Political Economy of Sanitation in India *

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Abstract

This study models the implementation of India's federal sanitation initiative (SBM) within its devolved, competitive multiparty democracy, marked regional electoral competition. The success of SBM depends on social and physical capital provided by the federal government but executed by regional authorities. Through a political thought experiment, we analyze the impact of changes in the regional governance model. Transitioning from federally aligned to non-aligned political parties (or vice versa) results in a 1.7 percentage point decrease (or 2.0 percentage point increase) in household toilet access, with the least wealthy (bottom 10%) disproportionately affected. Regional trends in sanitation-related diseases empirically corroborate these findings.

Keywords: Multilevel governance, Political strategy, Social messaging, Sanitation

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1 Introduction

Sanitation and politics in India have a complex and intertwined relationship. The origin of the idea of *Swachh Bharath Mission* (SBM, also known as the Clean India Mission) can be traced back to the pre-independence era, a change advocated by Mohandas Karamchand Gandhi (henceforth, Gandhi). Gandhi's concept of "Swaraj" (self-rule) extended far beyond mere political independence from colonial rule. He believed that true Swaraj encompassed self-rule at various levels: individual, community, and national. Gandhi emphasized the idea of self-discipline, self-sufficiency, and self-governance in all aspects of life. To make this concept understandable and relevant to the masses, Gandhi employed various social messaging strategies such as simplicity (using simple metaphors to explain complex ideas), symbolism (spinning a wheel to represent self-reliance), and mass mobilization (mobilizing people from all walks of life, including farmers, women, and students). Raising awareness of cleanliness and sanitation was one such strategy. Gandhi famously emphasized that sanitation was as vital as independence. This approach of engaging with the masses through social messaging was largely absent in India's post-independence development history.[1]

In this paper, we argue that following the victory of the 2014 federal election, Prime Minister (PM) Narendra Modi (henceforth, Modi) effectively used a similar social messaging strategy, like Gandhi, to implement various development projects, including SBM. The strategy was to deepen the connection with the masses, effectively broadening the recognition of Modi. Like Gandhi, who expanded the base of his supporters through social experiments, Modi also sought to achieve the same by broadening his supporter base, which initially comprised the urban middle class in northern and western India, to include people from more humble social strata with his promise of development for all. A unifying universal theme needed to be found, one that would convey an image of purity and absolute necessity. Meeting dual criteria was essential for the campaign: It needed to be quantifiable and demonstrate measurable success, hence the focus on toilet building; it also needed to be underpinned by the personal commitment of the PM. Our findings suggest that not only has there been an increase in the availability of toilets, but also the desire of households to build toilets has improved significantly since 2014.[2]

We model and examine political congruence in a federal setup, and analyze how the PM's efforts to connect with the public have influenced the management and utilization of funds allocated for SBM. Political congruence theory suggests that aligned governments, where state leaders share the same party affiliation as federal leaders, are more likely to prioritize and implement federal programs successfully (Béland 2016). Federal grants to finance state projects generate goodwill among voters for the ruling party at the national level. When state leaders belong to a different political party, there may be less incentive for the federal government to fund state projects, as some of the goodwill from federal expenditures may benefit the opposing party (Arulampalam et al. 2009). However, politically aligned states have added incentives to align their policy goals with federal priorities, resulting in greater accountability in the use of federal funds (Sakurai & Theodoro 2020). Aligned political interests foster better collaboration between state and federal officials, improving communication and information sharing on program requirements and best practices (Kincaid 1990). Although there have been precedents for programs like SBM, such as the Community-led Total Sanitation (CLTS) program launched at the federal level, the success of SBM can largely be attributed to political incentives, as its implementation was closely monitored by the PM's office. In contrast, CLTS, which was initiated between 2005 and 2010, had limited success in influencing behavioral change and stimulating demand for sanitation facilities due

[1] Political messaging, unlike social messaging, revolves around policies, governance, and the actions of government officials or political parties. Important social messaging follows political messaging, although we have not shown whether the reverse is true.

[2] The success of SBM is further suggested by the data published in the Annual Report of the Joint Monitoring Program of WHO/UNICEF. It highlights a notable 50% decrease in the prevalence of open defecation in the world, largely due to India's improved sanitation efforts ((WHO/UNICEF 2022)).

to a lack of clear leadership and oversight. After 2014, there was stronger evidence of political congruence. Curtis (2019) analyzed the reasons behind the successful coverage of toilets in more than 95% households in rural areas. Her findings indicate that high-level political support from the PM's office led to psychological changes in the mindset of district officials, leading to better implementation of building toilets at the grassroots level (village). When political affiliations align, the risk of agency problems within the principal-agent framework decreases, resulting in more effective fund utilization and better implementation of federally funded projects (Bennett & Howlett 1992).

The remainder of the paper is organized as follows. Section 2 provides a historical analysis of India's sanitation movement and policy evolution, focusing on the political decisions that shaped its trajectory. Section 3 delineates the multifaceted motivation and significance of sanitation within the policy domain, underscoring its contributions to public health, economic advancement, and social well-being. Section 4 articulates a theoretical framework that integrates political strategies, including the strategic deployment of social capital, into the implementation of federal policy objectives, and generates empirically testable hypotheses. Section 5 details the household and political data sets used in the empirical analysis. Section 6 investigates household preferences for toilet adoption and other consumer durables, controlling for wealth covariates to elucidate disparities in sanitation access. Section 7 employs a counterfactual thought experiment to evaluate the impact of transitions from federally aligned to non-aligned regional governments on the implementation efficacy of the Swachh Bharat Mission (SBM). Furthermore, in Section 7, regional data on the prevalence of sanitation-related diseases are analyzed to provide empirical support for arguments on political alignments and the role of social capital. Section 8 concludes with a discussion of the main policy implications derived from the research findings.

2 Political history of sanitation in India

The political history of sanitation in India has been dynamic, reflecting social reforms, public health emergencies, and changing governance approaches. From Gandhi's strategic integration of cleanliness into the political and moral fabric of the nation, to post-independence infrastructure projects, the trajectory has most recently favored strategic leveraging political influence to achieve mass behavioral transformation.

2.1 Pre-Independence India: Gandhi and Social Capital

The idea of social capital was developed by Coleman (1988, 1994) as a theory of social relations. Social capital is defined as characteristics of social life such as networks, norms, and trust that enable participants to work together in a group to effectively achieve a common purpose (Putnam 1993, 1995). In pre-independence India, MK Gandhi strategically cultivated political and social trust through the concept of 'Swaraj,' or self-rule, aiming to resonate with the broader populace by incorporating perspectives 'not touched by Western civilization' (Gandhi 1997). To gauge the receptiveness of 'Swaraj,' Gandhi integrated social experiments, notably focusing on cleanliness and sanitation throughout his public life (1893 – 30.1.1948). He asserted, 'Unless we get rid of our dirty habits and have improved latrines, Swaraj can have no value for us' (Gandhi 1997), recognizing the potential of these initiatives to foster political trust. Gandhi perceived collective action as a prerequisite for political independence, believing it fostered a sense of national contribution. Consequently, the social capital generated through the sanitation movement became integral to the broader independence movement. This movement served as a practical demonstration of the population's capacity for collective action and their readiness for self-governance.

The historic widespread engagement of Indian citizens in Gandhi's sanitation movement underscores its role in broadening support for the independence movement, which had previously been perceived as an elite endeavor. In contrast to the Indian National Congress (INC), an organization often characterized as elitist (Hanes 1993), Gandhi promoted a direct and reciprocal communication channel with the population. Recognizing the deficit of social trust and political understanding among the predominantly elite INC leadership, Gandhi used social projects, to establish a direct connection with ordinary citizens, circumventing the established political hierarchy. He championed a bottom-up approach to politics and development, leveraging social capital to implement his initiatives. By addressing immediate social concerns, Gandhi effectively generated political capital [3], thereby solidifying his position as a mass leader. This high-level behavioral intervention to build local, social, and political trust was forgotten post-independence when the modern Indian state was first formed. Jawaharlal Nehru, the first PM of independent India, had ideas that were different from those of Gandhi. The Gandhian idea of development was based on development at the Panchayat (local village council) level, involving people and the community so that it could empower people at the bottom echelon of the social income level. The Nehruvian concept of development represented a markedly distinct top-down approach. He believed that "tractors and big machinery...[and the] rapid industrialization of India is essential to relieve pressure on the land, to combat poverty, and raise standards of living" (Nehru 2008).

2.2 Post-Independence India: Top-down Elitism to Political Capital

After independence in 1947, the Government of India (GoI) led INC returned to an elitist top-down approach of 'nation-building' through supply-side initiatives, with marginal success. The priority was to increase agricultural production and develop the public manufacturing sector with significant investments in the heavy and basic industries. The emphasis on constructing toilets did not feature prominently within the broader scope of development. Between 1947 and 1980, water and sanitation programs were initiated concurrently, with the approval of 244 urban water supply (WS) schemes, 65 urban sewerage schemes, and 228 rural WS schemes (Chandana & Rao 2022). The prioritization of WS coverage over sanitation is evident in the disproportionate allocation of resources. Even the concept of sanitation was limited to building sanitation wells and hand pumps in rural areas and urban sewage systems. Both urban and rural areas lacked basic sanitation facilities, and the WS was given greater importance. The lack of a comprehensive administrative or economic policy to initiate a nationwide sanitation program, combined with individual states' inability to allocate adequate resources and build the necessary infrastructure, led to sanitation coverage remaining in the single digits until the 1980s. GoI did not prioritize building toilets until the 34th World Health Assembly declared 1981-1990 an international decade of drinking water supply and sanitation in response to an increase in deaths worldwide due to unhygienic living conditions (World Health Assembly 1981). Political will was lacking when it came to nudging a change in social behavior, for example, advocating people against open defecation.

Between 1986 and 1999, acknowledging the integral role of sanitation in the development of India, dedicated schemes were launched through the Central Rural Sanitation Program (CRSP) in 1986 (Government of India 1986) and the Total Sanitation Campaign (TSC) in 1999 (Government of India 1999). According to a survey conducted by the National Sample Survey Organization in 1989, the proportion of households that reported no latrines was much higher in rural areas (81%) than in urban areas (35%). As high as 83% of households in rural areas reported using no

[3] Political capital, as conceptualized by Banfield Banfield (1961), refers to the social credit accrued by political actors, enabling them to pursue broader objectives, such as citizen mobilization for the independence movement (Bourdieu 1991). This phenomenon resonates with Putnam's observations in Italy, where he attributes the trust deficit in southern Italian regional governments to historical legacies of civic engagement, dating back to medieval invasions (Putnam 1993). As Inglehart asserts, 'people live in the past much more than they realize' citepinglehart2018culture, p. 422.

latrines compared to only 26% in urban areas. Only about 8% and 1% of rural households reported using a septic tank and a sewer system, respectively, compared to 35% and 22% of urban households. Massive subsidies were provided to construct toilets as the poor lacked adequate resources to build them independently (Asthana 1997). However, people continued to practice open defecation.

A 1998-1999 report by the Central Bureau of Health Intelligence showed that on average 30 million people in rural areas suffered from sanitation-related diseases (*India's Total Sanitation Campaign* 2017). This indicates the failure of the CRSP to improve sanitary conditions in rural India despite the willingness of the GoI to subsidize the construction of toilets. One of the main causes of this failure was the total lack of community participation in this traditional supply-driven, subsidy-oriented government program. There was poor utilization of whatever toilets were constructed under the program, which was due to many reasons, such as lack of awareness, poor construction standards, emphasis on high-cost designs, and absence of beneficiary participation, among others. Most states were unable to give adequate priority to the sanitation program. The CRSP also neglected school sanitation, which is considered one of the vital components. Furthermore, CRSP failed to establish links with various local institutions (Kedia 2022). In September 2000, India signed the United Nations Millennium Declaration, committing to eradicate extreme poverty in all its forms by 2015, a target being the provision of access to basic sanitation for all. Between 2005 and 2010, the federal government launched the CLTS program. In implementing the CLTS program, the government not only aimed to construct toilets but also aimed to change behavior, generating demand for sanitation facilities. Subsequently, GoI intensified toilet construction throughout the country from 2008 through Nirmal Bharat Abhiyan, which was aimed at providing 50% of the rural population with sanitation facilities by 2015.

Against this backdrop, Modi launched the SBM in 2014. Modi, like Gandhi, aimed to connect with the masses through various social experiments, with the SBM being one of them. The SBM, previously Nirmal Bharat Abhiyan (2009), is one of these initiatives undertaken by GoI, which, among other things, planned to build 110 million toilets between 2014 and 2019. [4]

Modi used social and traditional media. Through a program titled 'Mann Ki Baat' (MKB) which is aired through All India Radio, Modi regularly addresses the nation and talks about various government programs. An analysis of 48 MKB broadcasts between 2014 and 2018 reveals that he used it primarily to publicize various government initiatives (Tewari 2018). Another analysis of the nine MKB broadcasts from 2019 shows that Modi mentioned "India" 220 times and "nation" 94 times, followed by "water", "young/youth", "clean" and"women" (Chatterji 2019). This was Modi's way of building political trust and a personal connection with citizens, which he believed was necessary to propagate the stability, predictability, and continuity of his socio-political agendas [5].

The Ministry of Health and Family Welfare (MoHFW, GoI) recruited some famous Bollywood stars, prominent sports personalities from Indian cricket and hockey teams, industrialists, and divine leaders (Singh & Jain 2018), to raise awareness and bring about behavior change among citizens. The SBM anthem was written by the renowned lyricist Prasoon Joshi and sung by popular singer Kailash Kher. A Bollywood film was made on the biopic of Anita Narre from Madhya Pradesh who left her husband's house because her in-laws did not have a toilet. All these activities were initiated by GoI, to reach out to the citizens to bring about behavioral change so that people start using toilets.

In this paper, we examine the factors that led to the successful implementation of SBM and the increase in the demand for toilets. The data show (Figure 1) that the number of households without access to toilets has fallen dra-

[4] In addition to SBM, Modi launched several initiatives, such as Jan Dhan Yojana and Beti Bachao, Beti Padhao, aimed at connecting with the masses.

[5] Indeed, in the very first MKB, broadcasted on October 3, 2014, Modi focused on the SBM or Clean India initiative, which had been announced a day earlier on Gandhi's birth anniversary.

matically between the NFHS-4 (2014) and NFHS-5 (2019) surveys. We investigate 1) the power of this political nudge in generating social and behavioral changes towards the sanitation initiative of SBM, and 2) whether the awareness towards sanitation has filtered down to the local levels of governance. There is a likelihood of a behavioral change if the same political party is present at every level of the administrative hierarchy, from the leaders of the central government to the ministry, state, district, block, and village [6]. This first-of-its-kind study examines whether political nudging from the top has facilitated better implementation of federal (central) government projects in states with a political affiliation similar to that of the federal government. We find that the implementation of SBM was better in states with similar political affiliations, indicating a synergy between the federal and state governments. We also assess the impact of the synergy between the state and federal governments on the implementation of the SBM. We find that social messaging became intertwined with political messaging, fostering trust in local administrations and generating demand for improved sanitation.

3 Sanitation, Public health and economic development

Strictly speaking, a household toilet is not a "public good", because it is excludable, but there is a strong "public good" justification for household toilets receiving public funds. Households without access to toilets can negatively affect both health and income outcomes.

According to a report by World Health Organization & UNICEF (2013), more than 500 million of the rural population in India continued to defecate in the open in 2011, suffering preventable deaths, illness, stunting, harassment, and economic losses. The same report linked one in ten deaths in India to poor sanitation. Spears (2020) argued that the variations in average height between developing countries cannot be adequately explained solely by differences in wealth. For example, children in India are on average shorter than children in Africa, despite the latter being economically less affluent. Banerjee & Banik (2014) find that using toilets is also economically important as better sanitation can produce higher income growth than the establishment of factories, banks and schools. A 1% increase in closed drainage systems increased per capita income between 0.96% and 2.58%, much higher than that generated by development indicators such as providing tap water to the households (between 0.16% and 1.30%); setting up factories (between 0.17% and 0.41%); opening bank accounts (between 0.01% and 0.1%); and electrification (between 0.03% and 0.41%).

Citizens continued to defecate in the open despite the benefits of using toilets. Such behavior can be explained by the fact that the people are either not aware of the health and income benefits, and/or are reluctant to change their behavior. The use of toilets can be considered as an investment good with the choice of adoption and the consequential health benefits separated in time. When it comes to changing behavior with respect to investment goods, there is a tendency to procrastinate (Ferrari et al. (1995)). People get used to open defecation when faced with a lack of sanitation-related infrastructures such as access to running water, solid waste management, and wastewater management (Kayser et al. 2019). In addition, there are social norms that inhibit the use of bathrooms. Gauri et al. (2023) find that there are two aspects of social norms leading to lower demand for toilets in rural parts of India. First is the belief that others do not use toilets or find open defecation acceptable. The second is the belief in ritual notions of purity that dissociate latrine from cleanliness. Rāmasvāmi (2005) argues that open defecation among Hindu households is due to the caste system, where the customary circumvention of excreta is sustained by keeping the

[6] To ensure accountability, MoHFW, GoI, created a live dashboard displaying progress on sanitation coverage showing the number of toilets built and the percentage of households covered.

defecation away from the house and entrusting the clean-up job to the so-called untouchables or 'lower' castes. These historical reasons have created a persistent behavioral preference for open defecation for citizens.

The earlier government-initiated projects such as the CRSP and the TSC failed because there were no attempts to change the behavior aspect and increase awareness about the beneficial impact of toilet use. As this paper suggests (Section 6), these behavioral changes against open defecation have yielded better results since the sanitation project was spearheaded by a political leader (along with other celebrities) who appealed for preference changes to the population.

3.1 Demand-side intervention

Banerjee et al. (2017) estimated demand for toilets using data from the National Family Health Survey 3 (NFHS-3, 2005-2006), which shows that even after taking into account the effects of wealth, the preference of the household to build toilets was much lower than the preference to have other durable household items. When ranking preference for toilets against other consumer durables, toilets were ranked lower than most other consumer durables. This pointed to the fact that a behavioral or preferential change will be needed to make India open-defecation-free.

There are three ways to nudge the existing behavior of defecating in the open. The first is to provide information. If people learn the beneficial impact of using the toilets, then they will start using them. And when many people start using toilets, it can 'nudge' others to believe it is the right thing to do. As part of the SBM, central and state governments, and non-governmental organizations (NGOs) launched awareness campaigns to educate people about the importance of using toilets and the negative consequences of open defecation. These campaigns include mass media, community mobilization, and interpersonal communication to change social norms and behaviors (Government of India 2022). Panda et al. (2017) find that effective communication about the bad effects of open defecation has helped increase the demand for toilets and promoted hygiene practices in rural India.

The second way to change behavior is through peer pressure. For example, the academic effort of college students is influenced by their peers in class and their roommates in hostels (Sacerdote 2001, Zimmerman 2003). During the time of COVID-19, people started wearing masks in public places such as airports or while traveling in airplanes, fearing they might be chastised by others. When people care about what other people are thinking, they are going to change their behavior. SBM introduced the CLTS program to promote behavioral change using peer pressure.

The third way is to provide monetary incentives for those who do not defecate in the open or through penalties if found to defecate openly. Under SBM, the government provides financial incentives to households to build toilets which have encouraged many households to use toilets. Gupta et al. (2019) find that the villages of the states of Bihar, Uttar Pradesh, Madhya Pradesh, and Rajasthan started using toilets when the government threatened them with withholding other government benefits if they found themselves not using toilets. In Sangola, a town in the Solapur district in Maharashtra, photographs of people found to be defecating in the open were flashed on digital displays. Some others were escorted home in loud processions (Economist 2017).

3.2 Supply-side intervention

The supply-side interventions for providing toilets arose from the fact that India has a large number of poor people who cannot afford to construct a toilet and therefore there is a need for government intervention to build toilets. The construction of these toilets also assumed that there was a demand for using the toilets. There is also a presumption that social returns, in terms of better health outcomes, will be higher when people use toilets and therefore people will

stop defecating in the open when they have access to toilets. Peer pressure mattered for the implementation of the SBM program, and so did the national pride associated with Modi's call to emphasize Gandhi's commitment to cleanliness. It should be noted that although there are disagreements related to statistics related to toilet coverage (Gupta et al. 2019, Ministry of Jal Shakti 2017), the NFHS data suggest a drastic improvement in the number of individual household latrines (IHHLs) built between NFHS-4 and NFHS-5. SBM has made significant progress in improving sanitation coverage not only through the construction of household toilets, but also by expanding the process of building toilets in public places such as schools, community centers, etc. In addition, the government through its Jal Shakti mission (read national water mission) has invested in the construction of sewage treatment plants and the improvement of existing facilities to treat wastewater. This also has a complementary impact on SBM. A study conducted by the National Sample Survey Office (NSSO) found that the percentage of households using toilets increased from 38.7% in 2014 to 77.5% in 2019 (NSSO, 2019). According to the World Health Organization (WHO), the percentage of the population practicing open defecation decreased from 55% in 2014 to 34% in 2018.

In the next section, we propose a theory model for SBM to generate hypotheses, which we later test with empirical models.

4 Modeling SBM

Proposition 1. *With the new government coming to power in 2014, all three factors, namely, socio-political messaging, subsidies for household toilet construction, and the government-initiated toilet construction project—occurred simultaneously, resulting in a shift in the preference structure for using toilets.*

Let $u(a_h T_h, W_h)$, be the utility function of household h using toilet T_h, where

$$T_h = \begin{cases} 1 & \text{household } h \text{ has a toilet} \\ 0 & \text{otherwise} \end{cases}$$

with preference parameter for the toilet being a_h and wealth level W_h. The function $u(a_h T_h, W_h)$, increases monotonically in both $a_h T_h \in \mathbb{R}^+$ and $W_h \in \mathbb{R}^+$. As a_h increases, the preference for a toilet increases when $T_h = 1$. Assume that a household h of preference type a_h.

Let P represent the price of installing a toilet. The household will proceed with the installation if the following condition holds

$$u(a_h, W_h - P)) > \bar{U} > u(0, W_h). \tag{1}$$

This applies to any marginal representative household that is indifferent between having a toilet and not having one, given the endowment pair (a_h, W_h). The household will use a toilet if the utility is above the threshold $\bar{U}$ or W_h above the corresponding wealth threshold $\bar{W}(a_h, P)$.

As discussed, GoI since 2014, has been trying to make people use toilets in two ways. The first is through social messaging, which affects the preference parameter from a_h to a'_h with $a'_h > a_h$. The second way is to give the household a subsidy ($S \geq 0$), which helps the households construct toilets by reducing the installation cost to $P - S$.

Looking at the changes in the utility we notice that:

$$\begin{aligned} & u(a_h', W_h - (P-S)) - u(0, W_h) \\ & = \overbrace{u(a_h', W_h - (P-S)) - u(a_h, W_h - (P-S))}^{\text{due to preference}} + \overbrace{u(a_h, W_h - (P-S)) - u(0, W_h)}^{\text{due to subsidy}} \end{aligned} \tag{2}$$

Both the changes are non-negative. When social/political messaging fails to motivate people to use the toilets, there is no change in the preference pattern ($a_h = a_h'$), indicating that the change in the preference structure is driven solely by the subsidy. Therefore, simply subsidizing the construction of toilets may not be effective, as people may derive less utility from using them. Changes in preferences driven by social messaging not only influence the outcome of the intervention but also enhance its cost-effectiveness. In fact, unlike previous government interventions that offered a full subsidy ($S = P$), the SBM project requires households to cover a portion of the costs. [7]

A household with a wealth level W_h but without preference for a toilet, that is $a_h = 0$, receives a subsidy of $S \leq P$. For this household, the utility decreases when he builds a toilet, that is, $u(0, W_h - (P-S)) \leq u(0, W)$. In an extreme case where the household gets a full subsidy, that is, $S = P$, the utility function of the household remains the same, that is, $u(0, W_h)$. Any marginal representative household can still choose not to use the toilet (that is, $\bar{U} > u(0, W_h)$), even if it is provided for free by the administration. Therefore, a change in preferences is a necessary condition for households to use the toilet.

4.1 Local political games with SBM

In a federal country such as India, administrative powers are devolved to the regional (state) level. The Indian constitution clearly outlines the responsibilities of states, including municipal sanitation. The state administration is usually run by local political parties, which implement the SBM program. For simplicity, suppose that there are two types of local administration, N (national) and L (local). The local administration of type N is politically aligned with the federal government, whereas that of type L is not.

Proposition 2. *SBM will be implemented effectively (resulting in more toilets and better use of funds to construct toilets) in states that are politically aligned with the federal government (N-type states) compared to states that are politically different from the federal government (L-type states).*

Consider a situation in which local administrations are imperfect and put effort e to provide a subsidy to a household with probability $\pi(e)$, where $e \in \mathscr{R}^+$, such that $\partial \pi(e)/\partial e > 0$. The effort depends on the social and political messages received by the local administrators. The probability $\pi(e)$ is less than one, which can be due to leakages or inefficiency or simply due to a different political affiliation to the national party.

Consider a household with toilet preference $a_h > 0$ and wealth W_h in a local administrative region e. The expected utility of installing a toilet for the household is:

$$E\left[u(a_h, W_h)\right] = \bar{u}(a_h, W_h, e) = \pi(e) \cdot u(a_h, W_h - (P-S)) + (1 - \pi(e)) \cdot u(0, W_h), \tag{3}$$

[7] For the community sanitary complexes construction of toilets will be undertaken only if 10% of the cost is borne by the village panchayat (Department of Drinking Water and Sanitation, Government of India (2023).

Notice that by (1), the expected utility increases with e, that is:

$$\frac{\partial \bar{u}(a_h, W_h, e)}{\partial e} > 0 \tag{4}$$

Assume that in local elections the only thing that matters is how well the SBM is implemented [8]. According to the Indian Constitution, *under the first-past-the-post system*, the party that receives the most votes wins.

Consider a local administration of type N that makes an effort e_N to implement SBM. The household h votes for the party N in the next local elections if it gets a toilet, that is, $\bar{u}(a_h, W_h, e_N) > \bar{U}$. Therefore, the total number of votes (or utility) of the party N is given by:

$$U_N(e_N) = \int_{a_h} \mathscr{I}(\bar{u}(a_h, W_h, e_N) > \bar{U}) dh \tag{5}$$

where $\mathscr{I}()$ is the indicator function.

Similarly, consider a state run by a party of type L that makes an effort e_L to implement SBM. A household in this state will vote for the incumbent L if it does not get a toilet, that is, $\bar{u}(a_h, W_h, e_L) < \bar{U}$. Thus, the utility of the local party is given by:

$$U_L(e_L) = \int_{a_h} \mathscr{I}(\bar{u}(a_h, W_h, e_L) < \bar{U}) dh \tag{6}$$

Since $U_N(e_N)$ increases with e_N and $U_L(e_L)$ decreases with e_L, the N-type administration would choose to increase e_N to maximize the number of households voting for N. Therefore, the optimal effort of the N-type administration is:

$$e_N^* = \arg\max_{e_N} U_N(e_N).$$

In contrast, the L party would choose to decrease e_L to maximize $U_L(e_L)$, that is:

$$e_L^* = \arg\max_{e_L} U_L(e_L) = \arg\min_{e_L} U_N(e_L).$$

Since $U_N(e)$ increases with e, $e_N^* > e_L^*$. As a consequence, $\pi(e)$ increases in regions controlled by N, making the administrations more efficient in providing subsidies to households to build toilets. However, L-controlled administrations decrease the effectiveness of providing subsidies to households, so the SBM is not implemented efficiently. Thus, implementation improves (or deteriorates) with a switch from the L to the N (N to L) type of administration.

Proposition 3. *Low-income households will be affected negatively by the inefficient implementation of the SBM by type L administrations than high-income households. Similarly, low-income households will be positively affected by the efficient implementation of type N administration.*

Since the expected household utility, $\bar{u}(a_h, W_h, e)$, is increasing in W_h, less wealthy households will be more negatively affected by the inefficient implementation of SBM by the type L administration. Using the same argument, it can also be illustrated that low-income households will benefit the most from the efficient implementation of the SBM by the type N administration.

[8] Of course the election outcome can be a function of other factors, and sanitation is one of them.

5 Data: Preliminary observations

The datasets of the National Family Health Survey (NFHS), encompassing NFHS-3 (2005-2006), NFHS-4 (2015-16), and NFHS-5 (2019-21), provide data on the use of household toilets, stratified by demographic characteristics, including gender, religion, location, and geographic region. The household serves as the unit of analysis throughout this study. The sample sizes for these surveys are: 109,041 households in NFHS-3, 601,509 households in NFHS-4, and 636,698 households in NFHS-5. The summary statistics for the relevant variables are presented in Table A1. Political data on the tenure of various state governments were sourced from multiple news outlets. In particular, we obtained these data from the website of One India news outlet, which collects data from the Election Commission of India (ECI) and presents the same in an easy-to-understand format (OneIndia n.d.). Regional public health data, specifically regarding the prevalence of sanitation-related morbidities, were obtained from the Institute for Health Metrics and Evaluation (IHME) at the University of Washington School of Medicine. [9]

5.1 Household data from the National Family Health Survey (NFHS)

We make use of the NFHS surveys to analyze and compare the evolving preferences for toilets. Since 1992-93, a total of five rounds of such surveys have been conducted. All five surveys have been conducted under the supervision of the Ministry of Health and Family Welfare, Government of India (MoHFW, GoI). The objective of these surveys is to help policymakers evaluate the effectiveness of existing programs and identify the need to implement new programs.

We determine whether a household has access to a toilet based on their response to the following question: "What kind of toilet facility do members of your household usually use?" The respondents could choose the type of toilet facility available from a list of 12 different types of toilets [10], or they could recognize that there is no facility available to them. We create a binary variable that indicates the availability of a toilet in a particular household. This variable takes value 1 if the household has access to any of these 12 types of toilets, otherwise zero. Figure 1 illustrates how access to toilets varied between surveys. Between the NFHS-3 and NFHS-4 surveys, approximately 38% of the respondents reported that they did not have access to toilets. However, in the NFHS-5 survey, only 18.1% of the respondents reported not having access to a toilet. This shows a significant improvement in the availability of toilets between 2014-15 and 2019-21.

As a preliminary analysis, we calculate the probability that a household engages in open defecation, conditional upon various characteristics of the household. We present our results in Table A2. The first section of Table A2 presents conditional probabilities of households having access to toilets based on their characteristics of living standards which include ownership of a computer, car, refrigerator, mobile telephone, motorcycle or scooter, television, radio, bicycle and electricity connection. We observe a trend in these probabilities in these three NFHS surveys. We explain this trend with the help of an example, let us say electricity connection. According to the NFHS-3 survey, 72.2% of all households with electricity connections had access to toilets. This percentage changed to 67.2% and 83% during the NFHS-4 and NFHS-5 surveys, respectively. This implies that between the NFHS-3 and NFHS-4 surveys, more households got access to electricity than toilets. However, between the NFHS-4 and NFHS-5 surveys, more households got access to toilets than electricity. A similar trend can be observed for other attributes of living standards, especially

[9] Global Burden of Disease Study 2021, Institute for Health Metrics and Evaluation, 2022. Available from `https://vizhub.healthdata.org/gbd-results/`.

[10] These 12 types of toilets are: (1.) Flush toilet, (2.) Flush to a piped sewer system, (3.) Flush to a septic tank, (4.) Flush to pit latrine, (5.) Flush to somewhere else, (6.) Flush, don't know where, (7.) Pit toilet latrine, (8.) Ventilated Improved Pit latrine (VIP), (9.) Pit latrine with slab, (10.) Pit latrine without slab/open pit, (11.) Composting toilet, Dry toilet, (12.) Other.

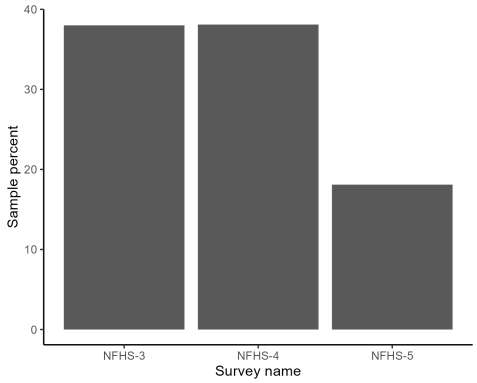


Figure 1: Percent of households without access to toilets across NFHS -3, NFHS-4, and NFHS-5 surveys

mobile phones. This is because the spread of mobile phones was rapid between the NFHS-3 and NFHS-4 surveys. However, an opposite trend can be observed for the radio as its users decrease over time.

We also calculate the probability of a household having access to toilets based on various wealth attributes, including fixed-in-supply items such as agricultural lands and the type of housing. Such fixed-in-supply wealth attributes differ from living-standard attributes (such as ownership of mobile phones and televisions) because they are not easily scalable through production in the short run. For our analysis, we include agricultural land, the type of housing, and access to a bank or a post office account as wealth variables.

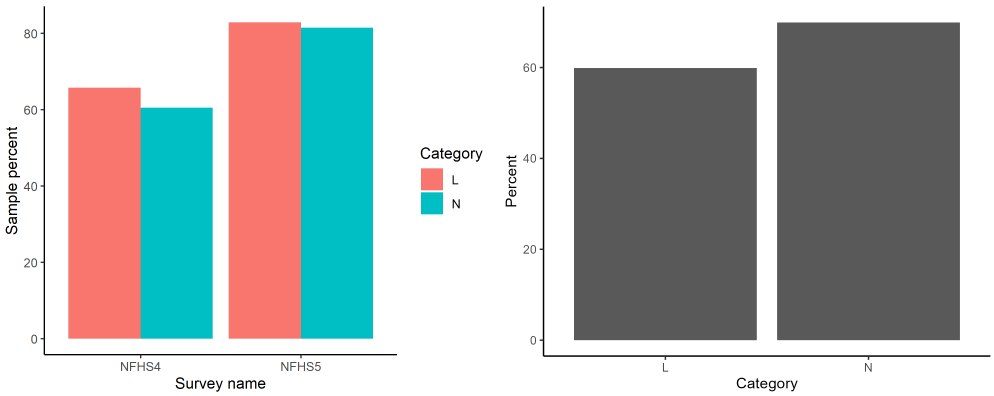
The observed pattern with wealth attributes is different from that seen with living-standard attributes. The percentage of households who owned a piece of agricultural land and had access to a toilet was 58.7% in the NFHS-3. This percentage changed to 59.9% and 81.3%, during the NFHS-4 and NFHS-5 surveys, respectively. These results imply that more households gained access to toilets than agricultural land between the NFHS-3 and NFHS-5 surveys. This result is not surprising because, as mentioned previously, the supply of agricultural land is fixed. However, an opposite trend is observed in the case of bank or post office accounts, that is, a greater number of households got access to bank or post office accounts between the NFHS-3 and NFHS-4 surveys. In contrast, toilets spread faster than bank or post office accounts between the NFHS-4 and NFHS-5 surveys.

Finally, we discuss the cultural attributes that can affect the probability that a household has access to the toilet. Here, we find that households headed by a Hindu are less likely to have access to toilets than those headed by a Muslim. We presume that this is because Muslim households have the religious practice of offering *Ajan*, and hence, are more inclined to use the toilet. However, both types of households showed substantial improvement in access to toilets between the NFHS-4 and NFHS-5 surveys.

5.2 Political data

Sanitation is a state subject. Hence, various sanitation-related tasks, for example, constructing toilets, initiating behavior change activities, providing solid and liquid waste management systems, etc. are done by state governments.

We observed a significant improvement in the access of Indian households to the toilets between NFHS-4 and NFHS-5. As a follow-up question, we examine whether states with political affiliations similar to those of the federal government performed differently between these two surveys. The Bharatiya Janata Party (BJP) received the mandate



(a) Percent of households without access to toilets

(b) portion of funds utilized

Figure 2: Differences between BJP and non-BJP administered states

to govern at the center in 2014. Polls to elect various state governments are held at different points in time depending upon when the tenure of a state government ends. In India, state governments are elected for five years. Therefore, it is challenging to categorize Indian states as politically aligned or non-aligned in relation to the ruling party at the Center. To address this problem, we categorize a state into politically aligned categories (N-type states) if it was ruled by the BJP at any point in time between 2014 and 2019. If a state did not have a BJP government in power between 2014 and 2019, we categorize it as a non-aligned state (L-type state). Table A3 reports the list of the N and L-type states.

As a preliminary analysis, we calculate the percentage of households that had access to toilets in both types of states using the NFHS-4 and NFHS-5 data sets. According to the NFHS-4 survey, 60.5% of the households had access to toilets in the N-type states, while 65.8% of the households had access to toilets in L-type states. However, according to the NFHS-5 data set, 81.5% of the households in the N-type states and 82.9% of the households in the L-type states had access to toilets. In marginal terms, the increase in the adoption of toilets was higher in the N-type states. However, in absolute numbers, the L-type states still have a higher usage of toilets (Figure 2(a)). From the supply-side perspective, we examined whether N-type states utilized a larger portion of the funds allocated to them under SBM. We analyze data on the funds allocated and utilized by each state or union territory under the SBM mission in Table A3.

Figure 2(b) summarizes the percentage of funds utilized by both types of states allocated to them under the SBM scheme. Data on SBM funds allocated and used were compiled by the Center for Budget and Governance Accountability, based on responses received through Right-to-Information (RTI) applications. As shown in the figure, on average, the N-type states utilized 70% of the funds allocated to them, while the L-type states used only 60% of the SBM funds. This indicates that strong political will from the party's leadership contributes to more effective implementation of federally run projects.

6 Empirical evidence: Wealth threshold and preference for toilet

We estimate the preference of households to use toilets (toilets are considered as aspiration goods) compared to other consumer durables, namely cot, watch, mattress, chair, bicycle, table, electric fan, television, pressure cooker, radio, motorcycle, water pump, mobile phone, telephone, sewing machine, refrigerator, tractor, animal-drawn cart, thresher, and computer (21 in total, including toilet). The objective of this exercise is to analyze how Indian households rank toilets compared to other consumer durables in the three surveys.

We account for a household's wealth when examining how it ranks different consumer durables because the likelihood of possessing any of them rises with household wealth. The NFHS dataset provides a wealth index for each household. This index cannot be used directly in our analysis as "access to the toilets" is used as one of the constituent elements. Using this index would create the problem of endogeneity.

Therefore, we create a new wealth index for each household using real and financial assets that appreciate over time. We include the following variables as components of wealth: ownership of a bank account (or a post office account), ownership of a piece of agricultural land, and the type of house in which the members of the household reside (kaccha, semipucca, and pucca). [11]

Since the components of wealth described above are categorical variables, we use multiple correspondence analysis (MCA) (Abdi & Valentin (2007)), a generalization of the PCA to categorical variables, to create a wealth index for each household surveyed in the NFHS as follows:

$$\text{Wealth}_\text{t} = \sum_a w_a A_{a,t} \tag{7}$$

where $A_{a,t}$ are different wealth components held by a household for the survey periods t =NFHS-3, NFHS-4, and NFHS-5. The weights w_a are obtained from the NFHS-3 data and remain constant during the NFHS-4 and NFHS-5 rounds.

The estimated weights are reported in Table 1. For example, the wealth index of a representative household that resides in a pucca house, owns a piece of agricultural land, and also owns a bank (or a post office) account is 23.05 + 8.21 + 19.88 = 51.14. The wealth indices of other households can be calculated similarly. The wealth index is an ordinal variable and the weights are the shadow market prices of the assets computed in the base time period, NFHS-3.

Table 1: Weights of different constituent asset categories in wealth index

Asset Class	Weight
Type of the house – Kuchcha (wood, bamboo, mud, etc.)	12.24
Type of the house – Semi-pucca	14.70
Type of the house – Pucca (brick house)	23.05
Ownership of agricultural land – No	5.53
Ownership of agricultural land – Yes	8.21
Ownership of a bank or a post office account – No	16.40
Ownership of a bank or a post office account – Yes	19.88

We estimate the probability that a household owns each of the 21 consumer goods described above, given its wealth index. For this purpose, we perform a logistic regression for each consumer good. In each of these 21 logistic

[11] The wealth index has a few limitations. For instance, there may be differences in land ownership between urban and rural areas, with urban households typically owning less acreage than their rural counterparts. Furthermore, although the Jan Dhan Yojana scheme has led the government to open many bank accounts, people may not be actively using them.

regression models, the dependent variable is the presence or absence of a consumer good in the household. The logistic regression models are given as:

$$\log\left\{\frac{\hat{p}^g}{1-\hat{p}^g}\right\} = \hat{\beta}_0^g + \hat{\beta}_1^g \text{Wealth} \tag{8}$$

where $\hat{p}^g$ is the probability that a household owns consumer good g. A household prefers Good A over Good B if a certain probability of owning Good A can be achieved at a lower level of wealth compared to Good B. We calculate the threshold level of wealth for which the probability of owning a consumer good g becomes 0.5. The threshold level of wealth (as discussed in (1)) at which the household is indifferent to aspire for good g is given by:

$$\widehat{\text{Wealth}}^g = -\frac{\hat{\beta}_0^g}{\hat{\beta}_1^g} \tag{9}$$

We estimate these wealth thresholds for all 21 consumer goods. We repeat the same analysis for NFHS-4 and NFHS-5 datasets. We report the results in Table 2. [12]

The result implies that the relative preference order of Indian households for toilets changed between the NFHS-4 and NFHS-5 surveys. More specifically, the demand for toilets among Indian households increased substantially between the NFHS-4 and NFHS-5 surveys. The preference for toilets ranked 5 out of 21 consumer durables in NFHS-3. The ranking deteriorated during NFHS-4 when the toilets were given a lower ranking of 8 out of 21 consumer durables. However, the preference for toilets improved substantially during NFHS-5, with the toilet receiving a ranking of 3 among 21 consumer durables.

We then divide the data into rural and urban areas and repeat the previous analysis. We keep the definition of the wealth index unchanged so that the comparison of wealth thresholds across rural/urban settings and across surveys remains valid. We present the wealth thresholds for rural and urban areas in Table 2. The first and second numbers inside parentheses represent the wealth thresholds in rural and urban areas, respectively. In rural areas, the wealth thresholds for toilets are 46.01, 43.66, and 32.17 in NFHS-3, NFHS-4, and NFHS-5, respectively. However, in urban areas, the wealth thresholds are 32.98, 34.12, and 28.42 in NFHS-3, NFHS-4, and NFHS-5, respectively. In each survey, the wealth threshold for toilets in urban areas was less than that of their corresponding rural areas. This result implies that urban households are more inclined to adopt toilets than their rural counterparts. Although wealth thresholds for toilets decreased substantially between NFHS-4 and NFHS-5 in both urban and rural areas, it is important to note that rural areas made more progress than their urban counterparts (a greater decrease in wealth threshold).

We also compute wealth thresholds for toilets for each state to compare the rate of adoption of toilets. We present our results in Table A4 in the Appendix. We found that toilet adoption is the highest in the northeastern states of India in all three NFHS surveys. There are not many differences in the ranking of states in the three NFHS surveys.[13] Northeastern states such as Mizoram, Tripura, Nagaland, Sikkim, Arunanchal Pradesh, Assam, and Meghalaya consistently performed well in the three NFHS surveys. The Union Territory of Lakshadweep and the southern Indian state of Kerala also ranked highly in terms of toilet adoption. Toilet adoption was low in eastern states such as Odisha (Orissa), Jharkhand, Bihar, and Chhattisgarh.

[12] As illustrated in Table 2, the wealth threshold for toilets calculated from the NFHS-3 dataset was 40.19, which marginally increased to 41.34 in the NFHS-4 dataset. However, the wealth threshold for toilets in the NFHS-5 dataset is 32.83, implying that more lower-income households are likely to have toilets during the NFHS-5 survey compared to the previous two surveys.

[13] A state that performs well in implementing SBM may still receive a lower rank if it starts from a lower baseline. The marginal improvement may not be significant enough for the state to advance in the ranking.

Table 2: Consumer goods and their corresponding wealth threshold levels. The first and second numbers inside parentheses represent the wealth thresholds in rural and urban areas, respectively.

NFHS-3		NFHS-4		NFHS-5	
Consumer durables	Wealth threshold	Consumer durables	Wealth threshold	Consumer durables	Wealth threshold
cot	24.23 (22.77, 24.76)	cot	15.93 (16.50, 14.65)	cot	8.24 (11.03, -1.08)
watch	33.46 (33.98, 28.96)	mobile	31.43 (31.28,26.83)	mobile	27.03 (26.24, 22.61)
mattress	38.28 (39.77, 34.78)	watch	36.50 (36.97, 30.56)	***toilet***	32.83 (32.17, 28.42)
chair	39.65 (40.81, 36.40)	bicycle	36.71 (49.03, 75.89)	chair	33.83 (33.97, 27.79)
toilet	40.19 (46.01, 32.98)	chair	37.26 (37.65, 33.45)	bicycle	35.26 (38.41, 137.26)
fan	41.20 (43.37, 36.89)	mattress	39.12 (39.97, 33.85)	fan	35.82 (36.04, 30.02)
table	41.75 (43.27, 39.14)	fan	39.82 (40.78, 34.06)	mattress	36.29 (36.68, 29.57)
television	42.44 (44.78, 38.70)	***toilet***	41.34 (43.66, 34.12)	watch	36.72 (37.14, 30.26)
cooker	42.98 (46.38, 38.86)	television	41.84 (43.22, 34.79)	cooker	40.33 (41.59, 32.01)
mobile	49.58 (53.65, 47.99)	table	42.58 (44.00, 37.90)	table	41.19 (42.54, 33.53)
refrigerator	49.75 (52.95, 48.47)	cooker	42.83(44.81, 35.73)	television	41.39 (42.51, 33.49)
bicycle	49.91 (46.47, 51.98)	scooter	49.05 (50.40, 47.00)	scooter	46.65 (47.66, 43.77)
radio	50.29 (50.77, 50.27)	refrigerator	50.09 (52.64, 46.25)	refrigerator	49.40 (51.70, 43.78)
scooter	50.89 (52.87, 50.17)	sewing	53.19 (54.78, 52.08)	sewing	55.51 (56.95, 54.95)
telephone	50.94 (52.51, 50.39)	computer	58.27 (62.08, 55.99)	pump	58.69 (59.12, 60.31)
sewing	51.34 (52.83, 51.13)	pump	58.28 (59.18, 58.20)	computer	61.58 (64.85, 59.25)
computer	56.89 (63.13, 55.62)	telephone	65.20 (69.40, 64.13)	tractor	71.76 (68.08, 90.92)
pump	59.72 (58.78, 58.63)	tractor	70.21 (66.05, 66.71)	telephone	89.50 (108.15, 96.29)
tractor	75.53 (64.50, 73.43)	thresher	83.10 (76.78, 77.98)	thresher	92.71 (85.33, 156.10)
thresher	105.99 (77.13, 81.95)	radio	92.99 (87.51, 189.67)	radio	98.79 (98.22, 155.31)
cart	283.46 (79.06, 118.14)	cart	118.02 (86.72, 117.52)	cart	126.26 (96.52, -535.75)

7 Local politics: The comparison between N-type and L-type states.

In this section, we first study how access to toilets changed between the three surveys from 2005-2006 to 2019-21. We then assess whether political alignment influenced the implementation of the SBM, specifically in terms of toilet construction (Proposition 1). To meet these objectives, we created a dummy variable to indicate whether a household has access to a toilet. This dummy variable is used as the dependent variable in all models within this subsection.

We combined data sets from three surveys to analyze how access to toilets changed between 2005-2006 and 2019-2020. The two dummy variables: "NFHS-4 dummy" and "NFHS-5 dummy" keep track of the time periods in the data, with NFHS3-3 being the baseline. The logistic regression on this combined dataset helps us to understand how access to toilets changed between 2005-06 and 2019-21. We included the wealth index (calculated in 7) in our model to incorporate the effect of a household's wealth on its access to a toilet. We present our results in Table 3. We ran another regression with demographic factors like religion, education, area (urban/rural), etc. to understand how they affect a household's access to toilets. The results are presented in Table 3.

The findings in Table 3 support the general understanding by showing that households with higher incomes are more likely to have access to a toilet. According to our first model, which disregards the effects of demographic factors, a household was less likely to have access to a toilet during the NFHS-4 survey than during the NFHS-3 survey. However, after accounting for demographic factors, the likelihood of having access to a toilet during the NFHS-4 survey was slightly better than during the NFHS-3 survey. These mixed results are consistent with Figure 1, which shows that the availability of toilets remained more or less the same between the NFHS-3 and NFHS-4 surveys. In contrast, both models unequivocally establish that the availability of toilets was significantly higher during the NFHS-5 than during the NFHS-3 survey.

The SBM is one of the flagship projects of the federal government, but the responsibility for building toilets is with state governments, which may be led by a different political party than the federal government. We test whether politically aligned states performed better in building toilets between the NFHS-4 and NFHS-5 surveys. We use logistic regression, the dependent variable being a binary variable that indicates the availability of a toilet.

To identify whether a household resides in an N-type or L-type state, we introduce another dummy variable, denoted as the "BJP dummy", which indicates that the household is located in an N-type state. Furthermore, we introduce an interaction term between the "NFHS-5 dummy" and the "BJP dummy" in the model. This interaction term is a dummy variable that takes the value 1, only for observations from the NFHS-5 survey and N-type states. The coefficient of this interaction term provides the DID effect. The significance of this interaction term indicates that politically aligned states outperformed non-aligned states in toilet construction between the NFHS-4 and NFHS-5 surveys. We also include the wealth index of a household in the model to account for the wealth effects. As we did previously, we created two models, one with demographic variables and the other without them. We present our results in Table 4.

According to the results shown in Table 4, the coefficient that captures the interaction between "NFHS-5 dummy" and "BJP dummy" is significant in both models, implying that politically aligned states outperformed non-aligned states in toilet construction between the NFHS-4 and NFHS-5 surveys. The coefficient of the "NFHS-5 dummy" is significant and positive in both models, implying that the availability of toilets improved significantly between NFHS-4 and NFHS-5. The coefficient of the 'BJP dummy' is negative and significant in the first model (without demographics), suggesting that access to toilets is poorer in politically aligned states compared to non-aligned states. However, the coefficient becomes insignificant after adding demographic variables, indicating no statistically significant difference in toilet availability between politically aligned and non-aligned states when accounting for demographics.

Table 3: Changes in Toilet Access Across Three NFHS Surveys.
Base categories for each categorical variable are as follows: Religion of the household head: Christian, Gender of the household head: Female, Area: Rural, Women's highest education: No education, Household's highest education: No education.

	Without demographics	With demographics
(Intercept)	-6.0336^{***}	-3.7496^{***}
	(0.0203)	(0.0253)
Wealth index	0.1519^{***}	0.1116^{***}
	(0.0004)	(0.0005)
NFHS-4 dummy	-0.2195^{***}	0.0585^{***}
	(0.0073)	(0.0086)
NFHS-5 dummy	0.7816^{***}	1.2930^{***}
	(0.0075)	(0.0089)
Demographic factors:		
Religion of the household head - Hindu		-2.3568^{***}
		(0.0122)
Religion of the household head - Muslim		-1.1640^{***}
		(0.0141)
Religion of the household head - Others		-0.7773^{***}
		(0.0171)
Gender of the household head - Male		0.0306^{***}
		(0.0063)
Area - urban		1.6539^{***}
		(0.0068)
Women's highest education - Primary		0.2451^{***}
		(0.0076)
Women's highest education - Secondary		0.5379^{***}
		(0.0058)
Women's highest education - Higher		0.8743^{***}
		(0.0127)
Household's highest education - Primary		0.0636^{***}
		(0.0102)
Household's highest education - Secondary		0.4383^{***}
		(0.0093)
Household's highest education - Higher		1.1558^{***}
		(0.0119)
AIC	1420281.5392	1184332.9190
BIC	1420329.9935	1184514.6226
Log Likelihood	−710136.7696	−592151.4595
Deviance	1420273.5392	1184302.9190
Num. obs.	1347248	1347248

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Table 4: Impact of Political Affiliation on SBM Implementation.

Base categories for each categorical variable are as follows: Religion of the household head: Christian, Gender of the household head: Female, Area: Rural, Women's highest education: No education, Household's highest education: No education.

	Without demographics	With demographics
(Intercept)	-6.0541^{***}	-3.6821^{***}
	(0.0222)	(0.0274)
Wealth index	0.1484^{***}	0.1126^{***}
	(0.0005)	(0.0005)
NFHS-5 dummy	0.8548^{***}	1.1204^{***}
	(0.0086)	(0.0095)
BJP dummy	-0.0618^{***}	0.0096
	(0.0065)	(0.0074)
NFHS-5 dummy:BJP dummy	0.1955^{***}	0.1406^{***}
	(0.0100)	(0.0109)
Demographic factors		
Religion of the household head - Hindu		-2.3719^{***}
		(0.0132)
Religion of the household head - Muslim		-1.1952^{***}
		(0.0151)
Religion of the household head - Others		-0.7703^{***}
		(0.0185)
Gender of the household head - Male		0.0382^{***}
		(0.0065)
Area - Urban		1.5570^{***}
		(0.0073)
Women's highest education - Primary		0.2517^{***}
		(0.0080)
Women's highest education - Secondary		0.5225^{***}
		(0.0061)
Women's highest education - Higher		0.8483^{***}
		(0.0130)
Household's highest education - Primary		0.0333^{***}
		(0.0107)
Household's highest education - Secondary		0.4086^{***}
		(0.0097)
Household's highest education - Higher		1.1150^{***}
		(0.0124)
AIC	1294908.9675	1092351.3866
BIC	1294969.1134	1092543.8534
Log Likelihood	-647449.4837	-546159.6933
Deviance	1294898.9675	1092319.3866
Num. obs.	1238207	1238207

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

7.1 Synergy between the federal and state governments

In the previous section, we demonstrated that synergy resulting from the presence of the same political party at both the federal and state levels can enhance the implementation of federally funded projects like SBM. One may ask a natural follow-up question: How effective is the synergy between the federal and state governments? We answer this question by considering a hypothetical situation in which all states ruled by the BJP are governed by non-BJP governments and vice versa (Proposition 2). We adopt the following procedure. We first calculate the average probability of having access to a toilet for all households residing in the N-type states, that is, P_N. Similarly, we calculate the average probability of having access to a toilet for all households residing in the L-type states, that is, P_L. We calculate the average probability of having access to a toilet in states of type N, under the assumption that they are ruled by an L-type government, that is, Q_N. Similarly, we calculate the average probability of having access to a toilet in states of type L assuming that they are ruled by an N-type government, that is, Q_L. Higher values of $P_N - Q_N$ and $Q_L - P_L$ indicate the presence of strong synergies between the federal and state governments. We describe how we calculate the four probabilities mentioned above.

We split the NFHS-5 data into two parts according to the type of government that administered SBM to a household: N-type or L-type. We fit a logistic regression model to each part of the data (equation 10) that is similar to those used in the previous section, except they incorporate an additional independent variable, that is, "Portion of funds utilized". This variable describes the portion of the funds (allotted by the federal government) utilized by each state under the SBM scheme. It acts as a proxy for bureaucratic administrative efficiency during the period between the NFHS-4 and NFHS-5 surveys. The results are described in Table 5.

$$\begin{aligned}\ln \frac{P_i}{1-P_i} = \hat{v}_{i,0} + \hat{v}_{i,1}\text{wealth_index}_\text{i} + + \hat{v}_{i,2} Util.Funds_i \\ + \hat{v}_{i,f}(demographic.factors)_i, \text{for } i = N, L. \end{aligned} \tag{10}$$

We apply the N-type model to each household residing in the N-type states to estimate its probability of having access to a toilet. Subsequently, we take the mean of these probabilities to estimate P_N. P_L is estimated similarly. Simply put, P_N and P_L are the averages of the predicted probabilities (fitted values) of models of type N and type L.

We consider a hypothetical situation in which the N-type states are governed by L-type governments and vice versa to estimate Q_N and Q_L. Subsequently, we explore the potential implications of this hypothetical change on the implementation of the SBM. To estimate Q_N (Q_L), we apply the L-type model (N-type model) to all households that reside in states of type N (L-type) and take the average of all predicted probabilities given by (11).

$$\begin{aligned}\ln \frac{Q_i}{1-Q_i} = \hat{v}_{i,0} + \hat{v}_{i,1}\text{wealth_index}_\text{j} + + \hat{v}_{i,2} Util.Funds_j \\ + \hat{v}_{i,f}(demographic.factors)_j \text{ for } i \neq j = N, L. \end{aligned} \tag{11}$$

Our estimates of these four probabilities are: $P_N = 81.54\%, P_L = 82.86\%, Q_N = 79.82\%$ and $Q_L = 84.90\%$ (also provided in Table 6). The interpretation of these results is as follows. If politically aligned states had been ruled by L-type governments, their average probability of having access to a toilet would have decreased by $P_N - Q_N = 1.72\%$. Similarly, if non-politically aligned states had been ruled by N-type governments, their average probability of having

access to a toilet would have increased by $Q_L - P_L = 2.04\%$. These results provide evidence in support of the presence of synergies in the implementation of SBM between the federal and state governments.

Table 5: The following table describes logit models for the BJP-ruled (N-type) and non-BJP-ruled (L-type) states

Base categories for each categorical variable are as follows: Religion of the household head: Christian, Gender of the household head: Female, Area: Rural, Women's highest education: No education, Household's highest education: No education.

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	N-type Model	AMEs	L-type Model	AMEs
Intercept	-2.4053^{***}		-2.6036^{***}	
	(0.0517)		(0.0820)	
Wealth index	0.1057^{***}	0.0133	0.0778^{***}	0.0097
	(0.0010)		(0.0015)	
Portion of funds utilized	0.7186^{***}	0.0901	0.6278^{***}	0.0779
	(0.0142)		(0.0332)	
Demographic factors				
Religion - Hindu	-2.3907^{***}	-0.2225	-0.9834^{***}	-0.1015
	(0.0291)		(0.0346)	
Religion - Muslim	-1.3551^{***}	-0.2008	0.0129	0.0016
	(0.0322)		(0.0454)	
Religion - Others	-1.0386^{***}	-0.1536	1.0497^{***}	0.0979
	(0.0370)		(0.1030)	
Gender - Male	0.0484^{***}	0.0061	0.1109^{***}	0.0140
	(0.0112)		(0.0165)	
Area - Urban	1.2375^{***}	0.1255	1.1437^{***}	0.1232
	(0.0160)		(0.0189)	
Women's education - Primary	0.3082^{***}	0.0367	0.4251^{***}	0.0487
	(0.0138)		(0.0222)	
Women's education - Secondary	0.5302^{***}	0.0669	0.6513^{***}	0.0813
	(0.0109)		(0.0183)	
Women's education - Higher	0.8889^{***}	0.0939	0.9277^{***}	0.0954
	(0.0249)		(0.0359)	
Household's education - Primary	-0.0140	-0.0018	-0.0456	-0.0057
	(0.0177)		(0.0280)	
Household's education - Secondary	0.3461^{***}	0.0446	0.1742^{***}	0.0219
	(0.0162)		(0.0250)	
Household's education - Higher	1.0123^{***}	0.1100	0.7642^{***}	0.0851
	(0.0224)		(0.0329)	
AIC	359649.9255		143414.3464	
BIC	359804.3344		143555.8472	
Log Likelihood	-179810.9627		-71693.1732	
Deviance	359621.9255		143386.3464	
Num. obs.	455526		181172	

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Models using data from entire wealth distribution		
	N-type model	L-type model
Data from N-type states	81.54% (P_N)	79.82% (Q_N)
Data from L-type states	84.90% (Q_L)	82.86% (P_L)
Models using using data from bottom 50% of the wealth distribution		
Data from N-type states	72.72% (P_N)	71.70% (Q_N)
Data from L-type states	73.79% (Q_L)	72.93% (P_L)
Models using using data from bottom 10% of the wealth distribution		
Data from N-type states	67.08% (P_N)	64.00% (Q_N)
Data from L-type states	68.53% (Q_L)	63.65% (P_L)

Table 6: Prediction of the average probability of household access to toilets conditional on demographic factors, NFHS5 survey. The models are from Tables (5), (A5) (A6) respectively.

7.2 Demography and inequality of outcomes

Demographics have a major impact on access to toilets. Previous studies show that demographic variables such as the religion and gender of the household head, women's highest education, etc. play an important role in the toilet adoption of that household (Banerjee et al. (2017)).

We compute the average marginal effects (AME) in Table 5, to analyze the impact of demographic variables. Hindu households are, on average, 22.5% less likely to use toilets compared to Christian households in N-type states. However, this probability reduces to 10% in L-type states. A similar pattern is observed for Muslim households. In N-type states, they are, on average, 20% less likely to have access to toilets than Christian households. However, in L-type states, the availability of toilets in Muslim households is slightly more than in Christian households. Our results are consistent with those of the literature. For example, Hindu households (religion) are the least likely to have access to toilets compared to all other religious groups, which is consistent with Rāmasvāmi (2005).

Households led by a male are more likely to have access to a toilet than those led by a female, although the marginal effect is small (0. 6% for N-type states and 1.4% for L-type states). A possible reason for this could be that male-headed households have more income. Households in urban areas are more likely to have access to a toilet than their rural counterparts in both types of states. Our results also show that education significantly and positively affects the likelihood that a household has access to a toilet. We find that the education of female members of a household is more effective in positively influencing the household's access to a toilet. A household with a woman with higher education is 9% more likely to have access to a toilet compared to a household in which women do not have education. These results are less pronounced, but directionally remain the same when we consider the overall level of education within the household.

Economic disparities impact living conditions and access to social resources. We analyze how access to toilets has changed with respect to household wealth, focusing on the less affluent segment of the population. For the bottom 50% of the population (conditional on wealth), the result remains largely consistent with a 1.02% ($P_N - Q_N$) lower probability of accessing toilets for states with a different political affiliation than the federal government, and the probability increases by 0. 86% ($Q_L - P_L$), otherwise. These numbers are more pronounced for the bottom 10% of the population according to wealth. In this group, the probability of accessing the toilet increases by 4.88% ($P_N - Q_N$) when the political party at the federal and state levels aligns. In contrast, there is a decrease in access to the toilets by 3.07% ($Q_L - P_L$), otherwise (see Table 6).

7.3 Politics and differences in public health outcomes

Although private toilets are strictly not a public good, as discussed in Section 3, poor sanitation facilities and the habit of open defecation may lead to serious public health issues.

Open defecation contributes to the spread of microorganisms that cause diarrheal diseases, with children of poor-income households the most vulnerable. Most of these open defecators are poor and live in conditions where diarrhea and malaria are the most common health problems (Mara 2017). Diarrheal diseases place a significant economic burden on households, especially among the poor. Families often face high medical expenses and lost income due to caregiving responsibilities (Sarkar et al. 2017). This cycle of illness and poverty can lead to long-term economic disadvantage. Wealthier individuals and communities generally have better access to clean water and sanitation, which helps reduce the incidence of diarrheal diseases (Marmot & Wilkinson 2005). Diarrheal diseases are particularly detrimental to children under five years of age, with studies showing that wealthier families are less likely to have children who suffer from diarrheal diseases (Ghosh et al. 2021, Rahman & Hossain 2022). Ayalew et al. (2018) showed that the prevalence of diarrhea is four times higher among communities with open defecation practices compared to areas without open defecation. Having toilets at home is only one public factor of sanitation and improving public health; the other factors, like improved access to health centers and diet, are missing, but will be captured in the general improvement of resources through the per capita state GDP.

We use data from the Institute for Health Metrics and Evaluation (IHME), at the University of Washington School of Medicine[14], to analyze the impact of increased toilet construction on diseases linked to open defecation across various states in India. As a metric, we examine the death rates associated with the prevalence of diarrheal diseases, malaria, typhoid, and paratyphoid fever. Death rates from these diseases are lower in politically aligned states in comparison to those with a different political affiliations.

Figure 3 shows that the death rates from diarrheal, malaria, typhoid, and paratyphoid fever decline as per capita income increases [15]. As people become richer, they are less likely to defecate in the open, reducing their chance of falling sick, similar to the results we report in Tables 4 and 5. Figure 3 also shows that between states aligned with the federal government (N) and those with different political affiliations (L), the gap in death rates between these two groups is a result of administrative efforts, with a steeper decline in death rates in the N states than in the L states.

We observe a notable reduction in deaths caused by diarrheal diseases. Recurrent diarrhea can inhibit growth and cognitive development, further exacerbating the wealth gap, as affected children are less likely to succeed academically and economically later in life (Guerrant et al. 2013). For other diseases, we still observe a disparity, although it is not as pronounced as that seen with diarrheal diseases.

To summarize the effects of the 2014 regime change and political congruence; we need to take away the income effects. We model death rates by regressing against income, which is reported in column (1) of Table 7. We note that 65% of the variation in death rates is due to income. We use the residuals of the model to assess the variation in the excess death rates due to SBM. Table 7 column (2) shows a significant gap between the two types of administration, with politically aligned states leading to the reduction of sanitation-related diseases after the SBM campaign. The significant reduction in death rates in N-type states after 2014 shows that political congruence helps improve public health issues with SBM. Political administration helps (explains 1% of variation), but, of course, increasing income helps more.

[14]Global Burden of Disease Study 2021, Institute for Health Metrics and Evaluation, 2022. Available from `https://vizhub.healthdata.org/gbd-results/`. This dataset, unlike the NFHS, is not at the household level. Hence, it is difficult to evaluate the distributional effect

[15]We use State per-capita GDP as a proxy for income, published by Reserve Bank of India (RBI) (*Reserve Bank of India - Handbook of Statistics on Indian States* n.d.). We use data from 2011 as the GDP calculation method changed after 2011.

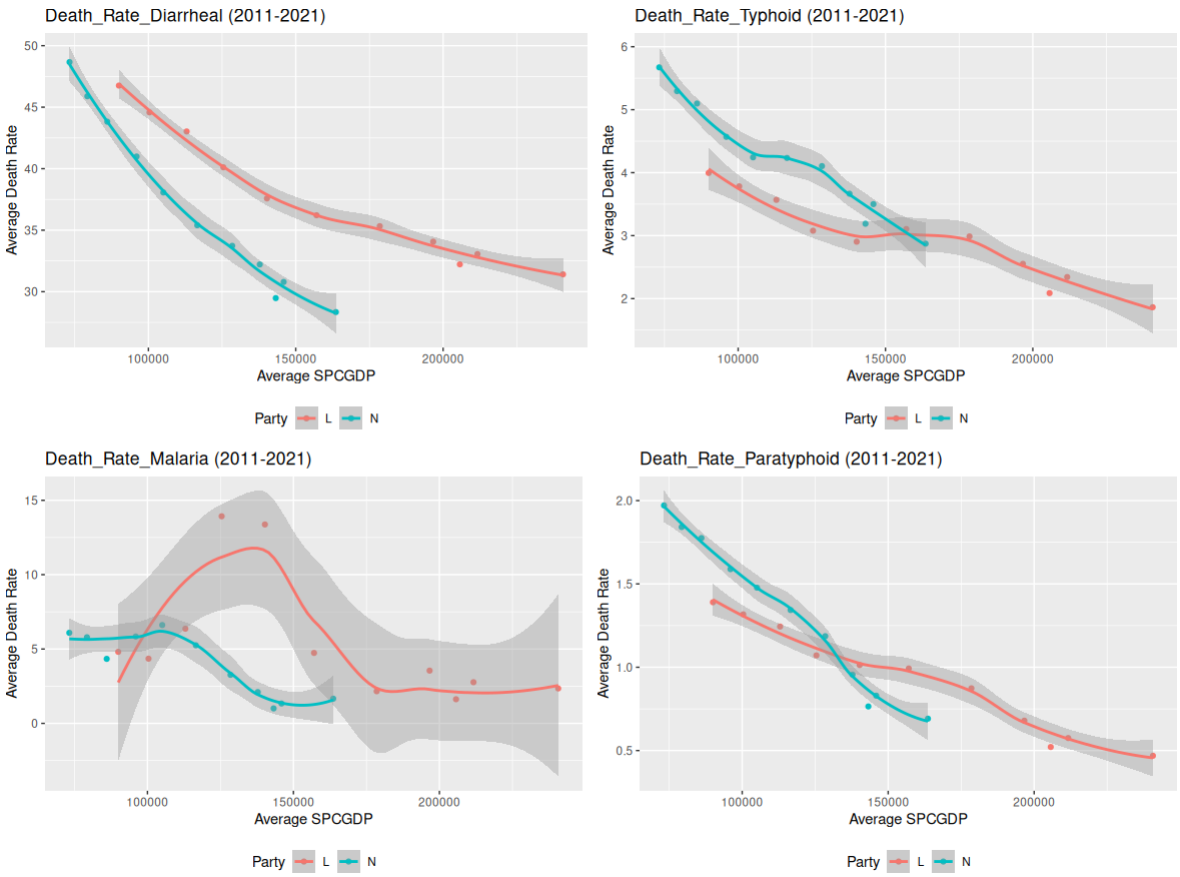


Figure 3: Death rate due to sanitation-related diseases and per-capita income

As shown in Table 6, wealth distribution plays a significant role, which aggregate data do not capture. To assess the health impact of SBM on citizens at the lower end of the income distribution, household-level data will be needed.

Table 7: Death rate due to sanitation-related diseases, 2011-2021 and Political gap between states, 2014-2019

	Dependent variable:	
	(‘death rate‘)	(resid.death)
	(1)	(2)
cause_nameParatyphoid fever	-2.58^{***} (0.90)	
cause_nameMalaria	0.74 (0.90)	
cause_nameDiarrheal diseases	33.52^{***} (0.90)	
log(SPCGDP)	-7.08^{***} (0.54)	
PartyL:regimeafter2014		1.90^{***} (0.66)
PartyN:regimeafter2014		-1.33^{***} (0.50)
PartyL:regimebefore2014		1.33 (0.87)
PartyN:regimebefore2014		−0.36 (0.66)
Constant	85.99^{***} (6.27)	
Observations	1,320	1,320
R^2	0.64	0.01
Adjusted R^2	0.64	0.01
Residual Std. Error	11.61 (df = 1315)	11.52 (df = 1316)
F Statistic	582.32^{***} (df = 4; 1315)	4.55^{***} (df = 4; 1316)

*p<0.1; **p<0.05; ***p<0.01

8 Conclusions

Toilet use has been a public health and public policy issue in India for a long time. In this paper, we examine the changes in household preferences and supply-side dynamics that contributed to the increased availability of household toilets in India between 2014 and 2019, in three NFHS surveys: NFHS-3, NFHS-4, and NFHS-5. Although there were not many differences in terms of preference for toilets between NFHS-3 and NFHS-4, the results indicate that there has been a substantial increase in preference for toilets between NFHS-4 and NFHS-5. We argue that political congruence is a significant factor contributing to the successful implementation of federal programs such as the SBM. When political affiliations align, the risk of agency problems within the principal agent framework decreases, especially when the top federal leadership oversees the implementation of the project (Section 6).

Our findings indicate not only an increase in the availability of toilets, but also a notable improvement in the household inclination toward constructing toilets since 2014. In the NFHS-3 survey, toilets ranked fifth among 21 consumer durables, dropping to eighth in NFHS-4. By NFHS-5, their preference increased significantly to third place. This trend is particularly pronounced when the political parties at the federal and state levels align. Aligned political interests foster improved collaboration among federal and state officials, as well as between political leadership who manages local administration.

It is observed that the probability of households accessing the toilets would decrease by 1.7% in a state with a different political affiliation than at the federal level. Similarly, the probability of households accessing the toilets would increase by 2% with an aligned political affiliation. These numbers are more pronounced for the bottom 10% of the population according to wealth.

A reason for politically aligned states performing better arises from the fact that the same political party is present at every level in the hierarchy, from leaders in the central government, through ministry, state, district, block, and village. Nudging from the PM's office incentivized state officials and motivated bureaucrats in politically aligned states to enhance the SBM implementation. On average, 70% of the funds allocated under the SBM scheme were utilized in politically aligned states, compared to 60% in states with different political affiliations. The interaction of social and political messaging had a substantial effect on sanitation demand, resulting in a notable difference in the NFHS-5 survey.

We found that better implementation of the SBM also improves health outcomes. Administrations in politically aligned states are better able to implement the SBM and reduce death rates resulting from open defecation-related diseases such as diarrhea, malaria, typhoid, and paratyphoid fever.

8.1 Further thoughts

The electoral impact of SBM will decrease as universal access to the toilet becomes widespread, leaving fewer marginal households to recognize its positive effects due to the success of SBM and the reduction in open defecation [16]. This approach of engaging with the masses can be applied to other federally funded projects, potentially leading to a broader impact on development metrics. It appears that the federal government recognizes the impact of such a mission-based approach. The 'Jal Jeevan Mission,' launched in 2019, is another example of a federally sponsored project that aims to provide functional household tap connections to every rural household by 2024.

Our methodology can be studied to understand the performance of public projects in other federally administered countries of the world. For example, examine the expansion of federally funded health projects and their implementation in states with varying political affiliations. Policymakers, politicians, and political parties can be either opportunistic, implementing policies to maximize their chances of reelection, or partisan, working to further the interests of their support groups. This paper can serve as a reference to understand these issues.

[16] The Ministry of Health and Family Welfare (MoHFW), GoI, through the SBM statistics claims 100% sanitation coverage throughout India (Government of India 2022).

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9 Appendix

Table A1: Summary statistic of relevant variables across NFHS-3, NFHS-4 and NFHS-5 Surveys

	NFHS-3		NFHS-4		NFHS-5	
	Sample total	Latrine users (%)	Sample total	Latrine users (%)	Sample total	Latrine users (%)
Total sample	109041	61.9	601509	61.9	636698	81.9
Type of residence						
Urban	50236	89.1	175946	88.9	160137	94.7
Rural	58805	38.6	425563	50.7	476561	77.6
Woman's highest education in the household						
No education	43061	43.8	212545	47.2	169719	68.9
Primary	12279	51.0	59842	52.4	71678	78.7
Secondary	41199	73.9	253934	68.3	295595	85.7
Higher	12502	95.5	75188	89.0	99706	95.1
Household head's gender						
Male	93332	62.1	514128	62.3	527219	82.5
Female	15709	60.8	87381	59.2	109463	79.2
Transgender	NA	NA	NA	NA	16	93.8
Household head's religion						
Hindu	80020	55.8	448411	54.8	482072	78.5
Muslim	13354	75.1	73067	77.7	72584	90.4
Christian	10042	85.2	49111	89.7	49729	95.3
Others	5625	75.0	30920	82.4	32313	93.1
Household has electricity						
No	23204	23.9	71810	22.2	22592	52.7
Yes	85837	72.1	529699	67.2	614106	83.0
Household wealth						
Owns house						
No	17508	78.8	114312	70.2	163687	83.8
Yes	91533	58.6	487197	59.9	473011	81.3
Owns agricultural land						
No	65149	71.7	332962	68.2	343100	83.7
Yes	43892	47.4	268547	53.9	293598	79.8
Owns a bank or post office account						
No	59746	48.8	65238	47.1	27934	77.5

Yes	49295	77.7	536271	63.7	608764	82.1
Type of house						
Kachcha (mud/bamboo house)	12151	29.8	61391	34.5	46530	66.9
Semi-pucca	39628	41.8	246666	45.6	246233	73.1
Pucca (brick house)	57262	82.6	293452	81.3	343935	90.3

Table A2: Conditional probabilities for open defecation

Attributes	NFHS 3	NFHS 4	NFHS 5
Living standards attributes			
Pr(Open defecation - has computer)	0.018	0.040	0.027
Pr(Open defecation - has car)	0.024	0.027	0.012
Pr(Open defecation - has refrigerator)	0.064	0.063	0.036
Pr(Open defecation - has mobile telephone)	0.070	0.347	0.165
Pr(Open defecation - has motorcycle/scooter)	0.123	0.207	0.112
Pr(Open defecation - has television)	0.188	0.225	0.099
Pr(Open defecation - has radio)	0.241	0.215	0.066
Pr(Open defecation - has electricity)	0.278	0.328	0.170
Pr(Open defecation - has bicycle)	0.393	0.431	0.189
Wealth attributes			
Pr(Open defecation - has a bank or post office account)	0.222	0.363	0.179
Pr(Open defecation - owns this or other house)	0.413	0.401	0.187
Pr(Open defecation - owns land usable for agriculture)	0.526	0.461	0.202
Pr(Open defecation - house is kaccha (mud/bamboo)	0.727	0.678	0.363
Pr(Open defecation - house is semi-pucca)	0.582	0.544	0.269
Pr(Open defecation - house is pucca (brick house)	0.173	0.187	0.097
Culturan attributes			
Pr(Open defecation - head of the household is Hindu)	0.441	0.452	0.215
Pr(Open defecation - head of the household is Muslim)	0.248	0.223	0.096
Pr(Open defecation - urban residence)	0.108	0.111	0.053
Pr(Open defecation - rural residence)	0.613	0.493	0.224

Table A3: Categories of Indian states and the funds utilized under the SBM.
Funds available for the SBM from FY 2015-19 to FY 2020-21 are presented in crores of rupees.
Funds utilised for the SBM from FY 2015-19 to FY 2020-21 are presented in crores of rupees.

States/UT	Category	BJP Ruling Duration	Funds available	Funds Utilised	% Funds Utilized
A & N Islands	N	UT	80.25	45.624	56.85
Andhra Pradesh	L	0	6041.67	3949.228	65.37
Arunachal Pradesh	N	32	478.57	370.11	77.34
Assam	N	36	6736.31	4318.339	64.11
Bihar	N	22	9255.04	5680.289	61.38
Chandigarh	N	UT	25.14	19.45	77.37
Chhattisgarh	N	55	3118.36	2201.293	70.59
Dadra & N. Haveli	N	UT	22.01	17.213	78.21
Daman & Diu	N	UT	3.45	2.288	66.30
Delhi	L	0	153.46	86.4	56.30
Goa	N	60	15.30	8.778	57.36
Gujarat	N	60	4375.52	2830.774	64.70
Haryana	N	55	767.87	354.186	46.13
Himachal Pradesh	N	17	399.94	313.186	78.31
Jammu & Kashmir	N	39	584.17	750.377	128.45
Jharkhand	N	53	4112.61	2772.393	67.41
Karnataka	L	0	5030.31	2720.211	54.08
Kerala	L	0	427.18	276.771	64.79
Ladakh	N	UT	3.43	2.871	83.80
Lakshadweep	N	UT	0.00	0	NA
Madhya Pradesh	N	55	6909.91	4842.176	70.08
Maharashtra	N	55	6817.99	4377.814	64.21
Manipur	N	26	461.45	363.411	78.75
Meghalaya	N	15	705.60	342.516	48.54
Mizoram	L	0	195.48	114.814	58.74
Nagaland	N	55	287.71	277.468	96.44
Odisha	L	0	8298.29	5158.641	62.17
Puducherry	L	0	166.77	44.851	26.89
Punjab	N	34	1274.25	583.178	45.77
Rajasthan	N	55	6739.10	4169.606	61.87
Sikkim	L	0	53.47	30.819	57.64
Tamil Nadu	L	0	4339.66	3607.043	83.12
Telangana	L	0	2597.57	1653.145	63.64
Tripura	L	0	501.27	331.881	66.21
Uttar Pradesh	N	26	19521.28	14522.264	74.39

Uttarakhand	N	26	1134.96	675.576	59.52
West Bengal	L	0	5533.06	3304.535	59.72

Table A4: Rankings of Indian states with respect to their wealth thresholds for toilets.

Rank	NFHS-3	NFHS-4	NFHS-5
1	Mizoram	Lakshadweep	Lakshadweep
2	Tripura	Sikkim	Mizoram
3	Manipur	Mizoram	Manipur
4	Nagaland	Manipur	Nagaland
5	Kerala	Nagaland	Kerala
6	Sikkim	Kerala	Ladakh
7	Arunachal Pradesh	Tripura	Sikkim
8	Assam	Delhi	Tripura
9	Meghalaya	Meghalaya	Arunachal Pradesh
10	Delhi	Chandigarh	Nct of Delhi
11	West Bengal	Arunachal Pradesh	Assam
12	Goa	Assam	Meghalaya
13	Punjab	Punjab	Punjab
14	Maharashtra	Andaman and Nicobar Islands	Chandigarh
15	Jammu and Kashmir	Haryana	Andaman & Nicobar Islands
16	Andhra Pradesh	Goa	Haryana
17	Uttaranchal	Himachal Pradesh	Goa
18	Madhya Pradesh	Daman and Diu	Himachal Pradesh
19	Bihar	Uttarakhand	Jammu & Kashmir
20	Uttar Pradesh	West Bengal	Uttarakhand
21	Tamil Nadu	Jammu and Kashmir	Puducherry
22	Himachal Pradesh	Puducherry	Dadra & Nagar Haveli And Daman & Diu
23	Gujarat	Dadra and Nagar Haveli	West Bengal
24	Haryana	Maharashtra	Chhattisgarh
25	Karnataka	Karnataka	Telangana
26	Rajasthan	Gujarat	Uttar Pradesh
27	Chhattisgarh	Telangana	Karnataka
28	Jharkhand	Uttar Pradesh	Maharashtra
29	Orissa	Madhya Pradesh	Andhra Pradesh
30		Tamil Nadu	Madhya Pradesh
31		Andhra Pradesh	Rajasthan
32		Rajasthan	Gujarat
33		Bihar	Jharkhand

34		Chhattisgarh	Tamil Nadu
35		Odisha	Bihar
36		Jharkhand	Odisha

Table A5: Logit models for the BJP (P_N) and non-BJP-ruled states (P_L) for households at the bottom 50% of wealth-distribution

	BJP Model	Non-BJP Model
(Intercept)	-0.1956^{*}	-2.9649^{***}
	(0.1048)	(0.1961)
Wealth index	0.0486^{***}	0.0844^{***}
	(0.0025)	(0.0045)
Portion of funds utilized	0.9289^{***}	0.9196^{***}
	(0.0164)	(0.0483)
Demographic factors		
Religion of the household head - Hindu	-2.3857^{***}	-1.0611^{***}
	(0.0306)	(0.0494)
Religion of the household head - Muslim	-1.3630^{***}	-0.1618^{***}
	(0.0345)	(0.0618)
Religion of the household head - Others	-1.0690^{***}	0.8680^{***}
	(0.0399)	(0.1235)
Gender of the household head - Male	0.0445^{***}	0.0638^{***}
	(0.0129)	(0.0239)
Area - Urban	1.0078^{***}	0.7920^{***}
	(0.0216)	(0.0301)
Women's highest education - Primary	0.2970^{***}	0.5076^{***}
	(0.0158)	(0.0310)
Women's highest education - Secondary	0.4828^{***}	0.6648^{***}
	(0.0127)	(0.0264)
Women's highest education - Higher	0.6676^{***}	0.8380^{***}
	(0.0308)	(0.0593)
Household's highest education - Primary	0.0296	-0.0281
	(0.0194)	(0.0379)
Women's highest education - Secondary	0.3986^{***}	0.2413^{***}
	(0.0180)	(0.0347)
Women's highest education - Higher	0.9435^{***}	0.6983^{***}
	(0.0264)	(0.0496)
AIC	253116.5175	64482.1453
BIC	253262.2109	64608.3948
Log Likelihood	-126544.2588	-32227.0726
Deviance	253088.5175	64454.1453
Num. obs.	244427	60951

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table A6: Logit models for the BJP (P_N) and non-BJP-ruled states (P_L) for households at the bottom 10% of wealth-distribution

	BJP Model	Non-BJP Model
(Intercept)	-0.3294	-0.0935
	(0.4741)	(0.8949)
Wealth index	0.0496^{***}	0.0203
	(0.0126)	(0.0235)
Portion of funds utilized	1.2781^{***}	0.4015^{***}
	(0.0472)	(0.1087)
Demographic factors		
Religion of the household head - Hindu	-2.5088^{***}	-1.5074^{***}
	(0.0696)	(0.1247)
Religion of the household head - Muslim	-1.7044^{***}	-0.5595^{***}
	(0.0803)	(0.1492)
Religion of the household head - Others	-0.9264^{***}	0.9106^{***}
	(0.0969)	(0.2793)
Gender of the household head - Male	0.0467	0.1995^{***}
	(0.0356)	(0.0577)
Area - Urban	0.7447^{***}	0.6454^{***}
	(0.0527)	(0.0690)
Women's highest education - Primary	0.1822^{***}	0.4562^{***}
	(0.0454)	(0.0752)
Women's highest education - Secondary	0.4866^{***}	0.6082^{***}
	(0.0395)	(0.0694)
Women's highest education - Higher	0.6035^{***}	0.9506^{***}
	(0.1246)	(0.1955)
Household's highest education - Primary	0.0331	0.1456^{*}
	(0.0464)	(0.0870)
Household's highest education - Secondary	0.4429^{***}	0.3681^{***}
	(0.0451)	(0.0836)
Household's highest education - Higher	1.1007^{***}	0.8714^{***}
	(0.0892)	(0.1417)
AIC	29099.4493	9828.2757
BIC	29214.4723	9926.6859
Log Likelihood	-14535.7247	-4900.1378
Deviance	29071.4493	9800.2757
Num. obs.	27335	8344

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$