Coronavirus projections for New York City
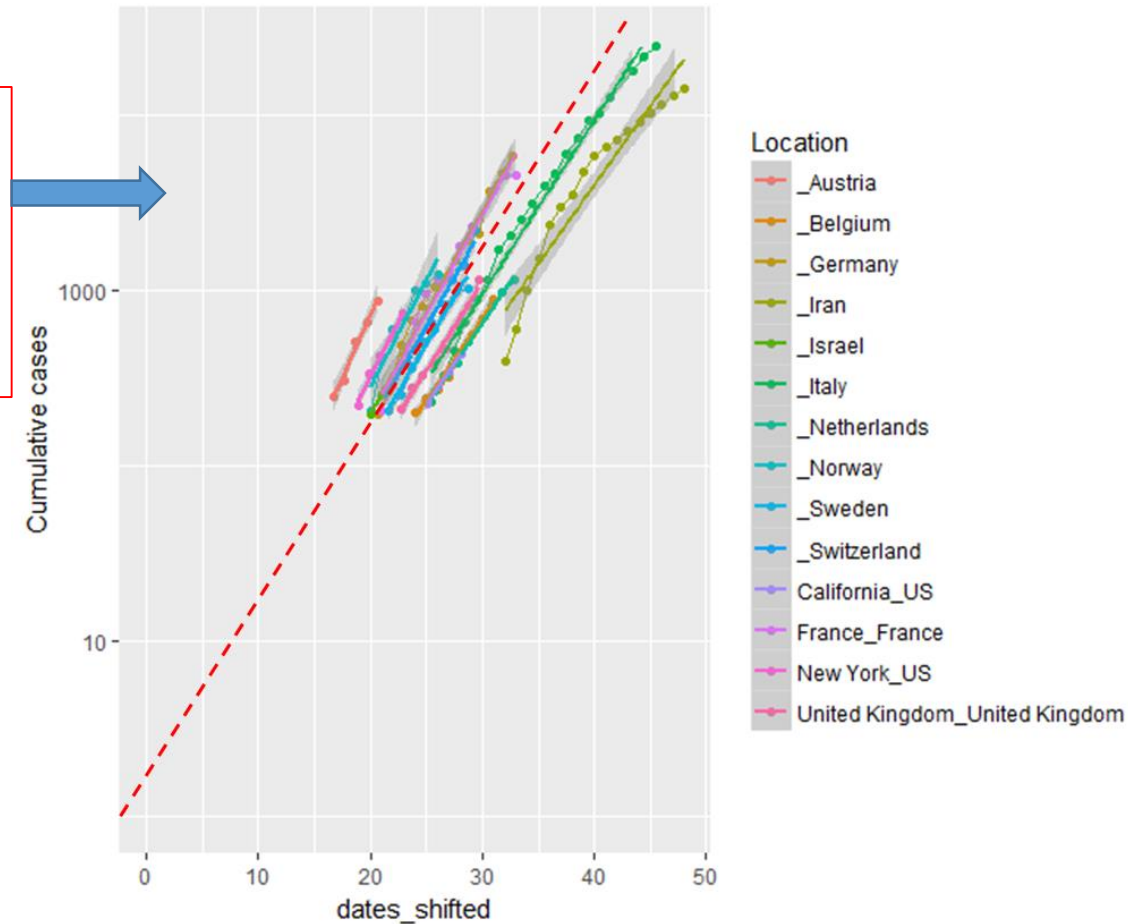
Matthew Oberhardt, PhD

03/16/2020

Takeaways

- By analysis of exponential growth curves, NYC is ~20 days behind Italy.

- Aggressive, early city lockdown worked in China. Earlier lockdown meant more lives saved.

- Aggressive policy action by the city might be the best chance to avoid ICU and inpatient bed overload.

- Time is of the essence.

NYC Growth dynamics mirror other cities

NYC's growth rate is similar to most nations and cities, including Italy. Here the time difference is removed, and the curves look almost the same.
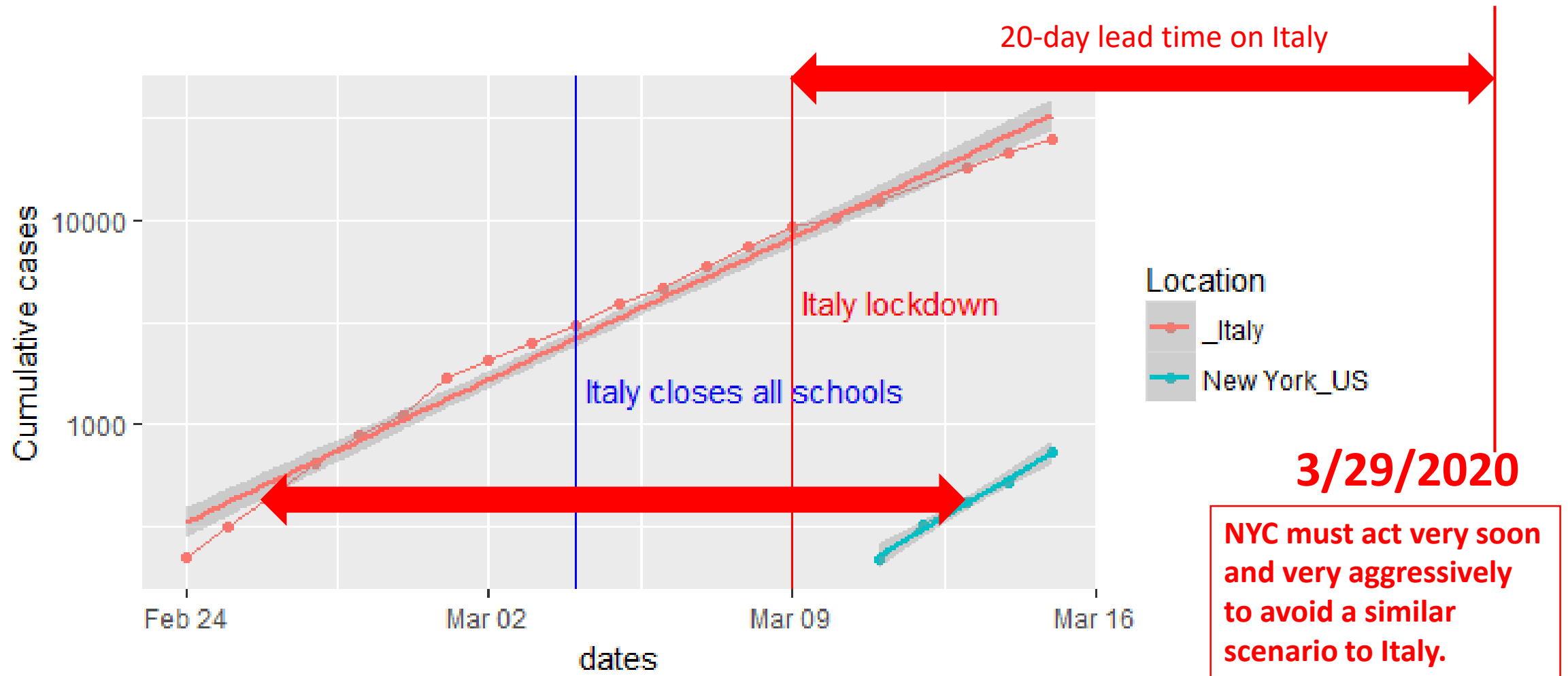
Time shifts from other cities to NYC, i.e., how many days behind them are we

Location	projected time of first case (t0)	Confirmed cases	Deaths	Time shift from NY (days)	Time shift from NY if NY undercounts cases by 10x (days)
Iran	1/26/2020	13938	724	**-25**	**-23**
Italy	1/29/2020	24747	1809	**-23**	**-20**
France	2/10/2020	4499	91	**-10**	**-8**
Netherlands	2/11/2020	1135	20	**-10**	**-8**
Germany	2/11/2020	5795	11	**-10**	**-7**
Belgium	2/13/2020	886	4	**-8**	**-6**
United Kingom	2/13/2020	1140	21	**-8**	**-5**
Switzerland	2/14/2020	2200	14	**-6**	**-4**
Sweden	2/15/2020	1022	3	**-6**	**-3**
California	2/15/2020	426	6	**-5**	**-3**
Norway	2/17/2020	1221	3	**-3**	**-1**
New York	2/21/2020	732	3	**0**	**2**
Israel	2/22/2020	251	0	**2**	**4**
Australia	2/23/2020	860	1	**2**	**5**

We are ~20 days behind Italy

20 days until NYC → Italy scenario

20-day lead time on Italy

Italy lockdown

Italy closes all schools

Cumulative cases

10000

1000

Feb 24   Mar 02   Mar 09   Mar 16

dates

Location

_Italy

New York_US

3/29/2020

NYC must act very soon and very aggressively to avoid a similar scenario to Italy.

Appendix

Growth rates of COVID-19
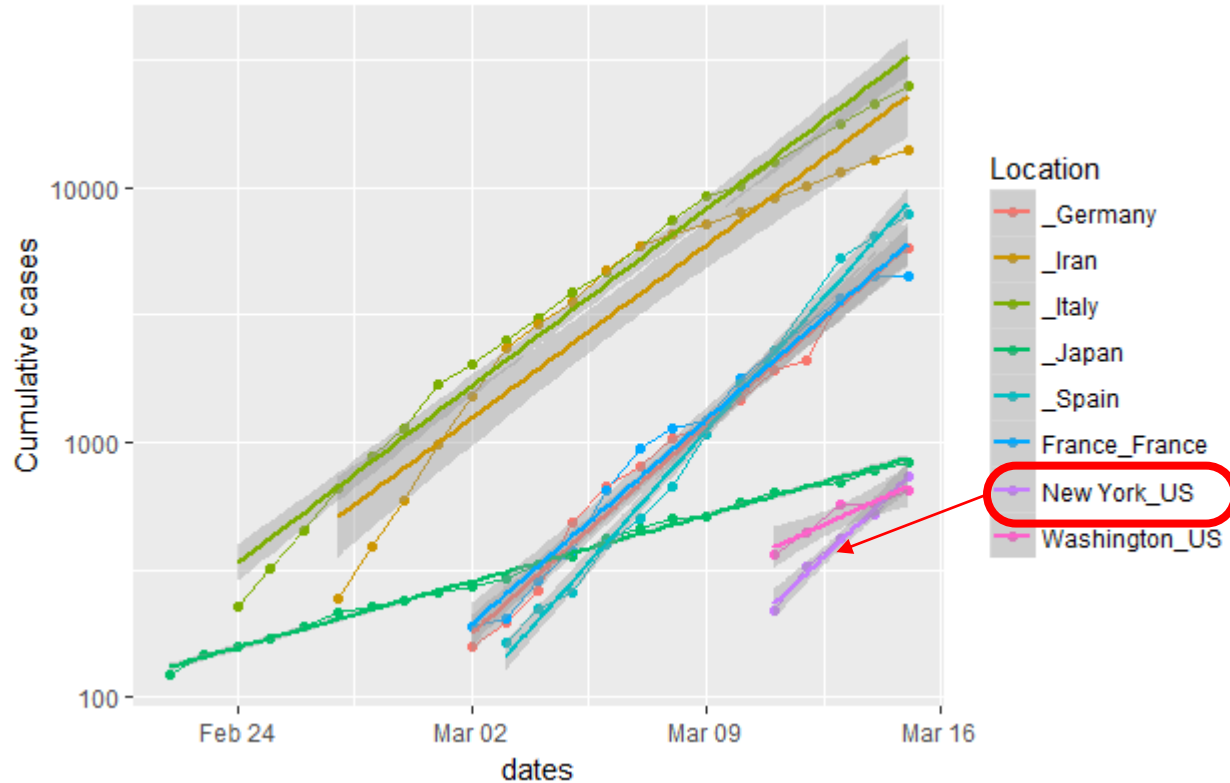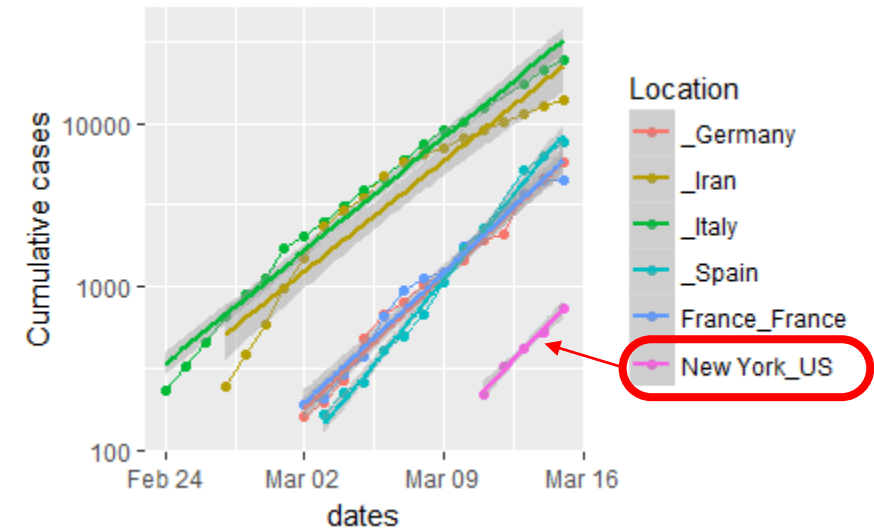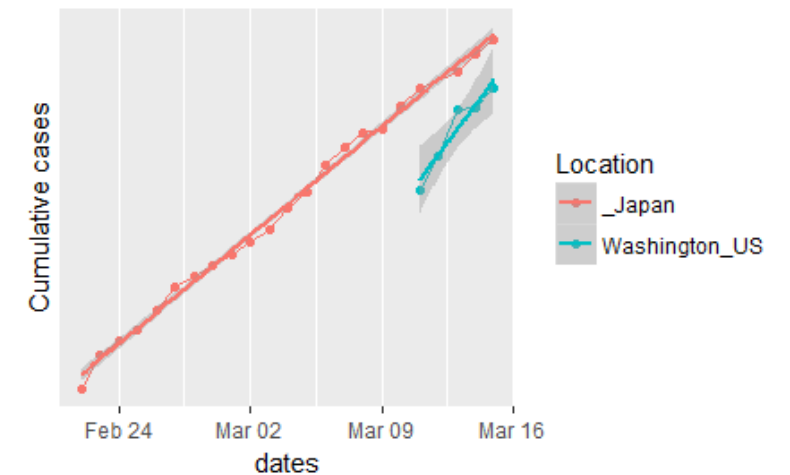
Growth rates for all locations aside from China that have >150 confirmed cases
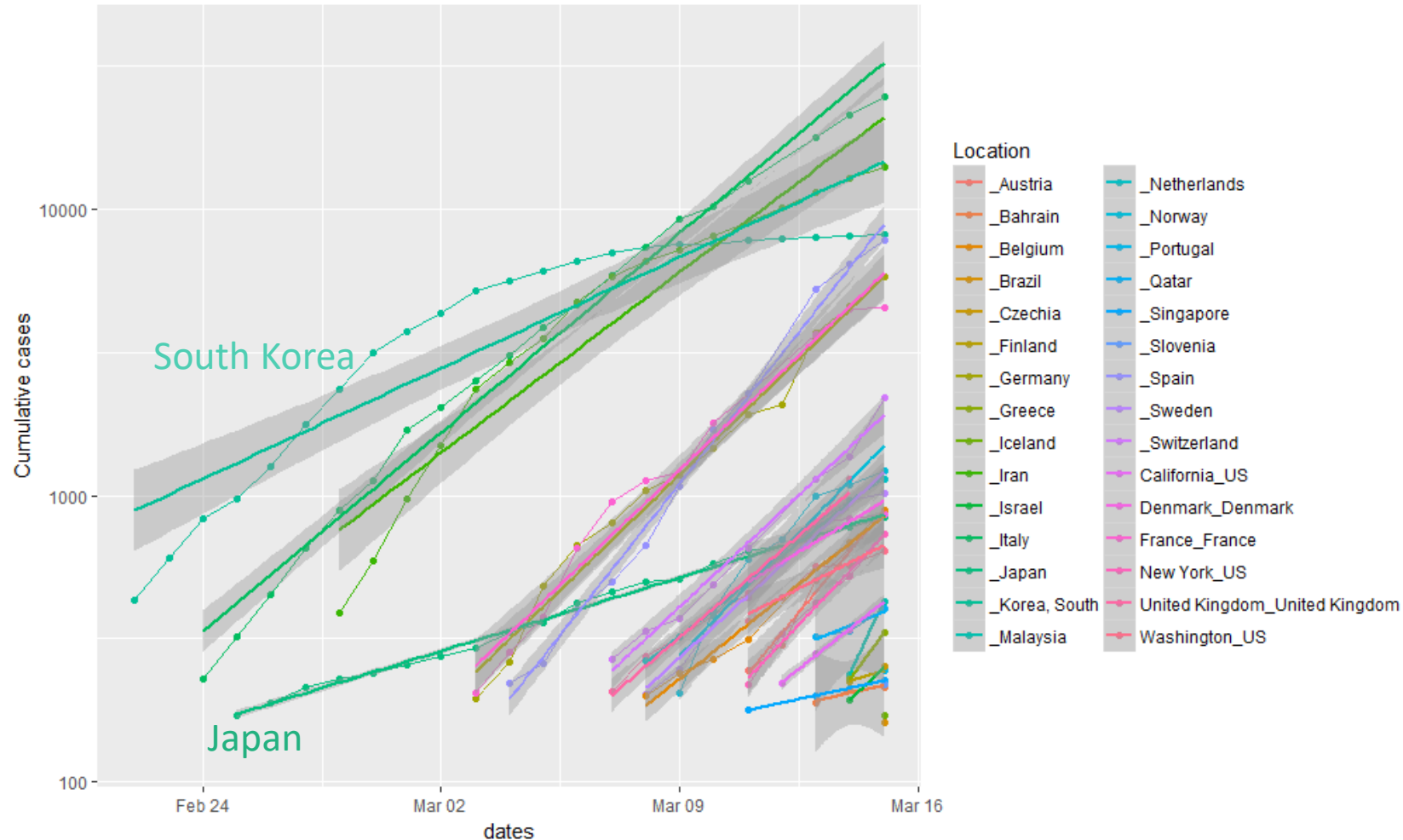
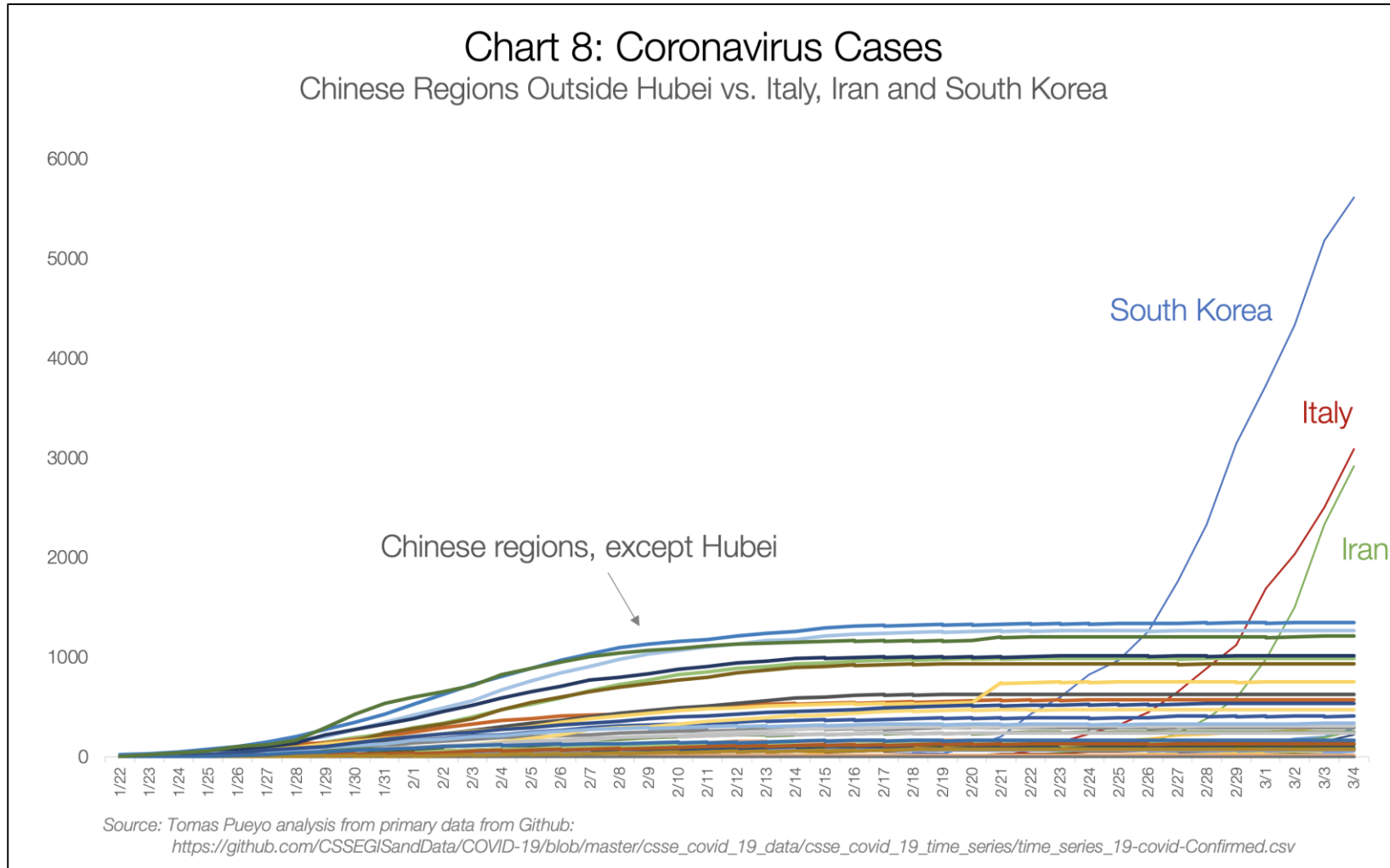
Most locations have a similar growth rate

Exceptions:
South Korea
Japan
...
Areas that took aggressive measures

Chinese city closures worked

Chart 8: Coronavirus Cases
Chinese Regions Outside Hubei vs. Italy, Iran and South Korea

Source: Tomas Pueyo analysis from primary data from Github:
https://github.com/CSSEGISandData/COVID-19/blob/master/csse_covid_19_data/csse_covid_19_time_series/time_series_19-covid-Confirmed.csv
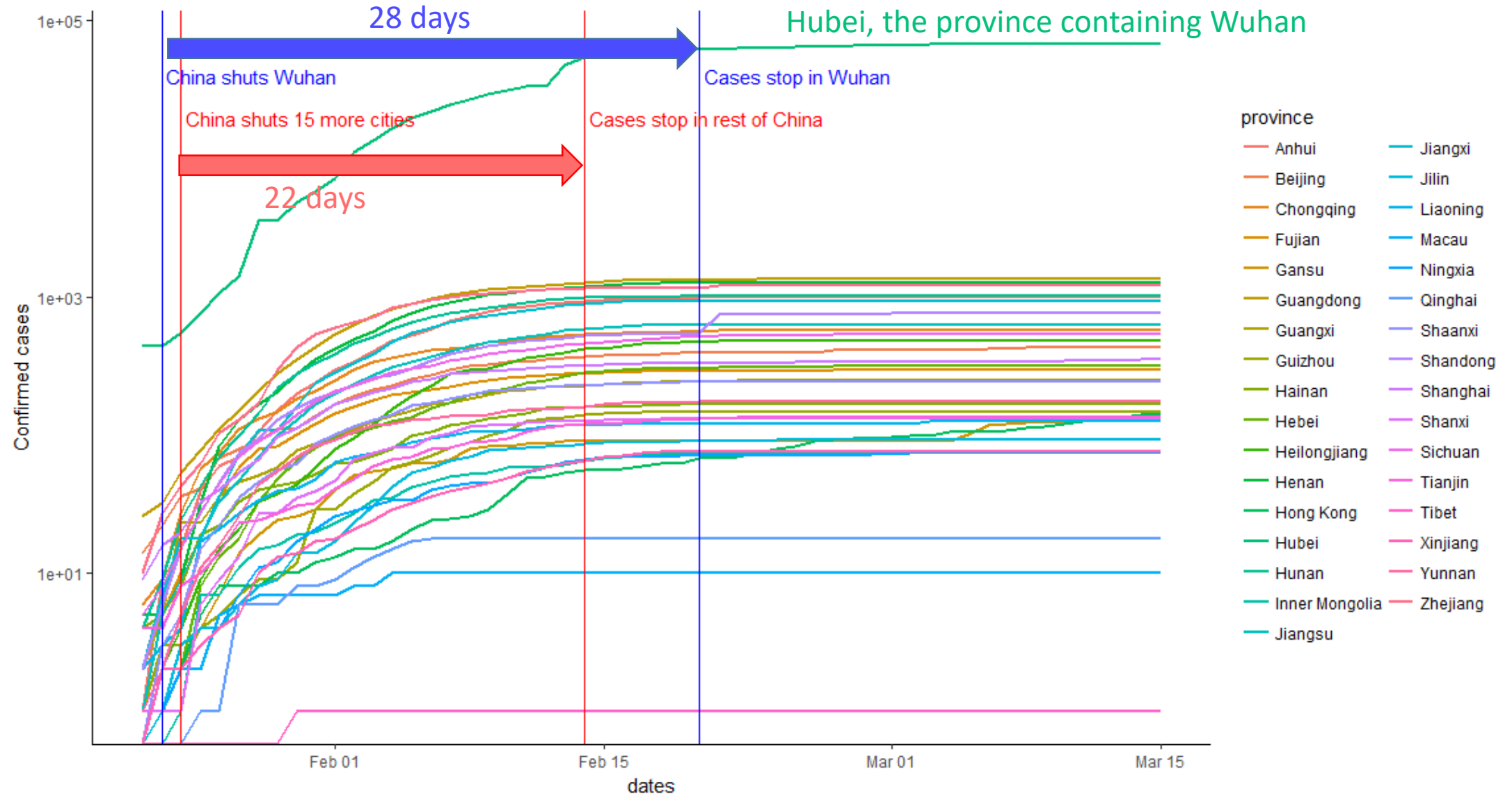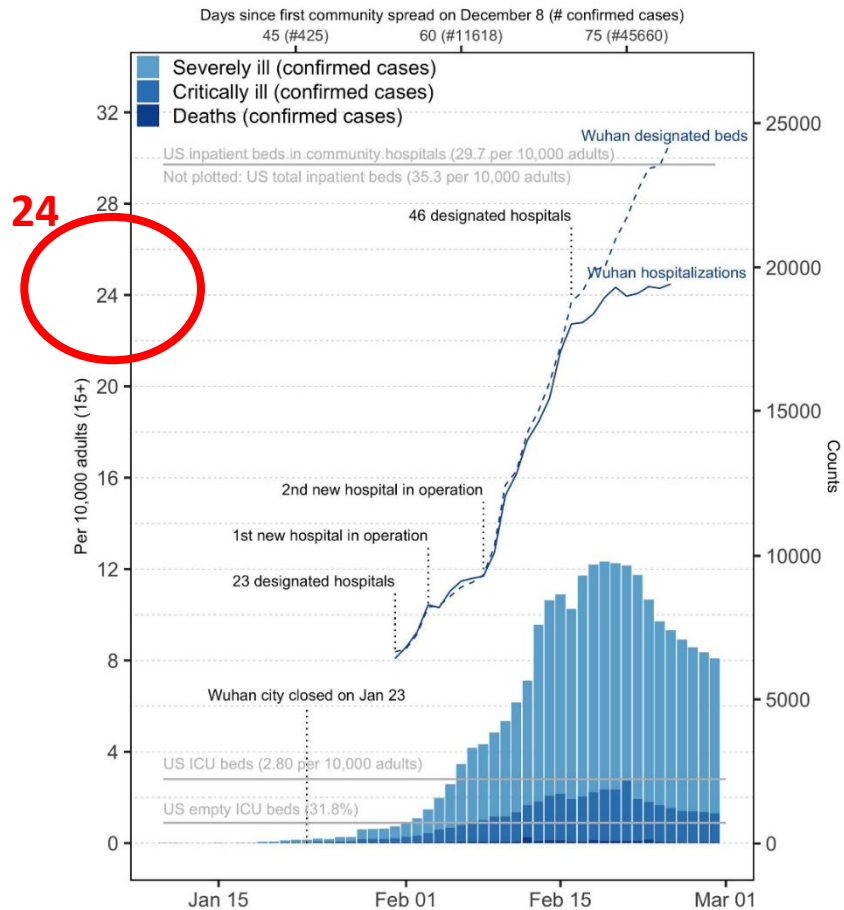
Coronavirus: Why You Must Act Now
https://medium.com/@tomaspueyo/coronavirus-act-today-or-people-will-die-f4d3d9cd99ca

Chinese Confirmed cases stop rising post-shutdown. Earlier shutdown had a huge impact

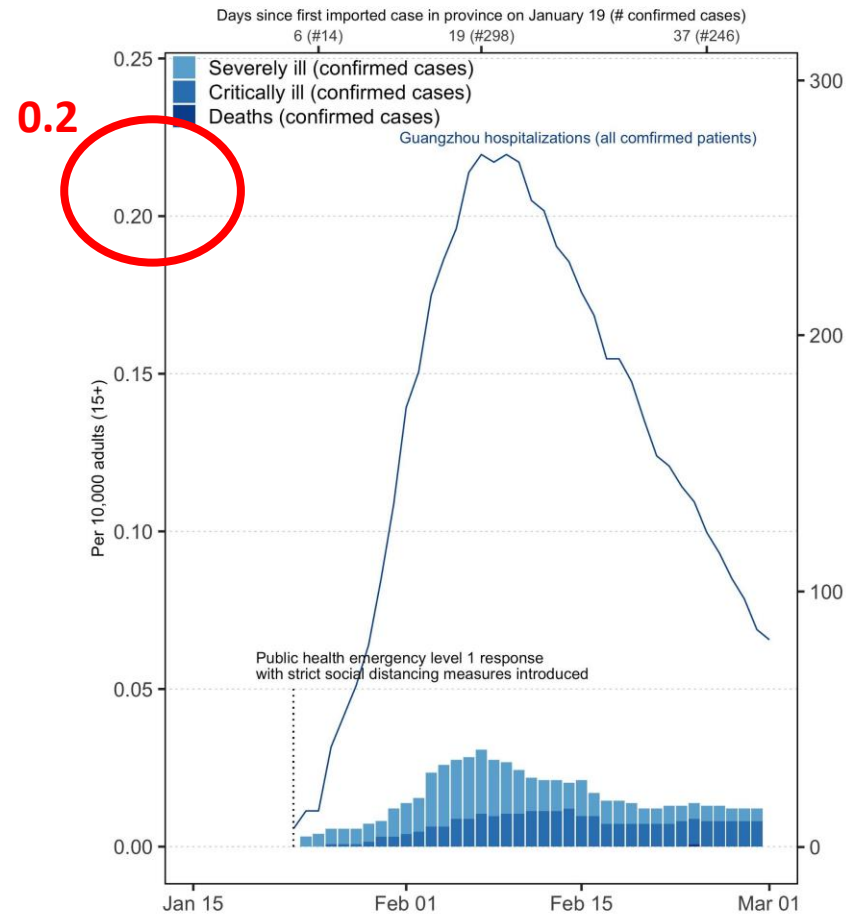# Impact of early city shutdown

Wuhan hospitalizations for COVID-19

Guangzhou hospitalizations for COVID-19

- Guangzhou was locked down early in its epidemic course.

- **It ended up having 100x less load on hospitals than Wuhan.**

Ruoran Li et al, The demand for inpatient and ICU beds for COVID-19 in the US: lessons from Chinese cities, a preprinted manuscript (not peer reviewed)

Confirmed cases lag actual cases (Hubei data)

From Tomas Pueyo & raw case data from the Chinese Center for Disease Control and Prevention
https://medium.com/@tomaspueyo/coronavirus-act-today-or-people-will-die-f4d3d9cd99ca
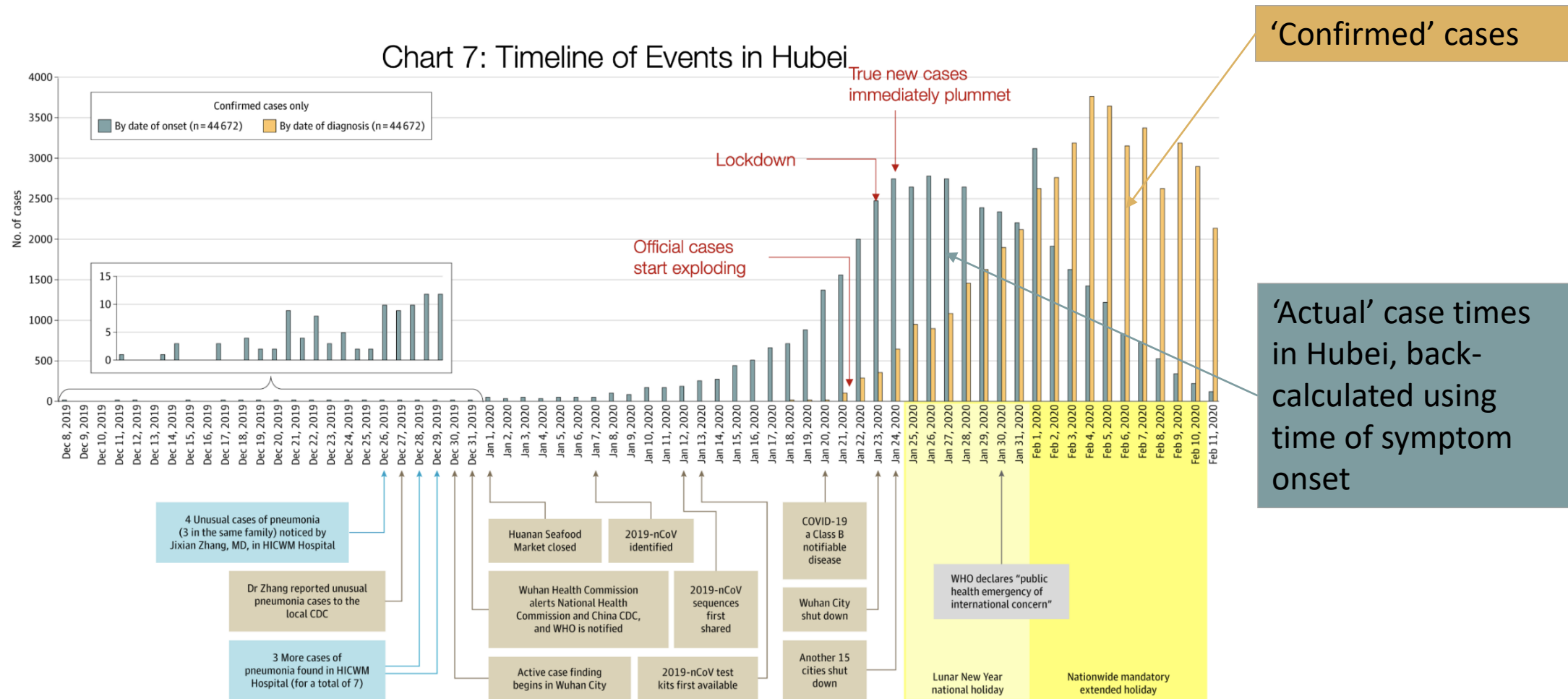
Doubling times in Hubei pre-shutdown, actual and confirmed cases

(log linear curves)
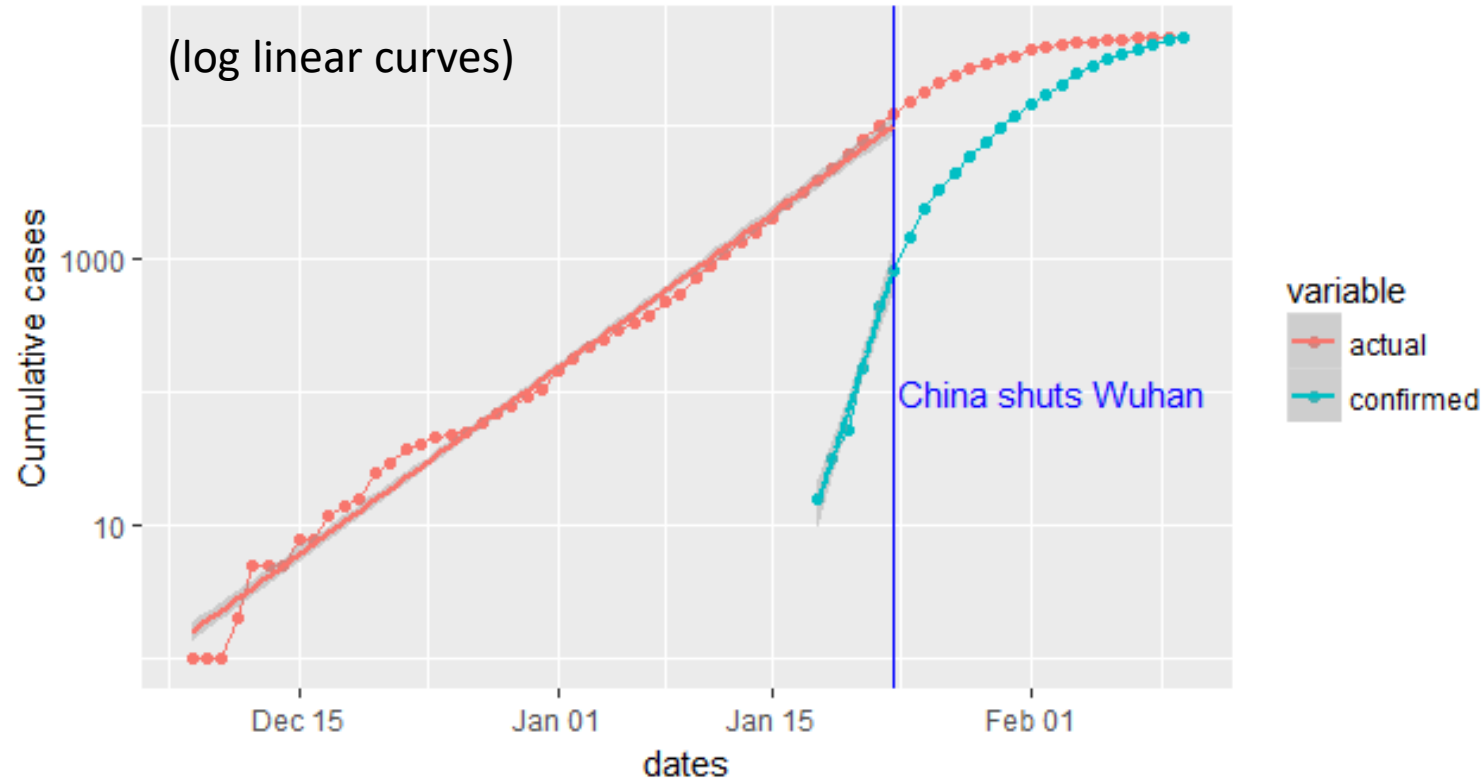
The shutdown **immediately** stopped exponential growth

The fast doubling of confirmed cases probably reflects catch-up once tests are available, not an actually faster growth rate

Doubling time of actual cases: 3.8 days
Doubling time of confirmed cases: 0.9 days

Doubling times, all locations (crude fits include full time-course, even after interventions)

New York's apparent doubling time of confirmed cases is in the same ballpark as Hubei's doubling time of Actual cases (lower doubling time is worse)
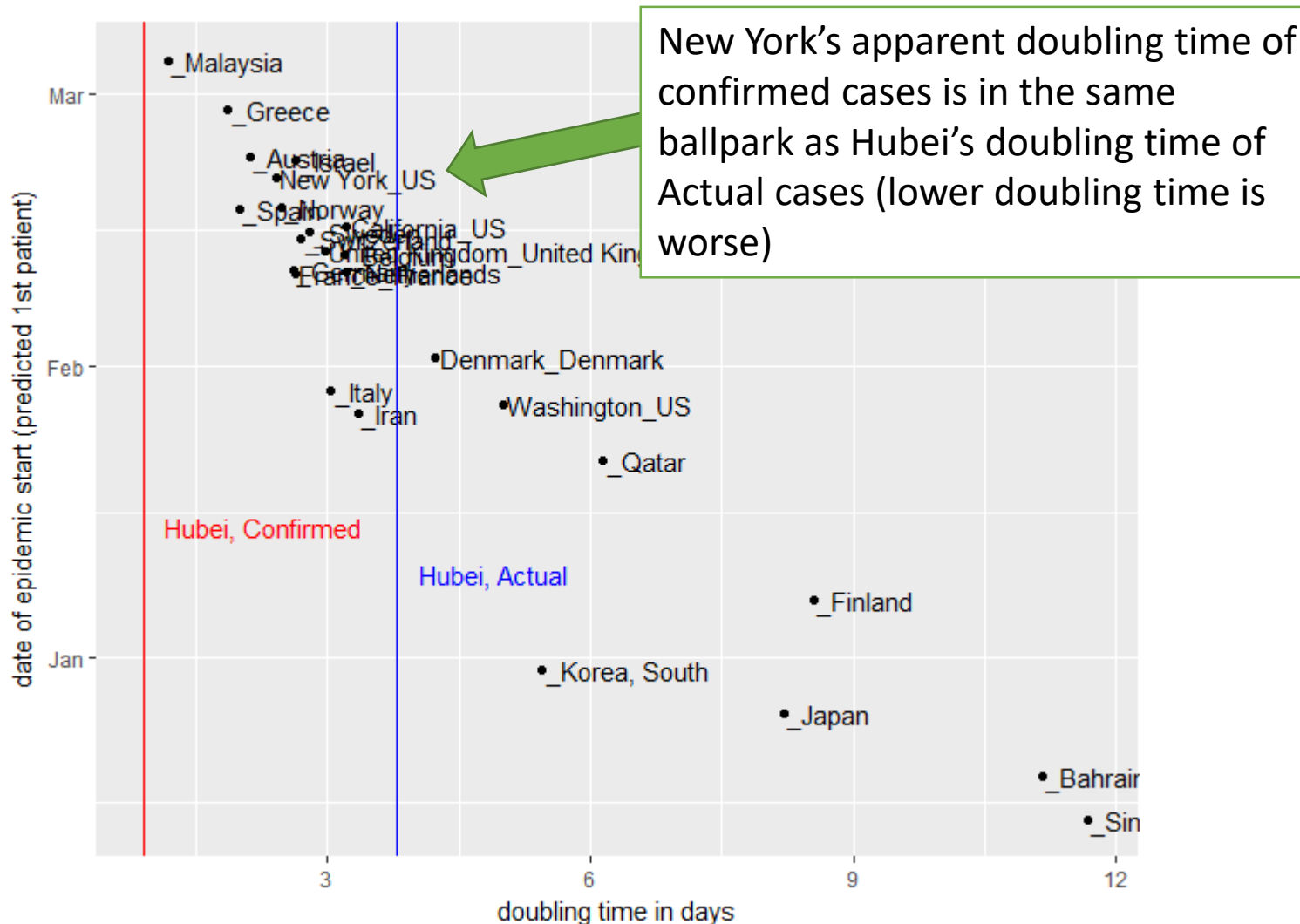
Shifting curves by their projected date of first case puts them in relative overlay

NYC's growth rate is similar to most nations and cities, including Italy. Here the time difference is removed, and the curves look almost the same.

Time shifts from other cities to NYC, i.e., how many days behind them are we

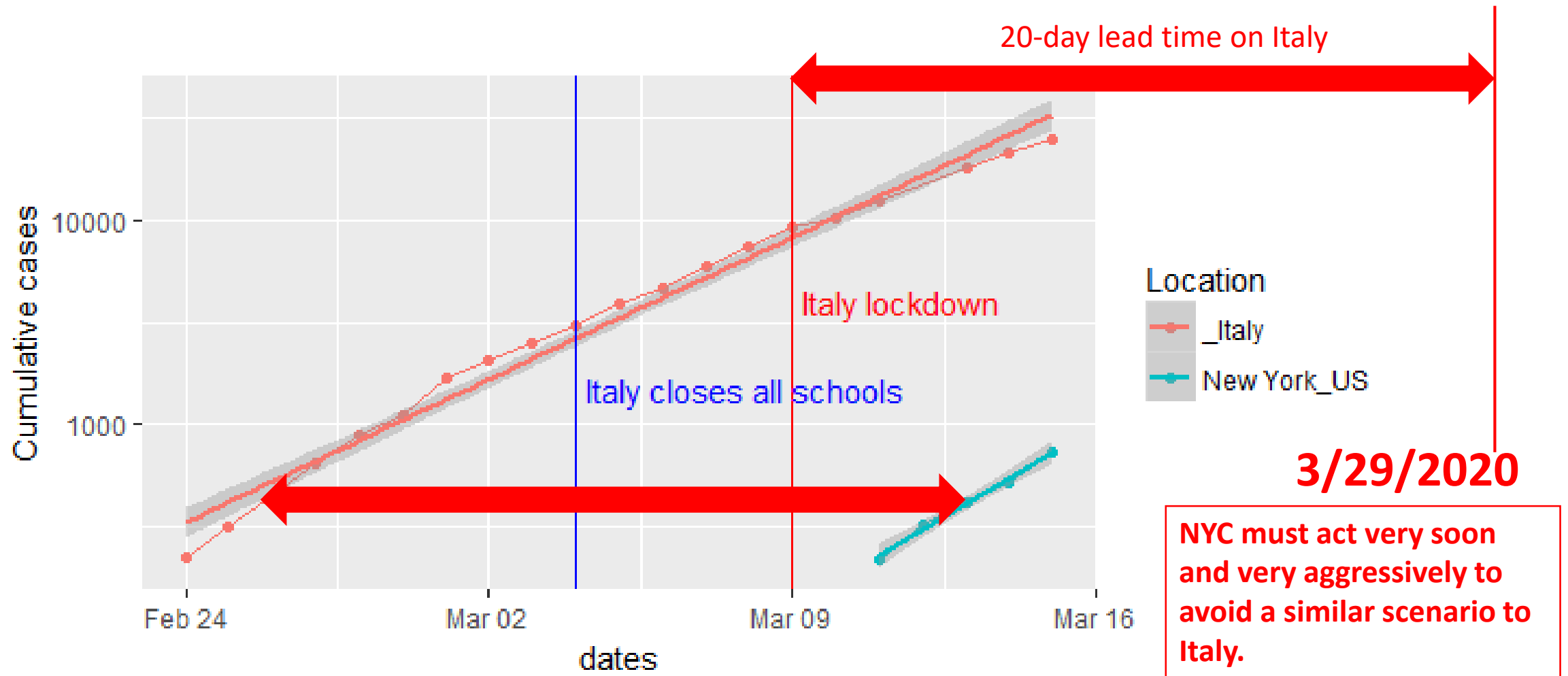| Location	projected time of first case (t0)	Confirmed cases	Deaths	Time shift from NY (days)	Time shift from NY if NY undercounts cases by 10x (days)
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Consequences of inaction in NYC

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_Italy
New York_US

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NYC must act very soon and very aggressively to avoid a similar scenario to Italy.

Good analyses have been done and should be examined carefully

Coronavirus: Why You Must Act Now

Politicians, Community Leaders and Business Leaders: What Should You Do and When?

Tomas Pueyo [Follow]
Mar 10 · 26 min read

Detailed analysis calling for early, aggressive action. (this article got >28 million views since published one week ago). **This is an excellent article and I recommend it to all policymakers.**

https://medium.com/@tomaspueyo/coronavirus-act-today-or-people-will-die-f4d3d9cd99ca

COVID-19: New York Will Be The Next Italy, But Doesn't Have to Be

Michael Donnelly [Follow]
Mar 14 · 4 min read

Epidemiological model suggests NYC has **until 3/19-3/24 to quarantine the city** or face dramatic bad outcomes.

https://medium.com/@donnellymjd/covid-19-new-york-will-be-the-next-italy-but-doesnt-have-to-be-54a5c8137d42

Takeaways

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