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# Building an Inclusive and Equitable Healthcare System in India

# Learning & Economic Insights Group

Enhancing customer experience
through knowledge, research and insights

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# PREFACE

**Nayna Banerjee**
Leader – Marketing, Communications and Learning & Economic Insights Group
Dun & Bradstreet India

Healthcare has emerged as a key indicator of the country's overall socio-economic development in the past decade. Over the years, India's healthcare sector has improved significantly, leading to an overall improvement in the life expectancy and reduction in infant mortality. It has emerged as one of the fastest growing sectors in India and presents an immense opportunity for the growth of the entire healthcare ecosystem – medical devices manufacturers, healthcare service providers, pharmaceutical manufacturers, insurance companies among others.

The sector is undergoing a rapid transformation with the government committing to make the healthcare services affordable and accessible to all. The government has taken a bold step to change its role from being a healthcare provider to also becoming an insurance provider. For example, the launch of Ayushman Bharat – a health protection scheme that provides insurance coverage of Rs 5 lakh each to 500 mn poor and vulnerable individuals, is a step in that direction.

However, there are several challenges that lie ahead of the Indian healthcare sector – such as vast disparities in the distribution of healthcare services in urban and rural areas, lack of availability of adequate healthcare infrastructure, lack of availability of affordable healthcare services, and shortage of qualified medical professionals. For example, according to the World Healthcare Organisation (WHO) report, there are 0.8 doctors per 1,000 population; there are 1.3 nurses per 1,000 population; and 1.2 hospital beds per 1,000 population.

Amidst these challenges, the Indian healthcare sector is now experiencing a new wave of opportunities – medical tourism and technological innovations. The major factors that are driving the growth of medical tourism in India are availability of world class facilities, cost effective treatments, well-trained practitioners, ability of practitioners to deal with international patients and availability of natural medicines.

On the technological innovation side, healthcare providers are identifying new ways to transform the existing delivery channels and bring healthcare services closer to the patients. Though at a nascent stage of adoption as compared to the developed nations, technology applications - such as less invasive diagnostics, remote monitoring solutions, robotic surgery etc., in the healthcare sector have evolved and converged significantly to address several gaps in the sector.

Further, increased penetration of mobile technologies in the urban and rural areas, cloud computing, digital imaging, analytics, AI, machine learning, IoT etc. are paving the way to move away from hospital-care towards technology-enabled home care. Implementing these technologies can ensure a better collaboration between healthcare providers and patients. However, there is a need to standardize various aspects of the healthcare system such as guidelines and protocols for treatments, and ownership and sharing of patients' records. More importantly, it is necessary to bring uniformity in costing of healthcare services across India.

In order to implement these reforms well, there is a need for agreement and continuous engagement between the government and different stakeholders from across the healthcare ecosystem. It is only through these continuous efforts it will be possible to realize a long-term vision towards building an Inclusive and Equitable Healthcare System in India.

I hope you enjoy reading the report and I look forward to receiving your feedback and suggestions.

**Nayna Banerjee**
Leader – Marketing, Communications
and Learning & Economic Insights Group
Dun & Bradstreet India

# Overview of the Healthcare Sector

# The Journey so Far

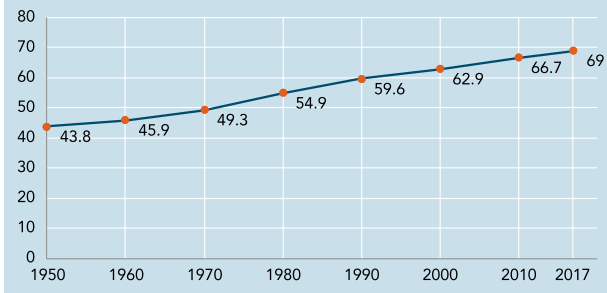
## Gradual but significant progress in the healthcare system so far

The Indian healthcare system has come a long way since the past decade and evolved substantially in terms of structural, institutional and technological reforms. The adoption of the millennium development goals (MDGs) from 2000 – 2015 was also partially successful, especially in areas of communicable diseases such as HIV/AIDS, tuberculosis, malaria etc. For example, estimates from the World Health Organization (WHO) show that deaths in India due to communicable diseases went down from 4.02 million in 2000 to 2.55 million in 2016. Due to the ever-increasing population, the priorities have changed for the Indian healthcare sector as well from the past 10 years. The analysis of key health indicators shows that India still has a lot to achieve in terms sustainable healthcare system. However, the disparity between the rural and urban healthcare service delivery and resources is the major challenge.

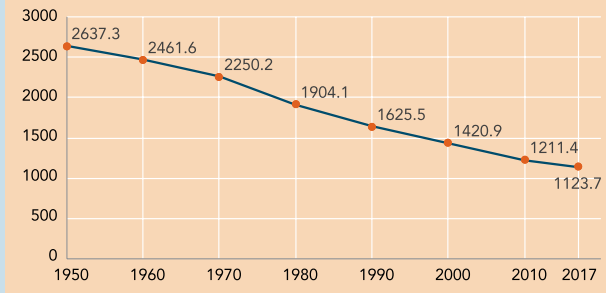
Although it's been a challenging journey so far, today we are in a transformation phase where attempts are being made to make healthcare more accessible and affordable. Initiatives in areas of health protection schemes such as the Ayushman Bharat Yojana, Rashtriya Swasthya Bima Yojana or the creation of Ministry of AYUSH (Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy) or the consolidation of various independent disease control programmes under one umbrella programme – the National Vector Borne Disease Control Programme (NVBDCP) to name a few are all clearly a tangible shift in strategy from disease focused programmes to build an integrated equitable healthcare system. The culmination of all such efforts in the past decades have resulted in significant improvement in increasing the life expectancy and reducing the mortality rate in the country.

During the last ten years, India has managed to set-up seven focus areas–prevention, digitalization of health records, nutrition, use of healthcare technologies (AI for social impact/e.g. in the last 10 years, a digital health program called eVIN is in place to track immunization, the plan is to use AI in ensuring treatment adherence and early diagnosis are the major focus areas), universal health coverage/public health schemes, training of medical resources, and opening new state-of-the-art healthcare facilities to improve the health outcomes across India. These seven areas are also expected to change the image of the public healthcare sector and in fact are already improving a range of health development indicators.

Life Expectancy (per 1,000 population)




Mortality rate (per 1,00,000 population)




*Source: Global Health Data Exchange, Global Burden of Disease Study 2017 (GBD 2017) Data Resources*

*Note: Mortality rate refers to age-standardized mortality rate*

## India's Key Macroeconomic and Healthcare Indicators

| Item | 2015 | 2016 | 2017 | 2018e | 2019p | 2020p | 2021p | 2022p |
|---|---|---|---|---|---|---|---|---|
| GDP (US$ billions) | 2,102 | 2.274 | 2,630 | 2,820 | 3,030 | 3,265 | 3,520 | 3,790 |
| Population (in billions) | 1.28 | 1.29 | 1.32 | 1.33 | 1.35 | 1.37 | 1.39 | 1.41 |
| Healthcare expenditure, HCE (US$ billions) | 83 | 90 | 100 | 113 | 133 | 144 | 162 | 174 |
| Healthcare market (US$ billions) | 123 | 140 | 160 | 185 | 215 | 250 | 291 | 340 |
| Pharmaceutical market (US$ billions) | 29.3 | 33.0 | 37.2 | 42.2 | 47.9 | 54.4 | 62.0 | 70.7 |
| Number of hospitals | NA | NA | NA | 227,525 | NA | NA | NA | NA |
| Number of hospital beds | 900 | 1,050 | 1,250 | 1,550 | 1,850 | 2,150 | 2,450 | 2,750 |
| Number of physicians (in thousands) | 998 | 1,023 | 1,041 | 1,072 | 1,152 | 1,252 | 1,452 | 1,752 |
| Crude Birth Rate (per 1,000 population) | 19.3 | 19.0 | 18.8 | 18.5 | 18.2 | 17.9 | 17.6 | 17.3 |
| Crude Death Rate (per 1,000 population) | 7.31 | 7.30 | 7.29 | 7.27 | 7.25 | 7.23 | 7.21 | 7.19 |
| Life expectancy at birth (per 1,000 population) | 68.3 | 68.6 | 68.9 | 69.2 | 69.6 | 69.9 | 70.2 | 70.6 |
| Infant mortality rate, (per 1,000 live births) | 35.3 | 33.6 | 32.0 | 30.4 | 28.9 | 27.4 | 26.1 | 24.8 |

- Real GDP growth will be 7.8% in 2022 as compared to 7.3% in 2018
- Per capita spending of US$2116 in 2018 to close to US$2,700 by 2022

- ~4.0% of GDP spent on Healthcare in 2018. It will reach 4.6% by 2022
- Per capita HC spending of US$139 in 2018 to US$242 by 2022

- OOP –HC expenditure to decrease to 50% in 2022 from 63%in 2018
- Per capita pharma spend to increase from US$32 2018 to US$50in 2022

- 1.2 hospital beds per 1,000 population in 2018 to 2 beds per 1,000 population in 2022
- ~1.5 million beds needed in the next five years to match the standards

- 0.8 doctors per 1,000 population in 2018 to 1.2 per 1,000 in 2022
- India is short of around nine million doctors to match the WHO average

- Infant mortality rate per 1,000 live births has reduced drastically. In 1990 it was 165, in 2015 it came down 35, and currently is at 30 (2018e). It is expected to be around 25 per 1,000 live births by 2022

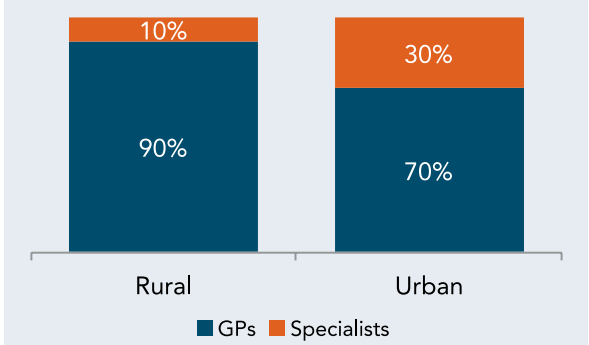
Indians now live 30 years longer than in 1951 as life expectancy at birth is estimated at 69.2 years which might increase to 70.6 years by 2022.

## There is a high level of disparity between rural and urban sectors across all key healthcare indicators

With respect to crude birth, death, and infant mortality, there has been a steady decline from 2000, and are expected to go further down due as evident from the figures shown in Table-I above. This decrease is attributed mainly to the improvement in access to healthcare facilities, increase in social health insurance coverage and more focus on prevention rather than treatment or cure. The fact that the rural rates of births as well deaths are higher than the urban areas, the government is keen on strengthening the rural healthcare sector more and by large as compared to the urban sector which is currently dominated by the private sector healthcare providers.

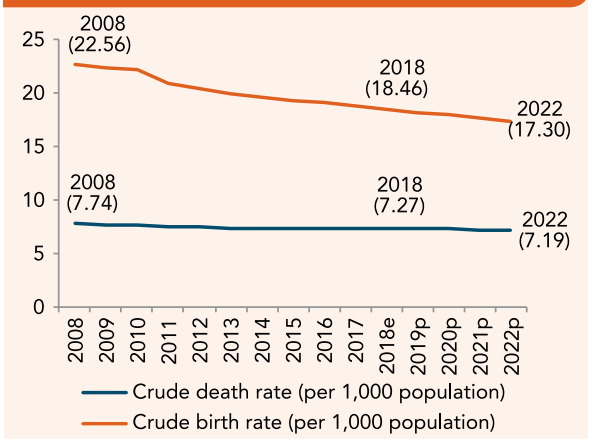
The non-availability of specialists, more referrals to public super specialty-cum-teaching hospitals such PGIMR, AIIMS, and others (which are far from patient's base rural locations), and lack of mid-to-high end healthcare technology/diagnostic facilities are some of the challenges that needs funding, resources, and moreover willingness to strengthen the rural healthcare service delivery framework. These challenges if addressed and resolved in the next decade will strengthen the access for the rural/poor population of India

GP vs Specialists in Rural and Urban areas, 2018(e)




## Significant improvement at key levels ofHealthcare – birth rate, death rate and infant mortality rate

Crude Birth and Death Rates, 2008-2022




### Crude Birth Rate (CBR)

The crude birth rate has decreased from 22.6 per 1,000 population in 2008 to 18.5 in 2018 and is expected to go down to 17.3 by 2022. The goal is to bring it down to less than 15 in the next decade. The CBR is generally higher in rural areas as compared to urban areas. Bihar recorded the highest birth rate (26.8), followed by Uttar Pradesh (26.2), Madhya Pradesh (25.1), and Rajasthan (24.3).

### Crude Death Rate (CDR)

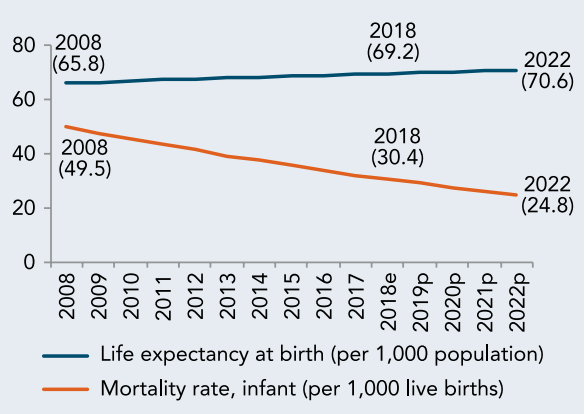
The crude death rate in India has declined from 7.7 in 2008 to 7.3 per 1,000 population in 2018 and is projected to be7.2 per 1,000 population by 2020. Similar to CBR, the CDR is also higher in rural regions as compared to urban areas and has been varying widely amongst states and union territories. Odisha

is estimated to have the highest CDR (7.8), and Delhi has the lowest (4.0). The states with higher CDR than the national average are Andhra Pradesh (6.8), Assam (6.7), Chhattisgarh (7.4), Karnataka (6.7), Kerala (7.6), Madhya Pradesh (7.1), Uttar Pradesh (6.9), Uttrakhand (6.7), Goa (6.7), Himachal Pradesh (6.8), Meghalaya (6.6), and Puducherry (7.2).

## Infant Mortality Rate (IMR)

The goal is to reduce the infant mortality rate to less than 25 by 2022. A remarkable reduction in the IMR is counted as the biggest achievements of the Indian government. The IMR per 1,000 live births is currently 30.4 with a goal to bring it down to below 20 in the next decade. The important aspect of all these rates, which is very critical, is how to bridge the gap between rural and urban CBR, CDR, and IMR rates. The 2018 rural IMR is estimated at 38 per 1,000 live births as compared to 22 per 1,000 live births in the urban areas. Madhya Pradesh (47) is expected to have the highest IMR with lowest being recorded in the state of Kerala (10-15). The other states with IMRs higher than the national average of 2018 are Assam (44), Bihar (38), Chhattisgarh (39), Odisha (44), Madhya Pradesh (47), Rajasthan (41), Uttar Pradesh (43), Arunachal Pradesh (36), Meghalaya (39), and Uttrakhand (38). It is important to note that still in India female infant mortality rate (32) is higher than male infants (28). Again, the rural infant mortality rate is higher in rural areas (37 per 1,000 live births) as compared to urban areas (23).

**Life Expectancy and Infant Mortality Rates, 2008-2022**

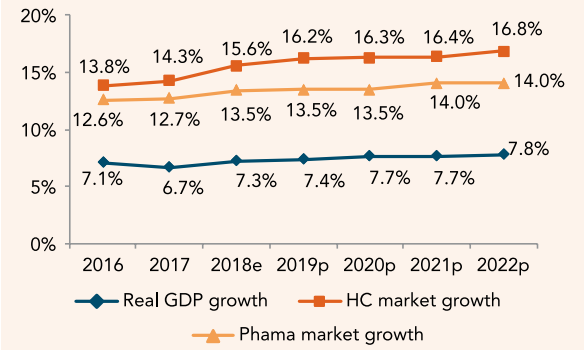



**Life Expectancy:** The goal is to increase the life expectancy at birth to above 70 by 2025. Life expectancy at birth (which is the number of years a person is expected to live basis some statistical averages and historical records) has also increased by almost one and a half year, from 65.8 years in 2008 to 69.2 years in 2018. It is expected to reach 71 by 2020. Generally, the life expectancy for females is higher than males in India.

# Performance of the Indian Healthcare Sector

## Sector's double-digit growth expected to continue in near future fueled by increased public health spending and private hospital market

**Real GDP, Healthcare, Pharmaceutical market growth rates (2016-2022)**

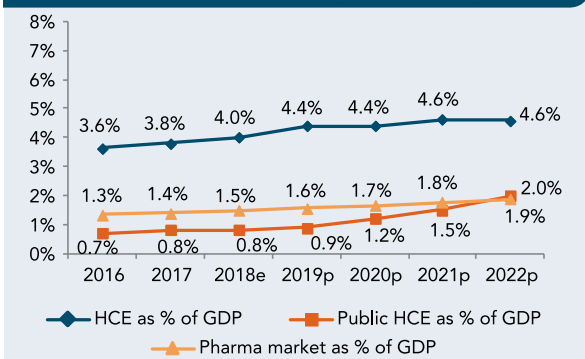



Indian healthcare is booming. There are many opportunities for investors, innovators, and also for the healthcare recipients. It is an industry which is growing by leaps and bounds, something like 16%-16.5% every year. At present, it is worth around US$160 billion (from 2013- US$79 billion), and it is expected to double essentially in the next five years. The bright spots of the Indian healthcare sector include hospital management services, medical equipment services, medical devices, robotics, AI, diagnostic services, medical tourism, analytics, consultation offshoring, and alternative healthcare options.

However, there are various challenges which the healthcare sector of India is currently facing. The major challenges are hurdles in tightening the regulatory regimes, sluggish public health expenditures, issues around the affordability and exclusivity, urban versus rural access, and high healthcare delivery and medical resource disparities. Other key challenges include the use of cost-effective healthcare technologies, an impediment to product innovations, upscaling of frontline health workers such as ASHA workers (training), improvements in the clinical trials, low pace of digitalization of health records, and the gap in the public and private sector engagements. The lack of active and enhanced participation of private sector in surveillance and notifying the incidences of critical diseases such as pTB, HIV, HCV, malaria etc. is also one of the important barriers.

The ultra-modern hospitals across India's key metro cities are attracting patients from all over the world. On one hand, the industry has got some well-equipped hospitals and on the other hand, 50% of the population does not have access to it. Among the leading emerging economies, India has the highest infant mortality rate (30/1,000 live births), its bed density is also very low (1.2/1000 population), and very few doctors per 1,000 population. ~70% of the healthcare is provided by the private sector which in turn is mimicking the US private system as there has been considerable growth in the percentage of private healthcare service providers.

**HCE as % GDP, Public HCE as % of GDP, and Pharma market as % GDP (2016-2022)**



Aster
We'll Treat You Well

**Dr Harish Pillai**
CEO, Aster Hospitals and Clinics, India

## 1. Kindly share with us the journey of Aster DM Healthcare in India.

Our India operations commenced in 2001 with the establishment of Malabar Institute of Medical Science in Calicut (Aster MIMS), Kerala. As the hospital grew, our vision for quality healthcare in India also strengthened. Since then, there was no looking back. Gradually, we started expanding and today we have 12 multi-specialty hospitals with 4,338 beds and nine clinics in India.

We have strong presence in south and western parts of the country as listed below:

1. Aster Medcity, Kochi
2. Aster MIMS (Calicut, Kottakkal & Kannur)
3. Aster Wayanad Specialty Hospital, Wayanad
4. Aster CMI, Bangalore (a new hospital scheduled to open in April 2019 – Aster RV)
5. Aster Prime, Hyderabad
6. Aster Aadhar, Kolhapur
7. Ramesh Hospitals (Vijayawada, Guntur, Ongole)

Aster DM Healthcare listed its stocks in Bombay Stock Exchange and the National Stock Exchange in February 2018. We have seen steady growth and have witnessed strong quarter-on-quarter results and positive appreciation from analysts and investors. Today, we are the second largest player in India by market capex. Most business and financial publications are listing us as one among the top companies in India. All these factors supported by our unique brand positioning has strengthened our resolve to continue to focus on India and provide quality healthcare.

## 2. Kindly provide the brief on healthcare services offered by your company.

An integrated healthcare provider, Aster DM Healthcare's network portfolio includes 21 hospitals, 113 clinics and 219 pharmacies, as of December 2018.

The uniqueness of the Aster model is our geographical presence in 9 countries and our clinical and brand segmentation. In GCC markets, we are very strong on primary, secondary and retail segment. Primary and Secondary care consists of Clinics and Hospitals, while our Pharmacy chain represents the Retail segment. Furthermore, in sync with the market conditions which is predominantly insurance based, we have three brands catering to all socio-economic tiers namely Access, Aster and Medcare. In India, all our hospitals have the prefix Aster and is mostly tertiary and quaternary care. Our three flagship hospitals – Aster Medcity, Kochi; Aster MIMS, Calicut and Aster CMI, Bangalore have best in class clinicians, infrastructure and technology. They are consequently able to offer niche services such as minimally access and robotic surgery; multi organ transplant

and several Centers of Excellence focusing on Cardiac Sciences, Neurosciences, Orthopedics, Gastroenterology, Urology & Nephrology, Oncology, Women & Child Health and Critical Care.

### 3. What needs to be done for developing accessible and affordable healthcare services in India? How is your company contributing towards it?

We see a huge opportunity in the healthcare sector in the next quarter century in India. As the country progresses economically and technologically, people want better, advanced treatments. Medical insurance coverage is expanding rapidly, however a clear majority of the population still pays for healthcare from their own pockets. In this context, the Ayushman Bharat initiative is uniquely positioned to transform the sector. Future growth is dependent on continued investment in the country's ability to make healthcare accessible and affordable. Public-private partnerships supported by conducive policy and investment environment will continue to encourage private players in playing a key role in making quality healthcare more affordable and easily accessible.

At Aster DM Healthcare, across the group we have a unique distinction of providing quality healthcare to all the segments of the society regardless of their economic and social positioning, across the 9 countries in which we operate. In India, our offerings are also customised as per the requirements of the patients. We have state of art VIP services which can be categorised under luxury care and at the same time we have affordable care with payment schemes which can be availed by the masses.

As a part of improving accessibility, we currently have at least four hospitals in the pipeline ranging in size from 100 beds to 500 beds with launches spanning from Chennai to Dubai.

*670-bed JCI and NABH accredited multispeciality quaternary care hospital Aster Medcity located at Kochi in Kerala, India*

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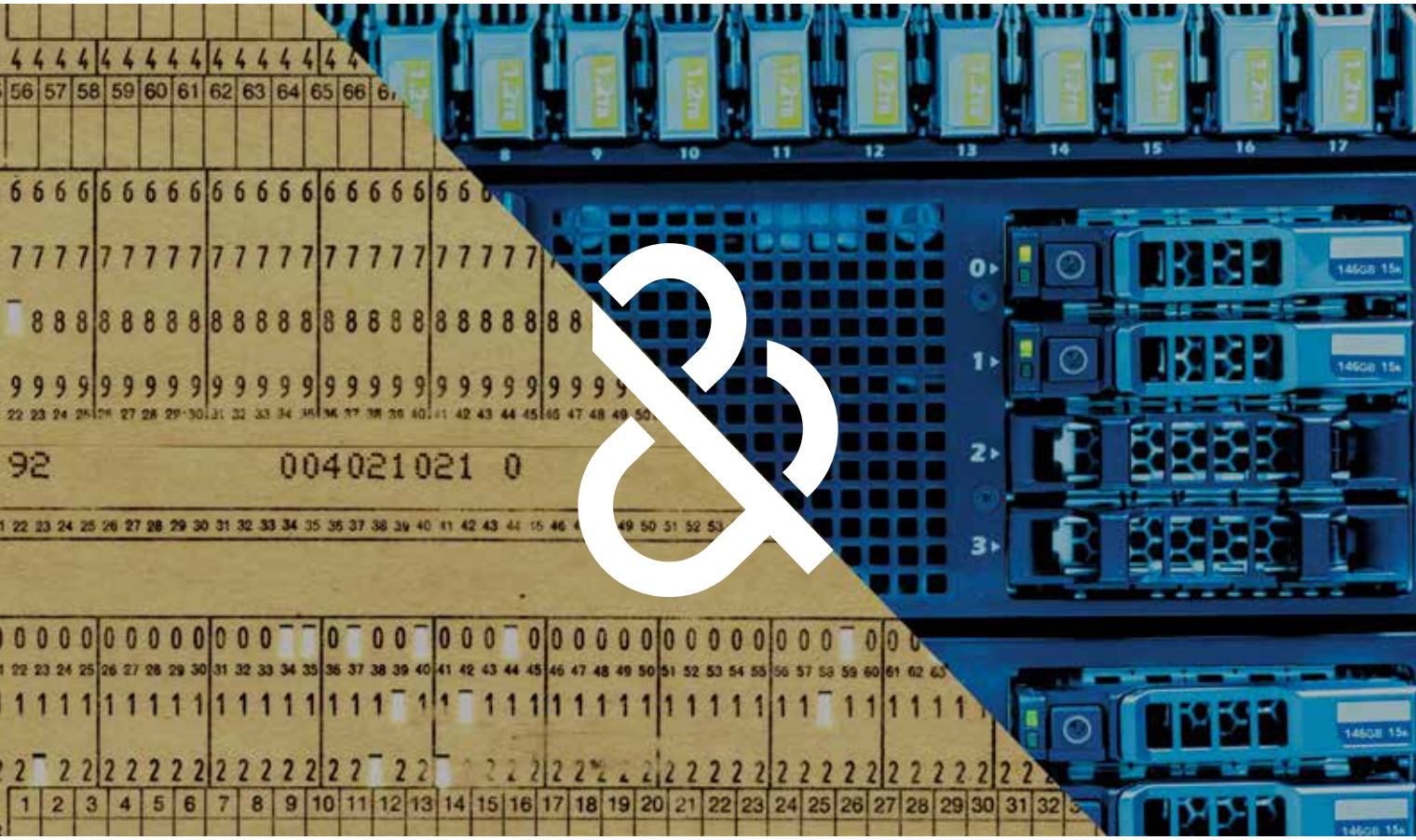

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# Key Elements for Building an Inclusive and Equitable Healthcare System

## Healthcare Financing and Coverage

### Most of the Indians still rely on out-of-pocket health expenses, but that might change due to ambitious public health coverage schemes and the penetration of private insurance as well

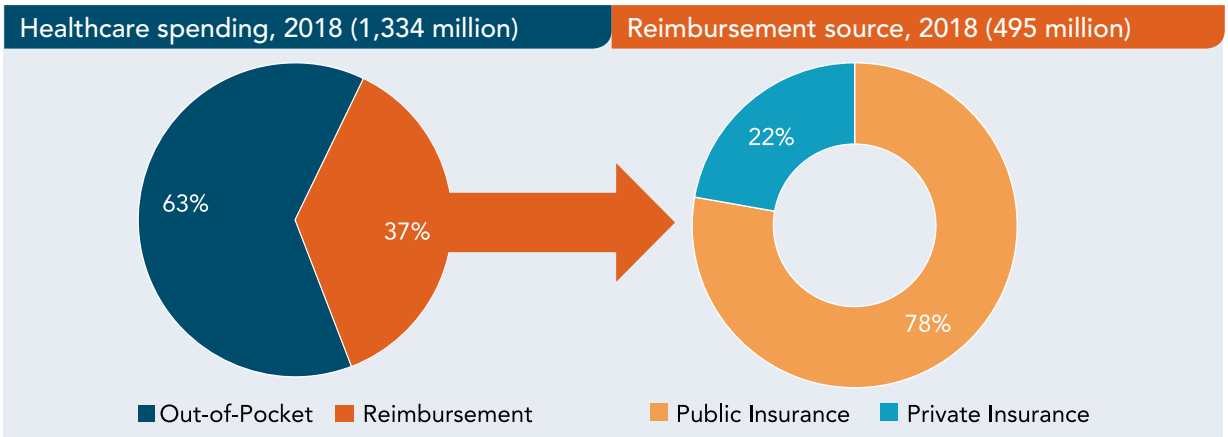
Around 495 million (or 37%) of the total population is estimated to be covered under any type health insurance scheme in 2018 with three out of every five persons still paying for their health and hospitalization expenses out of their pockets. Out of those who are insured, 78% are covered under government schemes and program. The health insurance penetration is expected to increase to 48% by 2022 from 37%in 2018.

The cost of accessing healthcare services and the cost of treatment is rising in India which is creating a gap between healthcare expenditures and access to healthcare services by the patient population.

According to the national health program and policy, India is aiming to double its public healthcare expenditure from 1% of GDP in 2018 to 2.5% by 2025 which will impact the per capita spending on health as well. The per capita healthcare expenditure has increased from ~US$65 in 2015 to ~US$85 in 2018 and is projected to cross the US$100 mark in 2020. The share of spending on medicine in the total healthcare expenditure is also expected to decrease from 24% in 2018 to 21% by 2022.

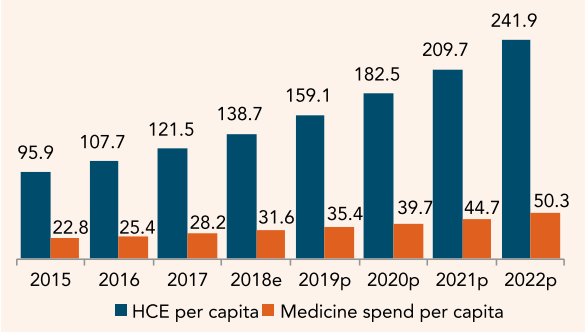
Private health expenditure accounts for the majority of the total healthcare expenditure (79%), however, the current Indian government has aggressive plans to increase the central and state health expenditures (including providing universal health insurance coverage to maximum number of beneficiaries) as evident through the budget allocations for health in 2019 (increased budget for healthcare services, infrastructure, public health schemes, and health resource).

The total public expenditure on health increased to US$23.6 billion in 2018 from US$22.1 billion in 2017, growing by 6.8% on a y-o-y basis. After the recent 2019 budget



announcement and allocation to health spending, the experts are speculating that the total public health expenditure might increase by ~10% to reach US$26 billion in 2019. Within public health spending, urban and rural health services are consistently accounting for over 70% of the total budget.

India - Heathcare and Drug Spending per Capita (in US$)




According to the recently presented budget, the Pradhan Mantri Jan Arogya Yojna (PMJAY)/Ayushman Bharat sees an increase in its budgets by US$300-US$400 million as compared to 2018 as almost US$1 billion has been allocated for this ambitious universal health coverage scheme. Ayushman Bharat provides has a highly optimistic aim to provide an annual cover of ~US$7,000 to around 500 million beneficiaries across the country under "package rates" schemes for the treatments and surgeries. The total budget of the Ayushman Bharat scheme is around US$2 billion in total.

**India is amongst the lowest healthcare-related spending country in the South East Asia region and falls well below the average of public and per capita expenditure on healthcare and medicines**

The recent budget provided a boost to the Ayushman Bharat in terms of US$230 million to open more than 10,000 health and wellness centres and ~150,000 sub-centres and PHCs by 2022 under urban and rural health missions, respectively. Other than this 22 new AIIMS like institutions (budget avocation up from US$470 million in 2018 to US$515 million in 2019), medical colleges upgrading, more than 100 new medical colleges, and an addition of over 12,500 MS/MD seats is also part of the new budget planning. Moreover, all these investments will complement the Ayushman Bharat scheme as well. Overall, although the government has taken steps to improve the healthcare infrastructure, access to healthcare services and costs, it still needs a three-fold investment to achieve the desired goals. The National Health Policy objectives and mission demand that the Indian government should

| Public Expenditure on Health, 2016 - 2019 (in US$ Billions) | 2016 | 2017 | 2018e | 2019p |
|---|---|---|---|---|
| Urban health services-allopathy | 6.7 | 8.3 | 8.8 | 9.6 |
| Rural heath services-allopathy | 4.4 | 5.8 | 6.3 | 6.7 |
| Public health | 2.2 | 2.9 | 2.9 | 2.9 |
| Medical education training and research | 2.1 | 2.7 | 3.1 | 3.6 |
| Urban health services - others | 0.8 | 1.0 | 1.0 | 1.0 |
| Rural heath services- others | 0.4 | 0.6 | 0.7 | 1.0 |
| General expendtiture | 0.7 | 0.8 | 1.0 | 1.1 |
| Total | 17.4 | 22.1 | 23.6 | 26.0 |
| Public Expenditure on Health as % of GDP | 0.7 | 0.8 | 0.8 | 1.0 |

increase their health funds from US$24 billion in 2018 to more than US$100 billion by 2025.

## Other public health schemes

Other key public health schemes include;

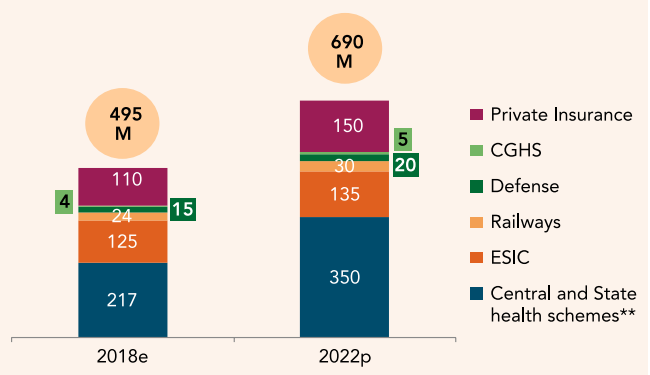
- Rashtriya Swasthya Bima Yojana (RSBY) for which US$23 million is allocated in the recent budget announcement, a decline of more than 50% since this scheme will be merged with the PMJAY scheme by the year-end
- Pradhan Mantri Swasthya Suraksha Yojana (PMSSY): This scheme has two branches; setting-up of AIIMS like Institutions, and upgrading of public medical Institutions
- Heath coverage schemes of states: Yeshaswini, Vajpayee Arogyasri (Karnataka), Rajiv Arogyasri (Andhra Pradesh, Telangana). Chief Minister's Comprehensive Health Insurance Scheme (Tamil Nadu), Mukhyamantri Amrutam (Gujarat), and so on, different states have their own health coverage schemes
- The National Program for Health Care for the Elderly(Increases from US$ 11 million in 2018 to US$15 million in 2019)
- National Mental Health Program (budget increased from US$0.85 million in 2018 to US$6 million in 2019
- Others
  - The budget for the National Program for prevention and control of Cancer, Diabetes, Cardiovascular Disease and Stroke was increased to US$25 million in 2019 from US$14 million in 2018
  - The budget for Tobacco Control Program and Drug Deaddiction Program was decreased to US$9.3 million from US49.6 million

## Healthcare Coverage Forecast:

**Public health coverage might change the health insurance dynamics in the next five years. The private sector will also see good growth; Overall India seems to be moving towards universal health coverage**

Apart from the per capita income growth, the various government health schemes and benefits will be by large the major force behind the increase in the population covered under any kind of health insurance, particularly through the ESIC, PMJAY, and PMSSY schemes. Private health insurance providers are also expected to see double-digit growth in their group health benefits, and also the private health insurance plans such as family floaters, child plan, and so on.

**Health Insurance Penetration 2018-2022 (Beneficiaries in millions)**




***includes: Central (PMJAY/PMSSY/RSNY/JSSK/NMBS etc. and State health schemes (Yeshaswini, Vajpayee Arogyasri, Rajiv Arogyasri, Mukhyamantri Amrutam and various other schemes of different states)*

The Ayushman Bharat Program or PMJAY is being considered has the masterstroke in the bridging the gap between healthcare infrastructure and resource demand and the supply side of it. Creating a pull from the patient is increasing pressure on the

healthcare providers to find cost-effective solutions, suppliers, and modes of healthcare delivery in order to comply with the government mandate. This pressure has been reciprocated well by the public healthcare service providers so far. However, recently in states where the program is co-branded with state-level schemes, the public hospitals are also joining the private sector in opposing the Ayushman Bharat scheme. For example, in Karnataka where the program is being co-branded as Ayushman Baharat-Arogya Karnataka (Ab-Ark), the public hospitals are claiming that they are incurring financial losses because of this scheme.

According to a leading public cardiovascular institute (in Karnataka), the reimbursement rates are 30% lower than the actual implant/ device or surgery costs at the government hospitals. For example, a government hospital is spending a minimum of US$715 on a double valve replacement surgery, the Ab-Ark rate is US$2,140 which is okay until then there is a need of for a third valve replacement. The actual cost of the two valves is US$1,430, however, the PMJAY package provides only US$285 for the third valve replacement. Further other factors such as GST, equipment maintenance costs, depreciation etc. builds up to the expenditures.

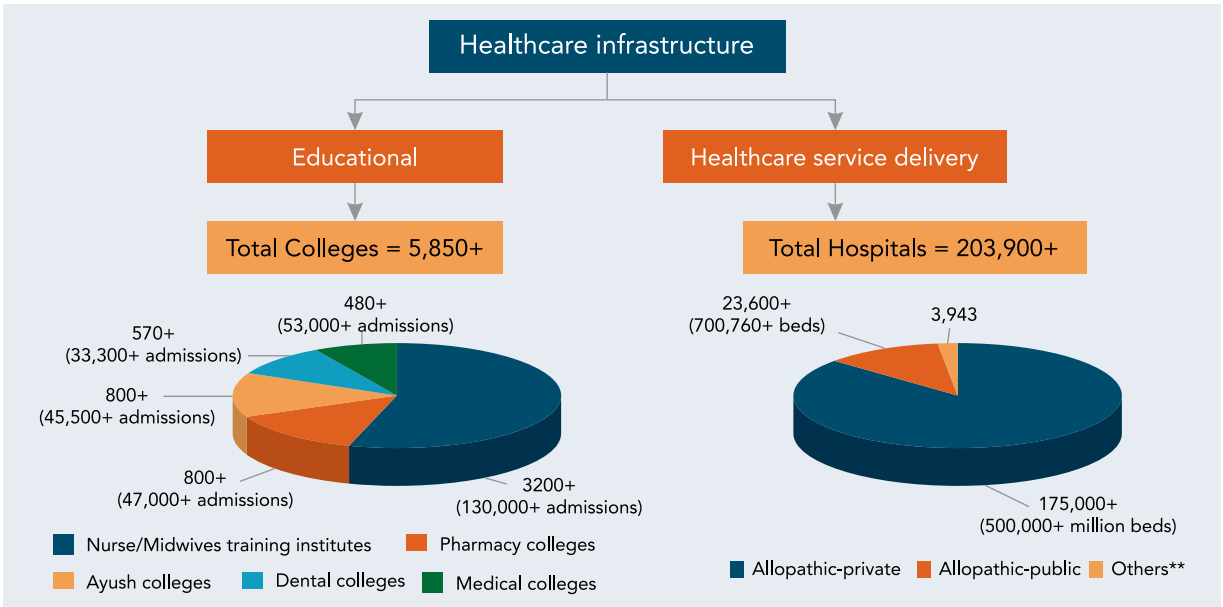
On the other hand, the private sector service providers have not been too much inclined towards the Ayushman Bharat scheme from the beginning. According to the private sector leaders, the government has not well thought of the therapies, value-based outcome approaches and so on. Particularly, in cancer treatment, for example, the Ayushman Bharat package rate US$70 for one session of chemotherapy, which is three to four times less than the chemotherapy with innovative medicines. Many think that it is only a failed tactics to force private hospitals to consider cheap generics chemotherapy options which are not good to adopt the value-based pricing approach.

Moreover, the private sector has already accused (in a way) that this move has discouraged investors who are now shying away from the hospital sector in particular. The other side of the coin is around the release of payments by the government. Many private hospitals claim that they have not got their reimbursement as promised within two weeks. Whereas, the government is keen on increasing the use of public health facilities to 50% by 2025 as compared to 30% as of now.

# Healthcare Infrastructure

## The ratio of doctors, hospitals, hospital beds, and other medical resources per 1,000 population is not encouraging and is below the global, OECD, and South East Asian averages

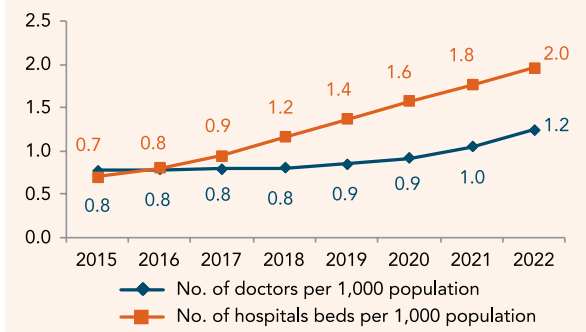
Healthcare delivery network of a country is one of the important healthcare sector indicators reflecting the country's capability to provide healthcare services to patient populations. The healthcare infrastructure can be segmented into two parts as shown below:




***Others include AYUSH hospitals [(Ayurvedic (3180+), Unani (264+), Siddha (297+), Yoga (12+), Naturopathy (19+), and Homeopathy hospitals (164+)]*

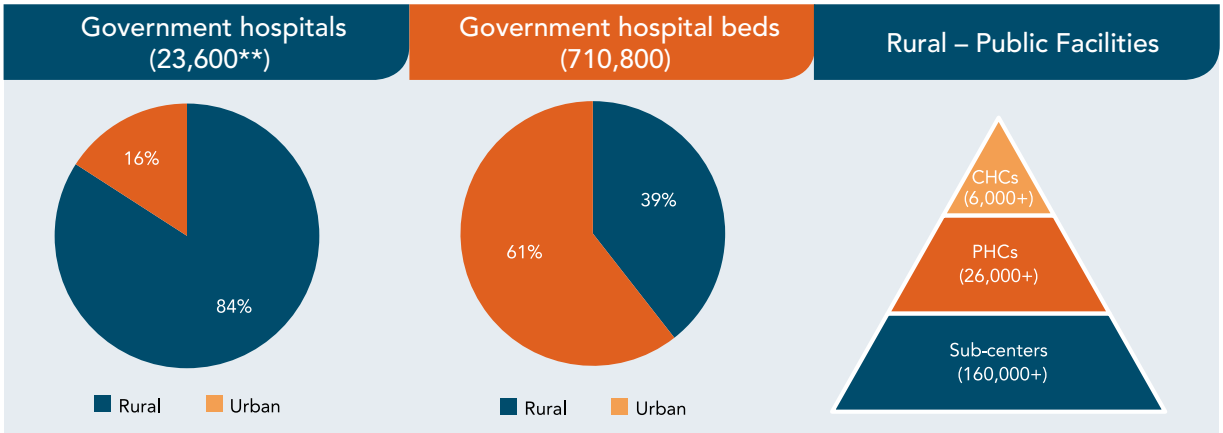
India currently has over 480+ medical colleges (53,000+ admissions), 320+institutions providing BDS courses (27,000+ admissions), and 250+ which provides masters in dental surgery (6,300+ admissions) in 2018. Apart from this there are more than 3,200colleges to provide nurse/midwives training and certifications with over 130,000 admission in 2018, 800+ pharmacy colleges (47,000+ admissions in 2018), and 800+ AYUSH colleges (45,500+ admissions).

**No. of Doctors / No. of Hospital Beds per 1,000 population**



Skilled health professional's density (physicians/nurses/midwives per 1,000 population) in 2017 was 3.0 per 1,000 population.

Total numbers of allopathic doctors recognized by the Medical Council of India are estimated at above 1 million as of 2018 translating into 0.8 doctors per 1,000 population which is very less as compared to WHO standards of at least 2 doctors per 1,000 population (The doctor per 1,000 population ration is expected to be 1.2 by 2022 and ~2 beds per 1,000 population could be the hospital beds per 1,000 population ratio by 2022).




*Note Bhore committee goals: Establish: 1 primary centre for every 30,000-40,000 population with at least 2 doctors, 4 PHN, 4 Midwives, 1 Nurse, and other workers, 6 beds and Expand: 1 PHC for 10-20K population, secondary unit with 650 beds, and district unit with more than 2,000 beds.*

*** ESIC has more than 20,000 beds across 150+ hospitals, railways have 125 hospitals and 13,800 beds*

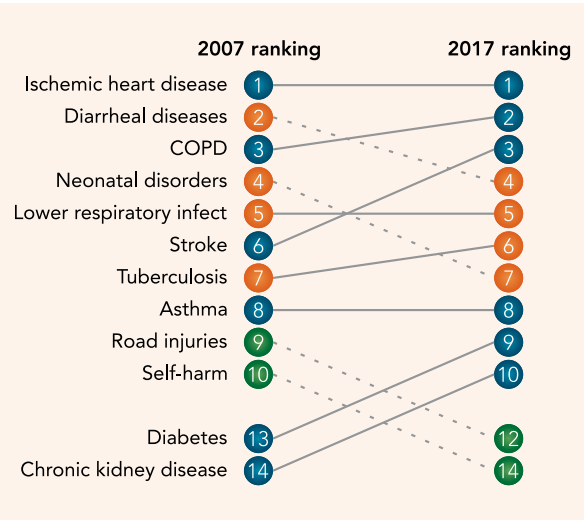
# Learning from Global Peers

## Fastest growing nation but lagging behind global peers in healthcare quality and accessibility

India has emerged as the fastest growing economy in the world with healthcare playing a key role in the country's overall socio-economic development. Our progress so far is aptly reflected in the latest scores of The Global Burden of Disease Study by Lancet which mentions that India's healthcare access and quality score stood at 41.2 in 2016 compared to 24.7 in 1990. But the fact remains that the global average stood at 54.4 indicating that India has still a long way to go in terms of providing affordable healthcare and continue to lag behind some of our peers.

According to the Global Burden of Disease Study, among 195 countries in 2016, India is ranked at the 145th position in terms of quality and accessibility of healthcare, behind its neighbours like China (48), Bangladesh (133), Sri Lanka (71) and Bhutan (134). According to the study, India performed poorly in addressing cases of tuberculosis, rheumatic heart diseases, Ischaemic heart diseases, stroke, testicular cancer, colon cancer and chronic kidney disease among others.

The below chart gives an indication about the most common causes of death which shows that the top seven causes have remained the same in the past 10 years.




*Source: Institute for Health Metrics and Evaluation*

The study also revealed that India and China had the highest disparities in healthcare access and quality.

Although there is pledged increase in spending for the healthcare system, India continues to have one of the world's lowest levels of healthcare spending as a proportion of its GDP. The situation is further compounded by income inequalities, infrastructure gaps, lack of adequate trained medical professionals, collaborative approach between the government and private players and limited awareness about various healthcare programmes to name a few.

## Global Comparison Table

Health expenditure as % share of GDP

| Major Developed Economies (G7) | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017* | 2018* |
|---|---|---|---|---|---|---|---|---|
| United States of America | 16.4 | 16.4 | 16.3 | 16.5 | 16.8 | 17.1 | 17.2 | 17.4 |
| France | 11.2 | 11.3 | 11.4 | 11.6 | 11.5 | 11.5 | 11.6 | 11.7 |
| Germany | 10.7 | 10.8 | 10.9 | 11.0 | 11.1 | 11.1 | 11.2 | 11.3 |
| Japan | 10.6 | 10.8 | 10.8 | 10.8 | 10.9 | 10.9 | 11.0 | 11.1 |
| Canada | 10.2 | 10.2 | 10.1 | 10.0 | 10.4 | 10.5 | 10.6 | 10.7 |
| United Kingdom | 8.4 | 8.3 | 9.8 | 9.7 | 9.8 | 9.8 | 10.1 | 10.4 |
| Italy | 8.8 | 9.0 | 9.0 | 9.0 | 9.0 | 8.9 | 9.0 | 9.0 |
| **Developing Economies - East Asia** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017*** | **2018*** |
| Myanmar | 1.7 | 1.9 | 2.1 | 5.0 | 5.2 | 5.1 | 6.3 | 7.9 |
| Viet Nam | 5.9 | 6.3 | 6.3 | 5.8 | 5.7 | 5.7 | 5.6 | 5.6 |
| China | 4.3 | 4.5 | 4.7 | 4.8 | 4.9 | 5.0 | 5.1 | 5.3 |
| Singapore | 3.2 | 3.4 | 3.7 | 3.9 | 4.2 | 4.5 | 4.8 | 5.1 |
| Malaysia | 3.4 | 3.5 | 3.6 | 3.8 | 3.9 | 3.8 | 3.9 | 4.0 |
| Thailand | 3.6 | 3.5 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.8 |
| Indonesia | 3.0 | 2.9 | 3.0 | 3.1 | 3.0 | 3.1 | 3.2 | 3.2 |
| **Developing Economies - South Asia** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017*** | **2018*** |
| Nepal | 5.1 | 5.2 | 5.3 | 5.8 | 6.2 | 6.3 | 6.6 | 6.9 |
| Sri Lanka | 3.7 | 3.4 | 3.8 | 3.6 | 3.9 | 3.9 | 3.9 | 4.0 |
| India | 3.2 | 3.3 | 3.7 | 3.6 | 3.6 | 3.7 | 3.7 | 3.8 |
| Bhutan | 3.3 | 3.5 | 3.6 | 3.5 | 3.7 | 3.5 | 3.5 | 3.5 |
| Pakistan | 2.3 | 2.4 | 2.6 | 2.7 | 2.7 | 2.8 | 2.8 | 2.9 |
| Bangladesh | 2.6 | 2.6 | 2.5 | 2.5 | 2.5 | 2.4 | 2.3 | 2.3 |
| **Other Developing Economies** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017*** | **2018*** |
| Brazil | 9.8 | 10.0 | 10.2 | 10.8 | 11.5 | 11.8 | 12.2 | 12.7 |
| Mexico | 5.5 | 5.7 | 5.8 | 5.5 | 5.7 | 5.5 | 5.5 | 5.4 |
| Egypt | 4.4 | 4.6 | 4.7 | 4.7 | 4.6 | 4.6 | 4.7 | 4.8 |

*Source: World Health Organization, Global Health Expenditure Database*

*Country are categorized as per United Nations Country Classifications*

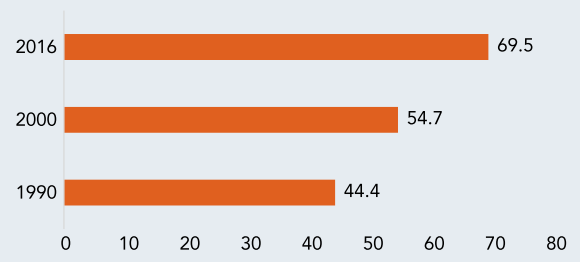
**Refers to projected figures*

## Global Case Studies and Learning

### Thailand: The 30 baht Universal Health Coverage

Thailand is a role model when it comes to showing how a middle income country can provide healthcare services to its entire population. It achieved universal health care (UHC) in 2002 when it introduced the 30 baht system for the entire population with a guarantee that a patient won't be paying more than 30 baht per visit for medical care. The most noteworthy aspect is the fact that the system includes drugs and diagnostics too, which actually account for a major portion of the healthcare expenses. There are also initiatives of special track to recruit high school students from economically backward areas into medical and nursing course with the provision that they have to work in their home districts upon completion of the course. Apart from the three year mandatory rural health service, there are also financial incentives for those working in rural areas upon completion of the course.

**Thailand: Healthcare Access and Quality Index**



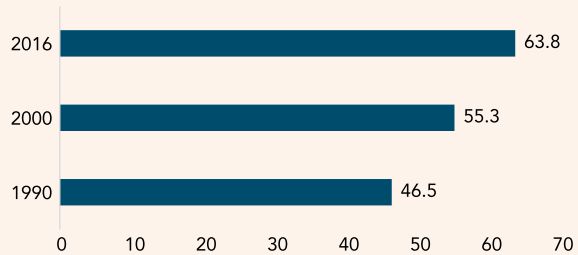

**Key Learning**

Infrastructure and human resource requirements of the public health system had been largely in place before the implementation of the scheme.

### Brazil – Community health workers as the first front line defense for primary health care

The health reforms in Brazil nearly took four decades of reform when in the 1980s and 1990s the population had largely become dependent on secondary and tertiary healthcare. Primary care seemed to be neglected leading to the decline of key health indicators. With the aim to rectify the worsening situation, the role of community health workers (CHW) came in to existence as low level intervention at the first level as well as achieve large areas of geographical coverage. Brazil's Family Health Strategy was started as a federal programme in 1994 to provide integrated primary care and today CHWs are an integral part of the programme along with the physician and nurse that provide preventive and basic health care. In short, CHWs which are more familiar with the community problems and tend to share a closer relationship with the patients form the nucleus of the country's primary health care health strategy.

**Brazil: Healthcare Access and Quality Index**



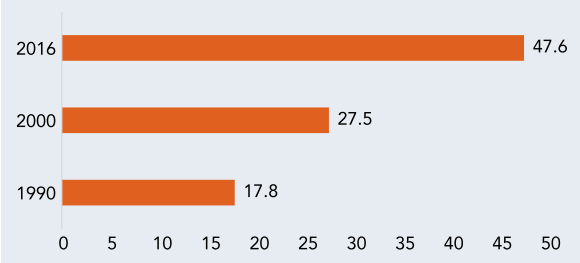

**Key Learning**

Community workers should be an integral part of the primary healthcare system as they are best suited to understand the specific health issues of particular locations.

## Bangladesh – Women empowerment in primary healthcare can make a major difference in early stage prevention

Bangladesh is a shining example of how women at the forefront, when equipped with the right knowledge and resources, can help in making strides in helping the country's health outcomes. Over the years, women from economically backward areas have been playing a central role by acting as frontline health mobilizers. Organizations such as The Bangladesh Rural Advancement Committee (BRAC) have been training rural women for decades to achieve great results by focusing on the first threshold of healthcare level i.e. child health interventions (including vaccinations), family planning and oral rehydration therapy among others. This dual strategy of using female workforce to combat the first level of healthcare issues has led to a tremendous improvement in the country's under-five and infant mortality rate, fertility rate and life expectancy levels.

Bangladesh: Healthcare Access and Quality Index



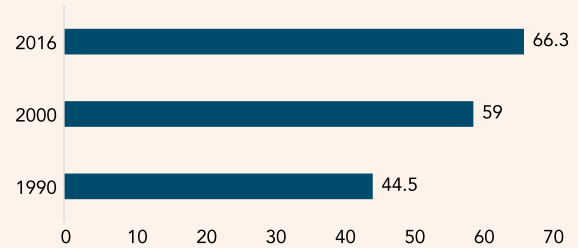

### Key Learning

Women empowerment in healthcare areas, especially in economically backward areas, can act as agents of change in early stage prevention areas.

## Mexico – Using digital technology to shift strategy from reactive to a proactive preventive approach

Mexico was suffering a dramatic increase in the number of adults suffering from NCDs (non-communicable diseases) that generally requires prolonged care with higher amount of expenses. In order to combat this issue on a nationwide scale, the Carlos Slim Foundation established the CASALUD programme to address chronic disease prevention and treatment of pre diabetes, pre obesity and pre hypertension to name a few by using health information technology and mobile health (mHealth) platforms. CASALUD provides mHealth tools and technical systems basically focusing on delivery of primary healthcare care in clinics to ensure that patients get the right treatment at the right time through early detection warnings. The technical tools include mobile screening tools, patient portals, online training, supply chain monitoring, national health statistics, and standardized electronic health records including a chronic information system.

Mexico: Healthcare Access and Quality Index



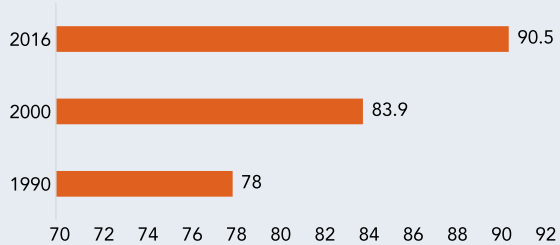

### Key Learning

Digital technology can play a key role in adopting a preventive approach for identifying and treating diseases before reaching the chronic stage.

## United Kingdom (UK) – Using a single window model to provide primary, secondary and tertiary healthcare

The UK uses a single window to deliver its healthcare services through its National Health Service (NHS) model. It is funded by the tax payers and free to all UK residents. The scheme entitles every beneficiary to a specified health package and provides a voucher generally with one year validity for insurance coverage specifying the health conditions that will be covered. Health service providers who are willing to provide services in terms of the NHS financial package and are adjudged to be competent enough to provide primary, secondary and tertiary services are accredited for the scheme. The annual premium paid by the NHS for each beneficiary is the healthcare provider's revenue. The NHS does not pay for any additional tests or treatment. This, in turn, ensures that service providers administer quality treatment and at the same time focus on preventive healthcare too. This system ensures that a universal healthcare system is in place with stipulated costs thus leading to equity and affordability of healthcare services in the nation.

United Kingdom: Healthcare Access and Quality Index



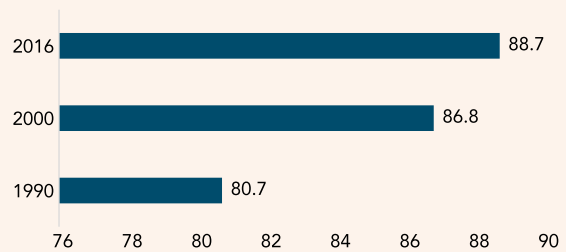

**Key Learning**

A single window model can work in building an integrated healthcare system.

## US – Collaborative approach for inclusive and equitable healthcare

In the US, it is mandatory to get health insurance and generally is comprehensive covering most of the things from a doctor's visit to hospitalization. As per the US guidelines, employers with more than 50 employees are required to provide health insurance to each full-time employee. In 2010, as a part of the healthcare reform to ensure that all US citizens have access to affordable healthcare, the Patient Protection and Affordable Care Act (PPACA), abbreviated to the Affordable Care Act (ACA) or popularly known as the 'Obamacare' came in to existence. Under it, insurers are mandated even to offer coverage to those with pre-existing condition –definitely a game changer for those who could not afford healthcare on account of this condition. Currently, the Government has proposed some changes to the existing Act.

United States: Healthcare Access and Quality Index




**Key Learning**

A universal health coverage has greater chances of success when government, employers and insurers work together.

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Fermenta Biotech Limited

## Brief Profile

Fermenta Biotech Ltd. (FBL), established in 1986 under the auspices of Duphar-Interfran Ltd., is a pioneer in the manufacturing of Vitamin D3.

FBL's facilities in Kullu and Dahej are certified by global accreditations. Its world class R&D center is located at Thane.

## FBL's Businesses

### Vitamin D

FBL is the only manufacturer of Vitamin D3 in South East Asia, and one of the leading players in the Vitamin D market globally.

With more than three decades of experience, it caters to over 300 customers across 50 countries with a worldwide distribution network for a variety of applications such as pharmaceuticals, dietary and nutritional supplements, food, feed, veterinary and rodenticides.

## Other Pharmaceutical APIs

**Phenyramidol HCl**: Phenyramidol Hydrochloride is a potent muscle relaxant with analgesic effect, which has promising opportunities due to a steady rise in low back, neck and shoulder pain incidence.

**Silicon powder**: Silicon powder (activated dimethicone powder) is a product that can replace dimethicone oil in anti-flatulent oral formulations.

## Biotechnology

FBL possesses proprietary enzymes for the production of beta-lactam antibiotics like Amoxicillin, Ampicillin, Cephalexin and Cefadroxil.

FBL's enzyme technologies enable new and eco-friendly manufacturing practices, addressing sectors comprising the pharmaceutical industry, fine chemicals, bio-plastics and cosmetics.

## Environmental Solutions

FBL offers integrated biotechnology as well as engineering solutions that address environmental issues.

Its tailor-made solutions and platform technologies provide unique waste water management and treatment advantages. FBL's products encompass a range of applications: sewage treatment plants and effluent treatment plants, as well as waste water and solid waste management.

## Recent Highlights

1. **Global Collaborations**: FBL has widened its Vitamin D3 sales and marketing footprint across geographies through international engagements spanning 6 continents to become a key player in the nutraceutical ingredients space.
2. **Export Leadership**: An increase in turnover as well as revenue from exports is proof of addition of new customers, market segments and geographies to FBL's portfolio.
3. **Operational Excellence**: FBL has implemented digitalization measures to improve efficiency of business processes through incorporating the ERP system SAP-S4 Hana, CRM module Salesforce.com and SAP Success Factors for performance management.
4. **Awards**:

- Winner of 3 prestigious awards at the India Pharma Week 2018
  - Excellence in CSR for companies with turnover less than INR 500 cr.
  - Pharma International Excellence
  - Excellence in Export Promotion
- Hindustan Times Thane Ratna 2019 award under the category Healthcare, Pharma and Biotech Manufacturing
- Abbott Strategic Business Partner 2018, winning its preferred supplier award for the seventh year in a row
- World HRD Congress Awards 2018
  - National Best Employer Brand
  - Business Leader of the Year
  - 101 Top HR Minds

## Our Associations

- **Vitamin D Guru**: FBL's public awareness initiative is a digital platform to enhance knowledge about the significance of Vitamin D for health and wellness.
- **Vitamin Angels**: FBL contributes towards Vitamin Angels' activities in the field of micronutrient deficiency in women and children in developing countries.
- **National Association for the Blind (NAB)**: FBL not only contributes towards corneal transplants, squint correction surgeries, educational Braille kits and grant for Diploma in Special Education course, but also integrates NAB's members with its internal activities for employee engagement.

# HealthNext

## Role played by key stakeholders such as Government, Pharma and Wellness companies

*"The health of people is the foundation upon which all their happiness and all their powers as a state depend"* said British Prime Minister Benjamin Disraeli. Health Care is one area where collective contribution of various stakeholders like government, pharma and wellness companies matters. In India, Government has been putting efforts from time to time to promote health care. Implementation of health care has been a collective effort of government at the center as well as states.

There has been emphasis on public private partnership to promote healthcare in the country as well. National Health Mission was started in 2013 with a broad objective to provide health care to a large section of underprivileged population. As per Government of India, "The main programmatic components include Health System Strengthening in rural and urban areas- Reproductive-Maternal- Neonatal-Child and Adolescent Health (RMNCH+A), and Communicable and Non-Communicable Diseases. The NHM envisages achievement of universal access to equitable, affordable & quality health care services that are accountable and responsive to people's needs." Another important initiative of the government is "Pradhan Mantri Jan Arogya Yojana"( PMJAY) which aims at making interventions in primary, secondary and tertiary care systems to address healthcare holistically. The PMJAY, aims to cover 10 crore families and it provides Rs. 5 lakh family floater insurance policy. Apart from these broad schemes, the government has also focused on eradication of some of the diseases such as "Polio", "Smallpox", "Yaws" etc. The National Health Policy of 2017 broad guidelines on how the government aims to achieve broad objectives of providing health care in India across population.

Apart from the government, pharma companies in India have also been at the forefront of providing health care. India is one of the emerging hubs of pharma manufacturing. The role of pharma companies just don't end with providing medicines at an affordable cost. They play an important role in research and development of new medicines and marketing the same for benefit of users. It is important to note that these companies also have to work on development on new medicines and solutions which is important to combat diseases. Speedy introduction of generic drugs into the market is another important role played by pharma companies.

Wellness companies, along with pharma companies have also been instrumental in spreading health care in India. Ayurveda has been instrumental in providing health care for treatment of diseases to the mass at an affordable cost. In India, health care cost is a key factor for treatment of diseases. There has been is a huge push toward traditional AYUSH mission, post 2014. The Ministry of AYUSH was formed on 9th November 2014 to ensure the optimal development and propagation of AYUSH systems of health care. Hospitals have been another backbone of health care in India. There has been a rapid

expansion in network of hospitals in both private and public sector. The government has worked on improving public health care by setting up network of All India Institute of Medical Sciences (AIIMS) across India. In private sector also, many high end hospitals have been set up.

Some of the key challenges in the health care sector are 1) The existing healthcare infrastructure of India is not sufficient to meet the needs of the rising population, 2) There is a shortage of funds and staff in the public healthcare institutions, 3) Public expenditure in healthcare is very low, 4) There is an urban-rural disparity in providing basic health care and 5) Apart from communicable diseases, diseases such as diabetes and hypertension are on a rise. Last but not the least, as per World Bank's Universal Health Coverage Index, India is at the 157th position of entire 195 nations. Challenges in the health care are not just confined to the government, even pharma and wellness companies face many challenges. The biggest challenge faced by the pharma companies is that there is constant pressure from government and public to make medicine affordable. There has been pressure of compliance from international as well local bodies on pharma companies in India. Paucity of key resources has been one of the key challenges faced by welcome companies. According to the World Health Organization (WHO) and the ministry of health, India has seven doctors per 10,000 people, which is less than 1:1000 ratio prescribed for doctors to patients' ratio.

In order to overcome challenges faced in the healthcare sector, the government of India plans to increase its public health spending to 2.5% of gross domestic product (GDP) by 2025. The increase in expenditure is required to build health care infrastructure, which is a critical part of health care program in the country. Two pronged approach of the government in promoting traditional as well modern health care is likely to spread health care facilities. Ayushman Bharat scheme, launched by the government, is targeted at poor, deprived rural families and identified occupational category of urban workers' families. Going by the Socio-Economic Caste Census 2011 data, 8.03 crore families in rural and 2.33 crore in urban areas will be entitled to be covered under these scheme. The program will effectively cover 50 crore people. Pharma and wellness companies are working in tandem with the government to provide health care across countries. When Cardiac stent price cap was lowered by the government, they worked together with bringing down the cost of it.

The government of India as well as state governments in India have worked from time to time with various agencies to find out key challenges faced by health care system. Similar efforts have been put by pharma and wellness companies. The learnings have helped them in rolling out better healthcare program. The way government used "Pulse Polio" program for eradication of polio from the country is an example of the fact that co-ordination amongst various stakeholders in health care sector is important to achieve broader objectives of health care.

## Emphasis on Innovation

Innovation is the buzzword these days. With the advancement of technology, innovation has provided impetus to various sectors and health care is no exception. In a country like India, where health care delivery remains a major challenge, innovation in health care is expected to provide big boost to the sector. India has a population of 1.3 billion people, and around 30% of this population is poor. Also, a big section of this population is uninsured. While there is a system of health care in government hospitals for poor, it is not easy to avail facilities in government hospitals as they are crowded and understaffed, providing poor health care. Rising population of India and ever increasing need for health care requires usage of innovative methods.

India has a mixed health-care system, inclusive of public and private health-care service providers. However, most of the private health-care providers are concentrated in urban India. Delivery of service in India needs improvement through innovation because population is very large and widely spread. Some of the new innovative methods which are driving delivery of health care includes digitization of patient records, telemedicine, virtual consultancy etc. There is an emphasis on electronic maintenance of records by the government, both at the center as well as state level. The government has started e-Hospital software. This is a generic software which covers major functional areas like patient care, laboratory services, work flow based document information exchange, human resource and medical records management of a Hospital. Given the staffing and infrastructural constraints, virtual-doctor consultations are also gaining ground in India. No doubt usage of such innovative methods are still restricted. In 2015, India started a health initiative in line with its Digital India mission named 'SEHAT - Social Endeavour for Health and Telemedicine. The aim of this project was to provide tele-consultation with the help of some of the leading hospitals of India.

It is important to encourage preventive health care in a society. This helps in reducing health issues in the society as it encourages awareness about health and prompts people to take preventive measures. There are innovative bands being developed and sold in the market, user of which is getting motivated to walk a few extra steps today to save the cost of treating obesity a few years down the line. Similarly, various emergence of technology has reduced cost of medical examinations. But the biggest benefit that has come from innovation in health care is that it has helped in developing an ecosystem where private public partnership can be used for better management of some of the killer diseases such as "Tuberculosis".

Preventive healthcare along with healthcare education can go a long way in building better healthcare program across the country. Healthcare education needs to be built to take care of rising requirement of healthcare across the country and rolling out of various schemes by the government. Using technology, trained healthcare providers can be created in the rural areas. It is pertinent to note that doctors need support of nurses, midwives, anesthetists, etc. for providing healthcare. Basically, the focus of education has to be on creating the bigger pool of resources for healthcare across the country for which technology can act as the bug enabler.

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## About Aster DM Healthcare and its global and India operations

Aster DM Healthcare Limited is one of the largest global integrated healthcare service providers currently operating in nine countries, including India. With over 353 establishments in its portfolio of multi-specialty hospitals, clinics, and pharmacies that span from South East Asia to Middle East, Aster DM Healthcare is the second largest healthcare services provider in India by market cap. Through its world-class network of hospitals, clinics and pharmacies, providing primary to quaternary care to all segments of the population, the company provides the complete circle of care to people.

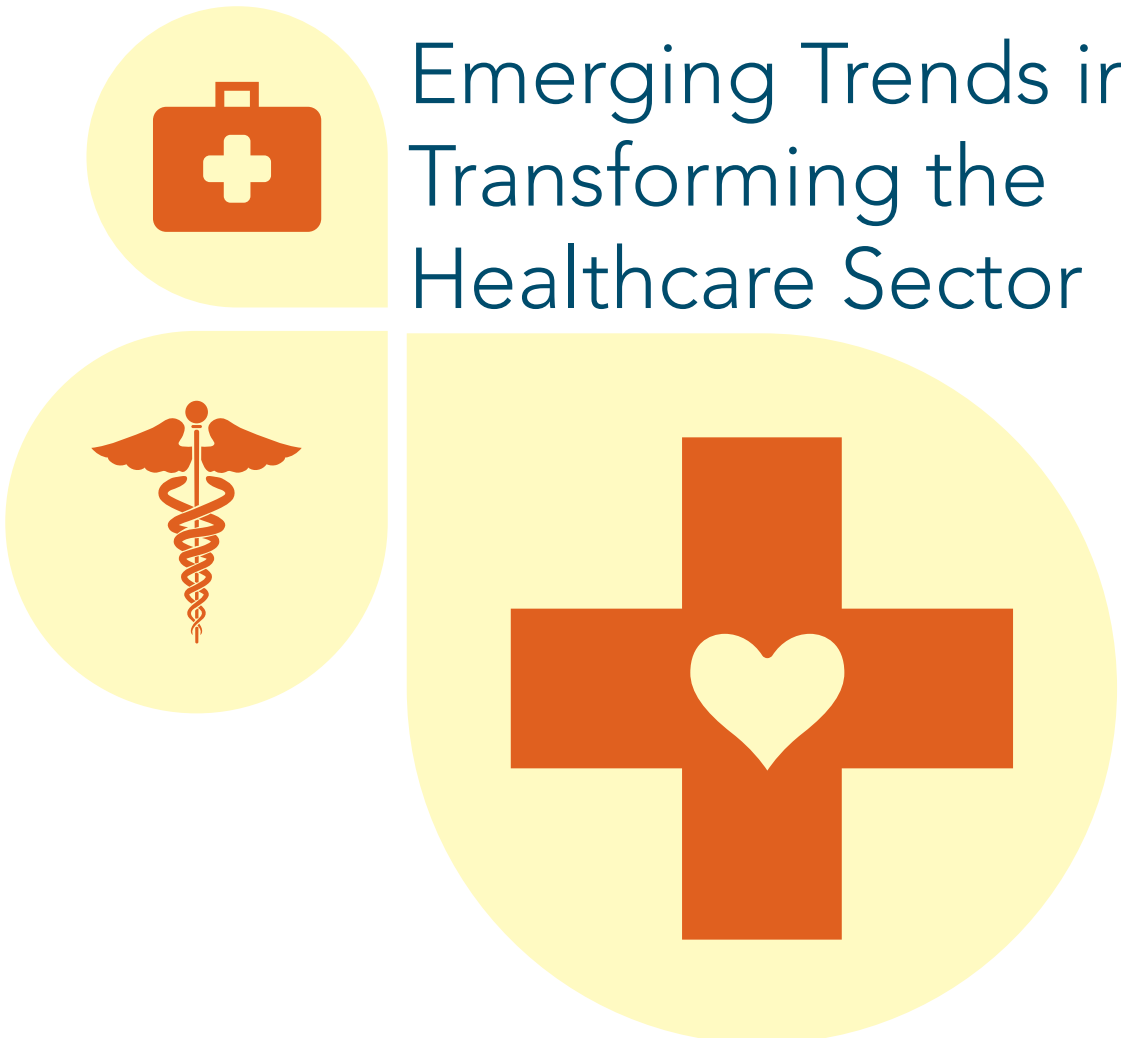
It's India operations commenced in 2001 with the establishment of Malabar Institute of Medical Science in Calicut (Aster MIMS), Kerala. Today its network comprises of 11 hospitals and nine clinics. Headquartered in Dubai in GCC and in Kochi in India, Aster DM Healthcare listed its stocks in Bombay Stock Exchange in February 2018. Established in 1987 with a single clinic in Dubai, its operations have gone from strength to strength in the last 31 years, and today it has emerged as a global healthcare player with 21 hospitals, 113 clinics and over 219 pharmacies in nine countries, including India. With a three-decade long proven track record in delivering clinical excellence, Aster DM Healthcare is pushing forth with its commitment to making quality healthcare accessible and affordable.

It is among the few global healthcare service providers that offer end-to-end care across primary, secondary, tertiary and quaternary healthcare. Its strong hospitals network in India that spans across major states and metro cities is determined to make quality healthcare accessible for millions of Indians and international patients.

It employs a total of 17,800+ people, including over 1500+ doctors and 5900+ nurses and paramedical personnels focused on delivering care and its brand promise: 'We'll Treat You Well.'

Aster Healthcare has created a healthcare eco-system across two geographical regions. In GCC region, Aster's primary care clinics act as the initial touch-points in the patient journey, while pharmacies and hospitals continue the care. Within the global network, Aster DM Healthcare's India operations is often leveraged for its expertise in advanced tertiary and quaternary care, and each year its multi-specialty hospitals in Kerala and Bangalore receive significant number of patients from the international markets in which it operates.

Aster DM Healthcare believes that profit is a by-product and not its purpose in healthcare. Aster Volunteers is a global CSR programme that was launched coinciding with its 30th anniversary in 2017 and aims at bridging the gap between people who would like to help, with those in need. A year later, it is running successfully in nine countries including India, through various initiatives like Blood Donation drives, Basic Life Support training, Free Surgeries and Investigations, Disaster Relief Efforts, Medical Camps and recruitment of differently abled people. So far, the programme has been able to impact 982,773 lives across geographies.



# Emerging Trends in Transforming the Healthcare Sector

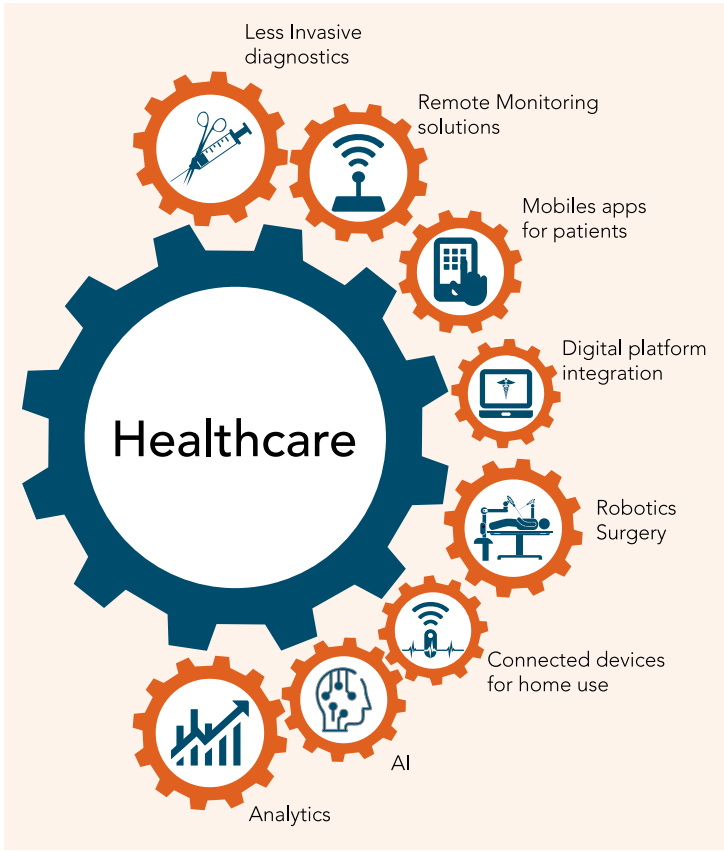
# MedTech: The Future of Healthcare Technology

## Reshaping the Future of Healthcare

The healthcare sector in India has made a considerable progress in the past decade. However, there are vast disparities in the distribution of healthcare services in the rural and urban areas, lack of availability of adequate healthcare infrastructure, lack of availability of affordable healthcare services, and shortage of qualified medical professionals. As per the World Healthcare Organisation (WHO) report, there are 0.8 doctors per 1,000 population; there are 1.3 nurses per 1,000 population; and 1.2 hospital beds per 1,000 population. Further, for a country like India where still 5% of its population still live in extreme poverty, making the healthcare services affordable is a major concern. To overcome these challenges and to cater to a large number of patients, the healthcare industry needs to move beyond the traditional growth model such as adding new beds, or hospitals or the number of physicians.

To change the way the healthcare industry operates, it is necessary to radically transform the sector. The medical technologies have the potential to have positive impact on the Indian healthcare ecosystem. Medical technology is an integral part of entire healthcare value chain – right from screening/ diagnosis to treatment, from bringing patients to normal lives to monitoring their health post treatment. The advancement in technology and sophistication of medical devices has enabled the industry to play a major role in addressing the healthcare requirements and improving the overall healthcare system across the globe.

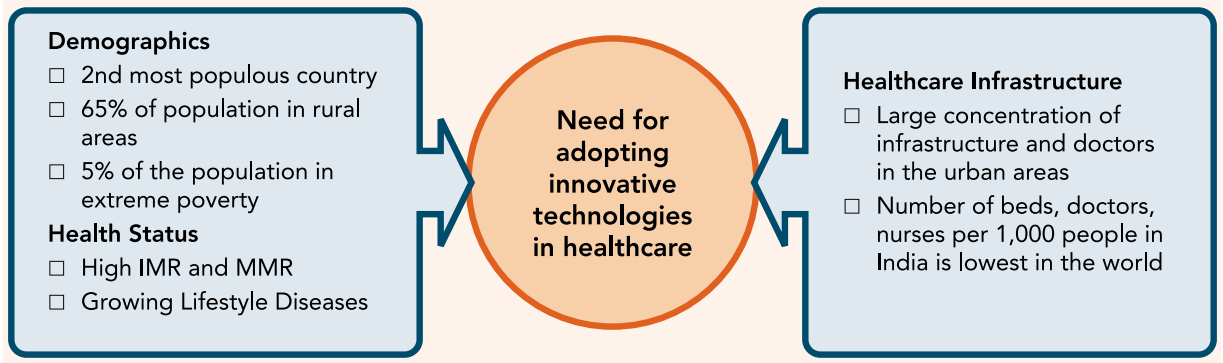
There are several technologies that are currently disrupting /reshaping the future of healthcare across the world:



## MedTech – Addressing healthcare issues in India

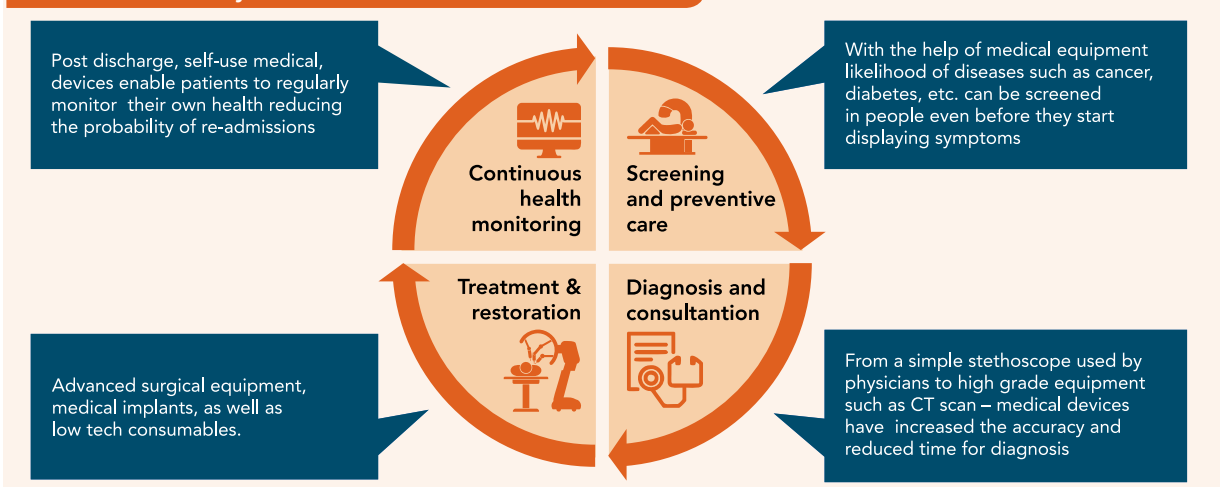
India faces the formidable challenge of improving the healthcare delivery on account of its large population and the vast divide in the concentration of urban and rural population. Existing healthcare delivery mechanism are inadequate to meet the ever-increasing needs of Indian population, especially those in the smaller towns and rural areas. At one end, India has highly-qualified doctors, clinics and hospitals using modern technologies, and attracts large number of medical tourists due to lower healthcare costs as compared to the developed countries. However, on the other side, a majority of India's population cannot afford healthcare services beyond the most basic healthcare. Further, the availability of adequate healthcare infrastructure and highly-qualified doctors is skewed largely towards the urban areas.

### The need for adoption of innovative technologies




These challenges have given rise to the need to adopt innovative technologies in the Indian healthcare sector. Medical Technologies, or MedTech as they are known today, have the potential to bridge the gap between the demand and supply of healthcare services in India, to make healthcare affordable and accessible for all and improve the quality of

### Patient Care Lifecycle



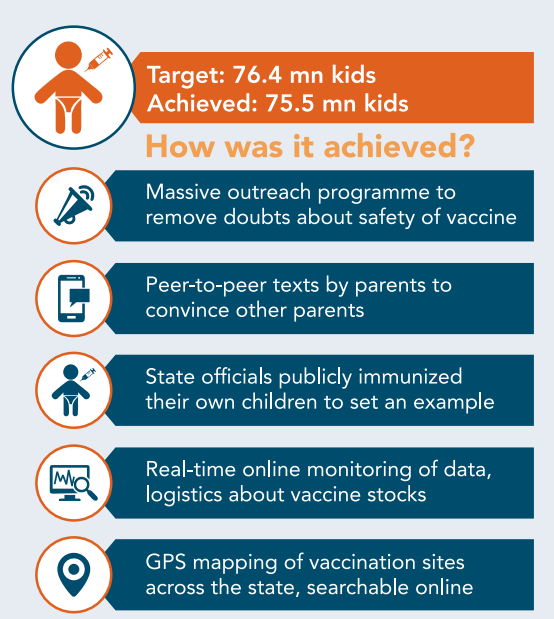
healthcare services. They have the potential in revolutionizing the way patients are diagnosed, treated and monitored

Using the video-conferencing and embedded computing devices, which can share data via the internet, the medical devices are able to provide enhanced patient care in the remote areas. By placing the servers and processing units in the central location, health of the patients can be monitored remotely. The data so obtained from remote monitoring can be transferred to the central processing units. Incorporation of IoT in healthcare can enable the remote tracking of complex machinery and devices like MRI and CT scanner, which are susceptible to breakdown by a simple power surge. Remote tracking, using IoT, can enable to predict the probability of breakdown and trigger preventive maintenance action, thus saving cost.

Using advanced equipment which are powered by technologies such as artificial intelligence and robotics can significantly improve the levels of diagnostics and surgical precision. This in turn will significantly increase the success rate of diagnostics/surgery and improve overall quality of care. Wearable devices such as pedometers, activity detectors etc. can also play a key role in monitoring people's health. These devices can transmit real time data related to a patient's health and vitals when connected with other medical equipment, diagnostics equipment, and healthcare analytics platform. This can enable caregivers to continuously monitor people's health and provide preventive healthcare services.

The most recent example in India where technology was used was to provide preventive healthcare to the remote location is that of Uttar Pradesh. Over a period of three months, despite the several problems with its healthcare system, Uttar Pradesh was able to vaccinate 98.8%, or 75 mn children from the Measles-Rubella (MR) virus by 14th February 2019. Faced with some resistance over the suspicion of possible side-effects of the vaccination, the state government used technology paired with social media to reach the last child possible. Through GPS mapping of fixed MR vaccination sites and peer-to-peer messaging the government was able to create awareness amongst the parents and directing them to the nearest vaccination site. Using peer-to-peer messaging and community radio station, the government was able to tackle the rumours related to the adverse effects of the vaccination.

Further, the technology was not only used in spreading awareness about the vaccination sites, but also in stocking the vaccines in cold chain points. The state used eVIN (Electronic Vaccine Intelligence Network) – a system that



digitizes vaccine stocks. Through this system, simply by using their laptops, district officials are able to monitor the temperature of the vaccine which needs to be maintained for its good quality. If the temperature fluctuates, an alert is sent out in the form of a text message, and prompt corrective action can be taken. The eVIN technology also helps in monitoring the existing stock at each cold chain point. This has helped the government manage the stock at each cold-chain to meet the demand.

Advanced technologies such as virtual reality and augmented reality can also be used to provide training to physicians, technicians, and doctors by simulating real time healthcare environment. This will eliminate the need for presence of actual equipment for training purposes.

The convergence of healthcare with emerging technologies such as IOT, AI, cloud computing, predictive analytics etc. will play a key role in improving accessibility and meeting the challenge of manpower shortage. There are several benefits the healthcare sector can witness from the adoption of emerging technologies. Few of them are:

- Enable doctors to focus on activities that require their expertise
- Monitor patients on regular basis to enable early stage diagnosis of any serious conditions
- Ensure collaboration between healthcare providers
- Standardization of treatment guidelines, protocols, ownership and sharing of patients' records

Through many such innovative technologies, the MedTech industry has the potential to lead the way to address many of the healthcare challenges of India.

In order to address the challenges faced by the Indian healthcare sector, the Government of India through The Ministry of Health and Family Welfare (MoHFW) has also undertaken several initiatives for the digitization of healthcare and has set-up a division called e-health. Through this division, the government plans to make the healthcare services accessible, affordable, provide quality services, lower disease burden and efficiently monitor health entitlements of citizens. Following are the e-Health initiatives by MoHFW, Government of India:

### National eHealth Authority (NeHA)

- A regulatory and promotional organisation to strategise eHealth adoption and set the standards, policies and legal framework for the health sector
- Responsible for setting up electronic health exchanges for interoperability and devising a certification framework for EHR products

### Integrated Health Information Program (IHIP)

- Intends to provide EHR to all citizens
- Provide interoperability to existing EHR/ EMRs on the Integrated Health Information Platform

### Electronic Health Record Standards for India

- First notified in September 2013 by MoHFW, and revised version was released in December 2016.
- Standards like Systematized Nomenclature of Medicine – Clinical Terms (SNOMED CT) available free for use in the country

### mHealth

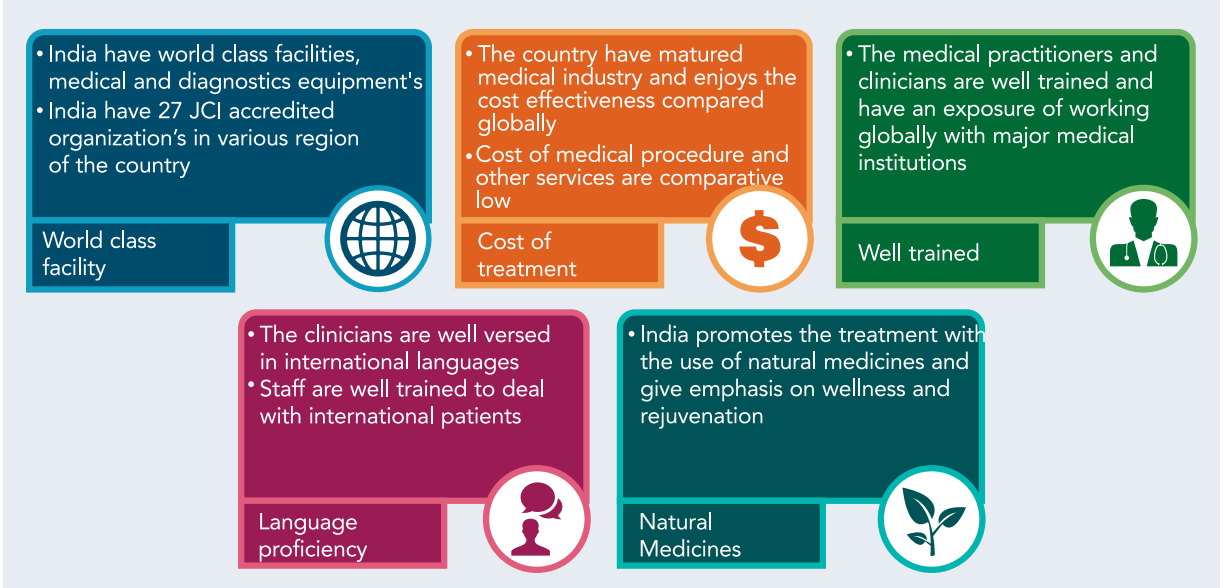
- Use of mobile apps and websites to provide intuitive and interactive modes of communication, treatment, data transmission, and retrieval to doctors/ hospitals and patients.

The growing healthcare market in India presents a huge opportunity for the MedTech industry. However, this potential cannot be realized without a strong collaboration between the government and industry. At the same, the public and private sector players have to play their respective roles to overcome the challenges faced by the sector.

By ensuring that all the stakeholders play their respective roles, India would be able to make itself self-reliant in medical technology and capitalize on the revolution started by medical technologies. This would enable India to achieve its vision of providing an affordable healthcare services to all its citizens.

## Medical Tourism: Placing India on the Global Healthcare Map

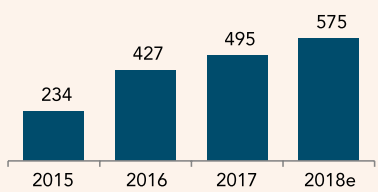
- India's medical tourism market is estimated to more than double from over US$5 billion in 2018 to between US$7-8 billion by 2020
- After Bangladesh and Afghanistan, the Gulf countries, CIS, and African regions offer the maximum opportunity for the Indian medical tourism growth. With respect to the leading domestic markets the key urban areas as mentioned in the beginning of this report (Delhi NCR, Mumbai, Kolkata, Hyderabad, Chennai, and Mumbai) are still the most preferred medical tourism destinations.(Chennai attracts about 45% of health tourists from abroad arriving in the country and 30%-40% of domestic health tourists)
- The major factors driving the growth of the Indian medical tourism market are:



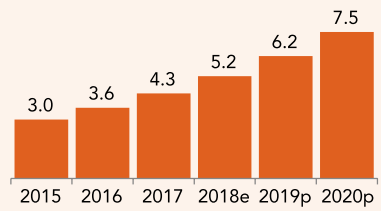
The other two key factors which are also driving the medical tourism sector in India are

- Availability of a strong alternative medicine healthcare infrastructure and medical resources (AYUSH-Ayurveda, Unani, Siddha, Yoga, and Homeopathy) providing India a competitive edge over other popular medical tourism destinations such as Thailand, Singapore, Malaysia, South Korea, and UAE
- Despite India's diversity of languages, English is an official language and is widely spoken

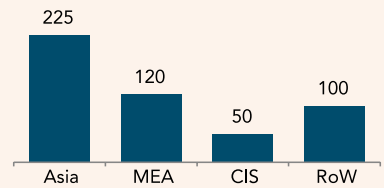
Medical Tourists Visiting India 2015-2018 (in Thousands)




Medical Tourism Market, India 2015-2020 (in US$ bilion)




Medical Tourists by Country - 2017 (In Thousands)



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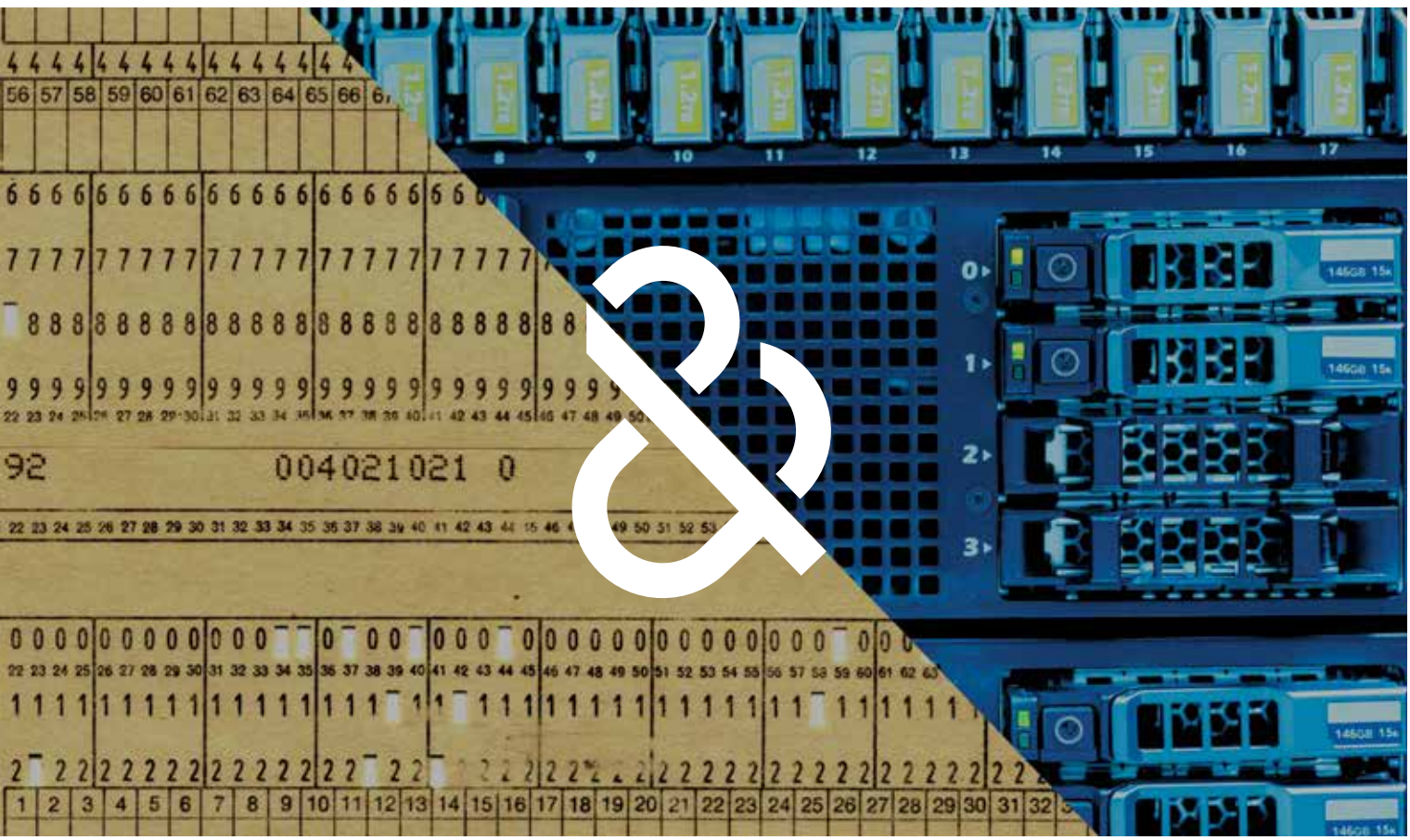

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# Challenges and Unexplored Opportunities

# Demand Supply Scenario for 4Ps – Providers, producers, physicians and payers

## Supply and Demand Analysis of the Key Indian Healthcare Ecosystem Participants

The strategic approach which the Indian healthcare sector is taking revolves around 4Ps of the healthcare system. These 4Ps are:

1. Providers (public and private sector – hospitals and hospital beds)
2. Producers (pharmaceutical companies, medical device manufacturers)
3. Physicians(private and public sector HCPs)
4. Payers(public and private health insurance sector)

Before concluding and providing an analysis covering the challenges faced by the Indian healthcare sector, un-explored opportunities, roles, and necessary actions required by the government, it is important to understand the Indian healthcare sector's from a 4Ps perspective. A brief analysis of the healthcare ecosystem participants with respect to problems faced by the Indian healthcare sector by looking at the supply and demand aspect, and challenges thereof has been summarized in the table:

| Stakeholder | Supply | Demand | Challenge |
|---|---|---|---|
| Providers (Hospital beds) | • Indian hospital market is expected to grow to US$133 from US$62 billion during 2017-2022 at a CAGR of 17%.<br>• Out of which the hospital beds market accounted for only US$200 million in 2017<br>• ~150,000 hospital beds sold per year<br>• Three segments: motorized (premium), medium category, and the low-end beds<br>• The major high-end hospital bed suppliers are Midmark, Stryker, Paramount, and Hill Rom<br>• Increase utilization of public health facilities by 50% from current levels by 2025 | • The number of hospital beds per 1,000 people is1.2 (2018) and is expected to increase to 2.0 by 2020<br>• This means there is a huge gap between the demand and the actual supply<br>• The Indian government along with the support from the private sector support is hoping to bridge this gap in the coming decade, however, the producers of hospitals beds will be the major players in meeting the demand | • To increase the hospital bed capacity by four times (mainly in the rural sector) to achieve a global average of 2.5-3.0 beds per 1,000 population<br>• Suppliers need to provide 1.5 million beds in the next five years, mainly across mid-to-low end segments. Their current rate of supply is only 50% of what is required, and they need to overcome the margin and cost barrier to produce mid-to-low end segment hospital beds in large quantities<br>• A specific challenge is related to the over-pricing of healthcare services and prescription of medicines which are not at all needed in the due course of treatment by the private sector hospitals |

| Stakeholder | Supply | Demand | Challenge |
|---|---|---|---|
| Producers (drugs and devices) | • Indian pharmaceutical market is expected to grow to US$71 billion from US$37.2 billion during 2017-2022 at a CAGR of ~14%<br>• Cost-effective chemotherapies, immunotherapy, and gene-therapies are expected to drive the market in the next 10-15 years or so with advanced therapies for the management of diabetes and cardiovascular disease management<br>• The major domestic manufacturers such as Cipla, Lupin, Sun Pharma, DRL, Cadila, and Glenmark etc. are capable of replicating the innovative products from global pharmaceutical companies such as Roche, BMS, Merck, Pfizer, and Novartis etc.<br>• However, the global pharmaceutical companies are also strengthening their R&D and manufacturing base in India to fight the price wars with the local manufacturers<br>• In the medical device segment, India is almost 90% dependent on imports (PKD/CKD) of high-end medical imaging equipment such as CT, MRI, PET/SPECT, and mammography. There are few indigenous manufacturing of ultrasound and x-ray machines in India<br>• Some of the global companies such as Philips started manufacturing ultrasound and other medical devices in Indian in early 2012<br>• In the in-vitro diagnostics sector (US$1.8 billion)<br>  • Reagents: 60%-70% are imported products and 30%-40% are manufactured indigenously in India<br>  • Systems/equipment: 80%-85% are imported products and 15%-20% are manufactured indigenously in India | • Government is the largest buyer of oncology, CVM, and virology drugs and accounts for the 60%-70% of the overall pharmaceutical spending across all types of products and therapeutic segments<br>• There is a shortage of 27% of clinical and over 55% of non-clinical equipment in government hospitals. Even critical equipment such as ventilators ratio per ICU is very-very low in India<br>• Critical medical not been used for more than five years because of no annual maintenance contract | • R&D spend to come up with an innovative therapy can cost anywhere between US$0.250 million to US$2 billion. Indian pharmaceutical manufacturers have the resources to produce indigenous innovative therapy but generally do not invest heavily because of cost constraints<br>• Moreover, producers have to provide discounted product and services to the public sector, which in case of high-value products and services is not feasible particularly when the growth in volumes is also not granted by the public sector<br>• More than 70% of treatment is still happening in the private sector. Some of the major reasons being the unavailability of critical medicines in the public sector hospitals, long waiting periods, unavailability of specialists, lack of skilled professional<br>• Lack of interest among private participants in increasing the awareness around preventive measures of a disease rather than cure or treatment<br>• The high cost of diagnosis in the private sector and lack of technicians in the public sector along with the shortage of required medical equipment (public sector) |

| Stakeholder | Supply | Demand | Challenge |
|---|---|---|---|
| Physicians | • There are close to 500 medical colleges that teach over 53,000 doctors each year and over 3,000 institutions that prepare 130,000 nurses every year<br>• Cumulatively India has a little over one million modern medicine (allopathic) doctors to treat its population of 1.3 billion people. Of these, only around 10% work in the public healthcare sector | • There is actually less than one doctor (0.8) per 1,000 population, which is lower than the countries such as China (2.0), ad OECD countries (3.2)<br>• There is a shortage of more than 3,000 doctors at rural PHCs which has increased by over 200%from the past decade<br>• The demand for specialists in the rural, tier-II, tier-II cities is increasing day by day with these cities moving towards self-sufficiency in terms of generating employment and thus keeping the local workforce in the region itself, however increasing the healthcare load on the state governments<br>• There is a more than 80% shortage of specialists at rural community health centres and hospitals | • India's population is increasing by 26 million every year, so supply is clearly not sufficient to suffice the demand<br>• The Indian government has announced the opening of new 22 AIIMS like institutions in some of the key tier-I and tier-II cities, however, there are high chances of doctor and medical staff shortage in many of them<br>• The shortage of doctors in rural areas is becoming more and more critical where millions of families are forced to go below the poverty line due to high medical expenses<br>• The last 15 years have seen various important healthcare sector policy changes, however, still, the underutilization of public healthcare facilities is a major concern - mainly due to the poor quality of services, unavailability of specialist doctors, and lack of skilled medical staff<br>• Brain-drain: Mostly the government prepares future doctors at a cost of approximately US$15,000 to US$ 20,000 but over 70%-80% of these doctors either join the private sector or chose to go abroad (every year ~5,000-7,000 doctors migrate out of India) |

| Stakeholder | Supply | Demand | Challenge |
|---|---|---|---|
| Payers | • The private sector contributes 80% to the total HCE<br>• The public sector accounts for 78% of the health insurance coverage<br>• The plan is to increase the public health expenditure as a percentage of GDP from the existing 1.0% to 2.5% during 2018- 2025 and increase the state sector health spending to by 8% by 2025<br>• The decrease in the proportion of households facing catastrophic health expenditure from the current levels by 25%, by 2025<br>• India's total health expenditure as a percentage of GDP is around 4.0%, with out-of-pocket spending accounting of around 63% and only 37% of the population being insured under any health insurance plan/scheme | • Huge demand from the poor, lower income, lower middle income, and middle income classes for a comprehensive public government health coverage (some part being addressed by PMJAY/ Ayushman Bharat)<br>• A supply and demand gap in the rural health services where many patients have to travel very far from their village to the community hospital or district hospital due to lack of services and doctors at PHCs/ Sub-centers<br>• Demand for more doctors and skilled medical staff at PHCs/ Sub-centers as they are the first point of contact<br>• Capability and capacity building of PHCs is one of the major demand from the viewpoint of strengthening of the public healthcare infrastructure in rural areas<br>• Reimbursement of out-patient expenses is still not being considered by many public and private health schemes except the children vaccination as some vaccines are highly expensive | • 100% universal health coverage by and large still remains a challenge. The Ayushman Bharat plans to cover 600 million or 45% of the total population<br>• Moreover, the PMJAY-AB program has not been rolled out nationally across all states/ UTs and might face state-level hurdles in the complete roll-out<br>• The package rates offered under Ayushman Bharat is are 30% lower than the actual implant/device or surgery costs at the public hospitals whereas issues related to reimbursements and package rates are the major concerns of the private sector providers<br>• With the merger of various other public health schemes into PMJAY program can create some confusions among beneficiaries<br>• Around 63% out-of-pocket health expenses and growing reliance on private health insurance due to a higher quality of services, greater attention, and easy claim related services are major challenges which public healthcare sector needs to tackle in the future |

# Roles and Responsibilities in the Implementation of the Solutions

Now having understood the major challenges through the perspective explained above. Let us have a look at the challenges, proposed solutions, roles, and necessary actions to be taken by the healthcare system participants:

| Challenge | Description and key points | Govt. | Private | Physicians | Producers | Patients |
|---|---|---|---|---|---|---|
| Inequality in the geographical spread of medical institutions | More than 60% of the medical colleges are in the South and West India where only 33% of the population resides as compared to states such as UP, Bihar, Madhya Pradesh, Orissa, and West Bengal where more than 60% of the population resides but they have only 33% of the medical colleges. | ● | ● | - | - | - |
| The low number of doctors per 1,000 population | The doctor shortage is the prime issue, particularly specialists such as oncologists, diabetologists, and cardiologists. In India over 50,000 MBBS students graduate every year but there are only 18,000 MS/ MD seats. So those who fall outside 18,000 PG seats work as junior doctors/GPs or either migrate to foreign countries. | ● | ● | ◐ | - | - |
| | India is amongst the lowest doctor density countries with only one doctor per 1, 000 population with very fewer physicians to patient ratio in rural India. | ● | ● | - | - | - |
| Weak rural healthcare infrastructure and services | This issue is very critical. Most of the doctors (specialists), hospitals, and hospital beds are concentrated in the urban areas which provide services to only 30%-35% of the population since rest of the population resides in the rural area (65%-70%). [Approximately 48% of patients and their relatives are making an overnight trip on account of health-related medical conditions]. It is quite evident that doctors are not willing to serve rural areas because of low pay, lack of basic amenities etc. in and around rural areas. | ● | ● | ● | - | - |
| | The quality of care is considered very poor in the rural healthcare sector with limited accountability, lack of awareness, poor access to facilities, insufficient medical resources and lack of interest of participation by the local communities as well. Also, the emergency service response in rural areas is one of the worst due to the unavailability of skilled medical staff and willingness of the same to work in such areas. | ● | ● | ● | - | - |
| | Pending comprehensive assessment of existing health system and facilities in the rural areas, improvements needed, material and resource need, and performance monitoring are required to improve the rural healthcare sector service delivery and to achieve better health-related outcomes in these regions. (For example, 84% of the public hospitals are located in rural areas which accounts for 39% of the hospi-tal beds as compared to 14% urban hospitals with 61% of the beds). | ● | ● | - | ◐ | - |

| Challenge | Description and key points | Govt. | Private | Physicians | Producers | Patients |
|---|---|---|---|---|---|---|
| Low public healthcare expenditure and public insurance imbalance | In India the private sector contributes 80% to the total healthcare spending, however, the private coverage accounts for a little less than a quarter of the total insured population. Whereas, public healthcare expenditure is 20% of the total healthcare spending but public insurance accounts for 78% of the insured population. This flaw has been in the stages of rectification after the launch of PMJAY program and increases in the healthcare budget for 2019. | ● | - | - | - | ◐ |
| | Currently, the government contributes 0.9% of the GDP to healthcare spending. This is expected to increase to 2.5% of GDP by 2025. The current contribution is inadequate and is the major reason why the level of services and facilities are rated as poor, below average by most of the healthcare system participants. However, hopefully, during the next decade, this might change completely with a high focus of the current government on the revamping the public healthcare facilities | ● | - | - | - | - |
| Expensive/ overpriced healthcare services and treatment at private hospitals/ facilities | In general, the allopathic health service and treatment is expensive. In the private sector, these services are sometimes overpriced making it difficult for a poor/lower middle income or even a middle-income class to consider going in for a treatment at a private hospital. There are four ways towards which the government is taking steps slowly and steadily:<br>1. Capping the drug and medical device prices<br>2. More emphasis and promotion of an alternative system of medicine and treatment (AYUSH)<br>3. Opening treatment route through schemes such as Ayushman Bharat and its mandatory package rates<br>4. Infusing more funds to tackle the disease burdens and capacity building of public healthcare infrastructure and services | ● | ● | - | - | - |
| | Since 63% of the total population depends on out-of-pocket expenditure, the induc-tion of outpatient services into health coverage is also one of the important aspects which need to be taken care of by the various stakeholders of the healthcare eco-system. The outpatient visits are expected to grow at a double-digit rate during 2017-2022 mainly because of the rise in incidences of chronic diseases such as diabetes, CHF, hypertension, GERD, and various cancer indications due to an unhealthy lifestyle, western alike eating habits, work pressure, late diagnosis, and relapsed cases. | ● | ● | ● | ◑ | ◐ |

| Challenge | Description and key points | Govt. | Private | Physicians | Producers | Patients |
|---|---|---|---|---|---|---|
| Insufficient use of healthcare technologies | According to a study in India, more than five million medical record errors occur every year because of untrained doctors and medical staff. This calls for training of the medical staff on how to use technology to measure and record the clinical outcomes more precisely. Digitalization of health records is the need of the hour of the Indian healthcare system | ● | ● | ● | ● | - |
| | Telemedicine needs boost from both the private and public sector for implementa-tion throughout the healthcare system thereby reducing the time taken to consult a doctor to 10-15 minutes, and avoiding the travel. Further Electronic Medical Rec-ords (EMRs) can be used to help doctors make accurate diagnosis and prognosis in comparatively less time | ● | ● | ● | ● | - |
| | Genomics is the future and in India, Human DNA analysis concept is also growing steadily. Multiple gene-panel testing and next-gen sequencing provides an innova-tive treatment and cure option to many genetic as well as cancer indications and is safe a defective treatment (Oligo-based drugs) | ◐ | ◐ | ● | ● | ◐ |
| | mHealth applications and devices which can provide real word evidence are proving to be highly useful in preventing diseases by increasing patient engagement and awareness, and expert support to patients as well as providers from one's care providers. Mobile technology also finds its use in increasing adherence to the treatment, live reporting of cases during outbreaks/epidemics, drug alerts/dosage alerts, and informing the general population about disease management. The healthcare industry is also adapting the automation in almost all of its departments and with that augmented reality and AI is also expected to further disrupt the Indian healthcare industry as well. | ◐ | ◐ | ● | ● | ● |

● Who should address the challenge?

Major challenge

Role in the implementation of the challenge ● High ◐ Medium

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## Annexure-II: Geographic snapshot of India

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## Projection

- For the data points where data from 2012 to 2017 is available such as in case of GDP, HCE, healthcare market, pharmaceutical market, life expectancy at birth, infant mortality rate, crude death and birth rates, the last five years average growth rate is considered and kept same for all corresponding estimated and projected annual growth rates under the business as usual scenario
- Rest of the data points are triangulated from various sources and gaps are filed across the data points from the year 2013 to 2017, the numbers
- All the per capita numbers and one parameter as percentage of other numbers are derived

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