Access to Toilets and Violence Against Women

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Abstract

This paper examines if in-home access to toilets reduces the risk of violent crimes against women. We use the roll out of the *Swachh Bharat Mission*, a flagship toilet construction program in India, to ascertain if assault and rape of women reduce when women have access to in-home toilets relative to open defecation. We also bolster our findings by using political alignment of locally elected representatives with the national government's political party as an instrument in an instrumental variable strategy. We find that construction of toilets reduces sexual assault of women, but we do not discern consistent changes in rape. Our findings are robustness to variety of controls, specifications, and identification approaches. We address reporting changes as a plausible alternative explanation.

JEL classification: D78, J16, O18
Keywords: Toilets, Violence Against Women, Open-Defecation

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1 Introduction

Despite growing standards of living worldwide, open defecation remains a widespread public health issue. Open defecation results in health externalities and has deleterious intergenerational impacts. Lack of toilet facilities at home, resulting in open defecation by household members, has been associated with lower health outcomes for children - lower height premiums, anaemia, and cognition among children (Geruso & Spears (2018), Coffey *et al.* (2017), Hammer & Spears (2016), Spears & Lamba (2016)). Yet neither government interventions nor private markets have adequately addressed this issue in many parts of the world. A leading example of this state and market failure is India, which has one of the largest rates of open defecation in the world even though the income per-capita has been growing rapidly in the last one decade. While the proportion of people defecating in the open decreased from 66% in 2000 to 40% in 2015, these numbers continue to remain large in comparison to the world average of 12% and Sub-Saharan African countries average of 23%.[1]

Lack of in-home toilets can have a disproportionately large detrimental effect on girls and women. Anecdotal evidence suggests that open defecation threatens safety of women as it makes them vulnerable to violent crimes in secluded areas often at dark hours of the day.[2] Women and girls are often sexually assaulted when alone. However, prior research has not addressed gender based consequences of the lack of proper sanitation facilities.

A heinous 2014 gang rape followed by the death of two adolescence girls in rural northwestern India brought to light the plight of women without in-home toilets. These girls were attacked when they were alone in the open field near their house in the evening hours to defecate there.[3] Subsequent to this incidence, toilet construction took a priority in the ensuing policy discourse in India. In the 2014 elections for the national parliament, Bharatiya Janata Party (BJP) formed the federal government and announced its flagship scheme 'Swachh Bhaarat Mission' (SBM) to combat open-defecation.

In this paper, we use the variation generated in the in-home toilet construction by this policy to test if access to in-home toilets affected sexual assault and rape of women in India. This program was viewed by the government as a safety enhancing policy lever for women and girls, in addition to addressing health concerns emerging from open defecation and lack of proper sanitation in rural and peri-urban areas of the country. The main mandate of the program was to reduce open defecation through construction of household toilets though the

[1] World Development Indicators at https://databank.worldbank.org/source/world-development-indicators.

[2] Women tend to use the open spaces very early in the morning or after dark as they do not want to be seen because of embarrassment.

[3] This incident was covered by many newspapers in India and worldwide. https://www.theguardian.com/global-development/2014/aug/28/toilets-india-health-rural-women-safety.

program also had other components to enhance cleanliness by provision of other sanitation services and a mass awareness campaign.[4]

This program has been a policy success and has led to the construction of 97.6 million toilets across India since October, 2014 when it was launched. In 2014, only 38.8 percent of the population had access to in-home toilets (individual household latrines). As of 2019, the official statistics put this percentage at 99 percent.[5] Despite this surge in toilet construction over time, there has been spatial variation in the density of toilets constructed during the initial years of the program. Figure 1 shows the district level access to toilets and how it changed between 2013-2016. Clearly there is an increase in access to toilets but the rate of increase has been different across districts. In Table 1, we document the state-by-year variation in access to toilets for the period 2012 to 2017. We exploit this variation at the level of Indian districts for identification. First, we estimate a two way fixed effects specification for our count outcomes analogous to differences-in-differences strategy. We control for district and year fixed effects in order to allay concerns about confounding effects of district-specific time invariant unobservables and year-specific common macro shocks, respectively.

However, construction of toilets is unlikely to be exogenous. Time varying district specific omitted variables which might have influenced construction of toilets and at the same time are correlated with violence against women, can result in biased estimates. To overcome this potential bias, we use an instrumental variable strategy which exploits the fact that the largest push for toilets occurred in areas where a greater proportion of state legislative members belonged to the party forming the national government. We use the results in close elections in which legislative assembly election winners by close margins were aligned with BJP to construct the instrument.

We find that an increase in household toilet facilities led to a significant reduction in sexual assaults reported by women. While reduced form estimation indicates a reduction in rapes, these results do not hold in our instrumental variable strategy and are not robust to additional specifications. The consistent and robust negative and statistically significant decline in assaults is indicative of a causal effect on assaults. Crimes against women typically are under-reported. In so far as this reporting tendency is time invariant and varies by regions, this is accounted for in our district fixed effects. This implies that if areas that benefit in terms of toilet construction under the SBM policy are the areas with regressive attitudes towards women and this does not change with time, our results would remain unbiased.

An issue would be that there is a change in reporting of crimes against women. For

[4]Details can be found at https://swachhbharatmission.gov.in/sbmcms/index.htm

[5]Statistics available at https://sbm.gov.in/sbmReport/home.aspx

example, if the mass awareness campaign/waste management component or other income shocks result in more awareness and empower women, then we would see an increase in reporting of crimes. However, we find a consistent decline in assaults. Even if there is a reporting effect of this nature resulting in more reporting, then incidence must have declined enough such that on the net we still see a reduction. Conversely, there could be a reduction in reporting and our results could only be picking that up. This could happen, for example, if government officials do not accurately record the assault cases in areas with more toilet construction. However, this reporting effect is less plausible to explain our results as we do not find changes in other crimes against women which should have also decreased if this was a channel. In addition, we also find heterogeneous results along several dimensions which would be difficult to reconcile with a reporting change mechanism. A related alternative explanation could be that the mass awareness campaign, with gender at its helm, led to gender sensitization and a reduction in incidences of crimes against women in general. This too is inconsistent with a series of our results and our heterogeneous findings.

There are two possible critiques of our instrument. It is possible that BJP has a broad policy of crackdown on crimes and all crimes fall when BJP affiliates are elected to local assemblies. This does not bear out in the data. Other crimes do not consistently reduce in our empirical analysis. Another possible hypothesis is that BJP alignment helps the local elected officials to bring more resources to the districts and improve economic prosperity which leads to building of more toilets and reduction in assaults against women.[6] We control for "average luminosity" (nightlights) as a proxy for economic prosperity following Henderson *et al.* (2012) and find that our results do not change.[7] Related to this, BJP alignment could also lead to changes in public service delivery which enhance the safety of women. To address this, we also control for trends in a series of public goods and our results remain robust. Also, aside from sexual assaults, we do not find large reductions in other crimes which plausibly should also have been affected by this mechanism.[8]

Our paper extends and complements three strands of literature. A growing body of work shows that infrastructure improvements can positively influence development outcomes and improve the status of women (Dinkelman (2011), Adukia (2017), Amaral *et al.* (2018),

[6] Asher & Novosad (2017) show that this type of alignment (with state governing party) affects economic prosperity in India.

[7] We present our results conditional on controlling nighlights. Hence, our instrument can be construed as a conditional instrument.

[8] A different mechanism through which construction of toilets can affect other crimes, without invalidating our instrument, is through the broken window theory of crime. This theory claims that visible signs of disorder can give rise to criminal behaviour. Construction of toilets was accompanied by a mass campaign on general cleanliness and upkeep of both household and public premises. Engel *et al.* (2014) undertake an extensive review of studies and do not find robust evidence in support of it in the developed countries. We also do not find evidence favoring this theory: other crimes do not decline across the board.

Bhuller *et al.* (2013), Sekhri & Hossain (2019), Hossain *et al.* (2019)).[9] Our paper complements this work and establishes that improved access to in-home toilets can increase the safety of women and reduce sexual assaults. While prior literature on linkages between infrastructure and welfare of women has focused on labor, health, and human capital formation, we make a novel contribution in showing that infrastructure improvements can enhance safety of women.

We also contribute to a body of work investigating the links between levers that affect economic well being and violence against women. Narrowing of gender wage gap reduces domestic violence Aizer (2010). Poverty can lead to killing of girls and women in developing countries (Rose (1999), Miguel (2005), Sekhri & Storeygard (2014)). Confluence of improved relative wages and autonomy resulting from increase in foreign direct investment can reduce rapes (Li *et al.* (2019)). Our paper augments this literature and shows that improved access to sanitation by way of in-home toilets can reduce sexual assaults. Finally, we also connect to the literature exploring the causes and consequences of unsanitary conditions, lack of toilets, and open defecation.[10] The focus of this literature has largely been health (Duflo *et al.* (2015), Patil *et al.* (2014), Geruso & Spears (2018), Coffey *et al.* (2017), Hammer & Spears (2016), Spears & Lamba (2016)) and mortality (Cutler & Miller (2005), Alsan & Goldin (2019)). None of these previous papers focus on investigating how violence against women is influenced. Our paper is the first to document the causal effects of in-home toilets on sexual assaults.[11]

Our findings are of significant policy relevance. Aside from staggering social and financial costs, concerns over safety can also lead to under-investment in human capital by women and reduce their welfare (Borker (2017) and Chakraborty *et al.* (2018)). We show that improving sanitation facilities in developing countries can be one channel for increasing public safety of women. Prior work indicates that policies aimed at alcohol prohibitions and regulation of drinking in bars are successful at reducing violent crimes against women (Khurana & Mahajan (2019) and Luca *et al.* (2015)). Our paper augments this work and highlights that state policies aimed at providing in-home sanitation facilities to women can also reduce violence against women in developing countries.

Rest of the paper is organized as follows. Section 2 provides the background for the

[9] More broad development outcomes are studied for example by Duflo (2001), Duflo & Pande (2007), Asher & Novosad (2019). Devoto *et al.* (2012) focus on access to piped water and conflict. There is also a literature focusing on how infrastructure affects trade costs and urbanization (Donaldson (2018) and Storeygard (2016) and citations therein).

[10] A burgeoning literature has also explored how to reduce open defecation and improve sanitation (Gertler *et al.* (2015)

[11] Srinivasan (2015) notes a correlation between violence against women and lack of access to in-home toilets using a large scale cross sectional survey in India.

sanitation conditions in India and the SBM policy. Section 3 describes the data we use. In Section 4, we discuss our estimation strategies. Main results are summarized in Section 5. The heterogeneous results are discussed in Section 6 while robustness tests are documented in Section 7. Section 8 provides concluding remarks.

2 Background

According to a National Sample Survey (NSS) conducted in 2012, only 38.8 percent of rural households had access to an in-home toilet in comparison to about 90% urban households.[12] In rural areas, lack of access to public toilets leads to large scale open defecation. The proportion of people practicing open defecation stood at more than 50% in rural India in 2015 (National Family Health Survey 2015-16). As discussed earlier, inadequate sanitation has been recognized as a leading cause of premature mortality of children and also has other negative effects on child health (Hammer & Spears (2016); Geruso & Spears (2018); Alsan & Goldin (2019)). An assessment by the World Bank (Bank (2011)), puts total economic cost associated with inadequate sanitation in India at 2.4 trillion ($53.8 billion) in 2006.

While sanitation policies were routinely pursued in India since 1986, it was not until 2014 that they received a big push and impetus to succeed. A program launched in 1986 known as the Central Rural Sanitation Program did not have a significant impact on improving access to toilets. The proportion of households having a toilet increased from 24% in 1991 to 37% in 2001 (Census 1991 and 2001): a paltry increase of 13% over a ten year period. This program was then restructured and renamed the 'Total Sanitation Campaign' (TSC) in 2000, and 'Nirmal Bharat Abhiyan' (NBA) in 2012. But these programs again only had minimal impact on access to in-home toilets. According to Census 2011, the proportion of households having toilets stood at 47% in 2011; again, only a 10% increase during 2001-2011.

In 2014, following the rape and deaths of two young girls while defecating in the open, the newly formed national government under prime minister Narendra Modi put access to toilets at the helm of its policy goals. On October 2^{nd}, 2014 the PM announced the government's flagship program, the 'Swachch Bharat Mission' (SBM) managed by the Ministry of Drinking Water and Sanitation (MDWS). This initiative (also called 'Clean India') was the PM's biggest endeavour after assuming office in 2014 to accelerate efforts towards universal sanitation in India.[13] SBM put a strong emphasis on achievement of targets (100 percent

[12] NSS 69^{th} Report on Key Indicators of Drinking Water, Sanitation, Hygiene and Housing condition in India.

[13] The other flagship launched by the government was distribution of subsidized LPG connections to women in households below poverty line through Ujjwala scheme. This was launched in May 2016, almost at the end of the period of consideration in our study from 2012-2016.

access to toilets) by 2019 since open defecation rates remained staggeringly high in the past two decades despite policy efforts.

Under the program, an end to open defecation was to be achieved through construction of toilets and solid and liquid waste management. Under SBM for rural areas, the main policy has been to provide subsidy toward construction of household toilets since low access to toilets and consequent open defecation is largely a rural phenomenon.[14] The share of the Individual Household Latrine (IHHL) subsidy is the largest component of expenditure under the SBM (97 per cent in Financial Year 2015-2016) with the overall program cost of USD 9.3 billion (Kapur & Deshpande (2018)). According to the guidelines, the toilets had to adhere to certain requirements. However, the state governments were given a free hand in the actual design and implementation since health is a state subject in India. This has led to a significant variation in the pace of success of this policy across states.

Government of India had conducted a baseline survey in 2012 to ascertain the number of households who did not have toilets. This survey provided the information subsequently for identifying the households which should be eligible for subsidy towards construction of IHHL. All the households below the poverty line (BPL) without an IHHL were eligible for this subsidy. Among the Above Poverty Line (APL) households, those belonging to Scheduled Caste, Scheduled Tribes, small and marginal farmers, landless laborers with homestead, physically handicapped and women headed households were also made eligible for the subsidy. The incentive amount provided under SBM to BPL and eligible APL households was up to INR 12,000 for construction of one unit of IHHL with water availability for hand-washing and cleaning of the toilet.[15] Data from the MDWS shows that there has been a steady expansion of toilets since the start of the program in 2014. Consequently, the proportion of rural households having in-home toilets has increased from 38% in 2014 to 84% in 2018 and nearly 99 percent in 2019.

It has been argued that construction of toilets does not necessarily imply that open defecation will be reduced because changing behaviours need to accompany provision of toilets (Coffey & Spears (2017)). While it may be true that there may not be a one to one relationship between toilet construction and reduction in open defecation, studies have found a substantial positive correlation between the two (Patil *et al.* (2014)). MDWS conducted a survey in partnership with World Bank, namely, The National Rural Sanitation Survey (NARSS) and found that 77% rural households had access to toilets and that 93.4% of individuals in those households use their latrines regularly (as on March 2018).

[14] According to Census 2011 of India, 92% of households without access to a toilet or latrine were rural. Similarly, IHDS reports that 90% of households practicing open defecation live in rural areas.

[15] The Centre-State split was 75%-25% (except for special North-Eastern and other special states such as Jammu & Kashmir).

Currently no study has evaluated the effect of the massive toilet construction program on outcomes. A few studies look at the factors which affect adoption of toilets under the scheme. Augsburg *et al.* (2019) examine whether provision of credit along with the subsidy can affect adoption of toilets by households. Chaturvedi *et al.* (2019) look at whether women politicians matter to provision of toilets across Gram Panchayats under the SBM policy. We use the variation generated by this program both temporally and spatially across Indian districts to identify causal impacts of access to in-home toilets on violent crimes of sexual nature against women.

3 Data

We combine several datasets to examine the effect of toilet construction on crimes against women outside their homes. Table 2 shows the summary statistics of all the variables constructed using these datasets. The description of datasets and the construction of variables is discussed below.

3.1 Crime

The crime data for the period of 2012 - 2016 are from the National Crime Records Bureau (NCRB), Ministry of Home Affairs.[16] NCRB data gives the number of reported crimes by district, year, and category of crime. It provides data for crimes at district level after aggregating them from all police stations. Crimes against women are reported separately under the following categories - rape, sexual assaults, insults (involves verbal attacks), rape, domestic violence as cruelty by husband or other relatives, dowry deaths, kidnapping of girls and importation of girls from foreign countries.

Of all these crimes, sexual assaults constituted 25%, rape 11%, insults 3%, , domestic violence 35% and dowry deaths 2% on average over the period of our analyses. The three category of crimes which are likely to be committed outside homes are rape, sexual assault and insult. Of these, verbal insults is a very small category and in this paper we focus only on rapes and sexual assaults. Note that these are reported crimes and there is under-reporting of gender based violence. We discuss the implications of this for our results in a later section.

3.2 Toilets

The data on number of toilets constructed each year is obtained from the Ministry of Drinking Water and Sanitation (MDWS). The MDWS is the nodal ministry for the implementation of

[16] Year 2016 is the last year for which crime data is currently available.

Swachh Bharat Mission in rural areas, which primarily involves construction of toilets in each household. The ministry provides district/block/gram panchayat level details of number of toilets constructed on its website.[17] In our paper, we use district level aggregate data on toilets since detailed crime data is only available at the district level.

As discussed earlier, there has clearly been an uptick in the toilets constructed since the program was launched towards the end of 2014 (Table 1). The proportion of households having toilets increased from 41% in 2013 to 66% in 2016 and further increased to 86% in 2017. There is considerable state level variation in adoption of the program post the launch of the scheme. The district level maps in Figure 1 clearly show the differential rates in adoption of toilets across the districts of India during 2013-2016. By 2017, most states had 90% household toilet coverage rate, except Bihar, Uttar Pradesh, Tripura, Odisha, Jharhand and Jammu & Kashmir.

3.3 Political and Voting Data

The detailed data for the local state level elections (legislative assembly elections) are from the Election Commision of India. These data are used to define the proportion of Members of Legislative Assembly (MLA's) in each state who are aligned with the national party which came to power in 2014, i.e. the Bharatiya Janata Party (BJP). We use data on close elections at various margins of victory to look at the robustness of this instrument variable. We focus on close elections as the outcomes in such elections are less likely to be affected by local conditions.

3.4 Demographic Variables

The district level demographic characteristics that we use as controls come from the Population Census 2011. These include - total population and the ratio of adult male to female population in a district. We control for differential trends in crimes based on these initial level of demographic characteristics of the districts. [18]

3.5 Census Development Variables

We construct a variety of variables which capture the extent of economic development in a district using the data from Census 2011 - proportion of villages in a district having Middle School, having a Secondary School, having a Senior Secondary School, having a paved

[17] The data can be obtained from https://sbm.gov.in/sbmReport/Home.aspx

[18] These levels are interacted with year indicators to construct the trend.

approach road, median distance of village (km) from the nearest town and proportion of villages where electricity is available for domestic use. These variables are highly correlated with each other and using a principal component analyses we construct an index of development which is used to control for trends in economic development starting at the pre-program levels of development. The first principal component obtained is defined as the development index. Trends in crime resulting from initial differences in the development index are controlled for. We also construct caste based population measures - proportion of population that is scheduled caste and proportion of population that is scheduled tribe - since regions with greater proportion of such castes are more backward and again control for trends in crime due to initial conditions.[19]

3.6 Nightlights

The nighttime average luminosity data called VIIRS (Visible Infrared Imaging Radiometer Suite) Day/Night Band (DNB) popularly called 'nightlights' are produced by National Oceanic and Atmospheric Administration (NOAA). We obtained and processed ths data for each year to construct year wise nightlight luminosity in each district. This variable is used to capture overtime development changes within a district that can possibly affect crimes.[20]

3.7 Police

The police force data is obtained from Bureau of Police Research and Development. The data is provided at the State level for each year. This is normalized by the population of each state in each year to arrive at the population served by each policeman. The reports also provide data on number of women police officers at State level. These data are used as controls in the robustness checks.

Table 2 shows the descriptive statistics for each of the above variables used in the analyses. The mean number of *Assault* cases reported in a year, across districts of India are 103 while for rape it is 49. The reported incidence is higher for domestic violence at 178 reported incidents per annum. The cases registered under *Attempts to Rape* and *Insults* are very small at 4.5 and 11 respectively. Among the other crimes, theft is the largest with mean reported incidents at 647. Each district has an average population of 1.9 million. On an average the number of males for each female is larger than one at 1.06, which reflects the skewed sex ratios in India. About 76% of population in India resides in rural areas. On an

[19]Scheduled Castes are the marginalized population groups historically facing discrimination.
[20]See Henderson *et al.* (2012) for details on how to use this data.

average there is one police officer for 739 people in India and there are about 5300 women police officers (this is approximately 6% of the total police force) over the period of analyses. Among the rural households 48% have an in-home toilet during 2012-2016. An outcome of close elections at 10% margin in any constituency was observed in 2809 district-year pairs. In India, assembly elections across states are held in different years and this gives us enough variation in the instrument. On an average BJP won in 24% of such close elections.

4 Identification Strategy

We take two approaches to identification. We first utilize the variation generated by the SBM in access to in-home toilets in a reduced form approach. We rely on a two way fixed effects approach analogous to differences-in differences strategy. We use a panel from 2012 to 2016 for our estimation as we have crime data for this period. Our reduced form estimation model is as follows:

$$Y_{it} = \alpha_o + \alpha_1 \ \text{(Proportion of Households with Toilets)}_{it} + \alpha_2 X_{it} + D_i + \tau_t + \epsilon_{it} \quad (1)$$

where Y_{it} is the count of either rape or assault in district i at time t. X_{it} are time varying district characteristics. D_i are the full set of district fixed effects and τ_t are the year fixed effects. α_1, the coefficient on proportion of households in district i in year t with in-home toilets, is our parameter of interest. Accounting for district fixed effects and year fixed effects allays concerns about time invariant unobserved district characteristics and year specific macro shocks confounding our results. Standard errors are clustered at the district level.

Since we are working with count data censored at zero, we use a Poisson model to estimate this empirical specification. We follow Sekhri & Storeygard (2014) and use a quasi-maximum likelihood procedure to handle the incidental parameters problem.[21] Thus, the parameter α_1 can be interpreted as a semi-elasticity. We conduct a variety of robustness tests and control for several additional controls in alternative specifications. These are discussed later in Section 5.

In order to address endogeneity of the toilets construction over time, we then resort to using an instrumental variable approach. In this approach, we use the proportion of local legislative assembly election winners (MLAs) in a given year who are aligned with the national government's political party (BJP) in closely contested elections as an instrument for

[21] They use the Hall *et al.* (1986) correction to transform their data.

the toilets post the policy reform. Asher & Novosad (2017) show that political alignment between state ruling party and MLA's can affect economic growth via channels of employment. They use nightlights data for measuring economic growth. Hence, this can affect the exclusion restrictions to the extent that state ruling party is BJP which was also came to power at the centre in 2014. To break this link between our instrument and economic growth, we control for nightlights in all our specifications using the instrumental variable approach. So our instrument can be viewed as a a conditional instrument. Our identifying assumption is that conditional on a measure of economic growth (nighlights), this party alignment affects sexual violent crimes against women only through construction of toilets. It is plausible that the alignment affects public goods provision such as policing, transportation, and road connectivity that matter for crimes. We rule out this possibility through inclusion of a number of controls. Our empirical model is discussed below.

The first stage is estimated as:

$$T_{it} = \beta_0 + \beta_1 \ \text{BJP}_{it} + \beta_2 \ \text{BJP}_{it} \ X \ Post \ SBM + \beta_3 X_{it} + D_i + \tau_t + e_{it} \tag{2}$$

where T_{it} is the proportion of households with toilet in district i in year t. BJP_{it} is the share of BJP MLAs in the closely contested constituencies within a district i in year t.[22] D_i and τ_t are the district and year effects respectively. X_{it} are set of district-year level controls. $\text{BJP}_{it} \ X \ Post \ SBM$ is the interaction of the BJP_{it} variable described above with an indicator post that takes the value one for years after the introduction of the SBM (2015 and 2016) and zero prior to that.

In the second stage, the proportion of households with in-home toilets is instrumented with the $BJP_{it} \ X \ PostSBM$. The second stage model is:

$$Y_{it} = \gamma_0 + \gamma_1 T_{it} + \gamma_2 \text{BJP}_{it} + \gamma_3 X_{it} + D_i + \tau_t + \mu_{it} \tag{3}$$

where Y_{it} is the crime count and T_{it} is the proportion of households with toilet in district i in year t. All other variables are as described above. We cluster the standard errors at the district level.

We use a control function approach to two stage instrumental variable strategy given our non-linear structural equation. In this approach, we control for the predicted value of the endogenous variable from the first stage regression in the second stage and estimate the second stage using a transformed Poisson model using quasi-maximum likelihood method. We bootstrap the standard errors to take into account the two-step procedure and continue

[22] State Assembly constituencies completely nest within district boundaries.

to cluster them at the district level. We also estimate a linear model where the dependent variable is transformed to logs.[23]

5 Results

We first report our reduced form results for rape and sexual assault in Table 3. Columns 2 and 4 control for additional district-year characteristics. These include the demographic characteristics, the index for development based on public goods availability, and nightlights. In our preferred specifications in columns 2 and 4 (with the above mentioned controls), we observe a negative and statistically significant coefficient for sexual assaults reported by women. The effect is negative and marginally significant for rape. The estimates imply that a change in the percentage of households with toilets from 0 to a 100 percent would reduce sexual assaults by 22 percent, significant at the 5 percent level. We also find a 14 percent decline in rapes but this is not significant when all controls are included.[24]

We now discuss the instrumental variable estimates. The first stage results are reported in Table 4. Columns 1 and 4 limit the margin of close wins to ten percent votes, columns 2 and 5 to five percent votes, and 3 and 6 to one percent votes. In Columns 4-6, we control for the additional district-year characteristics and these are our preferred specifications. While the BJP indicator bears a negative sign and varies in precision across columns 4-6, proportion of BJP MLAs in close contests in the districts interacted with the post SBM indicator is positive and statistically significant at the 1 percent significance level across the board.

This positive relation is also robust to including Asher and Novosad (2017) measure of economic growth – nightlights.[25] We also report the F-statistics from the first stage regression and it is always large enough to rule out weak instruments problem. This table clearly bears out that the alignment of the local MLAs with the national government's political party is highly correlated with access to toilets but only after the SBM program is announced. It is only post SBM that the BJP emphasis on toilet construction changes because of the big push by the Prime Minister. As noted before, we restrict our sample to close elections because in such elections the determination of the winner is less likely to be correlated with local conditions. Our sample size changes in this table because of different winning margins

[23] To deal with the problem of crime count being 0 in some districts, we add 1 to the crime count and then take logs for such observations in the linear specification.

[24] In a Poisson Quasi Maximum Likelihood Regression, the marginal effects in terms of proportionate change in the dependent variable are obtained by calculating $exp(\beta) - 1$, where β is the coefficient of interest.

[25] While Asher and Novosad (2017) rely on village level data in a regression discontinuity design framework, we do not have crimes data at the village level and hence use district level analysis.

used.[26]

The second stage is reported for the ten percent margin in Table 5. Columns 1 and 4 report the results from the control function approach. Columns 2, 3, 5 and 6 report the results from a linear specification. In column 1, we observe a negative and statistically significant (at 1 percent significance level) coefficient of magnitude -1.2 for assault. This is a reduction of 70 percent for a 100 percent change in proportion of households with toilets. Between 2014 and 2016, percentage households having toilets increased by 22 percent in India. This implies a 15 percent reduction in sexual assaults against women due to construction of toilets during this period. In column 2, the linear IV estimates and in column 3 estimates from a specification controlling state-specific time trends continue to indicate a statistically significant reduction in assault (the coefficients continue to remain negative and statistically significant effect at conventional levels of significance).

Next three columns (4-6) report the estimates from analogous specifications for reported rape. Both control function and linear IV approach (columns 4 and 5 respectively) yield a positive and significant coefficient in contrast to the reduced form estimates reported in columns 3 and 4 of Table 3. On controlling for the state-specific trends in our IV specification, the estimate reported in column 6 of Table 5 for rape changes sign (from positive to negative) and is not significant any longer. Clearly, rape coefficient is not stable across specifications. From this analysis we conclude two things. One, increase in access to in-home toilets led to a significant decline in sexual assault but we do not discern any consistent effects for rape and two, there does not appear to be a substitution across violent sexual crimes against women. We observe a reduction in assault but not in rape. During this period, rape laws had been changing and reporting was increasing substantially (See Figure A.1). It is plausible that incidence of rape did not fall enough to offset the increase in reporting whereas it did for assault. Our data does not allow us to parse this out. Hence, with our data we cannot conclusively rule out effects on rape though we do not discern consistent changes in reported rapes.

6 Heterogeneity

Large scale toilet construction under the SBM was a rural phenomenon. Hence, we evaluate whether our results vary by rural nature of the districts. Rural is defined as proportion of population in a district that resides in rural areas (Census 2011). The results are documented in Table 6. In column 1, we observe that the results are driven by the rural areas. The large

[26]We have enough power because 2014 and following years were unexpectedly dominated by the BJP in the Indian elections.

negative coefficient for the interaction of proportion of households with toilets and rural population share is statistically significant at the 1 percent significance level.[27]

Another dimension of heterogeneity that we explore is by comparison of North and South states. States in the Southern part of India are relatively richer and progressive.[28] In columns 2 , we report the rural-urban difference for the Northern states of India. The F-Stat is large statistically significant for the Northern States but not for the South. Consequently, the rural coefficient is large, negative, and statistically significant for the northern states. While it is negative and large for the southern states, it is imprecisely measured (estimates omitted for brevity). From these findings, we infer that the program was successful in reducing assault on women in rural areas and was driven by toilet construction in the North Indian states.

In column 3, we show that the reduction in assault occurred in districts with smaller population shares of scheduled caste and tribes population.[29] Finally, we also shed light on how the toilet construction effect varies by level of development. In column 4, we show the interaction effect with the development index of the districts. The effects are concentrated in less developed areas as opposed to more developed ones. In Figure 2, we plot the marginal effects by the development index.[30] Largest reduction in assault happens in the least developed areas. Hence, poor areas of India with less concentration of vulnerable populations see a decline in assault.

7 Robustness

If BJP increased policing intensity to crack down on crimes after forming the federal government in 2014, our exclusion restriction would be invalidated. Three facts cast doubt on this possibility: one, in our additional robustness tests reported in Table 7, we vary our specification on four dimensions and find the results stable across these. In column 1, we conduct a sensitivity analysis excluding insurgency affected states in the North-East and Jammu and Kashmir. Since these states have political unrest, crime incidence and reporting in these areas could have been very different here subsequent to the BJP (with a strong nationalist ideology) forming the federal government. Then, we control for state level overall police numbers and women police numbers, in our control function IV estimates (specifica-

[27]Slums in urban areas and peri-urban settlements have a much higher degree of crime incidence and very high population density in India plausibly explaining the positive urban effect.

[28]Southern states include Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Kerala, Goa and Puducherry.

[29]Scheduled castes are historically marginalized population group in India who face discrimination in many domains of life.

[30]The positive coefficient in the developed areas is not significant for most of the support. Whereas the negative coefficient for the less developed areas is negative and significant over the entire range of the support.

tion analogous to column 1 of Table 5) and find our results remain very similar (column 2 and column 3). Controlling for total crimes as a measure of lawlessness, in column 4, we still see a comparable negative and statistically significant estimate.

Two, in Table 6, we reported that our results vary by rural and urban living conditions of the districts. The results are driven by rural areas while urbanization is a positive correlate of crimes. Three, other crimes such as domestic violence (Table 8), theft, kidnapping, and murder (Table A.3) do not exhibit any systematic changes with toilet construction and are not consistently significant or negative in different specifications.[31] Increased policing or crackdown on crimes would have born out in these crimes as well. These facts cast doubt on this alternative hypothesis.

As an additional robustness check, we adjust the inference to account for multiple hypothesis testing. The results in Table 8 show effects of toilet construction for various crimes against women - sexual assaults, rapes, and domestic violence. Since we have multiple dependent variables, we calculate (False Discovery Rate) FDR-q values which adjust for proportion of rejections that are "false discoveries" (Anderson (2008)). The statistically significant negative effect of toilet construction on assaults continues to be statistically significant at the conventional levels of significance after this adjustment is made in our non-linear as well as linear estimation procedures (Panel A and B, Table 8). Note that rape has a positive coefficient and is also significant here. However, as shown in Column 6 of Table 5, it flips signs and becomes insignificant when we account for state trends unlike sexual assault reported in column 3 of that Table. Therefore, we do not infer that there are any consistent affects on rape.

Similarly, for regressions on other crimes in Table A.3 we report the FDR-q values. While Kidnapping bears a positive and significant coefficient in the linear estimates, it is not robust across specifications (Panel A). Theft and murder are insignificant.

7.1 Reporting Bias

Our crimes data is from the crimes reported to the police. Crimes against women tend to be under-reported. One concern with the interpretation of our results could be that crime incidence has not changed, rather reporting of assaults has gone down. There are several reasons which cast doubt on this as a driving mechanism:

- During this time in India, there was a significant increase in reporting in crimes against women. An infamous gang rape in 2012 was extensively covered by the media (Jolly,

[31] Having an in-house toilet can result in decrease in theft and domestic violence if women stay at home for longer (thus able to deter thieves and spend time on chores whose completion reduces conflict at home.)

2016) and led to widespread protests in India. This led to a surge in reporting of sexual crimes against women (see trends for rape and assault in Figure A.1). Against this backdrop, it is unlikely that reporting of assault reduced selectively in areas getting more toilets. In Table A.1 and table A.2, we ensure that excluding these years does not alter our findings. Assault estimates are similar if we exclude 2012 or 2012 and 2013 (columns 1 and 2). The sign and the magnitude of the rape coefficient does not change however, it is significant on excluding 2012 and 2013 whereas it is insignificant if we only exclude 2012. This further substantiates the fact that assault results are very robust and being generated by toilet construction unlike rape.

- In addition, in Table 6 we document that the effect varies along several dimensions: rural population shares, baseline development of districts, and share of scheduled castes. If reporting were to be driving our results, reporting would have to systematically change along these various dimensions which are consistent with reduction in assault due to building of more toilets in rural less developed areas.

- In order to consistently explain our instrumental variable framework results, reporting changes would also have to occur systematically in closely contested elections of state assemblies where BJP politician was the winner post 2014.

- Finally, in Tables 8 and A.3, we show that other crimes do not systematically reduce.

Given these arguments, we believe our findings disfavor reporting changes as an explanation of our results.

8 Conclusion

Our findings demonstrate that access to in-home toilets leads to a reduction in sexual assault of women. Access to sanitation facilities is promoted because of its impact on health and human capital, but we show that it also has a crucial safety enhancing impact on women. Widespread sexual crimes can be reduced, if only to some extent, by providing better access to in-home toilets for women. Thus, ensuring that they do not venture out alone in dark when they are likely to be sexually violated.

Prior research shows that there is a complementarity in access to water and sanitation in improving health (Duflo *et al.* (2015); Alsan & Goldin (2019)). Sekhri & Hossain (2019) also establish that water shortages increase rape of women in India. Thus, an avenue of future research would be to examine if such complementarities between water and sanitation access also exist for abating sexual crimes against women.

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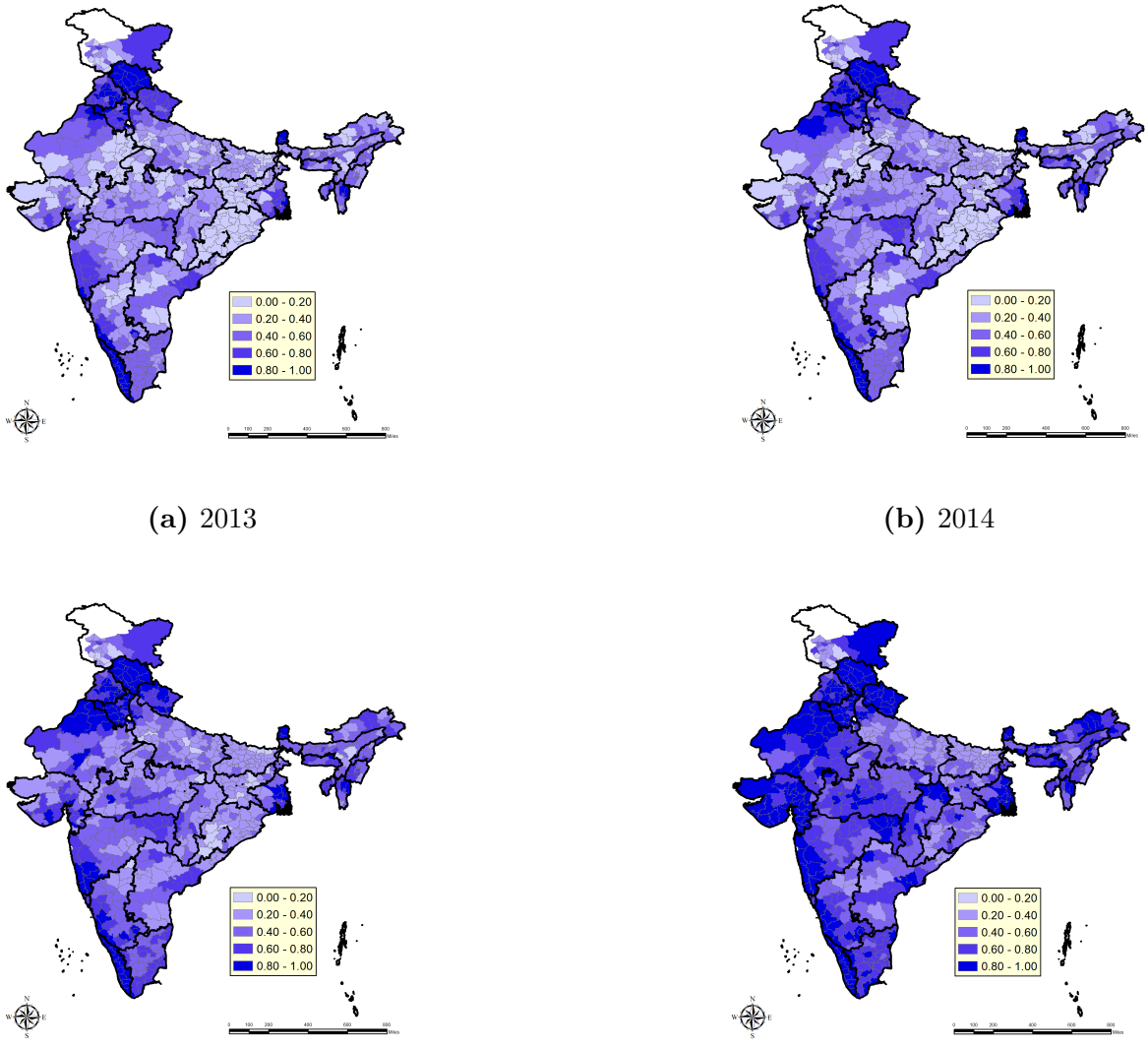
Figure 1: Proportion of rural households having a toilet



(a) 2013 **(b)** 2014

(c) 2015 **(d)** 2016

Source: Ministry of Drinking Water and Sanitation (MDWS), India

Figure 2: Heterogeneity in Marginal Effects of Toilets on Sexual Assaults: Development Index

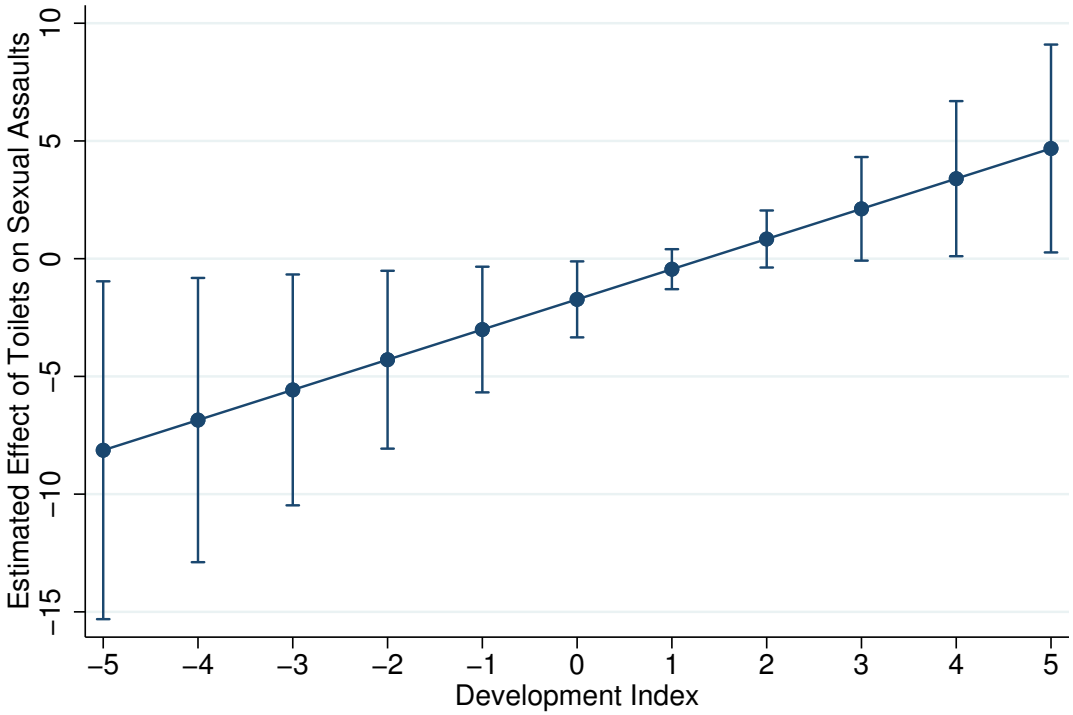


Table 1: Expansion in Toilets across Indian States over Time

	2012	2013	2014	2015	2016	2017
Andhra Pradesh	41%	44%	47%	52%	63%	94%
Arunachal Pradesh	33%	42%	49%	59%	82%	104%
Assam	38%	41%	44%	52%	73%	88%
Bihar	25%	26%	27%	30%	36%	58%
Chhattisgarh	31%	32%	33%	41%	71%	100%
Gujarat	35%	38%	45%	63%	93%	101%
Haryana	73%	75%	79%	83%	88%	100%
Himachal Pradesh	86%	86%	90%	94%	100%	100%
Jammu & Kashmir	23%	28%	29%	33%	39%	79%
Jharkhand	15%	17%	20%	28%	48%	79%
Karnataka	35%	43%	54%	61%	71%	92%
Kerala	95%	95%	96%	96%	100%	100%
Madhya Pradesh	28%	34%	40%	51%	71%	97%
Maharashtra	45%	50%	55%	63%	80%	101%
Manipur	43%	51%	57%	68%	77%	91%
Meghalaya	49%	56%	66%	76%	86%	106%
Mizoram	60%	64%	64%	69%	72%	92%
Nagaland	49%	57%	57%	65%	80%	88%
Odisha	12%	12%	14%	31%	47%	57%
Punjab	75%	75%	75%	78%	82%	84%
Rajasthan	24%	27%	34%	54%	80%	101%
Sikkim	84%	87%	93%	100%	100%	100%
Tamil Nadu	46%	49%	53%	63%	75%	99%
Telangana	27%	32%	35%	40%	53%	89%
Tripura	52%	53%	57%	67%	74%	79%
Uttar Pradesh	31%	34%	36%	39%	46%	68%
Uttarakhand	67%	67%	70%	75%	97%	99%
West Bengal	51%	56%	62%	72%	90%	97%
India	37%	41%	44%	52%	66%	86%

Source: Ministry of Drinking Water and Sanitation (MDWS), India

Note: The table shows the proportion of households having toilets in rural India.

Table 2: Summary Statistics

	Observations	Mean	Std. Dev.	Min.	Max.
Crimes					
Rape	3025	49.01	48.91	0	511
Assault	3025	103.45	122.75	0	1213
Domestic violence	3025	178.22	282.01	0	3599
Attempt to rape	3025	4.49	18.77	0	389
Insults to women	3025	10.95	37.89	0	750
Theft	3025	647.49	1,076.67	0	14064
Kidnapping	3025	99.14	119.63	0	1439
Murder	3025	49.08	42.09	0	356
District level demographics in 2011 (unweighted)					
Total population	608	1,902,610	1,523,840	8,004	11,100,000
Male/Female population	608	1.06	0.06	0.88	1.45
% SC population	605	0.16	0.10	0	0.53
% ST population	605	0.20	0.29	0	0.99
Development Index	599	0.01	1.60	-5.46	5.18
% Rural population	608	0.76	0.17	0	1.00
Variables varying over time					
Nightlight luminosity	3025	13.62	17.05	0	255
Police Intensity (population per police officer)	3025	738.54	351.89	95	1468
Women Police	3025	5300.60	4934.80	164	26208
Percentage rural households having toilet	3025	0.48	0.26	0	1
Close elections won by BJP (10% margin)	2809	0.24	0.33	0	1

Source: NCRB (crime data), MDWS(Toilet construction), Census 2011 (demographic and census controls), NOAA/NCEI (nightlights), Police (Bureau of Police Research and Development)

Table 3: Reduced Form Estimates: Toilet Construction and Sexual Assaults/Rapes (Quasi Maximum Likelihood Estimates)

	(1) Assault	(2) Assault	(3) Rape	(4) Rape
HH Toilet proportion	-0.231*	-0.248**	-0.183**	-0.151
	(0.122)	(0.120)	(0.0910)	(0.0939)
Observations	3,025	2,980	3,025	2,980
Controls				
Demographic		✓		✓
Census		✓		✓
Nightlights		✓		✓

Notes: The dependent variable is the number of reported rapes and sexual assaults in a district-year. The explanatory variable HH Toilet Proportion measures the proportion of households having a toilet in a district-year. Quasi-maximum likelihood estimates with district and year fixed effects. Demographic controls of district population and male-female ratio and Census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. Clustered standard errors (at district level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: First-Stage Regression Results for the Instrumental Variable Estimates

	(1) HH Toilet proportion	(2) HH Toilet proportion	(3) HH Toilet proportion	(4) HH Toilet proportion	(5) HH Toilet proportion	(6) HH Toilet proportion
	10%	5%	1%	10%	5%	1%
BJP*PostSBM	0.124***	0.095***	0.186***	0.132***	0.100***	0.181***
	(0.018)	(0.019)	(0.041)	(0.017)	(0.019)	(0.041)
BJP	-0.034**	-0.048***	-0.065	-0.027**	-0.043***	-0.077
	(0.014)	(0.015)	(0.050)	(0.014)	(0.015)	(0.055)
Constant	0.397***	0.402***	0.430***	0.398***	0.403***	0.430***
	(0.004)	(0.004)	(0.009)	(0.004)	(0.006)	(0.012)
Observations	2,809	2,431	981	2,764	2,390	965
F-Stat	49.55	25.29	20.84	57.63	27.90	19.94
Add. Controls				✓	✓	✓

Notes: The dependant variable, HH Toilet Proportion, measures the proportion of households having a toilet in a district. BJP is the proportion of close elections in a district which BJP won. PostSBM=1 for years 2015 and 2016. The instrumental variables vary in the bandwidth used to define close elections and the bandwidth is mentioned in each column heading. F-Stat is for the excluded IV in the first stage. Linear estimates with district and year fixed effects. Demographic controls of district population and male-female ratio and Census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. Clustered standard errors (at district level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Instrumental Variable Estimates: Effect of Toilet Construction on Rapes & Sexual Assaults

	(1) Assault 10%	(2) Assault 10%	(3) Assault 10%	(4) Rape 10%	(5) Rape 10%	(6) Rape 10%
HH Toilet proportion	-1.209***	-0.895*	-4.792*	0.764**	1.319***	-0.824
	(0.405)	(0.468)	(2.786)	(0.384)	(0.404)	(1.661)
BJP	0.107	0.104	-0.113	0.007	0.0464	0.0101
	(0.073)	(0.0967)	(0.120)	(0.046)	(0.0478)	(0.0472)
Observations	2,764	2,764	2,764	2,764	2,764	2,764
Specification	CF	Linear	Linear	CF	Linear	Linear
Controls						
State time trends			✓			✓

Notes: The dependent variable is the number of reported rapes and sexual assaults in a district-year in control function approach and log of crimes in Linear approach. The explanatory variable HH Toilet Proportion measures the proportion of households having a toilet in a district-year. Estimations include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. The Control function method with state time trends does not converge, linear estimates are shown for this specification. Clustered standard errors (at district level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Instrumental Variable Estimates: Heterogeneity in the Effect of Toilet Construction on Sexual Assaults (Linear Estimates)

X=	(1) Assault Rural 10%	(2) Assault Rural 10%	(3) Assault SC-ST 10%	(4) Assault Devt Index 10%
HH Toilet proportion	7.102**	4.087	-1.760*	-1.728**
	(2.837)	(3.069)	(0.943)	(0.823)
HH Toilet proportion*X	-11.06***	-10.05**	2.378	1.282**
	(4.183)	(4.673)	(1.818)	(0.585)
BJP	-0.258	-0.818	0.409**	0.0492
	(0.670)	(0.832)	(0.197)	(0.106)
BJP*X	0.519	1.021	-0.912*	0.146**
	(0.858)	(1.069)	(0.469)	(0.0728)
X*Post SBM	2.028***	1.099		
	(0.696)	(0.842)		
Observations	2,764	1,687	2,764	2,764
F-Stat	13.043	7.6	14.936	5.051
Specification	All States	North States	All States	All States

Notes: The dependent variable is the log of number of reported rapes and sexual assaults in a district-year. The explanatory variable HH Toilet Proportion measures the proportion of households having a toilet in a district-year. F-Stat is the weak identification Wald F-Stat for the excluded IV's in the first stage. Linear estimates are shown since they more straightforward than control-Function approach with two endogenous variables. In the second column we drop the north-eastern states and J & K. All states below Deccan are classified as South, namely, Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Kerala, Goa and Puducherry. Rural is defined as proportion of population in a district that resides in rural areas (Census 2011). Devt. Index is the Index of village level census variables generated using principal component analyses. SC-ST is the proportion of population in a district which is Scheduled Caste or Scheduled Tribe. Linear IV estimates include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. Clustered standard errors (at district level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Instrumental Variable Estimates: Effect of Toilet Construction on Sexual Assaults (Control Function Estimates, Robustness Checks)

	(1) Assault 10%	(2) Assault 10%	(3) Assault 10%	(4) Assault 10%
Toilet proportion	-1.840***	-1.497***	-1.241***	-1.018**
	(0.586)	(0.423)	(0.399)	(0.401)
BJP	0.084	0.116	0.071	0.061
	(0.074)	(0.073)	(0.071)	(0.071)
Observations	2,402	2,764	2,764	2,764
F-Stat	32.69	58.49	55.51	57.88
Specification	Restricted sample	Police Intensity Control	Women Police Control	Other Crimes Control

Notes: The dependent variable is the number of reported rapes and sexual assaults in a district-year. The explanatory variable HH Toilet Proportion measures the proportion of households having a toilet in a district-year. F-Stat is for the excluded IV in the first stage. Control function estimates include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. In the restricted sample states in the North East and JK are dropped. Police Intensity is measured by total population per policeman in the state. Women police force is measured as total women in the police force in a state. Other crimes include theft, kidnapping and murder in a district-year. Clustered standard errors (at district level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Crimes Against Women: Multiple Hypothesis Testing

Panel A: Control Function Estimates				
	Effect	Original p-value	FDR q value	Observations
Outcome				
Assault	-1.209	0.003	0.009	2,764
Rape	0.764	0.047	0.071	2,764
Domestic violence	-0.62	0.099	0.099	2,764
Panel B: Linear Fixed Effects Estimates				
	Effect	Original p-value	FDR q value	Observations
Outcome				
Assault	-0.895	0.056	0.084	2,764
Rape	1.319	0.001	0.003	2,764
Domestic violence	-0.125	0.815	0.815	2,764

Notes: The dependent variable is the reported incidence of crimes in Control Function estimates and log of number of reported incidence of crimes in the Linear specification, in a district-year. The explanatory variable whose effect is shown is the proportion of households having a toilet in a district-year. All specifications include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. The original p-values correspond to clustered standard errors (at district level) and the FDR q-values are calculated according to the procedure described in Anderson (2008).

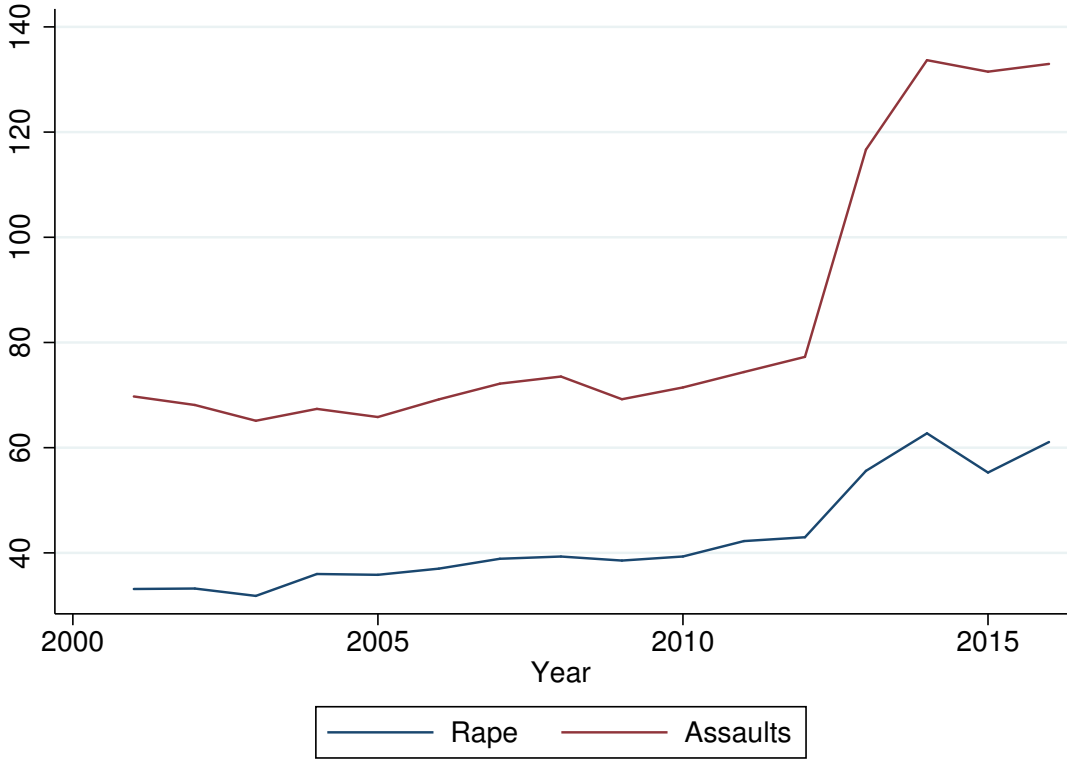
Table 9: Instrumental Variable Estimates: Effect of Toilet Construction on all Crimes against Women outside home (Control Function Estimates)

	(1) CAW 1 Outside home 10%	(2) CAW 2 Outside home 10%
HH Toilet proportion	-0.827**	-0.845**
	(0.325)	(0.340)
BJP	0.068	0.012
	(0.053)	(0.055)
Observations	2,764	2,764

Notes: The dependent variable CAW 1 is the number of reported incidence of rape, sexual assaults and attempts to rape in a district-year. The dependent variable CAW 2 adds reported incidence of Insults towards women to the CAW 1.The explanatory variable HH Toilet Proportion measures the proportion of households having a toilet in a district-year. Estimates include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. Clustered standard errors (at district level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX

Figure A.1 Crimes against women: Rapes and Sexual Assaults



Source: NCRB

Note: The figure plots total number of rape and sexual assaults reported in India per one million Indian women.

Table A.1 IV Estimates (Control Function, Excluding Years)

	(1) Assault 10%	(2) Assault 10%	(3) Rape 10%	(4) Rape 10%
Toilet proportion	-1.257***	-1.512***	0.635	0.930*
	(0.406)	(0.500)	(0.386)	(0.535)
BJP	0.147	0.268	-0.077	-0.226*
	(0.107)	(0.290)	(0.059)	(0.123)
Observations	2,206	1,653	2,206	1,653
F-Stat	51.978	38.06	51.978	38.06
Specification	Exc 2012	Exc 2012, 2013	Exc 2012	Exc 2012 2013

Notes: The dependent variable is the reported incidence of crimes in Control Function estimates and log of number of reported incidence of crimes in the Linear specification, in a district-year. The explanatory variable whose effect is shown is the proportion of households having a toilet in a district-year. Linear estimates include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data.

Table A.2 IV Estimates (Linear, Excluding Years)

	(1) Assault 10%	(2) Assault 10%	(3) Rape 10%	(4) Rape 10%
Toilet proportion	-1.051**	-1.342*	0.964***	0.759
	(0.481)	(0.720)	(0.373)	(0.465)
BJP	0.201	1.100**	-0.0202	-0.128
	(0.157)	(0.432)	(0.0613)	(0.120)
Observations	2,206	1,653	2,206	1,653
F-Stat	51.978	38.06	51.978	38.06
Specification	Exc 2012	Exc 2012, 2013	Exc 2012	Exc 2012 2013

Notes: The dependent variable is the reported incidence of crimes in Control Function estimates and log of number of reported incidence of crimes in the Linear specification, in a district-year. The explanatory variable whose effect is shown is the proportion of households having a toilet in a district-year. Linear estimates include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data.

Table A.3 Other Crimes: Multiple Hypothesis Testing

Panel A: Control Function Estimates				
	Effect	Original p-value	FDR q value	Observations
Outcome				
Theft	-0.531	0.05	0.15	2,764
Kidnapping	0.104	0.828	0.828	2,764
Murder	0.082	0.68	0.828	2,764
Panel B: Linear Fixed Effects Estimates				
	Effect	Original p-value	FDR q value	Observations
Outcome				
Theft	-0.110	0.65	0.66	2,764
Kidnapping	1.843	0.001	0.003	2,764
Murder	0.101	0.66	0.66	2,764

Notes: The dependent variable is the reported incidence of crimes in Control Function estimates and log of number of reported incidence of crimes in the Linear specification, in a district-year. Theft includes incidences of theft, burglary and robbery. Kidnapping refers to abduction crimes. The explanatory variable whose effect is shown is the proportion of households having a toilet in a district-year. Linear estimates include district fixed and year fixed effects, demographic controls of district population and male-female ratio and census controls for proportion of SC population and ST population and development index are interacted with year indicators. The luminosity in a district is controlled using nightlights data. The original p-values correspond to clustered standard errors (at district level) and the FDR q-values are calculated according to the procedure described in Anderson (2008).