COVID-19 Confirmed Cases Prediction as of March 29, 2020

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This report updates predictions for the number of COVID-19 confirmed cases at four time horizons (1-day, 5-day, 10-day and end of the outbreak) and for various countries/regions, based on a phenomenological approach detailed in [1], i.e., employing 3 versions of the generalized logistic growth equation to model the total number of confirmed cases. The prediction results are shown in Table 1. Note that, for countries/regions at early growth stages, the predictions for long-term horizon (10-day and end of the outbreak) are highly uncertain and will vary a lot as the situation changes.

This report relies on the daily update data published by the European Centre for Disease Prevention and Control (ECDC) [2] every day at 1pm CET, reflecting data collected up to 6:00 and 10:00 CET. Thus the daily data in some countries is one day delayed compared to other online live sources.

A summary of the situation:

- In Table 1, we report the latest confirmed cases per million population and estimated outbreak progress in the positive scenario (today's confirmed cases divided by the estimated total final confirmed case in the positive scenario). In Figure 1, we present the ensemble distribution of the estimated final total confirmed numbers per million population.
- Italy, Austria, Germany, Switzerland and Spain have emerging signs of approaching the inflection point[1], while Italy is still the most certain one, being the only country with a converged ensemble distribution of the estimated final total confirmed numbers per million people. Note that the estimated final confirmed numbers in positive scenarios tend to underestimate the final results. The reported outbreak progress serves both as a lower bound for future developments and as a guide of the dynamics of the evolution of the epidemics[2].

[1] The inflection point is the point on the curve of the total number of confirmed cases as a function of time where the curvature changes its sign. It is equivalently the peak of the daily increase curve. If the inflection point has been passed on the curve of the total number of confirmed cases, the worst of the outbreak is over. In terms of daily number of cases, this means that the daily number of cases is decreasing.
[2] One uncertainty with Italy (and other countries) is whether the main outbreak that is focused on the North may spread through other parts of the country. In other words, does the dynamics aggregated over a whole country represent correctly the dynamics in different parts?

- Numbers in France, UK and Belgium continue to grow above our prediction intervals obtained yesterday (Figure 2). All countries, except Italy, have distributions that have not converged, exhibiting very broad dispersion. Although some of the countries have developed signs of approaching the inflection point, others (Netherlands, US, France, Belgium, UK, Japan[3]) are still at an early stage, following an exponential or sub-exponential growth, which leads to unreliable longer-term forecasts. The predicted ranges overlap[4] and, as time passes, we anticipate our methodology to zero in on more reliable numbers.
- We present for the first time a more detailed study of Belgium, for which we have the luxury of having access to relatively reliable data on hospitalization, ICU admittance and mortality, in addition to infected cases. Only looking at the confirmed infection cases data, we would conclude that Belgium seems to be still far from the inflection point. However, its daily growth rate of hospitalization, ICU admittance and mortality are decreasing (Figure 3), indicating a positive sign that Belgium may approach the inflection point soon.
- Figure 4 presents deaths per million population for selected countries, which are subjectively divided into 4 groups: Rich North countries, Hot North countries, South Hemisphere countries, and the East Block countries (Russia, China and East Europe). It seems that the epidemic mainly lies in rich north countries, while Hot North, East Block countries and South Hemisphere countries do not have large scale epidemics yet. See the detailed breakdown on page 5.
- Predictions for the number of confirmed cases at four time horizons (1-day, 5-day, 10-day and end of the outbreak) in three scenarios are detailed in Table 2, and one can refer to the fitting results plotted in the supplement figures for each country/region. Note that we improved our simulation and fitting algorithm today and the prediction intervals of yesterday's predictions are updated based on the new algorithm as well.
- We need to emphasize that reported confirmed cases are a leading indicator that is subject to a large number of extraneous variables such as sampling rate, sample targeting and reliability of testing. See note at end of this report. The real number of cases in the population is likely to be many multiples higher than those computed from confirmed tests[5].

[3] From the deaths angle, there is no epidemic in Japan as the Japan cumulative death number is increasing linearly at a slow rate. This requires a special study of the Japanese exception.
[4] The problem here is that we are not measuring the true growth of the epidemic, but the epidemic dynamics as seen via time changing intensities and qualities of testing.
[5] We recommend that national governments should prioritise publishing the number (and conditions) of daily tests conducted since the outbreak began in order to facilitate all modeling works.

Country/Region	Confirmed per Million Population (March-29)	Estimated Outbreak Progress in Positive Scenario
Italy	1530	78.6%
Austria	937	72.8%
Germany	634	63.0%
Switzerland	1544	60.9%
Spain	1546	55.5%
Netherlands	567	47.8%
United States	381	40.3%
Europe	478	40.2%
France	561	35.8%
Belgium	800	<50%
Iran	433	<50%
United Kingdom	257	<50%
South Korea	186	<50%
Japan	13	<50%

Table 1. Current confirmed cases per million population and estimated outbreak progress in the positive scenario (today's confirmed cases divided by the estimated total final confirmed cases in positive scenario)

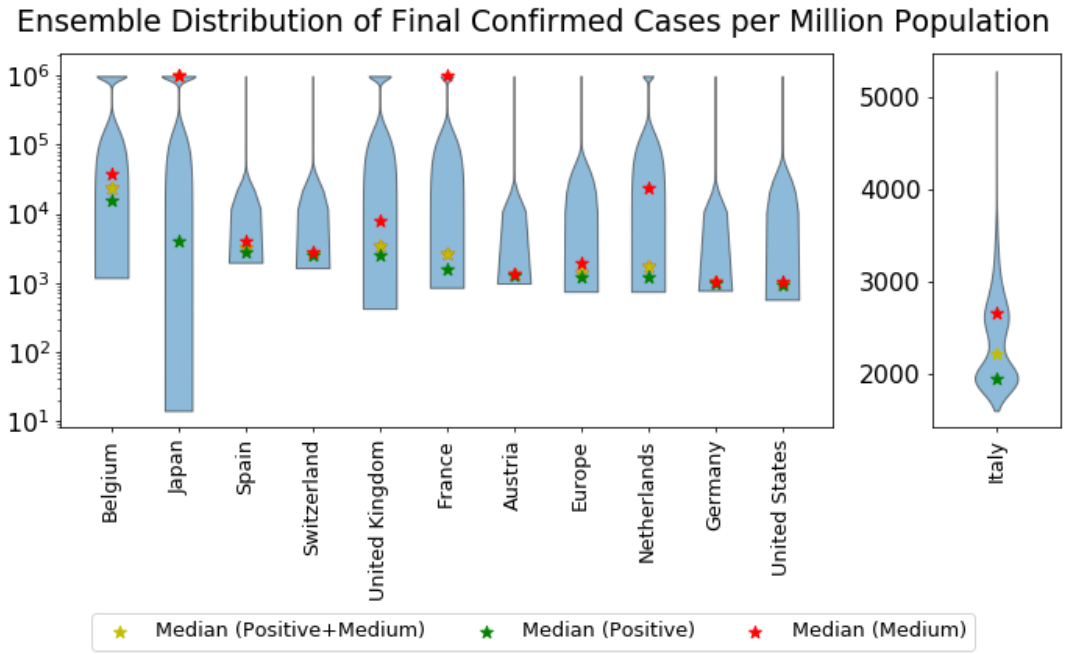


Figure 1. Violin plot of the distributions of the final total number of confirmed cases per million derived by combining the distributions of the positive and medium scenarios. The model setup in the negative scenario does not incorporate a maximum saturation number and thus cannot be used. The yellow star indicates the median prediction for the combined distribution, while the green and red stars indicate the median of the positive and of the medium scenarios respectively. Note that, where we have >1 million infections per 1 million of population, the results are deemed to be unreliable (Table 2).

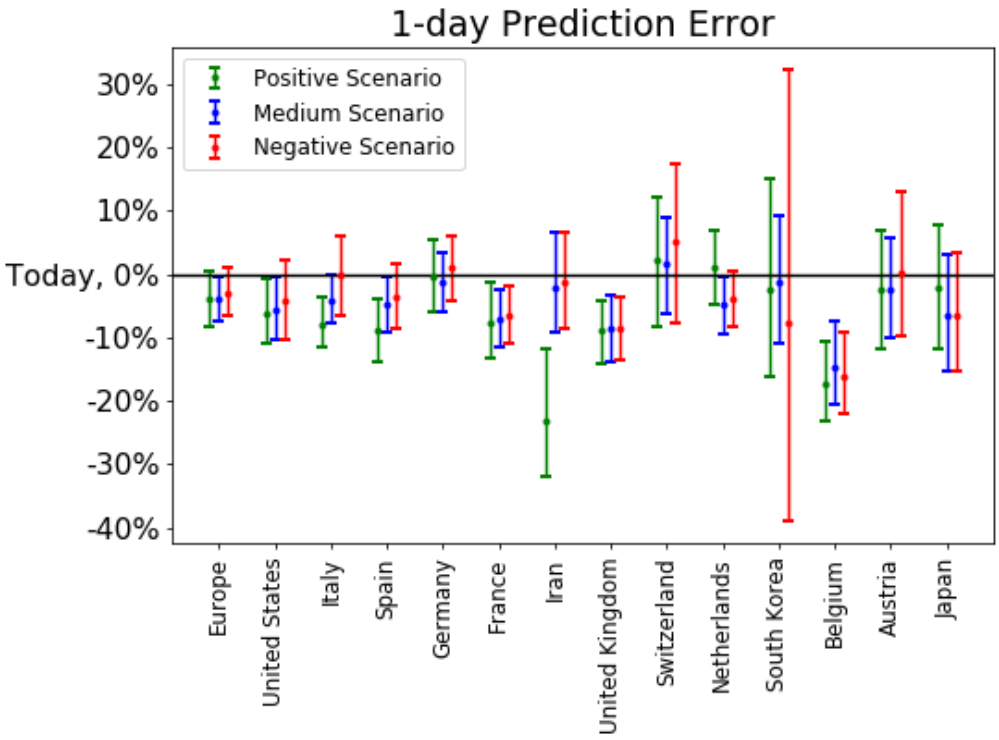


Figure 2. One-day prediction error of the 14 countries/regions. The horizontal line corresponds to today's empirical data.

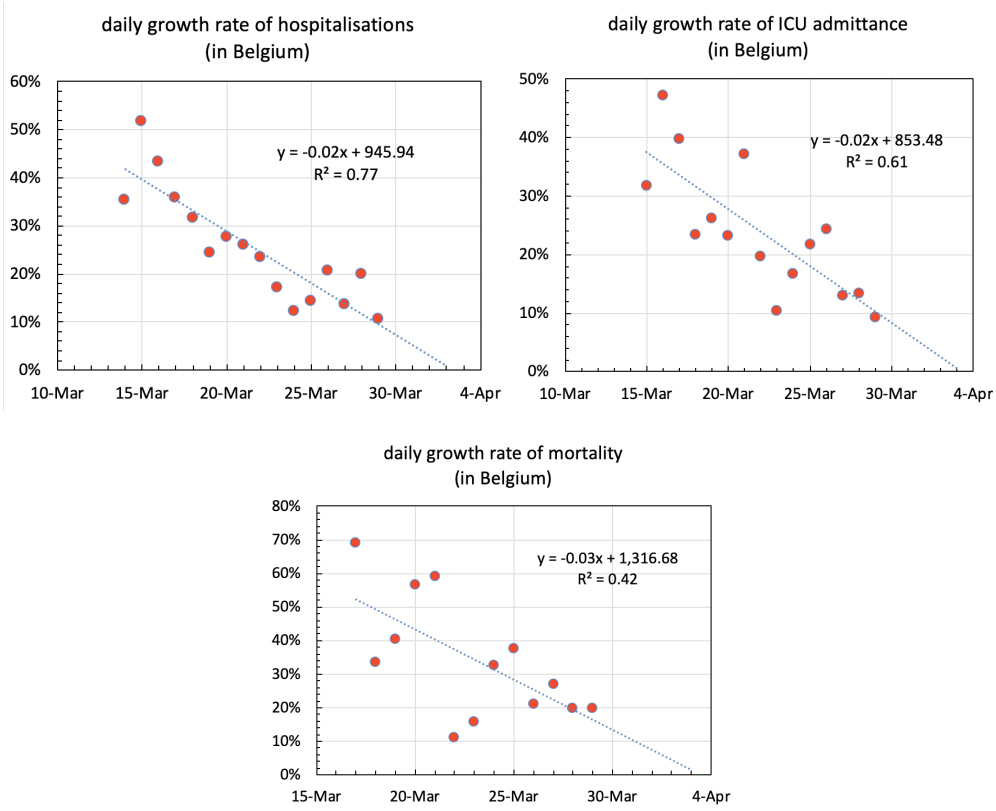


Figure 3. Daily growth rate of hospitalization, ICU admittance and mortality in Belgium. Data comes from manual recording of the numbers given at the press conference of the ministry of health every day at 11am. Provided by Dr. P. Cauwels.

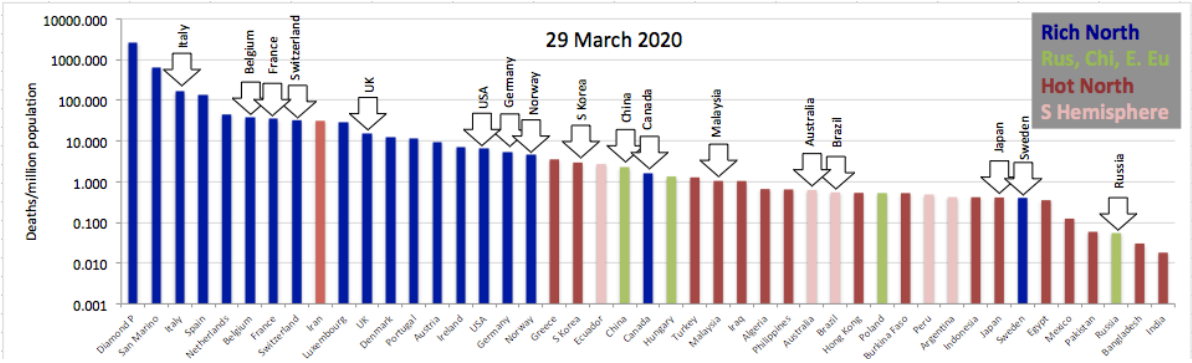


Figure 4. Selected countries are ranked by deaths per million population as of 29 March 2020. The distribution shows some clear trends and the data are subjectively divided into 4 groups: Rich North countries (blue), Hot North countries (dark red), South Hemisphere countries (pink), and East Block countries including Russia, China and East Europe (green).

A quick look at the death per capita in countries from different regions of the world

1. All countries to the right of Malaysia have <1 death per million population.
2. The Hot North countries do not have large epidemics yet. The worst case is Greece with 3.55 deaths / million.
3. The East Block countries do not have large epidemics yet either. The worst Countries are China 2.29 deaths / million and Hungary with 1.35 deaths / million. Many of these countries have climate similar to West Europe. There are three options to explain this.
   - The early lock down prevented the spread of the disease;
   - They are simply at an earlier stage and the epidemic is coming;
   - They are using a different reporting standard, for example recording cause of death as pneumonia.
4. The S hemisphere does not have a large epidemic yet either. The worst hit country is Ecuador with 2.72 deaths / million. If the epidemic comes in their winter, they will have time to prepare.
5. The large epidemic lies in Rich North countries where San Marino (647) and Italy (166) are worst hit and Norway (4.6) least hit. The order of this group likely reflects the stage of epidemic and most countries in the group Italy to Norway should expect to end up something like Italy. There is an indication that the daily increase in deaths in Italy is slowing. There is little difference in the spread of disease in this group. The reason that rich north countries have been hit so hard could be due to the cold climate and aging populations.
6. Iran is the only Hot North country to have a large epidemic. We think it was cold over Teheran during the early stage. But we speculate that old men sharing bubble pipes may have spread the virus among the vulnerable who then imported it to the family home.
7. Sweden is also a huge anomaly, with only 0.4 deaths per million people. We know that the disease arrived late in Sweden but also that they have only very light lockdown. Sweden should be moving left through the ranks, but it's not. Canada (1.62) is also somewhat anomalous like Sweden. It is possible that being big, low population density and very cold helps. But the Swedish numbers currently look suspect. It shares a very long border with neighboring Norway but has only 1/10 of the deaths. But it is also possible that they have a different reporting standard.

8. India, Pakistan and Bangladesh are all big countries that should have been in the thick of it early on given their location. They might not have enough resources to test and find the cause of death. But they appear to be seeing something going on now since India and Pakistan have gone into 3 week lockdown. This is probably futile given the stage of spread of the epidemic globally and the social structures.

Table 2. Predictions for the number of confirmed cases at four time horizons (1-day, 5-day, 10-day and end of the outbreak) and for various countries/regions. The values in parentheses are 80% prediction intervals based on 500 simulations using a negative binomial error structure. In Today's validation column, today's empirical data is presented below yesterday's 1-day predictive interval. "Not reliable" is declared if more than 10% of the simulations produce extreme numbers (larger than total population). All numbers are in thousands.

Country	Scenario*	Today's validation	30-Mar	3-Apr	8-Apr	Final Total Confirmed
Europe	Positive	(327, 356) 357	381 (364, 397)	534 (493, 585)	695 (596, 844)	888 (676, 1370)
	Medium	(333, 359) 357	379 (367, 393)	554 (517, 593)	790 (672, 947)	1470 (886, 5790)
	Negative	(333, 361) 357	387 (370, 403)	593 (565, 622)	969 (897, 1050)	Not Reliable
United States	Positive	(111, 124) 125	137 (130, 143)	218 (194, 252)	279 (229, 381)	310 (239, 491)
	Medium	(112, 124) 125	138 (131, 144)	223 (201, 266)	295 (243, 473)	337 (259, 881)
	Negative	(112, 127) 125	142 (133, 152)	282 (254, 317)	612 (509, 775)	Not Reliable
Italy	Positive	(81.4, 88.2) 92.5	90 (86.1, 94)	104 (98.4, 109)	112 (105, 119)	118 (109, 127)
	Medium	(85.3, 92.4) 92.5	94.8 (91.4, 98.4)	115 (110, 120)	133 (125, 143)	161 (142, 192)
	Negative	(86.5, 98) 92.5	98.6 (92.4, 105)	131 (122, 139)	180 (165, 193)	Not Reliable
Spain	Positive	(61.9, 68.6) 72.2	74 (70, 77.5)	102 (93.6, 112)	121 (106, 142)	130 (110, 164)
	Medium	(65.8, 71.9) 72.2	76.2 (72.8, 79)	113 (103, 124)	150 (124, 191)	193 (140, 372)
	Negative	(66.1, 73.5) 72.2	79.1 (74.4, 83.5)	131 (121, 139)	229 (207, 259)	Not Reliable
Germany	Positive	(49.3, 55) 52.5	54.2 (51.3, 57.4)	69.8 (64.8, 78.1)	79.1 (71.6, 97.2)	83.4 (74.1, 114)
	Medium	(49.6, 54.4) 52.5	54.2 (51.5, 57.3)	70 (64.3, 77)	79.7 (70.4, 92.1)	84.5 (72.2, 103)
	Negative	(50.4, 55.8) 52.5	57.6 (53.7, 61.7)	89.6 (82.5, 96.6)	146 (131, 166)	Not Reliable
France	Positive	(32.4, 36.4) 37.6	39.1 (36.9, 41.4)	58.6 (52.3, 66.5)	80.3 (64.7, 109)	105 (73.9, 234)
	Medium	(28.7, 32.3) 37.6	39.6 (37.9, 41.5)	62.7 (57, 66.9)	104 (79.4, 118)	Not Reliable
	Negative	(33.5, 36.9) 37.6	39.9 (38.2, 41.7)	63.9 (60.9, 67.5)	109 (100, 118)	Not Reliable
United Kingdom	Positive	(13.5, 15.6) 17.1	18.6 (17.6, 19.7)	36.4 (29.3, 42)	71.3 (41.4, 112)	Not Reliable
	Medium	(15.3, 17.8) 17.1	18.5 (17.6, 19.6)	36 (30.1, 40.7)	75.7 (43, 102)	Not Reliable

	Negative	(14.8, 16.5) 17.1	18.7 (17.7, 19.7)	37.7 (34.5, 41.6)	86.3 (72.4, 106)	Not Reliable
Switzerland	Positive	(11.9, 14.5) 13.2	14.4 (13, 15.9)	17.8 (15.6, 20.1)	20.1 (16.8, 24.3)	21.6 (17.5, 29.1)
	Medium	(12.3, 14.4) 13.2	14.3 (13.3, 15.5)	17.9 (16.3, 20.3)	21 (18.1, 26.5)	23.9 (19, 42.1)
	Negative	(12.1, 15.4) 13.2	14.8 (13, 16.8)	21.3 (18.5, 24.3)	31.3 (26.7, 38.4)	Not Reliable
Netherlands	Positive	(9.27, 10.3) 9.76	11.1 (10.5, 11.7)	15.2 (13.7, 17.1)	18.4 (15.5, 22.6)	20.4 (16.4, 27.9)
	Medium	(6.94, 7.49) 9.76	10.6 (10.2, 11)	17 (15.3, 18.3)	28.5 (21.6, 32.4)	Not Reliable
	Negative	(9.03, 9.71) 9.76	10.7 (10.3, 11.1)	17.5 (16.6, 18.4)	30.2 (27.9, 32.8)	Not Reliable
Belgium	Positive	(6.92, 8.03) 9.13	9.38 (8.64, 10.2)	20.3 (15.6, 25.1)	45 (21.9, 82.3)	Not Reliable
	Medium	(6.05, 10.8) 9.13	9.54 (8.72, 10.3)	20.7 (15.4, 24.4)	50.9 (20.5, 77.1)	Not Reliable
	Negative	(7.12, 8.3) 9.13	9.47 (8.69, 10.3)	21.8 (18.8, 25.2)	57.9 (42.4, 83.5)	Not Reliable
Austria	Positive	(7.32, 8.87) 8.29	8.45 (7.83, 9.25)	10.2 (9.29, 11.6)	11.1 (9.76, 13.1)	11.4 (9.9, 14)
	Medium	(7.46, 8.77) 8.29	8.62 (8.05, 9.36)	10.6 (9.79, 11.9)	11.7 (10.5, 13.9)	12.2 (10.8, 15.6)
	Negative	(7.48, 9.36) 8.29	8.93 (7.83, 10.2)	13.2 (11.3, 15.4)	20.1 (16.6, 25.4)	Not Reliable
Japan	Positive	(1.24, 1.62) 1.69	1.66 (1.5, 1.82)	2.21 (1.94, 2.5)	3.13 (2.45, 3.75)	Not Reliable
	Medium	(1.41, 1.7) 1.69	1.58 (1.44, 1.75)	2.18 (1.95, 2.47)	3.25 (2.7, 3.81)	Not Reliable
	Negative	(1.4, 1.64) 1.69	1.58 (1.44, 1.75)	2.2 (1.97, 2.47)	3.33 (2.87, 3.82)	Not Reliable
Iran	Positive	(23.4, 30.5) 35.4	30.6 (26.4, 34.6)	40.3 (32.3, 52.5)	48.7 (35.4, 94.3)	Not Reliable
	Medium	(17.2, 20.5) 35.4	37.3 (34.9, 40)	47.4 (43.4, 51.7)	61.5 (53.1, 69.7)	Not Reliable
	Negative	(32.1, 37.7) 35.4	37.8 (35.2, 40.3)	48.6 (45.3, 52.5)	64.7 (59.6, 71.1)	Not Reliable
South Korea	Positive	(7.76, 10.6) 9.58	9.51 (8.05, 11.2)	9.52 (8.05, 11.2)	9.52 (8.06, 11.3)	Not Reliable
	Medium	(8.45, 10.4) 9.58	9.58 (8.64, 10.6)	9.6 (8.64, 10.6)	9.6 (8.65, 10.6)	Not Reliable
	Negative	(5.84, 12.7) 9.58	8.86 (6.06, 12.2)	10.1 (6.87, 14.1)	11.5 (7.87, 16.9)	Not Reliable

* Note:

- The scenarios are based on the final total confirmed numbers. The positive and medium scenarios are derived from the Generalized Logistic Model and the Logistic Model. The model with the lower mean predicted final total confirmed number K, is classified as the positive scenario, and the other one is classified as the medium scenario. The negative scenario is based on the Generalized Growth model, which should only describe the early stage of the

epidemic outbreak and is therefore least reliable for countries in the more mature stage.

- Trajectories from Iran and South Korea have largely deviated from a typical logistic type growth (S curve), and can't be properly described by our models. Although we still report the results of the calibrations for these two countries in Table 1, they should not be taken as reliable in all scenarios and time horizons. In the case of South Korea, the bad fits could be due to the increased rate of testing and/or, less likely, to a resurgence of an outbreak. In the case of Iran, it is probably a result of unreliable reported data.

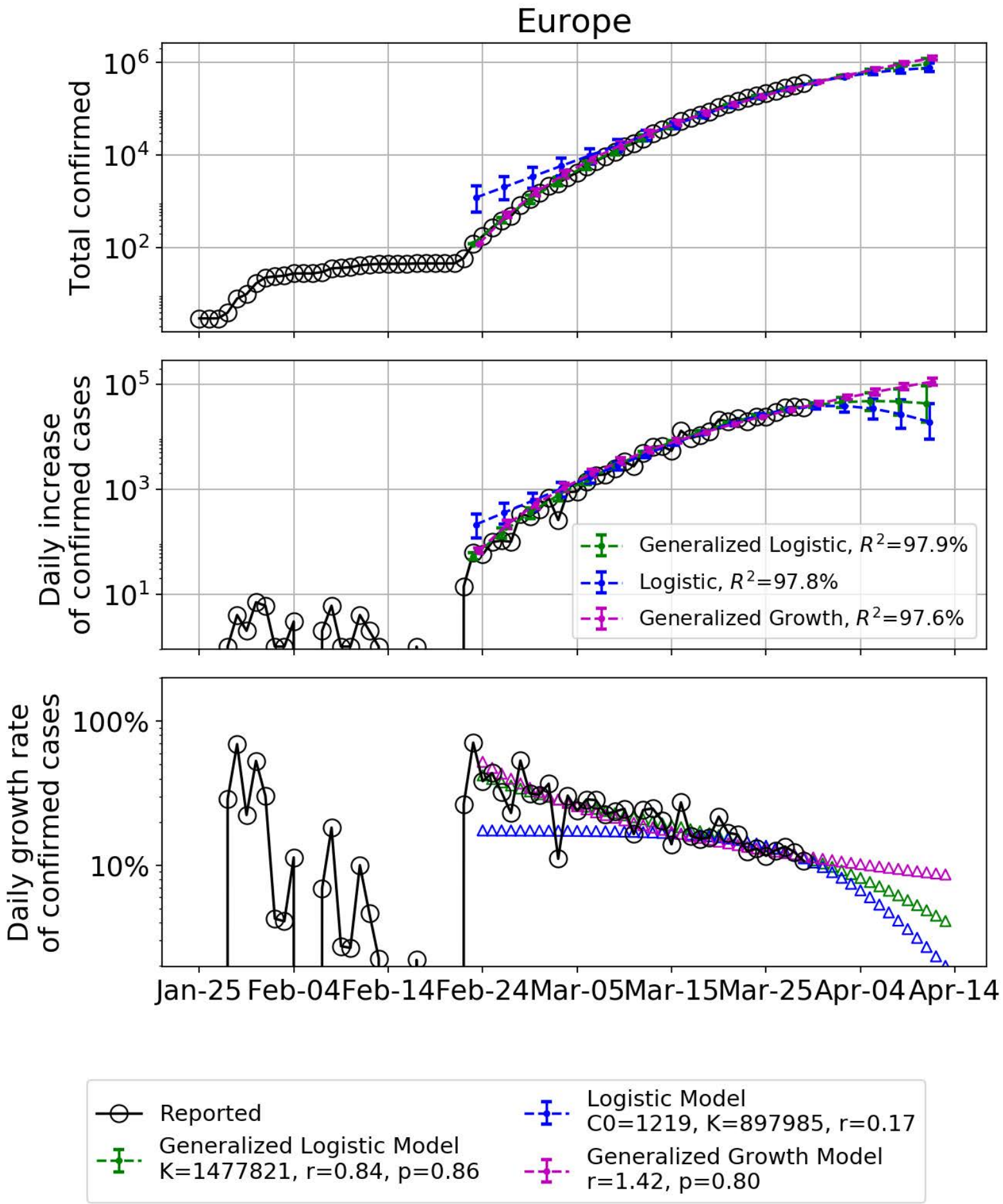
Limitations of using the statistics of reported confirmed number

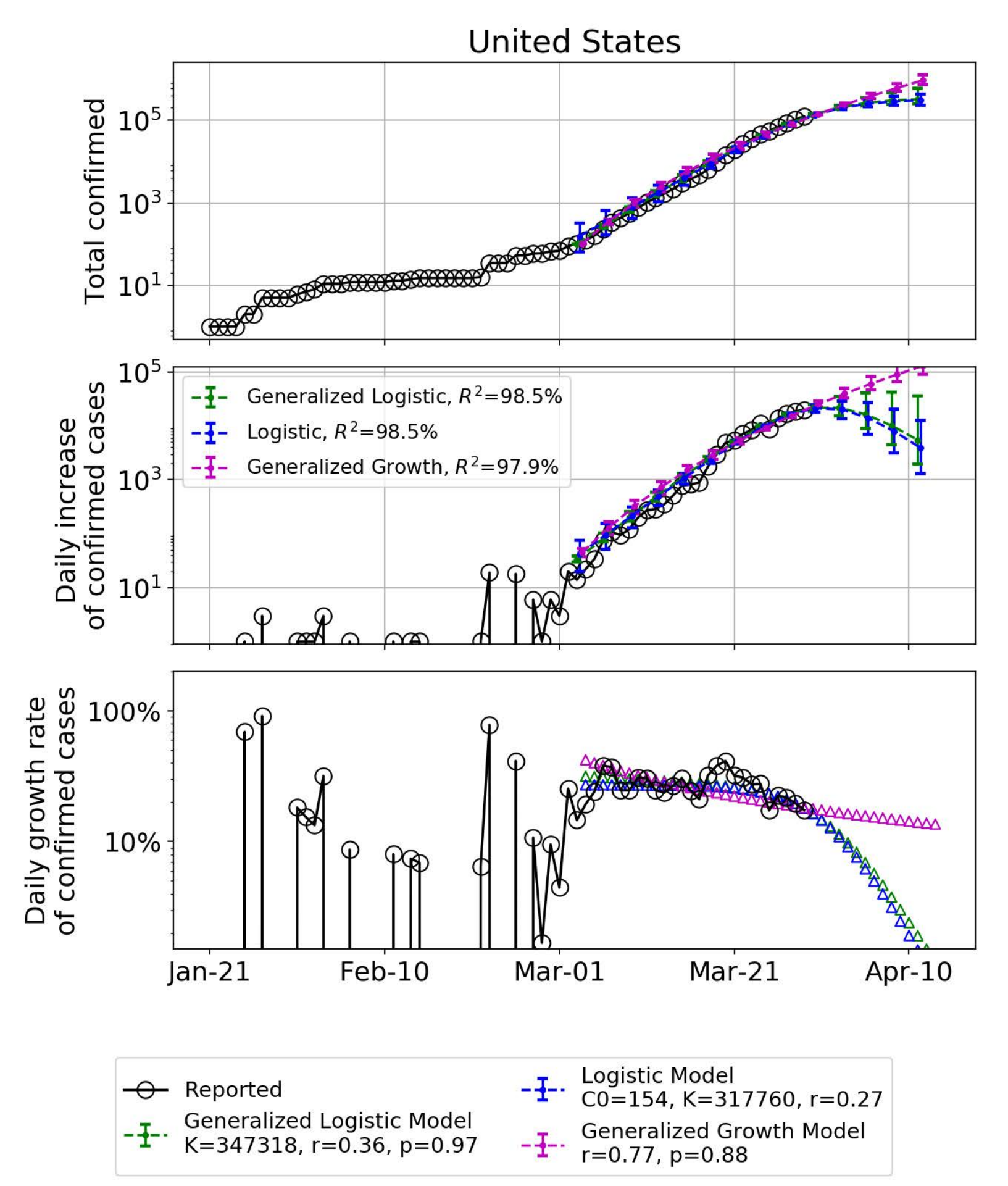
It is important to understand what our prediction models show. The predictions are based on cases identified on the basis of testing and they therefore predict the numbers of future positive tests. Relating positive test results to real levels of infection is subject to a large number of biases. It is a fact that the real number of infections is far higher than those recorded in positive tests since only a tiny fraction of any population has been tested. It is also the case that, in most countries, testing is biased towards those who think they are infected. The first bias, therefore, will underestimate the real number of infections while the second bias will tend to overestimate since it is biased towards those who think they are ill.

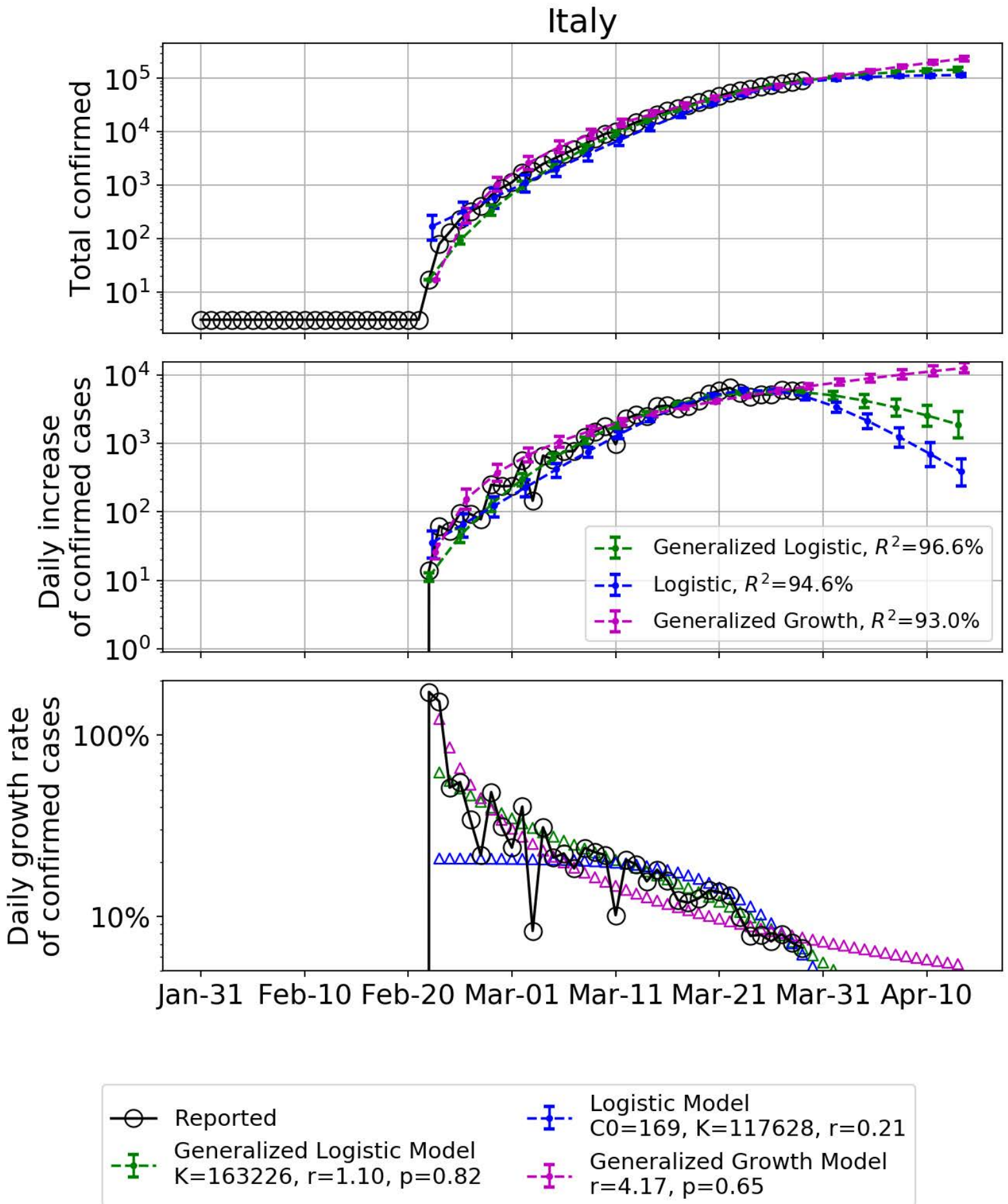
There are further complications. Depending on the testing protocols used, in some instances false positive results have been obtained. In other words, someone without the disease tested positive, probably because they were infected with some other coronavirus. And in other cases, false negative results were obtained, as was the case with the early testing deployed in the USA.
One final complication is the fact that tests are conducted sequentially over time. They do not represent a snapshot of a day in time. Many of those tested early, giving a negative result, may today get a positive result. And many, who tested positive early on, may today be cured.
We anticipate that, over time, our methodology will improve and will provide a more accurate picture of the true levels of infection and where they are headed.

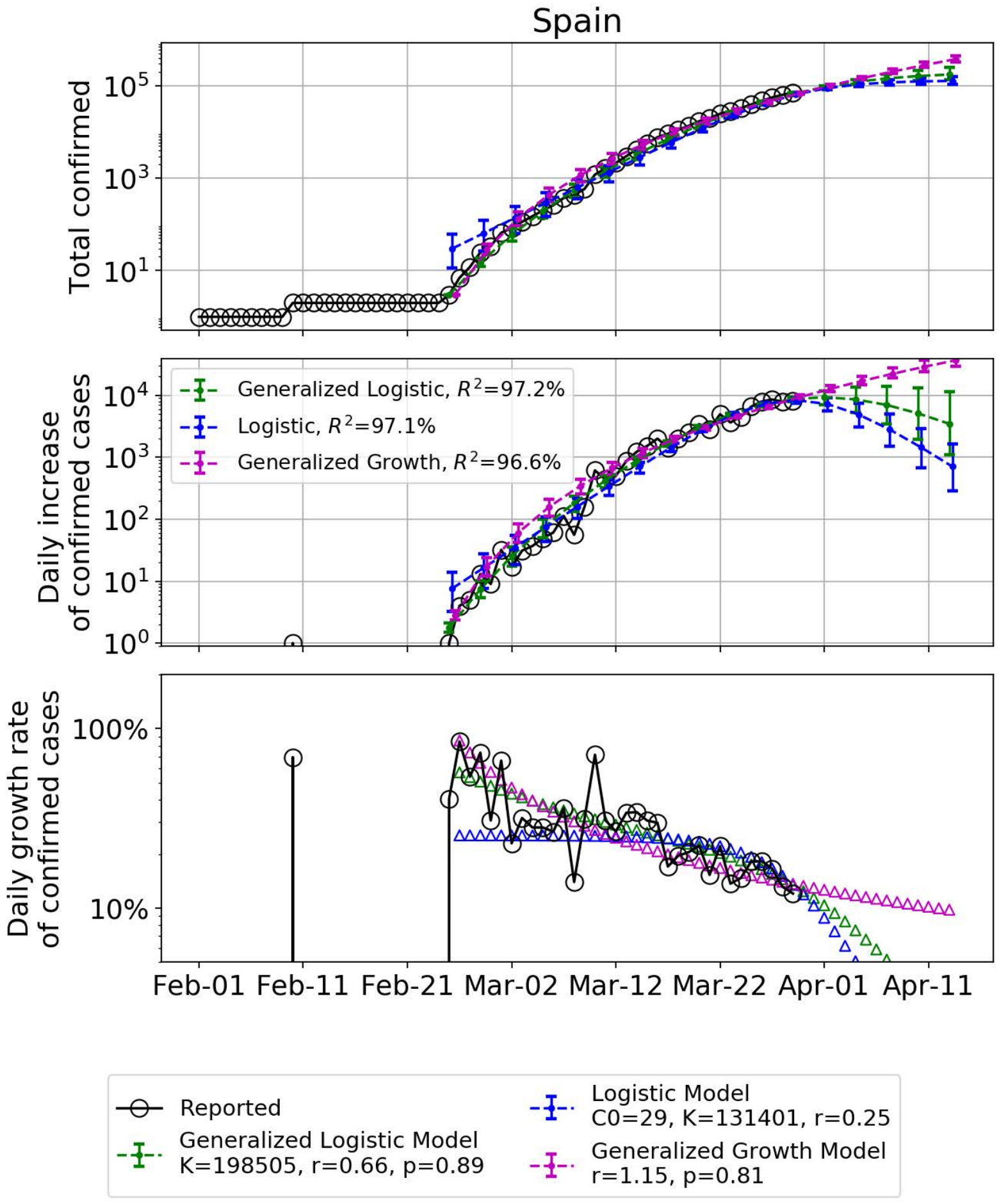
[1] Ke Wu, Didier Darcet, Qian Wang and Didier Sornette, Generalized logistic growth modeling of the COVID-19 outbreak in 29 provinces in China and in the rest of the world, preprint at http://arxiv.org/abs/2003.05681 and
medRxiv: https://medrxiv.org/cgi/content/short/2020.03.11.20034363v1

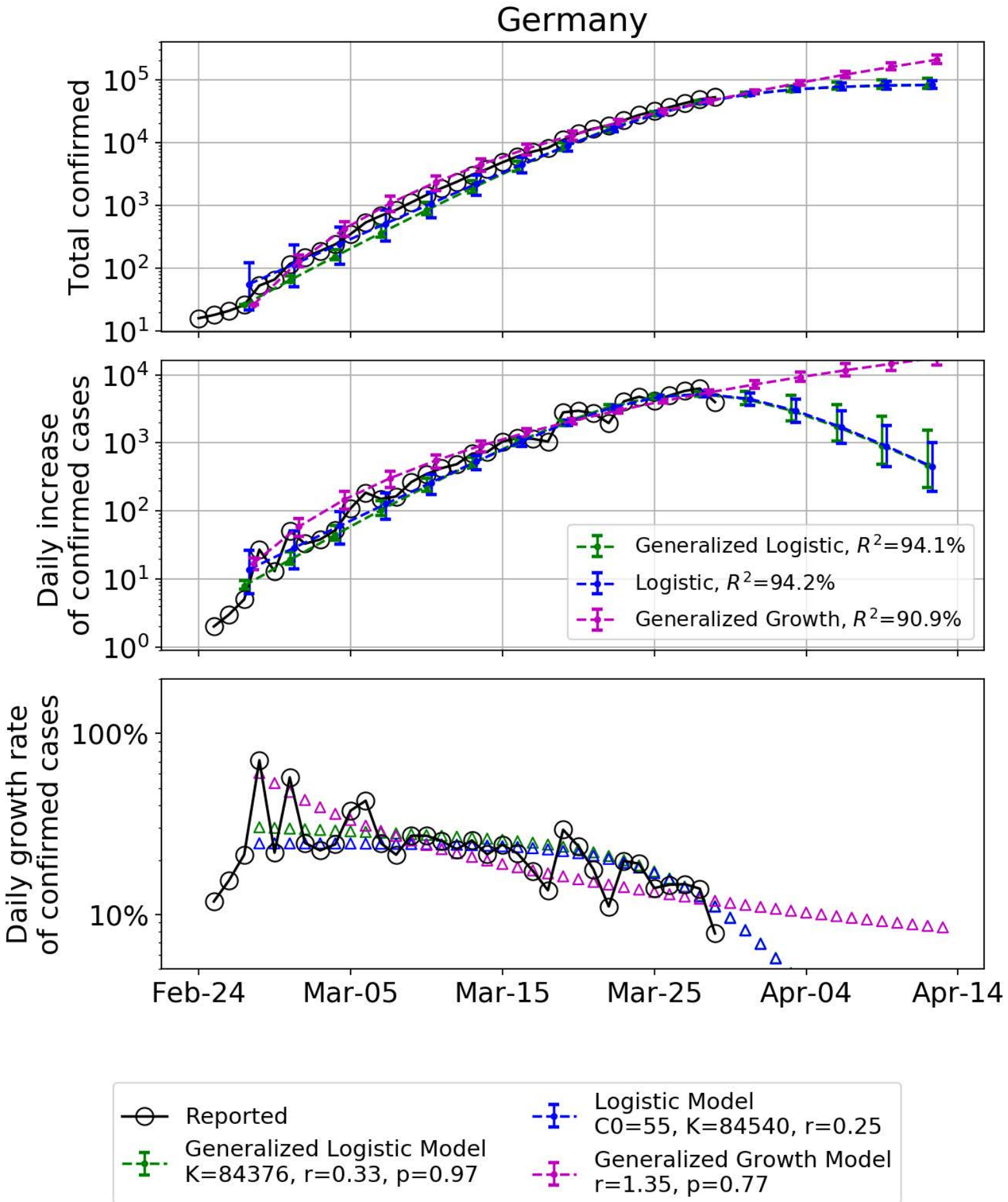
[2] https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases

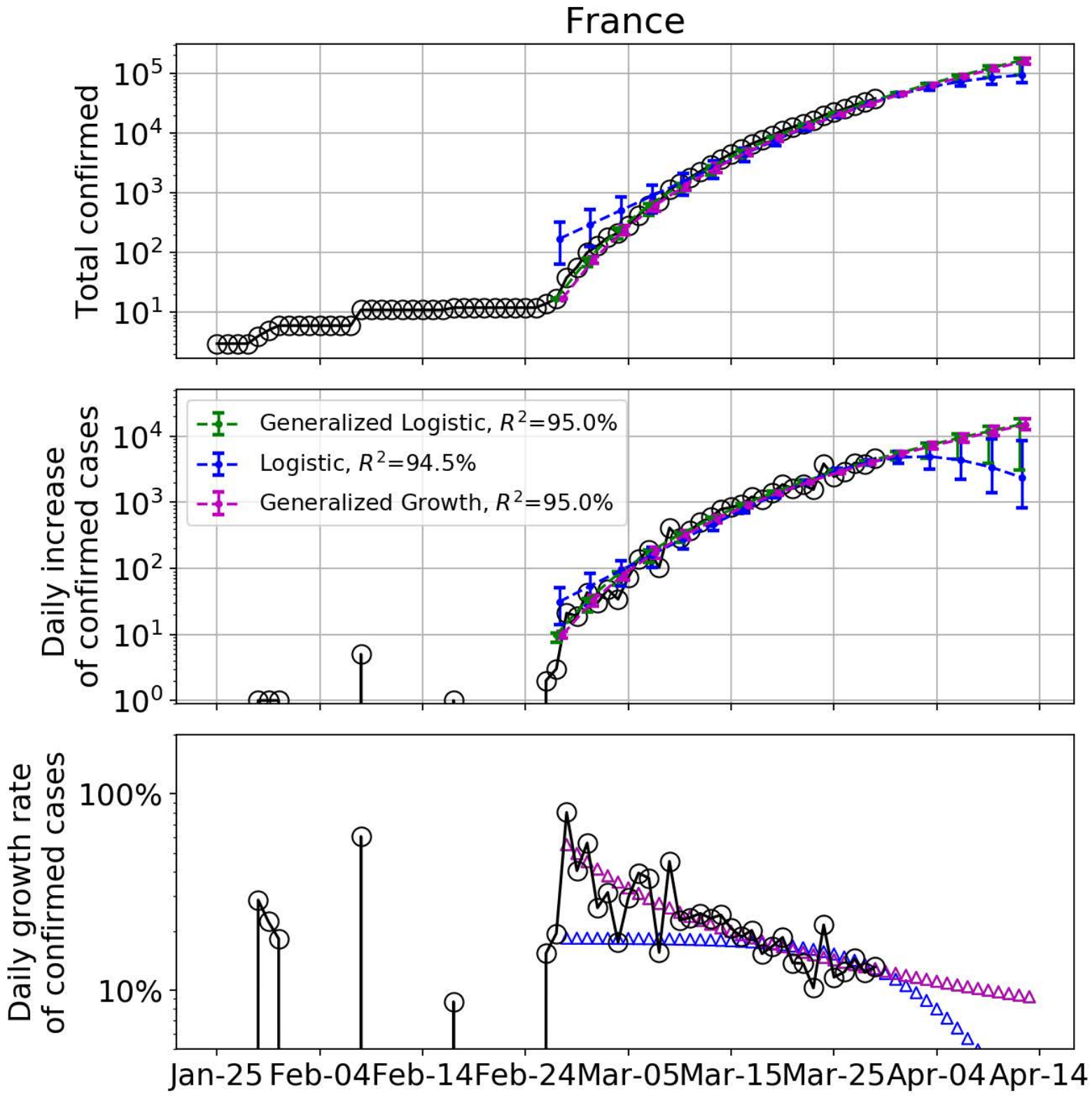

Europe
Total confirmed
10^6
10^4
10^2
Daily increase of confirmed cases
10^5
10^3
10^1
Generalized Logistic, R^2=97.9%
Logistic, R^2=97.8%
Generalized Growth, R^2=97.6%
Daily growth rate of confirmed cases
100%
10%
Jan-25
Feb-04
Feb-14
Feb-24
Mar-05
Mar-15
Mar-25
Apr-04
Apr-14
Reported
Generalized Logistic Model
K=1477821, r=0.84, p=0.86
Logistic Model
C0=1219, K=897985, r=0.17
Generalized Growth Model
r=1.42, p=0.80

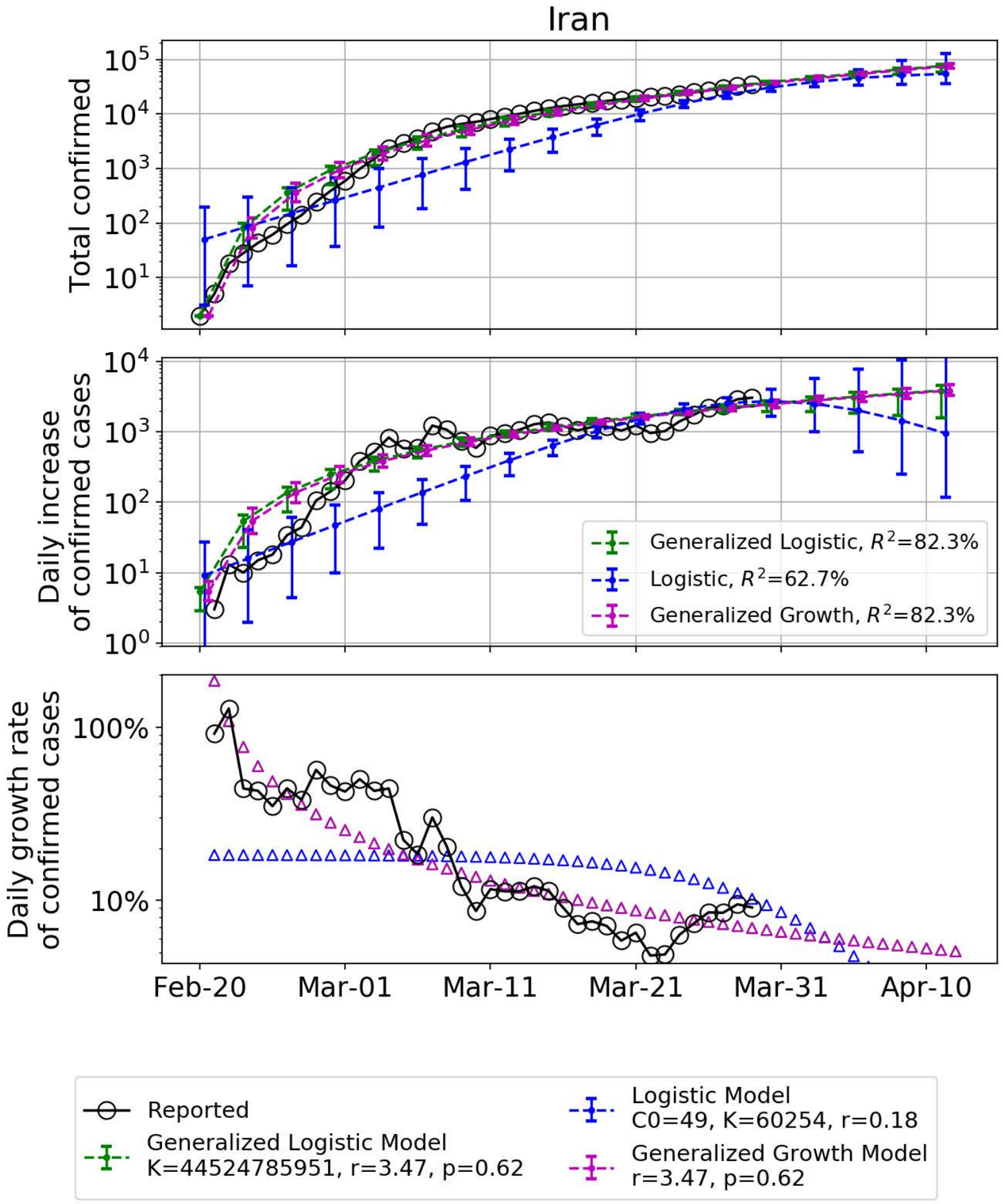

United States
Total confirmed
10^5
10^3
10^1
Daily increase of confirmed cases
Generalized Logistic, R^2=98.5%
Logistic, R^2=98.5%
Generalized Growth, R^2=97.9%
Daily growth rate of confirmed cases
100%
10%
Jan-21
Feb-10
Mar-01
Mar-21
Apr-10
Reported
Generalized Logistic Model
K=347318, r=0.36, p=0.97
Logistic Model
C0=154, K=317760, r=0.27
Generalized Growth Model
r=0.77, p=0.88

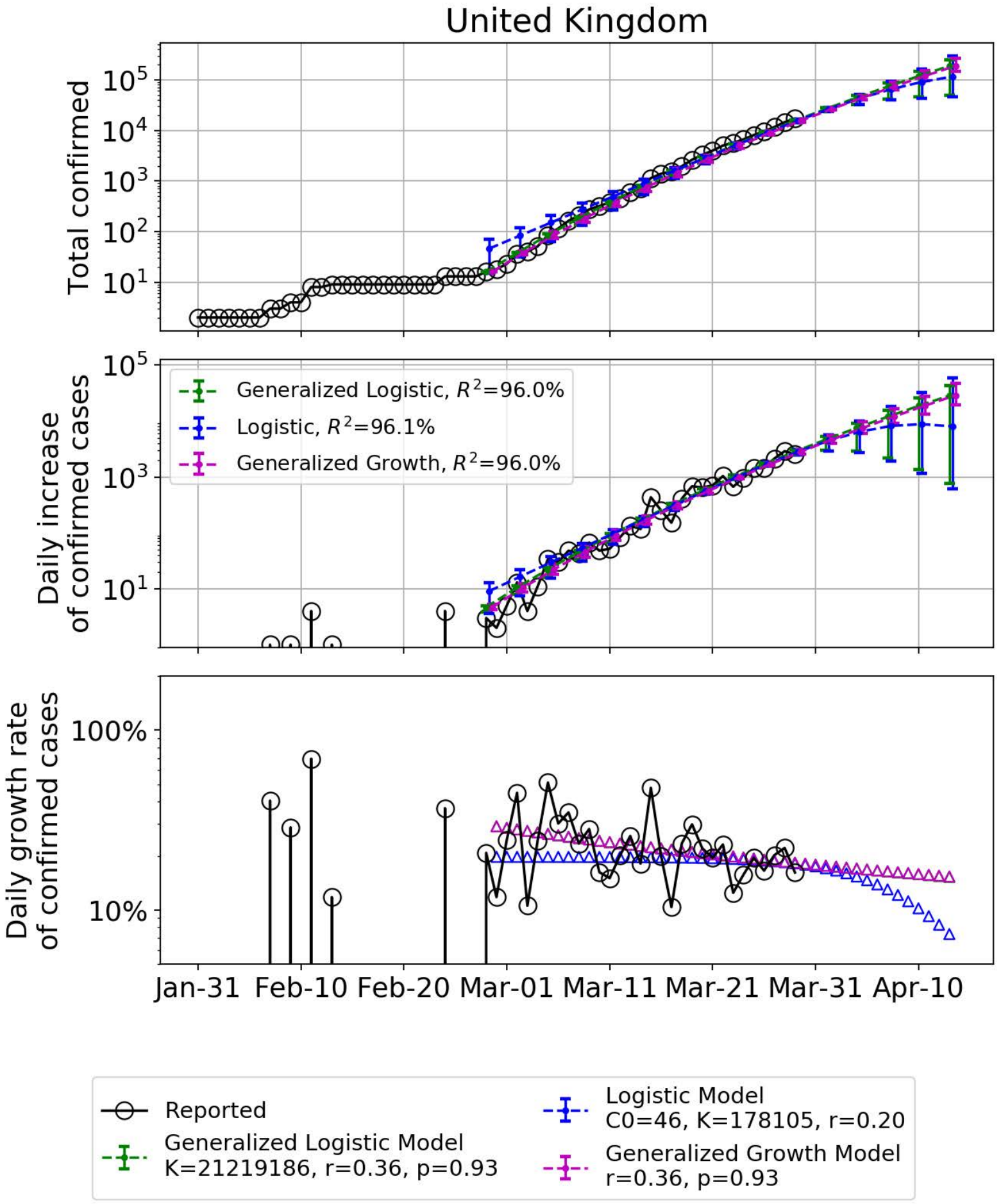

Italy
Total confirmed
Daily increase of confirmed cases
Daily growth rate of confirmed cases
Generalized Logistic, R^2=96.6%
Logistic, R^2=94.6%
Generalized Growth, R^2=93.0%
Jan-31
Feb-10
Feb-20
Mar-01
Mar-11
Mar-21
Mar-31
Apr-10
Reported
Generalized Logistic Model
K=163226, r=1.10, p=0.82
Logistic Model
C0=169, K=117628, r=0.21
Generalized Growth Model
r=4.17, p=0.65

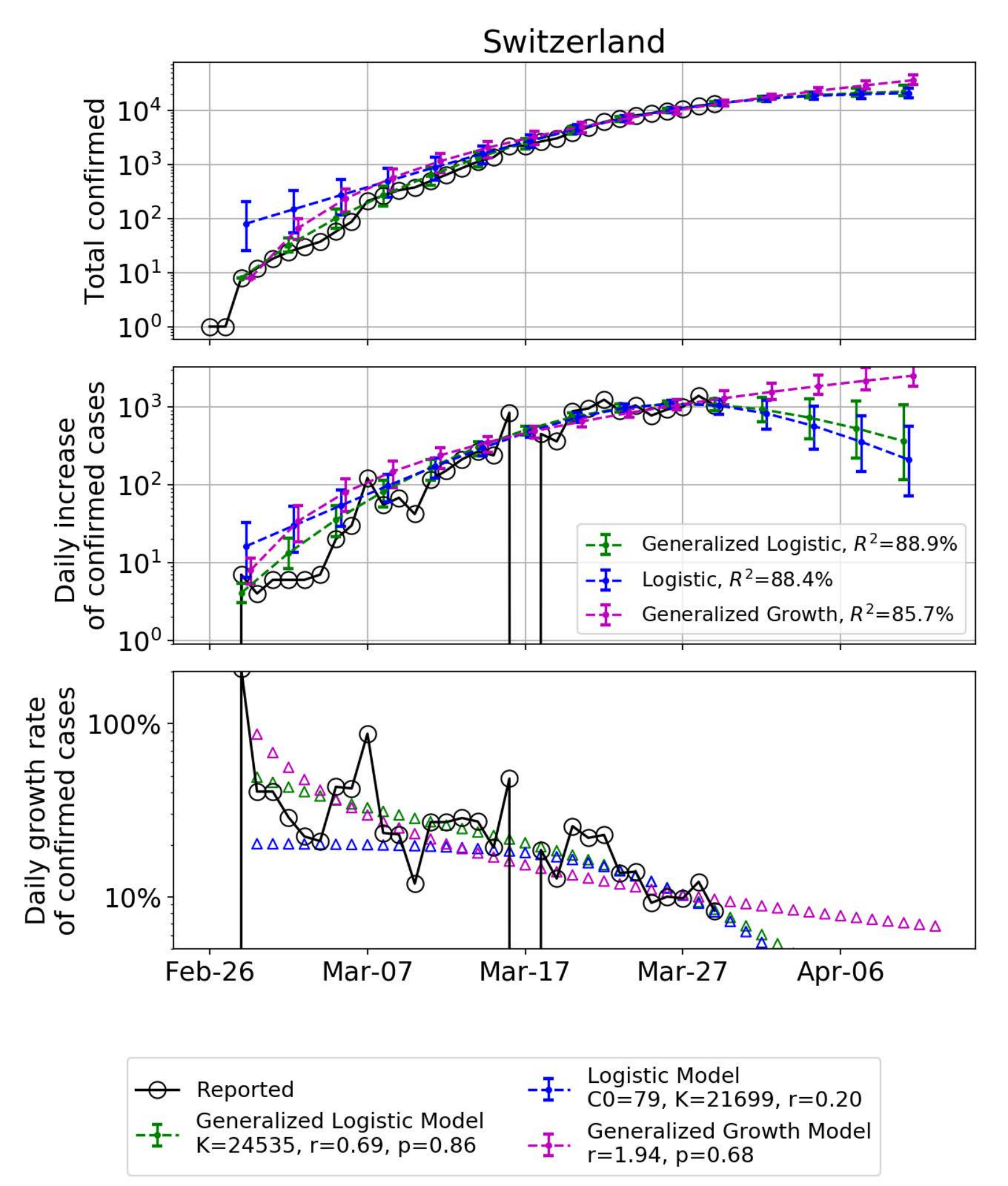

Spain
Total confirmed
10^5
10^3
10^1
Daily increase of confirmed cases
Generalized Logistic, R^2=97.2%
Logistic, R^2=97.1%
Generalized Growth, R^2=96.6%
10^4
10^3
10^2
10^1
10^0
Daily growth rate of confirmed cases
100%
10%
Feb-01
Feb-11
Feb-21
Mar-02
Mar-12
Mar-22
Apr-01
Apr-11
Reported
Generalized Logistic Model
K=198505, r=0.66, p=0.89
Logistic Model
C0=29, K=131401, r=0.25
Generalized Growth Model
r=1.15, p=0.81

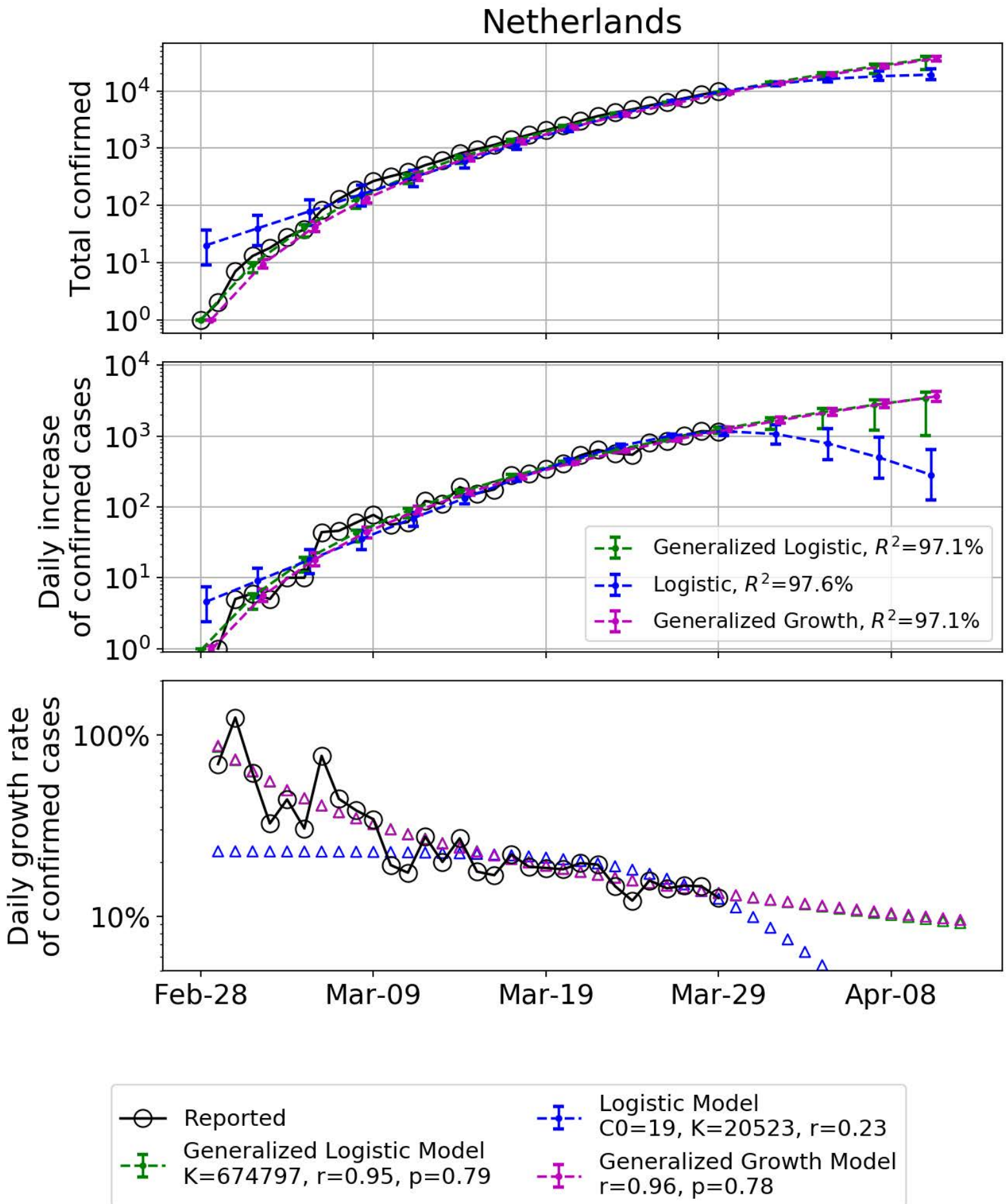

Germany
Total confirmed
10^5
10^4
10^3
10^2
10^1
Daily increase of confirmed cases
10^4
10^3
10^2
10^1
10^0
Generalized Logistic, R^2=94.1%
Logistic, R^2=94.2%
Generalized Growth, R^2=90.9%
Daily growth rate of confirmed cases
100%
10%
Feb-24
Mar-05
Mar-15
Mar-25
Apr-04
Apr-14
Reported
Generalized Logistic Model
K=84376, r=0.33, p=0.97
Logistic Model
C0=55, K=84540, r=0.25
Generalized Growth Model
r=1.35, p=0.77

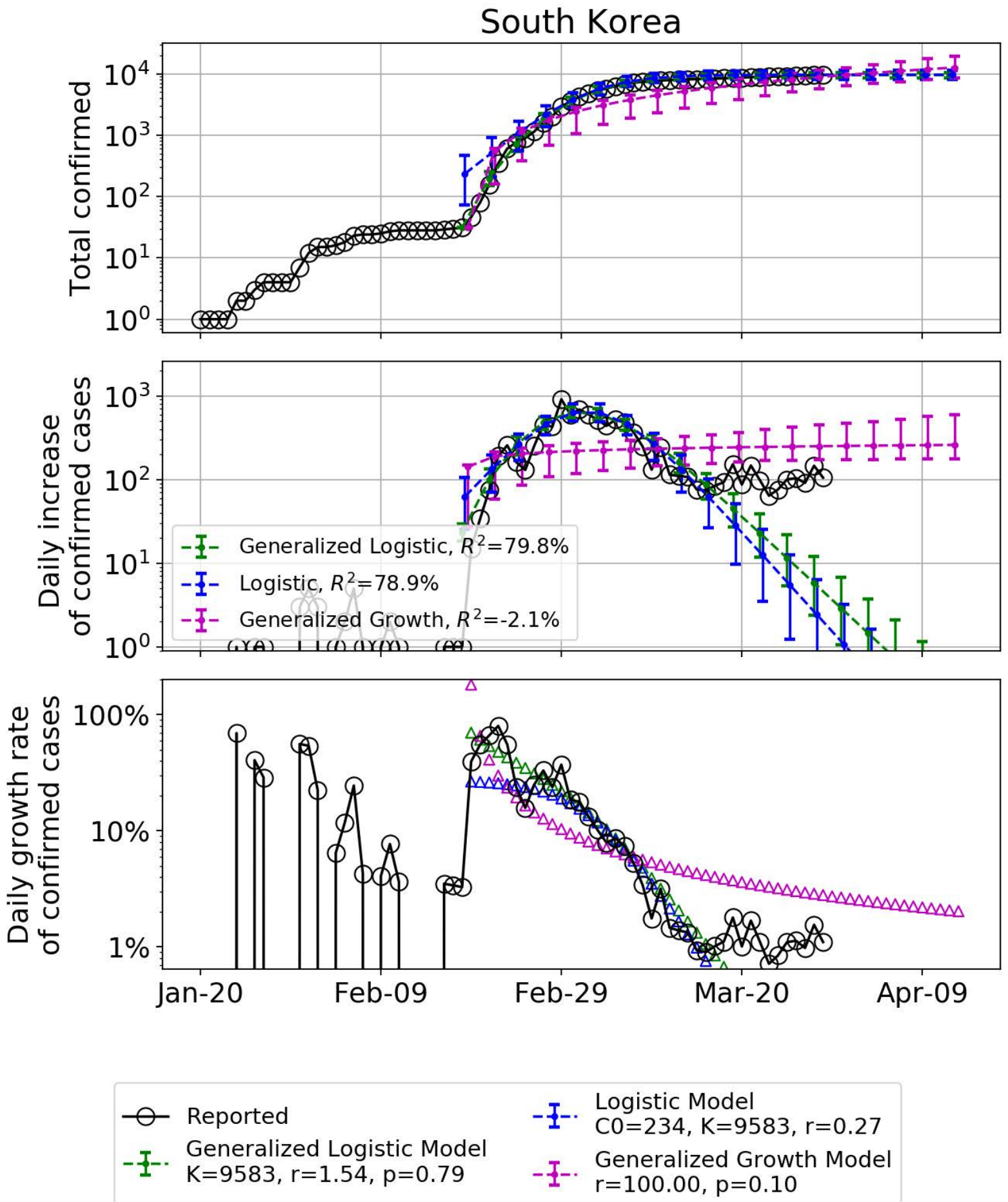

France
Total confirmed
Daily increase of confirmed cases
Daily growth rate of confirmed cases
Generalized Logistic, R^2=95.0%
Logistic, R^2=94.5%
Generalized Growth, R^2=95.0%
100%
10%
Jan-25
Feb-04
Feb-14
Feb-24
Mar-05
Mar-15
Mar-25
Apr-04
Apr-14
Reported
Generalized Logistic Model
K=35537299673, r=1.03, p=0.80
Logistic Model
C0=169, K=108137, r=0.18
Generalized Growth Model
r=1.03, p=0.80

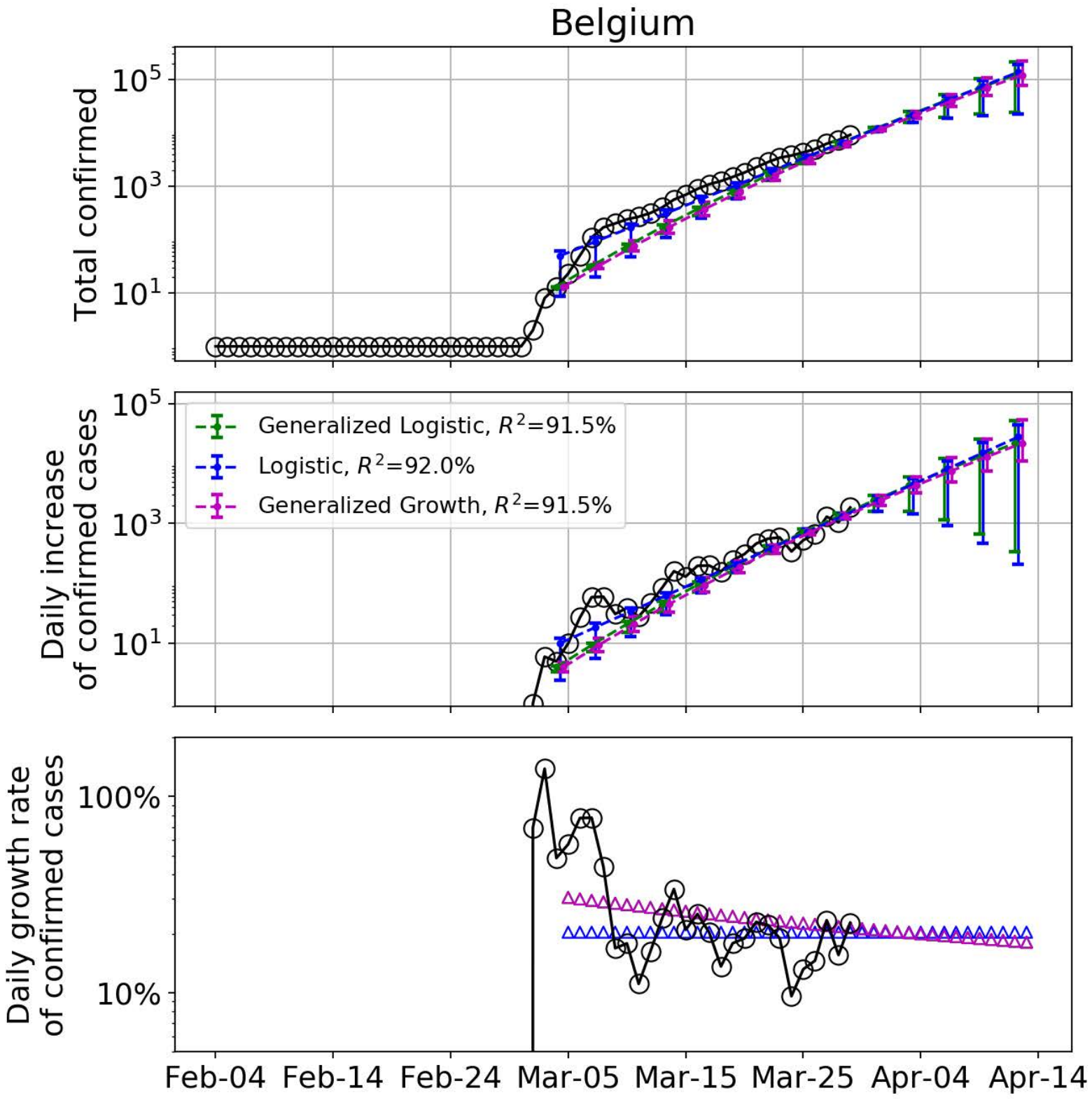

Iran
Total confirmed
Daily increase of confirmed cases
Daily growth rate of confirmed cases
Generalized Logistic, R^2=82.3%
Logistic, R^2=62.7%
Generalized Growth, R^2=82.3%
100%
10%
Feb-20
Mar-01
Mar-11
Mar-21
Mar-31
Apr-10
Reported
Generalized Logistic Model
K=44524785951, r=3.47, p=0.62
Logistic Model
C0=49, K=60254, r=0.18
Generalized Growth Model
r=3.47, p=0.62

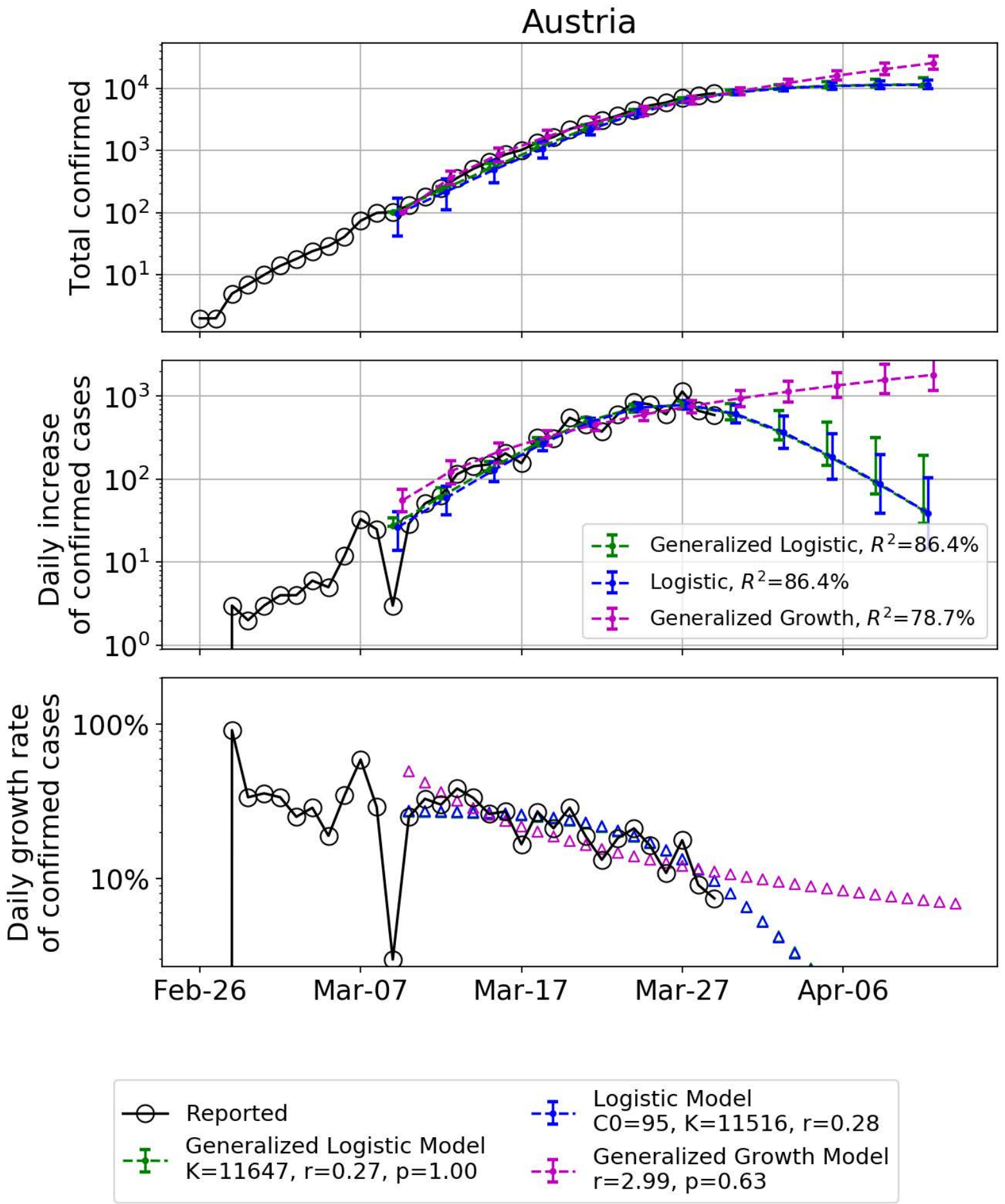

United Kingdom
Total confirmed
10^5
10^4
10^3
10^2
10^1
Daily increase of confirmed cases
Generalized Logistic, R^2=96.0%
Logistic, R^2=96.1%
Generalized Growth, R^2=96.0%
Daily growth rate of confirmed cases
100%
10%
Jan-31
Feb-10
Feb-20
Mar-01
Mar-11
Mar-21
Mar-31
Apr-10
Reported
Generalized Logistic Model
K=21219186, r=0.36, p=0.93
Logistic Model
C0=46, K=178105, r=0.20
Generalized Growth Model
r=0.36, p=0.93

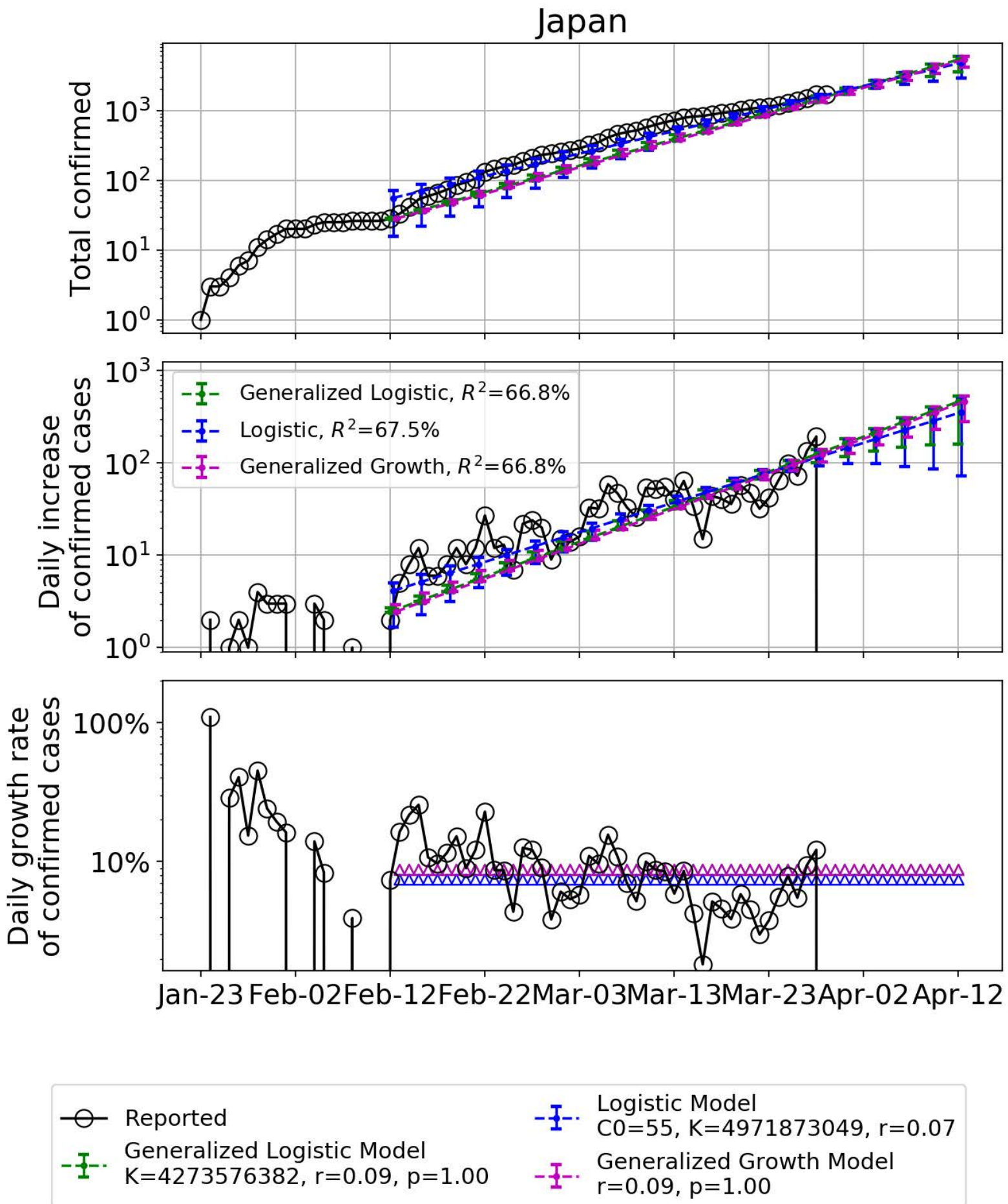

Switzerland
Total confirmed
10^4
10^3
10^2
10^1
10^0
Daily increase of confirmed cases
10^3
10^2
10^1
10^0
Generalized Logistic, R^2=88.9%
Logistic, R^2=88.4%
Generalized Growth, R^2=85.7%
Daily growth rate of confirmed cases
100%
10%
Feb-26
Mar-07
Mar-17
Mar-27
Apr-06
Reported
Generalized Logistic Model
K=24535, r=0.69, p=0.86
Logistic Model
C0=79, K=21699, r=0.20
Generalized Growth Model
r=1.94, p=0.68


Netherlands
Total confirmed
Daily increase of confirmed cases
Daily growth rate of confirmed cases
Generalized Logistic, R^2=97.1%
Logistic, R^2=97.6%
Generalized Growth, R^2=97.1%
Feb-28
Mar-09
Mar-19
Mar-29
Apr-08
Reported
Generalized Logistic Model
K=674797, r=0.95, p=0.79
Logistic Model
C0=19, K=20523, r=0.23
Generalized Growth Model
r=0.96, p=0.78


South Korea
Total confirmed
Daily increase of confirmed cases
Daily growth rate of confirmed cases
Generalized Logistic, R^2=79.8%
Logistic, R^2=78.9%
Generalized Growth, R^2=-2.1%
Jan-20
Feb-09
Feb-29
Mar-20
Apr-09
Reported
Generalized Logistic Model
K=9583, r=1.54, p=0.79
Logistic Model
C0=234, K=9583, r=0.27
Generalized Growth Model
r=100.00, p=0.10


Belgium
Total confirmed
10^5
10^3
10^1
Daily increase of confirmed cases
Generalized Logistic, R^2=91.5%
Logistic, R^2=92.0%
Generalized Growth, R^2=91.5%
Daily growth rate of confirmed cases
100%
10%
Feb-04
Feb-14
Feb-24
Mar-05
Mar-15
Mar-25
Apr-04
Apr-14
Reported
Generalized Logistic Model
K=18705255134, r=0.36, p=0.94
Logistic Model
C0=49, K=11475664923, r=0.20
Generalized Growth Model
r=0.36, p=0.94


Austria
Total confirmed
Daily increase of confirmed cases
Daily growth rate of confirmed cases
Generalized Logistic, R^2=86.4%
Logistic, R^2=86.4%
Generalized Growth, R^2=78.7%
Feb-26
Mar-07
Mar-17
Mar-27
Apr-06
Reported
Generalized Logistic Model
K=11647, r=0.27, p=1.00
Logistic Model
C0=95, K=11516, r=0.28
Generalized Growth Model
r=2.99, p=0.63


Japan
Total confirmed
10^3
10^2
10^1
10^0
Daily increase of confirmed cases
Generalized Logistic, R^2=66.8%
Logistic, R^2=67.5%
Generalized Growth, R^2=66.8%
Daily growth rate of confirmed cases
100%
10%
Jan-23
Feb-02
Feb-12
Feb-22
Mar-03
Mar-13
Mar-23
Apr-02
Apr-12
Reported
Generalized Logistic Model
K=4273576382, r=0.09, p=1.00
Logistic Model
C0=55, K=4971873049, r=0.07
Generalized Growth Model
r=0.09, p=1.00