Is India a Dark Horse??
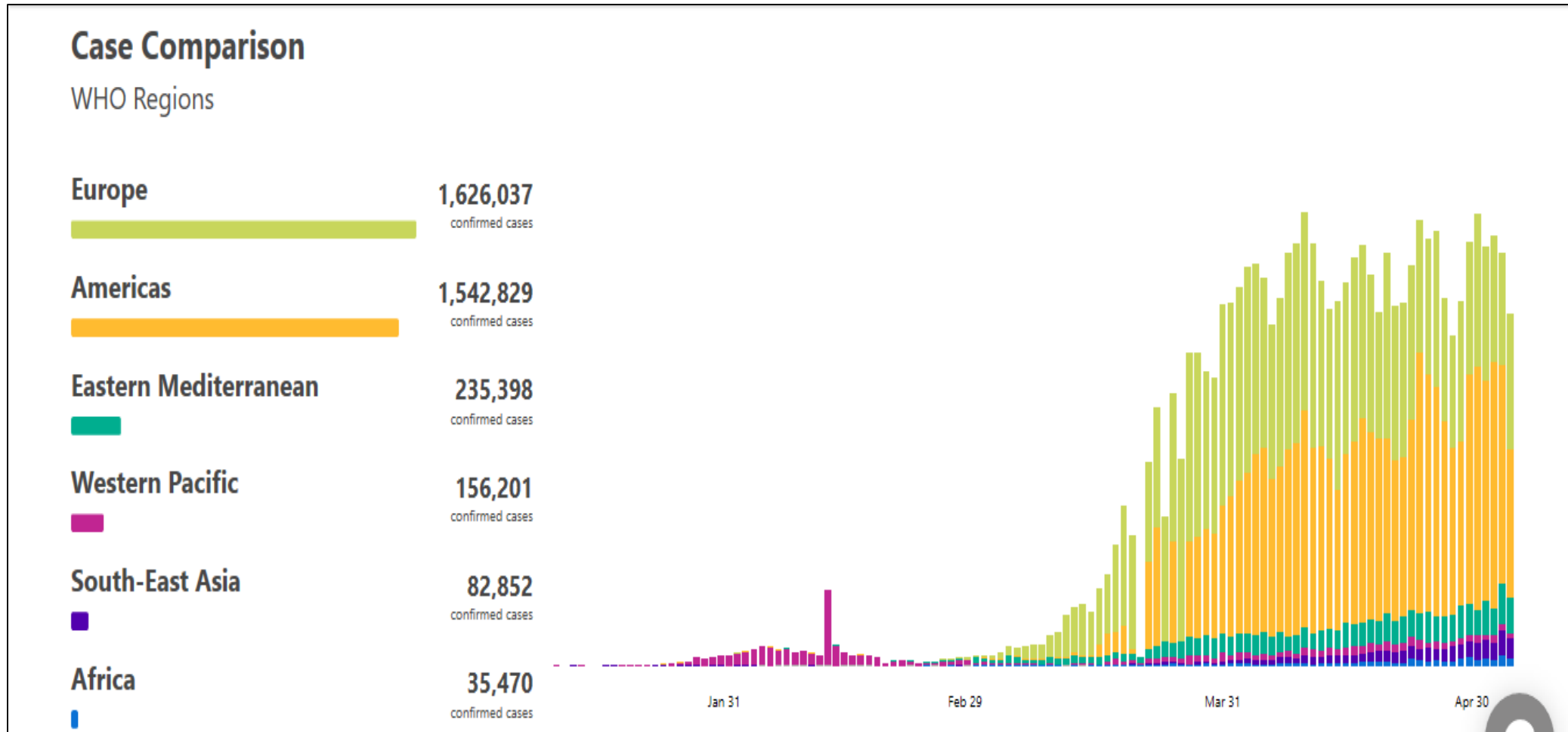
A perspective based on information from 02.05 to 09.05.2020

Covid-19 World Scenario- WHO (08-05-2020)

Case Comparison
WHO Regions

Europe	1,626,037	confirmed cases
Americas	1,542,829	confirmed cases
Eastern Mediterranean	235,398	confirmed cases
Western Pacific	156,201	confirmed cases
South-East Asia	82,852	confirmed cases
Africa	35,470	confirmed cases

Asia- African countries have the lowest incidence rate

World scenario of COVID 19

Countries	Total Cases	Total Deaths
USA	11,31,492	65,776
Spain	2,42,988	24,824
Italy	2,07,428	28,236
UK	1,77,454	27,510
France	1,67,346	24,594
Germany	1,64,077	6,736
Russia	1,24,054	1,222
Turkey	1,22,392	3,258
Iran	95,646	6,091
Brazil	92,202	6,412
China	82,875	4,633
Canada	55,061	3,391
Belgium	49,517	7,765
Peru	40,459	1,124
Netherlands	39,791	4,893
India	**37,336**	**1,223**

- **Top 15 Countries having the Maximum number of cases (Incidence rate)and deaths (Fatality Rate)**

- **Data as on 02-05-2020**

Source:
https://www.worldometers.info/coronavirus/?utm_campaign=homeAdUOA?Si#countries

Statistics on Number of tests performed

Country	Total Cases	Total Tests performed	Positive test %
USA	11,31,492	66,99,878	17
Spain	2,42,988	15,28,833	16
Italy	2,07,428	20,53,425	10
UK	1,77,454	10,23,824	17
France	1,67,346	11,00,228	15
Germany	1,64,077	25,47,052	6
Russia	1,24,054	39,00,000	3
Turkey	1,22,392	10,75,048	11
Iran	95,646	4,75,023	20
Brazil	92,202	3,39,552	27
China	82,875	NA	NA
Canada	55,061	8,32,222	7
Belgium	49,517	2,60,996	19
Peru	40,459	3,42,498	12
Netherlands	39,791	2,25,899	18
India	37,336	9,76,363	4

➢ **In India, for every 100 tests that are performed (in suspected cases), only 4 patients turns out to be positive. i.e. for every 25 tests performed, only 1 patient is tested positive**

➢ **In USA and UK, 1 in every 6 test is positive**

Comparison of Case Fatality Rate

Countries	Case Fatality
USA	6%
Spain	10%
Italy	14%
UK	16%
France	15%
Germany	4%
Russia	1%
Turkey	3%
Iran	6%
Brazil	7%
China	6%
Canada	6%
Belgium	16%
Peru	3%
Netherlands	12%
India	3%

- As per the data there is a wide range of fatality rates amongst different countries.

- E.g. Russia has total 1,24,054 covid positive case with Fatality rate of only 1%, where as Belgium, though has less number of positive cases (49,517) has a fatality rate of 16%

So….. Why the difference???

Source:
https://www.worldometers.info/coronavirus/?utm_campaign=homeAdUOA?Si#countries

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Environmental Factors impacting Fatality rate

Countries	Total Population	Population density/Km2	Socio Economic Background	Case Fatality
USA	32.8 cr	36	High Income	6%
Spain	4.69 cr	94	High Income	10%
Italy	6.04 cr	206	High Income	14%
UK	6.66 cr	281	High Income	16%
France	6.7 cr	117	High Income	15%
Germany	8.3 cr	232	High Income	4%
Russia	14.5 cr	8.4	Upper middle income	1%
Turkey	8.2 cr	110	Upper middle income	3%
Iran	8.37 cr	52	Upper middle income	6%
Brazil	21.2 cr	25	Upper middle income	7%
China	143.5 cr	153	Upper middle income	6%
Canada	3.76 cr	4	High Income	6%
Belgium	1.15 cr	383	High Income	16%
Peru	3.2 cr	26	Upper middle income	3%
Netherlands	1.73 cr	488	High Income	12%
India	136.6 cr	464	Lower Middle Income	3%

Findings

- **India is the only country which is in the Lower middle income economic status, while all others are in high or upper middle income group.**

- **Though India and China are the countries with maximum population they have only 3 and 6% fatality rate.**

- **High income group has high fatality**

Doctor patient ratio- WHO recommended- 1:1000 patients

Country	Total Cases	Total Deaths	Case Fatality	Doctor Patient Ratio
USA	11,31,492	65,776	6%	2.59
Spain	2,42,988	24,824	10%	4.06
Italy	2,07,428	28,236	14%	4.09
UK	1,77,454	27,510	16%	2.79
France	1,67,346	24,594	15%	3.23
Germany	1,64,077	6,736	4%	4.2
Russia	1,24,054	1,222	1%	4.01
Turkey	1,22,392	3,258	3%	1.76
Iran	95,646	6,091	6%	1.14
Brazil	92,202	6,412	7%	2.15
China	82,875	4,633	6%	1.78
Canada	55,061	3,391	6%	2.61
Belgium	49,517	7,765	16%	3.32
Peru	40,459	1,124	3%	1.27
Netherlands	39,791	4,893	12%	3.5
India	37,336	1,223	3%	0.78

Amongst the top 15 countries, India has the lowest doctor-patient ratio, below the WHO recommended minimum standards.

Source: https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?end=2018&start=2018&view=map&year=2018

World Healthcare Ranking-by WHO

Country	Total Cases	Total Deaths	Case Fatality	World Healthcare ranking- WHO
USA	11,31,492	65,776	6%	37
Spain	2,42,988	24,824	10%	7
Italy	2,07,428	28,236	14%	2
UK	1,77,454	27,510	16%	18
France	1,67,346	24,594	15%	1
Germany	1,64,077	6,736	4%	25
Russia	1,24,054	1,222	1%	130
Turkey	1,22,392	3,258	3%	70
Iran	95,646	6,091	6%	93
Brazil	92,202	6,412	7%	125
China	82,875	4,633	6%	144
Canada	55,061	3,391	6%	30
Belgium	49,517	7,765	16%	21
Peru	40,459	1,124	3%	129
Netherlands	39,791	4,893	12%	17
India	37,336	1,223	3%	112

- **Countries like France and Italy which are ranked topmost in "World Healthcare Ranking", are having highest fatality rate.**

- **While countries like India and China which are not even within the top 100, are having low fatality rate**

…… WHY ????

Source: (https://thepatientfactor.com/world-health-organizations-ranking-of-the-worlds-health-systems/
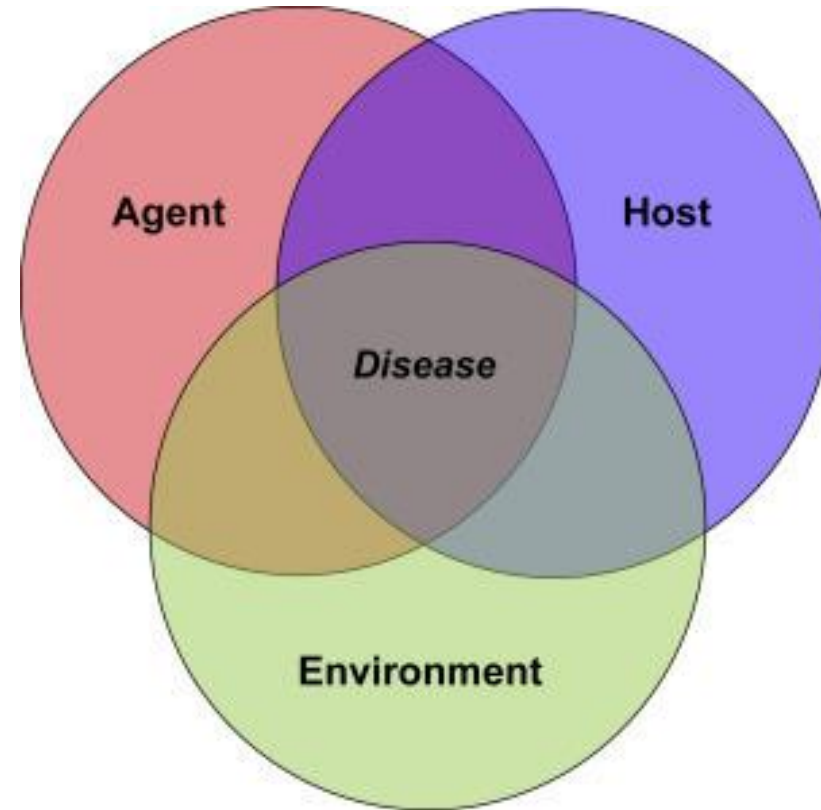
All odds are against INDIA

India has

1. Second largest populated country

2. High population density

3. Lower Middle Income group

4. Low doctor patient ratio and

5. Low in world healthcare ranking, then……

WHY is the incidence rate in India LOW???

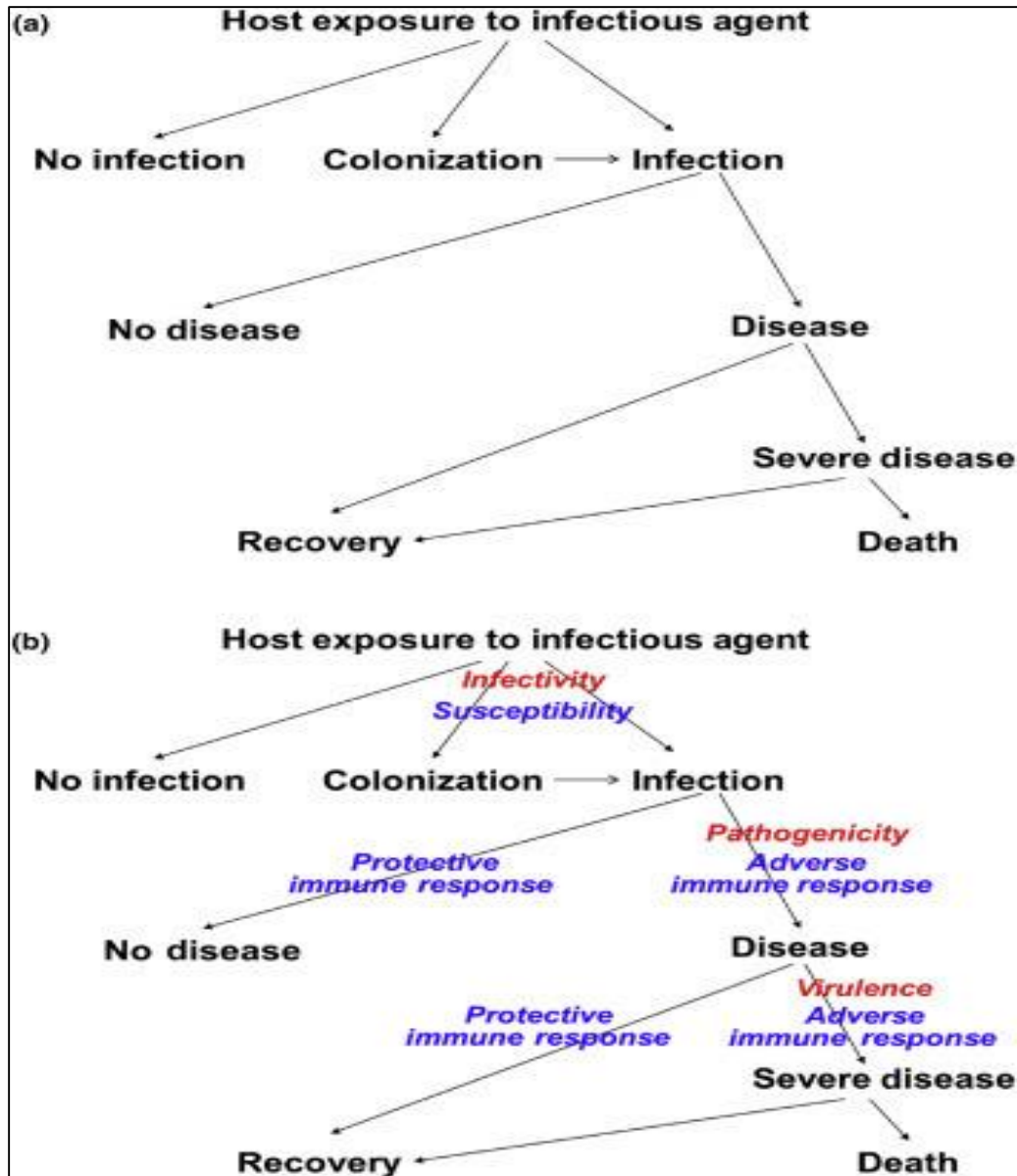WHY is the fatality rate low???

The Epidemiological Triad: Infectious Disease Causation

The epidemiological triad model of infectious disease causation. The triad consists of an agent (pathogen), a susceptible host, and an environment (physical, social, behavioral, cultural, political, and economic factors) that brings the agent and host together, causing infection and disease to occur in the host.

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7150340/

Determinants of Infectious Disease

Figure (a) and (b): Host exposure to infectious agent pathways showing No infection, Colonization, Infection, No disease, Disease, Severe disease, Recovery, Death; (b) adds labels: Infectivity, Susceptibility, Protective immune response, Adverse immune response, Pathogenicity, Virulence.

Infectivity is the likelihood that an agent will infect a host, given that the host is exposed to the agent.

Pathogenicity refers to the ability of an agent to cause disease.

Virulence is the likelihood of causing severe disease among those with disease.

Measurements:
Infectivity and pathogenicity can be measured by the *attack rate*, the number of exposed individuals who develop disease.

Virulence is often measured by the *case fatality rate* or proportion of diseased individuals who die from the disease.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7150340/

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Infectivity

- *Infectivity* is the likelihood that an agent will infect a host, given that the host is exposed to the agent

- Infectivity can be measured by testing the susceptible population, thereby calculating the Reproductive rate (Ro)

- In India, owing to limited access to testing kits, testing policy is designed to prioritize people who will be tested first.

Testing Policy- India

**India's current strategy has six criteria for individuals to get tested. These include:**

I. All symptomatic and asymptomatic individuals who travelled internationally in the previous 14 days.

II. All symptomatic contacts of laboratory-confirmed Covid-19 patients.

III. All symptomatic healthcare workers.

IV. Patients with Severe Acute Respiratory Illness (fever with cough and/or shortness of breath).

V. Also, testing is recommended for people in hotspots/clusters and in evacuee centers.

VI. The new criterion added was the testing of all persons displaying influenza-like symptoms (which includes fever, cough, sore throat and runny nose).

# R0(R naught)-an Important Metric

- R_0(R naught): Indicates how contagious an infectious disease is.

- R_0-**The basic reproduction number** (rate or ratio), is an epidemiologic metric used to describe the contagiousness or transmissibility of infectious agents.

- It tells us _average number of people who will catch disease from one infected individual_.

- It is referred to as reproduction number because as infection spreads to new people it reproduces it self.

- It Specifically applies to a population which is susceptible, exposed to pathogen for first time and is not vaccinated.

R_0 Metric of Contagiousness

- Fundamental Factors Included in R_0 Estimation

Infectious Period

Contact Rate

Mode of Transmission
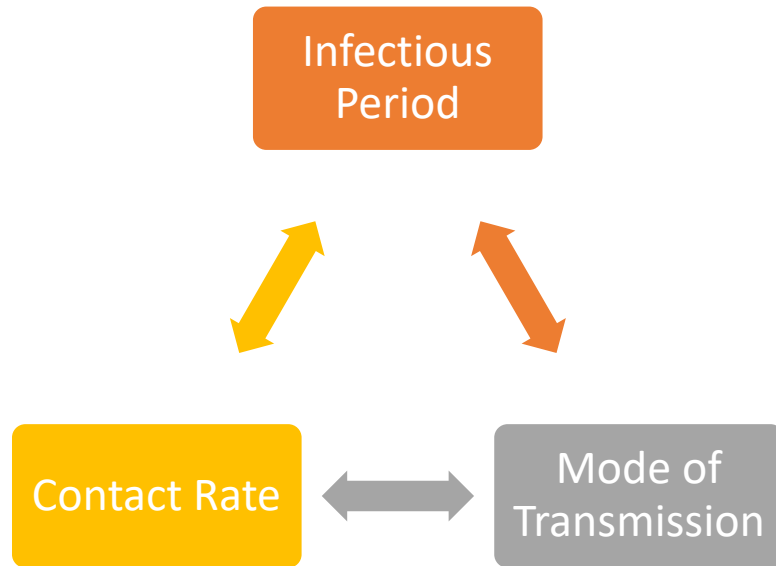
- Relative Factors that Affect R_0

Social Behaviour

Environmental Factors
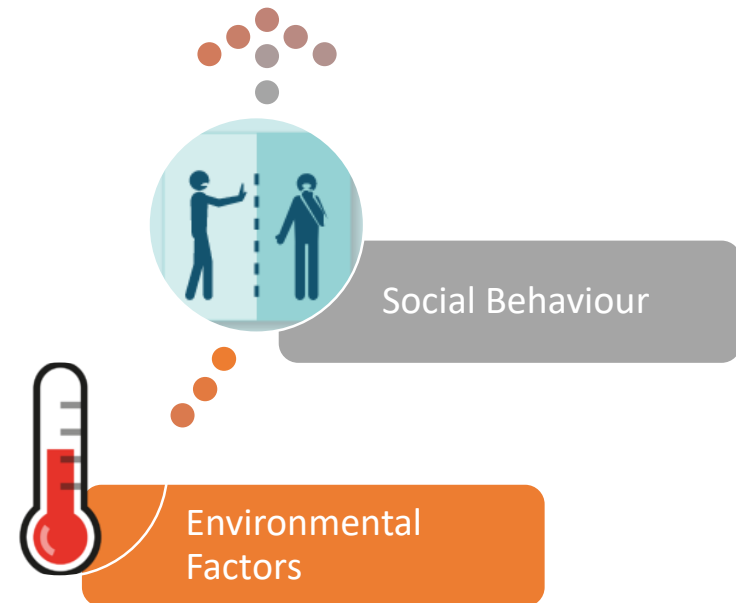
R_0- Basic Interpretations

$R_0 < 1$ — If R_0 is less than 1,the disease will decline and eventually die down

$R_0 = 1$ — If R_0 is equal to 1, the disease will stay alive and stable but there wont be an outbreak

$R_0 > 1$ — If R_0 is more than 1, the disease will spread between people and cause outbreak or epidemic.

Generally higher the R0, difficult it is to contain epidemic

Case Fatality Rate

- Case fatality rate, typically, is used as a measure of disease severity and is often used for prognosis.

- **Case fatality rate**, also called **case fatality ratio**, is the proportion of people who die from a specified disease among all individuals diagnosed with the disease over a certain period of time.

- Case fatality rates are not constant; they can vary between populations and over time, depending on the interplay between the causative agent of disease, the host, and the environment as well as available treatments and quality of patient care.

Factors impacting Fatality rate
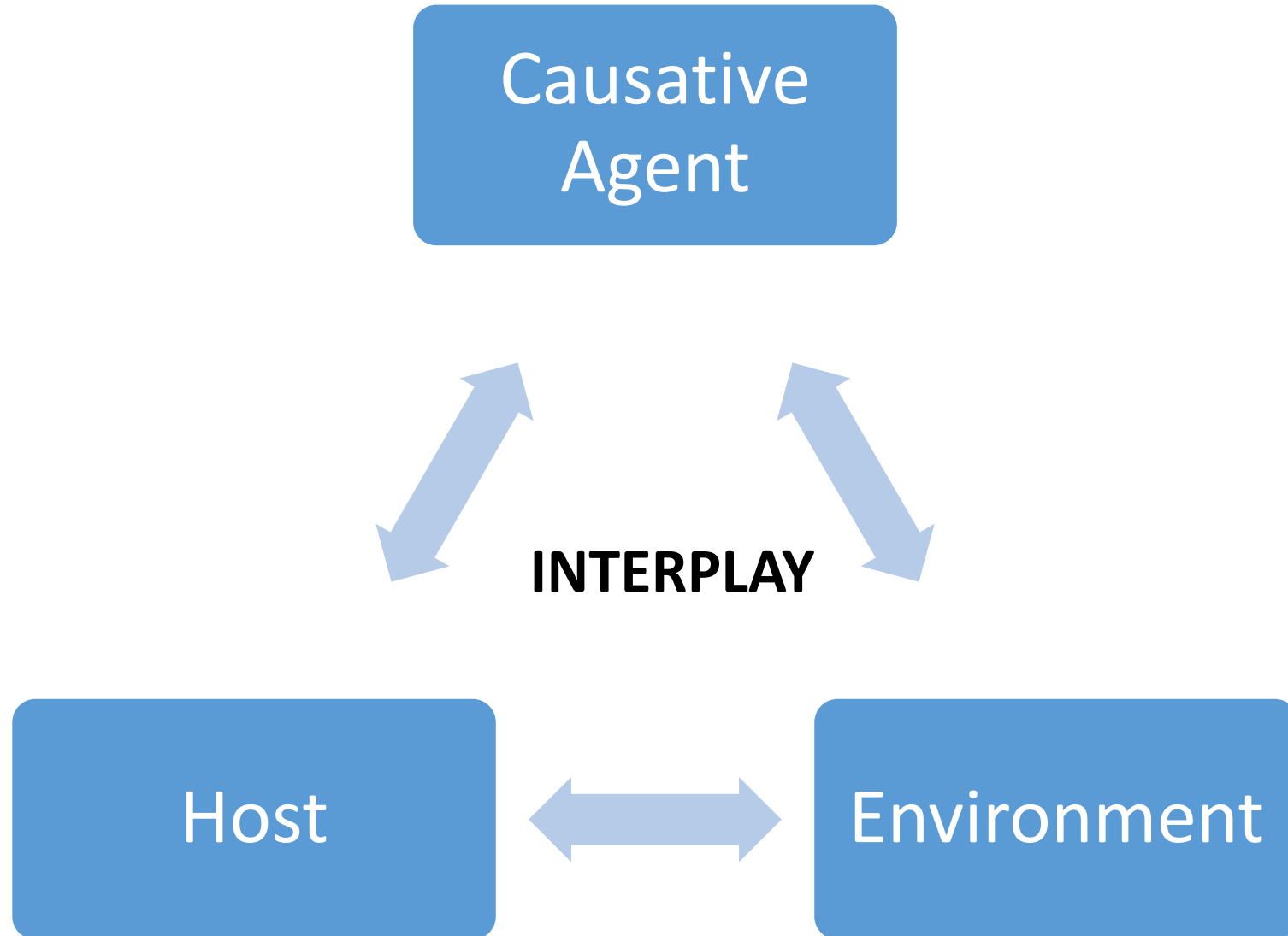
Factors impacting Fatality rate

Causative Agent

SARS-CoV-2 RNA virus

There may be slight difference in mutative strains (Not yet confirmed)

Environment

Socio Economic Background

Population Density

Host

Susceptibility to infection

Immunity to current Infection

Factors impacting Fatality rate

1. Causative Agent:

The term "coronavirus" refers to a large group of viruses known to affect birds and mammals, including humans.

- There are four common human coronaviruses: causing mild to moderate symptoms
  - 229E
  - NL63
  - OC43
  - HKU1

- SARS-CoV-2 causes COVID-19. This new coronavirus appeared in Wuhan, China in December 2019. Within a few months, SARS-CoV-2 has spread to hundreds of countries around the world after being transmitted through person-to-person contact.

- So far, the organism identified is the same, though slight mutation of the strain cannot be ruled out.

Source: https://www.healthline.com/health/coronavirus-types#types

Factors impacting Fatality rate

2. Environmental factors impacting Infectious Disease

- Physical, Behavioural, Cultural practices and Socio-economic background play an important role in spread of Infectious diseases.

- For any infection that spreads through droplets, overcrowding becomes an important factor responsible for spread of infection.

- Countries with larger population and high population density areas are at high risk for disease spread.

- Hence countries like China and India are supposed to be at high risk for COVID 19.

Factors impacting Fatality rate

Other environmental factors impacting the outcome of any Infectious disease are:

1. Availability of treatment: Currently no known vaccine or medical treatment is available for COVID-19. Research in these areas is ongoing

2. Quality of Patient care:

- Doctor Patient Ratio: Amongst the top 15 countries, India has the lowest doctor-patient ratio of 0.78

- In the WHO **"World Healthcare Ranking",** countries like France and Italy which are ranked topmost in ranking, are having highest fatality rate, while countries like India and China which are not even within the top 100, are having low fatality rate

Source: (https://thepatientfactor.com/world-health-organizations-ranking-of-the-worlds-health-systems/

Factors impacting Fatality rate

3. <u>Host Factors:</u>

- <u>Immunity to current Infection:</u> Since SARS- CoV-2 is a novel virus, appeared only in December -2019, there is no herd immunity that has been generated in the population

- <u>Susceptibility to Infection:</u> Various factors can impact the susceptibility of an individual and can make an individual either prone to an infection or help an affected individual limit the infection to mild or moderate grade.

Factors impacting Fatality rate

Factors impacting Susceptibility:

Age: Its known that Corona infection is more severe in Old age as compared to younger age group

Country	Total Cases	Total Deaths	Case Fatality	Median age
USA	11,31,492	65,776	6%	38.1
Spain	2,42,988	24,824	10%	42.7
Italy	2,07,428	28,236	14%	45.5
UK	1,77,454	27,510	16%	40.5
France	1,67,346	24,594	15%	41.4
Germany	1,64,077	6,736	4%	47.1
Russia	1,24,054	1,222	1%	39.6
Turkey	1,22,392	3,258	3%	30.9
Iran	95,646	6,091	6%	30.3
Brazil	92,202	6,412	7%	32
China	82,875	4,633	6%	37.4
Canada	55,061	3,391	6%	42.2
Belgium	49,517	7,765	16%	41.4
Peru	40,459	1,124	3%	28
Netherlands	39,791	4,893	12%	42.6
India	37,336	1,223	3%	27.9

- **India has an advantage of having predominantly younger population with a median age of being 27.9 yrs.**
- **Although countries like Germany and Russia, having higher median aged population, also has low fatality rate.**

Population Genetics

- Research is going on to assess whether polymorphism of Human Angiotensin-Converting Enzyme2 (ACE2) receptors can predict SARS-CoV-2 susceptibility.

- The viral spike (S) coat protein engages with the human ACE2 cell surface protein to invade the host cell.

- The "SARS-CoV-2 S-protein" has acquired mutations that increase its affinity to human ACE2 by ~10-15-fold compared to "SARSCoV S-protein", making it highly infectious.

- A comprehensive analysis of several large genomic datasets, that included over 290,000 samples representing more than 400 population groups, were done.

- They have identified multiple ACE2 protein-altering variants, some of which mapped to the S-protein-interacting ACE2 surface.

Population Genetics

- They have identified natural ACE2 variants that are predicted to alter the virus-host interaction and thereby potentially alter host susceptibility.

- There are certain human ACE2 variants which are predicted to increase the susceptibility to infection, while there are other human ACE2 variants which are putative protective variants predicted to show decreased binding to SARS-CoV-2 S-protein.

- The genomic database represented wide population including UK, Australia, Netherland, England, Asia and India.

Hence another possible reason for Indian case numbers to be low might be the presence of protective ACE 2 receptors in Indian population, which can be confirmed by specifically studying the genome of people to identify whether they are susceptible or immune to infection.

Source: https://www.biorxiv.org/content/10.1101/2020.04.07.024752v1

Factors impacting Fatality rate

Factors impacting Susceptibility:

- Previous Infections might give a cross immunity to an individual. e.g. since other types of corona infections produce a flu like illness, and, as in India, people are exposed to common flu very rampantly, we need to explore if the antibodies against the other variety of corona virus would give a cross immunity to SARS- CoV-2.

- Data suggests the intensity of illness is in general less in Asian and African countries.

*** ***We need to find out what are the factors which are common in these continents!!***

Factors common in Asian and African Continent

As per CDC, most of the countries in Asia and Africa is labelled as Malaria Endemic Zone

(https://www.cdc.gov/travel-static/yellowbook/2014/map_3-10.pdf)

# Factors common in Asian and African Continent

Figure 1: The 22 High Burden TB Countries (HBCs)

- ☐ Non-HBC
- ■ HBCs
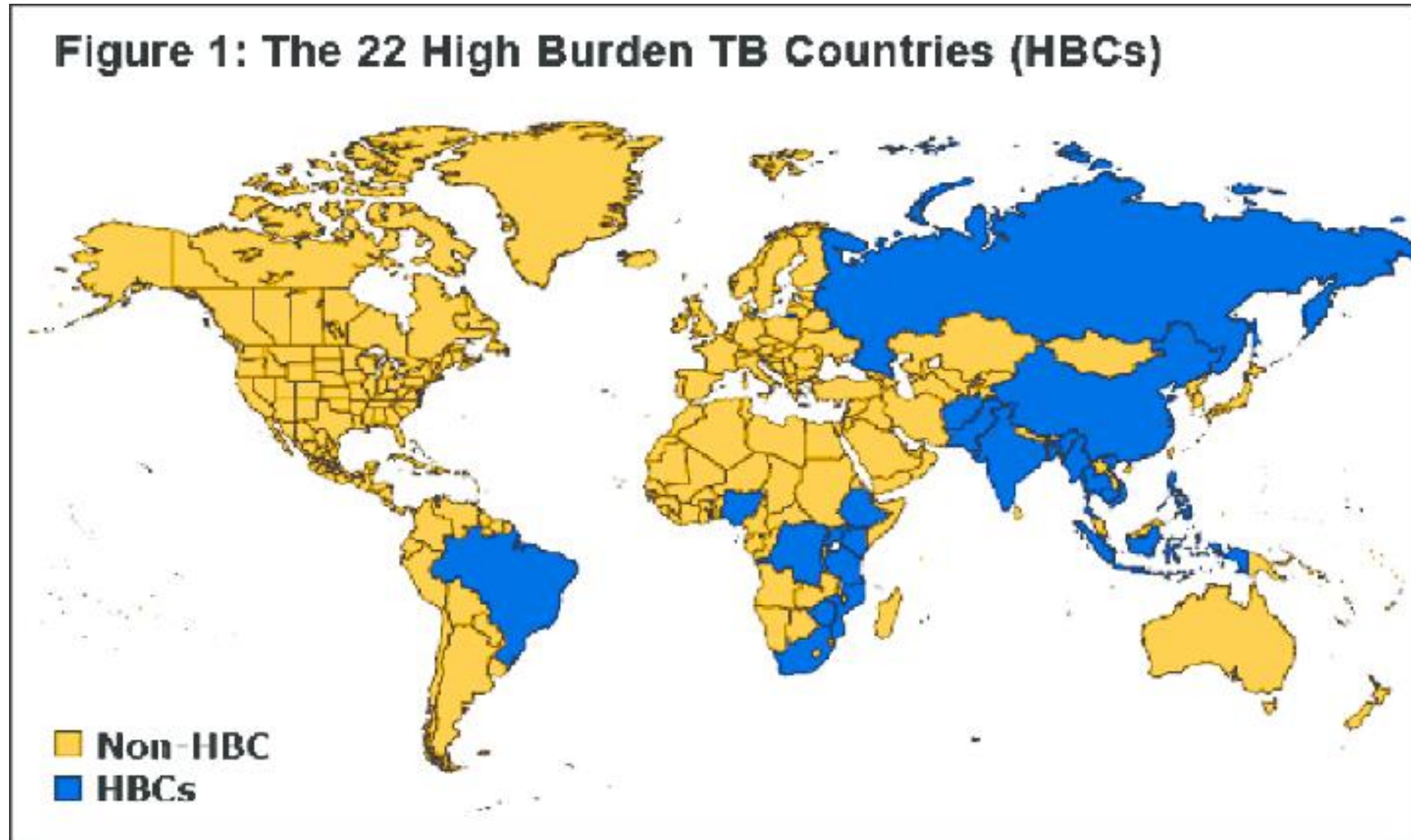
WHO has identified 22 High TB Burden Countries (highlighted in blue)

Factors impacting Fatality rate

- Since BCG vaccinations are mandatory in countries which are having high TB burden, we tried to study the countries which include BCG vaccination in their national immunization schedule and compared it with countries which doesn't vaccinate their population with BCG vaccine.

- We also studied the top 15 countries affected by COVID and understand their fatality rate vis-a- vis their vaccination status of BCG

Comparison of Intensity of Covid V/S BCG Vaccination

Comparison of Case Fatality rate amongst countries which have and donot have universal BCG vaccination
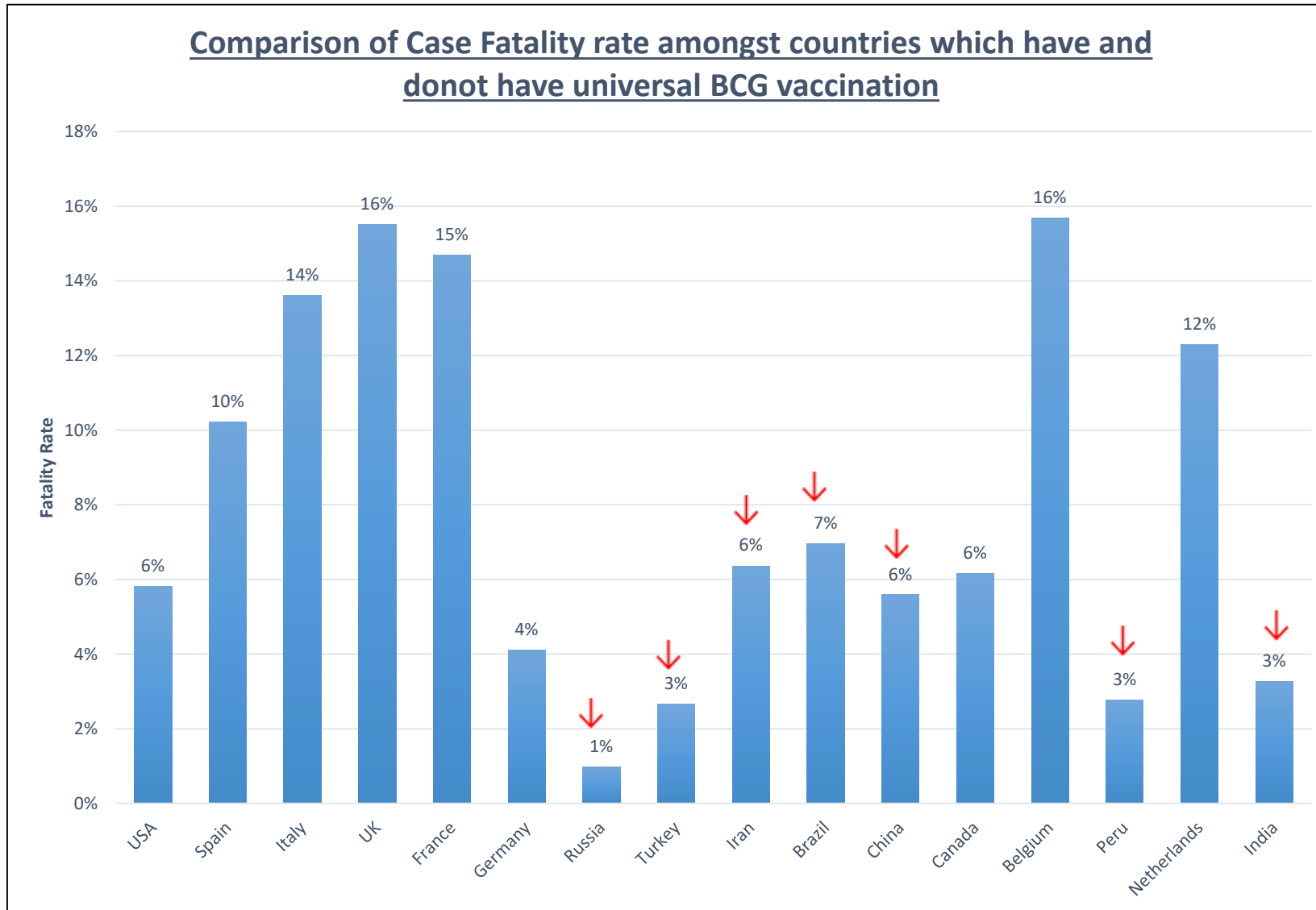
- **Countries which give BCG vaccines to their population (Red arrow ↓) have very low case fatality rate**
- **Rest of them either never gave BCG vaccination to their population at large or have stopped it many years back, have a high case fatality rate.**

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Covid status in countries with Malaria Endemic, High TB Burden and Giving BCG vaccination

Country	Malaria Endemic Country	Countries with High TB burden	Countries giving BCG vaccine	Total Cases	Total Deaths	Case Fatality
China	Y	Y	Y	82,875	4,633	6%
India	Y	Y	Y	37,336	1,223	3%
Pakistan	Y	Y	Y	18,114	417	2%
Indonesia	Y	Y	Y	10,551	800	8%
Philippines	Y	Y	Y	8,928	603	7%
Bangladesh	Y	Y	Y	8,790	175	2%
South Africa	Y	Y	Y	5,951	116	2%
Thailand	Y	Y	Y	2,966	54	2%
Afghanistan	Y	Y	Y	2,335	68	3%
Nigeria	Y	Y	Y	2,170	68	3%
Tanzania	Y	Y	Y	480	16	3%
Kenya	Y	Y	Y	411	21	5%
Vietnam	Y	Y	Y	270	0	0%
Congo	Y	Y	Y	229	9	4%
Myanmar	Y	Y	Y	151	6	4%
Ethiopia	Y	Y	Y	133	3	2%
Cambodia	Y	Y	Y	122	0	0%
Uganda	Y	Y	Y	85	0	0%
Mozambique	Y	Y	Y	79	0	0%
Zimbabwe	Y	Y	Y	40	4	10%

Case fatality rate of countries who are identified as malaria endemic zone and high burden TB countries, are very low
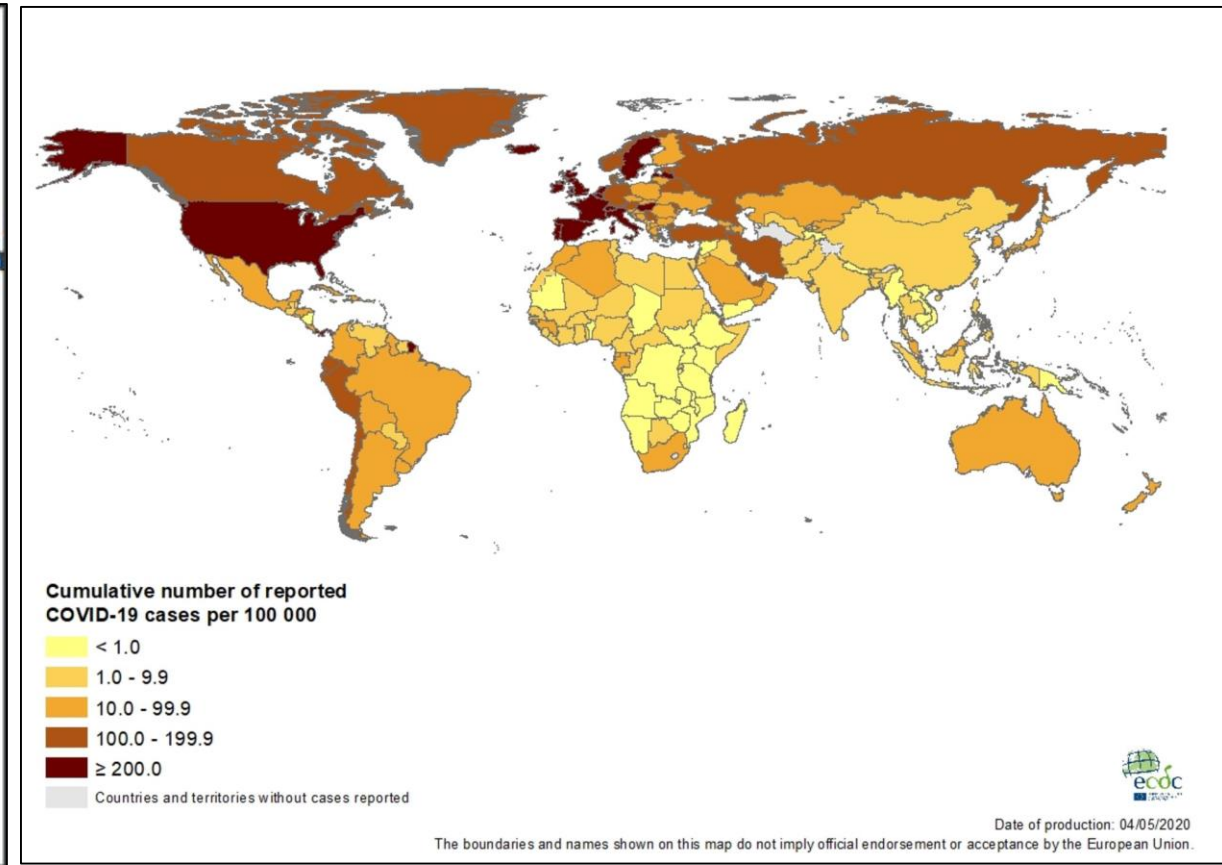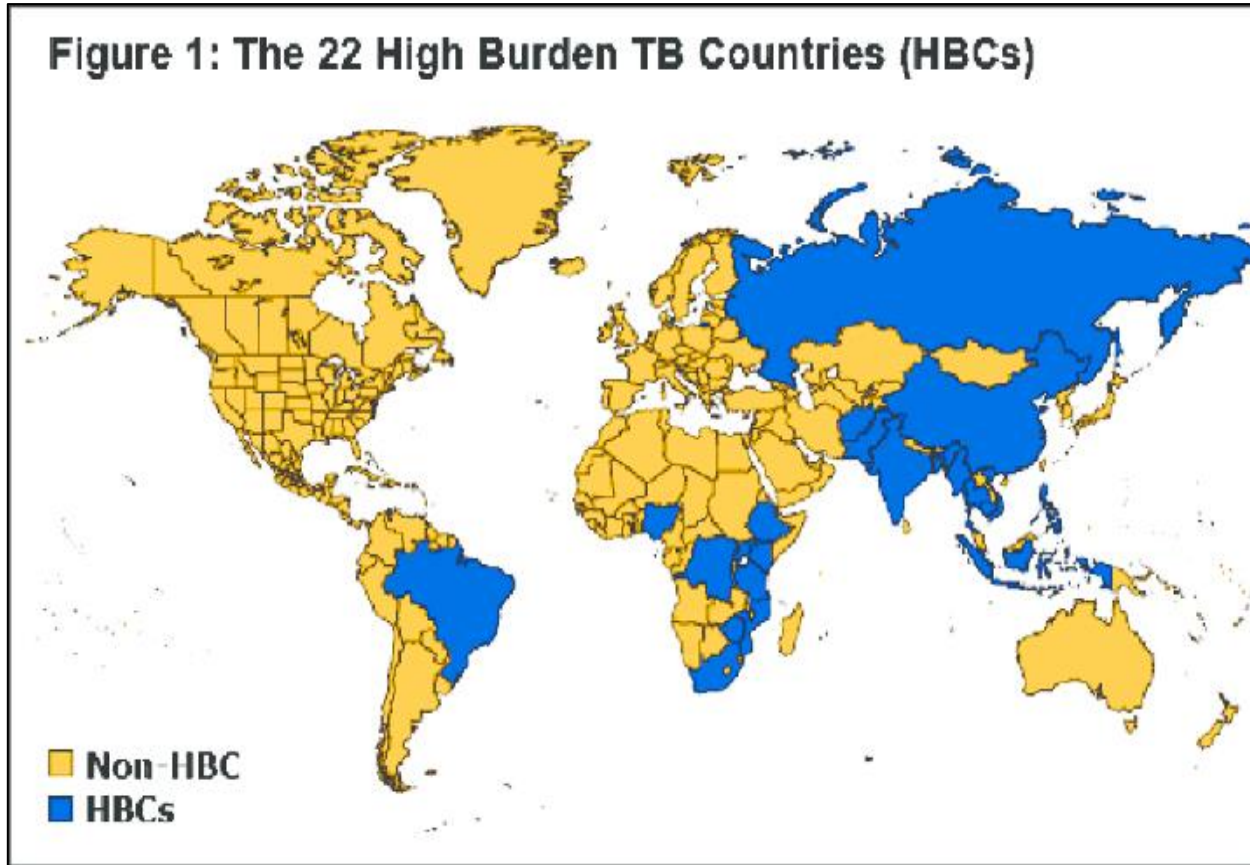
Source: http://www.bcgatlas.org/

Comparison of COVID distribution in malaria endemic zone
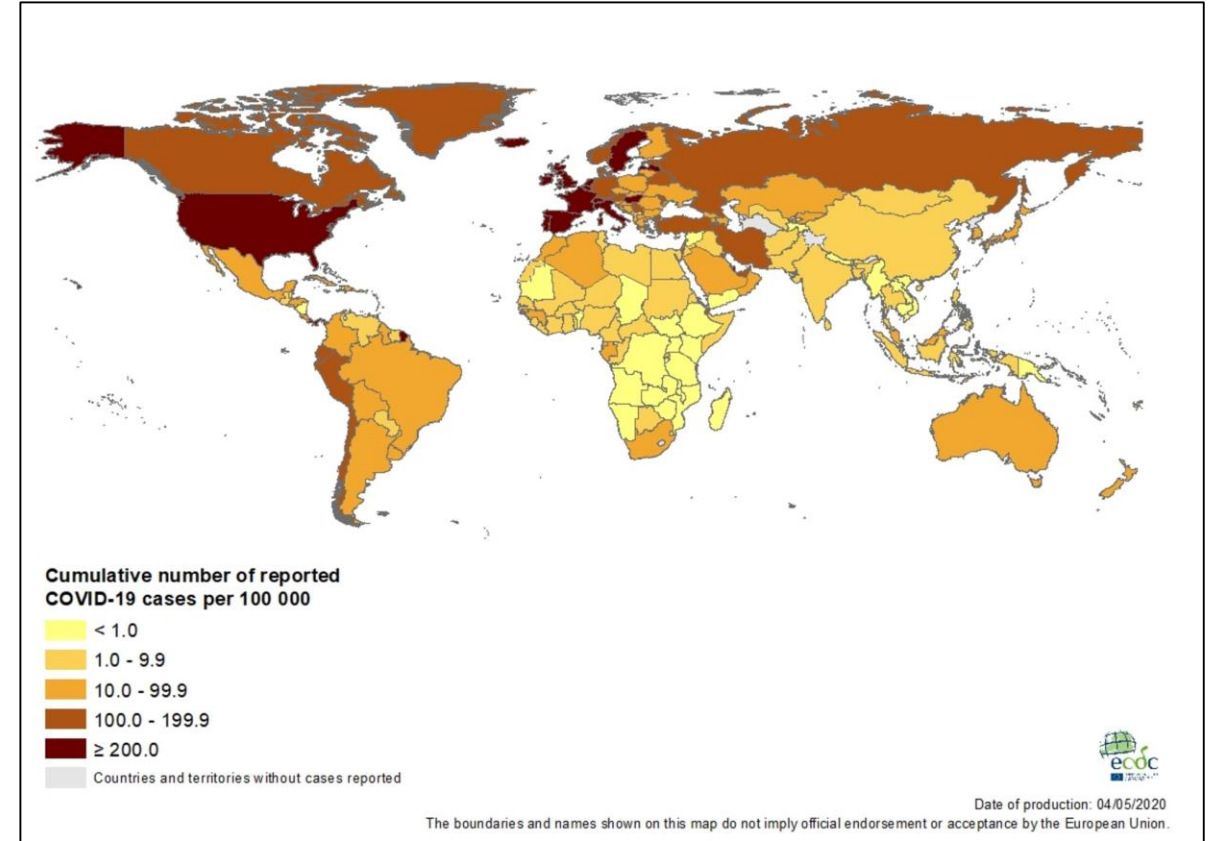
The comparison of the two maps shows clearly that the malaria endemic zone highlighted countries (in left) are distinctly showing less number of Covid-19 cases as compared to other countries.
(https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases)

Comparison of COVID distribution in High TB Burden Countries

Figure 1: The 22 High Burden TB Countries (HBCs)

Non-HBC
HBCs

Cumulative number of reported
COVID-19 cases per 100 000

< 1.0
1.0 - 9.9
10.0 - 99.9
100.0 - 199.9
≥ 200.0
Countries and territories without cases reported

Date of production: 04/05/2020
The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union.

The comparison of the two maps shows clearly that the countries identified as high TB burden countries (highlighted in blue in left) are distinctly showing less number of Covid-19 cases as compared to other countries.

(https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases)

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Conclusion

After 4 months of data collection, its distinctly observed that.....

- Countries exposed to varied infection or high infection burden have low case incidence and fatality rate.

- Although distinct Correlations are not established, Associations are clearly observed.

- In short, we know phenomena is happening but we don't know why??

# Covid 19- Statistics- Indian Scenario

- According to the study conducted by Scientists at the "Institute of Mathematical Sciences (IMS)" in Chennai, the reproductive rate, Ro – has gone down from 1.83 on 6th April to 1.29 on 2nd May, 2020 (https://theprint.in/health/indias-r0-lowers-further-to-1-29-say-scientists-predict-covid-cases-at-30000-by-3-may/411421/)

- But its difficult to predict how the Ro will change once the lockdown ends. Any change in rate will only be perceptible following a delay of 10 to 14 days after the lockdown is lifted.

- ***So how do we go about??***

Impact of Lock Down & Social Distancing

April
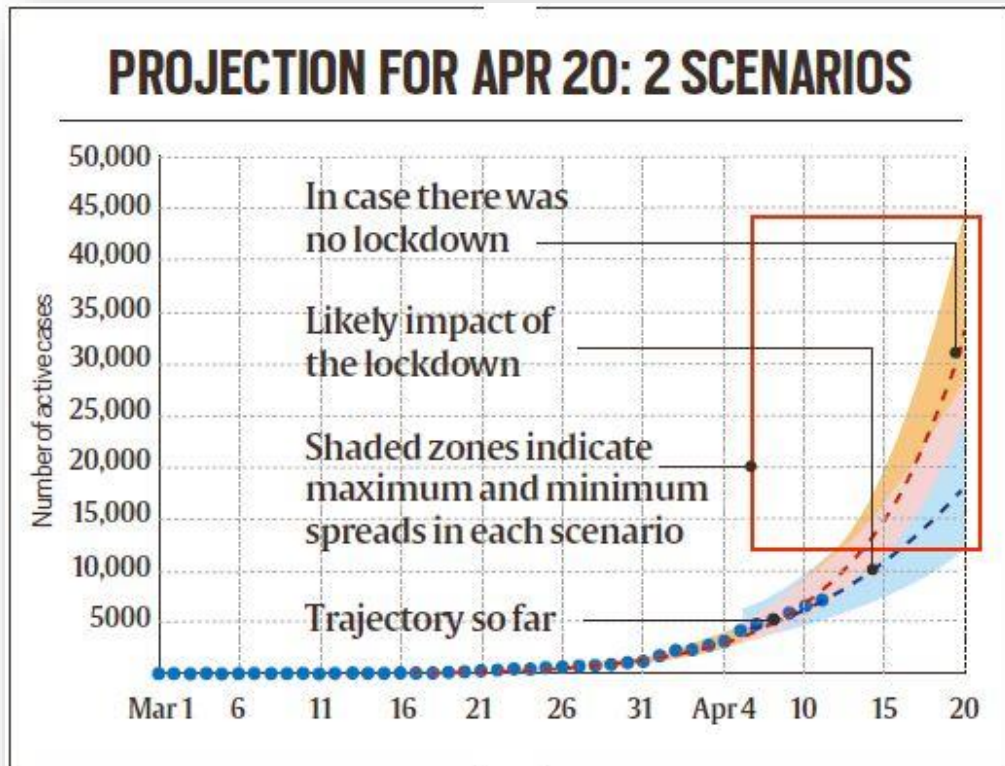
May
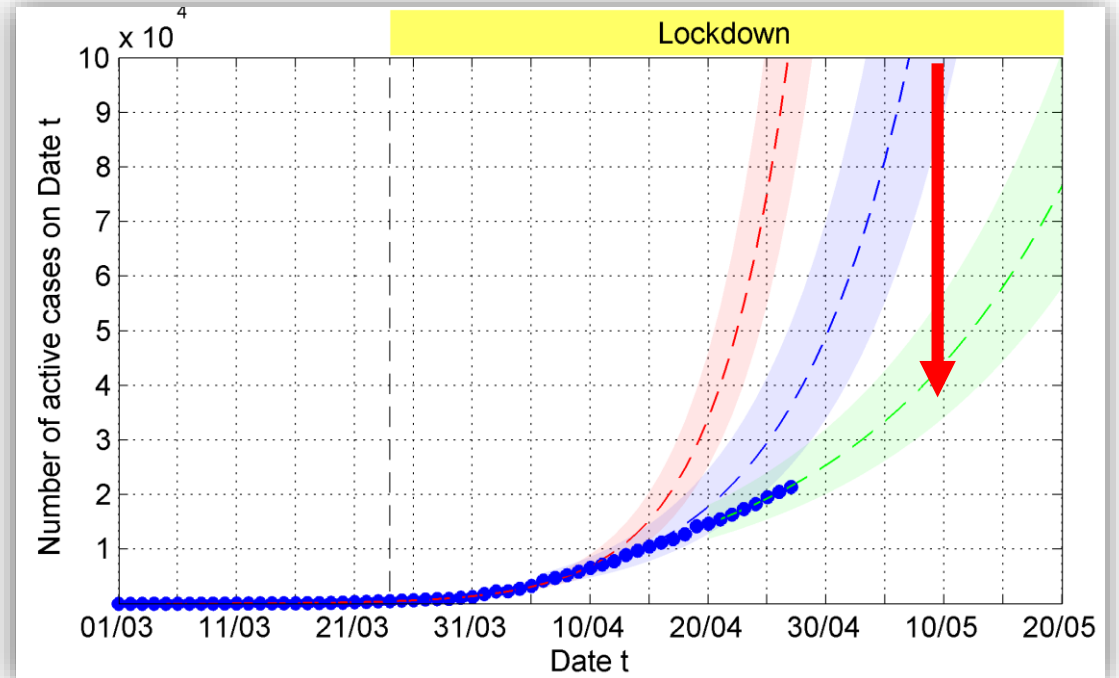
How do we move forward?

- Lockdown and Social Distancing has definitely brought down the pace of spread of illness.

- The Ro has reduced from 1.83 on 6th April to 1.28 on 2nd May.

- Government and people need to keep patience till Ro comes down to at least 1 and below.

- But at the same time, the economic shutdown has affected people all across with poor affected the most.

- Hence a strategy needs to be designed to balance both.

- Allowing economic activity in areas which are less affected and containing areas which have more cases.

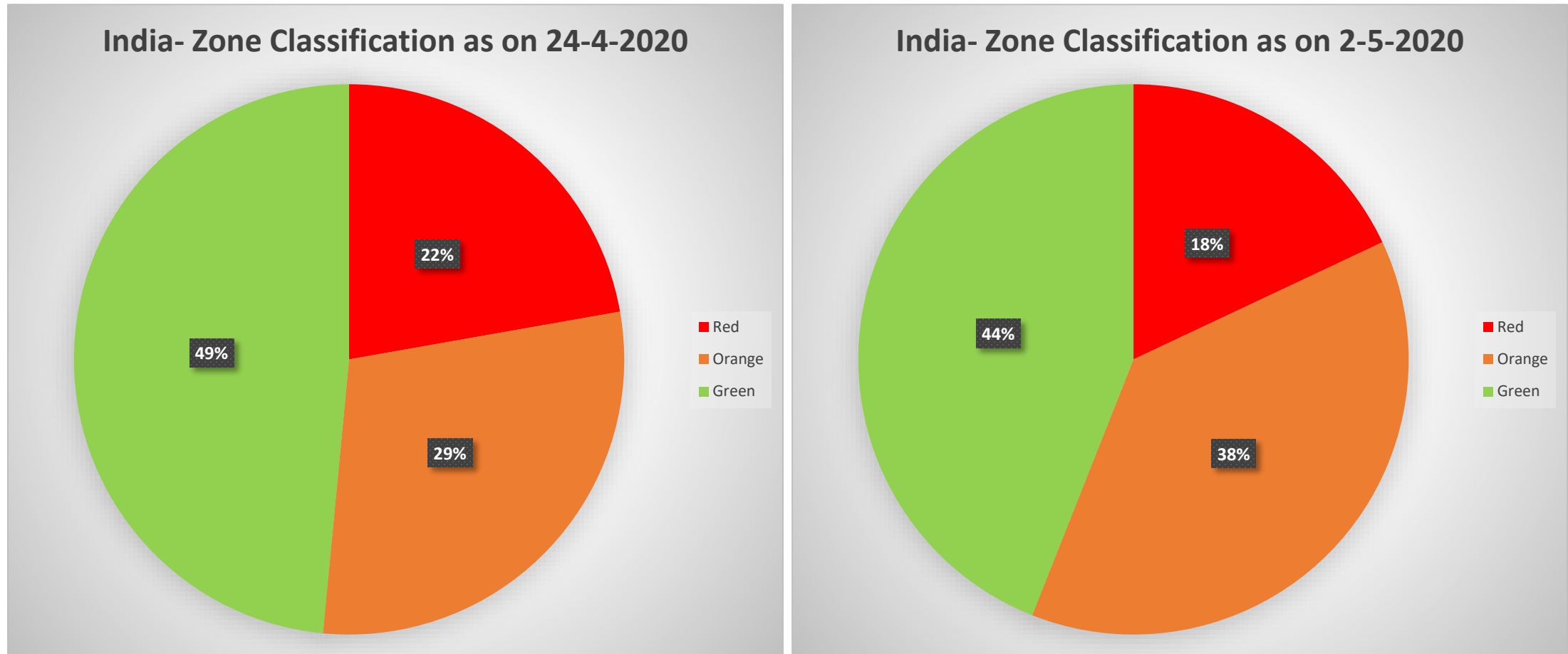- Hence Government have divided areas into zones, red, orange ad green based on the activity of disease in that areas.

HOTSPOT

'Hotspots' have been identified on the basis of areas where large COVID-19 outbreaks have been reported or in clusters with a significant spread of the disease according to the guidelines issued by the Ministry of Health and Family Welfare (MoHFW), Government of India.

Zone Definition

- RED ZONE: All the hotspot districts with large outbreaks and clusters

- ORANGE ZONE: Districts which have not seen any new cases in the last 14 days

- GREEN ZONE: All the non-infected districts are currently considered as Green Zones. A red zone district can be moved to the green zone if there is no new case seen in the last 28 days and an orange zone district can be moved to the green zone if there is no new case seen in the last 14 days.

Covid 19 status as on 2-5-2020

India- Zone Classification as on 24-4-2020

- 22% Red
- 29% Orange
- 49% Green

India- Zone Classification as on 2-5-2020

- 18% Red
- 38% Orange
- 44% Green

Almost 82% of India is in Green and Orange Zone. Hence, we need aggressive engagement in only with 20% of India. This helps resource mobilization.

Top 15 States in Red zone in India

State #	State	Red Zone %
1	CHANDIGARH	100%
2	DELHI	100%
3	Andhra Pradesh	46%
4	WEST BENGAL	43%
5	MAHARASHTRA	39%
6	ANDAMAN & NICOBAR ISLANDS	33%
7	TAMIL NADU	32%
8	GUJARAT	27%
9	UTTAR PRADESH	25%
10	RAJASTHAN	24%
11	JAMMU & KASHMIR	20%
12	TELANGANA	18%
13	PUNJAB	17%
14	MADHYA PRADESH	16%
15	KERALA	14%

Population Demographics of Red zone

STATE	Population density/Km2	Urban Population%	Rural Population%	Red Zone %
CHANDIGARH	**9252**	97.25	2.75	100%
DELHI	**11297**	97.5	2.5	100%
Andhra Pradesh	303	29.47	70.53	46%
WEST BENGAL	1029	31.87	68.13	43%
MAHARASHTRA	365	45.22	54.78	39%
ANDAMAN & NICOBAR ISLANDS	46	37.7	62.3	33%
TAMIL NADU	555	48.4	51.6	32%
GUJARAT	308	42.6	57.4	27%
UTTAR PRADESH	828	22.27	77.73	25%
RAJASTHAN	201	24.87	75.13	24%
JAMMU & KASHMIR	98	26.11	73.89	20%
TELANGANA	312	38.88	61.12	18%
PUNJAB	550	37.48	62.52	17%
MADHYA PRADESH	236	27.63	72.37	16%
KERALA	859	47.7	52.3	14%

States with high population density and majorly Urban population are mainly in RED zone
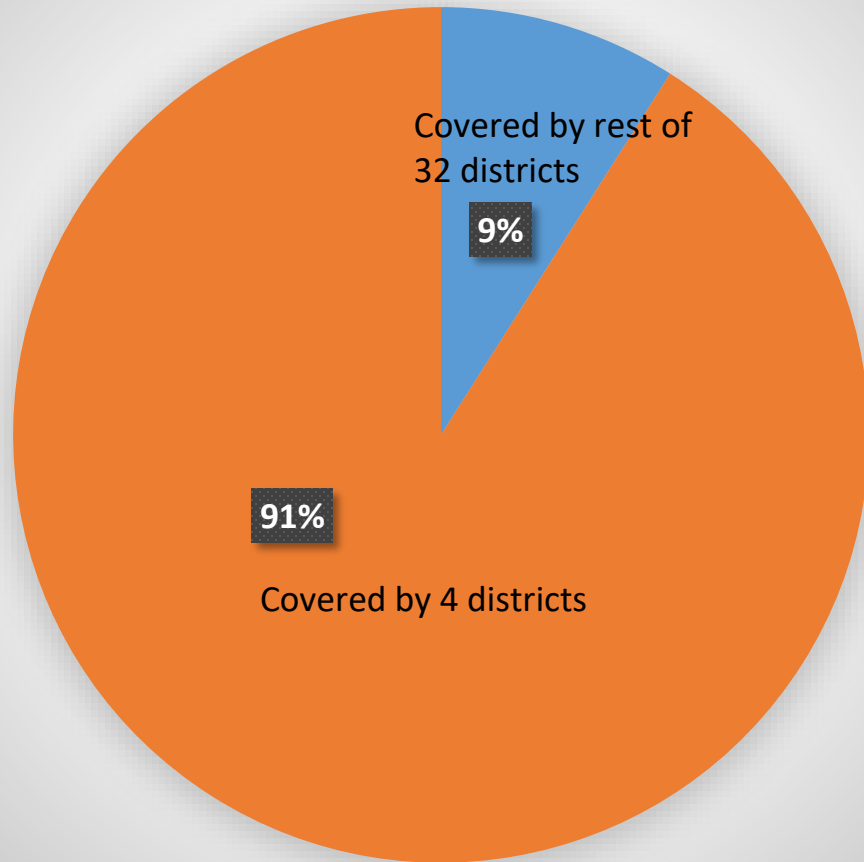
Contribution of Major cities in Red zone states

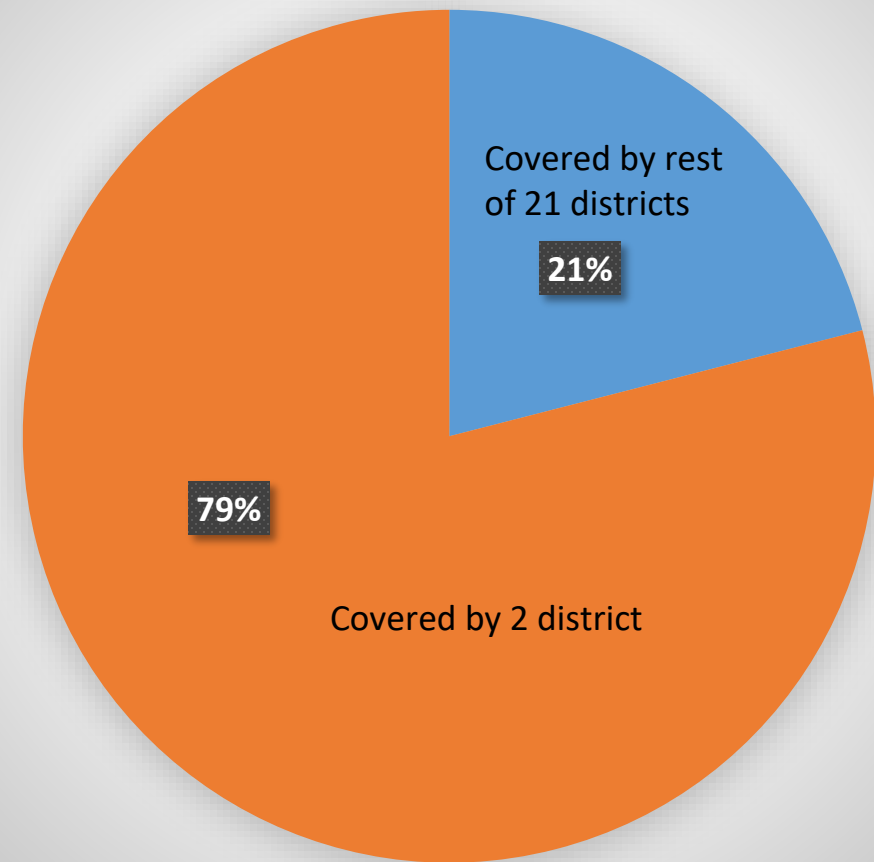| STATE Population	Total District	Population of Major cities	% of cases of state contributed by Major cities
CHANDIGARH (9258)	1	Chandigarh (9258)	100%
Delhi (11297)	11	North East Delhi (36155)	Due to Nizamuddin incident
		Shahdara (30709)	
		Central Delhi (27730)	
		East Delhi (27132)	
WEST BENGAL (1029)	23	Kolkata (24306)	79% by 3 districts
		Howrah (3306)	
		North 24 Parganas (2445)	
MAHARASHTRA (365)	36	Mumbai suburban (20980), Mumbai City (19652)	91% by 4 districts
		Thane (1157)	
		Pune (603)	
TAMIL NADU (555)	38	Chennai (26076)	30% by 2 districts
		Kanniyakumari (1119)	
GUJARAT (308)	33	Surat (1337)	79% by 2 districts
		Ahmedabad (983)	
UTTAR PRADESH (828)	75	Ghaziabad (3987)	48% by 4 districts
		Lucknow (1816)	
		Gautam Buddh Nagar (1286)	
		Agra (1093)	
TELANGANA (312)	33	Hyderabad (18172)	51% by 2 districts
		Medchali (2251)	
MADHYA PRADESH (236)	55	Bhopal (855)	78% by 2 districts
		Indore (841)	

- **Amongst the States in RED zone, most of the contribution of positive cases are through 2-4 major districts in each state.**
- **These are the metro cities like Delhi, Mumbai, Hyderabad, Chennai, Ahmedabad, Surat, Calcutta with International airport**

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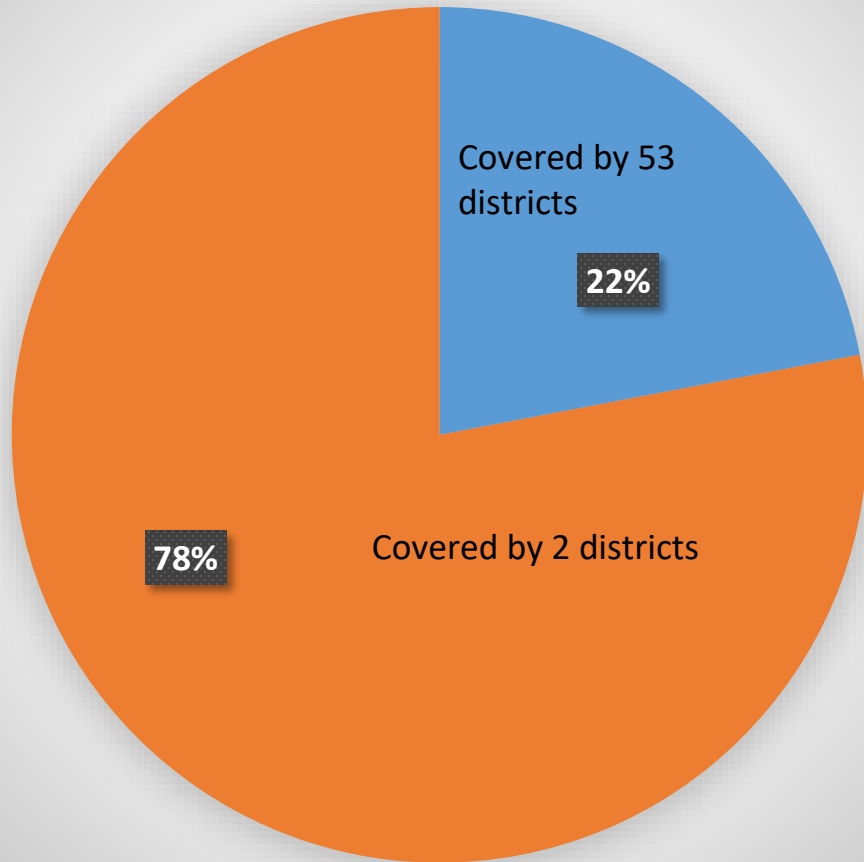# Contribution of Major cities in Red zone states
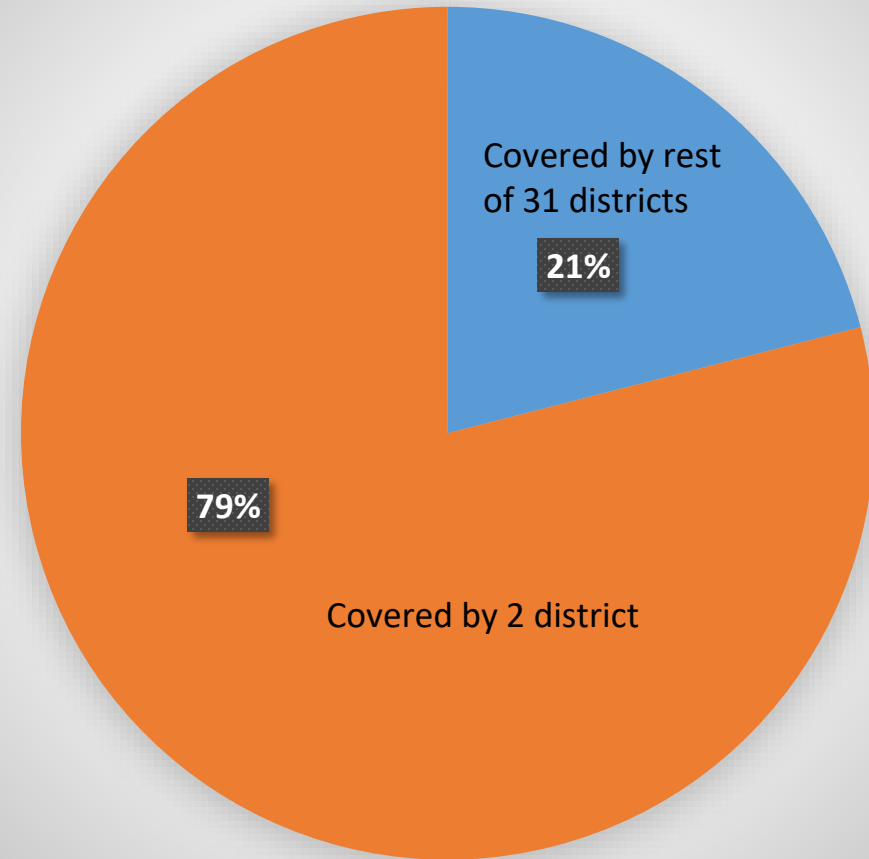
Maharashtra- Total positive cases

Covered by rest of 32 districts

9%

91%

Covered by 4 districts

West Bengal - Total positive cases

Covered by rest of 21 districts

21%

79%

Covered by 2 district

Contribution of Major cities in Red zone states

Madhya Pradesh- Total positive cases

Covered by 53 districts — 22%

Covered by 2 districts — 78%

Gujarat- Total positive cases

Covered by rest of 31 districts — 21%

Covered by 2 district — 79%

Contribution of Major cities in Red zone states

Uttar Pradesh- Total positive cases

Covered by 4 districts — 48%

Covered by 71 districts — 52%
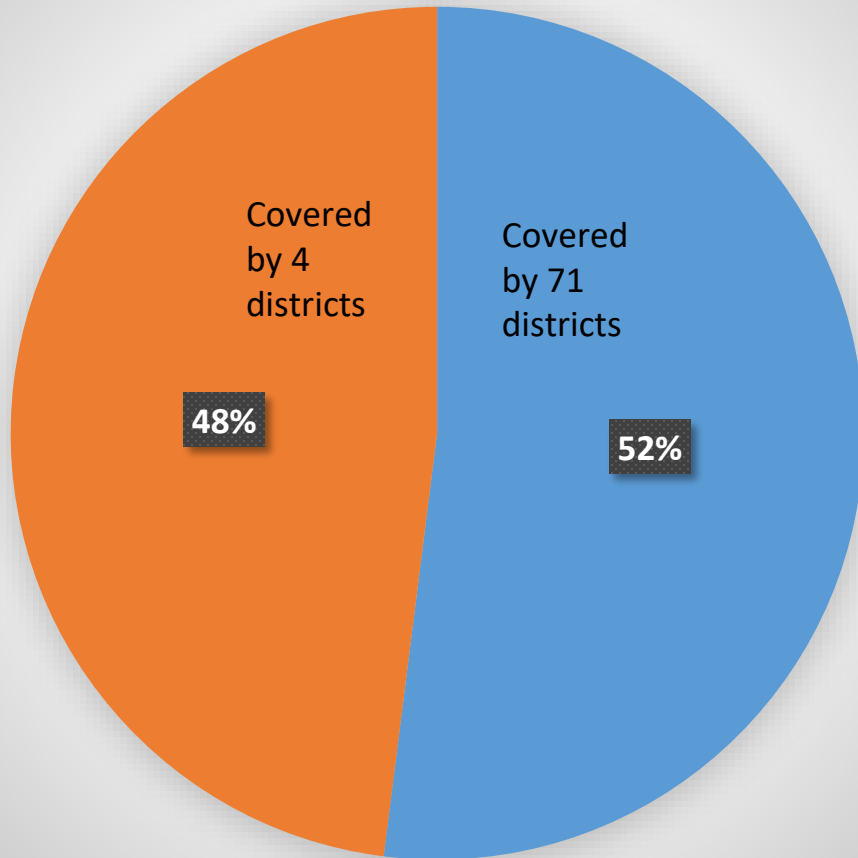
Telangana- Total positive cases

Covered by 2 districts — 51%

Covered by 31 districts — 49%
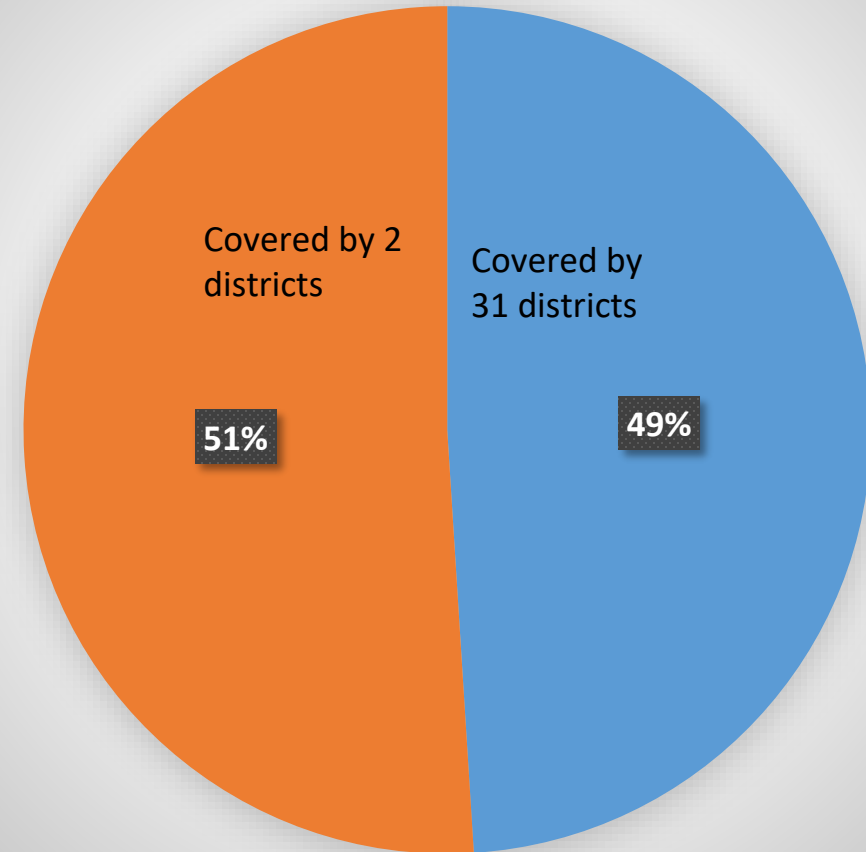
Top 15 States in Green zone in India

State #	State	Green Zone %
1	ARUNACHAL PRADESH	100%
2	Dadra and Nagar Haveli	100%
3	Daman and Diu	100%
4	GOA	100%
5	Lakshadweep	100%
6	MANIPUR	100%
7	MIZORAM	100%
8	Nagaland	100%
9	Sikkim	100%
10	CHATTISGARH	93%
11	ASSAM	91%
12	MEGHALAYA	91%
13	UTTARAKHAND	77%
14	PUDUCHERRY	75%
15	TRIPURA	75%

Population Demographics of Green zone

STATE	Population density/Km2	Urban Population%	Rural Population%	Green Zone %
ARUNACHAL PRADESH	17	22.94	77.06	100%
GOA	394	62.17	37.83	100%
MANIPUR	122	30.21	69.79	100%
MIZORAM	52	52.11	47.89	100%
Nagaland	119	28.86	71.14	100%
Sikkim	86	25.15	74.85	100%
CHATTISGARH	189	23.24	76.76	93%
ASSAM	397	14.1	85.9	91%
MEGHALAYA	132	20.07	79.93	91%
UTTARAKHAND	189	30.23	69.77	77%
TRIPURA	350	26.17	73.83	75%

States with low population density and majorly rural population are mainly in green zone

Observations and Suggestions

1. Detailed analysis of the data suggests that, most of the cases in a particular state   are coming from few specific cities or districts and are **not widely spread across.**

2. Hence, if we do further detailed study of each district we might be able to **identify specific areas or cluster** which predominantly contribute to the cases.

3. Strict containment measures should be practised in areas identified as hot zone clusters.

4. Vigorous Surveillance through health workers

Observations and Suggestions

5. Encourage **early reporting** of symptoms

6. **Aggressive testing** policy in containment zones

7. **Supervised quarantine** facilities

8. High risk positive cases to be treated aggressively in Covid hospitals

9. Encourage Private healthcare facilities and Doctors to resume services for Non Covid illnesses

10. Encourage **Covid testing for all critical patients** and emergency **surgical patients**

11. **All doctors and health workers should be tested due to risk of exposure.**

Observations and Suggestions

12. **State and District borders** should continue to remain **sealed**

13. Gradually **intra district start economic activity** and **revive local businesses** to establish supply chain.

14. Industries, businesses and healthcare establishments should be **encouraged to follow social distancing and hygiene measures at work places**.

15. **Strict surveillance** measures should be implemented to **detect new cases at work places.**

16. Rural economy and pre monsoon agricultural activities should be encouraged.

Cluster Management

1. Strict cluster containment.

2. Use Geo political as well as legal measures to implement containment.

3. Aggressive testing of all people within the cluster, irrespective of their travel or contact history, even if they are asymptomatic.

4. Samples for testing to be collected by doing home visits rather than spending resources on Covid Care Centres.

Cluster Management

5. If tested positive, citizens with enough resources should be home quarantined if they are asymptomatic or with mild to moderate symptoms.

6. Set up call centre to make video or audio call to take daily follow ups to assess the status of asymptomatic individual.

7. Supervised quarantine for high risk citizens and those in high population density area

8. Aggressive Integrative Medical Management if, illness progress

Management of Green and Orange Zone

- Start Intra District economic activity of essential services with strict adherence to social distancing and hygiene measures

- Active surveillance towards early detection and early reporting

- Restrict all social gathering

- Encourage e-commerce and home delivery system for all essential goods

- Promote online transactions through payment portals instead of cash transactions.

- Malls, Theatres, Dining Restaurants, Religious places to remain closed

Policy Concerns

- Maintain uniform policy for testing and reporting all across the country as management strategies are essentially based on the analysis of primary data.

- Institute measures to prevent under reporting of incidence and fatality rate. If not, will loose on the opportunity of early containment of the spread.

- Expand testing protocol to include all critical and emergency surgical patients to rule out Covid.

- Expand testing protocols to healthcare workers and doctors.

Policy Concerns

- Conduct trials for assessment of herd immunity development, this will allow us to take advantage of host immunity of Indian population and make the best use of it.

- Roll out comprehensive (social, economic and medical) schemes for protection and care of elderly population.

- Create health messages to avoid stigmatization of people suffering from corona.

- Roll out comprehensive (social, economic and medical) packages to support health workers, sanitation workers and all the security forces.

the new normal

Accept the New Normal- At home

- Maintain social distancing- No handshake/hugging/ kissing

- Minimize Travel- Local as well as distant travels.

- Avoid International travels until 2021.

- No social gathering

- Encourage hand wash, sanitization and use of mask.

Accept the New Normal- At home

- Eat home made food made with local ingredients.

- Frequent cleaning, mopping and dusting- Convert it into calorie burning exercises.

- Take care of emotional health of self and others

- Care of elderly

- Continue medicines for co-morbid conditions

Accept the New Normal- at Business

- Promote e-commerce.

- Digital transfers of money – avoid cash transactions.

- Improve e-Governance to include all statutory registrations, certificates, licenses etc.

- Tele meetings for education and Industry.

- New sanitation and safety measures for Manufacturing Sectors and Service Industries.

- Continue work from home, where ever possible.

India, Drive Home the Advantage !!

Stay Calm

Stay Safe

Stay Vigilant

Keep Patience