Coronavirus crisis in Switzerland – Statistical assessment and model verification

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The coronavirus SARS CoV-2 has impacted Switzerland. With the number of positive cases growing every day, it is worrying and of great concern for most of us when this crisis will end. A first article was published on the 2nd April and summarised as Part 1 the assessment and prediction based on the real time data till 1st April. Refer to Part 2 to see how accurate the model was in predicting the trend and the outcome.

PART 1: Development of Statistical model based on available real time data till 1st April

In order to attempt a prediction, the daily real time data of positive cases published on www.worldometers.info, most followed website and data published by the Swiss authorities at www.bag.admin.ch was modelled using the statistical tool Minitab.

Figure 1 - Trend from Worldometers.info daily positive case data:

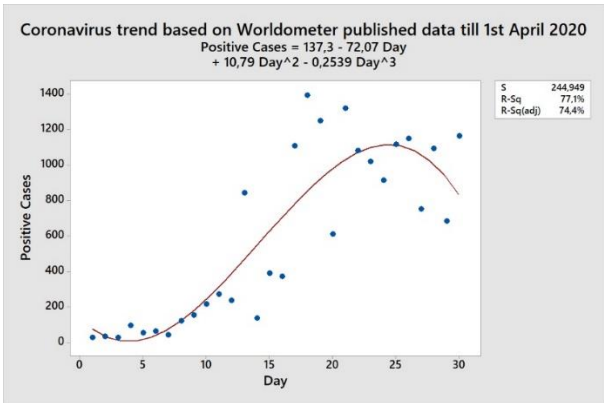
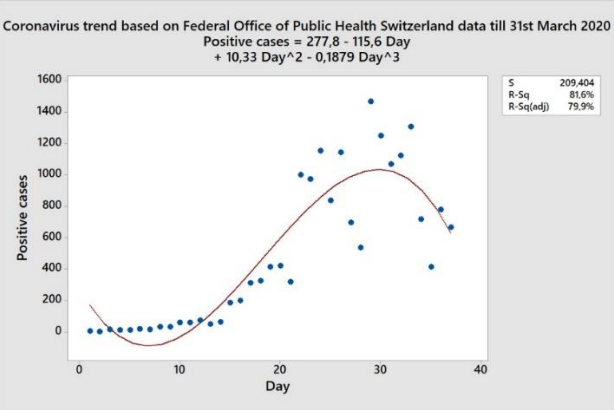


Figure 2 - Trend from www.bag.admin.ch daily positive data



Based on the trends presented in Figures 1 and 2, a non-linear regression analysis was carried out. In the following the observation – model prediction in comparison with real time data is presented.

Figure 3 - Model prediction vs real data based on Worldometer info till 1st April 2020

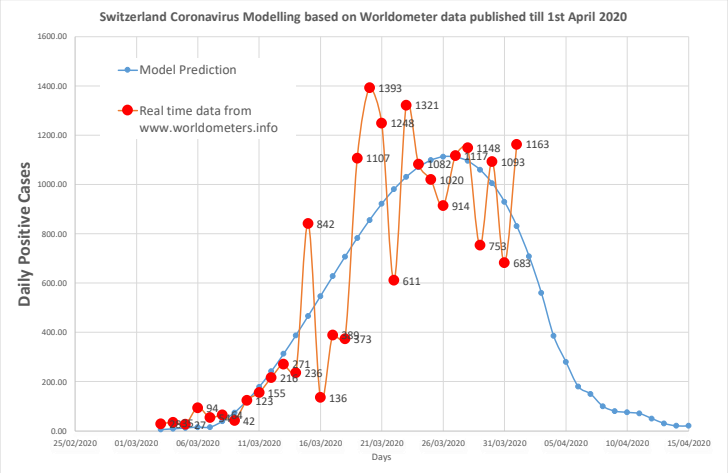
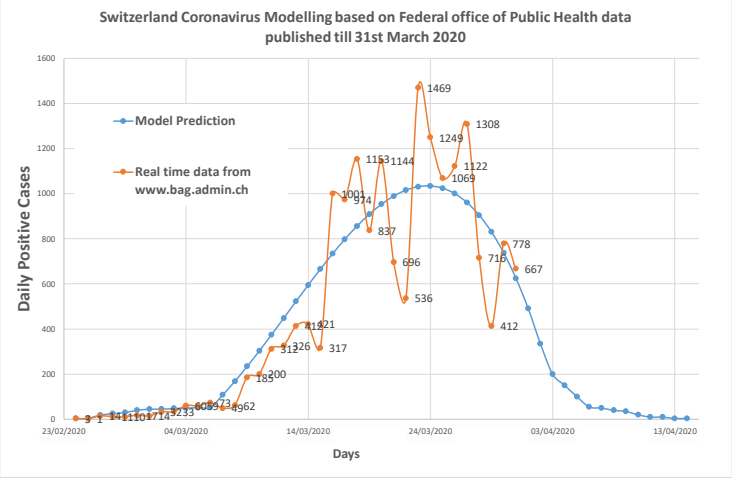


Figure 4 - Model prediction vs real data based on www.bag.admin.ch published till 31st March 2020



PART 2 – Validation of the assessment based on the additional new real time data till 14th April

In order to assess and validate the established model prediction, the new information of daily positive cases published on www.worldometers.info, most followed website and data published by the Swiss authorities at www.bag.admin.ch was used to verify whether good statistical assessment routinely used in the pharmaceutical industry for formulation and process development to draw conclusions of life impacting on the drug development process can help support real life issues – in this case the development of COVID-19 cases - with moving real time data.

The data published till 14th April from Worldometer and 13th April from Swiss authorities was used for the verification of the model prediction of the trend in number of new positive cases and also to develop guidance on the possible onset of the cooling period.

Figure 5 provides the trend observed using the data published in Worldometer and Figure 6 provide the trend observed based on the Swiss authorities data published in www.bag.admin.ch

The trend of new daily positive cases as shown in both, Figure 5 and Figure 6 matches exactly the trend as predicted in Figure 3 and Figure 4.

Figure 5 - Trend from Worldometers.info daily positive case data:

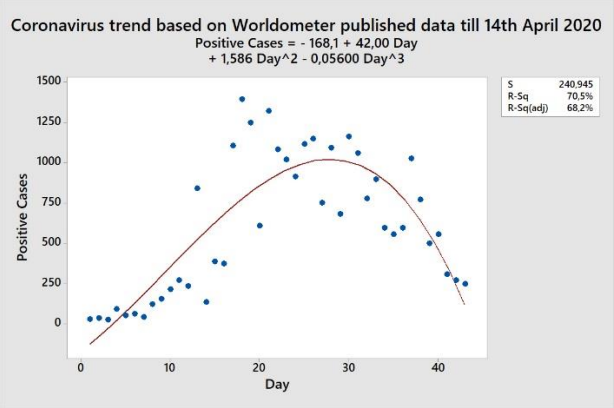
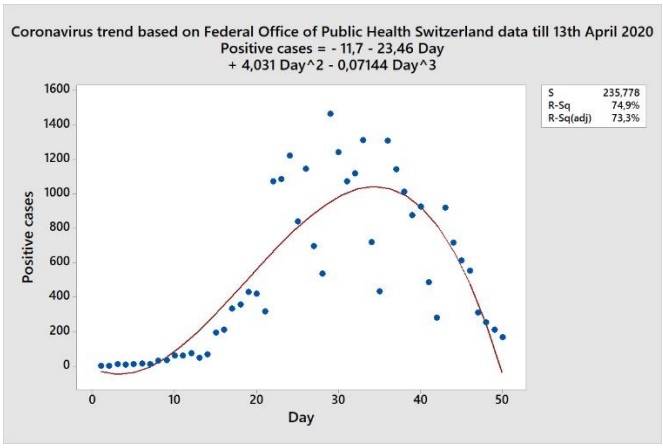


Figure 6 - Trend from www.bag.admin.ch daily positive data



Key conclusions and observations

A notable trend change was observed after the lockdown imposed on 15th March 2020 by the Swiss government and this is clearly based on both the real time data and model predictions using statistical tools commonly used in pharmaceutical formulation and process development.

If no major spikes in the number of new positive cases and no major out-of-trend observations will occur in the future, both the real time data and the model prediction support the original conclusion that by mid to end of April 2020 a significant reduction in the number of new cases will become apparent followed by a "cooling off" phase.

This work demonstrates that out of the box thinking and applying tools and skills normally used in assessing industrial data and problems can also support the management of major real life crises like the coronavirus pandemic, reiterating the fact that science has no boundaries. This work also encourages sharing knowledge from one research area to another research area in helping to move the boundaries of science and also benefit by sharing ideas and knowledge from different research areas.

Please Note

1) This work is based on an independent assessment as an individual scientist and elected supporting member of the Academy purely out of interest in this crucial period for our country. Data were obtained from publically accessible sources and were not fully validated and verified by either the Academy or myself.