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Public Expenditure, Medical Care and Infant Mortality: A Comparative Study of States in India

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PUBLIC EXPENDITURE, MEDICAL CARE AND INFANT MORTALITY: A Comparative Study of States in India

V.B.Tulasidhar*

I. Introduction

An important indicator of physical quality of life is the status of health. Status of health in any community depends on a variety of factors. The factors having immediate and direct influence on the quality of health can be called `proximate factors' and those which act indirectly but mainly through the former can be called `non-proximate' [Nag (1988) and Srinivasan K (1988)]. Studies on socioeconomic determinants of health have identified some important proximate factors which have a direct bearing on the quality of health measured usually either in terms of life expectancy or some measure of mortality [see Cochrane, Susan H. (1980), and Berribi Z. and J. Silber (1981) for a review of these studies]. In some cases, these studies have also analysed the interrelationship between proximate and non-proximate factors. Though, some of the important proximate factors identified by these studies, viz., medical care, medical infrastructure and

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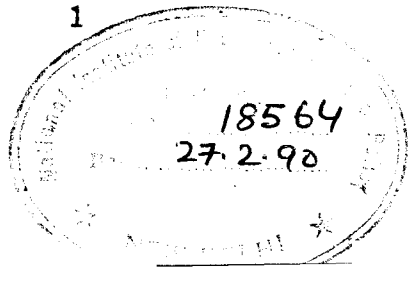

community level environmental factors such as water quality, waste disposal, vector control and immunisation, are influenced directly by the magnitude and pattern of public spending, interrelationship between public spending and these factors has not been studied. The determinant studies carried out in the Indian context too do not throw much light on this issue [see Jain,A. (1988), Nag (1983) and Visaria, Leela (1985)].

The level and the pattern of public spending, while adding to the existing stock of medical and public health infrastructure, also influences the demand for medical care which is considered as one of the important proximate factors determining health quality. The main objective of this paper is to analyse the interrelationship between public spending, infrastructure availability, medical care and health quality using State (province) level data for a period of twelve years ending 1982-83. Thirteen of the fifteen major States, for which mortality and medical care data are available, are included in the study. Health quality is measured by infant mortality rate (IMR) and the level of medical care by the proportion of births taking place under the supervision of trained personnel or in institutions to the total births.

In the next section, we look at the magnitude of resources devoted for health care, its division between public and private sectors and within the public sector the relative roles of the Central and the State governments. Besides, the section also analyses the growth and pattern of public spending of the States. Section III reviews the trends in the growth of medical system (infrastructure), the developments in medical care and infant mortality rates. In section IV the interrelationships between infant mortality rates (IMR), medical care and medical infrastructure are reviewed and analysed by juxtaposing with the developments in public spending. The role played by each of these

factors in determining inter-State variations in infant mortality rates is also examined in this section with the help of a composite model. Major findings are summarised in section V.

II. Trends in Expenditure on Health Care

At the outset, it should be mentioned that there can be many opinions about what constitutes expenditure on health care. At one extreme, it can be defined as the expenditure incurred on medical infrastructure including medical education and research, drugs, immunisation programmes and expenditure on prevention of communicable diseases. This is evidently a very narrow definition of health expenditure. On the other extreme, all items of expenditure which are likely to have direct bearing on the quality of health are included. In this wider definition, besides expenditure on medical services mentioned above, public health expenditures such as water supply, waste disposal, and vector control, expenditure on improvement of environmental quality, and expenditure on improvement of nutrition can also be included.

The definition adopted in this study for public expenditure on health falls somewhere between the two extremes described above. It includes, in addition to the items normally included in the narrow definition, expenditure on public health (water supply and waste disposal, vector control etc.). Public expenditure, thus defined, has been reclassified under two broad groups - curative and preventive. Direct expenditures on medical institutions (viz., hospitals, dispensaries, primary health centers), family planning programmes, medical education, research and administration are classified as curative expenditure. The remaining items (e.g. immunisation, public health, prevention of communicable diseases etc.) are categorised under preventive expenditures. Private expenditure on health however conforms to the narrow definition of health expenditures. It covers only the private final consumer

expenditure on health as reported in the National Accounts Statistics (NAS). There are reasons to believe that these figures are underestimates though the extent of underestimation is not known[1].

Expenditures on health care by the public and private sectors are shown in Table 1. Together they formed about 2.9 per cent of GDP during the period 1971-75. It has increased to 3.35 per cent during the next quadrennial period and remained stagnant thereafter. This being so, the share of public expenditure on health increased steadily from 1.25 per cent of GDP in 1971-75 to 1.8 per cent by the quadrennial period ending 1983. If the extent of underestimation of private spending on health had remained unchanged (which may not be an unreasonable assumption to make) this would imply a substantial increase in the role of government in providing health care. In fact, the income elasticity of public expenditure on health estimated at 1.35 was substantially higher than Ø.87 estimated for the reported segment private expenditure on health. The income elasticity of overall spending on health was marginally higher than unity[2]. Rapid increase in the rural health infrastructure during the seventies also indicates the possibility of increase in the role of government in proving health care.

According to the Constitutional arrangement, health care comes under the jurisdiction of State Governments. Due to this, States' share in the total health spending has been substantially higher than that of the Central Government. States collectively spent about 77 per cent of public expenditure on health, excluding family welfare (planning) programme, in 1971-72. What is more interesting, this share has increased steadily to 90 per cent by the year 1982-83. This has happened in spite of greater involvement of the Central Government on Family Welfare (Planning)programme. Centre's share in the population control programme has increased sharply from over 12 per cent in 1971-72

to around 51 per cent by the year 1982-83. Rising share of the States in health care expenditures in a sense, shows the increasing awareness of the need for better health services in the country, provision of which at more disaggregated level will be responsive to peoples' preferences.

A striking feature of States' expenditure on health is the existence of significant variations in the growth of health spending per capita (at 1970-71 prices) in different States (Table 2). Nevertheless, in all the states real per capita public expenditure[3] on health grew faster than the growth of per capita State Real Domestic Product (SDP) confirming the income elastic nature of the expenditures. In fact, on closer examination of Table 2, it is difficult to discern any systematic relationship between the growth of SDP and the growth of spending; even in cases where SDP has stagnated or grew very slowly, public spending on health grew fairly rapidly. This is further corroborated by the fact that the correlation between per capita preventive and curative expenditures with SDP was Ø.23 and Ø.54 respectively (Table 6) Not only has the growth of public spending on health care been faster than the SDP, but also, in eleven out of thirteen States the growth has been faster than the total public spending. As between curative and preventive components, the latter grew more rapidly in ten out of thirteen States

Another interesting aspect of the States' spending on health care is the lessening of inter-State inequalities in the level of curative expenditure. Thus, although, inter-State inequalities in the case of preventive expenditure remaining unchanged, due to the reduction in the inequalities in curative spending the inequalities in overall health expenditures have declined (last column of Table 2). While the recent emphasis on rural water supply and sanitation under the 'National Minimum needs Programme' appears to have caused a spurt in preventive care

expenditures, equalisation in the standards of medical services attempted by the Finance Commissions, since the sixth, seems to have resulted in the reduction of inter-State inequalities in curative health care expenditures.

III. Trends in Infrastructure, Medical Care and Mortality Rates:

Public spending influences the mortality rates mainly through the creation of medical and public health infrastructure and by ensuring its better utilisation. In this section, we review the expansion of medical infrastructure, the growth of medical care and the developments in mortality rates in the light of rapid the increase in public spending.

a. Infrastructure: Commensurate with the classification adopted for public spending, health infrastructure can be classified as medical infrastructure - financed essentially by curative spending and public health infrastructure financed by preventive spending. The relative growth of these two components of infrastructure, therefore, depends not only on total public spending on health but also on how the resources are allocated to curative and preventive sides. While, hospital beds, primary health centers and sub-centers, doctors and paramedical personnel, can be taken as the main elements of medical infrastructure, water supply and sanitation can be considered as public health infrastructure. Out of these, information on public health infrastructure is not available and hence the pattern of its growth cannot be examined. Data on medical infrastructure are obtained from Government of India, Health Statistics of India (renamed as Health Information of India since 1986).

In India, medical infrastructure is organised in a three tier structure. At the apex are teaching hospitals, district and sub-divisional hospitals. This tier is usually located in urban areas

and serves mainly the urban population and at the same time is intended to serves as referral hospitals for the two lower layers of health infrastructure. The second and the third tiers are located in rural areas serving almost exclusively the rural population. In the second layer, are the primary health centers which are expected to serve a population of about 100 thousand till recently. In the third layer are the sub-centers serving a population of around 10 thousand. In order to achieve the objective of the National Health Policy 1982 (Government of India (1982)), the Planning Commission has revised the norms for rural medical infrastructure to be achieved by 2000 AD (Government of India, (1981), p.368). The revised population norm for Primary Health Centres is 30 thousand and for sub-centres, five thousand.

Statewise growth of different elements of medical infrastructure depends upon the composition of curative expenditures and the variations in the cost of providing these services in different States. Cost of providing and sustaining the medical infrastructure can vary considerably across States due to difference in the density of population, topography and overall development of supporting infrastructure. Thus, in order to understand the impact of public expenditure on the growth of infrastructure,it is necessary to know the composition of curative spending as well as understand cost variations across States. Therefore, the effectiveness of a unit of public expenditure on any given element of medical infrastructure is likely to be different in different States.

The effectiveness of public expenditures or, in other words variations in the cost of providing and maintaining the infrastructure, can possibly be estimated if disaggregated data on the breakup of curative spending were available in sufficient detail. So far, no such information has been compiled and hence precise measurement of the impact of public spending on the growth

of medical system (infrastructure) in different States has not been possible. Here we have only attempted to analyse the growth of medical infrastructure in different states and examine the relationship between different elements of infrastructure and curative public spending. Four items of medical infrastructure viz., primary health centers and sub-centers (PHCSCs), hospital beds, paramedical personnel and doctors employed in primary health centers have been selected for this purpose. These variables together, are presumed to measure both the availability and the handling capacity of the physical infrastructure. It will be shown in the next section that these variable are important in determining the level and pattern of medical care. Details about the levels of infrastructure available in different states and its growth are summarised in Table 3.

There has been a rapid expansion in Primary health centers and sub-centers (PHCSC) during the period under review in all the States except in Kerala. As a result, the population as well as the area covered by theme fell sharply in most of the States. Further, the level of inter-State inequalities in PHCSC showed a reduction over the time period. The coefficient of variation for population per PHCSC fell sharply from Ø.4Ø2 in 1971-75 to Ø.319 in 1979-83. However, this variation is higher than the variation observed in the case of curative spending.

In contrast to this, total population per hospital bed (PPHB) has increased in five States, remained stable in two and fell in the remaining six States. If one takes only the urban population per hospital bed, it has increased in six states, remained stable in three states and fell in the rest. Thus, there is no uniform pattern in the growth of hospital beds at the apex level. Due to these variations in the growth rates, there is a sharp increase in inter-State inequalities in population per hospital bed.

As in the case of PHCSC, availability of doctors in PHCs and paramedical personnel both in hospitals and PHCs improved considerably in twelve of the thirteen States. Though inter-State inequalities in paramedical personnel came down, they are still high as compared to other elements of medical infrastructure. The number of doctors engaged in PHCs also depict considerable variation across States; while in Kerala there are two doctors or more in every PHC, in Uttar Pradesh only Ø.1 per cent of PHCs are manned by two doctors or more.

Among the four elements of infrastructure chosen for analysis, only population per hospital bed has high correlation (Ø.689) with the level of per capita curative spending. While the curative spending per area has low correlation (Ø.56) with population per PHC, its correlation with average maximum distance[3] to a PHCSC is fairly strong (Ø.71) (Table 7). In fact, no clear pattern emerges from the correlation between public spending and infrastructure. This strengthens the contention that there can be substantial variations in the cost of providing these services. This issue requires careful examination which is however not attempted here.

b. Medical Care: As the health quality is assumed to be measured by infant mortality rates (IMR), medical care is also measured in terms of medical attention at birth (MAB)[5]. MAB has two components, medical attention at birth in Institutions (MABI) and medical attention at birth under trained personnel (MABT). These variables are measured by the proportion of births taking place in the institutions or under the supervision of trained personnel to total births respectively. MAB, which is an important variable determining IMR, depends on the availability and accessibility of public medical institutions, the quality of services provided and the level of incomes and its distribution.

Institutional care in the rural areas is almost exclusively in the public sector, while in the urban areas public hospitals account for a substantial proportion of the institutional care. For this reason, MABI is taken as a proxy to reflect utilisation of public medical infrastructure for medical care at birth. MABT is exclusively private sector care both in Rural and Urban areas. MAB which is the sum of MABI and MABT depends on the utilisation of both these segments of medical facilities.

Accessibility of public medical infrastructure and availability of medical personnel at the institutions affect the choice of individuals about the type of medical facility to use. Given the perceived quality of these two facilities, the choice depends on relative costs. Although, public medical infrastructure is virtually free, there can be indirect costs in terms of transport cost, queuing costs in terms of loss of wage income and some times even informal payments (Berman, Peter, et.al (1987) p.297). Costs associated with transportation and queuing essentially depend on the availability of infrastructure and medical personnelper 1000 population respectively. In view of this, existence of medical infrastructure *per se* may not result in better utilisation of these services, unless, it also reduces the cost of demanding medical care at public institutions. Thus, the ultimate impact of public spending on mortality rates depends not only on its effectiveness in providing infrastructure, but also on the utilisation rate of the infrastructure so created.

Growth of medical care during the period under review presents an interesting picture (Table 4). In all except two States, MABI increased considerably. As between rural and urban areas, MABI in rural areas increased rapidly in many States. But in a few states, which have witnessed a rigorous family planning drive during 1975-77 period, the MABI fell sharply. Incidentally, those are the States with considerably low levels of MABI. Even

in these States, MABI picked up in the post 1977 period. Due to this fluctuation, trend lines fitted for these States were insignificant. Rapid increase in MABI in rural areas is in conformity with rapid growth in rural health infrastructure in the recent past. In the case of MABT, except in three States which witnessed near stagnation in per capita real SDP, there has been an increase in the rest of the States.

One would expect the inter-State inequalities in MABI to decline, since there has been a fall in the inter-State inequalities in rural health infrastructure and curative expenditures. This did not happen, perhaps, due to a fall in MABI in a few States associated with family Planning drive of 1975-77. Compared to the period 1971-75, the inequalities in MABI, increased sharply in quadrennial period 1975-79 and fell slightly thereafter. MABI still varied considerably across States with a minimum of 3.5 per cent in Punjab to over 51 per cent in Kerala. Increase in inter-State inequalities in MABT over time can be attributed to the increase in inequalities in real per capita SDP (Table 2).

c. Trends in Infant Mortality Rates: Consistent with the developments in infrastructure availability and medical care, IMR[6] too fell in all except three States one of which is a more developed State (Table 5). However, the decline is not uniform across States. In a few States, low trend growth rates can be attributed to fluctuations in IMR, particularly during the period 1975-79. As stated above, in a few States, MABI fell during the period 1975-79 and in almost all those States IMRs too increased, registering a fall in the subsequent quadrennial period. As between urban and rural areas, in five States, IMR in rural areas fell faster than or about the same rates as in urban areas. Generally, postnatal mortality rates (PNMR) fell faster than neonatal mortality rates (NNMR). In as many as eight States, PNMR

in rural areas registered either a steeper fall or at the same rates as in urban areas. In fact, it is interesting to note that the fluctuation in IMR noticed with the fluctuation in MABI, are not found in the case of PNMR. Only the NNMRs responded to fluctuation in MABI. As regards inter-State inequalities, in the case of NNMR there is a falling trend and in the case of PNMR inequalities increased. It should be noted here that a similar pattern was observed in the case of curative and preventive expenditures.

IV. Impact of Public Spending, Infrastructure and Medical Care on Infant Mortality

There are very few studies on the determinants of inter-State variations in IMRs in India. Nag (1983) while studying the differences in IMRs in Kerala and West Bengal, concluded that higher population density, better infrastructure and lower area per PHCSC in Kerala ensured better access to these facilities. This factor coupled with higher literacy rates and high degree of political awareness among the rural population explained comparatively better utilisation of health infrastructure and consequently lower IMRs in Kerala. Jain (1988) in a more comprehensive study of inter-State variations in IMRs in rural areas, categorised the factors determining IMRs into three levels - individual, household and village. He found that individual level factors play a strong role. Poverty and medical care at birth are found to be the most important determinants of NNMRs. In the case of PNMRs village level factors - better medical facilities and immunisation - seemed to have played a crucial role [p.152]. Literacy, on the other hand, influenced the mortality rates through its influence on life styles and the take up of medical care [p.150].

The framework of the present study is different from the earlier ones, in that, it distinguishes between the variables which are influenced by public spending on health care and the rest which are essentially socioeconomic factors. In the former group, the study includes the level of medical care, infrastructure, and public spending on curative and preventive care. In the latter group, literacy, level of income (per capita real SDP) and nutrition (poverty) are taken into account. The poverty variable has also been used as a crude measure of inequalities in income in the absence of a better alternative measure.

Once the variables are identified, it is necessary to ascertain the exact path of causation to formulate a model to determine factors responsible for inter-State variation in the infant mortality rates. For this purpose, it is useful to examine how the different variables sought to be included in the model, are correlated among themselves. This information is presented in Table 6. Mortality rates in general have the strongest inverse correlation with MAB, followed by per capita real curative spending and literacy. In the case of preventive expenditure, spending per area has better correlation with mortality rates than spending per capita. Among the infrastructure variables only population per hospital bed has a strong correlation with NNMRS. In general, distance to PHCSC has better correlation with mortality rates than other transformations (area and population coverage). With regard to medical personnel, doctors engaged in PHCSC exhibited a relatively high correlation. In general, the strength of correlation between infrastructure variables and IMR is lower than the correlation with public expenditure and medical attention as measured by MAB.

Medical care variable too has strong correlation with literacy and public expenditure. A closer examination reveals that public spending per area rather than spending per capita has stronger correlation with MAB (which includes private care also) as compared to MABI which is almost exclusively public care variable. However, literacy exhibited higher correlation with both MAB and MABI. Although infrastructure variables are also correlated with medical care, their inter-relationship was much weaker as compared to literacy and public spending. Among infrastructure elements, average maximum distance to PHCSC exhibited stronger correlation with MAB.

It is interesting to look at the relationship between socioeconomic variables and the remaining variables. Literacy, is the only variable in this group which exhibited strong relationship with both medical care and mortality variables. Further, it has a strong positive correlation with per capita real curative expenditure and real preventive expenditure per area. This relationship leads us to infer that the impact of literacy on IMRs is much more fundamental than what was believed earlier. Till now, the widespread belief has been that it has a strong influence on the use of medical facilities. But, in the light of its strong association with the level of spending,one can hypothesise that with higher literacy rates the perceived need for health care increases and at the same time the need gets articulated better in the political process. This, in a democratic society, influences the level of resources spent on health care which is perhaps the most important element of minimum needs. This hypothesis needs to be pursued more rigorously to test whether literacy has a strong influence on budgetary allocations. In contrast, per capita real SDP and poverty have very little correlation with infrastructure, medical care and mortality variables.

The above discussion brings into light the following inter-relationships among the variables. Level of public spending and MAB seem to have strong influence on IMRs. In the case of preventive spending, expenditure per area seem to have stronger influence than per capita spending. This suggests a strong possibility that density of population may be an important variable in determining the effective cost of providing preventive care. Among infrastructure variables, accessibility in terms of distance from PHCSC seem to be more important than population coverage. This in fact, is consistent with the findings of field level studies [Bose A., and R.P. Tyagi (1982), p.116]. Among socioeconomic variables, literacy is the only variable which has significant influence on all other variables under consideration. In particular, it has a strong direct influence on the level of public spending on health care.

Although literacy rate is found to be inversely correlated with mortality indices, its influence cannot be construed as direct in the presence of its strong correlation with medical care as well as the level of public spending. Its causation seems to operate through the utilisation of medical facilities and determining the level of public spending. Even in some earlier studies, the influence of literacy on mortality rates was found to be indirect (Jain, A. (1988) and wood, Richard H. (1988). Whereas in the case of MAB and public spending, the causation can be construed as direct; for they broadly reflect the quantity of medical care utilised and its quality respectively.

Given these interrelationships, a composite model for determining the factors influencing medical care can be formulated in the following manner. For assessing the impact on IMR, neonatal and postnatal mortality rates are studied separately as the factors influencing these two segments of IMR and their strength

of causation is likely to be different (Jain, A (1988) and Visaria, Leela (1988).

$$NNMR = f(MAB, RCURE, PVRTY) \quad (1)$$

$$PNMR = f(MAB, RPREV, PVRTY) \quad (2)$$

$$MAB = MABI + MABT \quad (3)$$

$$MABI = f(DPHC, PPHB, PPMP, DCPHC, CONEXP, LIT) \quad (4)$$

$$MABT = f(SDP, PVRTY, DPHC, PPHB, PPMP, DCPHC, CONEXP, LIT) \quad (5)$$

Alternatively

$$MAB = f(SDP, PVRTY, DPHC, PPHB, PPMP, DCPHC, CONEXP, LIT) \quad (3)$$

where NNMR is neonatal mortality rate; PNMR postnatal mortality Rate; RCURE is per capital real curative expenditure; RPREV per capita real preventive expenditure; PVRTY per cent of poor people in the population (poverty); MAB total medical attention at birth; MABI medical attention at birth in institutions; MABT medical attention at birth under trained personnel; SDP per capita real state domestic product; DPHC maximum distance (transformation)[4] from PHCSC; PPHB population per hospital bed; PPMP population per para-medical personnel; DCPHC per cent of PHCs with two doctors or more; CONEXP per capita real expenditure on purchase of commodities (within health expenditure)[7]; and LIT literacy.

The first two equations in the system determine post and neonatal mortalities as a function of MAB which is supposed to reflect the quantity of medical care, RCURE the quality of medical care (for NNMR), RPREV to reflect the level of availability of immunisation, water supply and sanitation (for PNMR) and nutrition status (PVRTY). The third equation defines total medical care as the sum of medicare at the institutions which is predominantly in the public sector and under trained personnel which is completely private medical care. The subsequent two equations determine MABI and MABT. As noted earlier, variables which influence

institutional (public) care also influence private medical care (under trained personnel) by altering the relative prices of public and private medical attention. Accessibility of infrastructure (DPHC and PPHB) queuing costs in (as reflected by (PPMP, DCPHC), and the possibility of obtaining free medicines (CONEXP) in public institutions has a strong bearing on the choice of going for private medical care. Therefore, these variables appear in both the medical care equations. Literacy, which is found to be an important determinant of medical care has been included in both the equations. In addition, SDP and PVRTY appear in private care equation to measure the impact of incomes and income distribution. In the alternative specification, the distinction between Public and Private care has been dispensed with and the total medical attention is determined in the third equation itself using all the relevant variables.

This composite model has been estimated using two stage least squares (TSL) to take care of simultaneity in the case of MAB. Estimated equations did not show serious problem of heteroscedasticity but there was a problem of serial correlation which can be attributed to the exclusion of some socioeconomic variables which have a bearing on mortality indices. To take care of this problem the the equations have been reestimated using two stage Cochrane Orcutt method (TSC)[8].

The results presented in Table 7 show that medical attention at birth and the level of public spending have a significant inverse relationship with neonatal mortality rate. Poverty and preventive expenditure per capita however, turn out to be insignificant. These variables under TSC method explained around 70 percent of inter-State variations in mortality rates.

In the case of determinants of MABI (medical care at the institutions) and MABT (private medical care) all the coefficients

except PPMP yielded expected signs under TSC method. The coefficient of this variable is, however, statistically not significant. The expected signs for PPMP, PPHB and DPHC are negative in MABI equation and positive in MABT equation as higher population coverage and greater distance from PHCSC imply higher accessibility and queuing costs and hence, lower demand for medical care at institutions. Similarly for DCPHC the expected sign is positive for MABI equation and negative for MABT equation as larger number of doctors per PHC is expected to decrease queuing costs in the institutions and at the same time increase the quality of services provided. This coefficient has yielded the expected sign in both the equations and is significant. The expected sign for literacy is positive. This variable is significant only for MABI. Level of income and poverty also yielded expected signs and both were significant.

Broadly, literacy is the most important variable determining the utilisation of institutional care although, it seems to influence private medical care as well. Among infrastructure variables, number of doctors per PHC and population per paramedical personnel seem to have stronger influence on medical care at institutions. Although these two variables showed correct signs in the case of private care, their influence on it seems to be negligible. Private care, however, is very sensitive to the level of incomes, poverty (interpreted as a proxy for income distribution) and public spending on commodity purchases in the health budget (availability of medicines in public institutions). The explanatory power of medical care equations was 91 per cent and 78 per cent respectively for MABI and MABT.

It can be seen from the above discussion that the infrastructure variables determining medical care in general act in opposite directions while determining the private and public sector components of total medical care. Thus, the net result of

these opposing forces determine the overall influence of infrastructure availability on medical care. Estimation of the composite model without distinguishing between private and public medical care shows the net effect of infrastructure on overall medical care. Results of the re-estimated model are given in Table 7. In this case, it would be difficult to say *a priori*, the expected signs for the coefficient of MAB equation. If the signs follow the pattern one expects for public care, the implication would be the overall improvement in MAB when the public institutional infrastructure expands. The signs of the coefficients obtained for MAB equation exactly followed the pattern expected for public institutional care indicating the possibility to improve the overall medical care by expanding medical infrastructure. Further, both the population coverage of infrastructure, distance from PHCSC have negative and significant coefficients, and doctors per PHC has positive and significant coefficient. This clearly indicates the possibility to improve MAB by enhancing the level of infrastructure. . While literacy and poverty have significant impact on MAB, the level of income (SDP) variable has statistically insignificant impact on medical care. The variables considered in this study explained around 80 per cent of inter-State variations in medical care.

V. Conclusions

The role of public sector in the provision of health care has increased during the Seventies with public expenditure responding faster to changes in income than the reported segment of private spending. In fact, the income elasticity of private consumption expenditure on health care was less than unity. Within the public sector, the share of State (provincial) Governments has increased during the seventies. There is, however, considerable variation in the growth of real per capita public spending across States. But in all the States, per capita real public spending

grew faster than real per capita State domestic product and in eleven out of the thirteen States covered by this study, public spending on health grew faster than the total public spending.

Commensurate with the growth in public spending medical infrastructure too expanded rapidly, particularly in rural areas. However, there is no systematic relationship between the growth of public spending and expansion of infrastructure in different States, indicating the possibility of considerable inter-State cost variations. But creation of infrastructure does not seem to have resulted in its better utilisation. Perceived need and relative costs in public institutions and private care determined the utilisation rates and consequently the overall medical care. In this context, the level of literacy was found to be important, exerting considerable influence on the perceived need for medical care. Thus, the ultimate impact of public spending appears to depend not only on its effectiveness in creating the infrastructure but also on how best the infrastructure is utilised.

Medical care at institutions has increased fairly rapidly during the period under review. The increase has been particularly impressive in rural areas. Infant mortality rates too fell in many States mainly on account of a sharp fall in postnetal mortality. Neonatal mortality however fluctuated in a few States; rising sharply during 1975-79 the period in which medical care in the institutions fell. In a large number of States, mortality rates showed a faster decline in rural areas which was probably due to the increase in medical care brought in by rapid expansion of rural health infrastructure during the seventies.

Results of the composite model show that medical attention and the level of public spending played a significant role in determining the inter-State inequalities in infant mortality rates. In contrast, poverty levels showed no significant impact. Choice of medical care from public and private sources is found to be sensitive to infrastructure variables and the level of literacy. In particular, accessibility and manpower availabilities in the public medical institutions had an important bearing on the utilisation of public institutional care as well as overall medical care. Private medical care, on the other hand, was sensitive to the level of income and its distribution and public spending on commodity purchases in the health budget. Among socioeconomic variables literacy had a strong influence on utilisation of public medical infrastructure. In particular, there was a positive association between literacy and public spending indicating the possibility of it having an influence on budgetary allocation of resources to health care. This issue needs to be looked into carefully. The results strongly suggest that infrastructure utilisation rates can be improved considerably if the resources are allocated in a manner that would reduce the costs of utilising public infrastructure.

NOTES

1 It is very likely that the reported private final consumption expenditure on medical care may be an underestimate for the following reasons. First, private final consumption estimates of expenditure on medicines as reported in the National Accounts Statistics (NAS) are based on the National Sample Survey on consumer expenditures which reports the expenditure on various consumer items. For this reason, expenditure on medicines met by the employers in the case of private and public enterprise sector workers who are not covered by the Employees State Insurance Scheme is not likely to be reported in these data. Second, even in doctor's fee component of private final consumption expenditure on health there is an element of under estimation. NAS first estimate the total personal incomes of medical professionals independently, using the incomes reported to the Income Tax Department. From this, income accruing from public sector by way of salaries is deducted and the rest is treated as accruing from private final consumption expenditure. In view of wide spread under-reporting of incomes (NIPFP (1985)), particularly by the self employed professionals, there is an element of underestimation of medical professionals incomes and hence private expenditures on doctors fees.

2. Details of the equations fitted to estimate elasticities are:

1. $\log GE = \log - 8.93 + 1.351 \text{ Log GDP}, \quad R^2 = Ø.97$
   $\qquad\qquad\qquad\qquad\qquad\quad (18.8) \qquad\qquad DW = 1.87$

2. $\log PE = \log - 2.28 + Ø.868 \text{ Log GDP}, \quad R^2 = Ø.97$
   $\qquad\qquad\qquad\qquad\qquad\quad (18.2) \qquad\qquad DW = 1.13$

3. $\log TE = \log - 4.78 + 1.Ø99 \text{ Log GDP}, \quad R^2 = Ø.98$
   $\qquad\qquad\qquad\qquad\qquad\quad (17.8) \qquad\qquad DW = 1.67$

where GE, PE, and TE are government expenditure, private final consumption expenditure and total expenditures respectively. The values of t-statistic are given in parentheses.

3. Various components of public spending on health have been deflated by appropriate price deflators (Eg. salaries and wages by consumer price index; buildings outlay by national income defaltor for construction sector and so on).

4. Distance transformation of the area covered by PHCSC is done by equating the area covered to a hexagon of the same

area and then by obtaining length of its side.

5. These data are obtained from *Sample Registration Systems* (SRS) published by the Registrar General of India (Government of India).

6. IMR data have been compiled from SRS published by the Registrar General of India. These data are fairly reliable (Jain, Anrudh, 1988, p.135) and comparable across states.

7. Data on commodity purchases are obtained from the unpublished worksheets made available by the CSO.

8. One interesting observations is that the values of coefficients by and large remained stable for most of the significant variables irrespective of method of estimation. This seem to suggest stability in the estimated coefficients.

TABLE 1

Public and Private Expenditure on Health
Aggregate Position

(Rs. million)

		Public Expenditure			Private Consmptn. Expndtre.	Total Expndtre. on Health	GDP at Factor Cost	Share(%) in Total Expndtre. Public		Public Expndtre. on Health as % of Total Health Expndtre.	Share(%) in GDP of expndtre. on Health	
		Center's (1)	States' (2)	Total (3)=(1)+(2)	(4)	(5)=(3)+(4)	(6)	Center's (7)	States' (8)	(9)	Public (10)	Private (11)
1971	i. Health	1056.8	3523.7	4580.5				23.07	76.93			
-72	ii. Fmlywelf	50.3	344.2	394.5				12.75	87.25			
	Total (i+ii)	1107.1	3867.9	4975.0	7340.0	12315.0	304300.0	22.25	77.75	40.4	1.3	1.9
1972	i. Health	1281.2	4079.8	5361.0				23.90	76.10			
-73	ii. Fmlywelf	58.5	715.0	773.5				7.58	92.44			
	Total (i+ii)	1339.7	4794.8	6134.5	7990.0	14124.5	432410.0	21.84	78.16	43.4	1.4	1.8
1973	i. Health	995.1	4476.6	5471.7				18.19	81.81			
-74	ii. Fmlywelf	47.7	480.5	528.2				9.03	90.97			
	Total (i+ii)	1042.8	4957.1	5999.9	8430.0	14429.9	537720.0	17.38	82.62	41.6	1.1	1.6
1974	i. Health	701.1	5784.6	6482.5				10.82	89.18			
-75	ii. Fmlywelf	587.8	619.9	1207.7				48.67	51.33			
	Total (i+ii)	1288.8	9401.3	7690.2	10560.0	18250.2	632630.0	16.76	83.24	42.1	1.2	1.7
1975	i. Health	1212.7	6526.3	7739.0				15.67	84.33			
-76	ii. Fmlywelf	1207.2	837.3	2044.5				59.05	40.95			
	Total (i+ii)	2419.9	7363.6	9783.5	11670.0	21453.5	883700.0	24.73	75.25	45.2	1.5	1.8
1976	i. Health	1251.5	7493.0	8735.1				10.33	85.67			
-77	ii. Fmlywelf	1440.2	1634.7	3080.9				88.94	53.06			
	Total (i+ii)	2687.7	9118.9	11818.0	13690.0	25508.0	714940.0	22.83	77.17	46.3	1.7	1.9
1977	i. Health	1545.3	8720.8	10266.1				15.05	84.95			
-78	ii. Fmlywelf	876.6	884.3	1760.9				49.78	50.22			
	Total (i+ii)	2421.9	9605.1	12027.0	14580.0	26607.0	809310.0	20.14	79.86	45.2	1.5	1.8
1978	i. Health	1690.8	10235.7	11926.5				14.18	85.82			
-79	ii. Fmlywelf	1028.1	1018.7	2046.8				50.23	49.77			
	Total (i+ii)	2718.9	11258.4	13913.3	15080.0	29053.3	972140.0	19.46	80.54	48.1	1.6	1.7
1979	i. Health	1549.4	12472.2	14021.6				11.05	89.05			
-80	ii. Fmlywelf	1084.4	1136.8	2221.2				48.82	51.18			
	Total (i+ii)	2833.8	13609.0	16242.8	15688.0	31922.9	952080.0	16.22	83.78	50.9	1.7	1.6
1980	i. Health	1658.0	15138.6	16796.6				9.87	90.13			
-81	ii. Fmlywelf	1268.6	1338.5	2607.1				48.67	51.33			
	Total (i+ii)	2926.8	16476.9	19403.7	17180.0	36583.7	1130090.0	15.08	84.92	53.0	1.7	1.5
1981	i. Health	9149.2	10943.0	20192.2				10.64	89.36			
-82	ii. Fmlywelf	1687.0	1789.1	3476.1				48.53	51.47			
	Total (i+ii)	3838.2	19832.1	23686.3	19870.0	43530.3	1304780.0	16.21	83.79	54.4	1.8	1.5
1982	i. Health	2256.7	20951.8	23202.5				8.78	90.80			
-83	ii. Fmlywelf	2848.9	2772.5	5721.4				51.54	48.48			
	Total (i+ii)	5199.6	23724.3	28923.9	22890.0	51813.8	1455650.0	17.98	82.02	55.8	2.0	1.6

Source: Government of India, National Accounts Statistics, New Delhi: C.S.O. (Various issues).
: Government of India, Indian Economic Statistics Vol.II (Public Finance), New Delhi: Ministry of Finance (various issues).
: Government of India, Combined Finance and Revenue Accounts, New Delhi: Comptroller and Auditor General (various issues).

TABLE 2

Per Capita Public Expenditure and State Domestic Product
(At constant prices)

Variable \ States@		APR	ASM	GUJ	HRY	KTK	KER	MHR	MNP	ORI	PNB	RAJ	TND	UPR	WBAS	C.V.
Curative (Rs.)	1971-75	4.28	3.57	5.01	8.01	4.27	8.79	5.11	3.4	3.8	5.07	5.18	9.7	2.88	4.82	0.28
	1975-78	5.32	4.44	8.38	8.34	8.44	8.81	5.57	4.33	4.75	7.26	5.88	7.43	3.22	5.84	0.258
	1978-83	6.88	4.82	7.81	8.87	8.56	8.48	8.85	4.88	5.68	8.86	8.31	7.91	4.85	8.68	0.247
Trend Growth Rate		4.12	3.85	5.14	1.87	5.41	3.82	3.88	4.48	4.82	5.8	2.38	1.87	4.11	3.78	-
Preventive(Rs.)	1971-75	2.57	2.22	4.43	3.88	2.55	5.13	4.88	3.38	2.38	4.37	5.38	2.28	1.45	3.42	0.373
	1975-78	3.48	2.88	4.83	4.48	2.58	4.47	5.28	2.85	3.24	5.26	8.88	2.42	2.81	3.88	0.348
	1978-83	4.58	3.88	8.22	7.88	3.87	5.43	7.38	5.37	4.88	4.83	8.81	3.88	3.81	5.88	0.374
Trend Growth Rate		7.88	8.88	4.72	8.14	2.31	8.7	5.8	8.3	8.8	1.43	8.24	8.82	8.88	8.21	-
Total(Rs.)	1971-75	8.83	5.78	8.44	8.81	8.82	11.92	8.81	8.7	8.89	10.84	10.48	8.96	4.34	8.24	0.274
	1975-78	8.81	8.84	11.18	10.74	8.86	13.28	10.85	7.28	7.99	12.52	11.88	8.85	5.23	8.84	0.245
	1978-83	10.58	8.31	13.83	14.53	8.83	14.81	14.34	10.23	10.48	13.88	10.22	11.77	7.86	11.88	0.238
Trend Growth Rate		5.27	4.47	4.88	4.88	4.28	2.54	4.7	5.35	8.48	3.82	5.52	3.37	8.15	4.78	0.278
Per capita State Domestic Product(Rs.)	1971-75	584	545	822	857	838	686	774	486	483	1888	573	583	488	648	0.327
	1975-78	687	548	881	825	681	597	888	492	456	1218	578	582	478	888	0.327
	1978-83	665	542	813	1848	715	828	886	588	512	1386	567	658	484	722	0.388
Trend Growth Rate		1.54	8.89*	2.21	2.39	1.48	8.54	2.85	8.41*	1.47	3.11	-8.11*	1.27	8.87	-	-
Total Health Expenditure as a	1971-75	1.17	1.86	1.15	1.14	1.88	1.87	1.28	1.38	1.32	8.92	1.82	1.51	8.84	1.27	
per cent of SDP	1975-78	1.45	1.27	1.4	1.18	1.35	2.22	1.21	1.51	1.75	1.83	2.82	1.68	1.1	1.42	
	1978-83	1.88	1.53	1.55	1.4	1.34	2.87	1.45	2.85	2.84	8.99	2.88	1.81	1.48	1.88	
Health Expenditure as a	1971-75	8.53	8.85	8.85	7.2	8.77	11.57	8.14	8.72	7.18	7.23	11.74	8.34	8.37	6.35	
per cent of total	1975-78	9.84	8.38	8.75	7.27	8.81	10.88	7.84	8.58	8.55	7.55	11.71	8.84	8.74	8.67	
Expenditure	1978-83	8.82	7.58	8.48	8.82	7.38	11.26	8.54	8.82	8.42	7.33	12.58	8.34	8.84	8.88	

Notes: * Indicates that the trend growth rate is statistically not significant at 10% level; C.V. is coefficient of variations.
@ List of States is given in the Appendix.
Source: Based on the sources indicated in Table 1.

TABLE 3

Infrastructure

Variable \ States@		APR	ASM	GUJ	HAR	HPR	KER	MHR	MPR	ORI	PNB	RAJ	TND	UPR	AVR.	C.V
Rural Population	1971-75	16366	29538	10463	10055	10478	10176	11526	12161	10960	11476	15417	8984	15634	13398	0.402
covered by each	1975-78	11134	20364	10209	11000	9864	10219	11141	10735	10132	11250	13489	9699	11755	12219	0.406
PHCSC	1979-82	8648	17530	9075	8582	7956	10435	8864	8928	8828	5701	11386	7965	7897	9145	0.3185
Area covered	1971-75	123	158	101	54	80	21	87	148	81	53	231	39	57	96	0.599
by PHCSC	1975-78	78	136	90	51	74	20	88	120	71	48	183	40	40	80	0.562
(Sq. KM)	1978-82	57	76	74	37	50	19	88	73	58	23	140	35	25	56	0.577
Maximum distance	1971-75	5.1	5.0	4.7	3.5	4.4	2.2	4.7	5.7	4.2	3.4	7.1	3	3.5	4.4	0.396
to PHCSC*	1975-78	4.2	5.5	4.5	3.4	4.1	2.1	4.4	5.2	4	3.3	8.4	3	3	4.1	0.286
	1978-82	3.8	4.1	4.1	2.8	3.4	2.1	3.8	4	3.8	2.3	5.8	2.7	2.4	3.4	0.285
Urban population	1971-75	302	228	446	293	300	106	425	484	195	358	296	403	331	323	0.28
per hospital	1975-78	337	284	496	307	315	100	352	509	228	271	277	339	352	318	0.313
bed	1978-82	394	232	488	423	388	115	335	708	310	109	165	496	346	341	0.482
Population per	1971-75	2415	3071	5255	17216	3022	2926	1106	3788	7496	668	3697	1151	7315	4525	0.988
medical persona-	1975-78	2388	3499	4416	10270	3112	1768	1145	3444	8929	634	3303	1077	6312	3718	0.737
nel(excl.doctors)	1978-82	2068	3379	2738	3868	2154	1185	845	2534	5392	518	2502	885	4088	2481	0.578
Percentage of	1971-75	78	34	84	88	88	100	95	81	12	58	22	98	9.1	85.5	0.548
PHCs with 2	1975-78	96	84	85	78	53	100	100	82	55	85	36	98	0.1	71.8	0.41
doctors or more	1978-82	89	88	81	88	79	100	99	81	85	89	57	98	9.1	78	0.349
TREND GROWTH RATES																
Rural population covera-ge of PHCSC		-7.21	-5.87	-2.15	-2.58	-4.28	0.24	-3.84	-8.55	-3.25	-8.12	-3.54	-1.51	-8.27		
Area covered by PHCSC		-8.65	-8.4	-4.13	-4.44	-5.84	-1.02	-4.57	-8.21	-4.84	-9.82	-5.85	-2.73	-8.93		
Maximum distance to PHCSC*		-4.43	-4.23	-2.07	-2.28	-3	-0.57	-2.33	-4.17	-2.33	-4.88	-2.98	-1.35	-5.05		
Population per hospital bed	(Urban)	3.35	0.84*	1.09	4.27	2.98	-4.8	-3.35	4.99	5.85	-13.48	-7.22	-0.18	0.34		
	(Total)	1.41	-0.02*	0.05*	2.85	1.22	-5.98	-4.47	2.7	2.12	-14.82	-8.84	-1.84*	-2.25		
Population per medical personnel (excl.doctors)		-2.89	1.63	-7.48	-10.4	-6.13	-6.5	-2.81	-4.85	-3.85	-3.87	-4.32	-3.71	-8.69		

Notes: * Indicates that the trend growth rate is statistically not significant at 10% level; C.V. is coefficient of variation.
@ List of States is given in the Appendix.

Source: Government of India, Health Statistics of India/Health Information of India (since 1986), New Delhi: Bureau of Medical Intelligence (various series).

TABLE 4

Medical Attention at Birth

Variable \ States@		APR	ASR	GUJ	HAR	KTK	KER	MHR	MPR	ORI	PRB	RAJ	TND	UPR	MEAN	C.V
Institutional	1971-75	10.8	8.6	12	2.2	15.3	33.1	22.6	9.6	7.9	2.7	4.9	21.2	3.6	11.9	0.764
(%) All areas	1975-79	12	7.9	14.2	2.6	16.5	39.2	25.4	8.7	4.1	2.6	2.6	30	2	12.9	0.936
	1979-83	16.2	15.6	14.3	7.9	19.1	51	27.7	9.7	5.3	3.5	4	32	4.6	16.2	0.851
Trained (%)	1971-75	10.5	9.5	6.5	19.3	15.6	23	5.9	6	15.5	34.4	6.6	18.9	15	14.6	0.546
All areas	1975-79	12.4	7.7	7.7	24.6	13.8	19.6	6.5	5.9	12.3	35.8	6.2	17.6	10.1	13.8	0.632
	1979-83	16.6	7.5	17.7	48.4	15	16.7	8.4	8.5	13.1	46.4	11.3	17.2	20	18.9	0.699
Trend Growth Rates Medical Attention (a)Institutional																
All areas		5.2	8.4	2.3	16.1	3.1	5.6	2.5	8.6*	-5.8	2.5*	-3.1	5.4	1.4*		
Rural areas		5.7	12.2	3.1	37.1	6	6.6	7	6.2*	-10	5*	-3.6*	7.2	2.7*		
Urban areas		4.9	8.6	1.6	10.5	8.6*	4.2	1.7	3.2	-1.3	1.7*	-1.6	2.4	3.4		
(b)Trained																
All areas		5.1	-4*	12.5	12.6	8.36*	-4	4.6	8.5*	-2.7	2.9	4.2*	8.9*	2.9*		
Rural areas		9.2	6.7*	14.5	17.3	8.68*	-3.6	3.3	3	-2.7	8.7	1.6	-8.6	7.2		
Urban areas		-2.4	-4.8	4.6	17.3	-3*	-1.6*	8.4	-4.2	-8.4	8.4	12.2	-1.5*	2.6		

Notes: * Indicates that the trend growth rate is statistically not significant at 10% level; C.V. is for coefficient of variation.
@ List of States is given in the Appendix.

Source: Government of India, Sample Registration System, New Delhi: Registrar General of India (various issues).

TABLE 5

Mortality Indicators

Variable \ States@		APR	ASM	GUJ	HAR	KTK	KER	MAH	MPR	ORI	PUN	RAJ	TND	UPR	MEAN	C.V.
Infant Mortality	1971-75	109.5	139.8	150.7	93.0	91.5	56.3	102.9	143.3	136.3	108.3	130.8	112.0	179.3	119.5	0.261
Rate	1975-78	121.9	125.3	140.0	112.0	83.5	49.7	91.0	145.0	139.0	107.0	144.7	107.5	180.3	118.9	0.278
(All areas)	1979-83	99.8	103.6	115.9	96.4	72.1	37.7	77.9	140.0	139.6	84.1	104.6	91.5	154.7	100.9	0.314
Neonatal	1971-75	87.4	78.7	76.6	46.7	56.1	34.1	60	75.2	77.7	55.9**	71.1	51.5	95.1	62.3	0.329
Mortality	1975-79	82.8	75.6	62.9	64.6	54.0	30.7	59.9	78.6	76.1	53.7	62.2	60.9	98.5	69.4	0.254
	1979-83	82.8	66.4	72.1	61.7	49.0	26.7	52.9	79.9	61.5	48.6	61.2	61.1	93.4	62.6	0.271
Postnatal	1971-75	42.1	56.1	73.9	46.3	35.4	24.3	42.8	66.1	60.8	53.5**	59.6	60.4	84.2	57.2	0.328
Mortality	1975-79	39.0	46.4	57.1	47.4	26.5	19	32.4	66.2	60.9	53.3	82.5	46.4	81.8	49.5	0.344
	1979-83	28.1	37.1	43.8	37.7	23.1	11	25.1	60.8	58.3	35.8	43.5	30.4	81.3	38.1	0.402
Trend Growth Rates																
All area		-2.5	-3.3	-2.9	1.1*	-3.0	-5.4	-3.4	-0.3	9.1*	-2.9*	-2.6	-2.8	-1.9		
Rural area		-2.4	-3.5	-2.4	1.4*	-2.6	-5.4	-3.2	-0.2	0.2*	-2.8*	-2.4	-2.3	-1.9		
Urban area		-3.2	-2.6*	-1.4	-1.1*	-2.9	-0.8	-4.5	-1.6	-1.7	-3*	-4.4	-3.2	-2.2		
Neonatal																
All area		-0.9*	-2.2	-1.0*	3.4	-1.9	-3.5	-1.7	0.7*	0.5*	-1.3	-2.0*	2.1	-0.3*		
Rural area		-0.7*	-2.3	-1.0*	3.5	-1.6	-3.4	-1.3	0.8*	0.6*	-1.7*	-1.6*	3.5	-0.2*		
Urban area		-1.4*	-1.4	0.2*	1.9*	-2.3	-5.0	-3.6	0.2*	0.1*	-1.7*	-3.9	-2.9	-0.7		
Postnatal																
All area		-5.4	-4.6	-4.4	-1.7*	-5.1	-9.0	-6.4	-1.5	-0.3*	-4.6	-3.4	-8.4	-4.0		
Rural		-5.5	-5.0	-4.4	-1.3*	-5.2	-9.1	-6.6	-1.4	-0.4*	-4.2	-3.2	-9.3	-3.9		
Urban area		-6.0	-4.4	-3.3	-4.3	-3.7	-7.9	-5.7	-3.4	-4.3	-4.3	-5.2	-3.6	-4.1		
Crude death Rate																
All areas	1971-75	15.7	17.3	15	11.9	12	8.6	12.9	16.6	17.4	11.4	15.9	14.4	21.2	14.6	0.227
	1975-79	14.3	14.5	14.6	13.1	11.5	7.7	11.5	17	16.1	11.1	15.3	14	20.6	13.9	0.228
	1979-83	11.4	12.1	12.2	10.6	9.6	8.6	6.7	15.5	13.8	9	13.5	11.6	16.1	11.6	0.224
Trend growth rates																
All area		-3.6	-4.2	-2.6	-0.8*	-2.7	-3.1	-3.2	-1.0*	-2.6	-2.6	-2.3	-2.7	-3.3		
Rural area		-3.5	-4.6	-2.6	-0.6*	-2.9	-3.2	-3.1	-0.6*	-2.9	-2.6	-2.4	-2.9	-3.2		
Urban area		-4.8	-3.2	-2.4	-1.7	-2.8	-2.4	-3.8	-1.8	-3.2	-2.8	-1.5	-1.2	-3.4		

Notes: * Indicates that the trend growth rate is statistically not significant at 10% level; C.V. is coefficient of variation.
@ List of States is given in the Appendix.
** Estimated.

Source: Same as Table 4.

TABLE 8

Correlates of Public Expenditure, Infrastructure and Morality

	Crude death rate	Infant mortality rate	Neonatal mortality	Post-natal mortality	Total medical attention at birth	Medical attention at birth institutional	State domestic product	Population per hospital bed	Population per PHCSC	Maximum distance from PHCSC	Population per para medical personnel	Per cent of PHCs with and two doctors or more	Literacy
Real curative expenditure per capita	-0.782	-0.732	-0.698	-0.655	0.743	0.544	0.537	-0.609	-0.379	-0.507	-0.317	0.529	0.649
Real preventive expd. per capita	-0.438	-0.32	-0.227	-0.31	0.197	0.071	0.399	-	-	-	-	-	0.186
Real curative expd. per area	-0.643	-0.873	-0.686	-0.559	0.647	0.784	0.228	0.228	-0.563	-0.788	-0.26	0.331	0.854
Real preventive expd. per area	-0.687	-0.659	-0.647	-0.567	0.683	0.584	0.348	-	-	-	-	-	0.774
State Domestic Product	-0.538	-0.381	-0.37	-0.332	0.499	-0.06	1	-0.499	-0.178	-0.278	-0.148	0.269	0.235
Literacy	-0.888	-0.727	-0.725	-0.619	0.76	0.812	0.235	-0.529	-0.048	-0.54	-0.386	0.479	1
Population per hospital bed	0.029	0.661	0.643	0.577	-0.592	-0.402	-0.489	1	0.231	0.346	0.306	-0.337	-0.579
Population per PHCSC	0.297	0.195	0.194	0.166	-0.321	-0.112	-0.178	0.166	1	0.596	0.017	-0.199	-0.048
Area covered by PHCSC	0.423	0.367	0.349	0.33	-0.641	-0.356	-0.28	0.291	0.589	0.893	0.025	-0.299	-0.4644
Maximum distance of PHCSC[4]	0.459	0.412	0.402	0.359	-0.705	-0.388	-0.278	0.348	0.596	1	0.058	-0.179	-0.54
Population per paramedical personnel	0.316	0.312	0.231	0.341	-0.407	-0.445	-0.148	0.306	0.017	0.058	1	-0.292	-0.386
Per cent of PHCs with 2 doctors or more	-0.627	-0.831	-0.8	-0.564	0.451	0.551	0.269	-0.337	-0.188	0.178	-0.292	1	-0.479
Poverty	0.487	0.255	0.198	0.27	-0.249	0.289	-0.736	0.32	-0.054	0.149	0.031	0.005	-0.869
Total medical attention at birth		-0.74	-0.721	-0.645	1	0.71	0.499	-0.592	-0.321	-0.705	-0.407	0.451	0.76

TABLE 7

Regression Results of the Composite Model

variable\equation	TSL				TSC				TSL	TSC
	HHHR	PHHR	HABI	HAHT	HHHR	PHHR	HABI	HAHT	HAB	HAB
Constant	77.88	109.28	-5.08	4.28	71.41	101.13	-2.97	1.01	42.0	44.5
HAB	-0.554	-0.863			-0.548	-0.865				
	(0.000)	(0.000)			(0.000)	(0.000)				
RCUHR	-3.881				-2.832					
	(0.000)				(0.060)					
HPREV		-1.588				-1.067				
		(0.015)				(0.250)				
PVETT	0.100	0.034			0.067	0.141				
	(0.181)				(0.795)	(0.400)				
PPHP			-0.048	0.006			-0.047	-0.003	-0.077	-0.002
			(0.011)	(0.706)			(0.135)	(0.932)	(0.060)	(0.000)
PPHB			-0.000	0.048			-0.108	0.352	-0.29	-0.137
			(0.000)	(0.710)			(0.530)	(0.134)	(0.011)	(0.430)
DPBC			0.008				-0.206		-5.017	-4.840
			(0.005)				(0.022)		(0.000)	(0.000)
DCPHC			0.072	-0.007			0.075	-0.035	0.052	0.048
			(0.000)	(0.007)			(0.040)	(0.471)	(0.016)	(0.174)
CONEXP			0.118	-2.599			0.079	-1.128	-0.757	-0.796
			(0.000)	(0.004)			(0.060)	(0.002)	(0.073)	(0.276)
SBP				0.027				0.029	0.001	0.003
				(0.000)				(0.001)	(0.001)	(0.580)
PHETT				-0.123				-0.259	-0.124	-0.108
				(0.119)				(0.044)	(0.078)	(0.071)
LIT			0.582	0.002			0.587	0.131	0.403	0.434
			(0.000)	(0.027)			(0.000)	(0.330)	(0.000)	(0.000)
No. of observation	156	156	156	150	156	156	156	150	156	150
R^2	0.548	0.47	0.000	0.470	0.730	0.702	0.911	0.781	0.701	0.983
F	63.77	46.77	66.20	20.00	130.44	121.82	285.4	79.65	74.31	122.10
DW	0.761	0.890	0.304	0.522	2.21	2.23	1.99	2.02	0.853	1.970
RHO					0.847	0.853	0.946	0.792		0.599

Figures in parentheses denote significance level
Eg: (0.01),(0.05) denote significance at 1 per cent and 5 per cent respectively.

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APPENDIX

LIST OF STATES

APR	Andhra Pradesh
ASM	Assam
GUJ	Gujarat
HAR	Haryana
KTK	Karnataka
KER	Kerala
MHR	Maharashtra
MPR	Madhya Pradesh
ORI	Orissa
PNB	Punjab
RAJ	Rajasthan
TND	Tamil Nadu
UPR	Uttar Pradesh