Journal of Finance and Economics, 2013, Vol. 1, No. 4, 118-127
Available online at http://pubs.sciepub.com/jfe/1/4/9

DOI:10.12691/jfe-1-4-9

Assessment of Progress Made in Health Infrastructure and Manpower through NRHM and Their Impact in Reducing IMR in India

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Received September 13, 2013; Revised November 14, 2013; Accepted December 11, 2013

Abstract One of the prime objectives of the National Rural Health Mission (NRHM) is to reduce the Infant Mortality Rate (IMR) in India. Different strategies adopted for child health under NRHM are directed to reduce IMR. Using review of available data sources and published literature, the paper aims to examine the impact of NRHM initiatives like health infrastructure and manpower in reducing IMR. The mission had set specific targets; these include a reduction in the infant mortality rate to 30 per 1000 live births. At the national level, there was a decline in the infant mortality rate from 58 per thousand live births in 2005 to 44 in 2011 (all India) after implementation of NRHM. The IMR in focus states like Bihar fell from 61 to 44, in Madhya Pradesh from 76 to 59, in Rajasthan from 68 to 52 and in Assam from 68 to 55. However, 14 states/UTs have already achieved MDG 4 of IMR. These figures are, however, still dismal even when compared to the target IMR rate of 30 under NRHM. Thus the NRHM has had an impact but a rather limited one.

Keywords: *IMR, NRHM, health infrastructure, manpower, India*

Cite This Article: M. R. Singariya, "Assessment of Progress Made in Health Infrastructure and Manpower through NRHM and Their Impact in Reducing IMR in India." *Journal of Finance and Economics* 1, no. 4 (2013): 118-127. doi: 10.12691/jfe-1-4-9.

1. Introduction

India's National Rural Health Mission (NRHM) was launched in 2005 and in the last seven years of the implementation of the mission the infant mortality rate declined from 58 in 2005 to 44 in 2011. The annual rate of decline of IMR accelerated by about 37 percent in between 2005-11 (after the inception of NRHM in 2005) as compared to 2000-2005. This is expected to show even better performance after latest survey results are known. While there has been a significant improvement in the rate of reduction of IMR, there is still a need to improve further [1].

Seven years ago, the National Rural Health Mission (NRHM) was launched with the aim to provide accessible, affordable and accountable quality health services to the poorest households in the remotest rural regions. With barely three years of the mission remaining, it may be worthwhile to take a look at the progress that has so far been made in achieving the objectives that had been set out. A preliminary assessment of the programme, based on health indicators, shows that the government has had very limited success in achieving its objective to establish a fully functional, community-owned, decentralized health delivery system.

The mission was launched to correct the skewed access to health care facilities between the urban and rural areas. While there were a plethora of schemes that catered to the healthcare needs of urban areas, there was little that had been done to set up a functioning rural health care system. One of the main reasons for inequalities in access to health care facilities between the rural and urban areas was the lack of good medical infrastructure in rural areas of most states, particularly Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Jammu and Kashmir, Manipur, Mizoram, Meghalaya, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Uttarakhand and Uttar Pradesh. Because the NRHM was specifically aimed at removing infrastructural (both physical and human) bottlenecks that resulted in unequal access, states with unsatisfactory health indicators and/or with weak infrastructure were classified as high focus states to ensure that efforts were concentrated where it was most needed.

In India, during 1968-70, the level of IMR was stable at 130 deaths per 1000 live-births. Following the Alma Ata Declaration of 1978, the Government of India envisaged a national goal for the attainment of an IMR of 60 by the year 2000. Since then, substantial resources have been put into the child survival programmes over the past 25 years. The Sixth and Seventh Five-Year Plans had aimed at nationwide programmes to realize this goal. The twenty-point programme included, as a key component, rapid improvement in the conditions of women and children. In 1979, the Expanded Programme of Immunization (EPI) was established to provide the tetanus toxoid (TT) vaccine

to pregnant women, and BCG, DPT, polio and measles vaccine to children. The Universal Immunization Programme (UIP) and oral rehydration therapy (ORT) were both launched in 1985 and the Safe Motherhood Programme initiated during the Eighth Plan was among the prominent components of the Family Welfare Programme. In the early 1990s, these programmes were integrated and further strengthened to shape the Child Survival and Safe Motherhood (CSSM) Programme. In 1994, the CSSM Programme was further expanded to the Reproductive and Child Health (RCH) services. These programmes had the desired effect of reducing child mortality and improving child health as evidenced from the child mortality statistics of 1978-2002. The National Population Policy (2000) and National Health Policy (2002) addressed the issues of child survival and maternal health, and increased the outreach and coverage of the comprehensive package of RCH services through the government as well as the voluntary non–government sector together [1].

The National Rural Health Mission (2005-12) seeks to provide effective healthcare to rural population throughout the country with special focus on 18 states, which have weak public health indicators and/or weak infrastructure. These 18 States are Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Jammu & Kashmir, Manipur, Mizoram, Meghalaya, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Uttaranchal and Uttar Pradesh. The Mission is an articulation of the commitment of the Government to raise public spending on Health from 0.9% of GDP in 2-3% of GDP [2].

Mortality is very responsive to social, economic and psychological factors. Historically, mortality has often used as a barometer of welfare. Statistical studies in the nineteenth and twentieth centuries showed concern for socioeconomic differences in infant and crude mortality. Level of death rate; more importantly, infant mortality reflects a society's status of well being. Such aspects can be taken as indicators of quality of life. The infant mortality rate (IMR) is defined as the risk for a live born child to die before its first birthday is known to be one of the most sensitive and commonly used indicators of the social and economic development. Children are important assets of a nation; therefore reduction in infant mortality is likely the most important objective of the any development plan. Infant mortality rate reflects a country's level of socioeconomic development and is used for monitoring and evaluating population, health programs and policies [6]. It is an outcome rather than a cause and hence directly measures the results of the distribution and use of resources. Figure 1 shows the level of infant mortality rate in selected sixteen countries in 2010. Countries like Japan, France, Norway, Germany, Australia, United Kingdom, Italy, and the United States have below 10 per thousand live births infant mortality, while Russia, China and Sri Lanka are ranging between 10 to20 IMRs. Most of the African countries are struggling with the infant mortality level of near fifty per thousand live births in a year in 2010. India and South Africa lie in the range of 40-50 infant deaths per thousand live births, while some other South Asian countries like Bangladesh and Pakistan have above fifty IMRs. It suggests that level of infant mortality in India is still too high and we are very far from our neighboring and developing countries like China and Sri Lanka. According to United Nations estimates; India accounts a quarter of total infant deaths in the world. Thus any study of Indian mortality has global significance.

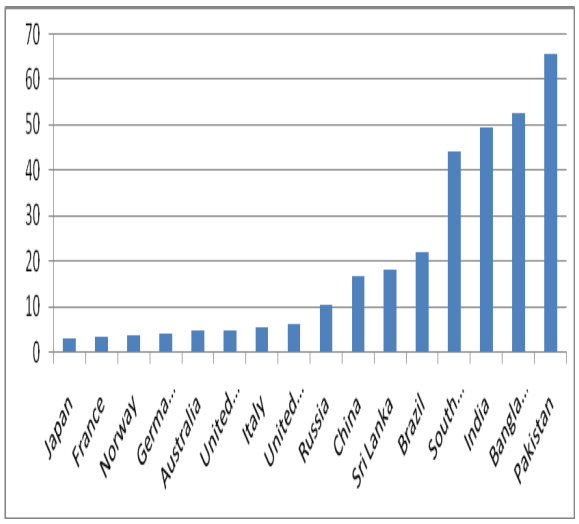

Figure 1. Infant Mortality Rate for Selected Countries, 2010, (*Source: U.S. Census Bureau, International Database)*

India has experienced an impressive decline in infant mortality since 1970s. From 130-140 deaths per one thousand live births in the early 1970s, mortality levels have declined to as low as 44 deaths per one thousand live births in 2011 (Economic Survey, 2012-13). India is a very diverse country by its demography. Due to wide interstate variations, it is always meaningless to talk about an average infant mortality rate for India. There are very basic variations in the levels and declining rate of infant mortality rate in major states of India [3,4].

The infant mortality rate for the most recent time period (2011) is 44 deaths per 1000 live births and which was 43 for male and 46 for female infants in India. This means that still 1 in 23 children die in India before reaching the first birthday and in case of the female infant's problem is deeper, for every one in 22 die before her first birthday. The research questions related to public health and especially a child or infant health is obvious. If infant mortality reflects a society's status of wellbeing and societal health can be measured by it, what are the various factors that increase or decrease it? Can the marginal effects of these factors improve the existing level? If so, which of these factors produces the largest health benefits to society? These questions are as important now as earlier. In this paper, a new attempt has been made to relate IMR with NRHM initiatives like health infrastructure and manpower and impact in reducing IMR in India in the light of above discussed research questions through econometric models.

2. Review of Literature

Historically high levels of infant mortality have been linked to infection and poor nutrition, which are still significant contributing factors in non-developed countries. High levels of infant mortality are also linked to preterm and low birth weight babies, and much of the reduction in infant mortality rates in the U.S. in the last half of the

twentieth century has been linked to better medical techniques to increase these infant's chance of survival. Progress in this area seems to have stagnated in recent years. Other risk factors believed to be linked to infant mortality include poor health of the mother (diabetes and chronic hypertension) and the mother's us of alcohol, tobacco, and other drugs [5,6].

Given the micro-level evidence on the success of selected public health intervention programs, the limited role of economic growth in explaining health improvements, and the ongoing debate over aid effectiveness, it is important to understand the relationship between foreign aid and health outcomes. Despite the vast empirical literature considering the effect of foreign aid on growth, there is little systematic empirical evidence on how overall aid affects health, and none (to our knowledge) on how health aid affects health [7].

Previous researchers have come to mixed conclusions about the effect of government intervention in the health care industry. Himmelstein and Woolhandler (1986) [8] believe that a nationalized health care system can increase life expectancy while controlling health care costs. Shortell and Hughes (1988) [9] believe that increased competition in the health care industry would lead to a decreased quality of health care. Ohsfeldt (2003) [10] examined survival rates of cancer patients in developed countries and showed that the United States health care system did significantly out perform other countries for those who could obtain treatment. The theory of government enterprise [11] (Ahlbrandt 1973), and the theory of economic regulation [12] (Stigler 1971) both suggest that government interference in the health care industry increase cost and does not increase health care quality. Friedman [13] (2001) found that government interference in the health system decreased available health care resources while increasing costs. Santerre, Grubaugh, and Stollar [14] (1991) found no direct effect of government intervention on infant mortality or health care costs, but concluded that government intervention in the economy will negatively impact economic growth which will then negatively impact health care.

To reduce infant mortality significantly, it is required to focus on the mother's level of education, which is inversely related to her child's risk of dying. Significant differentials have been observed by different years in Gross Domestic Product (GDP), Per capita health expenditure, mean age at marriage of female, the literacy rate of female and a source of pure drinking water attainment at a mortality rate [15].

Caldwell (1979) examines education as a factor in mortality decline using the Nigerian data. His stress on the role of parental education, particularly mother, in reducing infant and child mortality. He argued that a well educated mother can change the range of feeding and child care practices without imposing significant extra cost on the household [16].

Kisor and Parsuraman (1998) using data from the 1992-93, National Family Health Survey, found that mother's income translates into greater control over the expanding of resources, increased exposure and access to relevant information about childbearing and childrearing practices. Their study showed that mothers who are employed have a 10 percent higher infant mortality rate and a 36 percent child mortality rate than mothers who are not employed. Another issue of interest is whether urbanization plays an important role in influencing mortality levels. Greater urbanization should lead to lower mortality levels. Finally, the relationship between poverty and mortality is worth noticing. Does poverty have a strong effect on mortality rates after controlling for the other explanatory variables?

In India (1971 Census data) availability of family planning clinics and dispensaries significantly reduce woman's child mortality ratios, while hospital have a negative but insignificant effect on mortality. They found that doubling the number of villages with family planning programs reduce child mortality ratio by about 10% while doubling the number of villages with dispensaries would lower the ratios by 25% [17].

Da Vanzo (1984) tests for a relationship between distance to facilities and infant mortality with data collected as part of Malaysian family Life Survey. She found no evidence that such relationship exists possibly because the mortality data dates as far back as to late 1940s while the facility data refers to the time of survey.

No clear picture of effect of access to services on health outcomes emerges from above mentioned studies. Some health services improve health outcomes in some settings [17]. In other settings access to health services appear to have no effect on health outcomes [18]. While it is unreasonable to expect perfect consistency across studies from a multitude of countries and time periods relating to disparate health services to various health outcomes, the review fails to build a compelling body of evidence regarding the importance of health outcomes.

3. Objectives

Using review of available data sources and published literature, this paper aims to examine the scenario of infant mortality over the last seven years and the impact of NRHM initiatives like health infrastructure and manpower over the same.

4. Data & Methods

Data used in this paper are collected from various SRS Bulletins, Sample Registration System, office of the Registrar General, India and Rural Health Statistics in India, 2012, Ministry of Health and Family Welfare, Government of India, 30th April, 2013. It has been trying to explain the status of health infrastructure and health works in 2005 and changes occurring in them in 2012 through charts and figures. Finally, the Step wise regression model has been used to explain whether strengthening of health infrastructural facilities and health worker have any impact on the declining infant mortality rate in India during 2005-12 [19,20].

5. Results

Residence wise trends of the Infant mortality Rate of India during 1980 -2011, has been shown in Figure 1. It depicts a declining trend during 1980 -2011. Rural IMRs have been declined 76 points from 124 in 1980 to 48 in 2011 while urban IMRs have been registered 36 points

decline in the same period (Table 1). To find out the impact of NRHM on Infant mortality rate, it is necessary to calculate the level of IMR separately for pre and post NRHM implementation period. We have calculated annual rate of reduction in IMR during 1980-2011 (Table 2). It clearly shows that annual rate of reduction of IMR is much higher in the post NRHM period. It was near 2 percent in 2000 -05 and its previous years, but after implementation NRHM it has been accelerated to 4 percent in 2005-10 and nearly 6 percent in 2011 (Figure 2).

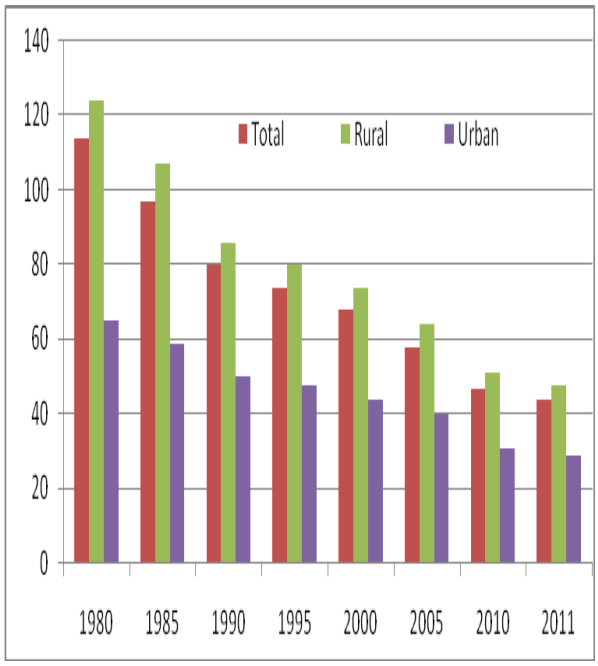

Figure 2. Trends of Infant Mortality Rate in India, 1980-2011. (S*ource: Sample Registration System, Registrar General of India)*

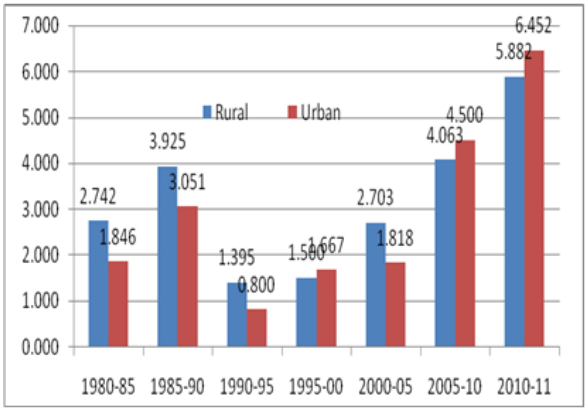

Figure 3. Annual Rate of Reduction in IMR in rural and urban India. (*Source: Author's Calculation)*

Table 1. Reduction in Infant Mortality Rate in India, 1980-2011

S.N.	Year	Total	Rural	Urban
1	1980	114	124	65
2	1985	97	107	59
3	1990	80	86	50
4	1995	74	80	48
5	2000	68	74	44
6	2005	58	64	40
7	2010	47	51	31
8	2011	44	48	29

Source: SRS, Registrar General of India

Table 2. Annual Rate of Reduction in IMR, 1980-2011

S.N.	Year	Rural	Urban
1	1980-85	2.742	1.846
2	1985-90	3.925	3.051
3	1990-95	1.395	0.800
4	1995-00	1.500	1.667
5	2000-05	2.703	1.818
6	2005-10	4.063	4.500
7	2010-11	5.882	6.452

Source: Author's Calculatio

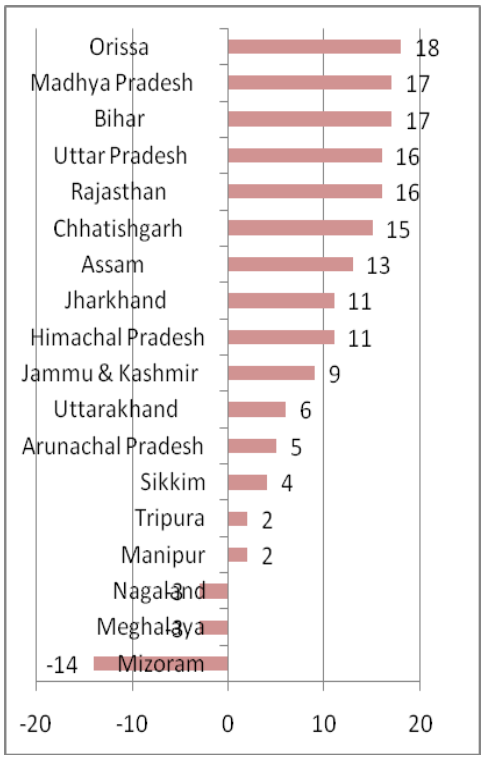

Figure 4. State Wise decline in infant mortality in High Focus states during 2005-11

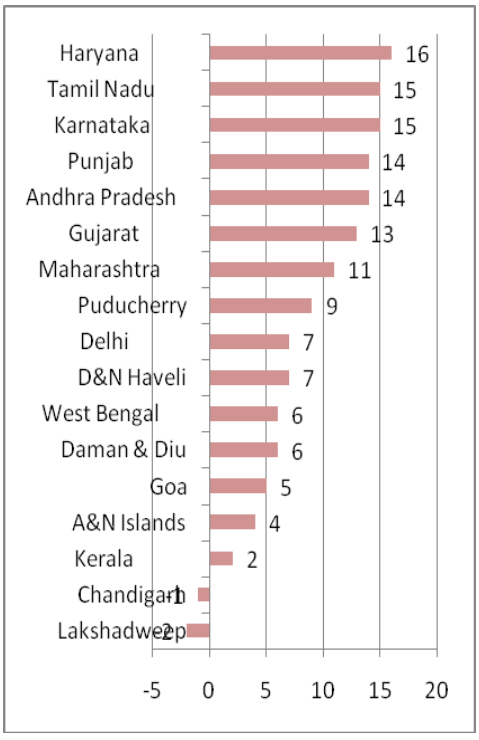

Figure 5. Decline in IMR in India's non high focus states during 2005-11

5.1. Declines in IMR

As far as the performance of individual states goes in terms of reducing their IMRs, Figure 4 shows, 3 states (Nagaland, Meghalaya and Mizoram) already included in high focus states have noted an increase in IMR. Orissa followed by Madhya Pradesh, Bihar, Uttar Pradesh and Rajasthan have registered a higher reduction in IMRs, while states like Tripura, and Sikkim have witnessed lower declining rate of IMR then national average in this period.

Among non focus seventeen states, the highest decline in IMR have regisered by Haryana followed by Tamil Nadu and Karnataka, while Kerala recorded two points decline during 2005-12. Two states and UTs namely Chandigarh and Lakshadweep have been noticed an increase of one and two points respectively in IMR during the same period.

Table 3. State wise trend of infant mortality rate during 2005-2011

S.N.	States	2005	2006	2007	2008	2009	2010	2011
1	A&N Islands	27	31	34	31	27	25	23
2	Andhra Pradesh	57	56	54	52	49	46	43
3	Arunachal Pradesh	37	40	37	32	32	31	32
4	Assam	68	67	66	64	61	58	55
5	Bihar	61	60	58	56	52	48	44
6	Chandigarh	19	23	27	28	25	22	20
7	Chhattisgarh	63	61	59	57	54	51	48
8	D&N Haveli	42	35	34	28	37	38	35
9	Daman & Diu	28	28	27	31	24	23	22
10	Delhi	35	37	36	35	33	30	28
11	Goa	16	15	13	10	11	10	11
12	Gujarat	54	53	52	50	48	44	41
13	Haryana	60	57	55	54	51	48	44
14	Himachal Pradesh	49	50	47	44	45	40	38
15	Jammu & Kashmir	50	52	51	49	45	43	41
16	Jharkhand	50	49	48	46	44	42	39
17	Karnataka	50	48	47	45	41	38	35
18	Kerala	14	15	13	12	12	13	12
19	Lakshadweep	22	25	24	31	25	25	24
20	Madhya Pradesh	76	74	72	70	67	62	59
21	Maharashtra	36	35	34	33	31	28	25
22	Manipur	13	11	12	14	16	14	11
23	Meghalaya	49	53	56	58	59	55	52
24	Mizoram	20	25	23	37	36	37	34
25	Nagaland	18	20	21	26	26	23	21
26	Orissa	75	73	71	69	65	61	57
27	Puducherry	28	28	25	25	22	22	19
28	Punjab	44	44	43	41	38	34	30
29	Rajasthan	68	67	65	63	59	55	52
30	Sikkim	30	33	34	33	34	30	26
31	Tamil Nadu	37	37	35	31	28	24	22
32	Tripura	31	36	39	34	31	27	29
33	Uttar Pradesh	73	71	69	67	63	61	57
34	Uttarakhand	42	43	48	44	41	38	36
35	West Bengal	38	38	37	35	33	31	32
	INDIA	58	57	55	53	50	47	44

Data Source: Sample Registration System, Registrar General, India.

5.2. Progress Made in Infrastructural Facilities during 2005-12

Table 5 gives an account of the state wise status of infrastructure between 2005 and 2012. The progress of each state in Sub Centers, PHCs and CHCs can be seen from the table. Nine states and UTs have registered a decline in opening new sub centers, while eight states have recorded no change. There are eighteen States and UTs which have noticed an increase in the number of sub centers. It can be seen from Figure 6 that highest progress has been achieved by Chhattisgarh followed by followed by Rajasthan, Orissa and Karnataka. There were 3818 sub centers in 2005 which has been increased to 5111 during 2005-12 in Chhattisgarh and in Rajasthan new 975 sub centers were made available in this period.

Table 4. Residence wise decline in infant mortality rate between 2005 and 2011

		2011			2005			Decline		
S.N.	State	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
1	A&N Islands	23	28	14	27	30	18	4	2	4
2	Andhra Pradesh	43	47	31	57	63	39	14	16	8
3	Arunachal Pradesh	32	36	10	37	39	17	5	3	7
4	Assam	55	58	34	68	71	39	13	13	5
5	Bihar	44	45	34	61	62	47	17	17	13
6	Chandigarh	20	19	20	19	25	18	-1	6	-2
7	Chhattisgarh	48	49	41	63	65	52	15	16	11
8	D&N Haveli	35	39	22	42	45	29	7	6	7
9	Daman & Diu	22	18	29	28	32	21	6	14	-8
10	Delhi	28	36	26	35	44	33	7	8	7
11	Goa	11	6	13	16	16	15	5	10	2
12	Gujarat	41	48	27	54	63	37	13	15	10
13	Haryana	44	48	35	60	64	45	16	16	10
14	Himachal Pradesh	38	38	28	49	50	20	11	12	-8
15	Jammu & Kashmir	41	43	28	50	53	39	9	10	11
16	Jharkhand	39	41	28	50	53	33	11	12	5
17	Karnataka	35	39	26	50	54	39	15	15	13
18	Kerala	12	13	9	14	15	12	2	2	3
19	Lakshadweep	24	21	27	22	17	27	-2	-4	0
20	Madhya Pradesh	59	63	39	76	80	54	17	17	15
21	Maharashtra	25	30	17	36	41	27	11	11	10
22	Manipur	11	11	12	13	12	14	2	1	2
23	Meghalaya	52	54	38	49	50	42	-3	-4	4
24	Mizoram	34	43	19	20	26	10	-14	-17	-9
25	Nagaland	21	21	20	18	17	22	-3	-4	2
26	Orissa	57	58	40	75	78	55	18	20	15
27	Puducherry	19	21	18	28	38	22	9	17	4
28	Punjab	30	33	25	44	49	37	14	16	12
29	Rajasthan	52	57	32	68	75	43	16	18	11
30	Sikkim	26	28	17	30	31	15	4	3	-2
31	Tamil Nadu	22	24	19	37	39	34	15	15	15
32	Tripura	29	31	19	31	31	29	2	0	10
33	Uttar Pradesh	57	60	41	73	77	54	16	17	13
34	Uttarakhand	36	39	23	42	56	19	6	17	-4
35	West Bengal	32	33	26	38	40	31	6	7	5
	India	44	48	29	58	64	40	14	16	11

Data Source: Sample Registration System, Registrar General, India.

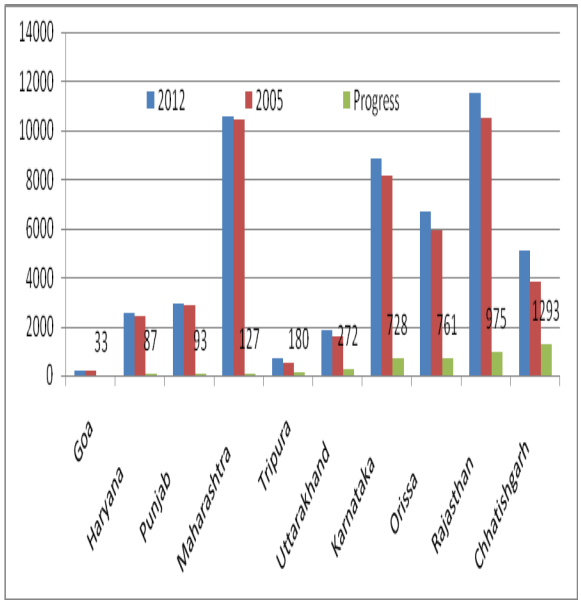

Figure 6. Progress made in Sub-Centers during 2005-12. (*Data Source: Rural Health Statistics in India, 2012)*

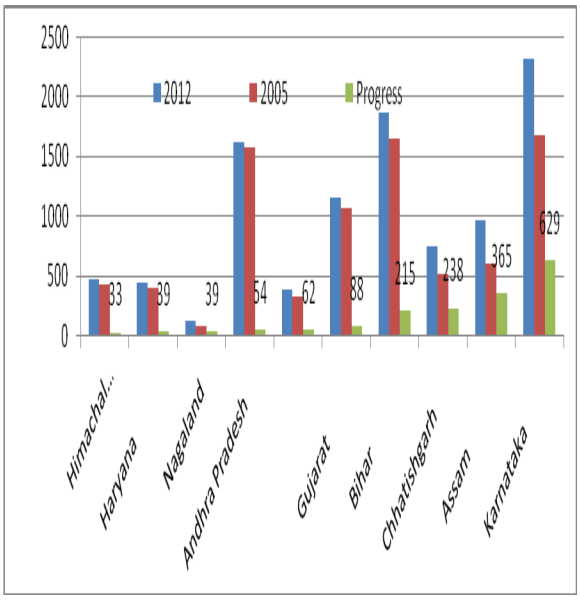

Figure 7. Progress made in PHCs during 2005-12. (*Data Source: Rural Health Statistics in India, 2012)*

Table 5. State wise status of health infrastructure facilities in India, 2005-12

		2012			2005			Progress		
S.N.	States	Sub centre	PHCs	CHCs	Sub centre	PHCs	CHCs	Sub centre	PHCs	CHCs
1	A&N Islands	119	22	4	107	20	4	12	2	0
2	Andhra Pradesh	12522	1624	281	12522	1570	164	0	54	117
3	Arunachal Pradesh	286	97	48	379	85	31	-93	12	17
4	Assam	4604	975	109	5109	610	100	-505	365	9
5	Bihar	9696	1863	70	10337	1648	101	-641	215	-31
6	Chandigarh	16	0	2	13	0	1	3	0	1
7	Chhattisgarh	5111	755	149	3818	517	116	1293	238	33
8	D&N Haveli	50	6	1	38	6	1	12	0	0
9	Daman & Diu	26	3	2	21	3	1	5	0	1
10	Delhi	41	5	0	41	8	0	0	-3	0
11	Goa	205	19	5	172	19	5	33	0	0
12	Gujarat	7274	1158	308	7274	1070	272	0	88	36
13	Haryana	2520	447	109	2433	408	72	87	39	37
14	Himachal Pradesh	2065	472	76	2068	439	66	-3	33	10
15	Jammu & Kashmir	1907	396	84	1879	334	70	28	62	14
16	Jharkhand	3958	330	188	4462	561	47	-504	-231	141
17	Karnataka	8871	2310	180	8143	1681	254	728	629	-74
18	Kerala	4575	809	217	5094	911	106	-519	-102	111
19	Lakshadweep	14	4	3	14	4	3	0	0	0
20	Madhya Pradesh	8869	1156	333	8874	1192	229	-5	-36	104
21	Maharashtra	10580	1811	363	10453	1780	382	127	31	-19
22	Manipur	420	80	16	420	72	16	0	8	0
23	Meghalaya	397	109	29	401	101	24	-4	8	5
24	Mizoram	370	57	9	366	57	9	4	0	0
25	Nagaland	396	126	21	394	87	21	2	39	0
26	Orissa	6688	1226	377	5927	1282	231	761	-56	146
27	Puducherry	51	24	4	76	39	4	-25	-15	0
28	Punjab	2951	449	132	2858	484	116	93	-35	16
29	Rajasthan	11487	1528	382	10512	1713	326	975	-185	56
30	Sikkim	147	24	2	147	24	4	0	0	-2
31	Tamil Nadu	8706	1227	385	8682	1380	35	24	-153	350
32	Tripura	719	79	12	539	73	10	180	6	2
33	Uttar Pradesh	20521	3692	515	20521	3660	386	0	32	129
34	Uttarakhand	1848	257	59	1576	225	44	272	32	15
35	West Bengal	10356	909	348	10356	1173	95	0	-264	253
	INDIA	148366	24049	4833	146026	23236	3346	2340	813	1487

Data Source: Rural Health Statistics in India, 2012. Ministry of Health and Family Welfare, Government of India, 30 April, 2013.

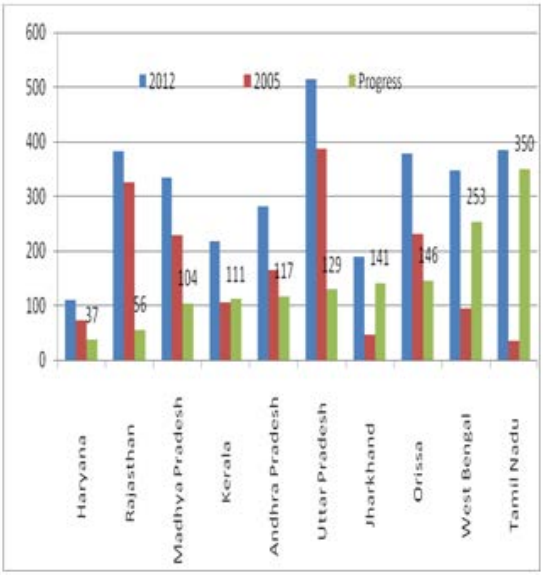

Figure 8. Progress made in CHCs during 2005-12. (*Data Source: Rural Health Statistics in India, 2012)*

The PHC is the first point of contact with a qualified doctor for people in rural areas. Uttar Pradesh has the largest number of functioning PHCs followed by Bihar, Maharashtra and Andhra Pradesh. Seven States and UTs namely Chandigarh, D& N Haveli, Daman & Diu, Goa, Lakshadweep, Mizoram and Sikkim have recorded no change in the number of functioning PHCs in this period. Karnataka has made the largest progress in the number of PHCs followed by Assam, Chhattisgarh and Bihar during 2005-2012 (Figure 7).

For the CHCs the nine states and UTs recorded no change, while four states and UTs have noticed declines in the number of functioning CHCs during 2005-12. Tamil Nadu registered highest progress of 350 CHCs in this period followed by West Bengal, Orissa and Jharkhand Figure 8.

5.3. Progress Made in Manpower facilities during 2005-12

Along with physical infrastructure, the availability of human resources is a significant determinant of the quality

of health care at PHCs and CHCs. In this section, we have included a number of ANM/ female health workers, number of doctors and a number of specialists.

Table 6. State wise status of man power facilities in India, 2005-12.

	2012			2005			Progress		
State & UTs	ANM	Doctor	Specialists	ANM	Doctor	Specialists	ANM	Doctor	Specialists
A&N Islands	193	33	0	127	36	0	66	-3	0
Andhra Pradesh	21853	3448	346	13740	2137	224	8113	1311	122
Arunachal Pradesh	395	92	1	454	78	0	-59	14	1
Assam	8723	1478	122	5719	610	NA	3004	868	NA
Bihar	16943	3532	151	11985	1648	NA	4958	1884	NA
Chandigarh	29	0	11	13	0	NA	16	0	NA
Chhattisgarh	5468	435	71	3667	628	18	1801	-193	53
D&N Haveli	82	6	0	38	6	NA	44	0	NA
Daman & Diu	39	5	2	24	5	NA	15	0	NA
Delhi	41	22	0	51	23	NA	-10	-1	NA
Goa	240	41	6	179	53	7	61	-12	-1
Gujarat	6431	778	76	6508	848	92	-77	-70	-16
Haryana	4973	342	19	2818	862	49	2155	-520	-30
Himachal Pradesh	1951	436	5	1790	467	NA	161	-31	NA
Jammu & Kashmir	3941	845	173	1588	643	142	2353	202	31
Jharkhand	6574	407	86	5023	561	NA	1551	-154	NA
Karnataka	11434	2089	495	8544	2041	691	2890	48	-196
Kerala	4173	1152	774	5565	949	82	-1392	203	692
Lakshadweep	39	9	0	22	4	0	17	5	0
Madhya Pradesh	10204	814	267	9345	839	49	859	-25	218
Maharashtra	22135	2760	514	10699	3158	1099	11436	-398	-585
Manipur	975	170	1	463	67	19	512	103	-18
Meghalaya	787	104	9	608	123	1	179	-19	8
Mizoram	650	49	0	345	35	0	305	14	0
Nagaland	867	99	9	342	53	0	525	46	9
Orissa	8211	1069	317	6768	1353	NA	1443	-284	NA
Puducherry	231	63	0	115	63	6	116	0	-6
Punjab	4199	457	279	2602	373	226	1597	84	53
Rajasthan	17638	1755	148	11425	1506	581	6213	249	-433
Sikkim	291	32	0	260	48	4	31	-16	-4
Tamil Nadu	9253	2271	0	10112	2257	48	-859	14	-48
Tripura	1169	119	0	561	152	2	608	-33	-2
Uttar Pradesh	22464	2861	1740	18146	3660	NA	4318	-799	NA
Uttarakhand	2016	205	51	1486	182	71	530	23	-20
West Bengal	12966	1006	175	9070	1319	133	3896	-313	42
India	1851144	28984	5858	133194	20308	3550	1717950	8676	2308

Data Source: Rural Health Statistics in India, 2012. Ministry of Health and Family Welfare, Government of India, 30 April, 2013.

Table 7 a. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.173	1.343		4.596	.000
	Increase in the number of ANMs	.001	.000	.424	2.692	.011
a. Dependent Variable: Decline in Infant Mortality Rate						
R Square = .18 Adjusted R Square = .155 F (1, 33) = 7.24 Sig. = .011						

Table 7 b. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.405	1.593		4.649	.000
	Increase in the number of ANMs	.001	.001	.353	2.165	.038
a. Dependent Variable: Decline in Infant Mortality Rate (Rural)						
R Square = .124 Adjusted R Square = .098 F (1, 33) = 4.687 Sig. = .038						

Table 7 c. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.221	1.257		3.359	.002
	Increase in the number of ANMs	.001	.000	.370	2.289	.029
a. Dependent Variable: Decline in Infant Mortality Rate (Urban)						
R Square = .137 Adjusted R Square = .111 F (1, 33) = 5.241Sig. = .029						

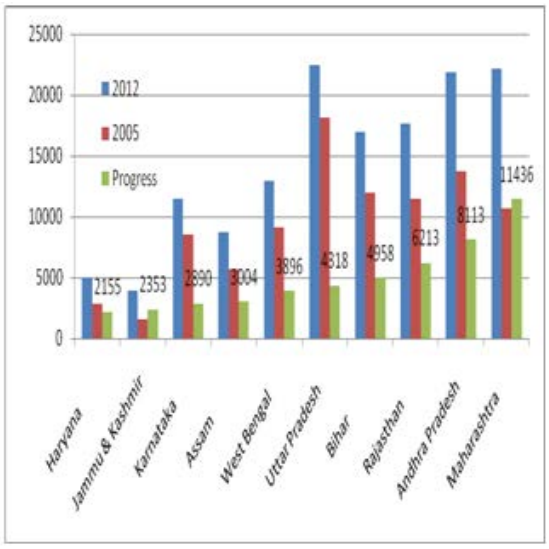

Figure 9. Progress made in manpower (ANM) during 2005-12. (*Data Source: Rural Health Statistics in India, 2012)*

Between 2005 and 2012, there has been a decline registered in a number of ANMs in five states namely Kerala, Tamil Nadu, Gujarat, Arunachal Pradesh and Delhi, while seven states have recorded an increase of less than hundred. Table 3, shows that nine states and UTs have registered an increase in the number of ANMs between one hundred and one thousand. Only fourteen states have satisfactory progress in this regard. Figure 9 shows Maharashtra has recorded highest progress of 11436 ANMs followed by Andhra Pradesh, Rajasthan and Bihar in giving new appointments to ANMs or female health workers during 2005-12.

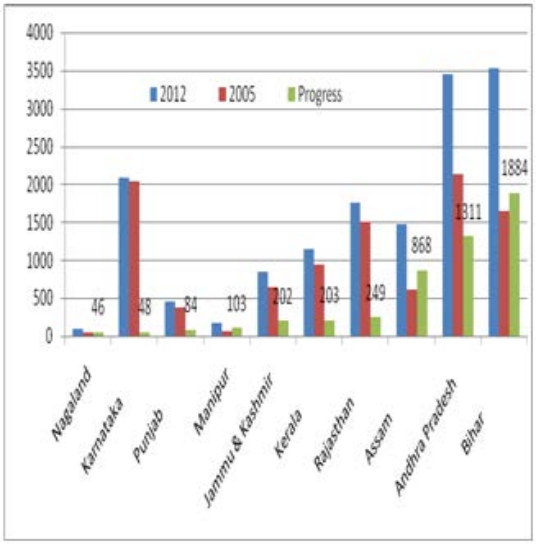

Figure 10. Progress made in manpower (Doctor) during 2005-12. (*Data Source: Rural Health Statistics in India, 2012)*

Data up to April 2013 reports that, twenty states and UTs have recorded no change in the number of doctors working at PHCs & CHCs, while five states have made substantial progress of appointing less than twenty five new doctors during 2005 -12. Figure 10 shows that Bihar, Andhra Pradesh, Assam and Rajasthan are among the best performers in this respect during 2005-12.

The availability of specialists (surgeons, pediatricians, physicians and obstetrician and gynecologists), at CHCs is far worse. There are significant improvement in the number of specialists in Andhra Pradesh, Karnataka, Maharashtra and Rajasthan during 2005 -12.

6. Have Physical Infrastructure and Manpower Facilities Reduced IMR in India?

In this paper an attempt has made to establish a relationship between declines in infant mortality rate and progress made in health infrastructure (Sub centers, PHCs & CHCs) and manpower (ANMs & Doctors) [2] during 2005-12. Using a decline in infant mortality rate during 2005-12 as dependent variable and progress made in a number of sub centers, number of PHCs, number of CHCs, number of ANMs and the number of doctors during 2005-12 as independent variables, we ran stepwise regression. Results of stepwise regression analysis show that an increase in female health workers or ANMs have statistically significant at 1 percent level positive association with a decline in infant mortality rate in India as remaining other relevant variables constant. When dataset divided in rural and urban, it has also statistical significant 5% level positive association between decline in IMR and increase in the number of ANMs.

7. Conclusion

Using review of available data sources and published literature, this paper aims to examine the scenario of infant mortality over the last seven years and the impact of NRHM initiatives like health infrastructure and manpower over the same.

To find out the impact of NRHM on Infant mortality rate, we have calculated annual rate of reduction in IMR (Figure 2). It clearly shows that annual rate of reduction of IMR is much higher in the post NRHM period. It was near 2 percent in 2000 -05 and its previous years, but after implementation NRHM it has been accelerated to 4 percent in 2005-10 and nearly 6 percent in 2011. As far as the performance of individual state is concerned, Orissa followed by Madhya Pradesh, Bihar, Uttar Pradesh and Rajasthan have registered a higher reduction in IMRs, while states like Tripura, Manipur and Kerala have witnessed lower declining rate of IMR then national average in this period.

The highest progress in functioning sub centers has been achieved by Chhattisgarh followed by followed by Rajasthan, Orissa and Karnataka, while Uttar Pradesh has the largest number of functioning PHCs followed by Bihar, Maharashtra and Andhra Pradesh. Tamil Nadu registered highest progress of 350 CHCs in this period followed by West Bengal, Orissa and Jharkhand. Maharashtra has

recorded highest progress of 11436 ANMs followed by Andhra Pradesh, Rajasthan and Bihar in giving new appointments to ANMs or female health workers during 2005-12. Bihar, Andhra Pradesh, Assam and Rajasthan are among the best performers in doctors during 2005-12. Results of stepwise regression analysis show that an increase in female health workers or ANMs have statistically significant at 1 percent level positive association with a decline in infant mortality rate in India as remaining other relevant variables constant.

Notes

1. This information was given by Minister of State for Health & Family Welfare Abu Hasem Khan Choudhury in written reply to a question in the Rajya Sabha (Upper House of the Parliament)

2. The number of specialists is not available for many of the states, and that is why, the number of specialists was not used as independent variable in a regression analysis.

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