PRIORITIES IN RESOURCE ALLOCATION FOR HEALTH CARE IN INDIA: A BASIC NEEDS APPROACH

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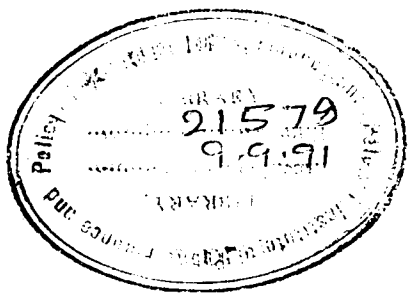

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SUMMARY

In the light of persistent low health status in India, this paper questions the development strategy followed and priorities accorded in resource allocation hitherto for health care and suggests alternative priorities based on `basic needs approach'. Of the several factors associated with health status (1) female literacy, (2) population served per nursing person, (3) percentage of couples using contraceptives (4) public health centres, sub centres, community health centres etc. per lakh of population, and (5) percentage of houseless population seem to have decisive influence on health status in order of priority. Therefore, it is suggested that budgetary allocations at all levels of government (Centre, States and Union Territories) should reflect these areas of concern which incidentally are the basic needs of people.

PRIORITIES IN RESOURCE ALLOCATION FOR HEALTH CARE IN INDIA: A BASIC NEEDS APPROACH

1. Introduction

As of 1988, health status of India (measured in terms of life expectancy at birth or in terms of infant mortality) is lower than that of many low income countries, e.g., China, Kenya, Sri Lanka, Indonesia, Vietnam etc. and much lower than middle and high income countries *(World Bank, 1990)*. It is somewhat strange that life expectancy at birth in India is 58 years only as against 70 years in China whose per capita GNP is lower than that of India by US $ 10. Two reasons seem to be responsible for such a status: One is the strategy of development followed hitherto and another is the priorities accorded by Central and State Governments in resource allocation.

The questions about strategy of development and relative effectiveness of strategies for improving health status are too complex and cannot be discussed in a short paper like this: they form a separate study by themselves. The general consensus of experts is that strategy of development based on "trickle down theory", is no longer valid as it had failed to reduce poverty and improve health status. In the words of Guy Carrin,

> "although one could certainly prove theoretically that economic growth had to accelerate the eradication of poverty, many economists felt that its impact occurred too slowly. Many stopped to believe in an instantaneous trickle down effect of economic growth..... Subsequently, a more direct

> method of poverty reduction was advocated: its aim was the direct fulfillment of basic needs such as health, clothing, sanitation, shelter, nutrition and education. It can be shown that the mentioned basic needs variables can play an important role in improving people's health. The explicit recognition of the latter leads them to a basic needs approach to health improvement. Essentially, it is an integrated approach to health care emphasizing that inadequate health services are not the only cause for poor health". *(Carrin, 1984, p.6)*.

Several international agencies like United Nations *(United Nations, 1970 and 1975)*, *World Bank (Chenery et. al., 1974)* and *ILO (ILO, 1976)* also supported basic needs approach and have been propagating it. Typical examples of countries that followed this approach were Sri Lanka, China and Indonesia. In fact, Indonesia's President has been awarded, this year, the "health for all" gold medal by the World Health Organisation (WHO) for his outstanding contributions towards realising the goal of health for all by the year 2000 AD. Briefly speaking, basic needs approach emphasises that the supply of basic needs would reduce absolute poverty more immediately than alternative strategies and ultimately determine the levels of living of population and hence their expectation of life at birth *(Drewnowski, 1979)*.

In India, priorities accorded in resource allocation among various services - general services, social services and economic services - and more so among social services in Central and State Government budgets seem to be out of alignment with basic needs approach. It appears that over a period of time little change has occurred in the structure of Government expenditure.[1] Nor there has been any increase in the share of Gross Domestic Product (GDP) devoted to health by Government.

Right from 1980-81, the share of health and health related expenditures in total expenditure of Governments (Central, State and Union Territory Governments) remained around 17 per cent or even declined marginally in the later years - from 17.69 per cent in 1987-88 to 17.67 per cent in 1988-89. Similarly, their share in GDP declined marginally from 5.41 per cent in 1987-88 to 5.20 per cent in 1988-89. This is more revealing in the case of expenditures on medical, public, health, water supply, sanitation, family welfare - known for their direct impact on health status - as their share in total expenditure and GDP remained constant or even declined marginally during 1987-88 and 1988-89. It implies that resource allocation was not in full conformity with the objectives of health policy of Government - that is, the achievement of health for all by 2001 AD. An important reason for that could be the vagueness about the determinants of health status and the priorities that had to be given in allocation of resources. It is high time now - barely 9 years to go to keep up the objectives of health policy - to go into the determinants of health status and arrive at a consensus and reorder the priorities in resource allocation. In what follows a modest attempt is made towards that end.

2. Determinants of Health Status

In this connection, it may be stated that there is no dearth of information on determinants of health status. Several studies have been made world over on the health determinants; the studies of ***Sheehan and Hopkins, 1978; Wheeler, 1980; Norman Hicks, 1982; Wolf and Behrman, 1983; Carrin, 1984; Merrick, 1985; Wood (Jr.), 1988; Chandrasekhar, 1972; Nag, 1983; Jain, 1988; Chandrasekhar et. al., 1989; Tulasidhar and Sarma, 1989,*** are typical illustrations. The common observation of these studies is that reduction in fertility, improvement in sanitary and housing conditions, increase in calories intake, education of

parents, control of diseases and improvement in health services help reduce infant mortality rate, child death rate and crude death rate and in turn increase overall level of living, along with expectation of life at birth. More specifically, the studies of ***Winikoff and Brown 1980; Scrimshaw et.al. 1968; Puffer and Serrano, 1973; Yayasuriya and Soysa, 1974; Chandra 1979; Sorkin 1976; Wintrobe et.al. 1970,*** show positive association of nutrition with health status; the studies of ***Van Zijl, 1966, Schliessman, 1959; Koopman, 1978; Sharpston 1976,*** confirm positive association of housing and environmental sanitation with health status. The studies of ***Cochrane et.al. 1980; Behrman and Wolf, 1979; Schultz 1979; Anker and Knowls, 1977; Wood Jr. 1988; Wolf and Behrman, 1983; Merrick, 1985,*** indicate positive association of literacy, particularly of women with health status; the studies of ***Morley et.al 1968; Gopalan and Rao, 1969; Wray 1971,*** indicate negative relationship between family size and spacing of children, and the study of ***Kunstadter 1978*** point out strong association between birth order of children and mortality risk for them. But, all the studies (except that of ***Norman Hicks, 1982),*** by and large refrain from mentioning priority areas for resource allocation to improving health status. Their mere mentioning of certain factors having positive or negative association with health indicators, although useful in other contexts, does not resolve resource allocation problem; for, health and other basic needs sectors are closely related to each other and simultaneous improvement in all sectors is extremely difficult in a developing country like India, where resources are very scarce.

The study of Norman Hicks - a cross country study on sectoral priorities in meeting basic needs - luckily provides some statistical evidence as to the priorities that developing countries should follow. But such an evidence is of limited significance to India because India is different from other developing countries in several respects, e.g., size of

population, wider inter and intra regional disparities in economic development, out-moded traditions, religious beliefs, etc. and therefore, the priorities shown by Hicks cannot be mechanically applied for India. Priorities based on Indian data, taking into account relevant factors may help guide resource allocation optimally and keep pace with the spirit of basic needs approach in achieving health for all by 2010 AD, if not by the end of 2000 AD.

3. Methodology

The following is the methodology followed by us. The model employed by Norman Hicks *(Hicks, 1982)*, has been closely followed. If his is the study across the selected countries, ours is the study across the selected States in India. Correlation and regression techniques have been used to find out the relative relationship of basic needs variables with health status (measured in terms of life expectancy at birth or infant mortality rate or crude death rate or in terms of all the three). Beta co-efficients have been calculated in multiple regression analysis **(See Table 6)** to facilitate comparison of the relative importance of each explanatory variable in explaining the variation in health status, both within and across the equations. Of the 25 States in India, only 14 States have been selected, partly because of data availability and partly because of atypical character of rest of the States. They are: (1) Andhra Pradesh, (2) Bihar, (3) Gujarat, (4) Haryana, (5) Karnataka, (6) Kerala, (7) Madhya Pradesh, (8) Maharashtra, (9) Orissa, (10) Punjab, (11) Rajasthan, (12) Tamil Nadu, (13) Uttar Pradesh and (14) West Bengal **(See Appendix 1)**. Due effort has been made to ensure comparability of data among variables. Latest data have been used to the possible extent and wherever Census data had to be depended upon, 1981 Census figures have been used **(See Table 2)**. The selection of variables has been based on theoretical or empirical evidence available without losing sight of specific and peculiar characteristics of India.

In regard to variables concerning broad basic needs areas, only those variables have been chosen which have positive relation with health sector. But as is well-known, the basic needs are highly related with each other and multi-collinearity problem had to be tackled. To overcome this problem, partially at least, variables have been chosen after looking at the correlation matrix of all the selected variables. The sampling of variables for various indicators for various stages of analysis is dealt with in respective sections.

Next, there is the problem of a small number of observations and a large number of basic needs variables, each having some impact on the health status. This has been tackled by selecting, as small a number of explanatory basic needs variables as possible. Variables chosen are such that they represent specific areas of concern for intervention to improve health status and have some commonness for comparison of ranks in deciding priorities based on correlation and regression methods. Macro variables like per capita income, per capita expenditure on health, percentage of population below the poverty line, etc. have been excluded from the study; the reason being that they do not represent specific areas of concern even though they might have their own share in explaining variation in health status.

The variables finally selected for the study are: (1) infant mortality rate (IMR), (2) crude death rate (CDR) and (3) life expectancy at birth (LEX) as dependent variables to represent health status and (1) crude birth rate (CBR), (2) population served per doctor (PPD), (3) hospitals and dispensaries per 1000 sq. km. area (HDK), (4) hospital and dispensary beds per lakh of population (HDB), (5) public health centers, sub-centers, etc. per lakh of population (PHC), (6) percentage of couples using contraceptives (PCC), (7) percentage of urban population with

access to safe water (UPW), (8) percentage of urban population with access to sanitation (UPS), (9) percentage of literate population (LIT), (10) percentage of female literacy (FLT), (11) percentage of houseless population (PHP), and (12) population served per nursing person (PPN) as explanatory variables to represent basic needs.[2]

4. Correlation Analysis

At first, simple correlation co-efficients have been calculated to have an insight into the nature of relationship among the broad basic needs indicators - that is, explanatory variables **(See Table 3)**. It can be seen that correct signs came for all the co-efficients, as expected. Also it is evident that CBR has high correlation with HDK, HDB, PCC, LIT, FLT and PPN while PPD has significant relationship with only PPN. Further, it can be seen that HDK has a significant relationship with HDB, LIT and FLT, while HDB is highly related to LIT, FLT and PPN. There is a significant relationship of PHC with PCC and UPS, of PCC with UPS, LIT, FLT and PPN; of UPW with UPS and of LIT with FLT and PPN. Similarly, the correlation between female literacy and population served per nursing population is significant and negative. It is interesting and at the same time confusing, because it indicates that employment of female nurses is the consequence of growth of female literates! It can be argued the other way round also, that an increase in the proportion of female literate population would result in opting for nursing jobs - as is the case in Kerala. This correlation matrix shows that the basic needs variables are highly correlated with each other and one cannot exactly identify cause and effect relationship and relative priorities.

Hence, (because of peculiar correlation of basic needs variables among themselves) all the three health status variables have been chosen for the study - (i) infant mortality rate (IMR), (ii) crude death rate (CDR) and (iii) life expectancy at birth (LEX) - and coefficients of correlation were calculated with each of the explanatory variables **(See Table 4)**. It can be seen that variables having significant relationship with IMR are also having significant relationship with CDR and LEX, although the degree of significance is different in each case.

The above process of calculation has led to the identification of 8 common variables, namely, CBR, PPD, HDK, HDB, PCC, LIT, FLT and PPN out of a total number of 12 explanatory variables having significant relationship with health status. The variables having a significant relationship with none of the indicators of health status were again common four, namely, PHC, UPW, UPS and PHP. It is somewhat surprising that percentage of houseless population (PHP) was not related to IMR, CDR or LEX, significantly, for which no satisfactory explanation is possible. One can understand that UPW and UPS may not significantly explain the variation in total health status of the country, as the percentage of urban population is only 23.31 (according to 1981 Census).

At the final stage of correlation analysis, a set of important basic needs variables, for regression analysis and final ranking, has been selected. This has been done to overcome the multi-collinearity problem, to whatever little extent possible, and to reduce the constraint of a small number of observations for multiple regression analysis. For this, alternative combinations of explanatory variables were tried for regression with the three indicators of health status. On the basis of the results, the combination of FLT, PPN, PCC, PHC and PHP was retained for final ranking.

The selection of five variables, PHC, PCC, PPN, FLT and PHP for regression analysis, finally, however does not mean that rest of the variables not so selected, were negligible in explaining health status. It only means that the excluded variables may well be represented by the selected variables in the present model, with due backing from the statistical inference. Similarly, the selected variables are not (infact should not) to be taken for granted as the only important variables in explaining the variation in health status. But within these five variables, we can measure their order of priority in a very broad manner so as to provide the direction in which government policy should move for improving health status in India. Therefore, these five variables only were selected on the basis of their correlation with IMR, CDR and LEX (the three indicators of health status).

5. Regression Analysis

Taking the above five explanatory variables, FLT, PPN, PCC, PHC and PHP, multivariate regression equations were calculated. In all, three equations were taken conforming to the three dependent variables IMR, CDR and LEX. And their results are presented below:

$$IMR = 60.570 - .937\ FLT + .013\ PPN - .375\ PCC + 1{,}591\ PHC + 12.300\ PHP \quad \ldots\ldots\ldots (1)$$

$$CDR = 10.577 - .069\ FLT + .001\ PPN - .088\ PCC + .159\ PHC + .604\ PHP \quad \ldots\ldots\ldots\ldots (2)$$

$$LEX = 54.868 + .130\ FLT - .001\ PPN + .255\ PCC - .430\ PHC - 2.778\ PHP \quad \ldots\ldots\ldots\ldots (3)$$

It is evident from R^2 in Table 5 that 89 per cent of the variation in IMR is explained by the five explanatory variables. In equation (1) the coefficients of FLT and PPN are significant at 5 and 1 per cent levels respectively. In equation (2), the same explanatory variables explain about 84 per cent variation in CDR. The significant coefficients are that of FLT and PPN at 5 and 10 per cent levels respectively. Equation (3) with life expectancy as the dependent variable, provided the best results with significant R^2 and with most of the coefficients being significant. Here the same five independent variables explain 86 per cent variation in life expectancy. The coefficient of PCC is significant at 5 per cent level while that of FLT, PPN and PHC at 10 per cent level (See Table 5).

In all the three multiple regression equations, the coefficient of PHP is not significant. Yet the variable is retained in the equations, because its absence makes wide distortions in the results. Similarly, the variable of PHC reported wrong sign in all the three equations, while all other variables have the correct sign. It may be mentioned here that none of the other equations tried, provided satisfactory results.

At the third and final stage, beta coefficients for all the 3 regression equations have been calculated to see the relative importance of all the five explanatory variables, PHC, PCC, FLT, PHP and PPN, both within and across the equations in explaining variation in health status (see Table 6). Then these beta coefficients of multiple regressions have been ranked to find out the determinants of health status or areas of our concern in order of priority.

6. Findings and policy implications

Based on the rankings made through correlation and regression techniques, the final score for all the variables under consideration has been obtained. The final score is the average of the ranks arrived at in all the six steps for each variable (See Table 7). The variable obtaining the lowest average rank is considered as the area of highest priority , female literacy and the variable obtaining the highest average rank is considered as the area of lowest priority, e.g. housing. Accordingly, when ranked, the following areas of basic needs emerged as the priority areas (in the descending order of preference) for resource allocation:

Percentage of female literates
Population served per nursing person
Percentage of couples using contraceptives
Public health centres, sub-centres, community health centres, etc. per lakh of population
Percentage of houseless population.

Female literacy, topping the priority areas for improving the health status in India need not surprise health economists. It only means that inputs of medical care - nursing person, public health centres, provision of contraception, etc. - will be less effective in the absence of female literacy. The causal relationship between female literacy and health may look sound, because educated women having the information and knowledge about hygiene are likely to improve sanitary conditions of their households and inmates therein. Better sanitary conditions, personal cleanliness, use of clean water etc., reduce disease rate and therefore improve health status, particularly of the infants.

But it may be noted that the findings of this study have to be viewed with due care and caution for policy making. For, conclusions deduced from statistical analysis of the variables which are correlated with each other, may not fully indicate the direction of cause and effect relationship. This may create doubt on the exact determination of relative importance of variables in explaining health status. However, despite the above limitations, the findings of this study may be of some use - particularly in the context of ad-hoc and incremental budgetary policies pursued by governments - in resource allocation among various items of expenditure in social services.

Table 1

Share of Budgetary Expenditure on Health and Health related items in total Expenditure (Governments of Central, States and UTs) and GDP (at current market prices)

Year		Medical, Public Health, Water Supply & Sanitation	Family Welfare	Education, Art & Culture	Housing	Social security & Welfare	Total expdt. on Health and Health related items (1 - 5)
		(1)	(2)	(3)	(4)	(5)	(6)
1980-81	(a)	4.57	0.41	9.87	0.61	0.82	16.28
	(b)	1.19	0.11	2.57	0.16	0.21	4.24
1981-82	(a)	4.76	0.47	10.02	0.71	0.87	16.83
	(b)	1.21	0.12	2.55	0.18	0.22	4.28
1982-83	(a)	4.67	0.61	10.22	0.67	0.90	17.07
	(b)	1.26	0.17	2.76	0.18	0.24	4.61
1983-84	(a)	4.85	0.70	10.03	0.68	1.05	17.31
	(b)	1.31	0.19	2.70	0.18	0.28	4.66
1984-85	(a)	4.54	0.64	9.82	0.58	1.02	16.60
	(b)	1.31	0.19	2.84	0.17	0.30	4.81
1985-86	(a)	4.54	0.70	10.13	0.55	0.91	16.83
	(b)	1.32	0.20	2.95	0.16	0.26	4.89
1986-87	(a)	4.44	0.62	9.76	0.67	1.09	16.58
	(b)	1.39	0.19	3.05	0.21	0.34	5.18
1987-88	(a)	4.66	0.63	10.69	0.59	1.12	17.69
	(b)	1.43	0.19	3.27	0.18	0.34	5.41
1988-89	(a)	4.54	0.61	10.82	0.55	1.14	17.66
	(b)	1.34	0.18	3.18	0.16	0.34	5.20

Notes: (a) Share in total Government expenditure
(b) Share in GDP (at current market prices)

Sources: (1) Government of India, Ministry of Finance, Indian Economic Statistics 1984, 1988, 1990.
(2) Government of India, Central Statistical Organisation, National Accounts Statistics, 1989 (New Series), 1990

Table 2

Dependent and Independent Variables - Their Notations and the periods to which they belong

Dependent Variables: (Health Status)	1.	Infant Mortality Rate (IMR) : 1986-88
	2.	Crude Death Rate (CDR): 1986-88
	3.	Life Expectancy (LEX): 1978-80
Independent Variables: (Basic Needs)	1.	Crude Birth Rate (CBR): 1986-88
	2.	Population served per doctor (PPD): 1987
	3.	Hospitals and dispensaries per 1000 sq. km. area (HDK): 1989
	4.	Hospital and dispensary beds per lakh of population (HDB): 1989
	5.	Public health centers, sub-centers, CHC per lakh of population (PHC):1988
	6.	Percentage of couples using contraceptives (PCC): 1990
	7.	Percentage of urban population with access to safe water (UPW): 1987
	8.	Percentage of urban population with access to sanitation (UPS): 1987
	9.	Percentage of literate population (LIT): 1981
	10.	Percentage of female literacy (FLT): 1981
	11.	Percentage of houseless population (PHP): 1981
	12.	Population served per nursing person (PPN): 1986

Sources:

1) For LIT, FLT and PHP, Census of India, 1981

2) For LEX, PPD and PPN, Govt. of India, Ministry of Health and Family Welfare, Health Information: India, 1988

3) For IMR, CDR, CBR, HDK, HDB, PHC and PCC, Centre for Monitoring Indian Economy, Basic Statistics, Basic Statistics Relating to Indian Economy, Vol. 2, States, Sept. 1990.

4) For UPW and UPS, Centre for Monitoring Indian Economy, Basic Statistics, Basic Statistics Relating to Indian Economy, Vol. 2, States Sept. 1989

Table 3

Correlation Matrix of Explanatory Variables

	CBR	PPD	HDK	HDB	PHC	POC	UPW	UPS	LIT	FLT	PHP	PPN
CBR	1.000											
PPD	.467	1.000										
HDK	-.644	-.243	1.000									
HDB	-.773	-.358	.968	1.000								
PHC	-.251	.198	.148	.176	1.000							
POC	-.550	-.118	.430	.485	.809	1.000						
UPW	-.136	-.049	.057	.173	.254	.489	1.000					
UPS	-.396	-.207	.258	.387	.528	.551	.614	1.000				
LIT	-.865	-.339	.871	.937	.216	.549	.254	.449	1.000			
FLT	-.873	-.369	.901	.954	.220	.544	.199	.407	.991	1.000		
PHP	.123	-.170	.021	.085	.205	.248	.405	.348	-.045	-.079	1.000	
PPN	.701	.543	-.477	-.609	-.329	-.619	-.444	-.322	-.589	-.624	-.205	1.000

Note:

CBR = Crude birth rate

PPD = Population served per doctor

HDK = Hospitals and dispensaries per 1000 sq. km. area

HDB = Hospital and dispensary beds per lakh of population

PHC = Public health centers, sub-centers, etc per lakh of population

POC = Percentage of couples using contraceptives

UPW = Percentage of urban population with access to safe water

UPS = Percentage of urban population with access to sanitation

LIT = Percentage of literate population

FLT = Percentage of female literacy

PHP = Percentage of houseless population

PPN = Population served per nursing person

Table 4

Correlation of Explanatory Variables with Dependent Variables

Explanatory Variables	Dependent Variables		
	IMR	CDR	LEX
CBR	.817	.824	-.762
PPD	.666	.627	-.621
HDK	-.723	-.650	.736
HDB	-.816	-.772	.793
PHC	-.120	-.269	.281
PCC	-.506	-.650	.676
UPW	-.278	-.386	.287
HPS	-.388	-.499	.405
LIT	-.815	-.811	.785
FLT	-.848	-.823	.822
PHP	.070	-.026	-.036
PPN	.808	.786	-.763

Note : For expansion of abbreviations, see Table 2.

Table 5

Regression Equations

Dependent Variable(s)	Intercept	Explanatory Variables					R^2	F Value
		FLT	PPN	PCC	PHC	PHP		
IMR	60.570	-.937[b]	.013[a]	-.375	1.591	12.300	.889[a]	12.792
	(2.399)	(-2.723)	(2.948)	(-.627)	(1.202)	(.968)		
CDR	10.577	-.069[b]	.001[c]	-.088	.159	.604	.837[a]	8.238
	(3.934)	(-1.893)	(1.671)	(-1.375)	(1.127)	(.446)		
LEX	54.868	.130[c]	-.001[c]	.255[b]	-.430[c]	-2.778	.857[a]	9.561
	(10.167)	(1.771)	(-1.498)	(1.990)	(-1.518)	(-1.022)		

Notes: 1) Figures in parentheses are t' values

a - Significant at 1 per cent level

b - Significant at 5 per cent level

c - Significant at 10 per cent level

2) For expansion of abbreviations, see Table 2.

Table 6

Beta Coefficients of Multiple Regression Equations

Explanatory Variables	Multivariate Regression Equations					
	IMR	Rank	CDR	Rank	EEX	Rank
FLT	.4797	2	.4040	2	.3543	3
PPN	.5130	1	.3520	3	.2957	4
PCC	.1830	4	.4862	1	.6597	1
PHC	.2775	3	.3152	4	.3979	2
PHP	.1257	5	.0701	5	.1507	5

Note: For expansion of abbreviations see Table 2.

Table 7

Overall Ranks

Explanatory Variables	Correlation			Multiple Regression			Total Score (Average Rank)
	IMR	CDR	LEX	IMR	CDR	LEX	
FLT	1	1	1	2	2	3	1.67
PPN	2	2	2	1	3	4	2.33
PCC	3	3	3	4	1	1	2.50
PHC	4	4	4	3	4	2	3.50
PHP	5	5	5	5	5	5	5.00

Note: For expansion of abbreviations see Table 2.

Appendix 1

Selected Dependent and Independent Variables

Sl. No.	States	Dependent Variables			Independent Variables											
		IMR 1986-88	CDR 1986-88	LEX 1978-80	CBR 1986-88	PPD 1987	HLK 1989	HDB 1989	PHC 1988	POC 1990	UPW 1987	UPS 1987	LIT 1981	FLT 1981	PHP 1981	PPN 1986
1.	Andhra Pradesh	81	9.9	55.7	29.6	2004	5.1	68	22.5	45.2	62.4	15.9	30	20	0.5	1467
2.	Bihar	100	13.2	52.3	36.8	4746	4.2	40	19.7	26.3	63.6	38.4	26	14	0.1	3187
3.	Gujarat	98	10.4	54.5	30.8	8090	37.9	150	30.5	56.6	93.4	79.2	44	32	0.9	2179
4.	Haryana	87	9.1	58.6	34.4	5668	6.6	61	25.0	58.3	100.0	35.3	36	22	0.3	2239
5.	Karnataka	74	8.7	58.5	28.9	1602	7.9	94	24.5	45.4	98.7	59.9	38	28	0.3	1313
6.	Kerala	28	6.2	66.5	21.4	1843	106.4	292	21.7	51.9	65.6	29.6	70	66	0.1	691
7.	Madhya Pradesh	120	13.7	50.2	36.8	7104	1.6	43	24.2	40.2	80.5	9.7	28	16	0.6	1803
8.	Maharashtra	66	8.5	58.1	29.4	1718	35.8	152	27.1	56.4	99.7	62.2	47	35	0.9	856
9.	Orissa	124	12.8	50.8	31.7	6297	3.3	49	26.5	40.7	37.1	26.8	34	21	0.2	3897
10.	Punjab	64	8.2	62.8	28.6	5128	38.1	133	38.5	74.2	71.2	51.0	41	34	0.3	409
11.	Rajasthan	104	12.2	52.5	34.8	3556	4.3	64	20.2	29.6	54.5	9.1	24	11	0.5	1911
12.	Tamil Nadu	77	9.5	55.9	23.4	6958	7.0	98	28.0	56.2	88.2	47.4	47	35	0.1	779
13.	Uttar Pradesh	128	14.1	46.8	37.4	16560	8.5	48	25.0	33.8	69.3	13.9	27	14	0.1	3421
14.	West Bengal	70	8.8	55.1	30.2	2105	10.8	99	23.4	33.9	68.3	39.6	41	30	0.2	1644
	Mean	87.21	10.38	55.59	31.01	5421.40	19.82	99.36	25.49	46.34	75.18	37.00	38.07	27.00	.36	1842.60
	Standard Deviation	27.40	2.41	5.16	4.80	3966.80	28.30	67.47	4.78	13.36	18.94	21.34	12.04	14.03	.28	1064.90
	Coeff. of Variation	.31	.23	.09	.15	.76	1.43	.68	.19	.29	.25	.58	.32	.52	.77	.58

Note: For expansion of abbreviations and sources of data see Table 2 in the text.

NOTES

1. It may please be noted that government expenditure refers to the amounts budgeted by Central Government, State Governments and Union Territories on medical and public health. It does not include substantial sums spent by departmental and public sector enterprises - at the behest of Central Government, State Governments, Union Territories and local bodies. It does not include considerable sums spent by various ministries/departments in Central and State governments on health care and grants given by governments to various private hospitals and voluntary organisations under one scheme or the other. Attempts are being made to quantify the total out go from government towards health care in India at NIPFP. It is unfortunate that no estimates, official or non-official, are available in India on this.

2. It may please be noted that each explanatory variable has been chosen after careful examination and statistical evidence. The rationale lying behind each explanatory variable and the hypothesis concerning it are as follows:

   1. Crude Birth Rate (CBR)

      (i) CBR is positively related to infant mortality rate (IMR) and crude death rate (CDR). For higher the CBR, lower will be the nutritional level and more will be insanitation and housing congestion. As a result, IMR and CDR will be higher due to increase in disease rate.
      (ii) CBR is negatively related to life expectancy at birth (LEX) and reasons are the same as in (i).

   2. Population Served per Doctor (PPD)

      (i) PPD is positively related to IMR and CDR. For higher the PPD, less will be the attention and care available per person or patient.
      (ii) PPD is negatively related to LEX and the reasons are the same as in (i).

   3. Hospital and Dispensaries per 1000 sq.km. area (HDK)

      (i) HDK is negatively related to IMR and CDR. For nearer the hospitals and dispensaries from the people, more will be the people to have access

to medical facilities, more people will be conscious of health and consequently better utilisation of medical facilities.

(ii) HDK is positively related to LEX and the reasons are the same as in (i).

4. Hospital and Dispensary Beds per lakh of Population (HDB)

(i) HDB is negatively related to IMR and CDR. For more hospital and dispensary beds provided, more patients will get intensive care for the cure of the diseases. Thereby incidence of various diseases will be reduced.

(ii) HDB is positively related to LEX and the reasons are the same as in (i).

5. Public Health Centres, Sub Centres, CHC per lakh of Population (PHC)

(i) PHC is negatively related to IMR and CDR. For more the hospitals like public health centres, sub centres and community health centres, more people will have access to medical facilities, more people will be conscious of health problems. This will lead to better utilisation of medical facilities and consequent reduction in disease rate.

(ii) PHC is positively related to LEX and the reasons are the same as in (i).

6. Percentage of Couples using Contraceptives (PCC)

(i) PCC is negatively related to IMR and CDR. For, more the percentage of couples using contraceptives, less will be the birth rate. This will reduce population per household and also overall growth rate of population. Housing and sanitation problems will be reduced. Nutritional level will improve. Children will receive better care. All the above factors will reduce IMR.

(ii) PCC is positively related to LEX and the reasons are the same as in (i).

7. Percentage of Urban Population with access to safe Water (UPW)

(i) UPW is negatively related to IMR and CDR. For, higher the percentage of urban population having access to water supply, lower will be the

possibility of insanitation in urban household; there will be less water-borne diseases and people will maintain personal hygiene. This will reduce IMR and CDR.

(ii) UPW is positively related to LEX and the reasons are the same as in (i).

8. Percentage of urban Population with Access to Sanitation (UPS)

(i) UPS is negatively related to IMR and CDR. For, higher the percentage of urban population with access to sanitation facilities, lower will be the disease rate.

(ii) UPS is positively related to LEX and the reason is the same as in (i).

9. Percentage of Literate Population (LIT)

(i) LIT is negatively related to IMR and CDR. For, higher the percentage of literate population, there will be more consciousness among the people towards health. Better hygienic and housing conditions will be managed and nutritional level will improve through higher income of the educated people. Health education will also lead to better utilisation of health facilities.

(ii) LIT is positively related to LEX and the reasons are the same as in (i).

10. Percentage of Female Literacy (FLT)

(i) FLT is negatively related to IMR and CDR. For, literate women are likely to improve the household and personal sanitation of the family to provide better care for the children. So IMR and CDR will be reduced.

(ii) FLT is positively related to LEX and the reasons are the same as in (i).

11. Percentage of Houseless Population (PHP)

(i) PHP is positively related to IMR and CDR. For, higher the percentage of houseless population, more will be the sanitary problems, lower will be food and nutritional level. The result is that disease rate will be higher and IMR and CDR will be higher.

(ii) PHP is negatively related to LEX and the reasons are the same as in (i).

12. Population served Per Nursing Person (PPN)

(i) PPN is positively related to IMR and CDR. For, more the population to be served per nursing person, less will be the care and attention available per patient. So IMR and CDR will be higher.

(ii) PPN is negatively related to LEX and the reasons are the same as in (i).

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