

Summer Training Report

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[Part-1]

Research Project

Magnitude of COVID-19 in INDIA

Abstract

Coronavirus is now a global threat and is a curse to humans. It has taken a life of around 208112 people around the world. It is a major challenge for the public health experts as in this modern time of science and technology we have no proven vaccine and cure. The disease emerged from Wuhan, China in the late December 2019. In India, the first case was reported on 30th January 2020 and on 30th April 2020 it has crossed the 33,000 mark. In this study, journals, articles, websites, and newspapers were analysed. The keywords used in the search strategy were COVID-19, SARS-Cov-2, Social Distancing, Lockdown, Novel Coronavirus, healthcare burden. The articles and data from the government sources were used to show about the total tests done, recovery rate, deceased rate, active cases, age and sex composition, measures taken by the government for the health professionals, and the effect of social distancing. Findings suggest that as there is no vaccine, social distancing is the key to reduce the cases and the strict restriction to be followed in the states with more cases. Kerala, Haryana, and Delhi have the highest recovery rate and there are no or fewer cases in the eastern states.

Introduction

Coronavirus is a family of viruses that can cause illness ranging from the common cold to Severe Respiratory syndrome. 2019-nCov is the new strain that was not identified in humans earlier.

Source: “Novel Coronavirus – Japan (Ex-China).” *World Health Organization*, World Health Organization, 20 Jan. 2020, www.who.int/csr/don/16-january-2020-novel-coronavirus-japan-ex-china/en/.

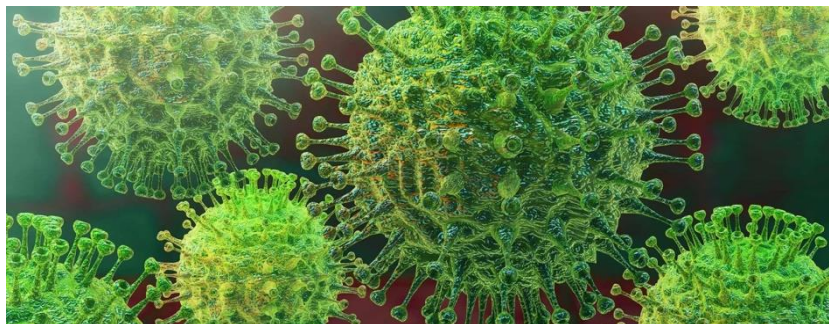


Figure 1 “What Is Coronavirus?” *What Is Coronavirus?* | *Johns Hopkins Medicine*, www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus.

It is a positive single-strand enveloped RNA virus belonging to the family of coronaviridae, the name is derived from the Latin word corona, meaning crown as the virus look under the microscope some of them four or five cause diseases in humans other types of corona effect to animals and sometimes in rare cases the virus jumps from animals to humans. When a new virus emerges, we must learn about how it spreads to person to person.

Source: “What Is Coronavirus?” *What Is Coronavirus?* | *Johns Hopkins Medicine*, www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus.

The Novel Coronavirus (COVID-19) is spread almost all over the world; it is closely related to severe acute respiratory syndrome (SARS) which swept around the world in 2002. The virus not only brought misery and death but also economic depression which already has taken livelihood from many. The source of the COVID-19 believed to be a “wet market” in Wuhan, China which sold dead and live animals including birds and fish. A set of pneumonia cases was reported by China in Wuhan, Hubei Province to the WHO country office on 31st December 2019, and a Novel Coronavirus eventually identified.

Seeing the hazardous face of COVID-19, its levels of spreading and severity, the World Health Organization (WHO) characterized it as a pandemic on 11 March 2020. The disease has already taken hold in the United States, Europe, South-East Asia, and now beginning to start its destruction in Africa and South America.

India, the second-largest populous nation has initially seen a low infection has taken a jump of doubling its cases in a few days. Prime Minister Modi, in exercise to the powers under the Disaster Management Act, 2005, issued the order for States/UT prescribing lockdown for the containment of the Coronavirus epidemic in the country. India's pre-active, proactive response is graded with high-level political commitment. World Health organization working with the Ministry of Health and Family Welfare to strengthen the surveillance, build the capacity of the health system and optimize ‘window of opportunity’ created by mandatory physical distancing in India.

Source: “Home Page Top Stories.” *NPR*, NPR, www.npr.org/.

Literature Review

Author	Year	Title	Main Question	Key Facts
Juliet Bedford Delia Enria Johan Giesecke Gary Kobinger	March 17, 2020	Covid-19: towards controlling a pandemic [The Lancet]	Preparedness in high, medium and low-income countries.	Middle and low-income countries need technical and financial support. Based on 500 genetic sequences submitted to GISAID, the virus is having multiple strain and changes in sequence are minimal. 85% human-to-human transmission in China is in home clusters. Countries are rapidly developing the capacity for

				PCR testing for COVID-19.
Lei Fang, George Karaliulakis, Michel Roth	March 11, 2020	COVID19- Diabetes and Hypertension [The LANCET. Respiratory Medicine]	Are patients with HTN and Diabetes mellitus at increased risk for COVID-19 Infection?	32 out of 52 or around 62%, who are non-survivors in the Intensive care unit (ICU) are having co-morbidities like Hypertension, Diabetes Mellitus, and Cerebrovascular Diseases.
Ying Liu, Albert Gayle, Annelies Wilder, Joachim Rocklov	March 2, 2020	COVID19 compared to SARS coronavirus [Journal of Travel Medicine]	The reproductive number of COVID-19 is higher compared to SARS coronavirus	COVID-19 is more transmissible than SARS. Despite of heightened public awareness and strong interventional response COVID-19 is more widespread than SARS.
Fei Zhou, Ting Yu, Ronghui Du, Zhibo Liu	March 11, 2020	Clinical course and Risk Factors for mortality of adult inpatients with COVID-19 [The LANCET]	Mortality of adult Inpatients	The most common symptom on admission was fever and cough followed by sputum production and fatigue. In non-survivors' sepsis is most common diagnosis followed by respiratory failure, heart failure and septic shock. 45% cases have cough even after discharge and 72% had cough had at the time of death.

				Increased age is associated with death in patients with COVID19.
Carmelo Ferlito	24 April, 2020	“Hard” vs “Mild” Lockdown [Research Gate]	Mortality by COVID-19	USA counts for about 26.44% cases and around 60% in west Europe and 0.68% in Southeast Asia. Where the lockdown was stricter or more strictly followed, the drop was higher. As the whole Europe and USA has population equivalent to one of the South Asian Nation the spread and mortality is different as USA and Europe account for 85% and South Asia for 0.68%.
John Watkins	February 28, 2020	Preventing a COVID-19 pandemic [The BMJ]	Planning for the worst from experience gained with SARS and 2009 Influenza Pandemic	The National Health system is severely challenged by the increase in number of cases. Most of the COVID-19 cases are displaying mild symptoms or none and death occurring mainly in older and chronically ill patients.
Srinivas Murthy	March 11, 2020	Care for critically ill patients with COVID-19	Capacity of Critical care Units	Approximately 5% of cases require Intensive care.

				Patient requiring Intensive care are older (median age-60 years), and 40% with comorbid conditions. Evidence-based guidelines for ARDS should be followed. Two metre distance between patients to be maintained in Intensive care units. N95 respirators or equivalent face masks and eye protection or face shield should be used by the health care workers.
Fernando E. Alvarez, David Argente, Francesco Lippi	April 2020	Planning problem for COVID-19 Lockdown	Analyse the optimal lockdown policy	If testing is higher in the optimal policy, it will be equal to one-time payment of 2% of GDP. If the lockdown is imposed after a month of outbreak will cover around 60% of population after a month. The unavailability of testing will increase the economic cost of lockdown.
Tanu Singhal	13 March, 2020	A review of Coronavirus Disease-2019	Challenges faced by the outbreak	Healthcare professionals should take travel history of all patients suffering from respiratory symptoms and any international travel. People should stop spreading myth

				and false information about the disease. Efforts should be made to prevent future outbreaks of zoonotic origin.
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Research Question

What is the magnitude of COVID-19 in India till 27th April 2020?

Specific Objectives

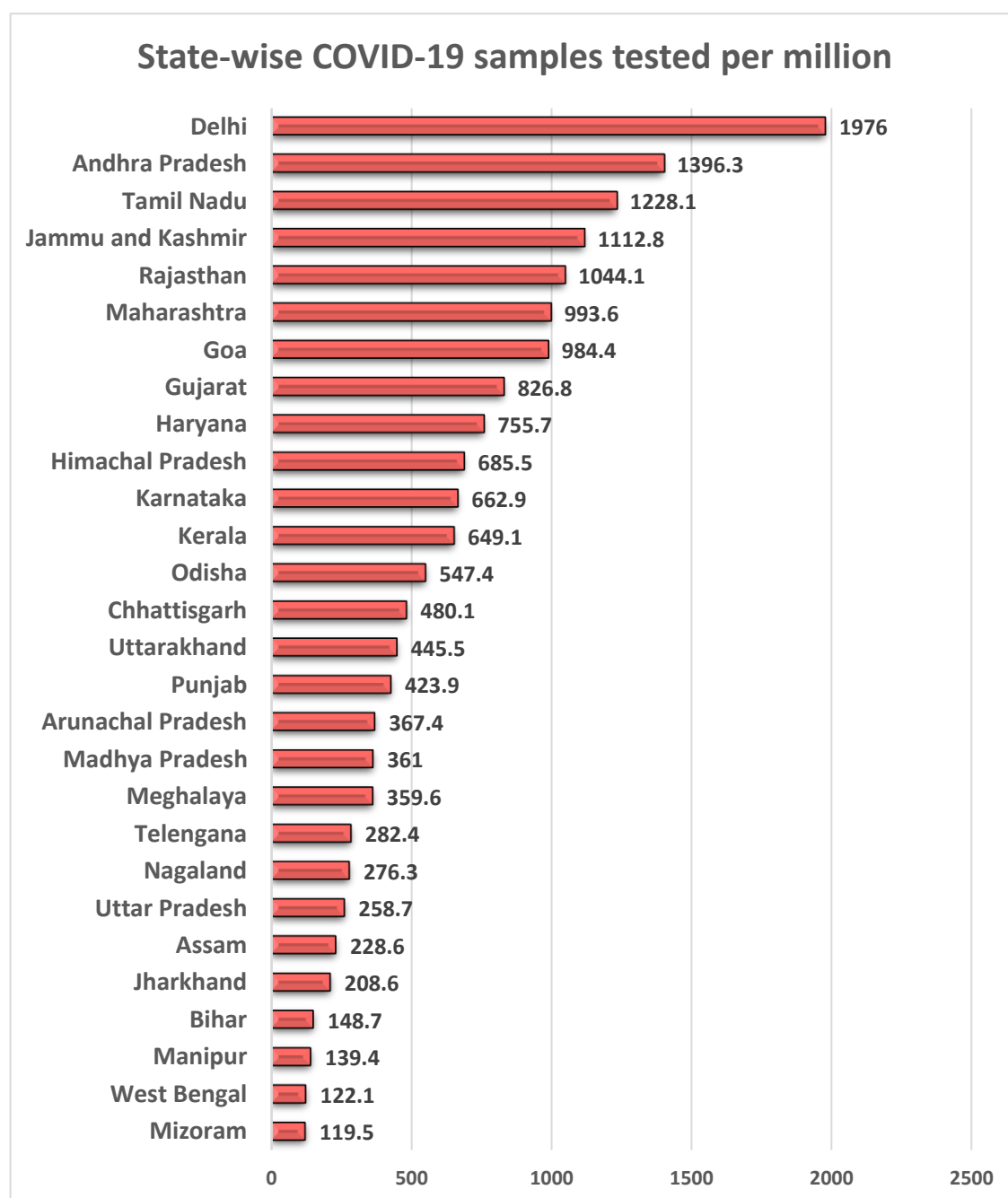
- To know the total number of tests done per million.
- To figure out the total number of confirmed active, recovered, and deceased cases.
- To find out important indicators like recovery rate, deceased rate and case rate of COVID-19 in India.
- To analyse the COVID-19 cases according to age-sex composition.

Equations Used

- $\text{Recovery Rate\%} = (\text{Total recovered} / \text{Total cases}) * 100$
- $\text{Death Rate\%} = (\text{Total Death} / \text{Total Cases}) * 100$
- $\text{Cases\%} = \text{Total confirmed cases of a state share} / \text{Total Cases} * 100$

In this study, we are using an observational study design. The data is collected from different sources like articles, journals, websites, and newspapers and the detailed analysis is done of the states of India. The state-wise analysis is done to figure out the number of tests done, to achieve the above-mentioned objectives.

COVID-19 Tests conducted by States



Source: www.covid19india.org

(Data for Telangana are as of April 16. Data for Madhya Pradesh, Manipur, Odisha, and Uttar Pradesh are as of April 26. Data for the rest of the states are as of April 27, 2020).

COVID-19 State wise Data(26th, April 2020)

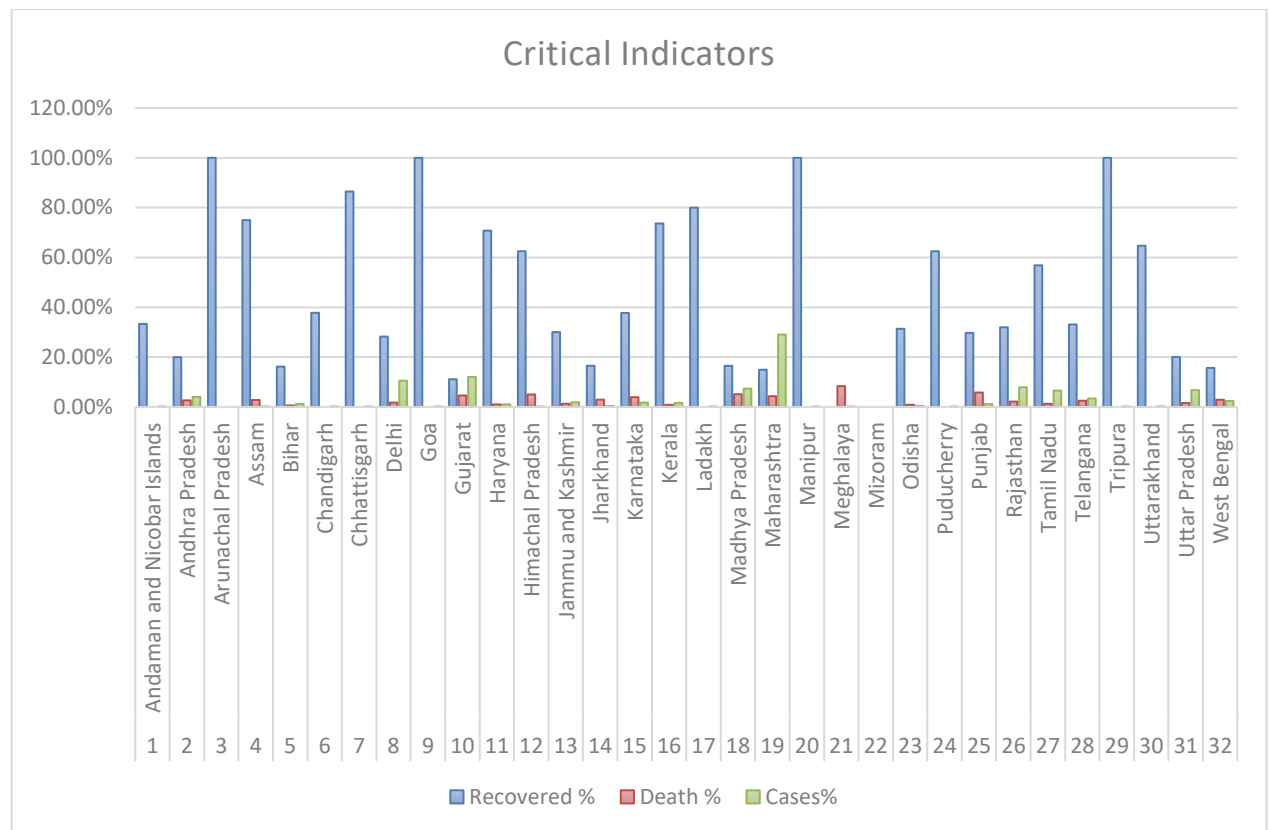
S. No.	Name of State / UT	Total Confirmed cases (Including 111 foreign Nationals)	Cured/Discharged/ Migrated	Death
1	Andaman and Nicobar Islands	33	11	0
2	Andhra Pradesh	1061	171	31
3	Arunachal Pradesh	1	1	0
4	Assam	36	19	1
5	Bihar	243	46	2
6	Chandigarh	28	15	0
7	Chhattisgarh	37	32	0
8	Delhi	2625	869	54
9	Goa	7	7	0
10	Gujarat	3071	282	133
11	Haryana	289	176	3
12	Himachal Pradesh	40	22	1
13	Jammu and Kashmir	494	112	6
14	Jharkhand	67	13	3
15	Karnataka	500	158	18
16	Kerala	457	338	4
17	Ladakh	20	14	0
18	Madhya Pradesh	2096	210	99
19	Maharashtra	7628	1076	323
20	Manipur	2	2	0
21	Meghalaya	12	0	1
22	Mizoram	1	0	0
23	Odisha	94	33	1
24	Puducherry	7	3	0
25	Punjab	298	67	17
26	Rajasthan	2083	493	33
27	Tamil Nadu	1821	960	23
28	Telangana	991	280	26
29	Tripura	2	2	0
30	Uttarakhand	48	26	0
31	Uttar Pradesh	1793	261	27
32	West Bengal	611	105	18
Total number of confirmed cases in India		26496*	5804	824

*Source- Ministry of Health and Family Welfare, Government of India (Data as on 26/04/2020, 08:00 GMT +5:30).

Critical Indicators (in %)

S. No.	Name of State / UT	Recovered %	Death %	Cases%
1	Andaman and Nicobar Islands	33.33%	-	0.11%
2	Andhra Pradesh	19.97%	2.63%	3.98%
3	Arunachal Pradesh	100%	-	0%
4	Assam	75%	2.78%	0.12%
5	Bihar	16.18%	0.58%	1.17%
6	Chandigarh	37.78%	-	0.15%
7	Chhattisgarh	86.49%	-	0.13%
8	Delhi	28.22%	1.74%	10.51%
9	Goa	100%	-	0.02%
10	Gujarat	11.10%	4.57%	12%
11	Haryana	70.76%	1%	1.02%
12	Himachal Pradesh	62.50%	5%	0.14%
13	Jammu and Kashmir	30.04%	1.28%	1.85%
14	Jharkhand	16.50%	2.91%	0.35%
15	Karnataka	37.70%	3.91%	1.73%
16	Kerala	73.65%	0.83%	1.63%
17	Ladakh	80%	-	0.07%
18	Madhya Pradesh	16.49%	5.08%	7.32%
19	Maharashtra	14.92%	4.30%	29.05%
20	Manipur	100%	-	0.01%
21	Meghalaya	-	8.33%	0.04%
22	Mizoram	-	-	0%
23	Odisha	31.36%	0.85%	0.40%
24	Puducherry	62.50%	-	0.03%
25	Punjab	29.70%	5.76%	1.12%
26	Rajasthan	31.96%	2.15%	7.87%
27	Tamil Nadu	56.84%	1.24%	6.55%
28	Telangana	33.10%	2.49%	3.39%
29	Tripura	100%	-	0.01%
30	Uttarakhand	64.71%	-	0.17%
31	Uttar Pradesh	20.09%	1.56%	6.72%
32	West Bengal	15.64%	2.87%	2.36%

*Source- Ministry of Health and Family Welfare, Government of India



18068 Active Cases



5803 Cured / Discharged



824Deaths



1Migrated

As per the updates on COVID-19 (24 April 2020) by the Ministry of Health and Family Welfare, Government of India 5804 people have been cured with a recovery rate of 21.90% and the fatality rate is 3.13%. After the implementation of lockdown 2.0, the situation of India is improving as Hot Spot Districts are moving towards Non-Hotspot Districts. About 283 District has not reported any COVID cases till date and 78 districts from 23 States/UTs have not reported any fresh cases during the last 14 days.

Age distribution among COVID-19 cases in INDIA

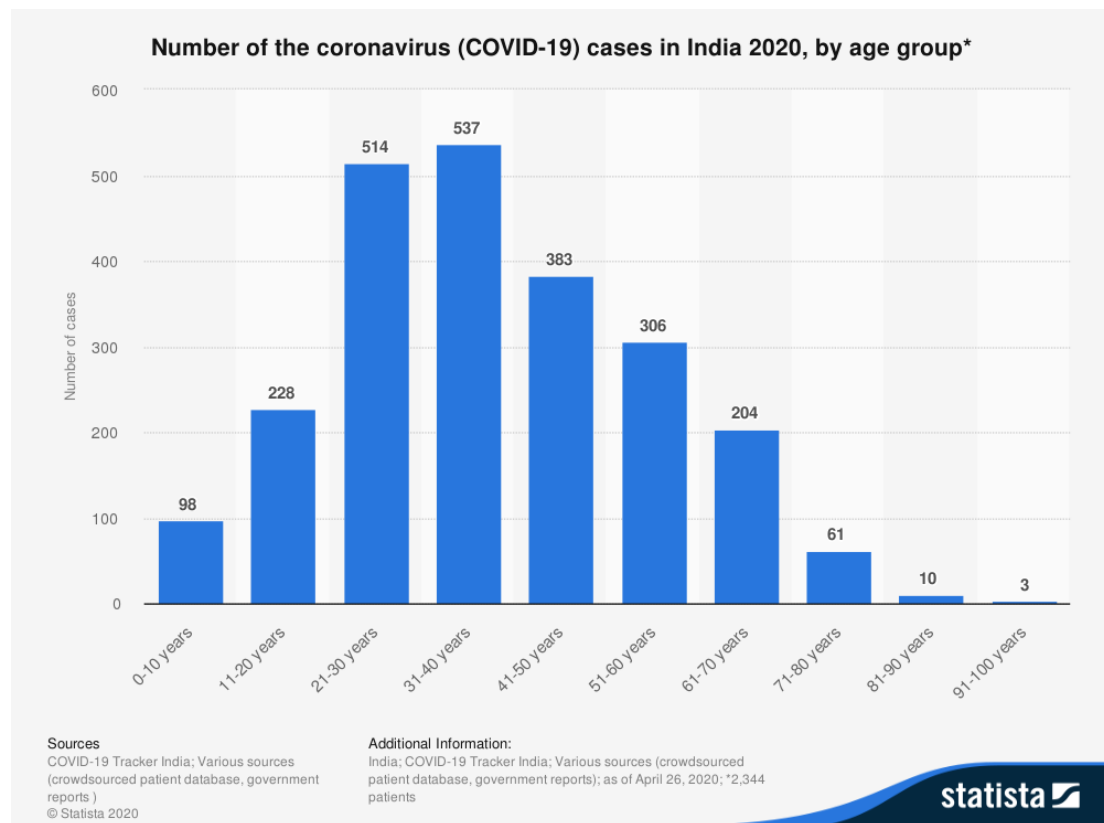


Figure 2 Keelery, Published by Sandhya, and Jul 7. "India - COVID-19 Cases by Age Group 2020." *Statista*, 7 July 2020, www.statista.com/statistics/1110522/india-number-of-coronavirus-cases-by-age-group.

Coronavirus positive cases risen to 28,380 in India (April 27, 2020). A majority of the coronavirus (COVID-19) cases in India affected people between ages 21 and 40 as of April 27, 2020. Of these, the age group between 31 and 40 years old were most affected with approximately 537 cases. This trend was significantly lower when compared to findings from other countries. However, compared to many western countries, India also had a younger population directly affecting the proportion of COVID-19 cases.

COVID-19 INFECTIONS -- AGE/GENDER-WISE

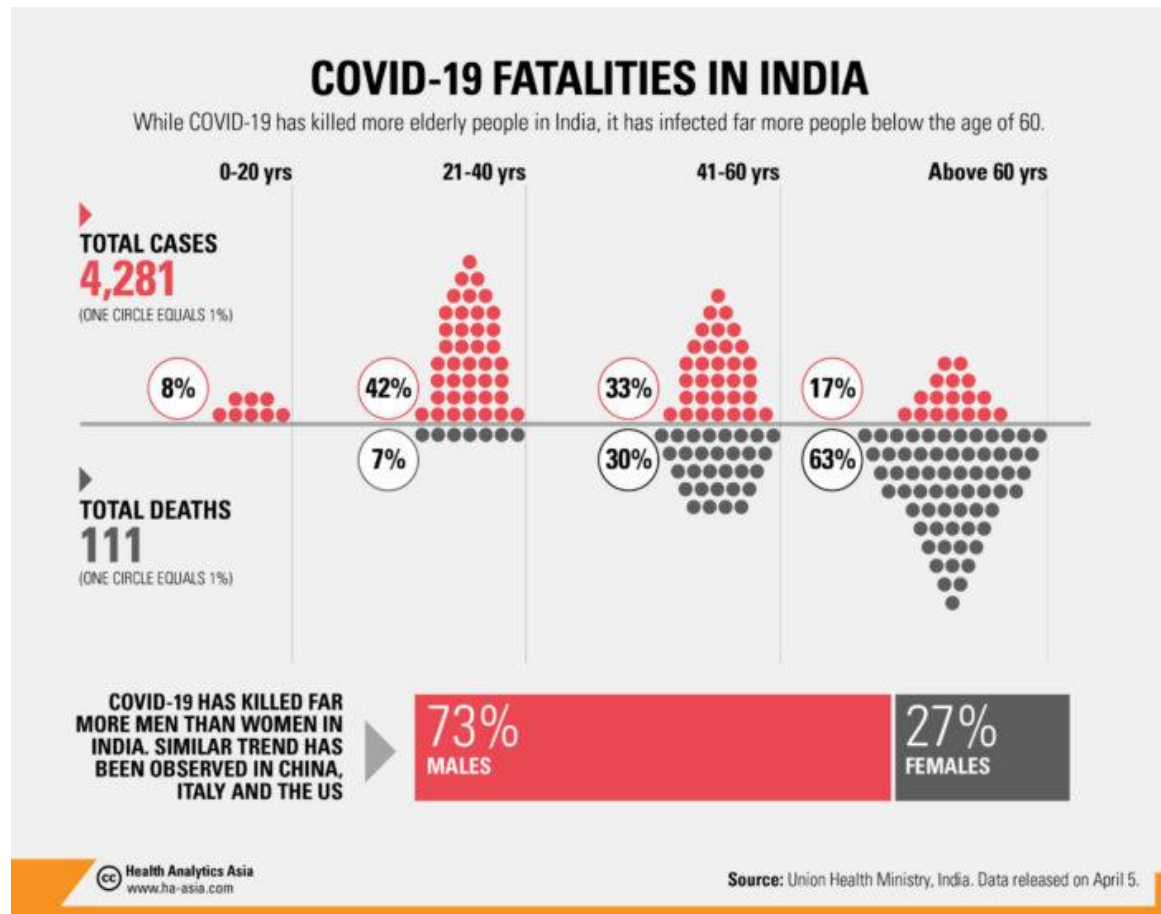


Figure 3 “COVID-19 Fatalities in India.” *Health Analytics Asia* 63 of COVID19 Deaths in India Are of 60+ Age Group Comments, 10 Apr. 2020, www.ha-asia.com/63-of-covid-19-deaths-in-india-are-of-60-age-group/.

In line with international data, those above 60 years of age account for maximum, that is 63 percent of COVID-19 deaths in India. The latest data released by the Union Health Ministry confirms that the virus affects the elderly population fatally.

It also revealed that the next most-hit age group was found to be those between 41-60 years, which comprises nearly 30 percent of the reported deaths, followed by the ones below 40 years of age with 7 percent fatalities.

Detailing the high-risk category people during a press briefing, Lav Agarwal, Joint Secretary, Health Ministry of India said: “The elderly and people with comorbid conditions are vulnerable to the infection. And, this high-risk category of people should take extra care.”

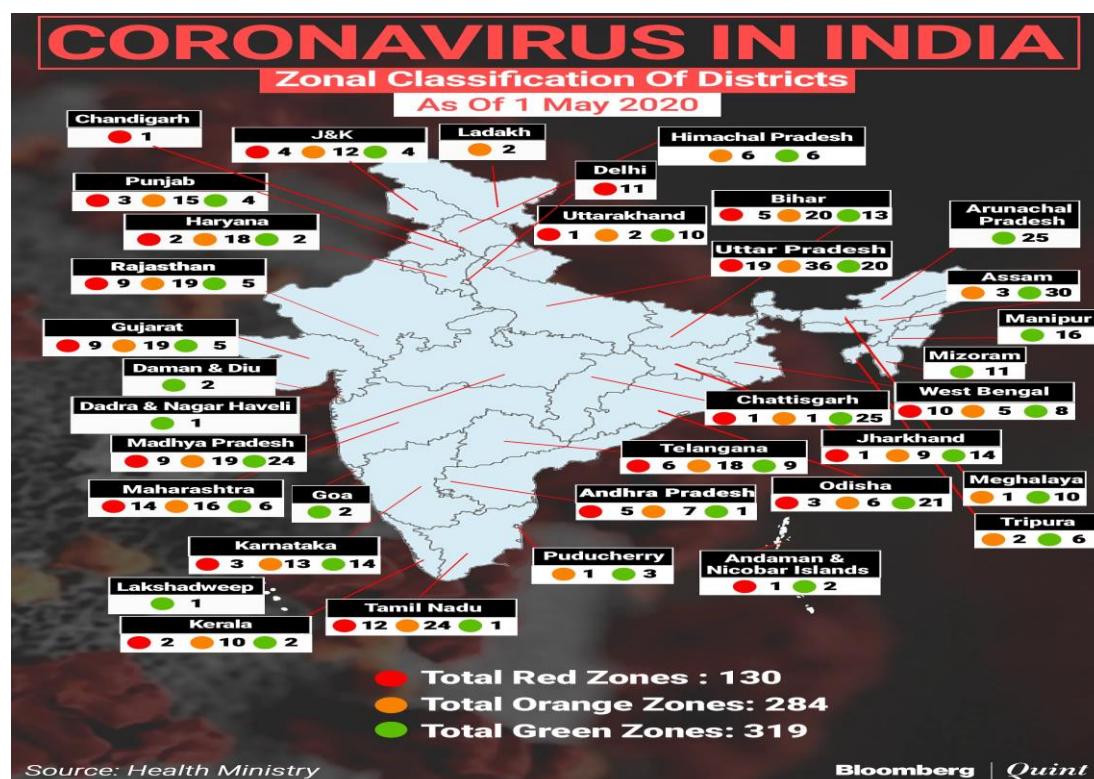
Looking at the Covid-19-related deaths India thus far, it is safe to say that the above trend in terms of the age-wise fatalities continues. The first thing to notice is, of course, the 9 deaths that have happened in the 60-69 years of age bracket. But, the two deaths in the 30-39 years of age bracket are also a cause for worry. India's male-female ratio roughly stands at 65:35, which is similar to global figures.

*Source- Ministry of Health and Family Welfare, Government of India
(<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1619609>)

As per the press briefing by the Joint Secretary of Health Ministry the people whose age is more than 60 years account for about 63% of COVID-19 deaths.

In detail, he told that the trend of COVID-19 is different in as about 42 % cases are of 21-40 years, 33% cases of 41-60 years, and 8% of 0-20 years age group. It also revealed that the most hit age was found of age 41-60 years having about 30% of reported deaths. Source: “#IndiaFightsCorona COVID-19.” *MyGov.in*, 3 Apr. 2020, www.mygov.in/covid-19.

To curb the situation in India, the Government of India has imposed extension to 21-days lockdown to May 3, 2020. The government is using the colour codes to mark the district with COVID-19 and virus-free zones. The red zone, the districts where the number of COVID-19 patients is more than 15, strict restrictions are imposed in the area or the area declared are hotspots. The orange zone where there are minimum activities are allowed are there is no case of COVID-19 from last 14 days. The green zone, have relaxations small MSME industries will be allowed to function with the guidelines to wear mask, follow hand hygiene and social distancing at workplace, the area where there is no case from last 28 days will also be declared as green zone.



Source: Warriar, Panchami. "Coronavirus India Updates: Covid-19 Cases Cross 35,000 As India Extends Lockdown for Two More Weeks." *BloombergQuint*, 1 May 2020, www.bloombergquint.com/coronavirus-outbreak/coronavirus-india-updates-toal-covid-19-cases-at-33610-lockdown-relaxations-ahead.

The Government issued guidelines for those who have mild symptoms so stay in isolation at home. On March 11, 2020 the government of India issued a containment policy with the objective to stop the transmission of COVID-19 thus reducing morbidity and mortality for the large outbreaks of COVID-19 it includes extensive contact tracing, testing all suspects cases, isolating all suspect cases, quarantining contacts, implementing social distancing measures and Intensive risk association. The mortality rate in the country is around 3% and the recovery rate is above 22%, the government is using graded and guided response to control the spread of novel coronavirus.

To protect the healthcare professionals from violence, the Government of India has made changes in the Epidemics Act, 1897 as to show zero tolerance to any form of violence against health services and clinical establishments. The government also announced 50 lakh insurance on the demise of health workers involved in managing the COVID-19 outbreak and it also includes sanitization staff, doctors, ASHA workers, paramedics, nurses, and even private doctors.

In the view of the spread of COVID-19, the Ministry of Health and Family Welfare issued an advisory on Social distancing measures as without it the cases double every 4 days and with it take 8 days. The median incubation period of COVID-19 is 5 days- after this period person starts experiencing symptoms.

If social exposure is reduced to 75% then one person will infect 0.625 people in 5 days, and they will infect 2.5 people in 30days.

If social exposure is reduced to 50% then one person will infect 1.25 people in 5 days, and they will infect 15 people in 30days.

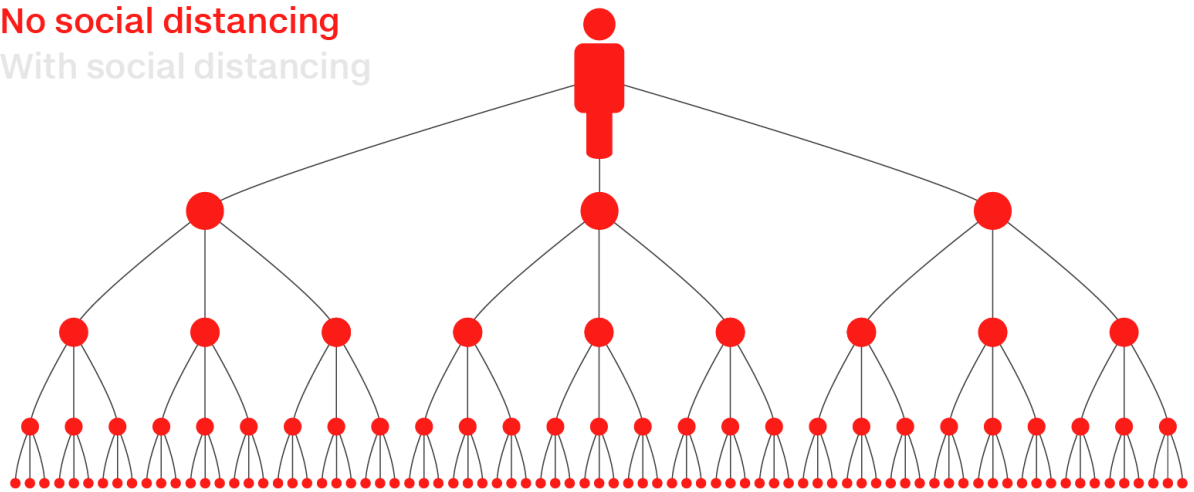
If there is no social distancing in place, then one person will infect 2.5 people in 5 days, and they will infect 406 people in 30days.

Source: <https://www.mohfw.gov.in/pdf/SocialDistancingAdvisorybyMOHFW.pdf>

Why staying home matters

Social distancing lowers the number of people that can get infected.
This diagram shows the wider impact in cutting infections by reducing contact.

No social distancing

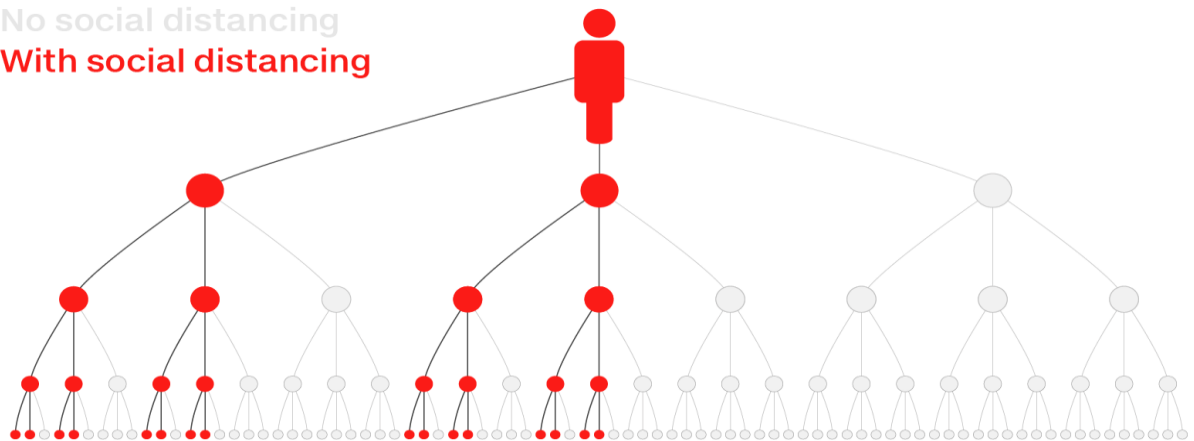


Source: World Health Organisation
Graphic: Natalie Croker, Henrik Petterson CNN

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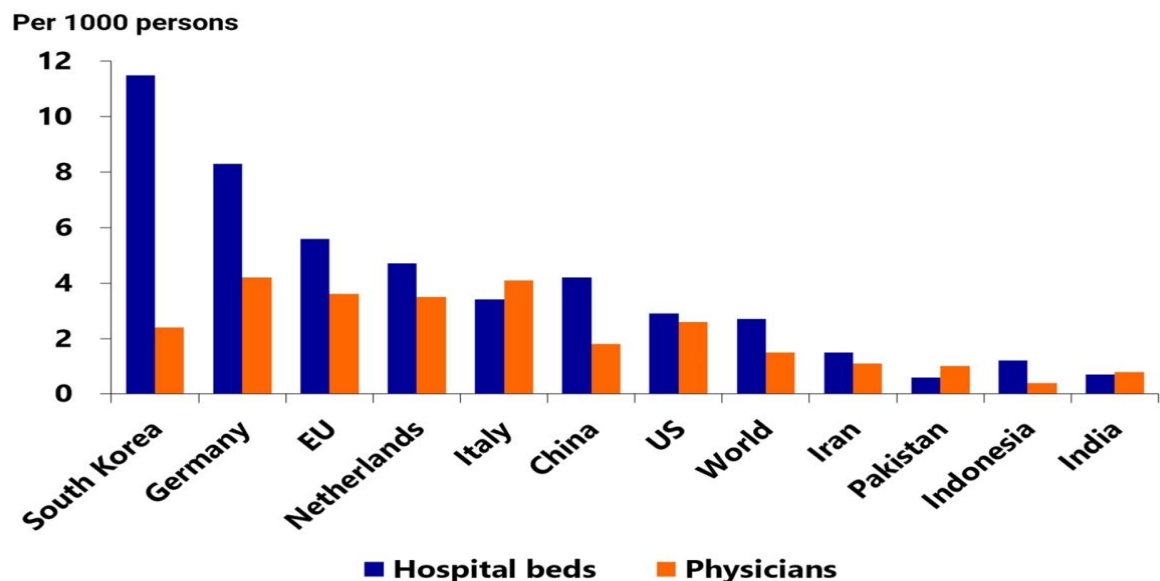
With social distancing



Source: World Health Organisation
Graphic: Natalie Croker, Henrik Petterson CNN

The situation of India in accordance with Healthcare

Healthcare Is Less Abundant In India Compared To Global Average



Source: World Bank

Bloomberg | Quint

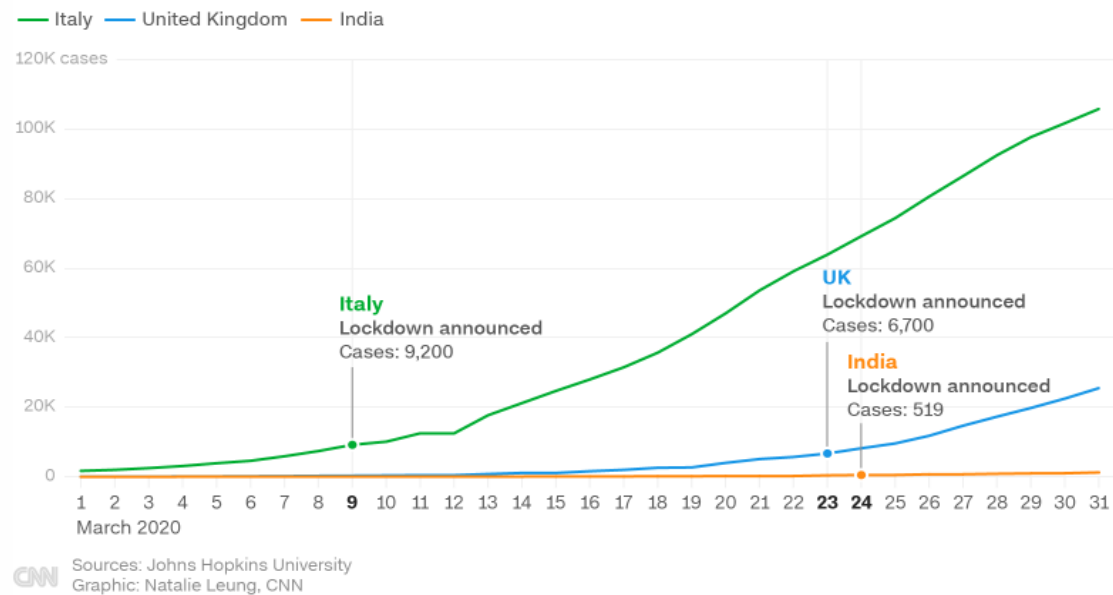
Since Coronavirus first emerged in late December almost 2,17,000 have died around the world. The three worst-affected countries are the United States (58,995), Spain (23,822), Italy (27,359) account for about 85% fatalities.

India spends about 3% of its GDP on healthcare which is the lowest among emerging economies and the suggested rate is around 6%. India does not meet the WHO standard of 1 doctor per 1,000 people. The global median of hospital beds is around 27 per 10,000 people and India has 7 beds per 10,000 people. About 70 % of healthcare infrastructure in India is in Urban areas and the situation in rural areas is worse as the rural areas account for only 5 beds per 10,000 population. India imposed lockdown even when its total cases are less than new cases in other countries is a great move towards this pandemic.

Coronavirus will have an impact on the global GDP and global trade, In the current situation, the stock market is falling in the global markets and India. The effect on the economy will depend on how effectively countries will respond for containing the pandemic, in how much time and how much the situation can aggravate. Some downfall is already visible due to large scale travel restrictions and the inception of lockdown in various countries.

Source: Hugo Erken RaboResearch Global Economics & Markets Rabobank KEO.
“Coronavirus: The Economic Impact of COVID-19 on India.” *RaboResearch - Economic Research*, economics.rabobank.com/publications/2020/march/coronavirus-economic-impact-covid-19-on-india/.

Countries announced lockdown



Italy waited till it had 9,200 coronavirus cases before it imposes nationwide lockdown, while the United states had 6,700, and India have moved into lockdown quickly as it was announced when the country had only 519 cases. According to the Health Ministry, the country has conducted around 625,000 tests as on 26-04-2020. Around 4% of India's test is positive as compared to US has 17%. Delhi the national capital has emerged to do the maximum number of tests 1976 per million, followed by Andhra Pradesh with 1396 per million. Maharashtra has the highest number of active cases- 9318 and accounts for about 30% of the total cases, Mumbai has the highest number of cases among the districts. Gujarat is the second state to have the highest number of cases followed by Delhi. Six states naming Arunachal Pradesh, Goa, Manipur, Tripura, Sikkim, and Nagaland with no new COVID-19 cases.

Source: "Around 1,000 Coronavirus Deaths in a Country of 1.3 Bn People? What's the Deal with Modi's India!" *WION*, www.wionews.com/india-news/around-1000-coronavirus-deaths-in-a-country-of-13-bn-people-whats-the-deal-with-modis-india-295441

The recovery rate of the country increases to 23.3% and despite having the third-highest number of cases in India, Delhi has a recovery rate of 30% and is in the top five states with the highest recovery rate. The study shows that people of 35-65 age group account for about 58.2% of the total cases followed by people of the age group above 60 years with 21% cases. Based on patient gender 67% of the cases are males and 33% of the cases are females. The fatality rate is highest among the age group of 35-65 years accounting for 64% deaths, followed by patients age 60 years and above with 30.5% deaths. Lockdown and strict restrictions have a severe impact on the chain of transmission. The study shows that Social distancing is the best tool to keep safe themselves as it reduces the risk of getting infected as the spread usually happens when

an infected person cough, sneezes or talks, and the droplets come out from their mouth or nose and start infecting other people. India and its public health experts are working to flatten the curve of COVID-19 as the country is going through lockdown. The Government decision on quarantining, social distancing, screening methods and strict restrictions in containment zones to fight the severity of COVID-19, will highly ensure that these strategies are the most successful approaches in controlling the morbidity and mortality.

Source: TIMESOFINDIA.COM / Updated: Apr 28, 2020. “Coronavirus Latest Developments: Covid Recovery Rate Improves to 23.3%; No Case in 17 Districts in 28 Days, Says Govt: India News - Times of India.” *The Times of India*, Times of India, 28 Apr. 2020, timesofindia.indiatimes.com/india/coronavirus-latest-developments-india-reports-62-deaths-in-24-hours/articleshow/75420352.cms.

Recommendation & Conclusion

COVID-19 pandemic is affecting communities all over the world. Countries are working hard to contain the virus and stop it from community transmission as it has taken the life of 2,17,000 people. Swift and early response of India in imposing lockdown to stop the transmission of the virus thereby reducing morbidity and mortality. Coronavirus has started its impact in India with 26496 cases. India is lacking in the testing rates as compared to other countries. The recovery rate of the country is improving as the hotspot districts are turning into non-hotspot districts. Experts predicted that India would have millions of coronavirus cases but so far, the world's second highest populous country appears to have avoided the worst. Experts suggested that the nationwide lockdown has halted the spread of COVID-19. Lockdown is effective measure for curbing the spread in the countries that implemented it than those countries that do not. The study also finds that social distancing or staying at home matters as it lowers the rate of infection.

As per the findings from my paper I recommend that if the lockdown should have been imposed in more effective manner with stringent measures the condition in the country would have been even more better than the present scenario to contain the virus. The government should also increase the testing rates in the states that are most affected. The timely implementation and a high compliance rate to public health measures would also help in reducing the transmission.

Source: “WHO Coronavirus Disease (COVID-19) Dashboard.” *World Health Organization*, World Health Organization, covid19.who.int/?gclid=Cj0KCQjw3ZX4BRDmARIsAFYh7ZI7JIdIMtwU4QmSv2tg_5f6Wh_BZ8JkjJQg6u9I6fOWIP5Lsj39swaAkSIEALw_wcB.

References

[1](Source: <https://www.who.int/csr/don/16-january-2020-novel-coronavirus-japan-ex-china/en/>)

[2] (Figure 1 – What is coronavirus? (Source: <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus>)

“What Is Coronavirus?” *What Is Coronavirus?* | Johns Hopkins Medicine, www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus.

[3](Source : <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus>)

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[Part-2]

Online Course Report

Course Portfolio

**[eHealth: More than just an electronic Record]
by The University of Sydney**



THE UNIVERSITY OF
SYDNEY

About this report-

To take up digital India initiative ahead, MoHFW has started various e-Gov. initiatives in Health care sectors in India; the division is named as e-Health division. E-Health is broadly defined as the use of Information and Communication Technology (ICT) in health. It will make a world of difference in India, where mobile technologies have been penetrating at rapid rate. As India has a strong presence in IT, the integrated health information system serves the needs of all stakeholders, by contributing approximately 8% to the GDP.

In this report I have focused on the various e-Health initiatives that has a vision to delivery better health outcomes in terms of access, quality, affordability, lowering of disease burden and efficient monitoring of health entitlements to citizens

The scope of these initiatives is to make all medical facilities available all time from any part of the world through Web services, mobile services, SMS, or Call centre services. Broadly the intent is to cover online medical consultation, online medical records, online medicine supply management and Pan-India exchange for patient information but not limited to the said services.

Executive Summary-

E-Health is a term for healthcare practice supported by electronic processes and communication. More recently, m-Health has begun to appear as a term for e-Health using mobile phones or cellular networks. M-Health is a very broad term that principally involves every kind of mobile health related communication, application, or data service.

This report covers home health monitoring involving patient self-testing using medical devices and remote transmission of the medical data to healthcare providers for disease management. Some of the most common conditions being monitored today are chronic diseases including cardiac arrhythmia, hypertension, ischemic diseases, sleep apnoea, diabetes, hyperlipidaemia, asthma, and chronic obstructive pulmonary disease (COPD).

At the end of 2018, around 8.2 million patients worldwide were using a home monitoring service based on equipment with integrated connectivity. The figure does not include patients that use monitoring devices connected to a PC or mobile phone. It only includes systems that rely on monitors with integrated connectivity or systems that use monitoring hubs with integrated cellular or fixed-line modems and the number is only expected to increase with each passing day especially in these unprecedented times of COVID-19 where everyone is urging to maintain physical and social distancing, so e- health is no more a future it's a present, it's a reality and a big one.

Course Description

The topic of e-health is widely discussed in the conferences, in the literature and in the popular press. There is a significant degree of attention and focus on ehealth initiatives globally: ehealth frequently forms a component of healthcare strategy and policy, and is represented in projects, financial outlays, cost benefit outcomes, clinical process improvement, safety, and quality.

The MOOC, "**eHealth: More than just an electronic record!**" is multidisciplinary in nature, and aims to equip the global audience of health clinicians, students, managers, administrators, and researchers to reflect on the overall impact of eHealth on the integration of care. It explores the breadth of technology application, current and emerging trends, and showcases both local and international eHealth practice and research.

Objectives of the course

- The fundamentals of eHealth and where it is heading
- What kind of health data we are currently collecting and how it will transform healthcare in the future
 - How new technologies are helping health consumers participate in their own healthcare
 - How eHealth can improve the coordination and efficiency of healthcare and what the barriers might be.

Learning Methodology

- **Video lectures:** This programme consists of five-week course module. The video lectures were held by the professionals working on E-health. Within a course, there are suggested due dates to help you manage your schedule and keep coursework from piling up. Quizzes and programming assignments can be submitted late without consequence. However, it is possible that you won't receive a grade if you submit your peer-graded assignment too late because classmates usually review assignment within three days of the assignment deadline.
- **Additional reading materials:** Reading materials were provided usually at the end of the session. Materials usually comprised of topics which were taught by the professor for the given session.
- **Assignments:** Classmates will be asked to provide a score for each part of the assignment. Final grades are calculated by combining the median scores you received for each section. Assignments were given at the end of the session, mainly consisting of quiz which were graded and must score 50% grade to clear the quiz.

Key Learnings

What is eHealth?

Just what is eHealth and what does it mean to you as a healthcare professional?



In fact, to all of us as health care consumers, clearly eHealth is already impacting on the way we deliver healthcare. But we are just at the beginning of a revolution in terms of what that means for the way care is delivered. Traditionally perhaps, when one thinks of eHealth, many people refer to the use of electronic health records, and devices, usually in the acute sector. However, that is certainly not the whole story. One of the growing areas of eHealth is how we are using technology to support communication between healthcare providers, and healthcare consumers.

Perhaps most often, this is used in the context of rural practice to reduce travel time for both practitioners and healthcare consumers. However, it is increasingly being used in a wide variety of different healthcare context.



Perhaps the most rapidly expanding and transformative area of eHealth relates to what we call, **health in the hands of consumers**. This includes the use of **apps, websites, social media, and wearable devices**. We are surrounded by people interfacing mobile technologies to record their every move. When they go home, they will often download their information, interact with friends on social media, and increasingly share their data with their health professionals. So, can eHealth really help us to deliver coordinated care in a more seamless health system? And how does eHealth empower us as professionals and health consumers to be more active participants in our own ongoing health and well-being management?

A model for eHealth

There are many formal definitions of e-health, and most are used interchangeably. Even as far back as 2005, a study found at least 51 unique definitions. They range from the very narrow, the focus on health informatics, through to wider definitions that are all encompassing. Rather than focusing on defining e-health, we have been developing a model to support how we conceptualize how e-health impacts on practice, teaching, and research.

We have identified three overlapping domains.

- Firstly, health in the hands of consumers. This includes the growing use of wearable devices, apps, and social media to monitor and report on our health and wellness.
- Secondly, the impact of new technologies on how health professionals communicate with patients, as well as how they communicate with each other. Traditionally this has been referred to as Telehealth but is much more than simply video conferencing for rural patients. It also includes emerging areas such as health coaching and maintenance of fitness.
- Thirdly, data records in the quantified self. This includes how we store data in traditional medical records through to how we store data associated with devices and apps.

The overlapping nature of these e-health domains is perhaps obvious, and it is important not to draw too tight a boundary around each of them. Where e-health has perhaps the greatest impact is in the sweet spot where the three domains intersect. Ideally any program being developed should consider or combine one or more aspects of these three domains for maximum health impact.

Challenges

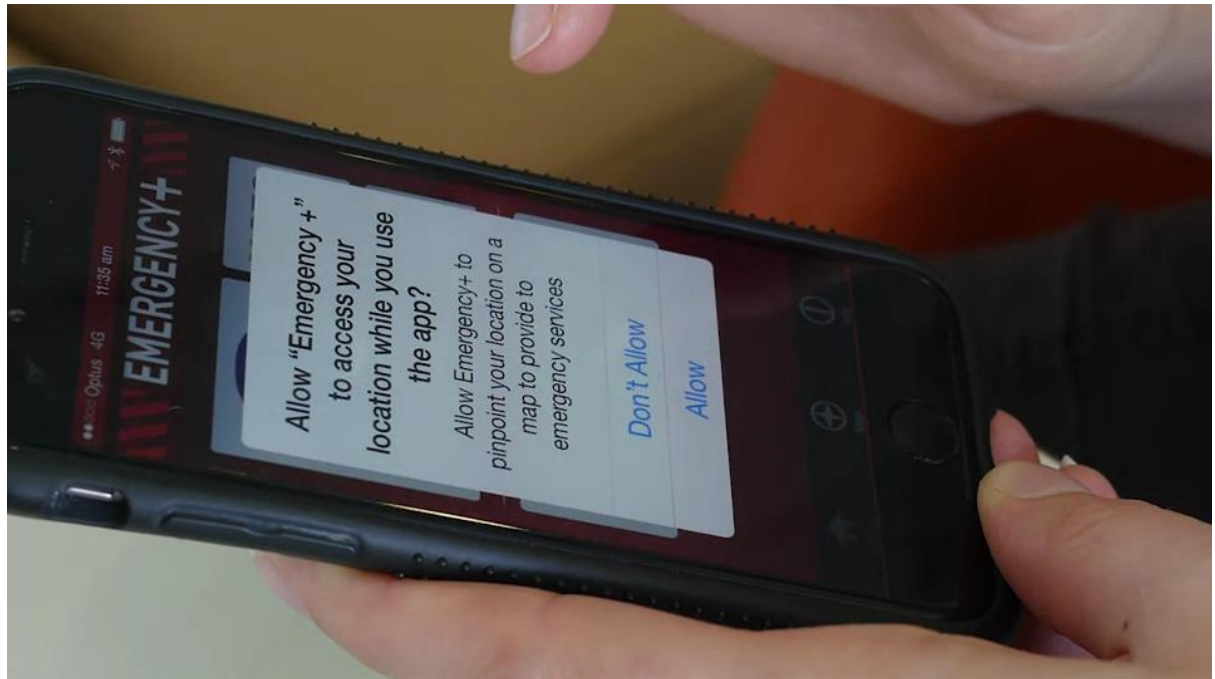
When you talk about the challenges of implementing eHealth solutions. It's the implementation of these great ideas that can get difficult. The digital world disruption, explosive technology change, those are not words that the health system is used to dealing with. So, we have got a whole culture change happening inside health, to allow this eHealth journey to occur. eHealth is a potent catalyst for change in healthcare delivery. We must be right up there with our education. The biggest challenges are taking what our patients expect, seamless, connected, coordinated care, and really delivering that. And eHealth could make those transitions seamless.

Health in our hands



Applications or apps, wearable devices, online health information and social media are all being used to motivate healthy behaviours and monitor existing conditions. While this is, perhaps, the fastest growing area of eHealth with the potential to transform healthcare delivery, it is also the least explored. All around us, devices are being used by a wide range of individuals to track their performance, diet, sleeping patterns, and almost every conceivable health metric. Wearable devices and associated apps can be used for a wide range of purposes. This includes capturing and displaying personal health data, plotting data to monitor and track progress, delivering information in a variety of formats and providing opportunities for communication with health care professionals and patients and providing links to social networks.

Mobile apps for health



The use of apps, mobile devices, sensors is commonly referred to as mHealth or Mobile Health and it represents a significant and ever-changing component of eHealth. We are increasingly seeing examples of mHealth in education and awareness using it as a helpline to provide assessment, and treatment support for remote monitoring, and data collection. It can also be used for disease and epidemic outbreak tracking. From the individual's point of view, Mobile Health is not only convenient. It puts health and healthcare into their own hands. It helps them to self-monitor and take control of their circumstances, which for people with chronic conditions, such as diabetes means that they can monitor their health in the comfort of their own home, which may reduce the need for unnecessary admissions to hospital. From the healthcare professional's perspective, it can help to make informed decisions faster to improve outcomes for the person by shifting some of the responsibility and control to the consumer. It may also reduce the increasing demands on resource stretch systems. If you have not already noticed, the quantified self-movement has really taken off. About 70% of people now use mobile apps daily to track health related information. Our friends, family and colleagues are using apps and devices to monitor things like calories, distance and terrain covered, sleep cycles, moods and more.

Health information online

We live in the information age. And increasingly, consumers are turning to the internet for information that can help them self-diagnose. Understand their condition. And support decision making. In many ways, this is turning the tables on the role of the health professional. From the prescriber, to the coach, collaborator, and facilitator of the consumers own health journey. Particularly because you have so much access to information now in your pocket. When you're doing things like re-charting medications for a patient or explaining something. To be able to pull out your phone and look it up and get the answer right there on the spot. People can comment and ask questions and share their experiences. So, it builds this interesting virtual community. From there, more ideas are shared. And more suggestions are made. So, it gives the reader more of an overall view of this topic and how it applies to them.

Co-design of eHealth solutions

Well eHealth relies entirely on the effectiveness of the interface that each of the users sees. Historically people would build backings of computer systems and then thought about what the interface should be like and we've seen a revolution where we think first of the interface, and then we worry about how to make the rest of it drive the interface. From a user's point of view, the interface is the system. And so, what the interface looks like is essential. So human computer interaction is about creating interfaces that people can actually use effectively and that they'll enjoy and that will perhaps even sometimes delight them, do things they had never expected, and certainly fit well into what they really want. And so often we need to create little prototypes, simple versions of an interface. And then see how people use it to do this co-design where the person designing and building the interface shares their vision, in a way, with the potential users. And the users are then able to understand the questions that are being asked of them. And so, there's this cycle where you are studying the user, sharing ideas, and then moving on to building systems. And the cycle continues, because once you build something, you need to bring people in again in, to try it out. To find out whether they can do what they need to do.

Evaluating health apps

Evaluation is one of those processes that brings everyone together. And this is because researchers, clinicians, and patients all have a vested interest in and a responsibility to evaluate. So, if we take apps and mobile devices to common technologies, there are

several ways that we can evaluate these tools. So on one level, we can look at the accuracy of the measurement. So, when my phone is telling me that I've taken 325 steps today, is it because I've taken 325 steps or is it because I've shaken my phone 325 times? So, this level of evaluation is important when we're using these tools to measure specific variables, such as range of motion. On another level, I can ask does measuring the number of steps I take motivate

me to take more steps. And in this case, the accuracy of the number of steps is secondary to what it does to me and how it motivates me. The portability of smartphones provides access to health information and interventions at any time in any context. It's increasingly difficult for users, health professionals, and researchers to readily identify and assess for high quality apps.

Selecting apps based on popularity yields little or no meaningful information on the actual quality of the app. Attempts to develop mobile health or mHealth evaluation criteria are often too general, complex, or specific to a health domain. We really need a reliable and objective instrument to rate the degree that mHealth apps satisfy quality criteria. And this scale or tool really needs to be easy to understand and easy to use with minimal training.

Data and digital health records (Data and the "Quantified Self")

Digitizing paper records is clearly beneficial. It enables a patient's medical history to be tracked over time. To alert patients for routine or follow up consultations, to monitor patients' vital signs. And overall, to improve the quality of care. In addition, aggregate medical records can be used to provide regular downstream information on individual team or organization performance. And to link with quality improvement programs. Despite the obvious potential for medical records to improve care. The creation of digital information has presented massive challenges across all health jurisdictions. Consequently, many health systems still focus on basic services such as providing health professionals with accurate information. The ability to use digital information to transform care is yet to be achieved. The terms real-time, patient centered, efficiency, wherever and whenever, are commonly used when describing electronic health information systems.

Privacy and security - should we be worried?

The challenge with digitization in health is how to do it safely. It's easy to disrupt when people don't care about information being public or don't feel the privacy sense that we maybe have, we've dropped our sense of privacy a little bit with most of the things that we see in the digital world. In the case of e-health, we know there are many databases

that we need. We rely on medical records, for example. Many of us collecting data for our quantified selves with our various trackers and phones that are keeping note of how active we are and so on. So, there's a lot of data and it is really challenging to build interfaces so that people can really control that data. But we need to work a lot harder at building those interfaces. Now, it's hard for users to control what happens to their data. For eHealth to really function at its best we need as much data connected about each patient. And to ask someone to give us all their private health data it really comes down to a matter of trust. Beyond any legislative requirements for security and privacy, the end user who is entrusting us in keeping their data needs to trust that we'll protect it correctly and I think that that approach to privacy within eHealth is what will make it work. If we don't have buy-in from what could be considered consumers or patients or even the clinicians because of a lack of trust, then nothing will work. Privacy and security in eHealth really needs to be thought of right from the beginning.

Interacting with Health Professionals using New Technologies

➤ Improving care: Ten eHealth advantages

In a remote location with a musculoskeletal injury and so traditionally these people have had three main options available to them. They could travel long distances to seek healthcare. They could Google generic health information online, but that can be unsafe and lead to poor outcomes, or they could just leave their injury and do nothing about it. But we know that that leads to poorer outcomes and greater occurrences. **So, with Physios Online, we wanted to create a better way. So from the comfort of their home or their workplace, people can get a full assessment done of their injury, come up with a diagnosis of what they're dealing with and give them a rehab plan to continue on with, all at a distance.**

Because we have so many patients that we want to connect with. So with cancer survivors,

there's about a million cancer survivors that we want to engage and connect with. And obviously face to face content isn't the best way to do that all the time. It's good for a lot of patients, particularly in acute settings, but maybe for follow-up settings using this data and having some kind of flagging mechanism and education mechanism behind that is a really good way to go forward.

It means we can access millions and millions of patients without burdening the health system as much as it would. Because these patients are doing so well now, they're normally working part or full time. So often they don't have a couple of hours spare in the week to do their supportive care consults.

So, what we can do is maybe think of a different way to deliver that service. So, we find that Skype, or video conferencing is a really, really good way of connecting with those patients.

The biggest benefits is sort of the ability to access a broader patient group than we would otherwise be able to access in our traditional face to face clinics. And so for instance, we know that adolescents and young adults would like to kind of get together. And they'd like to meet each other in groups. But the logistics of actually ever being able to coordinate a group of young people back at the hospital would really be near to impossible most of the time,

Increasingly in radiology, we're seeing handheld devices being used to access imaging data and radiology reports. So doctors can see annotated radiological images pointing them and directing them towards the area of interest on an image, as well as accessing the reports.

The treatments that matter in the first few hours of a condition are often quite simple treatments and with appropriate support and over the phone advice it's amazing how well the GPs and the nurses in these small sites can deliver excellent care.

And what we've found with experience is that when you do this, the patients arrive in better condition and not only that, they can be transferred with lower levels of support.

The most exciting thing about eHealth now is that we're starting to think about what it means to integrate e technologies into settings. Into schools, into universities, into workplaces. And into the community. And we haven't thought about it that way before. What that means is that we will fundamentally change the way people work, the way they contribute and the way we manage their care. With Telehealth, a lot of the dialogue is around the advantages to the patient, and rightly so. We can certainly improve access and improve quality of healthcare for the patients. But it also gives unprecedented opportunities to the actual health professional themselves.

Using apps to personalise healthcare

My Physio app has numerous benefits to the patients, particularly in regard to adherence to an exercise program. So, once they leave the clinic, they then get an email to their phone, which has the exercise program which they can download either as a

PDF or access the app inside. So then, once they get into the app, they can view video demonstrations of each exercise, but also a description of how to perform the exercise. In addition to this, we can provide customized instructions based on how the patient presents, including things about not holding your breath during exercise. An additional benefit to this is that the My Physio app comes with a whole lot of educational material that you can use and include in different patients' exercise programs. So, when the clinician's able to create the exercise program they're also able to specify the number of reps, sets, rest time, and number of days, that you're able to do the exercise.

And this makes it quite personalized to the individual presentation of the patient. It makes the patient feel as well like they are getting personalized exercise advice over the usual recommendation of doing just three by ten reps of an exercise.

In addition, the My Physio app tracks adherence to an exercise program. So, it also allows us to see how much they have been using the program. It means that patients can't hide behind excuses about not using it. So that people can do naming tasks, for example, or they can indicate whether they're feeling depressed or not on a five-point scale. Or they can indicate how happy they are with their life now and their life satisfaction. So, it has been a bit of a breakthrough having this multi-modal app.

eHealth in Professional Practice

➤ eHealth enabled professional development

Doctors are currently being trained on, for example, bringing bad news. For a doctor to have to come and tell a patient, sorry, but you have cancer. That is probably the hardest thing any doctor has ever had to do. And doctors therefore are trained on protocols on how to bring bad news as well as how to collect the information from patients and so on. Now, we are using technologies for doctors to communicate with patients remotely. people sometimes live in such remote locations; it is very important to have tele-health systems where a doctor and a patient can interact remotely.

This is a system that is going to be used by hundreds of medical students this year. They will be provided with what we call effective computing technologies, these are automatic detection of emotions. So, when we are having this conversation here, you are nodding, you are shaking, you're smiling. We take turns in our dialogue. All these aspects of the conversation can be automatically detected. We can use technologies to support those aspects of human communication and human nature

that are essential for good relations, that are essential for successful treatment and to develop full potential of doctors.

Aarogya Setu Application

The stated purpose of this app is to spread awareness of COVID-19 and to connect essential COVID-19 - related health services to the people of India. This app augments the initiatives of the Department of Health to contain COVID-19 and shares best practices and advisories

. It is a tracking app which uses the smartphone's GPS and Bluetooth features to track the coronavirus infection. The app is available for Android and iOS mobile operating systems. With Bluetooth, it tries to determine the risk if one has been near (within six feet of) a COVID-19 - infected person, by scanning through a database of known cases across India. Using location information, it determines whether the location one is in belongs to one of the infected areas based on the data available.



Aarogya Setu has four sections:

User Status (tells the risk of getting COVID-19 for the user)

Self-Assess (helps the users identify COVID-19 symptoms and their risk profile)

COVID-19 Updates (gives updates on local and national COVID-19 cases)

E-pass integration (If applied for E-pass, it will be available).

It tells how many COVID-19 positive cases are likely in a radius of 500 m, 1 km, 2 km, 5 km and 10 km from the user.

The app is built on a platform that can provide an Application Programming Interface (API) so that other computer programs, mobile applications, and web services can make use of the features and data available in Aarogya Setu.

Medlife

Medlife International, is an India online platform, which provides pharmacy, diagnostics, and e-consultation in India. It was founded in 2014 by Prashant Singh and Tushar Kumar. The company has a central laboratory based in Bengaluru and delivers daily to 29 states. Medlife has brought together doctors, pharmacist, path labs and consumers on a single platform. Medlife has a lot more to offer than just buying medicines online.



Medlife deliver to 25,000+ pin codes over 2500+ cities and 29 states across India. Medicine home delivery made easy.

- Pharmacy - Buy medicines online
- Medlife Labs -Book free collection of samples from home for laboratory tests
- Doctor Consultation - Consult a doctor from the comfort of your home
- OTC - Order healthcare and wellness products
- Medlife Essentials - Get herbal supplements and varied range of accessories.