed from the survey data rather than the numbers shown in the table.

TABLE A.3 Effect of village health sanitation and nutrition committee (VHSNC) on maternal health care use—Probit estimation

Variables	(1) Probit-1	(2) Probit-2	(3) Probit-3	(4) Probit IV-1	(5) Probit IV-2	(6) Probit IV-3
<i>Public facility deliveries</i>						
VHSNC	0.269*** (0.009)	0.194*** (0.010)	0.032*** (0.011)	0.421*** (0.068)	0.569*** (0.092)	0.523* (0.277)
Constant	-0.793*** (0.004)	-1.426*** (0.029)	0.173*** (0.061)	-0.818*** (0.011)	-1.389*** (0.031)	0.201*** (0.062)
Pseudo R ²	0.005	0.145	0.210	NA	NA	NA
Wald exogeneity test	NA	NA	NA	4.91**	16.31***	3.04*
First-stage IV	NA	NA	NA	0.010***	0.008***	0.003***
Observations	169,572	168,316	168,316	169,572	168,316	168,316
<i>Caesarean deliveries</i>						
VHSNC	0.295*** (0.012)	0.297*** (0.013)	0.079*** (0.015)	-0.329*** (0.119)	-0.659*** (0.164)	-0.278 (0.395)
Constant	-1.606*** (0.005)	-1.495*** (0.039)	-0.749*** (0.084)	-1.456*** (0.037)	-1.474*** (0.042)	-0.766*** (0.084)
Pseudo R ²	0.008	0.026	0.099	NA	NA	NA
Wald exogeneity test	NA	NA	NA	26.03***	30.36***	0.81
First-stage IV	NA	NA	NA	0.010***	0.008***	0.003***
Observations	169,553	168,302	168,277	169,553	168,302	168,277
<i>Antenatal care</i>						
VHSNC	0.405*** (0.009)	0.373*** (0.010)	0.164*** (0.011)	0.623*** (0.069)	1.012*** (0.086)	1.541*** (0.204)
Constant	0.465*** (0.003)	-0.152*** (0.026)	-0.412*** (0.057)	0.426*** (0.013)	-0.034 (0.026)	-0.265*** (0.060)
Pseudo R ²	0.010	0.036	0.124	NA	NA	NA

TABLE A3 (Continued)

Variables	(1) Probit-1	(2) Probit-2	(3) Probit-3	(4) Probit IV-1	(5) Probit IV-2	(6) Probit IV-3
Wald exogeneity test	NA	NA	NA	10.06***	48.09***	32.23***
First-stage IV	NA	NA	NA	0.010***	0.008***	0.003***
Observations	169,567	168,308	168,308	169,567	168,341	168,341
<i>Postnatal care</i>						
VHSNC	0.391*** (0.009)	0.347*** (0.009)	0.066*** (0.010)	0.446*** (0.081)	0.330*** (0.111)	0.578** (0.289)
Constant	-0.332*** (0.003)	-0.410*** (0.026)	0.534*** (0.055)	-0.341*** (0.013)	-0.291*** (0.025)	0.516*** (0.055)
Pseudo R ²	0.010	0.025	0.114	NA	NA	NA
Wald exogeneity test	NA	NA	NA	0.46	0.12	2.93*
First-stage IV	NA	NA	NA	0.009***	0.006***	0.003***
Observations	162,319	161,132	161,132	162,319	161,166	161,166

Note: Models 1 (col 1 & col 4) do not include any controls. Models 2 (col 2 & 5) include controls and time effects (date of birth, month of birth and year FE). Models 3 (col 3 & col 6) include controls, time effects and state FE. Controls are: whether the head of the panchayat lives in the village, caste of household head, household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Robust standard errors in parentheses.

Abbreviations: BCG, Bacillus Calmette-Guérin; DTP, Diphtheria, Pertussis, and Tetanus.

p* < .1. *p* < .05. ****p* < .01.

TABLE A.4 Effect of Village Health Sanitation and Nutrition Committee (VHSNC) on childhood vaccinations—Probit estimation

Variables	(1) Probit-1	(2) Probit-2	(3) Probit-3	(4) Probit IV-1	(5) Probit IV-2	(6) Probit IV-3
<i>BCG vaccine</i>						
VHSNC	0.250*** (0.012)	0.211*** (0.013)	0.023 (0.015)	0.827*** (0.108)	1.331*** (0.139)	1.196*** (0.374)
Constant	1.195*** (0.004)	0.018 (0.031)	1.780*** (0.078)	1.084*** (0.026)	0.076** (0.031)	1.726*** (0.094)
Pseudo R ²	0.004	0.048	0.160	NA	NA	NA
Wald exogeneity test	NA	NA	NA	26.50***	52.31***	8.18***
First-stage IV	NA	NA	NA	0.008***	0.007***	0.002***
Observations	191,952	190,483	190,229	191,952	190,483	190,229
<i>Polio vaccine</i>						
VHSNC	0.225*** (0.012)	0.178*** (0.013)	-0.006 (0.014)	0.387*** (0.125)	-0.070 (0.156)	-0.354 (0.407)
Constant	0.229*** (0.004)	0.534*** (0.030)	1.702*** (0.069)	0.209*** (0.017)	0.522*** (0.031)	1.672*** (0.083)
Pseudo R ²	0.002	0.011	0.077	NA	NA	NA
Wald exogeneity test	NA	NA	NA	1.70	2.55	0.72
First-stage IV	NA	NA	NA	0.007***	0.005***	0.002***
Observations	108,054	107,335	107,335	108,054	107,335	107,335
<i>DTP vaccine</i>						
VHSNC	0.193*** (0.010)	0.215*** (0.011)	0.069*** (0.013)	0.439*** (0.091)	0.883*** (0.120)	0.674* (0.361)
Constant	0.945*** (0.004)	-0.417*** (0.028)	0.794*** (0.065)	0.906*** (0.016)	-0.372*** (0.030)	0.813*** (0.065)
Pseudo R ²	0.002	0.055	0.142	NA	NA	NA

TABLE A4 (Continued)

Variables	(1) Probit-1	(2) Probit-2	(3) Probit-3	(4) Probit IV-1	(5) Probit IV-2	(6) Probit IV-3
Wald exogeneity test	NA	NA	NA	7.36***	28.74***	2.68
First-stage IV	NA	NA	NA	0.008***	0.007***	0.002***
Observations	186,682	185,271	185,271	186,682	185,271	185,271

Note: Models 1 (col 1 & col 4) do not include any controls. Models 2 (col 2 & 5) include controls and time effects (date of birth, month of birth and year FE). Models 3 (col 3 & col 6) include controls, time effects and state FE. Controls are: whether the head of the panchayat lives in the village, caste of household head, household below poverty, household size, mother's age, mother received financial assistance under JSY and gender of the child. Bacillus Calmette-Guérin (BCG); Diphtheria, Pertussis, and Tetanus (DTP); Robust standard errors in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.