COVID-19 Confirmed Cases and Cumulative Mortality Predictions as of June 19, 2020

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Summary of the situation:

- Iraq, Bolivia, Nigeria, and Armenia are added to the list.

- Europe reached 2.45 million confirmed cases today with a 0.8% daily growth rate. The decay of the after-peak trajectory continues slowly, as shown from the small estimated parameter "a" (=0.15) in the generalized Richards model. It is also important to understand that confirmed infections undershoot actual infections by a very large margin (see Supplements to COVID-19 Confirmed Cases Prediction: April 15, 2020[1]). Figure 1 allows us to suggest that the distributions of final confirmed cases/deaths in West European countries have converged, while Southern hemisphere and developing Northern countries have not.

- The US reached 2.2 million total confirmed cases today, with a 1.3% daily growth rate. Although the confirmed cases and mortality curve in the USA have passed the inflection point[2], the risk of a second wave is significant due to the ease of the lockdown and the street demonstrations where large numbers of people gather.

- The epidemics in Switzerland, France, Belgium, Germany, Austria, Ireland, Turkey, Italy, Netherlands, Spain, Israel, and Portugal have almost ended, with the outbreak progress closing to 100%. The UK, Europe, Japan and Canada (green in Table 1) are also in a matured stage with strong signs that inflection points have been passed and an outbreak progress of 80% to 95% in the medium scenario. The distributions of final confirmed cases and deaths in these countries/regions have converged.

- The US, Qatar, Russia, Afghanistan, Peru and Belarus are less matured with outbreak progress in the range 60-80% in the medium scenario. They may continue to follow the generalized exponential model, resulting in high uncertainties. The distributions of final deaths have not converged in these countries except the US.

- Brazil has developed signs of reaching the inflection point with the outbreak progress around 50%, while the remaining countries (Armenia, Oman, Philippines, Bahrain, Pakistan, Argentina, Chile, India, Mexico, Bolivia, Dominican Republic, Sweden, Saudi Arabia, Nigeria, Panama, Iraq and Iran) are still far from the inflection point. All of them have uncertain future projections, as shown by their non-converged or highly dispersed ensemble distributions of final confirmed cases (Figure 1). However, in terms of per capita infections, India, Pakistan, Philippines, Argentina and Japan do not have significant epidemics compared to West European countries, which may due to their earlier stage of the outbreak except Japan.

- Resurgence is found in the US, Saudi Arabia, Iran, Turkey, Portugal and Israel. Note that the models employed are not able to characterize the second wave, thus the predictions for these countries are significant biased.

- Our predictions for confirmed cases a week ago are correct in all matured countries, while mostly underestimates in immature countries or countries with resurgences including Chile, Turkey, Saudi Arabia, Panama and Argentina (see figure 2).

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[1] https://ethz.ch/content/dam/ethz/special-interest/mtec/chair-of-entrepreneurial-risks-dam/documents/Covid-19/Covid_Supplements_15April2020.pdf

[2] On a logistic curve, the inflection point indicates where the curvature changes its sign. As we model the total number of confirmed cases, it is equal to the peak of the daily increase curve, after which the daily number of cases is decreasing. If the inflection point has been passed, the worst of the outbreak is over.

Method:

This report updates predictions for the number of COVID-19 confirmed cases and deaths at four time horizons (1-day, 3-day, 7-day and end of the outbreak) and for various countries/regions, based on a phenomenological approach detailed in [1]. We employ 4 versions of the generalized logistic growth equation to model the total number of confirmed cases and deaths, resulting in a positive, medium and negative scenario for the final expected number of cases/deaths as explained in the last page. 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. The predicted ranges overlap and, as time passes, we anticipate our methodology to zero in on more reliable numbers. The data is neither normalized by population nor time-shifted for the calibrations.

Data source: European Centre for Disease Prevention and Control (ECDC) [2] updated 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.

Key Figures & Tables:

-In Table 1, we report the latest confirmed cases per million population and the estimated outbreak progress in the positive and medium scenario (today's confirmed cases divided by the estimated total final confirmed case in positive and medium scenarios).

-In Table 2 and Table 3, we report the prediction results of confirmed cases (Table 2) and deaths (Table 3) in each selected country/region at four time horizons (1-day, 3-day, 7-day and end of the outbreak) in three scenarios. The detailed fitting results for each country/region are plotted in the figures at the end of this report.

-In Figure 1, we present a distribution of the estimated final total confirmed cases and deaths per million population based on the positive and medium scenario.

-In Figure 2, we show the 7-day prediction error of yesterday's report.

- At the end of this report, we present two figures for each country, where the total number of confirmed cases/deaths are in the upper panel (log scale), the daily confirmed cases / deaths in the middle panel, and the daily growth rate of confirmed cases / deaths in the lower panel (log scale), respectively. The empirical data is marked by the empty circles. The blue, red, purple and green lines in the upper, middle and lower left panels show the fits with the Logistic Growth Model, Generalized Richards Model (GRM), Generalized Growth Model (GGM) and Generalized Logistic Model (GLM) respectively.

Comment: 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[3], 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.

[3] For instance, the UK has experienced issues with raising the testing rate linked to a global shortage of certain key reagents and swabs. From April 1st, all testing have been targeted at health sector staff and this obviously biases future data compared with past data. See Report (May 18, 2020): Analysis of unreported Covid 19 mortality statistics for the United Kingdom of Great Britain and Northern Ireland at https://er.ethz.ch/Covid-19/publications.html

Table 1. Current confirmed cases per million population and estimated outbreak progress in positive and medium scenarios (today's confirmed cases divided by the estimated total final confirmed cases in positive and medium scenario). The ranking is in terms of outbreak progress in medium scenario. Numbers in brackets are 80% confidence intervals. As positive scenarios predict a smaller final number of total infected cases, the outbreak progress is thus larger in the positive scenario. Note that the estimated final confirmed numbers tend to underestimate the final results, thus the estimated outbreak progress serves both as a lower bound for future developments and as a guide of the dynamics of the evolution of the epidemics. The estimated final case fatality rate in the medium scenario is reported in the 5th column[4]. The number of tests per million population and confirmed cases per test are presented in the last two columns based on the information from Wikipedia [3].

	Confirmed per Million Population (Jun-19)	Outbreak Progress in Positive Scenario	Outbreak Progress in Medium Scenario	Estimated Final Case Fatality Rate in Medium Scenario	Tests per Million Population (update date in brackets)	Confirmed Cases per Test (update date in brackets)
Switzerland	3654	100.0% (95.8%, 100.0%)	100.0% (96.4%, 100.0%)	5.6%	54099 (Jun 16)	6.7% (Jun 16)
France	2368	99.9% (91.4%, 100.0%)	99.8% (91.7%, 100.0%)	18.7%	22281 (Jun 02)	10.2% (Jun 02)
Belgium	5283	99.8% (90.0%, 100.0%)	99.7% (95.1%, 100.0%)	16.0%	66752 (May 23)	7.4% (May 23)
Germany	2273	99.7% (92.6%, 100.0%)	99.6% (93.1%, 100.0%)	4.8%	56454 (Jun 09)	3.9% (Jun 09)
Austria	1939	100.0% (92.8%, 100.0%)	99.4% (93.8%, 100.0%)	4.2%	62019 (Jun 19)	3.1% (Jun 19)
Ireland	5224	99.6% (94.8%, 100.0%)	99.4% (94.8%, 100.0%)	6.7%	80582 (Jun 19)	6.4% (Jun 19)
Turkey	2236	99.9% (94.8%, 100.0%)	99.4% (89.5%, 100.0%)	2.7%	27698 (Jun 06)	7.3% (Jun 06)
Italy	3941	99.8% (97.7%, 100.0%)	99.4% (90.0%, 100.0%)	14.5%	77796 (Jun 16)	5.1% (Jun 16)
Netherlands	2862	99.9% (95.6%, 100.0%)	99.0% (90.9%, 100.0%)	12.4%	21745 (Jun 03)	12.3% (Jun 03)
Spain	5256	99.6% (96.4%, 100.0%)	98.9% (90.5%, 100.0%)	13.2%	95550 (Jun 04)	5.4% (Jun 04)
Israel	2255	99.5% (89.0%, 100.0%)	98.6% (87.0%, 100.0%)	4.2%	89536 (Jun 19)	2.4% (Jun 19)
Portugal	3705	96.1% (89.6%, 100.0%)	94.9% (88.3%, 100.0%)	4.9%	67114 (May 23)	4.4% (May 23)
United Kingdom	4519	94.6% (92.0%, 97.5%)	93.3% (93.0%, 93.5%)	13.4%	110046 (Jun 18)	4.0% (Jun 18)
Japan	140	100.0% (92.6%, 100.0%)	92.3% (84.1%, 100.0%)	5.4%	4751 (Jun 17)	2.9% (Jun 17)
Canada	2704	91.4% (87.9%, 95.6%)	90.0% (87.1%, 93.5%)	8.2%	60574 (Jun 18)	4.3% (Jun 18)
Europe	3285	92.4% (88.0%, 97.0%)	87.9% (82.7%, 94.1%)	7.0%	NA	NA
United States	6697	79.8% (66.5%, 97.3%)	78.3% (68.9%, 89.6%)	4.5%	79157 (Jun 19)	8.4% (Jun 19)
Qatar	30356	78.3% (74.9%, 81.4%)	76.7% (72.6%, 79.9%)	Not reliable	102510 (Jun 15)	27.0% (Jun 15)

[4] Note that Case fatality rate (CFR) is different from infected fatality rate (IFR). There are two serious problems with the estimation that one should keep in mind for further interpretation. First, tests are not representative of the whole population and, depending on countries, are targeted to those who exhibit symptoms, which then makes the number of confirmed cases smaller than it is in reality, which thus makes the CFR larger. The second problem is that there are multiple pieces of evidence that the real number of infections is larger than reported by a significant factor, which would then make the IFR much lower than the CFR by the corresponding factor. See Report (May 18, 2020): Analysis of unreported Covid 19 mortality statistics for the United Kingdom of Great Britain and Northern Ireland

Russia	3884	74.4% (69.7%, 78.4%)	70.0% (66.2%, 74.8%)	Not reliable	111227 (Jun 18)	3.4% (Jun 18)
Afghanistan	741	70.2% (63.2%, 76.4%)	69.8% (56.8%, 80.6%)	Not reliable	988 (May 31)	37.8% (May 31)
Peru	7640	72.4% (65.5%, 79.0%)	69.5% (60.0%, 78.3%)	Not reliable	44518 (Jun 19)	16.7% (Jun 19)
Belarus	5973	68.1% (63.6%, 72.1%)	63.3% (58.0%, 69.5%)	Not reliable	84329 (Jun 18)	7.0% (Jun 18)
Brazil	4670	67.7% (44.0%, 85.6%)	55.8% (45.5%, 65.4%)	5.0%	50903 (Jun 05)	5.7% (Jun 05)
Armenia	6334	60.0% (48.7%, 69.9%)	50.2% (31.2%, 64.6%)	Not reliable	17074 (May 24)	12.5% (May 24)
Oman	5553	63.5% (50.1%, 75.1%)	44.9% (11.3%, 55.9%)	0.8%	21517 (May 31)	10.4% (May 31)
Philippines	261	88.4% (45.5%, 96.4%)	Not reliable	Not reliable	5598 (Jun 18)	4.8% (Jun 18)
Bahrain	13017	40.7% (1.1%, 63.6%)	Not reliable	Not reliable	176210 (May 23)	3.0% (May 23)
Pakistan	778	33.6% (19.8%, 46.2%)	29.5% (6.1%, 38.9%)	Not reliable	4390 (Jun 16)	15.7% (Jun 16)
Argentina	799	Not reliable	Not reliable	Not reliable	5831 (Jun 19)	13.4% (Jun 19)
Chile	12019	79.8% (15.5%, 100.0%)	Not reliable	Not reliable	41936 (Jun 12)	19.3% (Jun 12)
India	281	35.6% (6.5%, 78.3%)	19.5% (11.2%, 26.7%)	Not reliable	NA	NA
Mexico	1311	22.6% (12.1%, 31.0%)	15.6% (4.9%, 76.4%)	Not reliable	1803 (May 30)	36.5% (May 30)
Bolivia	1894	Not reliable	Not reliable	Not reliable	1855 (May 23)	26.3% (May 23)
Dominican Republic	2319	Not reliable	Not reliable	Not reliable	NA	NA
Sweden	5503	23.1% (11.0%, 85.4%)	Not reliable	Not reliable	37066 (Jun 17)	13.9% (Jun 17)
Saudi Arabia	4332	18.7% (13.3%, 83.1%)	Not reliable	Not reliable	28058 (Jun 09)	10.8% (Jun 09)
Nigeria	94	Not reliable	Not reliable	Not reliable	375 (Jun 07)	15.9% (Jun 07)
Panama	5591	Not reliable	Not reliable	Not reliable	19325 (Jun 09)	20.9% (Jun 09)
Iraq	669	19.2% (13.0%, 77.7%)	Not reliable	Not reliable	2998 (May 07)	2.1% (May 07)
Iran	2416	Not reliable	Not reliable	Not reliable	12506 (Jun 05)	15.8% (Jun 05)

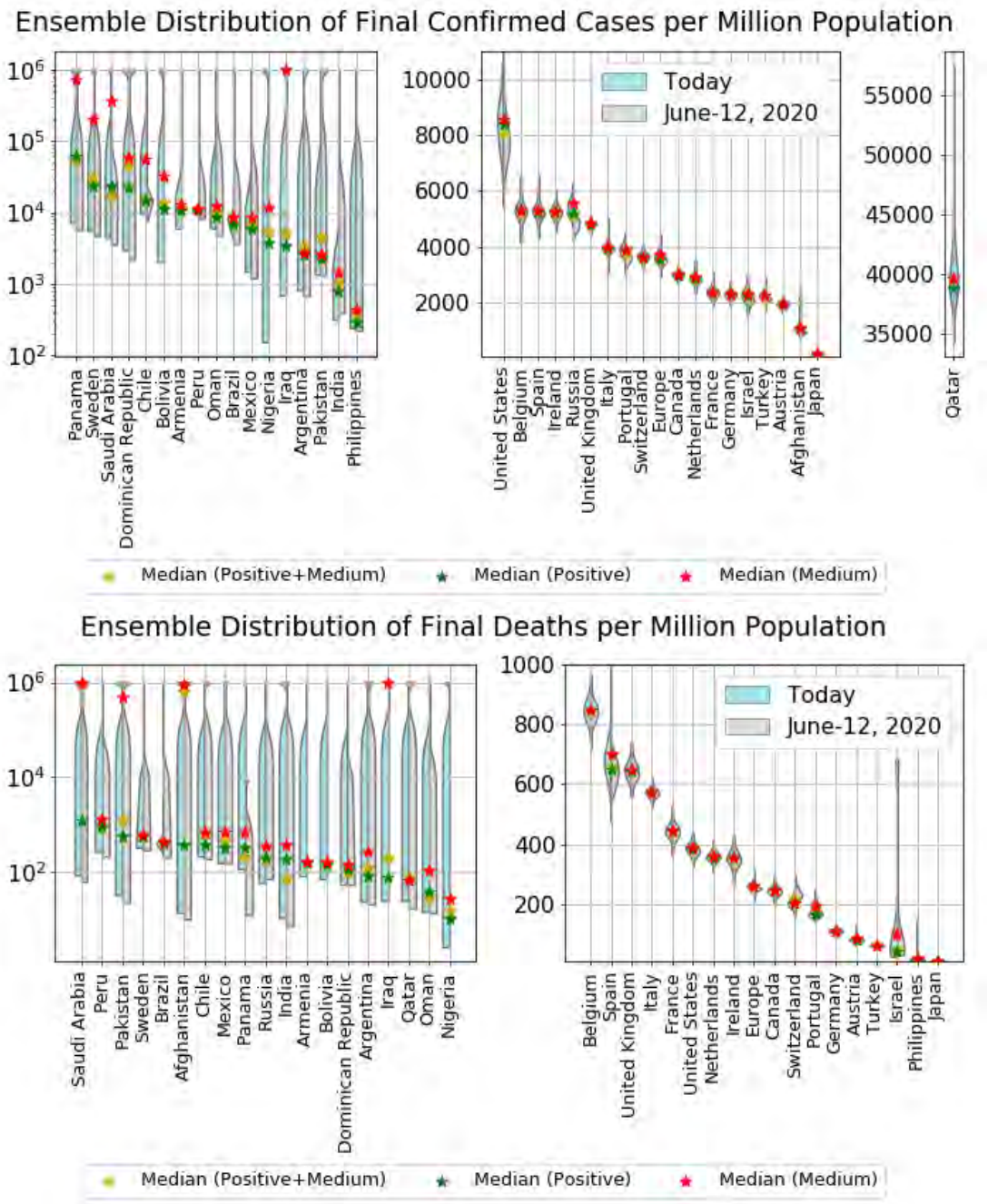


Figure 1. Violin plot of the distributions of the final total number of confirmed cases (upper panel) and deaths (lower panel) per million derived by combining the distributions of the positive and medium scenarios[5]. The left side of each violin in cyan is today's distribution, while the right side of each violin in grey is the distribution 7 days ago. 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 or deaths per 1 million of population, the results are deemed to be unreliable (Table 2 & 3).

[5] Different countries have different standards and processes for reporting deaths, some reporting all deaths and some reporting a fraction. Thus, the ranking shown here is likely quite misleading. For instance, we need to roughly double UK numbers, see Report (May 18, 2020): Analysis of unreported Covid 19 mortality statistics for the United Kingdom of Great Britain and Northern Ireland

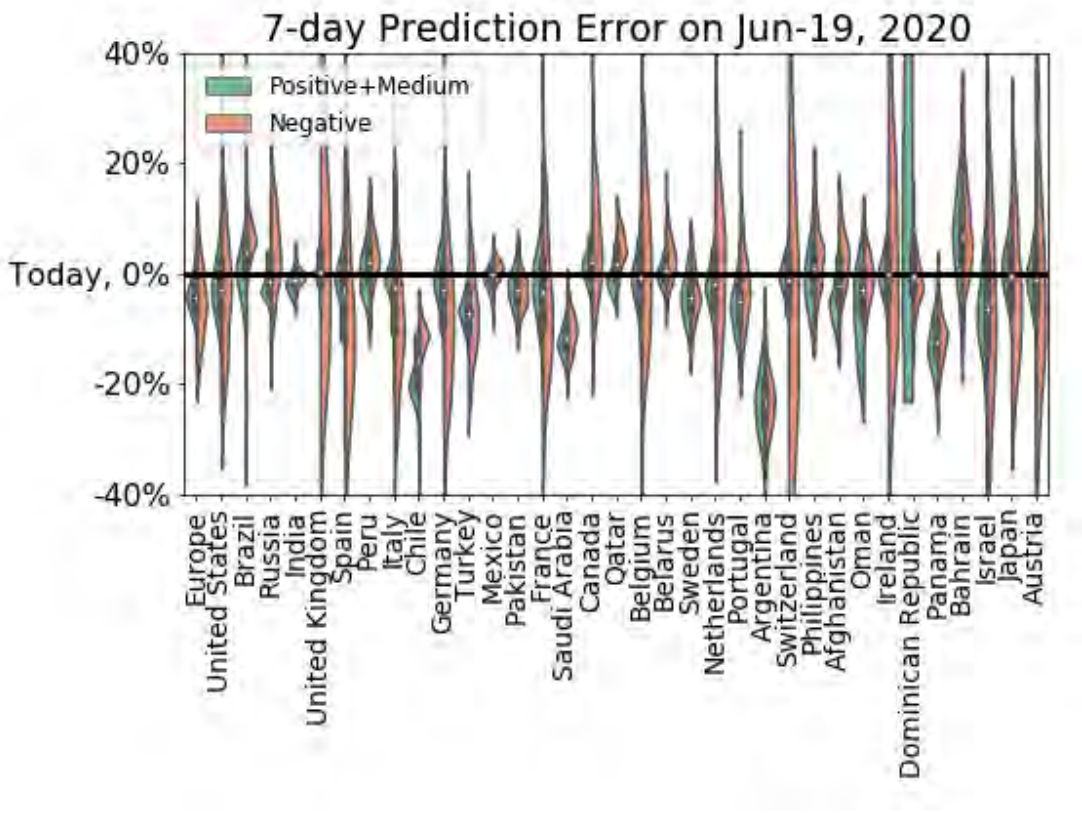


Figure 2. 7-day prediction error of the forecast performed 7 days ago for the total number of confirmed cases for the various countries/regions. The horizontal line corresponds to today's empirical data. We show the full distribution of errors for each of the two scenarios..

Table 2. Predictions for the number of confirmed cases (in thousands) at four time horizons (1-day, 3-day, 7-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 the 5-day predictive interval reported in the previous report. "Not reliable" is declared if more than 10% of the simulations produce extreme numbers (larger than total population).

Country	Scenario*	Today's validation	20-Jun	22-Jun	26-Jun	Final Total Confirmed
Europe	Positive	(2240, 2390) 2450	2350 (2260, 2440)	2370 (2280, 2460)	2400 (2310, 2490)	2650 (2530, 2790)
	Medium	(2290, 2530) 2450	2480 (2350, 2610)	2500 (2360, 2630)	2530 (2400, 2660)	2790 (2610, 2960)
	Negative	(2100, 2540) 2450	2210 (2040, 2420)	2280 (2100, 2490)	2410 (2220, 2630)	Not Reliable
United States	Positive	(1950, 2340) 2190	2240 (2020, 2480)	2270 (2050, 2510)	2310 (2070, 2570)	2750 (2250, 3300)
	Medium	(2010, 2250) 2190	2190 (2050, 2320)	2220 (2080, 2350)	2260 (2130, 2410)	2800 (2440, 3180)
	Negative	(1780, 2440) 2190	2060 (1750, 2350)	2130 (1810, 2420)	2260 (1920, 2570)	Not Reliable
Brazil	Positive	(894, 1030) 978	983 (944, 1020)	1030 (989, 1070)	1110 (1060, 1180)	1440 (1140, 2220)
	Medium	(944, 1040) 978	981 (939, 1020)	1030 (988, 1080)	1130 (1080, 1180)	1750 (1500, 2150)
	Negative	(1000, 1080) 978	1020 (979, 1070)	1090 (1040, 1140)	1230 (1180, 1280)	Not Reliable

Russia	Positive	(536, 565) 561	574 (558, 591)	586 (570, 605)	610 (592, 629)	754 (716, 805)
	Medium	(540, 561) 561	572 (558, 583)	585 (572, 597)	609 (596, 622)	802 (750, 847)
	Negative	(539, 654) 561	581 (533, 643)	604 (554, 667)	650 (594, 721)	Not Reliable
India	Positive	(365, 386) 381	385 (380, 390)	411 (404, 416)	462 (447, 472)	1070 (486, 5880)
	Medium	(364, 380) 381	385 (379, 391)	411 (405, 417)	465 (457, 474)	1950 (1420, 3380)
	Negative	(372, 385) 381	389 (383, 395)	417 (410, 422)	476 (468, 482)	Not Reliable
United Kingdom	Positive	(293, 309) 300	304 (296, 313)	306 (297, 314)	308 (299, 316)	317 (308, 327)
	Medium	(300, 302) 300	303 (303, 304)	305 (304, 306)	308 (307, 308)	322 (321, 323)
	Negative	(236, 402) 300	289 (224, 362)	297 (231, 372)	312 (247, 394)	Not Reliable
Spain	Positive	(236, 252) 246	246 (238, 255)	246 (238, 255)	246 (238, 255)	247 (238, 255)
	Medium	(222, 272) 246	248 (224, 271)	248 (224, 271)	248 (224, 271)	248 (224, 271)
	Negative	(172, 270) 246	196 (161, 244)	201 (166, 251)	211 (174, 263)	Not Reliable
Peru	Positive	(243, 278) 244	258 (244, 269)	265 (250, 278)	279 (262, 293)	337 (309, 373)
	Medium	(239, 266) 244	247 (237, 259)	256 (244, 268)	270 (257, 284)	352 (312, 407)
	Negative	(251, 279) 244	257 (243, 272)	269 (254, 284)	293 (277, 309)	Not Reliable
Italy	Positive	(213, 259) 238	237 (231, 242)	237 (231, 242)	237 (232, 243)	239 (233, 244)
	Medium	(231, 241) 238	240 (217, 265)	240 (217, 265)	240 (217, 265)	240 (217, 265)
	Negative	(178, 253) 238	201 (167, 235)	206 (171, 240)	216 (179, 252)	Not Reliable
Chile	Positive	(169, 188) 225	209 (167, 226)	228 (175, 247)	259 (188, 303)	282 (210, 1450)
	Medium	(170, 187) 225	209 (137, 232)	233 (141, 257)	282 (149, 315)	Not Reliable
	Negative	(192, 207) 225	217 (205, 232)	241 (228, 257)	298 (279, 318)	Not Reliable
Germany	Positive	(173, 200) 189	189 (174, 204)	189 (174, 204)	189 (174, 204)	189 (174, 204)
	Medium	(178, 196) 189	189 (177, 202)	189 (177, 202)	189 (177, 202)	189 (177, 202)
	Negative	(143, 207) 189	161 (130, 194)	165 (134, 199)	173 (140, 208)	Not Reliable
Turkey	Positive	(165, 177) 184	181 (172, 191)	181 (172, 191)	182 (173, 192)	184 (175, 194)
	Medium	(165, 180) 184	185 (165, 206)	185 (165, 206)	185 (165, 206)	185 (165, 206)
	Negative	(151, 191) 184	164 (147, 181)	168 (152, 186)	178 (160, 197)	Not Reliable
Mexico	Positive	(160, 168) 165	168 (165, 172)	178 (174, 182)	198 (194, 203)	732 (534, 1370)

	Medium	(157, 168) 165	168 (165, 171)	177 (174, 181)	197 (191, 202)	1060 (217, 3380)
	Negative	(163, 171) 165	170 (167, 175)	181 (177, 185)	203 (198, 208)	Not Reliable
Pakistan	Positive	(160, 175) 165	166 (159, 173)	179 (171, 187)	205 (195, 216)	491 (357, 832)
	Medium	(161, 177) 165	167 (161, 174)	180 (173, 187)	208 (199, 217)	560 (424, 2700)
	Negative	(161, 176) 165	169 (163, 175)	183 (176, 189)	213 (205, 221)	Not Reliable
France	Positive	(141, 171) 159	159 (145, 174)	159 (145, 174)	159 (145, 174)	159 (145, 174)
	Medium	(145, 166) 159	159 (148, 173)	159 (148, 173)	159 (148, 173)	159 (148, 173)
	Negative	(123, 181) 159	140 (116, 164)	143 (118, 168)	150 (124, 176)	Not Reliable
Saudi Arabia	Positive	(131, 143) 146	149 (143, 155)	157 (150, 163)	172 (162, 180)	782 (176, 1100)
	Medium	(129, 141) 146	148 (143, 155)	156 (150, 163)	174 (166, 181)	Not Reliable
	Negative	(133, 148) 146	149 (143, 155)	157 (151, 164)	175 (168, 182)	Not Reliable
Canada	Positive	(97.6, 105) 100	102 (97.9, 105)	102 (98.5, 106)	104 (99.6, 107)	110 (105, 114)
	Medium	(98.2, 105) 100	101 (98.4, 104)	102 (99.1, 105)	103 (100, 106)	111 (107, 115)
	Negative	(93.4, 120) 100	98.9 (86.6, 111)	101 (89, 114)	107 (93.6, 119)	Not Reliable
Qatar	Positive	(82.6, 88.1) 84.4	86.2 (83.8, 88.5)	88.4 (86, 90.8)	92.3 (89.7, 95)	108 (104, 113)
	Medium	(81.9, 86.4) 84.4	84.3 (82.5, 86.3)	86.7 (84.6, 88.8)	90.9 (88.6, 93.3)	110 (106, 116)
	Negative	(87.4, 94.6) 84.4	87.7 (83.5, 92.4)	91.7 (87.1, 96.4)	99.6 (94.7, 105)	Not Reliable
Belgium	Positive	(57, 62.5) 60.3	60.5 (55.2, 67.1)	60.5 (55.2, 67.1)	60.5 (55.2, 67.1)	60.5 (55.2, 67.1)
	Medium	(53.7, 66) 60.3	60.3 (57.5, 63.2)	60.3 (57.5, 63.2)	60.4 (57.5, 63.3)	60.5 (57.7, 63.5)
	Negative	(49.4, 73.5) 60.3	56.2 (46.3, 67.8)	57.6 (47.3, 69.4)	60.3 (49.3, 72.6)	Not Reliable
Belarus	Positive	(56.4, 59.7) 56.7	58.4 (57.1, 59.9)	59.7 (58.3, 61.2)	62.1 (60.7, 63.8)	83.2 (78.6, 89)
	Medium	(56.6, 59.6) 56.7	58.5 (57.1, 59.8)	59.8 (58.4, 61.1)	62.2 (60.8, 63.7)	89.5 (81.5, 97.7)
	Negative	(57.4, 63.5) 56.7	58.7 (55.5, 61.4)	60.7 (57.4, 63.5)	64.7 (61.1, 67.8)	Not Reliable
Sweden	Positive	(49.8, 56.8) 56	56.2 (53.1, 59.5)	57.9 (54.8, 61.4)	61.4 (58.1, 65.2)	243 (65.6, 510)
	Medium	(50.7, 56.9) 56	56.2 (53.3, 59.5)	58 (55.1, 61.4)	61.9 (58.6, 65.4)	Not Reliable
	Negative	(50.8, 57.5) 56	56.5 (53.2, 59.6)	58.4 (55, 61.7)	62.3 (58.7, 65.9)	Not Reliable
Netherlands	Positive	(46, 50) 49.3	49.1 (47, 51.4)	49.2 (47.1, 51.4)	49.2 (47.1, 51.5)	49.4 (47.3, 51.6)
	Medium	(43.8, 52.4) 49.3	49.8 (45.4, 54.3)	49.8 (45.4, 54.3)	49.8 (45.4, 54.3)	49.8 (45.4, 54.3)

	Negative	(40.9, 58.9) 49.3	47.9 (39.6, 56.3)	48.9 (40.5, 57.8)	50.9 (42.3, 60.3)	Not Reliable
Portugal	Positive	(33.4, 38) 38.1	37.6 (35, 39.8)	37.7 (35.2, 39.9)	38 (35.5, 40.3)	39.6 (36.9, 42.5)
	Medium	(33.8, 38.3) 38.1	37.6 (35.6, 39.8)	37.8 (35.7, 40)	38.1 (36, 40.3)	40.1 (37.6, 43.1)
	Negative	(33.8, 41.4) 38.1	36.9 (33.7, 40.3)	37.7 (34.5, 41.3)	39.5 (36.1, 43.2)	Not Reliable
Argentina	Positive	(33.5, 41.8) 35.5	36 (33.7, 38.9)	39 (36.3, 42)	45.3 (41.6, 49.2)	Not Reliable
	Medium	(32.8, 40.4) 35.5	37.1 (34.5, 40.2)	40.2 (37.1, 43.4)	46.6 (42.1, 51.2)	Not Reliable
	Negative	(34, 41) 35.5	37.1 (34.5, 39.8)	40.4 (37.6, 43.2)	47.6 (44.6, 50.8)	Not Reliable
Switzerland	Positive	(29.6, 32.5) 31.1	31 (29.2, 32.9)	31 (29.2, 32.9)	31 (29.2, 32.9)	31 (29.2, 32.9)
	Medium	(29.9, 32.2) 31.1	31.1 (30, 32.3)	31.1 (30, 32.3)	31.1 (30, 32.3)	31.1 (30, 32.3)
	Negative	(20.2, 41.9) 31.1	27.7 (18.3, 39.1)	28.4 (18.9, 39.9)	29.8 (20, 41.5)	Not Reliable
Philippines	Positive	(25, 29.2) 27.8	28.1 (26.9, 29.3)	28.8 (27.5, 30.1)	29.9 (28.3, 31.7)	31.4 (28.8, 61.1)
	Medium	(26.5, 30.4) 27.8	28.1 (27, 29.5)	29.1 (27.8, 30.6)	31 (29.5, 32.9)	Not Reliable
	Negative	(26.6, 30.5) 27.8	28 (26.9, 29.2)	29.2 (28, 30.5)	31.7 (30.1, 33.3)	Not Reliable
Afghanistan	Positive	(25.6, 28.6) 27.5	28.2 (27, 29.5)	29.3 (28.1, 30.6)	31.4 (29.9, 32.8)	39.2 (36.1, 43.6)
	Medium	(25.7, 28.6) 27.5	28.3 (27.2, 29.6)	29.5 (28.2, 30.7)	31.4 (30, 33)	39.4 (34.2, 48.5)
	Negative	(28.3, 32.3) 27.5	29.3 (27.4, 31.1)	31 (29, 32.9)	34.8 (32.4, 36.9)	Not Reliable
Oman	Positive	(21.8, 26.7) 26.8	26.3 (24.7, 28.1)	27.9 (26.3, 30)	31.1 (29, 33.8)	42.2 (35.7, 53.5)
	Medium	(25.3, 29.2) 26.8	28.6 (27.2, 30)	30.5 (29.1, 32.1)	34.5 (32.6, 36.5)	59.7 (48, 237)
	Negative	(26, 29.6) 26.8	28.4 (26.9, 29.7)	30.6 (29.1, 32.1)	35.6 (33.6, 37.6)	Not Reliable
Iraq	Positive	NA	29.7 (27.7, 31.9)	32.6 (30.2, 35.2)	38.8 (32.7, 43.2)	134 (33.1, 197)
	Medium	NA	29.7 (27.5, 32.1)	33 (30.4, 35.7)	40.6 (37, 44.1)	Not Reliable
	Negative	NA	30 (27.7, 32.3)	33.4 (30.7, 35.9)	41.1 (37.7, 44.6)	Not Reliable
Ireland	Positive	(23.9, 26.6) 25.4	25.4 (24.2, 26.7)	25.4 (24.2, 26.7)	25.4 (24.2, 26.7)	25.5 (24.2, 26.7)
	Medium	(24, 26.6) 25.4	25.5 (24.1, 26.7)	25.5 (24.1, 26.7)	25.5 (24.1, 26.7)	25.5 (24.1, 26.8)
	Negative	(19.4, 33.8) 25.4	23.3 (17.2, 31.5)	23.9 (17.8, 32.4)	25.1 (18.8, 33.9)	Not Reliable
Dominican Republic	Positive	(23.3, 26.1) 24.6	25.3 (24.3, 26.5)	26.1 (25.1, 27.4)	27.8 (26.7, 29.2)	Not Reliable
	Medium	(24.3, 83.9) 24.6	38.4 (26.8, 65)	39.4 (27.7, 65.9)	41.2 (29.3, 67.7)	Not Reliable
	Negative	(23.4, 26.1) 24.6	25.3 (24.2, 26.5)	26.2 (25, 27.4)	28.1 (26.8, 29.4)	Not Reliable

Panama	Positive	(18.6, 21.7) 23.4	21.3 (20.1, 22.5)	22.8 (21.5, 24.1)	26.1 (24.4, 27.7)	Not Reliable
	Medium	(19.2, 21.8) 23.4	21.1 (19.7, 22.5)	22.4 (21, 23.9)	25.1 (23.4, 26.9)	Not Reliable
	Negative	(19.4, 22) 23.4	21.4 (20.1, 22.8)	22.8 (21.3, 24.2)	25.6 (24.1, 27.3)	Not Reliable
Bolivia	Positive	NA	22 (20.9, 23.2)	23.5 (22.3, 24.9)	26.6 (24.9, 28.5)	Not Reliable
	Medium	NA	28 (20.6, 40.4)	29.6 (22.1, 42)	33.5 (24.6, 45.4)	Not Reliable
	Negative	NA	22 (21, 23.2)	23.6 (22.5, 25)	27 (25.5, 28.9)	Not Reliable
Bahrain	Positive	(20.1, 25.5) 20.4	21.9 (19.8, 24.2)	23.2 (20.9, 25.7)	25.8 (22.8, 29)	Not Reliable
	Medium	(20.4, 25.1) 20.4	21.7 (19.9, 23.3)	22.9 (21.1, 24.8)	25.4 (23.3, 28.1)	Not Reliable
	Negative	(20.9, 25.2) 20.4	21.8 (20.2, 23.6)	23.2 (21.5, 25.1)	26.2 (24.3, 28.6)	Not Reliable
Israel	Positive	(16.6, 20.9) 20	20.1 (17.8, 22.4)	20.1 (17.8, 22.5)	20.1 (17.8, 22.5)	20.1 (17.9, 22.5)
	Medium	(16.7, 21.2) 20	20.3 (17.6, 23)	20.3 (17.7, 23)	20.3 (17.7, 23)	20.3 (17.7, 23)
	Negative	(14.2, 25.6) 20	19.5 (14.8, 25.7)	19.9 (15.2, 26.3)	20.8 (15.8, 27.5)	Not Reliable
Armenia	Positive	NA	18.2 (17.3, 19.2)	19.3 (18.3, 20.3)	21.3 (20.1, 22.5)	31.1 (26.7, 38.4)
	Medium	NA	18.2 (17.3, 19.1)	19.3 (18.3, 20.3)	21.5 (20.3, 22.9)	37.3 (28.9, 60)
	Negative	NA	19 (18, 19.9)	20.3 (19.3, 21.3)	23.3 (22.1, 24.4)	Not Reliable
Nigeria	Positive	NA	18.6 (17.7, 19.4)	19.7 (18.8, 20.6)	22 (21, 23.1)	Not Reliable
	Medium	NA	21.1 (19.5, 22.8)	22.4 (20.7, 24.1)	25.1 (23, 26.9)	Not Reliable
	Negative	NA	18.6 (17.8, 19.6)	19.8 (18.9, 20.7)	22.2 (21.3, 23.3)	Not Reliable
Japan	Positive	(16.6, 18.3) 17.7	17.7 (16.6, 19)	17.7 (16.6, 19)	17.7 (16.6, 19)	17.7 (16.6, 19)
	Medium	(17.6, 19.6) 17.7	19.2 (17.7, 21)	19.2 (17.7, 21.1)	19.2 (17.7, 21.1)	19.2 (17.7, 21.1)
	Negative	(15.9, 22.6) 17.7	18.5 (15.4, 21.5)	18.8 (15.8, 21.9)	19.6 (16.4, 22.7)	Not Reliable
Austria	Positive	(16, 18.2) 17.2	17.2 (16, 18.5)	17.2 (16, 18.5)	17.2 (16, 18.5)	17.2 (16, 18.5)
	Medium	(16.1, 18.1) 17.2	17.2 (16.2, 18.3)	17.2 (16.2, 18.3)	17.2 (16.2, 18.3)	17.2 (16.2, 18.3)
	Negative	(12.9, 22.2) 17.2	15.9 (12.5, 20.4)	16.3 (12.8, 20.8)	16.9 (13.4, 21.6)	Not Reliable
Iran	Positive	(182, 210) 198	202 (190, 216)	207 (194, 220)	215 (201, 229)	577 (231, 2090)
	Medium	(182, 215) 198	202 (186, 218)	207 (191, 223)	216 (199, 233)	Not Reliable
	Negative	(178, 218) 198	202 (185, 218)	206 (189, 224)	217 (198, 235)	Not Reliable

Table 3. Predictions for the number of total deaths (in thousands) at four time horizons (1-day, 3-day, 7-day and end of the outbreak) and for various countries/regions, based on the Generalised Richards model [1]. The values in parentheses are 80% prediction intervals based on 500 simulations using a negative binomial error structure. "Not reliable" is declared if more than 10% of the simulations produce extreme numbers (larger than total population). Note that there can be a large variation in reporting standard between countries. In the UK, it is made clear that reported deaths are for hospital deaths only and do not include deaths in the community[6]. Similarly, data for Belgium is allegedly being revised to account for community deaths.

Country	Scenario*	Today's validation	20-Jun	22-Jun	26-Jun	Final Total Confirmed
Europe	Positive	(173, 203) 194	190 (184, 197)	191 (184, 197)	191 (185, 198)	193 (187, 200)
	Medium	(181, 191) 194	194 (178, 211)	194 (178, 211)	194 (178, 211)	194 (178, 211)
	Negative	(143, 245) 194	178 (136, 231)	182 (140, 238)	192 (147, 251)	Not Reliable
United States	Positive	(110, 125) 118	120 (112, 126)	120 (113, 127)	121 (114, 128)	126 (118, 134)
	Medium	(111, 123) 118	119 (113, 125)	120 (114, 126)	121 (115, 127)	127 (120, 134)
	Negative	(101, 143) 118	114 (96.7, 133)	118 (99.3, 137)	124 (105, 145)	Not Reliable
Brazil	Positive	(44.3, 49.4) 47.7	48.4 (46.2, 50.3)	50.3 (48.1, 52.3)	54 (51.3, 56.2)	83.2 (72.1, 106)
	Medium	(44.9, 50) 47.7	47.9 (46, 50.1)	49.9 (47.6, 52.1)	53.5 (50.9, 56.1)	87.8 (64.2, 135)
	Negative	(47.7, 52.8) 47.7	49.5 (46.6, 52.1)	52 (49, 54.8)	57.2 (54, 60.3)	Not Reliable
Russia	Positive	(7.74, 8.49) 7.79	7.91 (7.65, 8.2)	8.28 (8, 8.58)	9 (8.57, 9.39)	27.3 (9.28, 133)
	Medium	(7.46, 8.02) 7.79	7.89 (7.64, 8.16)	8.28 (8.02, 8.58)	9.08 (8.76, 9.42)	Not Reliable
	Negative	(7.59, 8.14) 7.79	7.97 (7.68, 8.21)	8.39 (8.07, 8.62)	9.24 (8.88, 9.5)	Not Reliable
India	Positive	(9.69, 10.9) 12.6	11.6 (10.6, 12.4)	12.9 (11.9, 13.9)	15.9 (14.6, 17.4)	Not Reliable
	Medium	(10.2, 10.9) 12.6	12.2 (11.4, 12.9)	13.5 (12.6, 14.4)	16.7 (15.2, 17.9)	Not Reliable
	Negative	(10.3, 11) 12.6	11.7 (10.9, 12.6)	13.1 (12.2, 14.1)	16.5 (15.1, 17.8)	Not Reliable
United Kingdom	Positive	(39.1, 44.1) 42.3	42 (39.3, 44.4)	42.1 (39.4, 44.6)	42.2 (39.6, 44.8)	42.8 (40.3, 45.6)
	Medium	(39.4, 43.9) 42.3	42 (39.7, 44.2)	42.2 (39.8, 44.3)	42.4 (40, 44.6)	43.2 (40.8, 45.6)
	Negative	(37.2, 50.8) 42.3	40.5 (34.7, 46.9)	41.6 (35.6, 48)	43.7 (37.3, 50.5)	Not Reliable
Spain	Positive	(26.6, 30.4) 30.2	30.1 (26.9, 33.3)	30.2 (26.9, 33.3)	30.2 (26.9, 33.4)	30.3 (26.9, 33.6)
	Medium	(29.5, 33.4) 30.2	32.8 (29.9, 35.9)	32.8 (29.9, 35.9)	32.8 (29.9, 35.9)	32.9 (30, 36)
	Negative	(9.28, 50.9) 30.2	31.3 (10.2, 72.1)	32.4 (10.4, 75.3)	34.5 (10.9, 85.4)	Not Reliable

[6] See Report (May 18, 2020): Analysis of unreported Covid 19 mortality statistics for the United Kingdom of Great Britain and Northern Ireland at https://ethz.ch/content/dam/ethz/special-interest/mtec/chair-of-entrepreneurial-risks-dam/documents/Covid-19/Reliability-reported-Covid%2019-confirmed-and-deaths_18May2020.pdf

Peru	Positive	(7.11, 7.69) 7.46	7.77 (7.53, 8)	8.13 (7.89, 8.38)	8.88 (8.47, 9.19)	29.3 (9.15, 126)
	Medium	(7.02, 7.64) 7.46	7.78 (7.53, 8.05)	8.17 (7.9, 8.46)	8.98 (8.65, 9.28)	Not Reliable
	Negative	(7.31, 7.92) 7.46	7.81 (7.54, 8.09)	8.22 (7.93, 8.5)	9.09 (8.77, 9.4)	Not Reliable
Italy	Positive	(32.9, 35.3) 34.5	34.3 (33.1, 35.4)	34.3 (33.1, 35.4)	34.4 (33.2, 35.5)	34.5 (33.3, 35.7)
	Medium	(33.4, 35.1) 34.5	34.3 (33.4, 35.2)	34.3 (33.4, 35.2)	34.4 (33.5, 35.3)	34.7 (33.8, 35.6)
	Negative	(29.6, 39.6) 34.5	32.6 (27.4, 37.8)	33.3 (28, 38.6)	34.6 (29.1, 40.3)	Not Reliable
Chile	Positive	(3.4, 4.9) 3.84	3.9 (3.36, 4.46)	4.25 (3.65, 4.91)	4.9 (4.15, 5.85)	6.69 (5.25, 13.1)
	Medium	(3.7, 5.08) 3.84	4.2 (3.63, 4.8)	4.6 (3.99, 5.26)	5.49 (4.68, 6.47)	Not Reliable
	Negative	(3.79, 5.08) 3.84	4.09 (3.52, 4.67)	4.57 (3.88, 5.22)	5.68 (4.82, 6.58)	Not Reliable
Germany	Positive	(8.41, 9.56) 8.87	8.94 (8.39, 9.53)	8.96 (8.39, 9.54)	8.97 (8.41, 9.57)	9.03 (8.44, 9.61)
	Medium	(8.22, 9.8) 8.87	8.98 (8.43, 9.54)	8.99 (8.45, 9.55)	9 (8.46, 9.57)	9.04 (8.51, 9.61)
	Negative	(7.58, 11.3) 8.87	8.95 (7.32, 10.8)	9.17 (7.48, 11.1)	9.6 (7.83, 11.6)	Not Reliable
Turkey	Positive	(4.65, 4.89) 4.88	4.81 (4.69, 4.93)	4.82 (4.7, 4.94)	4.84 (4.72, 4.96)	4.9 (4.79, 5.03)
	Medium	(4.78, 5.24) 4.88	5.04 (4.81, 5.31)	5.05 (4.81, 5.32)	5.06 (4.81, 5.32)	5.07 (4.83, 5.34)
	Negative	(4.62, 5.67) 4.88	4.93 (4.41, 5.49)	5.05 (4.53, 5.63)	5.3 (4.74, 5.91)	Not Reliable
Mexico	Positive	(18.2, 22) 19.7	19.9 (18.8, 21.3)	21 (19.8, 22.5)	23.1 (21.1, 25.1)	40.3 (21.9, 135)
	Medium	(18.3, 21.5) 19.7	19.8 (18.6, 21.3)	21.1 (19.7, 22.7)	23.5 (21.9, 25.6)	Not Reliable
	Negative	(18.6, 21.7) 19.7	20.2 (18.9, 21.7)	21.5 (20.1, 23.1)	24.3 (22.8, 26.1)	Not Reliable
Pakistan	Positive	(2.9, 3.23) 3.23	3.42 (3.28, 3.57)	3.69 (3.52, 3.84)	4.27 (4.07, 4.45)	Not Reliable
	Medium	(3.12, 3.47) 3.23	3.2 (3.08, 3.33)	3.46 (3.32, 3.6)	4.01 (3.84, 4.21)	Not Reliable
	Negative	(2.96, 3.27) 3.23	3.21 (3.09, 3.35)	3.46 (3.34, 3.62)	4.05 (3.89, 4.23)	Not Reliable
France	Positive	(27.3, 31.5) 29.6	29.7 (28.1, 31.3)	29.7 (28.2, 31.3)	29.7 (28.2, 31.3)	29.7 (28.2, 31.4)
	Medium	(27.5, 31.3) 29.6	29.8 (27.9, 31.7)	29.8 (27.9, 31.7)	29.8 (28, 31.7)	29.8 (28, 31.7)
	Negative	(21.3, 39.1) 29.6	27.9 (20.3, 37)	28.5 (20.8, 37.8)	30 (22.1, 39.7)	Not Reliable
Saudi Arabia	Positive	(1.04, 1.16) 1.14	1.15 (1.1, 1.19)	1.25 (1.2, 1.3)	1.47 (1.41, 1.54)	Not Reliable
	Medium	(1.08, 1.19) 1.14	1.15 (1.11, 1.2)	1.26 (1.21, 1.3)	1.48 (1.42, 1.55)	Not Reliable
	Negative	(1.09, 1.2) 1.14	1.15 (1.11, 1.19)	1.26 (1.21, 1.3)	1.49 (1.43, 1.55)	Not Reliable
Canada	Positive	(7.86, 8.89) 8.3	8.43 (7.94, 8.95)	8.49 (8, 9.01)	8.6 (8.1, 9.12)	9.02 (8.45, 9.63)

	Medium	(7.93, 8.83) 8.3	8.38 (7.95, 8.82)	8.45 (8.01, 8.88)	8.56 (8.12, 9)	9.09 (8.57, 9.64)
	Negative	(7.52, 10.5) 8.3	8.45 (6.89, 10)	8.68 (7.1, 10.3)	9.14 (7.53, 10.9)	Not Reliable
Qatar	Positive	(0.076, 0.17) 0.086	0.108 (0.083, 0.182)	0.114 (0.087, 0.19)	0.126 (0.093, 0.203)	Not Reliable
	Medium	(0.082, 0.116) 0.086	0.097 (0.085, 0.109)	0.102 (0.09, 0.116)	0.114 (0.099, 0.131)	Not Reliable
	Negative	(0.085, 0.122) 0.086	0.096 (0.084, 0.11)	0.104 (0.09, 0.119)	0.118 (0.101, 0.138)	Not Reliable
Belgium	Positive	(9.12, 10.1) 9.68	9.67 (9.26, 10.2)	9.68 (9.26, 10.2)	9.68 (9.26, 10.2)	9.69 (9.27, 10.2)
	Medium	(9.18, 10.1) 9.68	9.69 (9.04, 10.3)	9.69 (9.04, 10.3)	9.69 (9.04, 10.3)	9.69 (9.04, 10.3)
	Negative	(8.17, 12.1) 9.68	9.2 (7.01, 11.8)	9.42 (7.18, 12.1)	9.82 (7.59, 12.6)	Not Reliable
Sweden	Positive	(4, 5.91) 5.05	5.07 (4.19, 6.02)	5.11 (4.22, 6.07)	5.17 (4.28, 6.17)	5.58 (4.47, 7.84)
	Medium	(4.09, 5.96) 5.05	5.12 (4.18, 6.12)	5.16 (4.21, 6.19)	5.24 (4.26, 6.28)	5.88 (4.63, 7.89)
	Negative	(4.33, 6.24) 5.05	5.11 (4.27, 6.12)	5.25 (4.37, 6.28)	5.52 (4.62, 6.62)	Not Reliable
Netherlands	Positive	(5.81, 6.45) 6.08	6.1 (5.82, 6.43)	6.11 (5.83, 6.43)	6.12 (5.84, 6.45)	6.14 (5.86, 6.47)
	Medium	(5.8, 6.44) 6.08	6.14 (5.84, 6.47)	6.14 (5.85, 6.47)	6.15 (5.86, 6.49)	6.19 (5.9, 6.53)
	Negative	(5.12, 7.89) 6.08	6.13 (4.88, 7.61)	6.26 (4.99, 7.8)	6.54 (5.21, 8.13)	Not Reliable
Portugal	Positive	(1.51, 1.64) 1.52	1.57 (1.49, 1.64)	1.58 (1.5, 1.65)	1.59 (1.51, 1.66)	1.67 (1.58, 1.76)
	Medium	(1.77, 2.13) 1.52	1.93 (1.78, 2.1)	1.93 (1.78, 2.11)	1.94 (1.79, 2.12)	1.97 (1.81, 2.16)
	Negative	(1.54, 1.81) 1.52	1.55 (1.32, 1.77)	1.58 (1.36, 1.82)	1.66 (1.42, 1.9)	Not Reliable
Argentina	Positive	(0.826, 1.02) 0.929	0.948 (0.872, 1.04)	1 (0.916, 1.1)	1.11 (1.01, 1.22)	Not Reliable
	Medium	(0.786, 0.956) 0.929	0.913 (0.84, 0.992)	0.96 (0.884, 1.04)	1.05 (0.969, 1.15)	Not Reliable
	Negative	(0.809, 0.966) 0.929	0.914 (0.842, 0.987)	0.961 (0.89, 1.04)	1.06 (0.984, 1.15)	Not Reliable
Switzerland	Positive	(1.82, 2.12) 1.68	1.72 (1.55, 1.92)	1.72 (1.55, 1.92)	1.73 (1.56, 1.92)	1.73 (1.56, 1.92)
	Medium	(1.81, 2.24) 1.68	1.73 (1.57, 1.93)	1.73 (1.57, 1.93)	1.74 (1.57, 1.93)	1.74 (1.58, 1.94)
	Negative	(1.76, 3.26) 1.68	2.07 (1.6, 2.57)	2.11 (1.63, 2.63)	2.22 (1.71, 2.76)	Not Reliable
Philippines	Positive	(1.02, 1.2) 1.12	1.15 (1.07, 1.24)	1.17 (1.08, 1.25)	1.19 (1.1, 1.28)	1.43 (1.26, 1.71)
	Medium	(1.22, 1.77) 1.12	1.54 (1.31, 1.99)	1.54 (1.32, 2.01)	1.56 (1.33, 2.03)	1.7 (1.42, 2.26)
	Negative	(1.04, 1.26) 1.12	1.14 (1.05, 1.25)	1.16 (1.07, 1.28)	1.22 (1.12, 1.33)	Not Reliable
Afghanistan	Positive	(0.426, 0.673) 0.546	0.56 (0.483, 0.642)	0.601 (0.521, 0.689)	0.696 (0.591, 0.806)	Not Reliable
	Medium	(0.469, 0.657) 0.546	0.565 (0.466, 0.692)	0.606 (0.503, 0.738)	0.703 (0.572, 0.855)	Not Reliable

	Negative	(0.472, 0.657) 0.546	0.553 (0.474, 0.639)	0.595 (0.511, 0.692)	0.696 (0.594, 0.809)	Not Reliable
Oman	Positive	(0.094, 0.12) 0.119	0.132 (0.116, 0.148)	0.138 (0.121, 0.155)	0.147 (0.128, 0.168)	0.174 (0.139, 0.449)
	Medium	(0.095, 0.127) 0.119	0.3 (0.1, 5.09)	0.306 (0.104, 5.09)	0.318 (0.108, 5.11)	0.505 (0.115, 5.33)
	Negative	(0.105, 0.167) 0.119	0.13 (0.115, 0.147)	0.14 (0.122, 0.159)	0.159 (0.137, 0.184)	Not Reliable
Iraq	Positive	NA	1.15 (1.01, 1.29)	1.24 (1.08, 1.38)	1.4 (1.16, 1.65)	2.81 (1.19, 11.4)
	Medium	NA	1.15 (0.997, 1.3)	1.25 (1.09, 1.43)	1.48 (1.29, 1.72)	Not Reliable
	Negative	NA	1.14 (1.01, 1.3)	1.25 (1.1, 1.42)	1.5 (1.32, 1.72)	Not Reliable
Ireland	Positive	(1.56, 1.85) 1.71	1.72 (1.58, 1.87)	1.72 (1.58, 1.87)	1.72 (1.58, 1.87)	1.72 (1.58, 1.88)
	Medium	(1.55, 1.87) 1.71	1.71 (1.56, 1.85)	1.71 (1.57, 1.86)	1.72 (1.57, 1.86)	1.72 (1.57, 1.86)
	Negative	(1.59, 2.35) 1.71	1.84 (1.5, 2.29)	1.89 (1.53, 2.35)	1.98 (1.61, 2.47)	Not Reliable
Dominican Republic	Positive	(0.557, 0.674) 0.635	0.674 (0.611, 0.746)	0.685 (0.62, 0.761)	0.708 (0.638, 0.786)	1.21 (0.73, 12.5)
	Medium	(0.684, 1.41) 0.635	0.671 (0.608, 0.739)	0.683 (0.619, 0.753)	0.706 (0.639, 0.782)	1.48 (0.929, 10.9)
	Negative	(0.584, 0.713) 0.635	0.671 (0.6, 0.746)	0.686 (0.614, 0.764)	0.719 (0.643, 0.801)	Not Reliable
Panama	Positive	(nan, nan) 0.475	0.483 (0.468, 0.504)	0.499 (0.48, 0.521)	0.528 (0.5, 0.561)	1.29 (0.526, 5.02)
	Medium	(0.216, 35.8) 0.475	0.483 (0.467, 0.502)	0.499 (0.481, 0.521)	0.533 (0.506, 0.561)	Not Reliable
	Negative	(0.51, 0.794) 0.475	0.484 (0.466, 0.501)	0.501 (0.48, 0.521)	0.535 (0.509, 0.563)	Not Reliable
Bolivia	Positive	NA	0.712 (0.633, 0.796)	0.757 (0.671, 0.851)	0.853 (0.74, 0.97)	Not Reliable
	Medium	NA	0.71 (0.655, 0.769)	0.758 (0.698, 0.825)	0.853 (0.781, 0.939)	Not Reliable
	Negative	NA	0.714 (0.657, 0.781)	0.768 (0.703, 0.84)	0.886 (0.797, 0.972)	Not Reliable
Israel	Positive	(0.297, 0.359) 0.303	0.327 (0.296, 0.361)	0.328 (0.297, 0.363)	0.331 (0.298, 0.366)	0.345 (0.304, 0.397)
	Medium	(0.384, 5.97) 0.303	0.839 (0.416, 5.97)	0.84 (0.416, 5.97)	0.842 (0.417, 5.97)	0.854 (0.422, 5.99)
	Negative	(0.341, 0.456) 0.303	0.38 (0.334, 0.439)	0.389 (0.342, 0.451)	0.409 (0.358, 0.475)	Not Reliable
Armenia	Positive	NA	0.317 (0.257, 0.621)	0.331 (0.269, 0.643)	0.358 (0.287, 0.695)	0.425 (0.312, 2.16)
	Medium	NA	0.317 (0.295, 0.342)	0.334 (0.31, 0.362)	0.366 (0.335, 0.402)	Not Reliable
	Negative	NA	0.316 (0.293, 0.342)	0.337 (0.311, 0.367)	0.381 (0.348, 0.418)	Not Reliable
Nigeria	Positive	NA	0.623 (0.499, 0.892)	0.645 (0.518, 0.919)	0.693 (0.557, 0.973)	Not Reliable
	Medium	NA	0.489 (0.432, 0.554)	0.512 (0.452, 0.577)	0.555 (0.482, 0.624)	Not Reliable
	Negative	NA	0.491 (0.435, 0.551)	0.514 (0.454, 0.577)	0.562 (0.495, 0.632)	Not Reliable

Japan	Positive	(0.886, 1.1) 0.935	0.995 (0.896, 1.11)	0.998 (0.897, 1.12)	1 (0.899, 1.12)	1.01 (0.902, 1.13)
	Medium	(0.913, 1.14) 0.935	1.02 (0.908, 1.12)	1.02 (0.911, 1.12)	1.03 (0.917, 1.13)	1.04 (0.929, 1.14)
	Negative	(0.92, 1.32) 0.935	1.03 (0.863, 1.22)	1.06 (0.886, 1.25)	1.11 (0.933, 1.32)	Not Reliable
Austria	Positive	(0.614, 0.769) 0.688	0.696 (0.616, 0.767)	0.696 (0.617, 0.768)	0.698 (0.617, 0.769)	0.7 (0.617, 0.772)
	Medium	(0.631, 0.818) 0.688	0.72 (0.634, 0.826)	0.72 (0.634, 0.826)	0.72 (0.634, 0.826)	0.721 (0.634, 0.827)
	Negative	(0.677, 1.06) 0.688	0.813 (0.649, 0.993)	0.833 (0.665, 1.02)	0.873 (0.695, 1.06)	Not Reliable
Iran	Positive	(8.32, 9.21) 9.27	9.36 (8.87, 9.88)	9.42 (8.93, 9.95)	9.55 (9.06, 10.1)	10.7 (10, 11.5)
	Medium	(8.42, 9.2) 9.27	9.4 (8.92, 9.89)	9.47 (8.99, 9.97)	9.6 (9.1, 10.1)	10.8 (10.1, 11.7)
	Negative	(8.38, 10.1) 9.27	9.38 (8.68, 10.2)	9.57 (8.84, 10.4)	9.92 (9.18, 10.7)	Not Reliable

* Note:

-The scenarios are based on the final total confirmed numbers. On April 11, 2020, we introduced the Generalized Richards Model in addition to our existing three models: Generalized Logistic Model, Logistic Model and Generalized Growth model (see [1] for their presentation). We remove the lowest mean predicted final total confirmed number K among the four models (which is a classical statistical method ensuring robustness). Then, the model with the second lowest mean predicted final total confirmed number K is classified as the positive scenario, and the third lowest 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 have largely deviated from a typical logistic type growth (S curve), and can't be properly described by our models. Although we still report its calibration results in Table 1, they should not be taken as reliable in all scenarios and time horizons. This is probably a result of unreliable reported data from Iran.

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 limited fraction of the population has been tested in many countries. 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.

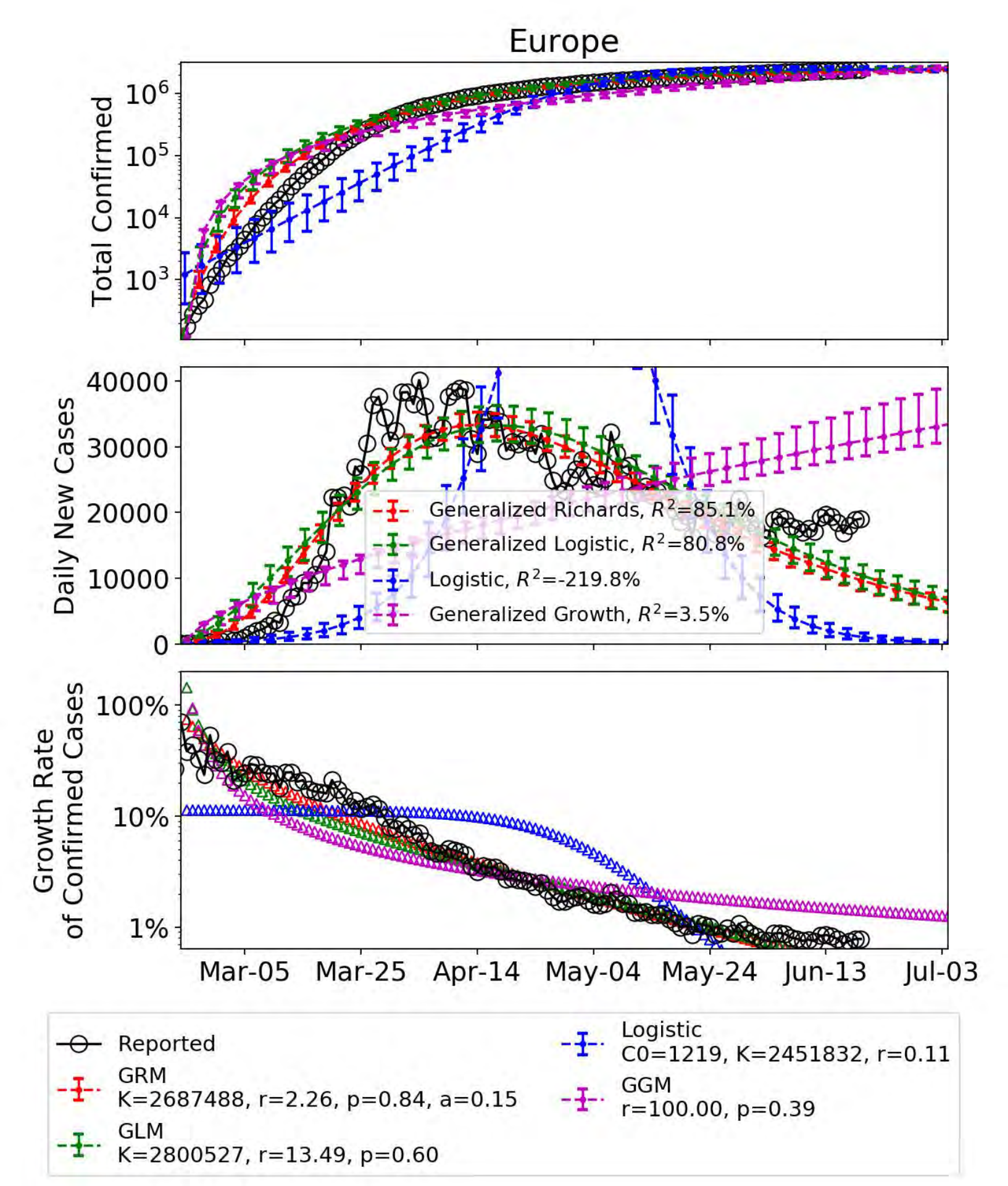
One final complication is the fact that tests are conducted sequentially over time. They do not represent a snapshot of a day in time. Many of those tested early, giving a negative result, may today get a positive result. And many, who tested positive early on, may today be cured.

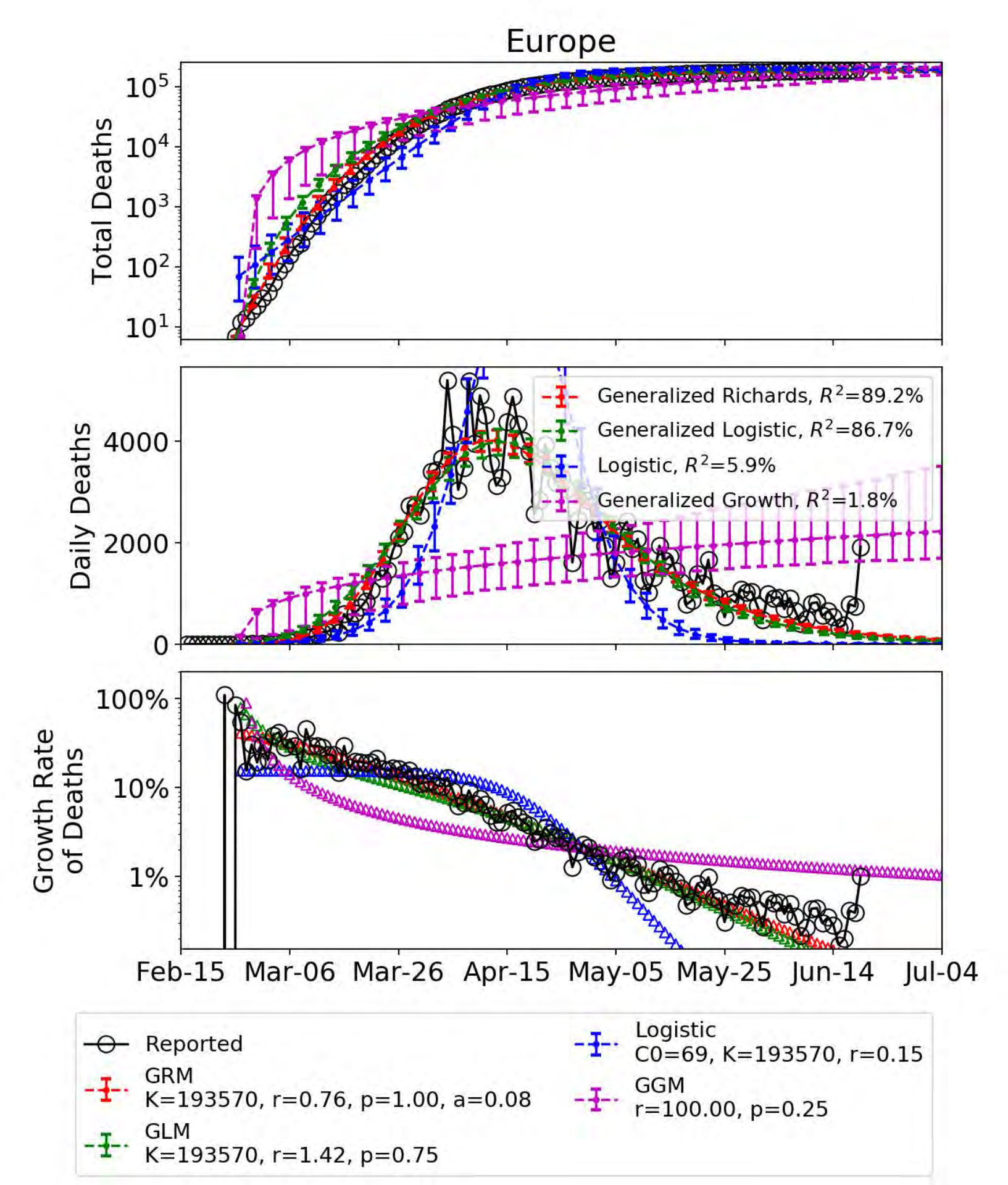
We anticipate that, over time, our methodology will improve and will provide a more accurate picture of the true levels of infection and where they are headed.

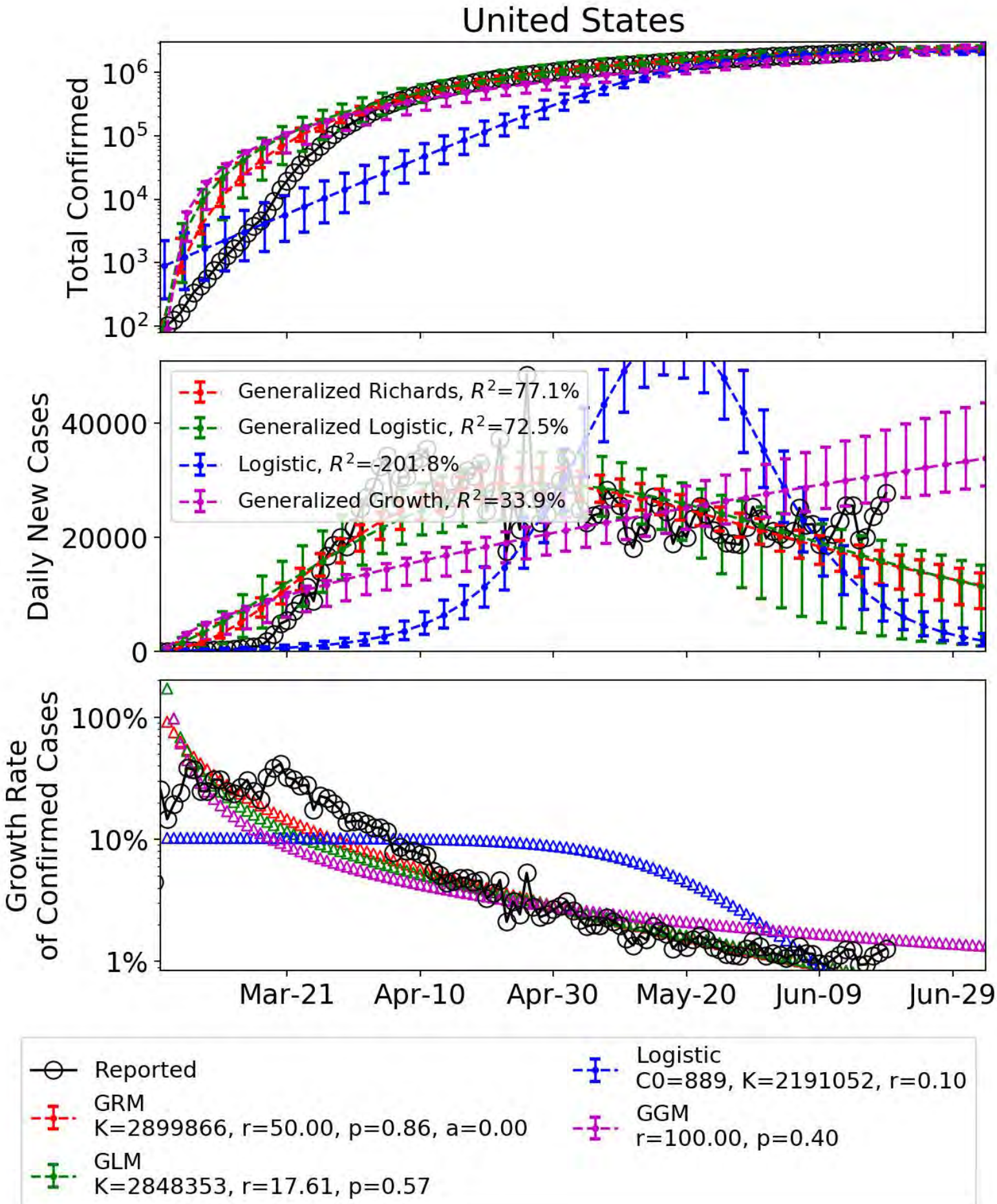
[1] Ke Wu, Didier Darcet, Qian Wang and Didier Sornette, Generalized logistic growth modeling of the COVID-19 outbreak in 29 provinces in China and in the rest of the world, preprint at http://arxiv.org/abs/2003.05681 and medRxiv: https://medrxiv.org/cgi/content/short/2020.03.11.20034363v1

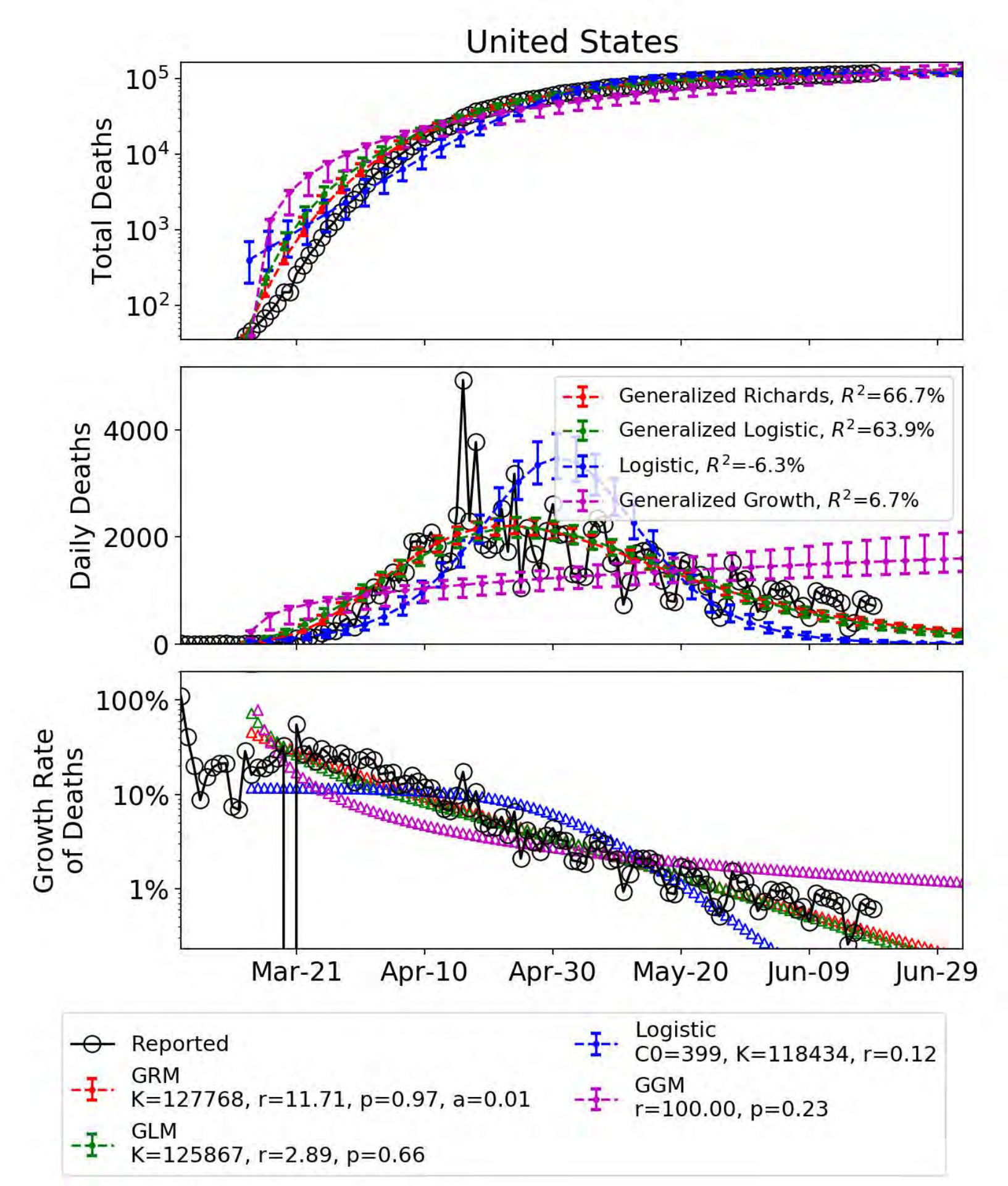
[2] https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases

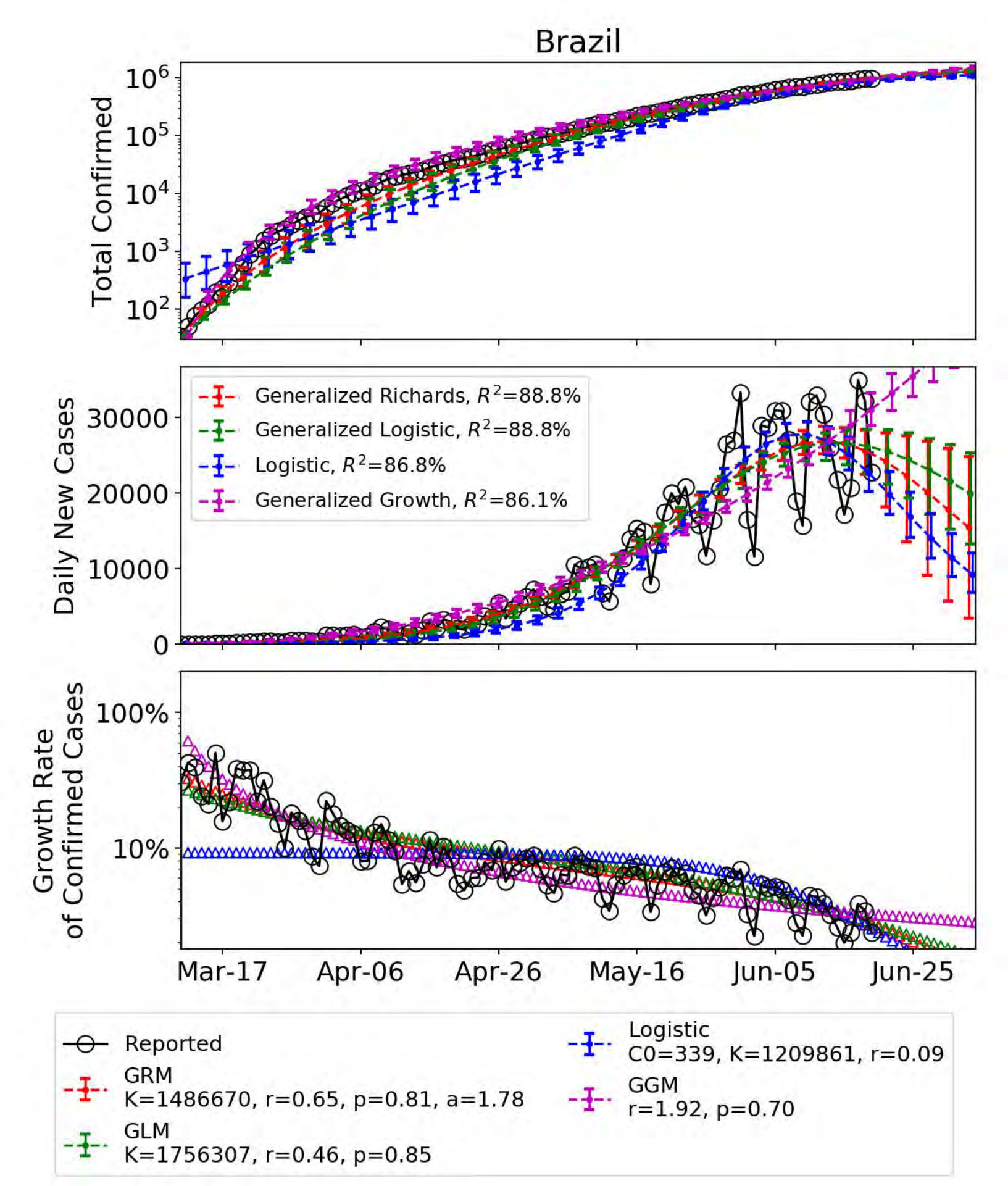
[3] https://en.wikipedia.org/wiki/COVID-19_testing

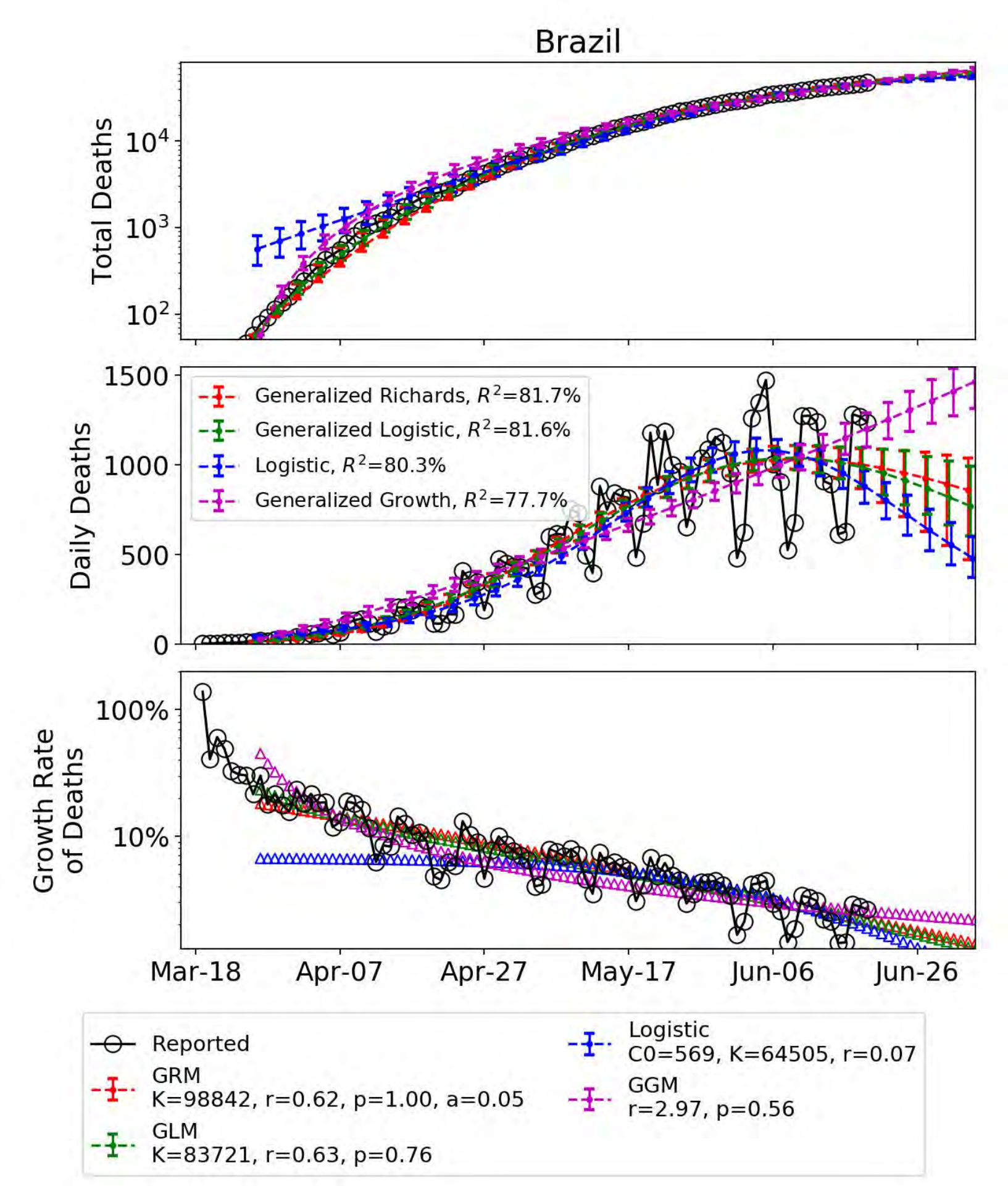

Europe
Total Confirmed
10^6
10^5
10^4
10^3
Daily New Cases
40000
30000
20000
10000
0
Generalized Richards, R^2=85.1%
Generalized Logistic, R^2=80.8%
Logistic, R^2=-219.8%
Generalized Growth, R^2=3.5%
Growth Rate of Confirmed Cases
100%
10%
1%
Mar-05
Mar-25
Apr-14
May-04
May-24
Jun-13
Jul-03
Reported
GRM
K=2687488, r=2.26, p=0.84, a=0.15
GLM
K=2800527, r=13.49, p=0.60
Logistic
C0=1219, K=2451832, r=0.11
GGM
r=100.00, p=0.39

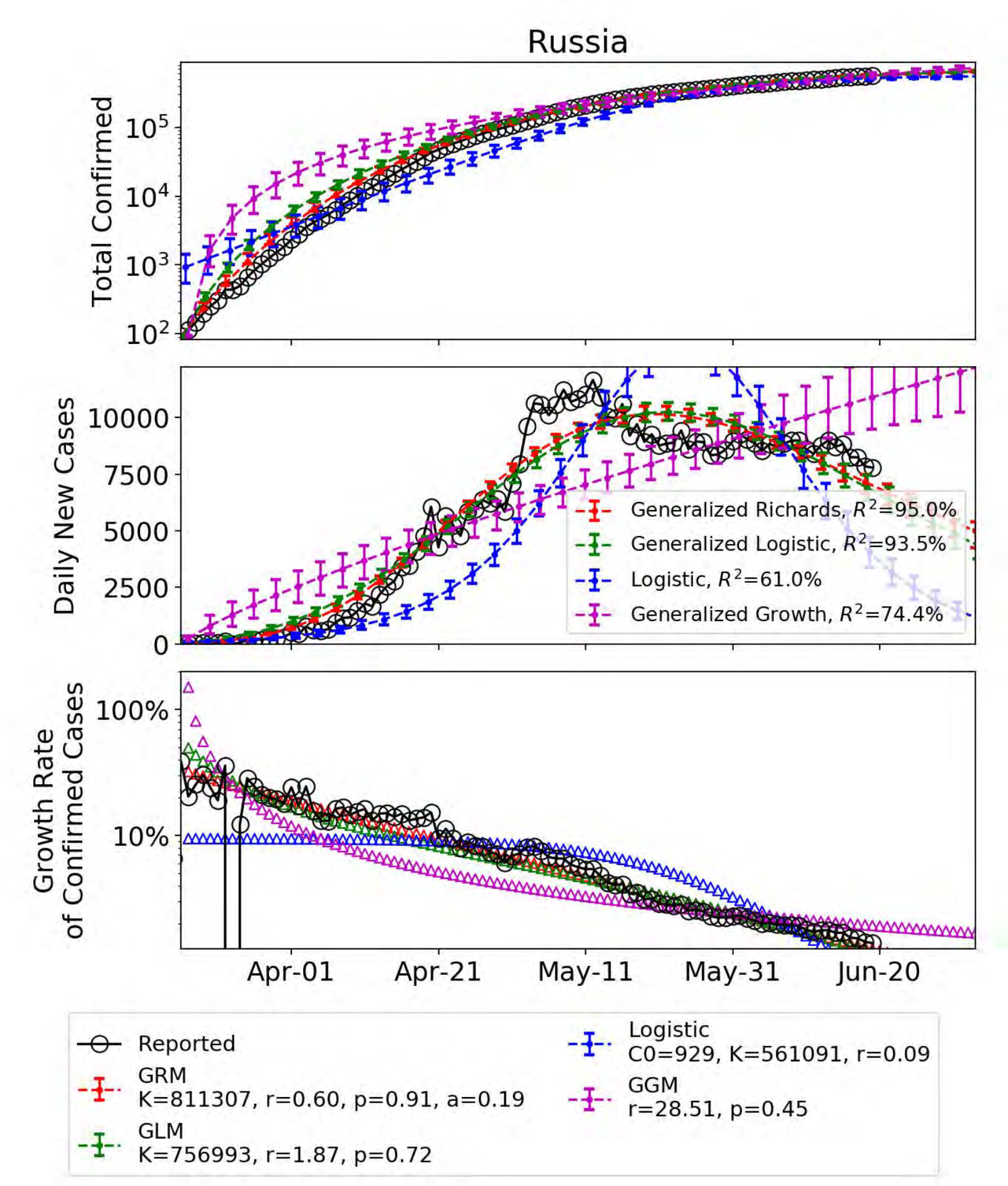

Europe
Total Deaths
10^5
10^4
10^3
10^2
10^1
Daily Deaths
4000
2000
0
Generalized Richards, R^2=89.2%
Generalized Logistic, R^2=86.7%
Logistic, R^2=5.9%
Generalized Growth, R^2=1.8%
Growth Rate of Deaths
100%
10%
1%
Feb-15
Mar-06
Mar-26
Apr-15
May-05
May-25
Jun-14
Jul-04
Reported
GRM
K=193570, r=0.76, p=1.00, a=0.08
GLM
K=193570, r=1.42, p=0.75
Logistic
C0=69, K=193570, r=0.15
GGM
r=100.00, p=0.25

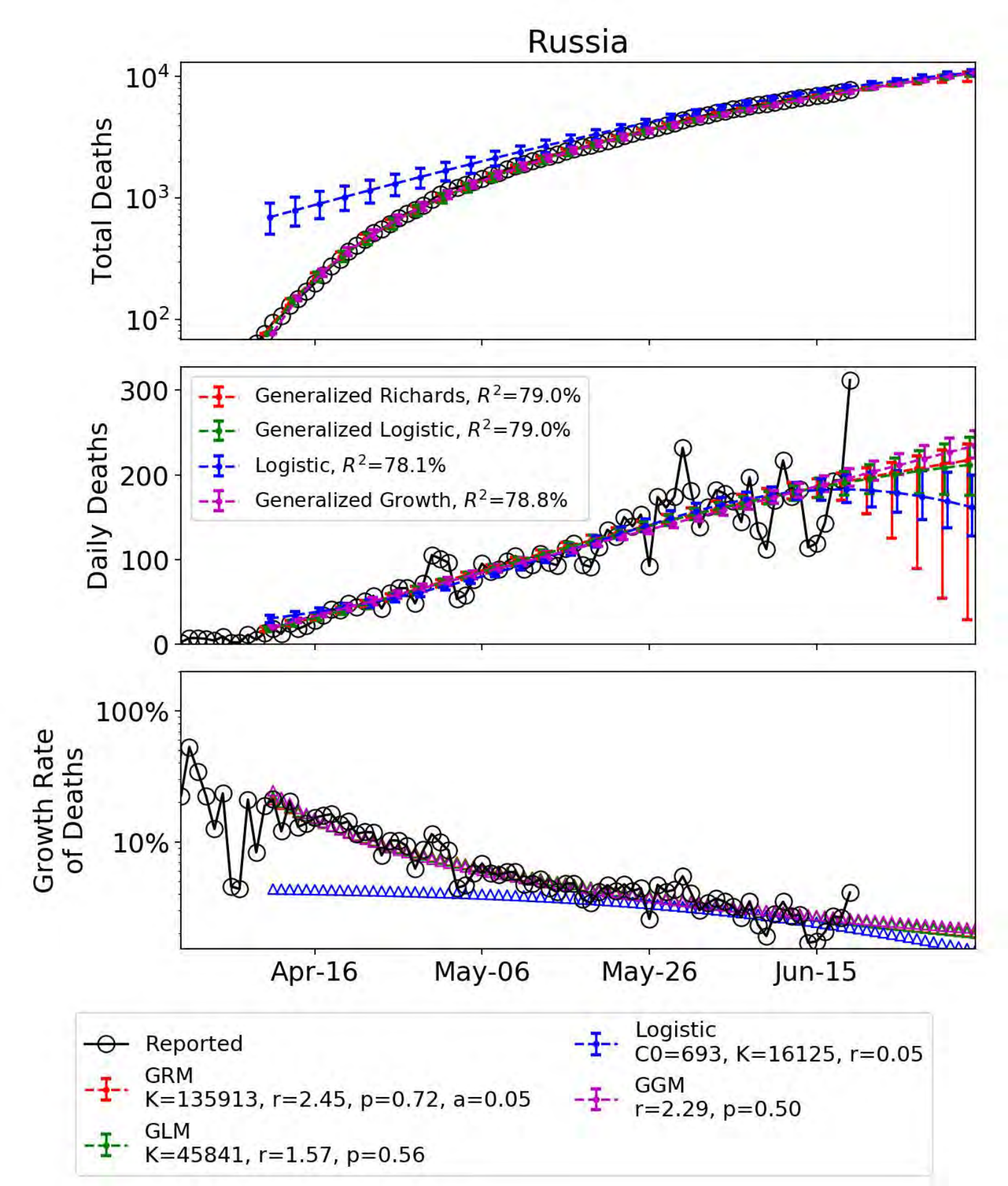

United States
Total Confirmed
10^6
10^5
10^4
10^3
10^2
Daily New Cases
40000
20000
0
Generalized Richards, R^2=77.1%
Generalized Logistic, R^2=72.5%
Logistic, R^2=-201.8%
Generalized Growth, R^2=33.9%
Growth Rate
of Confirmed Cases
100%
10%
1%
Mar-21
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=2899866, r=50.00, p=0.86, a=0.00
GLM
K=2848353, r=17.61, p=0.57
Logistic
C0=889, K=2191052, r=0.10
GGM
r=100.00, p=0.40

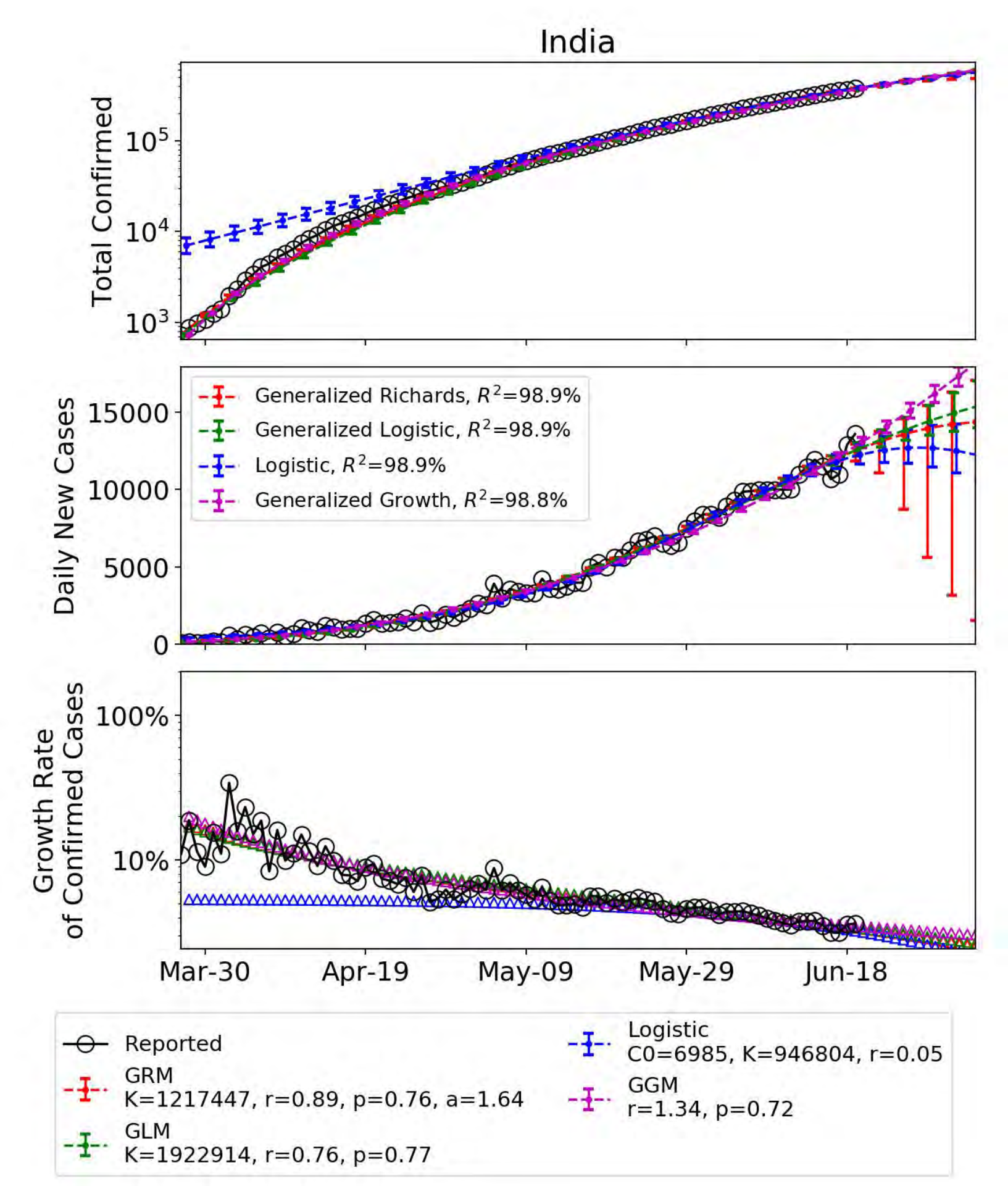

United States
Total Deaths
10^5
10^4
10^3
10^2
Daily Deaths
4000
2000
0
Generalized Richards, R^2=66.7%
Generalized Logistic, R^2=63.9%
Logistic, R^2=-6.3%
Generalized Growth, R^2=6.7%
Growth Rate of Deaths
100%
10%
1%
Mar-21
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=127768, r=11.71, p=0.97, a=0.01
GLM
K=125867, r=2.89, p=0.66
Logistic
C0=399, K=118434, r=0.12
GGM
r=100.00, p=0.23

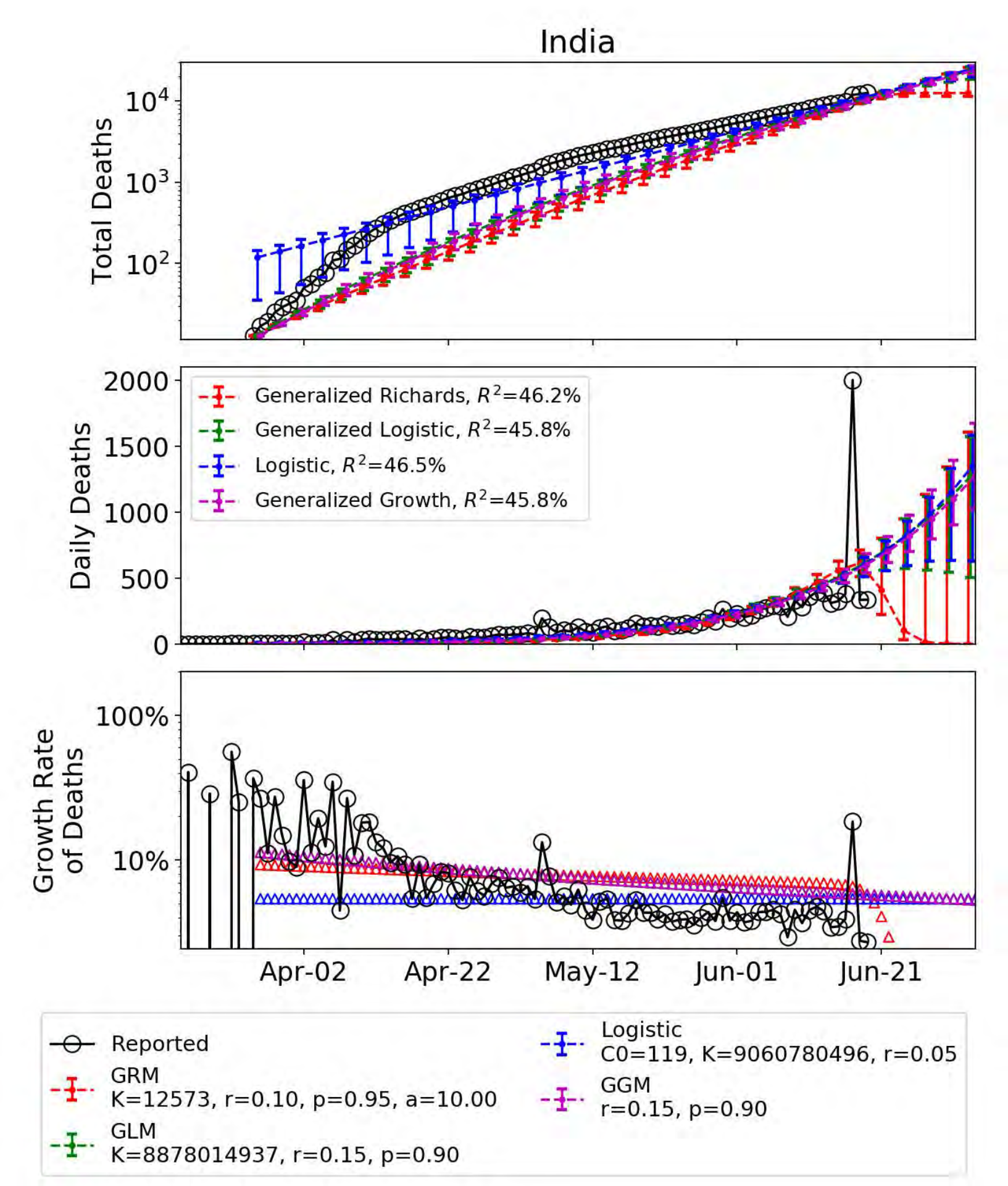

Brazil
Total Confirmed
10^6
10^5
10^4
10^3
10^2
Daily New Cases
30000
20000
10000
0
Generalized Richards, R^2=88.8%
Generalized Logistic, R^2=88.8%
Logistic, R^2=86.8%
Generalized Growth, R^2=86.1%
Growth Rate
of Confirmed Cases
100%
10%
Mar-17
Apr-06
Apr-26
May-16
Jun-05
Jun-25
Reported
GRM
K=1486670, r=0.65, p=0.81, a=1.78
GLM
K=1756307, r=0.46, p=0.85
Logistic
C0=339, K=1209861, r=0.09
GGM
r=1.92, p=0.70

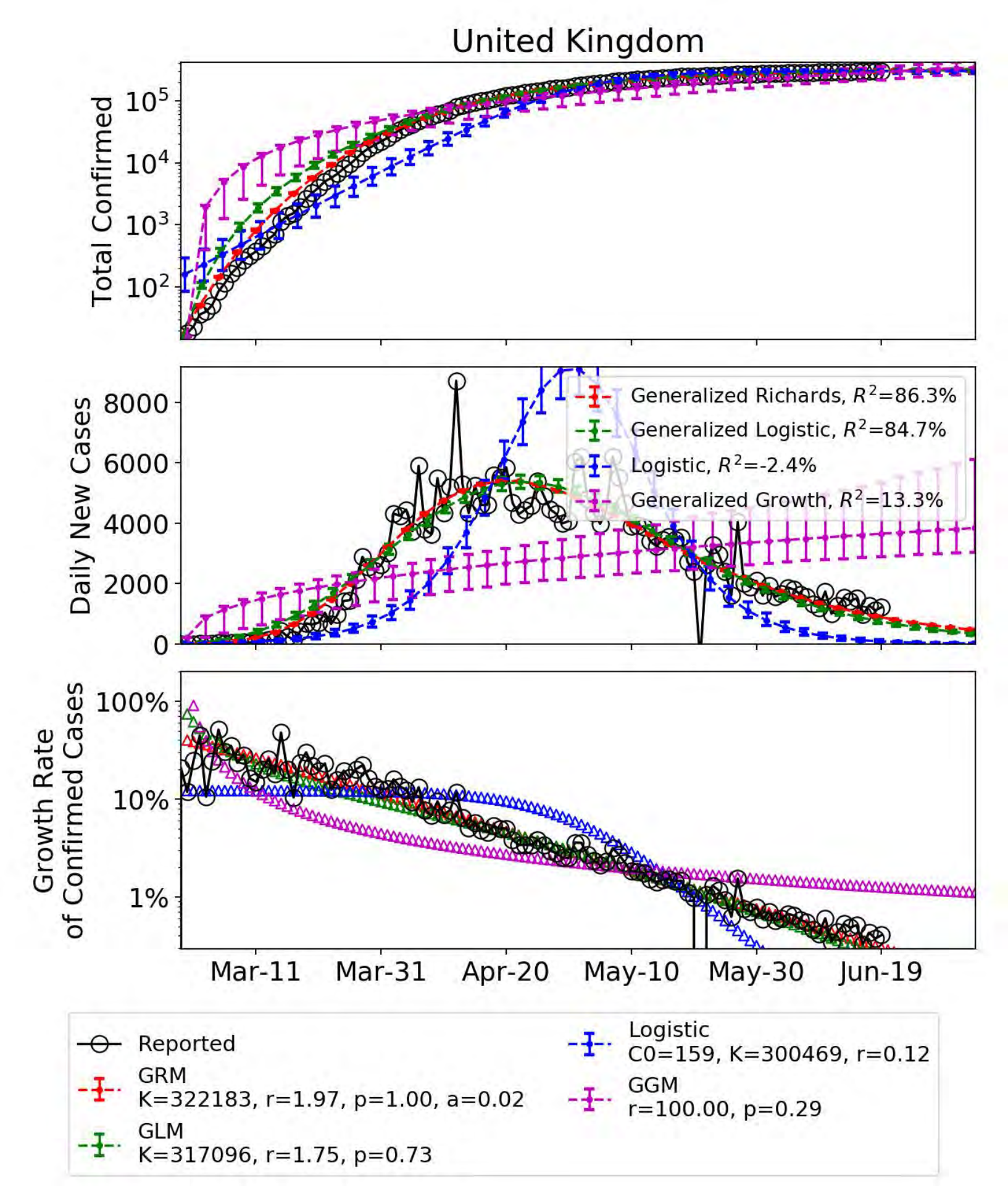

Brazil
Total Deaths
10^4
10^3
10^2
Daily Deaths
1500
1000
500
0
Generalized Richards, R^2=81.7%
Generalized Logistic, R^2=81.6%
Logistic, R^2=80.3%
Generalized Growth, R^2=77.7%
Growth Rate of Deaths
100%
10%
Mar-18
Apr-07
Apr-27
May-17
Jun-06
Jun-26
Reported
GRM
K=98842, r=0.62, p=1.00, a=0.05
GLM
K=83721, r=0.63, p=0.76
Logistic
C0=569, K=64505, r=0.07
GGM
r=2.97, p=0.56

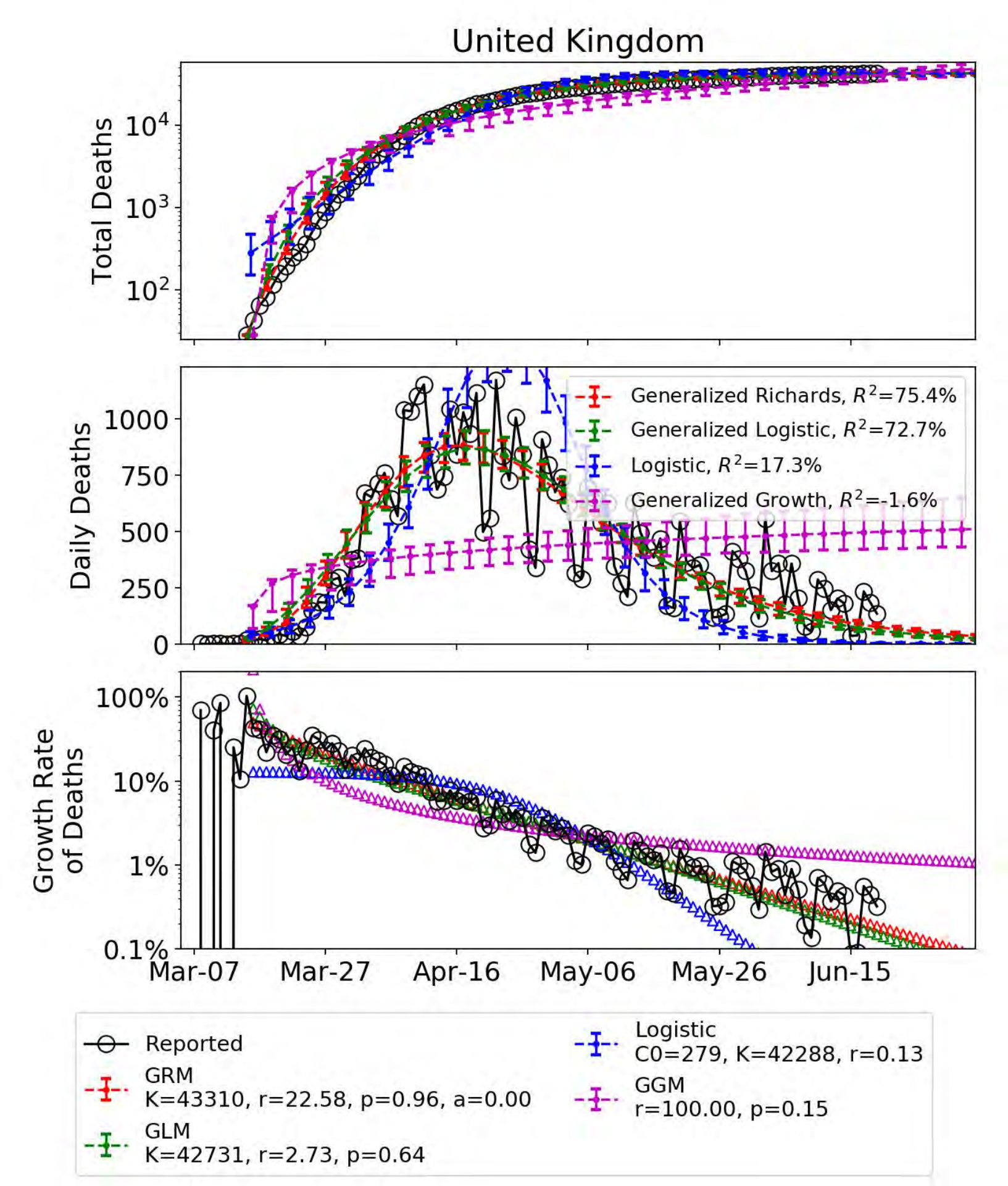

Russia
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
10000
7500
5000
2500
0
Generalized Richards, R^2=95.0%
Generalized Logistic, R^2=93.5%
Logistic, R^2=61.0%
Generalized Growth, R^2=74.4%
Growth Rate
of Confirmed Cases
100%
10%
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=811307, r=0.60, p=0.91, a=0.19
GLM
K=756993, r=1.87, p=0.72
Logistic
C0=929, K=561091, r=0.09
GGM
r=28.51, p=0.45

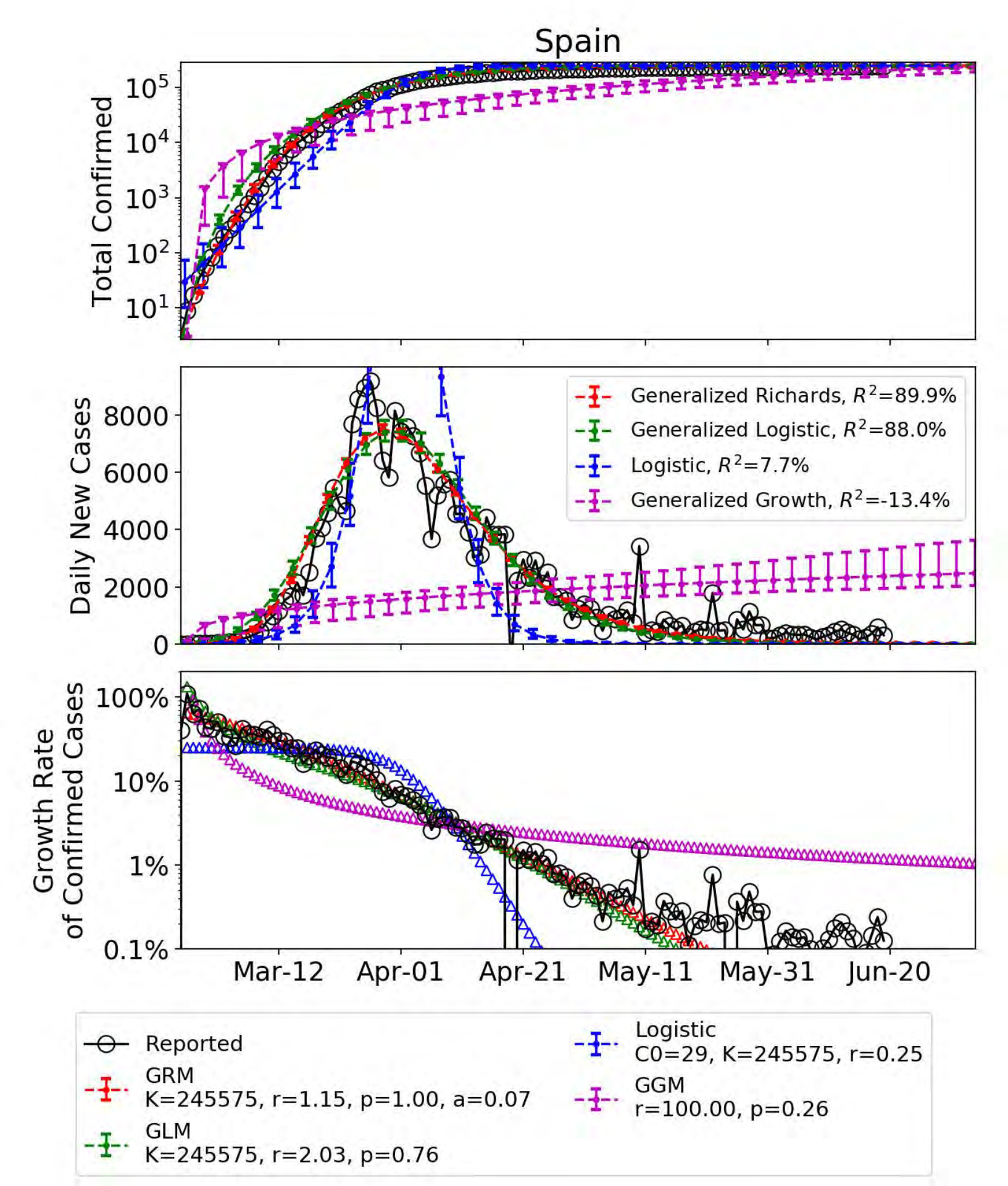

Russia
Total Deaths
10^4
10^3
10^2
Daily Deaths
300
200
100
0
Generalized Richards, R^2=79.0%
Generalized Logistic, R^2=79.0%
Logistic, R^2=78.1%
Generalized Growth, R^2=78.8%
Growth Rate of Deaths
100%
10%
Apr-16
May-06
May-26
Jun-15
Reported
GRM
K=135913, r=2.45, p=0.72, a=0.05
GLM
K=45841, r=1.57, p=0.56
Logistic
C0=693, K=16125, r=0.05
GGM
r=2.29, p=0.50

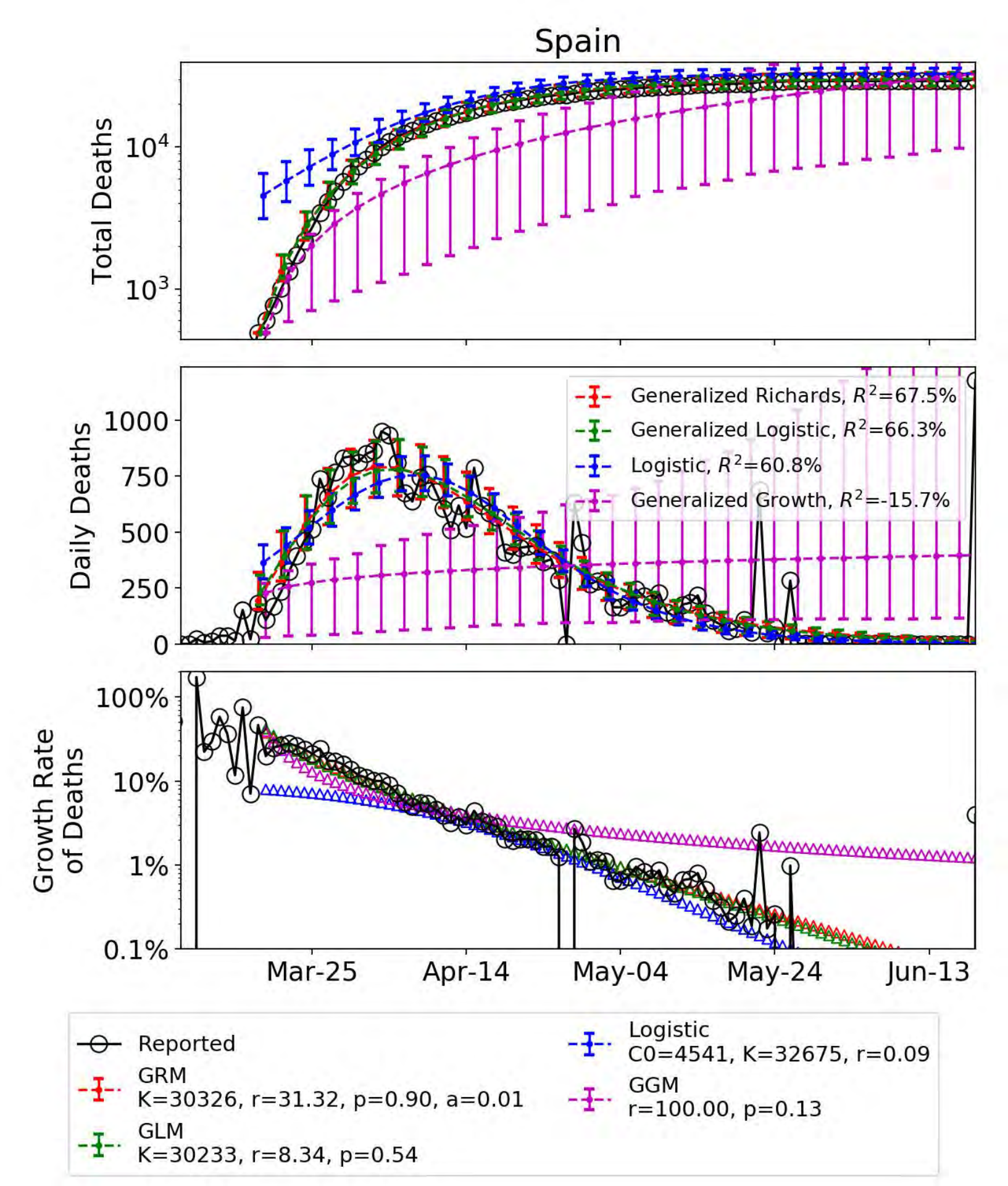

India
Total Confirmed
10^5
10^4
10^3
Daily New Cases
15000
10000
5000
0
Generalized Richards, R^2=98.9%
Generalized Logistic, R^2=98.9%
Logistic, R^2=98.9%
Generalized Growth, R^2=98.8%
Growth Rate
of Confirmed Cases
100%
10%
Mar-30
Apr-19
May-09
May-29
Jun-18
Reported
GRM
K=1217447, r=0.89, p=0.76, a=1.64
GLM
K=1922914, r=0.76, p=0.77
Logistic
C0=6985, K=946804, r=0.05
GGM
r=1.34, p=0.72

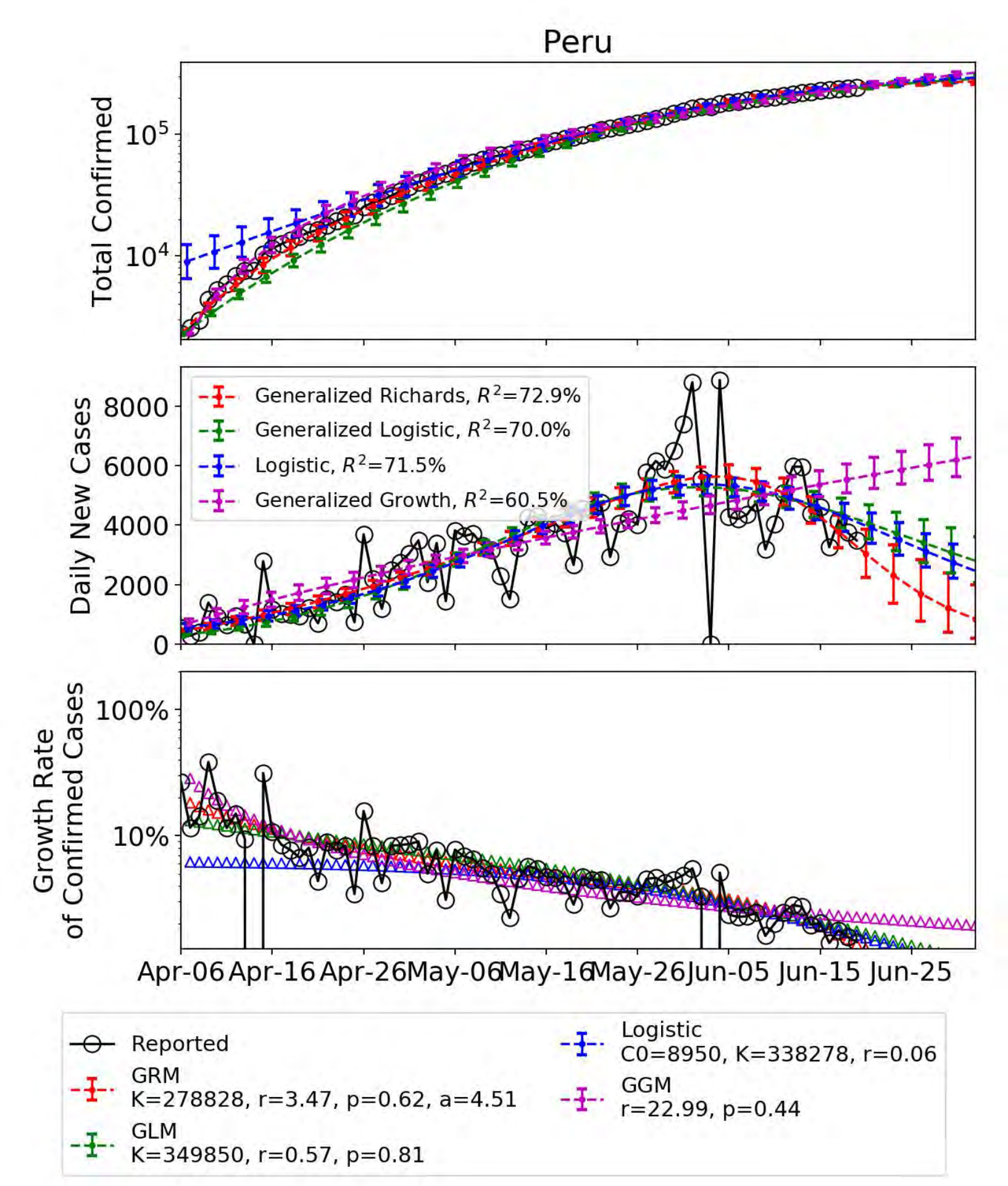

India
Total Deaths
10^4
10^3
10^2
Daily Deaths
2000
1500
1000
500
0
Generalized Richards, R^2=46.2%
Generalized Logistic, R^2=45.8%
Logistic, R^2=46.5%
Generalized Growth, R^2=45.8%
Growth Rate of Deaths
100%
10%
Apr-02
Apr-22
May-12
Jun-01
Jun-21
Reported
GRM
K=12573, r=0.10, p=0.95, a=10.00
GLM
K=8878014937, r=0.15, p=0.90
Logistic
C0=119, K=9060780496, r=0.05
GGM
r=0.15, p=0.90

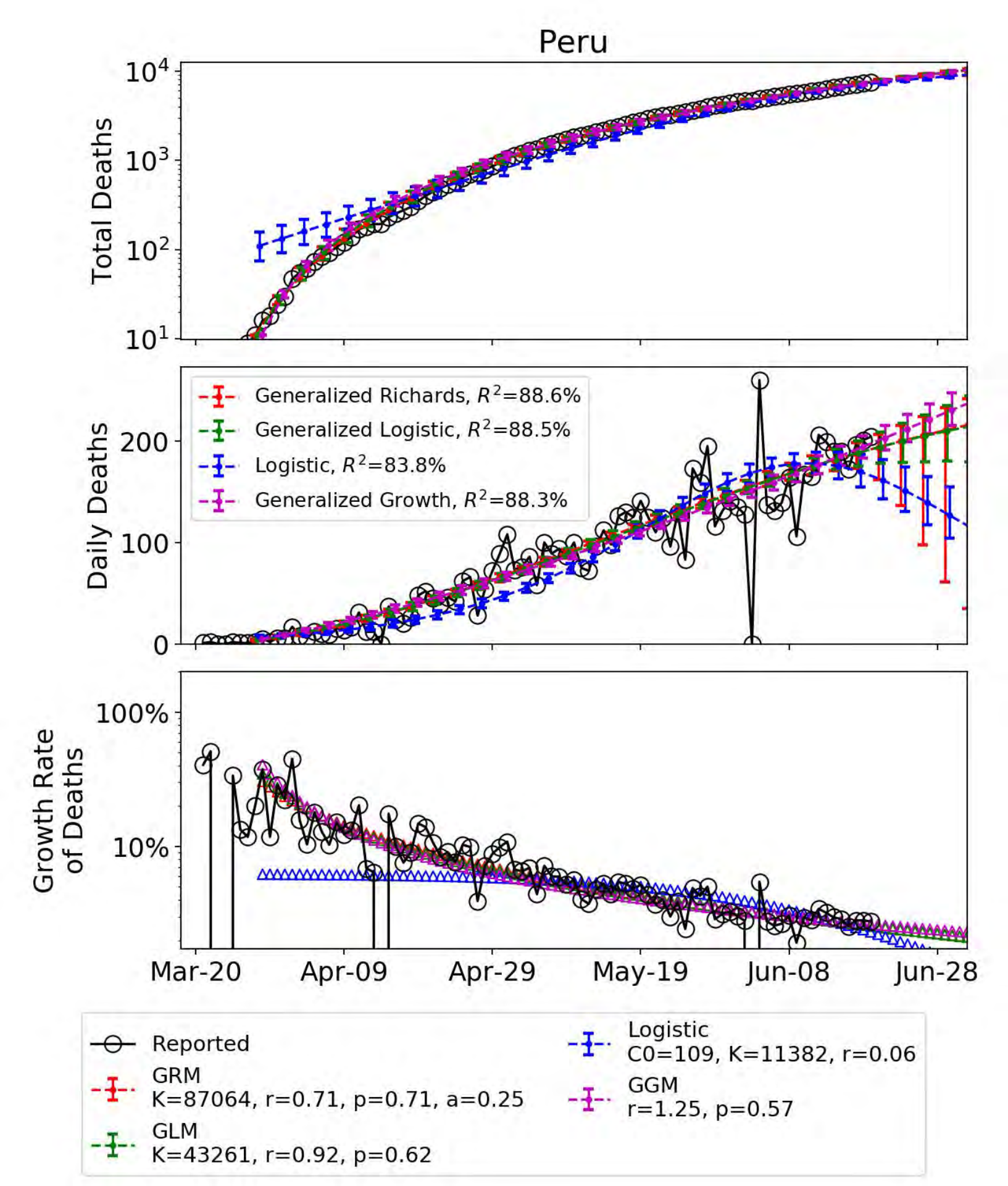

United Kingdom
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
8000
6000
4000
2000
0
Generalized Richards, R^2=86.3%
Generalized Logistic, R^2=84.7%
Logistic, R^2=-2.4%
Generalized Growth, R^2=13.3%
Growth Rate of Confirmed Cases
100%
10%
1%
Mar-11
Mar-31
Apr-20
May-10
May-30
Jun-19
Reported
GRM
K=322183, r=1.97, p=1.00, a=0.02
GLM
K=317096, r=1.75, p=0.73
Logistic
C0=159, K=300469, r=0.12
GGM
r=100.00, p=0.29

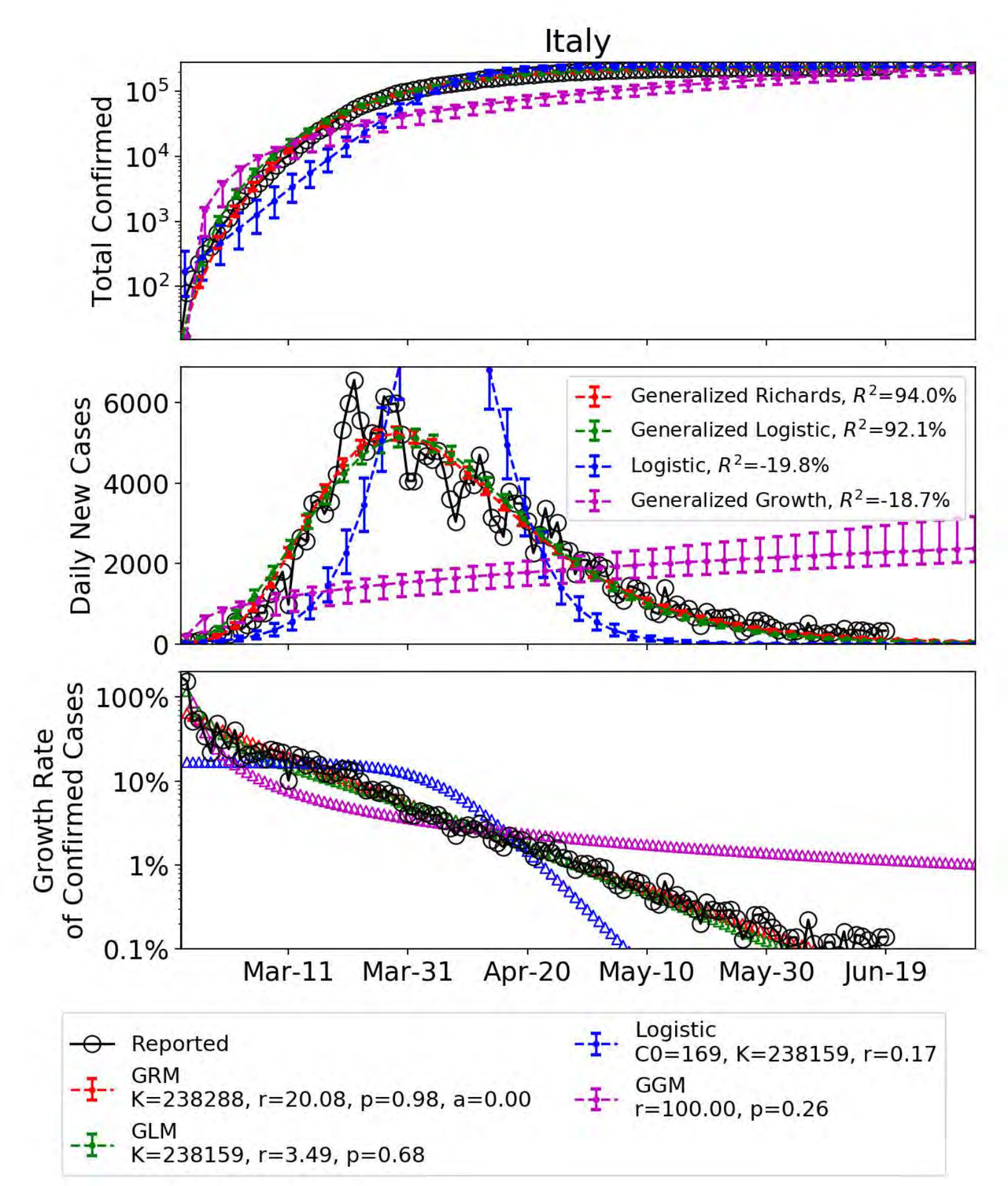

United Kingdom
Total Deaths
10^4
10^3
10^2
Daily Deaths
1000
750
500
250
0
Generalized Richards, R^2=75.4%
Generalized Logistic, R^2=72.7%
Logistic, R^2=17.3%
Generalized Growth, R^2=-1.6%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-07
Mar-27
Apr-16
May-06
May-26
Jun-15
Reported
GRM
K=43310, r=22.58, p=0.96, a=0.00
GLM
K=42731, r=2.73, p=0.64
Logistic
C0=279, K=42288, r=0.13
GGM
r=100.00, p=0.15

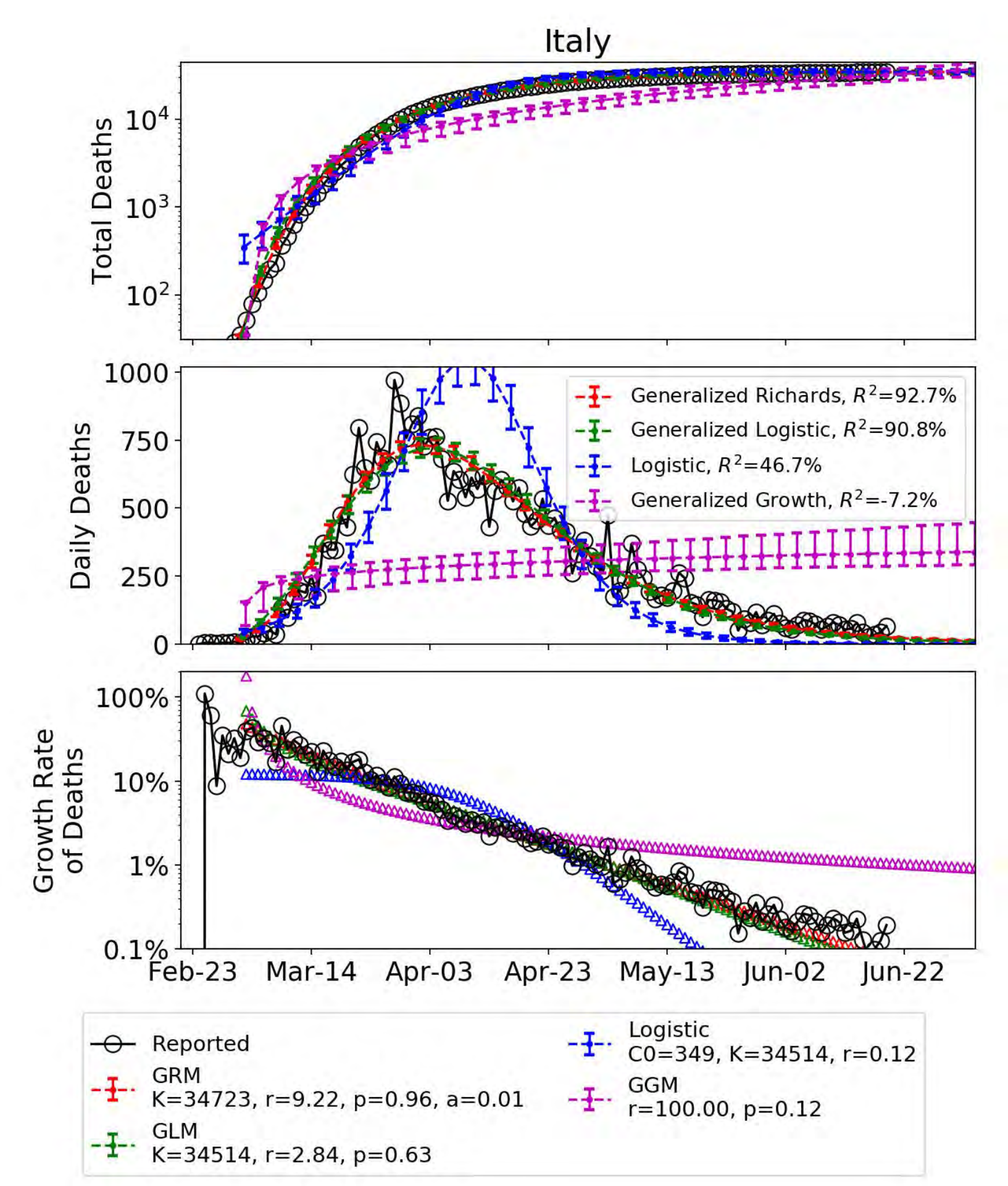

Spain
Total Confirmed
10^5
10^4
10^3
10^2
10^1
Daily New Cases
8000
6000
4000
2000
0
Generalized Richards, R^2=89.9%
Generalized Logistic, R^2=88.0%
Logistic, R^2=7.7%
Generalized Growth, R^2=-13.4%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-12
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=245575, r=1.15, p=1.00, a=0.07
GLM
K=245575, r=2.03, p=0.76
Logistic
C0=29, K=245575, r=0.25
GGM
r=100.00, p=0.26

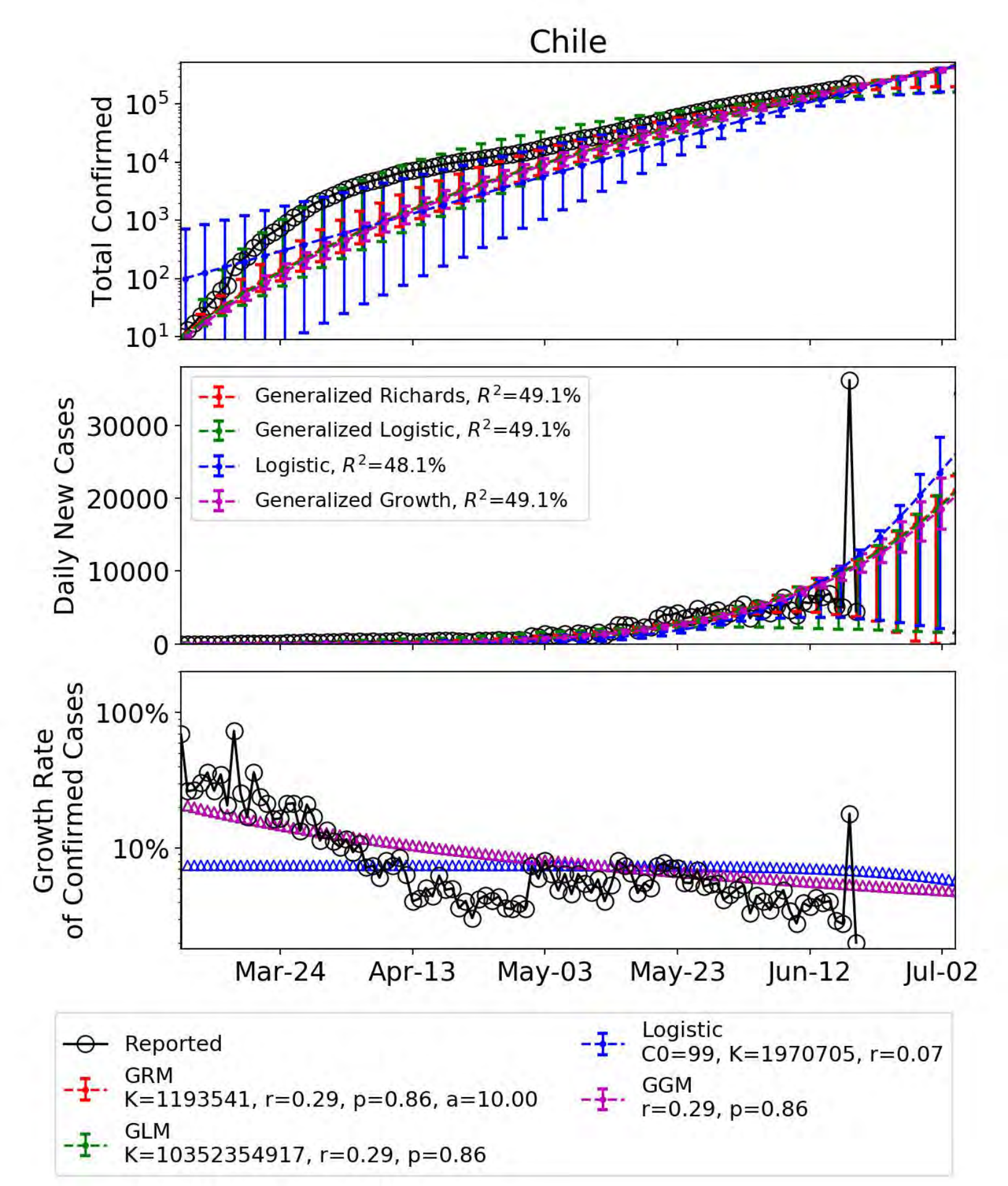

Spain
Total Deaths
10^4
10^3
Daily Deaths
1000
750
500
250
0
Generalized Richards, R^2=67.5%
Generalized Logistic, R^2=66.3%
Logistic, R^2=60.8%
Generalized Growth, R^2=-15.7%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-25
Apr-14
May-04
May-24
Jun-13
Reported
GRM
K=30326, r=31.32, p=0.90, a=0.01
GLM
K=30233, r=8.34, p=0.54
Logistic
C0=4541, K=32675, r=0.09
GGM
r=100.00, p=0.13

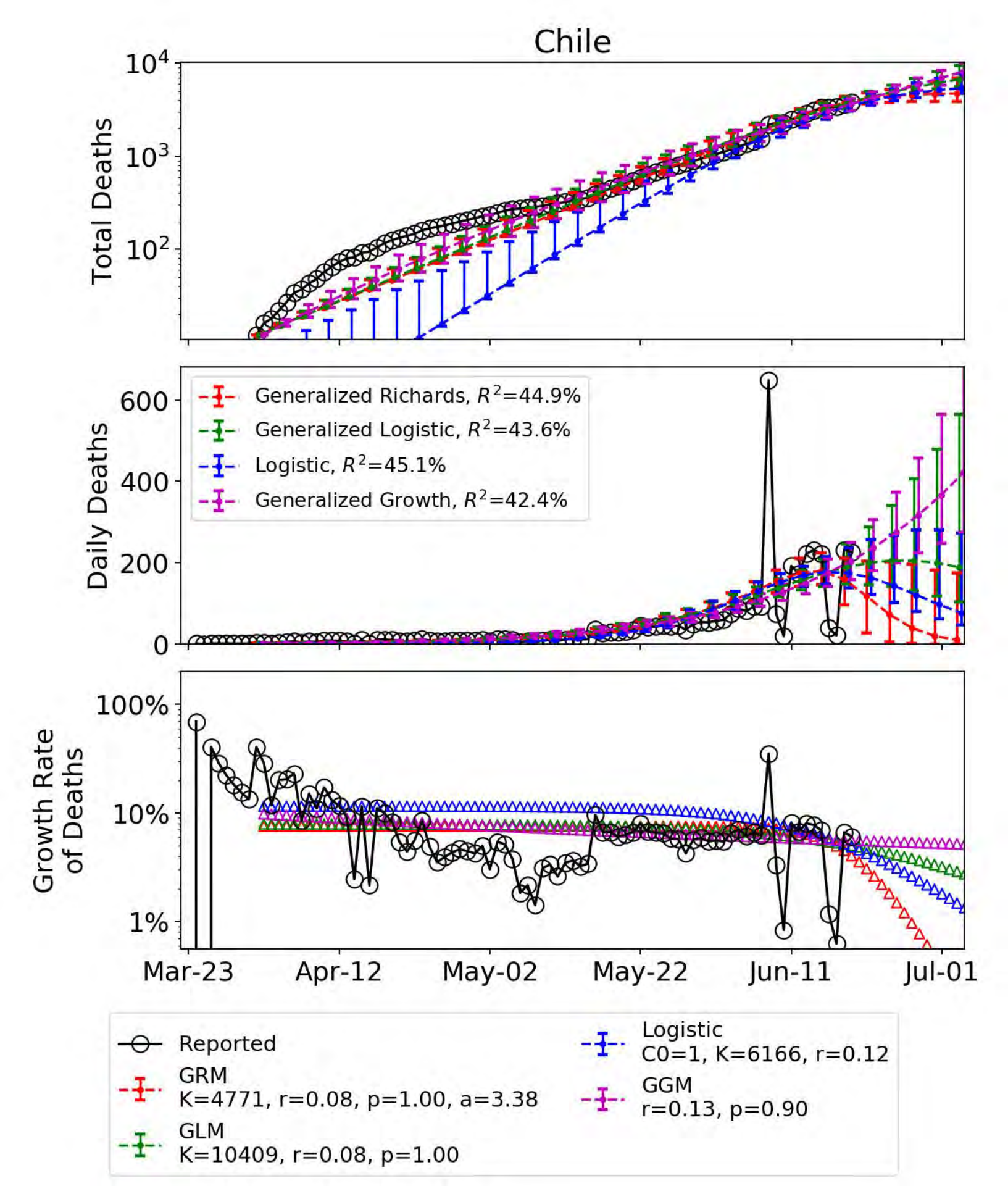

Peru
Total Confirmed
10^5
10^4
Daily New Cases
8000
6000
4000
2000
0
Generalized Richards, R^2=72.9%
Generalized Logistic, R^2=70.0%
Logistic, R^2=71.5%
Generalized Growth, R^2=60.5%
Growth Rate of Confirmed Cases
100%
10%
Apr-06
Apr-16
Apr-26
May-06
May-16
May-26
Jun-05
Jun-15
Jun-25
Reported
GRM
K=278828, r=3.47, p=0.62, a=4.51
GLM
K=349850, r=0.57, p=0.81
Logistic
C0=8950, K=338278, r=0.06
GGM
r=22.99, p=0.44

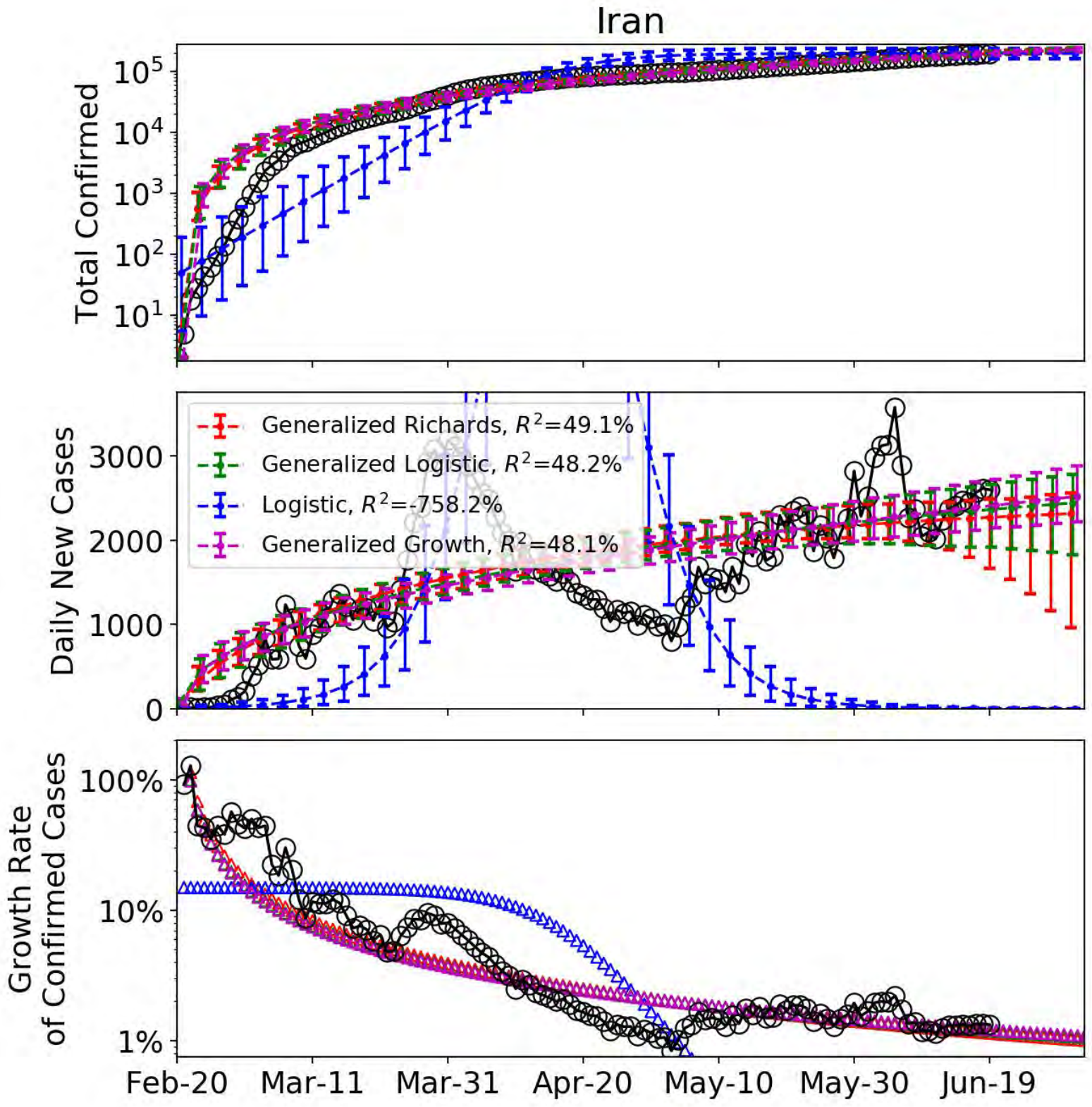

Peru
Total Deaths
10^4
10^3
10^2
10^1
Daily Deaths
200
100
0
Generalized Richards, R^2=88.6%
Generalized Logistic, R^2=88.5%
Logistic, R^2=83.8%
Generalized Growth, R^2=88.3%
Growth Rate of Deaths
100%
10%
Mar-20
Apr-09
Apr-29
May-19
Jun-08
Jun-28
Reported
GRM
K=87064, r=0.71, p=0.71, a=0.25
GLM
K=43261, r=0.92, p=0.62
Logistic
C0=109, K=11382, r=0.06
GGM
r=1.25, p=0.57


Italy
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
6000
4000
2000
0
Generalized Richards, R^2=94.0%
Generalized Logistic, R^2=92.1%
Logistic, R^2=-19.8%
Generalized Growth, R^2=-18.7%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-11
Mar-31
Apr-20
May-10
May-30
Jun-19
Reported
GRM
K=238288, r=20.08, p=0.98, a=0.00
GLM
K=238159, r=3.49, p=0.68
Logistic
C0=169, K=238159, r=0.17
GGM
r=100.00, p=0.26


Italy
Total Deaths
10^4
10^3
10^2
Daily Deaths
1000
750
500
250
0
Generalized Richards, R^2=92.7%
Generalized Logistic, R^2=90.8%
Logistic, R^2=46.7%
Generalized Growth, R^2=-7.2%
Growth Rate of Deaths
100%
10%
1%
0.1%
Feb-23
Mar-14
Apr-03
Apr-23
May-13
Jun-02
Jun-22
Reported
GRM
K=34723, r=9.22, p=0.96, a=0.01
GLM
K=34514, r=2.84, p=0.63
Logistic
C0=349, K=34514, r=0.12
GGM
r=100.00, p=0.12


Chile
Total Confirmed
10^5
10^4
10^3
10^2
10^1
Daily New Cases
30000
20000
10000
0
Generalized Richards, R^2=49.1%
Generalized Logistic, R^2=49.1%
Logistic, R^2=48.1%
Generalized Growth, R^2=49.1%
Growth Rate
of Confirmed Cases
100%
10%
Mar-24
Apr-13
May-03
May-23
Jun-12
Jul-02
Reported
GRM
K=1193541, r=0.29, p=0.86, a=10.00
GLM
K=10352354917, r=0.29, p=0.86
Logistic
C0=99, K=1970705, r=0.07
GGM
r=0.29, p=0.86


Chile
Total Deaths
10^4
10^3
10^2
Daily Deaths
600
400
200
0
Generalized Richards, R^2=44.9%
Generalized Logistic, R^2=43.6%
Logistic, R^2=45.1%
Generalized Growth, R^2=42.4%
Growth Rate of Deaths
100%
10%
1%
Mar-23
Apr-12
May-02
May-22
Jun-11
Jul-01
Reported
GRM
K=4771, r=0.08, p=1.00, a=3.38
GLM
K=10409, r=0.08, p=1.00
Logistic
C0=1, K=6166, r=0.12
GGM
r=0.13, p=0.90



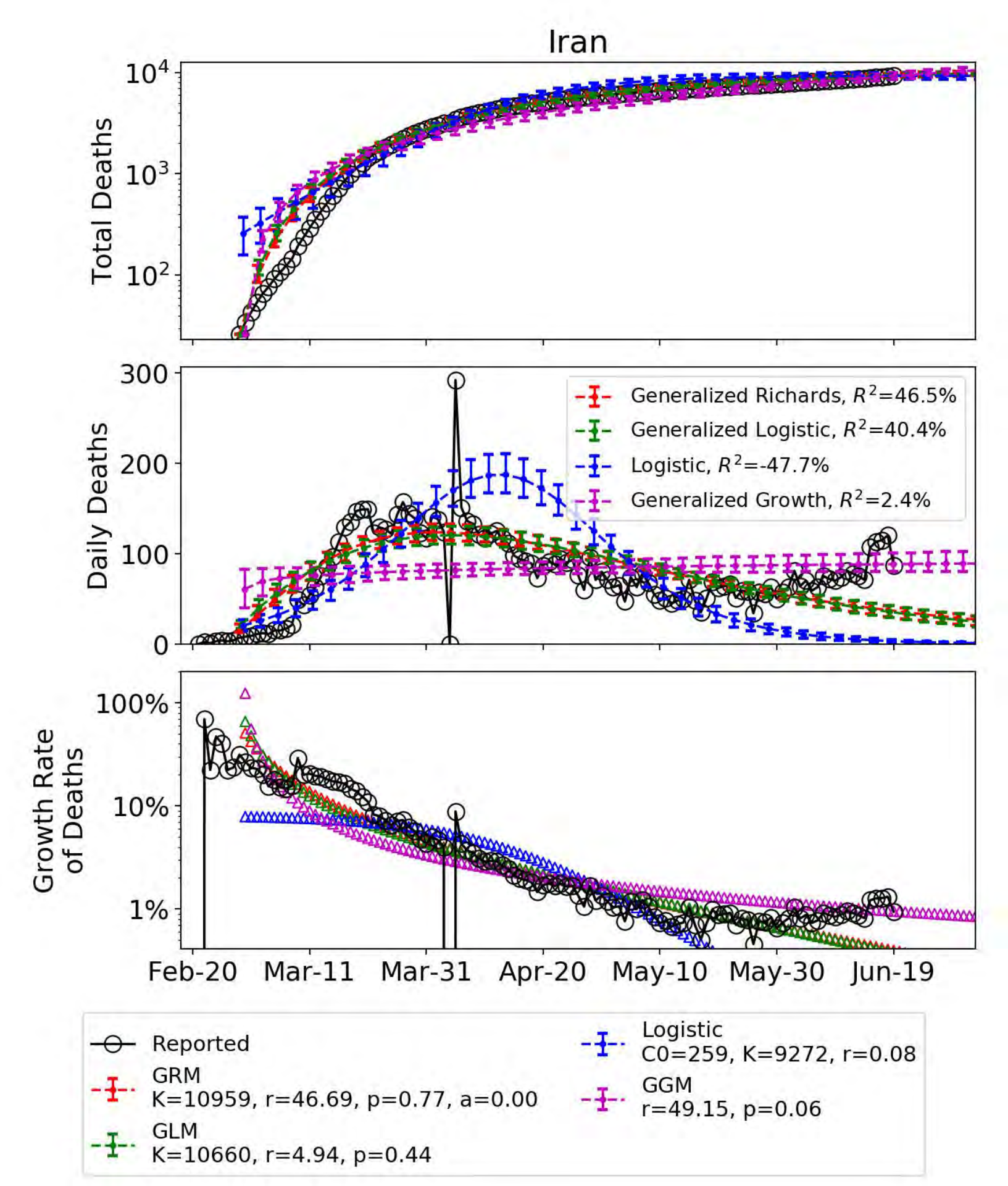
Reported

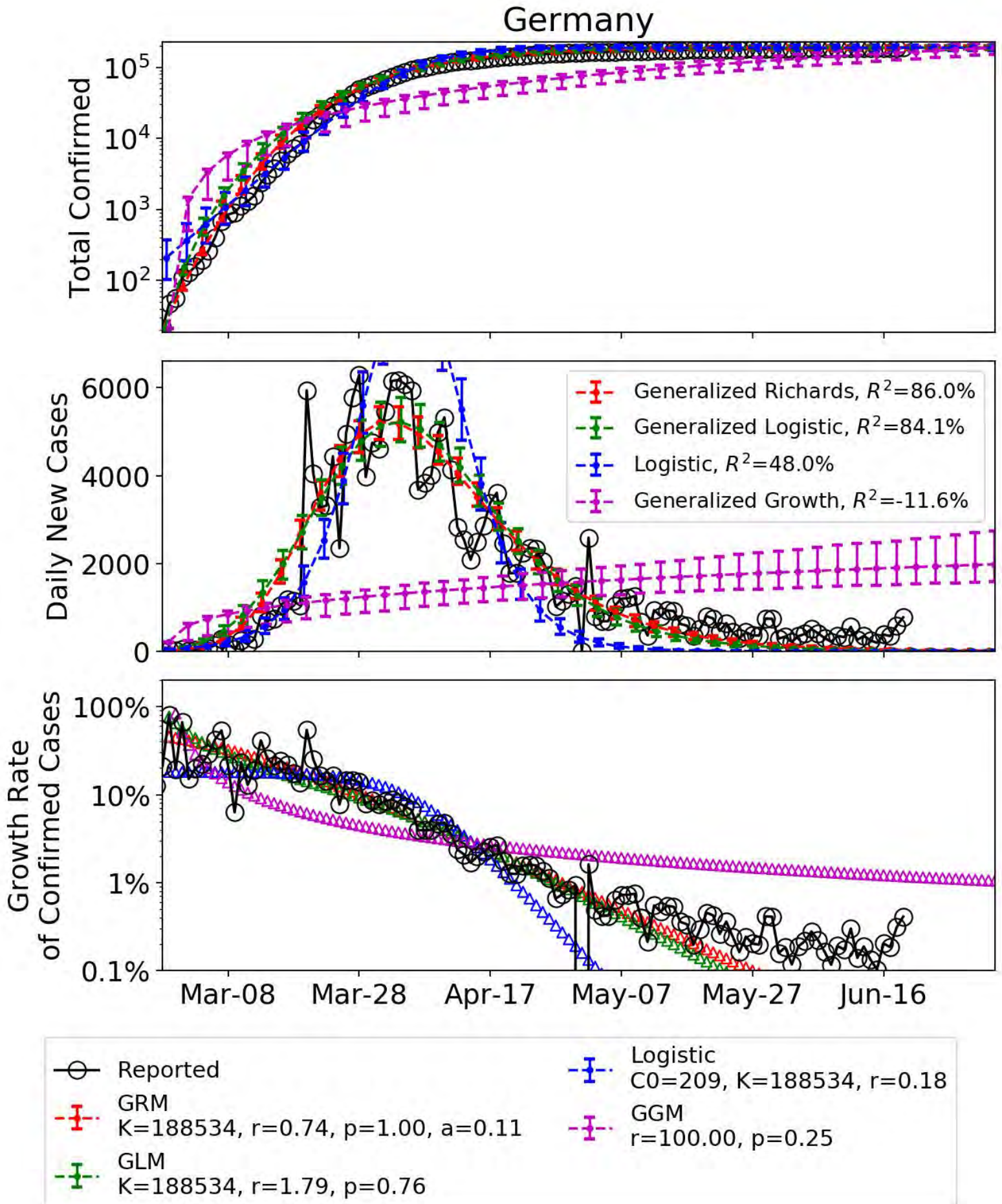
GRM
K=2799462, r=100.00, p=0.53, a=0.01

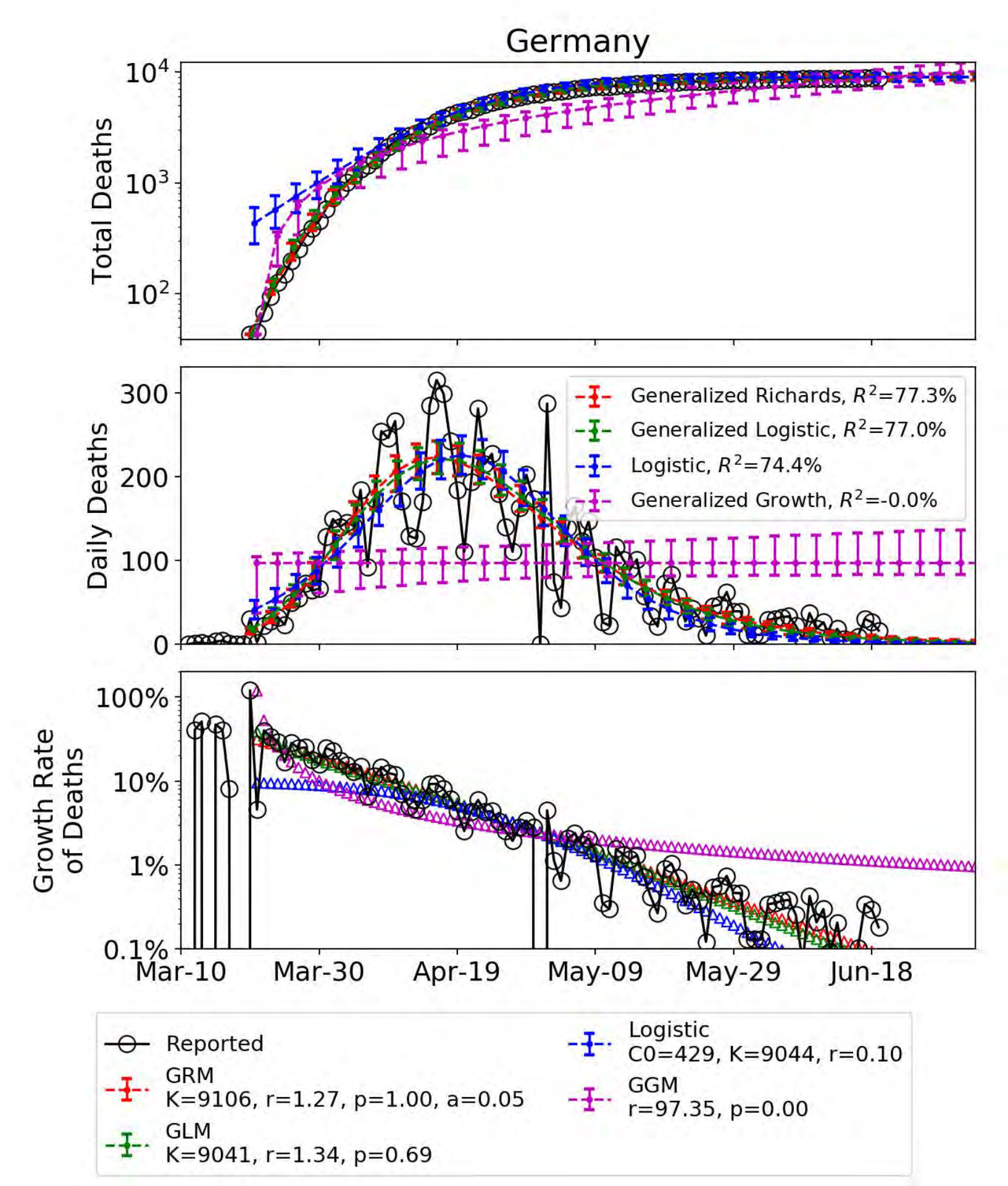
GLM
K=2739004, r=47.89, p=0.33

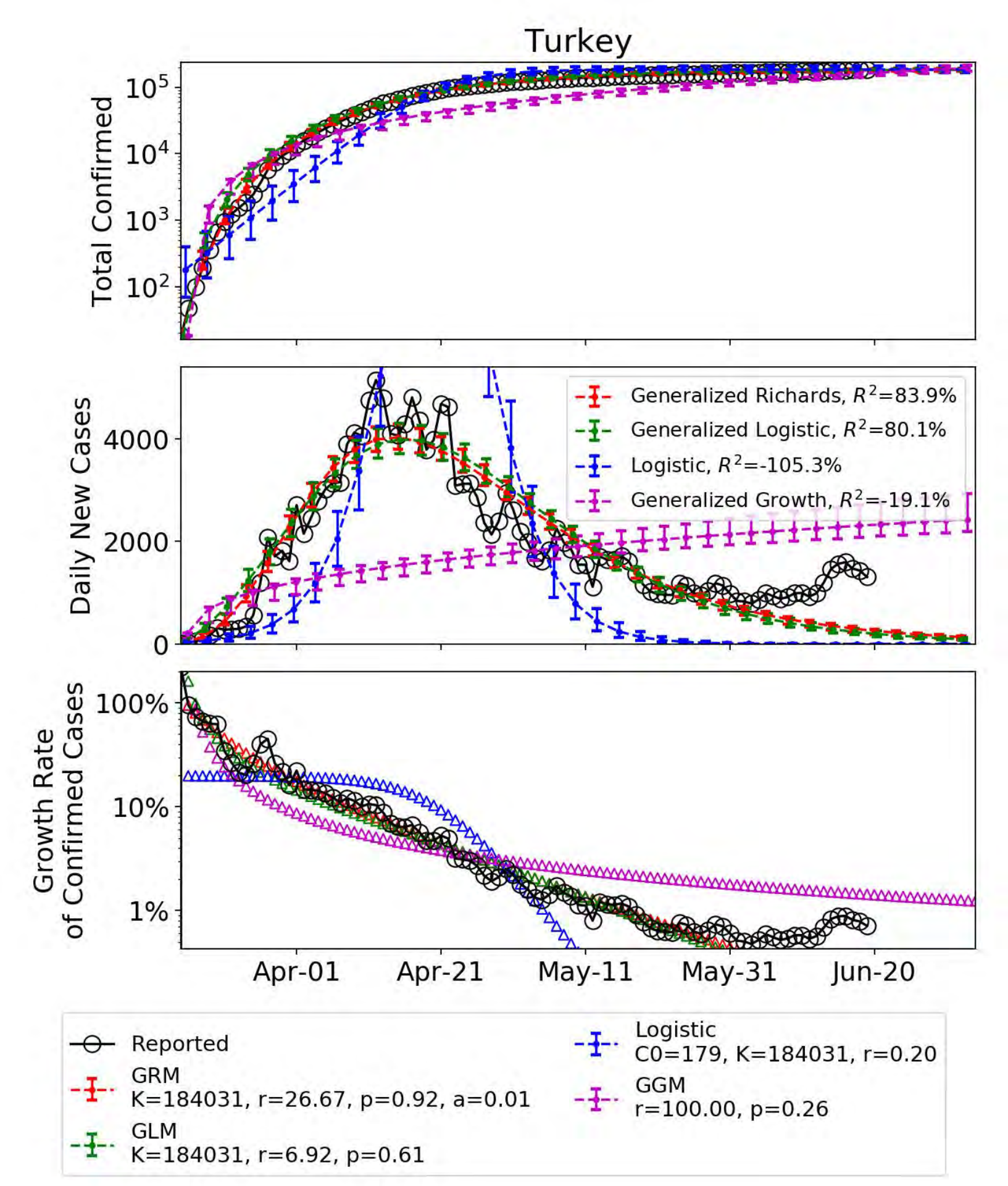
Logistic
C0=49, K=197647, r=0.15

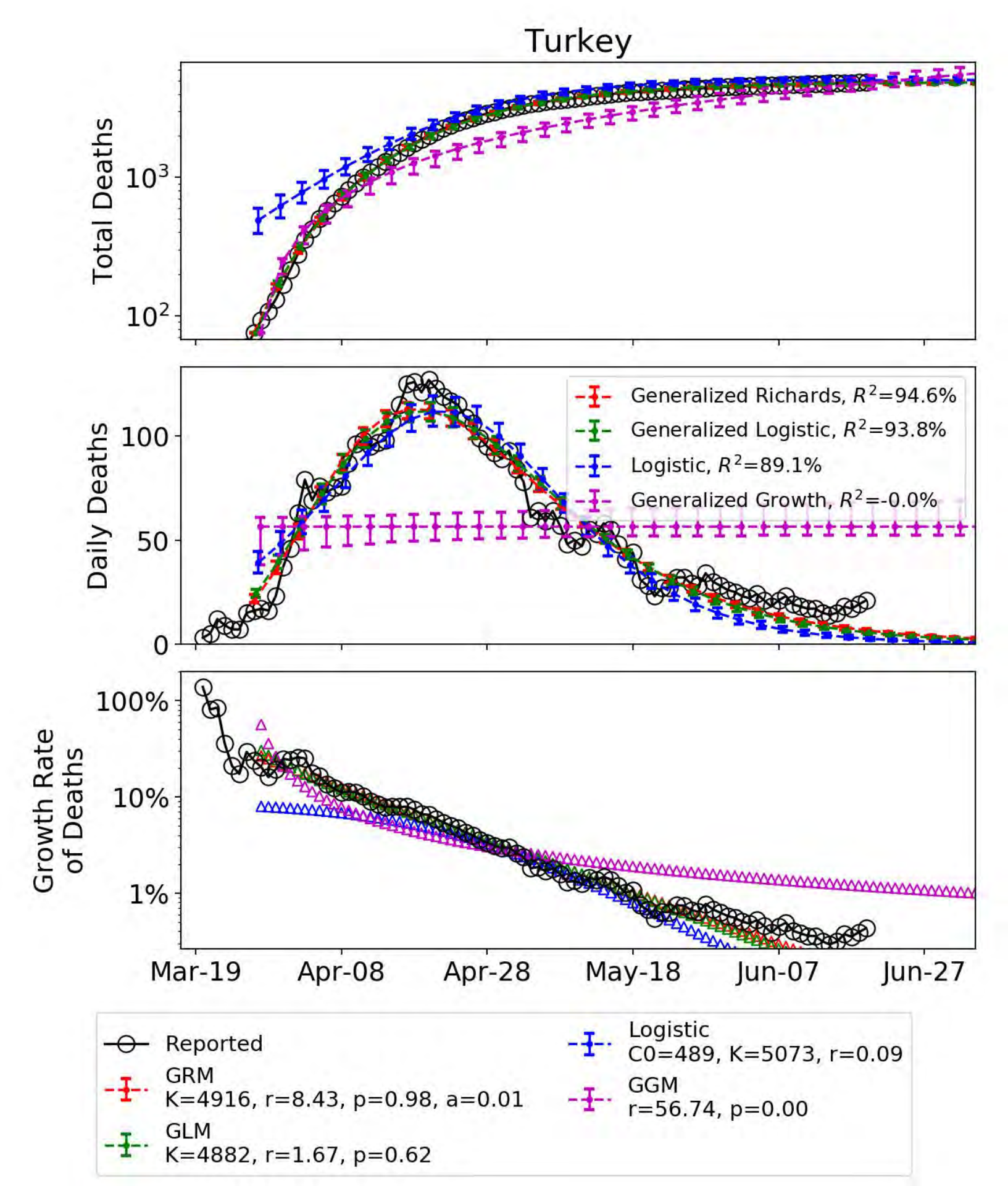
GGM
r=55.58, p=0.31

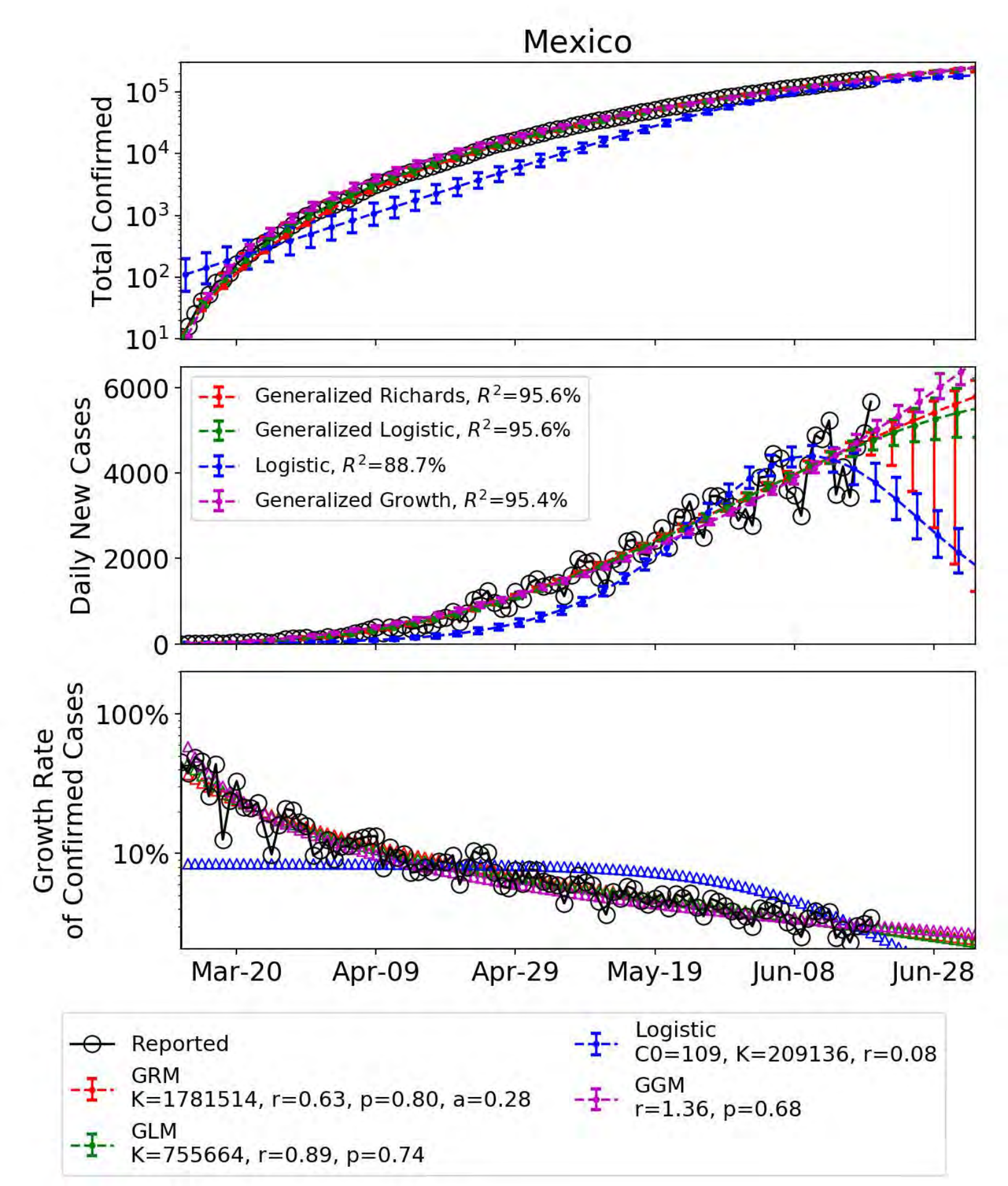

Iran
Total Deaths
10^4
10^3
10^2
Daily Deaths
300
200
100
0
Generalized Richards, R^2=46.5%
Generalized Logistic, R^2=40.4%
Logistic, R^2=-47.7%
Generalized Growth, R^2=2.4%
Growth Rate of Deaths
100%
10%
1%
Feb-20
Mar-11
Mar-31
Apr-20
May-10
May-30
Jun-19
Reported
GRM
K=10959, r=46.69, p=0.77, a=0.00
GLM
K=10660, r=4.94, p=0.44
Logistic
C0=259, K=9272, r=0.08
GGM
r=49.15, p=0.06

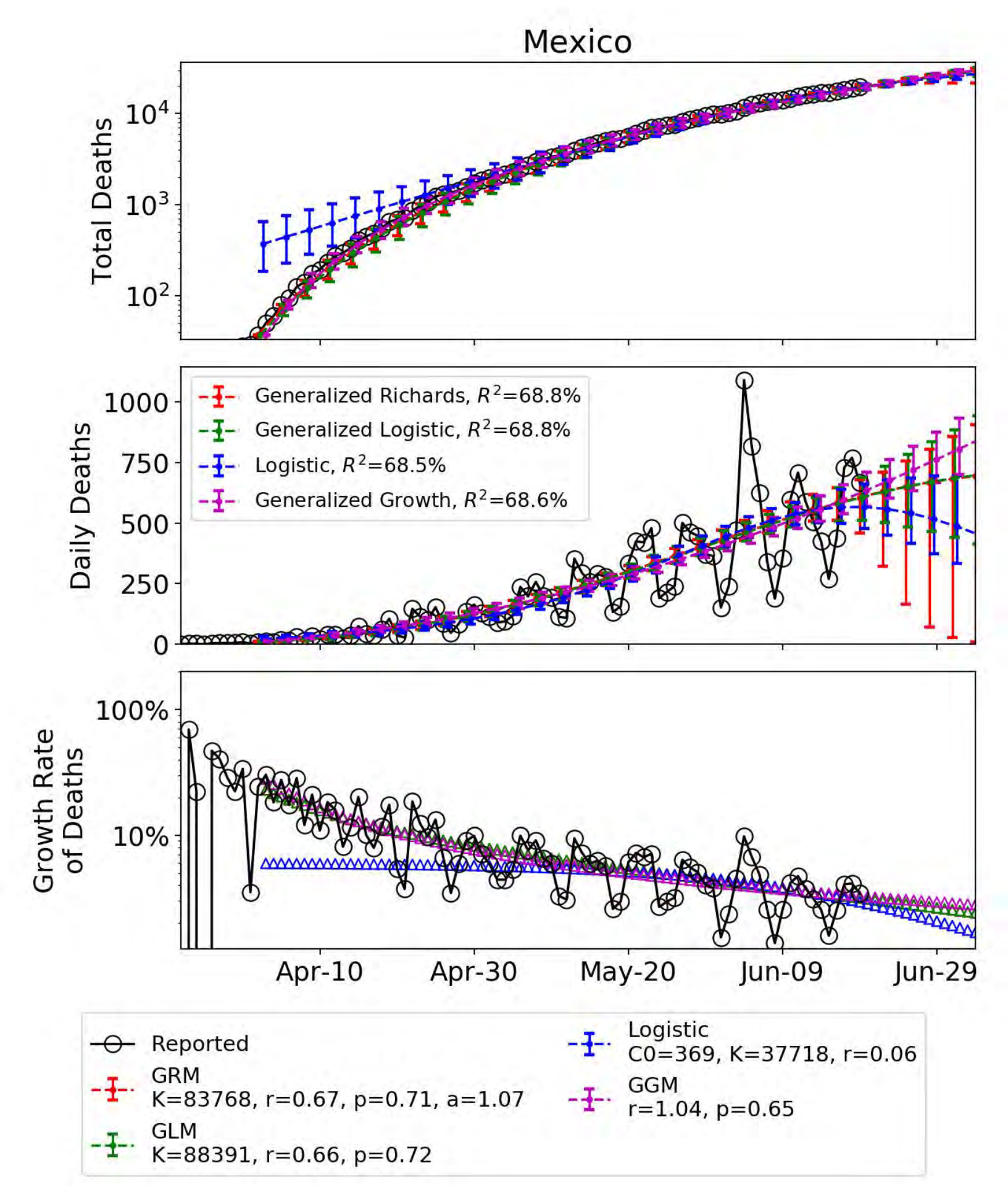

Germany
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
6000
4000
2000
0
Generalized Richards, R^2=86.0%
Generalized Logistic, R^2=84.1%
Logistic, R^2=48.0%
Generalized Growth, R^2=-11.6%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-08
Mar-28
Apr-17
May-07
May-27
Jun-16
Reported
GRM
K=188534, r=0.74, p=1.00, a=0.11
GLM
K=188534, r=1.79, p=0.76
Logistic
C0=209, K=188534, r=0.18
GGM
r=100.00, p=0.25

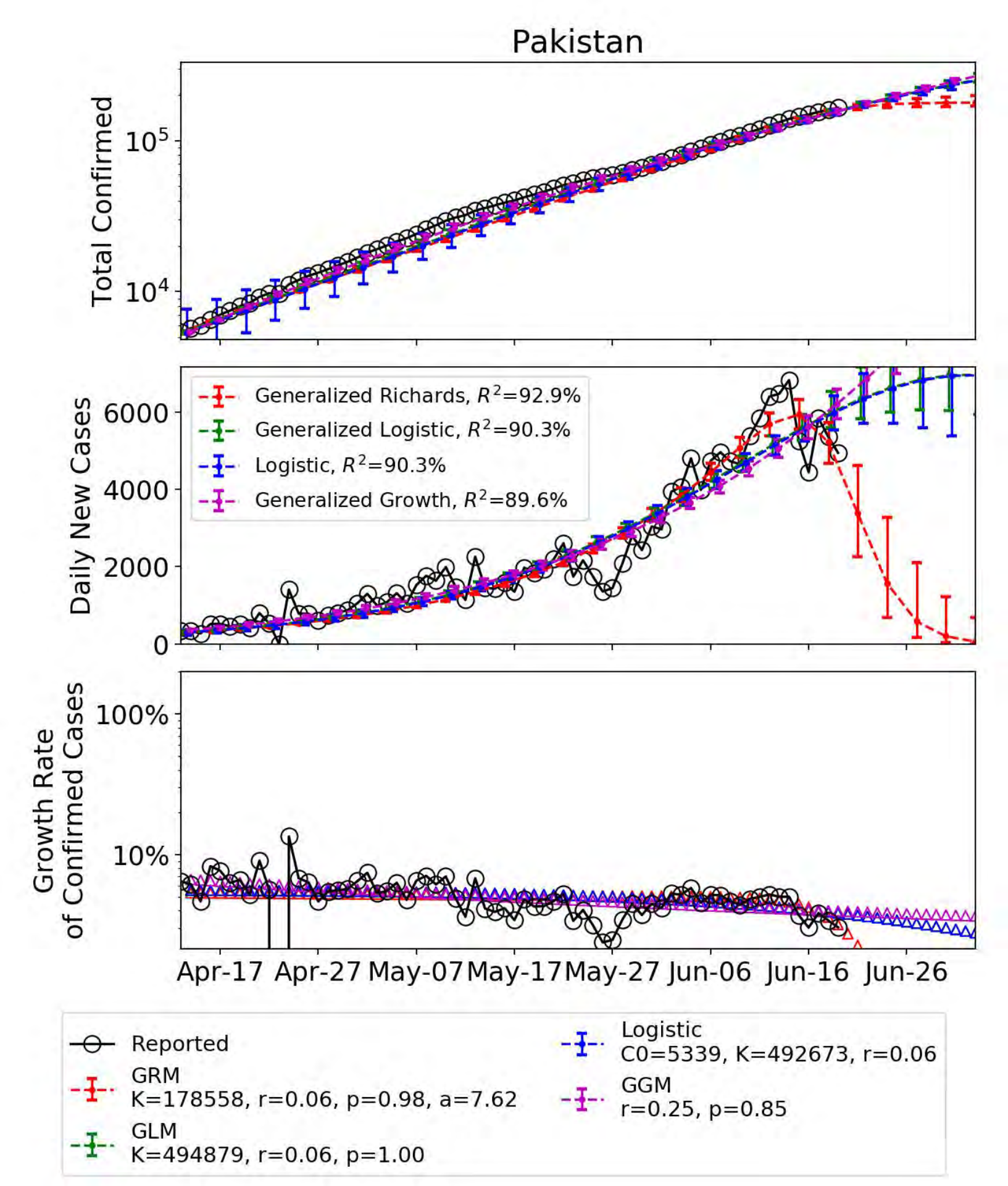

Germany
Total Deaths
10^4
10^3
10^2
Daily Deaths
300
200
100
0
Generalized Richards, R^2=77.3%
Generalized Logistic, R^2=77.0%
Logistic, R^2=74.4%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-10
Mar-30
Apr-19
May-09
May-29
Jun-18
Reported
GRM
K=9106, r=1.27, p=1.00, a=0.05
GLM
K=9041, r=1.34, p=0.69
Logistic
C0=429, K=9044, r=0.10
GGM
r=97.35, p=0.00

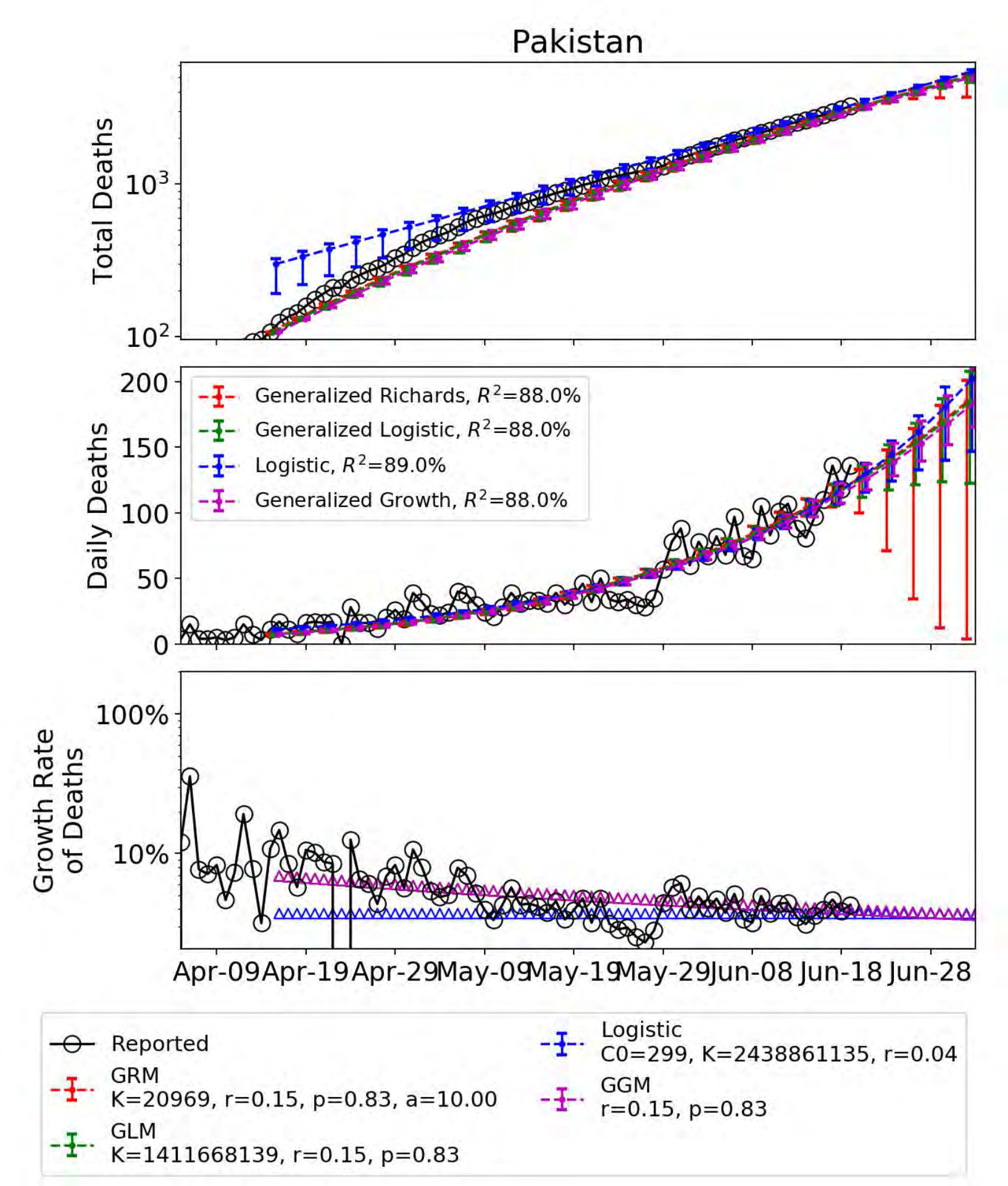

Turkey
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
4000
2000
0
Generalized Richards, R^2=83.9%
Generalized Logistic, R^2=80.1%
Logistic, R^2=-105.3%
Generalized Growth, R^2=-19.1%
Growth Rate
of Confirmed Cases
100%
10%
1%
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=184031, r=26.67, p=0.92, a=0.01
GLM
K=184031, r=6.92, p=0.61
Logistic
C0=179, K=184031, r=0.20
GGM
r=100.00, p=0.26

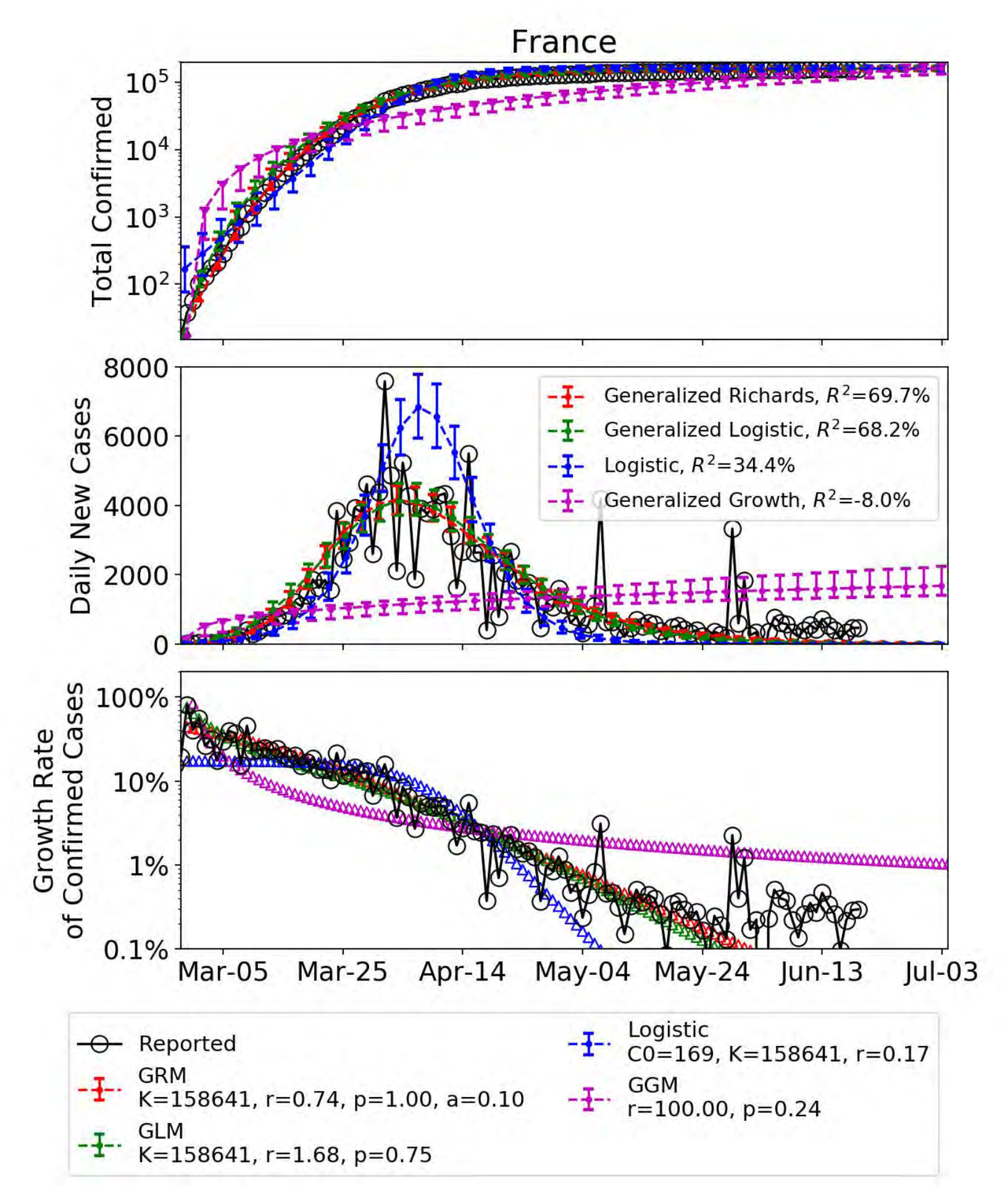

Turkey
Total Deaths
10^3
10^2
Daily Deaths
100
50
0
Generalized Richards, R^2=94.6%
Generalized Logistic, R^2=93.8%
Logistic, R^2=89.1%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
Mar-19
Apr-08
Apr-28
May-18
Jun-07
Jun-27
Reported
GRM
K=4916, r=8.43, p=0.98, a=0.01
GLM
K=4882, r=1.67, p=0.62
Logistic
C0=489, K=5073, r=0.09
GGM
r=56.74, p=0.00

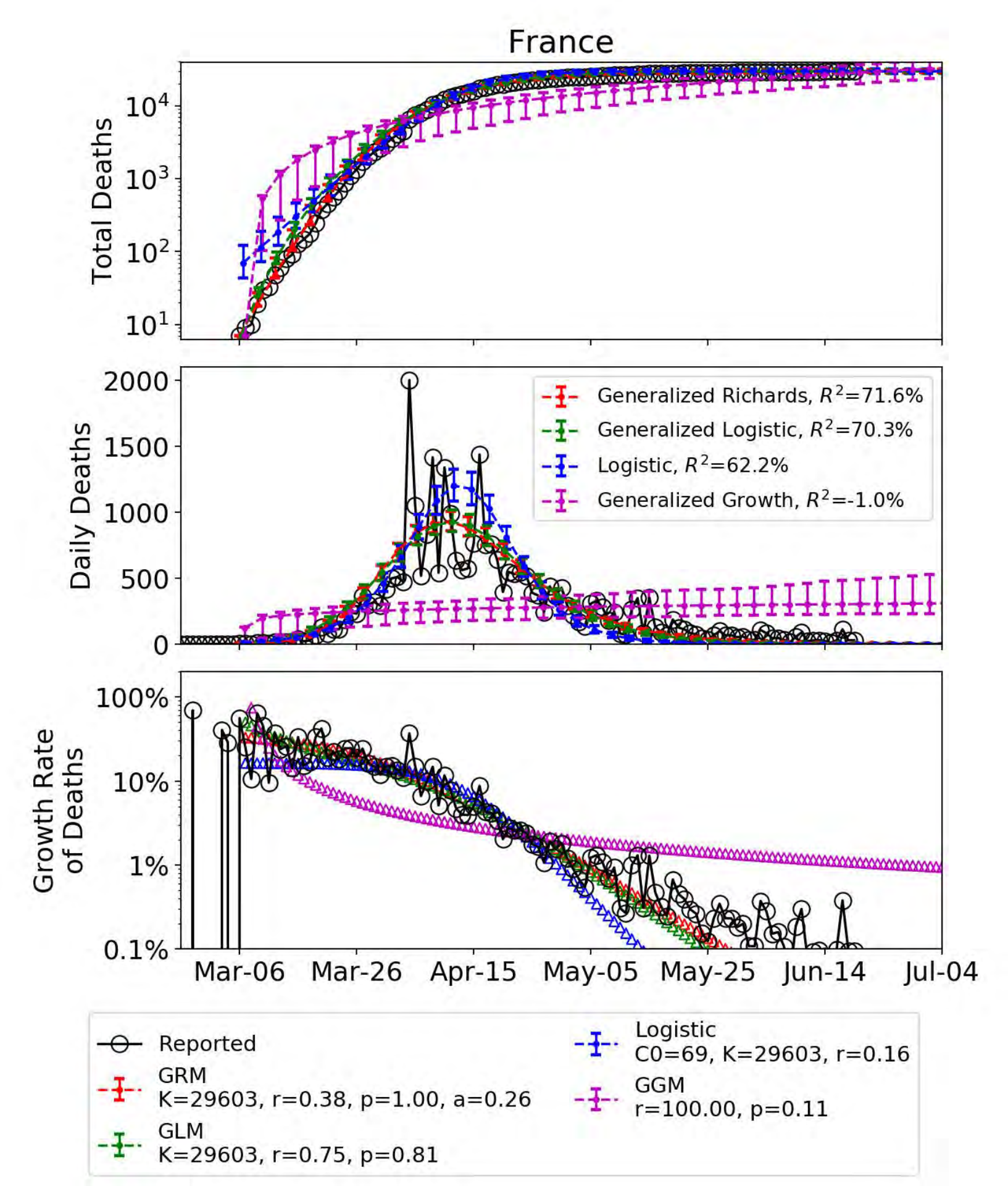

Mexico
Total Confirmed
10^5
10^4
10^3
10^2
10^1
Daily New Cases
6000
4000
2000
0
Generalized Richards, R^2=95.6%
Generalized Logistic, R^2=95.6%
Logistic, R^2=88.7%
Generalized Growth, R^2=95.4%
Growth Rate
of Confirmed Cases
100%
10%
Mar-20
Apr-09
Apr-29
May-19
Jun-08
Jun-28
Reported
GRM
K=1781514, r=0.63, p=0.80, a=0.28
GLM
K=755664, r=0.89, p=0.74
Logistic
C0=109, K=209136, r=0.08
GGM
r=1.36, p=0.68

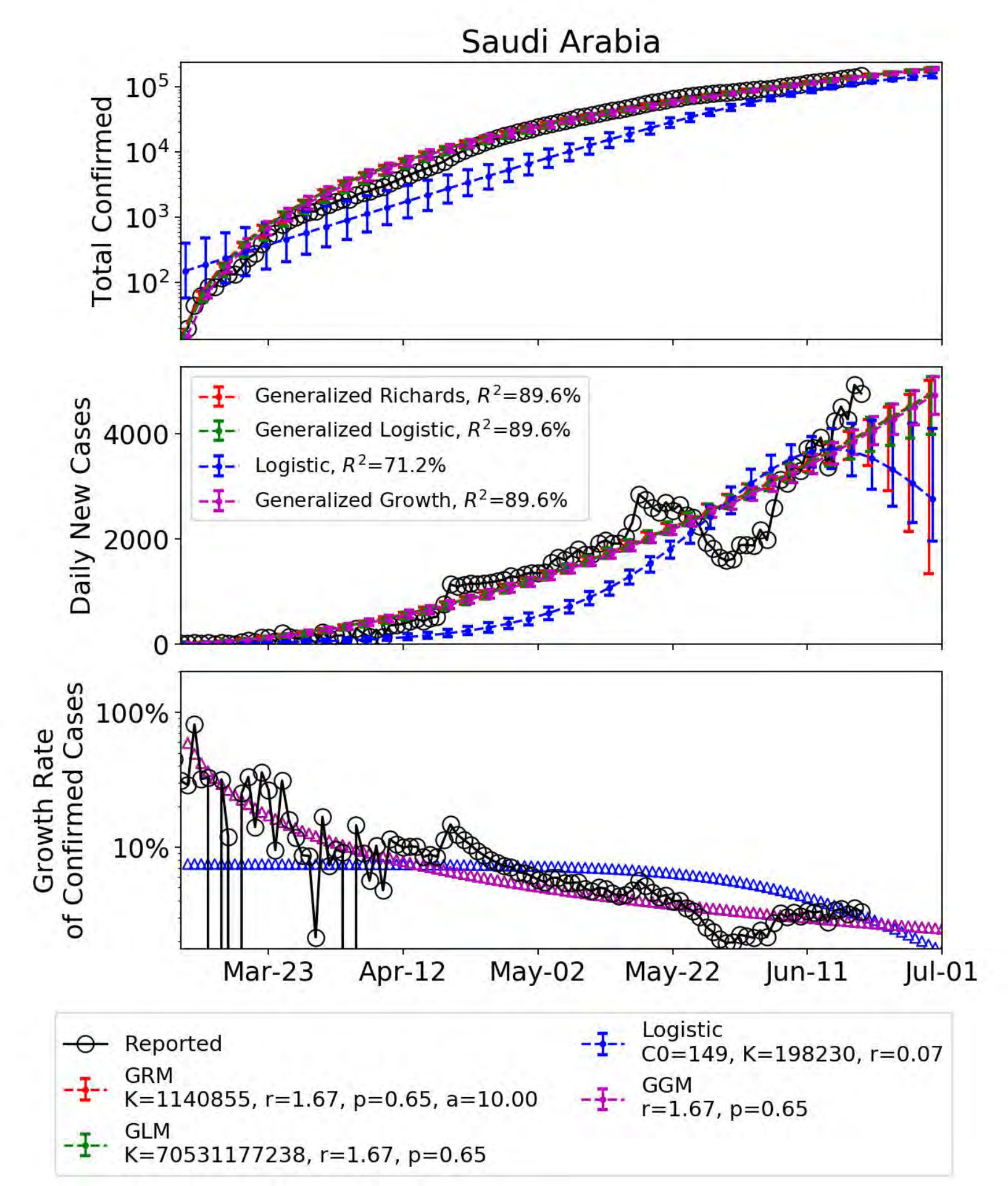

Mexico
Total Deaths
10^4
10^3
10^2
Daily Deaths
1000
750
500
250
0
Generalized Richards, R^2=68.8%
Generalized Logistic, R^2=68.8%
Logistic, R^2=68.5%
Generalized Growth, R^2=68.6%
Growth Rate of Deaths
100%
10%
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=83768, r=0.67, p=0.71, a=1.07
GLM
K=88391, r=0.66, p=0.72
Logistic
C0=369, K=37718, r=0.06
GGM
r=1.04, p=0.65

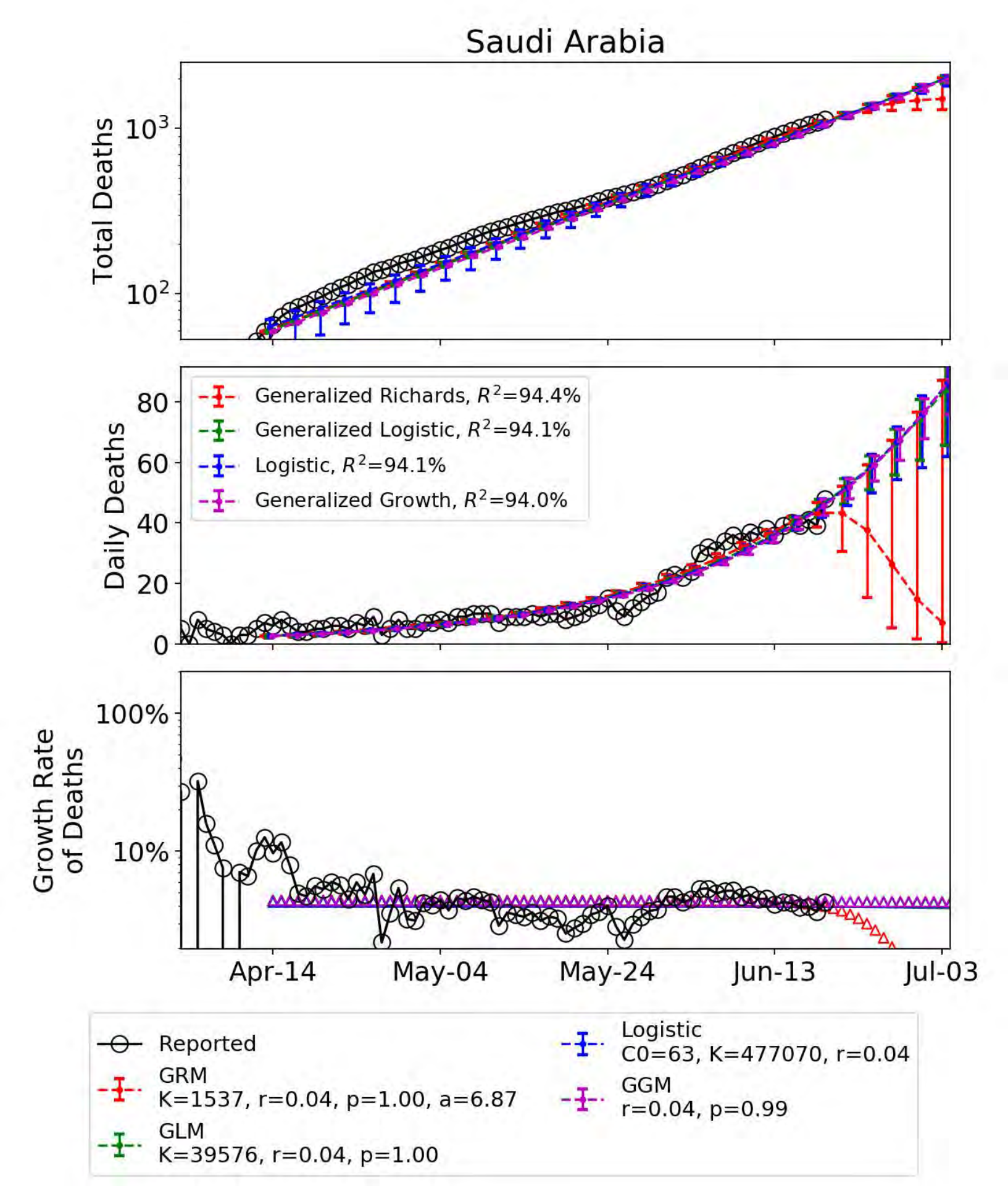

Pakistan
Total Confirmed
10^5
10^4
Daily New Cases
6000
4000
2000
0
Generalized Richards, R^2=92.9%
Generalized Logistic, R^2=90.3%
Logistic, R^2=90.3%
Generalized Growth, R^2=89.6%
Growth Rate
of Confirmed Cases
100%
10%
Apr-17
Apr-27
May-07
May-17
May-27
Jun-06
Jun-16
Jun-26
Reported
GRM
K=178558, r=0.06, p=0.98, a=7.62
GLM
K=494879, r=0.06, p=1.00
Logistic
C0=5339, K=492673, r=0.06
GGM
r=0.25, p=0.85

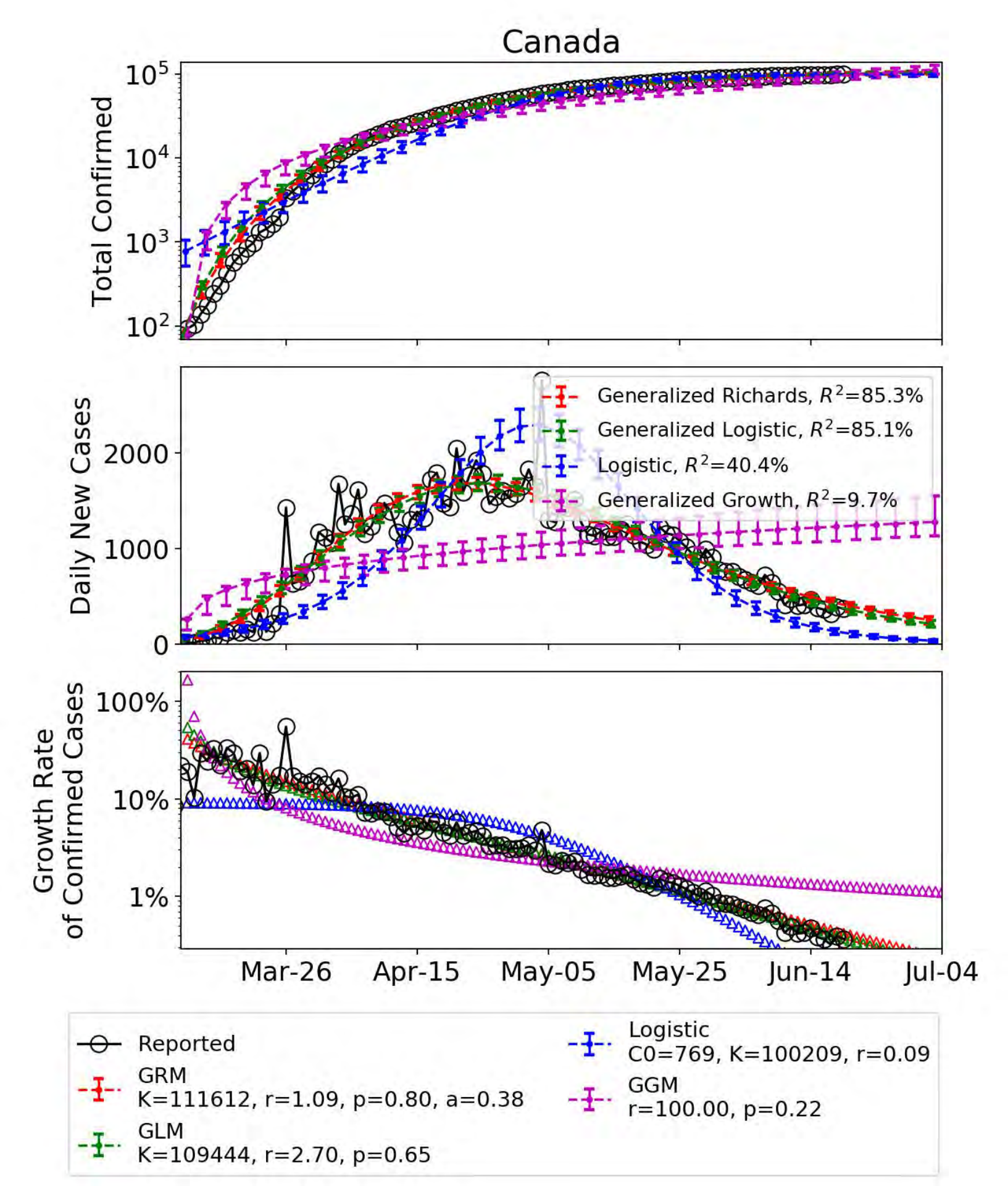

Pakistan
Total Deaths
10^3
10^2
Daily Deaths
200
150
100
50
0
Generalized Richards, R^2=88.0%
Generalized Logistic, R^2=88.0%
Logistic, R^2=89.0%
Generalized Growth, R^2=88.0%
Growth Rate of Deaths
100%
10%
Apr-09
Apr-19
Apr-29
May-09
May-19
May-29
Jun-08
Jun-18
Jun-28
Reported
GRM
K=20969, r=0.15, p=0.83, a=10.00
GLM
K=1411668139, r=0.15, p=0.83
Logistic
C0=299, K=2438861135, r=0.04
GGM
r=0.15, p=0.83

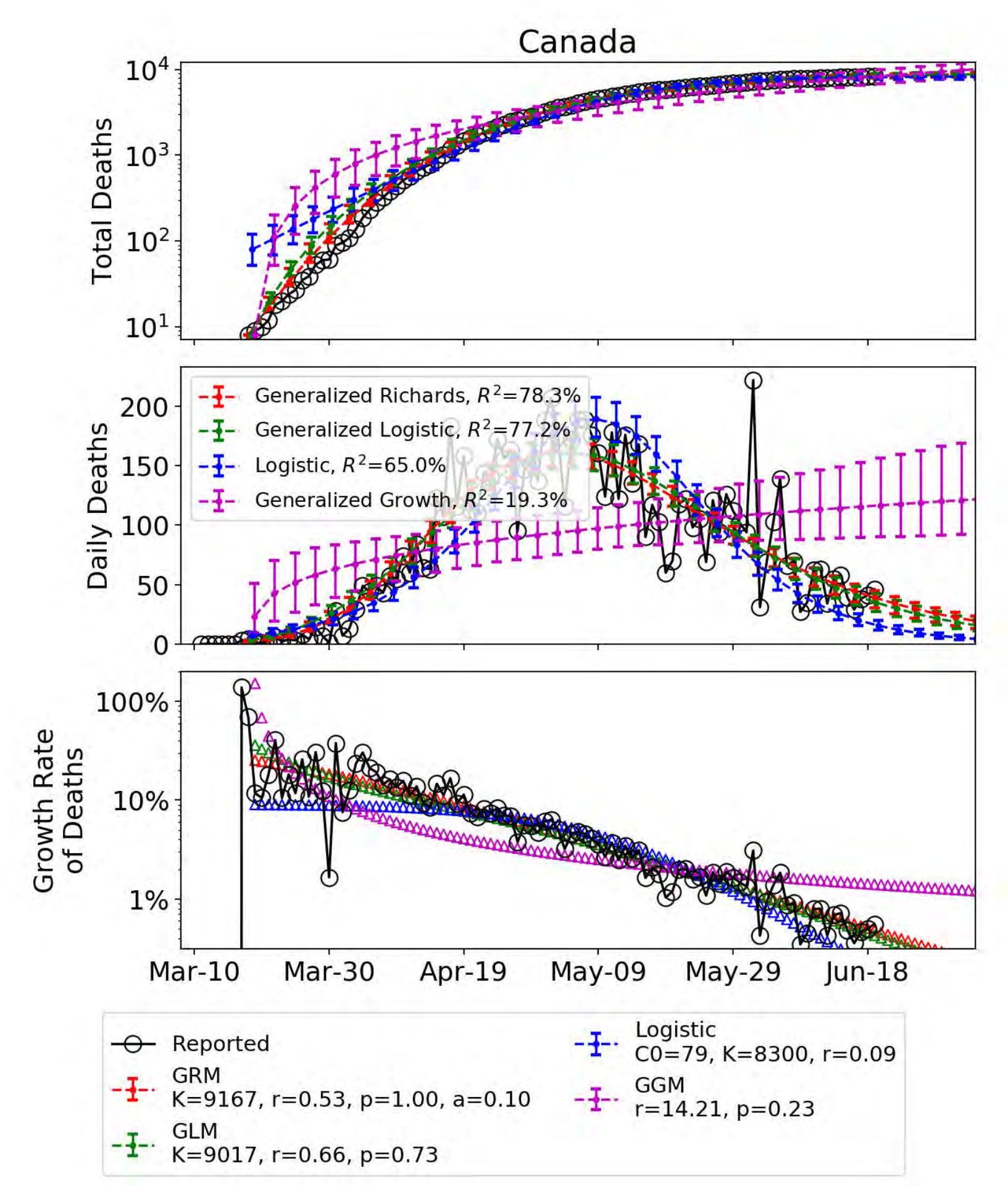

France
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
8000
6000
4000
2000
0
Generalized Richards, R^2=69.7%
Generalized Logistic, R^2=68.2%
Logistic, R^2=34.4%
Generalized Growth, R^2=-8.0%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-05
Mar-25
Apr-14
May-04
May-24
Jun-13
Jul-03
Reported
GRM
K=158641, r=0.74, p=1.00, a=0.10
GLM
K=158641, r=1.68, p=0.75
Logistic
C0=169, K=158641, r=0.17
GGM
r=100.00, p=0.24

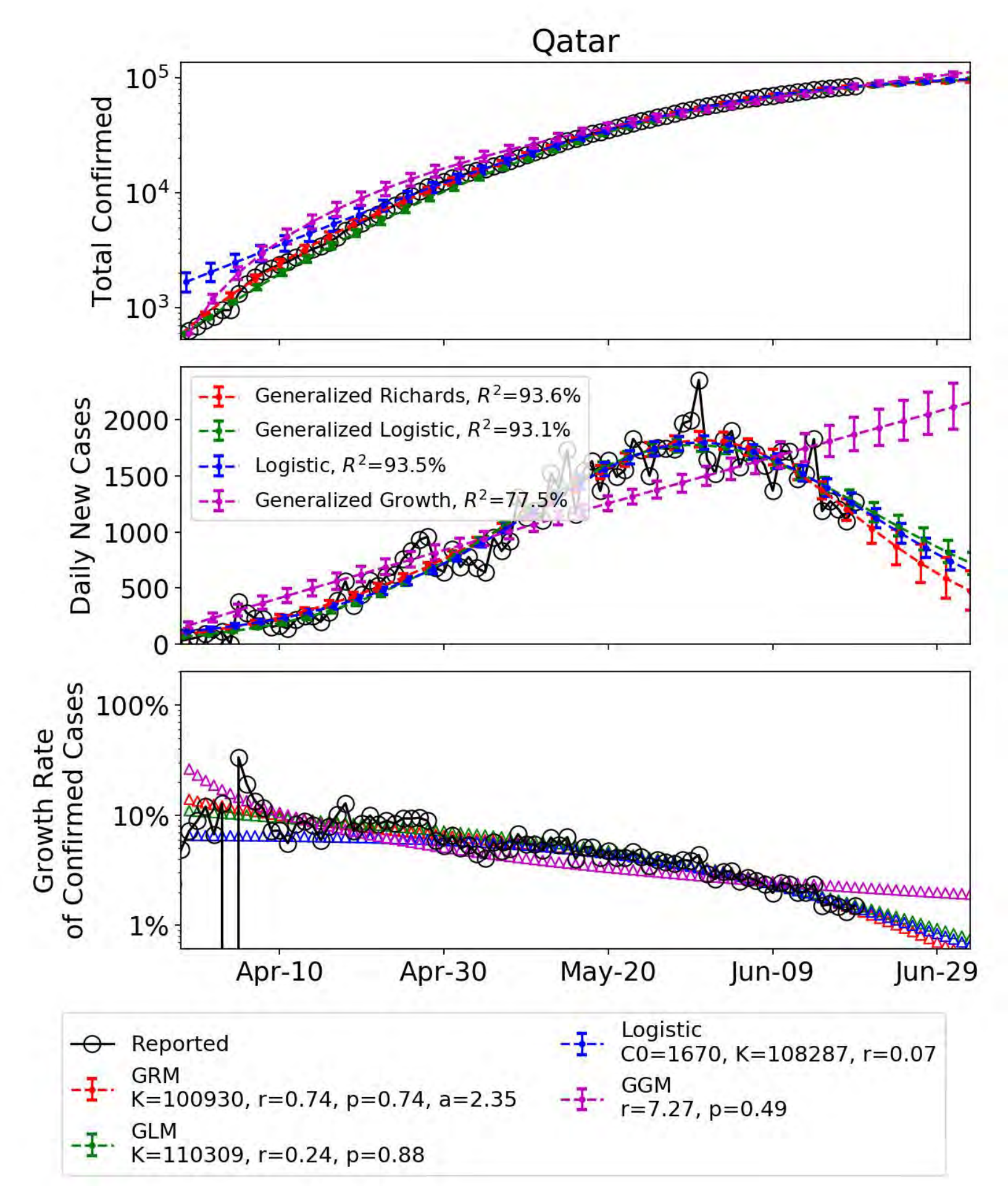

France
Total Deaths
10^4
10^3
10^2
10^1
Daily Deaths
2000
1500
1000
500
0
Generalized Richards, R^2=71.6%
Generalized Logistic, R^2=70.3%
Logistic, R^2=62.2%
Generalized Growth, R^2=-1.0%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-06
Mar-26
Apr-15
May-05
May-25
Jun-14
Jul-04
Reported
GRM
K=29603, r=0.38, p=1.00, a=0.26
GLM
K=29603, r=0.75, p=0.81
Logistic
C0=69, K=29603, r=0.16
GGM
r=100.00, p=0.11

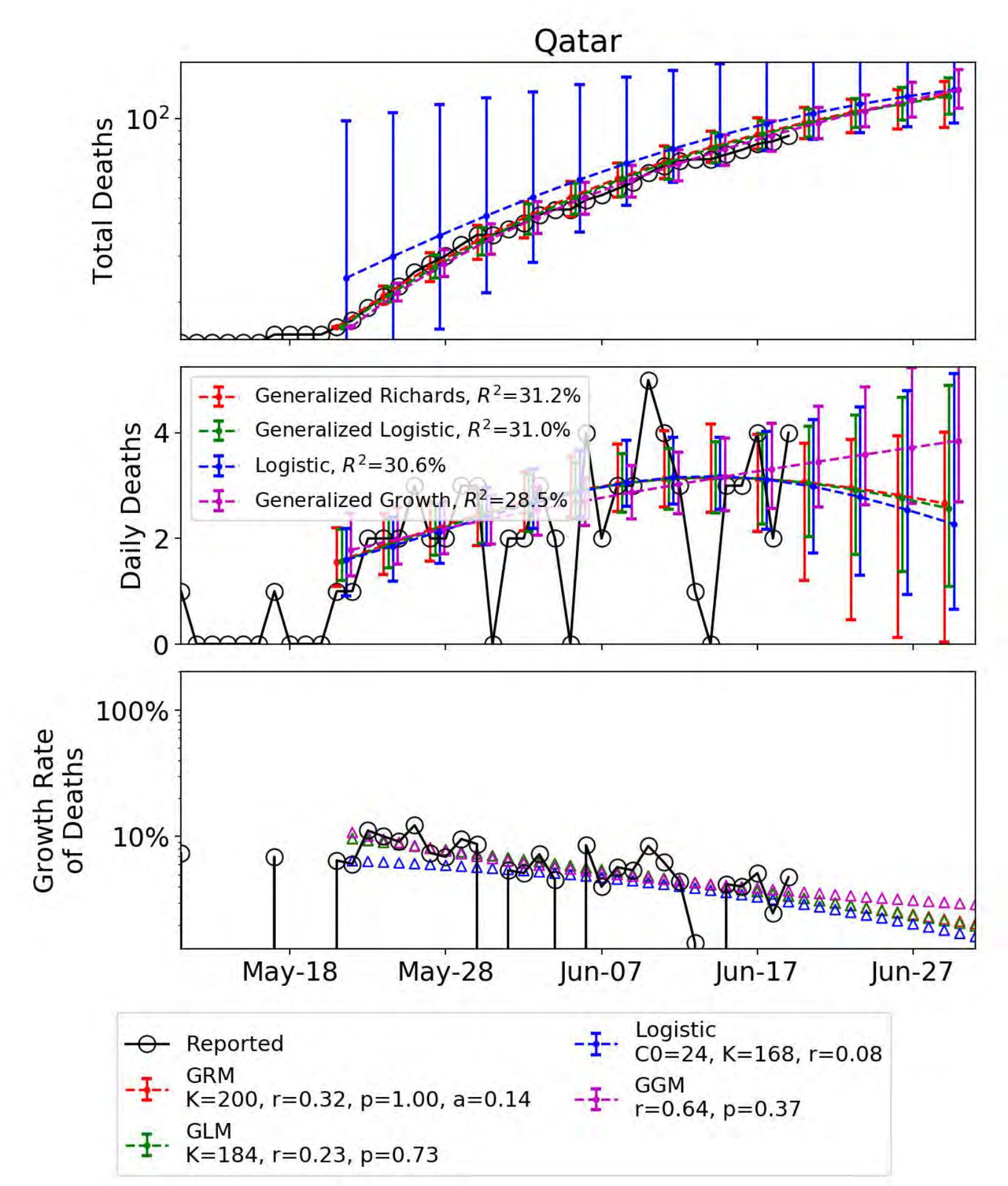

Saudi Arabia
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
4000
2000
0
Generalized Richards, R^2=89.6%
Generalized Logistic, R^2=89.6%
Logistic, R^2=71.2%
Generalized Growth, R^2=89.6%
Growth Rate
of Confirmed Cases
100%
10%
Mar-23
Apr-12
May-02
May-22
Jun-11
Jul-01
Reported
GRM
K=1140855, r=1.67, p=0.65, a=10.00
GLM
K=70531177238, r=1.67, p=0.65
Logistic
C0=149, K=198230, r=0.07
GGM
r=1.67, p=0.65

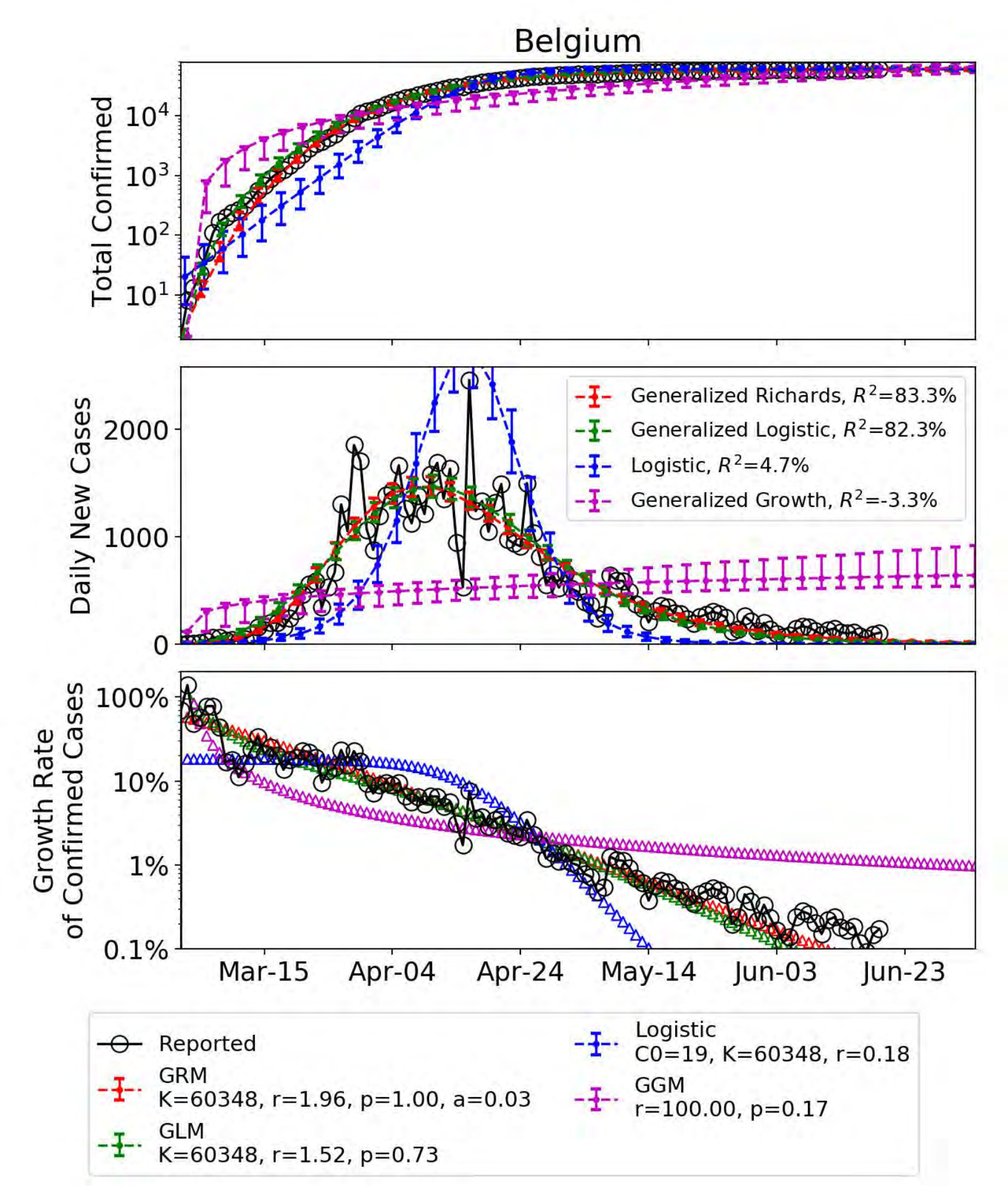

Saudi Arabia
Total Deaths
10^3
10^2
Daily Deaths
80
60
40
20
0
Generalized Richards, R^2=94.4%
Generalized Logistic, R^2=94.1%
Logistic, R^2=94.1%
Generalized Growth, R^2=94.0%
Growth Rate of Deaths
100%
10%
Apr-14
May-04
May-24
Jun-13
Jul-03
Reported
GRM
K=1537, r=0.04, p=1.00, a=6.87
GLM
K=39576, r=0.04, p=1.00
Logistic
C0=63, K=477070, r=0.04
GGM
r=0.04, p=0.99

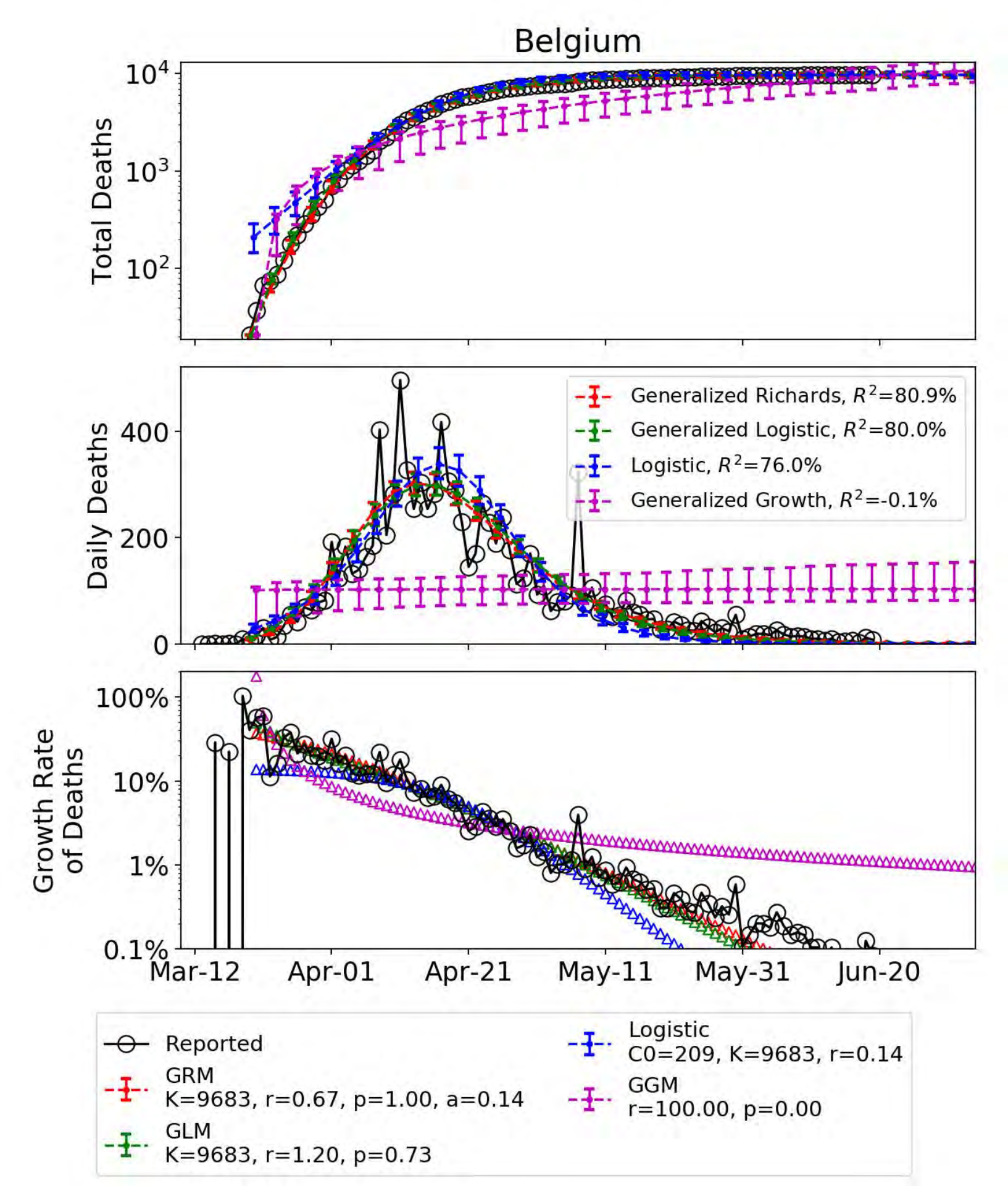

Canada
Total Confirmed
10^5
10^4
10^3
10^2
Daily New Cases
2000
1000
0
Generalized Richards, R^2=85.3%
Generalized Logistic, R^2=85.1%
Logistic, R^2=40.4%
Generalized Growth, R^2=9.7%
Growth Rate of Confirmed Cases
100%
10%
1%
Mar-26
Apr-15
May-05
May-25
Jun-14
Jul-04
Reported
GRM
K=111612, r=1.09, p=0.80, a=0.38
GLM
K=109444, r=2.70, p=0.65
Logistic
C0=769, K=100209, r=0.09
GGM
r=100.00, p=0.22

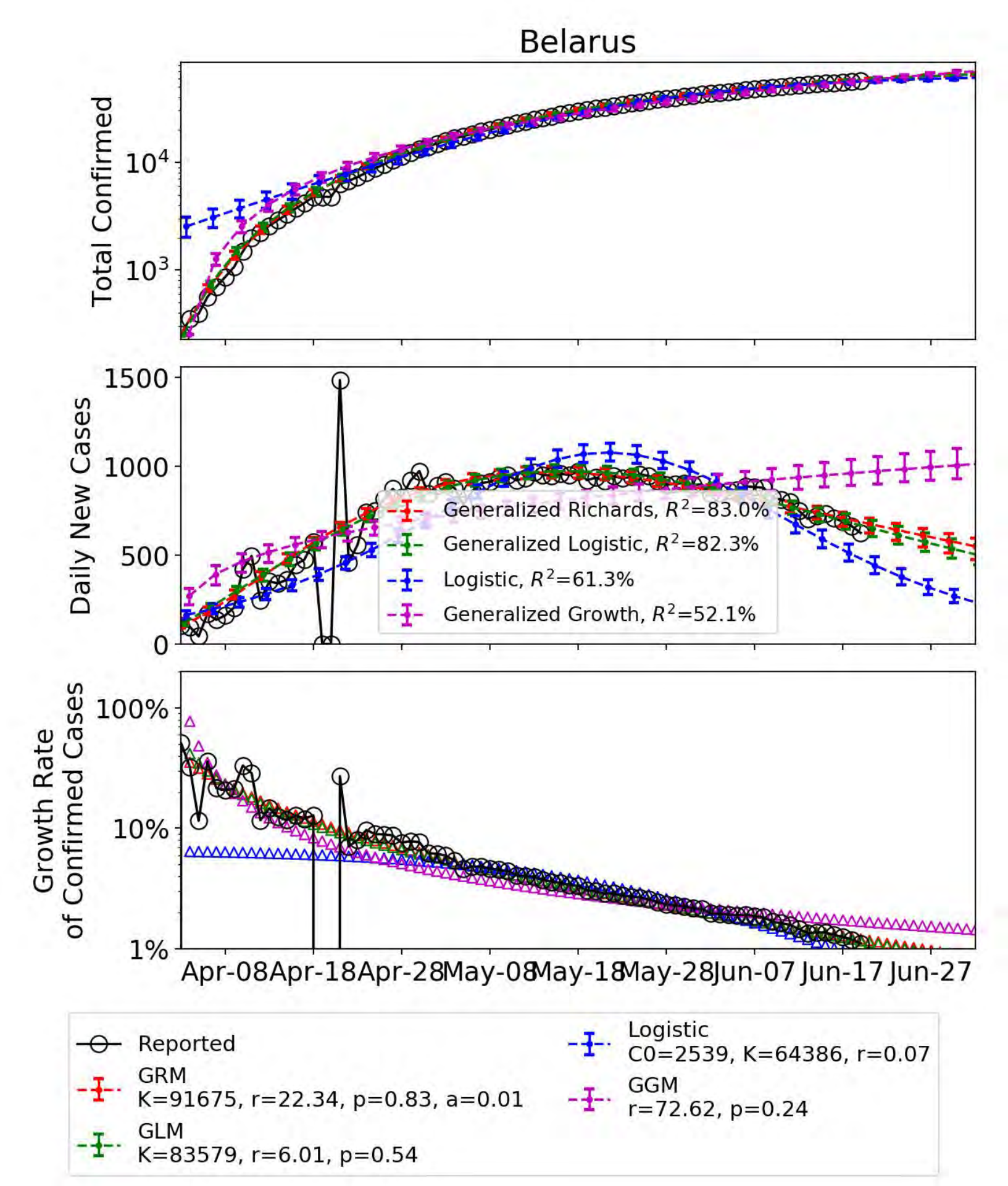

Canada
Total Deaths
10^4
10^3
10^2
10^1
Daily Deaths
200
150
100
50
0
Generalized Richards, R^2=78.3%
Generalized Logistic, R^2=77.2%
Logistic, R^2=65.0%
Generalized Growth, R^2=19.3%
Growth Rate of Deaths
100%
10%
1%
Mar-10
Mar-30
Apr-19
May-09
May-29
Jun-18
Reported
GRM
K=9167, r=0.53, p=1.00, a=0.10
GLM
K=9017, r=0.66, p=0.73
Logistic
C0=79, K=8300, r=0.09
GGM
r=14.21, p=0.23

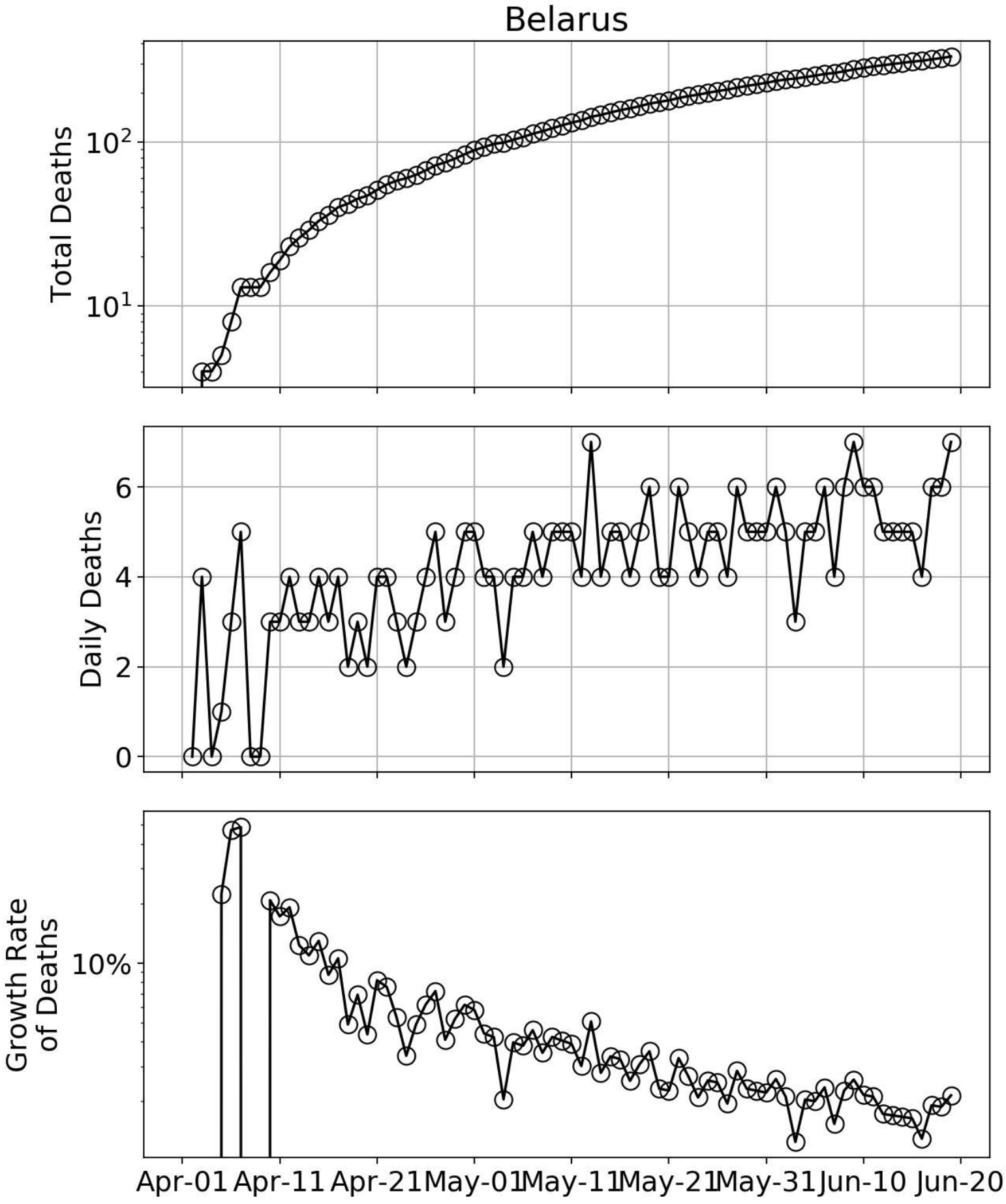

Qatar
Total Confirmed
10^5
10^4
10^3
Daily New Cases
2000
1500
1000
500
0
Generalized Richards, R^2=93.6%
Generalized Logistic, R^2=93.1%
Logistic, R^2=93.5%
Generalized Growth, R^2=77.5%
Growth Rate of Confirmed Cases
100%
10%
1%
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=100930, r=0.74, p=0.74, a=2.35
GLM
K=110309, r=0.24, p=0.88
Logistic
C0=1670, K=108287, r=0.07
GGM
r=7.27, p=0.49

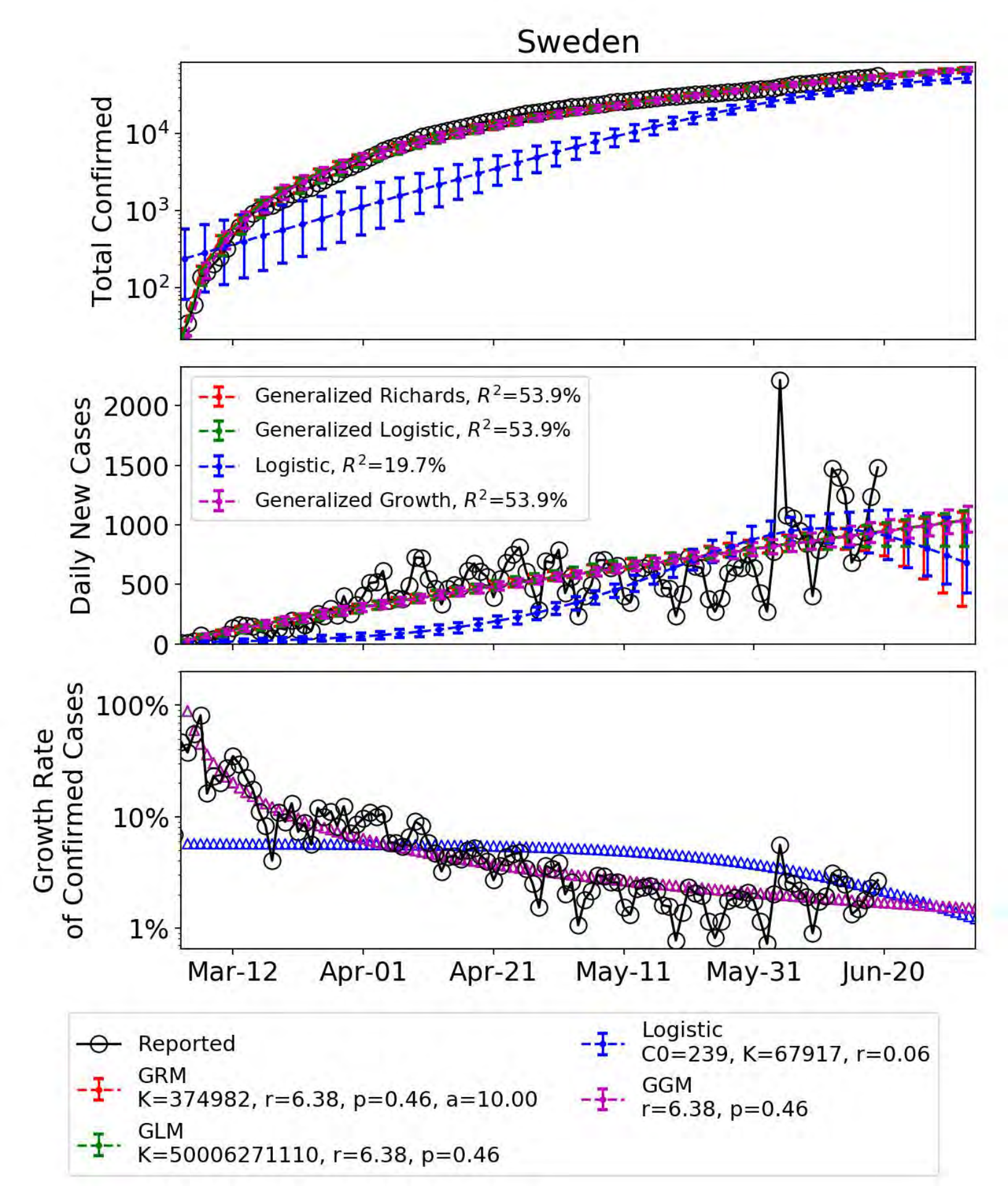

Qatar
Total Deaths
10^2
Daily Deaths
4
2
0
Generalized Richards, R^2=31.2%
Generalized Logistic, R^2=31.0%
Logistic, R^2=30.6%
Generalized Growth, R^2=28.5%
Growth Rate of Deaths
100%
10%
May-18
May-28
Jun-07
Jun-17
Jun-27
Reported
GRM
K=200, r=0.32, p=1.00, a=0.14
GLM
K=184, r=0.23, p=0.73
Logistic
C0=24, K=168, r=0.08
GGM
r=0.64, p=0.37

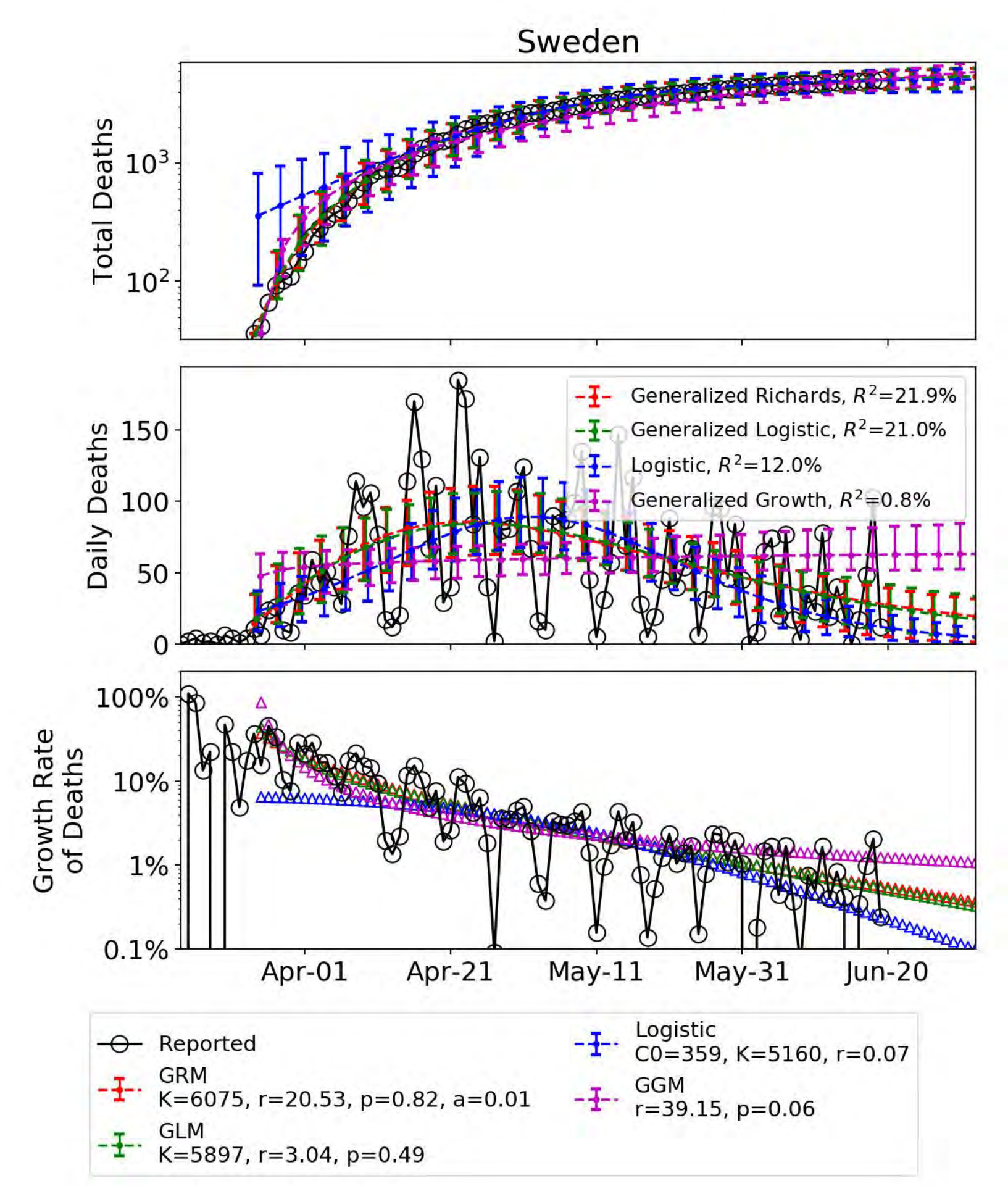

Belgium
Total Confirmed
10^4
10^3
10^2
10^1
Daily New Cases
2000
1000
0
Generalized Richards, R^2=83.3%
Generalized Logistic, R^2=82.3%
Logistic, R^2=4.7%
Generalized Growth, R^2=-3.3%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-15
Apr-04
Apr-24
May-14
Jun-03
Jun-23
Reported
GRM
K=60348, r=1.96, p=1.00, a=0.03
GLM
K=60348, r=1.52, p=0.73
Logistic
C0=19, K=60348, r=0.18
GGM
r=100.00, p=0.17

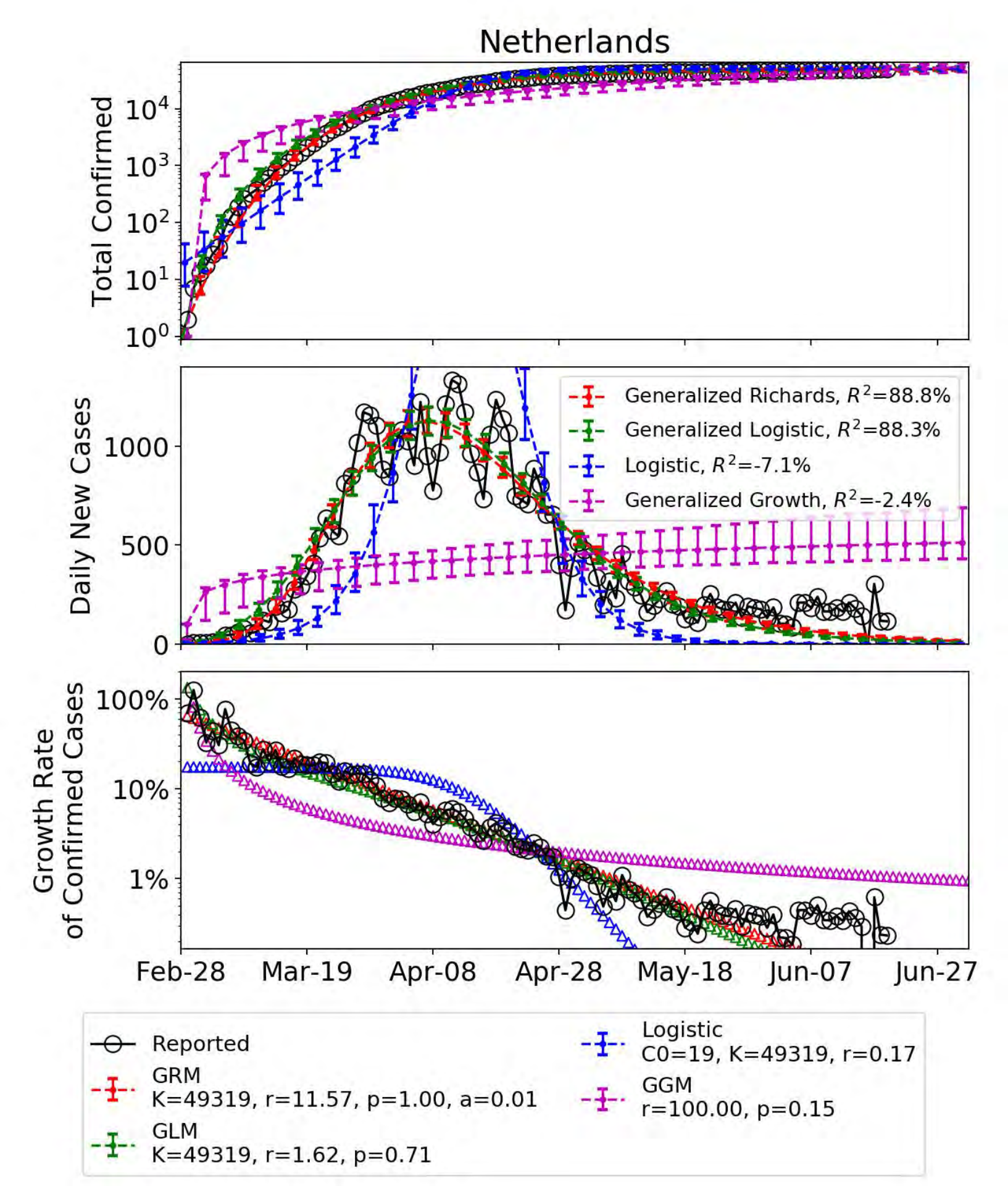

Belgium
Total Deaths
10^4
10^3
10^2
Daily Deaths
400
200
0
Generalized Richards, R^2=80.9%
Generalized Logistic, R^2=80.0%
Logistic, R^2=76.0%
Generalized Growth, R^2=-0.1%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-12
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=9683, r=0.67, p=1.00, a=0.14
GLM
K=9683, r=1.20, p=0.73
Logistic
C0=209, K=9683, r=0.14
GGM
r=100.00, p=0.00

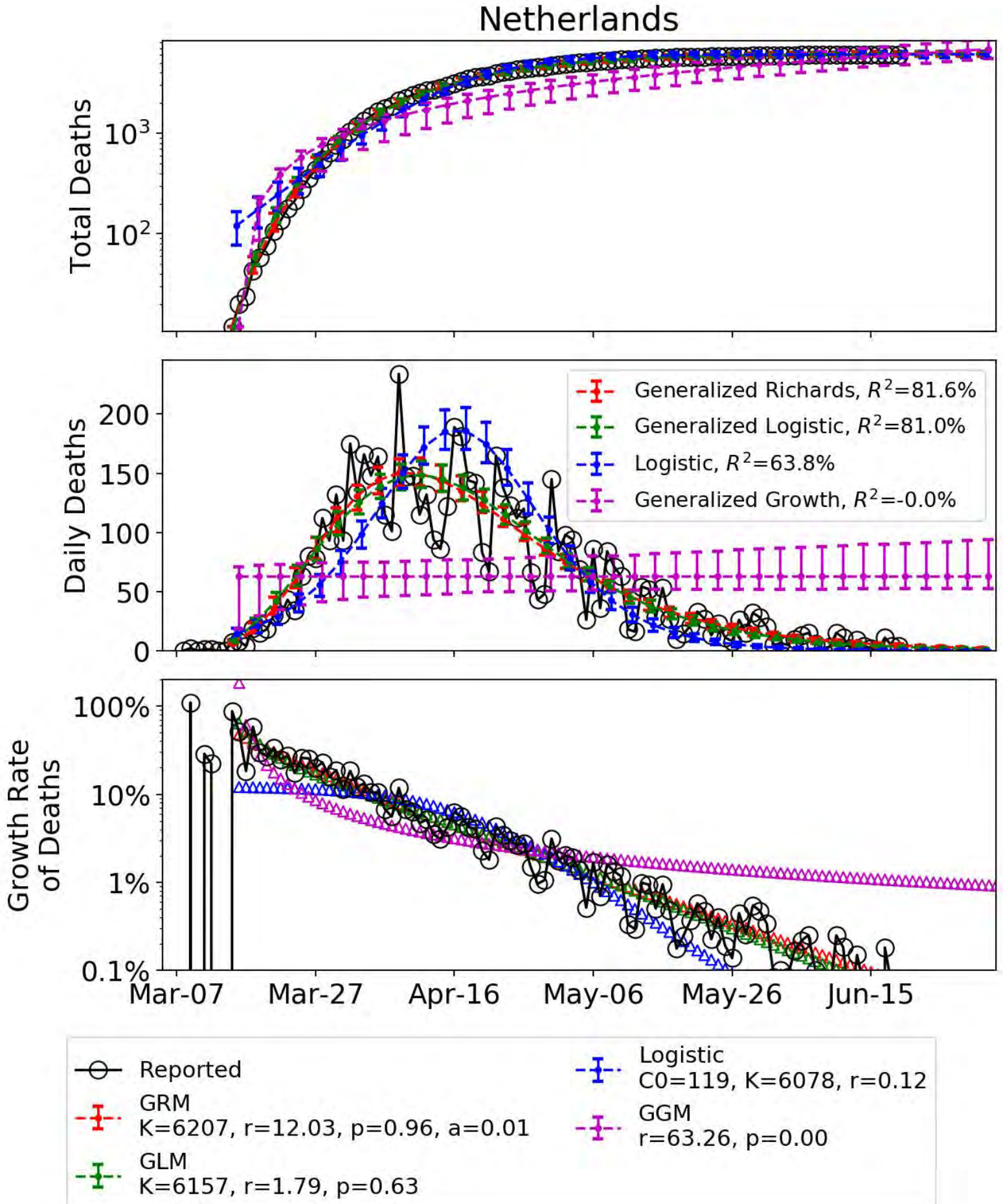

Belarus
Total Confirmed
10^4
10^3
Daily New Cases
1500
1000
500
0
Generalized Richards, R^2=83.0%
Generalized Logistic, R^2=82.3%
Logistic, R^2=61.3%
Generalized Growth, R^2=52.1%
Growth Rate of Confirmed Cases
100%
10%
1%
Apr-08
Apr-18
Apr-28
May-08
May-18
May-28
Jun-07
Jun-17
Jun-27
Reported
GRM
K=91675, r=22.34, p=0.83, a=0.01
GLM
K=83579, r=6.01, p=0.54
Logistic
C0=2539, K=64386, r=0.07
GGM
r=72.62, p=0.24

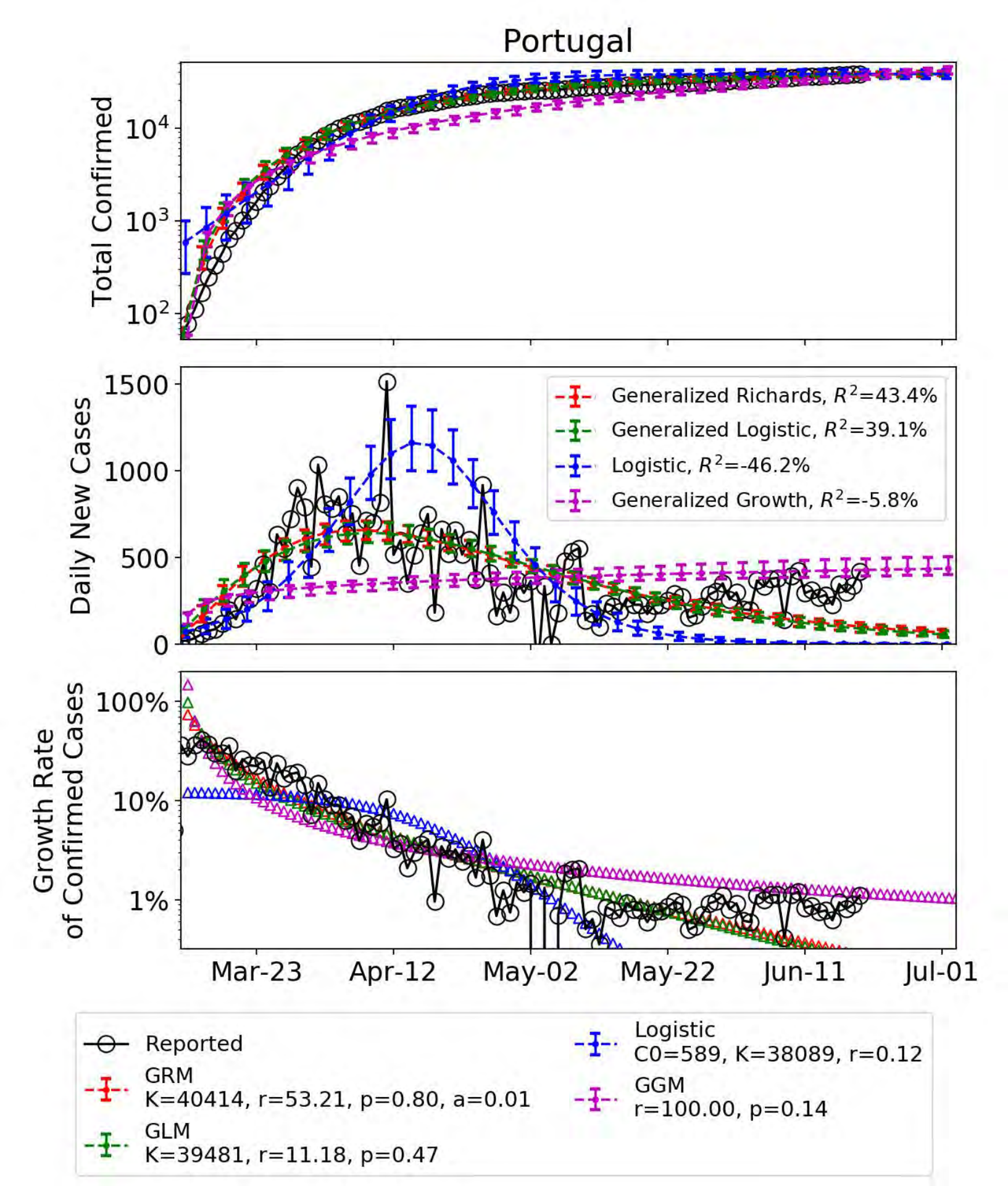

Belarus
Total Deaths
10^2
10^1
Daily Deaths
6
4
2
0
Growth Rate of Deaths
10%
Apr-01
Apr-11
Apr-21
May-01
May-11
May-21
May-31
Jun-10
Jun-20

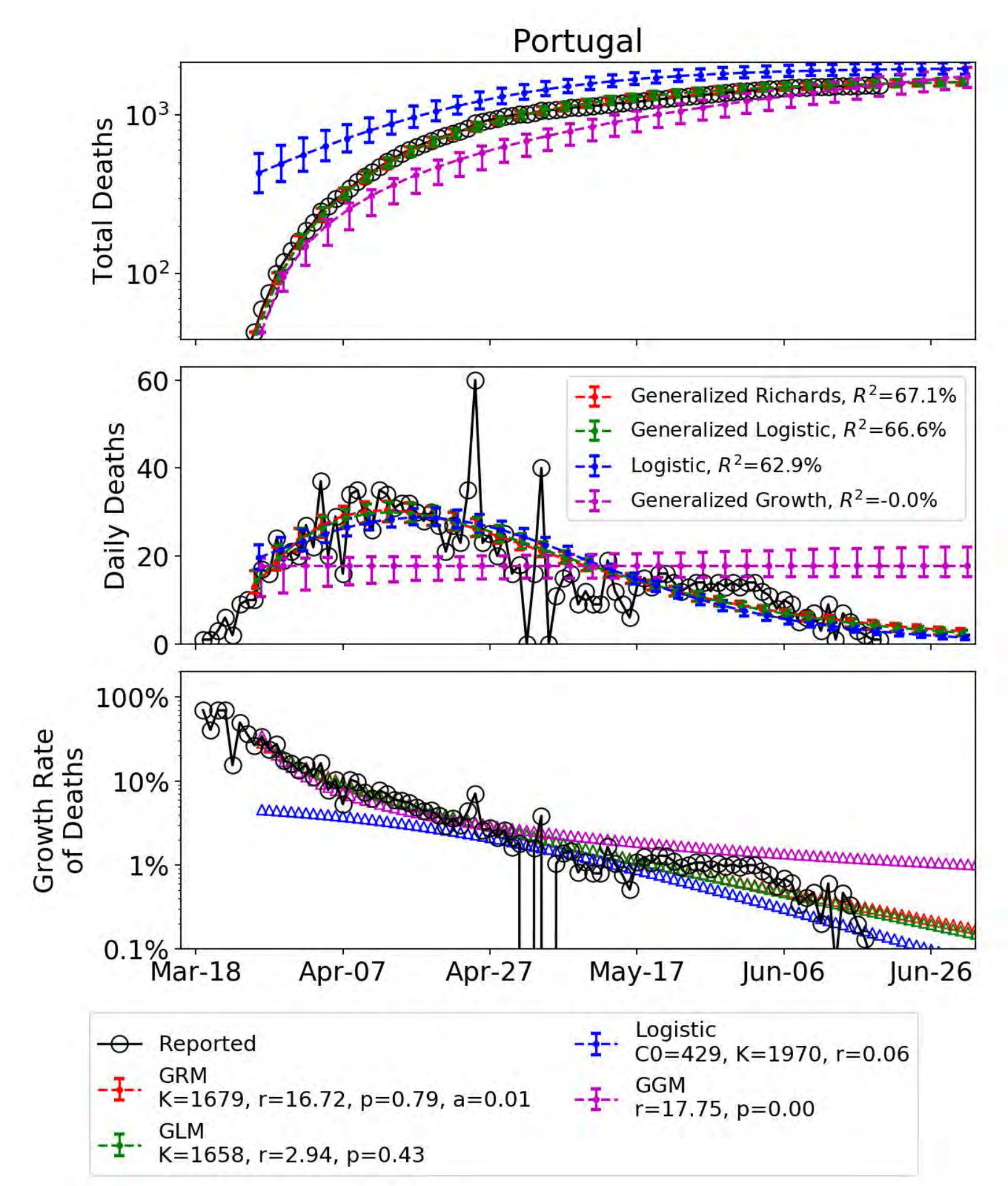

Sweden
Total Confirmed
10^4
10^3
10^2
Daily New Cases
2000
1500
1000
500
0
Generalized Richards, R^2=53.9%
Generalized Logistic, R^2=53.9%
Logistic, R^2=19.7%
Generalized Growth, R^2=53.9%
Growth Rate
of Confirmed Cases
100%
10%
1%
Mar-12
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=374982, r=6.38, p=0.46, a=10.00
GLM
K=50006271110, r=6.38, p=0.46
Logistic
C0=239, K=67917, r=0.06
GGM
r=6.38, p=0.46

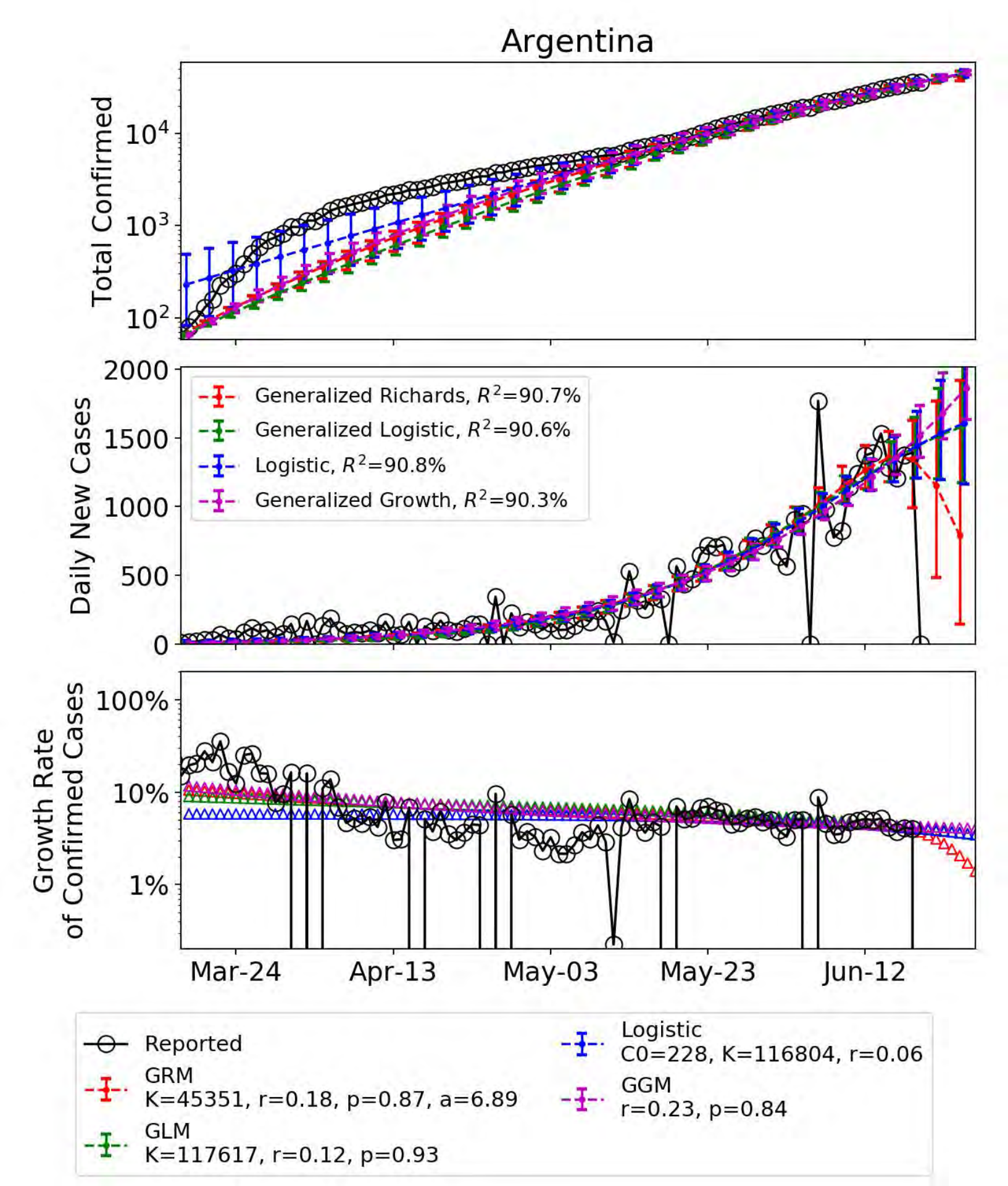

Sweden
Total Deaths
10^3
10^2
Daily Deaths
150
100
50
0
Generalized Richards, R^2=21.9%
Generalized Logistic, R^2=21.0%
Logistic, R^2=12.0%
Generalized Growth, R^2=0.8%
Growth Rate of Deaths
100%
10%
1%
0.1%
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=6075, r=20.53, p=0.82, a=0.01
GLM
K=5897, r=3.04, p=0.49
Logistic
C0=359, K=5160, r=0.07
GGM
r=39.15, p=0.06

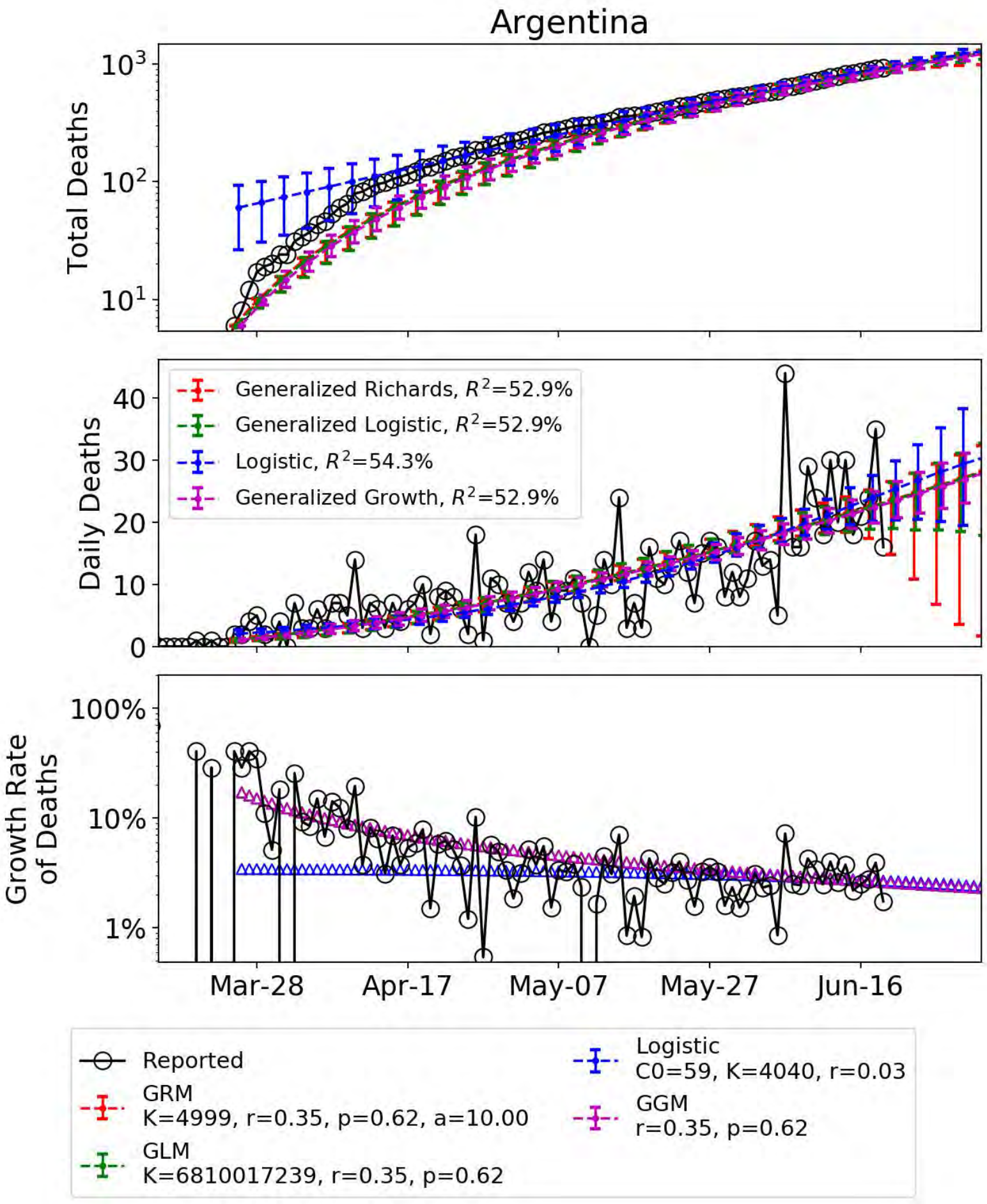

Netherlands
Total Confirmed
10^4
10^3
10^2
10^1
10^0
Daily New Cases
1000
500
0
Generalized Richards, R^2=88.8%
Generalized Logistic, R^2=88.3%
Logistic, R^2=-7.1%
Generalized Growth, R^2=-2.4%
Growth Rate
of Confirmed Cases
100%
10%
1%
Feb-28
Mar-19
Apr-08
Apr-28
May-18
Jun-07
Jun-27
Reported
GRM
K=49319, r=11.57, p=1.00, a=0.01
GLM
K=49319, r=1.62, p=0.71
Logistic
C0=19, K=49319, r=0.17
GGM
r=100.00, p=0.15

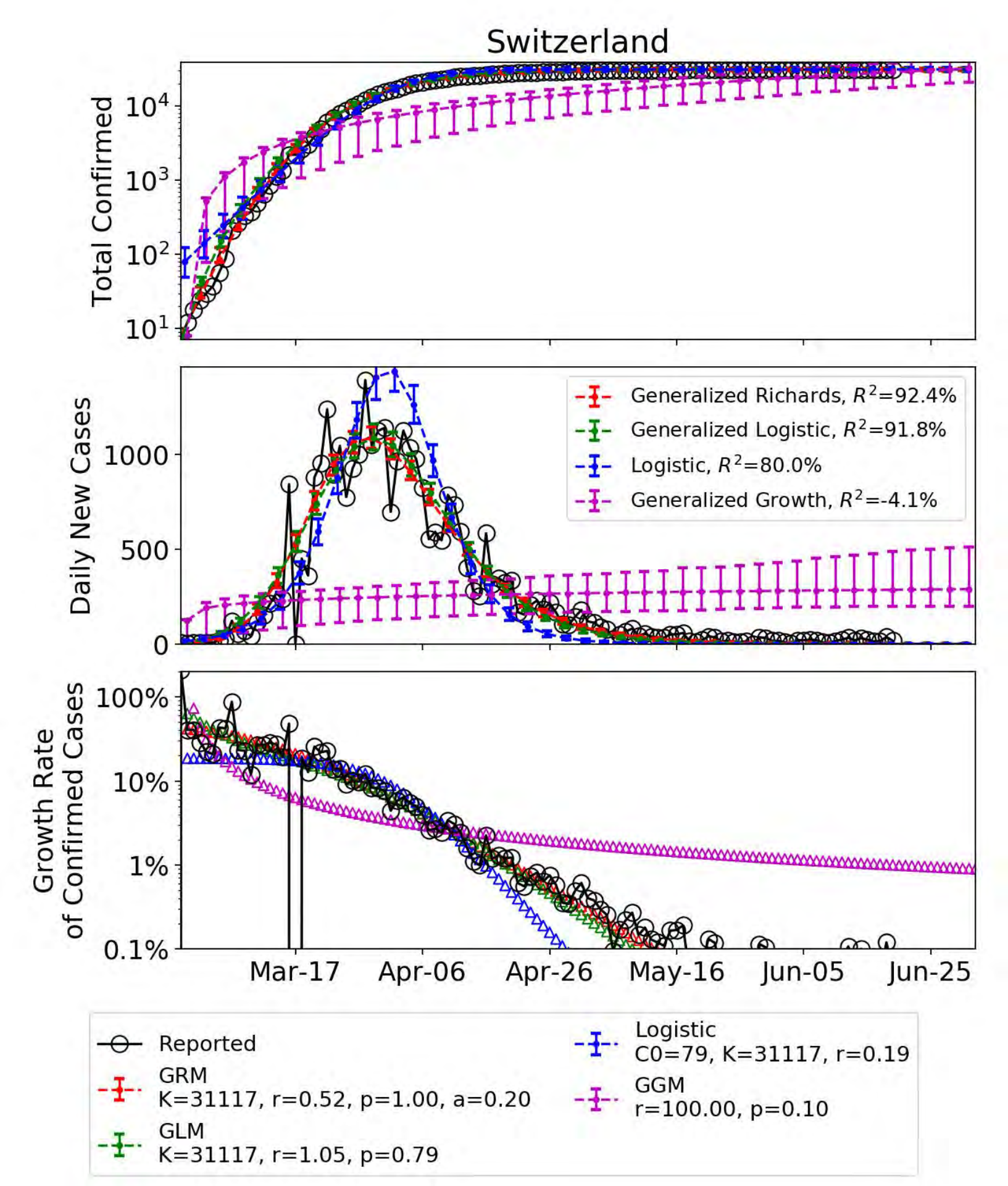

Netherlands
Total Deaths
10^3
10^2
Daily Deaths
200
150
100
50
0
Generalized Richards, R^2=81.6%
Generalized Logistic, R^2=81.0%
Logistic, R^2=63.8%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-07
Mar-27
Apr-16
May-06
May-26
Jun-15
Reported
GRM
K=6207, r=12.03, p=0.96, a=0.01
GLM
K=6157, r=1.79, p=0.63
Logistic
C0=119, K=6078, r=0.12
GGM
r=63.26, p=0.00

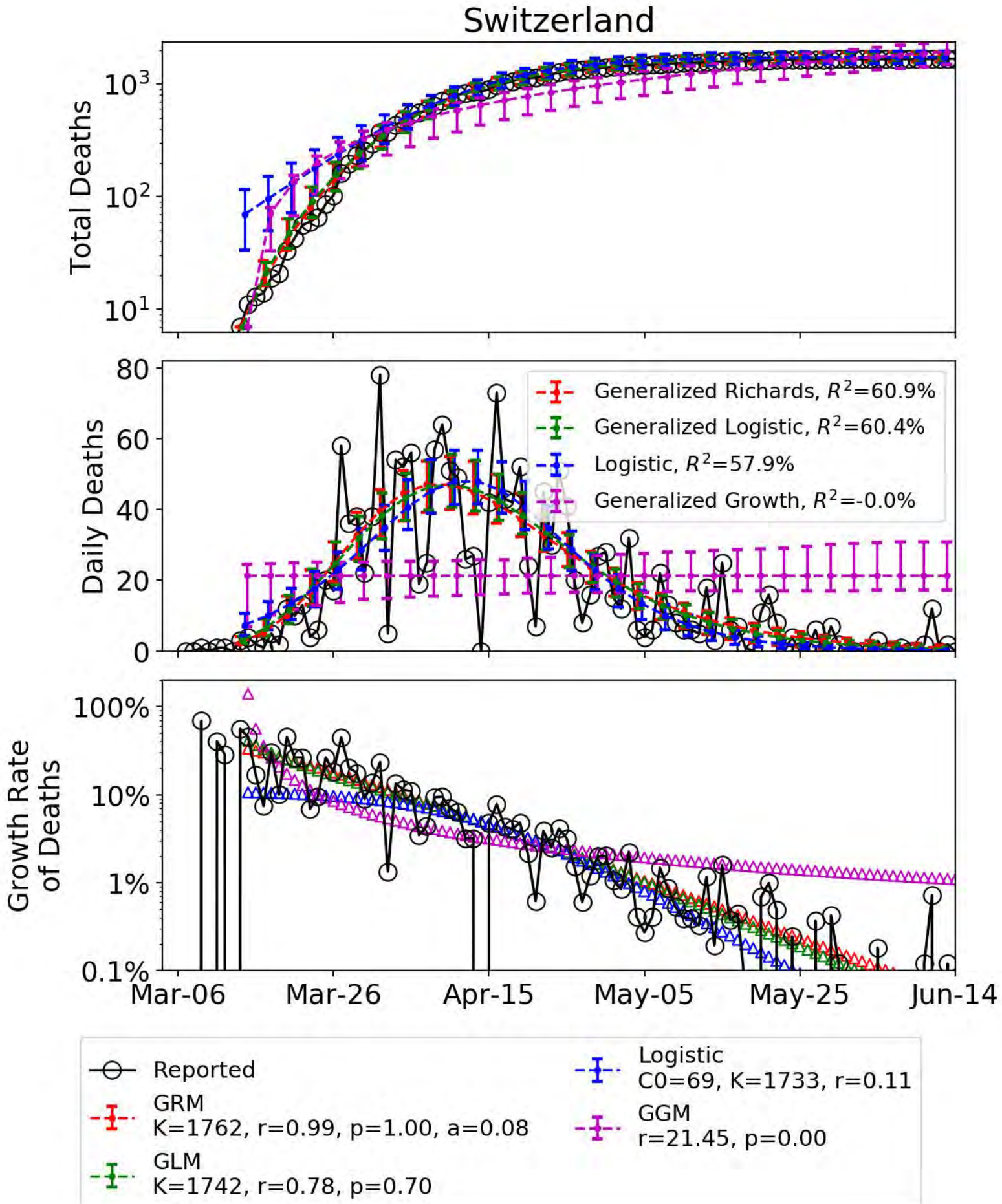

Portugal
Total Confirmed
10^4
10^3
10^2
Daily New Cases
1500
1000
500
0
Generalized Richards, R^2=43.4%
Generalized Logistic, R^2=39.1%
Logistic, R^2=-46.2%
Generalized Growth, R^2=-5.8%
Growth Rate of Confirmed Cases
100%
10%
1%
Mar-23
Apr-12
May-02
May-22
Jun-11
Jul-01
Reported
GRM
K=40414, r=53.21, p=0.80, a=0.01
GLM
K=39481, r=11.18, p=0.47
Logistic
C0=589, K=38089, r=0.12
GGM
r=100.00, p=0.14

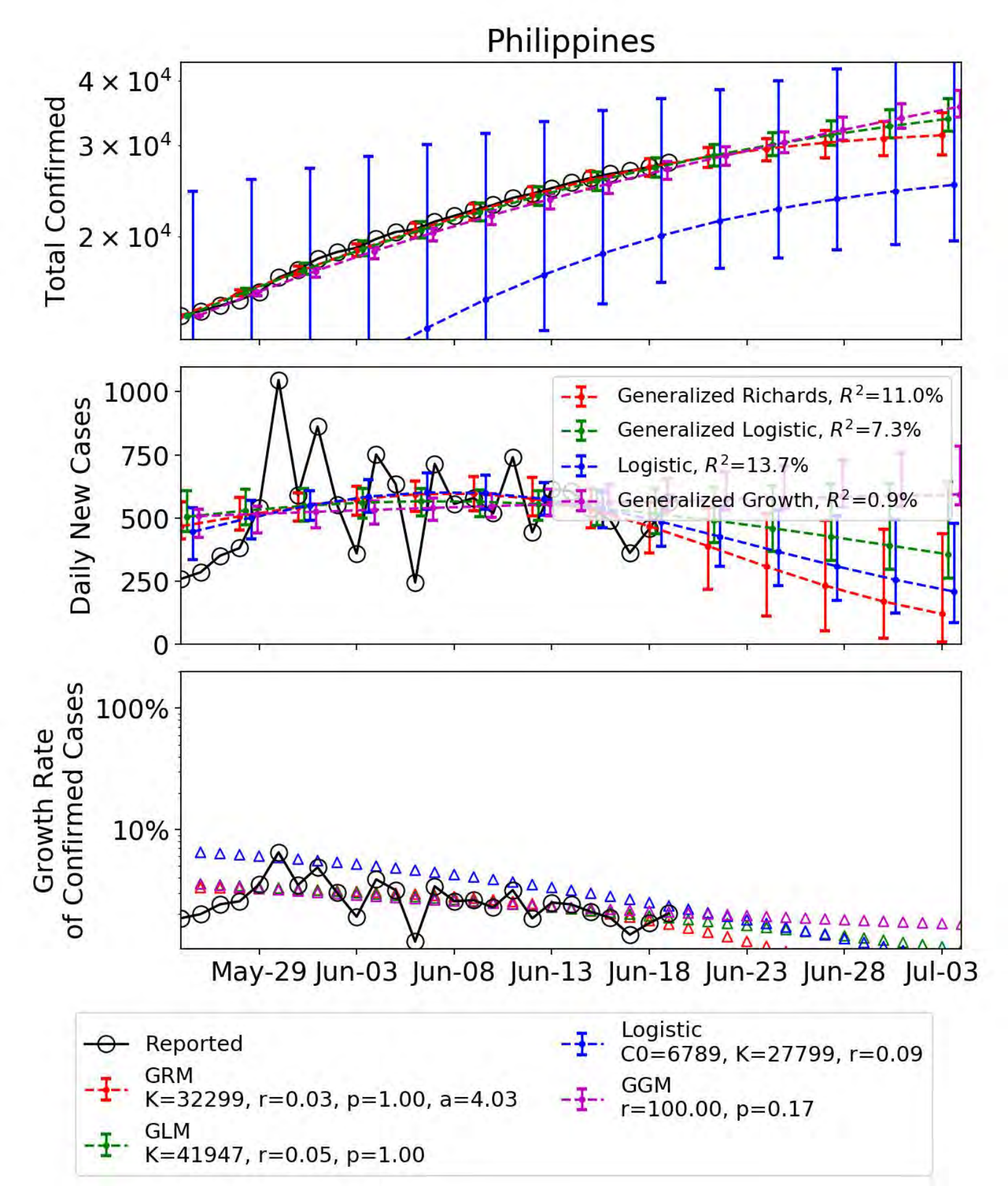

Portugal
Total Deaths
10^3
10^2
Daily Deaths
60
40
20
0
Generalized Richards, R^2=67.1%
Generalized Logistic, R^2=66.6%
Logistic, R^2=62.9%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-18
Apr-07
Apr-27
May-17
Jun-06
Jun-26
Reported
GRM
K=1679, r=16.72, p=0.79, a=0.01
GLM
K=1658, r=2.94, p=0.43
Logistic
C0=429, K=1970, r=0.06
GGM
r=17.75, p=0.00

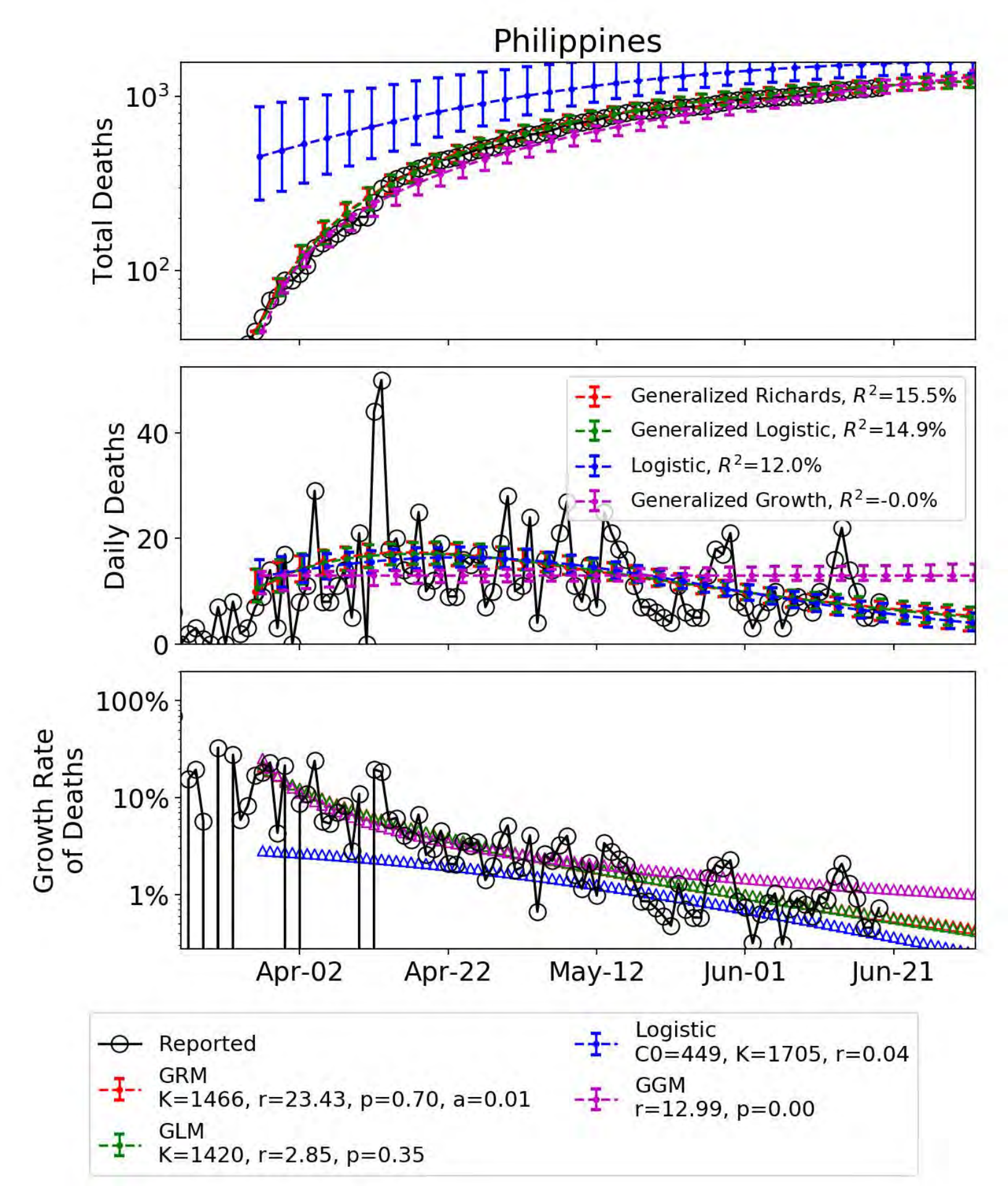

Argentina
Total Confirmed
10^4
10^3
10^2
Daily New Cases
2000
1500
1000
500
0
Generalized Richards, R^2=90.7%
Generalized Logistic, R^2=90.6%
Logistic, R^2=90.8%
Generalized Growth, R^2=90.3%
Growth Rate of Confirmed Cases
100%
10%
1%
Mar-24
Apr-13
May-03
May-23
Jun-12
Reported
GRM
K=45351, r=0.18, p=0.87, a=6.89
GLM
K=117617, r=0.12, p=0.93
Logistic
C0=228, K=116804, r=0.06
GGM
r=0.23, p=0.84

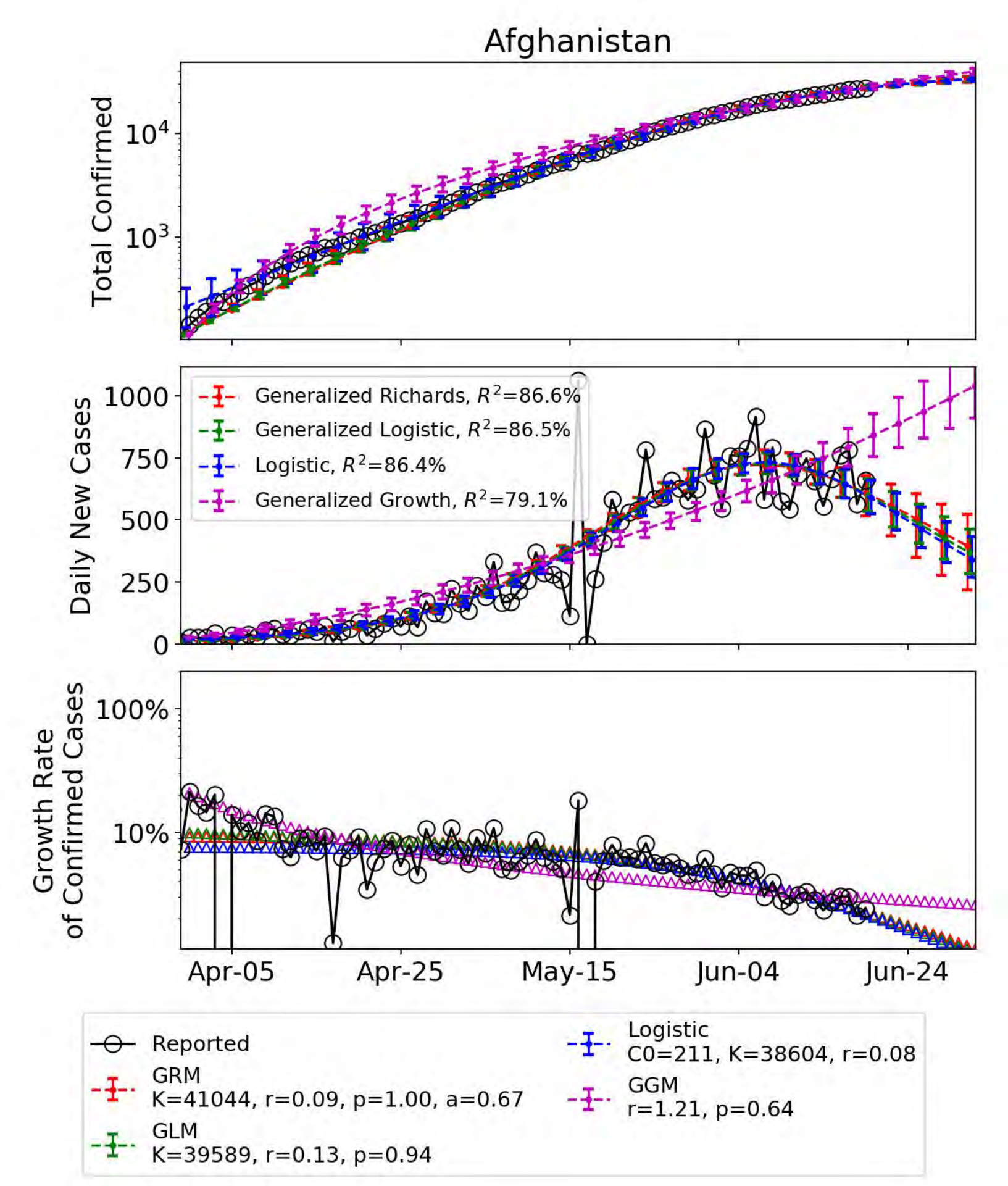

Argentina
Total Deaths
10^3
10^2
10^1
Daily Deaths
40
30
20
10
0
Generalized Richards, R^2=52.9%
Generalized Logistic, R^2=52.9%
Logistic, R^2=54.3%
Generalized Growth, R^2=52.9%
Growth Rate of Deaths
100%
10%
1%
Mar-28
Apr-17
May-07
May-27
Jun-16
Reported
GRM
K=4999, r=0.35, p=0.62, a=10.00
GLM
K=6810017239, r=0.35, p=0.62
Logistic
C0=59, K=4040, r=0.03
GGM
r=0.35, p=0.62

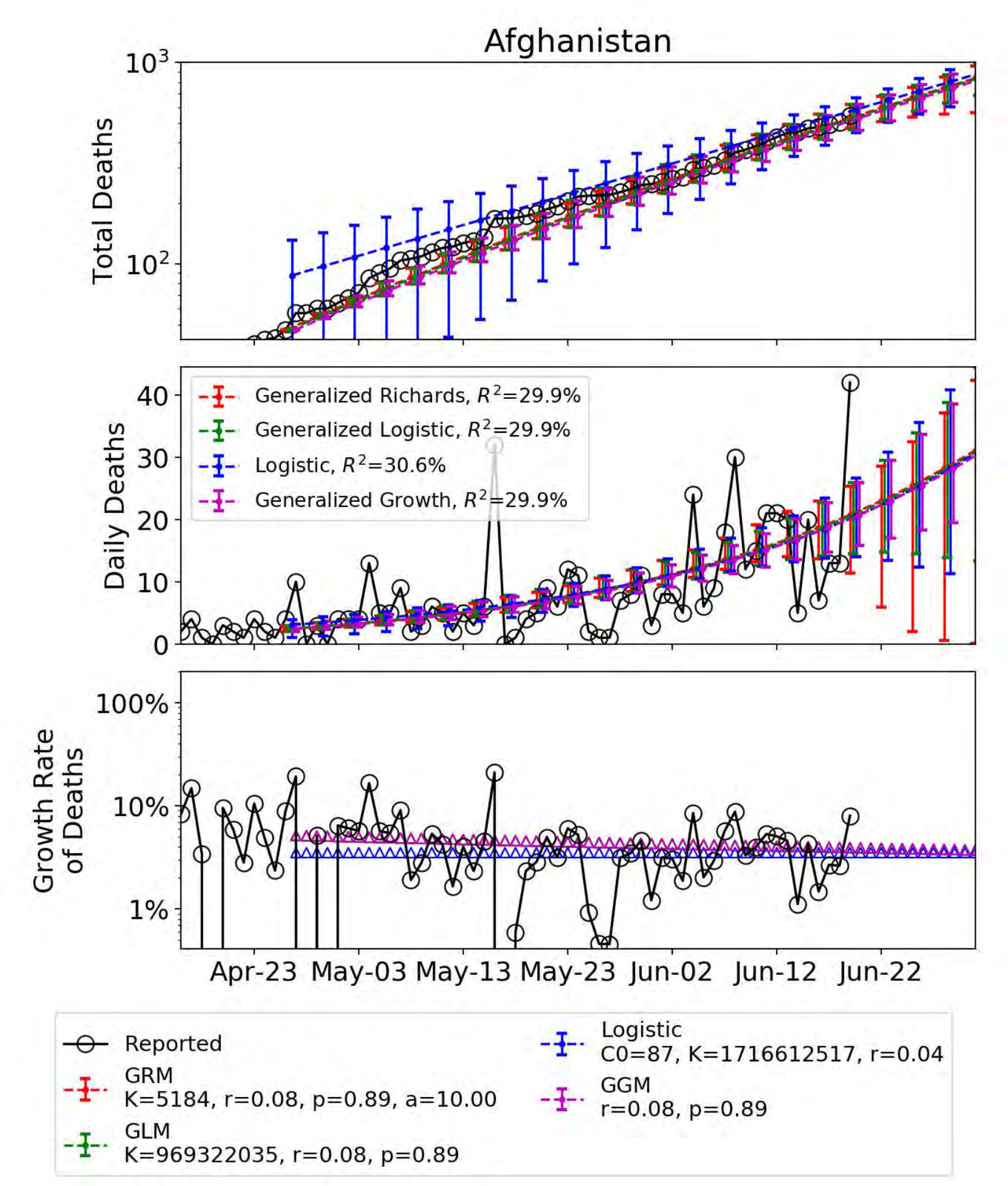

Switzerland
Total Confirmed
10^4
10^3
10^2
10^1
Daily New Cases
1000
500
0
Generalized Richards, R^2=92.4%
Generalized Logistic, R^2=91.8%
Logistic, R^2=80.0%
Generalized Growth, R^2=-4.1%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-17
Apr-06
Apr-26
May-16
Jun-05
Jun-25
Reported
GRM
K=31117, r=0.52, p=1.00, a=0.20
GLM
K=31117, r=1.05, p=0.79
Logistic
C0=79, K=31117, r=0.19
GGM
r=100.00, p=0.10

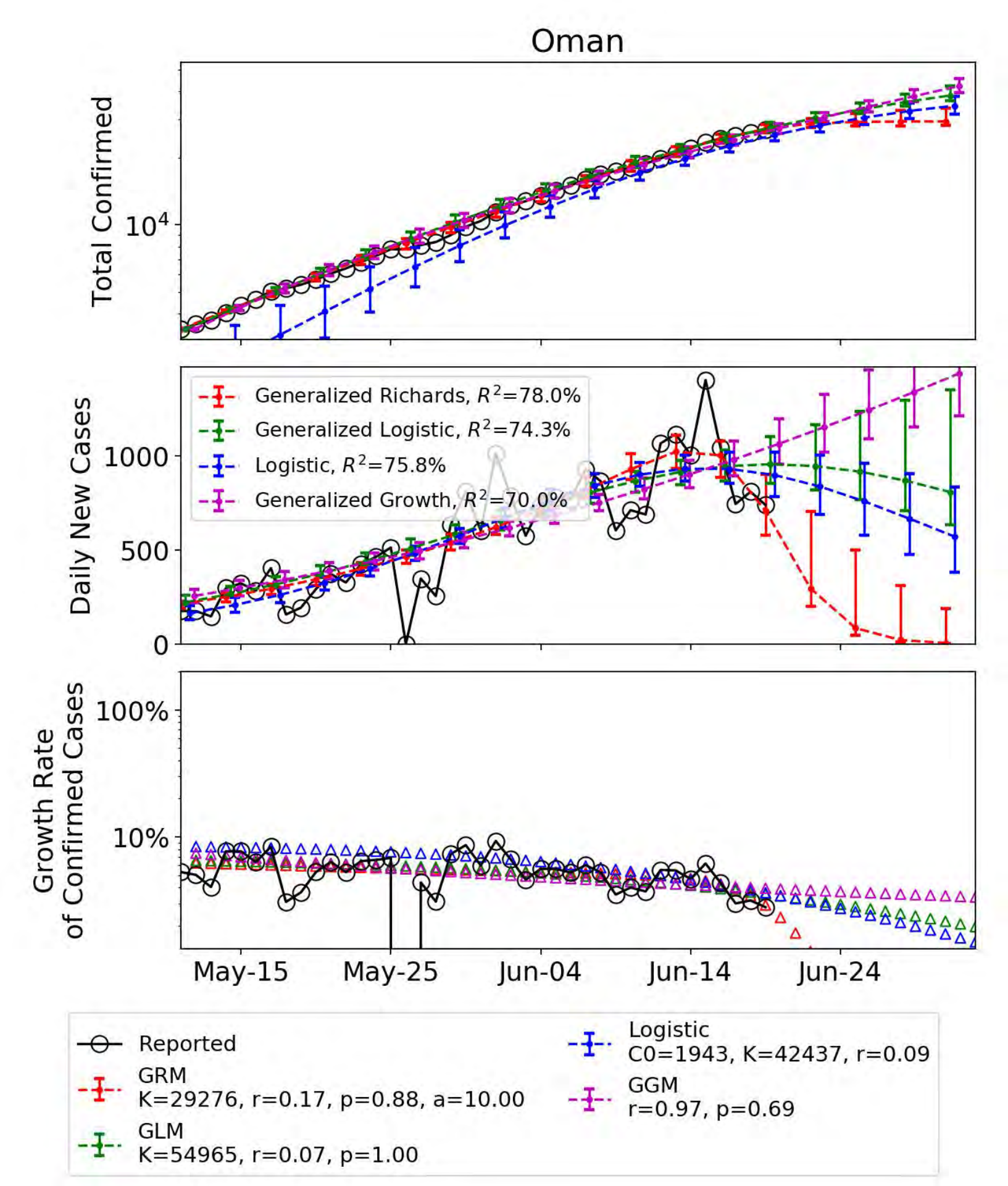

Switzerland
Total Deaths
10^3
10^2
10^1
Daily Deaths
80
60
40
20
0
Generalized Richards, R^2=60.9%
Generalized Logistic, R^2=60.4%
Logistic, R^2=57.9%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-06
Mar-26
Apr-15
May-05
May-25
Jun-14
Reported
GRM
K=1762, r=0.99, p=1.00, a=0.08
GLM
K=1742, r=0.78, p=0.70
Logistic
C0=69, K=1733, r=0.11
GGM
r=21.45, p=0.00

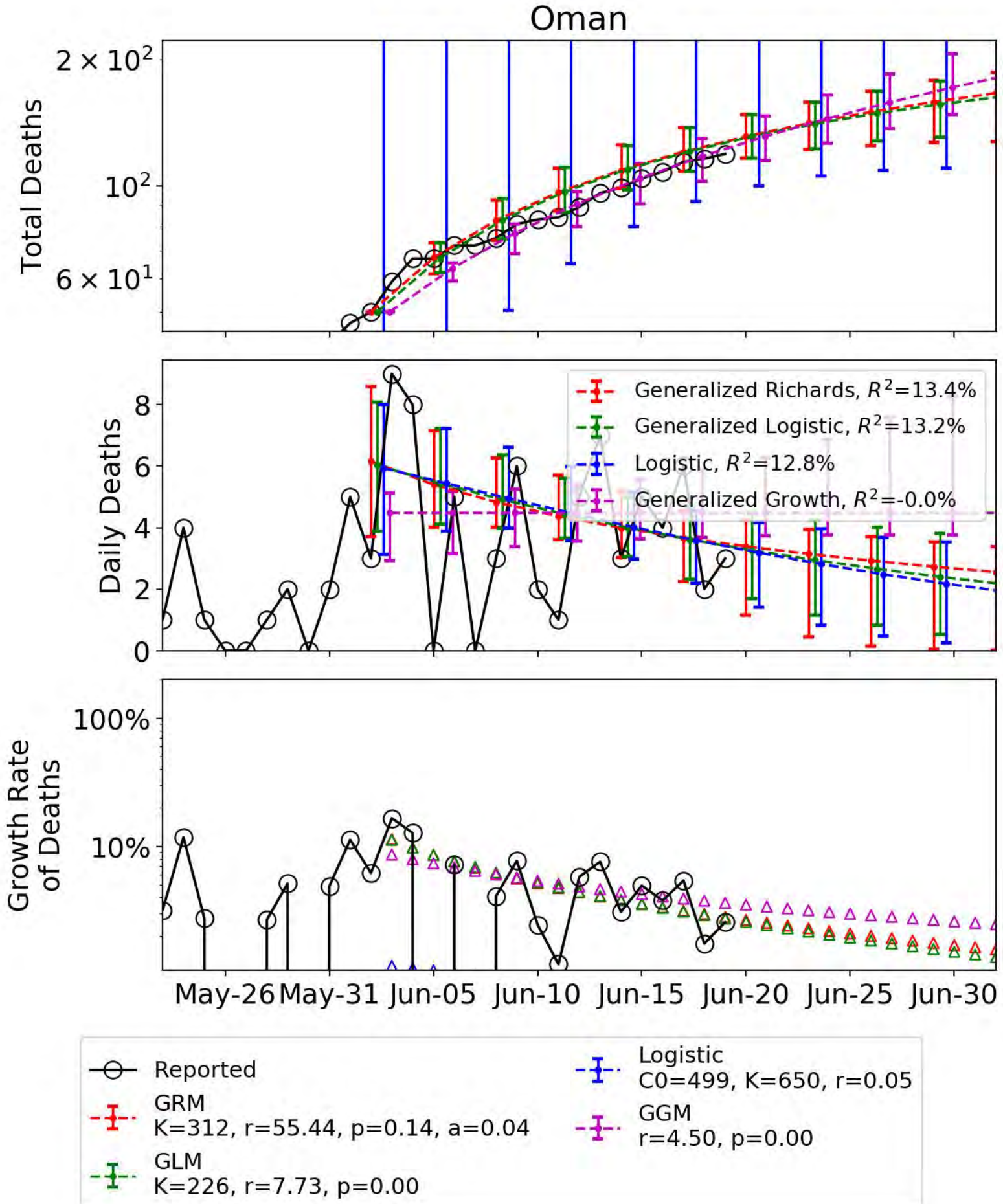

Philippines
Total Confirmed
4×10^4
3×10^4
2×10^4
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=11.0%
Generalized Logistic, R^2=7.3%
Logistic, R^2=13.7%
Generalized Growth, R^2=0.9%
Growth Rate of Confirmed Cases
100%
10%
May-29
Jun-03
Jun-08
Jun-13
Jun-18
Jun-23
Jun-28
Jul-03
Reported
GRM
K=32299, r=0.03, p=1.00, a=4.03
GLM
K=41947, r=0.05, p=1.00
Logistic
C0=6789, K=27799, r=0.09
GGM
r=100.00, p=0.17

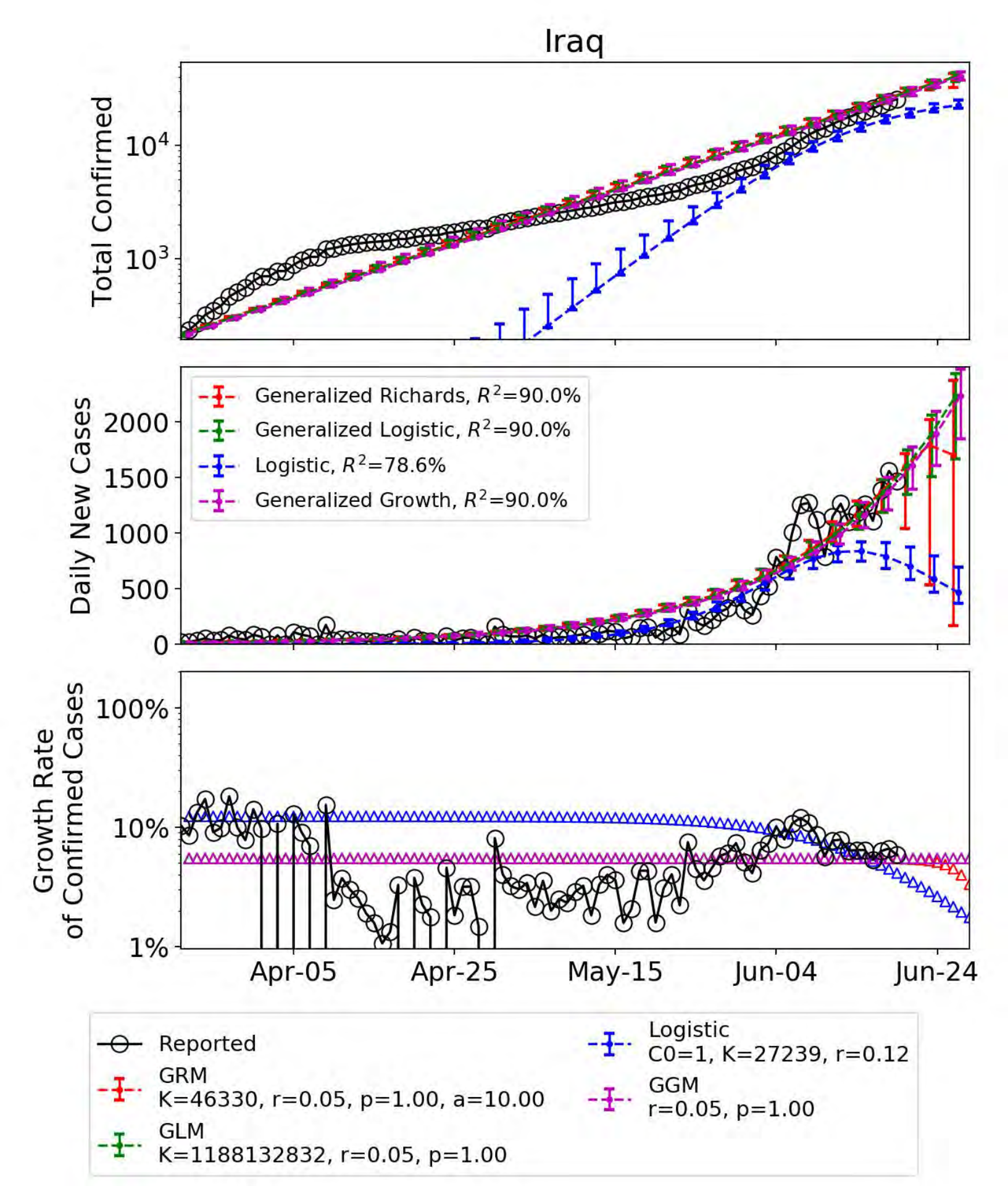

Philippines
Total Deaths
10^3
10^2
Daily Deaths
40
20
0
Generalized Richards, R^2=15.5%
Generalized Logistic, R^2=14.9%
Logistic, R^2=12.0%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
Apr-02
Apr-22
May-12
Jun-01
Jun-21
Reported
GRM
K=1466, r=23.43, p=0.70, a=0.01
GLM
K=1420, r=2.85, p=0.35
Logistic
C0=449, K=1705, r=0.04
GGM
r=12.99, p=0.00

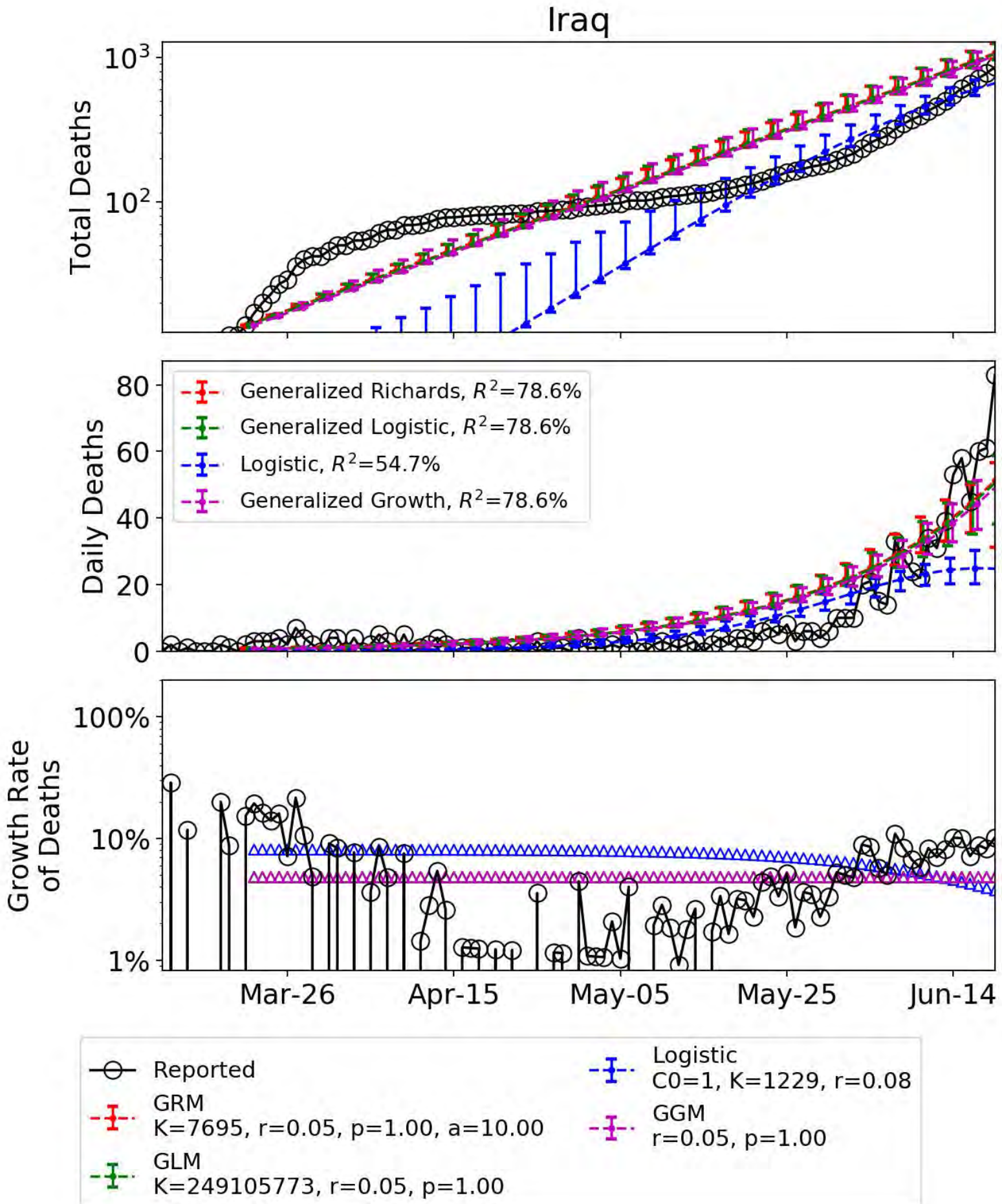

Afghanistan
Total Confirmed
10^4
10^3
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=86.6%
Generalized Logistic, R^2=86.5%
Logistic, R^2=86.4%
Generalized Growth, R^2=79.1%
Growth Rate
of Confirmed Cases
100%
10%
Apr-05
Apr-25
May-15
Jun-04
Jun-24
Reported
GRM
K=41044, r=0.09, p=1.00, a=0.67
GLM
K=39589, r=0.13, p=0.94
Logistic
C0=211, K=38604, r=0.08
GGM
r=1.21, p=0.64

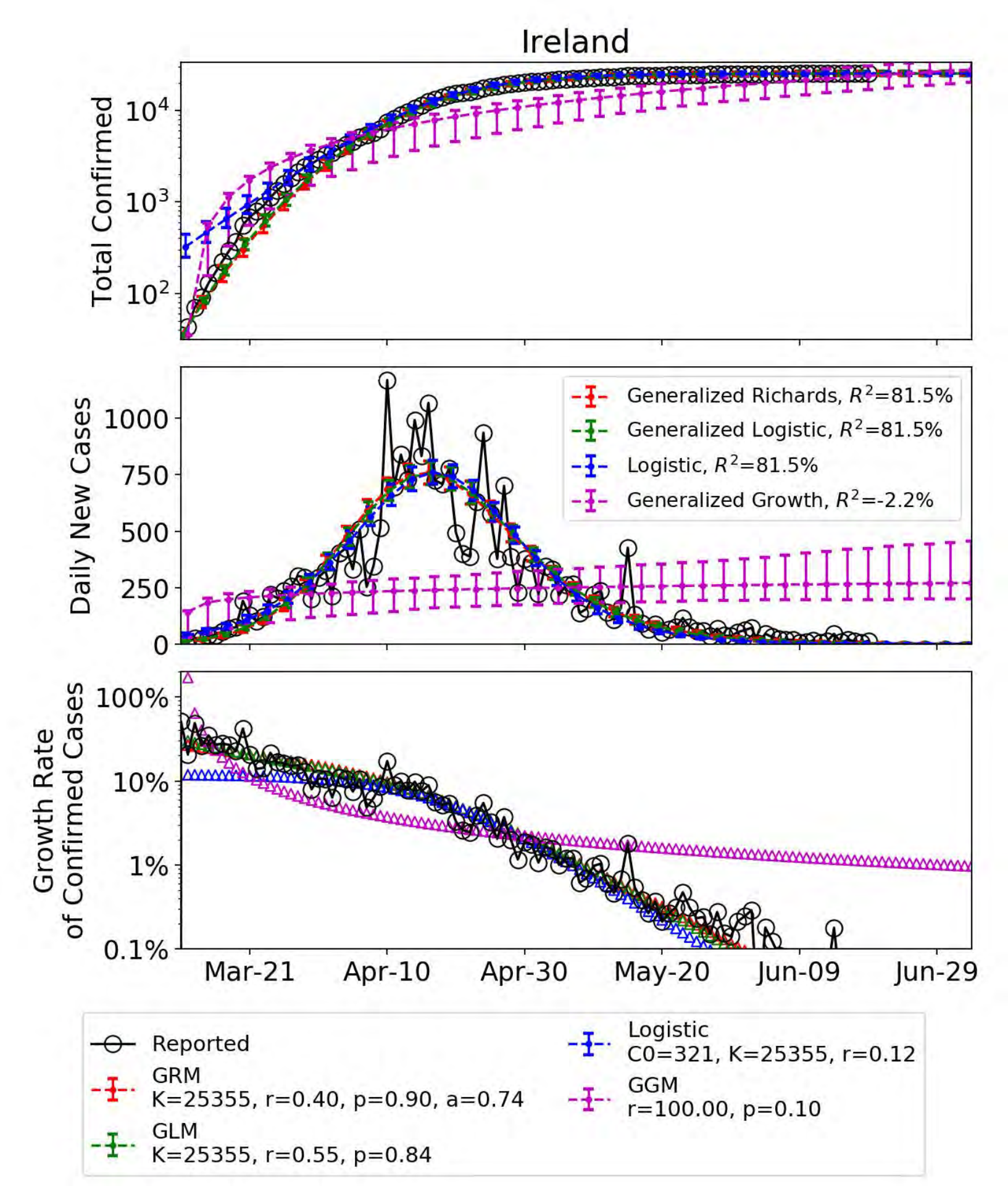

Afghanistan
Total Deaths
10^3
10^2
Daily Deaths
40
30
20
10
0
Generalized Richards, R^2=29.9%
Generalized Logistic, R^2=29.9%
Logistic, R^2=30.6%
Generalized Growth, R^2=29.9%
Growth Rate of Deaths
100%
10%
1%
Apr-23
May-03
May-13
May-23
Jun-02
Jun-12
Jun-22
Reported
GRM
K=5184, r=0.08, p=0.89, a=10.00
GLM
K=969322035, r=0.08, p=0.89
Logistic
C0=87, K=1716612517, r=0.04
GGM
r=0.08, p=0.89

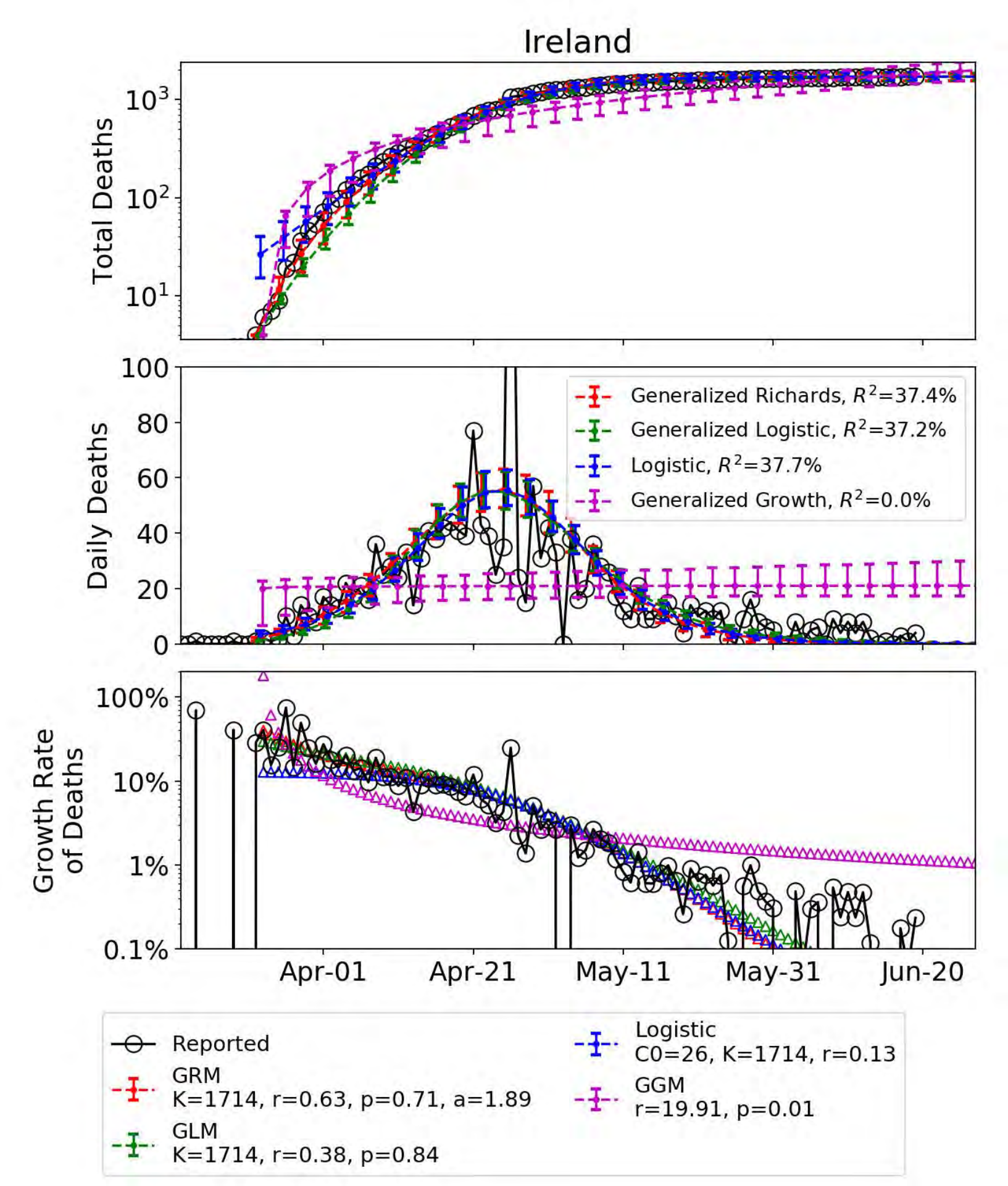

Oman
Total Confirmed
10^4
Daily New Cases
1000
500
0
Generalized Richards, R^2=78.0%
Generalized Logistic, R^2=74.3%
Logistic, R^2=75.8%
Generalized Growth, R^2=70.0%
Growth Rate
of Confirmed Cases
100%
10%
May-15
May-25
Jun-04
Jun-14
Jun-24
Reported
GRM
K=29276, r=0.17, p=0.88, a=10.00
GLM
K=54965, r=0.07, p=1.00
Logistic
C0=1943, K=42437, r=0.09
GGM
r=0.97, p=0.69

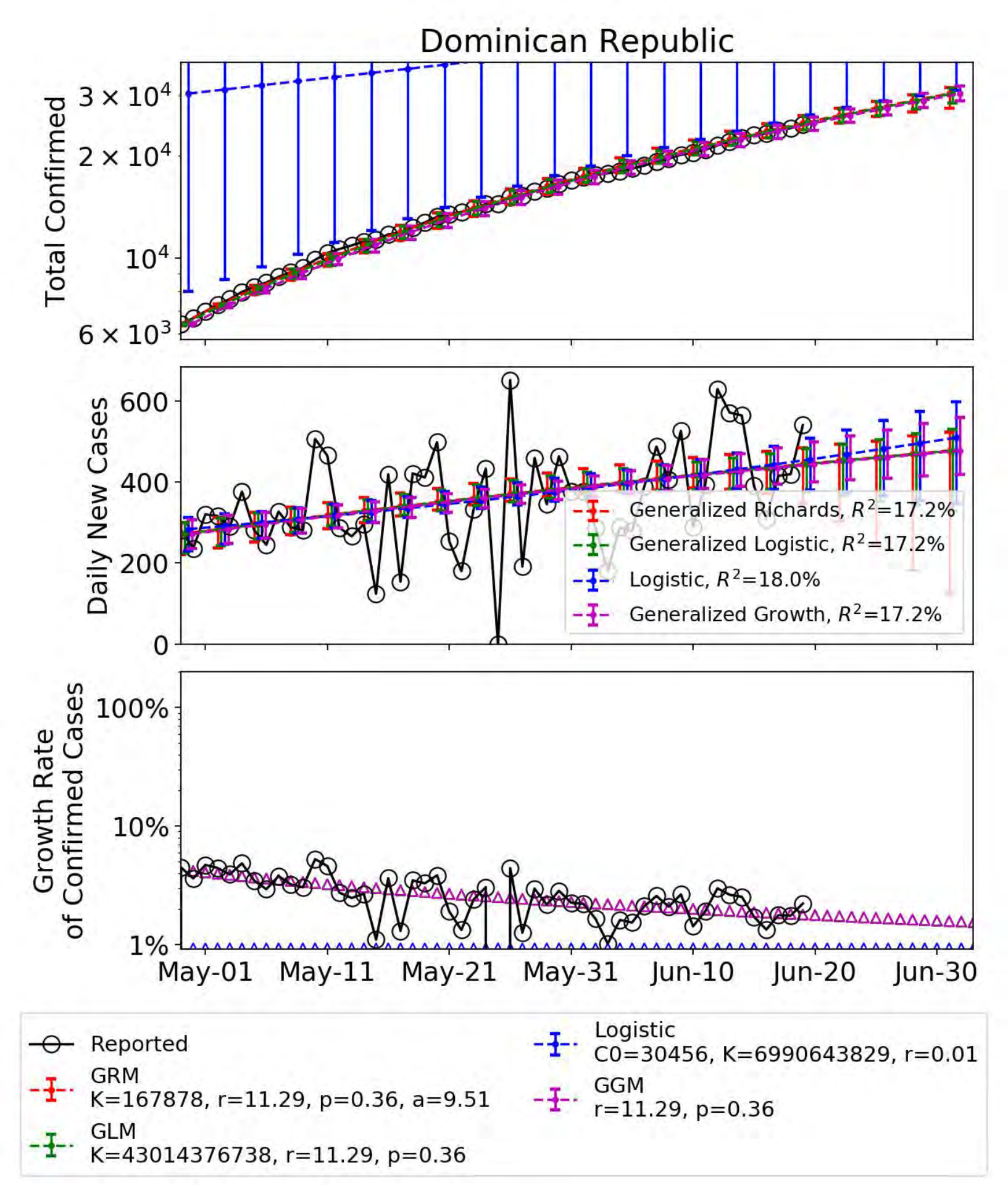

Oman
Total Deaths
2×10^2
10^2
6×10^1
Daily Deaths
0
2
4
6
8
Generalized Richards, R^2=13.4%
Generalized Logistic, R^2=13.2%
Logistic, R^2=12.8%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
May-26
May-31
Jun-05
Jun-10
Jun-15
Jun-20
Jun-25
Jun-30
Reported
GRM
K=312, r=55.44, p=0.14, a=0.04
GLM
K=226, r=7.73, p=0.00
Logistic
C0=499, K=650, r=0.05
GGM
r=4.50, p=0.00

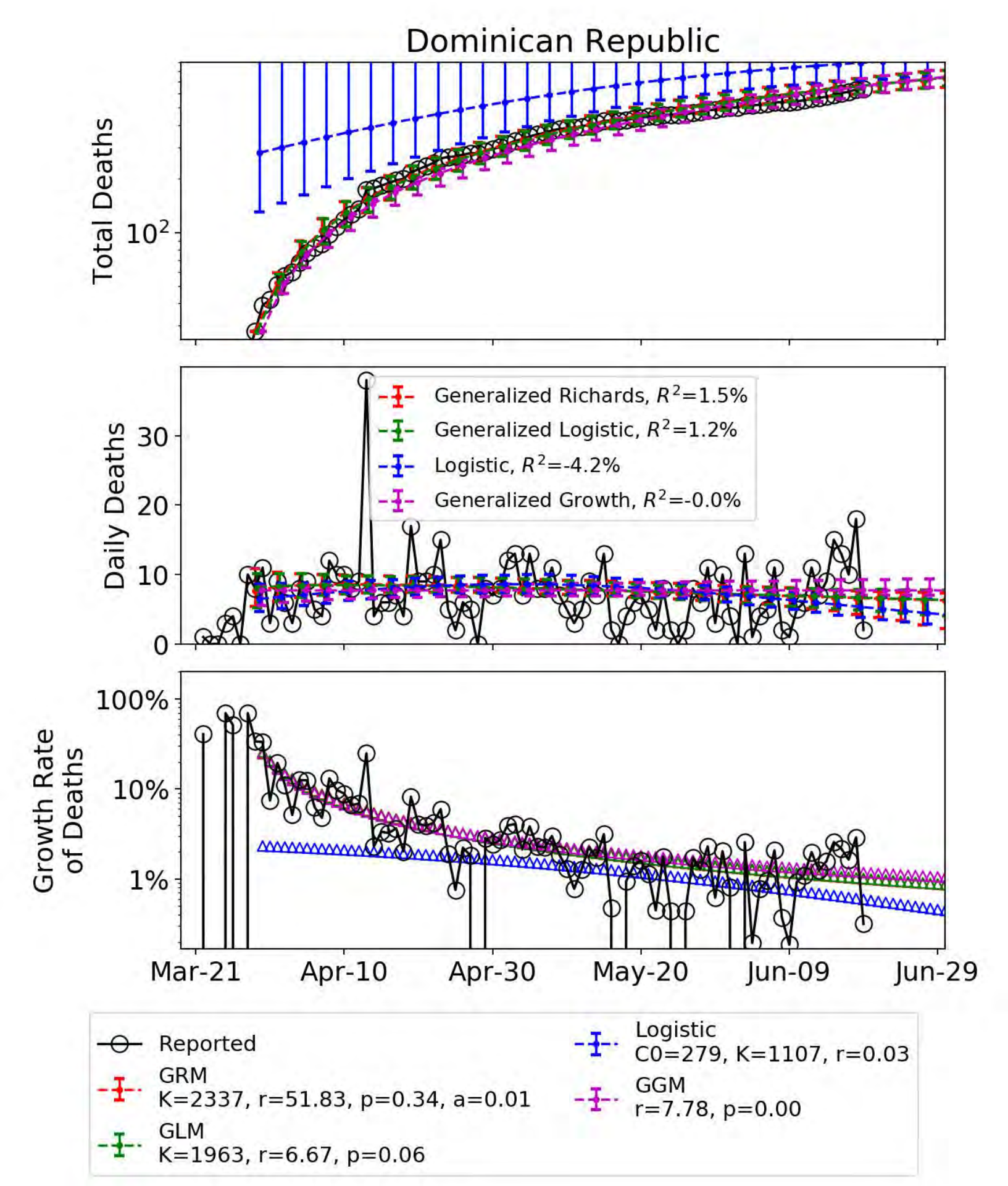

Iraq
Total Confirmed
10^4
10^3
Daily New Cases
2000
1500
1000
500
0
Generalized Richards, R^2=90.0%
Generalized Logistic, R^2=90.0%
Logistic, R^2=78.6%
Generalized Growth, R^2=90.0%
Growth Rate
of Confirmed Cases
100%
10%
1%
Apr-05
Apr-25
May-15
Jun-04
Jun-24
Reported
GRM
K=46330, r=0.05, p=1.00, a=10.00
GLM
K=1188132832, r=0.05, p=1.00
Logistic
C0=1, K=27239, r=0.12
GGM
r=0.05, p=1.00

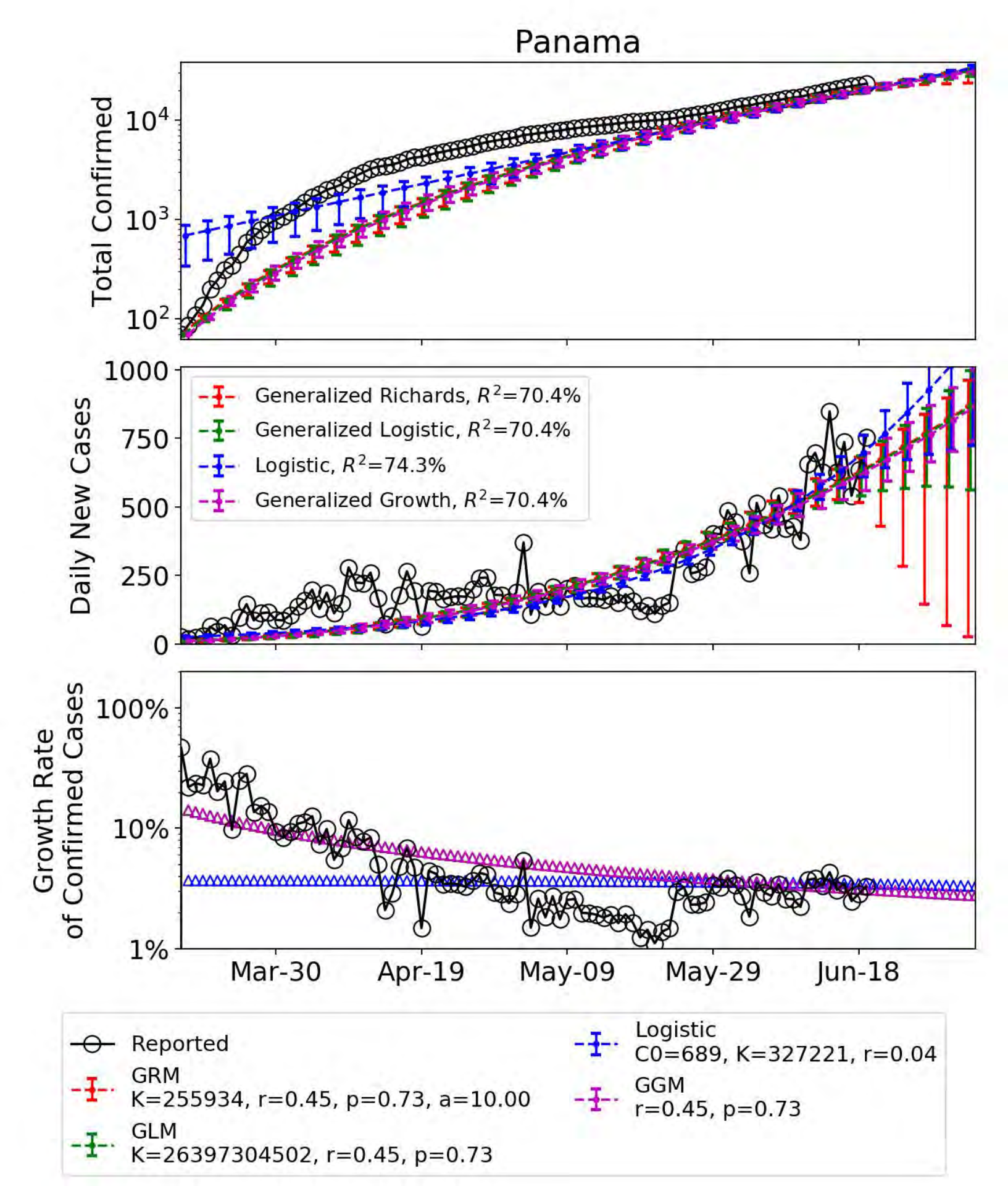

Iraq
Total Deaths
10^3
10^2
Daily Deaths
80
60
40
20
0
Generalized Richards, R^2=78.6%
Generalized Logistic, R^2=78.6%
Logistic, R^2=54.7%
Generalized Growth, R^2=78.6%
Growth Rate of Deaths
100%
10%
1%
Mar-26
Apr-15
May-05
May-25
Jun-14
Reported
GRM
K=7695, r=0.05, p=1.00, a=10.00
GLM
K=249105773, r=0.05, p=1.00
Logistic
C0=1, K=1229, r=0.08
GGM
r=0.05, p=1.00

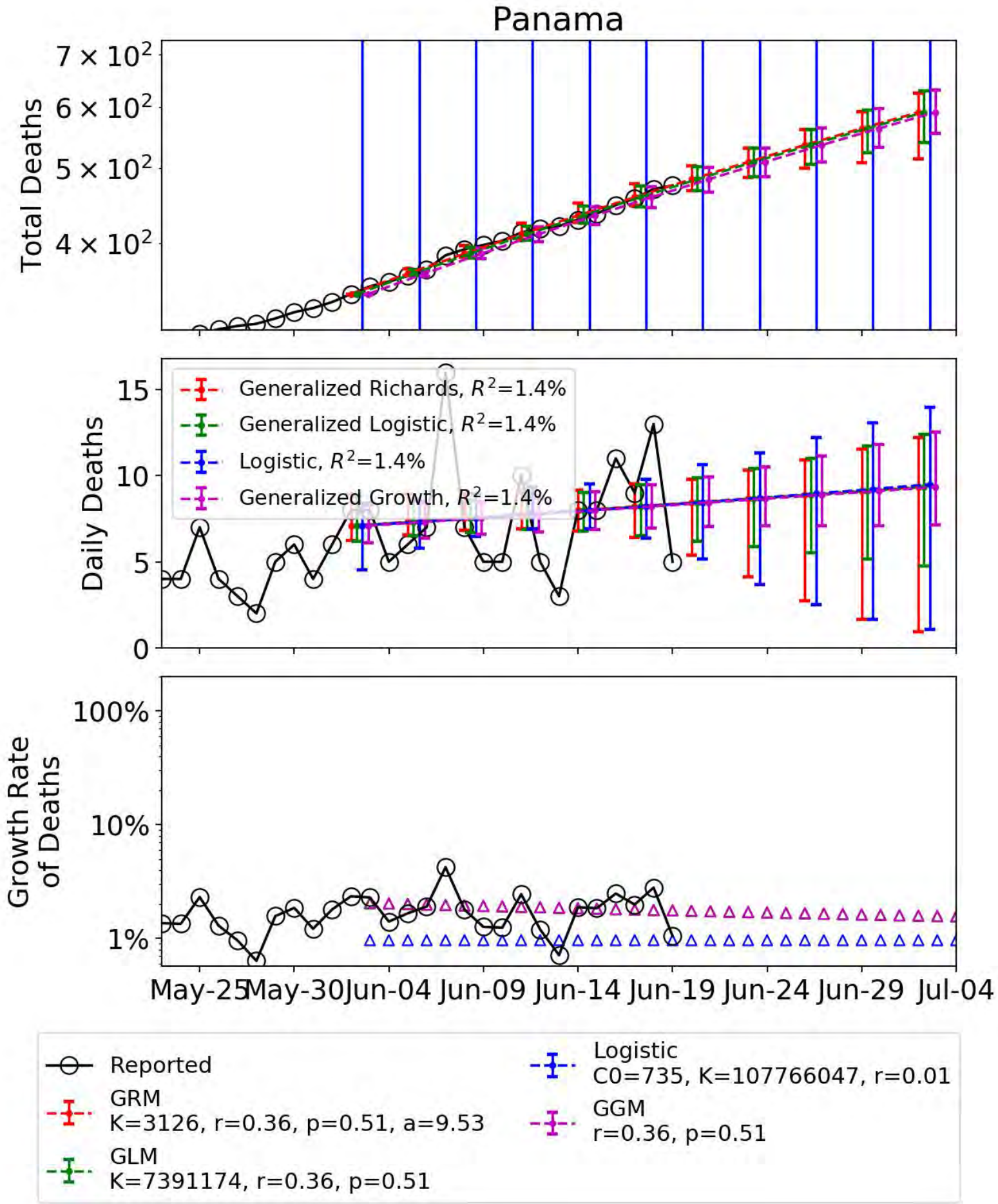

Ireland
Total Confirmed
10^4
10^3
10^2
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=81.5%
Generalized Logistic, R^2=81.5%
Logistic, R^2=81.5%
Generalized Growth, R^2=-2.2%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-21
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=25355, r=0.40, p=0.90, a=0.74
GLM
K=25355, r=0.55, p=0.84
Logistic
C0=321, K=25355, r=0.12
GGM
r=100.00, p=0.10

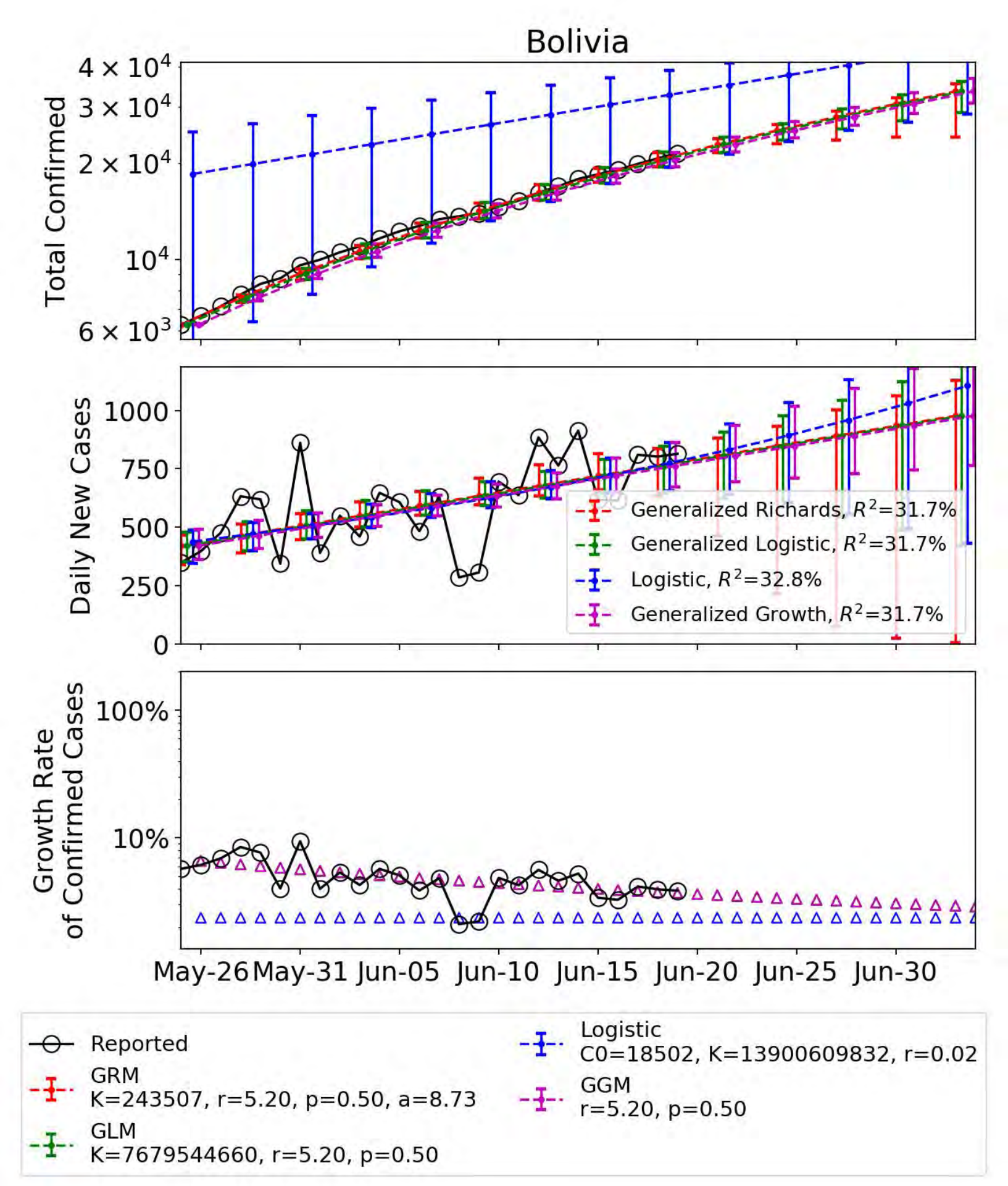

Ireland
Total Deaths
10^3
10^2
10^1
Daily Deaths
100
80
60
40
20
0
Generalized Richards, R^2=37.4%
Generalized Logistic, R^2=37.2%
Logistic, R^2=37.7%
Generalized Growth, R^2=0.0%
Growth Rate of Deaths
100%
10%
1%
0.1%
Apr-01
Apr-21
May-11
May-31
Jun-20
Reported
GRM
K=1714, r=0.63, p=0.71, a=1.89
GLM
K=1714, r=0.38, p=0.84
Logistic
C0=26, K=1714, r=0.13
GGM
r=19.91, p=0.01

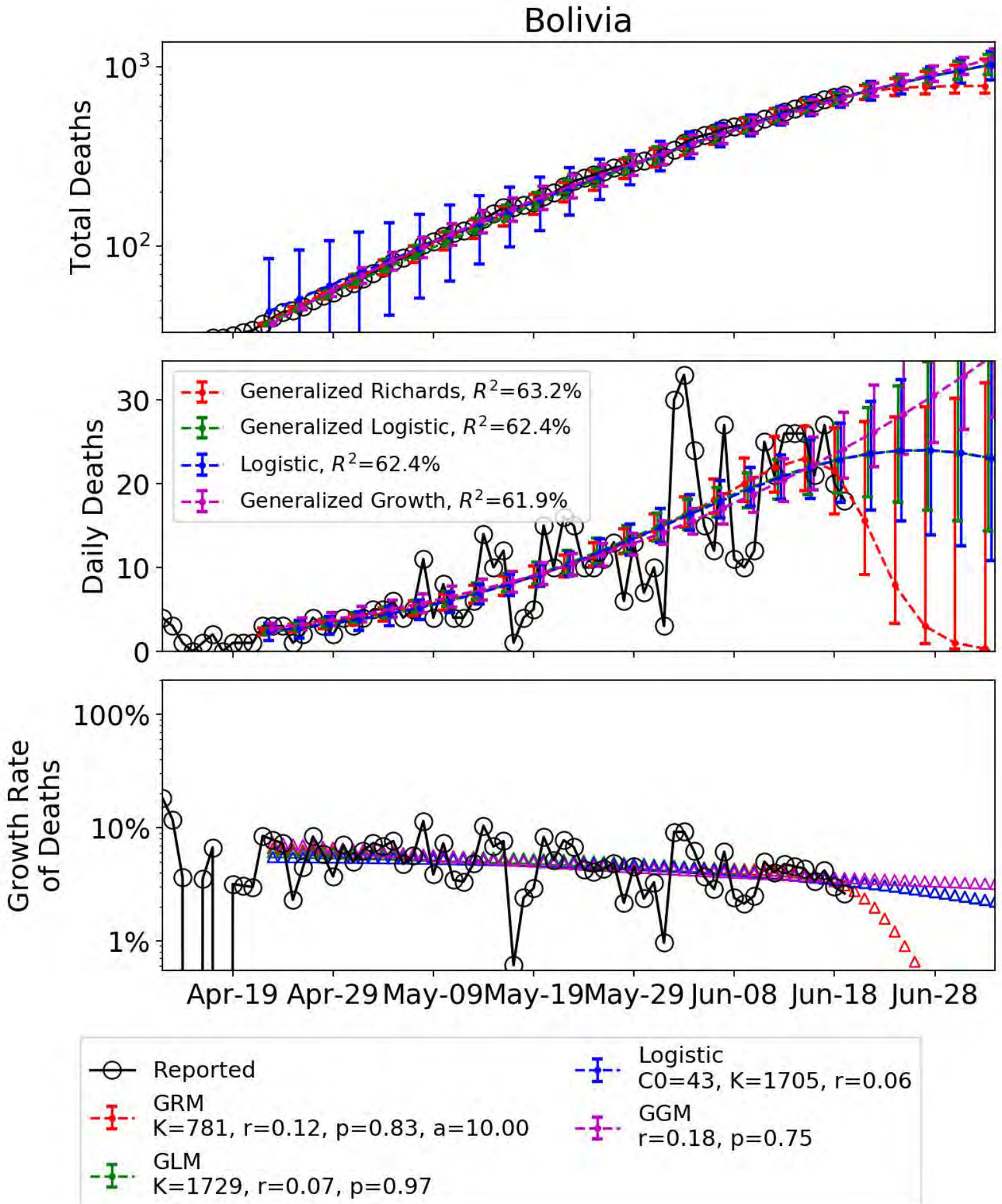

Dominican Republic
Total Confirmed
3×10^4
2×10^4
10^4
6×10^3
Daily New Cases
600
400
200
0
Generalized Richards, R^2=17.2%
Generalized Logistic, R^2=17.2%
Logistic, R^2=18.0%
Generalized Growth, R^2=17.2%
Growth Rate of Confirmed Cases
100%
10%
1%
May-01
May-11
May-21
May-31
Jun-10
Jun-20
Jun-30
Reported
GRM
K=167878, r=11.29, p=0.36, a=9.51
GLM
K=43014376738, r=11.29, p=0.36
Logistic
C0=30456, K=6990643829, r=0.01
GGM
r=11.29, p=0.36

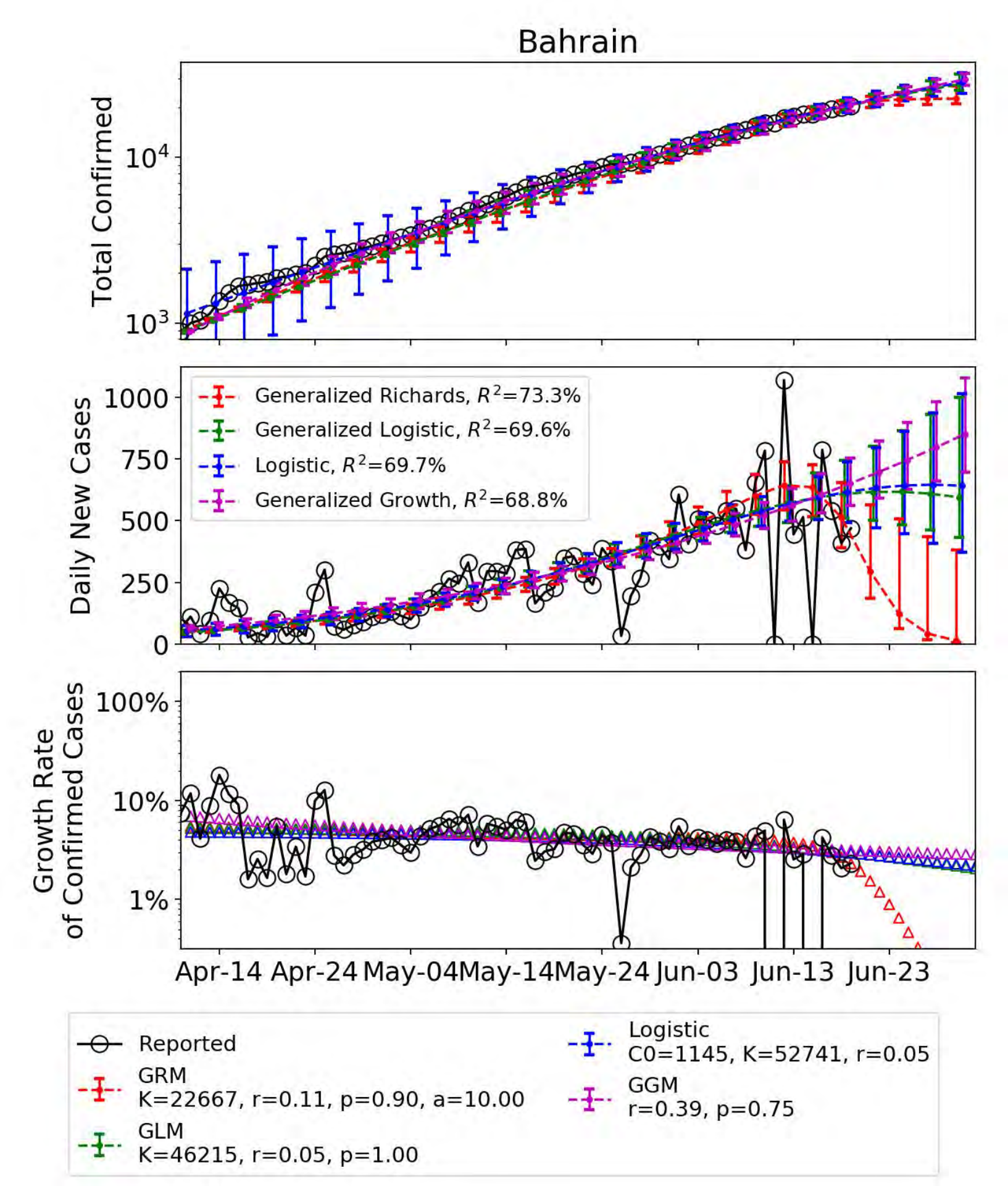

Dominican Republic
Total Deaths
10^2
Daily Deaths
0
10
20
30
Generalized Richards, R^2=1.5%
Generalized Logistic, R^2=1.2%
Logistic, R^2=-4.2%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
Mar-21
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=2337, r=51.83, p=0.34, a=0.01
GLM
K=1963, r=6.67, p=0.06
Logistic
C0=279, K=1107, r=0.03
GGM
r=7.78, p=0.00

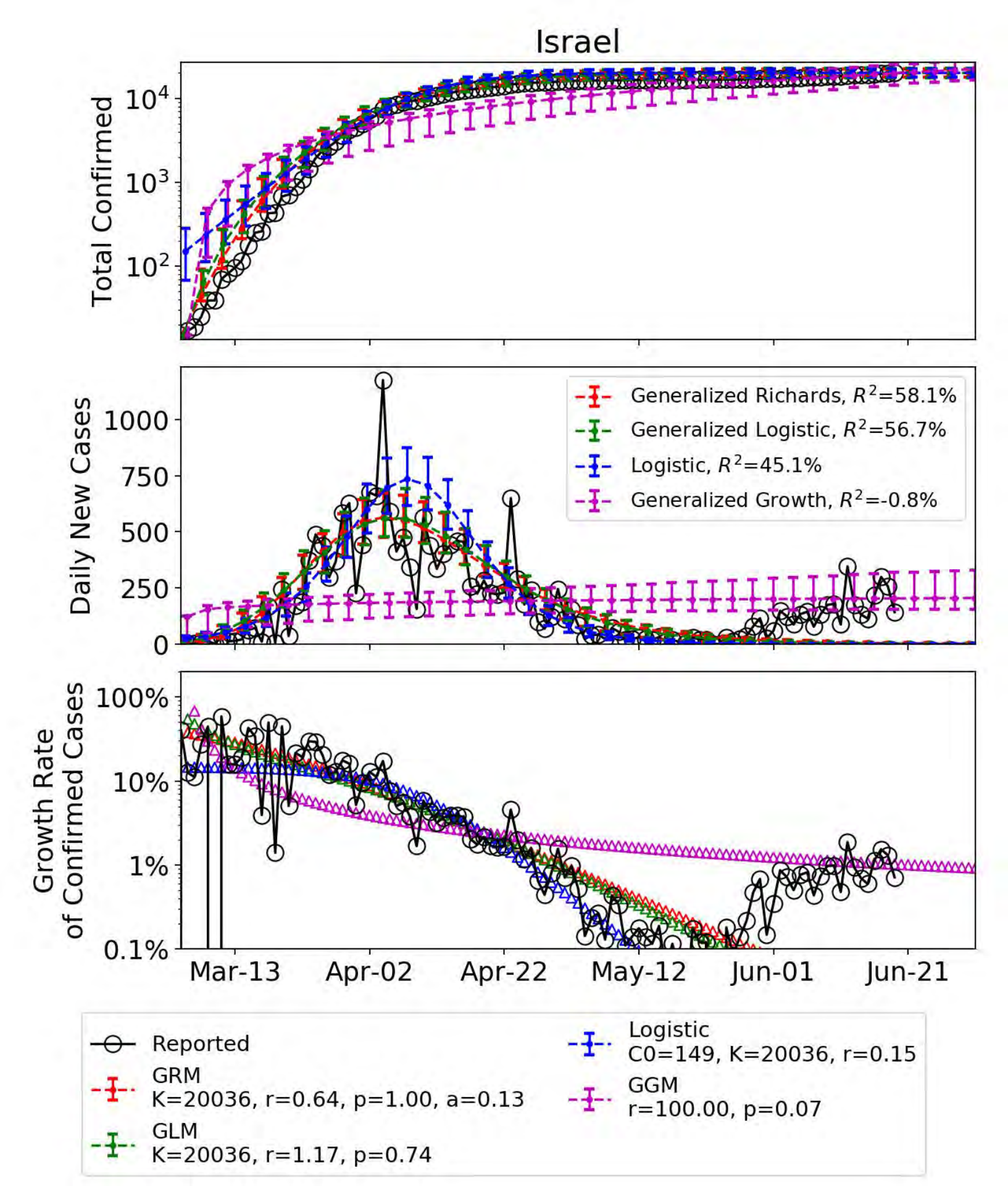

Panama
Total Confirmed
10^4
10^3
10^2
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=70.4%
Generalized Logistic, R^2=70.4%
Logistic, R^2=74.3%
Generalized Growth, R^2=70.4%
Growth Rate of Confirmed Cases
100%
10%
1%
Mar-30
Apr-19
May-09
May-29
Jun-18
Reported
GRM
K=255934, r=0.45, p=0.73, a=10.00
GLM
K=26397304502, r=0.45, p=0.73
Logistic
C0=689, K=327221, r=0.04
GGM
r=0.45, p=0.73

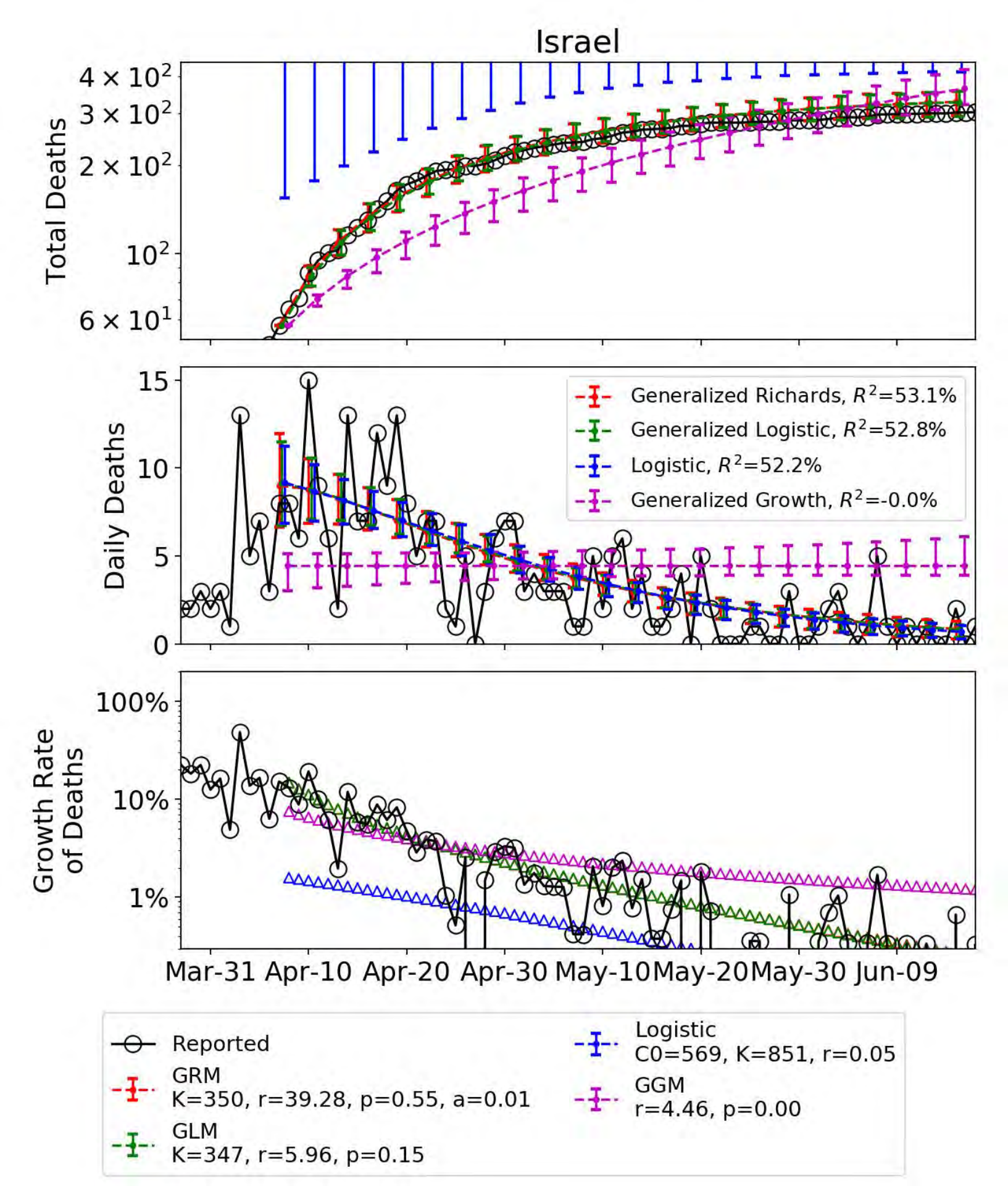

Panama
Total Deaths
7×10^2
6×10^2
5×10^2
4×10^2
Daily Deaths
15
10
5
0
Generalized Richards, R^2=1.4%
Generalized Logistic, R^2=1.4%
Logistic, R^2=1.4%
Generalized Growth, R^2=1.4%
Growth Rate of Deaths
100%
10%
1%
May-25
May-30
Jun-04
Jun-09
Jun-14
Jun-19
Jun-24
Jun-29
Jul-04
Reported
GRM
K=3126, r=0.36, p=0.51, a=9.53
GLM
K=7391174, r=0.36, p=0.51
Logistic
C0=735, K=107766047, r=0.01
GGM
r=0.36, p=0.51

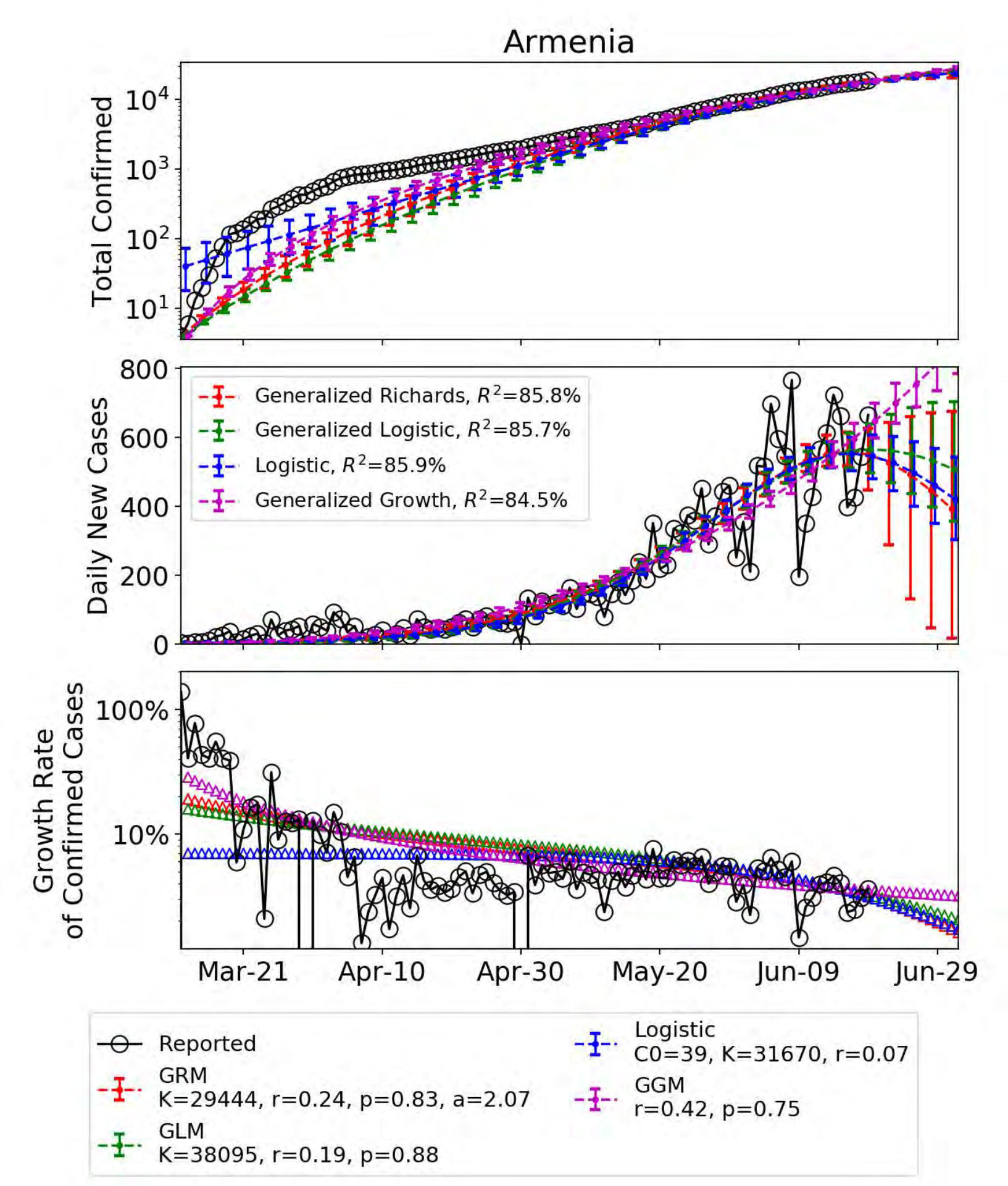

Bolivia
Total Confirmed
4×10^4
3×10^4
2×10^4
10^4
6×10^3
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=31.7%
Generalized Logistic, R^2=31.7%
Logistic, R^2=32.8%
Generalized Growth, R^2=31.7%
Growth Rate of Confirmed Cases
100%
10%
May-26
May-31
Jun-05
Jun-10
Jun-15
Jun-20
Jun-25
Jun-30
Reported
GRM
K=243507, r=5.20, p=0.50, a=8.73
GLM
K=7679544660, r=5.20, p=0.50
Logistic
C0=18502, K=13900609832, r=0.02
GGM
r=5.20, p=0.50

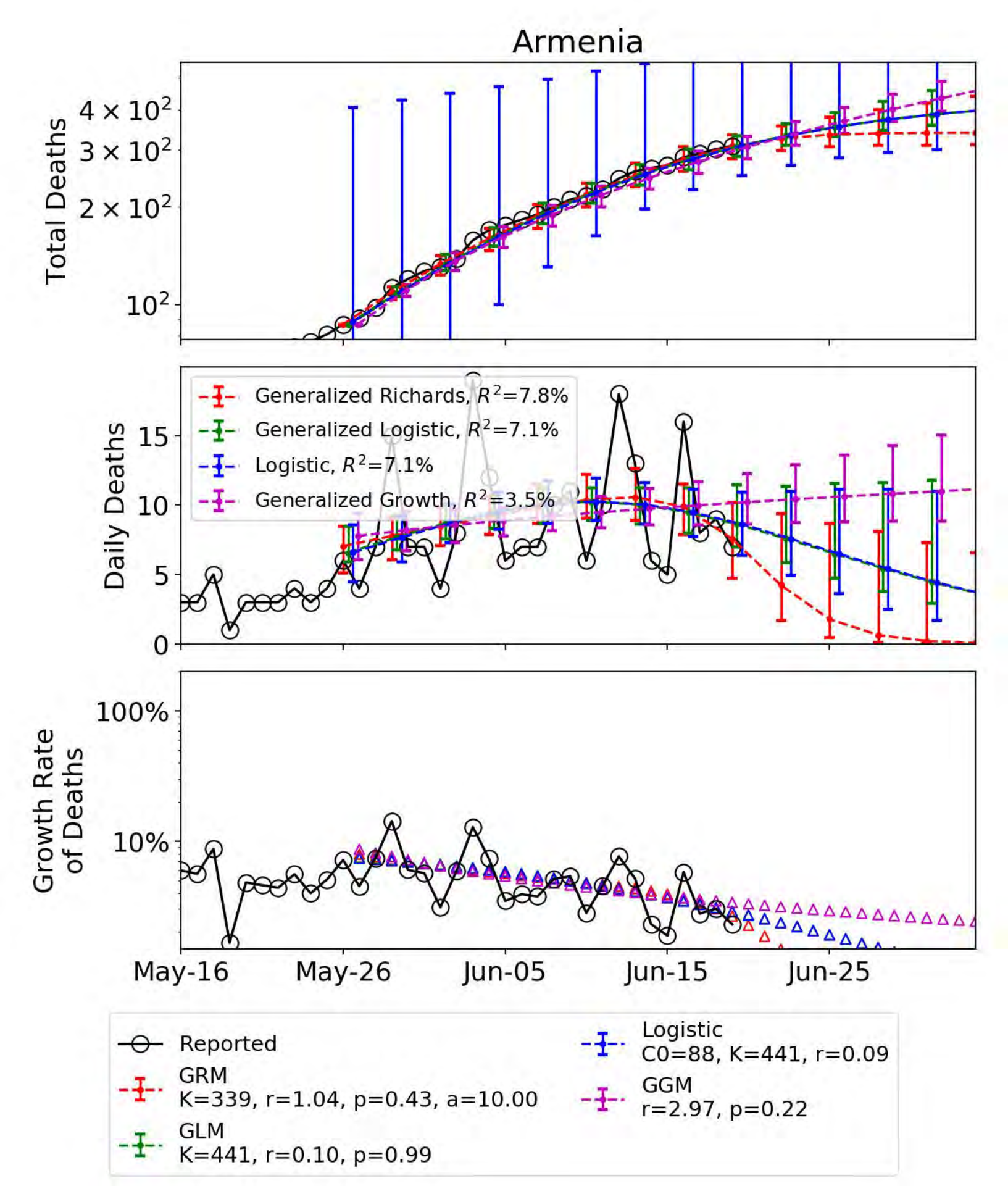

Bolivia
Total Deaths
10^3
10^2
Daily Deaths
30
20
10
0
Generalized Richards, R^2=63.2%
Generalized Logistic, R^2=62.4%
Logistic, R^2=62.4%
Generalized Growth, R^2=61.9%
Growth Rate of Deaths
100%
10%
1%
Apr-19
Apr-29
May-09
May-19
May-29
Jun-08
Jun-18
Jun-28
Reported
GRM
K=781, r=0.12, p=0.83, a=10.00
GLM
K=1729, r=0.07, p=0.97
Logistic
C0=43, K=1705, r=0.06
GGM
r=0.18, p=0.75

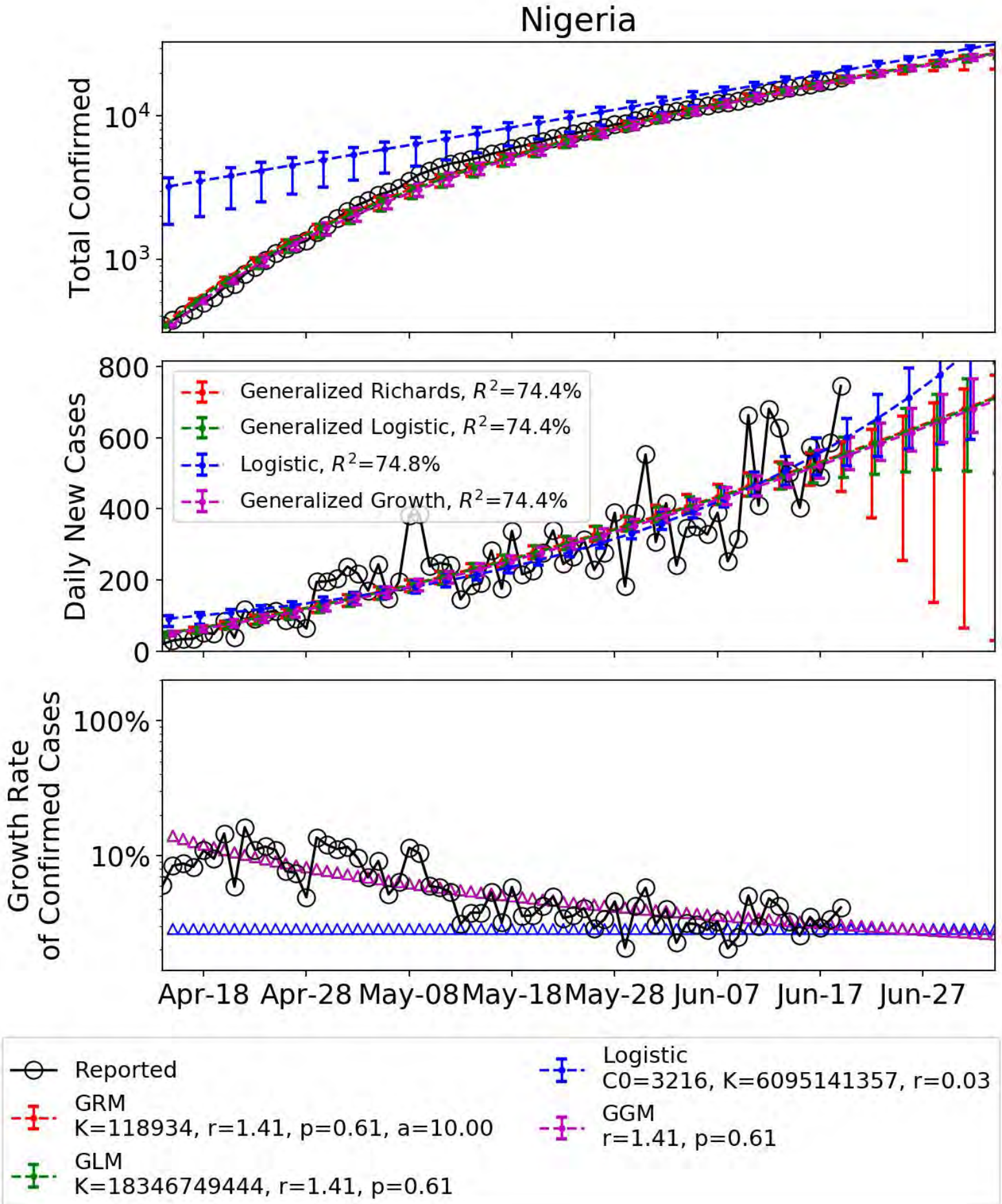

Bahrain
Total Confirmed
10^4
10^3
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=73.3%
Generalized Logistic, R^2=69.6%
Logistic, R^2=69.7%
Generalized Growth, R^2=68.8%
Growth Rate
of Confirmed Cases
100%
10%
1%
Apr-14
Apr-24
May-04
May-14
May-24
Jun-03
Jun-13
Jun-23
Reported
GRM
K=22667, r=0.11, p=0.90, a=10.00
GLM
K=46215, r=0.05, p=1.00
Logistic
C0=1145, K=52741, r=0.05
GGM
r=0.39, p=0.75

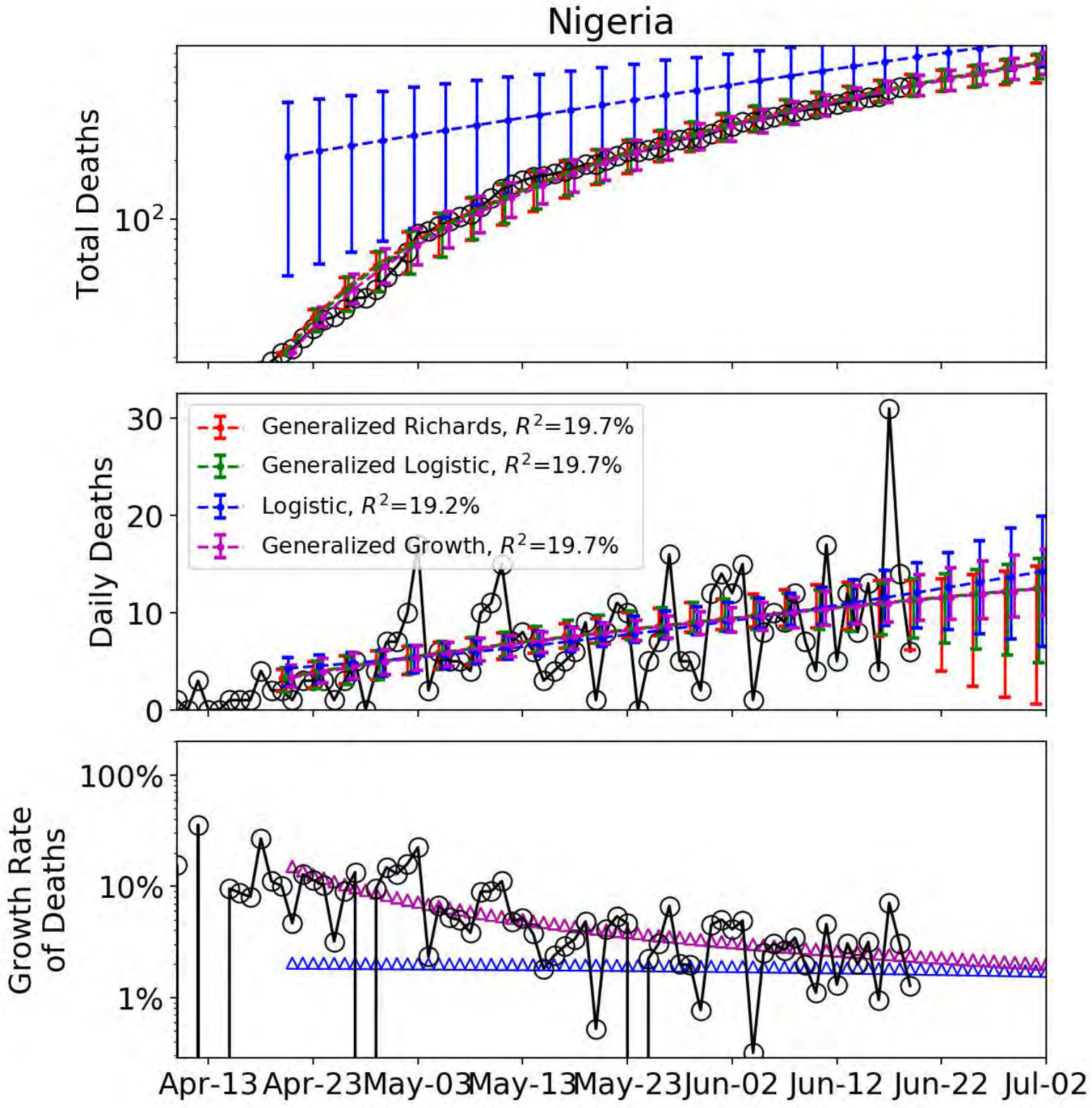

Israel
Total Confirmed
10^4
10^3
10^2
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=58.1%
Generalized Logistic, R^2=56.7%
Logistic, R^2=45.1%
Generalized Growth, R^2=-0.8%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-13
Apr-02
Apr-22
May-12
Jun-01
Jun-21
Reported
GRM
K=20036, r=0.64, p=1.00, a=0.13
GLM
K=20036, r=1.17, p=0.74
Logistic
C0=149, K=20036, r=0.15
GGM
r=100.00, p=0.07

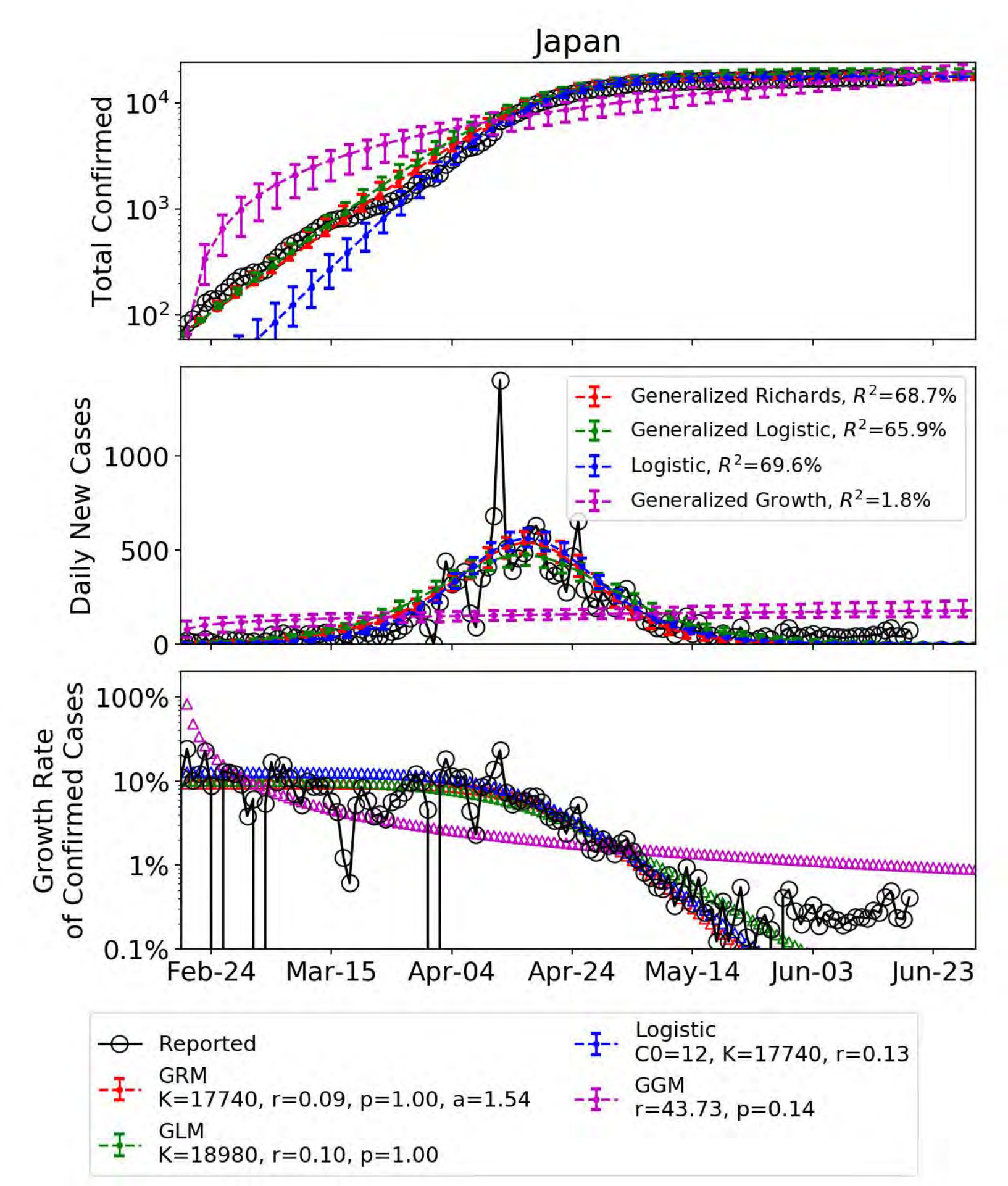

Israel
Total Deaths
4×10^2
3×10^2
2×10^2
10^2
6×10^1
Daily Deaths
15
10
5
0
Generalized Richards, R^2=53.1%
Generalized Logistic, R^2=52.8%
Logistic, R^2=52.2%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
Mar-31
Apr-10
Apr-20
Apr-30
May-10
May-20
May-30
Jun-09
Reported
GRM
K=350, r=39.28, p=0.55, a=0.01
GLM
K=347, r=5.96, p=0.15
Logistic
C0=569, K=851, r=0.05
GGM
r=4.46, p=0.00

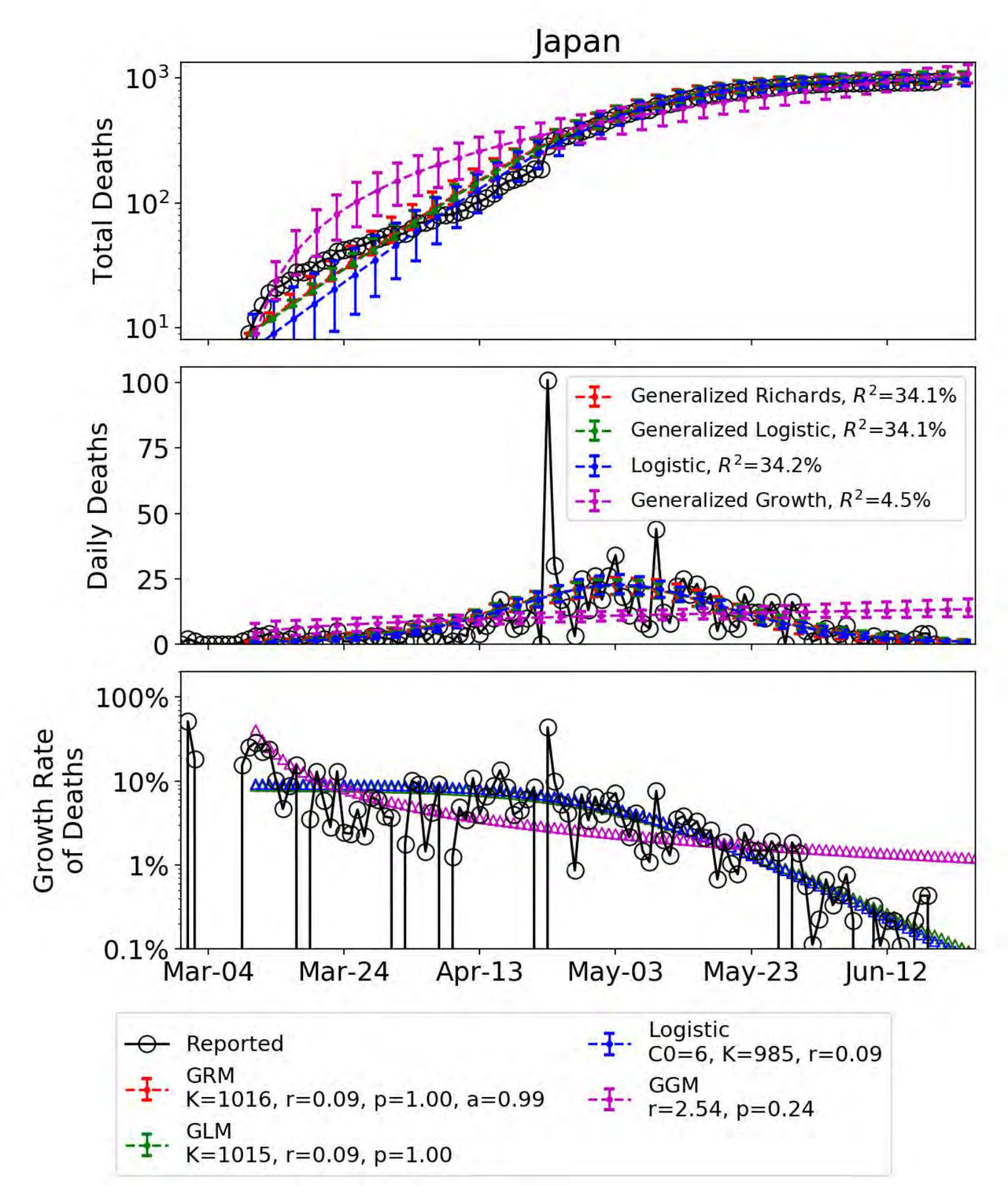

Armenia
Total Confirmed
10^4
10^3
10^2
10^1
Daily New Cases
800
600
400
200
0
Generalized Richards, R^2=85.8%
Generalized Logistic, R^2=85.7%
Logistic, R^2=85.9%
Generalized Growth, R^2=84.5%
Growth Rate
of Confirmed Cases
100%
10%
Mar-21
Apr-10
Apr-30
May-20
Jun-09
Jun-29
Reported
GRM
K=29444, r=0.24, p=0.83, a=2.07
GLM
K=38095, r=0.19, p=0.88
Logistic
C0=39, K=31670, r=0.07
GGM
r=0.42, p=0.75

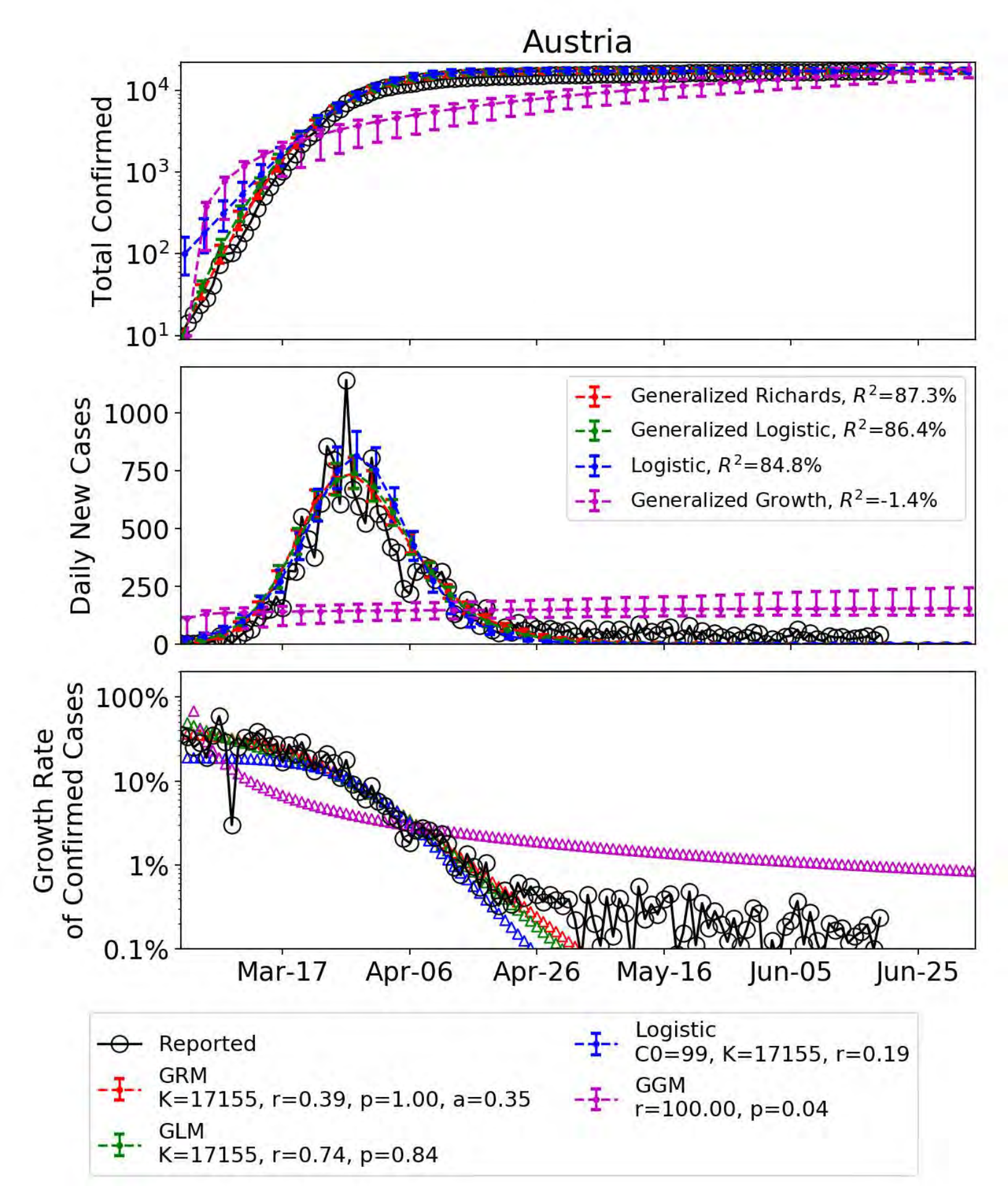

Armenia
Total Deaths
4×10^2
3×10^2
2×10^2
10^2
Daily Deaths
15
10
5
0
Generalized Richards, R^2=7.8%
Generalized Logistic, R^2=7.1%
Logistic, R^2=7.1%
Generalized Growth, R^2=3.5%
Growth Rate of Deaths
100%
10%
May-16
May-26
Jun-05
Jun-15
Jun-25
Reported
GRM
K=339, r=1.04, p=0.43, a=10.00
GLM
K=441, r=0.10, p=0.99
Logistic
C0=88, K=441, r=0.09
GGM
r=2.97, p=0.22

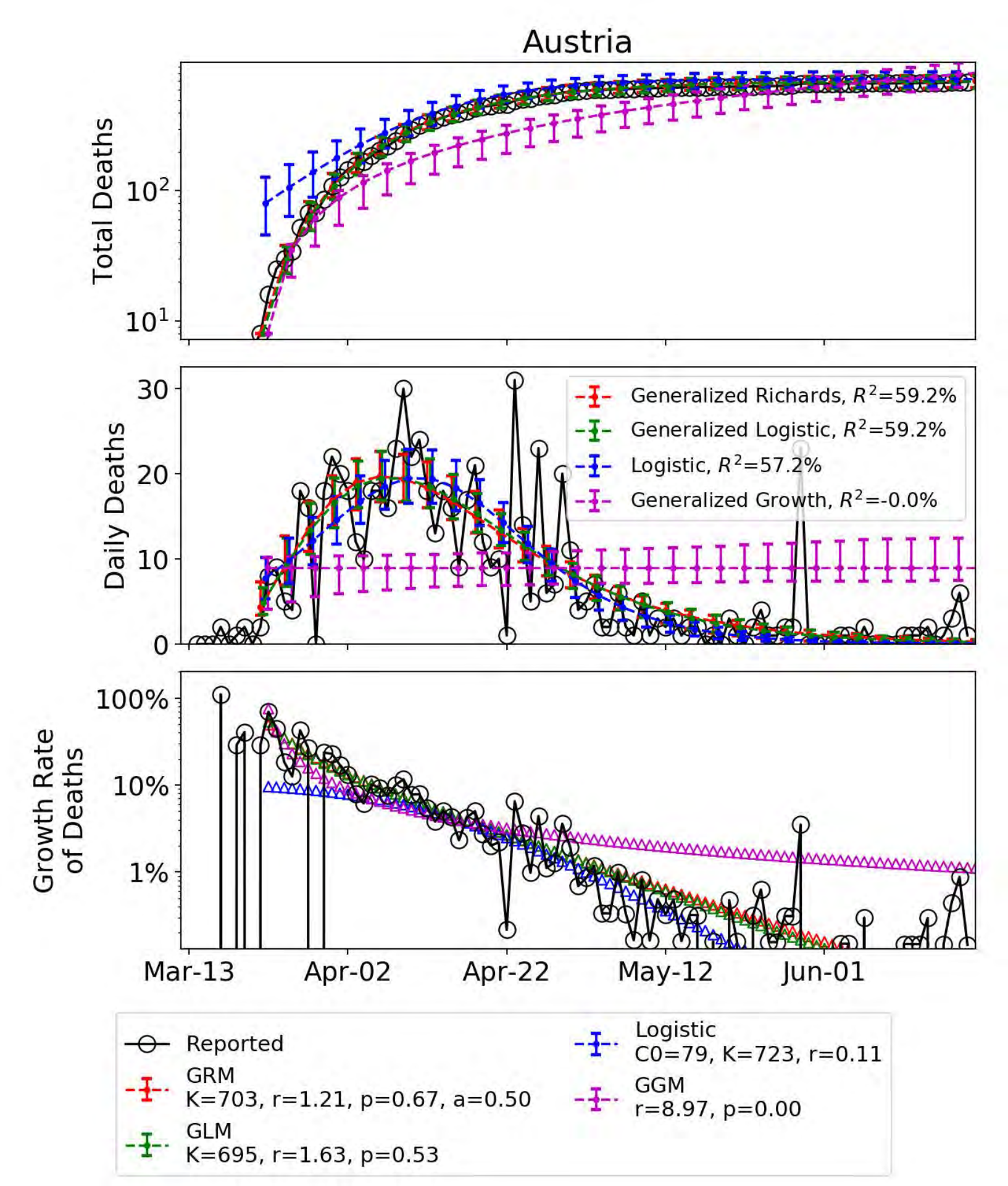

Nigeria
Total Confirmed
10^4
10^3
Daily New Cases
800
600
400
200
0
Generalized Richards, R^2=74.4%
Generalized Logistic, R^2=74.4%
Logistic, R^2=74.8%
Generalized Growth, R^2=74.4%
Growth Rate
of Confirmed Cases
100%
10%
Apr-18
Apr-28
May-08
May-18
May-28
Jun-07
Jun-17
Jun-27
Reported
GRM
K=118934, r=1.41, p=0.61, a=10.00
GLM
K=18346749444, r=1.41, p=0.61
Logistic
C0=3216, K=6095141357, r=0.03
GGM
r=1.41, p=0.61


Nigeria
Total Deaths
10^2
Daily Deaths
30
20
10
0
Generalized Richards, R^2=19.7%
Generalized Logistic, R^2=19.7%
Logistic, R^2=19.2%
Generalized Growth, R^2=19.7%
Growth Rate of Deaths
100%
10%
1%
Apr-13
Apr-23
May-03
May-13
May-23
Jun-02
Jun-12
Jun-22
Jul-02
Reported
GRM
K=4697, r=1.00, p=0.39, a=7.71
GLM
K=934524697, r=1.00, p=0.39
Logistic
C0=209, K=4223, r=0.02
GGM
r=1.00, p=0.39


Japan
Total Confirmed
10^4
10^3
10^2
Daily New Cases
1000
500
0
Generalized Richards, R^2=68.7%
Generalized Logistic, R^2=65.9%
Logistic, R^2=69.6%
Generalized Growth, R^2=1.8%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Feb-24
Mar-15
Apr-04
Apr-24
May-14
Jun-03
Jun-23
Reported
GRM
K=17740, r=0.09, p=1.00, a=1.54
GLM
K=18980, r=0.10, p=1.00
Logistic
C0=12, K=17740, r=0.13
GGM
r=43.73, p=0.14


Japan
Total Deaths
10^3
10^2
10^1
Daily Deaths
100
75
50
25
0
Generalized Richards, R^2=34.1%
Generalized Logistic, R^2=34.1%
Logistic, R^2=34.2%
Generalized Growth, R^2=4.5%
Growth Rate of Deaths
100%
10%
1%
0.1%
Mar-04
Mar-24
Apr-13
May-03
May-23
Jun-12
Reported
GRM
K=1016, r=0.09, p=1.00, a=0.99
GLM
K=1015, r=0.09, p=1.00
Logistic
C0=6, K=985, r=0.09
GGM
r=2.54, p=0.24


Austria
Total Confirmed
10^4
10^3
10^2
10^1
Daily New Cases
1000
750
500
250
0
Generalized Richards, R^2=87.3%
Generalized Logistic, R^2=86.4%
Logistic, R^2=84.8%
Generalized Growth, R^2=-1.4%
Growth Rate of Confirmed Cases
100%
10%
1%
0.1%
Mar-17
Apr-06
Apr-26
May-16
Jun-05
Jun-25
Reported
GRM
K=17155, r=0.39, p=1.00, a=0.35
GLM
K=17155, r=0.74, p=0.84
Logistic
C0=99, K=17155, r=0.19
GGM
r=100.00, p=0.04


Austria
Total Deaths
10^2
10^1
Daily Deaths
30
20
10
0
Generalized Richards, R^2=59.2%
Generalized Logistic, R^2=59.2%
Logistic, R^2=57.2%
Generalized Growth, R^2=-0.0%
Growth Rate of Deaths
100%
10%
1%
Mar-13
Apr-02
Apr-22
May-12
Jun-01
Reported
GRM
K=703, r=1.21, p=0.67, a=0.50
GLM
K=695, r=1.63, p=0.53
Logistic
C0=79, K=723, r=0.11
GGM
r=8.97, p=0.00