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STATUS OF HEALTH INDICATORS SINCE THE LAUNCH OF NRHM IN INDIA

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ABSTRACT: The current study examines the status of health indicators since the launch of NRHM. The findings of the study provide an important insight into the nature of association between availability of health infrastructure and manpower status towards decreasing health indicators. CBR was more spread out in NHFSL, CDR was more spread out in HFSNE and IMR was more spread out in NHFSS. Therefore, there is a need to develop, monitor and supervise infrastructure facilities and manpower status to control mortality and fertility rates. Along with that government should emphasize on improving the quality of health care services by improving access to water, sanitation, hygiene and immunizations for infants, women, men and children.

Index Terms—healthcare, health infrastructure, manpower status, Rural areas

JEL Codes: I18, I11, I15

1. INTRODUCTION

Wellbeing is a significant part of human turn of events (Saikia, 2014), India in recent years has received various arrangements to handle the issue of wellbeing and has made critical advancement in reducing new born child and maternal mortality rate (Mubarak &Qadri, 2018). NRHM was one intervention of the Government of India (GOI) to correct the public health sector of the country. It came into being on 12th April 2005 and was carried out in 18 states with weak public health indicators & infrastructure and was additionally reached out to the whole country. Although GOI adopted a time bound and mission-oriented approach, it started from 1st April 2012 and continued during the 12th Five Year plan [(Gopalakrishnan& Immanuel, 2017); (Narwal& Gram, 2013)]. NRHM was implemented across the entire country, however it stated that 8 Empowered Action Groups (EAG) states which were Bihar, Rajasthan, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh & Uttaranchal; 8 North Eastern States and the hilly states of Himachal Pradesh and Jammu & Kashmir were highly focused (R. Singariya, 2013), afterwards all the 35 states and union territories of the country were categorized into 4 different categories, i.e., High Focused States North East (HFSNE), High Focused States Non North East (HFSNNE), Non High Focused States Large (NHFSL) and Non High Focused States Small & UTs (NHFSS) (Veena R, 2012).

In 2005 Reproductive and Child Health Programme was launched as a part of the mission, its goal was to reduce mortality and fertility rate, along with other disease burden. Other than giving openness, reasonableness and quality medical care to provincial area, particularly the weak segments, its points were likewise to diminish MMR from 407 to 100 per 100,000 live births, IMR from 60 to 30 per 1000 live births and TFR from 3.0 to 2.1 within the 7 years i.e., 2005 to 2012. But as the targets were not achieved it was further continued [(Pandey& Mohan, 2019); (Narwal& Gram, 2013)]. At grassroot level ASHAs have done excellent job in mobilizing women from valuable communities to return to institutions, along with an increase in institutional deliveries which are one of the NRHM's success stories (Nandan, 2010).

In recent years the GOI has undertaken many initiatives to overcome the issue of underperformance in health care delivery (De et al., 2012) and has been focusing on providing comprehensive care to Maternal & Child Health (MCH). It has framed the policies that allow planning and implementation of programs for the same. However, watching the pace of achievements of the targets, it must focus more on framing the policies in terms of building capacity of existing personnel, enhancing allocation of finances dedicated towards MCH, identifying areas through operational research which may enhance quantity and quality of MCH in India (Chokshi et al., 2016).

At present health infrastructure in India is becoming increasingly inaccessible to the public because of inadequate health services and high cost of treatment at the non-government institutions (Sreenu, 2019). Maternal, new-born and child health needs recognition as well as development under NRHM, in terms of providing free drugs, diagnostics and transportation in government facilities, pregnant women receiving full ANC, post-natal check-up and institutional delivery [(Kulkarni et al., 2016); (Nagarajan et al., 2015)]; this must be followed up by strengthening of the mechanisms to make sure that quality services are available and accessible to the foremost needy and vulnerable groups (Narwal& Gram, 2013).

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The failure of the general public delivery system today is an outcome of systematic breakdown of accountability relations within institutional framework. Even the staff that is required to supply the health care services is insufficient from various perspectives. Because of this ,significant proportion of rural residents remain untreated even for basic ailments and therefore, there is a need for improvement in healthcare facilities [(Singh et al., 2019); (Bhandari & Dutta, 2007)].
The research questions associated with public health and particularly infant health is obvious. If infant death rate reflects a society's status of well-being and societal health is often measured by it, what varied factors increase or decrease it? How does the marginal effect of those factors improve the prevailing level? If so, which of these factors produces the most important health benefits to society? (R. Singariya, 2013).
This analysis differs from the above analysis as it focuses mainly on health infrastructures and manpower status available in rural India and its impact on reducing health indicators. The study is divided into three parts. The first part examines the variations in health indicators after the implementation of NRHM for rural and urban areas. The second part examines the impact of NRHM in terms of health infrastructure and manpower status available at PHCs, CHCs and SCs with focus on health indicators. And third part identifies the changes over time in manpower status.

2. METHODOLOGY

The study is based on secondary data. Data has been collected from Rural Health Statistics (RHS) India; Ministry of Health and Family Welfare (MOHFW), GOI report and SRS Bulletin from 2005-2018. Data has been analysed from IBM SPSS Statistics Version 21. The study has been divided into 4 parts i.e. HFSNE (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura), HFSNNE (Bihar, Chhattisgarh, Odisha, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh and Uttarakhand), NHFSL (Andhra Pradesh, Goa, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, West Bengal and Telangana) and NHFSS (Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Delhi, Lakshadweep, Puducherry and Andaman & Nicobar Islands). To determine the impact of NRHM in terms of health infrastructures i.e.; primary health centers (PHCs), community health centers (CHCs) & sub-centers (SCs) and manpower status i.e.; Health Workers (female)/ ANMs (HW-ANMs) at SCs & PHCs in rural areas, Doctors (Allopathy) at PHCs in rural areas & Total Specialists (TS) [Surgeons, OB&GY, Physicians & Paediatricians] at CHCs in rural areas multiple linear regression models has been applied to examine how multiple independent variables related to one dependent variable i.e.; for every individual health indicators i.e.; infant mortality rate (IMR), crude birth rate (CBR) & crude death rate (CDR). For health indicators, the measure of dispersion has been calculated separately for rural and urban areas. Before calculating the results data has been standardized using the log method in IBM SPSS Statistics. Line graph has been used to identify the changes over time in terms of total number of manpower available at PHCs, CHCs & SCs.
The multiple linear regression model for Health Infrastructure and Manpower Status can be written as:

Health Infrastructure -
Equation 1:

$$\boldsymbol{Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_i}$$

Manpower Status -
Equation 2:

$$\boldsymbol{Y_i = \beta_0 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon_i}$$

Where, Yi Health indicators i.e.; CBR, CDR and IMR.β0 constant, β1 denotes PHCs, β2 CHCs, β3 SCs, β4 HW-ANMs, β5 Doctors, β6 TS and εi Standard error of the estimate.

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3. RESULTS

Variations in Health Indicators

Crude Birth Rate

Table 1: CBR RURAL & URBAN AREAS

	HFSNE		HFSNNE		NHFSL		NHFSS	
	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN
Std. Error of Mean	.05945	.04564	.07192	.05498	.12231	.12825	.05676	.07092
SD	.22245	.17077	.26912	.20573	.45765	.47987	.21239	.26536
Variance	.049	.029	.072	.042	.209	.230	.045	.070
Range	.68	.50	.85	.58	1.23	1.21	.68	1.00
Minimum	9.85	9.09	13.38	12.22	12.40	11.88	8.50	7.78
Maximum	10.53	9.59	14.23	12.80	13.63	13.09	9.18	8.78

Source: Own Calculations of Authors

From Table 1 lowest standard deviation (SD) for NHFSS i.e., .21239 depicts lowest concentration of total number of live births per 1000 and the lowest range for NHFSS and HFSNE is .68. Whereas, NHFSL having highest SD with .45765 indicates total number of live births per 1000 is more spread out in this region, range highest with 1.23. In urban areas, HFSNE having lowest SD i.e., .17077 depicts lowest concentration of total number of live births per 1000, range lowest with .50. Whereas, NHFSL having highest SD with .47987 indicates total number of live births per 1000 is more spread out in this region, range highest with 1.21.

Crude Death Rate

Table 2: CDR RURAL & URBAN AREAS

	HFSNE		HFSNNE		NHFSL		NHFSS	
	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN
Std. Error of Mean	.05063	.06345	.07720	.06544	.07603	.05664	.02405	.02766
SD	.18944	.23742	.28886	.24486	.28446	.21193	.08997	.10349
Variance	.036	.056	.083	.060	.081	.045	.008	.011
Range	.64	.75	.88	.69	.72	.64	.32	.38
Minimum	5.66	4.67	8.20	7.08	8.70	7.51	4.89	4.44
Maximum	6.30	5.42	9.08	7.77	9.42	8.15	5.21	4.82

Source: Own Calculations of Authors

From Table 2 lowest SD for NHFSS i.e., .08997 shows lowest concentration of number deaths per 1000 inhabitants, range lowest with .32. HFSNNE having highest SD with .28886 indicates highest concentration of number of deaths per 1000, with range highest .88. In urban areas, the lowest SD for NHFSS i.e., .10349 shows lowest concentration of number of deaths per 1000 inhabitants, range lowest with .38. HFSNNE having highest SD with .24486 indicates highest concentration of number of deaths per 1000, with range being highest .75 in HFSNE.

Infant Mortality Rate

Table 3: IMR RURAL & URBAN AREAS

	HFSNE		HFSNNE		NHFSL		NHFSS	
	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN
Std. Error of Mean	.20921	.20085	.25023	.16289	.15685	.15797	.29443	.22156
SD	.78278	.75150	.93626	.60948	.58687	.59108	1.10167	.82899
Variance	.613	.565	.877	.371	.344	.349	1.214	.687
Range	2.86	2.94	2.68	1.65	1.76	1.84	3.28	3.01
Minimum	9.70	7.98	15.37	14.31	14.25	12.84	7.24	7.08
Maximum	12.56	10.92	18.05	15.96	16.01	14.68	10.52	10.09

Source: Own Calculations of Authors

Table 3 shows lowest SD for NHFSL i.e., .58687 shows lowest concentration in the number of infant deaths for every 1000 live births, range lowest with 1.76. NHFSS having highest SD i.e., 1.10167 indicates highest concentration in the number of infant deaths for every 1000 live births, with highest range of 3.28. For urban areas, NHFSL with lowest SD i.e., .59108 shows lowest concentration in the number of infant deaths for every 1000 live births, range lowest with 1.65 in HFSNNE. NHFSS having highest SD i.e., .82899 indicates higher concentration in the number of infant deaths for every 1000 live births, with the highest range of 3.01.

Multiple linear regression results

CBR in Rural Areas

Health Infrastructure

Table 4: Impact of Health Infrastructure in HFSNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	13.303	4.072		3.267	.008
PHCs	-.519	.074	-.729	-7.001	.000
CHCs	-.285	.077	-.428	-3.705	.004
SCs	.375	.208	.177	1.804	.101

a. Dependent Variable: CBR RURAL

b. R Square: .944 Adjusted R Square: .927

Source: Own Calculations of Authors

Table 5: Impact of Health Infrastructure in HFSNNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	36.574	7.819		4.678	.001
PHCs	-.010	.149	-.010	-.070	.946
CHCs	-.262	.068	-.641	-3.829	.003
SCs	-.446	.335	-.350	-1.332	.213

a. Dependent Variable: CBR RURAL

b. R Square: .983 Adjusted R Square: .977

Source: Own Calculations of Authors

Table 6: Impact of Health Infrastructure in NHFSL

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.229	2.065		2.532	.030
PHCs	.953	1.737	2.805	.549	.595
CHCs	-.089	.157	-.252	-.566	.584
SCs	-.481	1.369	-1.820	-.352	.732

a. Dependent Variable: CBR RURAL

b. R Square: .602 Adjusted R Square: .482

Source: Own Calculations of Authors

Table 7: Impact of Health Infrastructure in NHFSS

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.148	4.577		.688	.507
PHCs	-.060	.122	-.088	-.494	.632
CHCs	-.746	.152	-.815	-4.923	.001
SCs	.709	.401	.317	1.768	.108

a. Dependent Variable: CBR RURAL

b. R Square: .742 Adjusted R Square: .664

Source: Own Calculations of Authors

Considering the above Table 4 to
Table **7**, the dependent variable (CBR Rural) was regressed on predicting variables i.e.; PHCs, CHCs & SCs. The results depicts that a unit increase in PHCs & CHCs by .519 units (51.9%) & .285 units (28.5%) helps reduce CBR which implies a positive impact on reducing CBR; while a unit increase in SCs by .375 units (37.5%) will increase CBR, implying a negative impact in HFSNE. Similarly, a unit increase in PHCs, CHCs &

SCs by .010 units (1%), .262 units (26.2%) & .446 units (44.6%) will have a positive impact on reducing CBR in HFSNNE. For NHFSL, a unit increase in CHCs & SCs by .089 units (8.9%) & .481 units (48.1%) will reduce CBR; while a unit increase in PHCs by .953 units (95.3%) will increase CBR, implying a negative impact. On the contrary, a unit increase in PHCs & CHCs by .060 units (6%) & .746 units (74.6%) will reduce CBR; while a unit increase in SCs by .709 units (70.9%) will increase CBR, implying a negative impact in NHFSS. Moreover, R^2 depicts the variation in dependent variable (CBR) by 94.4% (in HFSNE), 98.3% (in HFSNNE), 60.2% (in NHFSL) & 74.2% (in NHFSS) because of independent variables i.e.; PHCs, CHCs & SCs.

Manpower Status

Table 8: Impact of Manpower Status in HFSNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	19.040	2.290		8.313	.000
HW-ANMs	-.427	.145	-1.073	-2.945	.015
DOCTORS	.077	.094	.473	.821	.431
TS	-.049	.058	-.326	-.838	.422

a. Dependent Variable: CBR RURAL
b. R Square: .715 Adjusted R Square: .629

Source: Own Calculations of Authors

Table 9: Impact of Manpower Status in HFSNNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	16.339	1.881		8.685	.000
HW-ANMs	-.118	.088	-1.095	-1.339	.210
DOCTORS	.088	.102	.771	.862	.409
TS	-.030	.071	-.362	-.424	.680

a. Dependent Variable: CBR RURAL
b. R Square: .528 Adjusted R Square: .386

Source: Own Calculations of Authors

Table 10: Impact of Manpower Status in NHFSL

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	7.302	1.794		4.069	.002
HW-ANMs	-.079	.161	-.353	-.490	.635
DOCTORS	.363	.221	1.256	1.645	.131
TS	-.114	.077	-.351	-1.471	.172

a. Dependent Variable: CBR RURAL
b. R Square: .622 Adjusted R Square: .508

Source: Own Calculations of Authors

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Table 11: Impact of Manpower Status in NHFSS

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	12.643	.534		23.662	.000
HW-ANMs	-.259	.054	-.806	-4.802	.001
DOCTORS	-.086	.090	-.159	-.962	.359
TS	.015	.058	.031	.251	.807

a. Dependent Variable: CBR RURAL
b. R Square: .855 Adjusted R Square: .812

Source: Own Calculations of Authors

From the above Table 8 to Table 11, multiple linear regression model shows the impact of HW-ANMs, Doctors & TS (independent variables) on dependent variable (CBR Rural). Considering HFSNE, a unit increase in HW-AMSs & TS by .427 units (42.7%) & .049 units (4.9%) have a positive impact on reducing CBR; while a unit increase in doctors by .077 units (7.7%) will increase CBR implying a negative impact. Similarly, an increase in .118 units (11.8%) & .030 units (3%) in HW-ANMs & TS will have a positive impact on reducing CBR; while a unit increase in doctors by .088 units (8.8%) will increase CBR implying a negative impact in HFSNNE. For NHFSL, a unit increase in HW-ANMS & TS by .079 units (7.9%) & .114 units (11.4%) will have a positive impact on reducing CBR; while a unit increase in doctors by.363 units (36.3%) will increase CBR implying a negative impact. Similarly, a unit increase in HW-ANMs & Doctors by .259 units (25.9%) & .086 units (8.6%) will have a positive impact on reducing CBR; while a unit increase in TS by .015 units (1.5%) will increase CBR implying a negative impact in NHFSS. Moreover, the values of R^2 shows the variation in dependent variable (CBR) 71.5% (HFSNE), 52.8% (HFSNNE), 62.2% (NHFSL) & 85.5% (NHFSS) because of independent variables i.e.; HW-ANMs, Doctors & TS.

CDR in Rural Areas

Health Infrastructure

Table 12: Impact of Health Infrastructure in HFSNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.624	6.900		.670	.518
PHCs	-.449	.126	-.740	-3.571	.005
CHCs	-.202	.130	-.357	-1.550	.152
SCs	.491	.353	.272	1.392	.194

a. Dependent Variable: CDR RURAL
b. R Square: .778 Adjusted R Square: .712

Source: Own Calculations of Authors

Table 13: Impact of Health Infrastructure in HFSNNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	39.409	9.881		3.989	.003
PHCs	-.142	.188	-.133	-.755	.467
CHCs	-.192	.086	-.438	-2.218	.051
SCs	-.598	.424	-.436	-1.412	.188

a. Dependent Variable: CDR RURAL
b. R Square: .976 Adjusted R Square: .969

Source: Own Calculations of Authors

Table 14: Impact of Health Infrastructure in NHFSL

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.402	1.190		3.698	.004
PHCs	.733	1.001	3.472	.732	.481

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CHCs	.076	.091	.348	.841	.420
SCs	-.492	.789	-2.992	-.623	.547

a. Dependent Variable: CDR RURAL

b. R Square: .658 Adjusted R Square: .555

Source: Own Calculations of Authors

Table 15: Impact of Health Infrastructure in NHFSS

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	7.842	3.259		2.406	.037
PHCs	.044	.087	.151	.503	.626
CHCs	-.140	.108	-.361	-1.297	.224
SCs	-.254	.285	-.268	-.891	.394

a. Dependent Variable: CDR RURAL

b. R Square: .271 Adjusted R Square: .052

Source: Own Calculations of Authors

Considering the above Table 12 to Table 15, multiple linear regression model shows the impact of PHCs, CHCs & SCs (independent variables) on dependent variable (CDR Rural). Considering HFSNE, a unit increase in PHCs & CHCs by .449 units (44.9%) & .202 units (20.2%) have a positive impact on reducing CDR; while a unit increase in SCs by .491 units (49.1%) will increase CDR, implying a negative impact. Similarly, a unit increase in PHCs, CHCs & SCs by .142 units (14.2%), .192 units (19.2%) & .598 units (59.8%) have a positive impact on reducing CDR in HFSNNE. For NHFSL, a unit increase in SCs by .492 units (49.2%) will have a positive impact on reducing CDR; while a unit increase in PHCs & CHCs by .733 units (73.3%) & .076 units (7.6 %) will increase CDR, implying a negative impact on it. On the contrary, a unit increase in CHCs & SCs by .140 units (14%) & .254 units (25.4%) will reduce CDR; while a unit increase in PHCs by .044 units (4.4%) will increase CDR, implying a negative impact in NHFSS. Moreover, the R^2 depicts that the model explains 77.8% (HFSNE), 97.6% (HFSNNE), 65.8% (NHFSL) & 27.1% (NHFSS) of the variations on CDR because of independent variables i.e.; PHCs, CHCs & SCs.

Manpower Status

Table 16: Impact of Manpower Status in HFSNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	10.367	2.223		4.663	.001
HW-ANMs	-.148	.141	-.439	-1.055	.316
DOCTORS	-.058	.091	-.417	-.636	.539
TS	.003	.056	.024	.054	.958

a. Dependent Variable: CDR RURAL

b. R Square: .629 Adjusted R Square: .518

Source: Own Calculations of Authors

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Table 17: Impact of Manpower Status in HFSNNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	11.525	2.154		5.350	.000
HW-ANMs	-.146	.101	-1.255	-1.438	.181
DOCTORS	.107	.117	.875	.917	.381
TS	-.021	.081	-.236	-.259	.801

a. Dependent Variable: CDR RURAL

b. R Square: .463 Adjusted R Square: .301

Source: Own Calculations of Authors

Table 18: Impact of Manpower Status in NHFSL

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.135	1.020		5.033	.001
HW-ANMs	.062	.092	.447	.678	.513
DOCTORS	.088	.126	.491	.702	.499
TS	-.061	.044	-.303	-1.387	.195

a. Dependent Variable: CDR RURAL

b. R Square: .684 Adjusted R Square: .589

Source: Own Calculations of Authors

Table 19: Impact of Manpower Status in NHFSS

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.767	.437		13.202	.000
HW-ANMs	-.107	.044	-.786	-2.428	.036
DOCTORS	.080	.073	.349	1.091	.301
TS	.036	.048	.185	.768	.460

a. Dependent Variable: CDR RURAL

b. R Square: .460 Adjusted R Square: .298

Source: Own Calculations of Authors

From the above Table 16 to Table 19, multiple linear regression model shows the impact of HW-ANMs, Doctors & TS (independent variables) on dependent variable (CDR Rural). Considering HFSNE, a unit increase in HW-ANMs & Doctors by .148 units (14.8%) & .058 units (5.8%) have a positive impact on reducing CDR; while a unit increase in TS by .003 units (0.3%) will increase CDR, implying a negative impact. Similarly, an increase by .146 units (14.6%) & .021 units (2.1%) in HW-ANMs & TS will have a positive impact on reducing CDR; while a unit increase in doctors by .107 units (10.7%) will increase CDR, implying a negative impact in HFSNNE. For NHFSL, a unit increase in TS by .061 units (6.1%) will have a positive impact on reducing CDR; while a unit increase in HW-ANMs & doctors by .062 units (6.2%) & .088 units (8.8%) will increase CDR, implying a negative impact. Similarly, a unit increase in HW-ANMs by .107 units (10.7%) will have a positive impact on reducing CDR; while a unit increase in doctors & TS by .080 units (8%) & .036 units (3.6%) will increase CDR, implying a negative impact in NHFSS. Moreover, the values of R^2 shows that model explains 62.9% (HFSNE), 46.3% (HFSNNE), 68.4% (NHFSL) & 46% (NHFSS) of variations in CDR due to HW-ANMs, Doctors & TS.

IMR in Rural Areas

Health Infrastructure

Table 20: Impact of Health Infrastructure in HFSNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	19.730	25.403		.777	.455
PHCs	-.532	.463	-.212	-1.151	.277
CHCs	-1.930	.480	-.825	-4.025	.002
SCs	.925	1.298	.124	.713	.492

a. Dependent Variable: IMR RURAL
b. R Square: .824 Adjusted R Square: .771

Source: Own Calculations of Authors

Table 21: Impact of Health Infrastructure in HFSNNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	130.237	33.123		3.932	.003
PHCs	-.545	.630	-.157	-.865	.407
CHCs	-.457	.290	-.322	-1.577	.146
SCs	-2.337	1.420	-.526	-1.646	.131

a. Dependent Variable: IMR RURAL
b. R Square: .974 Adjusted R Square: .967

Source: Own Calculations of Authors

Table 22: Impact of Health Infrastructure in NHFSL

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	14.870	2.963		5.018	.001
PHCs	-2.628	2.492	-6.031	-1.054	.316
CHCs	-.679	.225	-1.502	-3.012	.013
SCs	2.443	1.965	7.204	1.244	.242

a. Dependent Variable: IMR RURAL
b. R Square: .501 Adjusted R Square: .352

Source: Own Calculations of Authors

Table 23: Impact of Health Infrastructure in NHFSS

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	-36.962	24.261		-1.524	.159
PHCs	-.746	.648	-.210	-1.151	.277
CHCs	-3.174	.804	-.668	-3.949	.003
SCs	5.333	2.125	.460	2.510	.031

a. Dependent Variable: IMR RURAL
b. R Square: .730 Adjusted R Square: .650

Source: Own Calculations of Authors

Considering the above Table 20 to Table 23, the dependent variable (IMR Rural) was regressed on predicting variables i.e.; PHCs, CHCs & SCs. The results depicts that a unit increase in PHCs & CHCs by .532 units (53.2%) & 1.930 units (193%) helps reduce IMR, implying a positive impact on reducing IMR; while a unit increase in SCs by .925 units (92.5%) will increase IMR, implying a negative impact in HFSNE. Similarly, a unit increase in PHCs, CHCs & SCs by .545 units (54.5%), .457 units (45.7%) & 2.337 units (233.7%) will have a positive impact on reducing IMR in HFSNNE. For NHFSL, a unit increase in PHCs & CHCs by 2.628 units (262.8%) & .679 units (67.9%) will reduce IMR, implying a positive impact; while a unit increase in SCs by 2.443 units (244.3%) will increase IMR, implying a negative impact. On the contrary, a unit increase in PHCs &

CHCs by .746 units (74.6%) & 3.174 units (317.4%) will reduce IMR, implying a positive impact; while a unit increase in SCs by 5.333 units (533.3%) will increase IMR, implying a negative impact in NHFSS. Moreover, the R^2 depicts that the model explains 82.4% (HFSNE), 97.4% (HFSNNE), 50.1% (NHFSL) & 73% (NHFSS) of the variations on IMR, which is due to PHCs, CHCs & SCs.

Manpower Status

Table 24: Impact of Manpower Status in HFSNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	30.174	12.614		2.392	.038
HW-ANMs	-.844	.798	-.604	-1.058	.315
DOCTORS	.075	.519	.131	.145	.888
TS	-.060	.320	-.114	-.187	.856

a. Dependent Variable: IMR RURAL
b. R Square: .302 Adjusted R Square: .092

Source: Own Calculations of Authors

Table 25: Impact of Manpower Status in HFSNNE

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	24.845	7.240		3.432	.006
HW-ANMs	-.409	.340	-1.089	-1.203	.257
DOCTORS	.328	.392	.829	.838	.422
TS	-.098	.273	-.337	-.358	.728

a. Dependent Variable: IMR RURAL
b. R Square: .422 Adjusted R Square: .249

Source: Own Calculations of Authors

Table 26: Impact of Manpower Status in NHFSL

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	18.654	3.065		6.086	.000
HW-ANMs	-.567	.275	-1.977	-2.060	.066
DOCTORS	.664	.377	1.789	1.759	.109
TS	-.083	.132	-.200	-.628	.544

a. Dependent Variable: IMR RURAL
b. R Square: .329 Adjusted R Square: .128

Source: Own Calculations of Authors

Table 27: Impact of Manpower Status in NHFSS

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.
	B	Std. Error	Beta		
(Constant)	25.502	4.363		5.845	.000
HW-ANMs	-1.162	.440	-.697	-2.641	.025
DOCTORS	-.302	.731	-.108	-.413	.688
TS	.300	.474	.124	.632	.542

a. Dependent Variable: IMR RURAL
b. R Square: .641 Adjusted R Square: .533

Source: Own Calculations of Authors

From the above Table 24 to Table 27, multiple linear regression model shows the impact of HW-ANMs, Doctors & TS (independent variables) on dependent variable (IMR Rural). Considering HFSNE, a unit increase in HW-ANMs & TS by .844 units (88.4%) & .060 units (6%) have a positive impact on reducing IMR; while a unit increase in doctors by .075 units (7.5%) will increase IMR, implying a negative impact. An increase by .409 units (40.9%) & .098 units (9.8%) in HW-ANMs & TS will have a positive impact on reducing IMR; while a unit increase in doctors by .328 units (32.8%) will increase IMR, implying a negative impact in HFSNNE. For

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NHFSL, a unit increase in HW-ANMs & TS by .567 units (56.7%) & .083 units (8.3%) will have a positive impact on reducing IMR; while a unit increase in doctors by .664 units (66.4%) will increase IMR, implying a negative impact. Similarly, a unit increase in HW-ANMs & Doctors by 1.162 units (116.2%) & .302 units (30.2%) will have a positive impact on reducing IMR; while a unit increase in TS by .300 units (30%) will increase IMR, implying a negative impact in NHFSS. Moreover, the values of R^2 shows the impact on CDR is about 30.2% (HFSNE), 42.2% (HFSNNE), 32.9% (NHFSL) & 64.1% (NHFSS); which is due to HW-ANMs, Doctors & TS.

Changes over time in Manpower Status

Health worker (female)/ ANMs

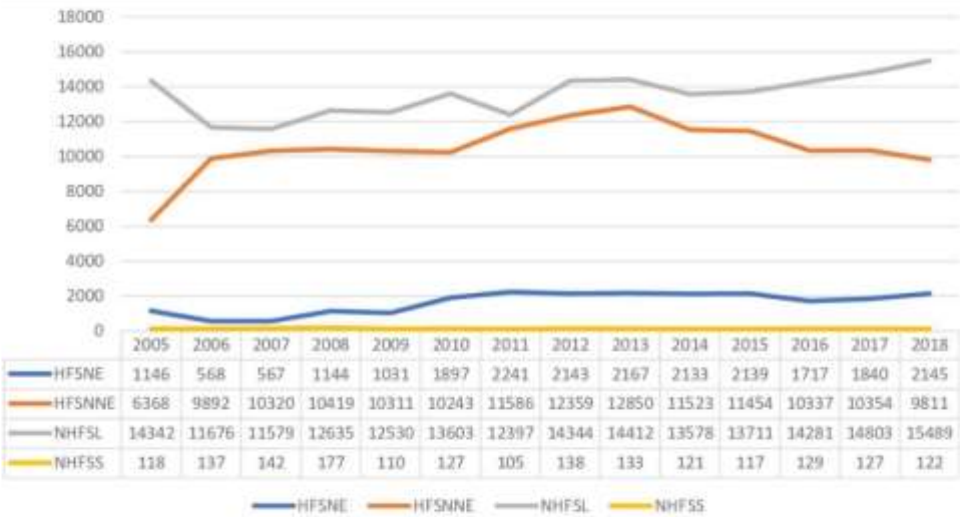
Figure 1:Trends overtime for HW-ANMs in position

Source: Authors Calculations from data through RHS & MOHFW, GOI

Figure 1 shows trends over years region wise for HW-ANMs available in PHCs & SCs from 2005 to 2018. In HFSNE, a decline in, in positions of HW-ANMs were registered in 4 years i.e.; 2011, 2014, 2015 & 2017 with -545, -384, -178 & -720. And for the remaining 9 years there have been an increase in number of positions of HW-ANMs with the highest record of in positions of HW-ANMs 3232 in 2008, followed by 1424 in 2018 & 1033 in 2012. Similarly, for HFSNNE in 2010, 2012, 2014 & 2018 there was a decline in number of positions of HW-ANMs with -3258, -1541, -14941 & -4842. For the remaining years HW-ANMs have shown an increasing trend with highest in position of 19711 in 2013 followed by 17200 in 2006 & 16530 in 2011. Considering NHFSL in 2006, 2007, 2014, 2015, 2016 & 2017 there was a decline in number of positions of HW-ANMs with -871, -2548, -2921, -6163, -71 & -4798; besides this the highest in position was registered with 27032 in 2009 followed by 8239 in 2013 & 3246 in 2010. For NHFSS; in 2009, 2010, 2014, 2015 & 2018 there was a decline in number of positions of HW-ANMs with -9, -36, -8, -22 & -57, while in 2007 there was no change in number of HW-ANMs working and for remaining years highest in position were registered with 189 in 2008 followed by 87 in 2016 & 81 in 2012.

Doctors

Figure 2: Trends overtime for doctors in position



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HFSNE	1146	568	567	1144	1031	1897	2241	2143	2167	2133	2139	1717	1840	2145
HFSNNE	6368	9892	10320	10419	10311	10243	11586	12359	12850	11523	11454	10337	10354	9811
NHFSL	14342	11676	11579	12635	12530	13603	12397	14344	14412	13578	13711	14281	14803	15489
NHFSS	118	137	142	177	110	127	105	138	133	121	117	129	127	122

Source: Authors Calculations from data through RHS & MOHFW, GOI

Figure 2 shows changes over years region wise for doctors available at PHCs in rural areas. In HFSNE, a decline in, in positions of doctors was registered in 2006, 2007, 2009, 2012, 2014 & 2016 with -578, -1, -113, -98, -34 & -422 and for the remaining years availability of doctors was highest with 866 in 2010, followed by 577 in 2008 & 344 in 2011. For HFSNNE, in 2009, 2010, 2014, 2015, 2016 & 2018 there was a decline in number of availability of doctors with -108, -68, -1327, -69, -1117 & -543. For the remaining years availability of doctors have shown an increasing trend with highest in position of 3524 in 2006, followed by 1343 in 2011 & 773 in 2012. Considering NHFSL in 2006, 2007, 2009, 2011 & 2014 there was a decline in number of availability of doctors with -2666, -97, -105, -1206 & -834; besides this the highest availability of doctors was registered with 1947 in 2012, 1073 in 2010 & 1056 in 2008. Availability of doctors in NHFSS shown a declining trend in 2009, 2011, 2013, 2014, 2015, 2017 & 2018 with -67, -22, -5, -12, -4, -2 & -5. While the highest availability of doctors was registered with 35 in 2008 followed by 33 in 2012 & 19 in 2006.

Total Specialists

Figure 3: Trends overtime for TS in position

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HFSNE	229	10	9	384	170	253	266	142	132	133	135	159	168	184
HFSNNE	878	1550	2029	1952	2599	2942	3684	3009	2936	2240	2121	2085	1939	1778
NHFSL	2830	2407	3070	1919	3001	3571	2972	2694	2714	1696	1789	1929	2029	2104
NHFSS	16	12	9	24	19	15	13	13	23	22	33	19	20	8

Source: Authors Calculations from data through RHS & MOHFW, GOI

Figure 3 shows changes over years region wise for TS available at CHCs in rural areas. For HFSNE, in 2006, 2007, 2009, 2012 & 2013 there was a decline in number of availabilities of TS with -219, -1, -214, -124 & -10 and for the remaining years availability of TS was highest with 375 in 2008. In HFSNNE, decline in number of availabilities of TS was registered in 2008 with -77 and after 2011 till 2018 there was a continuous decline in the number of availabilities of TS in this region. Considering NHFSL, highest decline in availability of TS was registered in 2008 with -1151 followed by -1018 in 2014 & -599 in 2011 and the highest availability of TS was registered in 2009 with 1082. For NHFSS, in 2006, 2007, 2009, 2010, 2011, 2014, 2016 & 2018 decline in availability of TS was registered, while in 2012 there was no change in number of TS working and for the remaining years there was an increase in the number of TS in this region but was not up to the mark as compared to other 3 regions.

4. DISCUSSION & RECOMMENDATIONS

India in the past 20 years, has accelerated financial development, but fared ineffectively in human improvement outcomes. Population midpoints like, child wellbeing and maternal mortality, remain unsuitably high (Baru et al., 2010) and India's performance in terms of Universal Health Coverage (UHC) depends predominantly on sufficient and successful human resources for health giving consideration at essential, optional and tertiary levels in both general society and private areas (Planning Commission of India , 2011). Despite significant increase in health infrastructure and manpower status, progress in health indicators has been uneven across states [(Sankar&Kathuria, 2014); (Dwivedi, 2015)], the poor people in poorer states are still not benefited adequately from healthcare services (Dash &Mohanty, 2019). Taking into account the variations in CBR, CDR & IMR; CBR was more spread out in NHFSL with 0.45765 total numbers of live births per 1000 in rural areas and 0.47987 total numbers of live births per 1000 in urban areas; CDR was more spread out in HFSNE with 0.28886 number of deaths per 1000 in rural areas and 0.24486 number of deaths per 1000 in urban areas. IMR was more spread out in NHFSS with 1.10167 number of infant deaths for every 1000 live births in rural areas and 0.82899 number of infant deaths for every 1000 live births in urban areas.

SCs are considered as the first reaching point between PHCs and CHCs, following PHCs at second level and CHCs as the topmost in rural healthcare systems. The main function of SCs is to take care of individuals’ health and basic needs (Bhandari& Dutta, 2007). Considering HFSNE, to minimize CBR, CDR & IMR government should increase the number of PHCs & CHCs; besides HW-ANMs & TS should be increased to reduce CBR & IMR and to reduce CDR, HW-ANMs & Doctors need to be increased in this region. For HFSNNE to minimize health indicators, more of PHCs, CHCs and SCs need to be established; besides HW-ANMs & TS need to be in position in this area. In NHFSL, to bring down the CBR more of CHCs & SCs need to be established with increasing the number of positions of HW-ANMs & TS, for controlling the CDR more of SCs & TS need to be increased and to decrease IMR, government should increase the number of PHCs & CHCs, with increasing the number of positions for HW-ANMs & TS in this region. For NHFSS to diminish CBR & IMR, more of PHCs & CHCs need to be established with increasing HW-ANMs & Doctors and for reducing CDR, more CHCs & SCs need to be established, with increasing the in position of HW-ANMs in this region.

Rural Health care services suffer from a shortage of availability of Specialists, public health infrastructure and well-trained manpower, measured against the minimal norms as prescribed by the government (Saikia& Das, 2014), although even if adequate health infrastructures are available in every state, a lack of manpower status renders the entire existing facility useless (Saikia, 2014). Besides considering all the four regions i.e.; HFSNE, HFSNNE, NHFSL & NHFSS the progress of manpower status is discussed in terms of availability of HW-ANMs in PHCs & CHCs, Doctors in PHCs & TS in CHCs in rural areas. The results conclude that availability of HW-ANMs in PHCs & CHCs was highest in HFSNNE & lowest in NHFSS, availability of doctors in PHCs was highest in NHFSL & lowest in NHFSS and availability of TS in CHCs was highest in HFSNNE and lowest in NHFSS followed by HFSNE & NHFSL. Although, for NHFSS whether it is the availability of HW-ANMs in PHCs & CHCs, Doctors in PHCs and TS in CHCs is lowest in this region. Similarly, in HFSNNE the availability of HW-ANMs in PHCs & CHCs, Doctors in PHCs and TS in CHCs is highest for this region, followed by NHFSL and HFSNE.

Since NRHM has been a mammoth attempt by the union government of India to construct the general well-being standard of individuals, lowering the sickness and ailment among the majority of the country. The mission deserves credit for providing medical services to rural India; additionally, it has been a pioneer in emphasizing the importance of public participation combined with intersectoral collaboration. The rural healthcare system has made progress in recent years in order to change the indicators' outlook, though it is limited to a few states [(MohdTaqi et al., 2017); (Gopalakrishnan& Immanuel, 2017)]. Therefore, the solution to the problem of meeting rural health needs is to strengthen public sector rural infrastructure including primary, secondary and tertiary referral facilities (Qadeer, 2011). Rural services must be made more appealing by offering competitive incentive packages, both monetary and non-monetary, as well as better working and living conditions in rural areas. This can only be accomplished by significantly increasing public expenditure on healthcare not only by the central government but also by each state government (Saikia, 2018).

5. CONCLUSION

The study concludes that in HFSNE increasing PHCs, CHCs along with increasing in positions of HW-ANMs is required to control health indicators. Similarly, in HFSNNE increasing PHCs, CHCs, SCs along with increase in positions of HW-ANMs & TS is required to control health indicators. In NHFSL increasing SCs along with increasing the in positions of TS is requisite to control health indicators. And in NHFSS increasing CHCs along with increasing the in positions of HW-ANMs is required to control health indicators. Future study in terms of health infrastructure and manpower status available at PHCs, CHCs and SCs with focus on other health indicators may be done over the period. The following study takes into consideration time frame of 2005-2018, but study with extensive period may be made to further study these variables.

For the improvement of mortality and fertility rates there is a need to develop proper infrastructure facilities and manpower status. Regular monitoring and management are required to improve the quality of essential medical care administrations. Along with increasing and improving the quantity of health care administrations, the government should emphasis on improving the quality of health care services by improving access to water, sanitation, hygiene and immunizations for infants, women, men and children.

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