Update on UK and Italy COVID-19 data

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Comparing Italy and UK reported cases and case rates on 3rd April 2020 with Logistic 3 parameter model

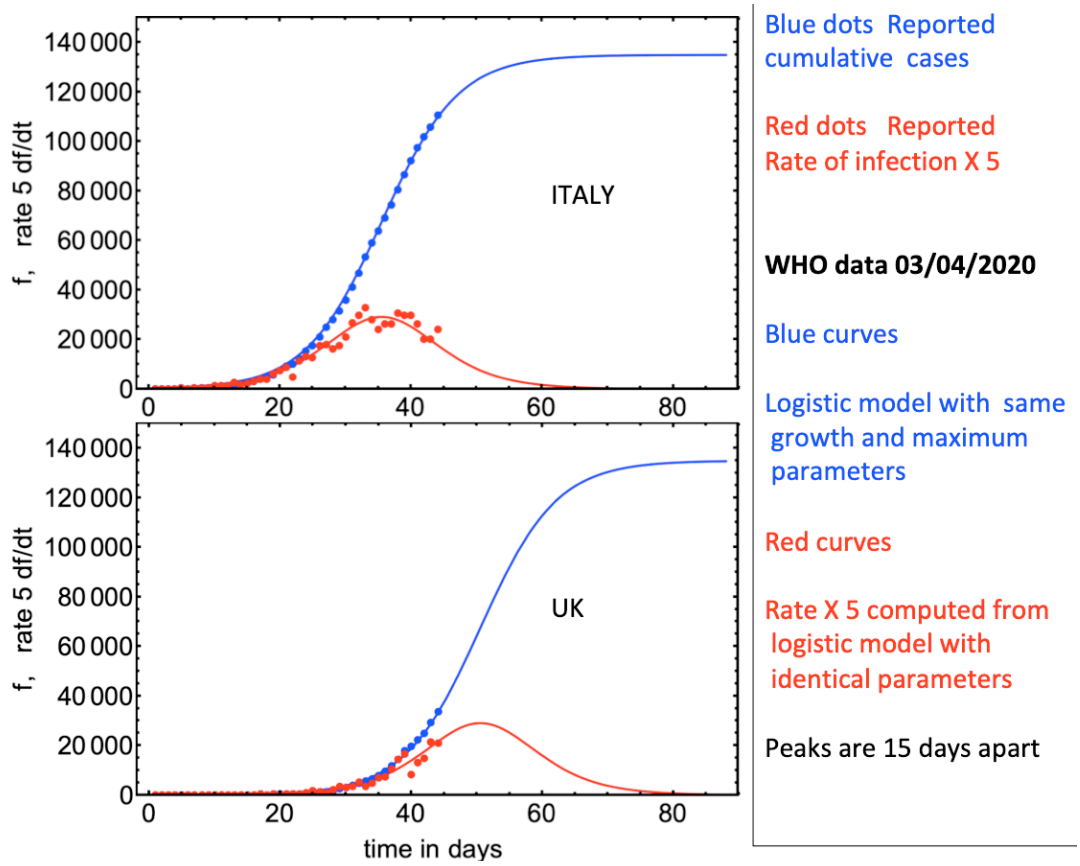
$$f(t) = \frac{c_{\max}}{1 + e^{-(t - t_{peak})/T}} \quad (1)$$

$$\frac{df}{dt} = \frac{f(c_{\max} - f)}{T}; \quad \text{boundary condition } f(t_{peak}) = c_{\max}/2 \quad (2)$$

Italy fit: $c_{max} = 135000$; $T = 5.8$ days; $t_{peak} = 35.5$ days

UK fit: $c_{max} = 135000$; $T = 5.8$ days; $t_{peak} = 50.5$ days

Day 1 corresponds to 20th February, 2020



These plots show the latest WHO situation-data for Italy and the UK
(blue dots: cases; red dots: 5 X (rate = change in cases per day).
The rates are scaled by 5 to show up clearly on the same plot
The smooth (blue and red) curves are based on a fit to the empirical 3-parameter logistic model of equations (1-2) ($c_{maximum}$ = maximum number of cases; T = time constant; t_{peak} = time at which the rate peaks). The fitting parameters for the Italy data were obtained 7 days ago.
The logistic parameters for UK *were not fitted* but chosen to be identical to the Italy data,
except that the UK logistic plot shifts the peak position by 15 days.

It is concluded that so far the UK cases are following same course as Italy.
The “real” numbers will be higher because the counting is systematically in error due to lack of testing, asymptomatic cases etc. The data is partly noisy because of changes in reporting.
The results for Italy and UK appear very similar. The UK cases are approximately 15 days behind that of Italy. The Italian case rates seem to have peaked. My analysis has no authority to interpret the apparent mini-peaks/fluctuations in the rates of infection near the main peak. It would be pure conjecture to ascribe them to a drop in the Northern Italy rates and rise in Southern Italy rates.
The UK cumulative curves do not seem to show effects of social distancing yet.
The purely empirical model seems to work quite well. Of course the logistic DE was originally derived for population studies in the nineteenth century. Modern epidemiological modelling is much more complex than the simple logistic model uses partitioning into different groups and compute the time constants and is therefore a proper predictive theory. If social distancing and “flattening the peak rate” it should clear by deviations from the logistic function predicted curves.

The data used is presented in the following Table

Day	Cumulative Italy	Rate Italy	Cumulative UK	Rate UK
1	3	0	9	0
2	3	0	9	0
3	3	0	9	0
4	9	6	9	0
5	76	67	9	0
6	124	48	13	4
7	229	105	13	0
8	322	93	13	0
9	400	78	16	3
10	650	250	20	4
11	888	238	23	3
12	1128	240	36	13
13	1689	561	39	3
14	2036	347	51	12
15	2502	466	89	38
16	3089	587	118	29
17	3858	769	167	49
18	4636	778	210	43
19	5883	1247	277	67
20	7375	1492	323	46
21	9172	1797	373	50
22	10149	977	460	87
23	12462	2313	594	134
24	15113	2651	802	208
25	17660	2547	1144	342
26	21157	3497	1395	251
27	24747	3590	1547	152
28	27980	3233	1954	407
29	31506	3526	2630	676
30	35713	4207	3277	647
31	41035	5322	3983	706
32	47021	5986	5018	1035
33	53578	6557	5687	669
34	59138	5560	6654	967
35	63927	4789	8081	1427
36	69176	5249	9533	1452
37	74386	5210	11662	2129
38	80539	6153	14547	2885
39	86498	5959	17903	3356
40	92472	5974	19526	1623
41	97689	5217	22145	2619
42	101739	4050	25154	3009
43	105792	4053	29478	4324
44	110574	4782	33722	4244