Covid-19 Modelling Results, as at 16 April 2020

CANADA

1. Total Confirmed Cases

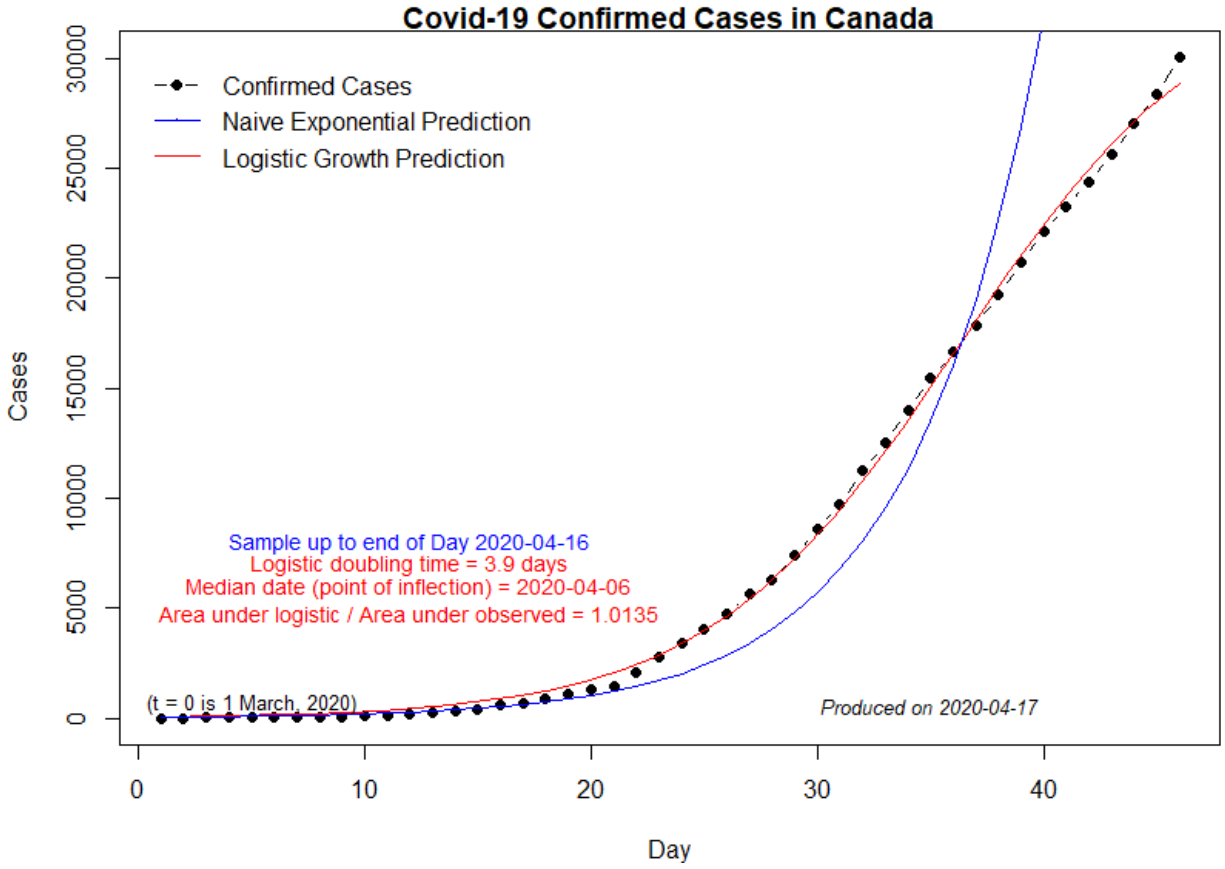
My R code for Covid-19 modelling is at

https://raw.githubusercontent.com/DaveGiles1949/r-code/master/Canadian_Covid-19_Cases.R

The code will automatically download the latest data from my github account.

The chart below shows results based on *data from 2 March to 16 April inclusive*.

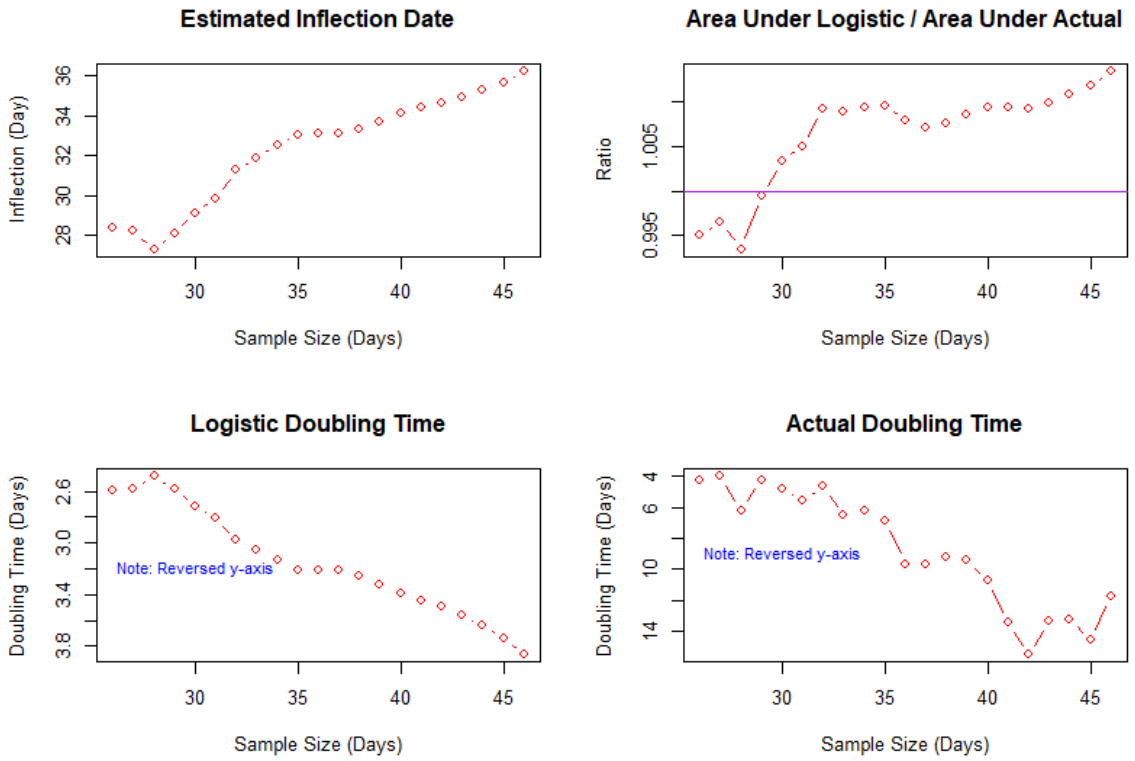
The Logistic model produces an "S-shaped" growth curve. One *disadvantage* is that this S-shape is symmetric about its point of inflection.



It's also interesting to see how the results change over time as more data become available.

This is summarized in the next set of charts, which are based on successive samples, each starting on 2 March, ending after 26, 27, …., 46 days. The last sample is the full sample used to get the chart above.

The second chart indicates the on-going "good fit" of the Logistic model to the observed data. A ratio value greater than 1.0 indicates that the model is over-predicting the actual data over the full sample range. A value of 1.0 would be "ideal", in a loose overall sense.



The following plot shows the projections for total confirmed cases of Covid-19 based on the latest version of the Logistic model. The projections go to 7 days beyond the end of the latest sample.

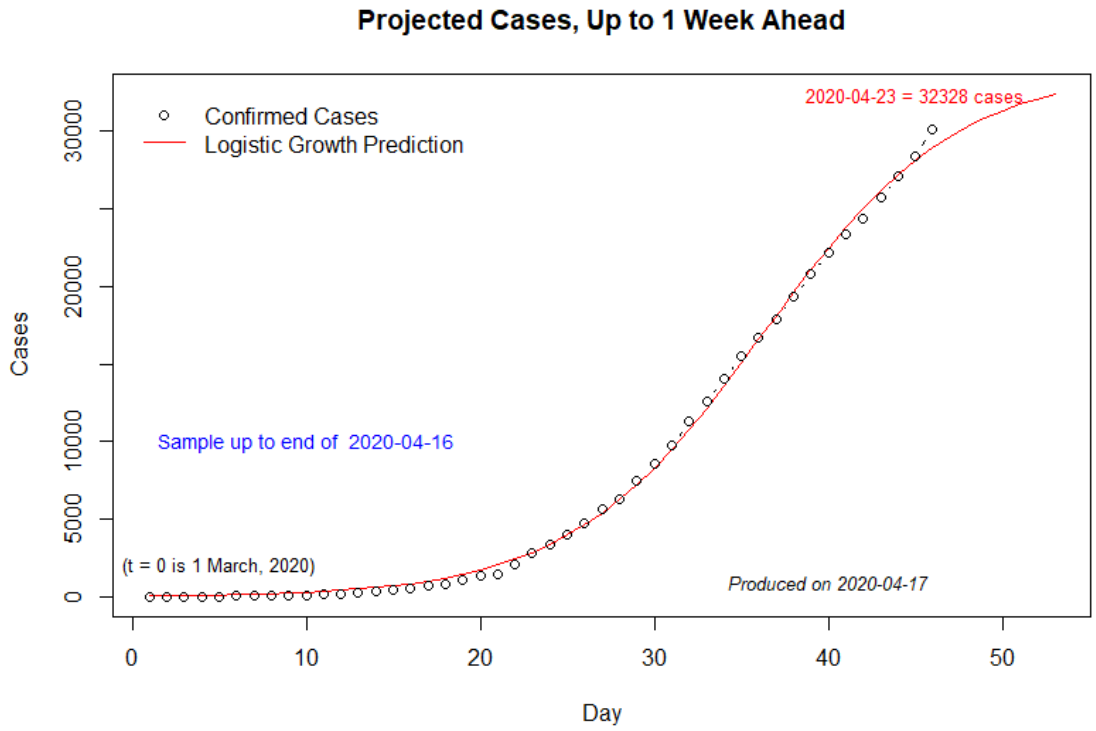


Table 1: Projected Covid-19 Cases in Canada

(Projections are in Blue; Actual Values are in Brackets)

Sample end (projection made): 08 April

09 Apr	*10 Apr*	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*
20162 [20765]	21096 [22148]	21916 [23318]	22627 [24383]	23236 [25680]	23753 [27063]	24188 [28379]

Sample end (projection made): 09 April

10 Apr	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*
21445 [22148]	22339 [23318]	23122 [24383]	23798 [25680]	24377 [27063]	24868 [28379]	25282 [30106]

Sample end (projection made): 10 April

11 Apr	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*
22724 [23318]	23582 [24383]	24331 [25680]	24977 [27063]	25531 [28379]	26000 [30106]	26396

Sample end (projection made): 11 April

12 Apr	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*
23883 [24383]	24687 [25680]	25385 [27063]	25987 [28379]	26500 [30106]	26936	27303

Sample end (projection made): 12 April

13 Apr	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*
24919 [25680]	25656 [27063]	26293 [28379]	26840 [30106]	27306	27700	28032

Sample end (projection made): 13 April

14 Apr	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*
25991 [27063]	26679 [28379]	27272 [30106]	27781	28214	28581	28890

Sample end (projection made): 14 April

15 Apr	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*
27127 [28379]	27783 [30106]	28349	28835	29250	29602	29899

Sample end (projection made): 15 April

16 Apr	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*22 Apr*
28281	28912	29458	29927	30329	30670	30960

[30106]

Sample end (projection made): 16 April

17 Apr	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*22 Apr*	*22 Apr*
29615	30247	30797	31272	31680	32030	32328

2. Total Number of Deaths

My R code for Covid-19 modelling is at

https://raw.githubusercontent.com/DaveGiles1949/r-code/master/Canadian_Covid-19_Deaths.R

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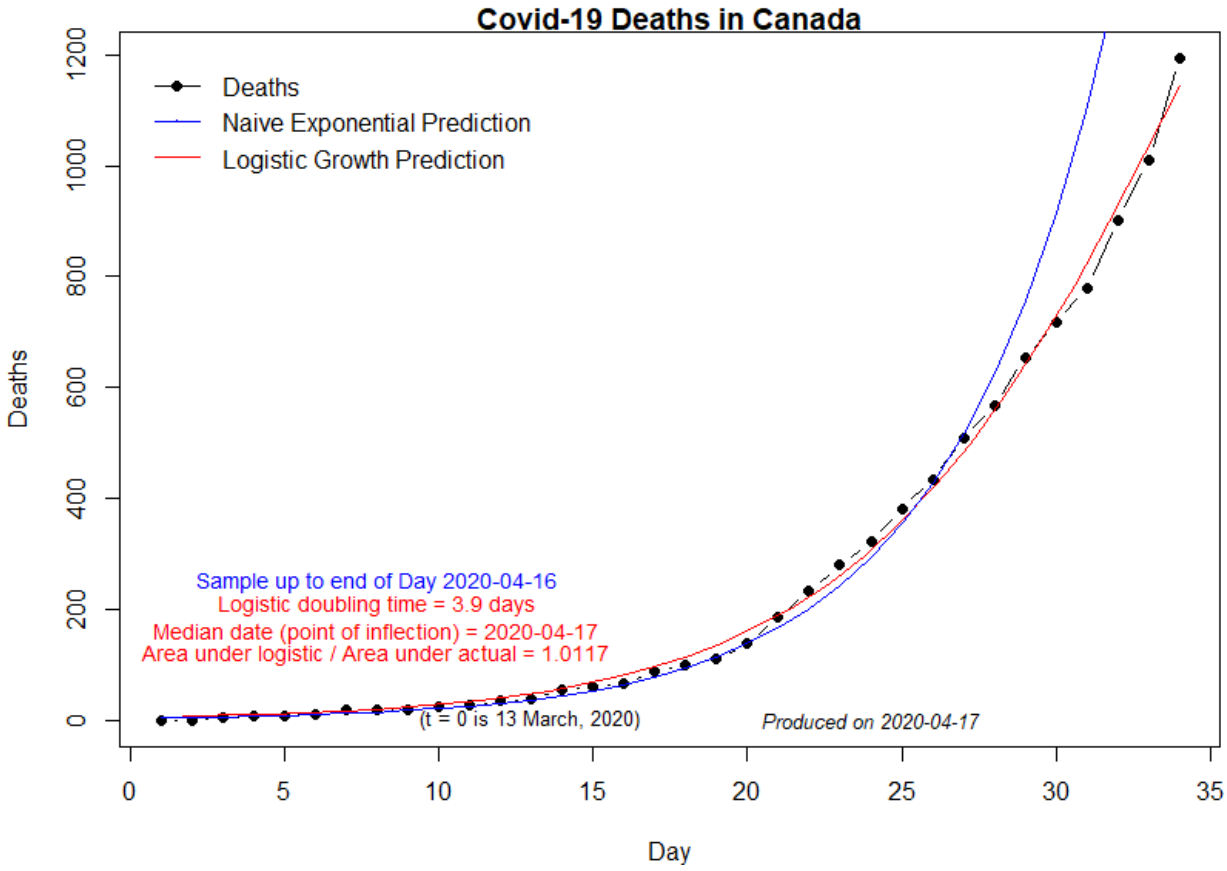
The chart below shows results based on *data from 14 March to 16 April inclusive*.

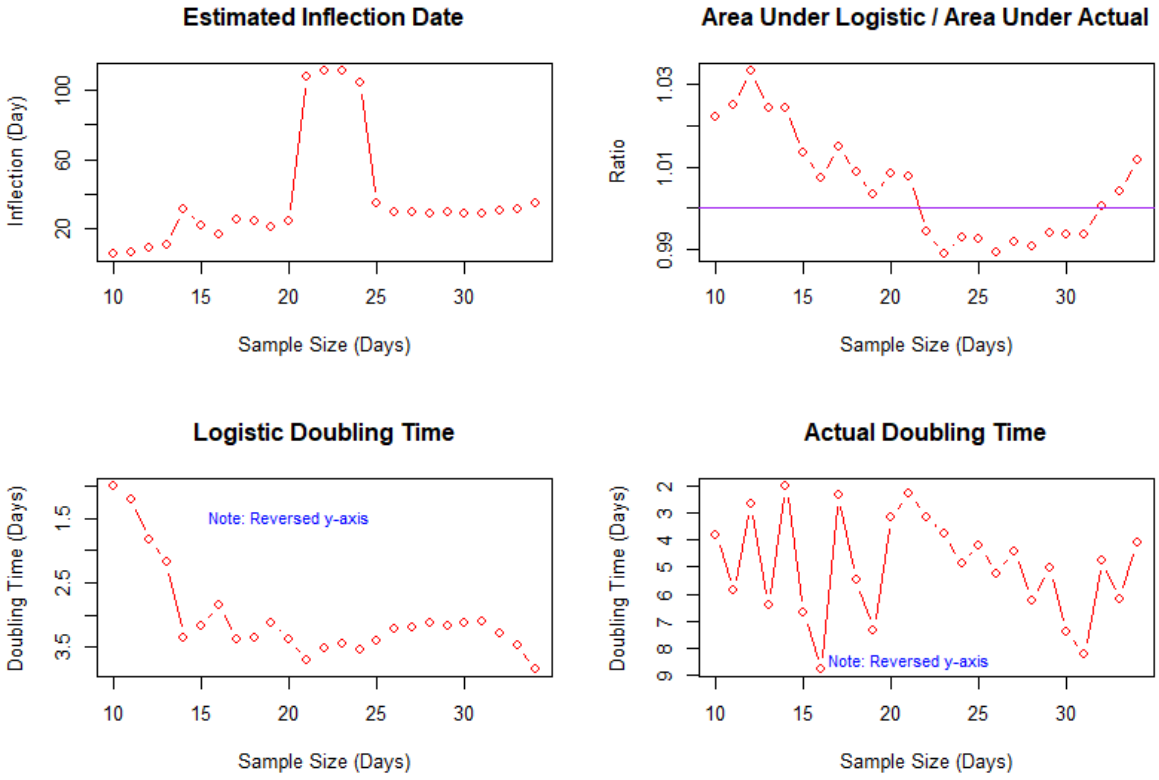
The Logistic model produces an "S-shaped" growth curve. One *disadvantage* is that this S-shape is symmetric about its point of inflection.



It's also interesting to see how the results change over time as more data become available.

This is summarized in the next set of charts, which are based on successive samples, each starting on 14 March, ending after 10, 11, …., 34 days. The last sample is the full sample used to get the chart above.

The second chart indicates the on-going "good fit" of the Logistic model to the observed data. A ratio value greater than 1.0 indicates that the model is over-predicting the actual data over the full sample range. A value of 1.0 would be "ideal", in a loose overall sense.



The following plot shows the projections for total confirmed cases of Covid-19 based on the latest version of the Logistic model. The projections go to 7 days beyond the end of the latest sample.

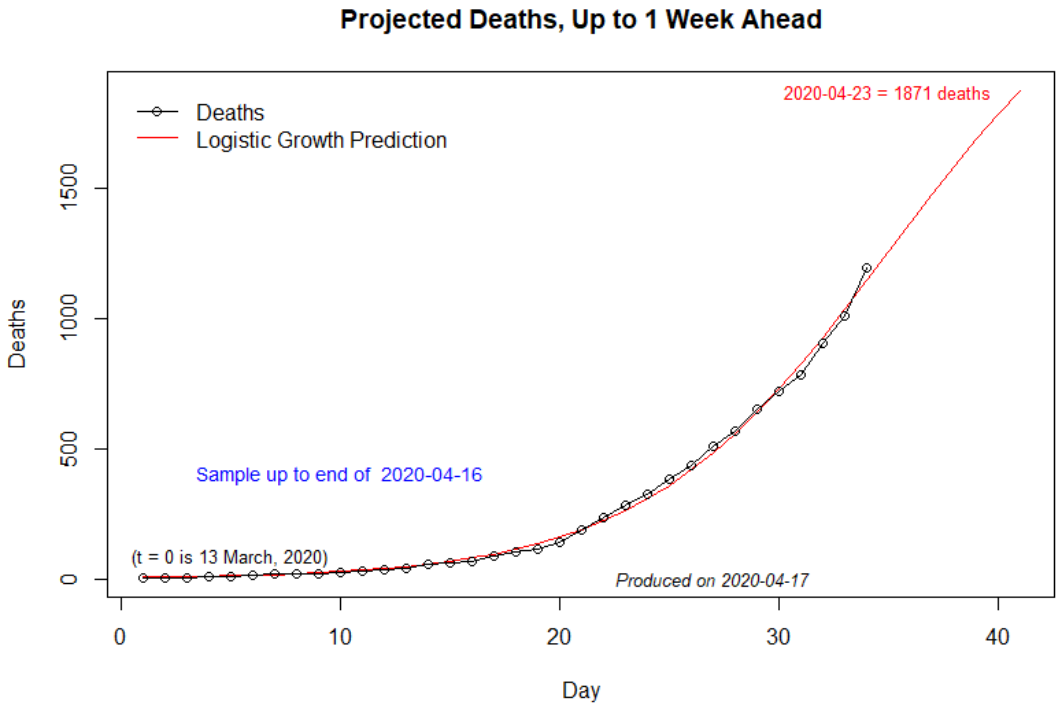


Table 2: Projected Covid-19 Deaths in Canada

(Projections are in Red; Actual Values are in Brackets)

Sample end (projection made): 08 April

09 Apr	*10 Apr*	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*
510	585	663	744	824	902	977
[509]	[569]	[653]	[717]	[780]	[903]	[1010]

Sample end (projection made): 09 April

10 Apr	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*
582	659	737	815	890	962	1029
[569]	[653]	[717]	[780]	[903]	[1010]	[1195]

Sample end (projection made): 10 April

11 Apr	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*
643	713	781	846	906	961	1010
[653]	[717]	[780]	[903]	[1010]	[1195]	

Sample end (projection made): 11 April

12 Apr	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*
723	795	865	930	991	1045	1093
[717]	[780]	[903]	[1010]	[1195]		

Sample end (projection made): 12 April

13 Apr	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*
789	856	919	976	1027	1073	1112
[780]	[903]	[1010]	[1195]			

Sample end (projection made): 13 April

14 Apr	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*
847	907	961	1010	1052	1088	1119
[903]	[1010]	[1195]				

Sample end (projection made): 14 April

15 Apr	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*
953	1021	1085	1142	1193	1238	1276

[1010]

Sample end (projection made): 15 April

16 Apr	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*22 Apr*
1068	1147	1220	1287	1348	1403	1451

[1195]

Sample end (projection made): 16 April

17 Apr	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*22 Apr*	*22 Apr*
1257	1369	1479	1585	1687	1782	1871

ONTARIO

1. Total Confirmed Cases

My R code for Covid-19 modelling is at

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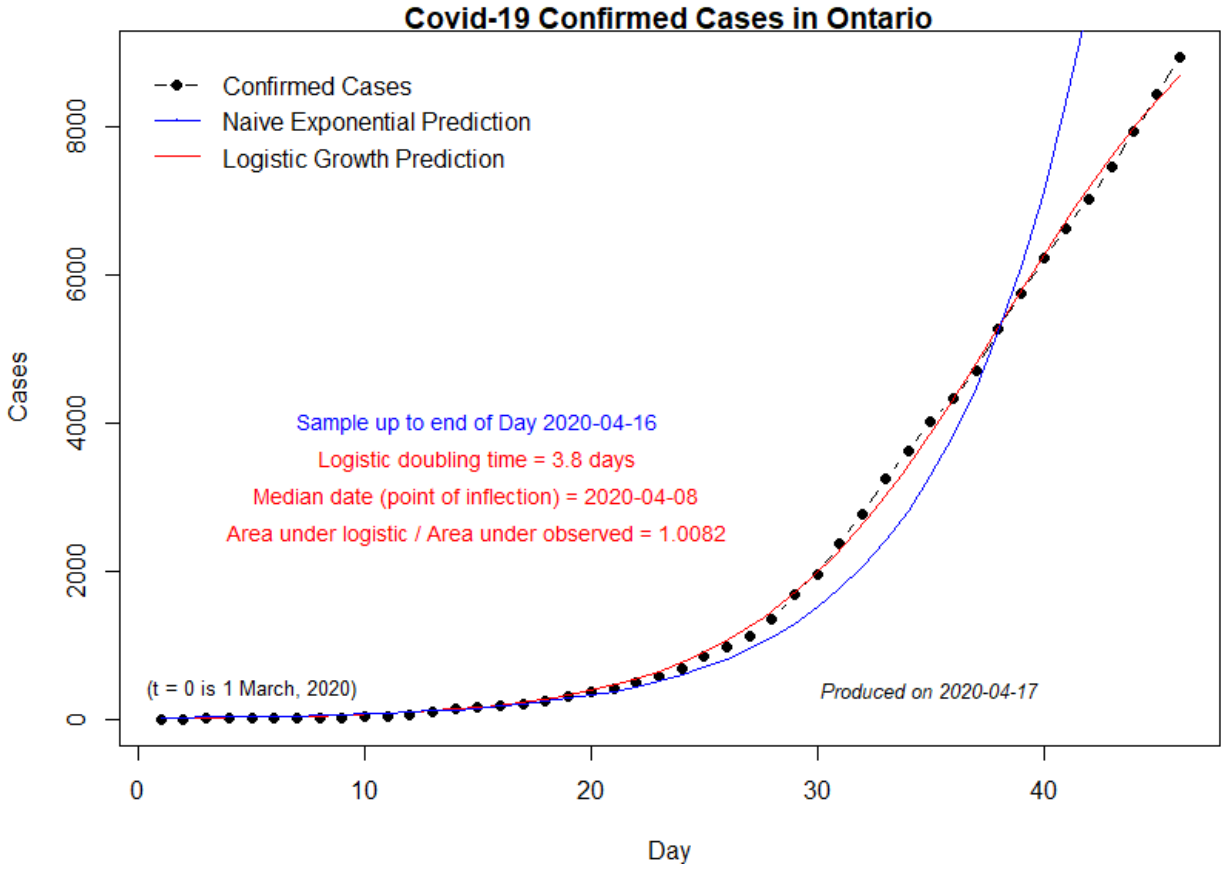
The chart below shows results based on *data from 2 March to 16 April inclusive*.

The Logistic model produces an "S-shaped" growth curve. One *disadvantage* is that this S-shape is symmetric about its point of inflection.

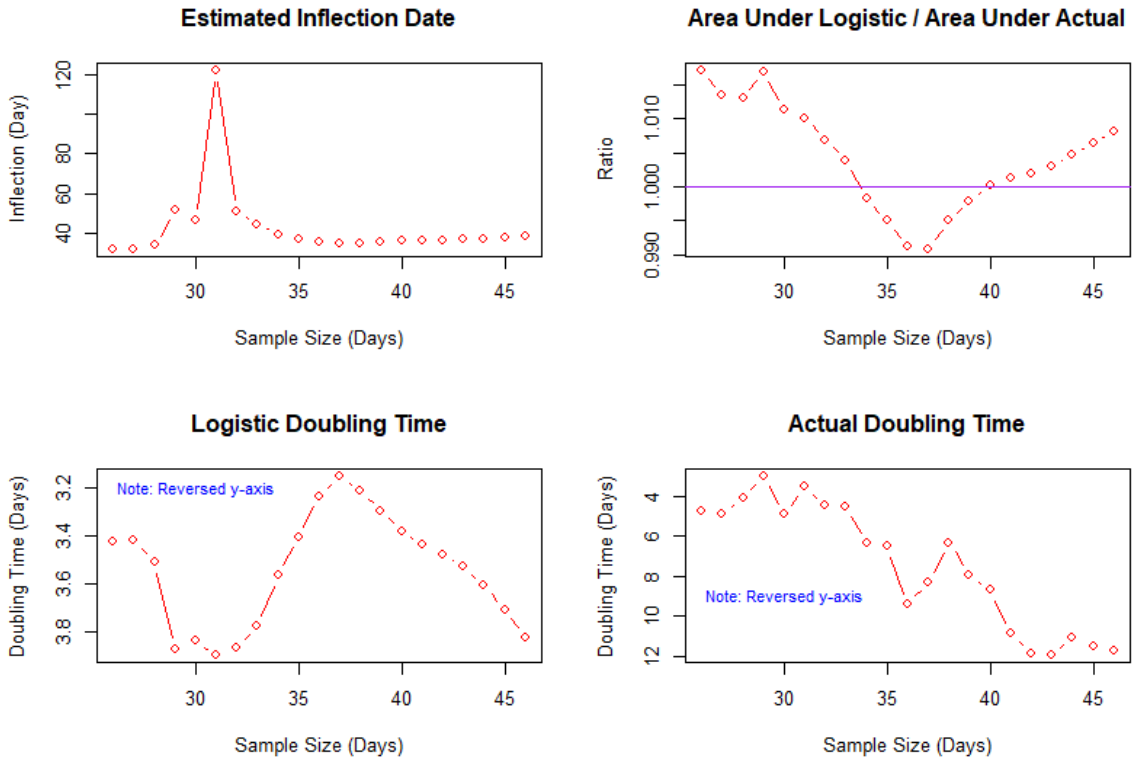


It's also interesting to see how the results change over time as more data become available.

This is summarized in the next set of charts, which are based on successive samples, each starting on 2 March, ending after 26, 27, …., 46 days. The last sample is the full sample used to get the chart above.

The second chart indicates the on-going "good fit" of the Logistic model to the observed data. A ratio value greater than 1.0 indicates that the model is over-predicting the actual data over the full sample range. A value of 1.0 would be "ideal", in a loose overall sense.

Both the observed and estimated "doubling times" for new cases have improved substantially. (Note the reverse axis on the last two charts, and the fact that a longer doubling time is better than a short one.)



The following plot shows the projections for total confirmed cases of Covid-19 based on the latest version of the Logistic model. The projections go to 7 days beyond the end of the latest sample.

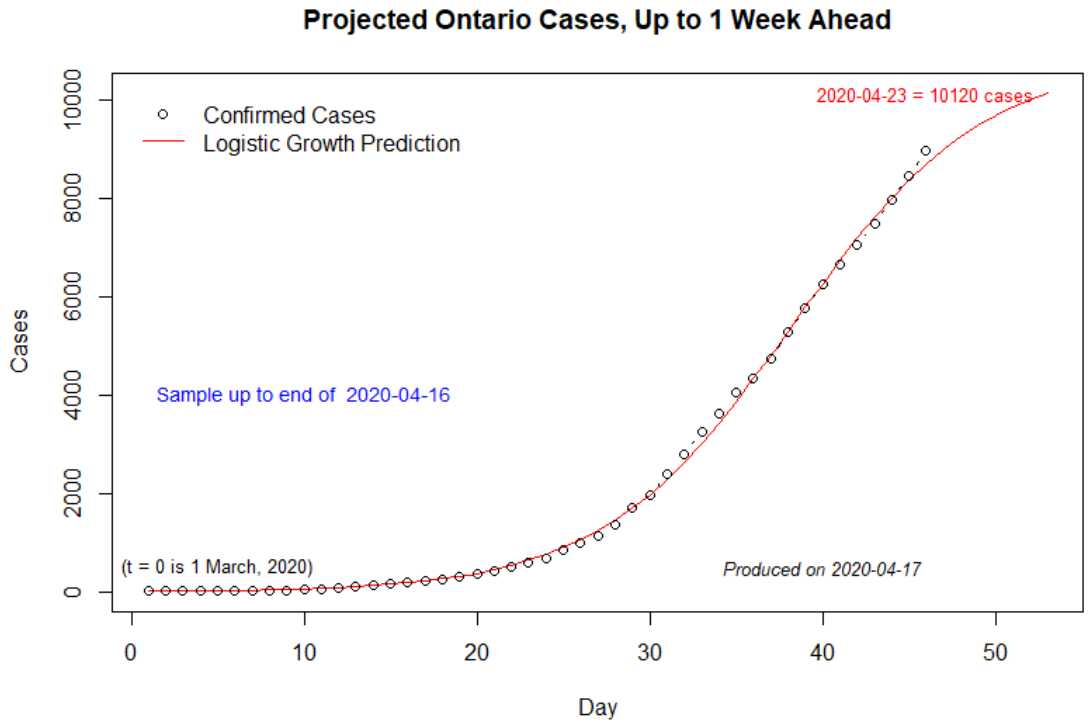


Table 3: Projected Covid-19 Cases in Ontario

(Projections are in Blue; Actual Values are in Brackets)

Sample end (projection made): 08 April

09 Apr	*10 Apr*	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*
5575	5913	6217	6485	6719	6920	7091
[5759]	[6237]	[6648]	[7049]	[7470]	[7953]	[8447]

Sample end (projection made): 09 April

10 Apr	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*
6033	6369	6670	6935	7167	7366	7535
[6237]	[6648]	[7049]	[7470]	[7953]	[8447]	[8961]

Sample end (projection made): 10 April

11 Apr	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*
6497	6830	7128	7390	7619	7815	7983
[6648]	[7049]	[7470]	[7953]	[8447]	[8961]	

Sample end (projection made): 11 April

12 Apr	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*
6916	7234	7516	7763	7978	8163	8320
[7049]	[7470]	[7953]	[8447]	[8961]		

Sample end (projection made): 12 April

13 Apr	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*
7303	7599	7861	8089	8286	8455	8599
[7470]	[7953]	[8447]	[8961]			

Sample end (projection made): 13 April

14 Apr	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*
7682	7960	8203	8415	8597	8753	8885
[7953]	[8447]	[8961]				

Sample end (projection made): 14 April

15 Apr	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*
8091	8357	8591	8794	8969	9119	9246
[8447]	[8961]					

Sample end (projection made): 15 April

16 Apr	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*21 Apr*
8523 [8961]	8784	9014	9213	9385	9533	9659

Sample end (projection made): 16 April

17 Apr	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*21 Apr*	*22 Apr*
8981	9241	9470	9669	9842	9992	10120

2. Total Number of Deaths

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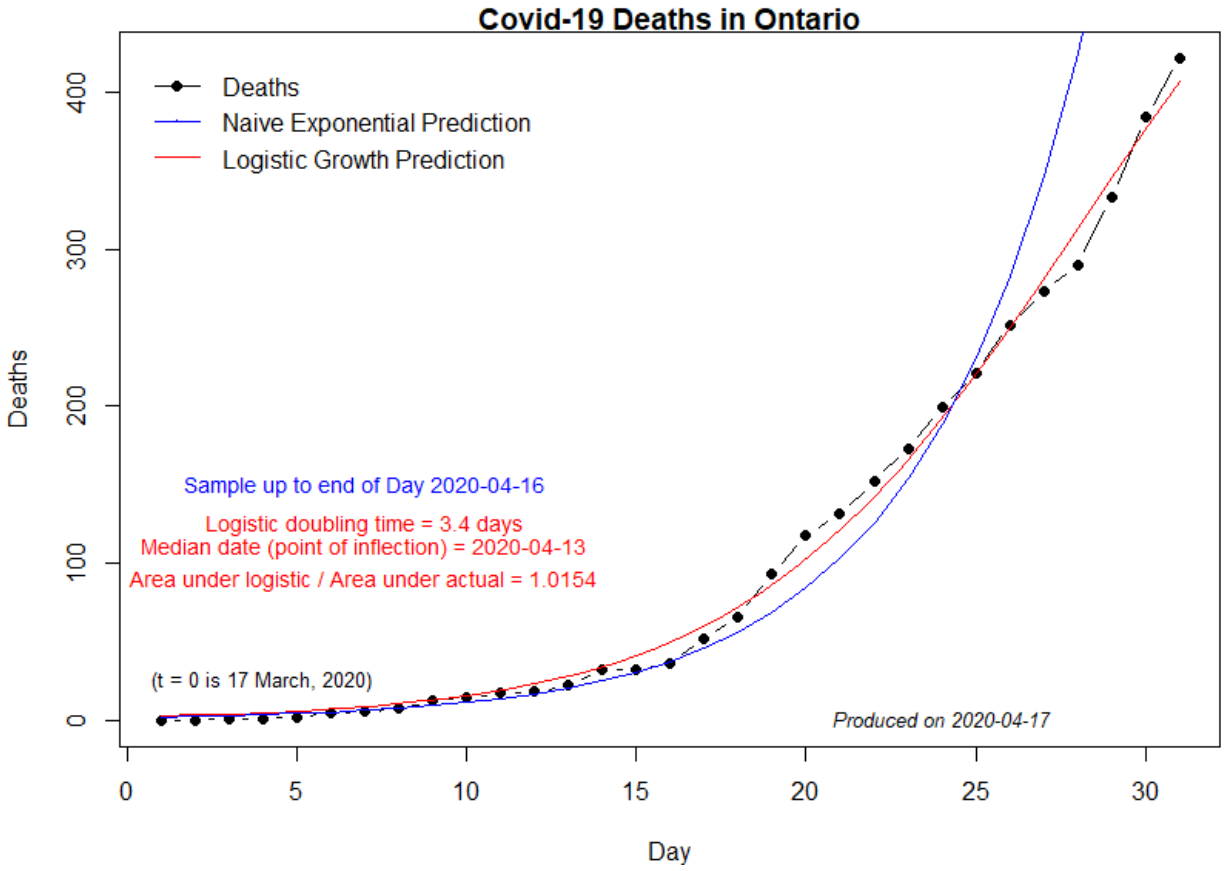
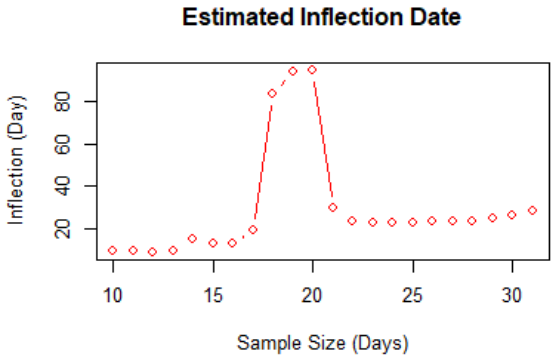
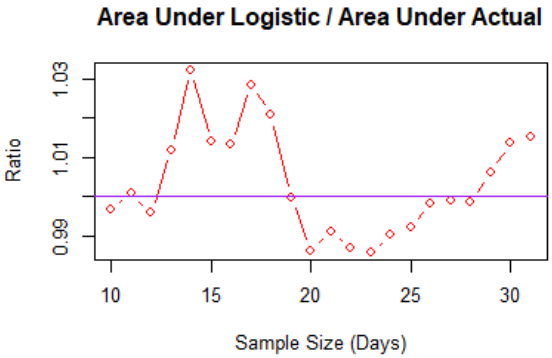


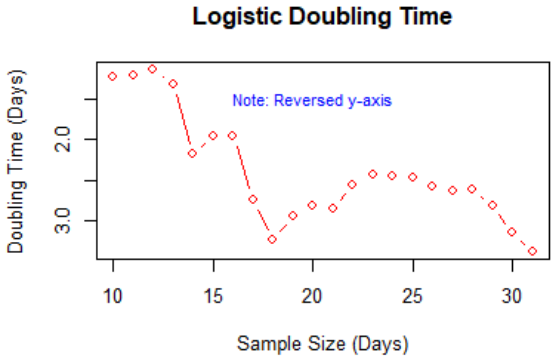
It's also interesting to see how the results change over time as more data become available.

This is summarized in the next set of charts, which are based on successive samples, each starting on 17 March, ending after 10, 11, …., 31 days. The last sample is the full sample used to get the chart above.

The second chart indicates the on-going "good fit" of the Logistic model to the observed data. A ratio value greater than 1.0 indicates that the model is over-predicting the actual data over the full sample range. A value of 1.0 would be "ideal", in a loose overall sense.







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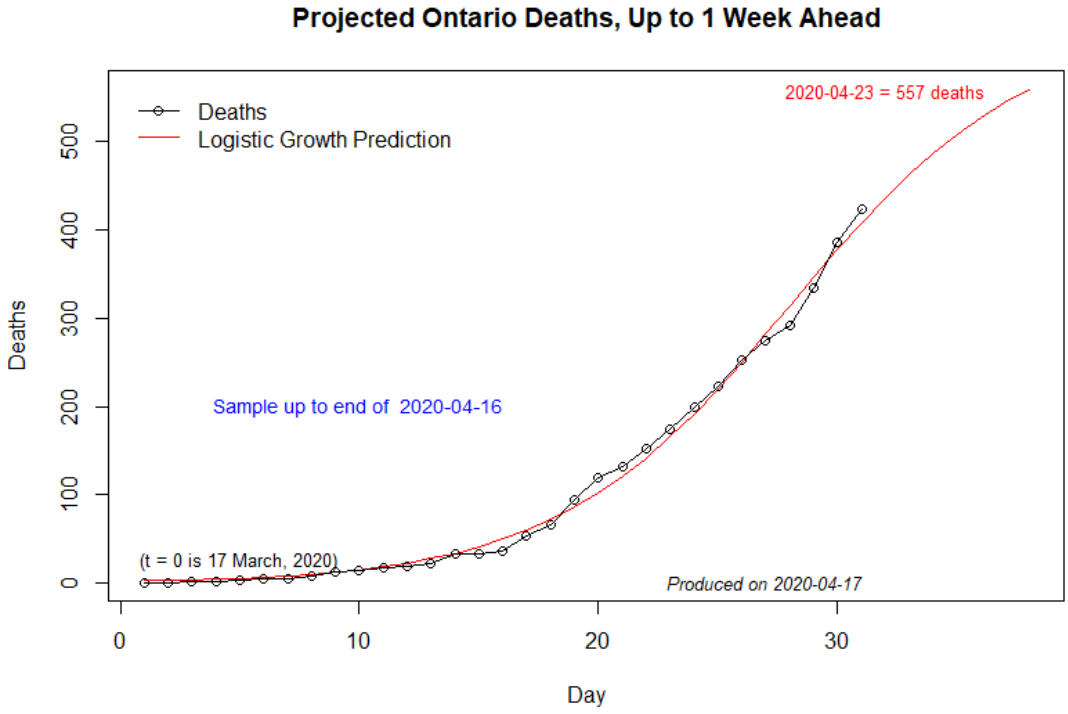

Table 4: Projected Covid-19 Deaths in Canada

(Projections are in Red; Actual Values are in Brackets)

Sample end (projection made): 08 April

09 Apr	*10 Apr*	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*
198	219	238	254	268	280	289
[200]	[222]	[253]	[274]	[291]	[334]	[385]

Sample end (projection made): 09 April

10 Apr	*11 Apr*	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*
220	240	257	271	283	293	301
[222]	[253]	[274]	[291]	[334]	[385]	[423]

Sample end (projection made): 10 April

11 Apr	*12 Apr*	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*
240	258	273	285	296	304	310
[253]	[274]	[291]	[334]	[385]	[423]	

Sample end (projection made): 11 April

12 Apr	*13 Apr*	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*
268	287	303	316	327	336	343
[274]	[291]	[334]	[385]	[423]		

Sample end (projection made): 12 April

13 Apr	*14 Apr*	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*
291	308	322	334	344	352	358
[291]	[334]	[385]	[423]			

Sample end (projection made): 13 April

14 Apr	*15 Apr*	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*
307	321	333	343	351	357	362
[334]	[385]	[423]				

Sample end (projection made): 14 April

15 Apr	*16 Apr*	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*
340	356	369	381	390	398	404
[385]	[423]					

Sample end (projection made): 15 April

16 Apr	*17 Apr*	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*21 Apr*
388	410	429	446	461	473	483

[423]

Sample end (projection made): 16 April

17 Apr	*18 Apr*	*19 Apr*	*20 Apr*	*21 Apr*	*21 Apr*	*22 Apr*
436	462	486	507	526	543	557