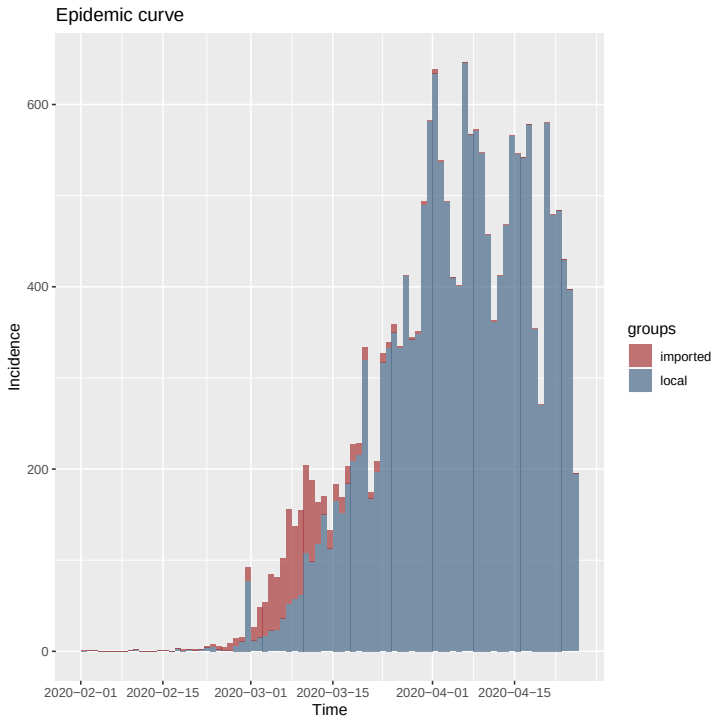
Folkhälsomyndigheten

Sweden: estimate of the effective reproduction number
29 april 2020

R_e is the reproduction number calculated at different time points during the epidemic, i.e. the average number of expected infected persons by a primary case in a population of susceptibles and infected individuals.

1 Epicurve

Figure 1 shows the epicurve with the daily number of new cases until 2020-04-25. The colors indicate which cases were imported and which were locally infected. A large number of imported cases were reported in the first two weeks of March, but after that most of the cases have been infected locally.



Figur 1: Sweden: Epicurve until 2020-04-25

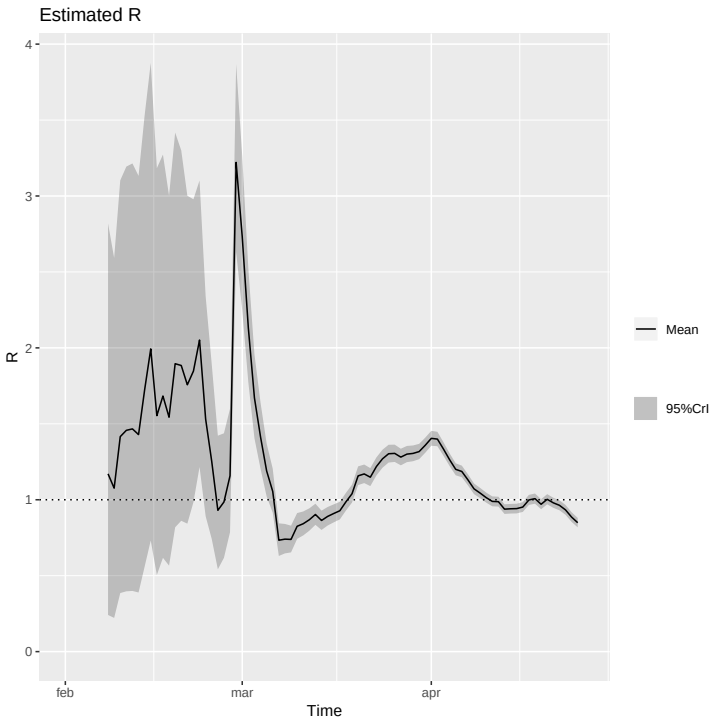
.

2 Effective reproduction number R_e

Tabell 1: Sweden: effective reproduction numbers with 95% credible interval, based on a sliding 7-day window starting: 1 April 2020 – 25 Apr 2020

End window	Mean	2.5% Quantile	97.5% Quantile
2020-04-01	1.40	1.36	1.45
2020-04-02	1.40	1.35	1.45
2020-04-03	1.33	1.29	1.38
2020-04-04	1.26	1.22	1.31
2020-04-05	1.20	1.16	1.24
2020-04-06	1.19	1.15	1.22
2020-04-07	1.13	1.09	1.17
2020-04-08	1.07	1.04	1.11
2020-04-09	1.04	1.01	1.08
2020-04-10	1.01	0.98	1.05
2020-04-11	0.99	0.96	1.02
2020-04-12	0.99	0.96	1.02
2020-04-13	0.94	0.91	0.97
2020-04-14	0.94	0.91	0.97
2020-04-15	0.94	0.91	0.97
2020-04-16	0.95	0.92	0.98
2020-04-17	1.00	0.97	1.03
2020-04-18	1.01	0.97	1.04
2020-04-19	0.97	0.94	1.00
2020-04-20	1.00	0.97	1.04
2020-04-21	0.98	0.95	1.01
2020-04-22	0.96	0.93	1.00
2020-04-23	0.93	0.90	0.97
2020-04-24	0.89	0.85	0.92
2020-04-25	0.85	0.82	0.88

In figure 2 we plotted R_e starting on 17 February 2020, and in table 1, the values of R_e are shown beginning on 15 March. During the first month the estimates of R_e were vary unstable. After that, R_e reached a maximum of 1.4 at the beginning of April, and steadily decreased after that. By the middle of April R_e fluctuated around the value of one during a week, and since 21 April it has slightly dropped below one.



Figur 2: Sweden: Effective reproduction number (line) with 95% credible interval based on sliding 7-day windows: 17 Feb 2020 – 25 Apr 2020.

3 Data

Here R_e is estimated based on the incidence growth curve, i.e. the daily epicurve, with the number of new cases reported to the Public Health Agency of Sweden. Specifically we use the epidate of the case which is the date of symptom onset as reported by the individual. If the date of onset is not available, the epidate is the date when the case was tested for SARS-CoV-2.

4 Method

The estimation of R_e requires knowing the serial interval. The serial interval is the time elapsed between the symptom onset of the primary case and the date of symptom onset of the secondary case. Here we used the estimated serial interval by Nishiura et al (2020), with a mean of 4.8 days and a standard deviation 2.3 days (Nishiura et al 2020). In our analyses, R_e was estimated in a sliding window of 7-days. The method applied here is based on Wallinga nd Teunis (2004).

Estimates of R_e were carried out in R v3.6.0, R-package EpiEstim v2.2-1. The code for plotting and calculating R_e based on Churches (2020).

5 References

Churches, T. (2020) Health Data Science Blog. 2020-02-18-analysing-covid-19-2019-ncov-outbreak-data-with-r-part-1. Accessed 2020-03-12.

Nishiura, H., Linton, N.M., Akhmetzhanov, A.R. (2020). Serial interval for novel coronavirus (COVID-19) infections". International Journal of Infectious Diseases. 93, 284-286.

Wallinga, J and Teunis, P. (2004) Different Epidemic Curves for Severe Acute Respiratory Syndrome Reveal Similar Impacts of Control Measures". Americal Journal of Epidemiology, 160(16)509-516.