Primary Health Landscape Study

A Swasti and HSTP Collaboration

TATA TRUSTS

The Final Project Report

HSTP
Health Systems Transformation Platform

Swasti
THE HEALTH CATALYST

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Abbreviations & Acronyms

Acronym	Name
CCTs	Conditional Cash Transfers
NGO	Non-Government Organisation
PrC	Primary Care
PHC	Primary Health Care
SDGs	Sustainable Development Goals
UHC	Universal Health Coverage

Introduction

Primary health care is a whole-of-society approach to health and well-being centered on the needs and preferences of individuals, families and communities[1]. Primary health care systems serve as a first point of contact for patients and are well positioned to help individuals navigate through changing needs in the life-course: addressing health promotion, prevention, treatment, rehabilitation, and palliative care. Primary health care promotes preventive care and good health by addressing underlying social and environmental determinants of poor health, acts as a bridge to the overall healthcare system, and may be leveraged to facilitate community participation and ownership in the healthcare system. It can quickly adapt to new technologies, demographic changes, health innovations and has a high return on investment due to reduced health system costs such as reduced hospital admissions, and reduced social costs through improved health, productivity, and number of healthy days for individuals. For a country to have a strong health system, it first needs to have a strong primary healthcare system, especially for the following reasons:[2]

a) Primary health care is well-positioned to respond to rapid economic, technological, and demographic changes, all of which impact health and well-being.
b) Primary health care has been proven to be highly effective in addressing the main causes and risks of poor health and well-being and handling the emerging challenges that threaten health and well-being. It has also been shown to be a good value investment, reducing healthcare costs and improving efficiency by reducing hospital admissions.
c) Stronger primary health care is essential to achieving the health-related Sustainable Development Goals (SDGs) and universal health coverage.

Health Systems Transformation Platform, Swasti and CMS formed a partnership to conduct a systematic review of the Primary Healthcare Landscape with a view to inform policy and decision makers on potential options of comprehensive PHC models and innovations.

The deliverables under this project are included in this report and cover

1. Framework for Primary Health Care
2. IEC approval for the study
3. Systematic review method
4. Database of model and innovations
5. Short list of models and innovations for case studies

[1] WHO (2019). Primary Health Care accessed from https://www.who.int/news-room/fact-sheets/detail/primary-health-care
[2] *ibid*

Primary health care in India

India's primary healthcare system's predicament is predominantly it's dual-burden, or multiple-burden of disease. It faces common infectious diseases, neglected tropical diseases, along with chronic deficiencies and a growing number of non-communicable diseases. For its PHC system to address such complex needs of multiple communities and uphold its responsibility of the Alma-Ata Declaration of Universal Health Coverage, it needs innovative solutions that can be flexible and scaled up even within low resource settings.

Healthcare in India is a state subject and is largely restricted to a network of government Primary Health Centres (PHC) that provide limited ambulatory care. The government health care system is designed as a three-tier structure comprising primary, secondary, and tertiary facilities. In rural areas, primary health care services are provided through a network of subcenters, primary health centers, and community health centers. Despite this elaborate infrastructure, severe shortages of staff and supplies in public-sector health facilities remain. India has a doctor-to-population ratio of 1:1,674, compared with the World Health Organization norm of 1:1,000, a situation that results in acute shortages and uneven distribution of doctors. Quality of health care is sub-par and is often plagued with "ghost" staff or absenteeism resulting in communities paying severe Out-Of-Pocket Expenditure at private facilities.

To increase access to and strengthen delivery of primary health care, multiple government, NGO, and private initiatives have implemented and studied innovative solutions to address

shortages, lack of infrastructure, inertia in health seeking behavior, and many others. Health innovations can describe any new or improved intervention, ranging from health policies to management methods to products and technologies. They are meant to respond to any unmet public health need by either creating new resources or streamlining existing ones to focus on vulnerable populations. Health innovations can be created and implemented at any point of the health system from health awareness, promotion, prevention, to curative, rehabilitative or assistive care. The aim of any innovation should be improved efficiency, effectiveness, quality, sustainability, safety, and/or affordability[3]. India is filled with a plethora of lay health workers, digital, and management innovations that have perhaps been documented but not placed in a medium that presents evidence in a way to be actively used by primary healthcare actors and decision makers. Systematically reviewing these and placing them in an interactive database allows for further reach, dissemination, and impact.

Addressing PHC challenges is particularly important in India, where the health systems are inadequate in fulfilling the needs of many rural communities while facing changing demographic and epidemiological threats such as chronic conditions and increased complex comorbidities. Several organizations have attempted to conduct landscapes of community health programs, most notably, Voluntary Health Association of India and ACCESS Health International. While these studies provide overviews, they are not meant to inform program design options for India. For this reason, it is essential to understand and strategically strengthen primary health care systems through innovations that work specifically within the Indian context.

[3] https://www.who.int/topics/innovation/en/ (WHO 2019)

Objectives of the study

The **objective** of this project was to develop a comprehensive resource that will serve as a tool for researchers, decision-makers and influencers in the healthcare system to more effectively design primary health care interventions in India while improving efficiency and effectiveness of PHC in the country.

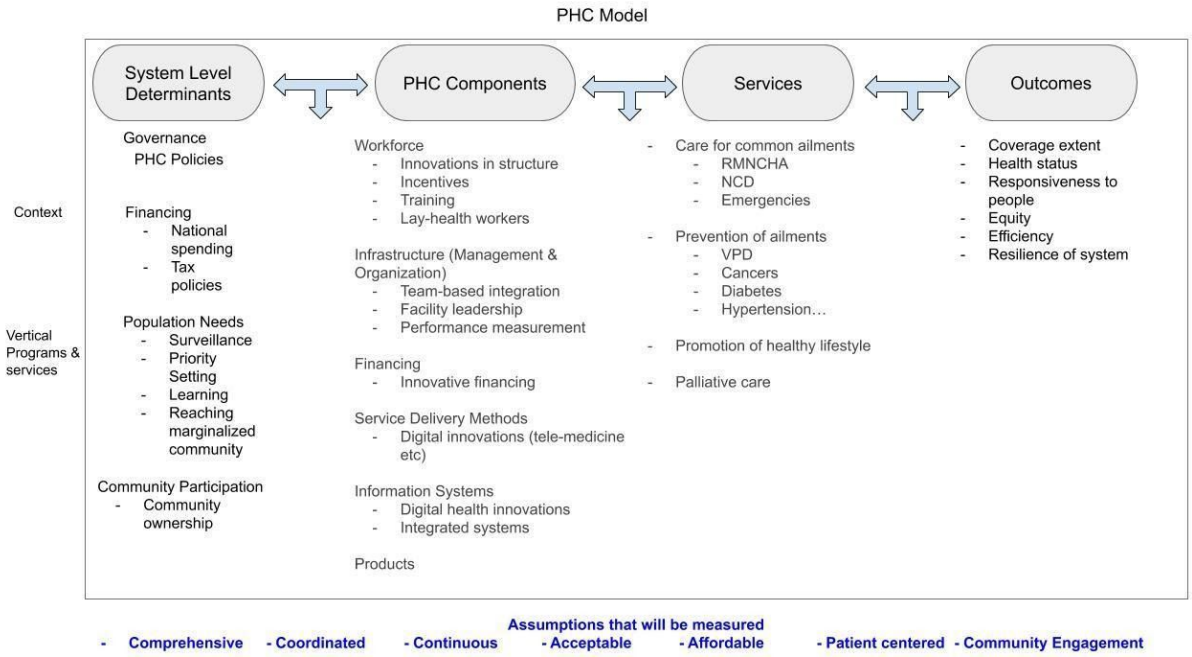
The purpose of the landscape is to systematically review the types of solutions that exist within PHCs in India, ranging from systems level governance to audit and feedback loops for nurse performance. By collating these innovations and categorizing them by health systems building blocks, HSTP and Swasti provides a knowledge resource for PHC actors and decision makers to use within their practice and programs.

Methodology

The PHC Landscape study was a secondary systematic review that searched reputed databases for all available PHC innovations that were publicly available and published. These results were then followed up to gauge the most promising interventions that can be further studied, documented as case studies, and advocated for on a larger platform. This was done through the following steps:

1. Creation of a foundational PHC framework with HSTP and Swasti consensus, including the building blocks of a PHC system
2. Development of a search strategy and keywords
3. Determining the inclusion/exclusion criteria
4. Training of staff to read through all search hits to systematically include and exclude publications according to our predetermined criteria
5. Categorization of all included publications and extraction of all impact evaluations
6. Data processing and analysis
7. Clustering of innovations and internal discussions
8. Conducting an PHC advisory group
9. Developing tools to conduct case studies with IRB approval

PHC Framework



Search Strategy

We sourced common keywords based on our framework of a PHC system and conducted searches in relevant and widely used health databases. The full search strategy and methodology are detailed in our previous technical (inception) report and can be found there for reference. The inclusion/exclusion criteria is included in Table 1. These criteria was vetted through HSTP and Swasti to ensure that we were not missing key publications moving through this process. As this is a broad systematic review on all forms of innovations, we included a wide range of publications: published journal articles, working papers, theses, newspapers, videos, and so on. Restrictions on the basis of study designs were not put in place as long as the studies were relevant by topic and location.

Included studies detailed any form of innovation that improves the efficiency, effectiveness, quality, sustainability, safety, and/or affordability of a primary care service. The focus was on innovations of both supply and demand side such as studies that changed PHC management or delivery. However, demand side interventions were limited to those that better community accountability of PHC systems and studies that were considered as health promotion, such as education and awareness campaigns.

Table 1. Parameters of PHC Innovations Landscape Literature Review	
Inclusion Criteria	
Aspect	**Criteria**
Year	After 1990
Publication	Newspapers Published studies and reports Working papers and grey literature Theses Videos
Study Design	RCTs Theory based papers Framework analysis Qualitative Quantitative Descriptive (has to provide outcome data to be included)
Implementation Area	Within India; no limiters placed on private/public/urban/rural
Topic	Any innovation included in products, management, finance, training, and delivery. These are outlined in detail within the keywords table. Care-givers that have been given training (acceptable quality standards of care) to provide home-based care or training for self-management for chronic conditions are also included.
Exclusion Criteria	
Aspect	**Criteria**
Publication	Opinion pieces Protocols History books/analyses
Study Design	Clinical trials
Implementation Area	Country: Outside India Location: Secondary and tertiary care settings Community Health Centers (CHCs) Sub-district hospitals District Hospitals

	Medical Colleges Super speciality hospitals
Topic	Pharmaceutical and drug innovations
Databases	
• Medline (Pubmed) • Embase (Ovid) • CINHAL (Ebsco)	• CAB Global Health (Ovid) • SCOPUS (Elsevier) • Cochrane Review

EPPI-Reviewer

3 reviewers/coders were trained on the framework, definitions, and inclusion/exclusion criteria to screen through studies that the search strategy yields. They were additionally trained on how to use EPPI-reviewer, a software for systematic reviews in which coders are able to reach through title and abstract and code for specific exclusion criteria, i.e. date, publication type, etc. or choose to include it for the full text review.

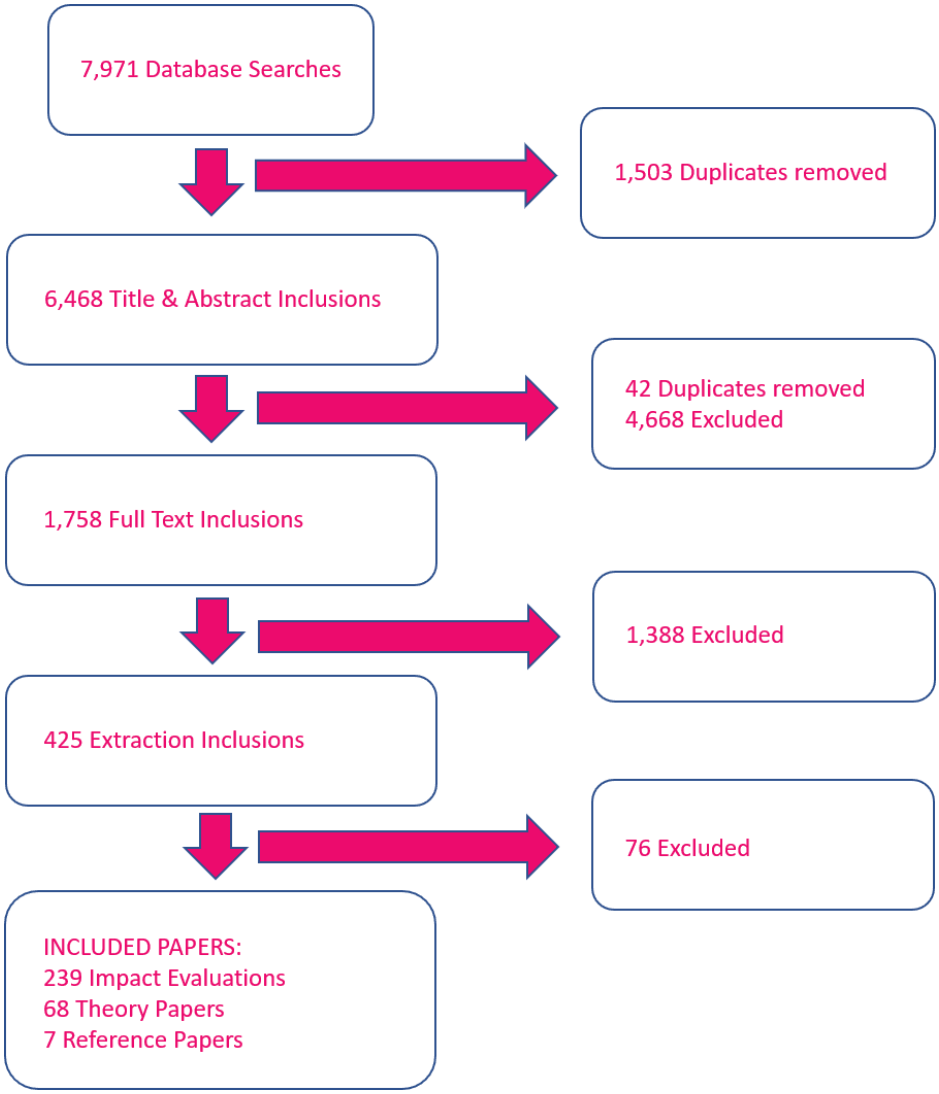
The coders first began by reading titles and abstracts for 5 different publications and discussed whether it should be included or excluded on any particular criteria. Once all the coders were able to reach consensus and reliability, they completed a set of 100 studies to calibrate the software. 1,503 duplicates were then removed if they had a 95% or higher similarity and the remaining 6,043 studies were reviewed by single coders to be excluded or included. Doubts were cleared through discussions over chat and a decision was taken with consensus. This process was then repeated at the full-text level, where the coders read through the full text of the publication to determine if it fit the study criteria. The final numbers and process is documented through the PRISMA diagram. After both rounds of coding, a total of 425 studies were put through for extractions.

Extractions

Extractions of the study included a coder going through an entire publication and categorizing data onto a spreadsheet to be able to give a quick snapshot of an innovation - it's name, location, time of implementation, intervention description, associated outcome, funding and so on. HSTP and Swasti co-developed the extraction sheet to ensure all outcomes and valid indicators are included. The extraction sheet is included within Appendix III. The extraction sheet was created along with its protocol to train the coders. This included where to find the unique identifier for each study and how to code studies with multiple innovations. For this reason we could have more innovations than the number of publications. Coders were given a total of 3 different publications to read and extract independently and then these were compared in a reliability check meeting, in which extraction details and discrepancies were discussed and finalized via consensus. Through the

process of extractions we excluded an additional 34 studies, some of which were protocols or studies that had interventions but no associated outcome data. We additionally categorized out the theory papers, reference papers, impact evaluations and systematic reviews. This gave us a final number of 349 studies and 239 impact evaluations that were in our final data extractions.

PRISMA Diagram



Clustering and Evaluations

239 impact evaluations were extracted into their innovations and impact, and further categorized into PHC health system building blocks from our framework to analyze. These are summarized in the results below. Categorizing these innovations, allowed us to critically assess the types of innovations and choose a representative sample of promising innovations from all building blocks of a PHC system. Our internal team reviewed each building block

and chose unique innovations that showed potential for scale, were unique in their design or application, and demonstrated positive impact. We finalised innovations (and models included in this list), reported in the results, to be taken up with a PHC advisory group to validate and/or refute our literature review recommendations.

PHC Advisory Group

A PHC advisory group was created to enhance our pre-selected PHC programs results through on the ground experience and a workshop was hosted by HSTP and Swasti to provide this platform for learning and vetting. The group consisted of top experts both in PHC system theory, policy, and practice. Many had spent years in growing their own PHC programs and could assist in referencing other primary healthcare program exemplars that may have been missed through an academic systematic review. These individuals also provided a network to connect the research team to PHC stakeholders for case study programs along with avenues for dissemination of research results. The following individuals participated in the PHC advisory group and offered valuable input:

- Dr Anand Krishnan, AIIMS, New Delhi
- Dr. Anuradha Jain, USAID
- Dr Chandrakant Lahariya, WHO
- Pavitra Mohan, Secretary, Basic Healthcare Services, Udaipur
- Dr Raman Kumar, Founder, Academy of Family Physicians of India
- Dr Rajani Ved, Independent
- Dr Rajesh Kumar, former PGI Chandigarh
- Rajeev Sadanandan, Health Systems Transformation Platform
- Shiv Kumar, Swasti
- Dr Vijayakumar, Amrita Medical College, Cochin
- Dr Yogesh Jain, Public health physician, Chhattisgarh

Case Study Tools Development

To create detailed case study narratives, interview tools were developed to encompass the vision, motivation of the innovation, the problem they looked to solve, and what was successfully implemented and has potential to be scaled up. These tools were developed for interviews with CEOs, program managers, implementers, and also included checklists for observational, operational, and quantitative data. Depending on the program and what would be feasible during Covid-19, we would collate all the information into one narrative case study. These tools were created and submitted to Catalyst Foundation' IEC Board and were approved on the 19th of October 2020. The tools and approval letter are both included in Appendix V and VI.

Project Results

Impact evaluations	239
Review papers	36
Theory	68
Reference papers	7
Repeated	7
Excluded	34
Total	390 [349 included publications]

In order to comprehensively assess the PHC landscape in India, we included publications such as theory papers, reference papers, system reviews and impact evaluations. There were a total of 404 publications that entered the extraction stage, 14 were excluded from the dataset due to lack of data within the publication, 5 additional publications were excluded since they were protocols and another 29 were excluded in the extraction process due to the lack of outcomes related to the intervention. 7 additional studies were repeated or were duplicates. This gave us 239 impact evaluations, 36 review papers, 68 theory papers, and 7 reference papers (349 included publications). Reference papers encompass publications that provide vital information on the state of the PHC system in India now and how it can be improved with its current trajectory. These reference papers allow us to recreate the context of the PHC system to understand how specific innovations can fit in. Theory papers are publications that may not contain research data but describe the behavioral theory or theory of change through experiences and anecdotes. These are critical in showing the big picture of many of the innovations and how they function within context. Many times this is missing from impact evaluations which is the bulk of our data along with systematic reviews. Impact evaluations were analysed and extracted for this study and is the majority of our dataset. Although there are 239 impact evaluations that were categorized and extracted, there were a total of 241 innovations gleaned from this dataset. This is because of studies that may include more than one innovation and is documented as such within our extraction sheet.

Publication	Number of extractions
Journal article	237
Report	1
Working paper	1
Editorial	0
Webpage	0

Location	Number of Innovations
Rural	126
Urban	27
Both	42
N/A	32
Tribal	13
Rural and tribal	1
Total number of innovations	241

The recorded impact evaluations were generally based within rural communities followed by mixed urban rural communities, urban communities, and finally tribal communities. Primary healthcare innovations tend to focus on improving conditions within rural areas where PHC's tend to be the focus and main source of medical care with limited resources and finances[4]. It is worth noting that there are six times more studies based in rural regions than urban, which could also indicate more funding opportunities and availability within these regions.

A lot of innovations in rural areas were focused on innovative workforce strategies as well as community ownership. In terms of workforce development, involvement of lay health workers such as ASHA workers or lay health counsellors to deliver health education, promotion and even treatment in some cases was the most popular kind of intervention. Training and task-shifting were also commonly seen workforce development interventions in rural regions. Digital service innovations were a close third and garnered encouragement and funding in rural areas. Similarly, urban regions also saw a lot of lay health worker-delivered interventions and digital innovations. Involvement of community members was an important aspect of several urban-situated interventions. Workforce centered interventions were also the most common type of interventions in tribal regions.
New diagnostic methods were a popular type of intervention in rural and urban regions. None of the interventions involving new products of any kind, such as tools, infrastructure, drugs and/or diagnostics were reported as being conducted in tribal regions. As far as management and performance measurement of healthcare workers was concerned, most interventions in rural areas were focused on continuous education and supportive mentoring.

[4] Pandit AP, Kulkarni M, Sonik S. Achieving quality in primary health care. J Nat Accred Board Hosp Healthcare Providers 2015;2:37-40

	Implementation	Funding
Government	63	45
NGO	38	6
Private-for profit	7	6
Foundation	11	85
Academic institution	75	23
Not-for profit	19	1
Other	9	5
Not available	9	24
Not applicable	1	11
Bi-lateral aid	N/A	9
Funding agency	N/A	17

Funding provided by foundations catered primarily to lay health worker-delivered interventions followed by digital service innovations and supportive mentoring programs. Funding by foundations also benefited interventions that focused on mobile outreach services and task shifting among healthcare workers. Academic institutions also tended to fund more programs that involved lay health workers. Whereas, funding agencies favoured digital service innovations the most. A lot of Government funding went into programs that facilitated community ownership.

Innovation Category Type:

a) Broad: Out of a total of 241 innovations, 76 of those were within the workforce followed by management and organization, and service delivery methods. The remainder had a similar number of innovations save for financing, which were surprisingly few. There were only 2 systems financing innovations identified which was the minimum among all categories.

b) Narrow: Most of the innovations under the workforce category involved employing lay-health workers, with training and task shifting being the next most common type of strategy. As for management and organization, the innovations were approximately equally distributed as supportive supervision or mentoring, continuous education, clinical guidelines and audit and feedback innovations. None of the innovations studied addressed modifying the leadership structure. This is also supported by the scarcity of innovations aiming to change the workforce structure. There were several service delivery innovations as well. Most of them fell under the digital service innovation category, and very few utilizing teleconsultations (only 4).

The number of impact evaluations under each category, broad and narrow, are provided in the table below.

Broad Category		**Narrow category**	
Governance	12	PHC Policies	5
		Social Policies (affecting PHC care and services)	7
System Financing	2	National spending	0
		Tax policies	0
		National insurance systems	2
Population Needs	15	Priority Setting	6
		Learning (systems to identify population need)	3
		Reaching marginalized community	6
Community Participation	19	Community ownership	19
Workforce	74	Workforce structure	1
		Incentives	4
		Training	17
		Lay-health workers	37
		Task-shifting	15
Management & Organization	37	Team-based integration	1
		Leadership structure	0
		Performance measurement - supportive supervision/mentoring	9
		Performance measurement - training (continuous education)	11
		Performance measurement - clinical guidelines	7
		Performance measurement - audit and feedback	9
Financing	9	Salary structure (performance based financing, fee-for service, capitation)	1

		Individual/community insurance structures	4
		Delivery point financing	4
Service Delivery Methods	33	Digital service innovations (this could include both clinical services and health promotion services)	20
		Mobile outreach services	9
		Teleconsultations	4
Information Systems	13	Digital medical records (EMRs)	3
		Integrating digital record systems	4
		Surveillance	6
Products	21	Products	7
		Diagnostics	10
		Consumable	2
		Drugs	0
		Infrastructure - beds/lab tools/etc	2

Specific Innovation Category Type:

Single vs. Layered	
Multilayered	10
Multi-arm innovations	7
Single	223

Most impact evaluations were single innovation focused studies with 10 being multilayered and 7 having multiple arms.
Multilayered innovations are ones that layer more than 1 category of innovation. For example an innovation that trains an outreach worker to utilize a decision support system and deliver ANC to their respective community, this would be incorporating both a lay-health/outreach worker and a service delivery innovation to reach an outcome of improving infant and maternal mortality. All of the multilayered studies had 2 layers of innovation.

The multilayered studies are described in the table below:

Study	Layer 1	Layer 2
Ajay (2016)[5]	Workforce: Task shifting. A nurse care coordinator was responsible for entering, examining patients and prescribing medications.	Service delivery methods: Digital service innovations. A mobile phone–based clinical decision-support software (mDSS) used to input patient information to generate an individualized prescription based on standard clinical management guidelines
Amarchand (2015)[6]	Management and organization: Continuous education. Healthcare workers underwent training for NCD risk assessment..	Management and organization: Clinical guidelines. A NCD risk-assessment tool was designed, based on data from the previous Indian Council of Medical Research multicentre risk-factor survey
Singh (2020)[7]	Workforce: Lay health workers. Health education imparted by Village Health Workers (VHWs).	Community participation: Community ownership. VHWs mobilised community members to seek diabetes monitoring and treatment.
Boone (2007)[8]	Workforce: Lay health workers. Lay health workers delivered health education, conducted discussions to make people aware of antenatal health needs and services available.	Service delivery methods: Mobile outreach services. Mobile teams providing antenatal check-ups, and facility-based care, with subsidised access to non-public health centres.
Carmichael (2019)[9]	Workforce: Incentives. Intervention incentivized long-term goals, non-monetary awards and integrated incentives	Management and Organization: Team-based integration. Promoted team building, solidarity and common goals. Teams would

[5] S., A. V., Devraj, J., Ambuj, R., Vidya, V., Rakshit, S., Abha, P., … Dorairaj, P. (2021). Development of a Smartphone-Enabled Hypertension and Diabetes Mellitus Management Package to Facilitate Evidence-Based Care Delivery in Primary Healthcare Facilities in India: The mPower Heart Project. *Journal of the American Heart Association*, *5*(12), e004343. https://doi.org/10.1161/JAHA.116.004343

[6] Ritvik Amarchand, Anand Krishnan, Deepika Singh Saraf, Prashant Mathur, Deepak K Shukla. et al. (2015). Lessons for addressing noncommunicable diseases within a primary health-care system from the Ballabgarh project, India. *WHO South-East Asia Journal of Public Health, 4* (2), 130 - 137. World Health Organization. Regional Office for South-East Asia

[7] Singh, S., Shukla, A., Sheikh, A., Gupta, G., & More, A. (2020). Effect of health education and screening location on compliance with diabetic retinopathy screening in a rural population in Maharashtra. *Indian Journal of Ophthalmology*, *68*(13), 47–51. https://doi.org/10.4103/ijo.IJO_1976_19

[8] Boone, P., Mann, V., Eble, A. *et al.* Community health and medical provision: impact on neonates (the CHAMPION trial). *BMC Pediatr* 7, 26 (2007). https://doi.org/10.1186/1471-2431-7-26

[9] Carmichael SL, Mehta K, Raheel H Ananya Study Group, *et al*Effects of team-based goals and non-monetary incentives on front-line health worker performance and maternal health behaviours: a cluster randomised controlled trial in Bihar, India*BMJ Global Health* 2019;**4:**e001146

	with goal settings.	pledge together at meetings.
Chandrashekarappa (2020)[10]	Service delivery methods: Mobile outreach services. The program used a mobile clinic model to deliver health education, ANC, and HIV/sexually transmitted infection testing and management.	Workforce: Lay health workers. To assist with care delivery frontline community health workers (CHW), were trained on perinatal mortality and morbidity, barriers related to institutional deliveries, counseling and testing for HIV, prevention of vertical transmission of HIV, and management of pregnancy-related complications.
Chatterjee (2014)[11]	Workforce: Lay health workers. Intervention to promote collaboration between Schizophrenic patient and caregiver, improve quality of care delivered by trained community health workers.	Management and Organization: Supportive mentoring. The treating psychiatrists supervised the intervention delivery through quarterly team reviews and ongoing supervision of community health workers. They also helped in training of CHWs.
Sharma (2020)[12]	Workforce: Lay health workers. The ANMs (Auxiliary Nurse Midwives) provided nutrition education on complementary feeding, hand hygiene and responsive feeding. ANMs conducted monthly home visits to counsel and support mothers for infant feeding practices and fortnightly home visits for undernourished infants.	Information systems: Surveillance. A digitized module was developed for tracking of the undernourished child. A monthly work plan showing the nutritional status was prepared; provided to all the ANMs in the area monthly, along with the routine tracking system work plan, so that they can also focus on mother-infant dyads with low infant growth along with their routine duties.
Taneja (2015)[13]	Workforce: Training. Community health workers in the intervention clusters were trained	Workforce: Incentives. Community health workers were provided performance–based

[10] Cohort profile: the *Kisalaya* cohort of mother-infant dyads in rural south India (2008-2012); Epidemiol Health. 2020;42:e2020010 Published online March 11, 2020, DOI: https://doi.org/10.4178/epih.e2020010

[11] Chatterjee, S., Naik, S., John, S., Dabholkar, H., Balaji, M., Koschorke, M., ... Thornicroft, G. (2014). Effectiveness of a community-based intervention for people with schizophrenia and their caregivers in India (COPSI): a randomised controlled trial. *The Lancet*, *383*(9926), 1385–1394. https://doi.org/https://doi.org/10.1016/S0140-6736(13)62629-X

[12] Sharma N, Gupta M, Aggarwal AK, Gorle M (2020) Effectiveness of a culturally appropriate nutrition educational intervention delivered through health services to improve growth and complementary feeding of infants: A quasi-experimental study from Chandigarh, India. PLOS ONE 15(3): e0229755.

[13] Taneja, S., Bahl, S., Mazumder, S., Martines, J., Bhandari, N., & Bhan, M. K. (2015). Impact on inequities in health indicators: Effect of implementing the integrated management of neonatal and childhood illness programme in Haryana, India. *Journal of Global Health*, *5*(1). https://doi.org/10.7189/jogh.05.010401

	to conduct home visits; counsel mothers on optimal essential newborn care practices, identify illnesses, treat mild illness and refer newborns with danger signs. Training was given using the Government of India IMNCI training module.	incentives, uninterrupted supplies of essential medicines were ensured through village level depots.
Tewari (2017)[14]	Service delivery methods: DIgital service innovations a) Mobile technology based electronic decision support systems (EDSS): Two separate EDSS were developed for screening by ASHAs, and clinical diagnosis and management by primary care doctors. b) Interactive voice response system (IVRS): An algorithm based IVRS sends out pre-recorded messages to the screen positive individuals to continue treatment as advised by the ASHA or the doctor.	Population needs: Reaching marginalized communities. A campaign was conducted to increase mental health knowledge and reduce stigma in the community for 8 weeks across all villages. Methods included informational brochures, street plays and a short film.

Multi-arm studies may utilize one or more categories of innovations and usually aim to achieve several outcomes. For example, an intervention that employs community health workers to screen community members for mental illness. They also promote self-care and encourage people to seek care for any mental health problems. Thus, this intervention has two arms; one using lay health workers to screen for mental illness and a community participation arm that focuses on improving demand for care.

The multi-armed studies are described in the table below:

Study	Arm 1	Arm 2	Arm 3
Alehagen (2012)[15]	Community Participation: Community Ownership. Women who were respected were recruited to motivate and educate the women and stress the importance of health check-ups and attending	Service delivery methods: Mobile outreach services. Five mobile clinics were established in the project area. The mobile clinics visited remote villages once a month following a pre-arranged schedule	Management and Organization: Continuous education. The education of the co-workers was a collaborative effort of the Indian and

[14] Tewari, A., Kallakuri, S., Devarapalli, S. *et al.* Process evaluation of the systematic medical appraisal, referral and treatment (SMART) mental health project in rural India.*BMC Psychiatry* 17, 385 (2017). https://doi.org/10.1186/s12888-017-1525-6

[15] Alehagen, S., Finnström, O., Hermansson, G., Somasunduram, K., Bangal, V., Patil, A., ... Johansson, A. (2012). Nurse-based antenatal and child health care in rural India, implementation and effects - an Indian-Swedish collaboration. Rural and Remote Health, 12(3). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-84262

	to issues such as nutrition, the need for rest and the prevention of accidental events. To promote hygienic home deliveries, special kits were first given to the TBAs but subsequently also to the pregnant women to make them more independent.	providing ANC and CHC, and attending to others who were sick.	Swedish teams. The Swedish team members educated experienced Indian nurses and medical officers. They then educated the Indian staff. A model called Training of Trainers (ToT) was established.
Amudhan (2013)[16]	Governance: PHC Policies. Under the first strategy, known as PHC 24/7, one PHC was upgraded to provide round-the-clock intrapartum care services free of cost. One additional auxiliary nurse midwife trained in conducting deliveries was stationed at the PHC with referral support from Civil Hospital Ballabgarh.	Financing: Delivery point financing. Additional Cash assistance to SC (Schedule Caste) beneficiaries: Under this State Government sponsored scheme launched in April 2008, additional cash of 1500 is given to each SC pregnant woman above 19 years of age who had delivery in the health institution irrespective of the birth order.	N/A
Chellaiyan (2018)[17]	Products: Infrastructure. To provide integrated services, earlier voluntary counseling and testing centers (VCTCs) and prevention of parental to child transmission were brought under one roof to cater general and ANC clients and was renamed as integrated counseling and testing centers (ICTCs)	Management and Organization: Audit and Feedback. The counseling sessions were observed for content and quality of counseling. The quality of sessions was assessed to inform strategies for treatment improvement.	N/A
Mustaphi (2005)[18]	Community Participation: Community Ownership. Community participation and mobilization using	Workforce: Training. Sensitization workshops were organized followed by joint training of key	N/A

[16] Senthil Amudhan, Kalaivani Mani, Sanjay K Rai, Chandrakant S Pandav, Anand Krishnan, Effectiveness of demand and supply side interventions in promoting institutional deliveries – a quasi-experimental trial from rural north India, *International Journal of Epidemiology*, Volume 42, Issue 3, June 2013, Pages 769–780, https://doi.org/10.1093/ije/dyt071

[17] Chellaiyan, V. G., Raut, D. K., & Khokhar, A. (2018). Integrated counseling and HIV testing centers of Delhi: An evaluation. *Journal of family medicine and primary care*, 7(4), 791–795. https://doi.org/10.4103/jfmpc.jfmpc_128_17

[18] Mustaphi, P., & Dobe, M. (2005). Positive deviance--the West Bengal experience. *Indian Journal of Public Health*, *XXXXIX*(No. 4), 207–214.

	self-help groups or VEC/VHC, building capacity of childcare functionaries and community, emphasizing on positive behavioral changes in childcare practices	functionaries on community mobilization using monitoring tools. This helped CHWs to identify AWCs with a high number of severe and moderate malnourished children after weighing all eligible children.	
Narayan (2017)[19]	Workforce: Lay health workers. Intervention consisted of community coordinators for disabilities (CC-Ds) to monitor and oversee the disability related activities, helping persons with disabilities form self-help groups. The CC-D had community development workers (CDWs) at grass roots level to help facilitate the activities of persons with disabilities and their families and link to village level activities.	Community Participation: Community Ownership. Intensive efforts were taken to identify persons, particularly women with disabilities from the villages. The women informed families in terms of training their children with intellectual disabilities in activities such as self-help skills as it was more culturally appropriate in the villages. In the case of intellectual disabilities, young mothers of children with intellectual disability were included in the training programme.	N/A
Shikha (2020)[20]	Community Participation: Community Ownership. Another arm involved counseling women by CHWs for the need for cervical cancer screening and client mobilization to a nearby PSI-India affiliated doctor.	Products: Diagnostics. A novel cervical cancer prevention program using the 'screen and treat' approach was implemented that used the Visual Inspection with Acetic acid (VIA) method for diagnosis.	N/A
Mehta (2018)[21]	Information systems: Surveillance. The digital intervention consisted of an electronic	Service delivery methods: Digital service innovations. Weekly messages to patients to remind them of	N/A

[19] Narayan J, Pratapkumar R, Reddy SP. Community managed services for persons with intellectual disability: Andhra Pradesh experience. *Journal of Intellectual Disabilities*. 2017;21(3):248-258. doi:10.1177/1744629516687180

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	tracking system. This involved entering the details of PLHIV in a dedicated database and updating it weekly.	appointments, check-ups and tips to manage their HIV.	

Outcome type:

Most interventions were focused on individual health and wellbeing outcomes followed by improvement in provider performance or managerial outcomes. Social outcomes were the least commonly reported outcomes. Economic analysis was only done for 35 of the studied interventions. Most studies that did a cost benefit analysis also did a sustainability analysis, although not all of them did. Thus, less than 10% of the included interventions mentioned any sustainability plans or considerations.

Case Studies

The chosen models and innovations for case studies are shown in the tables below:

PHC Models Case Studies

1. **ANANYA** -CARE India- (Bihar)
2. **KC PATTY PHC** - The Palani Hills Health Development Trust (Tamil Nadu)
3. **COMMUNITISATION PROGRAM** (Govt. of Nagaland)
4. **PACHOD**- Institute of Health Management (Pune)
5. **COMPREHENSIVE RURAL HEALTH SERVICES PROJECT**- Ballabgarh-AIIMS (Haryana)
6. **JAMKHED MODEL** - The Comprehensive Rural Health Project (Maharashtra)
7. **HOSPITALS & OUTREACH**- Emmanuel Hospital Association (EHA)- (India)
8. **VHS HOSPITALS** -Voluntary Health Services (Chennai)
9. **SEWA RURAL-** Society for Education Welfare and Action (Gujarat)
10. **VHAI NETWORK**- Voluntary Health Association of India (India)
11. **MOBILE CLINICS**- (Govt. of Delhi)
12. **SNEHA RMNCH**- Society for Nutrition, Education and Health Action (Mumbai)
13. **ASHWINI**- Association of Health Welfare in the Nilgiris (Tamil Nadu)
14. **RANGABELIA PROJECT**- Tagore Society for Rural Development (West Bengal)
15. **GUMBALLI PHC** -Karuna trust (Karnataka)
16. **COMMUNITY ACTION FOR NUTRITION**- Sathi-Cehat (Maharashtra)

PHC Innovations Case Studies

1. **CHIIP** by Broadleaf Health and Education Alliance: *Lay health workers : community based care*
2. **MANAS** by Sangath, *Workforce : Lay health worker*
3. **mPower Heart Project** by PHFI, *Service delivery: Digital innovation**
4. **Teleconsultations via e-mitra clinic** by Jiyyo Innovations, *Service delivery: Teleconsultation*
5. **AMANAT Project** by Care India, *Performance management : Task Shifting*
6. **VRIDDHI project** by IPE Global, *Management and organization: Supportive Supervision/Mentoring*
7. **Primary Healthcare-based Diabetes Registry in Puducherry** by St Johns Medical College, *Information systems : Digital Health records*
8. **Teleconsultations of Oral PMDs** by Manipal University, *Service Delivery Methods: Digital service innovations*
9. **Nurse-based antenatal and child health care in rural India** by Pravara Medical Trust, India, University of Linköping, *Mobile outreach : community based care**
10. **PRemIum for ADolEscents (PRIDE) research programme:** POD adventures Gamefied smartphone intervention for mental health by Sangath, *Products : Digital service*

*Multilayered study (2 and 3 layers, respectively)

All these models and innovations were presented to the PHC Advisory Group and vetted through an hour long discussion. The links and larger descriptions are located in Appendix IV. The Mohalla Clinics in Delhi were presented as a top priority PHC model to be studied and documented along with the Wayanad, Kerala Government run PHC. These were taken into consideration and were incorporated into our list of case study interviews beginning in another project. These will be detailed, discussed and documented in our final PHC interactive database.

Discussion

We see several innovations under the workforce category. This makes sense because the 2019-2020 Economic Survey revealed a severe shortage of medical personnel in the country[22]. India's current doctor population ratio is at 1:1456 as opposed to the WHO recommended ratio of 1:1000[23]. Thus, the fact that most innovations focus on capacity building either by task-shifting to lay health workers or continuous training and supervision measures or by providing incentives is not unreasonable. Although this did differ slightly by state, with southern states favouring health promotion campaigns and community ownership models over the large number of workforce restructuring interventions in the rest of the country.

Regional differences in innovation types:

The geographically Southern states had a variety of innovations in mostly rural and tribal regions. However, it was seen in Karnataka that most of the innovations conducted in urban settings were done in Bengaluru and involved some digital innovations; be it service delivery or information systems. Comparison of rural regions of Karnataka with rural Haryana was also seen which yielded higher impact in Karnataka. Similarly, several programs conducted in Tamil Nadu were done in rural and tribal areas with the urban ones concentrated in Chennai. Most of the interventions involved utilization of lay health-workforce. There were limited mobile outreach campaigns. It is interesting to note that several of the studies under the category, Governance were done in Tamil Nadu.

The southern state of Kerala had an abundance of health education and community ownership programs. They were catering to several health issues ranging from mental health to diabetes prevention and self-management of lymphatic filariasis. This indicates a larger focus on NCDs and specific programs in Kerala. Andhra Pradesh on the other hand focused more on care delivery pathways. Management of performance of healthcare workers, new methods of diagnosis and strengthening workforce comprised the majority of the innovations.

Gujarat has been popularized as a "model state" but has shown poor health indicators as compared to other states[24]. Most innovations in Gujarat were in rural regions and focused on innovative financing followed by digital innovations and training of workers. Maharashtra had the greatest number of innovations as compared to other states, with several conducted in Mumbai's urban slums. Most programs focused on the important role lay health workers play in care delivery and to mobilize community members to influence the demand side. Mumbai had some programs that utilized ASHA workers to address the poor maternal and child health outcomes.

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22 https://www.deccanherald.com/business/budget-2020/the-doctor-population-ratio-in-india-is-11456-against-who-recommendation-800034.html

23 Kumar, R., & Pal, R. (2018). India achieves WHO recommended doctor population ratio: A call for paradigm shift in public health discourse!. *Journal of family medicine and primary care*, 7(5), 841–844. https://doi.org/10.4103/jfmpc.jfmpc_218_18

24 https://scroll.in/pulse/860607/gujarats-model-of-development-has-done-little-to-improve-health-of-its-people

Comparatively Uttar Pradesh and Haryana, two of the more populous states had a variety of programs. Capacity building for workforce development was pretty widespread along with unique service delivery methods. There were a few innovations that aimed to improve working of PHCs and some to mobilize the communities. However, almost all were done in rural or mixed (rural and semi-urban settings), with only 3 innovations in cities (urban).

The North Eastern region had only 3 interventions of the 239 studied. Interestingly all 3 were delivering home-based care. The low accessibility and scarcity of medical personnel in this region is also reflected in this review.

Eastern states such as Jharkhand have a higher tribal population as compared to the rest of the country. Thus, all of the interventions in this area were in difficult to reach tribal or rural areas. All of these interventions involved some aspect of workforce improvement, such as lay health workers and task-shifting. There was only 1 intervention that tried to improve community ownership. As for the other eastern states of Orissa and West Bengal, we see a mix of rural and urban settings. Similar to Jharkhand, these 2 states also focus on strengthening the healthcare system via training, and performance management. There were very few community mobilization programs, thus, the main focus was on the supply side of healthcare in East India.

Of the 239 innovations, 24 were implemented in a controlled setting as a Randomized Controlled Trial (RCT). 25% (5 out of 20) of the digital service innovations were implemented as a RCT, making it difficult to consider their results as feasible and equally effective in a normal setting. This also sheds light on the lack of digitization of service delivery pathways, and the almost completely manual-dependent health infrastructure.

Digital innovations have been on the rise over the years though, with only 1 published per year until 2016 and then increasing every year until 2019. Similarly, there has been a strong upward trend of lay health workers delivering interventions over the years. The year 2020 did not have as many studies published. Innovative products have not seen much increase in the past decade. On an average 1 intervention per year was testing a new product or a diagnostic technique. Surprisingly, no interventions past 2012 have been conducted in priority settings. Similarly, interventions focused on information systems have been few and far apart; no program developing or improving the EMR system has been done past 2016 while integrating EMR with the existing systems has been tried sporadically. Finance-based interventions such as insurance schemes have also not been explored much with only 1 such program in 2017 while 3 in the previous decade.

This aggregated data sheds light on multiple problematic areas along with pools of progress and innovation. With many high impact studies falling under community health ownership and lay-health worker programs, we see a large focus, and perhaps a needed one, in community integration. However, with a lack of organizational and structural/governance innovations/changes, many innovations seem to be constricted within the current system, resources and status quo, which may no longer be the most effective system for India today. We need to further understand how these innovations function within their context, what

restricts them and what allows them to be successful, to understand where and what we need to prioritize when we think of furthering the primary healthcare system today.

Appendix I: Definitions

Primary Health Care vs. Primary Care

"Primary Health Care is essential health care based on practical, scientifically sound and socially acceptable methods and technology, made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination." [25]

Alma Ata Declaration on Primary Health Care, WHO-UNICEF, 1978

Primary health care should include these 3 components:

- meeting people's health needs through ***comprehensive promotive, protective, preventive, curative, rehabilitative, and palliative care throughout the life course,*** strategically prioritizing key health care services aimed at individuals and families through primary care and the population through public health functions as the central elements of integrated health services;
- systematically ***addressing the broader determinants of health (including social, economic, environmental, as well as people's characteristics and behaviours)*** through evidence-informed public policies and actions across all sectors; and
- ***empowering individuals, families, and communities to optimize their health***, as advocates for policies that promote and protect health and well-being, as co-developers of health and social services, and as self-carers and care-givers to others.

Primary Health Care (PHC) is therefore understood as an approach to health care that promotes the attainment by all people of a level of health that will permit them to live socially and economically productive lives. PHC is health care that is essential, scientifically sound (evidence-based), ethical, accessible, equitable, affordable, and accountable to the community. (UTC)

PHC is therefore not only primary medical or curative care, nor is it a package of low-cost medical interventions for the poor and marginalised. On the contrary, it calls for the integration of health services into the process of community development, a process that requires political commitment, intersectoral collaboration, and multidisciplinary involvement for success.[26]

"Primary care" should not be used interchangeably with Primary Healthcare as they have different components.[27]

Primary care is care provided by physicians specifically trained for and skilled in comprehensive first contact and continuing care for persons with any undiagnosed sign,

[25] https://www.who.int/news-room/fact-sheets/detail/primary-health-care
[26] http://www.primaryhealthcare.uct.ac.za/phcd/approach
[27] http://www.euro.who.int/en/health-topics/Health-systems/primary-health-care/main-terminology

symptom, or health concern (the "undifferentiated" patient) not limited by problem origin (biological, behavioral, or social), organ system, or diagnosis. (American Academy of Family Physicians.)[28]

Various definitions were consulted and reviewed to understand the difference and similarities in the usage of the terms Primary care and primary health care. The table below summarizes the key components of primary care and primary health care.

Table 4. Primary Health Care versus Primary Care

Aspect	Primary Health Care	Primary care
Approach	It is an approach to healthcare that may be provided by any person in any designation at first contact	Is healthcare provided by physicians/clinicians trained in family medicine or first contact.
Inclusion	Includes comprehensive promotive, protective, preventive, curative, rehabilitative, and palliative care throughout the life course	Primary care includes health promotion, disease prevention, health maintenance, counseling, patient education, diagnosis and treatment of acute and chronic illnesses in a variety of health care settings (e.g., office, inpatient, critical care, long-term care, home care, day care, etc.)
Nature	Is systemic in nature. Eg, PHC will include national health spending, universal access and community participation.	May or may not be systemic.
Pricing	The cost of care is fixed based on community needs. It may be free of cost or provided at a cost that can be borne by the community and the state.	The cost of care is based on the practise, experience and market competitive rates,
Point of contact	Brings health care as close as possible to where people live and work	Provides health care at a community level. May or may not focus on bringing healthcare to people.

In order to make our learning of health innovations within primary health care more comprehensive, we also included parallel primary care services within our primary health

[28] https://www.aafp.org/about/policies/all/primary-care.html

care model. This is especially important in India today, where the primary healthcare system is facing a rising burden of NCD and mental illnesses with many of these services still not integrated into the system. Utilizing disease specific key terms such as RMNCH, HIV, and mental health, especially those that are most commonly recognized as stand alone programs, we will be able to uncover otherwise hidden innovations in finance, delivery, training, or even outreach.

Health innovations

Health innovations can describe any new or improved intervention, ranging from health policies to management methods to products and technologies. It is meant to respond to any unmet public health need by either creating new resources or streamlining existing ones to focus on vulnerable populations. Health innovations can be created and implemented at any point of the health system from health awareness, promotion, prevention, to curative, rehabilitative or assistive care. The aim of any innovation should be improved efficiency, effectiveness, quality, sustainability, safety, and/or affordability

Appendix II: Keywords for search

Table 5: Keyword Search Strategy

Level	Aspects	KEYWORDS
System Level Components	Governance	policies; regulations; legal frameworks; universal health coverage (UHC); strategic purchasing; public-private partnerships; integrating public health and primary care; private sector; multisectoral action; quality
	Community Participation	Community Engagement; social participation; service-user social accountability; community-based monitoring; empowering communities
	Population Needs - Marginalized populations	marginalised groups; marginalised people; vulnerable populations; scheduled tribes (STs); scheduled castes (SCs); tribal communities; tribal populations; backward castes; dalits; people living with HIV (PLHIV); women in sex work (WiSW); men who have sex with men (MSM); transgender; rural communities; urban slums; below poverty line (BPL); women; gender equity; socially disadvantaged; scavengers; rag-pickers; lower castes; migrants; refugees; older people; social determinants
PHC Input Component - Workforce	Workforce	human resources for health; health professionals; primary care physicians; general physicians; healthcare workers; health personnel , health cadre ; healthcare providers
	Innovations in structure	task shifting; public-private partnerships; human resource strategies; human resource management, integration, segmentation, substitution, simplification
	Incentives	promotion; performance incentives, performance bonus, incentive systems, performance based salary system,blended payment mechanism, capitation, pay-for-performance
	Training	Peer training; capacity building; training aids; training needs analysis, professional development, continuous learning, skill development , self-directed learning
	Lay-health workers	community health workers; ASHA; outreach workers; self help groups, village health worker, community health aide, community health promoter, health advisor. voluntary health workers community health assistants, rural health auxiliaries, traditional midwives , traditional birth attendants, Community nutrition worker , Basic Health Worker, Anganwadi
PHC Input Component -	Infrastructure (Management	Healthcare administration; evidence based planning

Management & Organization	& Organization)	
	Team-based integration	Health care teams; team-based care; roles and responsibilities
	Facility leadership	community ownership; governing body; managers; facility management
	Performance measurement	audit & feedback; supportive supervision; training; mentorship; social accountability;
PHC Input Component - Facility Financing	Facility Financing	Health systems financing, out-of-pocket, Social health insurance, public financing for healthcare, social insurance, OOP spending, public expenditure
	Financing structure	fee-for-service; pay-for-performance; results-based financing; innovative finance; blended finance; insurance
PHC Input Component - Service Delivery Methods	Service Delivery Methods	Prevention; screening; diagnosis; treatment; home-based interventions; health camps; outreach campaigns
	Digital innovations (tele-medicine etc)	e-health; telemedicine; m-health; digital health delivery; telehealth
PHC Input Component - Information Systems	Information Systems	Healthcare information technology; medical informatics; health informatics; information and communication technologies; ICT; HMIS
	Digital health innovations	Digital innovations in health; information and communication technologies
	Integrated systems	referral systems; coordinated care
PHC Input Component - Supply	Products	Products, medical products, supplies, equipment, knowledge products, health technology, quality in PHC; data-driven decision-making; evidence generation
Services	Single Stream Services/Parallel Programs	RMNCH; Maternity care; maternal health; child health; sexual reproductive health and rights; Immunizations; vaccinations; noncommunicable diseases (NCD); communicable diseases; Mental Health; Vision; HIV; AIDS; TB (DOTS); Nutrition; geriatric care; rehabilitative care; palliative care; traditional medicine; ayurveda; antimicrobial resistance; promotive care; protective care; preventive care; curative care; population health; water and sanitation

Appendix III: Extraction Sheet

https://docs.google.com/spreadsheets/d/1dW4oQHTZUHOFY4npX5oyV_JdcnrnGY3kgLOorXPZf8U/edit#gid=1999431242

Appendix IV: Case Study Descriptions of Models and Innovations

https://docs.google.com/spreadsheets/d/1FO6kdUgehFRgo0csVTb0YQUmAC4784MoTzzDBpn2UxU/edit#gid=0

Appendix V: Case Study Tools (Models and Innovations)

Case Study Tools Models:
https://docs.google.com/document/d/1shvVvZaIINNm0jxZ-6lRDfM8mrhfB73z/edit

Case Study Tools Innovations:
https://docs.google.com/document/d/16bteBo9wGdGipfebK5OLoPKAAoyXmFdD/edit

Appendix VI: IEC Application and Approval

https://drive.google.com/drive/u/0/folders/1XPAFwib4o31wtQ6Ez0aNg4yiDKqwYkg_

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