

The Political Economy of Village Sanitation in South India

Capture or Poor Information?

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Abstract

Despite efforts to mandate and finance local governments' provision of environmental sanitation services, outcomes remain poor in the villages surveyed in the four South Indian states. The analysis indicates some key issues that appear to hinder improvements in sanitation. Local politicians tend to capture sanitary infrastructure and cleaning services for themselves, while also keeping major village roads reasonably well-served. Their decisions suggest, however, that they

neither understand the health benefits of sanitation, nor the negative externalities to their own health if surrounding areas are poorly served. Our findings suggest that improving sanitary outcomes requires disseminating information on the public goods nature of their health benefits, as well as on the local government's responsibilities. It also requires putting public health regulations in place, along with measures to enable accountability in service provision.

This paper—a product of the Human Development and Public Services and the Poverty Teams, Development Research Group—is part of a larger effort in the department to study socio-political processes and development outcomes. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at rban@worldbank.org, mdasgupta@worldbank.org, and vrao@worldbank.org.

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The Political Economy of Village Sanitation in South India: Capture or Poor Information?

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Introduction

Environmental sanitation outcomes are poor in rural India. Surveying villages in the four Southern states of the country, we find a shortfall in village cleaning: nearly a third of roads had some visible garbage on them, and one in ten drains was clogged. Sanitation infrastructure is also in poor shape: less than half the roads were paved, and just over a quarter had drains.

Typically local bodies are responsible for this anywhere in the world, as part of their task of providing basic civic amenities. These responsibilities include a multiplicity of tasks, including the maintenance and cleaning of various public facilities (including roads, drains, water supply, waste disposal sites, burial and cremation grounds), and “conservancy” (preventing unhealthy conditions by dealing with such matters as removing garbage, cutting back vegetation, and filling in areas where water accumulates). These tasks are necessarily performed at local level because they require a high level of local knowledge and engagement.

In India, local bodies have been given a clear mandate to provide these services. Moreover, funds are made available to these local bodies, such that it is not difficult to meet the modest costs of hiring someone for keeping roads and other public areas clean. Fund shortages are more of a problem for the capital-intensive tasks of paving roads and constructing drains.

Why then are outcomes so poor? There are several possible reasons. Firstly, the system of local governance may be poorly designed and implemented. In the next section we summarize some of the key gaps noted in the literature in the design and functioning of the system of local governance, and in the institutions to support local governments in the provision of sanitation and other basic services.

Secondly, citizens may lack information on sanitation. They may lack awareness of the benefits of better sanitation for reducing their own and their children’s exposure to disease, with its high levels of attendant morbidity and child mortality. They may not know which aspects of sanitation pose the greatest health threats. And they may lack awareness of their local government’s responsibility for ensuring sanitation. The latter is a reflection of systemic dysfunctions in local governance, while the former reflect more a broader lack of health education outreach.

Thirdly, elites may capture sanitation resources for themselves. A substantial body of work is devoted to the argument that local elites have disproportionately better access to the public goods provided by local governments.² The lack of effective accountability implied by elite capture is another reflection of systemic dysfunctions in local governance.

We analyze survey data collected in villages in the four South Indian states, to explore why sanitation outcomes are poor, and to explore the evidence for systemic dysfunctions which could contribute to poor sanitation outcomes. Our paper is organized as follows. In the next section, we summarize the main dysfunctions discussed in the literature on local governments. We then analyze our survey data and find considerable evidence of elite capture by political elites, but not by traditional social and economic elites. Strikingly, we find that elites’ decisions indicate a lack of understanding of the externalities and benefits of sanitation. More broadly, we find evidence of systemic governance failure which includes shortfalls in disseminating information on government responsibilities and the benefits of sanitation.

² Araujo et al. 2008, Dasgupta and Beard 2007, Bardhan and Mookherjee 2000, 2006, Galasso and Ravallion 2005

2. Background on the PRI Act and its sanitation mandate

During the colonial period, village councils (Gram Panchayats – henceforth GPs) were instituted as part of a move towards decentralizing government functions. Some of the key functions allocated to them were related to sanitation and epidemic control (Tinker, 1967). This included protecting drinking water wells, helping control disease outbreaks; collecting data for detecting epidemics; and providing civic amenities such as maintenance of roads and drains.³ In the post-independence period, intermittent efforts were made to systematize the village governments by instituting regular elections to gram panchayats. However, particularly after the 1960's most states neglected the panchayat system, elections were not systematically held and the functions and finances of panchayats were gradually reduced, to the extent that in most of the country they were merely vestigial bodies.

A concerted attempt to revive the panchayat system that began in the 1980s led to a constitutional amendment, passed in 1992, which greatly expanded their role. It created a three-tier system of democratically-elected local government below the state government, called Panchayati Raj Institutions (PRIs). The states were left to decide what specific powers, functions, and finances were to be devolved to panchayats (GoI 2004a), but the constitution specifies some “core” functions for GP. These include drinking water provision, village roads, health and sanitation, and maintenance of community assets for which GPs receive funds both from the central government and from the state government.

Thus, for example, in the state of Tamil Nadu,⁴ the GP's mandatory functions include the maintenance of the drinking water supply, of roads and drains, and of burial and cremation grounds, the removal of garbage and overgrown vegetation, the filling in of disused wells, insanitary ponds, pools, ditches pits or hollows, addressing other insanitary conditions, constructing and maintaining public toilets, and encouraging households to construct toilets. Their discretionary duties related to public health include the maintenance of public markets and slaughterhouses, and overseeing the conduct of public fairs.

a) Problems noted in the literature on the functioning of PRIs

A series of reports⁵ have highlighted some problems that typically hinder PRIs from being able to function effectively, and the following summarizes the issues affecting PRIs' capacity to provide services, and their accountability to citizens:

- *Overall problems of devolution of functions.* GPs have been delegated functions without adequate administrative, financial, and technical support. Moreover, there is excessive control by the state government, as a result of which PRIs function more as agents of the state government than as autonomous institutions
- *Insufficient clarity and differentiation of functions* between PRIs at the village, block and district levels, as well as with state government agencies and central government agencies. As World Bank (2005a) says, “This has created confusion among citizens, undermined accountability, and led to the duplication of efforts and the wastage of resources”.
- *Uncertainties of fund flows* that make it difficult for PRIs to plan and implement their work efficiently, and for citizens to hold their PRIs accountable. PRIs receive funds from a

³ Matthew 2000, Das Gupta and Dyson 2001, Amrith (forthcoming).

⁴ Source: http://www.rural.tn.gov.in/citizens_charter_rd_eng.htm

⁵ Johnson 2003, De Souza 2000, Jha 2002, Oomen 1999, 2004, World Bank 2000, 2004, 2005a, 2005b, 2007.

multiplicity of government sources, many of which do not supply funds on a predictable schedule. The central government has sought to mitigate this problem somewhat by directly providing PRIs with annual grants for the maintenance of civic services including health, sanitation, and safe drinking water.

- *Problems in performance management:* Performance standards for many services are unclear, and performance monitoring is inadequate, further hindering accountability. Performance incentives are also diminished since the devolution of funds to local bodies is typically not clearly performance-linked.

b) Additional problems specific to the delivery of sanitation services:

The problems besetting service delivery by PRIs are especially acute for sanitation services. The reasons for this become apparent when we consider, for example, the issue of vector control. A high level of organizational clarity and coordination is needed between local governments and the several line agencies involved, such as those dealing with health, minor irrigation, water supply, and public works. Funds must also be available at the right time: there is little point in trying to control vector breeding the week after the breeding season.

In addition to this, sanitation services have other specific needs:

- *Public health regulations.* A clear set of public health regulations, translated into local by-laws and backed by credible implementation mechanisms, is needed for upholding sanitation service delivery. Citizens need to know what their local government is supposed to do, and the local government needs to be able to make citizens comply with requirements for maintaining a sanitary environment. Yet Indian states typically lack uniform and updated public health regulations (Das Gupta 2005). Tamil Nadu is a notable exception in having a uniform Public Health Act applicable to the entire state --- and it is also the only one to invoke this Act when referring to the mandatory duties of the GP (Govt of India 2004b).
- *Public health advocacy and education.* Building public awareness and support is also very important for successful maintenance of environmental sanitation. Citizens need to understand how they stand to gain from sanitation, such that they can pressure their local governments to improve their service delivery. However, the political vision to do this has been thin.⁶

These problems make for poor GP performance in environmental sanitation, and set the context in which we interpret our survey results. We turn now to examine what our survey data reflect in terms of systemic dysfunctions on the ground.

3. Study design

3.1. Sampling

The sample was selected from seven districts in the four South Indian states – two in Andhra Pradesh (AP) -- Medak and Chittoor; three in Karnataka (KA) -- Bidar, Kolar and Dakshin Kanada; two in Kerala (KE) -- Kasargod and Palakkad; and two in Tamil Nadu (TN) -- Dharmapuri and Coimbatore. Districts within states and blocks (sub-district level entities) within districts were purposively chosen to control for common histories and cultural

⁶ Das Gupta and Rani 2004, Mavalankar and Shankar 2004.

similarities. The district and block sampling is less relevant for this paper and is described in more detail in Besley *et al.* (2005.)

Each block consists of several GPs, which in turn have between 1 and 6 villages depending on the state. From each sampled block, in the states of AP, KA and TN, we randomly sampled 6 GPs in every block. In Kerala the population per GP is roughly double that in the other three states. For this reason in Kerala we sampled 3 GPs in every block. This procedure gave us a total of 201 GPs. From these we selected a village sample. In AP, Karnataka and Tamil Nadu we sampled all villages if the GP had 3 or fewer villages. If it had more than three villages, then we selected the GP head's village and randomly selected two other villages. We excluded all villages with less than 200 persons from our sampling frame. All hamlets with population over 200 were considered as independent villages in drawing the sample. In Kerala we directly sampled wards instead of villages (as villages in Kerala tend to be very large) -- we sampled 6 wards per GP. This gave us a final village sample size of 527⁷ villages. For sampled villages, any associated hamlets were also included as part of the sample.

3.2. Data collection

The information about the sanitation outcomes was collected in 2003 through (1) questionnaires administered to Gram Panchayat members and (2) direct observation of the condition of the roads by field investigators. The questionnaires collected data on the frequency of actions regarding public health and sanitation and on the allocation of responsibility for these tasks. We specified a list of sanitation measures, and asked the Gram Panchayat members who was responsible for carrying them out, and whether these were ever done in the village. Tables 1 and 2 summarize this information. To collect the direct observation data, our investigators first constructed detailed maps of the village showing all the roads and paths. They then assessed the condition of each road along the dimensions detailed in Table 3, and noted the characteristics of the inhabitants by the side of that road. In particular they noted the caste and religion of the inhabitants, whether they were GP members, and whether important village institutions such as schools, health centers, were by the side of the road. Compared with the respondents' reported perception of whether a task was ever done, the direct observation data give us much more objective information on the actual sanitary conditions on the ground.

In addition to the sanitation outcomes, we have additional village-level information, collected in a previous survey conducted the previous year in 2002. This information was collected from the official census (population, literacy, area), interviews with GP members (whether the village is the GP headquarter and whether the village is the GP president's village), and from participatory appraisal methods (the fraction Scheduled Castes/Tribes in the village, the fraction land owned by the upper castes, and oligarchy – the extent to which the GP members control the important functions in the village.)

4. Analytical Methods

To analyze the determinants of information about GP responsibilities we use the village level data. To examine the inter- and intra-village distribution of sanitation outcomes we use the road level dataset onto which we merged the village level information. Hence, the unit of observation

⁷ The state-wise break up is AP: 69 villages, KA: 182 villages, KE: 126 wards; TN 129 villages.

is the road. Our method of analysis is the multivariate linear regression estimated with ordinary least squares. In the information regressions our dependent variable is whether the GP is viewed as responsible for the specific tasks summarized in Table 2. In the distribution regressions our dependent variables are the road level sanitation outcomes summarized in Table 3. In addition, our dependent variables are binary (i.e. yes-no, codified as 1-0) and we are using a linear probability model. Our explanatory variables are broken up into the following categories.

- (a) Village characteristics that might be expected to be associated with greater access to information about Gram Panchayat responsibilities and resources:
 - Higher proportions literate
 - Village which is the GP headquarters

- (b) Village-level factors that might be expected to be associated with lower popular awareness of the roles of modern local government institutions:
 - Villages with oligarchic control of resources and power
 - Villages where the upper castes own a higher proportion of the land
 - Villages with a higher proportion of scheduled castes/tribes

- (c) Villages with greater sanitation needs because of demographic pressures (making for higher production of garbage, and greater crowding which increases the health risks from poor sanitation):
 - Villages with larger population size
 - Villages with higher population density

- (d) Roads inhabited by socially excluded groups: Compared with roads inhabited by the upper castes, those inhabited by
 - Scheduled castes/tribes
 - Mixed castes
 - Muslims

- (e) Important village roads which might be expected to receive priority in terms of infrastructure:
 - Roads which are longer or have key institutions (school, bank, or post office)
 - Long roads, i.e. major village roads

- (f) Villages/roads with strong political connections:
 - Gram panchayat head lives in the village
 - Politician lives on that road

In these regressions we use “fixed effects” – dummy variables that control for variation across geographic entities. When we want to emphasize the village level variables, the regressions are estimated with block fixed-effects, which means that we are estimating effects across villages within the same block, controlling for variations across blocks, which allows us to analyze the inter-village distribution of sanitation outcomes within a block. We use village fixed effects when we want to emphasize the road level variables which determine the intra-village distribution. With village fixed effects, our analysis focuses on estimating the differences in outcomes across roads in the same village – controlling for any variation at the village level, or at higher levels.

5. Results

5.1 How aware are Gram Panchayat (GP) members of the GP's responsibilities for sanitation?

Table 2 lists a set of local sanitation functions that are solidly within the PRI Act's mandate for GPs. The most striking aspect of this table is that there is some confusion on GP responsibility for all these tasks, although the Gram Panchayat is reported by the majority of respondents to be responsible for carrying out each of these tasks.

The tasks with the four highest (80-86%) awareness of GP responsibility are cleaning drinking water tanks, roads, and drains, and spraying for mosquitoes (Table 2), with drinking water chlorination following closely behind. The provision of safe drinking water has been a high priority national program since the 1970s, as has the malaria program's mosquito-spraying campaigns. Roads and drains get some attention from the higher authorities, since they are capital-intensive investments with high political payoff. By contrast, garbage disposal and clearing accumulated water have not been the focus of major national or state efforts, and perhaps for this reason they rank lowest in awareness of GP responsibility despite the fact that both of these are fundamental functions of local governments.

Comparing Tables 1 and 2 we can see that an increased confusion is associated with a lower likelihood of the task being reported to have ever been done. However, the data do not allow us to draw any conclusion about the causal relationship between confusion and (lack of) action. Among the tasks with the four highest awareness of GP responsibility, three are also in the top four in the action ranking. In particular, cleaning the water tanks is the top ranked task in the responsibility and action ranking. In the action rankings, the two actions pertaining to providing safe drinking water rank the highest. The high responsibility rankings of road and drain cleaning is also consistent with the fact that Table 3 indicates that efforts are made to keep roads and drains at least moderately clean.

The similarities extend to the bottom of the ranking as well. Garbage disposal is the task on which there is greatest confusion and the least frequent action. Only 61% of respondents stated that the GP is responsible for this, and nearly a third actually said they did not know who was responsible for this task. 14% of respondents thought that higher levels of PRIs are responsible for clearing water accumulation in their villages, although it is not possible for people outside the locality to know what water accumulates where and under what conditions, and therefore make arrangements to manage the water accumulation. The confusion about garbage disposal is also consistent with the interviewers' observation that the poorest sanitation outcome pertains to garbage on roads (Table 3).

Table 4 analyzes the village characteristics associated with being better informed about GP responsibility for these tasks. Some interesting results emerge.

Firstly, villages with characteristics that might be expected to raise awareness of GP responsibilities do not seem to have much greater awareness than others. Villages with higher proportions literate are better informed only of GP responsibility for one task (cleaning drinking water tanks). Villages which might be expected to be exposed to more information about GP roles, either because the GP head lives there or because they are the GP headquarters where GP meetings are held, show little difference from other villages in their awareness of GP responsibilities, except with regard to cleaning drinking water tanks.

The same applies to factors that might be expected to be associated with lower popular awareness of the roles of modern local government institutions. Villages with oligarchic structures, those with high proportions of land controlled by the upper castes, and those with a high proportion of scheduled castes or scheduled tribes show little consistent evidence of being less informed than other villages.

A more consistent pattern of greater awareness of GP responsibility for sanitation tasks is shown only by villages with larger populations. These villages show significantly greater awareness of GP responsibility for garbage disposal and road cleaning, but possibly lower awareness of their responsibility for cleaning drinking water tanks. This suggests that larger villages receive more attention in terms of sanitation services, as should be the case given their greater need for these services. Villages which are more densely populated also show some (limited) evidence of greater awareness of GP responsibility for managing their drinking water safety and anti-malarial spraying.

5.2 Who is better served with road infrastructure and sanitation?

In Table 5 we examine the determinants of the inter-village distribution of sanitation benefits. To take into account variations in geography and across higher level government institutions we include block fixed effects in our estimation⁸.

We find that village characteristics that might be expected to be associated with greater access to information make little difference to these outcomes. Having higher proportions literate makes no difference, and living in the village which is the Gram Panchayat headquarters is associated only with a greater likelihood of having paved roads. This latter result could well be because villages with better facilities are more likely to be selected to the Gram Panchayat headquarters in the first place.

Village-level factors that might be expected to be associated with lower popular awareness of the roles of modern local government institutions also show limited difference in outcomes compared with other villages. Oligarchic control of resources and power makes no difference, while villages where the upper castes own a higher proportion of the land are only more likely to do better in one outcome (moderately clean roads). Villages with a higher proportion of scheduled castes/tribes show mixed results: their roads are significantly more likely to be free of garbage, but their drains are significantly more likely to be clogged.

There is some limited evidence of effort to meet the greater sanitation needs of villages with larger or denser populations. In terms of infrastructure, we find only that villages with a more dense population are more likely to have drains and moderately clean roads. However, these villages are also more likely to have clogged drains. Villages with larger populations do not have an advantage in infrastructure, and there is evidence that their roads are more likely to have garbage on them. Of course, it needs to be borne in mind that more populous villages generate more garbage.

By contrast, there is strong evidence that the Gram Panchayat head's village is likely to be privileged in terms of sanitation. This in both in terms of infrastructure – more likely to be paved

⁸ We include the road level variables in the Table 4 estimation, but for the sake of brevity we do not report their coefficients. The coefficients are very close to those in Table 5 and their significance level does not change.

and to have drains, and in terms of cleanliness – more likely to be moderately clean, and free of garbage. However, it is notable that drains in these villages are no less likely to be clogged than elsewhere. One possibility this suggests is that Gram Panchayat heads' have limited awareness of what improves sanitation and health outcomes, as opposed to the more aesthetic aspects of having roads that have upscale infrastructure and are kept well-swept. Another possibility is that the village electorate is much more responsive to visible public goods rather than more invisible aspects of public health and sanitation, and village politicians therefore act accordingly in making decisions to support their constituencies.

In Table 6 we examine the determinants of intra-village distribution of sanitation outcomes. To remove all variation due to village level characteristics we include village fixed effects in the estimation⁹.

Social exclusion plays a limited role. Roads inhabited by scheduled castes/tribes are significantly less likely to be paved as compared with roads inhabited by the upper castes, and more likely to have garbage on them. Other than this, caste and religion seem to play little role in determining the conditions of the roads that people live on. Roads inhabited by mixed castes are more likely to be paved than those of the upper castes. Roads inhabited by Muslims are not significantly different from those inhabited by the upper castes.

Important roads receive priority in terms of infrastructure: roads which are longer (i.e. are major village roads) or have key institutions (school, bank, or post office) on them are significantly more likely to be paved, and to have drains. However, these important roads show much weaker evidence of receiving more attention in terms of cleaning, and that too along only one of the three indices of cleaning analyzed here.

Political connections again make a large difference. Roads where politicians are resident show evidence of significantly better infrastructure, being more likely to have drains and to be paved. Their roads are also more likely to be moderately clean.

Discussion

We find that people are largely informed about the local bodies' responsibility for keeping the village clean, with the notable exceptions of garbage disposal and clearing accumulated water. Yet there is little significant informational advantage amongst villages which are better placed to know of these roles, such as villages with higher proportions literate, where the Gram Panchayat headquarters are located, or even where the Gram Panchayat head lives. Nor do these villages show better sanitation outcomes than others. Given that there has been a major expansion of Gram Panchayat roles in the previous decade, one would expect that such villages would have an initial advantage in terms of information, and greater citizen pressure to improve outcomes. This suggests the possibility that respondents know of the Gram Panchayats' sanitation roles because these are longstanding roles over the past century, and that the new PRI system has failed to inform people adequately about its newly-enhanced roles and powers.

We find strong evidence of capture of sanitation infrastructure and services by politicians. The scarce resources for paving roads and constructing drains are allocated overwhelmingly to those with political clout: infrastructure is better in the Gram Panchayat head's village, and on the roads

⁹ Naturally, this also removes all the geographic and upper level institutional variation that were previously removed through block fixed effects.

on which politicians live. The Gram Panchayat head's village also does significantly better along all the cleanliness dimensions except that of keeping drains clear. No other category of village or road appears to benefit in this way. Politician's roads are less privileged in terms of cleaning than in infrastructure provision, and do better along only one of the three measures of cleanliness. This indicates sanitation services are determined along political lines and serve the needs of village politicians – strong evidence for political capture.

The good news is that traditional social elites' ability to corner resources for themselves seems to have almost completely eroded. Compared with roads inhabited by upper caste households, those inhabited by scheduled castes and tribes were less likely to be paved and to have fewer roads with no garbage on them — but this does not apply to the other potentially socially excluded categories examined. Also, villages with characteristics associated with a concentration of power (oligarchic villages and those where the upper castes hold most of the land), or with a concentration of traditionally disempowered people (fraction of the population that is from the lowest castes and tribes) show no significant difference from other villages in terms of infrastructure, and limited evidence of difference in terms of cleaning.

Impersonal considerations do play a role in the allocation of resources for infrastructure. Roads are more likely to be paved and have drains if they are long roads (major village roads) or have major institutions located on them. However, these roads do better only in terms of one of our three measures of cleanliness. Another indication of impersonal considerations is that more densely populated villages are more likely to have drains and moderately clean roads. However, these villages do not do better on the other indices of cleanliness. On the whole, we find limited evidence that villages are better served if they have greater sanitary needs because of demographic pressures.

The bottom line seems to be that local politicians take some trouble to make sure that their own residential areas are paved and have drains, and that their roads are kept clean. They see to it that important village roads are paved and have drains, but are less careful to make sure they are kept clean. However, they do not take the actions that would indicate an appreciation of the health benefits of sanitation, such as an awareness of the negative externalities they themselves face from having people around them live in poor sanitary conditions, especially under conditions of crowding. This suggests that sanitary infrastructure and road sweeping is appreciated more for aesthetic reasons than because of awareness of their public health benefits.

This study has several policy implications. The most pressing implication is that much needs to be done through health education outreach to make citizens aware of the connection between sanitation and their own wellbeing in terms of exposure to disease. At present, even policymakers at the highest levels show a lack of awareness of these issues: for example, the new National Employment Guarantee Scheme which provides money to GPs to provide employment to villagers does not permit workers to be hired to work on village cleaning projects. Such awareness will encourage greater demand for and monitoring of panchayats' sanitary services, and also trigger personal behavioral changes that help keep villages cleaner and healthier. It will also help ensure that GP decisions on village sanitation are based more on considerations of maximizing their public health impact, and less on aesthetic considerations. A second policy implication is that the government needs to inform citizens about the sanitation responsibilities of their local governments. Thirdly, local bye-laws on sanitation are needed to enable citizens and local governments understand concretely their respective tasks in assuring sanitation, and be able to hold each other accountable for this. And fourthly, the government needs to strengthen accountability mechanisms, and provide incentives, to reduce the partisan allocation of scarce infrastructure resources, and resources for village cleaning.

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Table 1: Gram Panchayat members' assessment of the fraction of villages where public health and sanitation tasks were ever done

| Task | Ever done |
|-------------------------------|-----------|
| Spraying for mosquitoes | 0.37 |
| Clearing water accumulation | 0.26 |
| Drinking water chlorination | 0.59 |
| Cleaning drinking water tanks | 0.71 |
| Garbage disposal | 0.23 |
| Road cleaning | 0.34 |
| Drain cleaning | 0.39 |

Table 2: Gram Panchayat members' perception of who is responsible for village public health and sanitation (%)

| Task | Gram Panchayat | Higher Panchayat / line agencies | Individual / Community | Don't know | Sum of percentages |
|-------------------------------|----------------|----------------------------------|------------------------|------------|--------------------|
| Spraying for mosquitoes | 80 | 10 | 1 | 13 | 104 |
| Clearing water accumulation | 73 | 14 | 2 | 16 | 105 |
| Drinking water chlorination | 78 | 13 | 3 | 10 | 104 |
| Cleaning drinking water tanks | 85 | 8 | 3 | 7 | 103 |
| Garbage disposal | 61 | 2 | 7 | 32 | 102 |
| Road cleaning | 82 | 2 | 5 | 15 | 104 |
| Drain cleaning | 86 | 2 | 4 | 10 | 102 |

Note: The sum of percentages is over 100 because respondents were allowed to report more than one responsible agent.

Table 3 Summary statistics: Road level outcomes

| Number of roads | Road has drain | Road is paved | Road is moderately clean | No garbage on road | Road has unclogged drain (cond) |
|-----------------|----------------|---------------|--------------------------|--------------------|---------------------------------|
| 10408 | 0.28 | 0.47 | 0.84 | 0.68 | 0.90 |

Note: "Road is moderately clean" is derived from a direct observation variable, which quantifies the field worker's overall perception of the road's cleanliness. The field worker is thereby asked to note whether the road is "clean", "somewhat clean", or "dirty". We have coded "moderately clean" as being not "dirty". This measure therefore has some overlap with the variable "no garbage on road".

Table 4: Gram Panchayat members' perception of the GP's responsibility for public health and sanitation, by village characteristics (block f.e.)

| | Spraying for mosquitoes | Clearing water accumulation | Chlorinating drinking water tanks | Cleaning drinking water tanks | Garbage disposal | Drain cleaning | Road cleaning |
|--------------------|-------------------------------|-----------------------------------|---|--|---------------------|-------------------|--------------------|
| Population | -0.025 (0.018) | 0.007 (0.016) | -0.033 (0.020) | -0.044* (0.024) | 0.080*** (0.021) | 0.033 (0.022) | 0.048** (0.023) |
| Literacy rate | 0.339* (0.198) | -0.041 (0.229) | -0.044 (0.213) | 0.589*** (0.205) | -0.107 (0.238) | -0.015 (0.265) | 0.212 (0.209) |
| Population density | 0.004* (0.002) | -0.001 (0.004) | 0.004* (0.002) | 0.003* (0.002) | 0.003 (0.003) | 0.002 (0.002) | 0.002 (0.002) |
| Fraction SC/ST | -0.050 (0.074) | -0.020 (0.082) | -0.126 (0.110) | -0.164* (0.085) | -0.010 (0.089) | -0.026 (0.087) | 0.089* (0.051) |
| GP head's village | 0.034 (0.039) | -0.025 (0.041) | 0.033 (0.043) | -0.012 (0.038) | -0.046 (0.041) | -0.015 (0.042) | -0.016 (0.033) |
| GP HQ in village | -0.034 (0.052) | 0.013 (0.056) | 0.024 (0.052) | 0.127*** (0.047) | -0.030 (0.049) | -0.033 (0.045) | 0.010 (0.042) |
| Oligarchy | -0.340** (0.168) | -0.214 (0.233) | -0.128 (0.214) | -0.467* (0.238) | 0.134 (0.212) | 0.035 (0.216) | 0.378** (0.183) |
| Upper land prop. | -0.005 (0.052) | -0.056 (0.051) | 0.044 (0.069) | 0.002 (0.058) | -0.044 (0.074) | -0.052 (0.054) | 0.056 (0.050) |
| adjR-squared | 0.446 | 0.518 | 0.257 | 0.321 | 0.513 | 0.434 | 0.454 |
| N | 425 | 349 | 395 | 372 | 437 | 323 | 437 |

Notes:

1) controls included but not reported: whether the GP Presidency is reserved for women, scheduled or "backward" castes, fraction landless, number of castes, Gram Panchayat headman characteristics (age, education, wealth, experience)

2) standard errors clustered at Gram Panchayat level in parenthesis

3) *significant at 10%; **significant at 5%

Table 5: Road level regressions: block fixed effects: linear probability

| | Road has drain | Road is paved | Road is moderately clean | No garbage on road | Road has unclogged drain (cond) |
|-----------------------|---------------------|--------------------|--------------------------------|--------------------------|--|
| population | 0.002 (0.007) | -0.008 (0.006) | -0.002 (0.006) | -0.012* (0.006) | 0.003 (0.007) |
| literacy rate | 0.158 (0.101) | -0.097 (0.116) | 0.140 (0.105) | 0.128 (0.125) | -0.041 (0.141) |
| pop density | 0.007*** (0.002) | 0.003 (0.002) | 0.002** (0.001) | 0.000 (0.002) | -0.002* (0.001) |
| fraction scst | -0.021 (0.041) | 0.047 (0.047) | -0.017 (0.035) | 0.166*** (0.055) | -0.207*** (0.068) |
| GP head's village | 0.053*** (0.015) | 0.028* (0.016) | 0.037** (0.015) | 0.060*** (0.018) | -0.017 (0.024) |
| GP HQ in village | 0.022 (0.021) | 0.047** (0.021) | -0.027 (0.018) | -0.021 (0.023) | 0.004 (0.031) |
| oligarchy | (0.021) (0.074) | (0.021) (0.092) | (0.018) (0.074) | (0.023) (0.099) | (0.031) (0.220) |
| upper land proportion | -0.038 (0.027) | 0.017 (0.030) | 0.071*** (0.025) | -0.027 (0.034) | -0.040 (0.047) |
| psR-squared | 0.239 | 0.116 | 0.116 | 0.276 | 0.222 |
| N | 8452 | 8452 | 8398 | 8407 | 2038 |

Notes:

- 1) upper caste roadside as omitted category
- 2) drain regressions conditional on road having drain
- 3) inst roadside indicates whether a school/bank/post office is by the roadside
- 4) controls included but not reported: reservation status, fraction landless, number of castes, Gram Panchayat head characteristics (age, edu, wealth, experience), road characteristics (mixed caste road, muslim road, scst road, politician road, road with major institution, length of road)
- 5) standard errors clustered at colony level in parenthesis
- 6) *significant at 10%; **significant at 5%; ***significant at 1%

Table 6: Road level regressions: village fixed effects: linear probability

| | road has drain | road paved | road is moderately clean | no garbage on road | road with unclogged drain (cond) |
|------------------|---------------------|---------------------|--------------------------------|--------------------------|--|
| mixed caste road | -0.004 (0.011) | 0.032* (0.014) | 0.003 (0.010) | -0.012 (0.011) | -0.014 (0.018) |
| muslim road | -0.011 (0.026) | -0.057 (0.029) | -0.021 (0.020) | -0.024 (0.023) | 0.000 (0.025) |
| scst road | 0.015 (0.015) | -0.051** (0.016) | 0.001 (0.014) | -0.032* (0.013) | -0.025 (0.023) |
| politician road | 0.078*** (0.020) | 0.052* (0.021) | 0.055*** (0.016) | -0.006 (0.018) | 0.003 (0.020) |
| institution road | 0.054* (0.023) | 0.120*** (0.024) | 0.045* (0.021) | 0.033 (0.022) | -0.034 (0.020) |
| length | 0.115*** (0.013) | 0.165*** (0.020) | 0.010* (0.005) | 0.008 (0.004) | -0.009 (0.007) |
| adjR-squared | 0.336 | 0.232 | 0.286 | 0.494 | 0.492 |
| N | 10026 | 10026 | 9971 | 9976 | 2244 |

Notes:

- 1) upper caste roadside as omitted category;
- 2) drain regressions conditional on road having drain
- 3) inst roadside indicates whether a school/bank/post office is by the roadside
- 4) standard errors clustered at colony level in parenthesis
- 5) *significant at 10%; **significant at 5%; ***significant at 1%