



Is provision of healthcare sufficient to ensure better access? An exploration of the scope for public-private partnership in India

Sabitri Dutta^{1*}, Kausik Lahiri²**Abstract**

Background: India's economic growth rate in recent years has been fairly impressive. But, it has been consistently failing to make considerable progress in achieving health related Millennium Development Goal (MDG) targets. Lack of coherence between provisions and utilization becomes the face of the problem. Inadequacies in outreach, access and affordability coupled with escalating healthcare costs have aggravated the problem. Here the application of Public-Private Partnership (PPP) model seems to have enormous potential to ease the impasse.

Methods: This paper tries to find the gap between the provisions and access in healthcare. The paper attempts to construct a Health Infrastructure Index (HII) and Health Attainment Index (HAI) for different states of India. Considering the presence of regional variations found in health infrastructure and attainment among the states, two states, viz. Maharashtra (MAH) and West Bengal (WB) have been chosen. Then contributions of health programs like Rashtriya Swasthya Bima Yojana (RSBY), National Rural Telemedicine Network (NRTN) and Fair Price Shops (FPS), all PPP initiatives, have been assessed for both the states by carrying out comprehensive benefit-cost analysis.

Results: The health infrastructure for population per unit area captures the outreach/delivery issue and the health attainment reveals the true scenario about how far the infrastructure has been accessed by the people; and the gap between the two, as the paper finds, is the root of the problem. The combined effect of RSBY and NRTN will leave both MAH and WB higher benefits in terms of health attainment. The contributions of RSBY and NRTN have been assessed for both the states by carrying out comprehensive benefit-cost analysis. FPS comes up with immense benefits for WB. It is yet to be implemented in MAH.

Conclusion: The outreach and access problems arising from deficiencies in infrastructure, human resources and financial ability are expected to be well-addressed by the spread of RSBY and NRTN jointly. The FPS mechanism under PPP initiative can be an effective tool in solving affordability problem by reducing the cost of treatment.

Keywords: Health Infrastructure, Health Attainment, Public-Private Partnership (PPP), Benefit-Cost Analysis

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Key Messages

Implications for policy makers

- Healthcare outreach/delivery and financing are the major bottlenecks in achieving the targets. Infrastructure does not necessarily ensure attainment unless the facilities reach the population who are in real need of this. Outreach and access to the health services have been identified as two major areas where the country lags. Lack of spread of the services to every remote corner of the country leads to the outreach problem; where the financial incapability of the general population to avail the required health facility is the origin of access problem. Moreover, the exorbitant prices of the medicines make the situation harder for ordinary people. Hence, building healthcare infrastructure and addressing healthcare financing issues are the calls of the hour.
- Public-Private Partnership (PPP) in the health sector can be an effective way out. Three policies viz. Rashtriya Swasthya Bima Yojana (RSBY), National Rural Telemedicine Network (NRTN) and Fair Price Shops (FPS) under PPP initiatives can be possible solutions.
- Combination of NRTN and RSBY can help overcome the outreach/delivery and healthcare financing constraints. A combined expansion of the two programmes has the potential to generate benefits which may not be possible in the absence of any one.
- The medicines can be supplied to the public at much cheaper rate through the FPS mechanism. Hence, it can address the affordability problem by reducing a major part of the cost of treatment.

Implications for public

The programs under Public-Private Partnership (PPP) initiatives are likely to ensure better quality service at affordable price all over the country and the Millennium Development Goals (MDGs) related to health will no longer appear unreachable for an emerging country like India.

Background

The Millennium Development Goals (MDGs) put a special emphasis on health. Three out of eight goals are related to health. India has failed to achieve considerable progress in MDG targets in health indicators (1). The mortality rate for children under five years of age in India tends to be 50 per thousand birth by the end of 2015 against the MDG target of 42 per 1,000 live births. For maternal mortality ratio India is expected to fall short of the 2015 target by 26 points. India made a significant effort in reducing the incidences of HIV/AIDS, Malaria, tuberculosis (TB), and other diseases (2). The gap between the targets and achievements of MDGs needs special attention on the part of the Government. The failure to achieve the targets indicates problems in any or all of provision, outreach, access and affordability. Percentage of Gross Domestic Product (GDP) in India spent on health is as large as 4% in 2012 (3). It is almost impossible to achieve the targets through the public sector expansion alone over a finite time frame. The only solution may lie in the adoption of Public-Private Partnership (PPP) as an institutional breakthrough in the health sector. The World Bank (2001) and the National Commission on Macroeconomics in Health (2005) advocated inclusion of the private sector in achieving health related goals and making both public and private sectors more accountable. The Tenth Five-Year Plan (2002–7) also stressed the need for private sector participation in the delivery of healthcare services.

In Indian federal structure health is a subject of both centre and state. So adoption and implementation of any policy in this sector is likely to experience an inter-state variation. For a successful MDG achievement three aspects are crucial, viz. provision, utilization and attainment. Any mismatch among these may lead to failure of the entire system. This paper investigates the gap between the provisions and access and hence utilization and attainment of healthcare services among the target population in India. For that purpose attempt has been made to construct a Health Infrastructure Index (HII) and Health Attainment Index (HAI) for different states of India. On the basis of these indices two states, Maharashtra (MAH) (a high performing state) and West Bengal (WB) (an average performer) have been selected.

Utilization of healthcare facilities again depends on affordability and access to these services that involve the cost of care or Out-of-Pocket (OOP) expenditure of the patient. This cost could be both medical and non-medical in nature. The medical cost includes cost of medicine and other related expenses including that incurred due to hospitalization or for availing diagnostic facilities, and so on. Non-medical part includes travel to the place of treatment, loss of wage due to travelling etc. Effective strategy can be adopted in these cases through PPP initiatives. Though a large number of medicine shops or diagnostic centers are available, there is an absence of effective competition among them; a tacit collusion through implicit market sharing agreement is apparent. To break this market power the governments of different states of India have decided to go for open bidding where a part of the infrastructure support will be provided by public and private will supply medicines and implants at significantly below the Maximum Retail Price (MRP) level. The medicines can be supplied to the patients at a reduced

cost through fair price mechanism and can be implemented through setting up Fair Price Shops (FPS) in the public hospitals. The cost of hospitalization treatment can be taken care of by Rashtriya Swasthya Bima Yojana¹ (RSBY) program where for the household living below the poverty line the cost of hospitalization would be reimbursed even when the treatment is carried out in the private institutions. Similarly, the non-medical expenses can be addressed by the program of National Rural Telemedicine Network (NRTN). All of these three programs are implemented through PPP mechanism. The paper analyzes the spread and prospect of FPS, RSBY, and NRTN in two selected states to assess the outreach expansion through enhancement of e-connectivity and smoothening out of financial risks in terms of insurance coverage and provision of supply of medicine at reduced cost. In fact, spread of telemedicine network is believed to play an important catalytic role in eliminating the time and space constraints of healthcare delivery system. Cost saving by the consumer (patient) is expected to be very beneficial in terms of financial access (non-medical) apart from geographical barriers of the outreach problem of healthcare delivery. Again, the RSBY scheme is currently acting as a very good example of PPP in India, in both healthcare service delivery as well as healthcare financing in the form of affordable health insurance scheme. About 129 million poor people are currently registered with approximately 37 million households covered under the scheme.

The rest of the paper is organized as follows: section 2 (Programs) discusses three programs separately. The methodology of developing HII and HAI as well as method adopted to assess net benefit of NRTN, RSBY, and FPS programs are discussed in section 3 (Methods). Section 4 (Data) provides details the available data sources in India at the state level; section 5 (Results) presents the main findings and elaborates the rationale behind selecting MAH and WB as two representative states. Section 6 (Discussion) discusses the results and reports the status of NRTN, RSBY, and FPS under PPP in the selected states. Section 7 (Conclusion) concludes the paper by highlighting major findings and indicating their health policy implications.

Programs

Fair Price Shops (FPS)

The price monopoly of the drug manufacturers is broken in this system through PPP mechanism. The drugs are procured through tender and by pursuing doctors to prescribe by the generic name. These medicines are made available at fair price medicine shops located at the Government hospitals. Patients are made aware that generic medicines are of the same quality i.e. in identity, purity, strength and effectiveness as branded medicines. The basic purpose of the system is to make available quality medicines, surgical items, cardiac implants, anti-cancer drugs, prosthetic and orthopedic devices at a cheaper cost so that patients can get the best advantage. The space for the shops is provided by the Government hospitals and the private partners are selected through an open bid. The highest bidder in terms of discount given on the medicine is chosen. Both Generic and branded generic medicines are sold. It is thought to be useful in India where 65% of the population still lacks regular access to

essential medicines, with the rise in healthcare cost; over 23% of the sick do not seek treatment because they are not having enough money to spend (4).

With programs like NRTN and RSBY, it is expected that there will be increased participation of the weaker section of the population in healthcare market due to increased connectivity through NRTN and increased financial support through RSBY. In both these cases, the support is not confined to the publicly owned resources (infrastructure, service and manpower) alone; there is wide scope for PPP.

Rashtriya Swasthya Bima Yojana (RSBY)

The RSBY scheme covers protection up to Rs. 30,000 on a floater basis as hospitalization benefits. Fixed rates have been determined for intervention packages and it covers pre-existing conditions without any age bar. It covers up to five members per family including the head of the household, spouse and three dependants. The beneficiaries need to register to the scheme with minimal fees of Rs. 30 per family. The premium burden of the policies is shared by the Central and the State Governments in 75:25 ratios. Selection of the insurers is done through competitive bidding. Both private and public insurers are allowed to be involved in the scheme. Similarly both public and private healthcare institutions are eligible for empanelment under the scheme and are very strictly monitored.

National Rural Telemedicine Network (NRTN)

The NRTN covers three levels: Networking Primary Health Centers (PHCs) to District Hospitals (Level-I), District Hospitals to State/Super-specialty Hospitals (Level-II), interconnected State/Super-specialty Hospitals (Level-III) and also mobile units connected to nearest PHCs and District Hospitals (Level-M), all connected through high bandwidth fiber optic/satellite connection. Medical opinions, consultation, diagnosis and surveillance are possible at a very cost effective and efficient manner through telemedicine network spread across the country.

Methods

This section discusses methodology developed for: (i) constructing different HIIs, (ii) HAI, and (iii) that to estimate potential (net) benefit generated by the selected out-reach programs.

Health Infrastructure Index (HII)

HIIs have been constructed by incorporating three different dimensions: (a) purely public health infrastructure related components like hospital beds for per 100,000 population, absolute number of government hospitals (including Community Health Centers and PHCs), number of doctors, nurse and pharmacists per hospital; (b) the hygiene related indicators like the source of drinking water and the types of latrine used by the households, and (c) the accessibility dimension captured in terms of availability of infrastructure per square kilometer of population (population density) to shed light on the congestion factor. Principal Component Analysis (PCA) has been used for determining the endogenous weights to combine this information, λ_j being the Eigen value for the j th factor (f_j). HII_1 considers factors (a) and (b)

whereas HII_2 considers all the three dimensions.

$$HII_i = \sum_j \lambda_j f_j / \sum_j \lambda_j, i=1,2$$

Where,

f_j : j th factor obtained from PCA

λ_j : eigen value for j th factor

$$HII_i_final = (Actual_HII_i - Min_HII_i) / (Max_HII_i - Min_HII_i)$$

Applying this formula on suitable data² for both HII_1 and HII_2, 3 factors have been extracted by PCA with the associated Eigen values exceeding unity³, and the indices explained 83% to 85% of total variation in health infrastructures across states.

Health Attainment Index (HAI)

Three indicators have been selected to construct the HAI. The percentage of population completed the full course vaccinations (V); the percentage of Non-Anemic (NA) persons and the mean Body Mass Index (BMI) for each state are the chosen set of variables. The health of an individual largely depends upon his/her resistance against the communicable diseases. So, in the analysis completion of vaccination is taken as an indicator of health attainment as it builds the required resistance against the communicable diseases. The incidence of anemia may again affect this resistance power. State wise percentage of population who are not suffering from anemia is considered as healthy and hence added in health achievement indicators of the state. In addition, a healthy person with resistance against diseases should always have a standard BMI which reflects the body physique and hence wellness of the person. The average BMI across the states is the third factor taken to form the HAI. National Family Health Survey-3 (NFHS-3) provides information on all these three variables. The BMI and NA data are given separately for males and females. A weighted average has been calculated for the variables with percentage of males and females in the total population of the state as the weights. First each of these variables has been normalized to bring them to same scale of variation. Finally simple average of V, NA and BMI is taken to construct the final HAI. As this have a huge range of values it has further been indexed as (Actual value-minimum value)/(Maximum value-minimum value).

$$HAI = \frac{Avg.BMI_n + Avg.NA_n + V_n}{3}$$

where

$$xk_n = (Actual_xk - Min_xk) / (Max_xk - Min_xk); k=1, 2, 3$$

x_1 : BMI, x_2 : NA, x_3 : V

$$Avg_p = (m*y_{p-m} + w*y_{p-w}) / (m+w); p=1, 2$$

m : % of males in total population

w : % of females in total population

y_{p-m} : y_p for males

y_{p-w} : y_p for females

y_1 : BMI, y_2 : NA

Benefit-cost estimation of selected out-reach targeted programs

NRTN: The National Telemedicine Task Force was set up by the Ministry of Health and Family Welfare, GoI, in 2005. Central and the different state governments are setting up telemedicine centers with technical guidance and assistance from Indian Space Research Organization (ISRO). Under

National Rural Health Mission (NRHM), telemedicine has the potential to expand service base to the remote places in absence of physical infrastructure.

Cost: The cost of telemedicine network across the states consists of important components: (i) Cost of network connectivity, (ii) Fixed cost of installing computer set-up in the receiving stations, (iii) Fixed cost of medical devices, and (iv) Recurring cost of running the network. With the given number of PHCs, District Hospitals and State/Super Specialty Hospitals (facilities) per state the as well as given infrastructural requirements for these, let the fixed cost per capita be F_{CM} for MAH and F_{WB} for WB.

Total Fixed Cost for first level= $FC_i = \text{No. of total facilities involved} \times \text{unit fixed cost per facility}$

Total Recurring Cost for first level= $RC_i = \text{No. of total facilities} \times \text{unit recurring cost per facility}$

$l=1,2,3,M$

$$\text{Per capita Fixed Cost (FC)} = \frac{\sum_i FC_i}{\text{Population}}$$

$$\text{Per capita Recurring Cost (RC)} = \frac{\sum_i RC_i}{\text{Population}}$$

The fixed investment is expected to depreciate over a period of 5 years after which it would be required to get replaced. So, the annualized value (A_t) with an interest rate of 15% would be:

$$A_{t-M} = \left[\sum_{t=0}^5 \left(\frac{1}{1+0.15} \right)^t \right]^{-1} xFC_M \text{ for MAH and}$$

$$A_{t-WB} = \left[\sum_{t=0}^5 \left(\frac{1}{1+0.15} \right)^t \right]^{-1} xFC_{WB} \text{ for WB.}$$

where F_{CM} : Fixed cost for NRTN in MAH,

F_{WB} : Fixed cost for NRTN in WB,

$N_C = \text{Per capita cost for NRTN} = A_t + RC$; $A_t = \text{annualized per capita fixed cost for NRTN}$,

$RC = \text{recurring cost of NRTN per Capita}$.

Benefit: The per capita benefit from NRTN is calculated as the per capita OOP expenditure on non-medical expenses for healthcare including travel, food and other services related to treatment but not strictly related to illness for the Below Poverty Line (BPL) population.

$N_B = \text{Per Capita Benefit for NRTN}$

$\text{Per Capita Net Benefit} = (N_B - N_C)$

RSBY: It was launched by the Ministry of Labour and Employment (GoI) in 2008 as a health insurance scheme for the BPL population of the country to provide financial assistance to the target group against huge OOP expenditure on health. The main objective of the scheme is to include the targeted population into the healthcare net by putting forward the much needed financial assistance through health insurance protection.

$R_C = \text{Per capita cost for RSBY} = (\text{Premium per family} / \text{No. of family members registered for RSBY})$

$R_B = \text{Per capita benefit for RSBY} = (\text{Amount of claims in rupees} / \text{No. of claims})$

$R_{NB} = \text{Per capita net benefit} = (R_B - R_C)$

FPS: No specific methodology has been used for cost-benefit

analysis of FPS in these two states. Only the reduced cost of medicines in the FPS is reported in comparison to the MRP to show the extent of potential benefit on the part of the patients.

Data

For this study relevant data have been collected from several sources. The National Health Profile 2005 (5) published by the Central Bureau of Health Intelligence (CBHI), India provided information on indicators of health required for construction of the HII. CBHI mainly compile data collected through a system called Sample Registration System (SRS)⁴ (6). The relevant information used in the study includes the number of hospitals, beds, doctors, nurses and pharmacists in 28 states of India including Delhi⁵. It also uses hygiene related information like drinking water source and type of sanitation from National Sample Survey Organisation (NSSO) 60th round (2004) (7) household survey data⁶. The survey provides all household related information (like house type, structure, social group, religion, monthly expenditure of household, type of latrine, drainage, drinking water source, etc.) along with information on hospital access, reasons for not being treated, medical and non-medical expenses and on morbidity at the individual level: whether the individual is ailing over the last 15 days before the survey (yes/no type) or not⁷.

HAI uses state wise data on percentage of population completed the full course of V, percentage of NA population and the average BMI. Information provided by NFHS-3, 2005-6 (8) has been used for the analysis⁸. Population data has been taken from Census 2001 (9) where data is collected on complete enumeration basis. The ailments in this case are the self-reported morbidity by the informant⁹.

The supply side data required for the analysis of telemedicine (NRTN Network) and provision of social health insurance (RSBY) have been collected from the relevant official websites as well as respective State Government sources and some demand side information has been extracted from NSSO 60th round household level data.

Results

Comparative position of states in terms of Health Infrastructure Index (HII) and Health Attainment Index (HAI)

When the health infrastructure is represented in terms of availability of medical institutions, medical persons and provision related to hygiene and sanitation at per capita basis (HII_1) then the correspondence between HII and HAI is 0.61 with a high level of statistical significance. This endorses the popular policy orientation of creating better infrastructure to attain better health status. However, once the spread of this infrastructure across the state has been taken into consideration by expressing everything in terms of population density (population per square kilometer), the picture changes drastically. Now, the correlation between HII_2 and HAI is statistically insignificant indicating location-based concentration of health infrastructure. This observation leads us to the question that how the specifically targeted outreach programs are helping to even out this inherent bias in the provision of infrastructure and related amenity services? We have already selected three such program, viz. FPS, NRTN, and RSBY and now for in-depth investigation we will choose 2 states from the whole set of 28.

Table 1. HII by states of India^a

Sl. No.	State	Population density	HII_1	HII_2	HAI	Sl. No.	State	Population density	HII_1	HII_2	HAI
1	AP	275	21.73	54.67	46.35	15	MP	196	11.56	47.21	31.07
2	ARP	13	40.76	58.91	44.42	16	MAH	314	20.08	98.61	60.54
3	ASM	340	12.42	26.01	15.49	17	MNP	107	22.23	19.18	72.86
4	BHR	880	5.36	32.63	17.46	18	MEG	103	22.99	26.03	44.38
5	CHGH	154	3.89	37.35	32.29	19	MIZ	42	26.23	15.07	68.31
6	DEL	9294	99.89	43.14	88.07	20	ODI	236	4.70	40.66	30.60
7	GOA	363	82.27	33.30	88.55	21	PUN	482	31.95	37.22	91.95
8	GUJ	258	24.86	54.49	47.37	22	RAJ	165	15.82	63.99	30.85
9	HAR	477	23.17	36.14	61.77	23	SIK	76	45.03	1.34	72.71
10	HP	109	24.79	45.66	70.20	24	TN	478	25.61	48.13	77.89
11	JK	99	25.10	42.19	64.46	25	TRI	304	32.55	26.21	26.77
12	JKND	338	1.02	26.60	0.05	26	UP	689	4.16	36.65	31.27
13	KAR	275	24.35	58.80	55.42	27	UTRK	159	53.71	41.40	51.47
14	KER	879	24.26	20.50	99.95	28	WB	904	25.74	39.67	40.94

HII= Health Infrastructure Index; HAI= Health Attainment Index.

^aAll India Average: HII_1= 27.01, HII_2= 39.71, HAI= 52.27; Corr (HII_1, HAI)= 0.61 (significant), Corr (HII_2, HAI)= 0.07 (insignificant).

Source: Authors' calculation.

In [Table 1](#) the values of HII_1, HII_2 and HAI are reported for 28 states of India.

Maharashtra (MAH) vis-à-vis West Bengal (WB): a comparative analysis

In terms of both HII_1 and HII_2, WB's scores (25.74 and 39.67) are marginally below the all India average scores (27.01 and 39.71) whereas for MAH the corresponding scores are 20.08 and 98.61 respectively, indicating a drastic change in the relative position in terms of inclusion of the out-reach dimension. While WB is representing an average state, MAH is extremely favorably placed in terms of uniform spread of health facilities over the entire state. In terms of health attainment, the value of HAI for MAH is 60.54 and that of WB is only 40.94. The all India average score is 52.27, which is closer to that of MAH. Though in terms of both HII_1 and HII_2, WB is pretty close to all India score, in terms of attainment it is lagging far behind. So, access to provision is appeared to be a weak point for WB and strong point for MAH. It would be interesting to compare the performance of FPS, NRTN, and RSBY programs in these two states to see how they are deriving benefits from these specifically targeted out-reach expansion programs in the health sector.

Program evaluation

Benefit and cost (RSBY): RSBY scheme has the potential to expand the healthcare base for the BPL population. Average premium of RSBY per family comes to Rs. 372 for MAH and Rs. 346 for WB ([Table 2](#) fourth block). With an average of 3.5 members per family registered for RSBY (10), the per capita cost comes to Rs. 106 for MAH and Rs. 99 for WB. Again, the value per claim can be regarded as the benefit that accrues to the consumers (patients). This comes out to be Rs. 4,817 per capita for MAH and Rs. 5,941 per capita for WB. Thus the net benefit of RSBY comes to Rs. (4,817–106)= Rs. 4,711 for the former and Rs. (5,941–99)= Rs. 5,842 per capita for the latter. After suitable price adjustment this comes to Rs. 3,780 for MAH and Rs. 4,711 for WB at 2008–9 prices.

Benefit and Cost (NRTN): The OOP expenditure on non-medical expenses for healthcare including travel, food and other services related to treatment but not strictly related to

illness for the BPL population approximately comes out to be Rs. 400 for MAH and Rs. 330 for WB ([Table 2](#)). After suitable price adjustment it comes to Rs. 524 for MAH and Rs. 432 for WB at 2009 prices. With free NRTN services envisaged by the Government, the entire amount accrues as benefit to the people.

Since the population density of WB (904/ km²) is much higher than that of MAH (314/ mk²) the fixed cost per capita is equal to Rs. 61 for MAH and Rs. 35 for WB while the recurring cost per capita is estimated to be Rs. 24 and Rs. 14 for the states respectively. The fixed investment is expected to depreciate over a period of 5 years after which it would be required to get replaced. So, the annualized value (A_t) with an interest rate of 15% would come up to Rs. 14 for MAH and Rs. 8 for WB. Thus, the per capita total cost of NRTN becomes Rs. 38 (fixed cost + recurring cost) for MAH and Rs. 22 for WB. The annual cost of accessing the service of HealthSAT, a dedicate satellite for telemedicine related networking comes out to be approximately equal to Rs. 1.1 billion (11). This is expected to provide service to 802 million rural people with a per capita cost of Rs. 1.5 (approximately) (12). After suitable price adjustment it comes to Rs. 1.75 approximately. This added to the total cost amounts to Rs. 40 per head for MAH and Rs. 24 per head for WB.

The net benefit will be Rs. (524–40)= Rs. 484 for MAH and Rs. (432–24)= Rs. 408 for WB. According to NSS data the reported morbidity of the BPL population is 14.50% in MAH and 15% in WB. With spread of telemedicine a 10% increase in reported morbidity would generate a net benefit of Rs. 2.15 billion for MAH and Rs. 1.82 billion for WB.

FPS: No cost-benefit analysis has been carried out as such for FPS. The difference in the price of the medicines in open market shops and that in the FPS where the medicines are sold in generic name is shown in [Table 3](#). Benefits from the system have been tried to be made out from this information. On the part of the Government the entire system requires only space for opening FPS. As this space is already there in the Government hospitals and does not require any additional infrastructure, marginal cost for the program, on the side of the Government, is effectively zero. In the private front, the cost of advertisement for any particular brand gets

Table 2. Estimation of per capita net benefit from NRTN and RSBY programs

Demography ¹	MAH	WB	Public hospital ²	MAH	WB	Treatment availed ³	MAH	WB
Population	97 mn	80 mn	Primary	1,809	909	Morbidity (%)	20	20
BPL (%)	25	27	Secondary	23	15	Morbidity (BPL) %	14.50	15
Area (km ²)	308 K	89 K	Tertiary	897	291	In public hospital	28	72
Population density	314	904	Private hospital ⁴	3,023	2,013	In private hospital	72	28
Untreated BPL⁵			Treatment not availed (BPL)⁶			Average expenditure incurred (BPL)⁸		
Morbidity (%)	15	15	No facility (%)	25	14	Medical (Rs.)	3,476	2,009
Without treatment (%)	7	9	No money (%)	33	36	Non-medical (Rs.)	400	330
NRTN⁹ (Cost and net Benefit)⁷								
Level-I (Rs. mn)	5,018	2,901	Level-III (Rs. mn)	4,132	1,341	Total cost (Rs. mn)	9,492	4,465
Level-II (Rs. mn)	147	96	Level-M (Rs. mn)	195	127	Per capita Cost (Rs.)	85	49
Per capita fixed cost (Rs.)	61	35	Per capita recurring cost (Rs.)	24	14	Per capita net benefit (Rs.)	484	408
RSBY^c (cost and net benefit)⁸								
Enrolment			Claims			Receipt & Payment		
Family	510,753	5,368,404	Count	59,478	526,898	Premium/ policy (Rs.)	372	346
Individual	1,787,636	18,252,574	Disbursed (Rs. mn)	286.50	3,130.20	Receipt/ policy (Rs.)	4,817	5,941
Per capita cost (Rs.)	106	99	Per capita gross benefit (Rs.)	4,817	5,941	Per capita Net Benefit (Rs.)	780	4,711

NRTN= National Rural Telemedicine Network; RSBY= Rashtriya Swasthya Bima Yojana; BPL= Below Poverty Line; MAH= Maharashtra; WB= West Bengal. ^a Monetary values in 2008–9 prices. ^b Monetary values in 2006–7 prices. ^c Monetary values for MAH in 2011-2 prices and for WB in 2013–4 prices.

Source: Authors' calculation by collating information from different sources; 1: (9) 2001; 2: Official sites of the respective state governments; 3, 5, 6 (7,13, 14); 4: (15); 7: (16); 8: (10).

Table 3. Drug price comparison: generic name versus brand name

Disease/use generic/name of drug	Generic name of drug	Pack size	Generic drug tender Price (Rs.)	Equivalent popular brand	MRP of Branded Medicine
Pain killer	Diclofenac sodium tablets IP 50 mg	10 tab strip	Rs. 1.24	Voveran (Novartis)	Rs. 31.73
Cholesterol lowering drug	Atorvastatin tablets IP 10 mg	10 tab blister	Rs. 2.98	Atrova (Zydus)	Rs. 103.74
Heart diseases	Clopidogrel tablets IP 75 mg	14 tab strip	Rs. 8.54	Plavix (Sanofi)	Rs. 1,615.68
Diabetes	Glimepiride tablets IP 2 mg	10 tab strip	Rs. 1.95	Amaryl (Aventis)	Rs. 117.40

MRP= Maximum Retail Price.

Source: Reference 17.

reduced. This is because in such shops drugs sold are either generic or branded generic. In case of generic without brand, the advertisement cost of the manufacturer is absent. In case of branded generic a group of medicines (with different generic name) are sold under the same brand umbrella. So advertisement for drugs with different names sold under a particular brand is not needed, only brand advertisement is sufficient. This indicates that the marginal cost of such program is very low whereas the benefit is huge. Benefits outweigh cost and therefore it is worth implementing. The FPS under PPP has already started in WB. It has launched Fair Price Medicine shops in the secondary and tertiary hospitals in the state. No such specific attempt has so far been noticed in MAH.

Discussion

As mentioned earlier our choice of study remains restricted to MAH and WB. In Table 2, we briefly report the demography and infrastructural availability related to healthcare for WB and MAH. The availability of private infrastructure (in terms of hospitals alone) is, in manifold, larger in both MAH and WB compared to the public network alone (as mentioned in Table 2 first block). Therefore PPP could be the strategic instrument to expand outreach at an affordable price. Clearly, from Table 2 MAH is ahead of, WB in terms of, absolute number of available infrastructure. Fifteen percent of BPL population in WB and 14.50% of BPL population in MAH is morbid with approximately 9% and 6.50% of them

in WB and MAH not receiving any treatment. Interestingly, among those who have availed the treatment the morbidity percentages of the BPL category are lower than the average morbidity rates of the two states. This reveals the fact that healthcare services remain out of the reach of a high percentage of the BPL population, keeping in mind the fact that data reflects reported morbidity only. Among the major reasons of not getting treated are lack of facilities and financial reasons. This conforms to the infrastructural deficiencies and financial inability to meet healthcare demand. Moreover, high OOP expenditures, both for non-medical and medical purposes for healthcare keep high percentage of population, who actually need it, out of the healthcare market. Study by Chatterjee (18) revealed that the perceived need for healthcare culminates from actual need, availability, ability and affordability. This raises the issue of social justice regarding availability and affordability of healthcare of the population in need. With greater overall access to public healthcare facilities in WB (72.28%) than in MAH (28.33%), the average expenditure for healthcare is lower in WB than in MAH. Expansion of telemedicine services through the NRTN would enable the remotely located people to avail healthcare services within their region without outbound travel saving travel cost as well as time. NSSO 60th round survey database on 'Morbidity and Health Care' data reveals that the high percentage of not availing any medical attention arises from: (i) absence of facility within reach, (ii) long waiting time, (iii) lack of fund to finance healthcare related services, and (iv)

not considering the ailment serious enough to be reported. It is expected that reported morbidity rates for the BPL population would be higher and the left out population will have enough incentive to avail the benefits of healthcare with available NRTN coupled with financial access through RSBY, thus the gap, even between reported morbidity rate through NSSO and RSBY would lessen.

From Table 2 it is evident that WB is way ahead of MAH in terms of RSBY coverage. It is expected that the target population will soon be reached in both the states to cover the entire BPL population. WB has now got a dedicated website for RSBY unlike MAH. An important fact is revealed from Table 2. The ratio of number of claims to the number of individuals registered for RSBY reflects the morbidity scenario among the BPL population. It reflects that only 2.88% of the BPL population is morbid, according to WB data. This is in sharp contrast to what we find in Table 2 (15%). Since WB is a state where RSBY has reached a fair amount of coverage, this gap reflects the non availability of infrastructure for the deserving population, especially in the remote rural areas. Moreover, high OOP expenditure related to non-medical expenses for healthcare, not covered by RSBY still deters a high percentage of population in need from availing the healthcare services. In face of reduced public share of healthcare facilities, it is evident that without a prepared market the private sector participation would not be ensured in remote rural areas. A matured insurance market such as RSBY could have catalytic effect in preparing rural markets for healthcare.

Table 2 also produces a net benefit of Rs. 4,711 for WB and Rs. 3,780 for MAH at 2009 prices. Moreover, with Rs. 382.82 being the per capita per month poverty line for WB (2004) and Rs. 362.25 the per capita per month poverty line for MAH (2004), the annual value of per capita BPL incomes becomes Rs. 5,400 for WB and Rs. 5,100 for MAH after suitable price adjustment. Rs. 30,000 potential coverage per year for implies a 555% of annual income coverage for BPL population of WB and 588% of annual income of BPL population for MAH. As per RSBY coverage of 3.5 persons per family (10), if we calculate with two earning members per family with 1.5 dependant members, the annual income per family per year is expected to be Rs. 10,800 for WB and Rs. 10,200 for MAH. With Rs. 30,000 floating coverage of RSBY, it covers 278% of the annual income of BPL families in WB and 294% of the BPL families in MAH. With morbidity coming as a shock and the treatment part leading to disastrous outcomes in terms of burden leading to medical poverty trap for most of the deserving population. With high potential coverage as proportion of annual income, the potential benefit is very high even if family is taken as unit. This coverage in turns protects the families from the potential medical poverty trap. Considering a combined effect of RSBY and NRTN, the expected net benefit per capita comes to Rs. 5,186 for MAH and Rs. 5,110 for WB for the deserving population. Thus a 10% more spread of the duo would result in Rs. 22.58 billion for MAH and Rs. 22.63 billion for WB for the deserving BPL population alone which is approximately 0.24% and 0.52% of the gross State Domestic Product (SDP) of the respective states. Since NRTN network is for all, the resultant benefit is expected to be more than as estimated. Population density being higher in WB and MAH being spread across larger

area, the benefits of telemedicine would expectedly serve MAH more. Though MAH is one of the better performers in India in terms of health infrastructure and health attainment indices and WB is an average performer in these respect, both States will be in a position to benefit largely from the expansion of RSBY as well as NRTN projects

Medicines take the major share in treatment cost. Drugs are different from other consumer items. So the free market economy and the price competition cannot make the prices lower for them. Branding in drugs creates artificial monopoly and drug manufacturers are able to keep the MRP higher in spite of presence of competitors in the market. The need for the drugs is always urgent. Consumers of drugs are vulnerable. The branding and high MRP make the situation worse especially for those who come from poor economic background. Table 3 compares the price of some common life saving medicines when sold in generic name and in branded pack. The difference is enormous as revealed from the table. If the drugs are sold through FPS in generic name it would be of immense benefit for the people who avail public healthcare services. The mechanism has been extremely successful in WB. The OOP expenditure of the patient for treatment is 6.15% of the average annual SDP of the state out of which 66% is spent on medicines only (19). FPS was introduced in the state in the end of 2012. The present scenario says, as mentioned in the article, that the patients who are admitted in the hospitals are getting more medicines free of cost, Government doctors are prescribing 60% generic drugs on an average and most importantly the cost of treatment for medicines has reduced. Since end of 2012, 93 stores have become operational selling medicines at a discount ranging from 47% to 67% of the MRP quoted in the open market to all customers. The data provided by the state health ministry shows that for 35 FPS, during December 2012 to November 2014, total discount availed by the people is as large as 250 crores that have benefited 85 lakh persons (20). This puts enough evidences that FPS under PPP can be one of the solutions to the problem of affordability for the healthcare services. The example of WB can be an instance for other states including MAH which has not adopted any such policy so far.

Conclusion

Health is the key issue in the MDGs set for the countries globally. In spite of having a dramatic economic growth rate and food surplus India has failed to make significant progress in achieving the MDG targets. Infrastructure does not necessarily ensure attainment unless the facilities reach the population who are in real need of this. Outreach, affordability and access to the health services have been identified as the major areas where the country lags. The health infrastructure for population per square kilometer captures the outreach/delivery issue and the health attainment reveals the true scenario about how far the infrastructure has been accessed by the people; and the gap between the two, as the paper finds, is the root of the problem. On the basis of infrastructure and attainment indices two states have been chosen for the further analysis. MAH, being a better performer in both, has been selected as an above average state; WB is chosen as an average/below average state in terms of the indices mentioned. Lack of spread of the services to every remote corner of the country

leads to the outreach problem; where the financial incapability of the general population to avail the required health facility is the origin of access problem. Solution is hardly possible using only the public resource. A joint initiative from public and private both may work well. PPP in health is therefore an efficient way out. NRTN, RSBY, and FPS under PPP come extremely effective when used together in a combination. A combined expansion of the three schemes will generate the estimated benefits which may not be possible without any of the three. Separately the outcome may be lower rate of morbidity reporting as found for RSBY in WB. Thus under the combined influence of these three social programs, the outreach and access problems of healthcare delivery system in India can be tackled. PPP becomes the most crucial and useful instrument for a successful implementation of the programs. With the present pace of progress a convergence between WB and MAH is expected in next few years. The validation of the hypothesis is possible when more updated data in the relevant field would be available. Programs undertaken under PPP schemes are likely to lead to better equity prospects and social justice for the population under the aegis of globalization and privatization especially for a conceptually changing good like healthcare.

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Ethical issues

No primary survey of any sort has been done in the study, and hence no data has been collected from human subjects directly. So, the ethical issues are clear for the paper.

Competing interests

Authors declare that they have no competing interests.

Authors' contributions

SD: locating the gap between health infrastructure and health attainment, methodology for index construction and discussion, data exploration and analysis, PPP mechanism in FPS, discussion. KL: addressing the access and outreach problem on the basis of three Government sponsored health schemes in India (NRTN, RSBY and FPS), methodology for cost and benefit analysis and discussion.

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Endnotes

1. RSBY: Rashtriya (National) Swasthya (Health) Bima (Insurance) Yojana (Plan).
2. Section 3 discusses the data sources.
3. For HII_1 the Eigen values are (2.36, 1.50, 1.12) and for HII_2 the Eigen values are (2.67, 1.25, 1.15).
4. The sample design adopted for SRS is a uni-stage stratified simple random sample without replacement.
5. The administrative status of Delhi has been changed from Union Territory to State in 1993.
6. NSSO collects data from all Indian states and union territories through stratified random sampling technique.
7. It has been established by NSSO through several experiments carried out on optimal recall period that for temporary indisposition recall is most reliable over

last 15 days only. The remote memory of any temporary ailment is not retained over a longer period barring the exception of hospitalization episode. So, here for hospitalization episode the reference period has been taken as 1 year and for other ailments, last 15 days.

8. NFHS-3 uses two-stage sampling design for villages and three-stage sampling design for urban areas. The design is based on probability proportional to population size (PPS) method, stratification and systematic sampling method.
9. It may be noted that some ailments may be treated (either as an inpatient of a hospital or otherwise) and some untreated – both the cases are considered here. A person under medication for an ailment during the reference period, whether he/she felt sick or not, is treated as ailing; cases of complications arising during pregnancy or after childbirth are considered as ailment; untreated injuries like cuts, burns, scald, bruise etc. of minor nature are not considered unless the informant considered them to be severe enough.

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