This is a combination of many recent Quora answers of mine related to ongoing COVID19 pandemic.

### My answer to “What is herd immunity, and how can it be effective for countries like India? ”

Originally answered here: <https://qr.ae/pNywoi>

“Herd Immunity” is a state of a communicable disease (epidemic/pandemic) where enough people from the susceptible population have become immunity-wise resistant to the disease so as to not to spread it to more venerable people of society who have weak immunity or who cannot develop immunity (Cancer patients, little children, seniors etc.). These venerable people are typically at more risk during the outbreak.

Once this state is reached, it will end up confining the disease in small pockets of low resistance and pandemic would end as such. Reaching Herd Immunity is thus how any communicable disease will be controlled in the long run. However, how we reach herd immunity is more important than we think. There are people with crazy theories about reaching herd immunity (like injecting young healthy people with virus etc.), however, if there is one thing you should take away from this answer, it is “*Herd Immunity without vaccine is a Joke for a contagious disease”.*

Let’s say for the most contagious diseases out there like measles, if we don’t have a vaccine, how many people need to get infected before herd immunity is achieved. Answer is around 95% of the population. COVID19 is less contagious than measles (but more so than the flu) and hence around 70% of the people need to get infected for herd immunity to be achieved. Think of 70% of 1.3 Billion getting (around 900 million or 90 Crore people) sick if one wants to achieve herd immunity this way. Think of the number of people losing their lives if this happens (3% of 90 Crore is 3 Crore if you try to estimate by Indian numbers and assume that the curve would stay flattened not making the mortality ratio higher)

Another big assumption in the 70% population who get sick develop long term immunity. We are not sure of the fact that a person who gets cured of COVID19 is immune to the disease in the long term, heck the pandemic just started spreading few months back. “*Absence of Evidence is not Evidence of Absence”*. There were some news (not supported too scientifically) that some cured people in South Korea contracted COVID19 again. Other species of Coronavirus that cause common cold dont seem to make humans develop any long term immunity. Everyone contracts cold once or twice a year, every year. If such is the case, you cannot achieve herd immunity ever despite infecting everyone !

We also don’t have any records of long term effects the COVID19 infections are causing. ~~It seems there are none as of now, but what if it weakens some bodily function in the long run ? 70% people weak in a country will be very bad.~~ It seems many people have long term consequences even after they are cured off CoronaVirus. Think of many people in country developing these long term problems : <https://twitter.com/devisridhar/status/1268240519227981828> .

So if we race towards herd immunity blindly, it might turn out to be a disaster. We need to do more scientific research, understand whether immunity is long term / short term and accordingly we need to build onetime/recurrent vaccination regime.

With the recent success of Moderna in initial vaccine trials and confidence of Indian vaccine makers, I think there is a reason to believe that India will be able to build Herd Immunity around COVID19 in maybe 12–18 months. Till then we have to take precautions and maintain social distancing.

[Adar Poonawalla on Twitter](https://twitter.com/adarpoonawalla/status/1262646441983401984)

This would be what helps us to build Herd Immunity.

Refs :

[Here's Why Herd Immunity Won't Save Us From The COVID-19 Pandemic](https://www.sciencealert.com/why-herd-immunity-will-not-save-us-from-the-covid-19-pandemic)

<https://www.modernatx.com/sites/default/files/RNA_Vaccines_White_Paper_Moderna_050317_v8_4.pdf>

### My answer to “Why is COVID-19 spreading relatively slowly in India?”

This was written during the lockdowns, after removal of lockdowns, the rate seems to have fastened a bit. Original answer here: <https://qr.ae/pNKNR5>

As of now (26th April 2020), I would agree that India has been able to somewhat slow the growth of COVID19.

Some things I think which have contributed to it are:

1. (Most if not all) People listen to government. They don’t think that government is sitting and doing nothing and they are cooperating with whatever steps government takes, despite inconveniences. You can see the support for government at very grassroot levels.
2. Indians deal with more communicable disease outbreaks than western countries due to tropical climate and high population. ( [2018 Nipah virus outbreak in Kerala - Wikipedia](https://en.wikipedia.org/wiki/2018_Nipah_virus_outbreak_in_Kerala), [2019 Bihar encephalitis outbreak – Wikipedia](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak) ). They were never thinking of COVID19 as “just another flu”.
3. Lockdowns have been very effective. Except for some idiots and a few religious zealots, the country has taken social distancing carefully. Poor people have displayed real fortitude.

### My answer to “How can machine learning aid in corona virus detection and prevention?”

Originally answered here: https://qr.ae/pNKNRS

I have written an extensive answer here : [Muktabh Mayank's answer to How can machine learning help against COVID-19?](https://www.quora.com/How-can-machine-learning-help-against-COVID-19/answer/Muktabh-Mayank)

I will just copy it so that you dont have to click the link :

AI and Machine Learning can help in many ways against COVID 19 :

**Diagnostics :** It can help doctors read slides, XRays , CT Scans faster by making things simpler for them by pre-categorizing scans as +, - , confusing etc. Here is a dataset to create a COVID19 detector in XRays : [ieee8023/covid-chestxray-dataset](https://github.com/ieee8023/covid-chestxray-dataset)

. Some relevant discussion on Fast AI : [Notebook COVID-19 x-ray 3.7% error rate](https://forums.fast.ai/t/notebook-covid-19-x-ray-3-7-error-rate/66557). Here is an RSNA paper to detect COVID19 from CT Scans: <https://pubs.rsna.org/doi/10.1148/radiol.2020200905>

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**Triage:** As you know that test kits for COVID19 are a important resource. Due to this their usage is rationed and triaged. A classifier can be trained to determine whether a person showing features should be tested or kept in quarentine immediately based on the locality they live in, their day-to-day interaction with people, their closest COVID19 case and other variables. An example project here: [Machine learning for rapid triaging of Covid-19 at the front door of hospitals: request for data](https://www.interacademies.org/news/machine-learning-rapid-triaging-covid-19-front-door-hospitals-request-data)

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**Forecasting:** Bayesian Modelling (and other Machine Learning models) can be used to forecast various effects of the pandemic. Here is some analysis by Thomas Wiecki analyzing growth. [COVID-19 Growth Analysis](https://www.quantopian.com/posts/covid-19-growth-analysis)

. SIR models used to model epidemics are not exactly Machine Learning, but rather simulations and differential equations, but its quite interesting to see for people interested in Maths and Data.

**Discovering Drugs and Proteins:** AI can help test different drugs proteins against COVID19. You might have heard of the Deepmind AlphaFold algorithm which came out a few days back: [AlphaFold makes its mark in predicting protein structures](https://techxplore.com/news/2020-01-alphafold-protein.html)

. Its now being used to predict protein structures for COVID 19: [Computational predictions of protein structures associated with COVID-19](https://deepmind.com/research/open-source/computational-predictions-of-protein-structures-associated-with-COVID-19) . Such a Just in Time discovery. Another way is using Generative AI to create new possible compounds that can fight the disease: [Drug Discovery AI to Scour a Universe of Molecules for Wonder Drugs](https://singularityhub.com/2017/11/19/drug-discovery-ai-to-scour-a-universe-of-molecules-for-wonder-drugs/) and [TCS partners with CSIR to design AI based drug discovery process for COVID-19 - Express Computer](https://www.expresscomputer.in/news/tcs-partners-with-csir-to-design-ai-based-drug-discovery-process-for-covid-19/51647/)

are some relevant pieces of news.

**Sifting Available Research:** Many high priority questions whose answers are needed to solve COVID19 could have already been worked on some scientists who probably don’t even know their work can save the world. This is an immense matchmaking problem. Text Mining/ Machine Learning approaches can help sift through huge research literature to find out what’s already known and can be used. There is a huge dataset on Kaggle (curated by some really serious people) where Data Scientists can participate and help discover answers : [COVID-19 Open Research Dataset Challenge (CORD-19)](https://www.kaggle.com/allen-institute-for-ai/CORD-19-research-challenge)

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**Quick Testing:** A brilliant idea of doing a basic screening by recording sounds of breath may be achieved by Deep Learning. This can screen people on a smartphone, at their homes, for almost zero cost, without spending any money for procuring test kits, at whatever scale is desired. A project by NYU/FAIR to collect data has started here: [Breathe for science](https://www.breatheforscience.com/)

### My answer to “How many countries are working on the COVID-19 vaccine? Has anyone succeeded so far?”

Originally answered here: <https://qr.ae/pNKNR3>

There are over 120 potential vaccines for CoronaVirus being developed : [Draft landscape of COVID-19 candidate vaccines](https://www.who.int/who-documents-detail/draft-landscape-of-covid-19-candidate-vaccines)

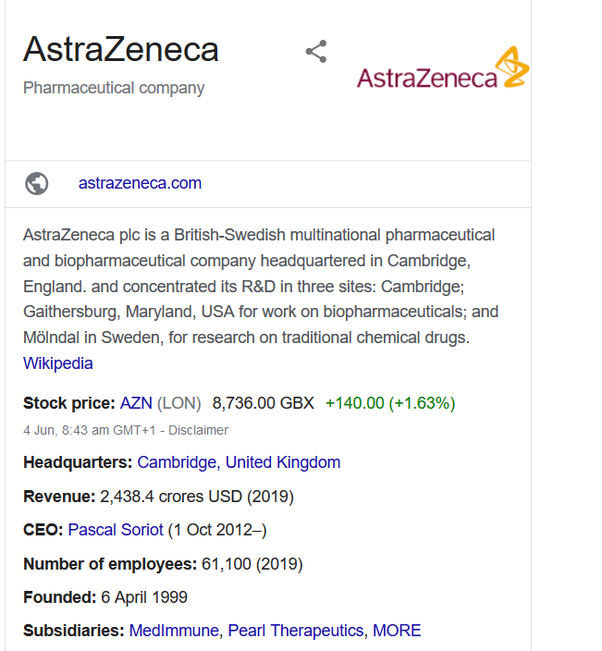
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10 of them are in clinical trials now.

What the person asking the question doesn’t understand is that unlike defense or nuclear engineering, “industrial” research in the world is almost never restricted by country boundaries. In fact, most research in vaccines is driven by financial incentive of making money for investors out of it. A lot of these vaccines are being developed by a collaboration of companies headquarters in different countries (and their research facilities located in sometimes countries where they are not officially from). Unlike say Socialist (Political Capitalist ?) China (whose public companies are sometimes still collaborating with other companies and countries), western Capitalism doesn’t work on National desires or needs or government policies, but, cater to simple supply-demand. Countries are incentivizing companies by making the financial outcome more lucrative at best : [AstraZeneca receives $1 billion in U.S. funding for Oxford University coronavirus vaccine](https://www.cnbc.com/2020/05/21/coronavirus-us-gives-astrazenena-1-billion-for-oxford-vaccine.html)



$1B, AstraZeneca must be US company right ? (Because Oxford sure as hell is not in US). **No.**



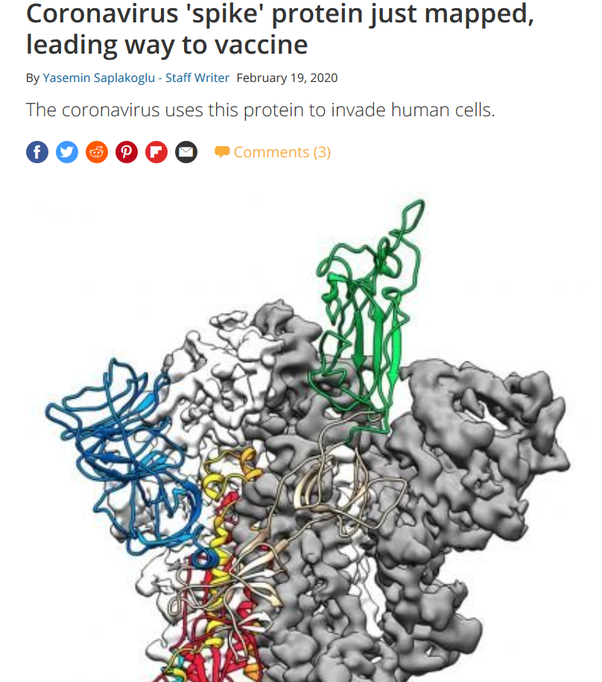
So no, unlike how probably some countries (or people) might be thinking of making vaccine as a new “Space Race”, its actually just a bid to make a good early bird into market.

Let’s speak about 3 promising candidate vaccines ::

**Oxford-AstraZeneca vaccine:**

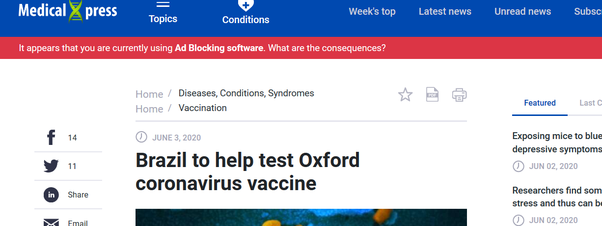
The above mentioned *Oxford-AstraZeneca vaccine* is one of the promising ones. It is a “Non-Replicating Viral Factor”, that is it doesn’t really introduce any multiplying genetic material of virus into the body but rather will teach the immune system to target other structures of the virus, like the spike protein. That is done by introducing weakened Adenoviruses (which dont cause any disease in humans) with material to produce CoronaVirus like spike proteins.

[Coronavirus 'spike' protein just mapped, leading way to vaccine](https://www.livescience.com/coronavirus-spike-protein-structure.html)



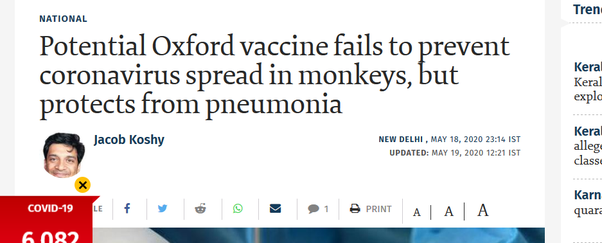
It has been proven to be safe for humans in first few trials and larger trials are now starting in Brazil. (The current epicenter of the disease).

[Brazil to help test Oxford coronavirus vaccine](https://medicalxpress.com/news/2020-06-brazil-oxford-coronavirus-vaccine.html)



However, we still don’t know if medicine works. All we know is that it is safe. It doesn’t work well in monkeys and if it were an ideal world, the vaccine would not have been tested anymore.

[Potential Oxford vaccine fails to prevent coronavirus spread in monkeys, but protects from pneumonia](https://www.thehindu.com/news/national/potential-oxford-vaccine-fails-to-prevent-virus-spread-in-monkeys/article31617852.ece)



You now understand probably why we need many parallel vaccine candidates. (And also understand that the most promising vaccine we have is ineffective on monkeys with COVID19 infection).

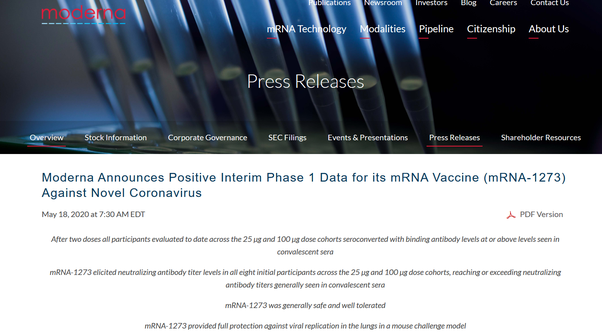
**Moderna vaccine:**

The other vaccine which is promising is the *Moderna mrna* based vaccine.

Moderna is a US startup (or you can call it a relatively smaller public pharma company, quite tiny as compared to other big Pharma involved).

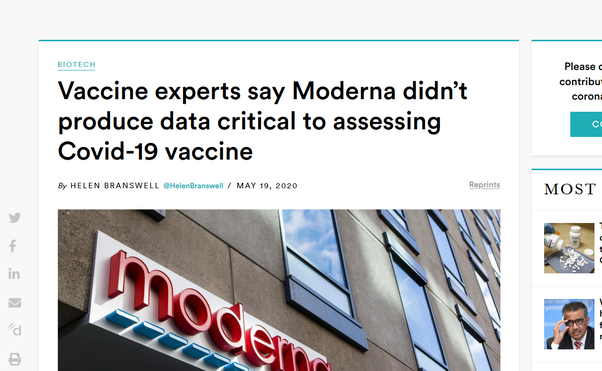
The clever thing about Moderna vaccine is the technique it uses. It literally genetically engineers human cells to produce material that would trigger an immune response to COVID19 infection. (Which is done by infecting humans with a genetically engineered bacteria). The genetic material introduced into humans for producing this immune response for CoronaVirus is not actually its DNA/RNA but rather its mRNA (mitochondrial RNA). This makes sure that no replication of CoronaVirus genetic material occurs (mrna doesnt cause replication), while the immune cells learn to recognize the CoronaVirus components and kill the cells containing them. This technique is new and has never been used for any vaccine before COVID19.

The initial results (according to Moderna and Dr. Fauci) seem to be promising. [Moderna Announces Positive Interim Phase 1 Data for its mRNA Vaccine (mRNA-1273) Against Novel Coronavirus | Moderna, Inc.](https://investors.modernatx.com/news-releases/news-release-details/moderna-announces-positive-interim-phase-1-data-its-mrna-vaccine)



However, that is just data that company has released. As of now, I don’t know about if they have an official publication for the results of study. That is what a lot of people are complaining about as well.

[Vaccine experts say Moderna's Covid-19 data leave big questions](https://www.statnews.com/2020/05/19/vaccine-experts-say-moderna-didnt-produce-data-critical-to-assessing-covid-19-vaccine/)

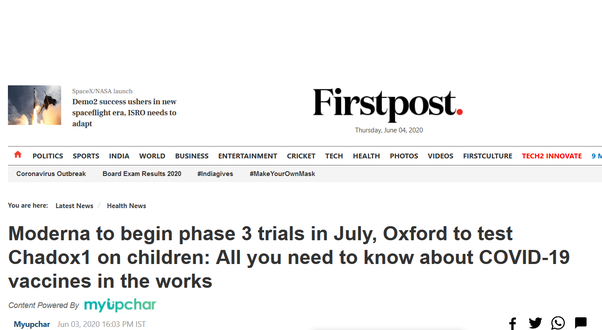


Moderna has started its Phase 2 trials and Phase 3 trials will start in July.

[Moderna starts dosing in Phase II Covid-19 vaccine trial](https://www.clinicaltrialsarena.com/news/moderna-phaseii-vaccine-trial/)



[Moderna to begin phase 3 trials in July, Oxford to test Chadox1 on children: All you need to know about COVID-19 vaccines in the works - Firstpost](https://www.firstpost.com/health/moderna-to-begin-phase-3-trials-in-july-oxford-to-test-chadox1-on-children-all-you-need-to-know-about-covid-19-vaccines-in-the-works-8443411.html)



**Sinovac Vaccine:**

Now lets see about the Sinovac vaccine. Sinovac as it sounds from the name, is a Chinese public company. It has more than one candidate vaccine but there is one for which it has made some public data available. [Rapid development of an inactivated vaccine for SARS-CoV-2](https://www.biorxiv.org/content/10.1101/2020.04.17.046375v1)

. The paper claims that SinoVac vaccine cures monkeys from COVID19, something that Oxford vaccine could not.

The vaccine works by first multiplying and then killing SARS-COV-2 viruses by dipping them into an organic chemical and then injecting the dead virus into humans to make immune system learn to fight COVID19. They have started clinical trials too:

[Three COVID-19 vaccines approved for clinical trials](https://covid-19.chinadaily.com.cn/a/202004/15/WS5e965bb8a3105d50a3d163de.html)



This vaccine is also being tried outside China.

[Coronavirus: China’s Sinovac Biotech in talks to test Covid-19 vaccine globally](https://www.livemint.com/news/world/coronavirus-china-s-sinovac-biotech-in-talks-to-test-covid-19-vaccine-globally-11588937378011.html)



If you look at the list of potential vaccines, there are vaccine candidates from Europe, Japan, India etc. apart from famous ones like those from US, UK, China based companies.

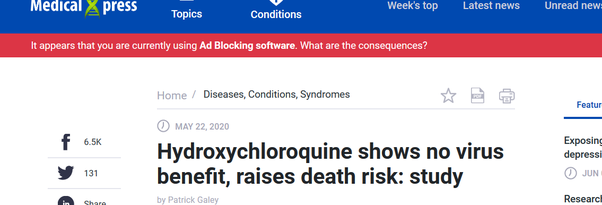
### My answer to “Is hydroxychloroquine hype or hope?”

Originally answered here: https://qr.ae/pNKNRd

From what we know right now, HydroxyChloroquine (HCQ) is one of the most practical methods we have to prevent COVID19 in frontline workers and serious patients.

1. There is some indication that it works : [Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7102549/). It is actually one of the prescriptions in recommended approach to ICU management in COVID19: [Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30161-2/fulltext)
2. Its side effects are known. Proper trials have been done. So doctors can calculate how much of a tradeoff it is to prescribe.
3. It is cheap and can be produced in large quantities. Thus can be used by poor countries, who really have no other alternatives.
4. Other Anti-Virals that have been proposed have similar “not sure if it works” results with no clinical trials and studies on side effects.

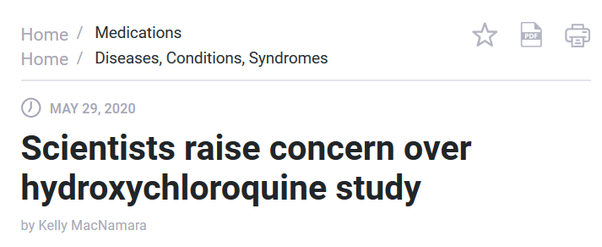
If this question was asked in context of latest Lancet study : [Hydroxychloroquine shows no virus benefit, raises death risk: study](https://medicalxpress.com/news/2020-05-hydroxychloroquine-coronavirus-benefit-death.html)



Link to the study observations here: [Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31180-6/fulltext)

The issue gathered steam and WHO paused HCQ trials and France and a few other countries stopped prescribing HCQ. (India/Brazil etc still continued the prescriptions).

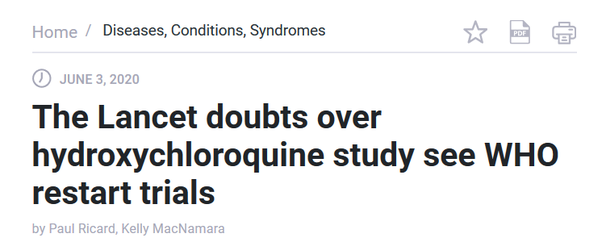
This study seems to have some grave issues : [Scientists raise concern over hydroxychloroquine study](https://medicalxpress.com/news/2020-05-scientists-hydroxychloroquine.html)



The dataset for study was not exactly public and was not from a randomized trial. After may scientists expressed concerns, Lancet actually issued doubts about the published study itself: [Expression of concern: Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31290-3/fulltext)

As of now, WHO trial for HCQ has been restarted (and its result is what we should believe about efficacy of HCQ) and HCQ continues to be prescribed.

[The Lancet doubts over hydroxychloroquine study see WHO restart trials](https://medicalxpress.com/news/2020-06-hydroxychloroquine-coronavirus-trials-resume.html)



So, for now, we still dont have enough data, but given data right now, it seems HCQ is a good bet. Time will tell.

### My answer to “How plausible is it to implement Sweden's model of herd immunity in a country like India to fight COVID-19?”

Originally answered here: <https://qr.ae/pNKN88>

Sweden’s herd immunity model was a failure :

["Could Have Done Better, Clearly," Says Man Behind Sweden's COVID-19 Plan](https://www.ndtv.com/world-news/sweden-coronavrus-could-have-done-better-says-man-behind-swedens-covid-19-plan-2240104)

[We should have done more, admits architect of Sweden's Covid-19 strategy](https://www.theguardian.com/world/2020/jun/03/architect-of-sweden-coronavirus-strategy-admits-too-many-died-anders-tegnell)



[Sweden's coronavirus plan is a 'failure', opposition politicians say](https://www.dailymail.co.uk/news/article-8401823/Swedens-coronavirus-plan-failed-miserably-opposition-politicians-declare.html)

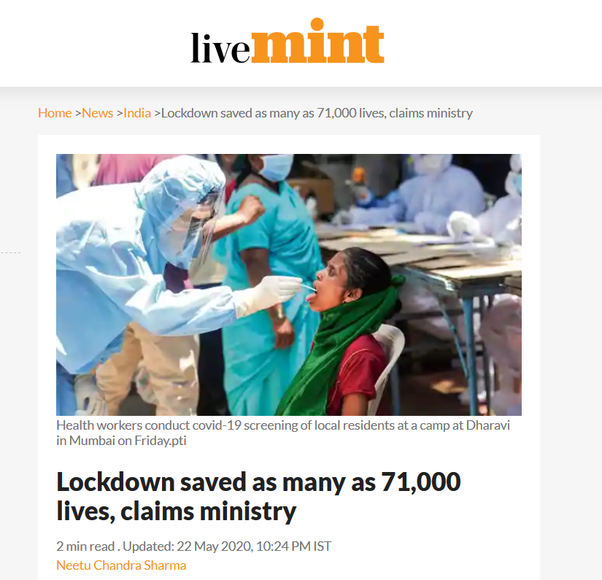


India’s lockdowns on the other hand were quite successful.

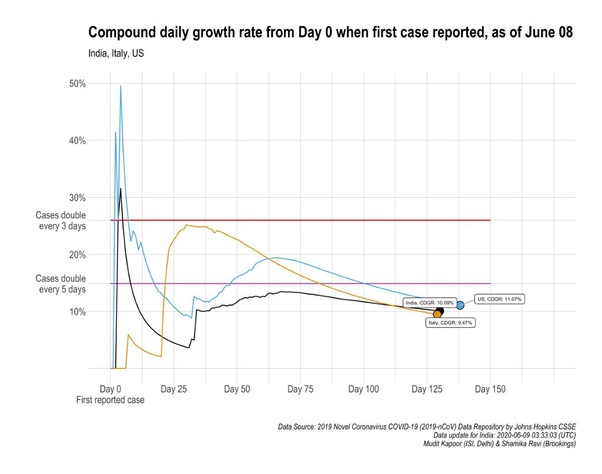
[Lockdowns may have averted 3 million deaths in Europe by curbing Covid-19: Study - Times of India](https://timesofindia.indiatimes.com/world/europe/lockdowns-may-have-averted-3-million-deaths-in-europe-by-curbing-covid-19-study/articleshow/76269187.cms)



[Lockdown saved as many as 71,000 lives, claims ministry](https://www.livemint.com/news/india/lockdown-saved-as-many-as-71-000-lives-claims-ministry-11590166354449.html)



You can generally see that India’s Corona curve had a consistently falling doubling rate due to quickly implemented lockdowns.

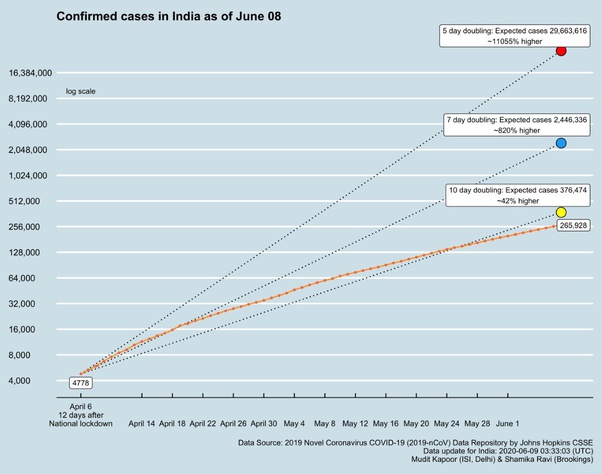


Source:

[Prof Shamika Ravi on Twitter](https://twitter.com/ShamikaRavi/status/1270229327578308608/photo/1)

Compare it to other countries like US and Italy where an immediate lockdown was not imposed. That saved many many lives, unprepared people are the most vulnerable in a pandemic.

Although the condition is getting worse in Delhi (where most of the media is an thus reports on television have become gloomy), as of now, India seems to be recovering as a whole :



Source:

[Prof Shamika Ravi on Twitter](https://twitter.com/ShamikaRavi/status/1270228654732296192/photo/1)

Look at other possible paths the curve could have taken. A strategy like Sweden would have required many-many deaths in the country before the disease could have been contained.

Herd Immunity without vaccine is a joke.

### My answer to “Is the Indian government adopting a herd immunity strategy by easing up lockdown restrictions?”

Originally answered here: <https://qr.ae/pNKN8G>

No. Herd Immunity is not a practical solution : [Muktabh Mayank's answer to What is herd immunity, and how can it be effective for countries like India?](https://www.quora.com/What-is-herd-immunity-and-how-can-it-be-effective-for-countries-like-India/answer/Muktabh-Mayank). Herd Immunity means exposing (almost) everyone to the virus and waiting to see who comes out alive, that would be disastrous.

What Indian government is trying to do is to keep the infected numbers to the minimum possible as long as a vaccine/cure is not found out. We had early lockdowns to try:

1. If we could just crush the curve. That is have a flattened curve in areas with virus going up. Stop movement of people and make sure the rest of the country could reopen. Eventually the hotzones would cool off too.
2. We could produce enough PPEs, Hand Sanitizers, HCQ etc so that we can look after the sick.

Here’s what Crushing the curve is:

1. Immediate Action
2. Travel Restrictions
3. Lockdowns
4. Test + Isolate
5. Wait for curve to slowly go down.

Prof. Yaneer Bar-Yam explaining it below :

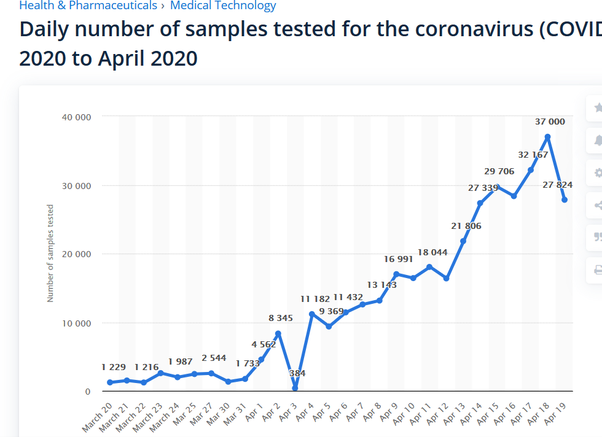


https://youtu.be/fXUVFqKKcBM

While for countries with smaller population, 1 is easy to achieve, that is the infections can be brought down to zero just using lockdowns. it turns out for countries with large populations (We don’t know much about China, but everyone below China in population like India, Indonesia, US, Brazil, Russia…) the amount of lockdowns required is longer (just due to large numbers) to crush the curve altogether. So for example, a country with small population like New Zealand needs to wait lesser to crush the curve than say Indonesia. The patience of people will die after sometime and they stop supporting the lockdowns. India started seeing on-foot movement of people despite all transport disabled and UBI announcements. Public servants and representatives were afraid of lighter government coffers , businessmen became restless and people were slowly more afraid of economy tanking than the virus itself. One cannot thus continue the the lockdowns and travel restrictions. *So we are trying to have a midway approach : Reopen and try to restrict infections despite of that.*

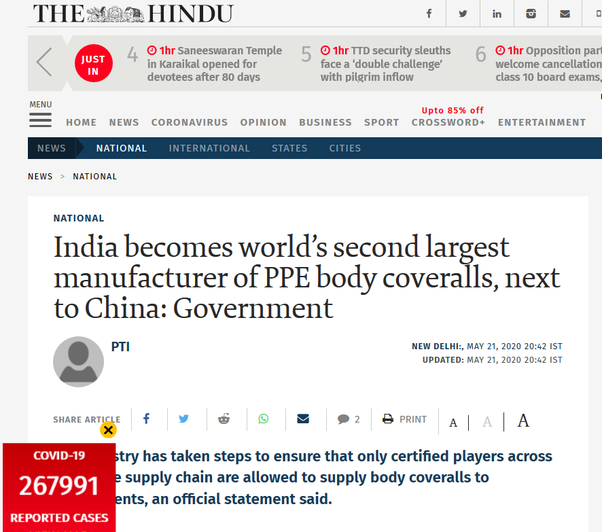
What we have been able to do is achieve 2 well:

We now have capability to test lot of people: [India: COVID-19 tests per day | Statista](https://www.statista.com/statistics/1107370/india-coronavirus-covid-19-tests-per-day/)



We now have enough PPE capacity :

[India becomes world’s second largest manufacturer of PPE body coveralls, next to China: Government](https://www.thehindu.com/news/national/india-becomes-worlds-second-largest-manufacturer-of-ppe-body-coveralls-next-to-china-government/article31643400.ece)



We have enough masks and sanitizers in market (remember 2 months back ?)

However, it seems that community spread has started in Delhi and Mumbai while we have reopened these cities. Both of these cities have very high population density.

We might have lockdowns in Delhi/Mumbai again while rest of the country reopens.

### My answer to “ Is India successfully ‘flattening the curve’? ”

Original answer here: https://qr.ae/pNCrKI

Based on what “experts” predicted at the start of the pandemic, given India’s infrastructure and capabilities, I guess Yes !

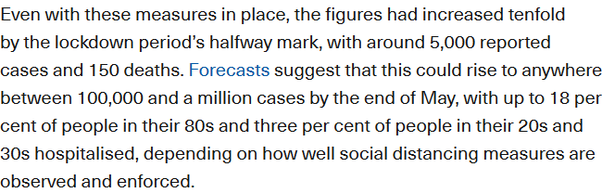
["300-500 million Corona cases in India"](https://www.facebook.com/themojostory/videos/529703107943201/)



We have lost many people, around 75,000 people by early September, but I guess we have controlled the spread as compared to what this expert believed. More about the expert here: [Ramanan Laxminarayan - Wikipedia](https://en.wikipedia.org/wiki/Ramanan_Laxminarayan)

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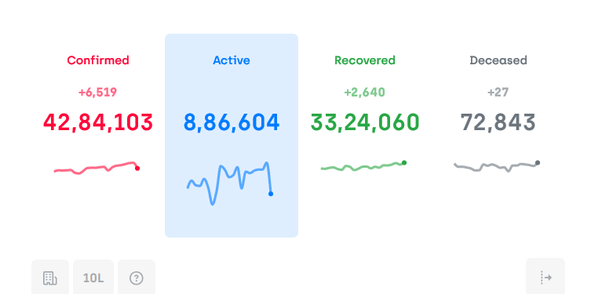
Here is Imperial College predicting that 3% of people between 20–30 years would be hospitalized by May 2020 in India : [Coronavirus vs. poverty: Is India doing enough to incentivise isolation?](https://www.imperial.ac.uk/business-school/ib-knowledge/health/coronavirus-vs-poverty-india-doing-enough-incentivise-isolation)



So yes, we had not had the worst possible outbreak. Italy for example had a spike that its health services could not manage despite having the best healthcare system as the curve was steep.

We first need to understand what “Flattening the Curve” is. (And why its one of the strategies to overcome a pandemic, but not the best). Flattening the Curve basically means to not allow disease to grow faster than how fast a country can expand its health infrastructure. India’s health infrastructure was not really capable to handle the pandemic, so we had to screw up our economics for almost a full quarter and wait for health infrastructure to grow enough to reopen and not starve people to death. Delaying the onset also means we would use clinical care practices other outbreaks would help humanity come up with. So using this definition, for sometime, India has been trying to flatten the curve only. Regular local lockdowns have been imposed if cases grew at a fast velocity in a locality and we have been trying to keep the number of cases in step with the available healthcare. The problem with flattening the curve is that you will see spike in numbers whenever you reopen and it will be an ongoing battle for a long time till a vaccine comes in or we reach herd immunity. I am writing this answer from a remote corner of Uttar Pradesh (a state not really known for its public services’ diligence) and there are free testing booths on every few blocks for free testing and isolation, could not have thought of it say even 3 months back. Herd Immunity is very long drawn stupid battle [Muktabh Mayank's answer to What is herd immunity, and how can it be effective for countries like India?](https://www.quora.com/What-is-herd-immunity-and-how-can-it-be-effective-for-countries-like-India/answer/Muktabh-Mayank) and thus India is actually batting for a vaccine. To answer your question, yes, we are trying to flatten the curve itself. Just that in most flatten the curve graphs you see, there is an assumption of health services being static and hence you see the required infected persons curve to be FLAT. This assumption was for maybe for 2–3 months for a country with a small population, not a Billion people and 3 quarters and hence you dont see “flatness of curve” in India.

As of 8th September 2020, here is the curve we see: ( taken from [Coronavirus in India: Latest Map and Case Count](http://covid19india.org/) )



Ok. now what is the best way to get over the pandemic ? it is “Smash the curve”. The austere strict sister of curve flattening. Basically lot of testing, compulsory masks and regional lockdowns before you freely reopen the economy on reaching Zero Cases. Countries with small populations and relatively richer populations have been able to pull it off like NewZealand, but its just hard to stop economic activity in a large country like US, Brazil, India etc without starving the poor and middle class. We would have liked the cases to reach Zero during lockdowns, but some orthodox religious people and other careless covidiots made us elongate the lockdowns and thus later India’s poor and businesses couldn’t bear with the lockdown reducing the efficiency. Net net, you can lockdown only for so long, because it slowly kills your economy, and India was forced to reopen without smashing the curve. The only option we have at this level of pandemic is to flatten the curve. People expecting to see zero cases probably are not understanding how the economy functions maybe.

More about smash the curve strategy :

COVID-19: Crush the curve video <https://t.co/G6KqIsHyJ2>

— Yaneer Bar-Yam (@yaneerbaryam) [April 6, 2020](https://twitter.com/yaneerbaryam/status/1247195448902930437?ref_src=twsrc^tfw)

[https://static1.squarespace.com/static/5e7b914b3b5f9a42199b3337/t/5ec2c0a70a471b4ca7e82122/1589821608242/9+Essential+Actions+to+#CrushtheCurve+(Short).pdf](https://static1.squarespace.com/static/5e7b914b3b5f9a42199b3337/t/5ec2c0a70a471b4ca7e82122/1589821608242/9+Essential+Actions+to+" \l "CrushtheCurve+(Short).pdf)

### **My answer to** “Amongst this exponentially increasing COVID-19 cases, is unlock V a good move? Why?”

Originally answered here: <https://qr.ae/pNMilQ>

As of 12th October number of active cases are **coming down** in India. This has been a trend for last few days. They are not going up, not at all exponentially right now.

[#DailyUpdate](https://twitter.com/hashtag/DailyUpdate?src=hash&ref_src=twsrc^tfw) [#COVID19India](https://twitter.com/hashtag/COVID19India?src=hash&ref_src=twsrc^tfw)   
Growth rate of active cases = -1.1% [pic.twitter.com/A1JgQwSGvh](https://t.co/A1JgQwSGvh)

— Prof Shamika Ravi (@ShamikaRavi) [October 12, 2020](https://twitter.com/ShamikaRavi/status/1315620727731572736?ref_src=twsrc^tfw)

Basically the first wave of the pandemic in India has past its peak. Also the fatality rate of COVID19 has gone down not just in India but in the world:

Case Fatality Rate - falling sharply over time - globally and in India. [pic.twitter.com/2wHb9yRDqm](https://t.co/2wHb9yRDqm)

— Prof Shamika Ravi (@ShamikaRavi) [July 26, 2020](https://twitter.com/ShamikaRavi/status/1287306040619356160?ref_src=twsrc^tfw)

Of course the best way was to just continue the restrictions for more time and let the active cases fall to Zero. [https://static1.squarespace.com/static/5e7b914b3b5f9a42199b3337/t/5ec2c0a70a471b4ca7e82122/1589821608242/9+Essential+Actions+to+%23CrushtheCurve+%28Short%29.pdf](_blank). Just like how NewZealand/Singapore did. However, that is the good thing with relatively rich countries with small populations (and East Asian countries with high Mask compliance due to 2002 CoronaVirus outbreak: [2002–2004 SARS outbreak – Wikipedia](https://en.wikipedia.org/wiki/2002–2004_SARS_outbreak) ). They can restrict economy for enough time till the disease is eliminated. Most large countries on the other hand are playing the seesaw of letting people collect money by reopening for sometime and then closing back again when COVID cases rise in the process, hoping we will have a vaccine in a couple of iterations. Bill Gates thinks by next year sometime, at least the rich countries will be back to normal (if we are not super unlucky and vaccines don't fail) :

[Bill Gates predicts when rich countries will be 'back to normal'](https://7news.com.au/business/finance/bill-gates-says-rich-countries-will-be-back-to-normal-by-late-2021-c-1368831)



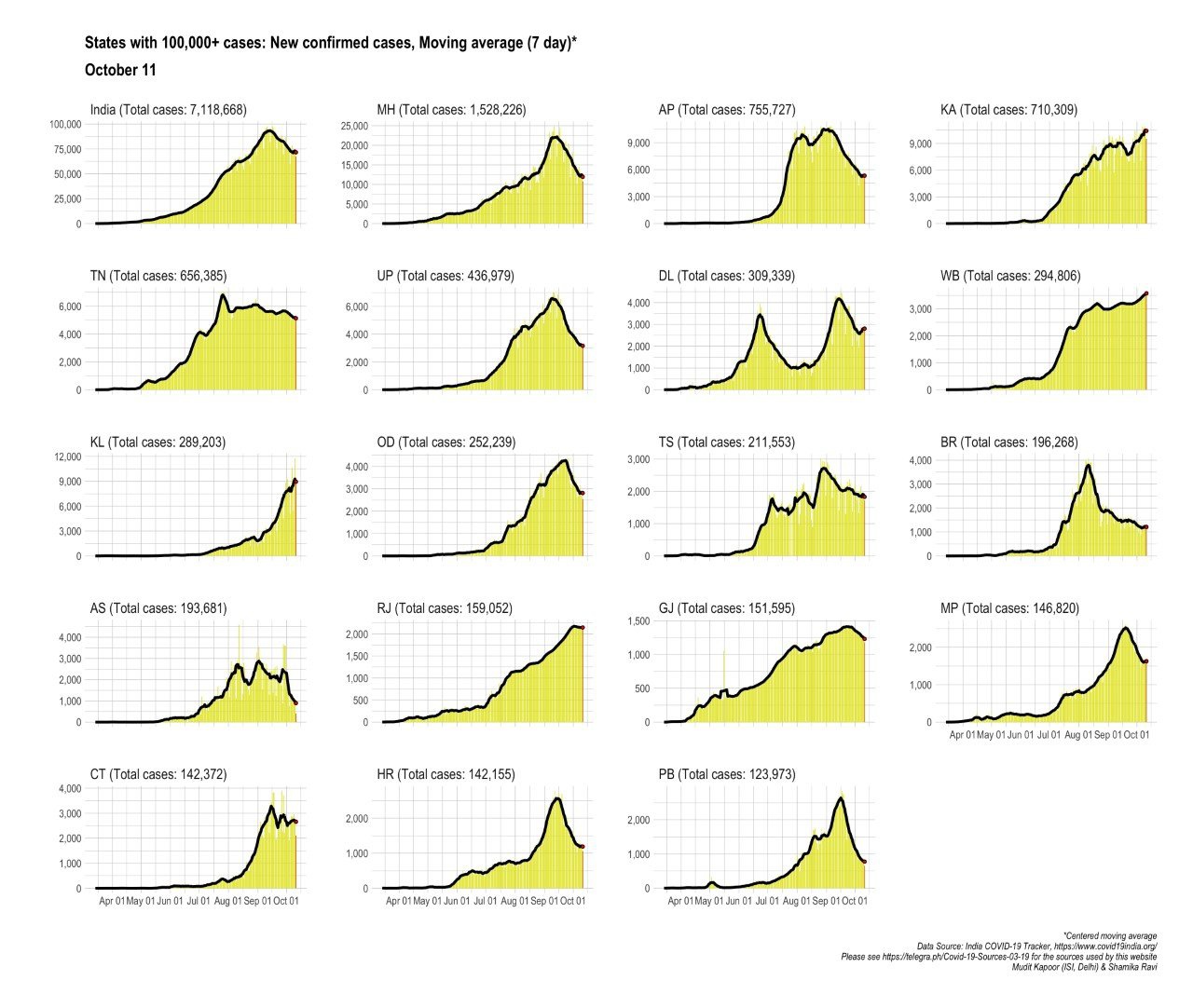
With respect to the rest of the world, India stayed close for a very long time. Europe and other cold countries where businesses need to open during summers for people to survive during summers, reopened earlier as soon as cases were declining so that the economy moves and people just don’t die starving. Economy is slightly ok for them now, but second wave of pandemic set in many parts of the world and hence you see news like this :

JUST IN: 383,359 new cases of coronavirus worldwide, the biggest daily increase since the pandemic began.

— The Spectator Index (@spectatorindex) [October 10, 2020](https://twitter.com/spectatorindex/status/1315013401437859840?ref_src=twsrc^tfw)

Now the Indian festival season is starting and India is in a similar situation as cold countries were during the summer months. Most sales in India happen during Spetember-November season of festivals and marriage season thenceforth. If India doesn’t open up, earnings will become lesser and more and more people will be pushed towards bankruptcy. Economy is basically me and you going out and spending, that is what makes others earn and spend again and so on. Economy just vanishes in a string lockdown and many people stop making money, while expenses never stop. So its a delicate balance of 2 processes till we have a vaccine: 1. not letting too many people catch disease and 2. not letting too many people get bankrupt.

Kerala had to reopen due to high economic activity in Onam and they are shooting up now :



Where are NEW cases coming from? [pic.twitter.com/nkRYx5qYsG](https://t.co/nkRYx5qYsG)

— Prof Shamika Ravi (@ShamikaRavi) [October 12, 2020](https://twitter.com/ShamikaRavi/status/1315620754570973185?ref_src=twsrc^tfw)

I have no clue what West Bengal is doing but the rest of the states are past their first peak (Delhi past its second peak) and they will now reopen so that people spend, make money and government fills their coffers and betters the infrastructure .

Let’s hope that India’s mask compliance is high, social distancing is maintained and we don't get a second wave in other parts of the country. Worst case, the reopening allows people to save and governments to build infrastructure to fight any second wave.

## Questions below were answered for the more devastating second wave in April 2021 onwards

### My answer to “Why is Government of India not trying to control COVID vaccine prices? Why are the private manufacturers given power to fix vaccine prices?”

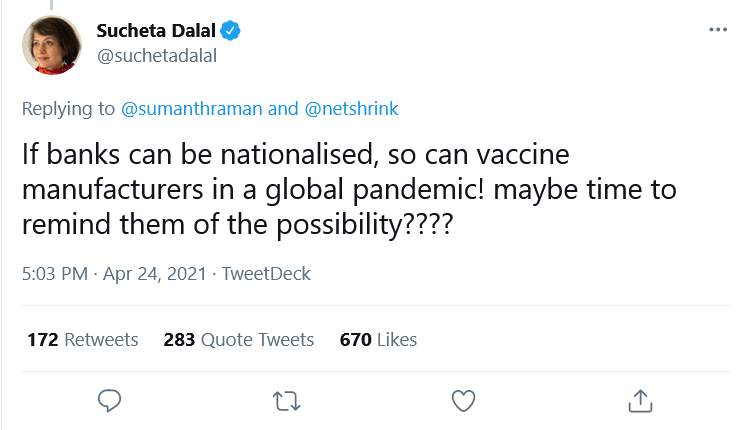
Originally answered here: <https://qr.ae/pGvtlX>

Vaccines are being given for free in India for most people. {I got mine for free, paid Zero money, middle class person }. Governments (both center and state) are bearing the costs. Mine was given from the UP state government quota. I will donate the amount of money required to buy vaccines to government anyway, but that is not required. Center government has already announced that weaker sections of society will get vaccines for free from their quota. Even if the non-poor sections of society are required to pay for it, cost of one dinner at a restaurant {around 1000 Rupees} is nothing to pay for a vaccine.

The vaccine price debate is a useless political issue for the outcome its being projected to be effecting most : “Fast and Free vaccination”. Its a fight between the 0.01% , 0.1% and 1% maybe and wherever it goes, the end result for the masses in the short term would be the same : “Free vaccines which would take time to roll out for all 1 Billion+ people”. There is no way to vaccinate all Billion in a few weeks.

Mostly the debate of vaccine price control against the current administration is raised by people who think risk taking and profit making (which is any sort of entrepreneurship) during pandemic is morally wrong. The other is a set of people who are against India developing its own vaccination infrastructure and supply chain and giving free market a chance. The points raised by two parties respectively are : A. Whether entrepreneurs should be allowed to earn money selling vaccines to government or vaccines should be made by public sector companies. [People like Sucheta Dalal [the actual reporter from our favorite web series Scam 1992] :

<https://twitter.com/suchetadalal/status/1385919709023916040>

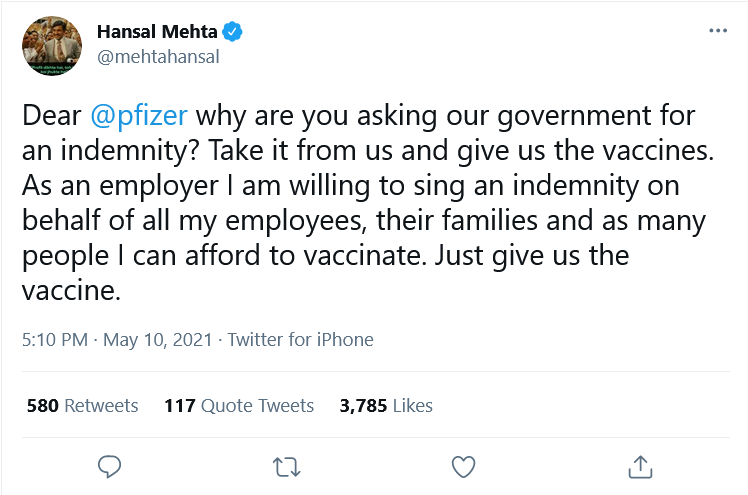


and B. Free trade enthusiasts who think developing self vaccine private infrastructure is wrong where free trade can solve all our problems. Case in point Mr. Chetan Bhagat and Mr. Hansal Mehta.

<https://twitter.com/chetan_bhagat/status/1389182795105329158>

<https://twitter.com/mehtahansal/status/1391719826540826630>





Think of it, people from these two schools are generally not seen in the same camp often. Here is Hansal Mehta trolling Chetan Bhagat :

## 

So why doesn’t government just import Pfizer vaccines and we can be assured of vaccinating everyone in a few days ? Why even make people wait months for local vaccines. That is because Pfizer doesn’t seem to deliver as fast as expected everywhere : <https://www.bbc.com/news/world-europe-55666399>



There is no guarantee that 1 Billion doses can be ordered if not assured.

Even as of today in the EU [which is depending upon US and UK for vaccine supply] :

https://twitter.com/MacaesBruno/status/1390621384561283073

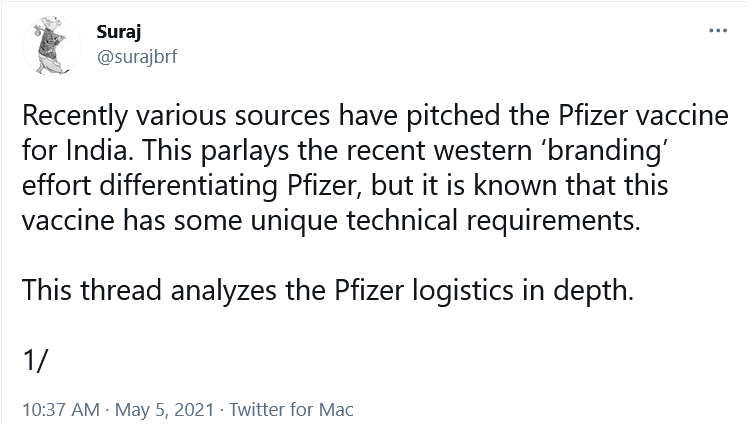
https://twitter.com/MacaesBruno/status/1392433371091963906





Also, we know that Pfizer and other mrna vaccines would not be suitable for Indian supply chain :

https://twitter.com/surajbrf/status/1389808837486530565?ref\_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1389808837486530565%7Ctwgr%5E%7Ctwcon%5Es1\_&ref\_url=https%3A%2F%2Fwww.quora.com%2FWhy-is-Government-of-India-not-trying-to-control-COVID-vaccine-prices-Why-are-the-private-manufacturers-given-power-to-fix-vaccine-prices



There are also news stories about Pfizer negotiating shady deals for the vaccines. Net net, many suspicions about Pfizer vaccine in India.

That said, its not that Pfizer is not allowed to sell vaccines in India, just that Indian government doesn’t want to use it in its free ubiquitous vaccination programme :

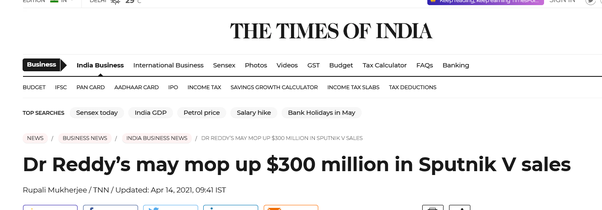
https://twitter.com/ShivaniGupta\_5/status/1392887476352544768?ref\_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1392887476352544768%7Ctwgr%5E%7Ctwcon%5Es1\_&ref\_url=https%3A%2F%2Fwww.quora.com%2FWhy-is-Government-of-India-not-trying-to-control-COVID-vaccine-prices-Why-are-the-private-manufacturers-given-power-to-fix-vaccine-prices

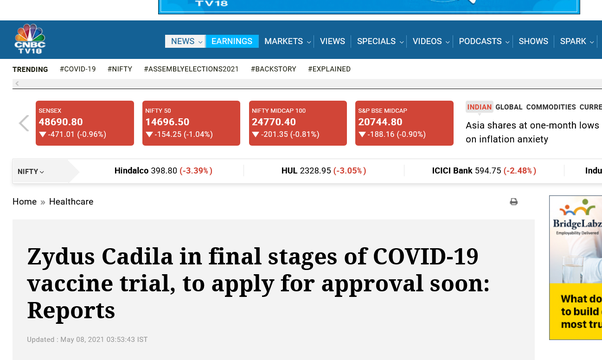


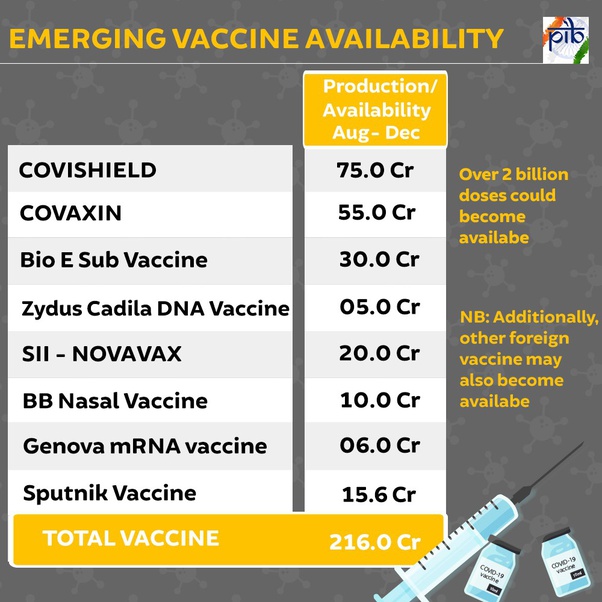
Now we can of course have a debate about whether it’s fair to allow people like Adar Poonawalla or Krishna Ella who invested 100s of Millions taking risk to make profit or use compulsory license to bring vaccines into public domain and make anyone or government manufacture it. But if you want a private manufacturing ecosystem in place, you need to do the former. Latter would definitely convey the message that taking risks is not worth it. India is going ahead with former it seems for now. Seeing SII or Bharat Biotech making profits, you now have many new upcoming vaccines which will be made locally : Zydus Cadila, Dr. Reddy’s , Novovax and Nasal vaccines from SII and Bharat Biotech.

https://timesofindia.indiatimes.com/business/india-business/dr-reddys-may-mop-up-300mn-in-sputnik-v-sales/articleshow/82056025.cms

https://www.cnbctv18.com/healthcare/zydus-cadila-in-final-stages-of-covid-19-vaccine-trial-to-apply-for-approval-soon-reports-9235841.htm





Most fears of people right now that it will take an year or two to vaccinate the whole country are unfounded as SII, Bharat Biotech, Cadila and Dr Reddy’s are all going to increase production in the ext two quarters to 100s of Millions of vials/month.

There is just one way to induce efficient vaccine production and manufacturing ecosystem within the country in country and that is to incentivize private players to produce more and more and faster. India’s aim right now seems not just to vaccinate its people but do so by creating its own pharmacy infrastructure. Indian government is thus subsidizing the vaccines and giving money to private players for COVID vaccination.

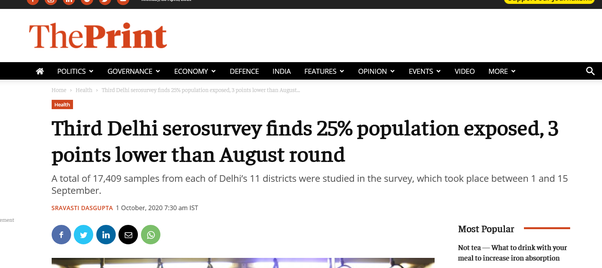
### My answer to “India is experiencing COVID havoc for more than a year now. We could've easily prepared new hospitals and facilities within this period. Why do we fail?”

Originally answered here : https://qr.ae/pGvtqM

You need to be able to predict to be prepared. Since there is no way you could predict, you cannot possibly have been prepared !

If someone tells you we could have made X beds, Y Liters of Oxygen and then this pandemic wave would have easily passed/contained {or they claim to predict such a capacity for a third possible wave}, they are are just pure lying. Its not mathematically/statistically possible : https://www.quora.com/Why-does-India-face-oxygen-shortage-in-the-second-wave-of-the-COVID-19-pandemic/answer/Muktabh-Mayank

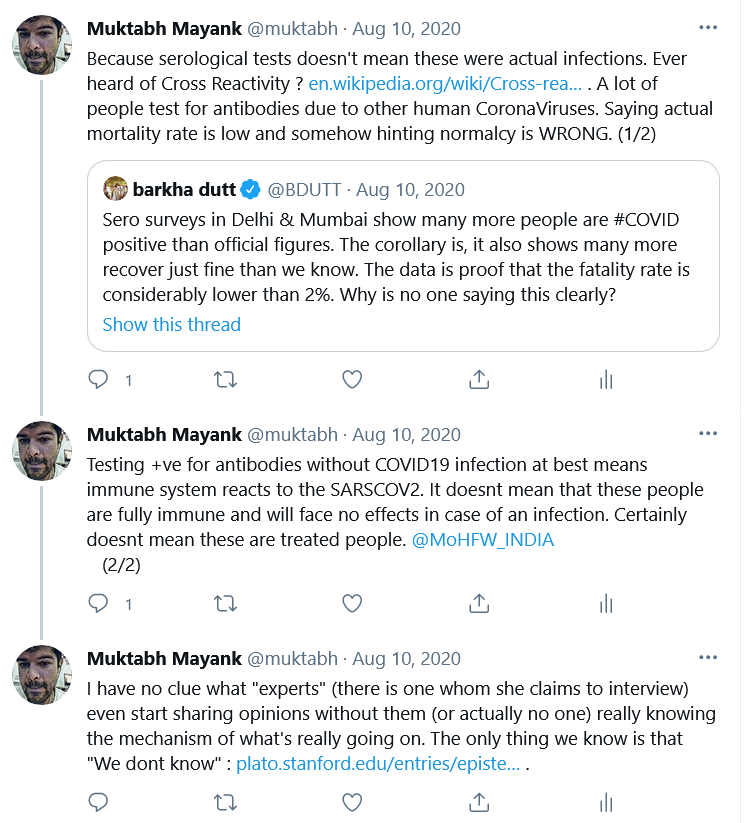
How many beds do you need to handle a COVID wave effectively ? How many Oxygen cylinders you need during a COVID wave ? There is just no way to predict this. How could possibly one have been prepared in advance ? Do you remember anyone predicting we would have 350 k + cases per day a month back when people were visiting Goa, Maldives and Manali ? There were in fact people who wanted schools to be open and life to restart as normal. While it is a fact that until vaccination program is complete, you cannot really think of herd immunity, its hard to hold a Billion impatient people from going on with their lives just by saying there might be a possibility of a second wave. If we could predict this for sure, why would people be slowed traveling for festivals and holidaying ? With stupid news articles like “Serological surveys find 25% people have already been effected” going and suggesting people that a “herd immunity” might already be existing gave people false sense of “getting over the virus”. https://theprint.in/health/third-delhi-serosurvey-finds-25-population-exposed-3-points-lower-than-august-round/514077/



There were people who were criticizing the harsh lockdown and said that the pandemic anyway infected 25% of Delhi by October 2020 [and similarly rest of the country] despite it. We could now ask them, why are so many people getting reinfected if there was a immunological response in a quarter of population already.

No one wanted to really listen to scientific blabber at that time [or even now] :

https://twitter.com/muktabh/status/1292732004983648256?ref\_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1292732004983648256%7Ctwgr%5E%7Ctwcon%5Es1\_&ref\_url=https%3A%2F%2Fwww.quora.com%2FIndia-is-experiencing-COVID-havoc-for-more-than-a-year-now-We-couldve-easily-prepared-new-hospitals-and-facilities-within-this-period-Why-do-we-fail

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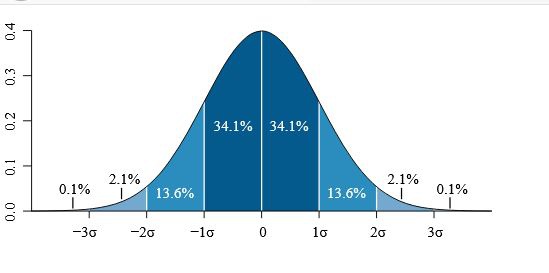
If this were a peak like previous one [100 k patients per day] and the system was crashing you could say that it was poor planning, but its a peak possibly 4 [350 k + patients] times in size. Anyone in government, any set of citizens [Europe America Singapore], no one can really be fully prepared for the next peak because you just don't know how big the next pandemic could be.

It boils down to the fact that you cannot predict how much preparation you need, you can never really be prepared. It was always going to be a stimuli-response scenario like it is now. Staying united and reacting to circumstances addressing weak points of our system is the way to go. We need to learn to stick together as a nation and help each other out.

### My answer to “Why does India face oxygen shortage in the second wave of the COVID-19 pandemic?”

Originally answered here: https://qr.ae/pGGtCT

Here is a follow up question to the original question. How much permanent Medical Oxygen capacity would you prepare in anticipation of a possible third wave of coronavirus pandemic given you have seen the first and second wave peaks {I hope that the peak is passing as on 25th April 2021} now ? Let’s say the first pandemic peaked at around 100k new cases a day and the ongoing [much worse] second wave has 250k new cases a day, how much oxygen would you produce/keep in stock always ? What’s the worst case scenario of a pandemic peak ?



If Coronavirus pandemic [or any other pandemic for that matter] followed a normal distribution, you would know that it would peak somewhere around the percentage of population it had effected in the past. So in case a Normal distribution was being followed, India should have been ready in its second wave with 100k + 1 X standard deviation [to make sure that they would cover ~85% of scenario] of 100k + 2 X standard deviation to make sure they would cover ~98% of possible scenario. Everyone who knows Gaussian Bell curve can guess that , right ?

Keep in mind keeping high Oxygen in stock always requires :

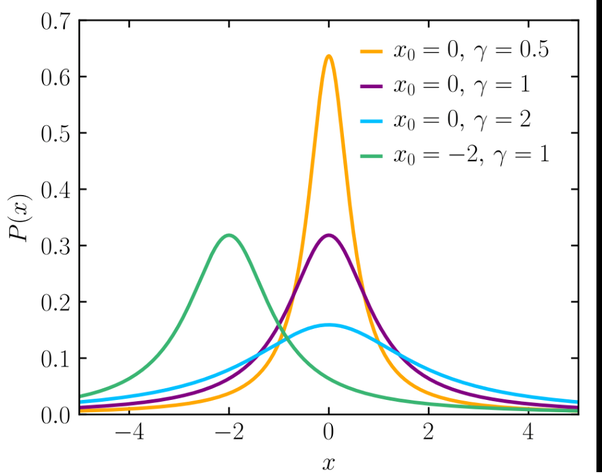
1. **Production Capacity:** You definitely need more oxygen than is produced by sum total medical oxygen producers in India in response to common supply-demand equilibrium. Even in emergency mode, where most industrial units of India are producing as much oxygen as possible, we are barely reaching required capacity. So building permanent medical oxygen production for the “100 k + 2 X standard deviation new COVID patients / day” scenario is a LOT of investment. You should remember that pumping so much speculative money into permanent medical oxygen is only temporary as after the peak recedes, all this investment and oxygen plants will face a demand crunch [and I hope they do face low demand scenario, meaning the country is out the pandemic]. Even if we understand or not, the way to fight the pandemic once its spreads is tactical, converting ones existing resources [other industries] into weapons. But suppose that you still made the Oxygen supply capacity manyfold investing Billions of dollars. You now have permanent medical oxygen being produced for 100 K + 2 X standard deviation new COVID patients per day for the next wave.

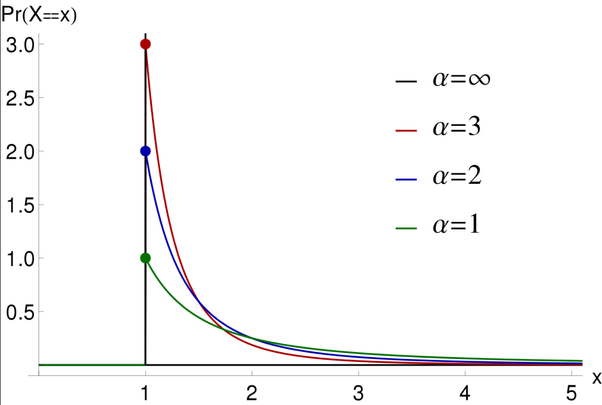
2. **Transportation Capacity:** Transportation is the main bottleneck during Indian COVID second wave. You suddenly cannot build better roads or create 2X the amount of oxygen trucks which have been procured over years. It would take time. Let’s say that in the gaps between waves, you spend billions of dollars just produce tens of 1000s of oxygen trucks to make sure Oxygen can be supplied to address the 98% scenario above.

Let’s just say that India had Billions of Dollars and kept 100 K + 2 X standard deviation resources [98% of scenario] functional to beat the peak. Let’s say India was willing to write off all that money in case there was no peak as most of the medical oxygen / oxygen cylinder would have been un-needed in that scenario {that amount of money going waste would have been a great political gossip store in case no second wave would have happened}. We would all be set for the second wave if we addressed 98% of scenario [or looking at the first two waves, we would be all set for a third wave] right ?

Unfortunately, you cannot predict and cannot be prepared.

No government/ person can be sure of what the next pandemic peak size would be. If this would be the case, countries like EU or the US [with tonnes of cash] would have had much better responses to their second wave {they were struggling too}. The reason is the pandemic peaks [unlike many other phenomenon] do not follow a Normal Distribution. You just have no clue Mathematically what you have to prepare for. All human statistics [and Machine Learning] work around the feeling that similar things happen [or the Gaussian bell is true]. They fail to predict COVID waves or Earthquake Richter Scales or Size of a financial downturn because : 1. You have much less data as these are rare events [for example in above, what do you think the standard deviation in 100k + 2 X standard deviation patients/day is ?], 2. Even if you have data, these things don’t follow a Gaussian Bell. They follow other bells {or whatever you want to call the curve} like say Cauchy’s or Pareto’s.





When eccentricity parameters are out of control [when they are during cases like pandemics], such distributions will give infinite predictions to cover 98% scenario. Basically, whatever amount of money you invest, an even larger pandemic wave can come and your resources would be meager. You have no expected value even. You cannot ever be prepared for a pandemic wave.

All a country can do is :

A. during the pandemic wave, be resourceful and adaptable. Convert existing resources into emergency pandemic resources [Like India has done converting large private firms like Tatas and Jindals into emergency Oxygen providers], ask people to social distance and hope for pandemic wave to go away. Trains and Airforce are carrying Oxygen to those who need.

B. Try to do things which keep virus spread to minimum. Social Distancing

### My answer to “Why is the Indian government hiding the actual COVID numbers?”

Originally answered here : https://www.quora.com/Why-is-the-Indian-government-hiding-the-actual-COVID-numbers/answer/Muktabh-Mayank?ch=10&share=9ab22616&srid=qie

It’s a well known fact that the numbers any governments report are a lower bound of the total number of COVID causalities. Not just India, US,UK, China, every country would give numbers that are well below the actual loss of lives due to COVID.

The reason is :

1. Method of assigning someone’s death to COVID or not. From everyone who had tested positive COVID and did not make it for any reason [even say an accident] being counted as a COVID casualty to people who did not make it specifically due to COVID symptoms being counted only, there can be many ways to determine whether a death is a COVID death or not. Depending upon which method a government uses, different numbers can come up.
2. Post COVID complications can run for months if not weeks after some people test negative. These are extremely hard to track.

This has always been known, not new information : https://qr.ae/pGnznv

How do we quantify what is the excess number of people lost which governments cannot keep a track of ?

A. Take COVID death numbers from governments

B. Take total death numbers

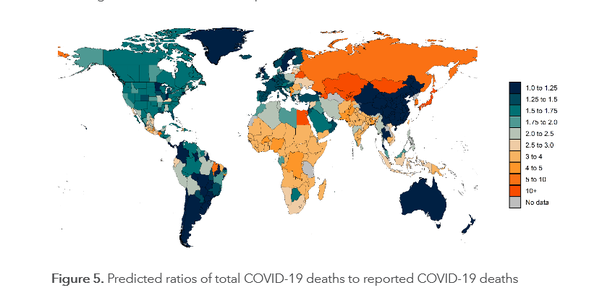
C. Take estimated increment from among total death numbers that was caused due to COVID or healthcare system under strain and the decrement due to less road accidents less influenza and other such factors.

D. Come up with a model to understand roughly N times is the actual COVID mortality as compared to reported numbers by government.

That is what a few researchers tried to do here :

http://www.healthdata.org/special-analysis/estimation-excess-mortality-due-covid-19-and-scalars-reported-covid-19-deaths

Taking in account that such calculations are super heavy approximations, you can at best treat the numbers they predict as some indications and not really exact quantities. What they found was that for most countries, the death numbers die to COVID were 2X [parts of North America] -10X [parts of Central Asia]. India is estimated to have 3–4 times the number of deaths. [For period of March 2020 - May 2021]



That sounds believable. No one is complaining about such estimates, not even any of the governments mentioned.

However, nowhere else has been such differences is estimates been politicized like in India. There has been days of articles showing last rights of Hindus being performed. With total lack of regard for the dead and their family’s privacy, western {and Indian} media has made it a sensationalist headline to get click revenues. Its just sad !

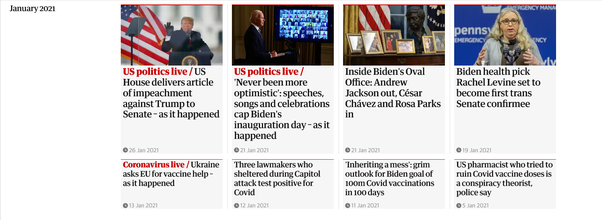
There are crazy estimates of India undereporting by 95% and so on. [And these are on “respected” sites like Guardian]



See that image of a Hindu pyre which I have purposely cropped here ? Why was that put in a Guardian Opinion piece ? This piece by the way reports India to be underreporting by 90–95% . A couple of weeks back the same author was writing about something very different :



And in January, she was a US political correspondent :



And now suddenly, we Indians are supposed to believe that due to her Indian name she is an expert at India’s COVID situation ! I mean one can believe her “opinion” that India has 8 Million+ new COVID cases / day, but one cannot really say that she has a scientific basis of it.

It’s not just this. Too much preaching and clear forced narratives from international media makes their intentions suspicious and hence more reason for us Indians to believe all “experts” are not good estimators. Look at the few examples below :

This is not just it. 7–8 idiots decided to dip themself in cowdung to ward off COVID [or who knows were made/paid to do a photo-op] and this is not even a relevant news in India. And guess who covers it.. Reuters !! And in a language like the country of 1 B + people is doing this.



I mean people living in India don’t know of Indians doing this. And 5 odd people in photograph do this and Reuters covers it saying Doctors advise not to do such an act [implying this is a common practice !].

An analogue will be this article getting published on Reuters [which won’t be btw] :



Most Indians totally understand that many in Western Media want to portray us like some weird lost in time people needing help to become civilized. There is no need complaining as there is no impartial authority to decide what is fair and what is not. Best we can do is make lemonades out of lemons. People who help us in spirit of friendship are most welcome, people who help us thinking we are some weird aboriginals are welcome too [as long as they get nothing in return that is ;-) ].



Meanwhile in India, a lot of the English press basically copies pastes the west and lot of “informed politics” runs on it, so you can find a lot of murmur. Pandemics are hard for everyone, not just India. That is a hard one to swallow.because how can everyone be as helpless as a poor country like India ! Technically, India is not handling the pandemic the worse, its response could have been better. We have lost too many near and dear ones and are emotional right now. When we later look at how every country dealt with the COVID waves, we will see that there are advantages of being rich but the rest of world is not too different from India. Discussion in common circles and mainstream media would have moved on by then.