Do health policies address the availability, accessibility, acceptability, and quality of human resources for health?: Analysis of three decades of National Health Policy of India

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Research Article

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Abstract

Background Human Resources for Health (HRH) are crucial to improve health services coverage and population health outcomes. The World Health Organisation (WHO) promotes four dimensions - availability, accessibility, acceptability, and quality (AAAQ) for HRH strengthening. Integrating AAAQ dimensions in policymaking is essential to reduce the critical shortage of HRH in India.

Methods We created a multilevel framework to evaluate the incorporation of AAAQ dimensions along with strategies and actions that can improve them in HRH-related policies. HRH-related recommendations of all versions of the National Health Policy of India (NHPI) were classified according to targeted dimensions and cadres. We evaluated the extent to which NHPIs incorporated AAAQ dimensions over three decades. Furthermore, dimension-wise normalized indices were formulated to calculate HRH deficits for pre-NHPI years to assess situational deficiencies. Finally, we evaluated whether or not the HRH recommendations of NHPIs addressed the deficient cadres and dimensions for the corresponding year.

Results We observed that HRH availability and quality were focused more in NHPI compared to accessibility and acceptability. Doctors were prioritized over auxiliary nurses-midwives and health assistants. AAAQ indices showed deficits in all dimensions in almost all cadres over the years. The cadres focused by NHPI recommendations did not completely correspond to the deficient cadres.

Conclusion The framework and indices based method can help identify the gaps between targeted and needed dimensions and cadres for effective HRH strengthening in countries. At the global level, the application of framework and indices will allow a comparison of strengths and weaknesses of HRH-related policies of various nations.

Background

Human resources for health (HRH) are “all people primarily engaged in actions with the primary intent of enhancing health”.⁽¹⁾ HRH is a crucial component of health systems to improve health services coverage and population health outcomes.⁽²⁾ HRH strengthening is, therefore, quintessential to achieve Universal Health Coverage (UHC)⁽³⁾ within the broader Sustainable Development Goals (SDGs) framework.⁽⁴⁾ However, there is a shortage of 6.9 million and 4.2 million skilled HRH in South-East Asia and Africa, respectively.⁽⁵⁾ To address this shortage, under SDG-3.c, the World Health Organization (WHO) encourages nations with an HRH crisis to create and implement national and local policies focused on four HRH dimensions - availability, accessibility, acceptability, and quality (AAAQ).⁽⁵⁾

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India is facing a critical shortage of HRH with only 160 skilled health workers per 100,000 people.⁽⁶⁾ In 2016, 36% of total HRH served in rural areas which had 71% population with doctors and nurses constituting the largest portion of HRH.⁽⁷⁾ In response to global calls and the existing crisis, India adopted the target of achieving 550 physicians, nurses, and midwives per 100,000 population by 2030 under SDG indicator 3.c.⁽⁸⁾ The National Health Policy of India (NHPI), arguably, the most comprehensive policy securing the health of a billion Indians, encompasses recommendations and plans to attain UHC.⁽⁹⁾ The first NHPI (1983) was framed as a response to the 1978 Alma Ata Declaration. Subsequently, NHPI was revised in 2002 and 2017 to match the country's needs and progress. Integrating HRH recommendations aimed at AAAQ dimensions in NHPI can bridge national priority-setting and global calls for action.

Analysis of NHPIs in the context of HRH is crucial for the following reasons. First, it helps to study policy changes and their effects on HRH strengthening over an extensive period of three decades. Second, it helps to evaluate the nation's policy commitment towards addressing HRH needs and achieving development targets. Third, it could guide the development of future policies geared towards areas of need in an evidence-based fashion. Thus, our analysis has three main aims:

1. Identify the degree of incorporation of WHO's AAAQ dimensions in NHPI's HRH-related recommendations.
2. Identify dimensional deficiencies in HRH cadres prior to three NHPI adoptions to gauge situational needs and also assess longitudinal trends in deficiencies.
3. Investigate whether NHPI recommendations targeted the deficient HRH dimensions and cadres.

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Methods

Data Sources and Variables:

We obtained NHPI reports for 1983, 2002, 2017, and the 'Situational Analyses: Backdrop to NHPI 2017' report from the Health Policy section of the National Health Portal of India.⁽¹⁰⁾ We extracted the absolute number of national and rural personnel present for 49 HRH cadres enlisted in Indian Public Health Standards (IPHS),⁽¹¹⁾ for pre-NHPI years 1982, 2001, and 2016. Data sources and specifications are given in **Additional file 1**- Table 1. The cadre-wise absolute numbers were converted to HRH personnel density per 100,000 people (P) using population estimates taken from the census tables (**Additional file 1**- Table 1). We calculated two cadre-wise requirement thresholds (R) i.e density of HRH personnel required per 100,000 population using benchmark planning committee reports from Health Survey & Development or the Bhore Committee (R-1)⁽¹²⁾ and High-level Expert Group (HLEG) (R-2).⁽¹³⁾ Calculations of P and R values are detailed in **Additional File 2**. We chose the Bhore Committee (1946) and HLEG (2012) reports as the former presented the first HRH requirement thresholds for Independent India while the latter presented the latest norms. Together they cover the span of over thirty years encompassing the same period covered by NHPIs. The Bhore Committee set an ambitious target for the then India, which would have brought India closer to UHC much earlier. The HLEG presents a recent and realistic target-setting, considering the existing HRH shortage and global development calls.

Table 1

Cadre-wise distribution of HRH-related strategies and actions used in the NHPI recommendations for

NHPI Year	Availability			Accessibility			Acceptability	
	Cadre focused	Recommendations given	Strategy not used	Cadre focused	Recommendations given	Strategy not used	Cadre focused	Recommendations given
1983	Other ^a	-Create new cadre of sanitary-cum-epidemiological staff	-Establish new training institutes -Increase number of seats in existing training institutes	Doctors	-Monetary incentive by non-practice allowance	-Establish training institutes in underserved areas -Task shifting & multi-tasking of HRH cadres in underserved areas -Develop information systems & tools to measure & monitor geographical distribution of HRH -Tele-consultation -Mainstream & integrate indigenous HRH in underserved areas -Identify groups/individuals motivated to work in underserved areas	No recommendation focused on HRH	
	Non-cadre specific ^b	-Create norms for HRH production, -Measure and monitor availability of HRH using information systems	-Task shifting & task sharing -Recruiting HRH from foreign countries -Retaining HRH within country	AYUSH ^c	-Mainstream and integrate indigenous HRH cadres -Task shifting in underserved areas by deploying AYUSH to urban areas			
				Other	-Create new cadre of sanitary-cum-epidemiological staff specifically for underserved areas	-Remove professional isolation -Remove administrative barriers in recruitment like walk-in interviews -Mandatory rural postings		
2002	Doctors	-Introduce minimal deployment norms -Increase no. of specialist seats in medical institutes -Establish new training institutes -Task sharing with paramedics -Task shifting by AYUSH and LMPs ^d -Task shifting in public health specialty by allied professionals -Task shifting by medical officers	-Recruiting HRH from foreign countries -Retaining HRH within country -Develop information systems & tools to measure & monitor availability of HRH	Doctors	-Mandatory rural service -Removing administrative barriers of recruitment -Task shifting by AYUSH, LMPs, medical officers in underserved areas -Task sharing with paramedics -Tele-consultation	-Establish training institutes in underserved areas -Incentives for rural services -Identification of groups or individuals motivated towards serving underserved areas -Removing professional isolation -Develop information systems & tools to measure & monitor geographical distribution of HRH	Non-cadre specific	-Establish staff norms to meet specific requirements of women
	Nurses	-Increase no. of nursing institutes -Introduce minimal deployment norms						
	Other	-Establish new training institutes -Create new cadre of LMPs		AYUSH	-Mainstream & integrate indigenous HRH in underserved areas			

^aOther cadres include dentists, mid-level practitioners, community health workers and multi-purpose workers. ^bNon-cadre specific recommendations are applied to Siddha and Homeopathy, ^dLMPs: Licentiate Medical Practitioners, ^eCHWs: Community Health Workers, ^fIPHS: Indian Public Health Standards, ^gASHAs: Accredited Social Health Activists

				Other	-Create new cadre of LMPs specifically for underserved areas			
2017	Doctors	-Establish new training institutes -Increase no. of seats in existing institutes -Task shifting by paramedics AYUSH, nurses, pharmacists -Creating new HRH cadre of family medicine, from College of Physician and Surgeons -Establish new training institutes	-Recruiting HRH from foreign countries -Reducing immigration -Creating new HRH cadre	Doctors	-Mandatory rural postings -Financial and non-financial incentives -Establish medical college in underserved areas -Task shifting by bridge course by paramedics, AYUSH, nurses, pharmacists, medical officers, community mental health workers, -Removing professional isolation -Identifying individuals to work in underserved areas by voluntary work private practitioners voluntary work, -Attract and retain HRH by increase in sanctioned posts and financial incentives -Tele-consultation by psychiatrists	-Removing administrative barriers identifying groups/individual motivated to serve underserved areas -Establish training institutes in underserved areas	Doctors	-Prefer student: from underserv area in medica colleges -Curriculum changes to develop socio-cultural competence
	Nurses	-Increase no. of training institute -Create new HRH cadre by nurse practitioner, nurse trainers and public health nurses						
	Other	-Establish new training institutes for CHW -Increase number of seats in existing training institutes -Develop tools to measure HRH specifically for CHWs according to IPHS ^f norms -Create new HRH cadre of public health management cadre, community mental health worker		Paramedics (pharmacists)	-Task shifting and multitasking of HRH cadres in underserved areas			
	Paramedics (pharmacists)	-Increase number of seats in existing training institutes, -Retaining HRH within the country by reducing attrition,		AYUSH	-Mainstream and integrate indigenous HRH in underserved areas -Tele-consultation		Nurses	-Expand cadres with high local acceptance preferentially e preferential selection of ASHAs ^g in nursing courses

^aOther cadres include dentists, mid-level practitioners, community health workers and multi-purpose workers. ^bNon-cadre specific recommendations are applied to Siddha and Homeopathy, ^dLMPs: Licentiate Medical Practitioners, ^eCHWs: Community Health Workers, ^fIPHS: Indian Public Health Standards, ^gASHAs: Accredited Social Health Activists

-Task shifting and task sharing, -Develop tools to measure HRH by IPHS norms	Other	-Task shifting and multitasking of HRH cadres in underserved areas by CHWs -Creating cadre specific for underserved area as B.Sc. in community health	Paramedics	-Expand cadres with high local acceptance preferentially e preferential selection of ASHAs in paramedical courses
	Non-cadre specific	-Provide financial and non-financial incentives		

^aOther cadres include dentists, mid-level practitioners, community health workers and multi-purpose workers. ^bNon-cadre specific recommendations are applied to Siddha and Homeopathy, ^dLMPs: Licentiate Medical Practitioners, ^eCHWs: Community Health Workers, ^fIPHS: Indian Public Health Standards, ^gASHAs: Accredited Social Health Activists

Framework for Policy Analysis:

We created a three-tiered framework with dimensions, strategies, and actions for assessing HRH strengthening (Fig. 1). The first level is based on four HRH-AAAQ dimensions proposed by the Global Health Workforce Alliance (GHWA)(14) - availability (total number of personnel: stock and production), accessibility (distribution across sectors: public and private, demographics: rural and urban, and levels of care: primary, secondary and tertiary), acceptability (compatibility with the population being served in terms of HRH sex/age composition, skill-mix, cultural awareness, attitudes, and behaviors), and quality (competencies, training and skills, knowledge, and professional work ethics and patients' satisfaction). Based on an iterative scoping review of literature for Indian HRH, we added strategies and actions that could improve each dimension. Strategies are the broad approaches that can be used independently or in combination to improve a dimension. Cutting across dimensions and working in synergy, actions under strategies are directly implementable measures to produce such an improvement. The framework has four dimensions, twenty strategies, and twenty-four actions (Fig. 1).

Indices for Dimensional HRH Deficits

We formulated four indices that quantified an important strategy corresponding to each AAAQ dimension. Availability deficit (AvD) measures the deficit in the total stock of HRH, accessibility deficit (AsD) measures the maldistribution of rural HRH against their gross national presence, acceptability deficit (ApD) measures the skew in skill-mix, and quality deficit (QD) measures the deficit of qualified HRH.

AvD measures the deficit of present HRH with respect to the requirement thresholds.

$$AvD = 1 - \left(\frac{P}{R}\right) \quad (\text{Eq 1})$$

AsD measures the deficit of HRH present in rural areas with respect to the national estimates.

$$AsD = 1 - \left(\frac{P_{rural}/R_{rural}}{P_{national}/R_{national}}\right) = 1 - \left(\frac{P_{rural}}{R_{national}}\right), \text{ as } R_{rural} = R_{national} \quad (\text{Eq 2})$$

ApD measures the deficit of nursing and supporting cadres with respect to doctors.

$$ApD = 1 - \left(\frac{P_{cadre}/R_{cadre}}{P_{doctor}/R_{doctor}}\right), \text{ cadre} = \text{nursing and supporting cadres} \quad (\text{Eq 3})$$

QD measures the deficit of qualified HRH with respect to total estimates i.e. qualified and unqualified.

$$QD = 1 - \left(\frac{P_{qualified}/R}{P_{qualified+unqualified}/R}\right) = 1 - \left(\frac{P_{qualified}}{P_{qualified+unqualified}}\right)$$

(Eq 4)

These deficit indices (collectively represented as D) normalized as per contextual pre-determined requirement thresholds (R) indicate (a) no deficit if D = 0, (b) a positive deficit if D > 0, and (c) a surplus if D < 0. Here, we classified HRH deficit quartiles as critical (1 to 0.75), high (0.74 to 0.50), moderate (0.49 to 0.25), and low (0.24 to 0). The surplus was categorized as low (-0.01 to -0.24), moderate (-0.25 to -0.49), high (-0.50 to -0.74), and extreme (<-0.75).

Data Analysis:

Inclusion criteria

We included only the cadres with P values available for at least two out of three years at the national level and R prescribed by at least one committee, resulting in eight cadres - auxiliary nurse midwives (ANMs), health assistant females (HAFs), pharmacists, nurses, dentists, indigenous medical practitioners - AYUSH (Ayurveda, Yoga, Unani, Siddha, Homeopathy), and doctors (graduates and postgraduates in allopathic medicine). We considered ANMs, HAFs, and nurses together as nursing cadres, while pharmacists and nursing cadres together as supporting cadres.

Analysis 1

To evaluate the incorporation of AAAQ dimensions and focussed cadres, we screened all NHPI sections for HRH-related recommendations. Each recommendation was coded according to - addressed dimensions, targeted cadres, recommended strategies, and employed actions (**Additional file 1**- Table 2). Recommendations not specific to any cadres were coded as 'non-cadre specific'. Cadres apart from the eight mentioned above were grouped as 'others'. For each NHPI, we recorded the total number of dimension-wise and cadre-wise recommendations independently and further cross-tabulated them. Variations in the total number of mentions across NHPIs were used to determine trends in changing focus. The focus was determined by the number of mentions.

Table 2
Number of cadre-wise recommendations of HRH in the NHPIs for AAAQ dimensions.

Cadres	Dimension-Wise Recommendations											
	Availability			Accessibility			Acceptability			Quality		
	1983	2002	2017	1983	2002	2017	1983	2002	2017	1983	2002	2017
Doctors	0	6	12	1	4	12	0	0	0	0	4	14
Nurses	0	4	2	0	1	2	0	0	1	0	1	6
AYUSH ^a	0	0	0	1	0	4	0	0	1	0	0	1
ANMs ^b	0	0	0	0	0	0	0	0	0	0	0	0
HAFs ^c	0	0	0	0	0	0	0	0	0	0	0	0
Dentists	0	1	0	0	0	0	0	0	0	0	0	1
Pharmacists	0	0	4	0	1	1	0	0	0	0	2	4
Others ^d	1	1	7	0	1	6	0	0	2	2	0	2
Non- cadre specific ^e	2	0	1	1	1	1	0	2	0	4	1	6
Total recommendations	3	12	26	3	8	26	0	2	4	6	8	34
^a AYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy, ^b ANMs: Auxiliary Nurses-Midwives, ^c HAFs: Health Assistants Female. ^d Other cadres include dentists, mid-level practitioners, community health workers and multi-purpose workers. ^e Non-cadre specific recommendations are the ones which are not specific to any cadre.												

Analysis 2

We calculated AAAQ deficit indices for eight cadres using R-1 and R-2 for pre-NHPI years at national (total) and rural levels. P values were unavailable for 1982 rural HRH. Hence, six sets of national and four sets of rural AvD and ApD and two sets of AsD were obtained. Similarly, two sets of QD were calculated as the qualification status of HRH was unavailable for 1982. (a) We looked at the longitudinal changes in cadre-wise national and rural deficits from 1982 to 2016 using both R-1 and R-2. (b) For situational analyses, we used cadre-wise national-level deficit indices calculated using 'P' values for each pre-NHPI year (1982, 2001, and 2016) and relevant 'R' values i.e. R-1 for 1983-NHPI and 2002-NHPI, R-2 for 2017-NHPI. Cadres were classified into corresponding deficit or surplus categories.

Analysis 3

To check whether NHPI recommendations targeted the deficient HRH dimensions and cadres, we compared focused cadres for each dimension in each NHPI with their deficit categories for corresponding years. We used (a) cadre-wise recommendations corresponding to each dimension from Analysis 1 (b) cadre-wise deficit categories under each dimension taken from Analysis 2.b. We arranged the cadres in descending order according to the number of NHPI-recommendations. We then compared whether or not the focused cadres in NHPI corresponded with their deficit categories i.e. whether cadres with high deficit had more focus in the NHPI recommendations and vice versa.

Results

1. Dimension-wise and cadre-wise distribution of NHPI recommendations

The total HRH-related recommendations increased from twelve in 1983, thirty in 2002 to ninety in 2017. Figure 2A shows the distribution of recommendations across AAAQ dimensions. Across the years, the dimensional focus shifted from HRH quality to availability and back to quality. Focus on accessibility increased while acceptability was consistently neglected. The commonly proposed strategies for improving availability, accessibility, and quality were: establishing new and expanding existing training institutes, task shifting/sharing, and need-based changes in training, respectively (Table 1). The total cadre-specific recommendations increased from five in 1983, twenty-six in 2002 to eighty-two in 2017 (Fig. 2B) with seven, four, and eight non-cadre specific recommendations, respectively. Doctors were prioritized across all NHPIs while ANMs and HAFs were neglected. The commonly proposed implementation strategies for doctors were mandatory rural service and changes in the curriculum. Improvement in training, integrating AYUSH in underserved areas, and establishing professional councils were common strategies for nurses, AYUSH practitioners, and paramedics, respectively (Table 1). Cross-tabulation of cadre-wise and dimension-wise number of recommendations is given in Table 2.

2.a. Longitudinal trends of the dimension-wise deficits over three decades

Over three decades, national AvD showed a decreasing trend for all cadres under both norms. The steepest decrease indicated as percentage drop was seen for pharmacists (150%) and doctors (766%) using Bhore (Fig. 3A) and HLEG norms (Fig. 3B), respectively. Least fall was in HAFs under both norms (30% - Bhore and 26% - HLEG). Majority cadres showed little change in rural AvD. ANMs (16%) and AYUSH (248%) showed the greatest fall in rural AvD using Bhore and HLEG norms (Figs. 3C and 3D), respectively. AsD for nurses, pharmacists, and doctors was almost constant (~ 1% change) between 2001 and 2016 while AsD increased for remaining cadres (Fig. 4). ApD showed a decreasing trend under both requirement thresholds at national (Figs. 5A and 5B) and rural levels (Figs. 5C and 5D). QD for all cadres declined with the fall being steepest for dentists (621%) and least for pharmacists (47%) (Fig. 6).

2.b. Retrospective situational analyses of HRH for pre-NHPI years

In 1982, all cadres had critical-to-high AvD with the greatest deficit for nurses using R-1 as norm (Fig. 3A). High and moderate ApDs were noted for nursing and supporting cadres, respectively (Fig. 5A). AsD and QD were not measured due to a lack of data. In 2001, all cadres except pharmacists had positive AvDs with nurses being the most deficient (Fig. 3A). All cadres showed poor accessibility with AsD being greatest for nurses and least for HAFs (Fig. 4). For all cadres, unqualified HRH was more than the qualified indicating deficit in quality with QD being highest for pharmacists and lowest for AYUSH (Fig. 6). Moderate and low ApDs were noted for HRH, considering nursing and supporting cadres, respectively (Fig. 5A). In 2016, using R-2, all cadres except ANMs and HAFs had surplus availability (Fig. 3B). All cadres showed accessibility deficits with AsD categories almost identical to that in 2001 (Fig. 4). QD was highest for pharmacists and lowest for dentists (Fig. 6). Nursing and supporting cadres showed high and moderate ApDs, respectively (Fig. 5B).

3. Comparison of cadre-wise deficit categories with cadre focused in NHPIs

Table 3 shows that no cadre-specific recommendations were made under AAAQ-dimensions in NHPI-1983 while majority cadres had moderate-to-critical deficits. In 2002, no availability-related recommendations were made for HAFs and ANMs which had high and moderate AvDs. Pharmacists and nurses with critical AsD had only one accessibility-related recommendation each, and AYUSH, dentists, and ANMs with moderate-to-high deficits had none. Pharmacists and nurses with critical QDs had only two and one quality-related recommendations respectively, and AYUSH and dentists with high to moderate deficits had none. In 2017, there were twelve availability-related recommendations for doctors who had extreme surplus while HAFs and ANMs with high to low availability deficits had no recommendations. Nurses and pharmacists with critical AsD had two and one recommendations, respectively while dentists, ANMs, and HAFs with critical to high deficits had none. Doctors had fourteen quality-related recommendations despite showing a low deficit. In all NHPIs, negligible acceptability-related recommendations were made despite consistent deficits.

Table 3
Number of cadre-wise recommendations compared with their deficit categories for AAAQ dimensions.

1983		2002				2017		
Dimension	Cadre	Recommendations	Deficit category using Bhore threshold	Cadre	Recommendations	Deficit category using Bhore threshold	Cadre	Recommendations
Availability	ANMs ^a	0/3	critical deficit	Doctors	6/12	high deficit	Doctors	12/26
	HAFs ^b	0/3	critical deficit	Nurses	4/12	critical deficit	Pharmacists	4/26
	Nurses	0/3	critical deficit	AYUSH	1/12	-	Nurses	2/26
	Pharmacists	0/3	high deficit	HAFs	0/12	high deficit	HAFs	0/26
	AYUSH ^c	0/3	-	ANMs	0/12	moderate deficit	ANMs	0/26
	Dentists	0/3	-	Dentists	0/12	-	Dentists	0/26
	Doctors	0/3	high deficit	Pharmacists	0/12	low surplus	AYUSH	0/26
Accessibility	ANMs	-	-	Doctors	4/8	critical deficit	Doctors	12/26
	HAFs	-	-	Nurses	1/8	critical deficit	AYUSH	4/26
	Nurses	-	-	Pharmacists	1/8	critical deficit	Nurses	2/26
	Pharmacists	-	-	ANMs	0/8	high deficit	Pharmacists	1/26
	AYUSH	-	-	Dentists	0/8	high deficit	Dentists	0/26
	Dentists	-	-	AYUSH	0/8	moderate deficit	ANMs	0/26
	Doctors	-	-	HAFs	0/8	low deficit	HAFs	0/26
Acceptability	Nursing cadres	0/0	high deficit	Nursing cadres	0/2	moderate deficit	Nursing cadres	1/4
	Supporting cadres	0/0	high deficit	Supporting cadres	0/2	low deficit	Supporting cadres	1/4
Quality	ANMs	-	-	Doctors	4/8	high deficit	Doctors	13/34
	HAFs	-	-	HAFs	4/8	-	Nurses	6/34
	Nurses	-	-	Pharmacists	2/8	critical deficit	Pharmacists	4/34
	Pharmacists	-	-	Nurses	1/8	critical deficit	AYUSH	1/34
	AYUSH	-	-	Dentists	0/8	high deficit	Dentists	1/34
	Dentists	-	-	AYUSH	0/8	moderate deficit	ANMs	0/34
	Doctors	-	-	ANMs	0/8	-	HAFs	0/34

'-' indicates uncalculated deficits due to unavailable data. AvD of AYUSH and dentists for 1982 and 2001, AsD of all cadres for 1982, QD of all cadres for 1983, ANMs and HAFs for 2001 and 2016 were not calculated due to unavailability of data. HRH deficit quartiles were classified as - critical (1 to 0.75), high (0.74 to 0.49), moderate (0.49 to 0.25), and low (0.24 to 0). The surplus was categorized as low (-0.01 to -0.24), moderate (-0.25 to -0.49), high (-0.50 to -0.74), and extreme (-0.75 to -1.00).

^aANMs: Auxiliary Nurse-Midwives, ^bHAFs: Health Assistants Female, ^cAYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy.

Discussion

Our results showcase that NHPIs' HRH-related recommendations were not structured to incorporate AAAQ dimensions. Over three decades, the main focus has been on HRH availability and quality, with reduced attention to accessibility and acceptability. Recommendations consistently seem to prioritize doctors over other cadres like ANMs and HAFs. The situational analysis revealed dimension-wise deficits in most cadres for all three NHPIs. Longitudinally, the magnitude of deficits declined for all dimensions except accessibility. NHPIs did not always focus on the deficient cadres thus failing to fully address the situational HRH deficiencies.

The 2014 GHWA report indicated that there was 'insufficient data' for reliance on India's HRH policy on the AAAQ dimensions(14). We evaluated the HRH-related recommendations of NHPIs for the incorporation of AAAQ dimensions to fill this gap. Deficiencies in HRH dimensions have been previously identified for India as shortages in HRH availability(15), skewed urban-rural distribution depicting disparities in accessibility(15), poor quality indicated by a substantial proportion of unregistered/unqualified HRH(15), and low nurse-to-physician ratios compromising workforce acceptability(14). While policies focusing on increasing HRH production have had success in enhancing availability, they have failed to improve the accessibility and quality of the workforce(16). Moreover, acceptability and regulation of outsized unqualified HRH remain completely unaddressed(14, 17).

Previously, HRH availability and accessibility in India (7) and other countries have been measured cross-sectionally(18) and longitudinally(19, 20), using density as a metric. Here, we formulated normalized cadre-wise AAAQ deficit indices for HRH that can bridge research and policymaking. The advantage of indices over density is that they are indicative of surplus or deficit with respect to contextual requirement norms (thresholds) determined by factors such as health financing, workforce efficiency, etc. In other studies, HRH-related policies have been assessed through interview methods(20), process tracing(18), or qualitative summarization(21). Our framework-based policy analysis is systematic and allows evaluation against quantitative indices. It can be used to study the progress of the National Health Mission (India) and translated to evaluate the HRH policies of other countries. The framework focuses on standardized policy analysis removing stakeholder bias seen in interviews and the investigator's bias in qualitative summaries. The conjoint application of framework and indices generates information useful for rigorous process-tracing.

Focusing on all four dimensions is crucial because population health outcomes can improve only when the high-quality HRH is available where needed in the form acceptable to the people(22). Integrating AAAQ dimensions in HRH parts of the health policies have shown to increase HRH density and improve population health outcomes(18). Adopting and locally implementing policies that address these dimensions is crucial and demands several prerequisites - a) identification of deficiencies in cadres through dimension-wise indices(19, 20), b) identification of dimension-wise and cadre-wise focus of HRH policies using a predetermined framework(21, 23), c) assessing the mismatches between dimensional deficiencies of HRH and focus of policy, d) experimentation with and evaluation of strategies and actions for their relevance, effectiveness, and cost-effectiveness(16, 24). Application of integrated indices-framework approach will allow cross-national comparison of strengths and weaknesses of HRH policies with respect to contextual needs and generate evidence for strategies and actions instrumental for dimension-wise HRH improvements.

In India, policies should be restructured to incorporate strategies addressing AAAQ dimensions for HRH strengthening. This will allow for an evidence-based, coordinated, and sustained response towards the HRH crisis. Indicators for HRH acceptability should be to be defined in the Indian context and actively integrated into policies. Cadre-specific recommendations should focus on primary-care level cadres like ANMs, HAFs, community health workers, and rural physicians. Implementation of strategies like reducing attrition in HRH, removing administrative barriers for deployment, developing socio-cultural competence, and regular assessment of in-service staff is crucial. Robust efforts to continually develop and check HRH requirement thresholds are necessary to address the relevance of AAAQ indices. There is an urgent need for a dedicated national HRH policy that measures needs, and develops, executes, and monitors plans to enhance AAAQ of HRH in India.

Our study has several limitations. First, the P values for 1982 are calculated using data from different sources (**Additional File 1- Table 1**) demanding caution for interpretation of the results. Second, 1982 rural AvD, rural ApD, AsD, and QD were not calculated due to a lack of cadre-wise rural HRH data for the preceding year. However, following the longitudinal declining trend of the deficit, we can infer that the above-mentioned deficits must be higher than those in 2001 and 2016 for all dimensions. Third, focused dimensions and cadres in NHPIs were determined using the number of mentions. There are other ways to determine focus such as measuring relevance, effectiveness, and cost-effectiveness of the recommended strategy(24). However, such data is not for LMICs, and measuring the strength of strategies/actions was out of the scope of study(24)].

Conclusions

The framework and indices based method can help identify the gaps between targeted and needed dimensions and cadres for effective HRH strengthening in countries. At the global level, the application of framework and indices will allow a comparison of the strengths and weaknesses of HRH-related policies and indicate implementation strategies and actions.

List Of Abbreviations

HRH: Human Resources for Health

AAAQ: Availability, Accessibility, Acceptability, and Quality

NHPI: National Health Policy of India

UHC: Universal Health Care

HLEG: High-level Expert Group

P: HRH personnel density per 100,000 people

R: density of HRH personnel required per 100,000 population

R-1: density of HRH personnel required per 100,000 population according to Bhore Committee thresholds

R-2: density of HRH personnel required per 100,000 population according to HLEG thresholds

GHWA: Global Health Workforce Alliance

AvD: Availability Deficit

AsD: Accessibility Deficit

ApD: Acceptability Deficit

QD: Quality Deficit

ANMs: Auxiliary Nurse Midwives

HAFs: Health Assistants Female

AYUSH: Ayurveda, Yoga, Unani, Siddha, Homeopathy

LMICs: Lower-Middle income countries

CHW: Community Health Worker

LMP: Licentiate Medical Practitioner

ASHA: Accredited Social Health Activist

IPHS: Indian Public Health Standards

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Study concept and design: SD and SZ

Acquisition, analysis, or interpretation of data: All authors

Drafting of the manuscript: All authors

Literature review: SD and JV

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Figures

Figure 1
Strategies and actions for HRH strengthening for availability, accessibility, acceptability, and quality dimensions. Legend - HRH: Human Resources for Health

Figure 2
A: Dimension-wise distribution of HRH-related recommendations of NHPI. Legend - Numbers written inside the bars denote the number of recommendations. NHPI: National Health Policy of India. B: Cadre-wise distribution of HRH-related recommendations of NHPI 1983, 2002, 2017. Legend - *Others include dentists, mid-level practitioners and multi-purpose workers. **Non-cadre specific recommendations are applicable to all HRH cadres. NHPI: National Health Policy of India, HRH: Human resources for Health, AYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy, ANMs: Auxiliary Nurse-Midwives, HAFs: Health Assistants Female.

Figure 3

Availability Deficit (AvD) for pre-NHPI years 1982, 2001, 2016 according to Bhore and HLEG norms. Legend - Dashed lines indicate the longitudinal changes in deficit. Truncated bars indicate that the deficit was less than -1 and the corresponding values are written on the bars. Availability Deficit of AYUSH and dentists for 1983 and 2002 were not calculated due to unavailable requirement thresholds. NHPI: National Health Policy of India, AYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy, ANMs: Auxiliary Nurse-Midwives, HAFs: Health Assistants Female.

Figure 4

Accessibility Deficit (AsD) for pre-NHPI years 2001 and 2016 according to Bhore and HLEG norms. Legend - Dashed lines indicate the longitudinal changes in deficit. Truncated bars indicate that the deficit was less than -1 and corresponding values are written on the bars. Accessibility Deficit for 1983 was not calculated due to unavailable present rural HRH data for the corresponding year. NHPI: National Health Policy of India, HRH: Human resources for Health, AYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy, ANMs: Auxiliary Nurse-Midwives, HAFs: Health Assistants Female.

Figure 5

Acceptability Deficit (ApD) for pre-NHPI years 1982, 2001, 2016 according to Bhore and HLEG norms. Legend - Dashed lines indicate the longitudinal changes in Acceptability Deficit. Truncated bars indicate that the deficit was less than -1 and the corresponding values are written on the bars. Nursing cadres include ANMs, HAFs, and nurses. Supporting cadres include pharmacists along with nursing cadres. NHPI: National Health Policy of India.

Figure 6

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Quality Deficit (QD) for pre-NHPI years 2001, and 2016. Legend - Quality Deficit for all cadres of 1983, and ANMs and HAFs for 2002 and 2017 as their qualification details were not available. NHPI: National Health Policy of India, HRH: Human resources for Health, AYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy, ANMs: Auxiliary Nurse-Midwives, HAFs: Health Assistants Female.

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