COVID-19 AI Prediction Platform for Multiple Countries (Work In Progress)

Data Science and Advanced Analytics
Apr 8, 2020

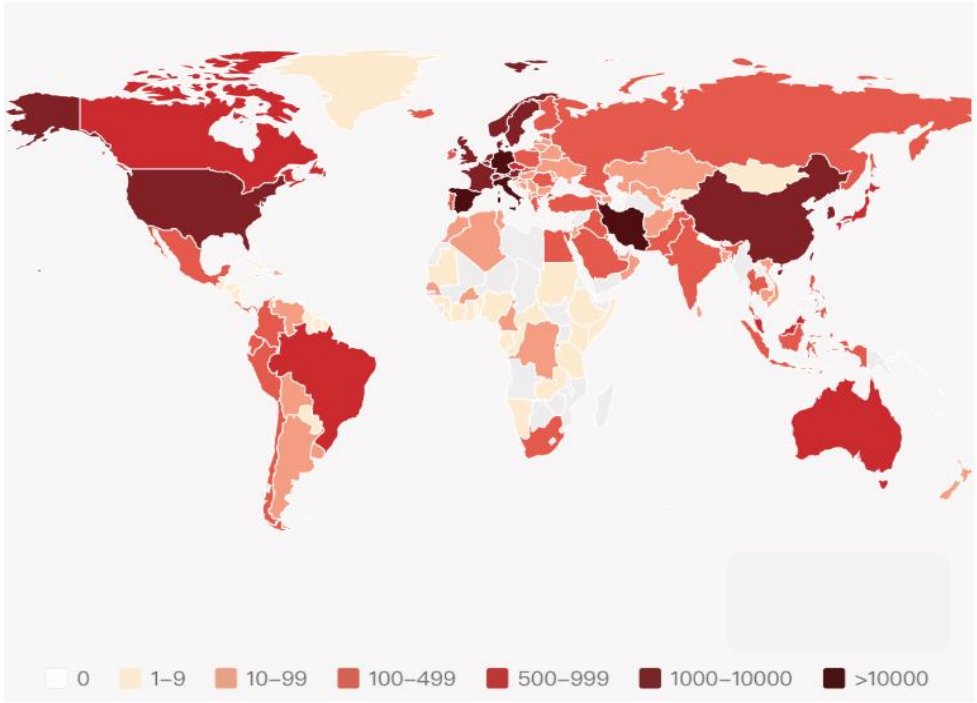
Agenda

+ **COVID-19 Predictions**
  - **US National and Regional**
  - **Italy National and Regional**
  - **EU**
  - **Canada National and Regional**
  - **Japan**
  - **Platform**

+ Next steps

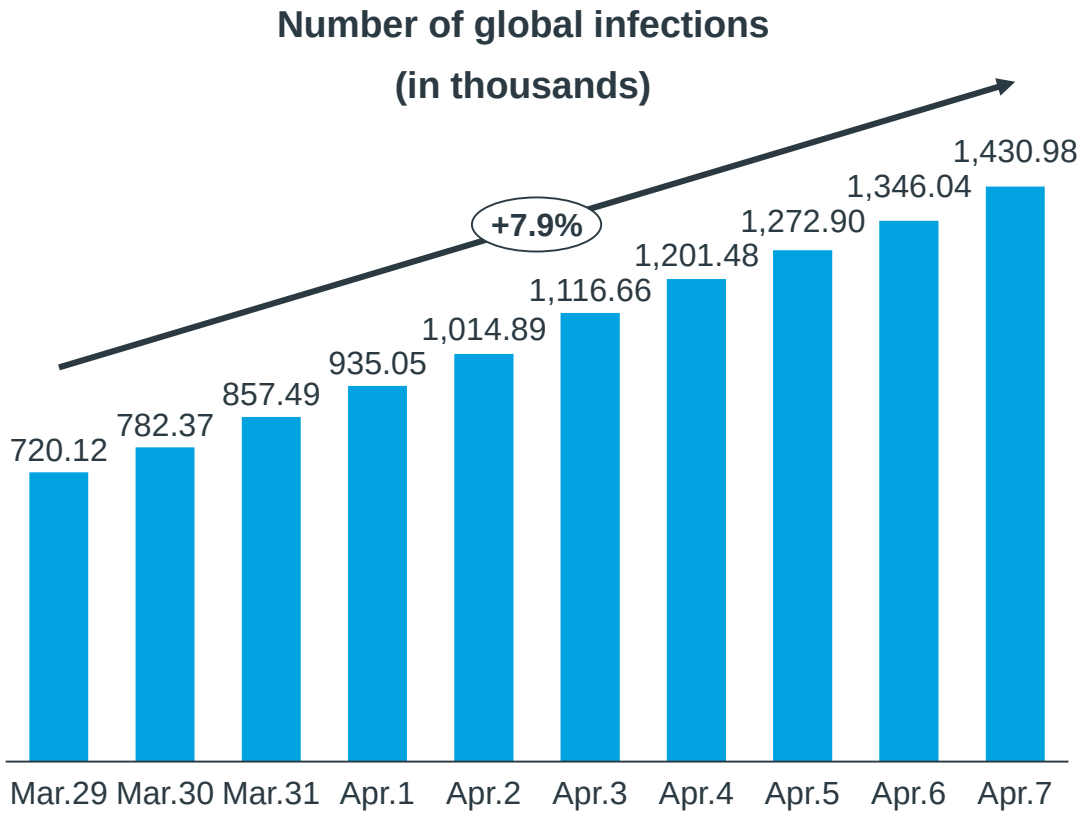
COVID-19 spreads rapidly to more than 200 countries

COVID-19 cases is expanding rapidly worldwide



As of April 7,
1,430,981 confirmed cases, 83,087 deaths
209 countries, areas or territories with cases

Number of infections globally is increasing rapidly in the past 10 days



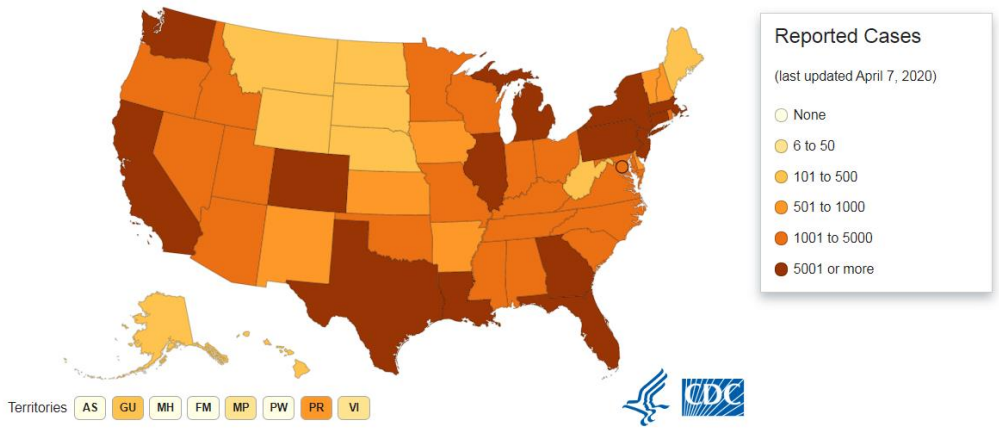
Source: JHU, CSSE, https://systems.jhu.edu/research/public-health/ncov/, as of Apr 7

US national and regional

COVID-19 spreads quickly in US, more cases are reported as more people being tested

United States
329.5M people

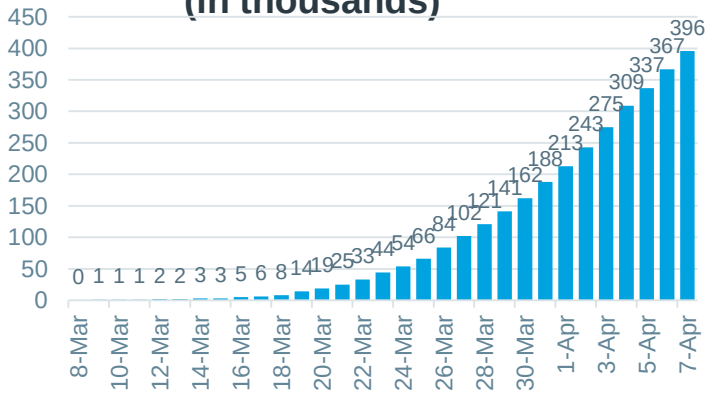
States Reporting Cases of COVID-19 to CDC*



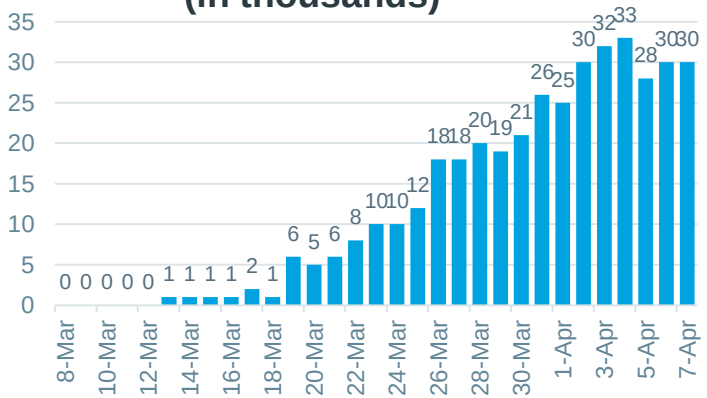
- March 13 – President declared National State of Emergency
- March 26 – US has most cases in world
- April 5 – 96% of Americans under stay-at home orders

As of 7:00am EST April 8:
399,929 confirmed cases
12,911 deaths

Number of total cases in US (in thousands)



Number of new cases in US (in thousands)



Source: Johns Hopkins University

United States Response Timeline

Federal Government and CDC provide direction and recommendations for State and Local Gov’ts

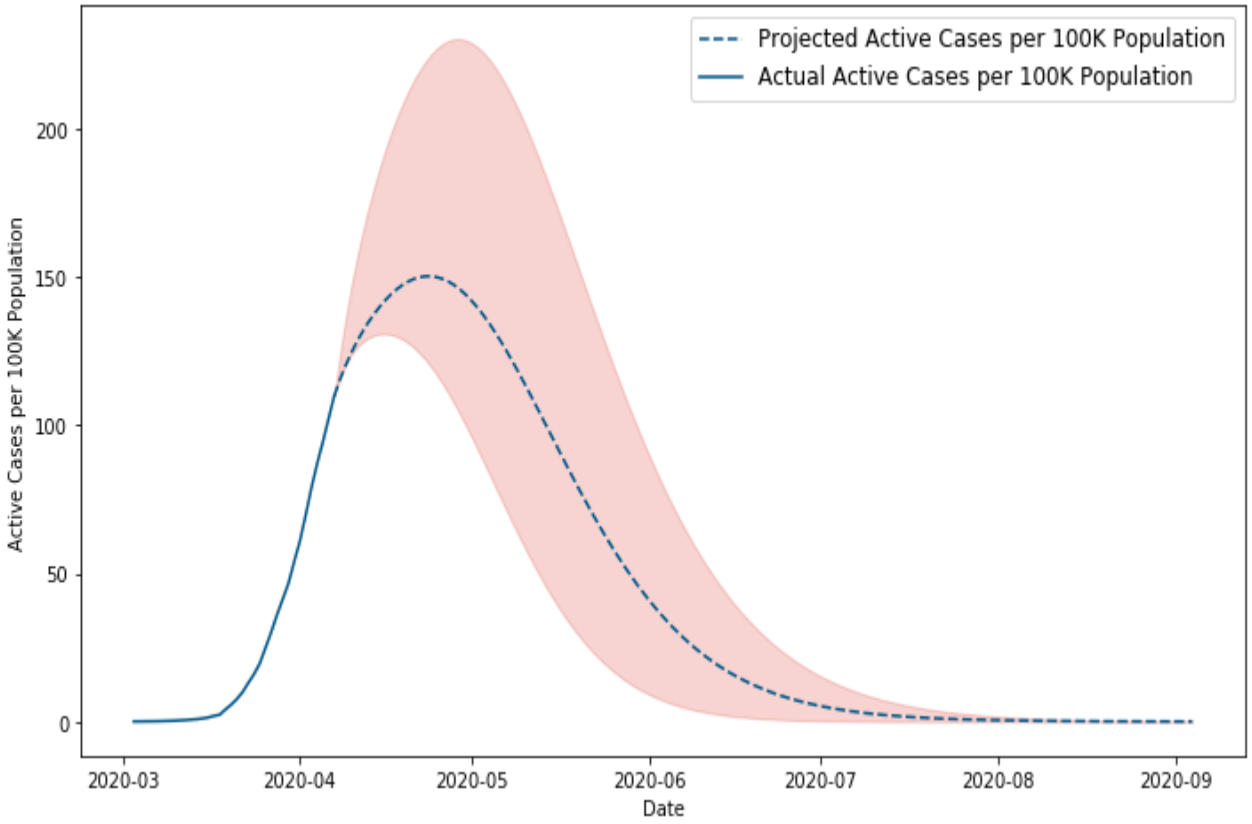
- January 22, 2020 – First confirmed COVID-19 case in the US
- January 31, 2020 – Entry into the US from China restricted
- February 29, 2020 – First US death reported in Washington (WA) and state of emergency in WA declared; FL and CA follow days later
- March 6, 2020 – University of Washington cancels classes; NY and CA soon follow; President signs $8.3B emergency funding bill related to the virus
- March 11, 2020 – NBA and NHL professional sports leagues suspend season after players test positive
- March 13, 2020 – President orders travel ban from most European countries for 30 days; declares national emergency
- March 16, 2020 – 22 States, the District of Columbia, and Puerto Rico closed schools; President issues 15-day plan for Social Distancing to curb spread of virus
- March 19, 2020 – Virus present in all 50 states; 43 states have closed schools; CA orders shelter in place; State Department advises against any foreign travel
- March 21, 2020 - 5 states and more than 25% of US advised to shelter in place

United States Response Timeline

Federal Government and CDC provide direction and recommendations for State and Local Gov’ts

- March 25, 2020 – 17 states and nearly 50% of US shelter in place
- March 26, 2020 – US now has the most COVID-19 cases in the world
- March 27, 2020 - $2T stimulus package signed into law; the third stimulus package in response to COVID-19
- March 29, 2020 – President extends nation-wide Social Distancing through the end of April
- March 30, 2020 – 27 states (225M people) and over two-thirds of US shelter in place
- March 31, 2020 – 30 states (250M people) and over three-quarters of US shelter in place
- April 1, 2020 – 90% of US now sheltering place
- April 3, 2020 – US deaths top 6,000
- April 6, 2020 – NYC shows signs that daily cases are flattening
- April 8, 2020 – NYC reports highest daily death toll

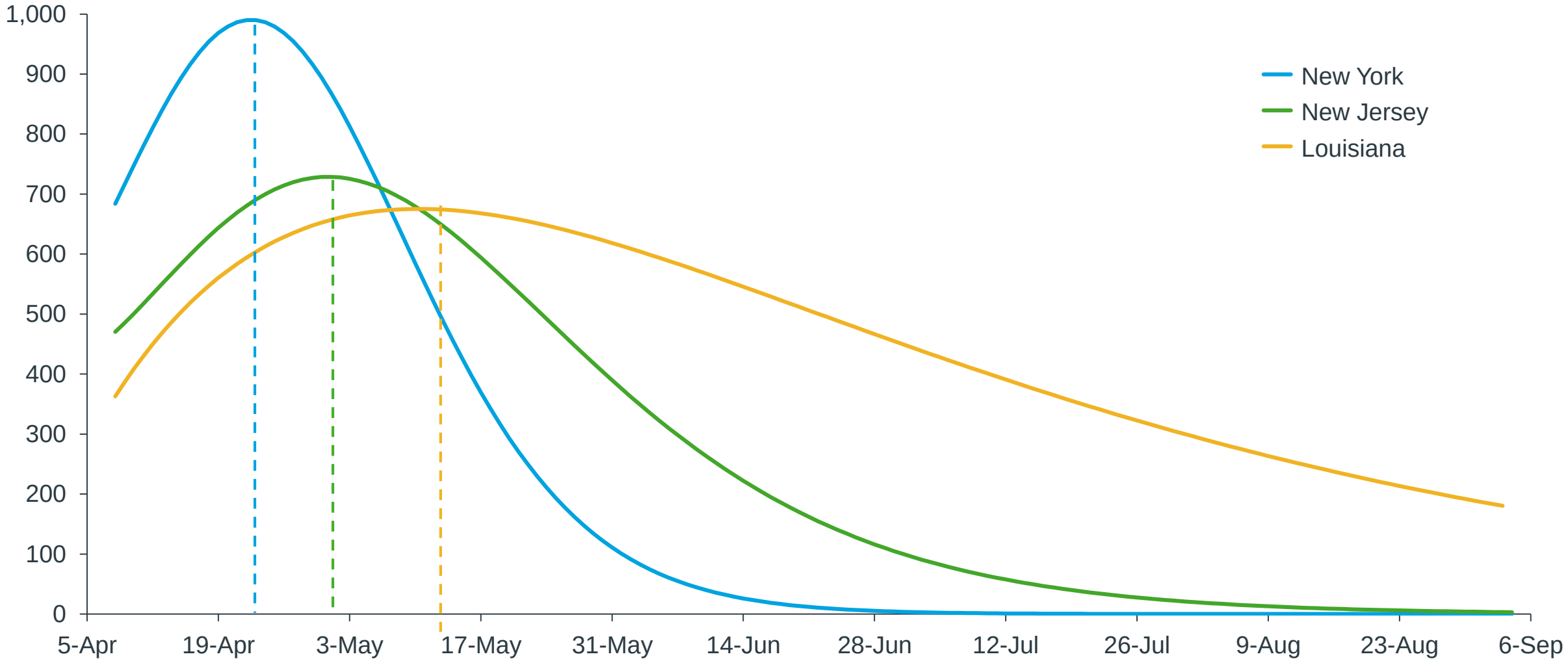
Projection band of active cases in next 150 days in US



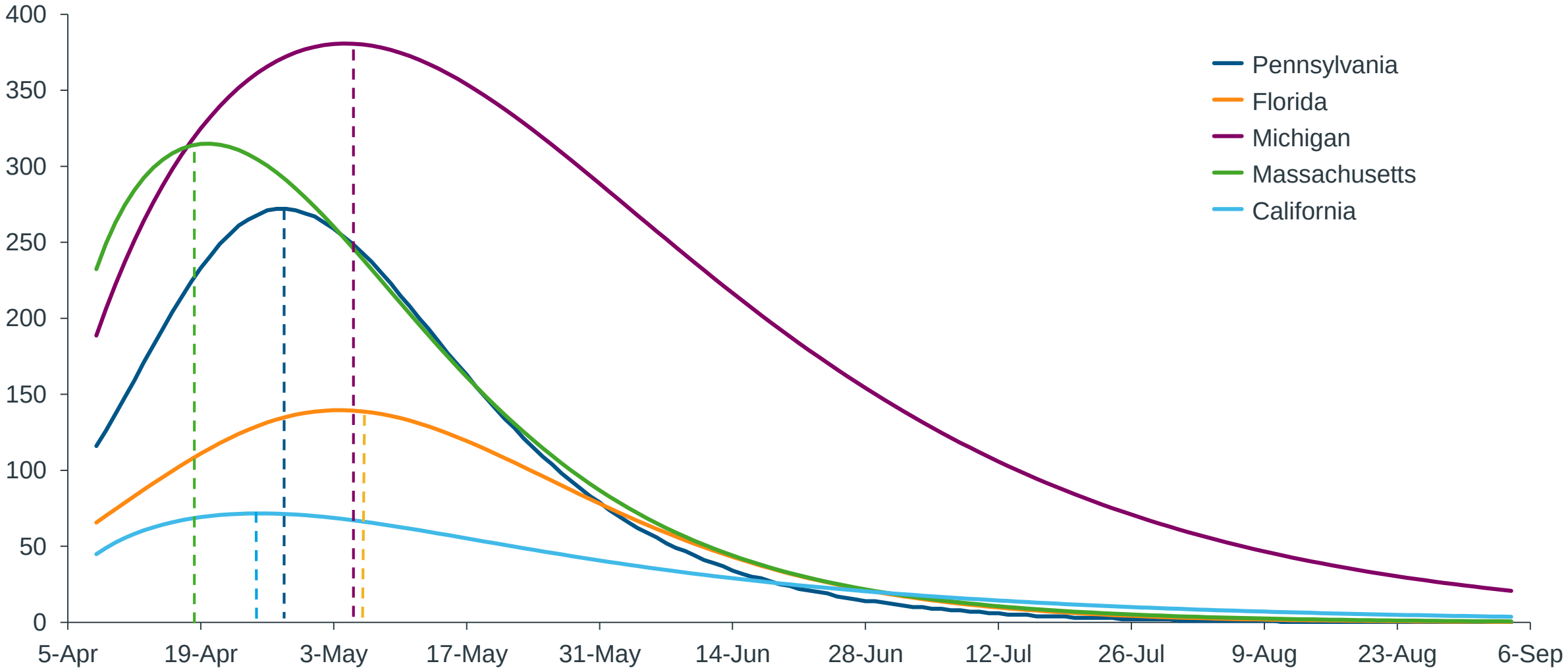
	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	1.91M	579.8	4/16/2020
Normal Scenario	2.30M	696.9	4/23/2020
Pessimistic Scenario	3.06M	930.2	4/29/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

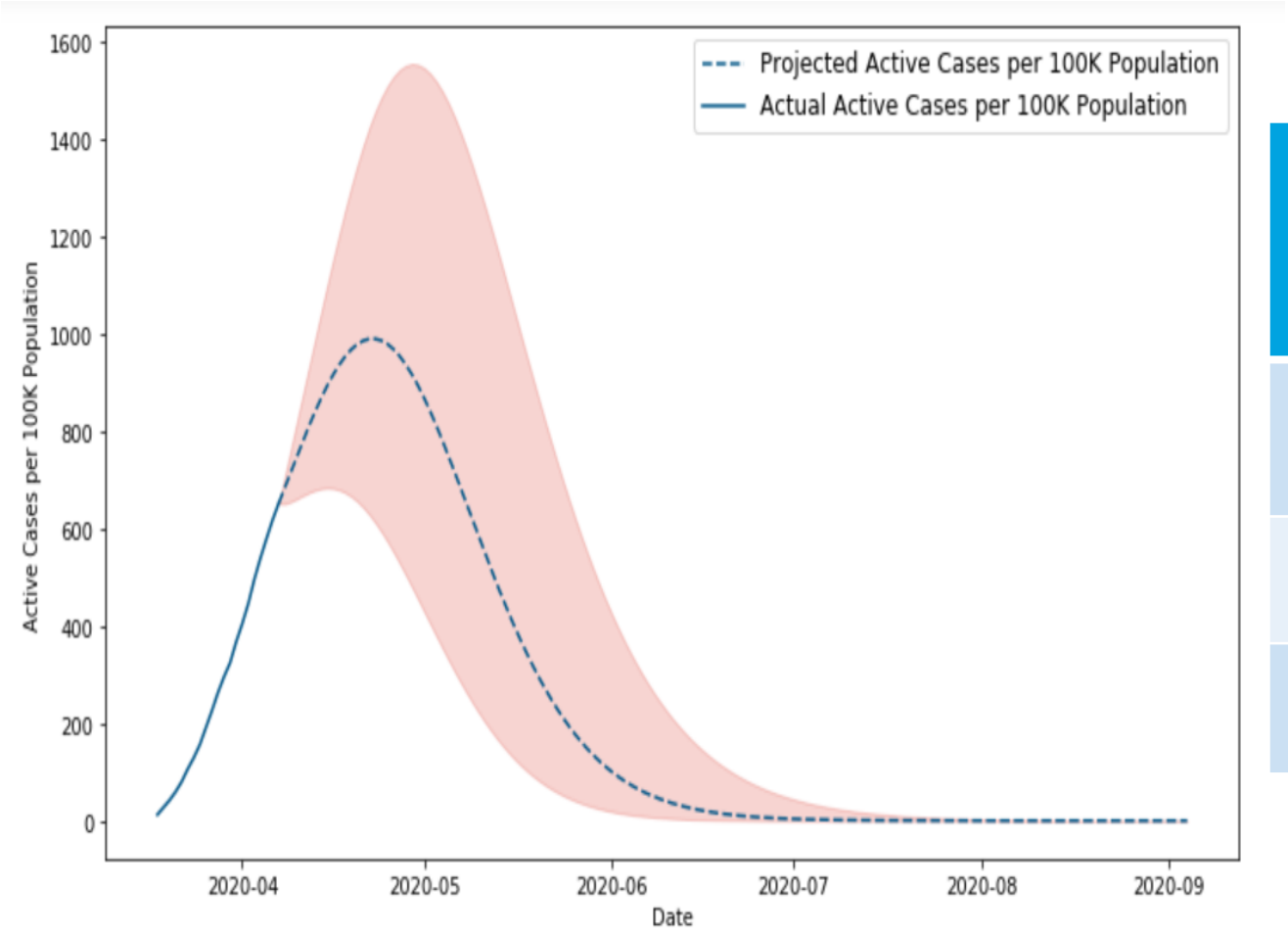
Projection of active cases per 100k population in next 150 days in New York, New Jersey, and Louisiana



Projection of active cases per 100k population in next 150 days in Pennsylvania, Florida, Michigan, Massachusetts, and California



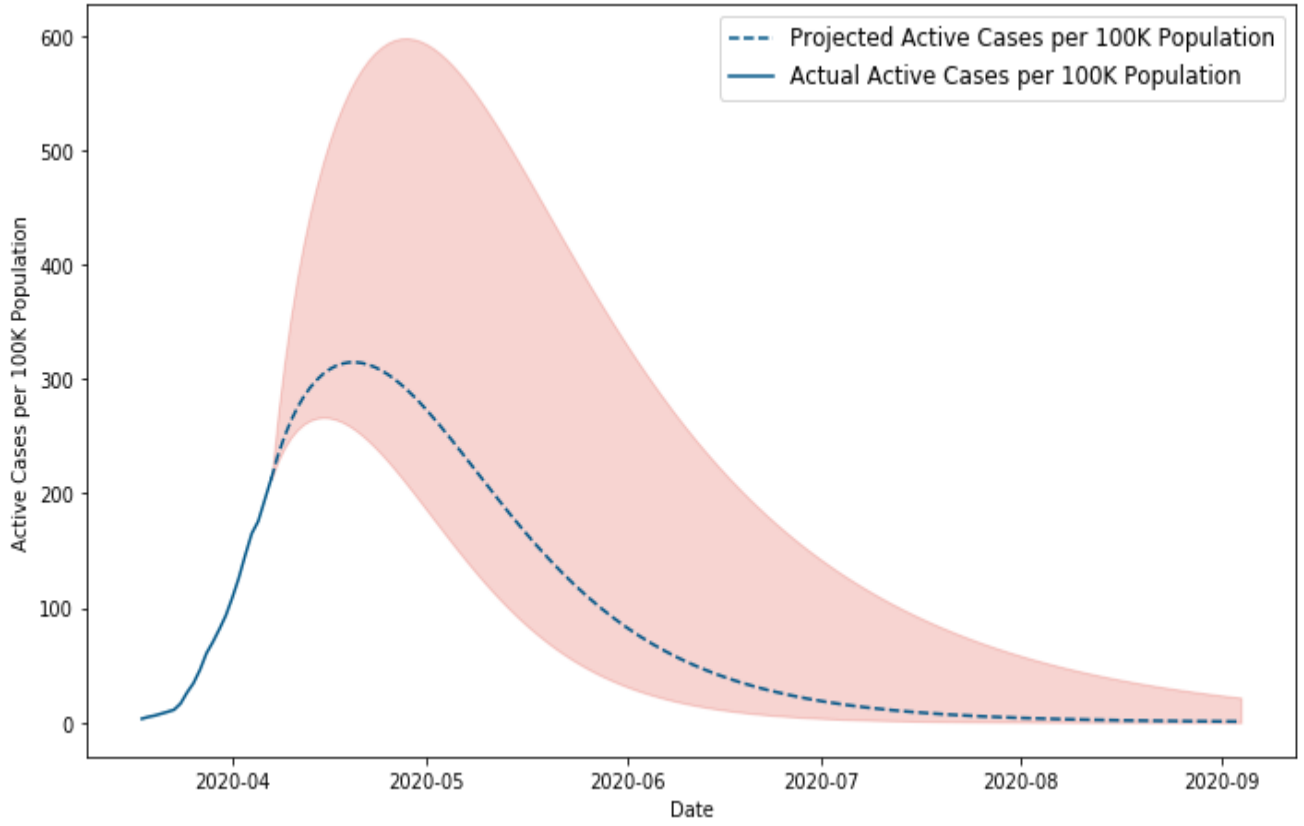
Projection band of active cases in next 150 days in New York



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	666.8K	3429.9	4/15/2020
Normal Scenario	832.9K	4284.5	4/22/2020
Pessimistic Scenario	1.06M	5443.9	4/29/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

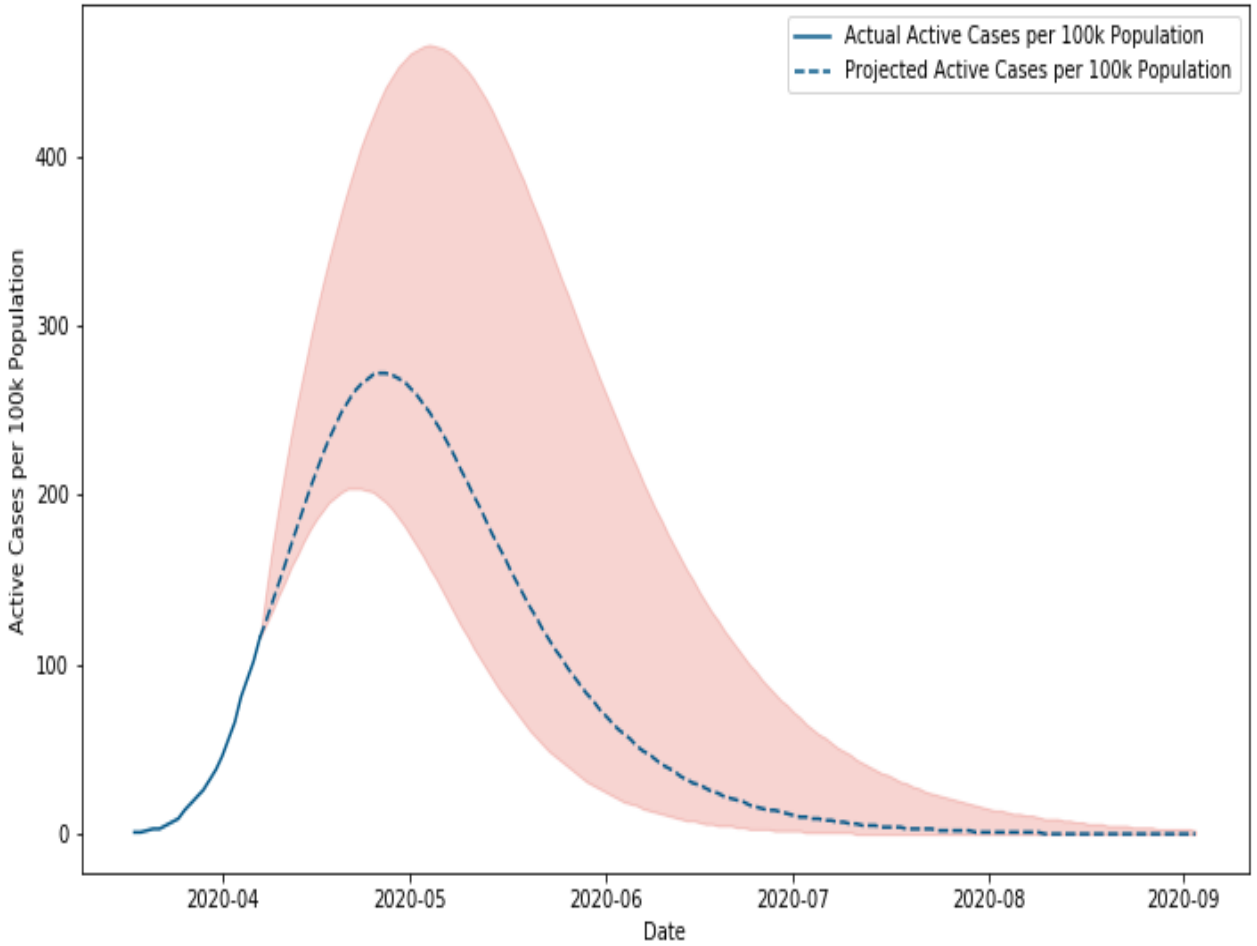
Projection band of active cases in next 150 days in Massachusetts



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	46.32K	663	4/15/2020
Normal Scenario	49.36K	707	4/21/2020
Pessimistic Scenario	77.27K	1107	4/28/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

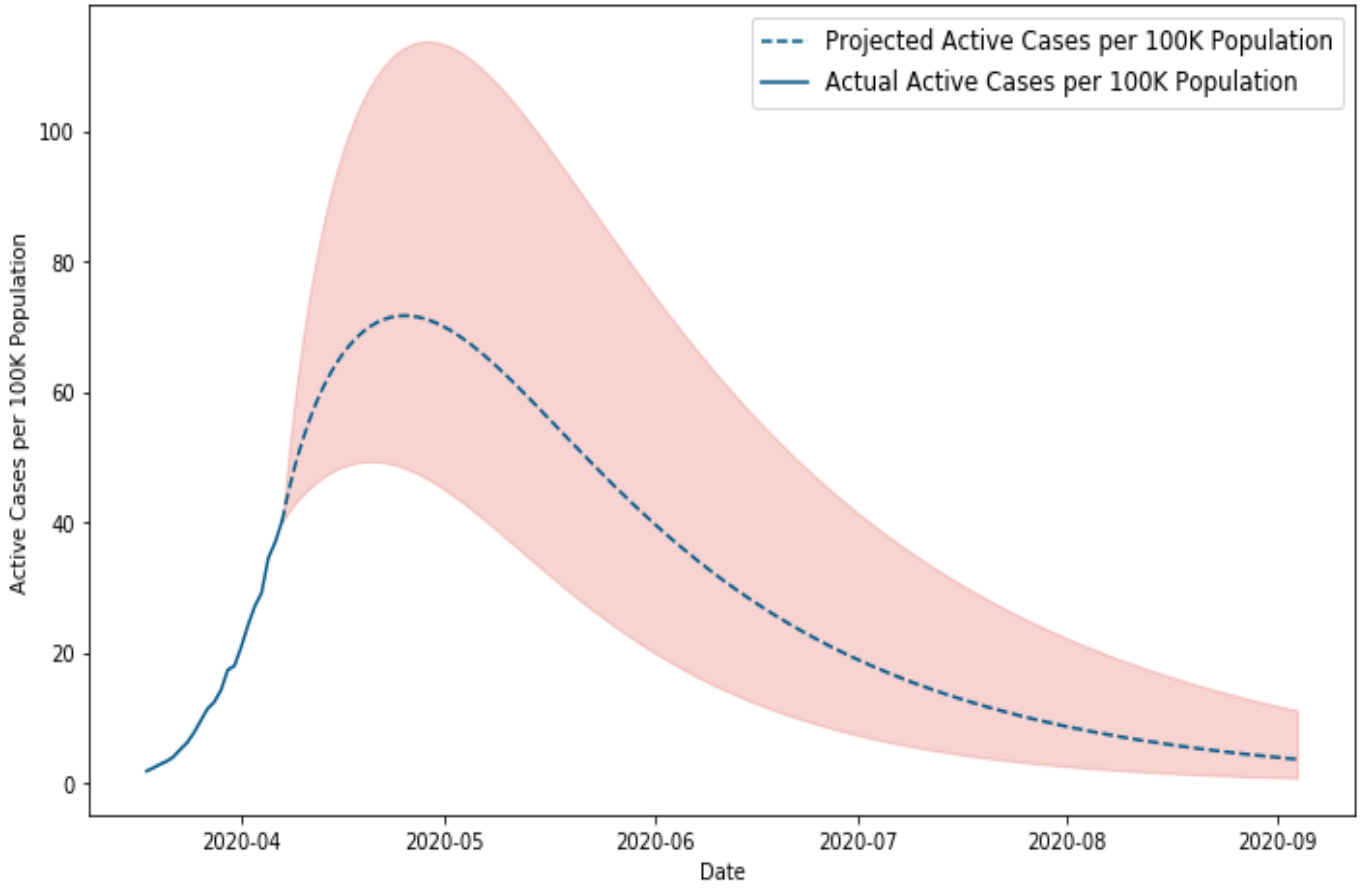
Projection band of active cases in next 150 days in Pennsylvania



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	76.5K	597	4/20/2020
Normal Scenario	90.3K	705	4/25/2020
Pessimistic Scenario	169.0K	1320	5/03/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

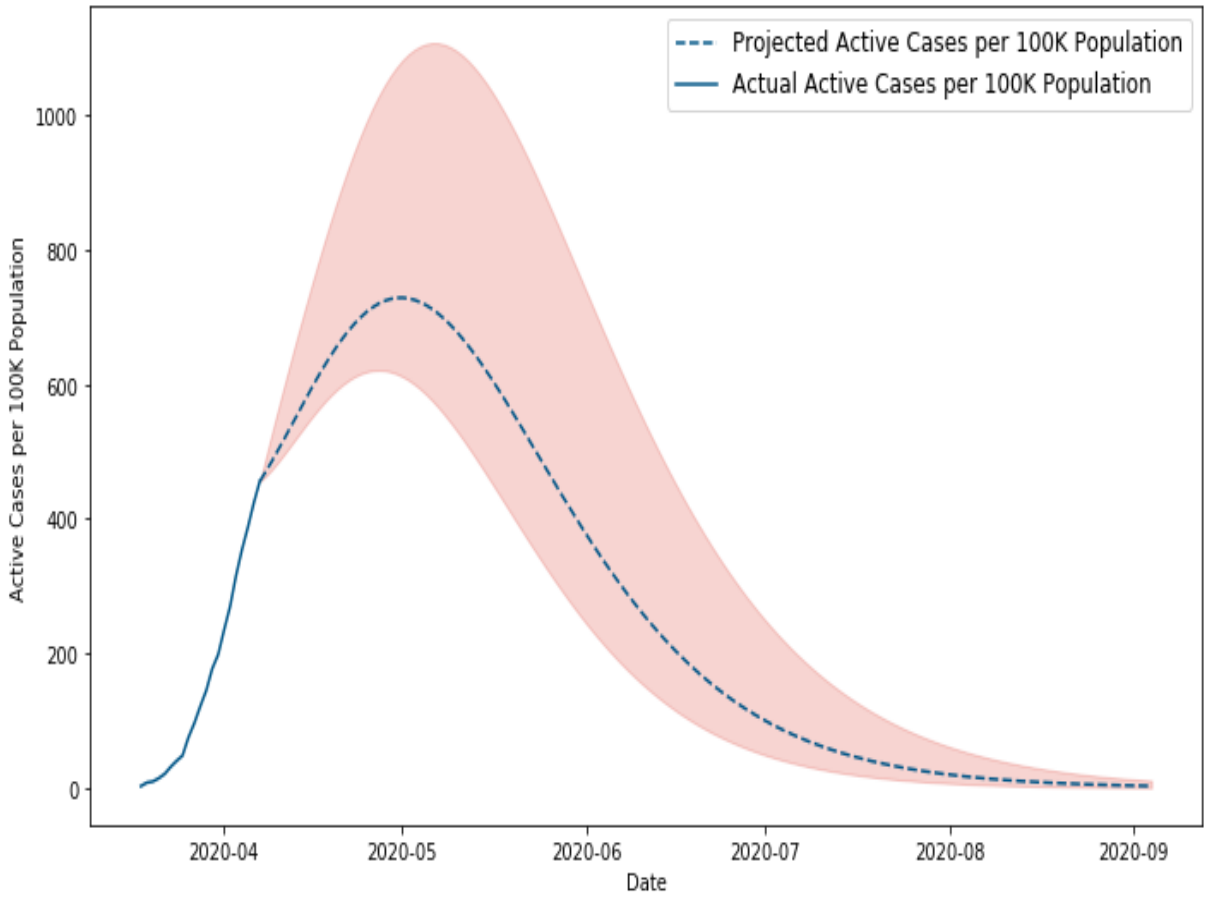
Projection band of active cases in next 150 days in California



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	37.9K	94.95	4/20/2020
Normal Scenario	50.2K	125.68	4/24/2020
Pessimistic Scenario	73.8K	184.83	4/29/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

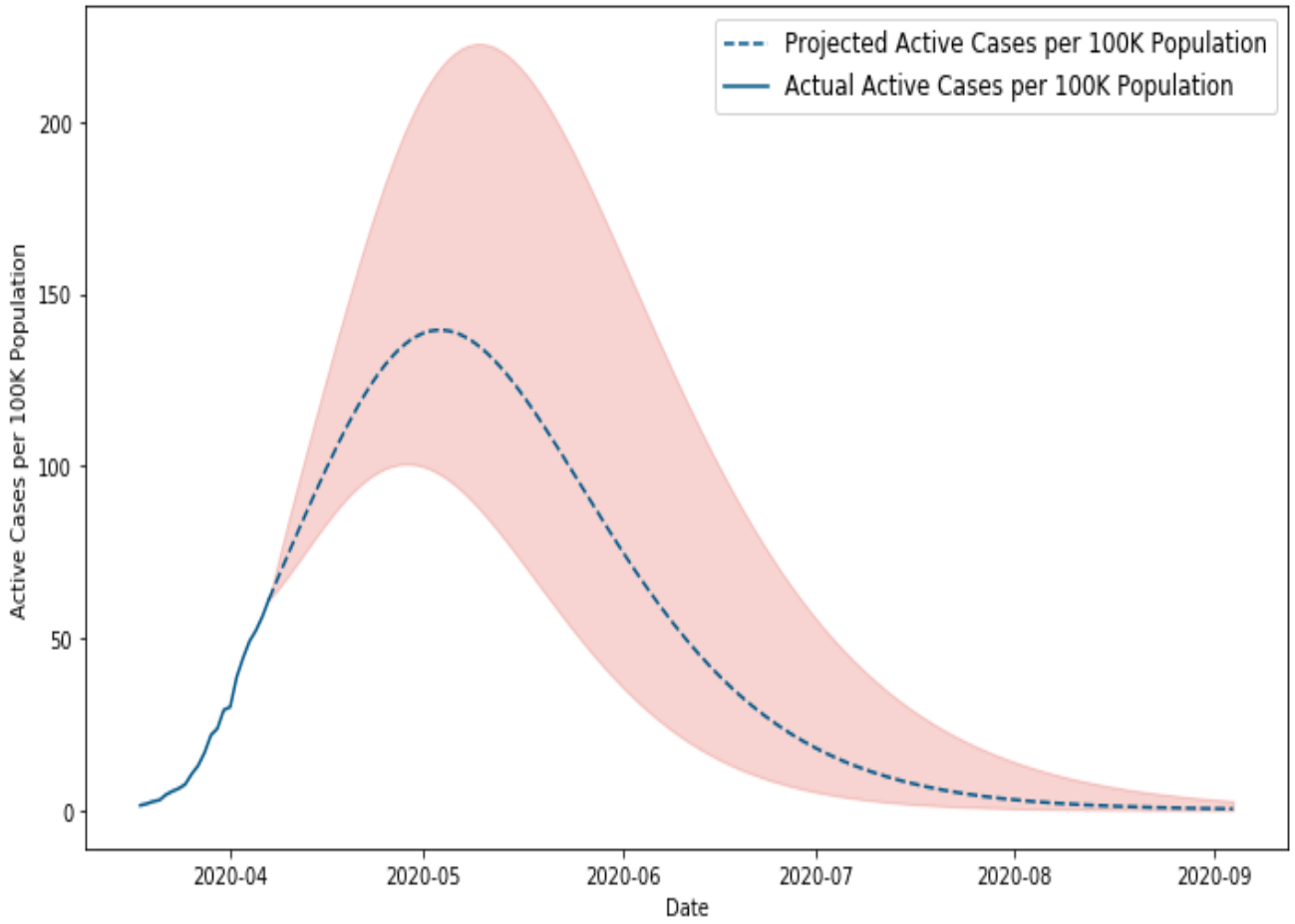
Projection band of active cases in next 150 days in New Jersey



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	275.9K	3087.6	4/27/2020
Normal Scenario	302.0K	3380.3	5/01/2020
Pessimistic Scenario	378.8K	4239.2	5/06/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

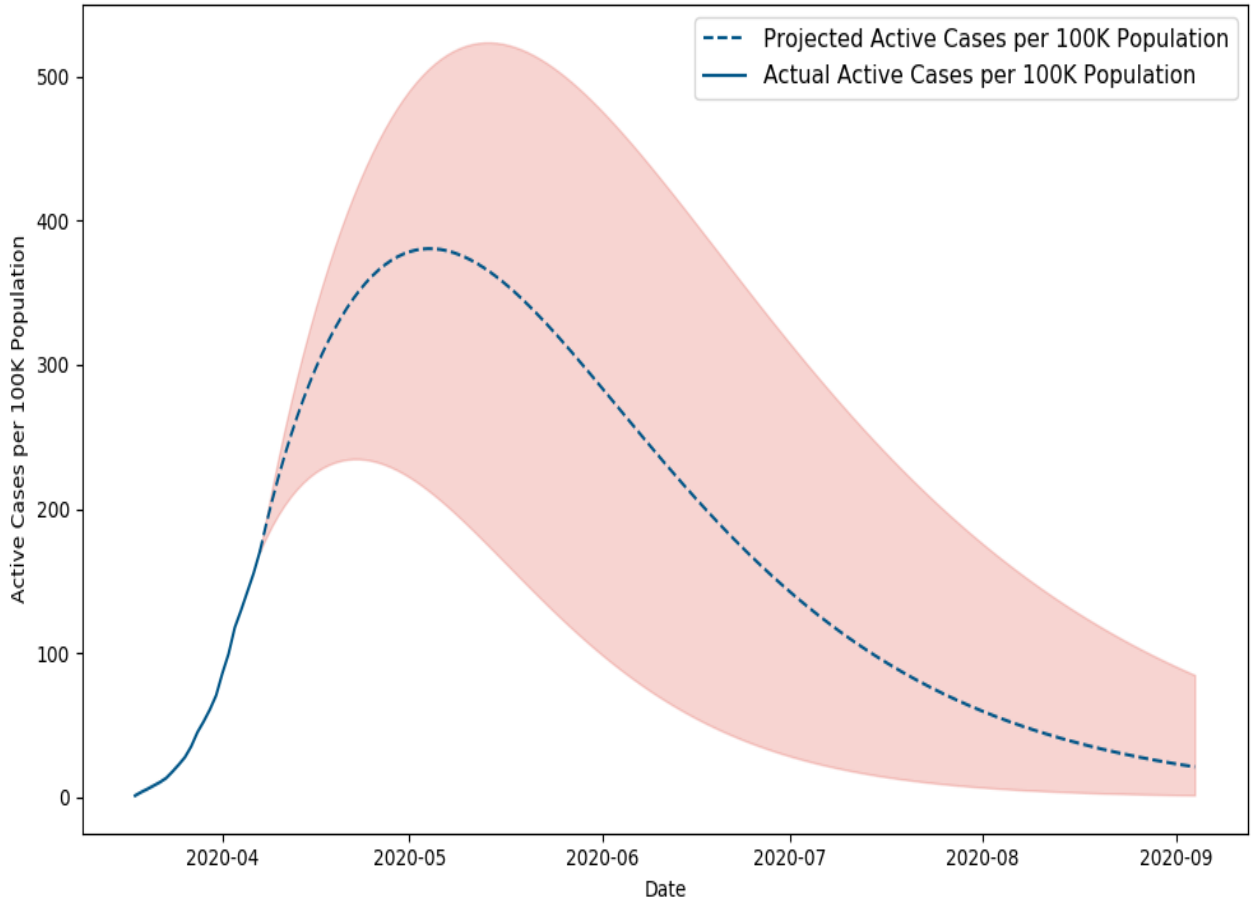
Projection band of active cases in next 150 days in Florida



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	97.7k	444.2	4/28/2020
Normal Scenario	120.7k	548.6	5/04/2020
Pessimistic Scenario	156.3K	710.8	5/10/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

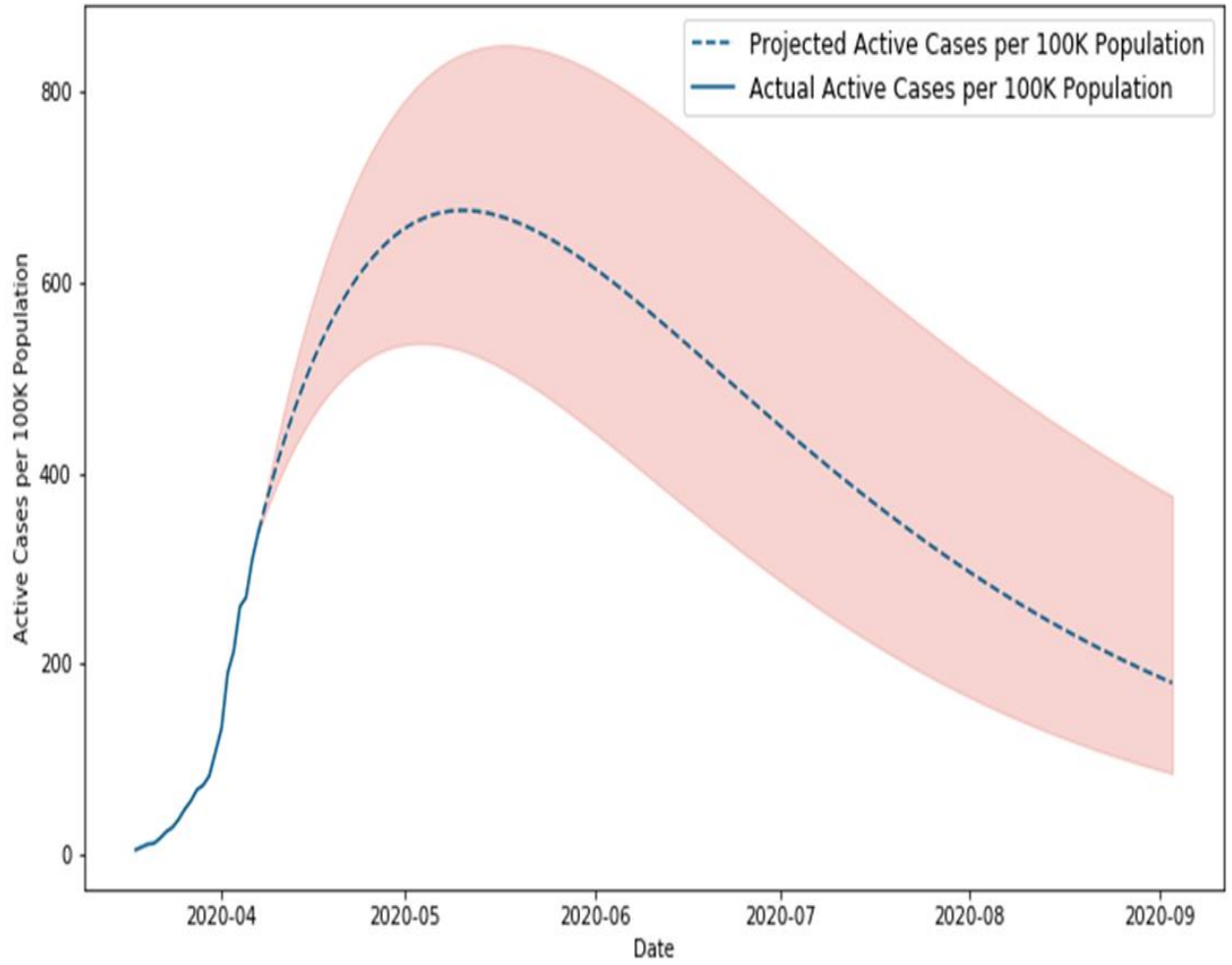
Projection band of active cases in next 150 days in Michigan



	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	65.7K	654.5	4/22/2020
Normal Scenario	100.2K	998.7	5/04/2020
Pessimistic Scenario	131.5K	1315.2	5/14/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

Projection band of active cases in next 150 days in Louisiana

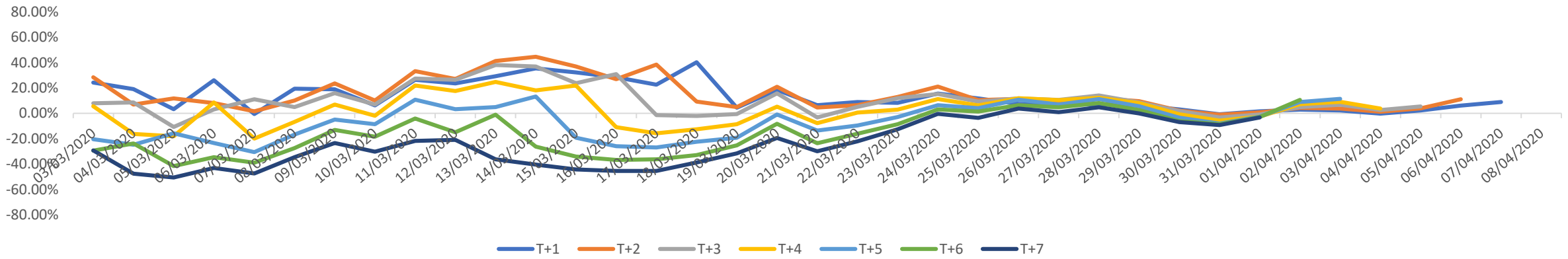


	Projected total confirmed cases	Projected total confirmed cases per 100k population	Estimated Peak time
Optimistic Scenario	24.91k	536	5/04/2020
Normal Scenario	31.36k	675	5/10/2020
Pessimistic Scenario	39.42k	849	5/17/2020

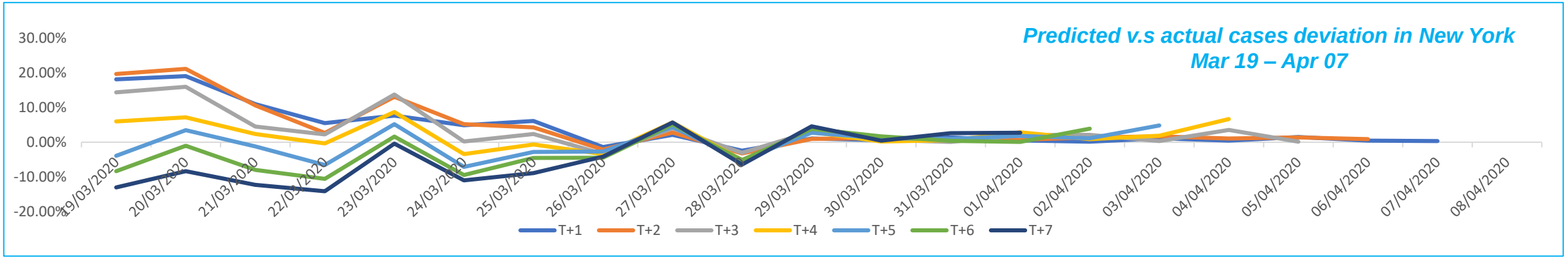
Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

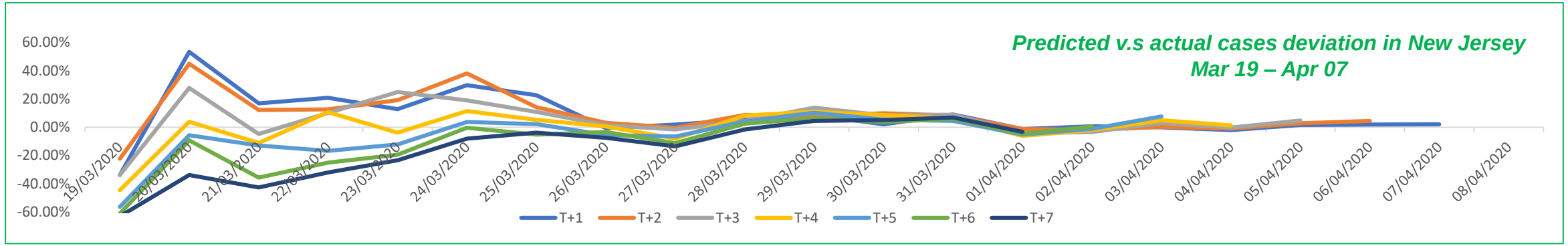
Validation results for US

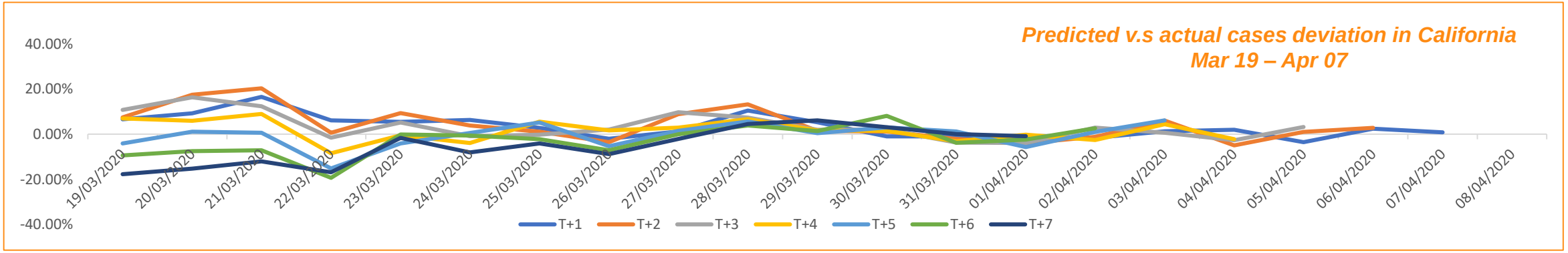
Predicted v.s actual cases deviation in US
Mar 03 – Apr 07



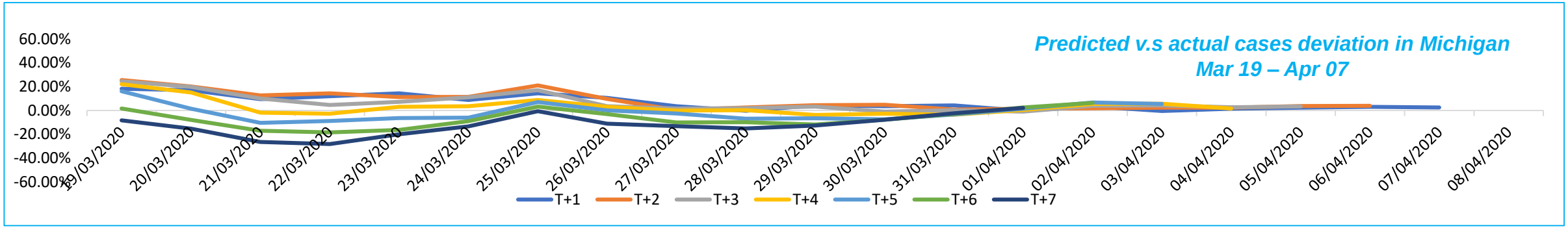
Validation results for NY/ NJ/ CA

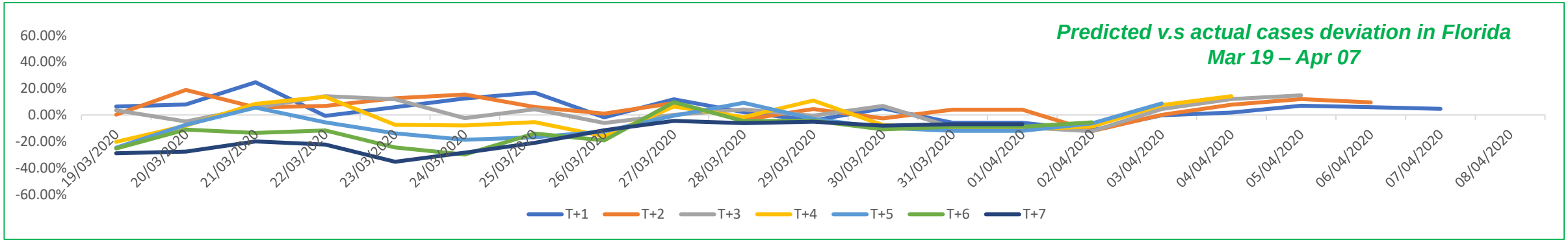


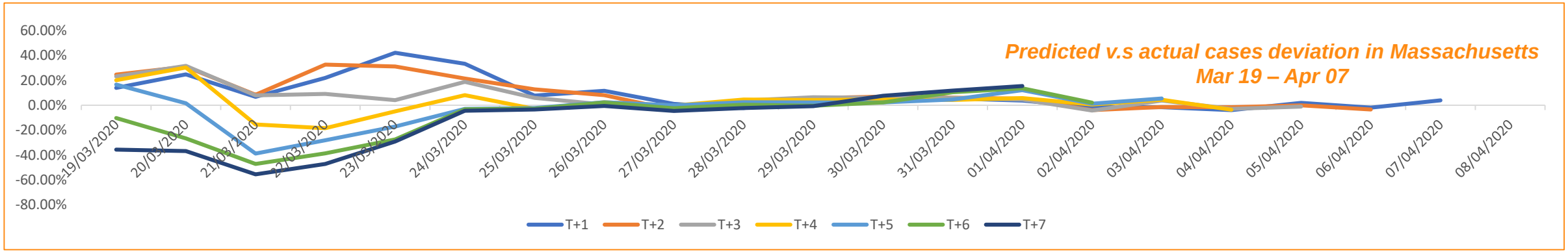




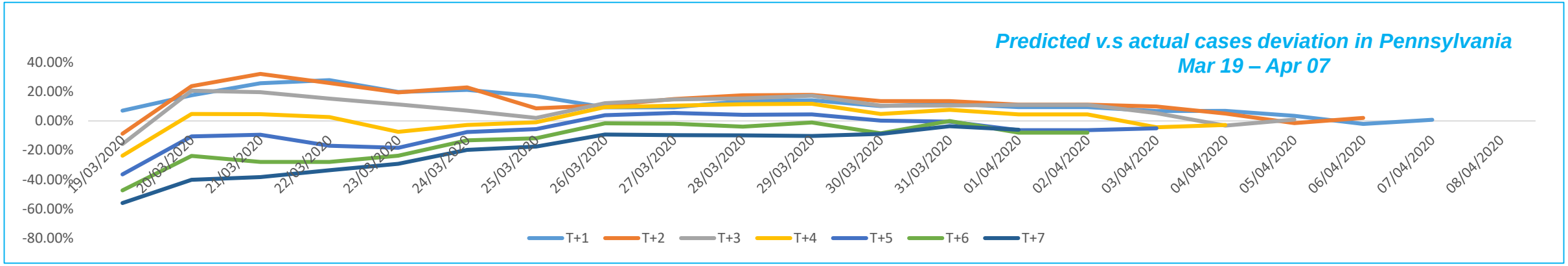
Validation results for MI/ FL/ MA

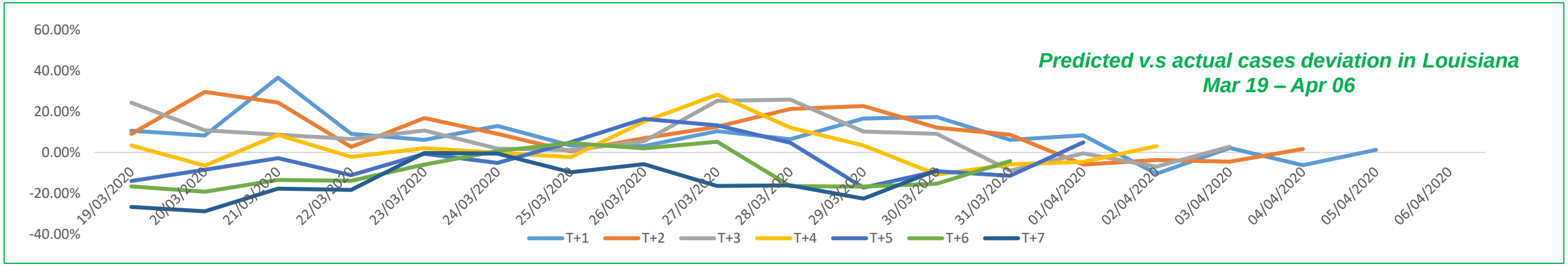






Validation results for LA/ PA

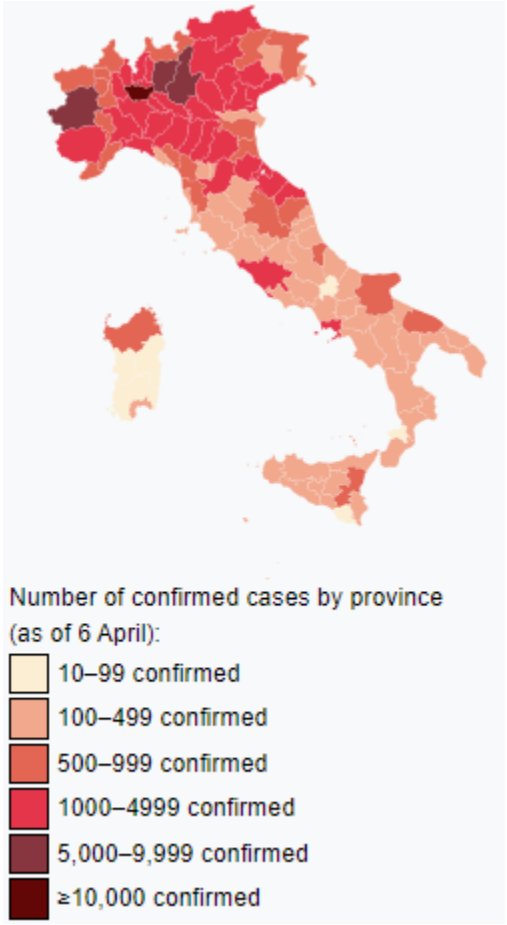




Italy national and regional

New infections steadily decrease since end of March

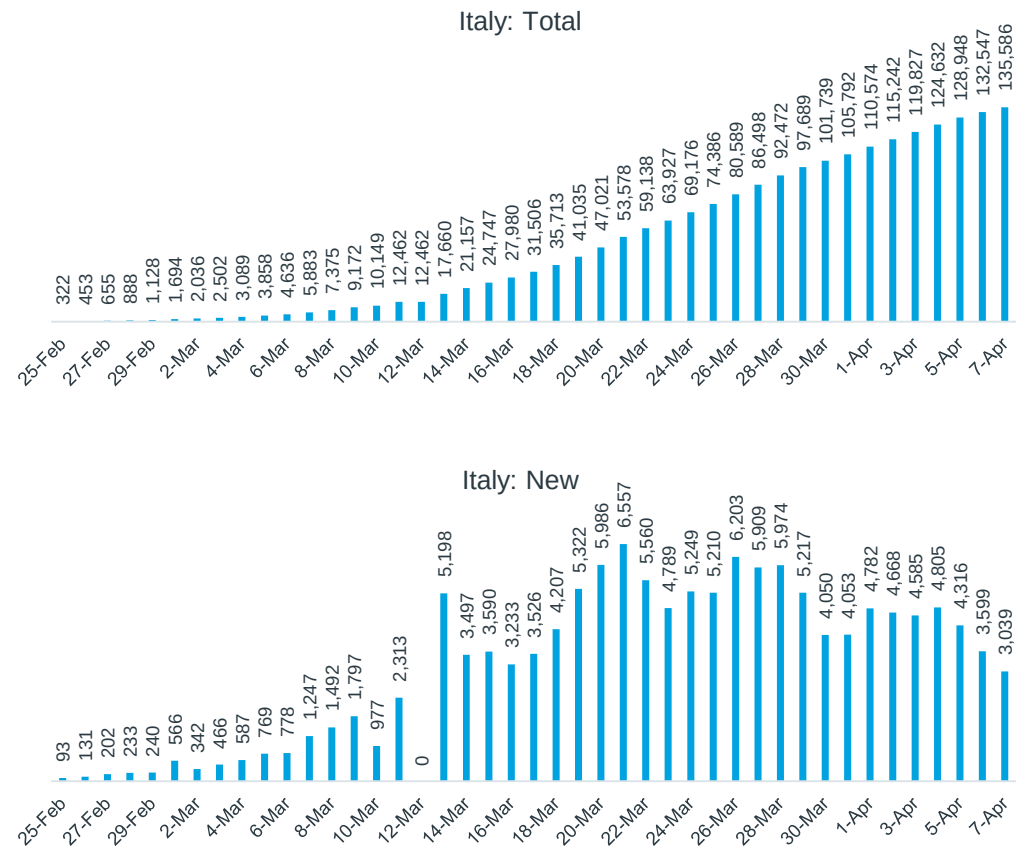
Italy



135,586 Confirmed cases
17,127 Deaths
60m Population

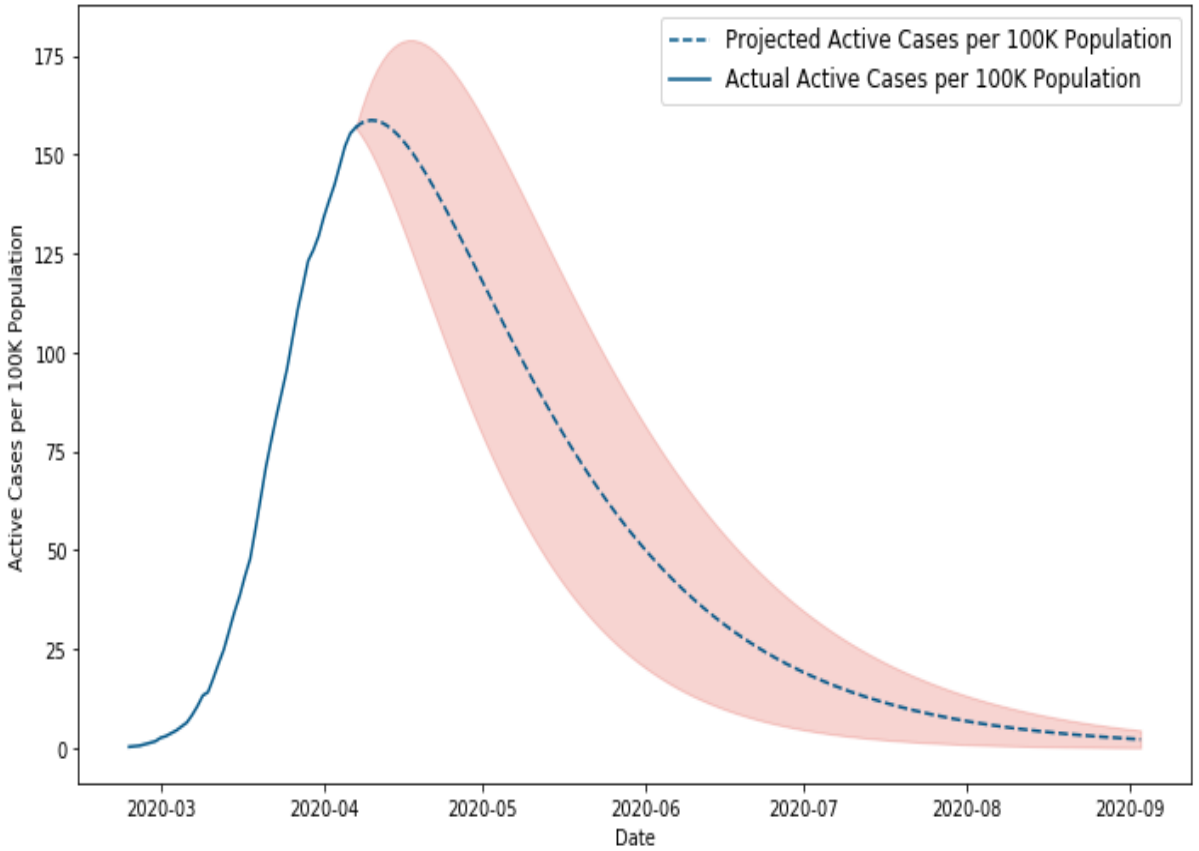
- **Flights** from China closed since Jan-20
- **Early measures** (starting Feb): restrictions on mass gatherings, collective sports, gyms etc.
- **Schools** closure since Feb-24th for selected regions, Mar 2-5th for other
- **Restrictive measures** starting Mar.8th: people movement allowed only for basic necessities (work or health or urgencies (incl. essential goods supply)
- **Additional measures** starting Mar 22nd : Stop production and commercial activities except essential supply chains (food, energy, health ..); further limitation for movements across municipalities, increased penalties for non-compliance

Number of infections in Italy



Source: Center for System Science and Engineering (CSSE) at John Hopkins University JHU)
https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6

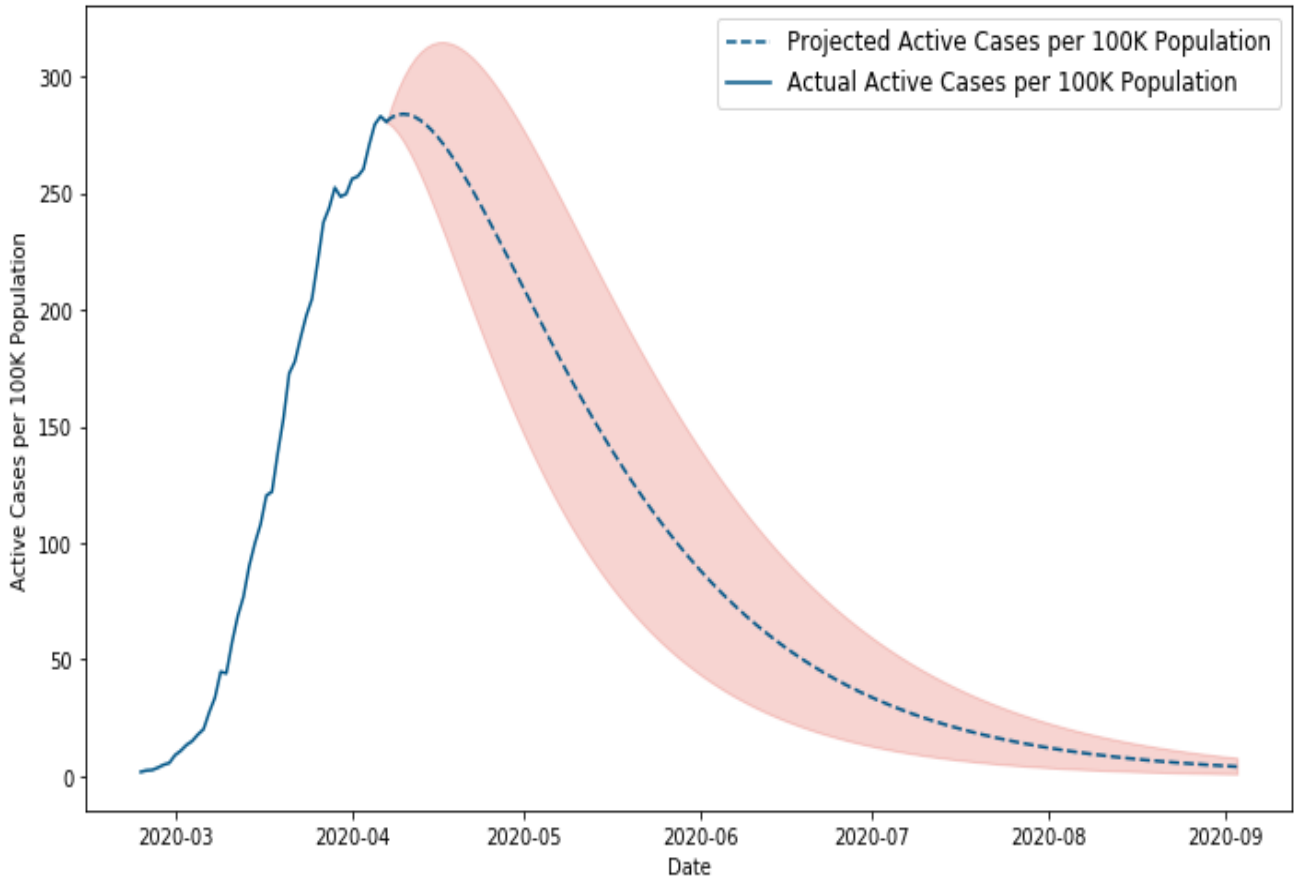
Projection band of active cases in next 150 days in Italy



	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	184.0K	306	4/8/2020
Normal Scenario	193.5K	322	4/10/2020
Pessimistic Scenario	45.8K	425	4/16/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

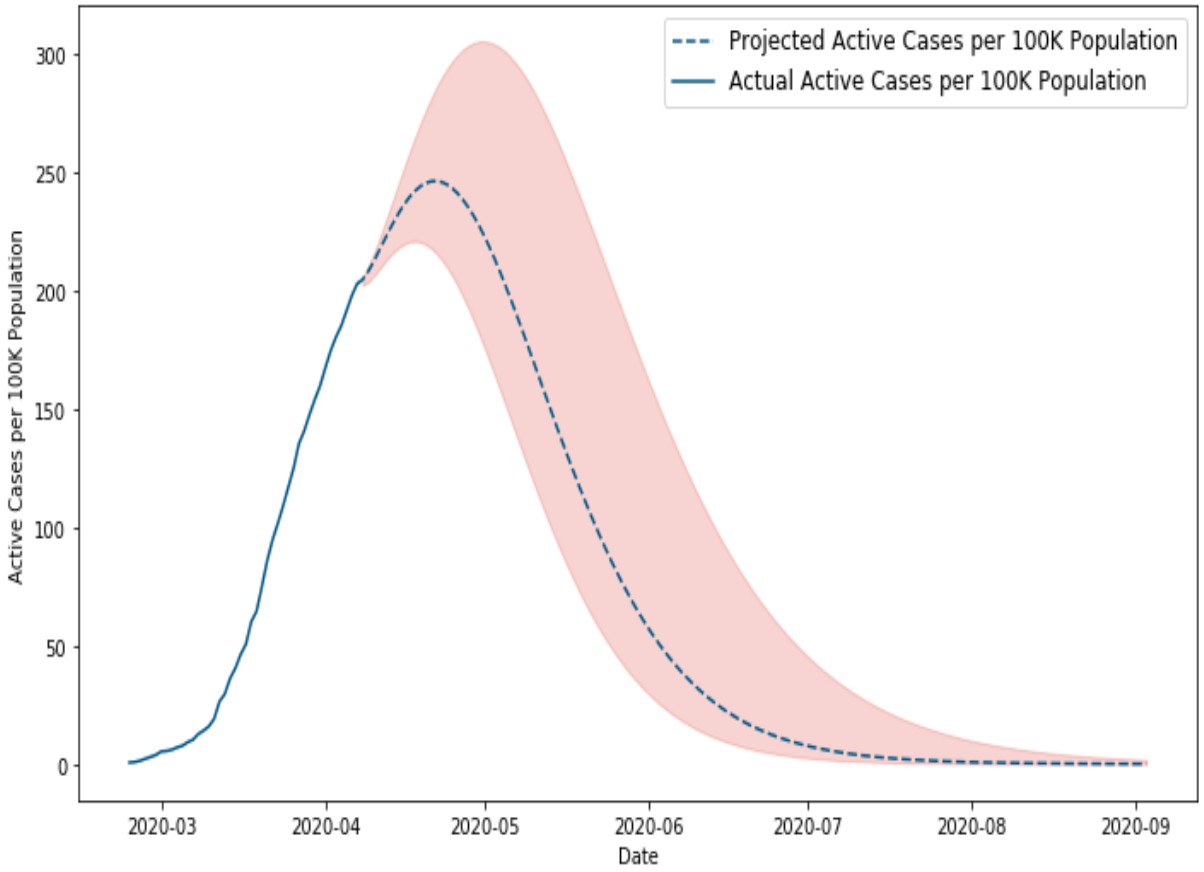
Projection band of active cases in next 150 days in Lombardia



	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	60.8K	604	4/6/2020
Normal Scenario	69.3K	688	4/10/2020
Pessimistic Scenario	86.2K	934	4/17/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

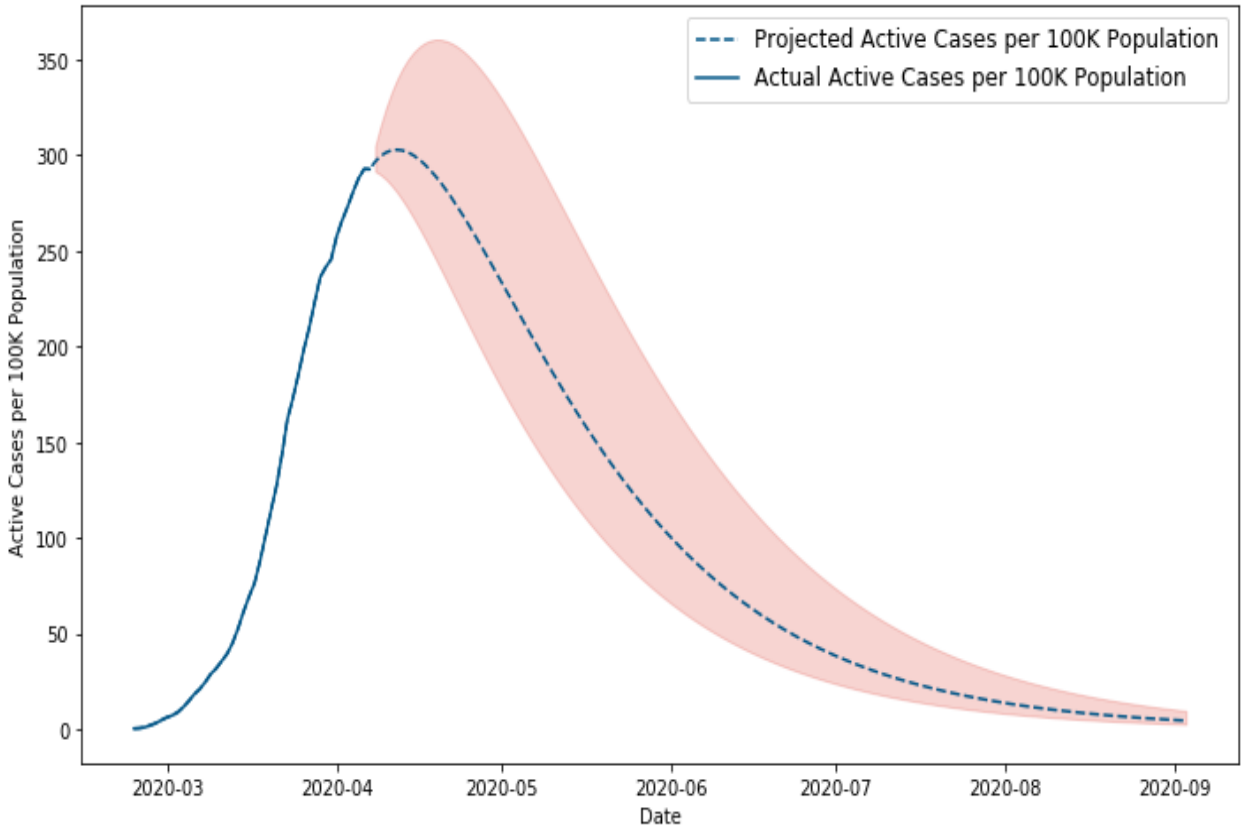
Projection band of active cases in next 150 days in Veneto



	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	30.4K	619	4/16/2020
Normal Scenario	36.8K	750	4/20/2020
Pessimistic Scenario	45.8K	934	5/1/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

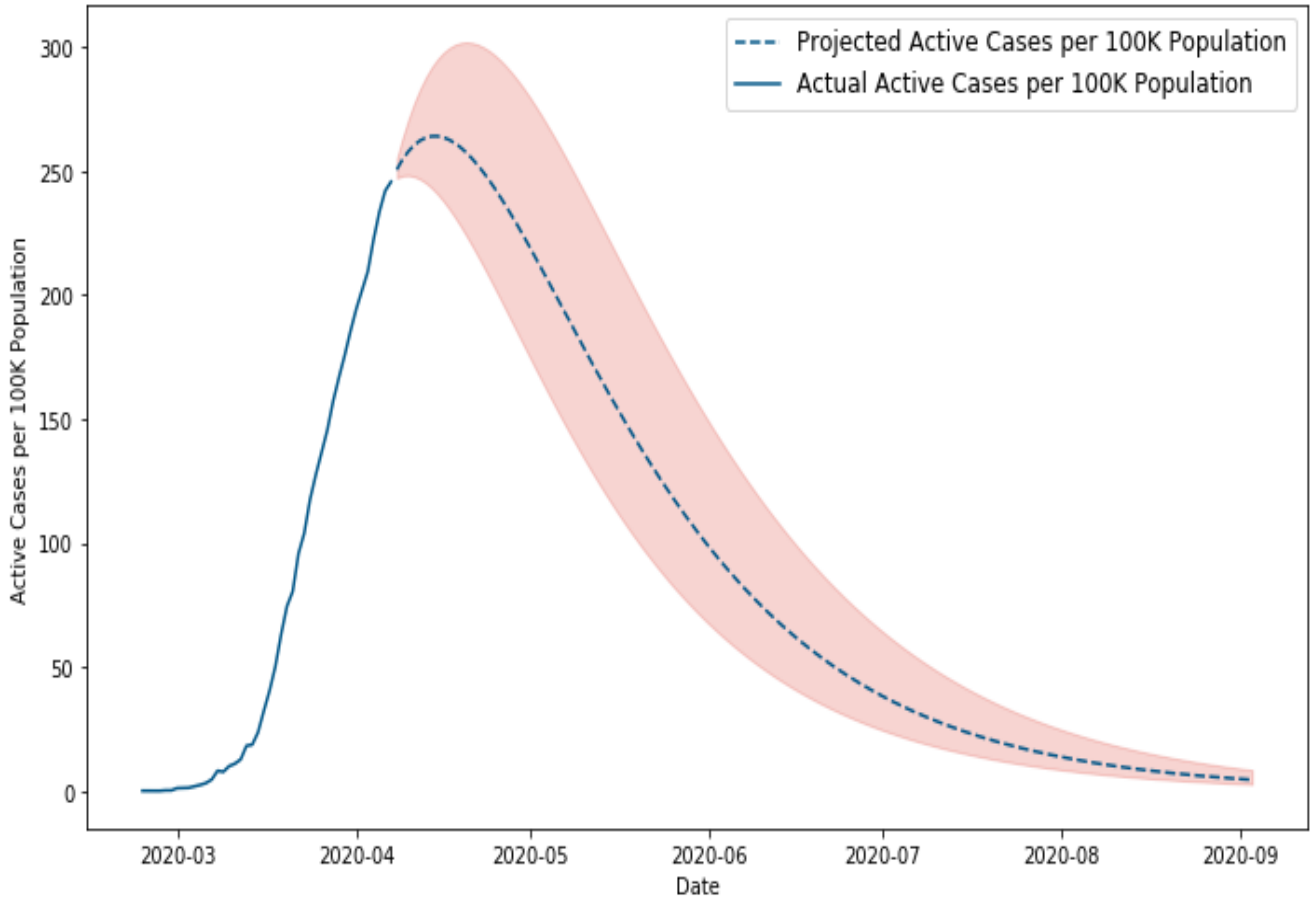
Projection band of active cases in next 150 days in Emilia



	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	21.8K	490	4/6/2020
Normal Scenario	28.4K	750	4/12/2020
Pessimistic Scenario	37.5K	840	5/1/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

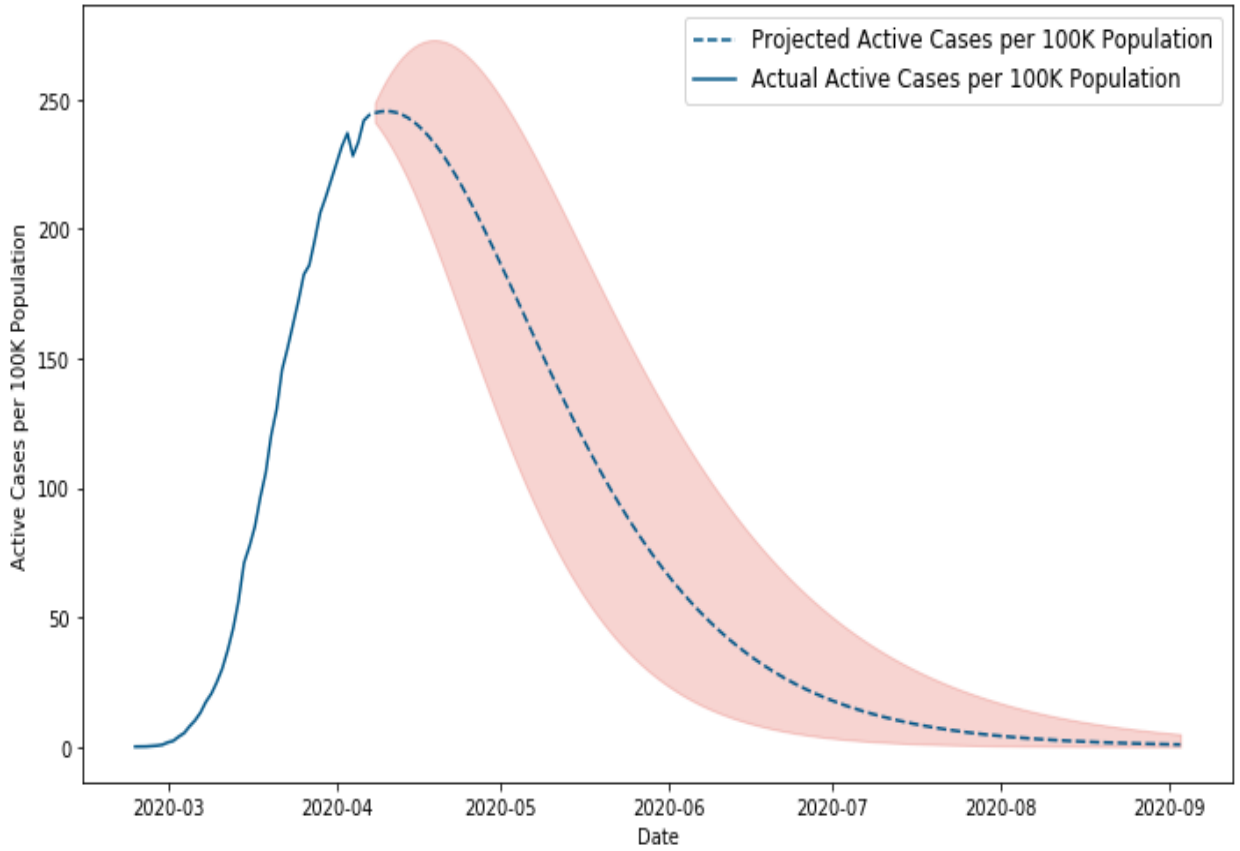
Projection band of active cases in next 150 days in Piemonte



	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	18.6K	428	4/10/2020
Normal Scenario	23.0K	528	4/15/2020
Pessimistic Scenario	30.0K	688	4/20/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

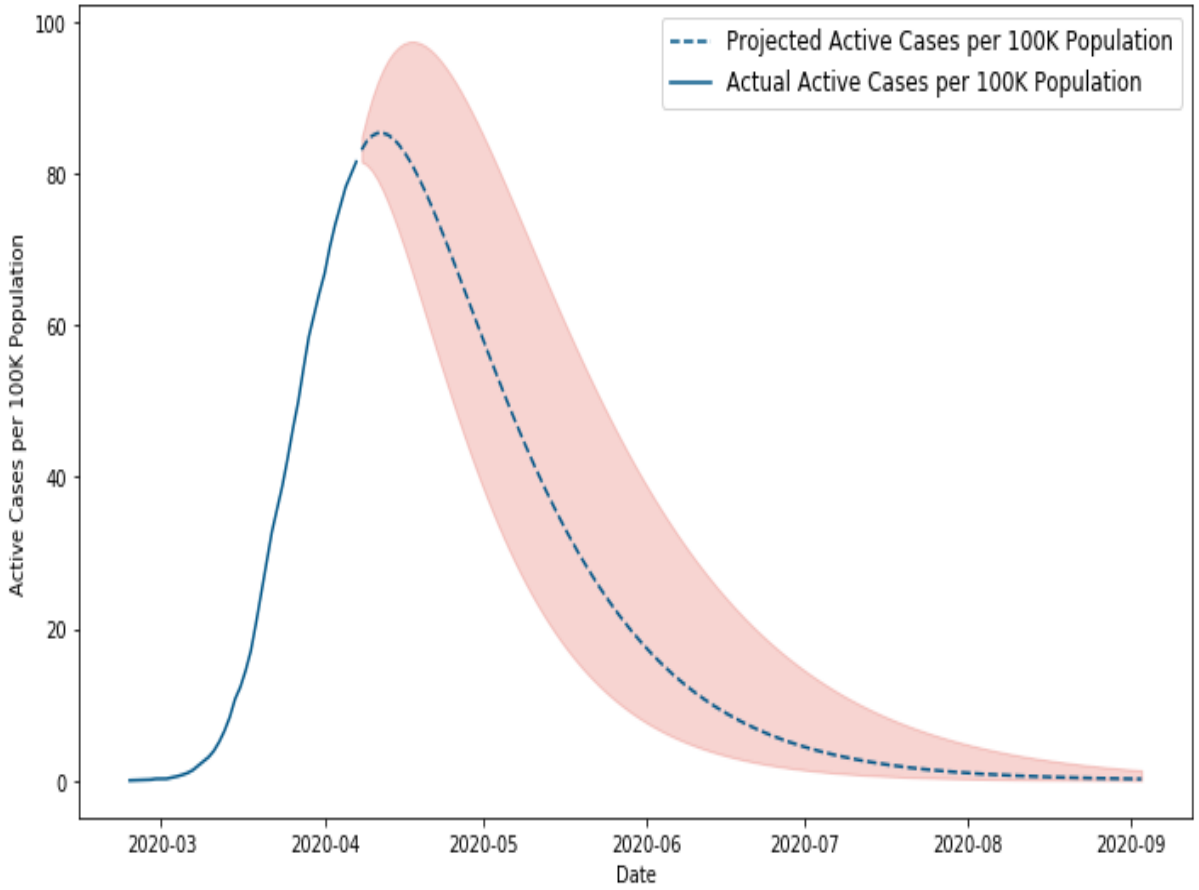
Projection band of active cases in next 150 days in Marche



	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	8.2K	533	4/7/2020
Normal Scenario	9.3K	604	4/10/2020
Pessimistic Scenario	12.1K	787	4/18/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

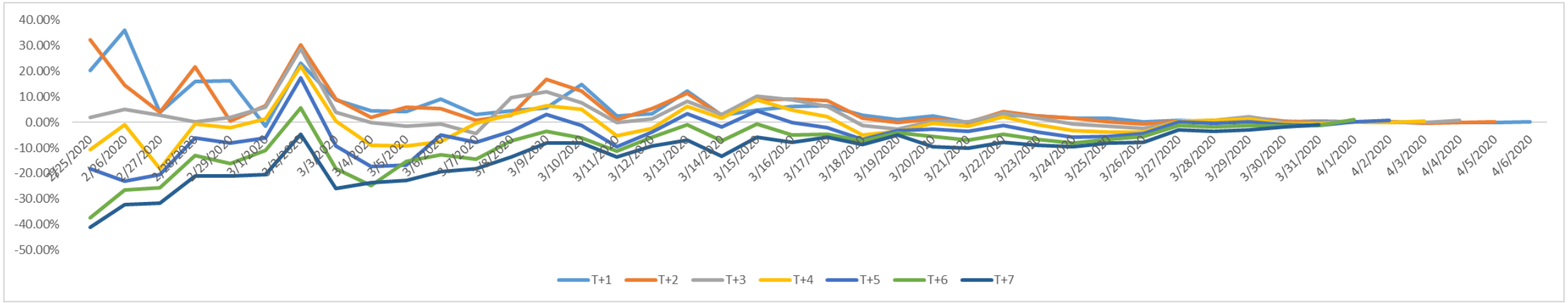
Projection band of active cases in next 150 days in Rest of Italy



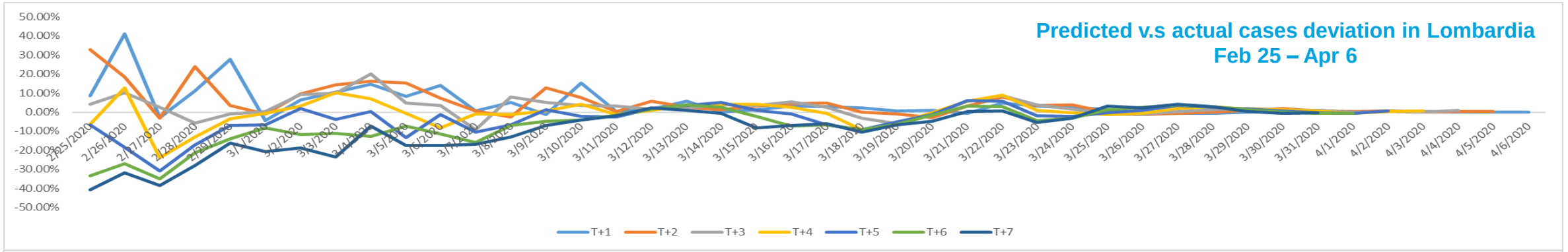
	Projected Total Confirmed Cases	Projected total confirmed cases per 100K population	Estimated peak time
Optimistic Scenario	51.4K	148	4/8/2020
Normal Scenario	65.0K	187	4/12/2020
Pessimistic Scenario	80.8K	233	4/17/2020

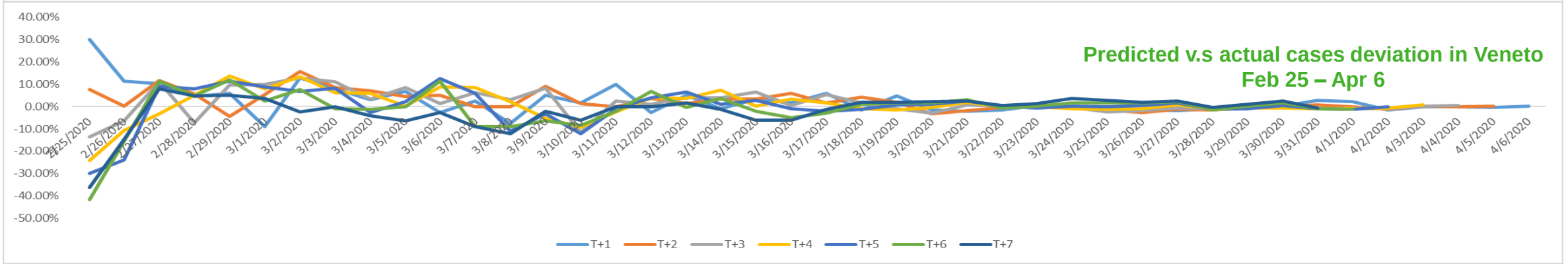
Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

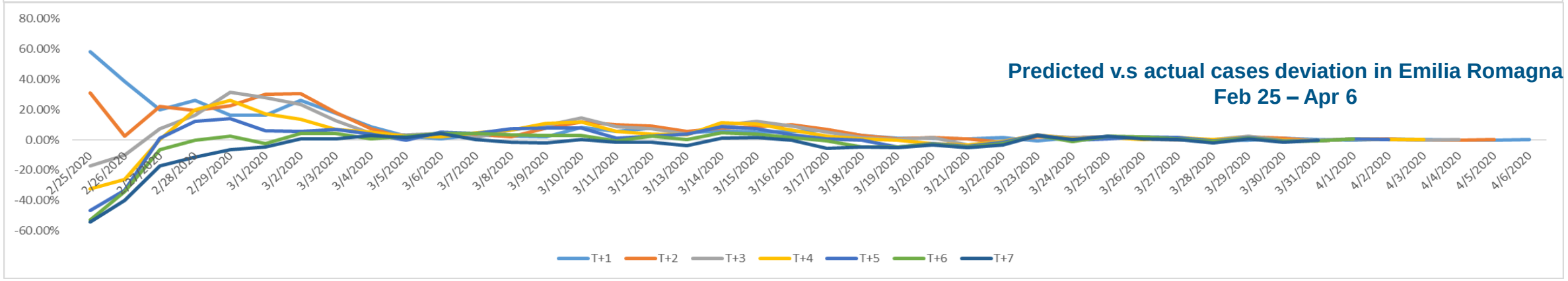
Validation results for Italy



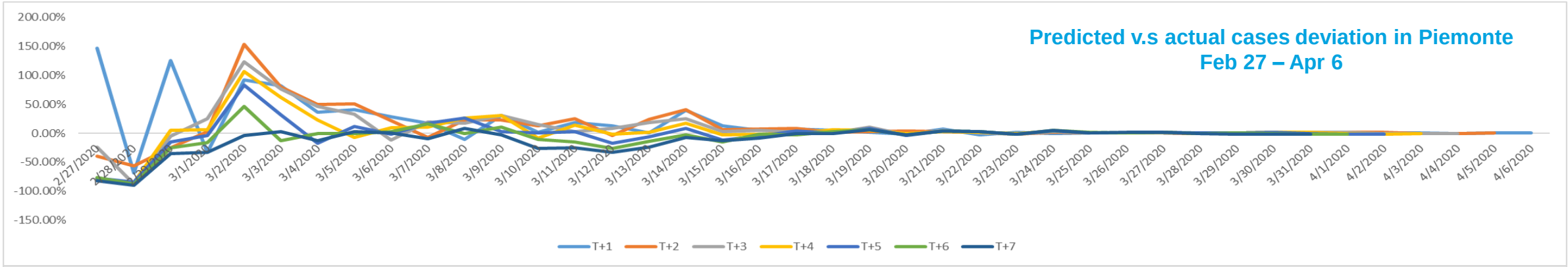
Validation results for Lombardia, Veneto and Emilia Romagna

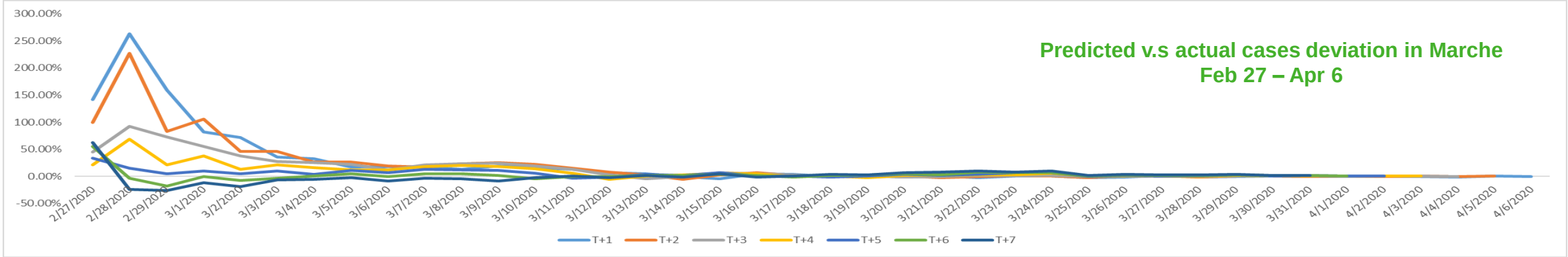


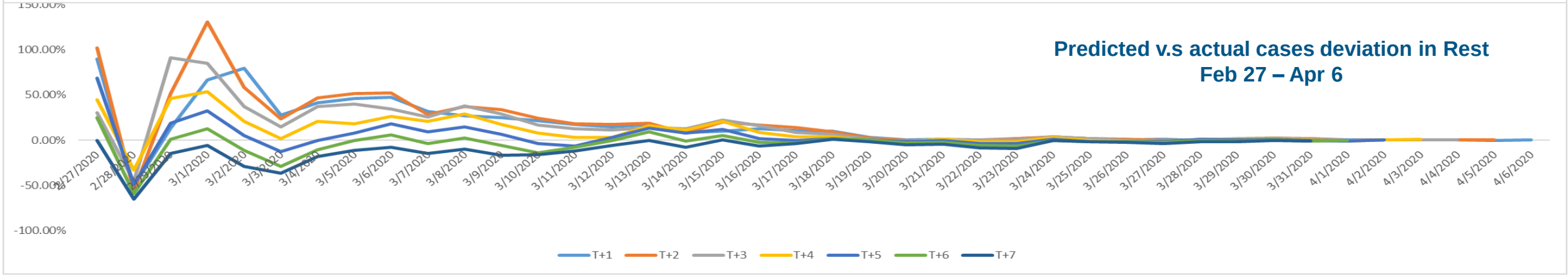




Validation results for Piemonte, Marche and Rest



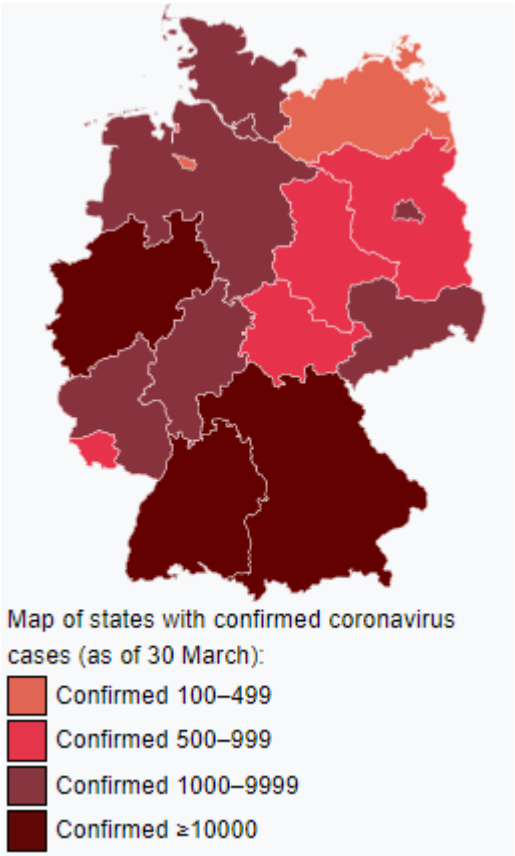




Germany

New infections on a decreasing trend for about 5 days

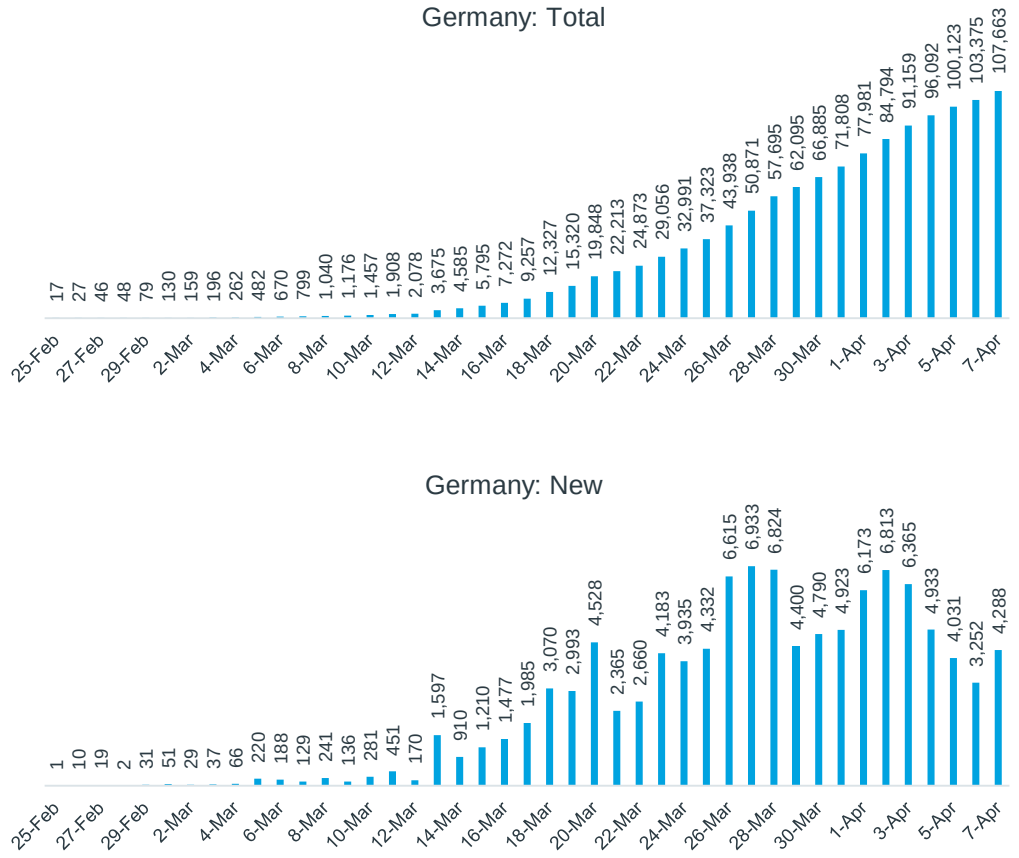
Germany



107,663 Confirmed
2,016 Deaths
83m Population

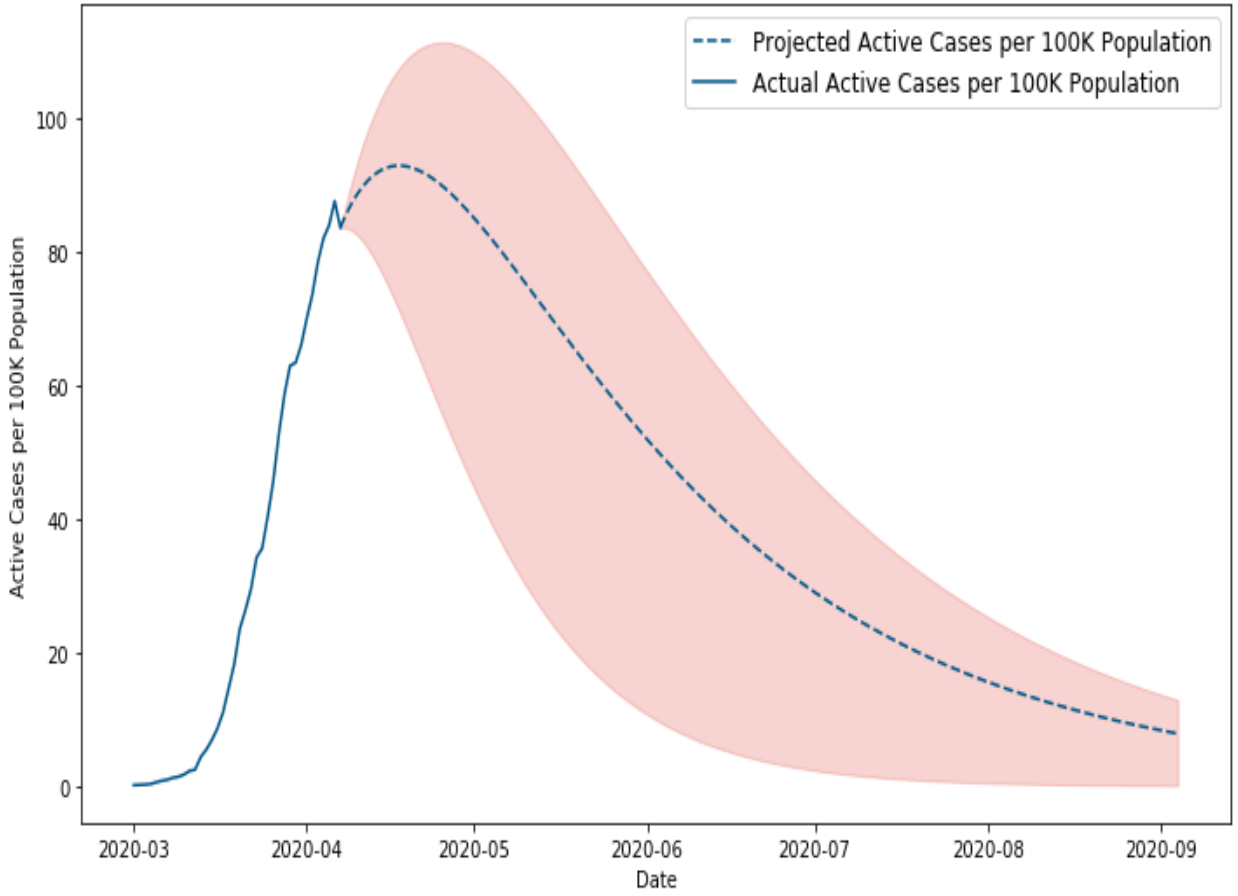
- Risk assessment of COVID-19 classified as “high”
- Extensive measures enforcing social distancing
- Mar 16: school and daycare closures
- Mar 16: Germany closed borders with Austria, Denmark, France, Luxembourg and Switzerland
- Mar 22: Next 14 days - except for same household not more than 2 person allowed outside; closure of personal care shops

Number of infections in Germany



Source: Center for System Science and Engineering (CSSE) at John Hopkins University JHU)
https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6

Projection band of active cases in next 150 days in Germany

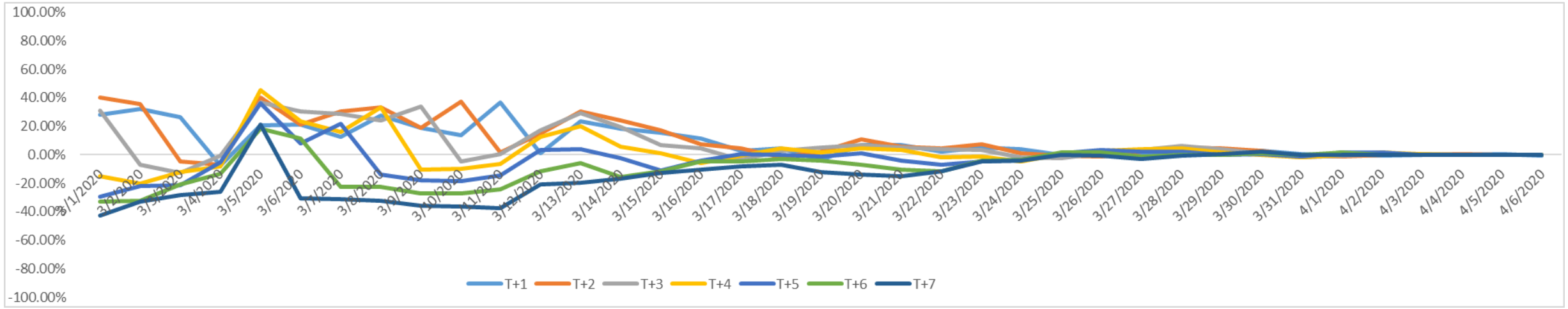


	Projected Total Confirmed Cases	Projected Total Confirmed Cases per 100k Population	Estimated Peak Time
Optimistic Scenario	147.1K	176.9	04/06/2020
Normal Scenario	153.7K	184.8	04/17/2020
Pessimistic Scenario	198.9K	239.2	04/25/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

Validation results for Germany

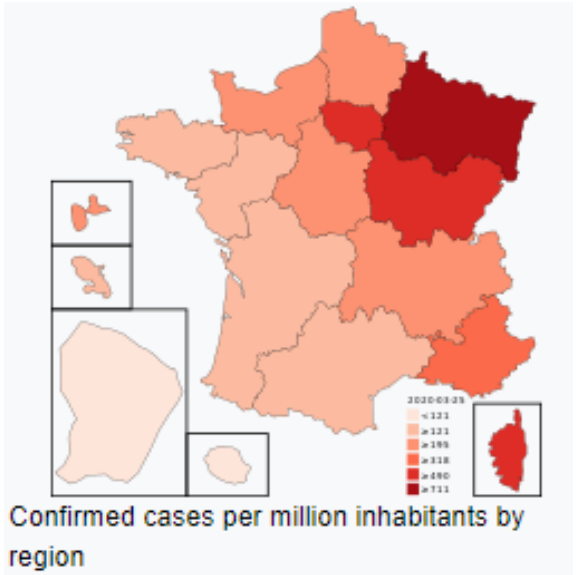
Predicted vs. actual cases deviation in Germany
Mar 1 – Apr 6



France

Spikes in new infections may reflect under reporting in previous days

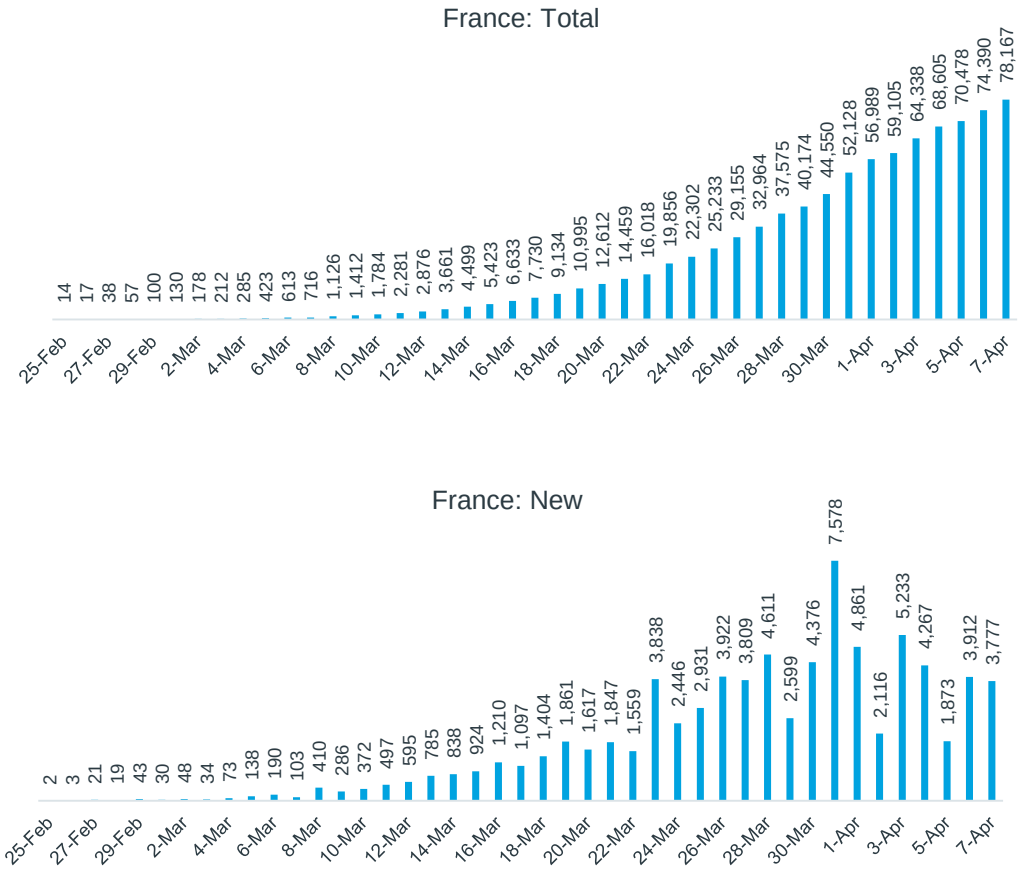
France


Confirmed cases per million inhabitants by region

78,167 Confirmed cases
10,343 Deaths
65m Population

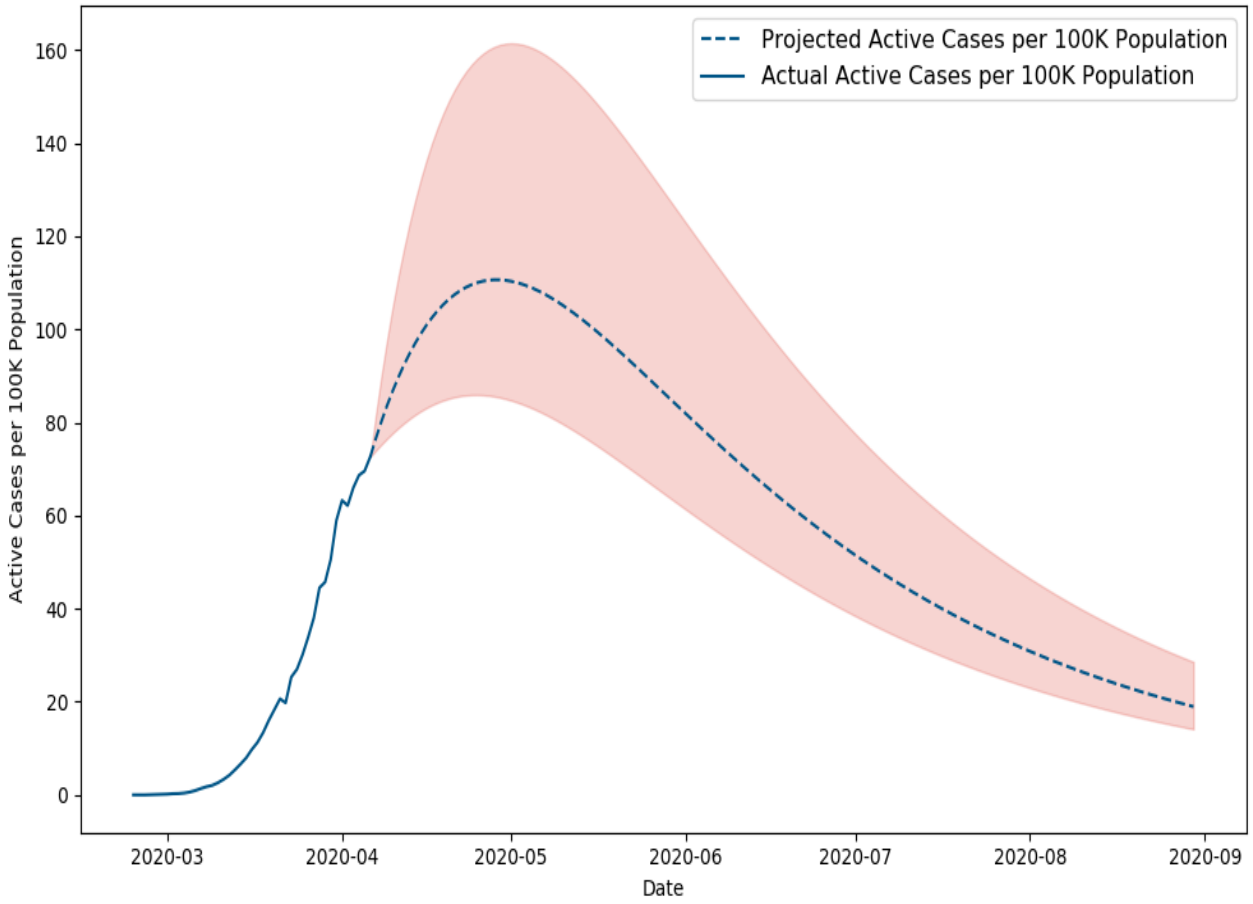
- Mar 13: schools closure
- Mar 16: closed borders
- Mar 17: 15 day containment phase began

Number of infections in France



Source: European Centre for Disease Prevention and Control
https://www.ecdc.europa.eu/en/publications-data/download-todays-data-geographic-distribution-covid-19-cases-worldwide

Projection band of active cases in next 150 days in France



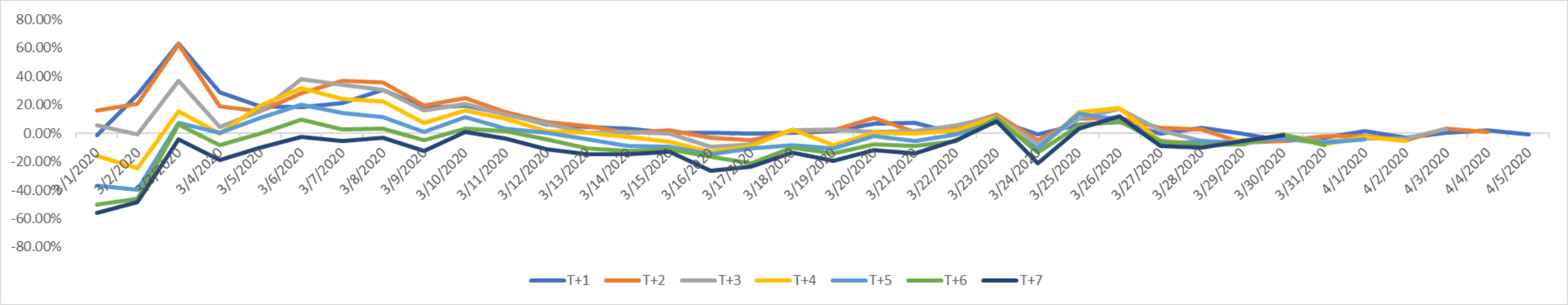
	Projected Total Confirmed Cases	Projected Total Confirmed Cases per 100k Population	Estimated Peak Time
Optimistic Scenario	116.8K	178.8	04/21/2020
Normal Scenario	144.1K	200.9	04/26/2020
Pessimistic Scenario	198.8K	304.6	05/01/2020

*The data is from ECDC.

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

Validation results for France

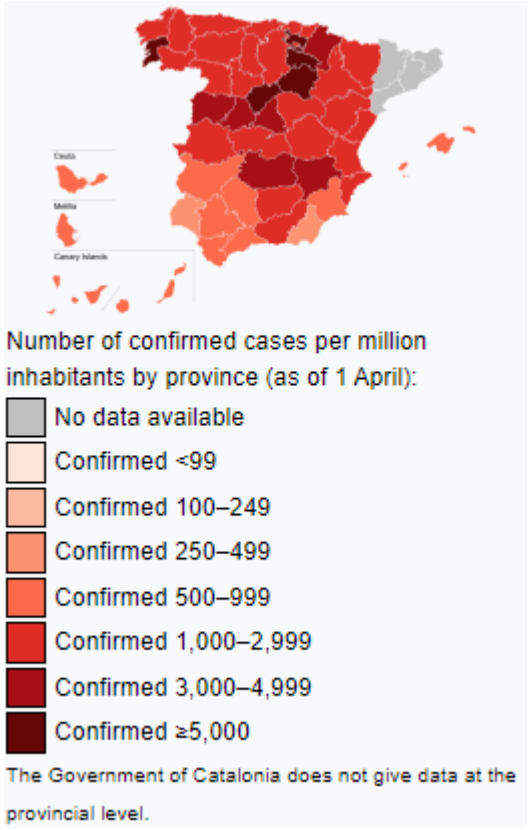
Predicted vs. actual cases deviation in France
Mar 1 – Apr 6



Spain

New infections on a decreasing trend for about 6 days

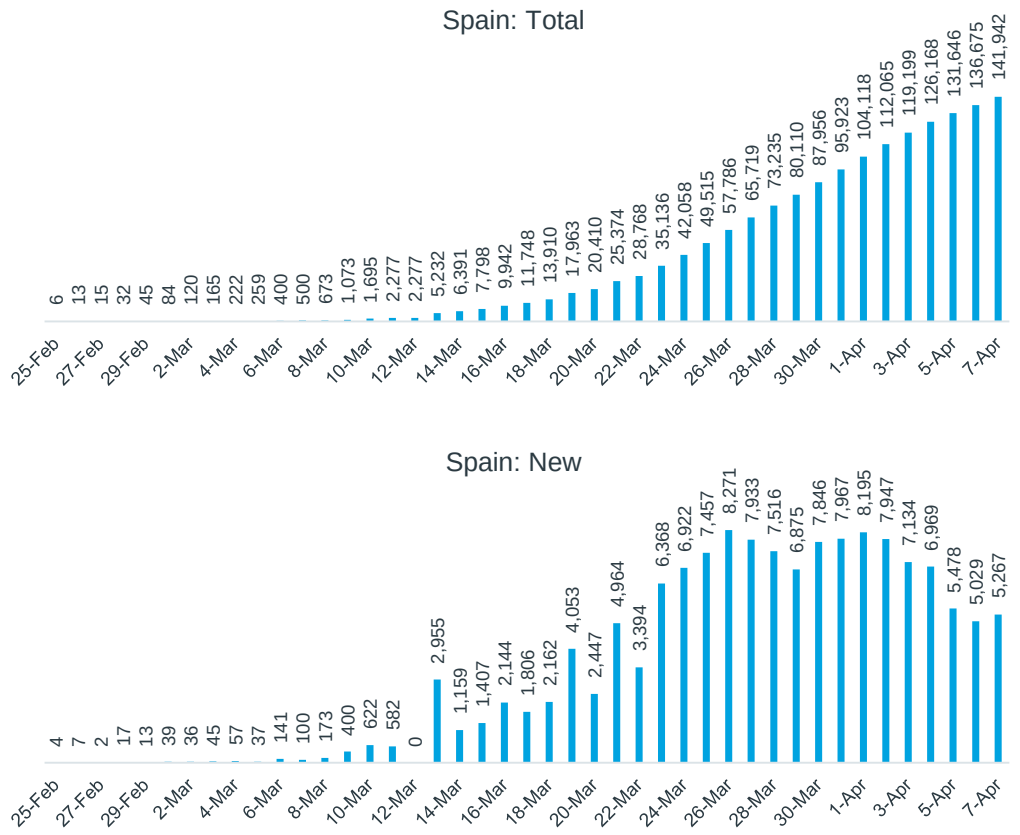
Spain



141,942 Confirmed cases
14,045 Deaths
47m Population

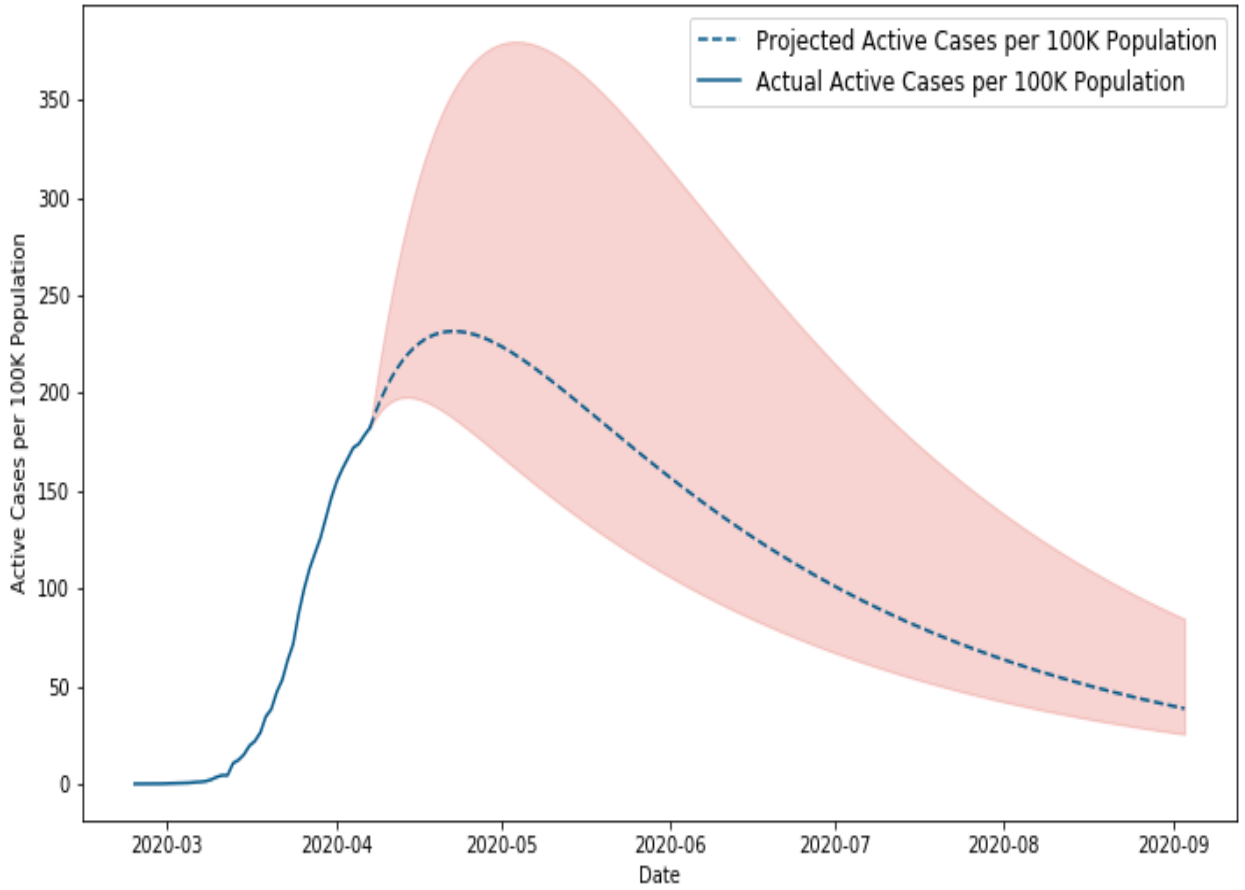
- Mar 11: school closure
- Mar 14: Government Alarm State Declaration
- Mar 22: Restrictive measures extended until April 12th

Number of infections in Spain



Source: Center for System Science and Engineering (CSSE) at John Hopkins University JHU)
https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6

Projection band of active cases in next 150 days in Spain

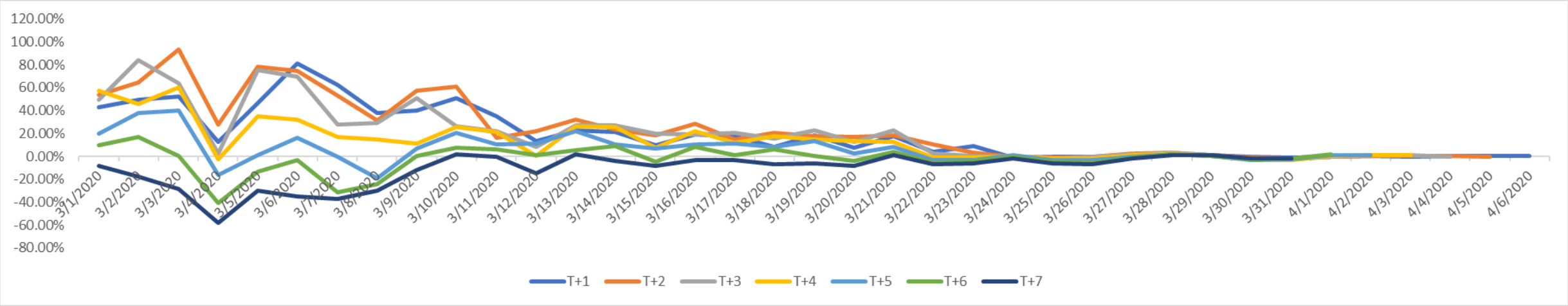


	Projected Total Confirmed Cases	Projected Total Confirmed Cases per 100k Population	Estimated Peak Time
Optimistic Scenario	167.4K	359.9	04/14/2020
Normal Scenario	209.8K	451.1	04/22/2020
Pessimistic Scenario	345.1K	742.2	05/04/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

Validation results for Spain

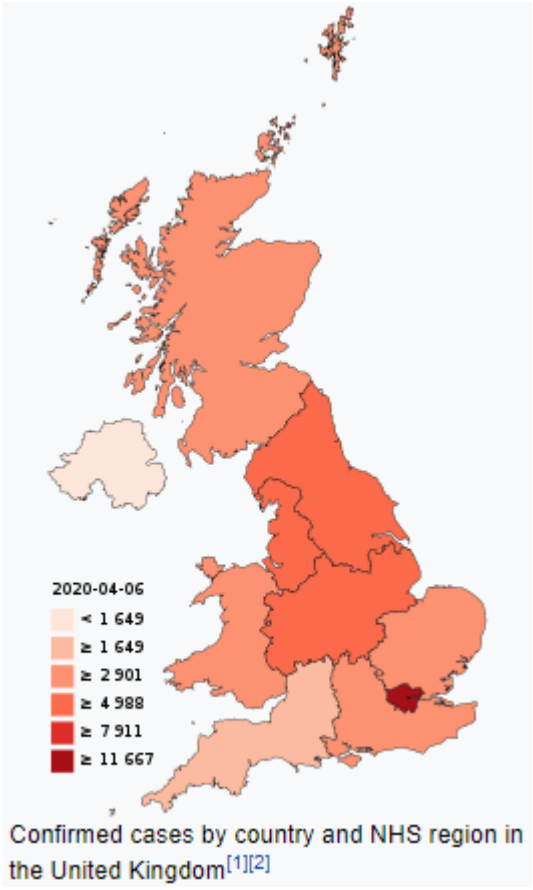
Predicted vs. actual cases deviation in Spain
March 1 – Apr 6



UK

New infections seem to stabilize, the #s are likely underreported due to limited testing

UK

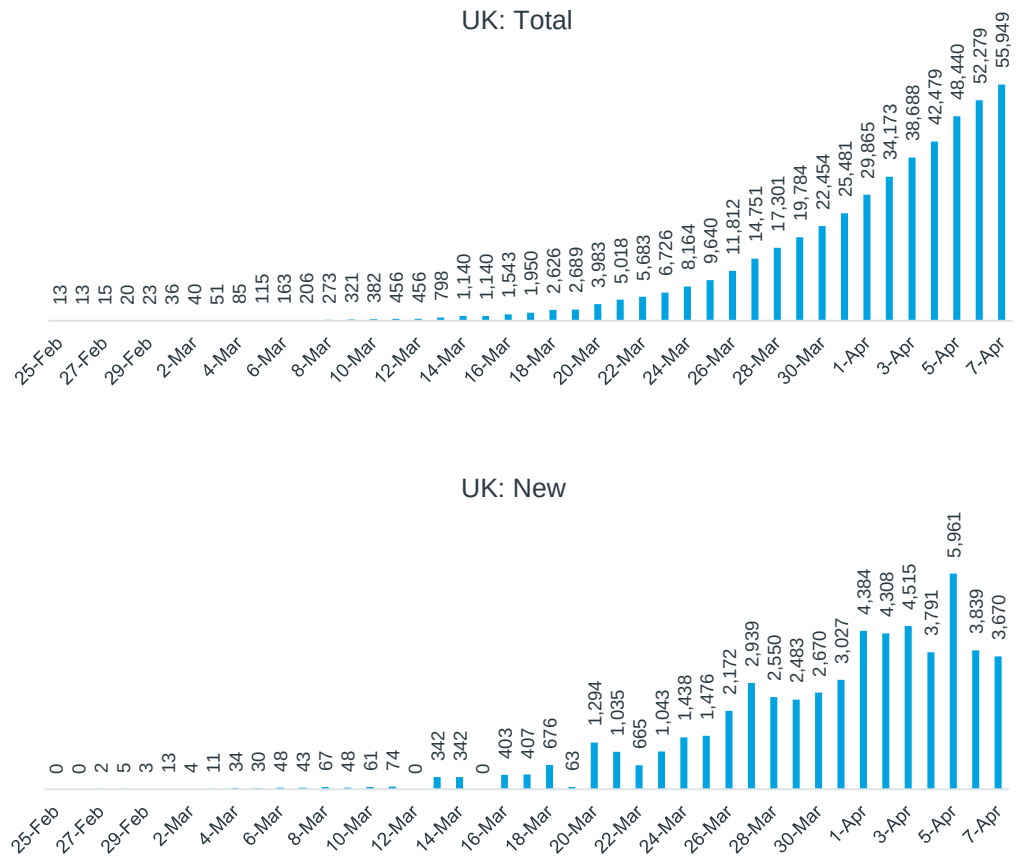


Confirmed cases by country and NHS region in the United Kingdom[1][2]

55,949 Confirmed cases
6,171 Deaths
66m Population

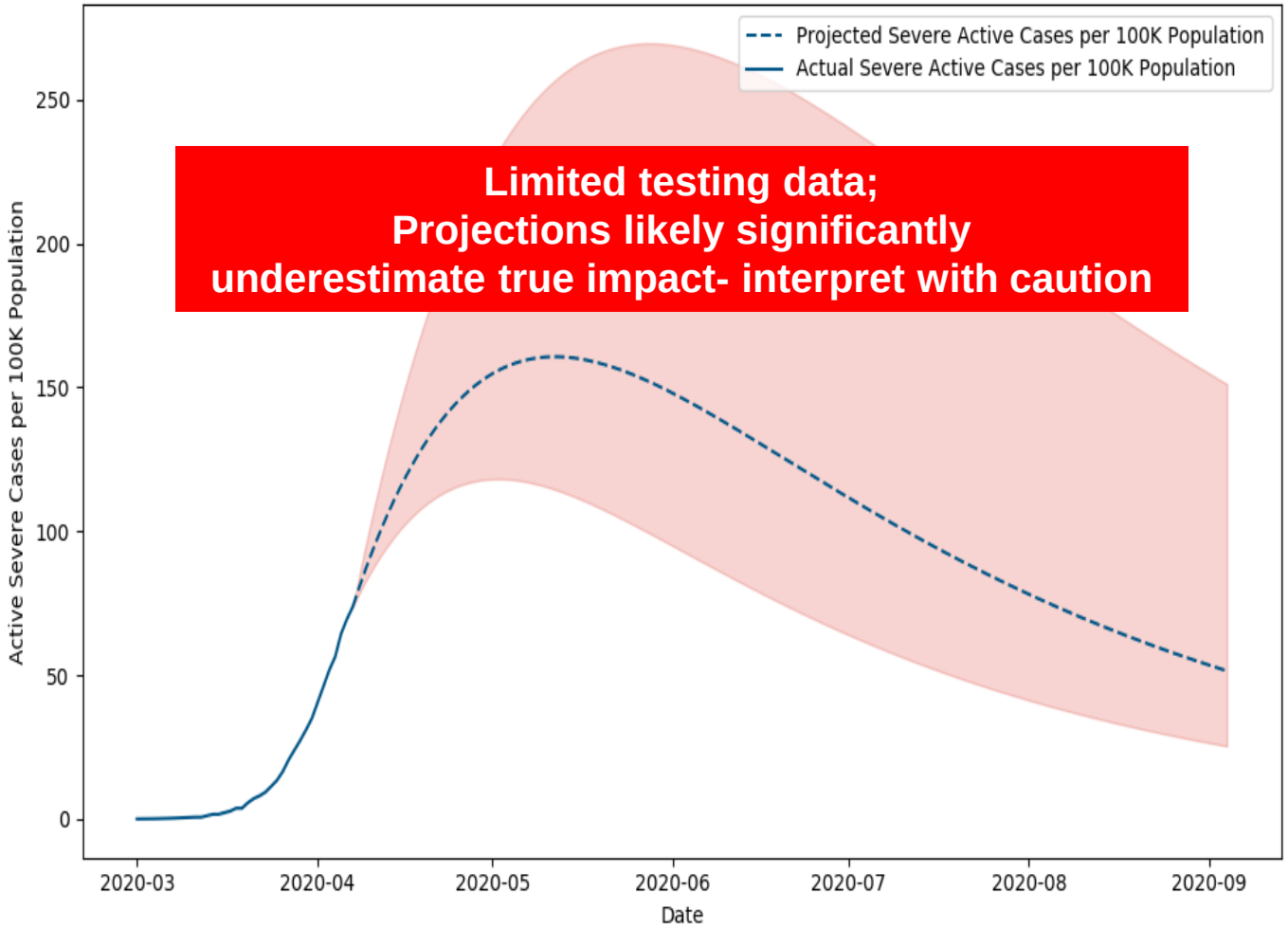
- Early measures: home isolation of suspect cases (first 2 cases reported on the 31st of January)
- 12th of March: social distancing of anyone with symptoms + certain population (elderly people, asthma, diabetes) + encourage working from home
- Friday 20th March: School closures except children of key workers
- 23rd March Restrictive measures announced people movement allowed only for basic necessities
- 28th March: announcement of testing extension

Number of severe cases in the UK



Source: Center for System Science and Engineering (CSSE) at John Hopkins University JHU)
https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6

Projection band of severe active cases in next 150 days in UK



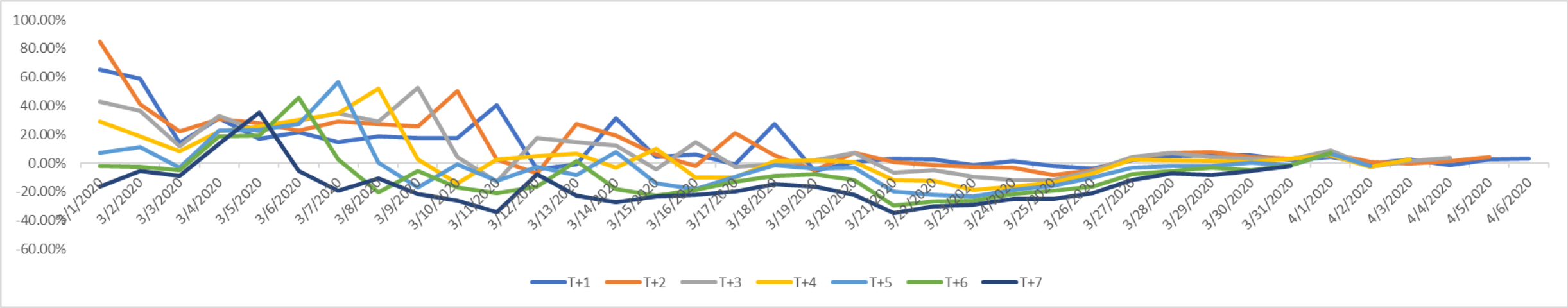
	Projected Total Severe Confirmed Cases	Projected Total Severe Confirmed Cases per 100k Population	Estimated Peak Time
Optimistic Scenario	127.6K	192.1	05/02/2020
Normal Scenario	180.6K	271.8	05/12/2020
Pessimistic Scenario	286.6K	431.4	05/28/2020

*The recovery data from JHU source remains the same from 3/23/2020 .

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

Validation results for UK

Predicted vs. actual cases deviation in UK
Mar 1 – Apr 6



Japan

COVID-19 spreads in Japan

Japan

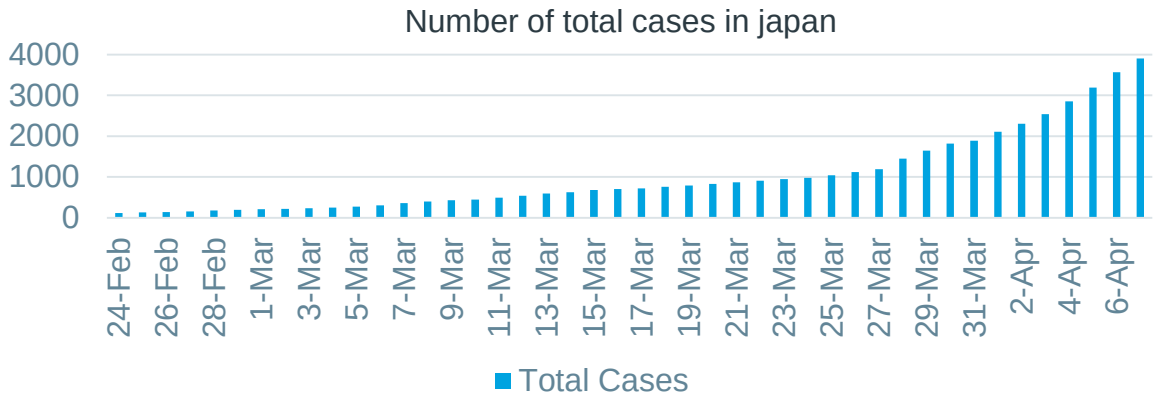
Status (as of 7-Apr):

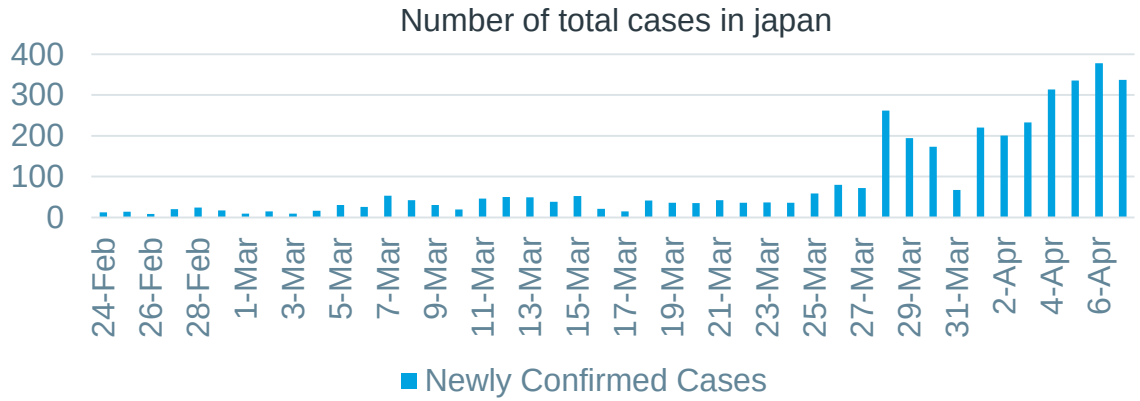
- 3,906 confirmed cases, 80 deaths, 622 recovered.
- 44 of total 47 prefectures affected. Many infections have occurred in clusters in four areas, Hokkaido, Tokyo, Nagoya and Osaka.

Measures:

- School closures: since 2-Mar
- Quarantine: 14-day quarantine needed for all travellers since 3-Apr.
- Travel restrictions: travel alert raised to level ‘stop unnecessary travel’ for all countries since 3-Apr.
- Border Control: non-Japanese travellers cannot enter Japan since 3-Apr.
- State of emergency: government announced being “Near to declaring state of emergency for specific cities such as Tokyo, Osaka” on 6-Apr.

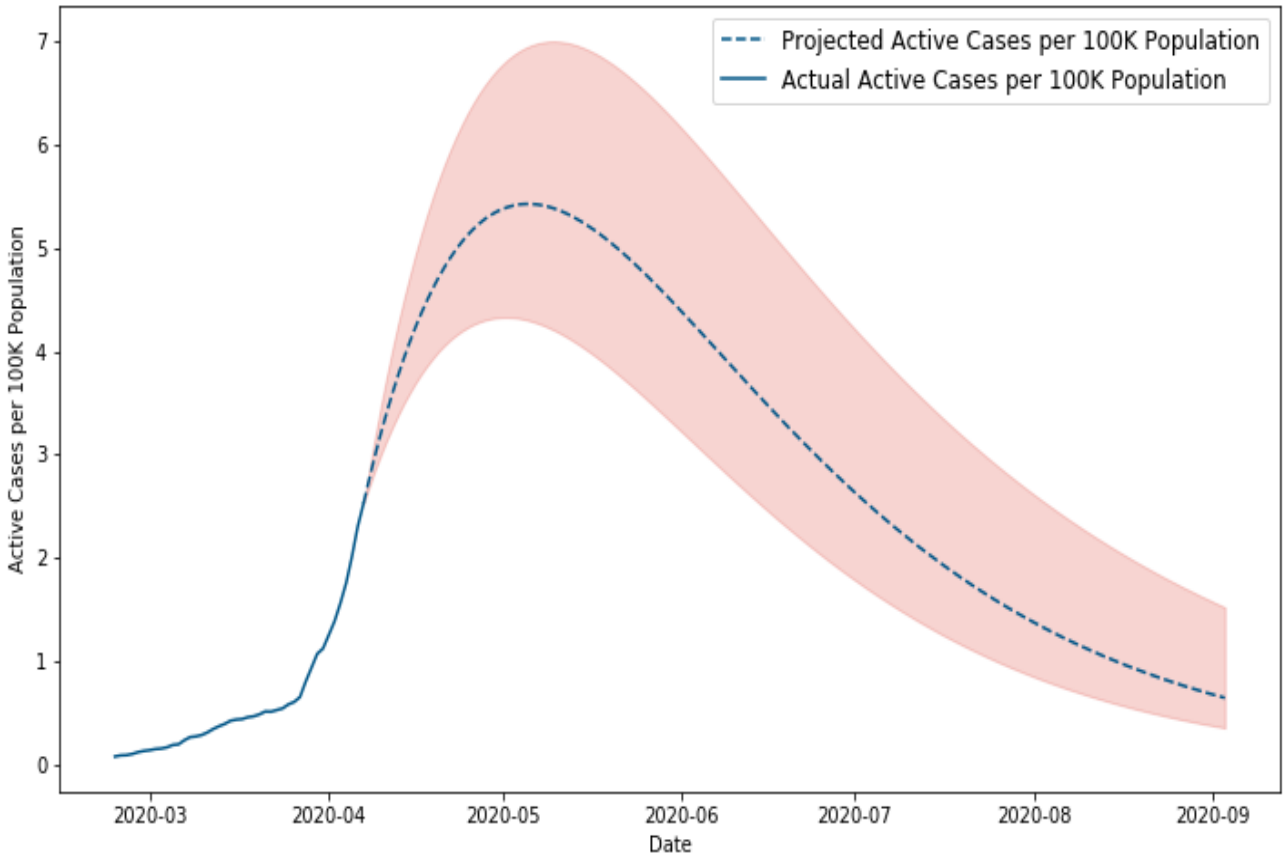
Number of infections in Japan keeps on increasing rapidly





Source: Ministry of Health, Labour and Welfare

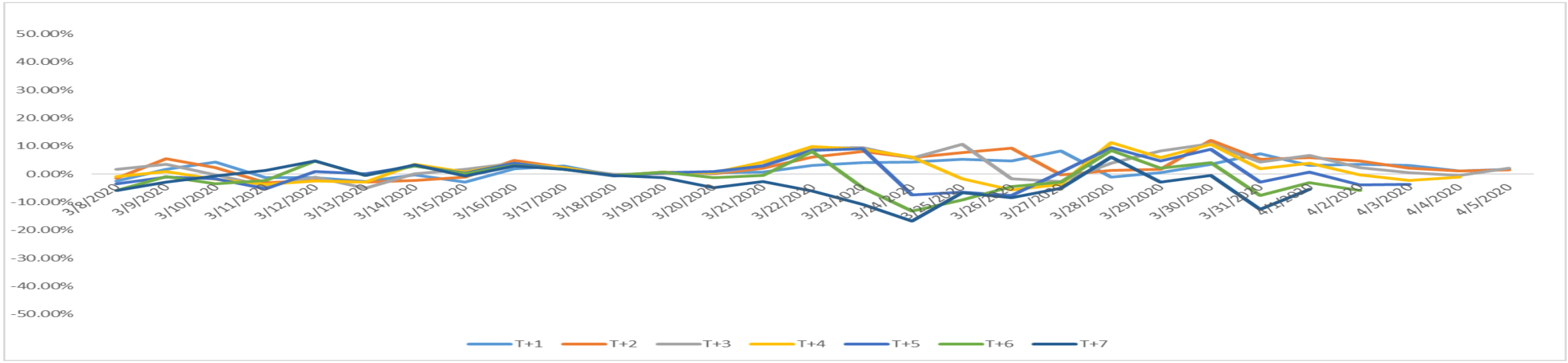
Projection band of active cases in next 150 days in Japan



	Projected Total Confirmed Cases	Projected Total Confirmed Cases per 100k population	Estimated Peak Time
Optimistic Scenario	5.49k	4.33	05/01/2020
Normal Scenario	6.88k	5.43	05/05/2020
Pessimistic Scenario	8.88k	7.00	05/10/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

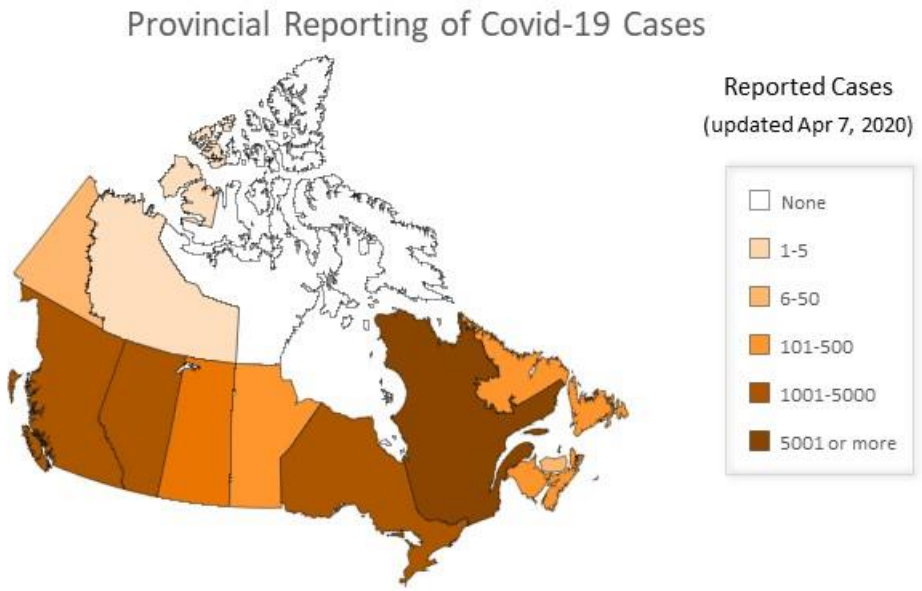
7-day Validation results for Japan



Canada national and regional

COVID-19 continuing to spread in Canada
Due to lack of testing up to March 22, new cases are under reported

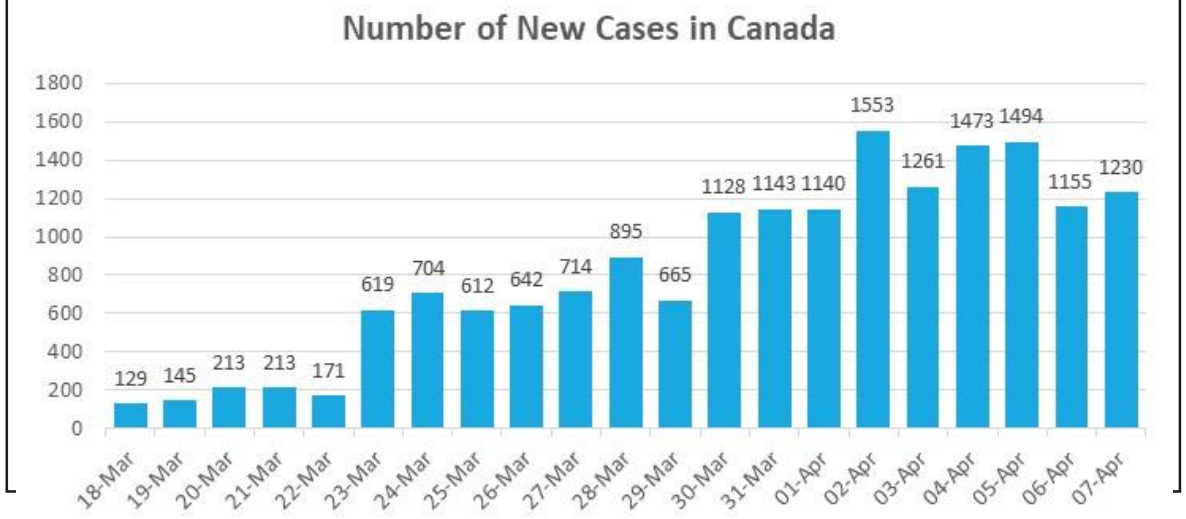
Canada
37.7M people



- **Québec's optimistic scenario, COVID-19 could kill 1,263 Quebecers by the end of April. Worst-case scenario the death toll could hit 8,860.**
- **Saskatchewan and Newfoundland set to release projections on COVID-19 today.**

As of 11:59pm EST April 7:

- **17,897 confirmed cases**
- **1,230 new cases**
- **381 deaths**
- **4,028 patients recovered**

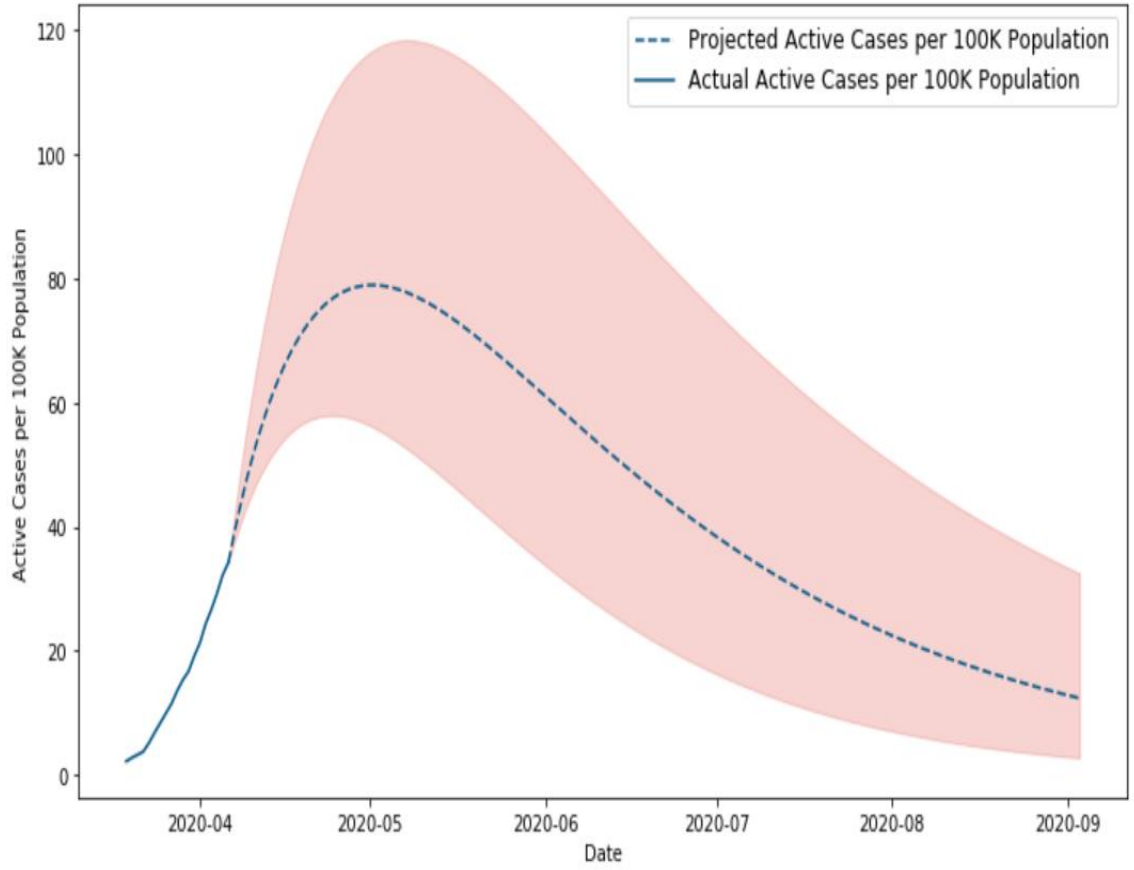


Source: Johns Hopkins University (https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6)

Canada Response Timeline

- January 25, 2020 : **First** confirmed COVID-19 case in the **Canada (Ontario Resident)**
- February 28, 2020 : **First** presumed case of COVID-19 is confirmed in **Quebec**
- March 7, 2020: **First** person in Canada to die after contracting COVID19
- March 13, 2020 : Quebec shuts all **daycares,** public **schools,** CEGEPs and universities for **two weeks**.
- March 16, 2020 : **Trudeau** announces the Canadian **border** will **close** to all countries except the United States.
- March 16, 2020: Ontario announces that bars and restaurants close, as well as private schools, daycares.
- March 17, 2020 Premier Doug Ford announced a **state of emergency for Ontario**
- March 23: Ontario and Quebec order all non-essential workplaces to close
- March 25, 2020 :The **federal** government announces that **isolation** is now **mandatory** for people who return to Canada from outside the country.
- March26, 2020: The federal government **imposes quarantine regulations** that would mean heavy fines for travellers returning to the country who ignore self-isolation rules.
- April 4, 2020 : Québec added two new regions, Charlevoix and Rouyn-Noranda, to the list of regions subject to cross provincial boarder checkpoints.
- April 4, 2020 : Several more businesses, and construction sites in Ontario will to close at the end of the day.
-

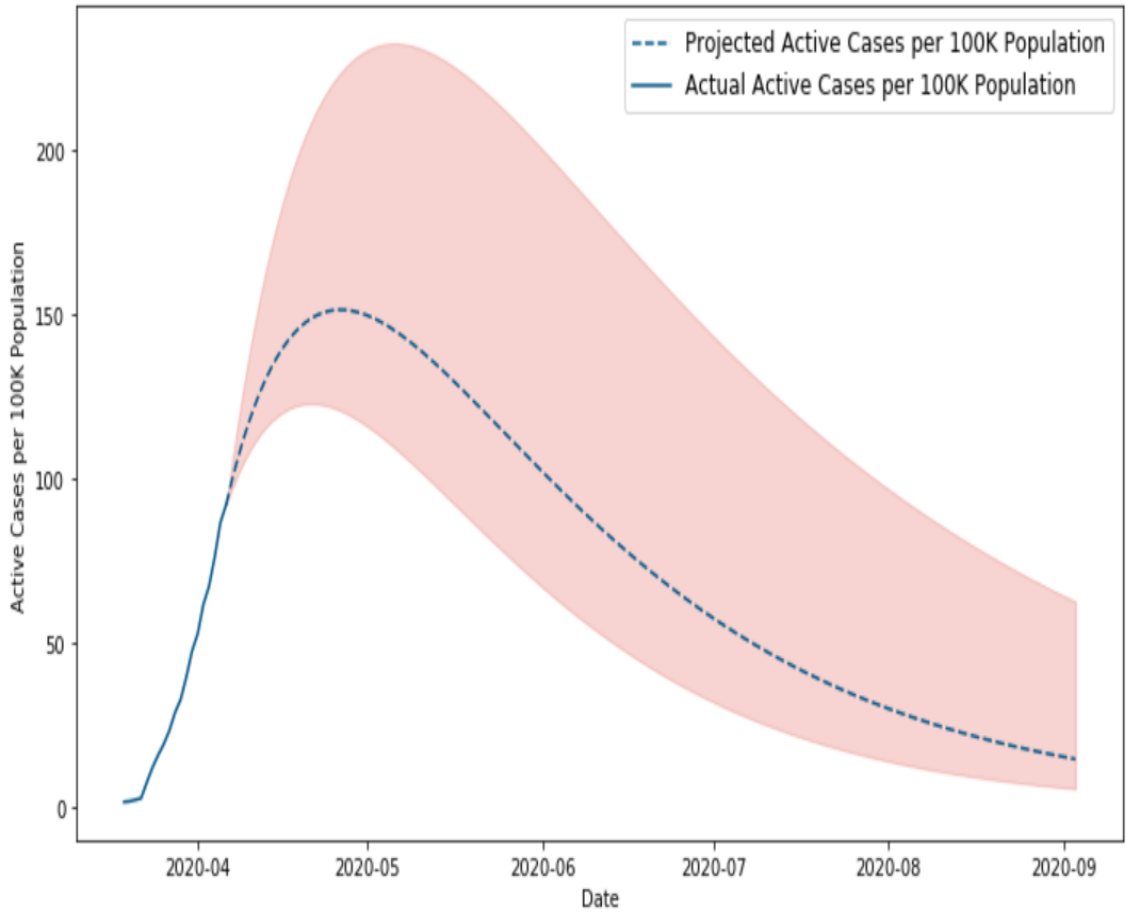
Projection band of active cases in next 150 days in Canada



	Projected total confirmed cases	Projected Total Cases per 100K Population	Estimated Peak time
Optimistic Scenario	47.6K	126.46	04/24/2020
Normal Scenario	55.34K	147.0	05/01/2020
Pessimistic Scenario	74.67K	198.35	05/07/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

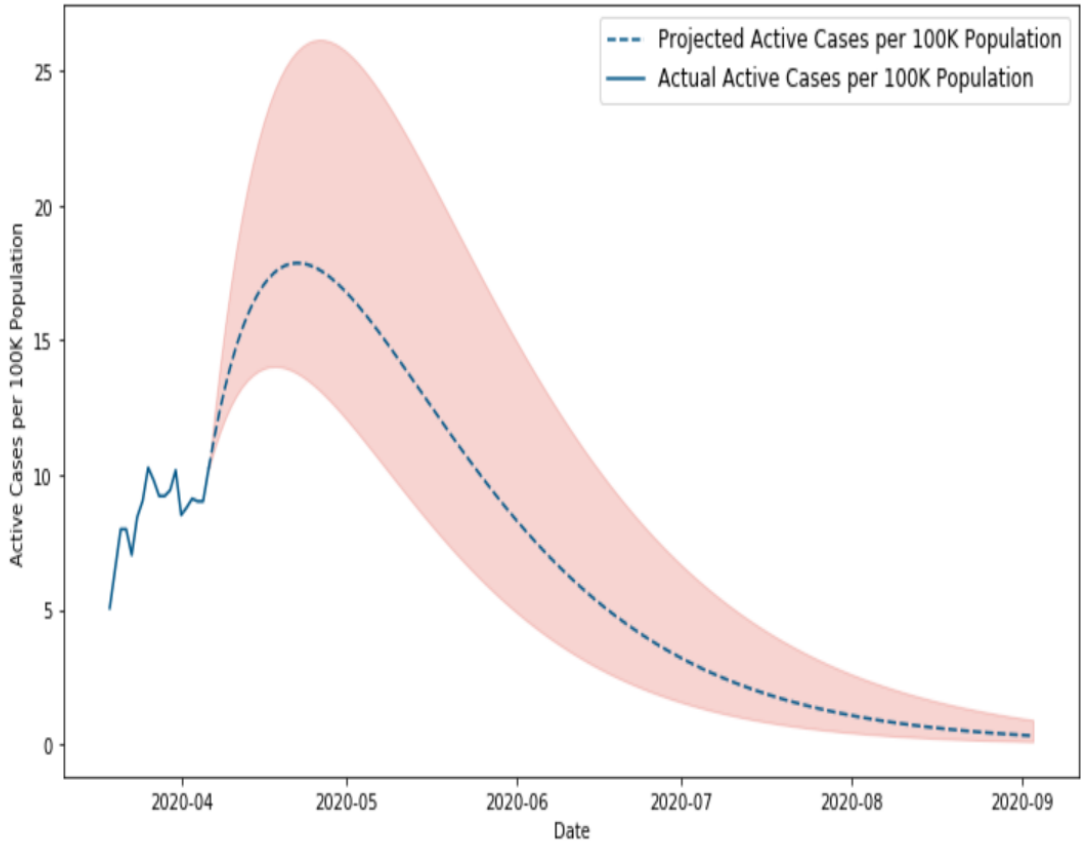
Projection band of active cases in next 150 days in Quebec



	Projected total confirmed cases	Projected Total Cases per 100K Population	Estimated Peak time
Optimistic Scenario	21.19K	248.24	04/19/2020
Normal Scenario	24.34K	285.11	04/26/2020
Pessimistic Scenario	32.21K	377.21	05/06/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

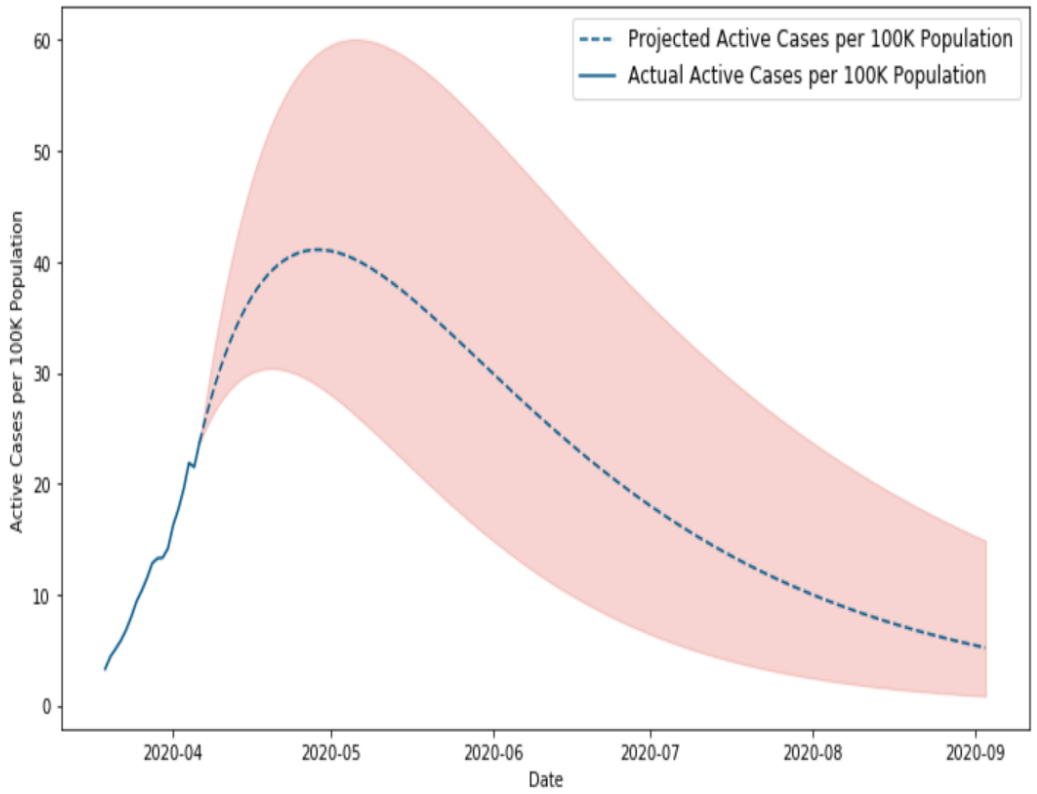
Projection band of active cases in next 150 days in British Columbia



	Projected total confirmed cases	Projected Total Cases per 100K Population	Estimated Peak time
Optimistic Scenario	2.57K	50.29	04/18/2020
Normal Scenario	2.89K	56.63	04/22/2020
Pessimistic Scenario	3.7K	72.36	04/26/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

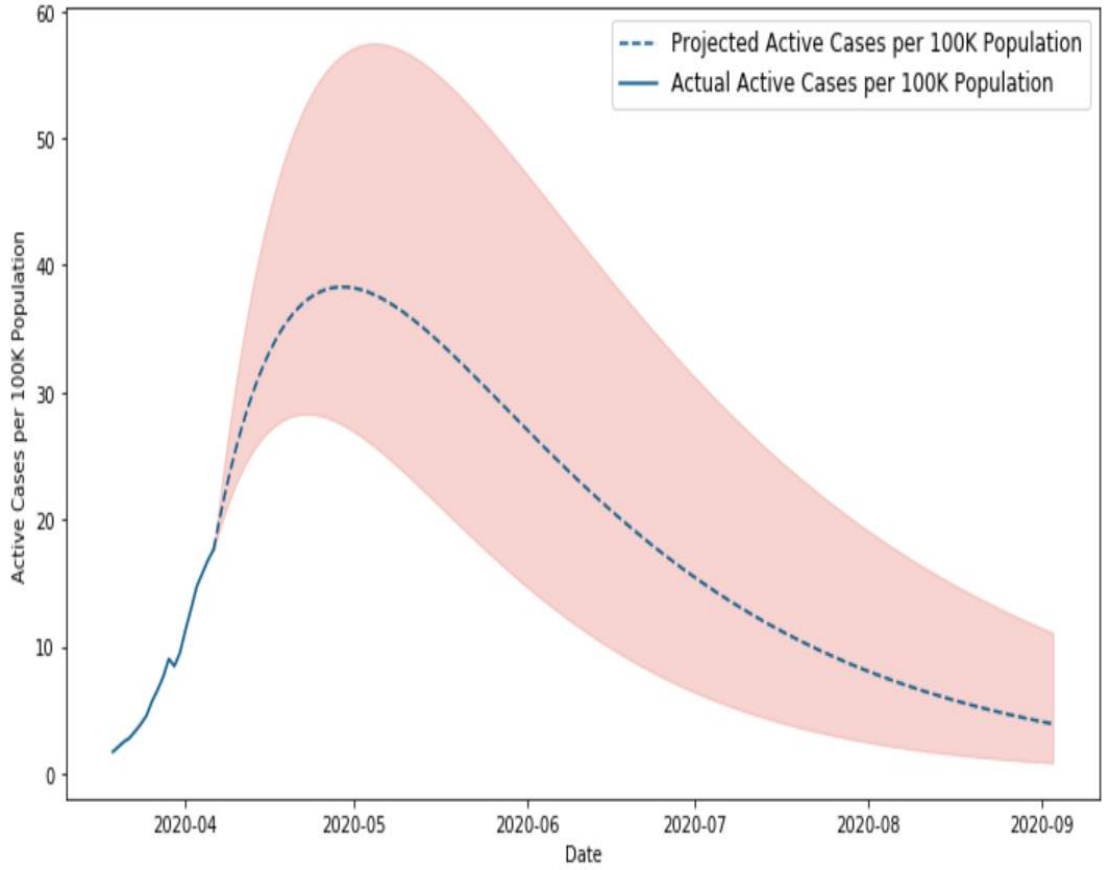
Projection band of active cases in next 150 days in Alberta



	Projected total confirmed cases	Projected Total Cases per 100K Population	Estimated Peak time
Optimistic Scenario	3.11K	70.55	04/20/2020
Normal Scenario	3.55K	80.51	04/29/2020
Pessimistic Scenario	4.63K	104.92	05/06/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

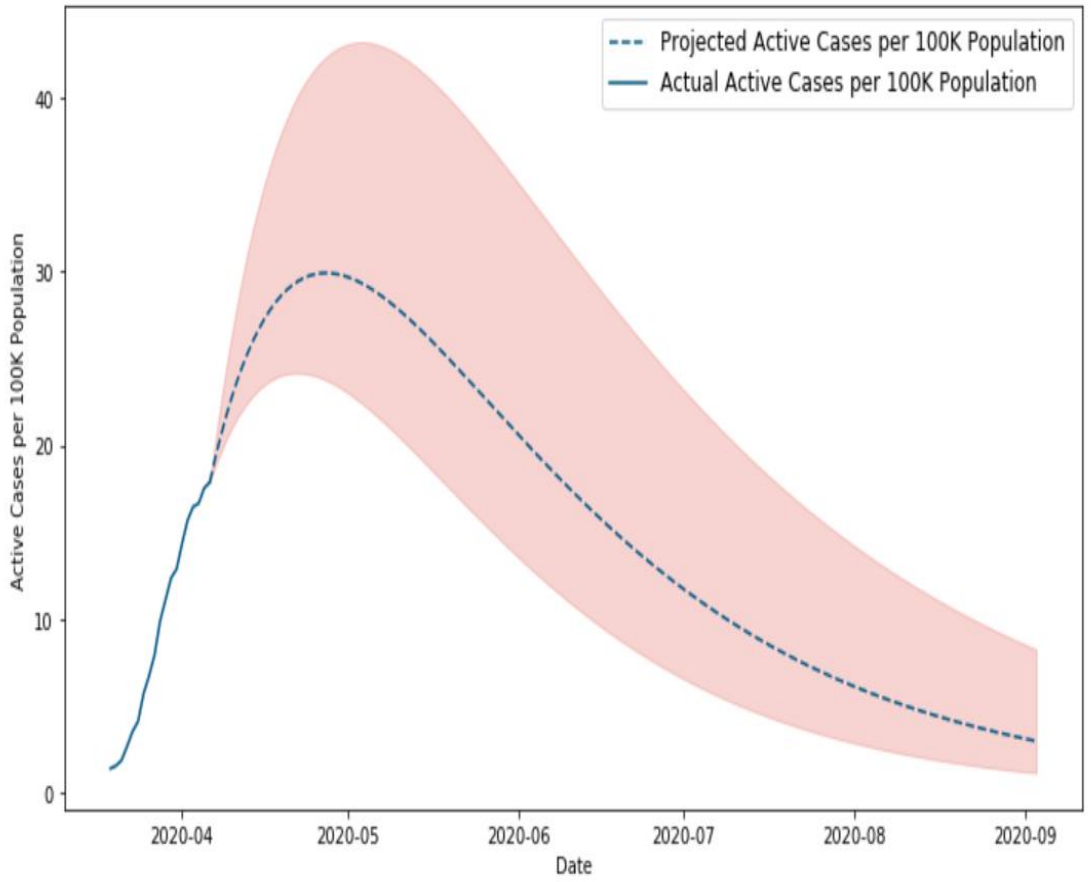
Projection band of active cases in next 150 days in Ontario



	Projected total confirmed cases	Projected Total Cases per 100K Population	Estimated Peak time
Optimistic Scenario	10.67K	72.53	04/23/2020
Normal Scenario	12.25K	83.25	04/29/2020
Pessimistic Scenario	16.17K	109.93	05/05/2020

Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

Projection band of active cases in next 150 days in Rest of Country

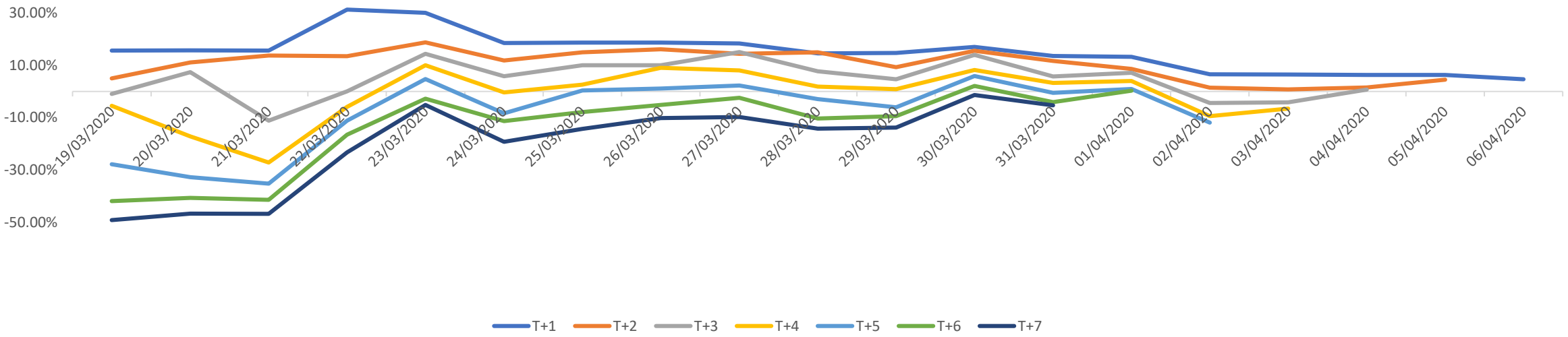


	Projected total confirmed cases	Projected Total Cases per 100K Population	Estimated Peak time
Optimistic Scenario	2.59K	53.1	04/22/2020
Normal Scenario	2.95K	60.51	04/27/2020
Pessimistic Scenario	3.84K	78.91	05/04/2020

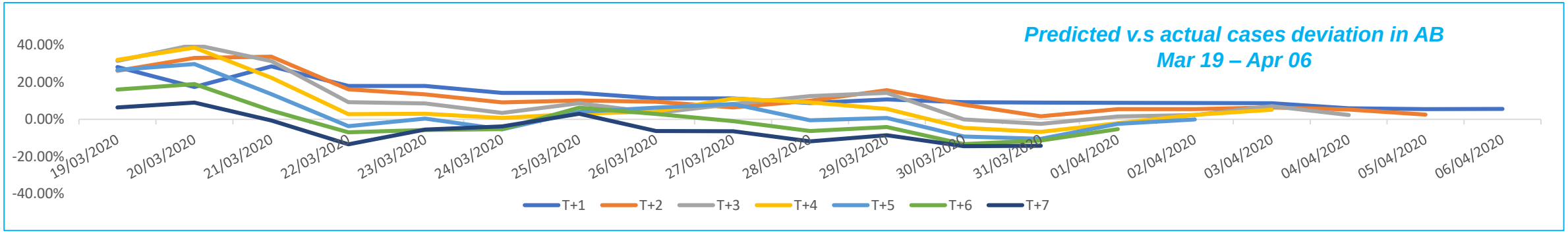
Note: Shaded area is the range of values that is likely to include the correct projected estimate for a given data category. Wider band can result from limited data availability, small studies, and conflicting data, while smaller band can result from extensive data availability, large studies, and data that are accurate and transparent. The model presented has 3 scenarios and is represented by the shaded area(s) on each chart

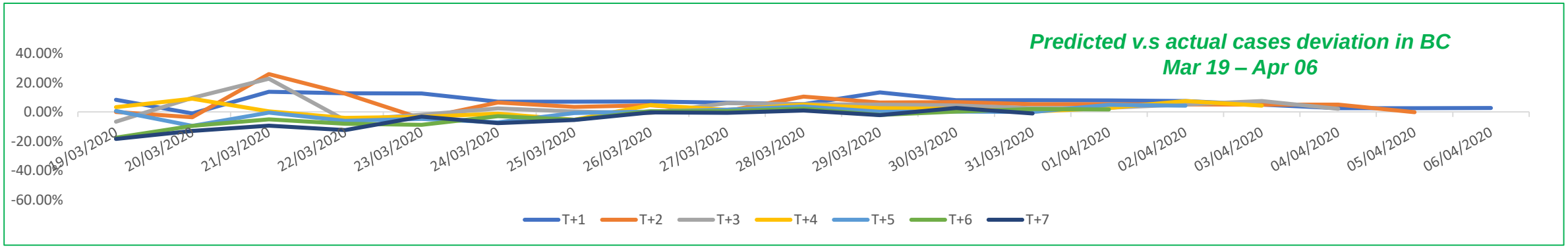
Validation results for CA

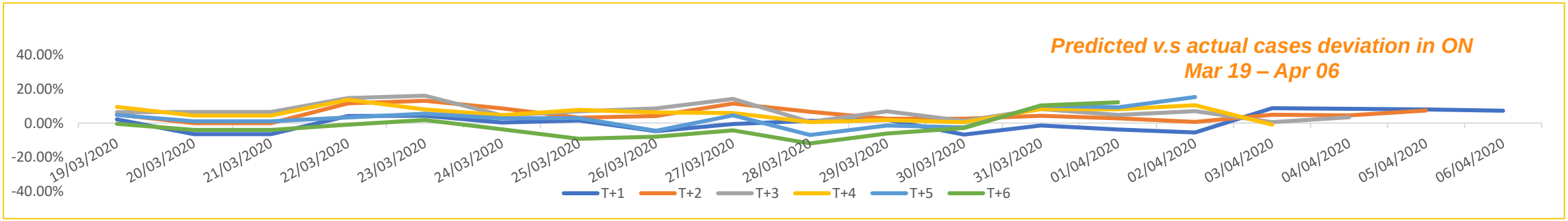
Predicted v.s actual cases deviation in CA
Mar 19 – Apr 06



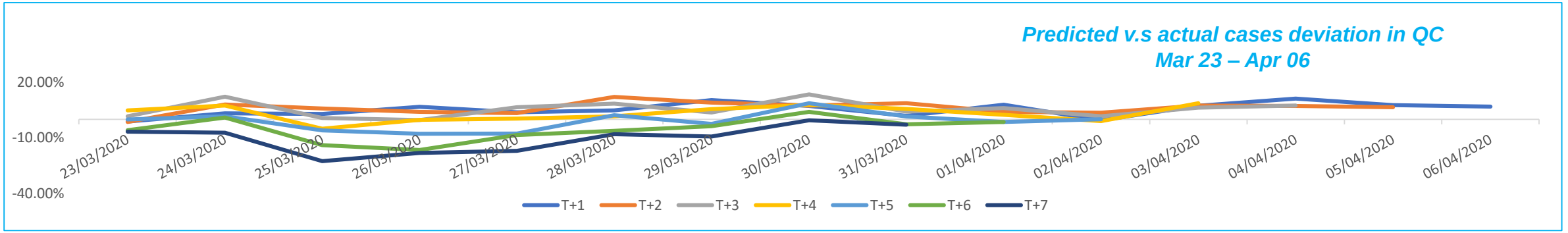
Validation results for AB/ BC/ ON

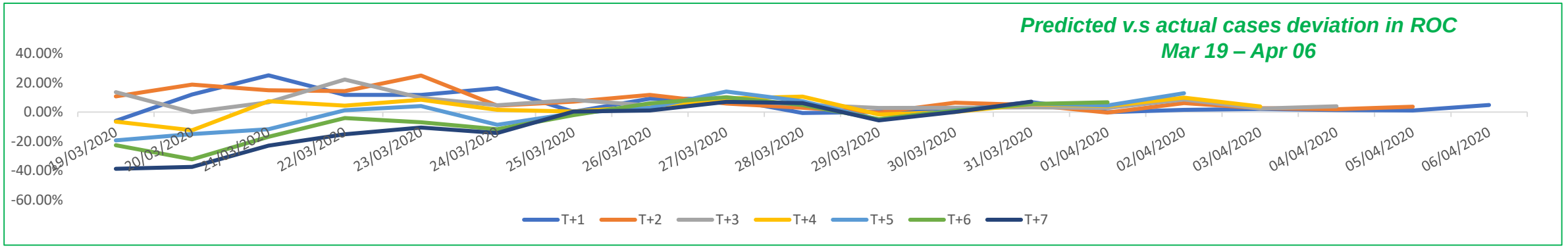






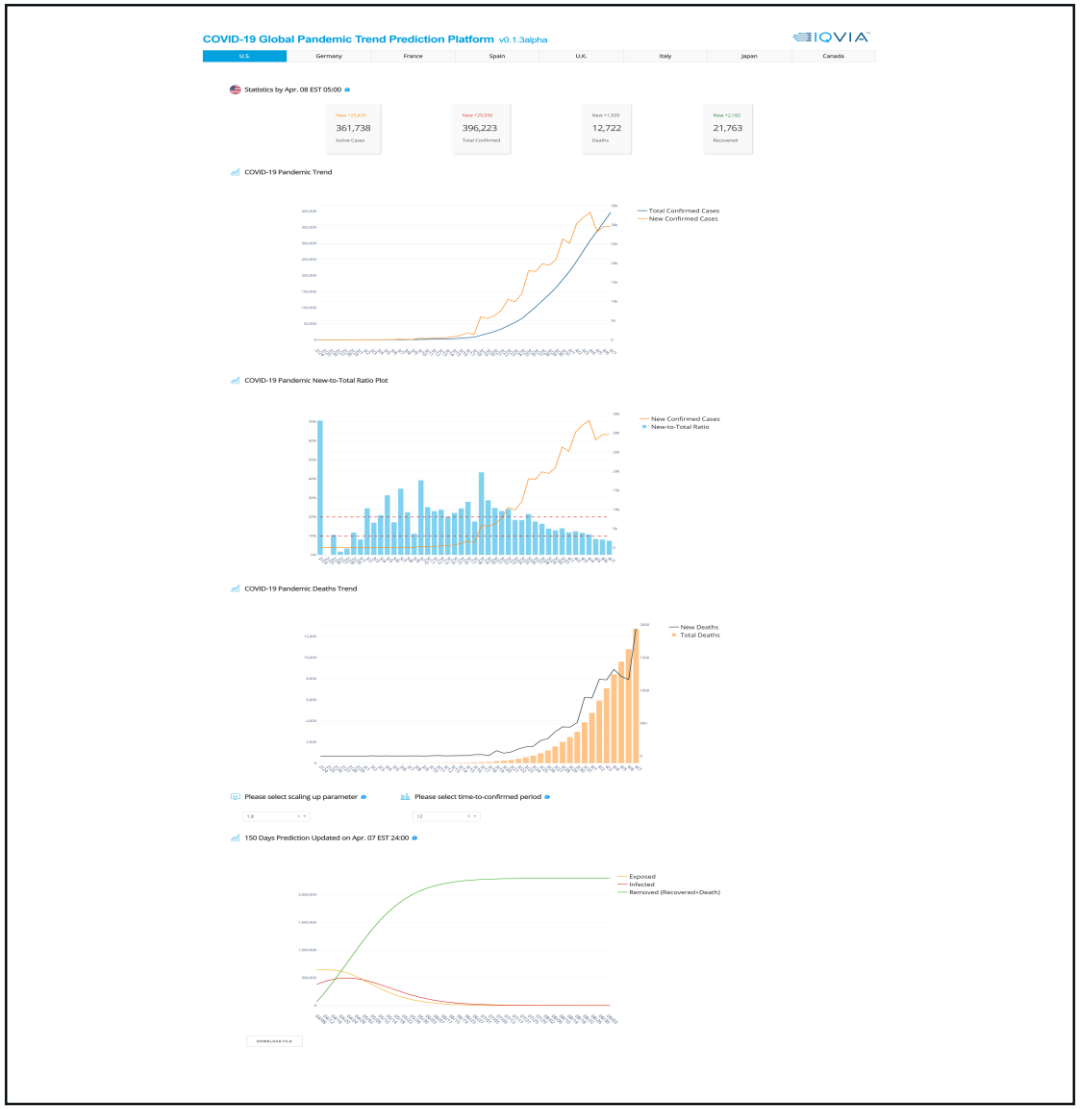
Validation results for QC and ROC





COVID-19 AI Prediction Platform v0.1.3

- Automated process to update the statistics for each country from JHU
- Daily updated predictions with new data
- Projections with range for different scenarios
- Drill down to state or province or city level
- Visualization with heat maps
- Country response measures over time
- Automate PPT generations



Agenda

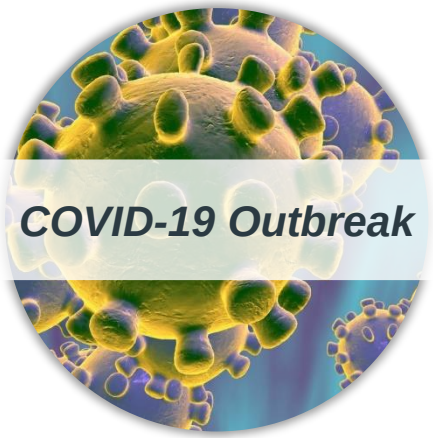
+ COVID-19 Predictions
  - US National and Regional
  - Italy National and Regional
  - EU
  - Canada National and Regional
  - Japan
  - Platform

+ **Next steps**

COVID-19 AI Prediction for additional countries

- We developed China, Japan, US, EU top 5 national level predictions.
- For Italy, we delivered national and 4 regional predictions to Italy RBU team
- For Canada, we developed national prediction and 6 regional predictions
- For Japan, we delivered national prediction and 2 regional predictions to Japan RBU team
- For Romania, we delivered the national level prediction to Romania RBU team.
- We started developing predictions for Brazil, Hungary, Mexico, Poland, Lithuania, Switzerland, and Australia

Next steps



Expansion

- Continue expanding to more countries
- Expanding predictions at lower geographic levels

Simulation

- Develop simulations for COVID-19 diagnosed cases for scenarios of non pharmaceutical interventions being removed post peaks

Platform

- Continue developing the platform as expanding to more countries and lower geographic level

Appendix

COVID-19 AI Prediction Platform potential applications

INTERNAL

- Input for business impact assessment
- Input for business continuity planning
- Input for consulting and service projects

EXTERNAL

- To help federal and state governments to plan and build hospital beds and ICU units, to procure medical suppliers
- To help payer and insurance companies to evaluate the financial impact of COVID-19.
- To help providers to plan healthcare resources needed to care for CoVID-19 patients
- To help manufacturers and suppliers to plan the manufacturing capacity, inventory and distribution to meet the demand

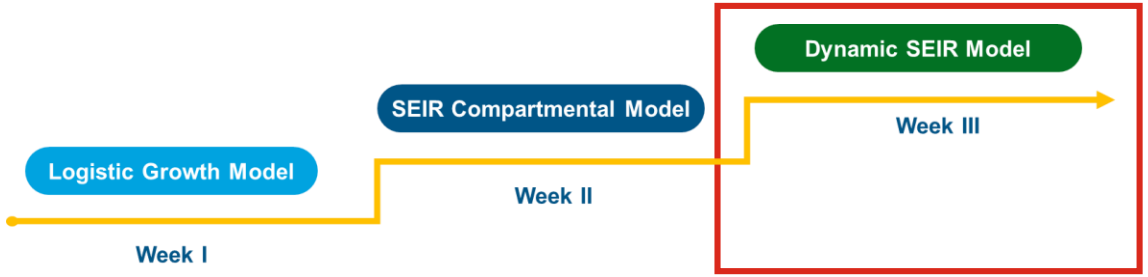
The main objective is to predict the peak and extend of COVID-19 epidemic based on public data from national and regional health commissions

Objectives

- **Predict newly confirmed and total confirmed cases daily** to forecast the inflection point and the number of total confirmed cases;
- Predict **different scenarios,** and test challenges like returning to work impact on disease control;
- **Predict cases at regional level as data is available,** esp. the “hot spots”, to provide information for medical resource planning
- Automated process with **platform and visualization**

Model Selection and data sources

Different models/approaches were tested, AI Dynamic SEIR model was chosen with best performance



Public data usually released by national/regional health commission will be fed into model for daily prediction

Date	☑	☑	☑
Total Population	☑	☑	☑
# of Net Infectious (Confirmed) Cases	☑	☑	☑
# of Exposed Case (Estimated by Projection Factor)		☑	☑
# of Death		☑	☑
# of Heal Cases		☑	☑

Note:
- All raw data is from National Health Commission and Regional Health Commission
- The model performance highly depends on accuracy, transparency, and promptness of public data