

Lockdowns - are they effective in curbing the spread of COVID-19 and do the pros outweigh the cons?

The impact of the Covid-19 Pandemic has been devastating, closing down global markets while countries plunge into recession and its citizens sink into debt. As of the 25th of July, over 16.1 million people have been infected globally, no suitable containment method or vaccine has been procured by world governments. This deadly strain of a novel coronavirus has exposed the weak global medical infrastructure and while no blanket statement can be made, countries with high population densities have been the worst affected, India or the USA for example. While India was quick to impose a national lockdown, it still is the 3rd worst impacted country. The Indian Government refutes claims of 'community transmission' and stresses that the lockdown was effective, however over a million people have been infected. Countries like Thailand and Vietnam have extremely high population densities and majority of their population are below the poverty line, however a strict lockdown was announced in both countries. Thus, Thailand has reported only 3,239 total cases, out of which only 58 casualties have been reported. This brings us to the question, are lockdowns effective, and to what extent do the pros outweigh the cons.

Much on the contrary, it is imperative to note the multiple factors involved in such precarious circumstances. Thailand for example, had a very low number of infected people due to the fact that only 8,600 people were being tested per a million people. Since the entire population is not being tested, one cannot know the entire extent of the issue. Thus, in this report, any fallacies, factors or defining constants shall also be pointed out and its consequences will be stressed upon.

Most countries have imposed national lockdowns to slow the spread of the virus, while waiting for a vaccine. However, procuring a vaccine will take a very long time; the director of the

NIH, Dr Fauci, stated that a vaccine would be ready in 18 months, however this is a best-case scenario, the virus could take more than a year or two to be available commercially worldwide.

During the progression of COVID, our scientific knowledge of the same has rapidly increased due to the focus given to it. Thus, we have realized new cures, improved methods and understood the virus much better. Initially Hydroxychloroquine, a Malaria drug, showed promise but a WHO study proved that its cons overshadowed its benefits. Remdesivir, an antiviral injection manufactured by Gilead Sciences has shown significant benefits, it decreases the length of hospital stay by 3-5 days, but has shown no impact on the death rate. This study was carried out by the National Institutes of Health of the USA (NIH) on 1,068 hospitalized adults across 10 countries. This has led to massive increases in the production of Remdesivir, with Gilead pricing a vial of Remdesivir at \$520. Indian pharmaceutical companies Cipla and Hetero Labs¹, are few in a host of companies producing generic versions of the same, though at much cheaper prices of \$71 per vial. Favipiravir, an Influenza drug has also shown success in improving lung conditions of those suffering from COVID-19. Dexamethasone is also a drug in the running to act as a cure for the virus. Based on a study carried out by the University of Oxford, 1 death would be prevented by treatment of around 8 ventilated patients or around 25 patients requiring oxygen alone.² A notable mention is that Dexamethasone had no impact on the SARS and MERS virus, this can highlight a roadblock to discovery of cures. The entire purpose of imposing lockdown is to buy time and create

¹ Thacker, Teena. "Covid-19 Treatment." *The Economic Times*, Economic Times, 25 May 2020, economictimes.indiatimes.com/industry/healthcare/biotech/pharmaceuticals/cipla-hetero-get-nod-to-sell-remdesivir/articleshow/75958389.cms?from=mdr.

² "Dexamethasone Reduces Death in Hospitalised Patients with Severe Respiratory Complications of COVID-19." *University of Oxford*, www.ox.ac.uk/news/2020-06-16-dexamethasone-reduces-death-hospitalised-patients-severe-respiratory-complications.

effective drugs/cures to fight the virus effectively, however countries have still failed to procure a viable solution to the pandemic, thus questioning the very purpose of lockdowns.

CFR is the ratio of the number of deaths divided by the number of *confirmed cases* of the disease. It does not account for asymptomatic, untested or false-negative tests. The models given below are from an MIT research paper which highlights the possibility of different COVID curves. This research was carried out to find the true number of cases and deaths in different countries. From this, “Cases and deaths through June 18, 2020 are estimated to be 11.8 and 1.48 times³ official reports, respectively, at 88.5 (85-95.3) million and 600 (586-622) thousand.”⁴

IFR is the ratio of deaths divided by the number of actual *infections* with SARS-CoV-2. Because nucleic acid testing is limited and currently available primarily to people with significant indications of and risk factors for COVID-19 disease, and because a large number of infections with SARS-CoV-2 result in mild or even asymptomatic disease, the IFR is likely to be significantly

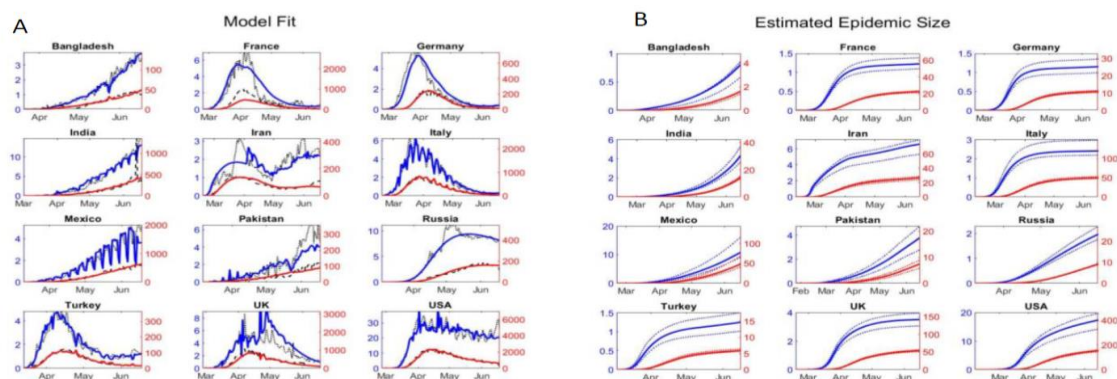


Figure 1-Simulated trajectories of epidemic in countries with more than 60 million population and 40,000 confirmed cases. A) Comparison of model (solid) with data (dashed or dotted) for daily new confirmed cases (blue; left axis in thousands) and daily new confirmed deaths (red; right axis in thousands). B) Estimated actuals (with 95% CI in dotted lines) for cumulative cases (blue; left axis in millions) and cumulative deaths (red; right axis in thousands).

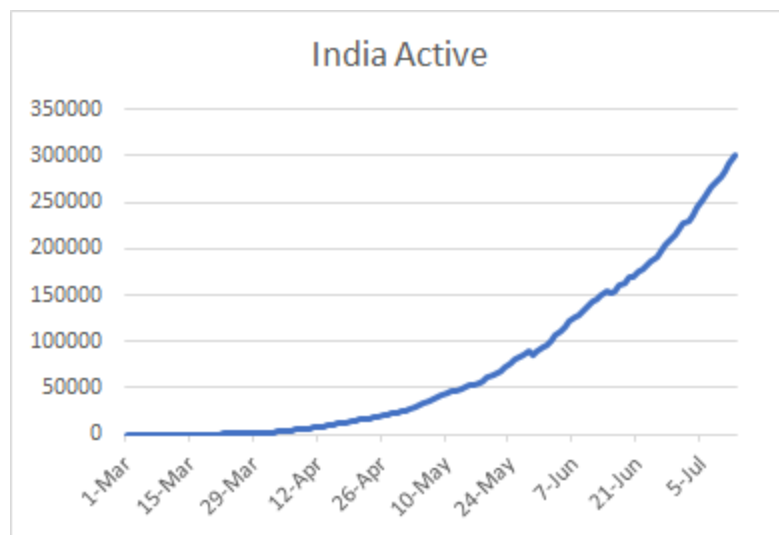
³ Rahmandad, Hazhir. “Estimating the Global Spread of COVID-19.” SSRN, 1 July 2020, papers.ssrn.com/sol3/papers.cfm?abstract_id=3635047.

⁴ Harrington, Rebecca A. “Case Fatality Rate.” *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., 5 May 2020, www.britannica.com/science/case-fatality-rate.

lower than the CFR.⁵ Additionally, factors such as population density, healthcare infrastructure, testing levels and even socio-economic conditions impact the spread of COVID-19. Consequently, this is not a definite argument, for example, Dharavi, a slum in Mumbai, managed to contain its spread through extensive surveying of the populace along with prompt setting up of tens of local clinics.

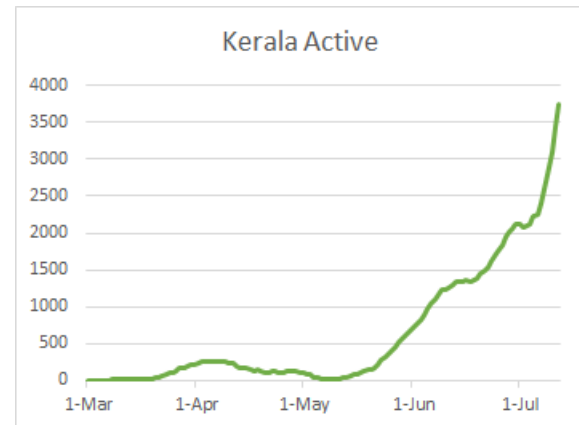
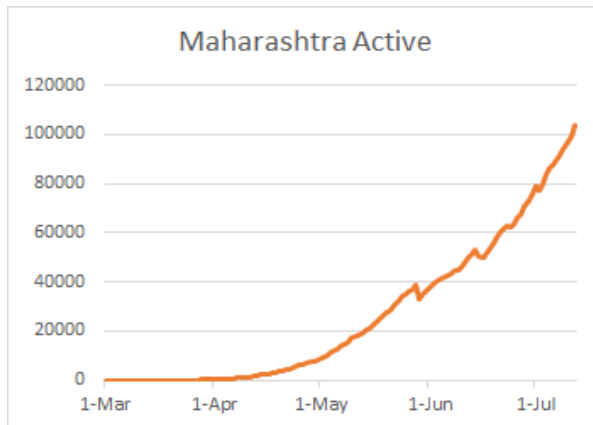
India had a very slow initial curve and extensive lockdown through March, April and May, during which COVID grew rapidly in Maharashtra and Gujarat. As Unlock 1 began, (June 1st), a national spike in cases across all states and territories was seen. Maharashtra still accounts for a large portion of cases, but recent spikes in North Eastern and Southern States have heightened worries of rampant COVID spread. Many parts of India at a regional level are undergoing lockdown again. COVID cases have spread from initial hotspots to the larger blanket of the country.⁶

Kerala and Maharashtra have taken two very different curves. Maharashtra has over 105,000 active cases compared to Kerala's 4,000. Kerala was able to quickly take action due to reform in the health infrastructure post the Nipah Virus outbreak of 2018. Kerala's



⁵ 2020, 5 April. *Infection Fatality Rate – A Critical Missing Piece for Managing Covid-19*. 5 Apr. 2020, www.virology.ws/2020/04/05/infection-fatality-rate-a-critical-missing-piece-for-managing-covid-19/.

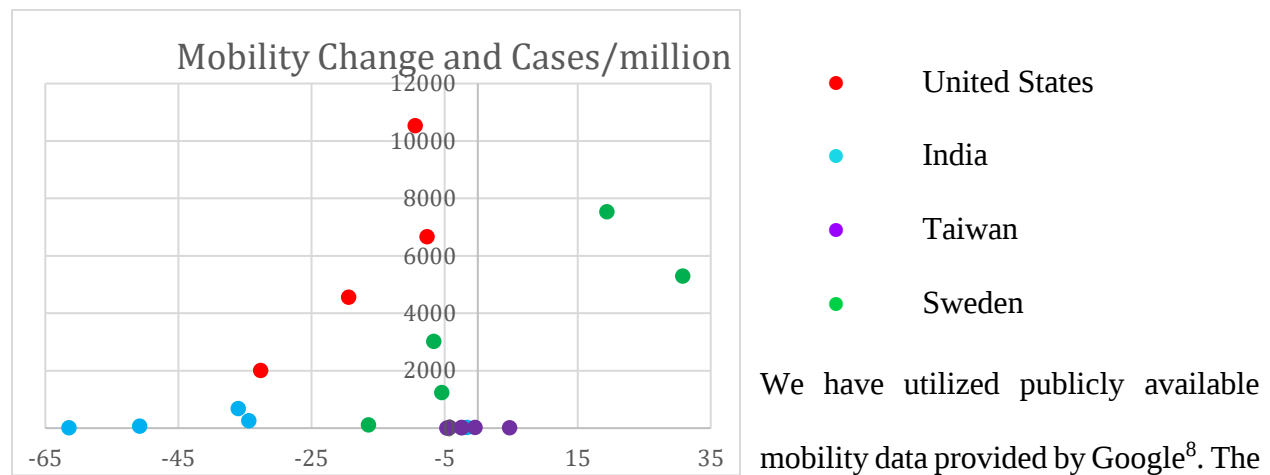
⁶ *Coronavirus in India: Latest Map and Case Count*. www.covid19india.org/.



government took a bottom up approach, working with community leaders to inform people, this coupled with the country's highest literacy rate allowed Kerala to quickly inform people about viral information. Additionally, Kerala quickly ramped up testing and set up checkpoints at airports and state borders and a strict lockdown and curfew were imposed. Kerala has achieved a TPM of 12,000 and CPM of 237 compared to the national average of 680. Kerala also allocated beds, staffed hospitals and enforced quarantine protocols. Their cases became negligible, until Unlock 1, where cross border travel increased. However, they have only experienced 4,000 active cases with a 6% growth rate and a very low mortality rate of 0.41%. Maharashtra took a very different route, cases grew rapidly in Mumbai, with constant spikes in a variety of districts. While cases are now subsiding the rest of the state is experiencing a spike comparable to that of Mumbai. This clearly shows the contrast between two states that experienced lockdown at the same time, however one was better prepared due to a more advanced medical infrastructure. Thus, it proves that lockdowns could be useful if prior infrastructure is suitable to the same.⁷

⁷ StriKe. "Covid-19 Sources." *Telegraph*, 24 June 2020, telegra.ph/Covid-19-Sources-03-19.

Google Mobility Reports



data has been aggregated from Google Maps users, for countries and further broken down into provinces or states. It measures different criteria, mapping the change in movement.

One drawback can be the penetration of Google Maps, for example, the United States has a much higher Google Maps penetration compared to India. Still, Google states that they have balanced the dataset to ensure their analysis is accurate. We used this data to try and find a correlation between mobility and cases per million. We averaged the mobility to “non-essentials” locations

State	Confirm	Recover	Death	Acti	Last_Updated	Migrated_Ot	State_co	Delta_Confir	Delta_Recov	Delta_Dea
Total	879904	554922	23200	301400	13/07/2020 17:14:06	382	TT	437	493	13
Maharashtra	254427	140325	10289	103516	12/07/2020 19:07:08	257	MH	0	0	0
Tamil Nadu	139470	89532	1966	46372	12/07/2020 22:08:10	0	TN	0	0	0
Delhi	112494	89368	3371	19155	12/07/2020 18:22:07	0	DL	0	0	0
Gujarat	41906	29198	2046	10662	12/07/2020 19:41:34	0	GJ	0	0	0
Uttar Pradesh	36476	23334	934	12208	12/07/2020 21:07:07	0	UP	0	0	0
Karnataka	30943	15411	686	22742	12/07/2020 20:40:07	4	KA	0	0	0
Telangana	34671	22482	356	11833	12/07/2020 21:07:03	0	TC	0	0	0
West Bengal	30013	18581	932	10500	12/07/2020 19:26:09	0	WB	0	0	0
Andhra Pradesh	29168	15412	328	13428	13/07/2020 17:01:08	0	AP	0	0	0
Rajasthan	24487	16236	514	5737	13/07/2020 13:53:08	0	RJ	35	133	4
Haryana	21482	16256	301	4325	13/07/2020 13:53:10	0	HR	242	273	0
Madhya Pradesh	17632	12876	653	4103	12/07/2020 22:17:08	0	MP	0	0	0
Assam	16807	10895	41	5868	12/07/2020 23:40:08	3	AS	0	0	0
Bihar	16305	11953	125	4227	12/07/2020 18:22:10	0	BR	0	0	0
Odisha	13737	8750	91	4896	13/07/2020 10:43:08	0	OR	616	0	7
Jammu and Kashmir	10513	5979	179	4355	12/07/2020 21:50:12	0	JK	0	0	0
Punjab	7821	5392	199	2230	12/07/2020 19:26:12	0	PB	0	0	0
Kerala	7874	4095	32	3743	12/07/2020 19:07:10	4	KL	0	0	0
State Unassigned	2358	0	0	2358	13/07/2020 10:27:10	0	UN	-666	0	0
Chhattisgarh	4081	3153	19	909	12/07/2020 21:50:16	0	CT	0	0	0
Uttarakhand	3537	2786	47	674	12/07/2020 20:07:08	30	UT	0	0	0
Jharkhand	3774	2308	33	1433	13/07/2020 13:53:13	0	JH	14	0	2
Goa	2453	1487	14	952	12/07/2020 20:17:08	0	GA	0	0	0
Tripura	2067	1421	2	630	13/07/2020 00:17:09	14	TR	0	0	0
Manipur	1609	896	0	713	12/07/2020 19:50:09	0	MN	0	0	0
Puducherry	1468	785	18	665	13/07/2020 13:53:15	0	PY	50	46	0
Himachal Pradesh	1213	923	10	267	13/07/2020 13:53:16	13	HP	0	7	0
Ladakh	1086	328	1	157	12/07/2020 18:22:14	0	LA	0	0	0
Nagaland	845	340	0	505	13/07/2020 17:14:10	0	NL	71	13	0
Chandigarh	559	417	8	134	12/07/2020 15:28:11	0	CH	0	0	0
Dadra and Nagar Haveli and Daman and Di	511	287	1	352	13/07/2020 15:59:08	4	DN	13	19	0
Arunachal Pradesh	360	198	2	220	13/07/2020 00:17:11	0	AR	0	0	0
Mizoram	231	151	0	80	13/07/2020 17:14:11	0	MZ	0	1	0
Andaman and Nicobar Islands	163	100	0	63	12/07/2020 21:07:14	0	AN	0	0	0
Sikkim	166	82	0	71	13/07/2020 16:56:09	13	SK	2	1	0
Meghalaya	295	45	2	248	12/07/2020 13:06:11	0	ML	0	0	0
Lakshadweep	0	0	0	0	26/03/2020 07:19:29	0	LD	0	0	0

Raw Case Data

⁸ “COVID-19 Community Mobility Report.” Google, Google, www.google.com/covid19/mobility/index.html?hl=en.

and compared that to the CPM of the country. Our regression analysis using the TI showed a weak correlation with an R^2 of 0.33, thus highlighting that major changes in movement do not necessarily impact case count.

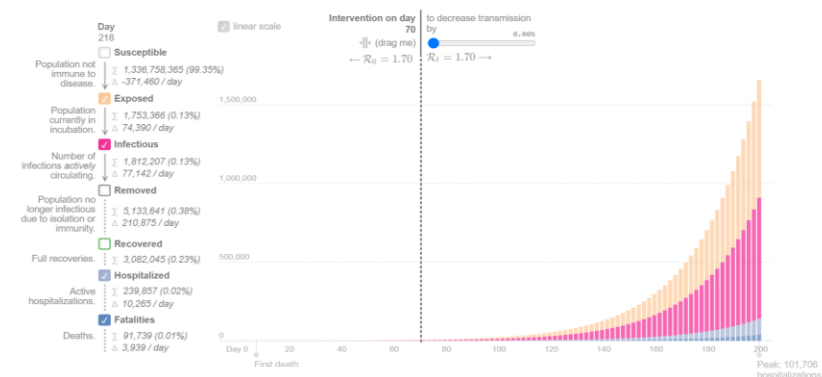
For our data collection we used a variety of reliable sources, mainly using covid19india.org and to a greater extent, John Hopkins Coronavirus Resource

Countries Aggregated Mobility

country_region	date	retail_and_recreation	grocery_and_pharmacy	parks	transit_stations	workplaces	residential
India	3/15/2020	-11	-1	-6	-7	2	3
India	4/15/2020	-78	-51	-48	-66	-64	29
India	5/15/2020	-76	-22	-56	-52	-48	23
India	6/15/2020	-56	3	-49	-37	-33	15
India	7/10/2020	-57	-1	-50	-39	-33	16
Sweden	3/15/2020	-25	-2	-15	-30	-10	5
Sweden	4/15/2020	-19	-5	63	-35	-31	11
Sweden	5/15/2020	-17	-4	47	-33	-26	9
Sweden	6/15/2020	6	8	193	-23	-30	5
Sweden	7/10/2020	-5	-4	189	-30	-53	9
Taiwan	3/15/2020	-2	7	31	-13	1	2
Taiwan	4/15/2020	-13	1	1	-18	8	3
Taiwan	5/15/2020	-5	6	0	-11	2	1
Taiwan	6/15/2020	-5	8	-4	-14	3	2
Taiwan	7/10/2020	-1	10	1	-8	-4	2
United States	3/15/2020	-9	12	5	-13	-7	3
United States	4/15/2020	-36	-13	-16	-49	-49	20
United States	5/15/2020	-29	-7	21	-40	-42	16
United States	6/15/2020	-14	-2	45	-32	-35	11
United States	7/10/2020	-18	-4	43	-31	-37	11

Center⁹ GitHub repository. Most of the data including the Google Mobility Reports were in .csv format, which were queried into Excel, and in the case of the mobility analysis, into the TI Software. We used John Hopkins due to the global reliability of the data.

On the other hand, what must be noted is the variability of the information and very high likelihood



India Model

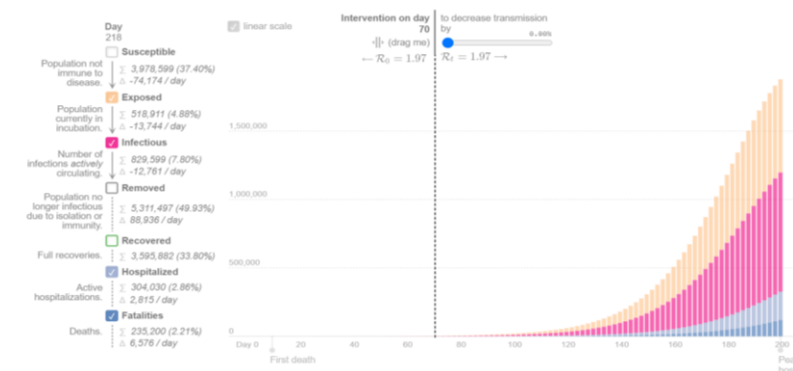
or the likelihood of aerial transmission.

of the given statistics changing.

At the moment the pandemic is ongoing and there are constant, rapid developments. For example, the strong U-turn taken on Hydroxychloroquine

⁹ "COVID-19 Map." Johns Hopkins Coronavirus Resource Center, coronavirus.jhu.edu/map.html.

Above are graphs created using an epidemic calculator¹⁰, showing probable curves for Sweden and India respectively. While it is common knowledge that India imposed a strict lockdown,



Sweden Model

Sweden gained global attention for taking a more relaxed approach to fighting the spread of the novel coronavirus. Its confidence in attaining herd immunity has been its downfall, herd immunity requires 60-70% of the population to become immune to the virus, though, some believe a 90% rate is needed. However, for that to occur more people would have to be exposed to the virus, and due to Sweden's aging population more people died than became immune¹¹.

Lockdowns restrict movement of people to help contain the virus, however it has had severe socio-economic consequences. India for example, which enforced a national lockdown on the 24th of March, still has not lifted its lockdown. Unemployment rose from 6.7% on 15 March to 26% on 19 April and then back down to pre-lockdown levels by mid-June¹²

In India, thousands of migrants walked several thousand kilometers since state borders were closed and no form of safe transportation was available. While 'Shramik' trains were

¹⁰ *Epidemic Calculator*, gabgoh.github.io/COVID/.

¹¹ Mack, Eric. "Sweden Stayed Open And More People Died Of Covid-19, But The Real Reason May Be Something Darker." *Forbes*, 8 July 2020, www.forbes.com/sites/ericmack/2020/07/07/sweden-stayed-open-and-more-people-died-of-covid-19-but-the-real-reason-may-be-something-darker/.

¹² *CMIE*, www.cmie.com/kommon/bin/sr.php?kall=warticle.

launched on the 4th of May, over 400 migrants had died since the 24th of April, a figure that could have been completely avoided with prior planning. During the first 21 days of the national lockdown, the Indian economy was projected to lose over ₹32,000 crore (US\$4.5 billion) every day¹³ and less than a quarter of India's \$2.8 trillion economy was functional.

A counterclaim to this argument however, is that even though the US never announced a nationwide lockdown, the unemployment rate has grown by almost 10% from January this year. It is still facing economic recession and has been impacted relatively worse than India. Thus, the correlation between lockdown and economic turmoil may not be very strong.

However as soon as India began its Unlock movement; its economy did bounce back. By mid-June, unemployment levels were back to pre-lockdown levels.¹⁴ Hindustan Unilever registered pre-COVID levels in sales in late June. On 2 July 2020, The Times of India reported that a number of economic indicators such as goods movement, GST collections, electricity usage and rail freight transport showed significant improvement as compared to previous months. Writing the report was an eye-opening experience, gathering and understanding data whilst constantly having to update it. The other critical consideration is that COVID 19 is currently ongoing and dynamic. Therefore, its end impact remains variable at this time. We have done our best to use reliable data, research papers, expert testimonies and reviewed news reports to vilify the claim stipulating whether lockdown's truly beneficial. From what we see, having a prompt, strict and quick lockdown to slash case growth followed by a careful re-opening whilst returning

¹³Bureau, Our. "Covid-19 Lockdown Estimated to Cost India \$4.5 Billion a Day: Acuité Ratings." @Businessline, The Hindu BusinessLine, 2 Apr. 2020, www.thehindubusinessline.com/economy/covid-19-lockdown-estimated-to-cost-india-45-billion-a-day-acuit-ratings/article31235264.ece.

¹⁴"Some Signs of a Fast Recovery." *Economic Times Blog*, 23 June 2020, economictimes.indiatimes.com/blogs/et-editorials/some-signs-of-a-fast-recovery/.

to the “new normal” are the best paths to take. At the same time lockdowns freeze the economy, but provide opportunity to ramp up testing, medical facilities and ideate an action plan. So far, there have been 16.1 million people infected globally, with over 95% of infected patients expected to recover with only 1 in 5 requiring hospitalization. That said, the world has seen a fatality count of 586,900 and counting. Additionally, we have not looked into the impact of population, weather and many other factors influencing the spread of COVID-19, additionally, COVID-19 transmission possibilities are still unknown with a possibility for aerial transmission, which has not been considered here.

In conclusion, learning from Tomas Pueyo¹⁵ and our in-depth analysis and research we believe strict and well enforced lockdown, followed by a period of wariness is key preventing steep COVID growth. We also noticed noticeable faults countries made, whether India’s lack of national level consensus or the lack of protocol in the US. The best route countries can take is that of Taiwan. Through research and increasingly evident evidence, Sweden ‘herd immunity approach is not a correct one to take’ as without awareness, it can lead to high deaths among the elderly and extremely low penetration among the young population. Therefore, enforcing strict lockdown including prohibiting international and regional travel followed with strict mask orders and well-defined protocols will ensure COVID cases do not reach high day-on-day growth rates. Following this a carefully planned ‘relaxation’ with concurrent restrictions ensures that the slow reopening does not give COVID the growth opportunity.

¹⁵ *Tomas Pueyo*. medium.com/@tomaspueyo.