THE SLOW DECLINE IN THE INFANT MORTALITY RATE IN INDIA
can governance be an explanation?

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INTRODUCTION

The Infant Mortality Rate (IMR) remains one of the most important indicators of the progress regions and countries have made in improving the health status of their populations, and enables comparisons of relative achievement in health outcomes. Globally, there have been many studies that have attempted to explain factors that are important in bringing about a decline in mortality, including IMR (Rosero-Bixby, 1986; Wennemo, 1993; Ahmad et al. 2000; Rutstein, 2000; Hanmer et al. 2003). The determinants of IMR based on these various studies are: a) child care factors like proportion of immunized children, proportion of malnourished children, medical care for children with diarrhoea, b) maternal care factors like prenatal medical care, medical care during pregnancy, and delivering in a health facility, c) demographic factors like fertility rate, and d) socio-economic factors like per capita income, expenditure on public health, mother’s education and living conditions.

India’s record in bringing about a greater reduction in child mortality has been disappointing, and the recent report on “The State of the World’s Children 2007” indicates that in 2005, some 1.92 million children died before reaching the age of 5 in India, which is the highest among countries in the world (UNICEF, 2006). The average annual rates of reduction in under-5 mortality and IMR for India are 3.4 percent (from 123 to 74 children per 1000 live births) and 2.2 percent (from 84 to 56 infants per thousand live births) respectively, during 1990-2005, putting India among countries with the lowest rates of decline during this period (UNICEF, 2006). Most of the progress towards reducing child deaths has been in the
earlier decades, but this decline has slowed down in the recent past. India has not been able to bring about a more rapid decline in IMR and remains behind countries like Sri Lanka in its achievements in the health sector.

While the proximate determinants of IMR could be many, in the long run, which regions are better able to bring down IMR faster, *ceteris paribus*? In other words, controlling for economic and socio-demographic indicators, are there some key elements that are usually not taken into account while discussing the constraints facing a faster reduction in IMR? The role of structural variables including governance is slowly gaining recognition (Menon-Johansson, 2005; Lazarova, 2006; Reidpath et al., 2006), and there is now some evidence that weak governance affects health outcomes adversely.

The Worldwide Governance Indicators (WGI) project of the World Bank (http://www.govindicators.org) ranked 212 countries for 1996–2006, for six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. Interestingly, India ranked poorly on most of these indicators of governance. While poor governance is talked about widely in India, there is very little work done to relate health outcomes to governance.

This paper explores the role of factors like political stability and corruption in affecting IMR in the long run, in addition to the more standard determinants like health expenditure and literacy. It uses time series data on IMR over 30 years across 16 states (for those states for which data were available) as well as other secondary data on corruption, well being and IMR to look for possible relationships among these variables, and uses a multivariate framework as well to test some of these relationships.

**TREND IN IMR IN INDIA**

How has India fared in reducing its IMR over the years? Graph 1 shows that India has made considerable progress in reducing IMR from 129 in 1971 to 58 in 2005. However, the progress has been uneven and there has been a perceptible slowing down towards the recent years, especially the last 3 years.

As Table 1 shows, the IMR declined at a very low rate of around 1 percent during the decade of 1961-71, followed by a five year period of actually negative decline, with an increase in IMR from 129 in 1971 to 140 in 1975. Thereafter, there was a steady and increased decline till 1990. However, this phase was short lived and the decade of the 90s actually saw the IMR almost stagnating. The average annual rate of decline during 1996-2000 was lower than that of the 60s. India’s neighbour Sri Lanka, showed an impressive picture of decline in IMR for the same time periods, as can be seen from Table 1.
While looking at the IMR situation through the prism of rural-urban distribution, the rate of decline in IMR shows an interesting picture.

As can be seen from Graph 2, except for the two five year periods of 1976-80 and 1986-90 the rate of decline for both rural and urban IMR has been below 10 percent. The two lines depict the actual values of the IMR in rural and urban India, and indicate that there has been a substantial convergence over the years. In the last fifteen years, the rate of decline in urban IMR has been steadily going down (from an impressive 19.4 percent during 1986-90 to around 5 percent in 2001-05). During the 90s, both rural and

**TABLE 1** Rate of decline in IMR in India and Sri Lanka

<table>
<thead>
<tr>
<th>Time period</th>
<th>India</th>
<th>Sri Lanka</th>
<th>Average annual decline</th>
<th>Average annual decline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IMR at the start</td>
<td>IMR at the end</td>
<td>Average annual decline</td>
<td>IMR at the start</td>
</tr>
<tr>
<td>1961-1971</td>
<td>146</td>
<td>129</td>
<td>1.2</td>
<td>52</td>
</tr>
<tr>
<td>1971-1975</td>
<td>129</td>
<td>140</td>
<td>-1.7</td>
<td>45</td>
</tr>
<tr>
<td>1976-1980</td>
<td>129</td>
<td>114</td>
<td>2.3</td>
<td>44</td>
</tr>
<tr>
<td>1981-1985</td>
<td>110</td>
<td>97</td>
<td>2.4</td>
<td>30</td>
</tr>
<tr>
<td>1986-1990</td>
<td>96</td>
<td>80</td>
<td>3.3</td>
<td>23</td>
</tr>
<tr>
<td>1991-1995</td>
<td>80</td>
<td>74</td>
<td>1.5</td>
<td>18</td>
</tr>
<tr>
<td>1996-2000</td>
<td>72</td>
<td>68</td>
<td>1.1</td>
<td>17</td>
</tr>
<tr>
<td>2001-2005</td>
<td>66</td>
<td>58</td>
<td>2.4</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: Various Sample Registration Survey Bulletins and Compendium, Sri Lanka
urban IMR declined at almost equal rates of 6-7 percent, but in the recent years, the urban IMR has mostly been stagnant. During 1996-2005, when rural IMR decreased from 77 to 64, the urban IMR declined by only 6 points from 46 to 40. While the urban IMR is lower than the rural one, it is not low enough to prevent a further decline in its value. Clearly, Kerala has achieved a much lower urban IMR, which has not happened in the rest of the states.

The story of the urban IMR is better understood if one looks at the health indicators of urban poor and non-poor. There is now an increasing amount of evidence that the health indicators are much worse for the urban poor compared to urban non-poor as well as rural India. Organizations like the Urban Health Research Centre (UHRC) have been documenting the health disparities in urban India for a while now, and there are other research findings as well that bring out the adverse health outcomes among the slum dwellers of cities (Gupta & Mitra, 1999; Gupta & Guin, 2007).

There have been a few hypotheses offered for explaining the stagnation of IMR in India during the 1990s. Claeson et al. (2000) mentioned lower social, cultural and health status of women as possible factors contributing to the stagnation of IMR during the 90s in India. Das and Dey (2003) indicated that in the states with low and moderate level of infant mortality, the stagnation in IMR could be attributed to neonatal mortality, since post-neonatal mortality has been controlled to a certain extent. This analysis also emphasized the need for educational and nutritional programmes for women for further reduction in IMR in these states. For states with higher IMR, the combination of higher rates of both neonatal and post-neonatal mortality seemed to be playing an important role. The paper clearly emphasized the role of development programmes in bringing down the IMR.

TREND IN IMR IN INDIAN STATES

Moving from all India to state level, huge interstate differences in IMR are observed in levels as well as rates of decline. States like Madhya Pradesh (79) and Orissa (77) are still struggling with an IMR that is way beyond the national average (56), while states like Kerala (12) has an IMR comparable to many developed countries.

The interstate variation in IMR is not a new phenomenon, however, since this analysis is based on the last three decades, it is useful to look at the status of IMR in selected Indian states in 1975, as is done in Graph 3.

The variation across states was huge. While Kerala had an IMR of 54 in 1975, which was lower than today’s national average, states like Uttar Pradesh
had an IMR of almost 200. Apart from Kerala, only Karnataka had an IMR of 80. All other states had an IMR above 90.

How have the various states fared in reducing IMR over the last thirty years? In the analysis, states have been divided into three categories of low, moderate and high IMR based on the value of IMR in 1975. These are then compared with the IMR in 2004 in Table 2.

Among the states that already had low IMR to start with, Karnataka and Punjab had low rates of decline in the last thirty years. In fact, Karnataka’s rate of decline (38.8%) is the lowest among all the states; it was second highest only after Kerala in 1975 but by 2004, its rank reduced to 6th with an IMR of 49. West Bengal and Tamil Nadu performed well among the moderate baseline states with decline rate of above 60 percent each. Haryana – which currently is at the second lowest position among all the states in this group – has fared relatively poorly. In the last group, where IMR was above 140 in 1975, Gujarat tops the list with reduction of IMR from 154 in 1975 to 53 in 2004; the rate of decline for Gujarat (65.6%) is second highest only to Kerala. States like Madhya Pradesh and Orissa are the worst performing states. These are the states, which had huge scope of improvement in their IMR but could not reduce their IMR burden beyond fifty percent in 30 years. Interestingly, the ranking of the states changed substantially in the last 30 years. While Kerala and Maharashtra remained in the low IMR group in 2004, West Bengal and Tamil Nadu joined this group from their earlier moderate-IMR group.

Source: Various Sample Registration Survey Bulletins and compendium
Overall, except for Gujarat, all the states in the last category remain a cause of concern with very high IMR.

While looking at the decline between rural and urban areas across states (Table 3), the performance in urban IMR seems clear. The more recent
period of 1990-2005 saw a much lower rate of decline in urban IMR in many states, indicating that the earlier contribution of urban India to the fast decline in IMR is no longer happening.

The progress in improving IMR in the country can also be gleaned from the following matrices drawn up by plotting values of IMR across 6 years: 1975, 1980, 1985, 1990, 1995 and 2000. There are 6 charts in all, shown together in Graph 4, with each IMR plotted for states across each adjacent year. Clearly, improvement in IMR would mean a movement below the diagonal towards the origin- more such movements, better has been the progress in the country.

The graphs clearly indicate that states were doing better in the initial years, and were converging in values by the 1990s. Since then there has been very little movement towards the origin especially during 1990-2000, indicating virtual stagnation in the rate of improvement across states as they seem to have stayed almost at the same place in the these three periods. However, there has been some positive movement in the last period, but not enough to make any significant dent in the average IMR in the country. Needless to say, Kerala has remained an outlier over the years, much more so now than before when there was much more variance in the value of IMR.

**IMR AND ECONOMIC DEVELOPMENT**

While there could be a myriad of reasons that go into determining changes in IMR, it is generally accepted that economic development is necessary for sustained lowering of IMR. The association between economic growth and life expectancy (Preston curve) can also be seen in the case of growth and IMR, and seems to hold true for India as well for the earlier periods. Evidence indicates that this relationship has weakened in the recent past, especially in the nineties and later (Deolalikar et al., 2007).

From a cross-sectional perspective, how do states stand relative to each other in terms of this relationship? Table 4 gives the ranking of states according to the decline in IMR and increase in Net State Domestic Product (NSDP) during the last 30 years (1975-2004). The two worst performing states in terms of IMR reduction- Karnataka and Haryana – are relatively richer states that are ranked third and fourth for their performance in economic development. The more intuitively logical results are seen in states like Madhya Pradesh and Orissa, which have performed poorly on both indicators, while rich states like Gujarat, which tops the list in economic development, ranks only second to Kerala in reducing IMR. This achievement seems phenomenal since Gujarat, with IMR of 154 in 1975, belonged to the category of states having high IMR at the baseline.
This ambiguous relationship is also brought out by using data on economic well-being index\textsuperscript{2} from Basu (2004). Graph 5 gives a cross-sectional

![Graph 5](image-url)
view of IMR and the well being index for the year 2004. It shows that while there is a negative relationship between the two, it is a weak one.

What else can go into determining how states perform in reducing IMR in the medium term? If it is not merely economic development, there must be other factors that determine why a relatively rich state is unable to bring about a faster decline in IMR. Enhanced health expenditure is seen as a necessary condition for improvement in health outcomes, and investment in health has been widely prescribed by development and health experts, especially in developing countries where the allocation to the health sector from the countries’ GDP has generally been low.

**INVESTMENT IN HEALTH**

Clearly, no progress can be made towards improving the health status of a population without substantial investment in health. This, of course, is not a new hypothesis. The World Development Report of the World Bank (1993) and a vast amount of subsequent literature have brought out clearly that investment in health is a necessary condition for sustained improvements in the health status of a population. A paper by Gupta and Mitra (2004) on the relationship between poverty, economic growth and health expenditure using pooled cross-section and time series data from India showed that these relationships are significant, and that IMR responds positively to both economic growth and health expenditure. A more recent paper indicates that IMR responds positively to health expenditure in India, and estimates a long run elasticity of –0.24 (Bhalotra, 2007).

But how does a region bring about a sustained increase in health expenditure? Does higher economic development necessarily mean higher expenditure on health and family welfare? In this paper, it is argued that investment on health itself is determined by more than higher economic development. How much (and how well) states will invest on health depends to a large extent on the prevailing political will. While political will is not party-specific, over a longer time period, a weak political structure is likely to hit social sector investment first. While effectiveness of spending is the more relevant variable here (and very difficult to capture for empirical analysis), the volume of health expenditure can be affected positively if the governments so desire, either by raising allocations to health in the state, or by bargaining for a higher allocation from the centre. Political will is even more difficult to define as well as measure--political will and governance are definitely not the same thing. However, it is contended here that a state which has had a stable government is likely to be better governed in the long run. An attempt is made to measure
political stability in this paper by looking at changes in the government, and cumulating such changes over the years. The greater the value of this variable, the lower is political stability.

While there are now a total of 35 states and union territories in India, due to data availability, only 16 major states were taken to look at trends in political stability.

The analysis posits that (a) health expenditure is determined by economic growth and political stability, and (b) IMR is determined by health expenditure, economic growth and female literacy. While it stands to reason that the level of expenditure on health is an important determinant of all health related outcomes including IMR, the question posed here is does the level of health expenditure continue to matter in the long run in affecting IMR?

Table 5 presents the results of a regression run on pooled time series-cross section data, with random effects assumed in the model. As can be seen, both the variables are significant with the right sign, though the coefficients are small. NSDP influences health expenditure positively, whereas political instability affects it adversely.

### WHAT INFLUENCES IMR THE MOST?

The determinants of IMR were taken to be (a) per capita NSDP, (b) per capita health expenditure and (c) female literacy. Alternative variants were tested-- in one variant a 2 Stage Least Squares (2 SLS) was used by first running the equation for health expenditure mentioned above, and then using the estimated values of health expenditure in the IMR equation. The equation was also run with the original value of health expenditure. Finally, per capita electricity consumption was used instead of per capita NSDP in the assumption that development of a state may be better gleaned from power consumption. Political instability by itself was believed to not affect IMR, though it indirectly did through estimated values of health expenditure. All the variants yielded similar results, so only one set of results are reported here.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficient</th>
<th>Z value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per capita NSDP</td>
<td>0.000004</td>
<td>27.3</td>
</tr>
<tr>
<td>Political instability</td>
<td>-0.0007</td>
<td>-1.98</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.01</td>
<td>-3.6</td>
</tr>
<tr>
<td>R square: 0.37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Authors' calculation*
The only variable that seems to determine IMR is female literacy, whichever variant one uses. Neither economic development nor expenditure on health matter in the long run, but female literacy comes out to be the most significant determinant of long run changes in IMR.

While these results square with many earlier findings highlighting female literacy as a key to improved household health, it cannot be the only parameter affecting IMR in the long run. It is contended here that the issue of governance still needs investigation, and clearly, the political instability variable used in the regressions above do not capture how well a state is governed. However, this variable continues to be meaningful for determining the level of health expenditure. A better variable for governance is corruption.

**CORRUPTION, GOVERNANCE AND IMR**

Transparency International India (TII) had conducted a study entitled ‘India Corruption Study 2005’, which ranked states according to an index of corruption and also brought out the areas where India sees the most corruption. The study listed 11 public services, under need-based and basic services. While police services were found to be the most corrupt under need-based services, government hospitals were seen to be the most corrupt under basic services. According to the study, “the corruption in Government Hospitals is mostly to do with non availability of medicines, getting admission, consultations with doctors and availing diagnostic services”.

While government hospitals are not necessarily the most critical facility for affecting IMR, it certainly indicates the possibility of corruption in other spheres as well, including in the lower rung of the health system like the primary health centres, district hospitals etc. Further, corruption and lack of governance weakens the effectiveness of public spending considerably, thereby weakening the relationship between spending and well being indicators.

Since no time series information is available for all the states on either corruption or governance, the TII data is used again for 2005 to look at corruption

<table>
<thead>
<tr>
<th>Table 6 Determinants of IMR, GLS random effects results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent variables</strong></td>
</tr>
<tr>
<td>Per capita NSDP</td>
</tr>
<tr>
<td>Female literacy</td>
</tr>
<tr>
<td>Per capita expenditure on health (predicted)</td>
</tr>
<tr>
<td>Constant</td>
</tr>
</tbody>
</table>

*Source: Authors’ calculation*
and IMR to find possible patterns, if any. As can be seen from Graph 6, there is fairly close association between corruption and IMR (correlation coefficient is 0.6), though it is not high enough to warrant an unequivocal conclusion.

However, if the results of the regression are seen in combination with these results, a possible picture and explanation emerge around stagnant IMR. Table 7 presents a 2-by-2 table of states with different levels of female literacy (a variable that was significant in the regression reported earlier) and corruption.

First, a few explanations about the classifications-- high and low for corruption and literacy were simply based on the two sides of the mean. Thus, anyone with a corruption index greater than the mean of the group was considered to be in the high corruption category. For each cell, the average IMR of that group was calculated.

The 2-by-2 table can help understand better the results from the regressions and the corruption-IMR graph, which indicated the following hypothesis:

1. High literacy and low corruption should yield the best (lowest) average IMR, i.e. states that have the best female literacy and lowest level of corruption should show the best average IMR.
2. Low literacy and high corruption should yield the worst (highest) average IMR, i.e. states that have adverse female literacy and high corruption should show the worst average IMR.

While these two combinations seem logical, it is the two other combinations listed below that speak more about the relative importance of female literacy and corruption.

3. High literacy and high corruption
4. Low literacy and low corruption

While which of these two would yield relatively better results on IMR can be answered only by looking at real data, some insights can be gleaned from the 2-by-2 table (Table 7).

Tables 7 shows that results 1 and 2 above are borne out by data. States with high literacy and low corruption show the lowest average IMR. These are Kerala, Maharashtra, Punjab, Himachal Pradesh and West Bengal. This bears out the first hypothesis mentioned above. Similarly, the worst IMR is evidenced in states with low literacy and high corruption. These are the states of Assam, Bihar, Haryana, Karnataka, Madhya Pradesh, Rajasthan and Uttar Pradesh. Thus the second hypothesis is also confirmed.

### TABLE 7 Distribution of Indian states on the basis of female literacy and corruption index (2005)

<table>
<thead>
<tr>
<th>Corruption index</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Tamil Nadu (41)</td>
<td>Assam 557</td>
</tr>
<tr>
<td></td>
<td>Bihar</td>
<td>Haryana</td>
</tr>
<tr>
<td></td>
<td>Haryana</td>
<td>Karnataka</td>
</tr>
<tr>
<td></td>
<td>Madhya Pradesh</td>
<td>Rajasthan</td>
</tr>
<tr>
<td></td>
<td>Uttar Pradesh</td>
<td>(65)</td>
</tr>
<tr>
<td>Low</td>
<td>Himachal Pradesh</td>
<td>Andhra Pradesh 401</td>
</tr>
<tr>
<td></td>
<td>Kerala</td>
<td>Gujarat</td>
</tr>
<tr>
<td></td>
<td>Maharashtra</td>
<td>Orissa</td>
</tr>
<tr>
<td></td>
<td>Punjab</td>
<td>(63)</td>
</tr>
<tr>
<td></td>
<td>West Bengal</td>
<td>(36.8)</td>
</tr>
<tr>
<td></td>
<td>73.3</td>
<td>57.8</td>
</tr>
</tbody>
</table>

Source: IMR - Various Sample Registration Survey Bulletins and compendium, Literacy Rate - Census of India 2001
The other two categories lead to interesting conclusions. There is only one state with high corruption and high literacy, category 3. This is Tamil Nadu, which is doing considerably better in IMR than the last category of states with low corruption and low literacy. These are the states of Andhra Pradesh, Orissa and Gujarat.

Overall, it seems that highly corrupt states can bring down IMR by 37 percent if they improve female literacy (IMR of 65 reducing to IMR of 41). On the other hand, low literacy states can improve IMR by only 3 percent if they take care of corruption (IMR of 65 reducing to IMR of 63). This indicates that improved literacy will bring greater dividends in the less corrupt states.

SUMMARY

The study was exploratory in nature, and offered an interesting hypothesis that one of the missing links explaining low IMR could be the state of governance of a region. While female literacy was important in determining IMR, it is the combination of female literacy and governance (proxied by corruption in this paper) that may hold a key to the mystery of the stagnant IMR in India. It was found that the combination of high female literacy and low corruption brought out the best results. Though the effect of female literacy continued to be the most important determinant of IMR, states that were less corrupt seem to be able to take advantage of improved female literacy to affect IMR.

Other results indicated that while the level of health expenditure was to a certain extent also explained by political stability, it did not seem to make much difference to the level of IMR over a long time period, which in turn could be explained by the missing variable – governance - that measures quality of spending.

The tentative results indicate that further reduction in IMR may be difficult to obtain, especially in states that are poorly governed, unless greater attention is paid to structural factors like governance. It also brings out the need for more rigorous research to establish these links, which of course, is only possible if better state-wise data are available on indicators of governance.

NOTES

1. http://www.uhr.c.in
2. Economic well-being index (EWBI) is constructed on the basis of fifteen variables selected from five different socio-economic dimensions, namely, health, knowledge, income, technological progress, and infrastructure.
3. Police (Crime/Traffic), Judiciary, Land Administration, Municipal Services, Govt. Hospitals, Electricity (Consumers) PDS (Ration Card/Supplies), Income Tax (Individual Assesses), Water Supply, Schools (upto 12th) and Rural Financial Institutions (Farmers).
REFERENCES


