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Effects of state-level public spending on health on the mortality probability in India

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Abstract

This study uses the second National Family Health Survey (NFHS-2) of India to estimate the effect of state public health spending on mortality across all age groups, controlling for individual, household, and state-level covariates. We use a state's gross fiscal deficit as an instrument for its health spending. Our study shows a 10 % increase in public spending on health in India decreases the average probability of death by about 2%, with effects mainly on the young, the elderly, and women. Other major factors affecting mortality are rural residence, household poverty, and access to toilet facilities.

1. Introduction

One of the most fundamental, yet unresolved, issues in health policy is whether public spending on health yields health benefits, especially in the form of improved health outcomes. Economic considerations, such as the public good, externalities, catastrophic cost, the failure of the insurance market, and the existence of highly cost-effective public health measures, provide a rationale for the public provision of health services. If these considerations were important we would expect to see a strong connection between health spending and health outcomes. It is this connection that we test. We would note, however, that political concerns, especially the public demand for health care, and ethical arguments, in which health can be considered a fundamental good that is required for human capabilities, have also been important driving forces for public spending on health (Musgrove 1999) and health care spending may depend on these factors as well as economic efficiency.

International cross-country studies of the relationship between public health spending and health outcomes, relying on aggregate health indicators, usually find little effect of public health spending on health outcomes. The level of income is often found to be the major determinant of a population's health status, while public health spending is a relatively poor predictor of cross-country differentials in health indicators (Kim and Moody 1992; McGuire, Parkin et al. 1993; Musgrove 1996; Filmer and Pritchett 1999; Gupta, Verhoeven et al. 2002). In their influential study, Filmer and Pritchett (1999) find that 95% of cross-national variation in mortality can be explained by a country's income per capita, inequality of income distribution, extent of female education, level of ethnic fragmentation, and predominant religion, while public health spending explained only one-seventh of 1% of the observed differences in mortality across countries. These results confirm the findings of previous studies that had concluded that poverty and income, rather than public health spending, are the crucial determinants of health status (Carrin and Politi 1995; Demery and Walton 1998).

Similar research limited to OECD countries also shows a very weak relationship between public spending on health care and premature mortality (Or 2000). In contrast, a few cross-country studies find that public health spending has a statistically significant effect on health status if the analysis is limited to poor countries (Anand and Ravallion 1993; Hojman 1996; Bidani and Ravallion 1997)

Bidani and Ravallion (1997) use the two-dollar-per-day poverty line to decompose health indicators into subgroup averages for 35 countries using a random coefficients model. They find that the poor have comparatively worse health status, and that they are affected more by public spending on health care, than the better off. Gupta et al. (2003) use King's methodology[1] (1997) and demographic and health survey (DHS) data from 70 developing and transition economies, to extend Bidani and Ravalli's approach, finding similar results. These results suggest that public spending on health may have different effects on the health of people of different socio-economic status (SES), due to differing levels of need and ability to substitute private spending for public spending.

A major weakness in much of the existing literature is the use of aggregate data. Utilizing aggregate data on indicators often mask important variations in health status and health service use by individuals living in households with different socio-economic backgrounds. Using household level data allows a more detailed analysis of health outcomes and the effects of public

[1] King uses Bayesian statistics to determine the probabilistic values of subgroups in populations within the permissible bounds. It assumes random coefficients, allowing the distribution of health status to vary from country to country. To explain the variation in subgroup averages across *i*'s as a function of measured explanatory variables, he recommends performing instead a second-stage analysis, such as regression analysis, with the estimated subgroup averages as dependent variables.

health spending. Some studies, for example, report that mortality is higher for girls (Kishor 1993) and for rural, low-income, agricultural households (Schultz 1993). Urban areas may also provide better access to health facilities (Stanton 1994). Therefore, to have reliable estimates of the effects of public health spending on mortality we need to consider factors affecting health at state-, household- and individual-levels.

A second methodological issue in estimating the link between spending and health outcomes using cross country is the lack of comparability of data on both mortality and government health expenditure across countries. There is a great heterogeneity in health care provision, and mortality rates, across countries at different stages of the epidemiological transition, which makes pooling these disparate countries in a single analysis problematic.

Some studies have avoided the difficulties imposed by data heterogeneity inherent in cross country international analyses by using sub-national data (Pierre-Yves Crémieux 1999; Bhalotra 2007; Deolalikar 2005). The study by Cremieux et al. examines the relationship between expenditure and outcomes across ten Canadian provinces over the fifteen-year period 1978-1992. They find that low healthcare spending was associated with high infant mortality rate and low life expectancy.

Our study uses data from the states of India. Deolalikar (2005) uses an Indian state panel for 1980-99 and finds that current health expenditure does not have a significant effect on mortality rates, once state fixed effects and a linear time trend are included in the model. Bhalotra (2007) on the other hand, restricts the sample to rural households and allows for lagged effects, and finds a significant effect of health expenditure on infant mortality rates, with the long run elasticity being about -0.24.

In this study we explore the effect of variation in public health spending across the states of India on individual mortality using household level data from the National Family Health Survey (NFHS II) conducted in 1998-99. There are numerous advantages to using micro-data. Pooling data from states within India raises less of a problem of heterogeneity than comparing outcomes across countries. We can control for a wider range of variables at different levels of aggregation; individual, household and state level characteristics can be included in the analysis. The data on individual mortality also allows us to explore heterogeneity in the effect of health expenditure in sub-populations such as the rural versus urban population, men versus women, and different socio-economic groups.

India is a large federated union of states and state governments play a larger role than the central government in funding health service provision. Health is a Concurrent subject[2] under the Indian Constitution, but State governments are dominantly responsible for health provision, both in terms of health care and public health measures. State governments account for about two-thirds and the Central Government about one-third of the total public spending on health (National Health Accounts India 2005). This decentralization of funding means that there is a wide range of public health spending across states of India due to different policy choices by State governments. While there are some specific central interventions, especially in various "Missions" as well as high-end curative facilities, the bulk of the health provision that affects most of the citizenry is the result of spending by State governments (Das Gupta and Rani 2004).

As in Bhalotra (2007) we find effects of health spending on mortality outcomes. The difference in our approach is that we look at mortality over the whole age range while Bhalotra focuses on infant mortality. A cost of our approach is we only have a single cross section of

[2] The Concurrent subject is the joint domain of both the State Governments and the Union territories of India as well as the Central Government of India.

data, while she was able to use retrospective fertility histories to construct a time series for infant mortality. This means we cannot control for state level fixed effects, or dynamics, in our specification. We address the problem of unobservable state level variables that may affect both health spending and health outcomes by checking the robustness of our results using an instrumental variable. We instrument public health spending with the overall state budget deficit, the argument being that a higher state deficit will be associated with lower health spending, but will not otherwise directly affect health outcomes. We use public spending in the year before the survey to explain observed mortality. Due to data limitations we do not address the issue of longer lags in the response of health outcomes to health spending and the provision of health services, though these lags may be important (Farahani, Subramanian et al. 2009).

The main objective of this study is to evaluate the relationship between public spending on health at the state level and the probability of death at the individual level. The specific research questions are: Does public spending affect the probability of individual mortality? And if so, are the effects different by sex, urbanization, socio-economic level, or age group? We find a significant effect of public health spending on mortality rates. However this effect is predominately for women, the young (under 18 years old) and the elderly (over 40 years old). Surprisingly we find no differential effect of public spending by urban-rural status, or by asset quintile (a proxy for socio-economic status).

We also investigate the effect of public spending on health on the prevalence of a number of illnesses reported in NFHS II, namely asthma, tuberculosis, malaria, and jaundice. We find no significant effect of public health spending on these illnesses, though as we argue below this finding may be due to reporting errors. Our analysis leaves open the issue of the mechanism through which public spending is affecting health.

2. Data

We use the second National Family Health Survey (NFHS II) conducted in 1998-99 in all 26 states of India existing at that time. We use the NHS II rather than NFHS III, which was released in 2007, since mortality data for all age groups were collected only in NFHS II.[3]

This is a rich dataset containing information on individual characteristics and mortality. The survey response rate ranged from 89% to almost 100%, with 24 of the 26 states having a rate of higher than 94%. This dataset is supplemented by state-level data on government health spending, average household spending on health care and state gross income.

The analyses are based on a representative cross-sectional of 519,502 individuals from 91,573 households in 26 Indian states. The survey collected extensive information on household members and their characteristics. The data on each household member, including those who had died in the previous two years, consist of information on age and gender for both living and dead household members. The household survey provides current information on caste, religion, and household assets, which was linked to members who were alive at the time of the survey as well as to the deceased members. This linkage assumes that the household members who died in the two years prior to the survey had a standard of living, caste, and religion similar to those of household members who were still alive (Subramanian, Nandy et al. 2006).

The Household Questionnaire asks questions on current household members and deaths occurring to usual residents of the household during the two years preceding the survey. The outcome of interest is whether the person is reported as dead or alive at the time of survey. The explanatory variables will be at three levels: individual, household and state. At the individual level the only variables common to both the dead and alive were age and sex. For the household

[3] Correspondence with the MEASURE DHS (Demographic and Health Surveys) indicated that while data in infant mortality are collected in each round, comprehensive mortality data is scheduled to be collected every 10 years. It is expected be collected in the next round of the NFHS.

covariates, following the literature (Esrey and Habicht 1986; Subramanian, Nandy et al. 2006), we use asset index quintile, caste, religious affiliation, residence (urban, rural), and access to safe water and sanitation.

Age was divided into five age groups: namely, infant (0-1), child (1-5), youth (5-18), young adult (18-40), and above 40 years of age. Because probability of dying increases steadily after age 40 we also use a continuous variable for number of the years the person lived after age 40. Religious affiliation was categorized into Hindu, Muslim, Christian, and others.

The standard of living is proxied by an asset index, constructed from the household’s ownership of assets such as an iron, radio, television, or car. The econometric evidence suggests that the asset index is as reliable as conventionally measured consumption expenditures (Filmer and Pritchett 2001). To construct the asset index, we use principal component analysis, following the method set out Filmer and Pritchett (2001). The asset index is a weighted sum of the assets owned and does not have a natural interpretation as an absolute value. For the purpose of our analysis, we think of it simply as an ordinal ranking and we divide the index into quintiles.

The variable “caste” has five categories: scheduled caste, scheduled tribe, other backward classes, other caste and no caste. These are the terms used in the Census of India. The ‘other castes’ are considered to have the highest social status among these designations and the ‘scheduled caste’ and ‘tribe categories’ the lowest. Scheduled castes and scheduled tribes are recognized by the Government of India as socially and economically disadvantaged and in need of special protection from injustice and exploitation. The government of India designates members of scheduled caste, scheduled tribe and other backward class as eligible for affirmative action. We classified members of groups for which caste may not always be applicable and participants who did not report any caste affiliation in the survey as ‘‘no caste.’’

Access to water is divided into three categories, regardless of the ownership (private or public): access to piped-water, access to well water, and other sources. Similarly, access to toilet facilities were divided into households that has access to a flush toilet, a latrine, or other means for human waste disposal.

We add state level data on government spending on medical expenses and public health (hence forth called public health spending) obtained from the Reserve Bank of India (Reserve Bank of India 2007). We did not include the government spending on family welfare, for that budget line is mainly allocated to family planning purposes.[4] Given the fact that out-of-pocket expenditure accounts for the major part of health care spending in India, it would be best if we had data on private household health spending. However, because this data was not collected in NFHS, we used the Household Consumer Expenditure in India for 1998 to calculate the average household out-of-pocket medical expenses in each state in that year and use this as a state level explanatory variable.[5] We also control for the overall level of economic development of the state, by including 1998-1999 per capita net state domestic product, at current prices, obtained from India Reserve Bank (Reserve Bank of India 2007).

The individual and household level covariates allow us to control for these variables in our analysis. There are wide disparities in health outcomes in India by individual and household characteristics. In spite of an increase in public funds in health care, improvements in health have not been shared equally. Infant mortality declined by 68 percent (from 37 to 12 per 1,000) in Kerala but by only 52 percent in Uttar Pradesh (from 150 to 72) between 1981 and 2004. Uttar Pradesh alone contributes one-quarter of all infant deaths in the country and, along with Madhya

[4] We experimented with family welfare spending as an explanatory variable but did not find any statistically significant effect on mortality rates.
[5] Medical expenses include expenditure on medicines and medical goods including family planning appliances, payments made for medical treatment, and expenses incurred for clinical tests.

Pradesh, Bihar, and Rajasthan, accounts for slightly more than half of the total. During 1994-1999, just 10 percent of India's 602 districts accounted for nearly 30 percent of all infant deaths, and 23 percent of the districts accounted for approximately half of the total. Furthermore, there are variations across social groups. Scheduled Tribes have an under-five mortality rate of 117 deaths per 1,000 live births, and Scheduled Castes have a rate of 108, compared with an all-India rate of 93 (Yip and Mahal 2008).

3. Methods

A multilevel probit model is used to estimate the effects of health spending at the state-level, on probability of death at the individual level, controlling for covariates at individual-, household-, and state-level (Leyland and Goldstein 2001). The advantage of this model is that it simultaneously considers the household-level and individual-level predictors while allowing for non-independence of observations within groups (Snijders 1999). Clustering is at the Primary Sampling Unit level. This analysis of public spending is at the state level, which is meaningful for policy decisions; we lack data on public health spending at lower levels of aggregation.

The outcome of interest is binary response (dead or not) for individual *i* in cluster *j*. Assuming the binary response, y_{ij} is Bernoulli distributed with probabilities $\pi_{ij} : y_{ij} \sim Bernoulli(1, \pi_{ij})$. If $\pi_{ij} = P(y_{ij} = 1)$ denotes the probability the i^{th} individual is dead, the probit model is represented as

$$\Phi^{-1}(\pi_{ij}) = \alpha_0 + \sum_k (\beta_k x_{ijk}) + \sum_l (\gamma_l z_{jl}) + \sum (\tau_{kl} x_{ijk} z_{jl}) + u_{0jk} \quad \textbf{(1)}$$

Where $\Phi^{-1}(\pi_{ij})$ is the inverse cumulative distribution function of the standard normal and *i* and *j* refer to the individual and cluster, respectively:

α_0 = the probability of death for the reference group

π_{ij} = probability that the individual i in cluster j is dead;

β_k = the coefficient of the k^{th} individual explanatory variable;

x_{ijk} =the k^{th} individual/household-level covariate;

γ_l = the coefficient of the l^{th} state explanatory variable;

z_{ijk} =the l^{th} state-level covariate;

τ_{kl} = the coefficient of the cross-level interaction terms;

u_{ojk} = the error term

A challenge in studies of this kind is that the observations are nested within units and super-unit structures making it likely that the individual observations are not independent. Failing to deal with this lack of independence leads to biased parameter estimates. We estimate equation (1) using the probit MLE estimator. All standard errors reported in this paper are robust and clustered by the primary sampling unit (PSU). We adjustment for conditional heteroskedasticity and for correlation within clusters (Cameron and Trivedi 2005). This procedure corrects our standard errors for the fact that the sampling design randomly selects primary sampling units (and then purposively selects within these) rather than randomly selecting individuals

A major concern is the possibility that public health spending is endogenous, in the sense that it is to some extent been influenced by the level of health, or is driven by some unobserved variable that also affect health outcomes. Our solution to this problem is to use an instrumental variable (IV) (Wooldridge 2002). A good IV will be correlated with public health spending and simultaneously exogenous to probability of dying. By using instrumental variables estimation, we present an important piece of evidence that the relationship we observe is causal.

The use of the instrumental variable approach is, of course, dependent on the availability of a valid instrument. Since resource allocation to health sector in India is influenced by the general fiscal situation of the respective State Governments[6], we use the state gross fiscal deficit as the instrumental variable. A two-stage probit regression is used to control for the endogeneity of public health spending. The first-stage regression uses ordinary least squares to predict the public health spending as a function of the state gross fiscal deficit, the instrument, and other explanatory variables. In the second stage we use the predicted value of the health spending plus other exogenous variables to estimate the probability of death. More specifically, the IV estimator uses the instrument to predict the value of the potentially endogenous regressor. The predicted values are then used as a regressor in the original model. Under the assumptions that the instrument is correlated with the endogenous explanatory variable but has no direct association with the outcome under study, the IV estimates of the effect of the endogenous variable are consistent (Bound, Jaeger et al. 1995).

4. Empirical Results for Public Health Spending and Mortality

There are large variations in both public and private health spending per capita across states in India. Figure 1 shows public and private health spending by state; the states being placed in descending order according to the government's per capita expenditure on health as a share of total health spending. Figure.2 shows the relationship between total health spending and the percentage that is publically funded. There is little relationship between these variables indicating that that low public expenditure may play a role in generating higher levels of private expenditure, so there is not a one to one mapping from public health spending to total health

[6] For a complete discussion see Financing and Delivery of Health Care Services in India, 2005, pp. 245-250.

spending. This “crowding out” of private health spending is a potential reason why public health spending may be ineffective.

We focus on the effect of state level public health spending. It is noteworthy that there are rural-urban differentials in public spending, with per capita spending in urban areas generally much higher than in rural areas for most states (Peters, Yazbeck et al. 2002), which may produce differential results in terms of health outcomes in urban and rural areas.

Public health expenditures seems to have a direct impact on the infant mortality rate (Bhalotra 2007). Figure 3 shows the relationship per capita health spending of the State government and infant mortality[7]. Richer states tend to spend more per capita, and generally have lower infant mortality rates (IMRs). However, this is not always the case. Some of the richer states, such as Maharashtra and Haryana, have comparatively low per capita public expenditure on health. On the contrary, Sikkim, with relatively low per capita income, has high per capita public spending on health.

Table 1 reports summary statistics, based on data for individuals, with household and state level variables being linked to each individual. Overall, the probability of dying in the two year period under study in this sample is about 2 percent. Average per capita public health spending is 125 Rupees, ranging from 49 (Bihar) to 406 Rupees (Goa). 69% of the sample population lives in rural areas. Only 45% of the population under study has access to a toilet (28% to a flushed toilet and 17% to a latrine). Less than half (42%) of the people have access to piped water. Note that the 20% of households are in each asset quintile, but the percentage of people in each quintile may differ due to different household sizes across quintiles

Table 2 presents the results of the probit model of mortality displayed in the methods section. We use the log of public health spending in the state for 1997-98 as the main

[7] The individual level data was aggregated to the state level using sampling weights to obtain state level IMR.

explanatory variable. This model shows the inverse association between public health spending and mortality. Public health spending has a significant effect and reduces mortality rates. We estimate that a 10 percent increase in per capita public health spending, i.e., about 13 Rupees, in an average state with all variables at their mean values, decreases the probability of death for an average individual by about 0.004. Given the overall mortality rate of 2% in the sample, this is a reduction in mortality rates of about 2%, giving an elasticity of mortality with respect to public health spending of about -0.2.

The estimated effect of the log of private household spending on health has a similar impact on health outcomes. Most health spending comes from private sources[8]; Berman(1998) shows that 82 percent of people in rural areas and 79 percent in urban areas go to private providers for primary care. Our results suggest that the same percentage increase in either public or private spending has similar effects. Given that public spending is much less than private spending this means that each rupee of public health spending is about 4 times more effective at reducing mortality as private health spending.

In table 2 we find that the log of per capita net state domestic product is not a statistically significant predictor of mortality. It contrast to the cross country literature that stresses the importance of average income in determining mortality (Carrin and Politi 1995; Demery and Walton 1998; Filmer and Pritchett 1999), our findings indicate a more important role of household economic status, as proxied by the asset index level. We find higher mortality rates among households in the lower quintiles of the asset index, with mortality being more than 1.1 percentage points higher in the bottom quintile than the top quintile (the baseline). Given an

[8] Public expenditure constitutes 20.3 percent, private sector expenditure 77.4 and external support 2.3 percent of total health expenditure in India (NHA India (2005). National Health Accounts India 2001-02. New Delhi, Ministry of Health and Family Welfare, Government of India.

overall mortality rate of around 2%, this means mortality is about 50% higher among the poorest quintile.

We find higher mortality in rural areas as compared with urban areas. We find access to a flush toilet or a latrine significant in reducing mortality, though there are no significant effects of water sources on mortality which his is consistent with prior evidence in the literature (Lee, Rosenzweig et al. 1997). We find no significant effects of caste or religion on mortality.

We find significantly higher mortality among men as compared to women. We take as our reference group infants aged zero to one year. Children aged one to five years have significantly lower mortality than infants, and mortality tends to fall with age at first with the lowest mortality is among those aged 14-40. Mortality rises with age after age forty.

Table 3 reports effects of interaction terms between public health spending and gender, place of residence (urban, rural), and socio-economic group of the household as well as with the age group of the individual. This interaction effects allow us to investigate if the effect of public spending on health is uniform across groups or is concentrated on specific populations.

Model 1 in Table 3 investigates the effect of public health spending on mortality by sex. The default group is women and we find that after adding this interaction the direct effect of public spending becomes twice as great as the model with no interaction (in Table 2) while the interaction term between public health spending and being male is positive. This indicates that public spending on health has a significantly larger impact on the mortality of women than men.

In Model 2 we investigate the effect of interacting public health spending with rural residence. We do not find a significant effect of the interaction term, indicating similar impacts of public health spending across urban and rural areas. Navaneetham and Dharmalingam (2002) also show that in the case of antenatal care, there is no significant rural-urban gap, due to the role played by the multipurpose health workers posted in the rural areas to provide maternal health care services.

Similarly, in Model 3, we find no differential impact of public health spending by the economic level of the household, proxied by the asset index quintiles. While we find that lower socio-economic status households have higher mortality rates we find no evidence that they benefit disproportionally from public health spending. The results of Model 3 contrast with previous studies which used more aggregated data and showed that the poor benefit more than the rich from public spending on health (Bidani and Ravallion 1997; Gupta, Verhoeven et al. 2003). Public spending in India has shifted significantly toward primary care (Mahapatra and Berman, 1995), resulting in improved access to public facilities by all income groups. However, the results of the India's National Sample Surveys (NSS) of 1986-87 and 1995-96 showed a considerable decline in the utilization of public health services by the poor, especially the rural poor (Selvaraju 2001). They show that the rich consumed public services at three times the rate the poor and had a much higher chance than the poor of admission to public health facilities.

Model 4 examines the effect of public health spending by age group. We find that the interaction term between the young adult (18-40 years old) age group and public health spending is statistically significant. The coefficient on this interaction is positive and almost completely offsets the overall reduction in mortality caused by public health spending in Model 4. This means that the 18-40 age group appears to receive little or no benefit in mortality from public health spending, with larger than average effects accruing to younger and older people.   There is little differential in health care utilization by age group in India (Berman 1998) but generally better health, and lower mortality of the 18-40 year olds may make the effects of health care less noticeable in this group.

The results in Tables 2 and 3 treat public spending on health as exogenous. It may be that there is a feedback from health needs to health spending, or some hidden variable that affects both health spending and health outcomes. Either of these would mean that the relationship between health spending and mortality rates we observe in tables 2 and 3 was not causal. To address this concern our estimation strategy in this section is to identify the causal effect of public health spending on mortality using an instrumental variable. The instrument needs to be a variable that is correlated with public health spending but exogenous with respect to health outcomes, and it also needs to be a variable that is not driven by any unobserved "third" variable we might suspect might be causing both changes in public health spending and health improvement. Evidence from other countries suggests that whenever there is a fiscal consolidation and stress, social sectors like health and education are targeted for reduced budget allocations (Tanzi 2000). In India, since public health at the state level is financed through general tax and non-tax revenue resources (the cost recovery from the services delivered has been negligible, at less than 2%), resource allocation is influenced by the general fiscal situation of the respective state governments (Selvaraju 2001). As a result, an increase in the fiscal deficit and a general resource crunch results in budget cut in the health sector (NCMH 2005). We use the state's gross fiscal deficit as an instrument for its public health spending. We find that the deficit is indeed negatively correlated with the public spending on health and it seems unlikely that the fiscal deficit will be associated with mortality rates through other mechanisms[9].

Table 4 presents the results of IV estimation of Equation (1) using the state gross fiscal deficit in 1997-1998 as the instrument[10]. Compared to the probit results without instrumentation

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[9] The deficit may be associated with state average income levels since a recession will hurt both income levels and tax receipts, but we control for average state income per capita in our model.

[10] We experimented with the following alternative IV estimators: whether the dominant political party in the State is in the dominant national political party, the time interval remaining to the next parliamentary election, and the

(Table 2), the coefficients we estimate (-0.114 versus -0.120) and the marginal effects (-0.0044 versus -0.0045) are very similar. The similarity of the results with and without instrumentation indicates that our results are reasonably robust, though our first stage F-test of 5.51 indicates with our instrument may not be very strong (Wooldridge 2002; Cameron and Trivedi 2005) [11]

5. Public Spending on Health and Morbidity

In this paper we focus on the effect of public health spending on mortality. We would also like to measure the effect of public health spending on morbidity as well as mortality. However the data on the morbidity in NFHS II that covers all age groups are limited to the prevalence of asthma, tuberculosis, malaria, and jaundice. In table 5 we report marginal effects of our explanatory variables in a probit model explaining the prevalence of each of these illnesses using the same explanatory variables as were used in our mortality study.

In no case do we find that public state spending on health is a significant predictor of illness, even at the 10% significance level. We find higher prevalence of these illnesses in people living in households in the lower quintiles of our asset index. The prevalence of asthma and tuberculosis appear to increase with age, while malaria is higher among those over 1 year of age rather than below, while jaundice appears mainly in the 1-5 year old age group. Men appear to have higher prevalence of tuberculosis and jaundice than women. The effects of other variables on disease prevalence are not consistent, though there is some evidence that access to clear water is protective.

A major problem with these morbidity data is measurement error. The data are based on reports from the head of the household, there is a high risk of inaccuracies with regard to

percentage of women members in the state parliament but did not find them good predictors of state public health spending.

[11] The regression for the first stage F test is weighted and clustered at state-level.

morbidity data due to errors in reporting and recall (Boerma and Sommerfelt, 1993, Manesh et al., 2007). Recall error has been well described in studies of self and proxy health reporting (Coughlin, 1990, Beckett et al., 2001). In addition, we only have disease prevalence for those alive at the time of the study; those who died from these illnesses are excluded (we do not have cause of death, or illness reports, for the deceased) which creates a selection bias. In addition, public spending on health may affect the outcome of these illnesses on health status, rather than their prevalence. For these reasons we do not regard our results for morbidity to be very reliable.

This leaves open the mechanism through which increased public health spending is affecting mortality rates. It may be that public health spending is particularly important in countries that still face a substantial burden of infectious disease where very cost effective preventive measures are available. It would be very interesting to see how public health spending affects mortality by cause of death, but our dataset lacks this information. We leave this question to future research.

6. Conclusion

We have identified a significant impact of public spending on health at the state level given individual-, household-, and other state-level variables, on the probability of dying in India. The effects seem to be concentrated on woman, the young, and the elderly. Our results bear out recent evidence finding significant effects of public health spending in poor populations. The other major factors determining mortality in our study are an individual's age and sex, household poverty, and access to hygienic toilet. Using a plausible instrumental variable gives some support to the idea that the relationship between mortality and public health spending is causal and not just an artifact of reverse causation or incidental association. We did not find significant results for the effect of public health spending on disease prevalence, perhaps due to measurement error.

A potential issue is the applicability of our results to current policy debates, given that the data that is almost a decade old and India has undergone significant economic reforms, unprecedented GDP growth, and marked improvement in health over the course of the last decade (World Bank, 2009). Income growth has created higher expectations and demands for higher-quality health services. A widening socioeconomic gap between high- and low-income households also poses increased challenges to achieving the societal goal of equal health status and access to health care.

Before the economic reforms in the mid-1980s, public spending on health in India peaked at about 1.6 percent of GDP and 4 percent of the government budget. During the 1990s, government health spending failed to keep up with the expanding economy, and by 2001 it constituted 0.9 percent of GDP and 2.7 percent of the government budget. These numbers fell to 0.8 percent and 2.4 percent, respectively, by 2005. The 2006-07 budget reversed this trend, increasing allocations to social sectors (including education, health, and woman and child development) (Deolalikar et al., 2008). However these changes not changed the health system in India substantially from what it was a decade ago and it remains to be seen what effect recent increases in public funding will have (Yip and Mahal 2008).

References:

ANAND, S. & RAVALLION, M. (1993) Human Development in Poor Countries: On the Role of Private Incomes and Public Services. *The Journal of Economic Perspectives,* 7**,** 133.

BECKETT, M., VANZO, J. D., SASTRY, N., PANIS, C. & PETERSON, C. (2001) The Quality of Retrospective Data: An Examination of Long-Term Recall in a Developing Country. *The Journal of Human Resources,* 36**,** 593-625.

BERMAN, P. A. (1998) Rethinking health care systems: Private health care provision in India. *World Development,* 26**,** 1463-1479.

BHALOTRA, S. (2007) Spending to save? State health expenditure and infant mortality in India. *Health Economics,* 16**,** 911-928.

BIDANI, B. & RAVALLION, M. (1997) Decomposing social indicators using distributional data. *Journal of Econometrics,* 77**,** 125.

BOERMA, J. T., BLACK, R. E., SOMMERFELT, A. E., RUTSTEIN, S. O. & BICEGO, G. T. (1991) Accuracy and completeness of mothers' recall of diarrhoea occurrence in pre-school children in demographic and health surveys. *International Journal of Epidemiology,* 20**,** 1073-80.

BOERMA, J. T. & SOMMERFELT, A. E. (1993) Demographic and Health Surveys (DHS): contributions and limitations. *World Health Statistics Quarterly,* 46**,** 222-6.

BOUND, J., JAEGER, D. A. & BAKER, R. M. (1995) Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogeneous Explanatory Variable is Weak. *Journal of the American Statistical Association,* 90**,** 443-450.

CAMERON, A. C. & TRIVEDI, P. K. (2005) Microeconometrics : methods and applications. Cambridge University Press.

CARRIN, G. & POLITI, C. (1995) Exploring the health impact of economic growth, poverty reduction, and public health expenditure. *Tijdschrift voor Economie en Management,* 40**,** 227- 246.

COUGHLIN, S. S. (1990) Recall bias in epidemiologic studies. *Journal of Clinical Epidemiology,* 43**,** 87-91.

DAS GUPTA, M. & RANI, M. (2004) India's public health system : how well does it function at the national level? *Policy research working paper ; 3447.* World Bank, Development Research Group, Public Services Team.

DEMERY, L. & WALTON, M. (1998) Are Poverty Reduction and Other 21st Century Social Goals Attainable? . Washington, DC, World Bank.

DEOLALIKAR, A. (2005) Attaining the Millennium Development Goals in India: How Likely and What Will it Take to Reduce Infant Mortality, Child Malnutrition, Gender Disparities and Hunger-Poverty and to Increase School Enrollment and Completion? . New Delhi, Oxford University Press.

DEOLALIKAR, A. B., JAMISON, D. T., JHA, P. & LAXMINARAYAN, R. (2008) Financing Health Improvements In India. *Health Affairs.* Project HOPE/HEALTH AFFAIRS.

ESREY, S. A. & HABICHT, J.-P. (1986) EPIDEMIOLOGIC EVIDENCE FOR HEALTH BENEFITS FROM IMPROVED WATER AND SANITATION IN DEVELOPING COUNTRIES. *Epidemiol Rev,* 8**,** 117-128.

FILMER, D. & PRITCHETT, L. (1999) The impact of public spending on health: does money matter? *Social Science & Medicine,* 49**,** 1309.

FILMER, D. & PRITCHETT, L. H. (2001) Estimating Wealth Effects without Expenditure Data-or Tears: An Application to Educational Enrollments in States of India. *Demography,* 38**,** 115-132.

GUPTA, S., VERHOEVEN, M. & TIONGSON, E. R. (2002) The effectiveness of government spending on education and health care in developing and transition economies. *European Journal of Political Economy,* 18**,** 717.

GUPTA, S., VERHOEVEN, M. & TIONGSON, E. R. (2003) Public spending on health care and the poor. *Health Economics,* 12**,** 685-696.

HOJMAN, D. E. (1996) Economic and other determinants of infant and child mortality in small developing countries: the case of Central America and the Caribbean. *Applied Economics,* 28**,** 281 - 290.

KIM, K. & MOODY, P. M. (1992) More resources better health? A cross-national perspective. *Social Science & Medicine,* 34**,** 837.

KING, G. (1997) A solution to the ecological inference problem : reconstructing individual behavior from aggregate data. Princeton University Press.

KISHOR, S. (1993) "MAY GOD GIVE SONS TO ALL": GENDER AND CHILD MORTALITY IN INDIA. *American Sociological Review,* 58**,** 247.

LEE, L.-F., ROSENZWEIG, M. R. & PITT, M. M. (1997) The effects of improved nutrition, sanitation, and water quality on child health in high-mortality populations. *Journal of Econometrics,* 77**,** 209.

LEYLAND, A. H. & GOLDSTEIN, H. (2001) Multilevel modelling of health statistics. *Wiley series in probability and statistics;.* Wiley.

MANESH, A. O., SHELDON, T. A., PICKETT, K. E. & CARR-HILL, R. (2007) Accuracy of child morbidity data in demographic and health surveys. *Int. J. Epidemiol.***,** dym202.

MCGUIRE, A., PARKIN, D., HUGHES, D. & GERARD, K. (1993) Econometric analyses of national health expenditures: Can positive economics help to answer normative questions? *Health Economics,* 2**,** 113-126.

MUSGROVE, P. (1996) Public and Private Roles in Health Theory and Financing Patterns. Washington, DC., World Bank.

MUSGROVE, P. (1999) Public spending on health care: how are different criteria related? *Health Policy,* 47**,** 207.

NATIONAL HEALTH ACCOUNTS INDIA (2005) National Health Accounts India 2001-02. New Delhi, Ministry of Health and Family Welfare, Government of India.

NAVANEETHAM, K. & DHARMALINGAM, A. (2002) Utilization of maternal health care services in Southern India. *Social Science & Medicine,* 55**,** 1849-1869.

NCMH (2005) Financing and Delivery of Health Care Services in India New Delhi, Ministry of Health & Family Welfare Government of India

NHA INDIA (2005) National Health Accounts India 2001-02. New Delhi, Ministry of Health and Family Welfare, Government of India.

OR, Z. (2000) Determinants of Health in Industrialized Countries: A Pooled Cross-country Time Series Analysis. *OECD Economic Studies No. 30, 2000/I.* Paris, Organisation for Economic Cooperation and Development.

PETERS, D. H., YAZBECK, A. S., SHARMA, R. R., RAMANA, G. N. V., PRITCHETT, L. H. & WAGSTAFF, A. (2002) *Better Health Systems for India's Poor : Findings, Analysis, and Options,* New Delhi, The World Bank.

PIERRE-YVES CRÉMIEUX, P. O. C. P. (1999) Health care spending as determinants of health outcomes. *Health Economics,* 8**,** 627-639.

RESERVE BANK OF INDIA (2007) Handbook of Statistics on Indian Economy. Reserve Bank of India.

SCHULTZ, T. P. (1993) Mortality decline in the low income world: causes and consequence. Economic Growth *American Economic Review,* 83**,** 337-342.

SELVARAJU, V. (2001) Budgetary Subsidies to the Health Sector among Selected States in India. *Journal of Health Management,* 3**,** 261-281.

SNIJDERS, T. A. B. B. R. J. (1999) Multilevel analysis : an introduction to basic and advanced multilevel modeling. Sage Publications.

STAIGER, D. & STOCK, J. H. (1997) Instrumental Variables Regression with Weak Instruments. *Econometrica,* 65**,** 557-586.

STANTON, B. (1994) Child health: Equity in the non-industrialized countries. *Social Science & Medicine,* 38**,** 1375.

SUBRAMANIAN, S. V., NANDY, S., IRVING, M., GORDON, D., LAMBERT, H. & SMITH, G. D. (2006) The Mortality Divide in India: The Differential Contributions of Gender, Caste, and Standard of Living Across the Life Course. *American Journal of Public Health,* 96**,** 818-825.

TANZI, V. S. L. (2000) Public spending in the 20th century : a global perspective. Cambridge University Press.

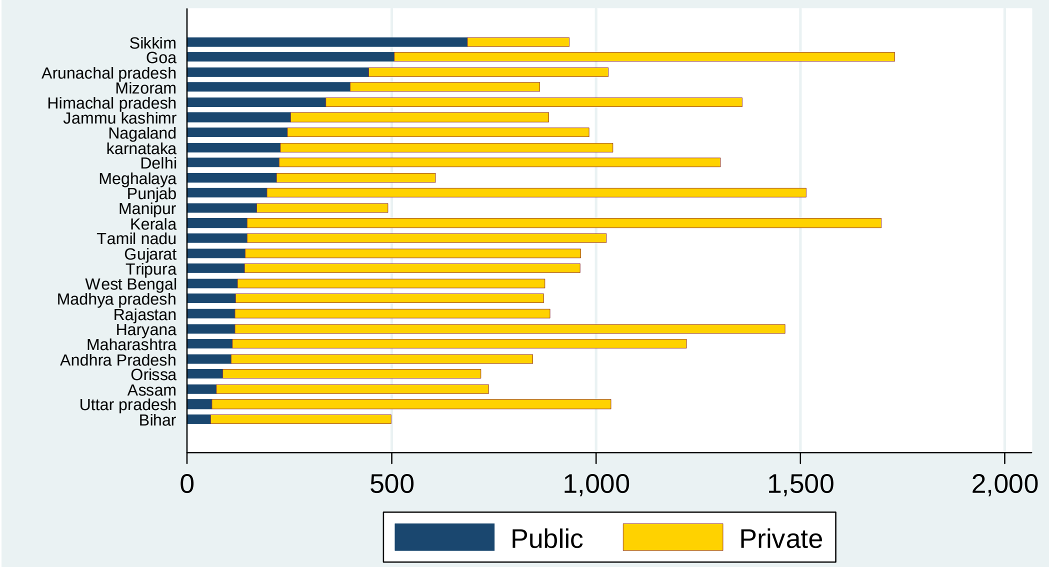
WOOLDRIDGE, J. M. (2002) *Econometric analysis of cross section and panel data,* Cambridge, Mass., MIT Press.

WORLD BANK (2009) World Development Indicators. The World Bank, Washington: D.C.

YIP, W. & MAHAL, A. (2008) The Health Care Systems Of China And India: Performance And Future Challenges. *Health Affairs.* Project HOPE/HEALTH AFFAIRS.

Figure 1 Per capita health spending (in Rupees)

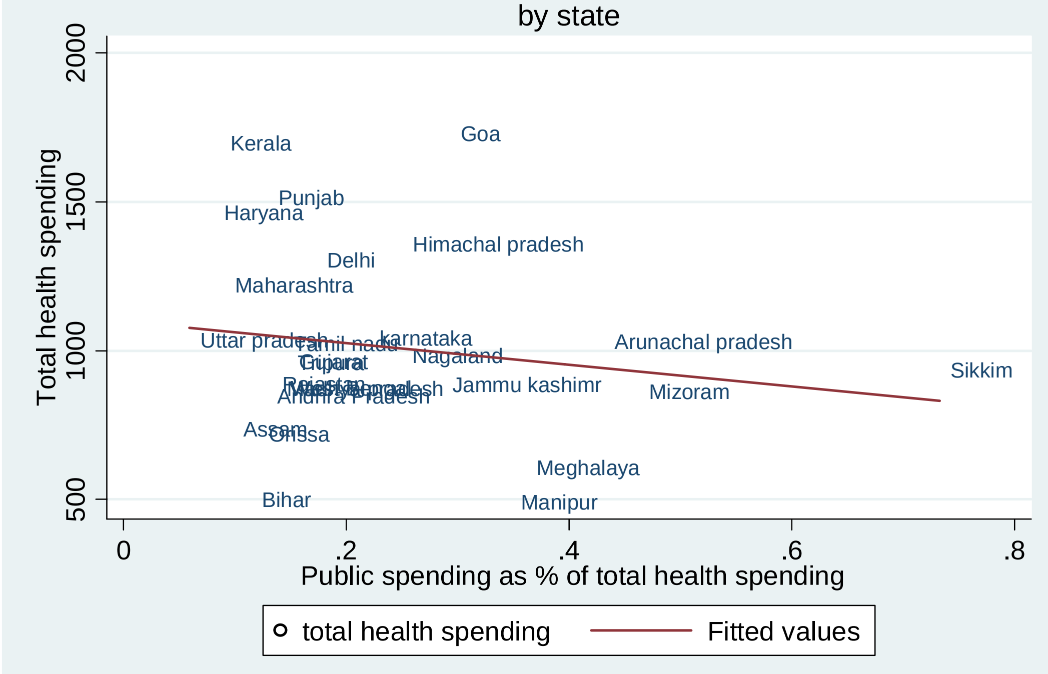
1998-1999



Source:
private spending calculated by the author from Household Consumer Expenditure Survey in India 1998
public spending from Reserve Bank of India

Figure 2 public and total health spending

by state



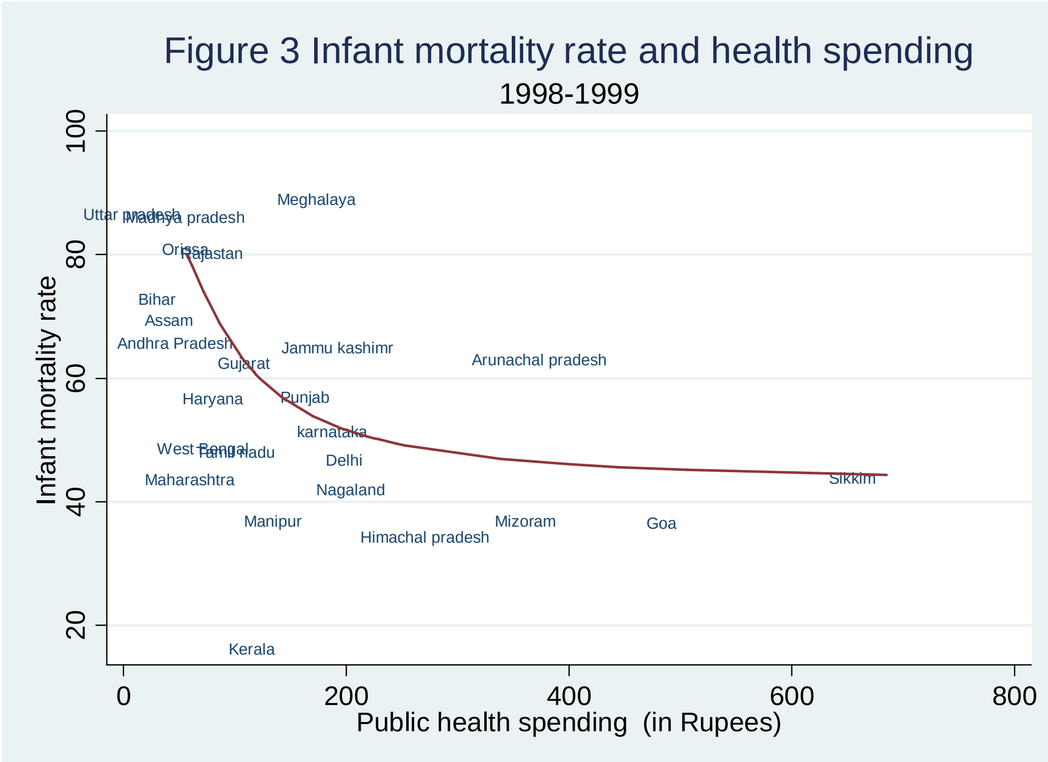


Figure 3 Infant mortality rate and health spending
1998-1999
Infant mortality rate
Public health spending (in Rupees)
0
200
400
600
800
20
40
60
80
100
Meghalaya
Uttar pradesh
Madhya pradesh
Orissa
Rajastan
Bihar
Assam
Andhra Pradesh
Jammu kashimr
Arunachal pradesh
Gujarat
Haryana
Punjab
karnataka
West Bengal
Tamil nadu
Delhi
Maharashtra
Nagaland
Sikkim
Manipur
Mizoram
Goa
Himachal pradesh
Kerala

Table 1. summary statistics

	Mean	Std. Dev.	Min	Max
State-level variables				
Probability of the death in the sample	0.02	0.15	0	1
Public health spending in 1997-98(in Rupees)	125	80	49	406
Log of public health spending in 1997-98	4.67	0.51	3.89	6.01
Log of household spending on health in1998-99	6.67	0.35	5.52	7.35
Log of Per Capita Net State Domestic Product 1998-99	9.43	0.46	8.41	10.60
Household-level variables				
Rural resident(d)	0.69	0.46	0	1
Access to flushed toilet(d)	0.28	0.45	0	1
Access to latrine(d)	0.17	0.37	0	1
Access to piped water(d)	0.42	0.49	0	1
Access to well water(d)	0.53	0.50	0	1
Hindu(d)	0.77	0.42	0	1
Muslim(d)	0.13	0.34	0	1
Christian(d)	0.06	0.24	0	1
Other religions(control)	0.04	0.37	0	1
Scheduled caste(d)	0.17	0.37	0	1
Scheduled tribe(d)	0.13	0.33	0	1
Backward class(d)	0.28	0.45	0	1
Other caste(d)	0.38	0.49	0	1
No caste(control)	0.05	0.22	0	1
Bottom asset index quintile(d)	0.16	0.37	0	1
Second asset index quintile(d)	0.17	0.38	0	1
Third asset index quintile(d)	0.20	0.40	0	1
Forth asset index quintile(d)	0.22	0.42	0	1
Top asset index quintile(control)	0.24	0.43	0	1
Individual variables				
Infant (0-1 yr) (d)	0.05	0.21	0	1
Child(1-5 yrs) (d)	0.10	0.29	0	1
Youth(5-18 yrs) (d)	0.30	0.46	0	1
Young(18-40) (d)	0.35	0.48	0	1
Above 40(d)	0.21	0.41	0	1
Age above 40 (for people 40 yrs old and above)	3.59	8.72	0	58
Male(d)	0.51	0.50	0	1

number of observations: 519502
(d) for dummy variable
Age above 40 is the number of years a person lived after the 40^{th} birthday

Table 2 Effect of health spending at state-level on probability of death at individual-level (Probit model)

	Probit Coeff.	Std. Err	Marginal effect
State variables			
Log of public health spending in 1997-98	-0.120***	(0.021)	-0.004***
Log of average household spending on health 1998-99	-0.123***	(0.030)	-0.005***
Log of Per Capita Net State Domestic Product 1998-99	0.04	(0.027)	0.001
Household-level variables			
Rural resident(d)	-0.044**	(0.016)	-0.002**
Access to flushed toilet(d)	-0.076***	(0.021)	-0.003***
Access to latrine(d)	-0.037*	(0.019)	-0.001*
Access to piped water(d)	-0.020	(0.028)	-0.001
Access to well water(d)	-0.041	(0.026)	-0.002
Hindu(d)	-0.013	(0.034)	-0.001
Muslim(d)	0.002	(0.037)	0.0001
Christian(d)	-0.085	(0.048)	-0.003
Other religions(control group)	-	-	-
Scheduled caste(d)	0.020	(0.029)	0.001
Scheduled tribe(d)	0.060	(0.031)	0.002
Backward class(d)	-0.025	(0.028)	-0.001
Other caste(d)	-0.055	(0.029)	-0.002
No caste(control group)	-	-	-
Bottom asset index quintile(d)	0.245***	(0.023)	0.011***
Second asset index quintile(d)	0.194***	(0.022)	0.008***
Third asset index quintile(d)	0.129***	(0.021)	0.005***
Forth asset index quintile(d)	0.109***	(0.019)	0.004***
Top asset index quintile(control group)	-	-	-
Individual variable			
Infant (0-1 yr) (d)	-	-	-
Child(1-5 yrs) (d)	-0.075**	(0.026)	-0.003**
Youth(5-18 yrs) (d)	-0.413***	(0.024)	-0.013***
Young(18-40) (d)	-0.396***	(0.022)	-0.013***
Above 40(d)	-0.461***	(0.026)	-0.013***
Age(for people 40 yrs old and above)	0.044***	(0.001)	0.002***
Male	0.047***	(0.010)	0.002***
Constant	-1.010***	(0.159)	

number of observations: 519502
(d) for discrete change of dummy variable from 0 to 1
* p<0.05, ** p<0.01, *** p<0.001
Age above 40 is the number of years a person lived after the 40th birthday

Table 3 Effect of health spending at state-level on probability of death at individual-level with interactions				
	Model 1 (Female)	Model 2 (Rural)	Model 3 (SES)	Model 4 (Age)
State variables				
Log of public health spending	-0.183***	-0.116***	-0.106**	-0.168***
	(0.026)	(0.032)	(0.035)	(0.036)
Log of household spending on health	-0.122***	-0.122***	-0.122***	-0.123***
	(0.030)	(0.030)	(0.030)	(0.030)
Log of Per Capita NSDP	0.038	0.037	0.035	0.039
	(0.027)	(0.027)	(0.027)	(0.027)
Household variables				
Rural resident	-0.044**	-0.021	-0.045**	-0.044**
	(0.016)	(0.142)	(0.016)	(0.016)
Access to flushed toilet(d)	-0.076***	-0.076***	-0.077***	-0.076***
	(0.021)	(0.021)	(0.021)	(0.021)
Access to latrine(d)	-0.037*	-0.037*	-0.038*	-0.037*
	(0.019)	(0.019)	(0.019)	(0.019)
Access to piped water(d)	-0.020	-0.020	-0.019	-0.020
	(0.028)	(0.028)	(0.028)	(0.028)
Access to well water(d)	-0.041	-0.041	-0.040	-0.042
	(0.026)	(0.026)	(0.026)	(0.026)
Hindu(d)	-0.012	-0.013	-0.014	-0.014
	(0.034)	(0.034)	(0.034)	(0.034)
Muslim(d)	0.003	0.002	0.001	0.001
	(0.037)	(0.037)	(0.037)	(0.037)
Christian(d)	-0.084	-0.085	-0.086	-0.085
	(0.048)	(0.048)	(0.048)	(0.048)
Other Religion (control group)	-	-	-	-
	-	-	-	-
Scheduled caste(d)	0.020	0.020	0.020	0.020
	(0.029)	(0.029)	(0.029)	(0.029)
Scheduled tribe(d)	0.060*	0.060*	0.060*	0.061*
	(0.031)	(0.031)	(0.031)	(0.031)
Backward class(d)	-0.025	-0.025	-0.025	-0.026
	(0.028)	(0.028)	(0.028)	(0.028)
Other caste(d)	-0.055	-0.055	-0.055	-0.055
	(0.029)	(0.030)	(0.029)	(0.029)
No cast (control group)	-	-	-	-
	-	-	-	-
Bottom asset index quintile(d)	0.245***	0.245***	0.325	5.245***
	(0.023)	(0.023)	(0.220)	(0.023)
Second asset index quintile(d)	0.194***	0.194***	0.220	0.194***
	(0.022)	(0.022)	(0.201)	(0.022)
Third asset index quintile(d)	0.130***	0.130***	0.022	0.130***
	(0.021)	(0.021)	(0.188)	(0.021)
Forth asset index quintile(d)	0.110***	0.110***	0.415*	0.110***
	(0.019)	(0.019)	(0.198)	(0.019)
Top asset index quintile (control group)	-	-	-	-
	-	-	-	-

Individual variables				
Infant age group (0-1) (d)	-	-	-	-
	-	-	-	-
Child age group (1-5) (d)	-0.075**	-0.075**	-0.076**	0.114
	(0.026)	(0.026)	(0.026)	(0.304)
Youth age group (5-18) (d)	-0.413***	-0.413***	-0.414***	-0.258
	(0.024)	(0.024)	(0.024)	(0.248)
Young adult age group (18-40) (d)	-0.396***	-0.397***	-0.397***	-0.853**
	(0.022)	(0.022)	(0.022)	(0.272)
Above 40 age group(d)	-0.461***	-0.461***	-0.461***	-0.722*
	(0.026)	(0.026)	(0.026)	(0.298)
Age(for people 40 yrs old and above)	0.044***	0.044***	0.044***	0.055***
	(0.001)	(0.001)	(0.001)	(0.007)
Male(d)	-0.473***			
	(0.108)			
Interactions				
Male*public health spending interaction	0.117***			
	(0.024)			
Rural* public health spending interaction		-0.005		
		(0.031)		
1st quintile* public health spending interaction			-0.018	
			(0.049)	
2nd quintile* public health spending interaction			-0.005	
			(0.044)	
3rd quintile* public health spending interaction			0.024	
			(0.040)	
4th quintile* public health spending interaction			-0.067	
			(0.043)	
infant* public health spending interaction				0.035
				(0.055)
child* public health spending interaction				-0.008
				(0.045)
young* public health spending interaction				0.137***
				(0.040)
Above 40* public health spending interaction				0.094
				(0.052)
Male* public health spending interaction				-0.002
				(0.002)
	-0.739***	-1.002***	-1.036***	-0.940***
	(0.168)	(0.194)	(0.207)	(0.277)
Number of observations	519502	519502	519502	519502

Table 4 probability of dying and public health spending, instrumental variable estimator

	Coefficient	Std. Err	Marginal effect
State variables			
Log of per capita public health spending 1997-98	-0.114***	(0.029)	-0.005
Log of household spending on health	-0.104***	(0.024)	-0.004
Log of per capita Net State Domestic Product	0.069	(0.030)	0.003
Household-level variables			
Rural resident(d)	-0.009	(0.013)	-0.0004
Access to flushed toilet(d)	-0.078***	(0.015)	-0.003
Access to latrine(d)	-0.043**	(0.014)	-0.002
Access to piped water(d)	0.020	(0.019)	0.001
Access to well water(d)	0.001	(0.019)	0.0000
Hindu(d)	-0.092***	(0.022)	-0.004
Muslim(d)	-0.071**	(0.025)	-0.003
Christian(d)	-0.123***	(0.028)	-0.004
Other religions(control)	-	-	-
Scheduled caste(d)	0.041	(0.023)	0.002
Scheduled tribe(d)	0.099***	(0.024)	0.004
Backward class(d)	0.010	(0.022)	0.0004
Other caste(d)	-0.005	(0.022)	-0.0002
No caste(control)	-	-	-
Bottom asset index quintile(d)	0.233***	(0.019)	0.011
Second asset index quintile(d)	0.183***	(0.018)	0.008
Third asset index quintile(d)	0.125***	(0.017)	0.005
Forth asset index quintile(d)	0.085***	(0.015)	0.004
Top asset index quintile(control)	-	-	-
Individual variable			
Infant (0-1 yr) (d)	-	-	-
Child(1-5 yrs) (d)	-0.091***	(0.021)	-0.003
Youth(5-18 yrs) (d)	-0.428***	(0.020)	-0.014
Young(18-40) (d)	-0.409***	(0.019)	-0.014
Above 40(d)	0.432***	(0.018)	0.023
Age(for people 40 yrs old and above)	0.060***	(0.008)	0.002
Male(d)	-0.091***	(0.021)	-0.003
Constant	-1.442***	(0.112)	-
Number of observations	519502	519502	519502

Weak identification test (First-stage F-statistic) $F(1, 25) = 5.51$ Prob > F = 0.0271

Table 5 Effect of public spending on disease prevalence, probit model				
	Asthma	TB	Malaria	Jaundice
	Coef	Coef	Coef	Coef
Log of public health spending in 1997-98	0.11	0.11	-0.14	0.08
Log of average household spending on health 1998-99	-0.13	-0.09	-0.22	-0.38*
Log of Per Capita Net State Domestic Product 1998-99	-0.18	-0.31 ***	0.00	-0.03
Rural resident(d)	0.00	-0.05	0.03	-0.03
Access to flushed toilet(d)	-0.03	-0.08	-0.13	0.05
Access to latrine(d)	0.087 *	0.00	-0.12	0.02
Access to piped water(d)	-0.13*	-0.02	-0.11	-0.12
Access to well water(d)	-0.21**	-0.13*	-0.10	-0.11
Hindu(d)	-0.17	-0.08	-0.06	-0.10*
Muslim(d)	-0.14	0.08	-0.16	-0.09
Christian(d)	0.00	0.07	0.10	-0.10
Other religions(control group)				
Scheduled caste(d)	-0.053*	0.10**	-0.02	0.00
Scheduled tribe(d)	-0.07	0.06	0.33***	0.03
Backward class(d)	-0.06	0.00	-0.01	-.085*
Other caste(d)				
Bottom asset index quintile(d)	0.26***	0.37***	0.24***	0.16*
Second asset index quintile(d)	0.24***	0.31***	0.21**	0.12**
Third asset index quintile(d)	0.16***	0.29***	0.12*	0.12**
Forth asset index quintile(d)	0.10**	0.16***	0.05	0.09***
Top asset index quintile(control group)				
Infant (0-1 yr) (d) (control group)				
Child(1-5 yrs) (d)	-0.07	-0.09	0.13*	0.24***
Youth(5-18 yrs) (d)	-0.14*	-0.11*	0.11	0.08
Young(18-40) (d)	0.09	0.35***	0.16**	0.10
Above 40(d)	0.46***	0.49***	0.20***	-0.03
Age(for people 40 yrs old and above)	0.02***	0.004***	0.00	0.00
Male	0.01	0.10***	0.01	0.13***

number of observations: 519502
(d) for discrete change of dummy variable from 0 to 1
* p<0.05, ** p<0.01, *** p<0.001
Age above 40 is the number of years a person lived after the 40th birthday