THE ECONOMY, THE FINANCIAL MARKETS AND THE CORONA VIRUS

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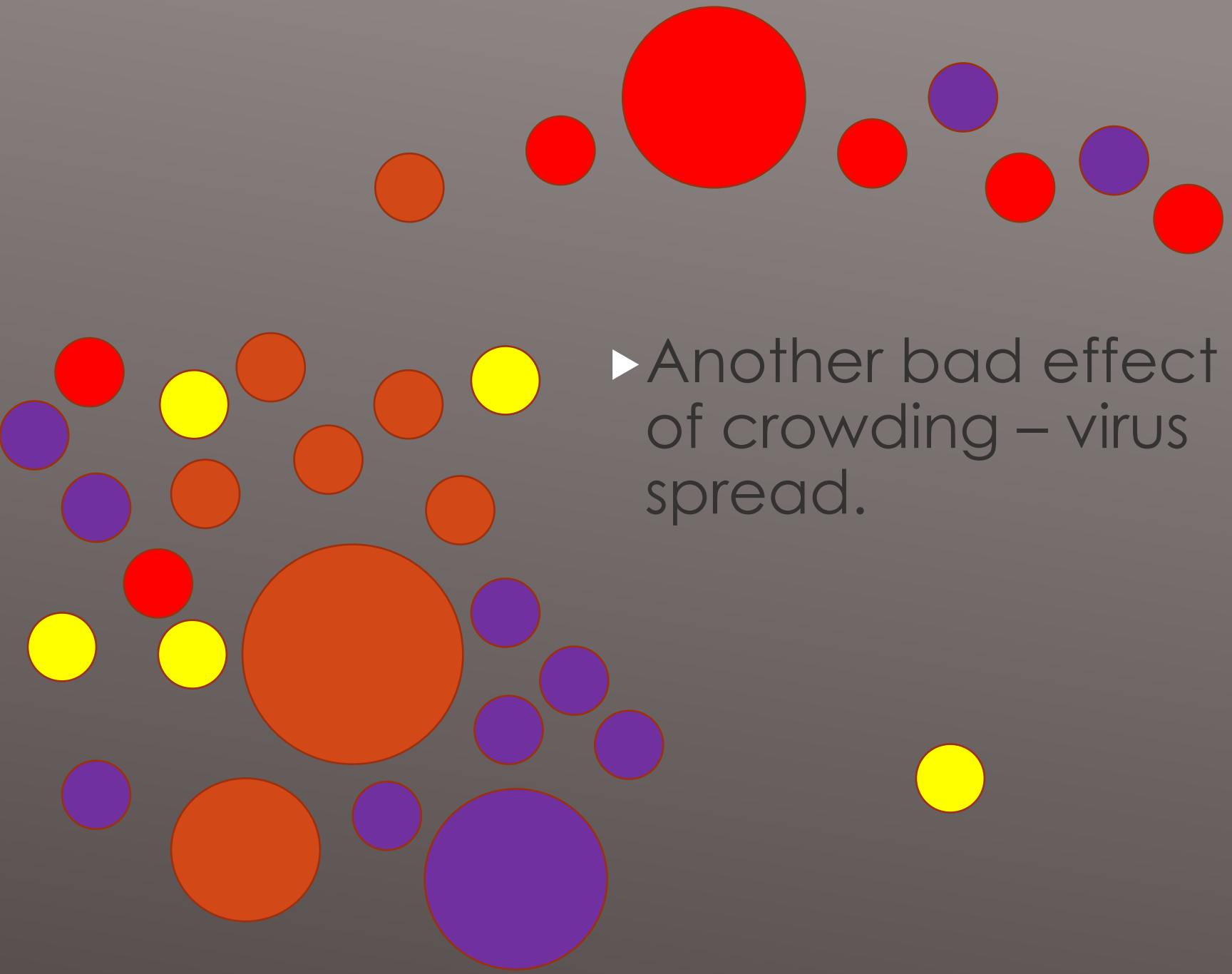
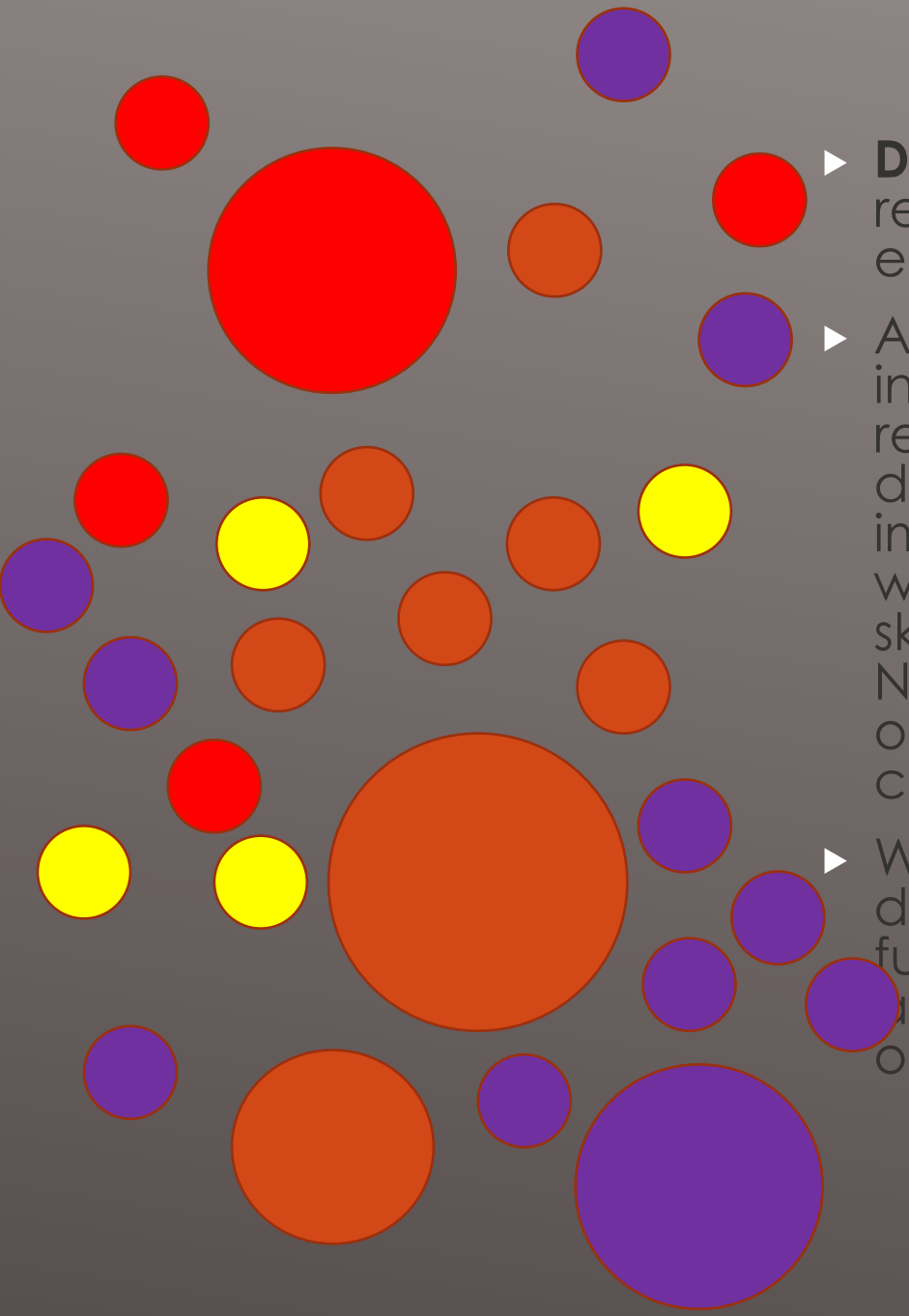
Thanks to Jim Angel, Pierangelo DePace, and Fabio Moneta for comments and suggestions.



- Another bad effect of crowding – virus spread.



- **DISCLAIMER**: None of us do research in medicine, disease, or epidemiology.
- A group of us collected information, data, and analysis regarding the corona virus to develop our own view about this important matter. Much of the work is crude and one should be skeptical about our results. Nevertheless, we decided to organize and share what we collected with others.
- We are also happy to share our data and collaborate with others further. If you have an idea and/or would like to work with us on this, just **email us**.

1. INTRODUCTION

- Wuhan Corona Virus, Wuhan Virus, SARS-CoV-2, Novel Coronavirus, Corona Virus, and many other names, was first believed to have originated in wet animal market in Wuhan, China in December 2019.*
- Although the consensus opinion is that it was an accident from the wet market, some believe it may be linked to a level-4 biological research/ weapons lab in Wuhan, China.**
- Many, including Italian TV warned of the dangers of this type of experimentation: https://www.youtube.com/watch?v=IJPrBS9uZi8&feature=youtu.be&app=desktop
- Regardless of how it started, there is also criticism of China for failing to alert the world to the dangers of the virus early enough. It is also possible that the Chinese government simply made a mistake.***

*COVID-19 is not a virus, it's the disease that the virus created. We spoke to one of the top epidemiologists and he said that we are not absolutely sure that the disease first crossed into humans in Wuhan, nevertheless current knowledge is that it was Wuhan, China. **If true, the hope is that it left the lab by accident, but some people believe, although hard to imagine, it could have been done on purpose. Some science evidence finds it doesn't seem like it was created in a lab. An epidemiologist told us that he didn't believe the science community yet had the ability to create such a virus. Also past epidemics all originated along food chain. *** This seems highly unlikely, since journalists were also expelled from the country.

1. INTRODUCTION

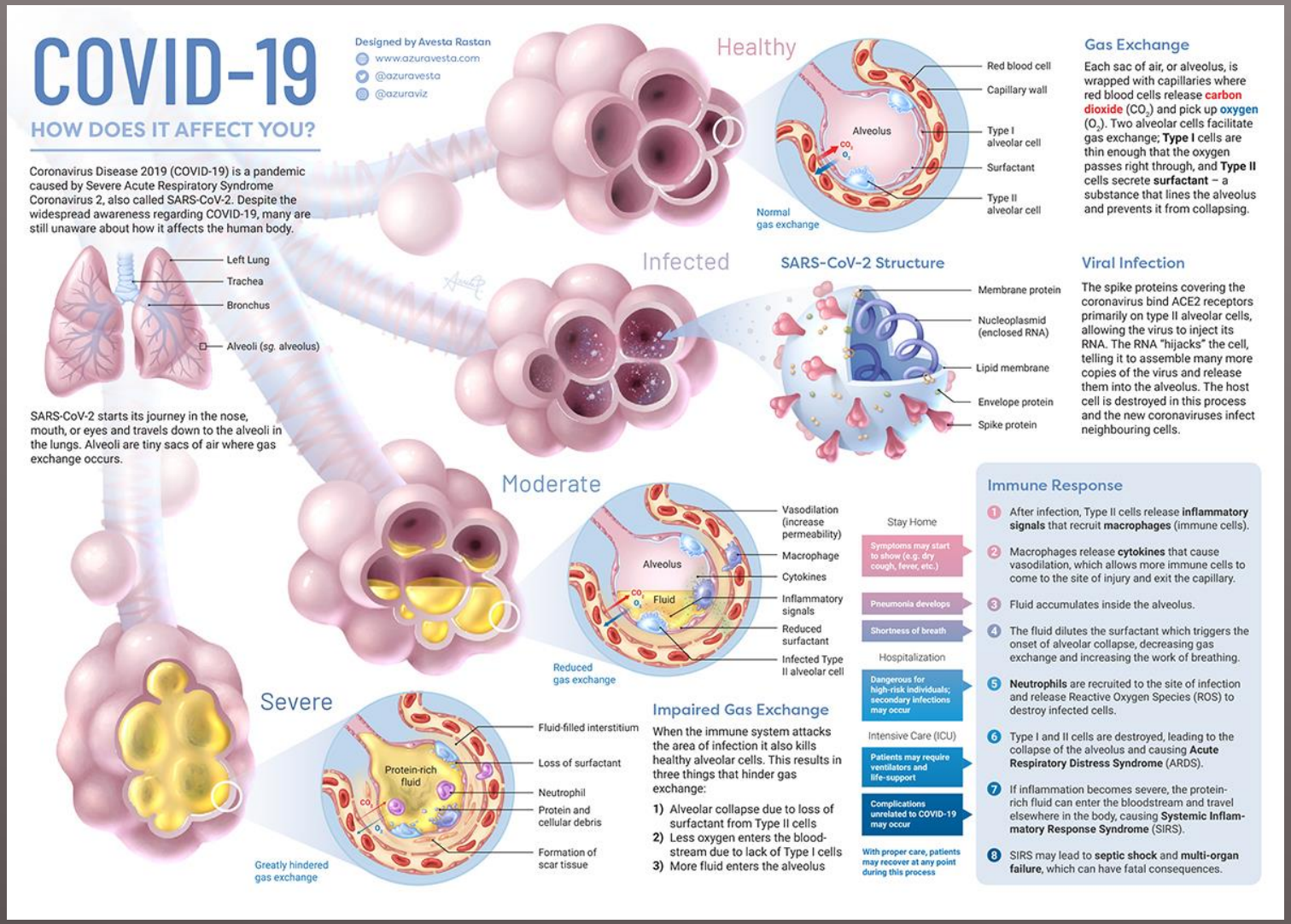
- The US provided $3.7 million in funding to the Wuhan Lab in question during the Obama administration. The bats were captured and sampled for coronaviruses used for lab experiments. All sampling procedures were performed by veterinarians with approval from the Animal Ethics Committee of the Wuhan Institute of Virology. Bat samplings were conducted ten times from April 2011 to October 2015 at different seasons in their natural habitat
- Warnings about this research started as early as five years ago. Simon Wain-Hobson, a virologist at the Pasteur Institute in Paris in an article in Nature (12/2015): "if the virus escaped, nobody could predict the trajectory". He said this in response to criticism of Dr. Zhi Shengli's research into modifying bat coronaviruses so they could infect humans at the Wuhan Virology Laboratory.
- Dr. Judy Mikovits (former Dir. of Lab Antiviral Mechanisms at NCI/NAID) has supported the view that the Wuhan Virus came from a recombination event at a lab.
- The US State Department received **two cables** from US Embassy officials in 2018 warning of **inadequate safety** at a Wuhan, China biolab conducting 'risky studies' on bat coronaviruses, according to the *Washington Post*

1. INTRODUCTION

- The Chinese Communist Party (CCP) has banned any investigations into the origin of the coronavirus (Source: Gordon Chang on "Tucker Carlson Tonight 4/13/2020) https://www.cnn.com/2020/04/12/asia/china-coronavirus-research-restrictions-intl-hnk/index.html
- The disease has so far caused chaos and deaths around the world, particularly in Italy (very high death rate). The United States currently has the largest number of confirmed/reported cases; Spain, France and Germany also have cases in the 6-digits.
- The best advised action, to date, against the disease has been to separate people and shut down business to slow the spread, which has caused an economic situation not seen in modern history.

1. INTRODUCTION

- THE DISEASE IN GRAPHIC FORM



Source: https://www.visualcapitalist.com/visualizing-what-covid-19-does-to-your-body/

1. INTRODUCTION

Some countries are not practicing social distancing.

The one who follows the crowd will usually get no further than the crowd. The one who walks alone is likely to find themselves in places no one has ever been before. --- Albert Einstein

Foolishness of the crowd

Trips planned by residents, 100=usual level

Public transport and walking, selected cities, March 2020

Western Europe

City	9th-15th	14th-20th	20th	21st
Milan	9	5	4	3
Vienna	69	18	5	3
Madrid	46	7	4	4
Barcelona	61	11	5	4
Lyon	86	26	5	4
Paris	57	18	5	4
Monaco	51	21	8	4
Rome	16	6	5	5
Brussels	71	23	7	7
Netherlands	68	26	8	8
Copenhagen	54	16	8	9
Hamburg	64	30	14	9
Berlin	69	32	13	12
Lisbon	87	31	13	13
Rhine-Ruhr	60	32	16	13
London	83	50	31	23
Manchester	89	55	36	26
Stockholm	73	44	30	31
Birmingham	91	56	38	31

United States and Canada

City	9th-15th	14th-20th	20th	21st
San Francisco	57	20	9	9
New York City	67	25	12	10
Boston	64	23	12	11
Chicago	78	27	13	12
Washington DC	66	24	12	14
Los Angeles	71	31	19	15
Seattle	47	24	16	18
Vancouver	83	50	27	27
Toronto	84	44	27	30
Rest of world				
Istanbul	93	37	14	11
São Paulo	104	45	19	17
Tokyo	48	39	35	27
Mexico City	95	59	42	31
Seoul	42	40	44	39
Melbourne	97	66	49	46
Moscow	98	77	56	53
St. Petersburg	101	87	72	65
Singapore	82	75	70	72

Source: Citymapper

The Economist

2. OVERREACTION OR DIFFERENT DISEASE?

- *What is the value of experts like me? I likely know more about infection, epidemics and vaccines than most. I have studied epidemics across the world. I have made and designed vaccines. Do I know what will happen next with this epidemic? Which of the experts are right? The World Health Organisation (WHO)? The politicians and their teams of scientists and modellers?*
- *In reality, we are all trying to take informed guesses.* - Professor Gordon Dougan

2A. OVERREACTION OR DIFFERENT DISEASE?

- Many people wonder why there has been such a strong reaction to Corona versus other respiratory viruses. We believe the reason is the following:

  a. Although many die from the flu, they would not need ICU and respirators and spend less time in hospital. Thus, no hospital overload.

  b. Corona seems to be more contagious than flu (also asymptomatic transmission). Whereas the flu does damage over months, this disease is spreading quickly.

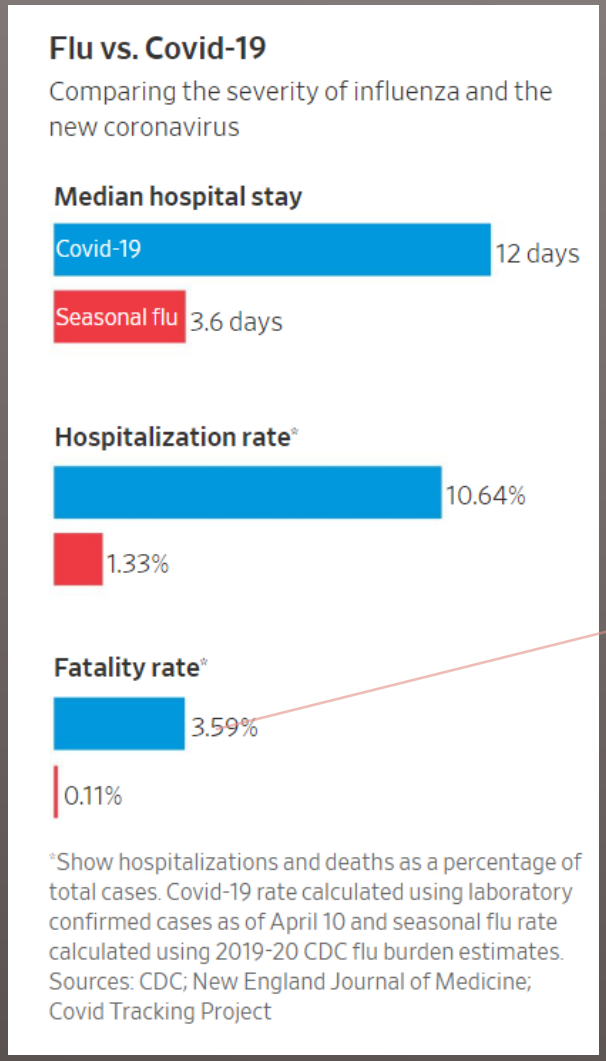
  c. The death rate for Corona is still being estimated, but might be around 1% or lower, although measured rates in different countries have been over 10% in some cases. In all cases, higher than the flu (0.1%).

  d. It is believed to have a very high death rate for older people (still being estimated). See slide 12 for deaths by age bracket in Italy as of February 27, 2020.

  e. There are no vaccines for this virus yet.

  f. Finally, there are unknown long-term effects to consider, future mutations and a recurrence of the virus in the future.

2A. OVERREACTION OR DIFFERENT DISEASE?

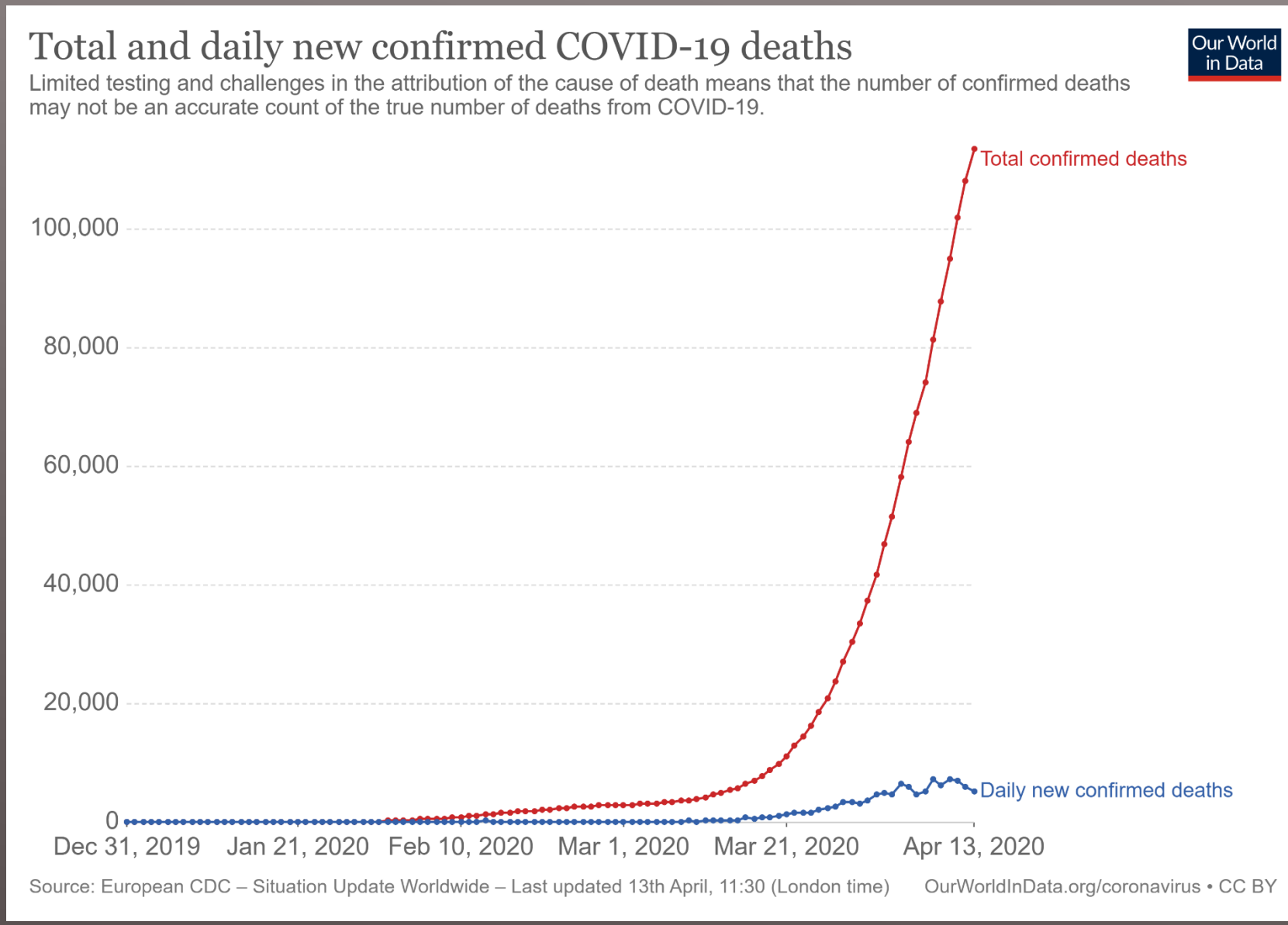


Still not sure what actual value is.

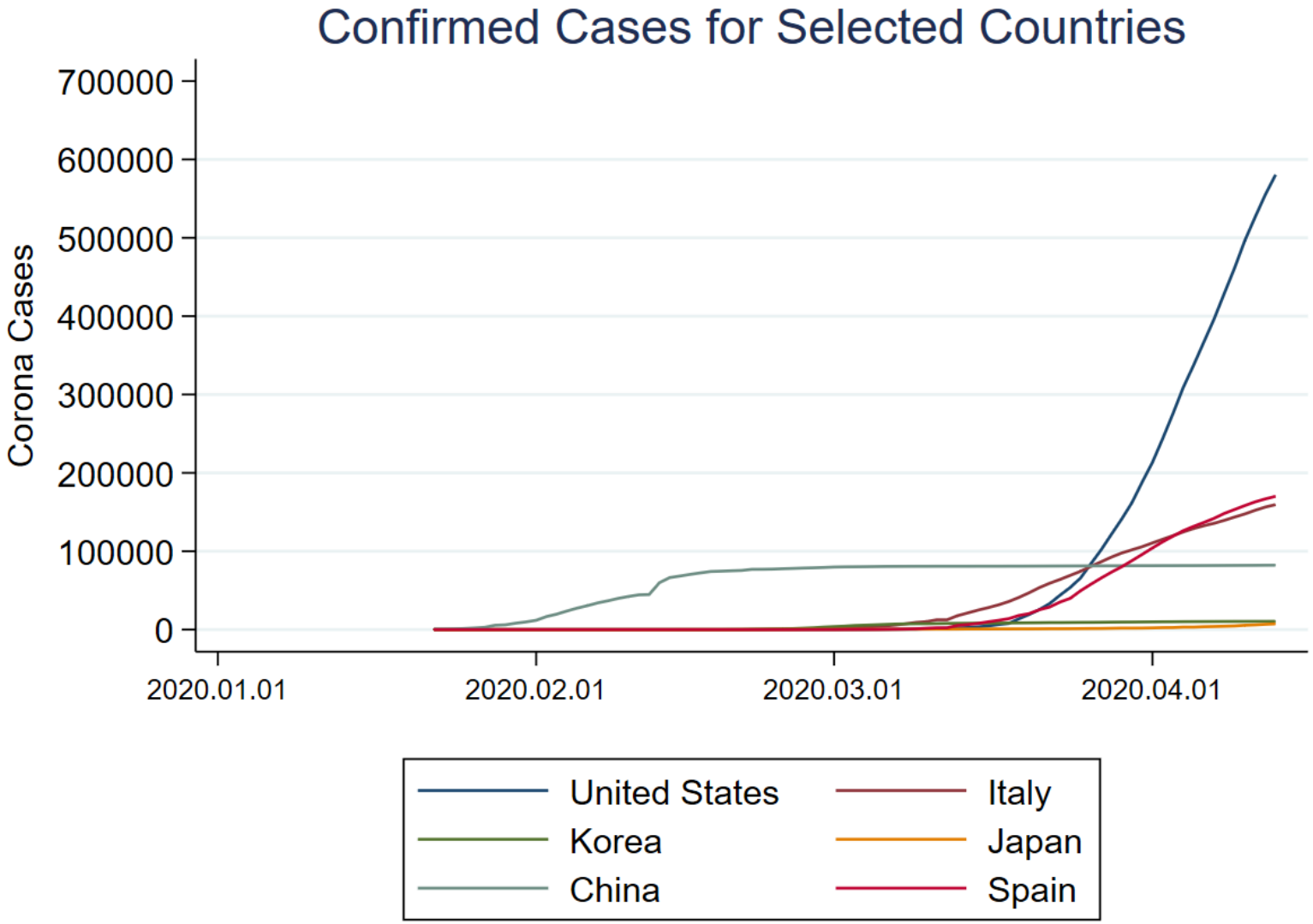
2B. DEATHS IN ITALY BY AGE BRACKET (02/27/20)

Age Range	Deaths	Fatality
0-9	0 (0%)	0%
10-19	0 (0%)	0%
20-29	0 (0%)	0%
30-39	5 (0.2%)	0.3%
40-49	12 (0.6%)	0.4%
50-59	56 (2.8%)	1%
60-69	173 (8.6%)	3.5%
70-79	708 (35.3%)	12.3%
80-89	851 (42.5%)	19.6%
>=90	198 (9.9%)	22.9%
Not indicated	0 (0%)	0%
Total	2003 (100%)	7.1%

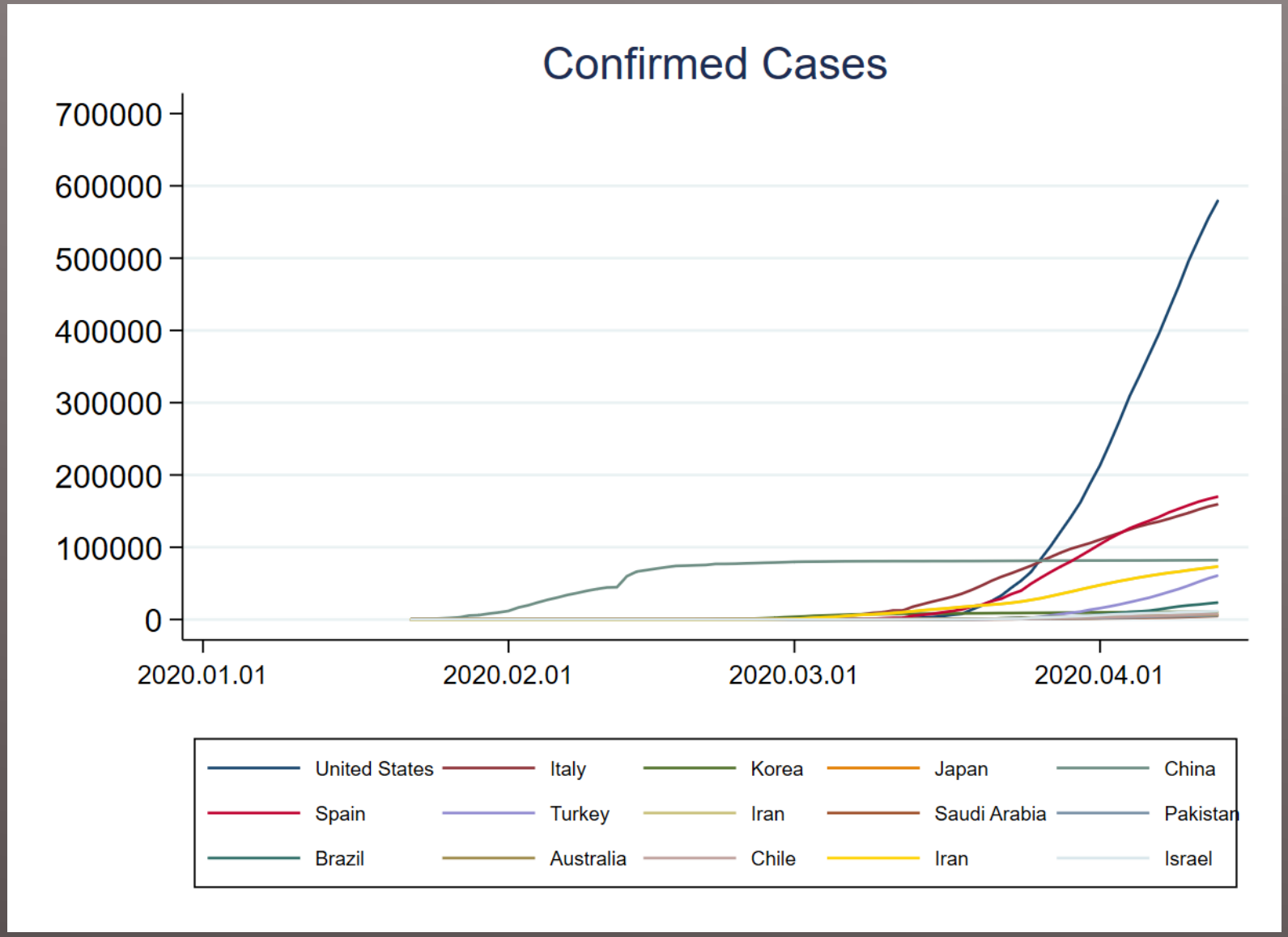
2C. WORLD CORONA CASES COUNTED



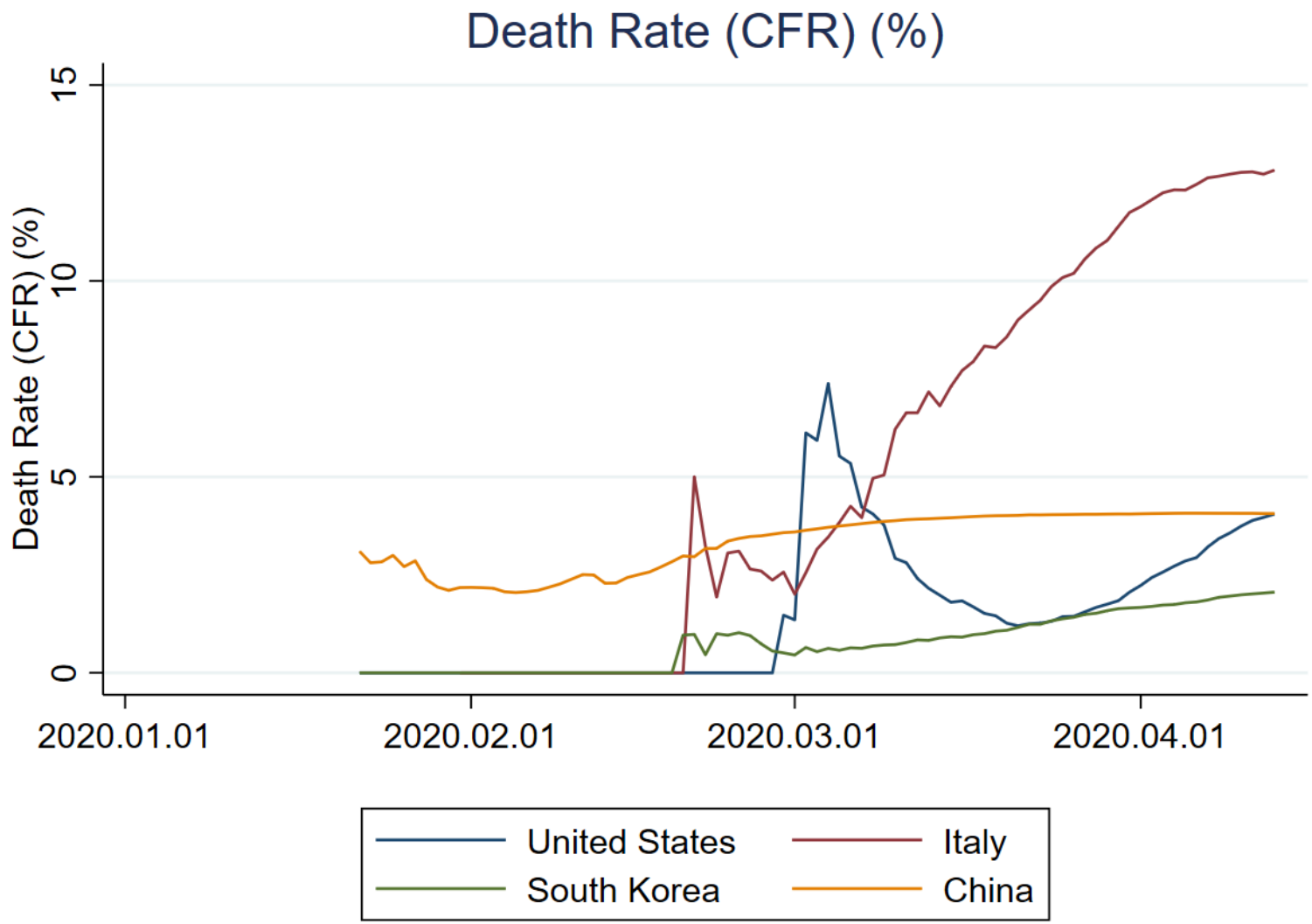
2C. WORLD CORONA CASES COUNTED



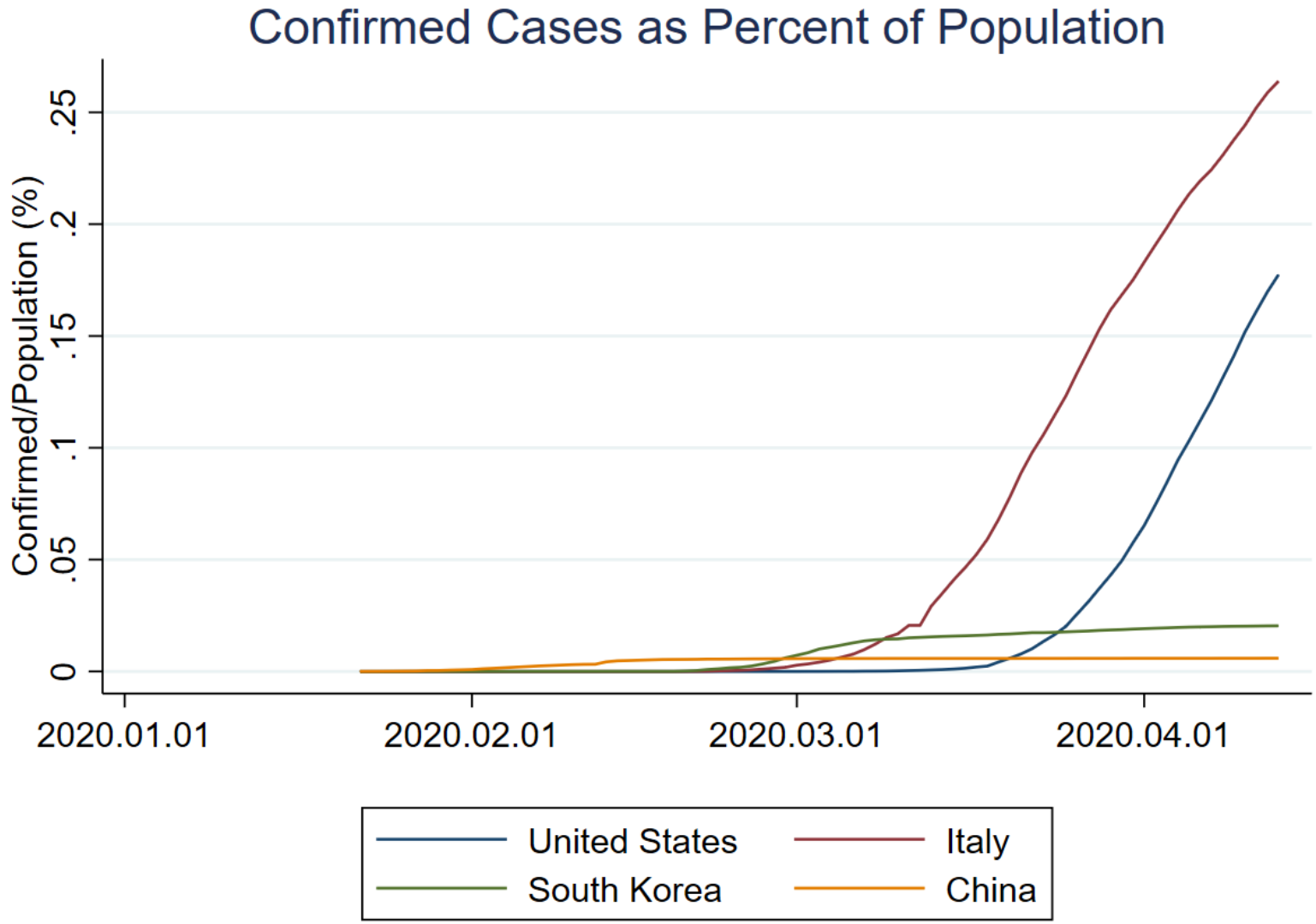
2C. WORLD CORONA CASES COUNTED



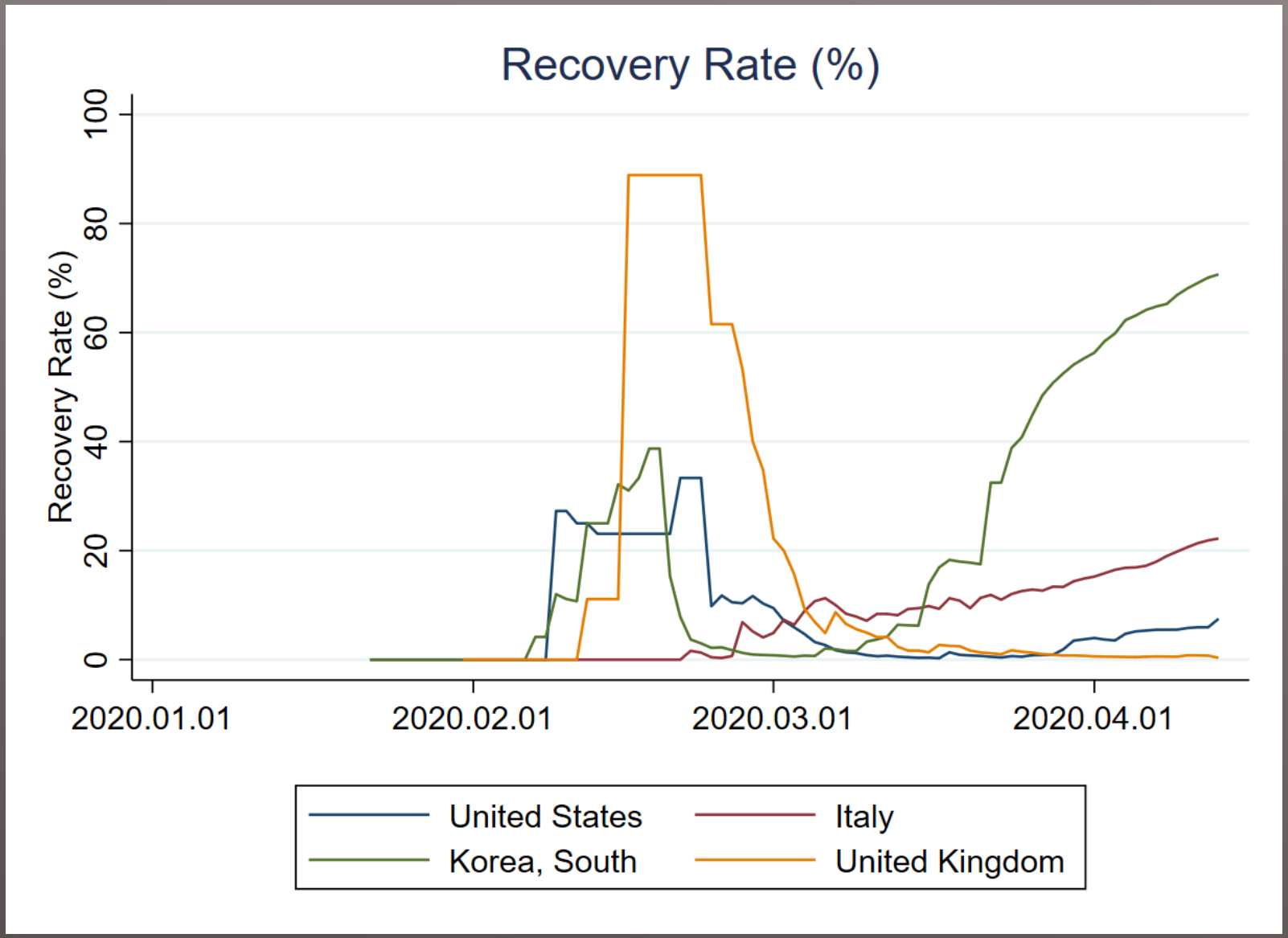
2D. CFR OR MEASURED DEATH RATE



2E. CONFIRMED PER CAPITA

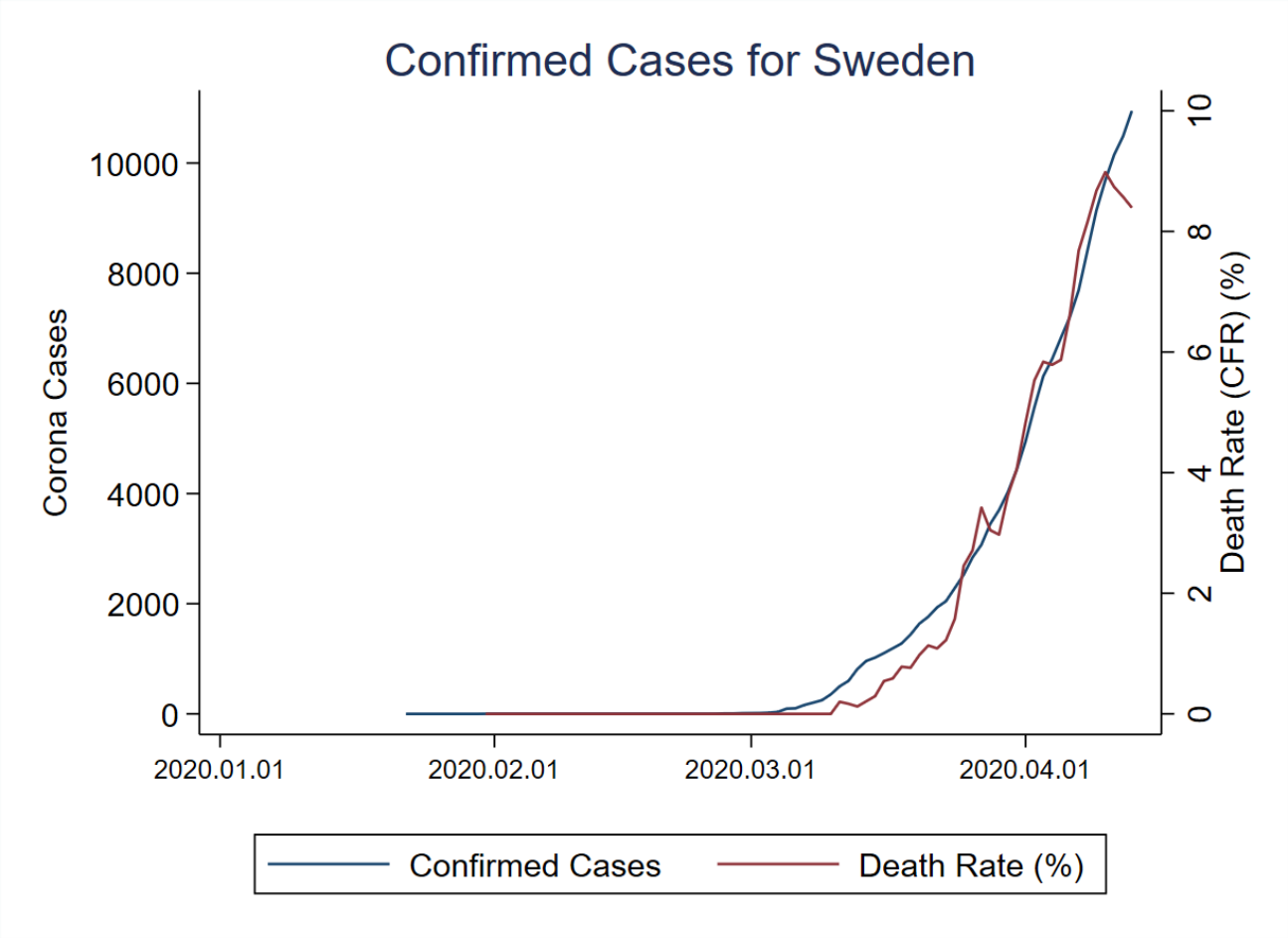


2F. RECOVERY RATES IN SELECT COUNTRIES



2G. SWEDEN – A DIFFERENT STRATEGY

- As of April 12, 2020, Sweden has decided to allow the society to function as normal and let immunity build within as well as allow for deaths. It will be very Interesting to see which strategy pays off the most.*



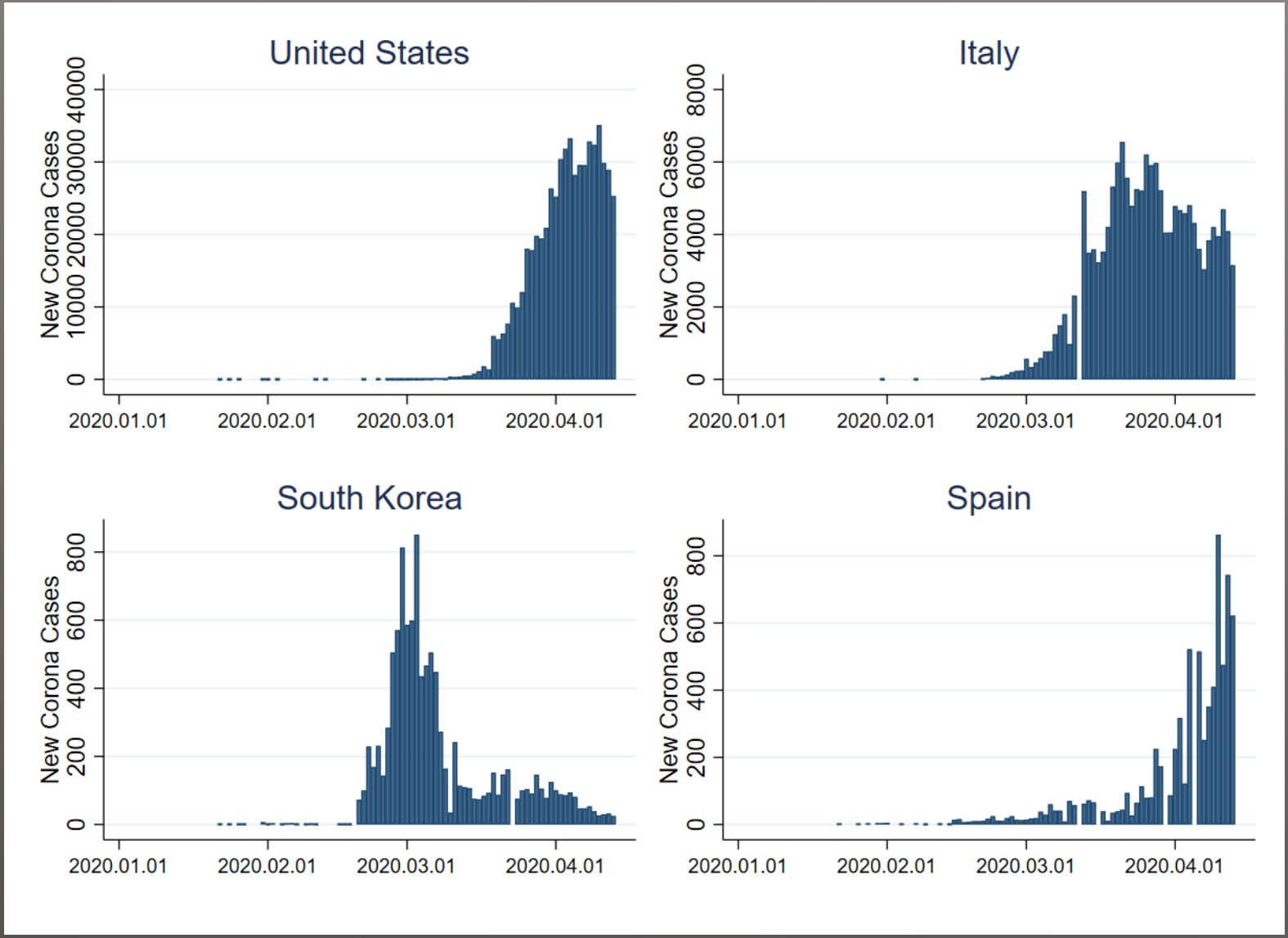
*On April 13, they have suggested a light lock down might start.

2H. IMPORTANCE OF NEW CASES

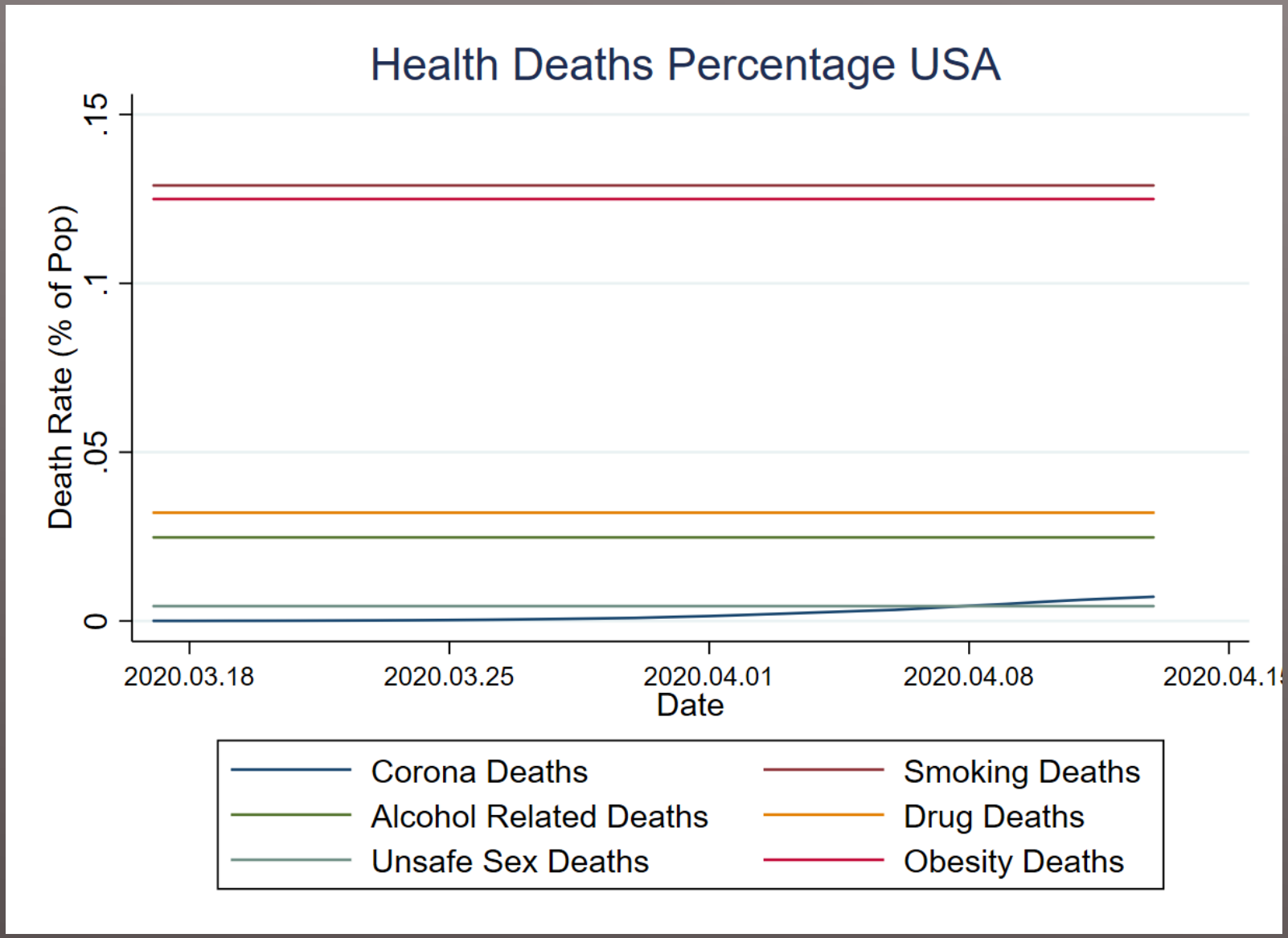
- As the number of new cases declines, rather than accelerates, we are approaching the "flattening of the curve" or the end of the spread for total cases – that is, the PEAK.

- This is why looking at the new cases is an indicator of when the spread of the disease is slowing down or close to an end.

2H. NEW DAILY CASES IN SELECT COUNTRIES



2I. CORONA DEATH RATE COMPARED TO OTHER DEATH RATES



2I. CORONA DEATH RATE TO OTHER DEATH RATES

- The graph on the previous page shows that the Corona death rate as a percentage of the US population (0.0071%) is far less than deaths from alcohol, and drugs and far below deaths from obesity and smoking (as of April 13, 2020).

- We have to be very careful interpreting this graph, since corona virus deaths have only been tracked for approximately 3 months, while those death rates are annual death rates for the other diseases. Also, some experts believe it's going to be much higher than this measured rate. The intent of the graph is provide *perspective*.

2J. WHAT IS THE TRUE DEATH RATE?

- **What is the true death rate of Corona?**

Hard to tell, because we don't know true number of infected, can only measure:

Measured death rate or Case Fatality Rate (CFR) = number died/number we know are infected*

In our graphs, we use deaths/confirmed cases for each country.

We would like to know infected fatality rate (IFR) = deaths/(confirmed + those with virus but untested).

Finally, another useful term is age-adjusted mortality rate (AAMR) which takes the age distribution of a country into consideration when computing the potential death rate for a particular country.

*More Info: https://ourworldindata.org/covid-mortality-risk

2J. WHAT IS TRUE DEATH RATE?

- **What is the true death rate of Corona?**
  - Hard to tell, because we don't know true number of infected, can only measure:

Measured death rate or CFR = number died/number we know are infected

  - One early clue, the death rate on the Diamond Princess – raw calculations give fatality rate of 1% (7/697)(experts provided a number of 1.2%). This is probably an **upper bound**, since the average age on cruise ship was 58 and 33% were older than 70. All 7 deaths were above 70 (as of 03/03/20).
  - Furthermore, the infection rate for the Diamond Princess, which could be considered a natural infection rate without any mitigating actions like social distancing, etc., was 19% (697 infected/3711 total passengers/crew) overall across all age groups (again a higher bound if the elderly are more susceptible (all on board were tested)). This suggests that notwithstanding the older nature of the group on board, the infection rate was comparable to the H1N1 infection rate of 19% in 2009-2010 according to the CDC.

2J. WHAT IS TRUE DEATH RATE?

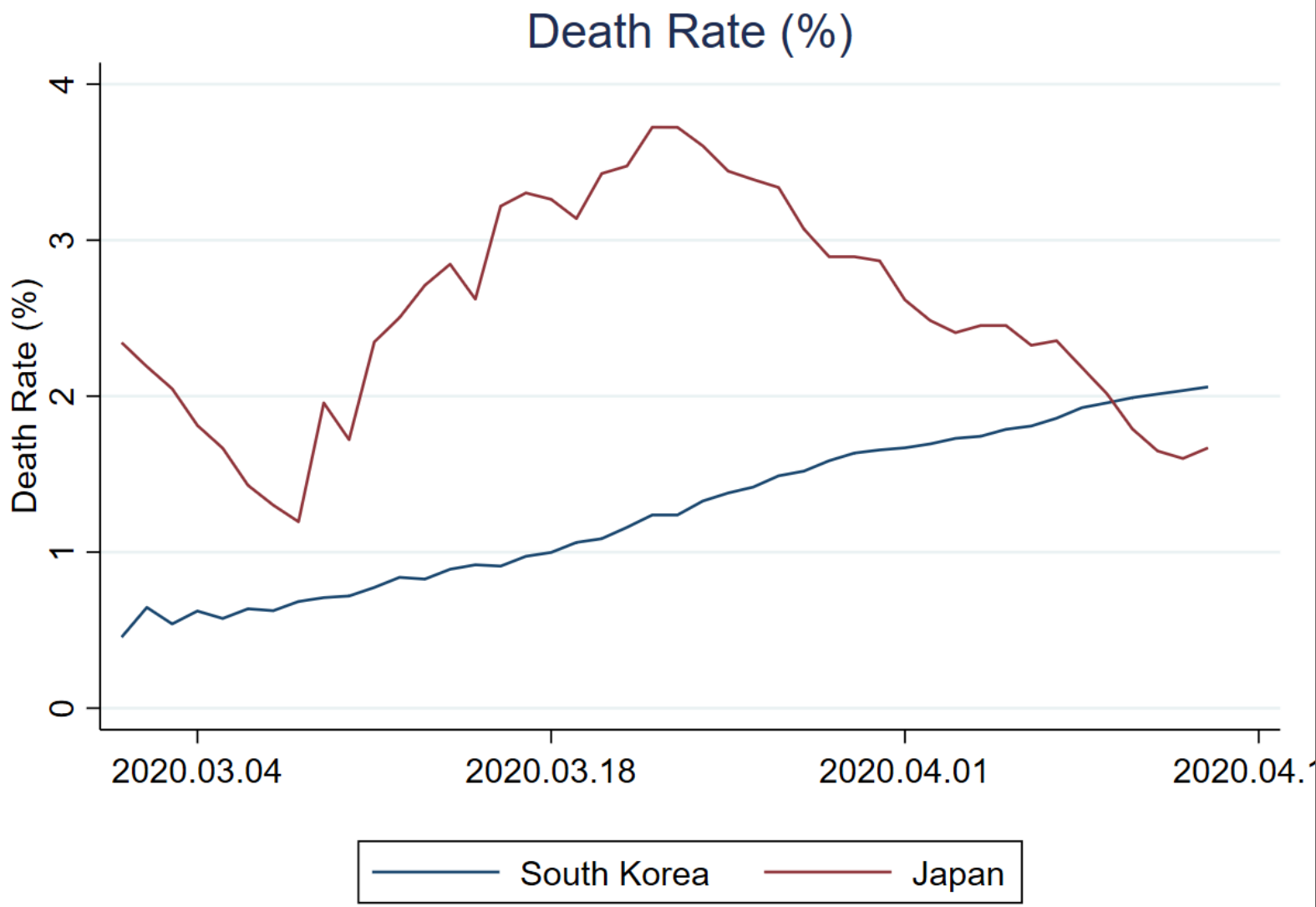
- **What is the true death rate of Corona?**
  - Using a very crude method with strong assumptions based on Diamond Princess, the US population death rate (AAMR) might be closer to 0.3% (for Italy would be 0.47%).
  - Korea did the most testing per capita and so might reflect the closest accurate measure of actual confirmed. Their death rate (CFR) as of April 14 of 2.06%. (Note: Korea has 14.4% of people over 65 which is above the world country average of 9.39% for 2018)
  - A recent study, using Chinese data, found that the CFR was 1.38%, but the infection fatality rate was 0.66%. *Note*: It is not clear you can trust the data from China, so still unclear about deadliness.

2J. WHAT IS TRUE DEATH RATE?

- **What is the true death rate of Corona?**
  - Some data from New York as of 5pm on 4/13/2020*:
- **As of 4/13/2020 there were a total of 6,182** total deaths in NY and 195,031 infections. Yet just **128** had no underlying health conditions (which included: diabetes, lung disease, cancer, immunodeficiency, heart disease, hypertension, asthma, kidney disease, gastrointestinal, liver disease.) So across all ages, just 2% of the deaths were due to otherwise healthy individuals, and the **average death rate among otherwise healthy individuals was 0.1% (128/195,031).** This is comparable to the flu.
- A total of 222 died in the 18-44 age range. Only 26 of those had no underlying health conditions.
- A total of 2114 died in the over 75 age range only 25 had no underlying health conditions.
- Summary: Too early to tell what the true death rate is.

*Source: NY Department of Health reporting on 4/13/2020.

2J. WHAT IS TRUE DEATH RATE?

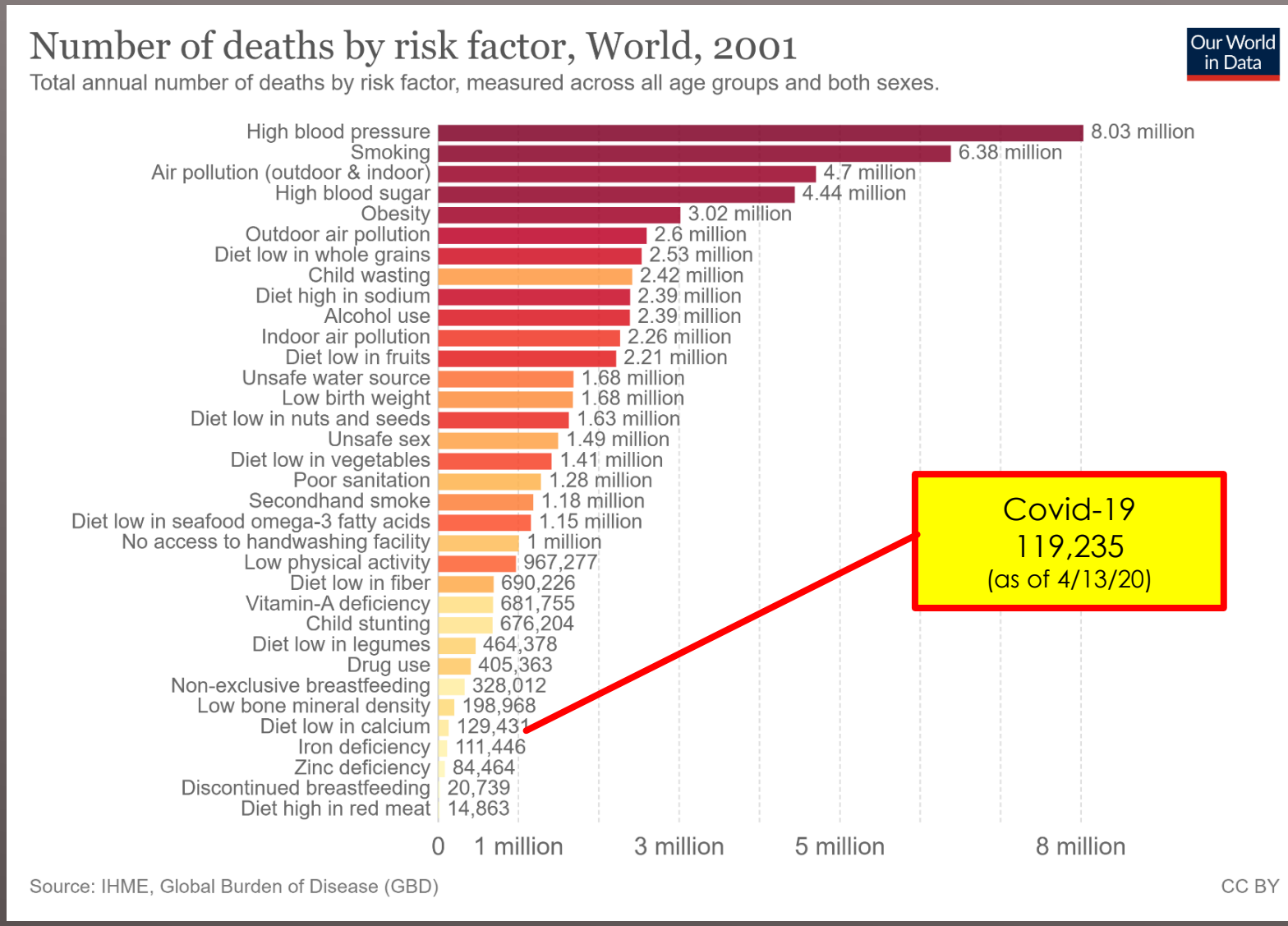


3. CROSS-COUNTRY CRUDE ANALYSIS

- Taking data from a broad set of countries with confirmed corona virus cases can we spot patterns and understand why it might be worse in some countries than others?

- First, let's look at what other health factors humans typically die from.

3. CROSS-COUNTRY CRUDE ANALYSIS



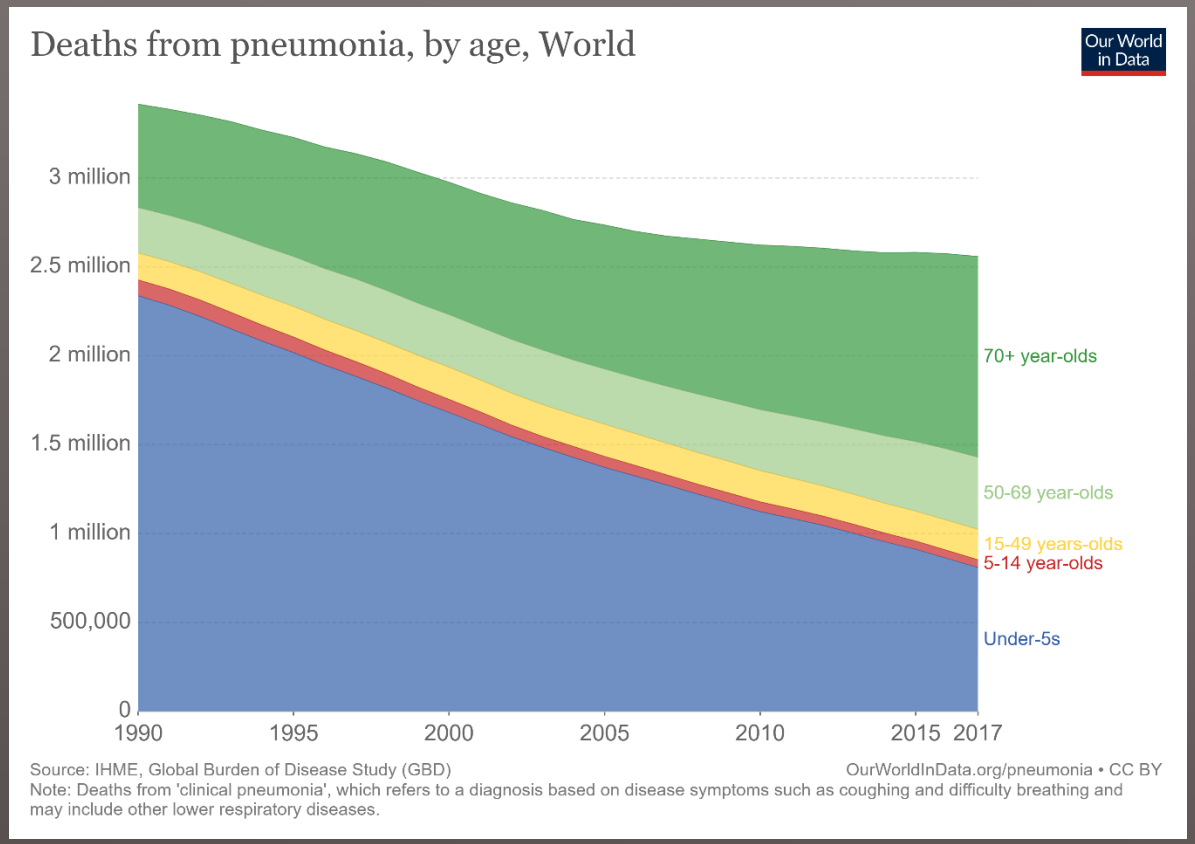
3. CROSS-COUNTRY CRUDE ANALYSIS

- United States – Flu and Pneumonia Deaths

Influenza and pneumonia (J09–J18)	55,672
Influenza (J09–J11)	6,515
Pneumonia (J12–J18)	49,157
Covid-19 (USA only, as of 4/13/2020)	23,462

3. CROSS-COUNTRY CRUDE ANALYSIS

- World - Pneumonia Deaths (WHO estimated another 290K – 650K of Flu Deaths, let's say 339K)



Est. Flu & Pneumonia = 2.9M

Just Age 50+ people, maybe 1.7M (1.535 Pneumonia + est flu)

3. CROSS-COUNTRY CRUDE ANALYSIS

- As of April 13, 2020
- Corona World Wide Deaths = 119,235 (disease around circa 3 months)
- Est. World Deaths Flu & Pneumonia in typical year = 2.9M
- Right now, if we annualize Corona deaths, they are 16% of the level of deaths from flu/pneumona. This probably underestimates the true number because we are not even sure how many are currently dying of corona.
- Of course, we don't know what this would be like WITHOUT social distancing and hospital capacity build-up.

3. CROSS-COUNTRY CRUDE ANALYSIS

DATA SOURCES:

1. World Bank country wide data on:

- Percent of population over 65
- Number of airline passengers per year (indication of potential virus spreaders)
- Percent of population that smokes (since it seems to be a respiratory disease – although may also be neurological/cardiovascular disease as well)
- The number of hospital beds per capita (we would really like the number of ICU beds per capita, but maybe correlated*)
- Density of Population (how fast the virus can spread – of course, national density isn't the same as regional density (i.e. New York City versus Colorado).

*We recently found this data, but have not had time to study it specifically.

3. CROSS-COUNTRY CRUDE ANALYSIS

DATA SOURCES:

1. World Bank country wide data on:

- Foreign born population (more links to China, however, again, very geographic specific)

2. WHO Data on:

- Deaths from other diseases in each country

3. CROSS-COUNTRY CRUDE ANALYSIS

FINDINGS:

1. The death rate is higher anecdotally for countries with a higher percentage of elderly individuals.

2. The higher the amount of air passengers per year to a country, the higher the cases of Corona. Thus, for every 1M passengers that fly to a country in a year, they are likely to have 49 more Corona cases.

3. CROSS-COUNTRY CRUDE ANALYSIS

FINDINGS:

3. We also find a relationship between smoking percentile and number of beds per 1000 with the death rate per capita (mortality rate) of the Corona virus.

4. We found that freedom of speech/press is correlated to a higher reported number of confirmed cases and deaths.

5. We find no relationship between many other variables and the confirmed corona cases or the death rate of corona.

*Disclaimer: It is very early in the corona outbreak to make final conclusions on these matters and more research will probably require including more control variables across countries and other more sophisticated analysis before firm conclusions can be drawn. Also countries will differ in the reliability of their statistics.

3. CROSS-COUNTRY CRUDE ANALYSIS

SUMMARY OF FINDING IN CRUDE CROSS-COUNTRY REGRESSIONS (as of April 7, 2020):

Test	Rationale	Correlated	Notes
Airline Passengers Per Year	More open countries will have higher infection rate	YES	Every 1 Million more per year associated with 49 more cases
Percent Old People (65 older)	It is believed that Corona is deadlier for old people	YES	
Beds Per 1000 People	This could be correlated with general hospital capacity, ICU, and other things.	YES	When controlling for older population and beds, 1 more bed per 1000 is associated with -0.39% decrease in the death rate. Example: US has 2.9 beds per person, Italy 3.4, and Korea 11.5.
Percent of Adults that are Overweight	Some doctors have witnessed heavier people dying from Corona - health issue.	YES	A 1% decline in the percentage of people overweight is associated with a decrease of 0.5 corona deaths per 1 million people. Note: For US, Corona deaths are about 3.1 per million people (as of April 7, 2020). Obesity rate in Korea is 32% compared to Italy of 64%, compared to USA of 70%.
Percent of Population that Smokes	Smoking can affect respitory function.	YES/NO	A 1% higher percentage of smokers in population is associated with 120 more deaths per million of people from Corona. Example: Italy, United States, Korea, and China have the following percentage of smokers in 23.7, 23.3, 21.8, and 25.6. The main reason for this result is a lot of the "hot" countries don't smoke very much. Thus, temperature really captures the smoking results.
Percent of Foreign-Born in country, Percent of Diabetes, Percent of Drug Deaths.	Health Related	NO	Do seem correlated.

3. CROSS-COUNTRY CRUDE ANALYSIS

Note 1: We would have also liked to find country data on flu deaths in a typical year to compare to the Corona deaths. We could not find this in a suitable form.

Note 2: These are crude cross-country correlations that may not be related to causation.

3. CROSS-COUNTRY CRUDE ANALYSIS

There has been speculation that warm weather could reduce or stop the Wuhan Corona Virus.

We collected data on the average temperature per month in all of the countries that we could. We then performed two sets of tests.

Test #1: We did a cross-sectional regression of growth in confirmed corona cases versus average temperature in that country.

Test #2: Every day, we created a "portfolio" of countries with the 20% highest temperatures and 20% lowest temperatures using avg. temp. of the country in each particular month. We then looked at the growth of those "portfolios" by the growth rate of the portfolio in terms of confirmed corona cases.

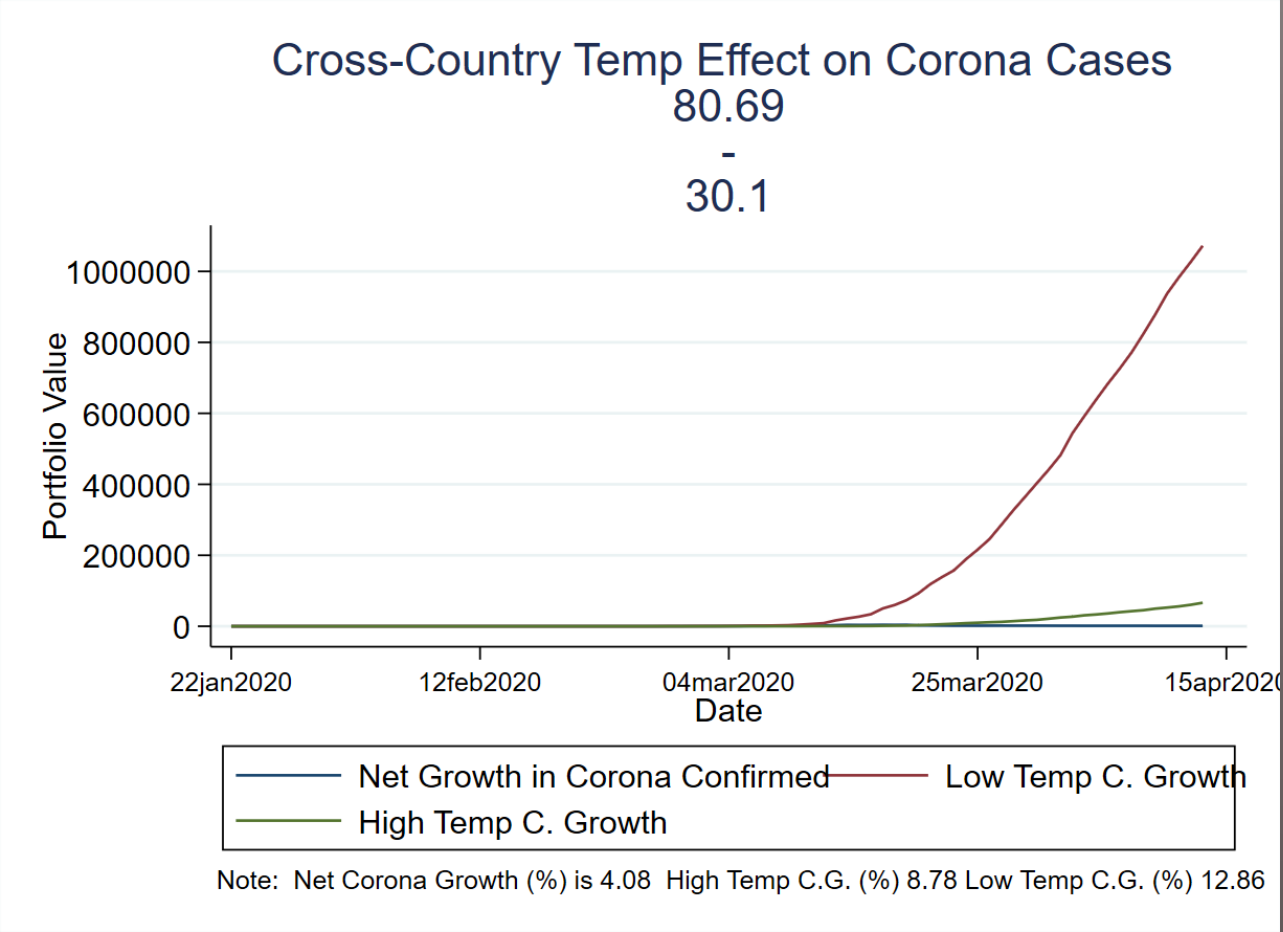
3. CROSS-COUNTRY CRUDE ANALYSIS

Test #1: A one degree rise in temperature across a cross-section of countries is accompanied by a 99% higher growth rate in confirmed corona cases (no adjustment for outliers).

Test #2: The average growth of the high weather countries is much lower than the low weather countries. This is a crude analysis and incomplete, but suggests that corona could die out with warmer weather (see next slide for picture).

3. CROSS-COUNTRY CRUDE ANALYSIS

Test #2: Below is the graph of the growth of the portfolios starting at 100.



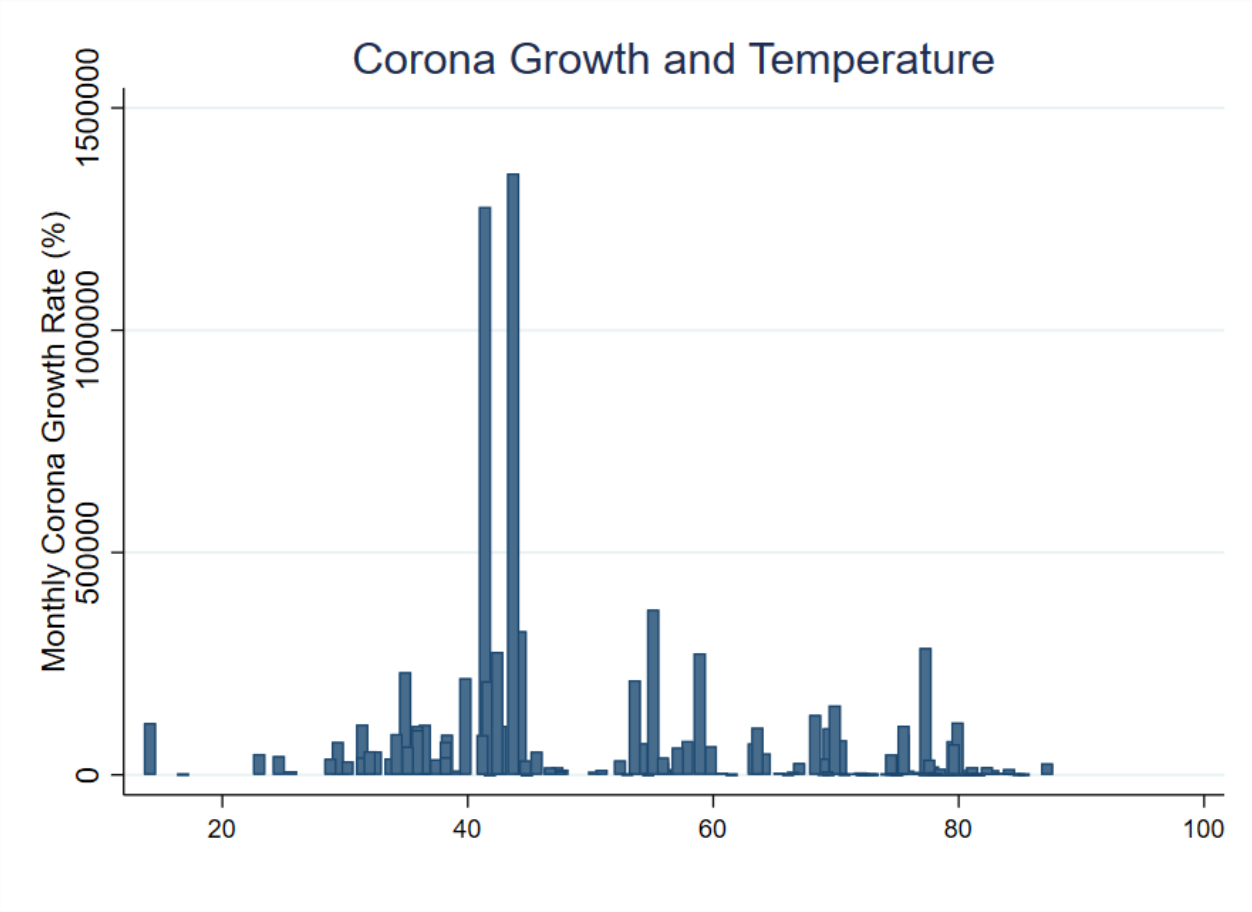
3. CROSS-COUNTRY CRUDE ANALYSIS

Test #2: Notes:

1. Our hot countries average 80 F and our cold countries average 30 F.
2. We performed the test by removing outliers, there is still a difference between the portfolio of hot weather countries and low weather countries.
3. We also considered growth in deaths (since confirmed is measured less accurately) and the same pattern emerges)
4. Of course, there could be lots of differences between hot and cold places we haven't account for, like amount of infected that arrived, density of population in a specific region (e.g. NYC), and other items.
5. The next page shows the distribution which is a bit more ambiguous.

3. CROSS-COUNTRY CRUDE ANALYSIS

Test #2: Avg. Growth and Weather for March 2020



4. FURTHER RESEARCH ON DISEASE

Other Things We Would like to do, but haven't done:

1. Since the density of population is probably related to virus spread, we would like to test this more regionally, because with country data, country density is not accurate for density in pockets (e.g. New York City).
2. We would like to obtain data on confirmed flu cases and deaths around the world to put Corona in perspective by country, but we have not been able to easily get this data.
3. We would like to have more data on the conditions of people dying. To understand the characteristics that might make one vulnerable to death as well as to understand how many of these people might have died from the regular flu as well. We cannot find this data. For example, in Italy, many of the dying had pre-existing conditions.
4. Although we did some preliminary work on how weather and the disease are related, would like to do more.
5. It would be interesting to check how different countries counted cases of Corona – was it consistent?

4. FURTHER RESEARCH ON DISEASE

Other Things We Would like to do, but haven't done:

6. Later on, when we know more about true confirmed cases, it might be interesting to see the connection between a freedom index and the reported cases of Corona. Maybe some countries are censoring or not reporting accurately their results. Our preliminary work shows a correlation between reported cases and freedom of speech/press.

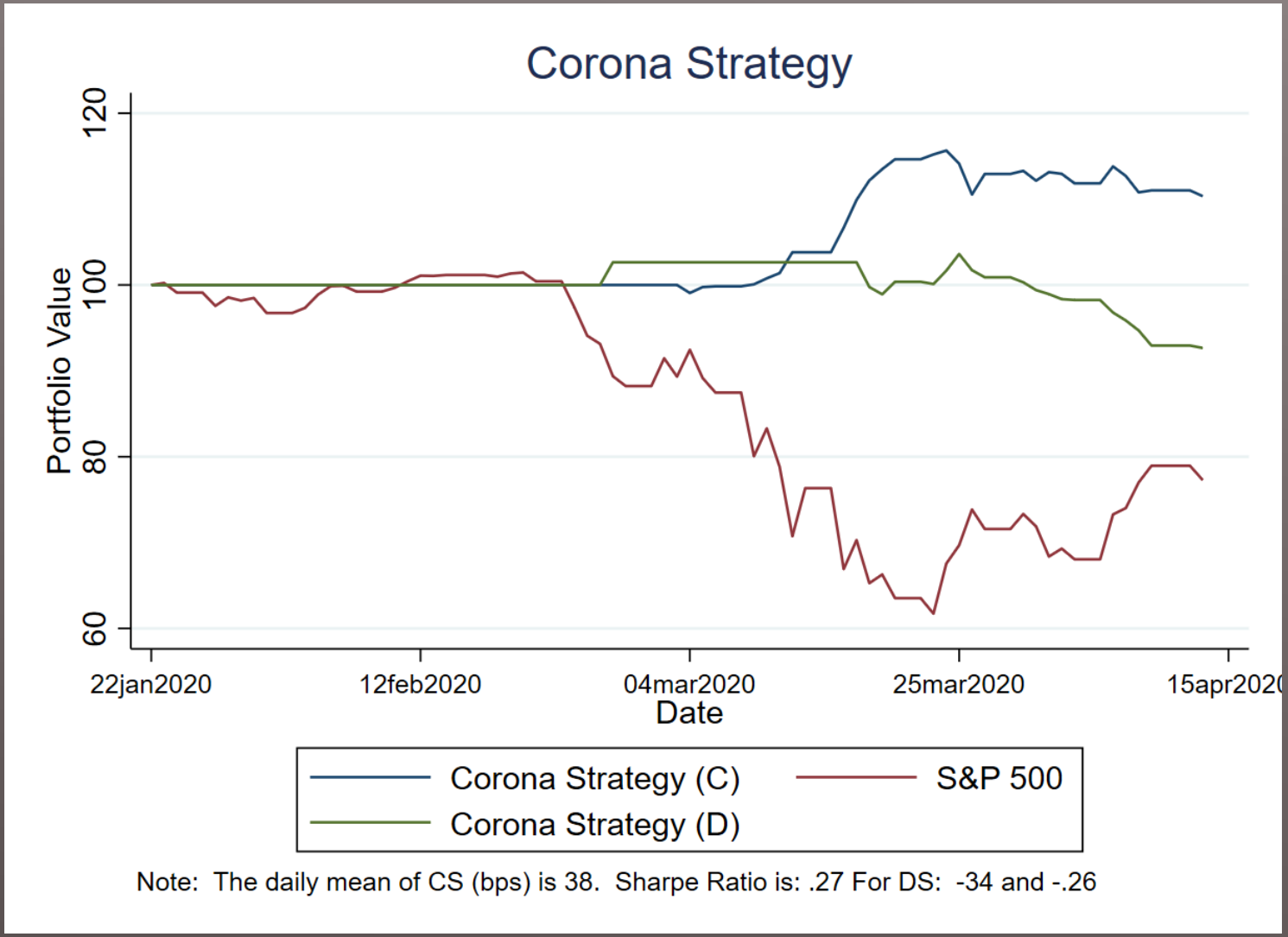
4. STOCK MARKET AND CORONA

Question #1: Do countries with higher growth in confirmed cases and/or death rates lead to lower stock market returns? One way to do this is creating a decile of lowest growth countries (with active ETFs) versus highest growth countries and computing the returns of such portfolios. Do they have excess returns?

The idea is not so much for a "stock market strategy" but since markets react quicker than the economy, it is interesting to see how markets are paying attention to Corona.

4. STOCK MARKET AND CORONA

Zero-Investment Corona Strategy Portfolio makes 38 bps per day (was higher in early stages).



4. STOCK MARKET AND CORONA

Strategy C: Buys countries with lowest previous day Corona growth and sells countries with highest previous day Corona growth. Has provided a significant daily return.

Strategy D: Does the same thing but with deaths. We didn't believe the market would react to this as much, but did it for those who were curious. This doesn't do much better than cash.

4. STOCK MARKET AND CORONA

Other Questions we would like to examine:

1. Are markets efficient? Meaning, if we look at stocks with similar characteristics, do they move in the same way due to a shut down? Or is market drop driven by ETFs and large passive world without regard to idiosyncratic issues?
2. Can you infer the GDP drop implied for a country by the movement of the ETF?
3. Are there particular investments that will do well at different phases of the pandemic?
4. Can you create a hedge portfolio of stocks against corona (other than a straight short of market)?

5. THE ECONOMY AND CORONA

Questions:

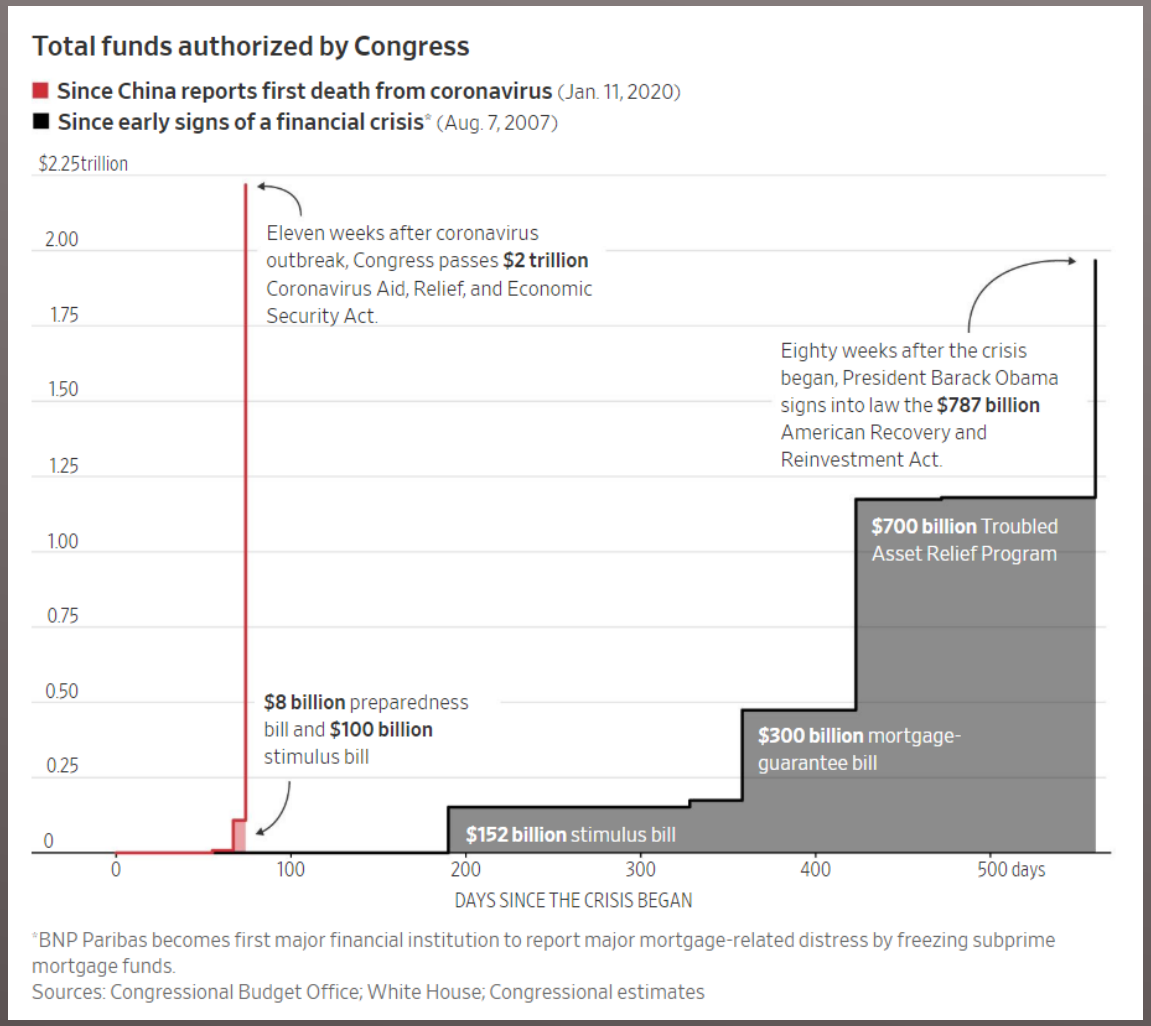
1. The big question is how much will the virus harm the economy?
2. How much of that damage will translate into stock market losses and for how long?
3. How much will President Trump's stimulus and Chairman Powell's Fed actions alleviate the economic hit?
4. What are the costs of the stimulus packages in the future, higher debt, higher future taxes, more support for bubbles?

5. THE ECONOMY AND CORONA

1. The big question is how much will the virus harm the economy?

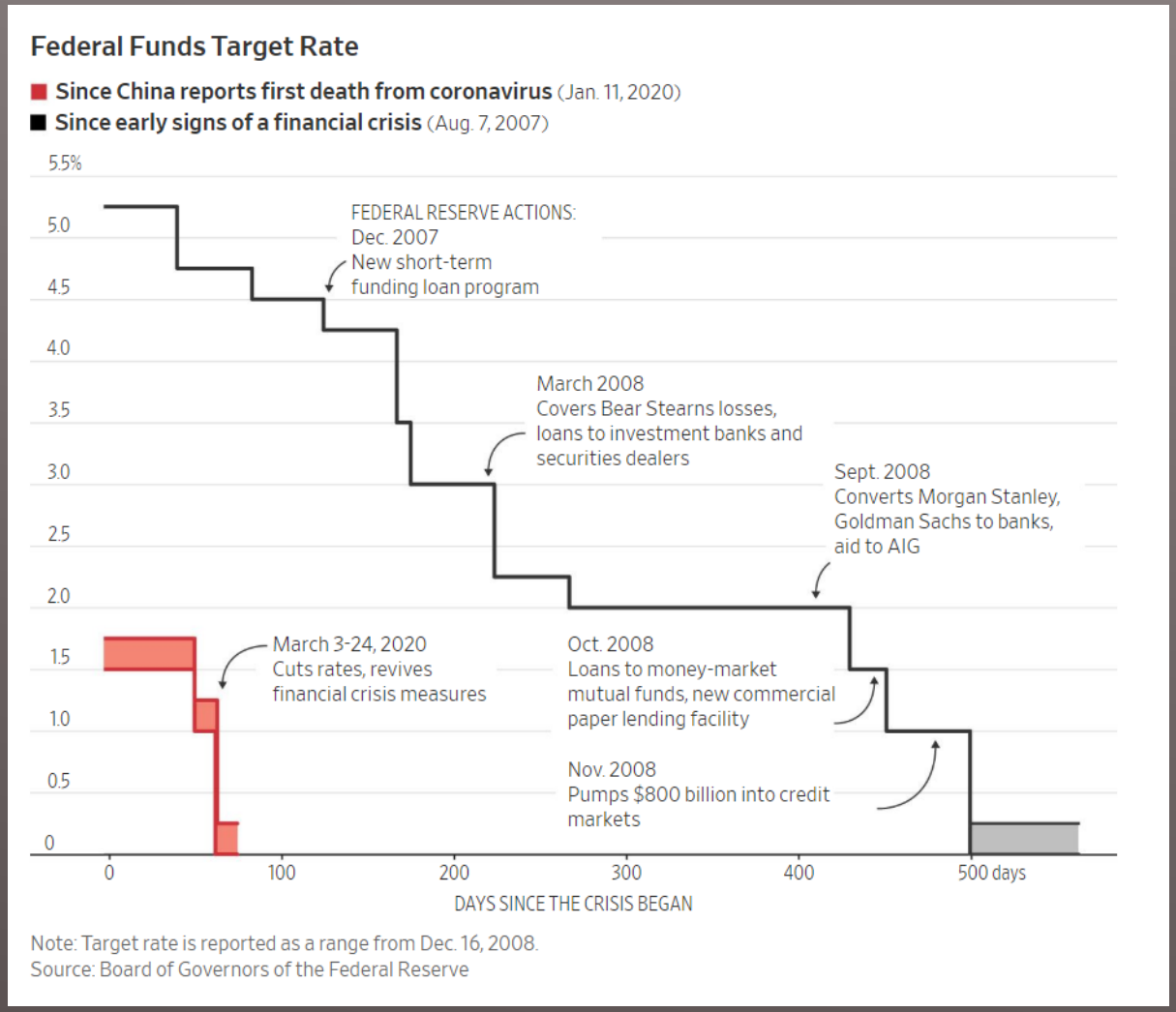
- **We don't know**. Partly because this is a self-imposed shutdown which depends on how fast we tackle the virus. There is a domestic element to this (small business are particularly crushed) and an international element (supply-chains/trade/world interaction is hit). We might be able to say, the worst case is 1 year (vaccine availability).

5. THE ECONOMY AND CORONA (SPEED OF ACTION BY GOVT)



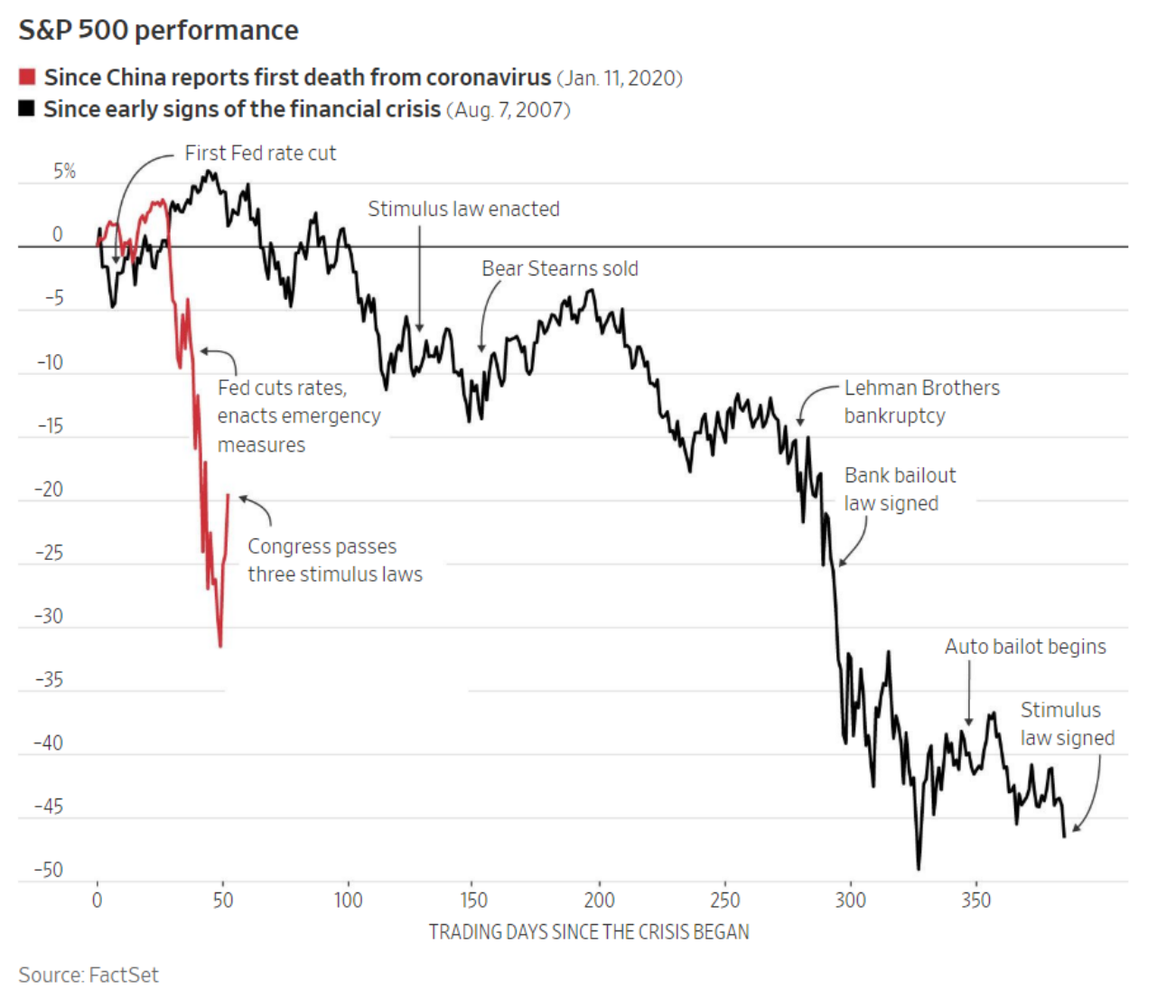
Even Universities are benefiting from Trump's package: https://www.datawrapper.de/_/oDYXT/

5. THE ECONOMY AND CORONA
FEDERAL RESERVE ACTIONS



5. THE ECONOMY AND CORONA

THE SPEED OF STOCK MARKET REACTION



5. THE ECONOMY AND CORONA

UNITED STATES – March Job Report (released April 3, 2020)

- 24% decline in retail employment
- Most of the decline of 701,000 jobs occurred in leisure and hospitality (459,000 job losses) – mainly in food services and drinking establishments (-417,000).
- Unemployment rose from 3.5% to 4.4%
- Future numbers will probably be worse.

5. THE ECONOMY AND CORONA

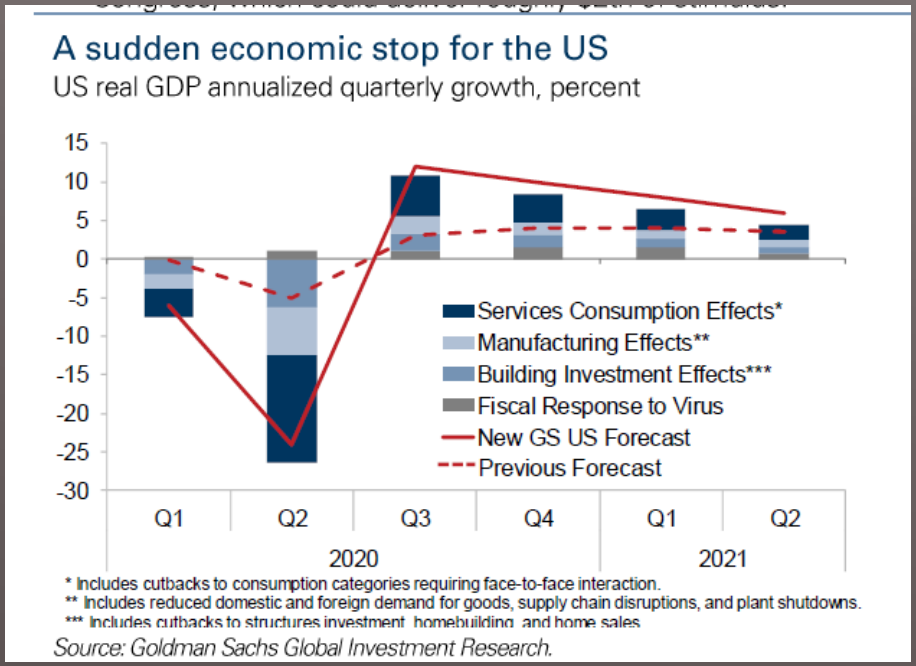
UNITED STATES – How much could it cost the economy and the stock market? No one knows.

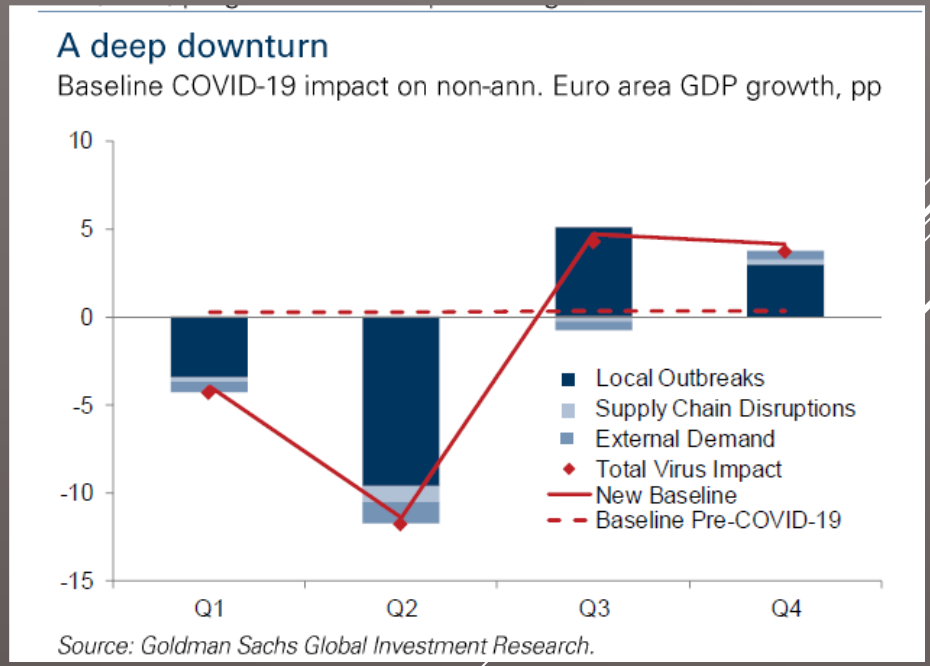
Estimates of the effect of 1918 flu pandemic say that stock market losses could be between 26% and 42% and GDP growth between -6% and -8% (Barro et al (2020)). This assumes that we have a 2% death rate as in 1918, which at the present time appears unlikely.

However, a self-imposed lock down adds more complexity to this situation. If it goes on longer, then the one year GDP estimate could turn into 2x or more.

5. THE ECONOMY AND CORONA

UNITED STATES – Goldman Sachs estimated two scenarios for the decline in Q2 GDP.





5. THE ECONOMY AND CORONA

UNITED STATES – One method to guess what might happen is to reduce various components of 2019:Q4 and see what nominal GDP would be. With our assumptions, one can get to a decline in 2020:Q1 GDP of 6.5% (2-weeks lockdown) to 13% decline in 2020:Q2 (1 month lockdown). If the lockdown continues into May (i.e. 2 months of lockdown), then Q2 drop could be 26%.*

These assumptions are contained in the footnote to the table on the next page.

*We did our own analysis independent of knowing the Goldman Sachs report details, yet we both arrived at very similar numbers. Of course, their report, which we received after doing our back-of-the-envelope calculations was much more thorough.

5. THE ECONOMY AND CORONA

UNITED STATES – If this is true and using certain death rate assumptions of the corona virus, we can estimate the cost of keeping the country closed.

Scenario	True AMMR in USA	Deaths Close Month	Deaths Open Month	Cost Per Net Death Per Month Closed
1	0.3	327,000	981,000	$ 1,108,562.69
2	1	327,000	3,270,000	$ 246,347.26
3	3	327,000	9,810,000	$ 76,452.60
4	4	327,000	13,080,000	$ 56,849.37

*Assumptions: Closed Economy leads to a death rate of 0.01% (Note: USA Mortality Rate 0.004% as of April 9, 2020), 1 month of closing causes a decline of annualized Nominal GDP of 13.35% or $725 Billion per month. This assumes that during a lockdown, durable good consumption drops to 10% of it's typical value, nondurable good consumption drops to 40% of typical value (food, etc), Services drop to 37% of typical value (healthcare is part of that), gross private investments drops to 9% of typical value (residential/commercial real estate), and net exports drops to 60% of its typical value. I also assume that the original govt. stimulus is divided and 1/3 of the $2.3 trillion is spent each month (note: a lot of it is in the form of loans rather than direct spending). The cost per month of this situation is $725 Billion. Using these assumptions, 3 months of lock-down leads to a lost of 40% of GDP.

5. THE ECONOMY AND CORONA

UNITED STATES –

Note 1: The cost of human life is taking the economic cost of a slow down divided by the net difference of all deaths that might eventually occur if open. It assumes eventually all those people will die.

Thus, if the mortality rate in the US population is 0.3% and everyone in the population gets exposed that fraction dies. Each life that we saved, will cost us $1.1M per month closed. Thus, three months closed would be $3.3M.

Note 2: This naïve example does not include the costs of hospital overflow and spillover deaths.

Note 3: More in-depth analysis could be done to improve and make more accurate these tradeoffs.

5. THE ECONOMY AND CORONA

UNITED STATES –

There are other costs as well from lock down. Unemployment, feelings of isolation, hysteresis. Some of the other effects on the economy according to GS are:

THE US ECONOMIC AND FINANCIAL OUTLOOK

(% change on previous period, annualized, except where noted)

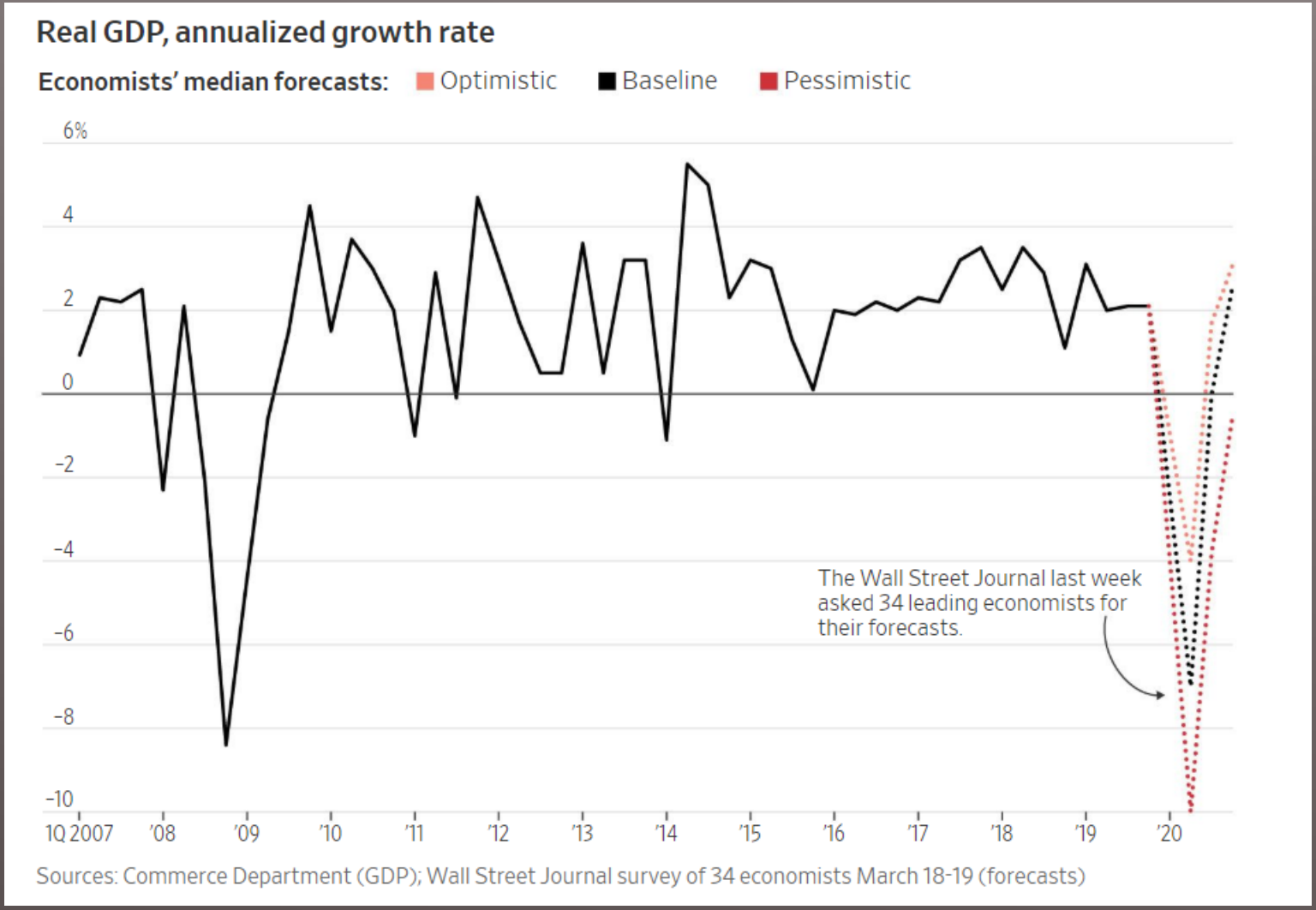
	2018	2019	2020 (f)	2021 (f)	2022 (f)	2023 (f)	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
HOUSING MARKET														
Housing Starts (units, thous)	1,250	1,298	1,334	1,348	1,367	--	1,334	1,335	1,329	1,338	1,343	1,344	1,349	1,356
New Home Sales (units, thous)	615	682	701	707	717	--	713	691	693	707	714	695	701	717
Existing Home Sales (units, thous)	5,334	5,330	5,452	5,504	5,556	--	5,433	5,446	5,458	5,471	5,485	5,497	5,510	5,523
Case-Shiller Home Prices (%yoy)*	4.1	3.3	3.0	2.2	2.1	2.3	3.4	3.4	3.2	3.0	2.8	2.5	2.3	2.2
INFLATION (% ch, yr/yr)														
Consumer Price Index (CPI)	2.4	1.8	1.2	1.9	2.1	2.2	2.2	0.9	0.9	0.9	1.1	2.2	2.3	2.1
Core CPI	2.1	2.2	2.1	2.0	2.1	2.2	2.3	2.2	2.0	2.0	1.9	2.0	2.0	2.0
Core PCE**	2.0	1.9	1.6	1.6	1.8	2.0	1.7	1.6	1.4	1.6	1.5	1.6	1.7	1.6
LABOR MARKET														
Unemployment Rate (%)	3.9	3.7	6.8	6.6	5.1	4.2	3.7	6.6	9.0	7.7	7.3	6.8	6.4	6.0
U6 Underemployment Rate (%)	7.7	7.2	12.8	12.1	9.5	8.0	7.1	12.8	16.9	14.5	13.4	12.4	11.7	11.0
Payrolls (thous, monthly rate)	192	174	-465	350	288	170	90	-1,500	-1,200	750	350	350	350	350
GOVERNMENT FINANCE														
Federal Budget (FY, $bn)	-779	-984	-1,025	-1,050	-1,200	-1,250	--	--	--	--	--	--	--	--

5. THE ECONOMY AND CORONA

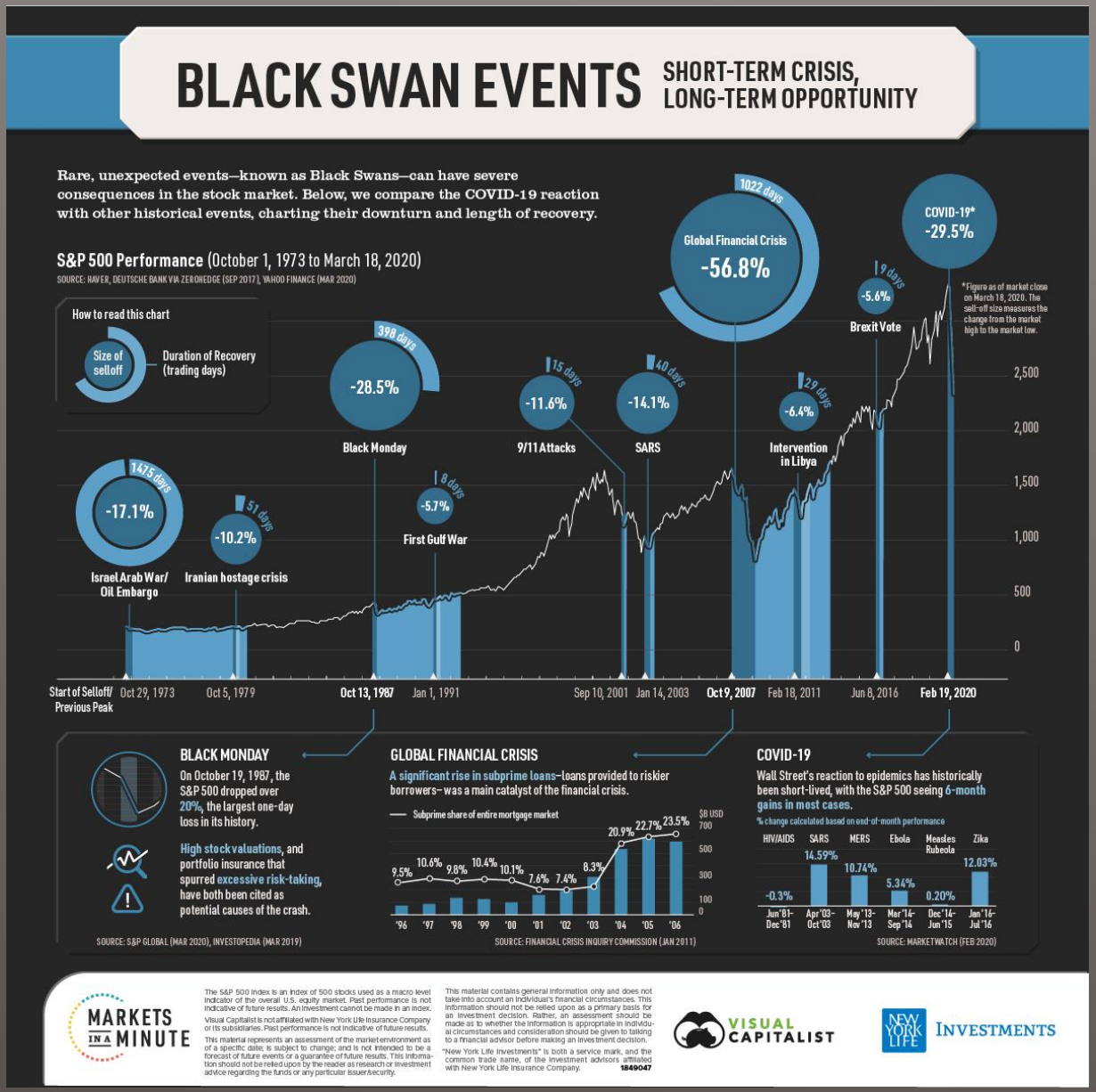
ONE POTENTIAL IDEA DUE TO REDUCE COSTS

- Open up the economy in May or shortly after testing capacity is sufficient and cases are declining. Allow people to go to work and even socialize, but with caution. Inform elderly people to continue to be very cautious. Supply a year's worth of masks to everyone so that people can choose to work with masks. Also choose to do social activity (with distancing and mask). And continue to test randomly for Corona in all areas followed up by intelligent tracing.

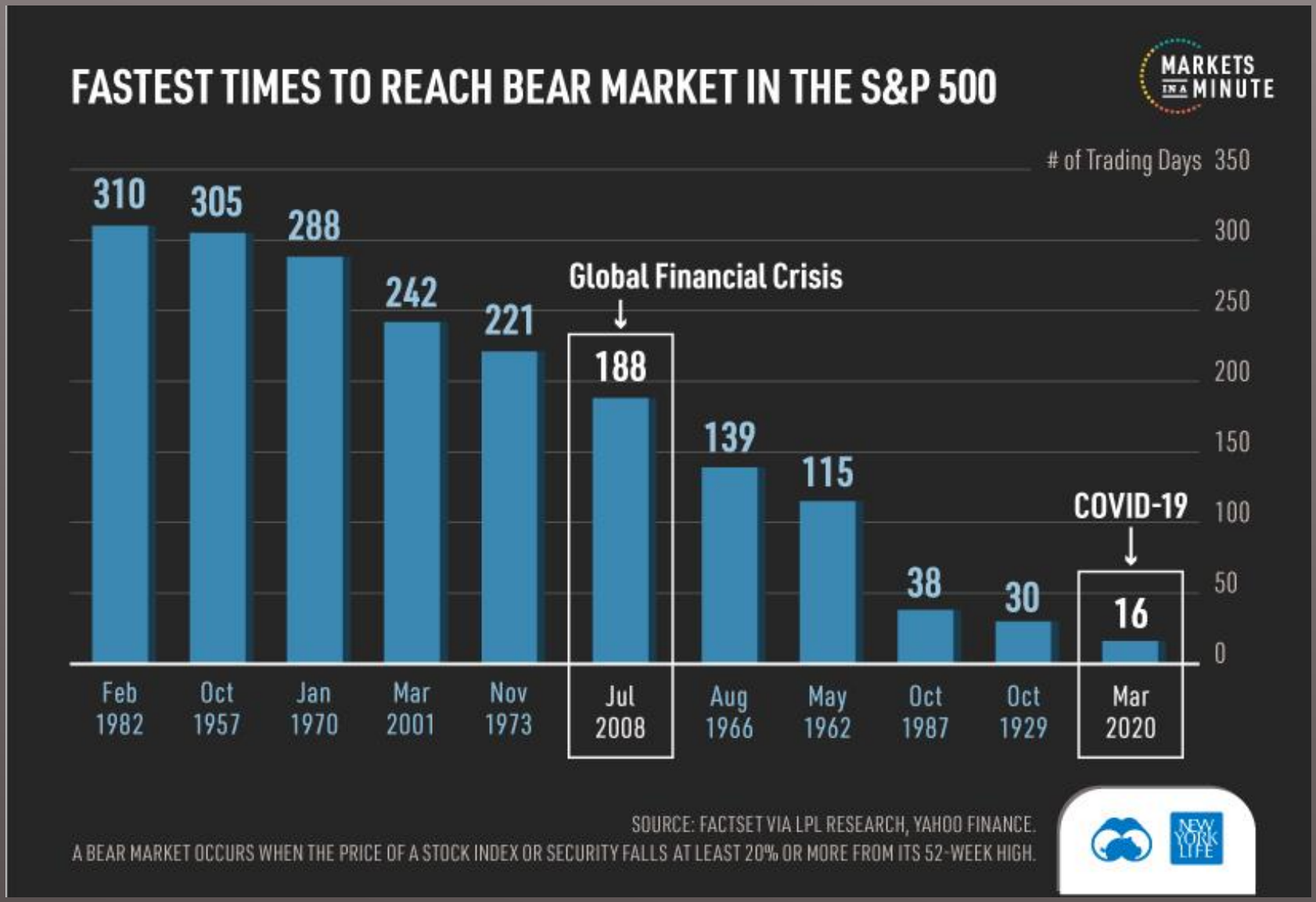
5. THE ECONOMY AND CORONA
REAL GDP FORECASTS BY ECONOMISTS



6. WHOLY UNUSUAL?



6. WHOLY UNUSUAL?



7. POTENTIAL CURES & WORRIES

- https://www.centivax.com/
- Virus could mutate into a different form rendering past immunity useless, and vaccines not effective.
- There may be new waves of Corona in Fall and Winter and thus repetitive lock downs until a vaccine is found.

9. THE FUTURE

- We believe that the Corona pandemic will cause people to re-think about their previous accepted notions.

- First, when the immediate crisis is over, this will place a new question about **globalization and it's future**. For example, Europe and the USA, as well as other countries will have to think hard about whether it makes sense to be so interlinked to one country (especially a nation-state) and whether they should diversify more their international trade and relationships. Also, some essential products (like drugs, medical equipment, and others might be produced at home).*

- Second, common economic prescriptions about **"free trade"** should be re-examined in a broader context that includes dynamic economies (rather than static), and other non-economic related concerns that ultimately matter for a nation, but are often neglected.

*This is already happening. Link 1, Link 2, Link 3

9. THE FUTURE

- Third, the global world and wide sharing of information means terrorist or nation-led virus attacks could possibly occur. Nations must have procedures in place to deal with this.*

- Finally, we hope and pray that the social distancing and the work of medical researchers can provide a quick solution to the mess that has been caused.

*Or maybe we have to heed Sting's lyrics: There is no monopoly on common sense - On either side of the political fence - We share the same biology, regardless of ideology - Believe me when I say to you - I hope the Russians love their children too

10. SUMMARY

1. There is ample and increasing evidence to suggest that this deadly virus started in Wuhan, China. Most people believe it was a natural mistake through a wet market. Some people believe it was lab generated, and some in the Western world believe the Chinese govt. may have done this on purpose. We are only very confident about the first statement.

2. We still do not know the true infection fatality rate or death rate. We do think it's much higher for people over 65 and that because of the length of hospitalization and equipment needs, large numbers can create havoc for the hospital system.

3. We have found that certain characteristics of countries have enabled them to lower the death rate and that hot weather is associated with a lower spread of the disease.

4. We also find that the stock market has reacted to countries with a higher growth in cases, especially as the virus started exploding.

10. SUMMARY

5. The economic cost in the USA (ignoring long-term lasting hysteresis effects) is around $750 B per month or about 3.5% of annual GDP (output).

6. We propose an idea for how to re-open the economy but still keep people protected. This decision should be made with input from medical experts, of course, but also taking into account the real human costs of economic destruction through prolonged shutdowns.

7. We also believe that nations will seriously reconsider how they conduct international trade – in particular, diversify much more.

APPENDIX. INFORMATION SOURCES

- https://ourworldindata.org/coronavirus
- https://ncov2019.live/
- https://coronavirus.jhu.edu/map.html
- https://covidtracking.com/
- Economic Papers: https://www.nber.org/wp_covid19.html
- https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-Europe-estimates-and-NPI-impact-30-03-2020.pdf
- https://www.northinfo.com/documents/937.pdf

APPENDIX. DATA SOURCES

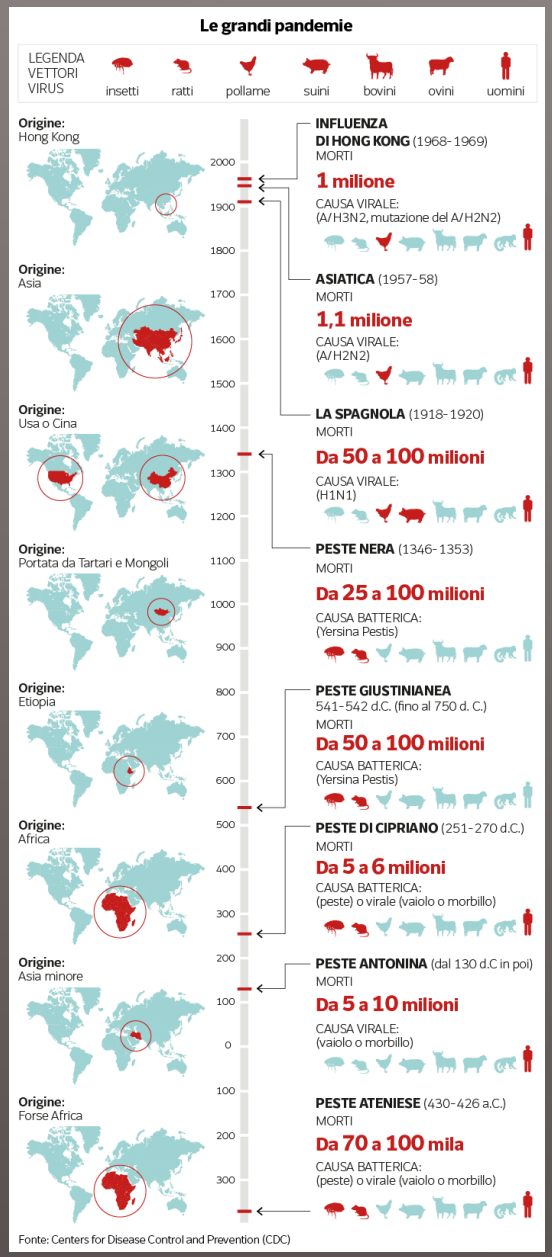
- World Corona Data: /CSSEGISandData/COVID19/master/csse_covid_19_data

- Country Disease and Health Data:
https://ourworldindata.org/coronavirus
https://data.worldbank.org/

Weather Data:
https://www.ncdc.noaa.gov/
www.weatherbase.com

Stock Market Data:
Finance.yahoo.com

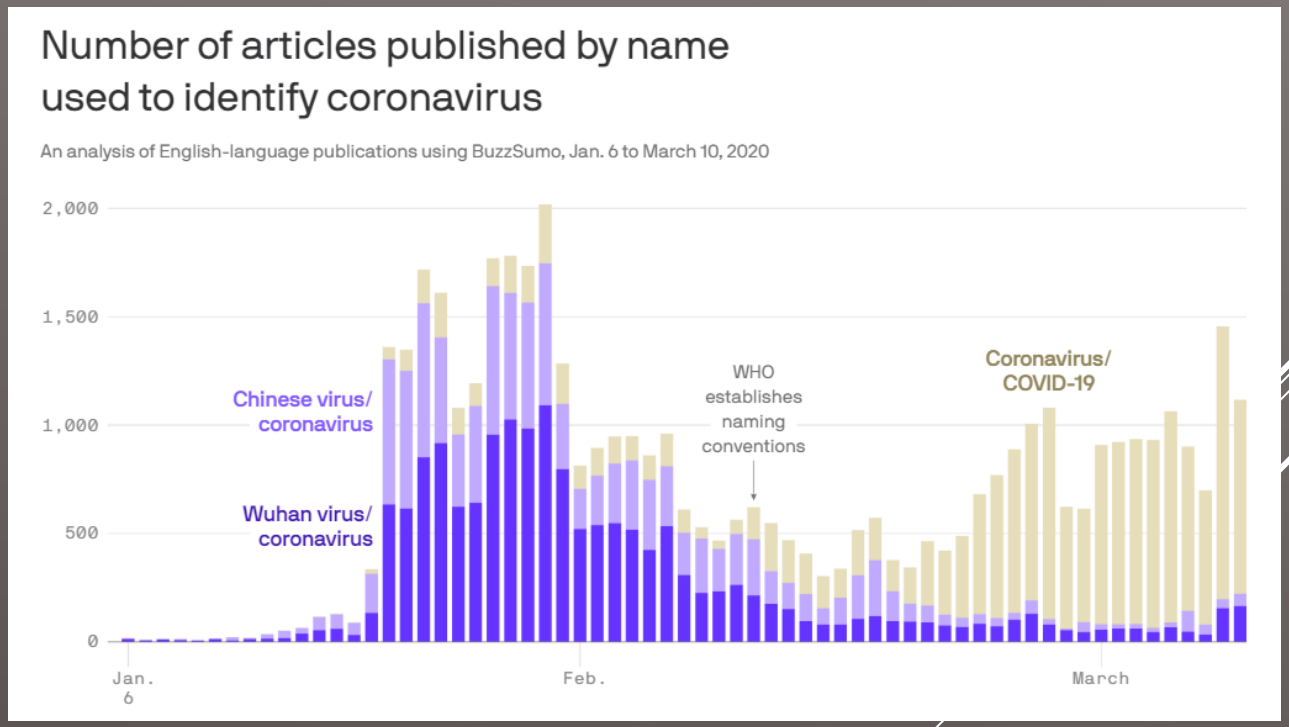
APPENDIX. HISTORY OF PANDEMICS



APPENDIX. CENSORSHIP OF NAMES

▸ After the outbreak of the Wuhan Virus, there has been an effort at the censorship of the various names of the Virus linked to its origin, which is not subject of our presentation, but we thought it was worth mentioning.

- Link 1
- Link 2
- Link 3
- CNN Link
- WHO



APPENDIX. CENSORSHIP OF NAMES

- CNN Montage
- We encourage you to use whatever name makes you most comfortable and ignore the intimidation, censorship, and PR efforts of the censors.