Supplementary information

Sensitivity analysis on serial interval distribution

We calculated the basic reproduction number using the maximum likelihood method, while considering estimates of the serial interval at early epidemic stages in Lombardy Italy and referring to assumed serial interval in S. Abbott et al research.[1,2] The trends of sensitivity analysis are robust with our choices of the serial interval, which expand our basic assumption of same interval distribution among the different countries. Clearly, the shorter the serial interval is, the smaller the estimated R_0 value is (Table 1). We also conducted sensitivity analysis using a wide range of mean serial interval distribution between 4 days and 12 days among the twelve countries (Figure 1 to Figure 12).[3]

Table 1 Estimated basic reproduction number to the choice of serial interval distribution

	Serial Interval (7.5, 3.4)		Serial Interval (6.6, 4.9)		Serial Interval (4.7, 2.9)	
Country	R_0	95% CI	R_0	95% CI	R_0	95% CI
Republic of Korea	1.593	(1.582-1.604)	1.486	(1.476-1.496)	1.315	(1.306-1.324)
Japan	1.749	(1.711-1.788)	1.593	(1.558-1.628)	1.405	(1.374-1.436)
Islamic Republic of Iran	2.416	(2.402-2.431)	2.019	(2.007-2.031)	1.680	(1.670-1.690)
Algeria	3.163	(2.820-3.534)	2.490	(2.220-2.782)	2.053	(1.830-2.293)
Italy	3.194	(3.180-3.207)	2.470	(2.459-2.481)	2.020	(2.011-2.029)
Argentina	4.046	(3.669-4.447)	2.917	(2.646-3.207)	2.324	(2.107-2.554)
France	4.075	(4.038-4.112)	2.894	(2.868-2.920)	2.318	(2.297-2.339)
the United Kingdom	4.861	(4.781-4.941)	3.286	(3.233-3.341)	2.631	(2.588-2.674)
Germany	5.382	(5.337-5.426)	3.572	(3.543-3.602)	2.864	(2.840-2.888)
Spain	5.484	(5.444-5.525)	3.487	(3.461-3.513)	2.737	(2.717-2.758)
South Africa	7.532	(6.946-8.150)	4.191	(3.865-4.535)	3.256	(3.003-3.523)
United States of America	8.213	(8.139-8.288)	4.780	(4.737-4.823)	3.789	(3.755-3.823)

Notes: Serial Interval (mean, standard deviation); 95%CI: 95% confidence interval

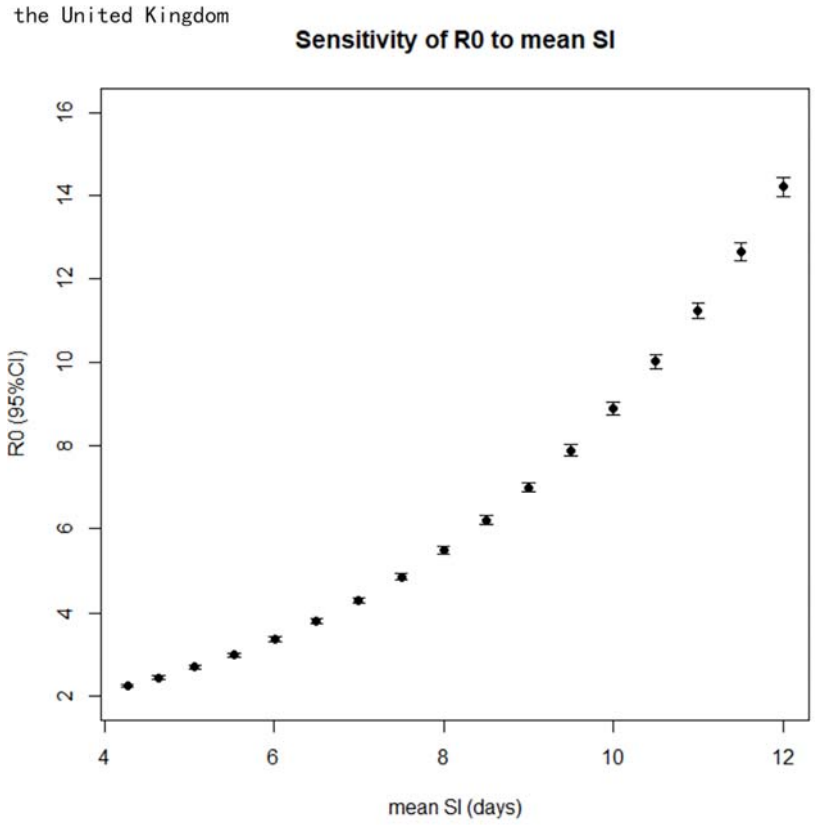

Figure 1. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in the United Kingdom

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

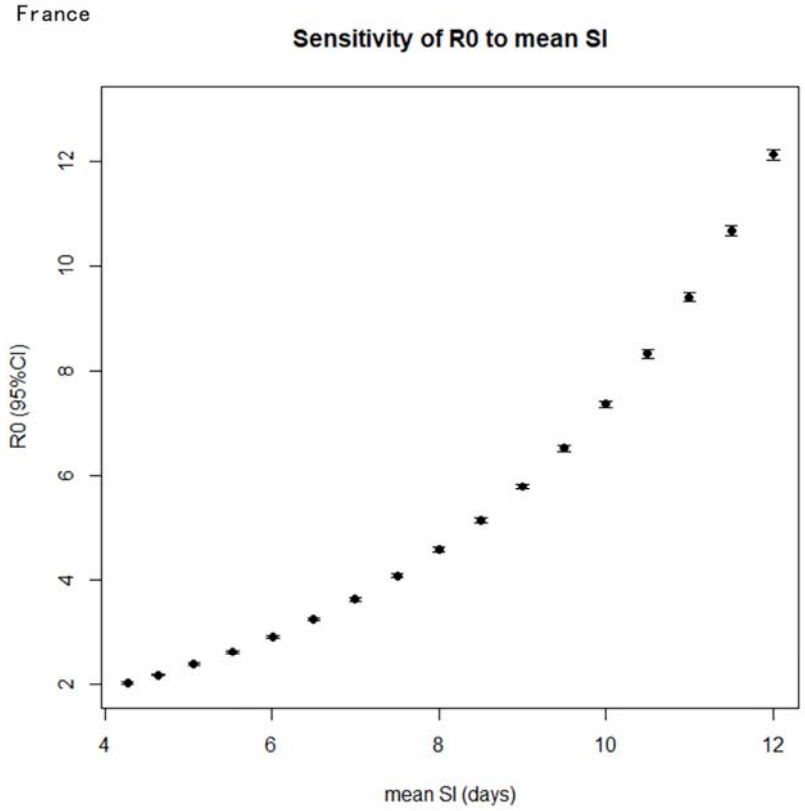

Figure 2. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in France

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

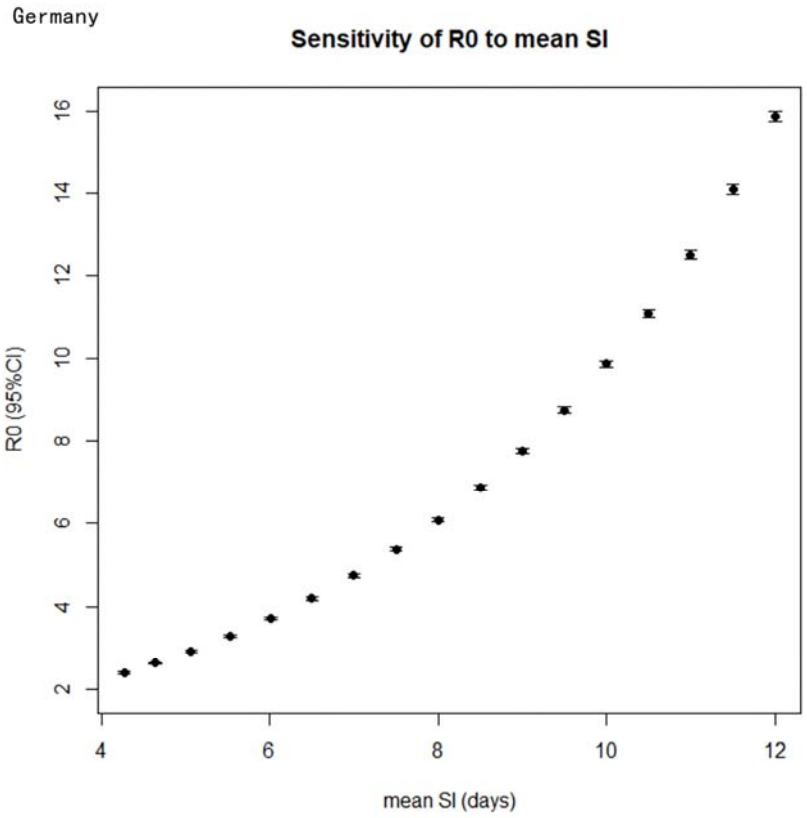

Figure 3. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Germany

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

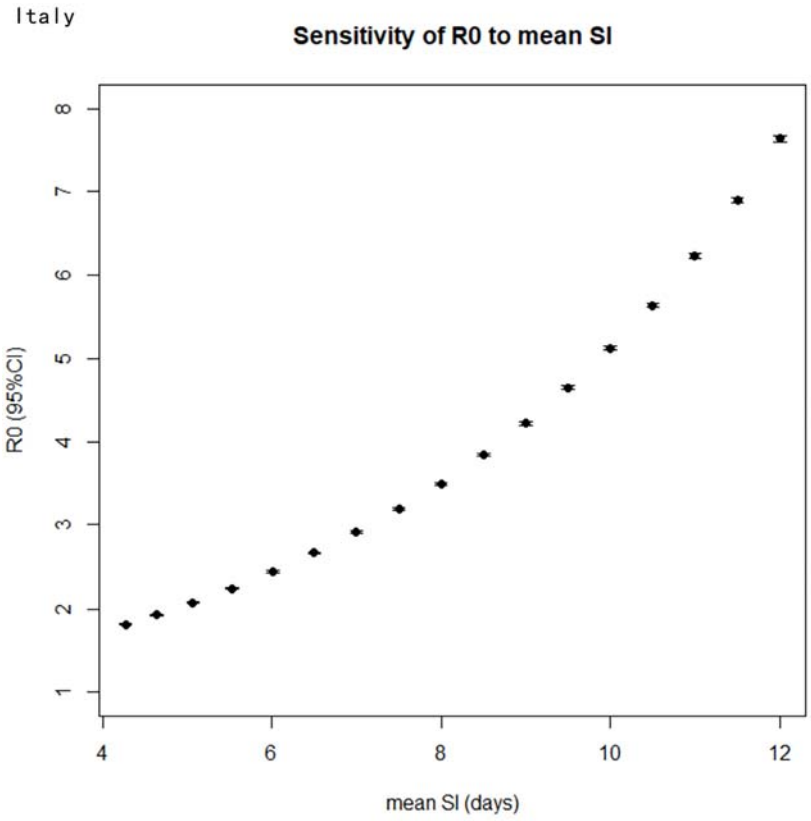

Figure 4. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Italy

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

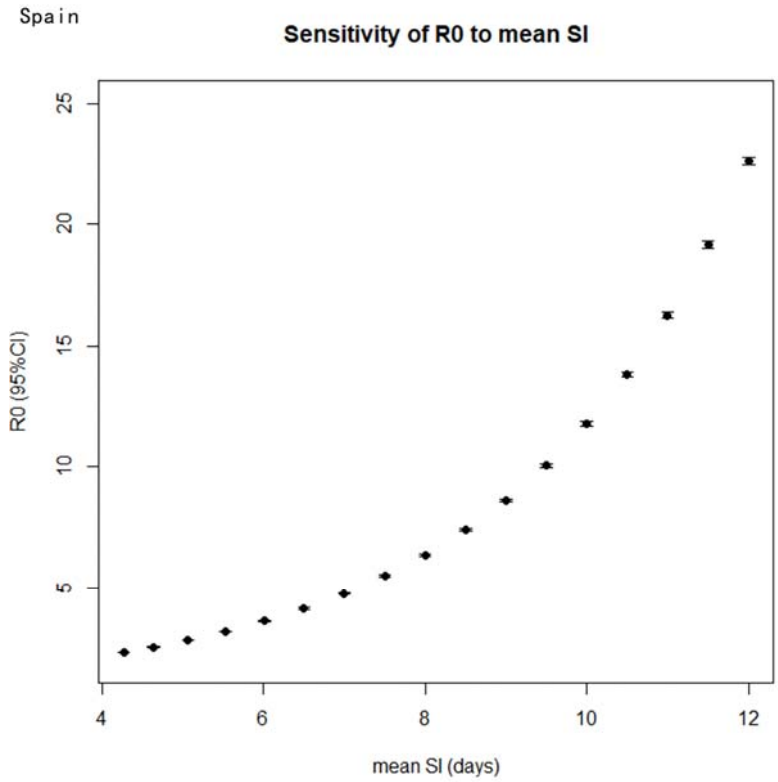

Figure 5. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Spain

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

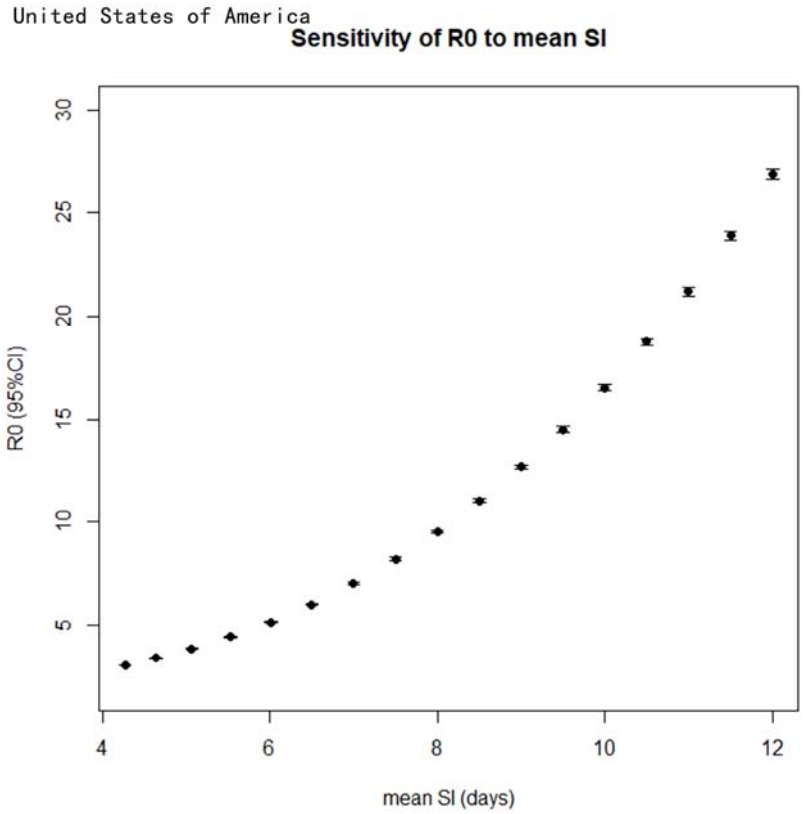

Figure 6. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in United States of America

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

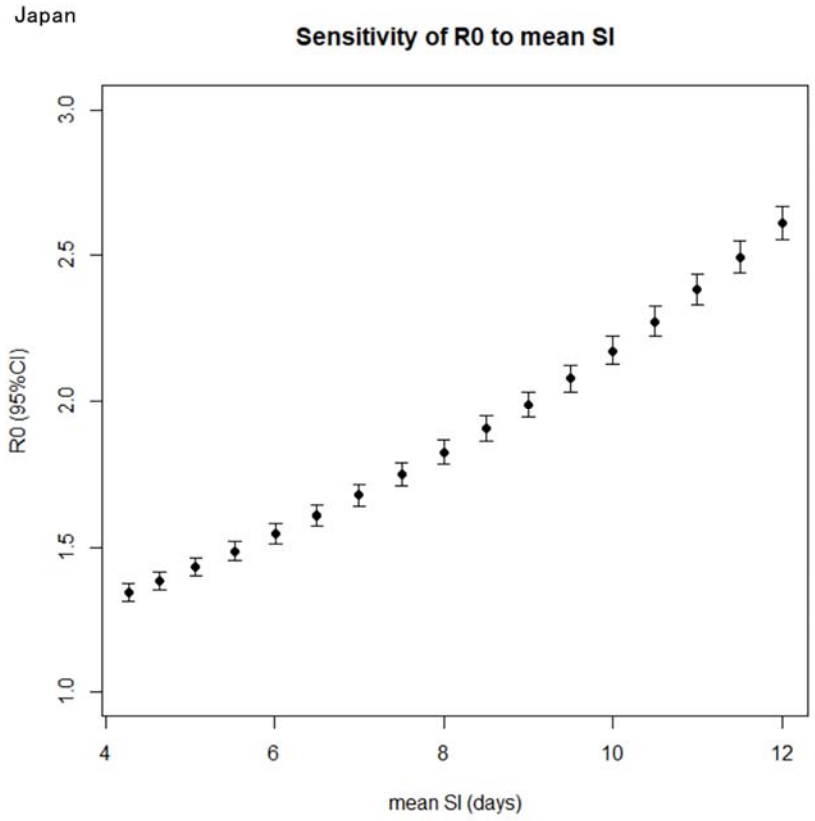

Figure 7. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Japan

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

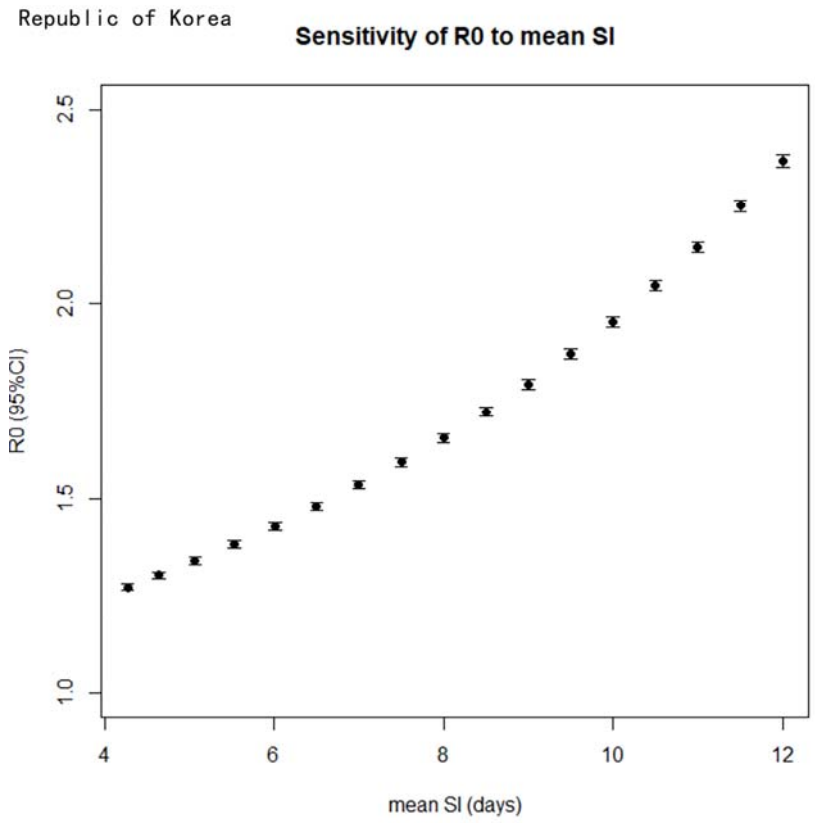

Figure 8. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Republic of Korea.

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

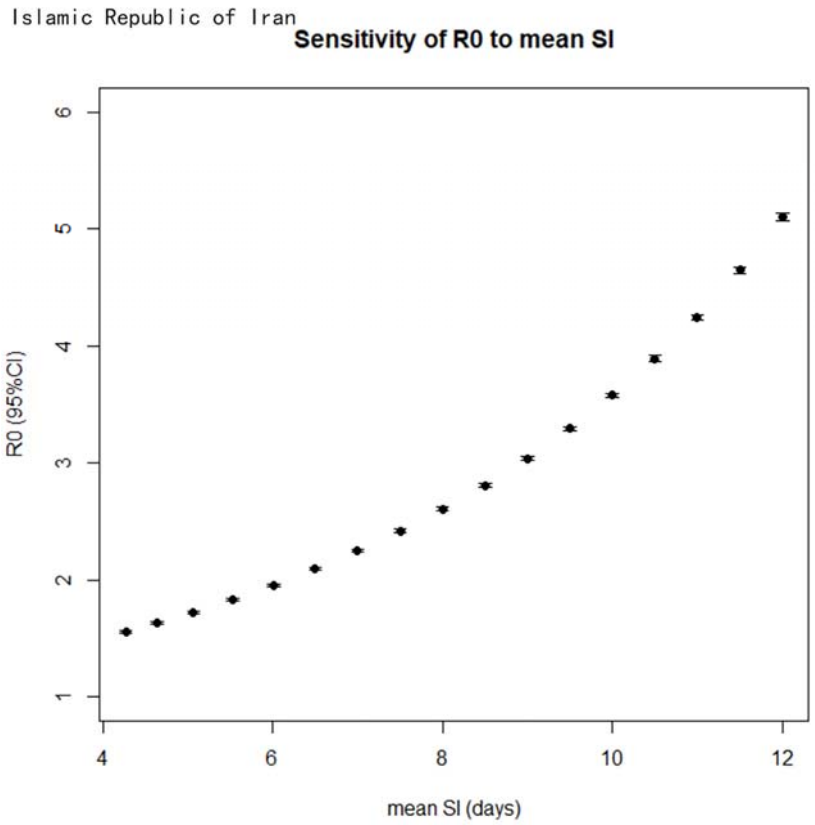

Figure 9. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Islamic Republic of Iran

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

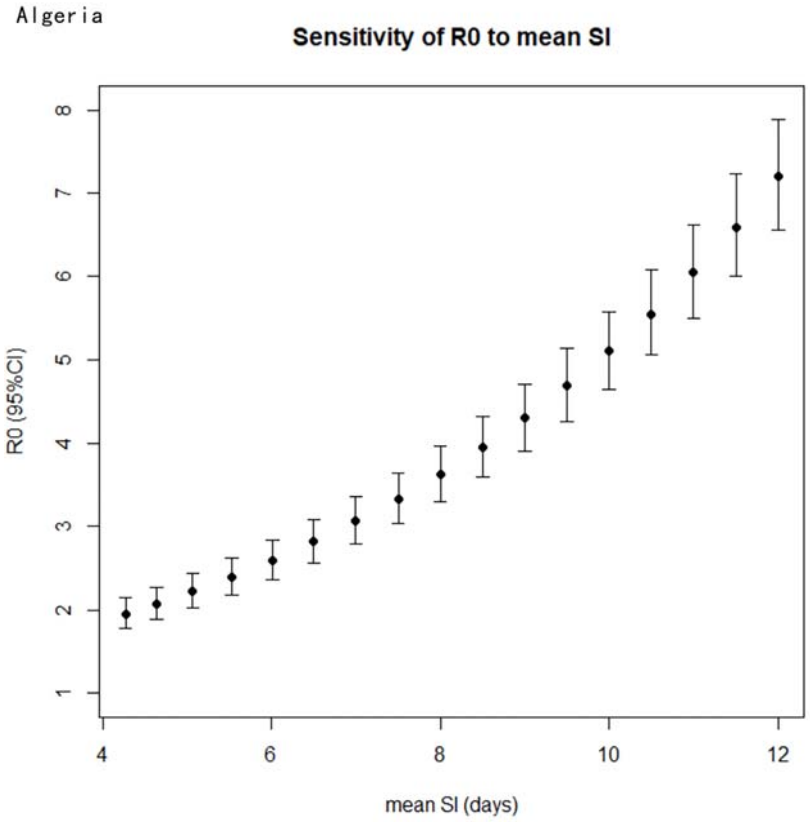

Figure 10. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Algeria

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

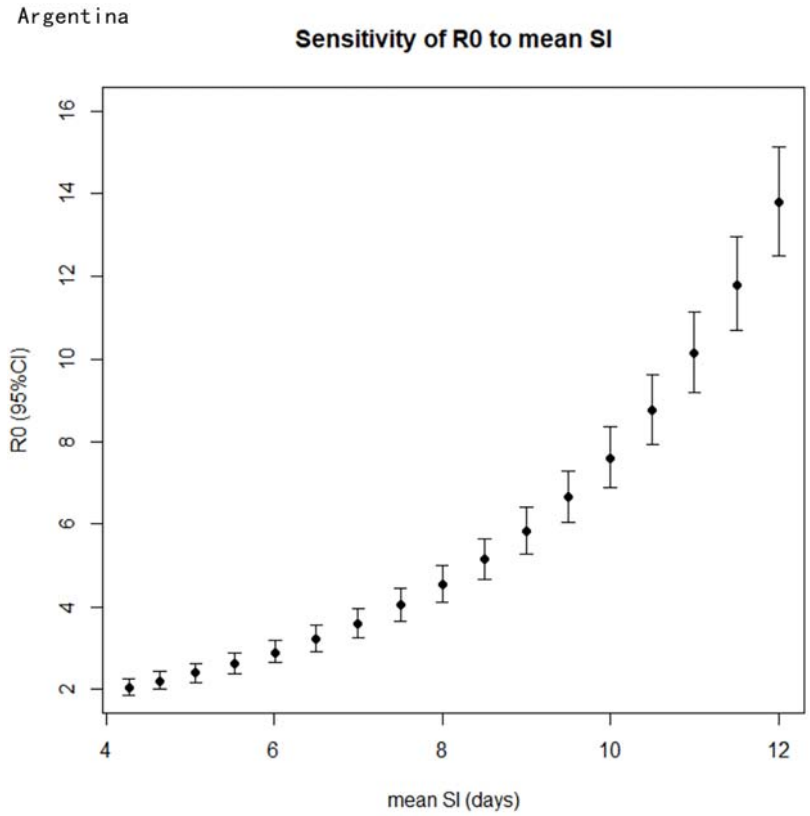

Figure 11. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in Argentina

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

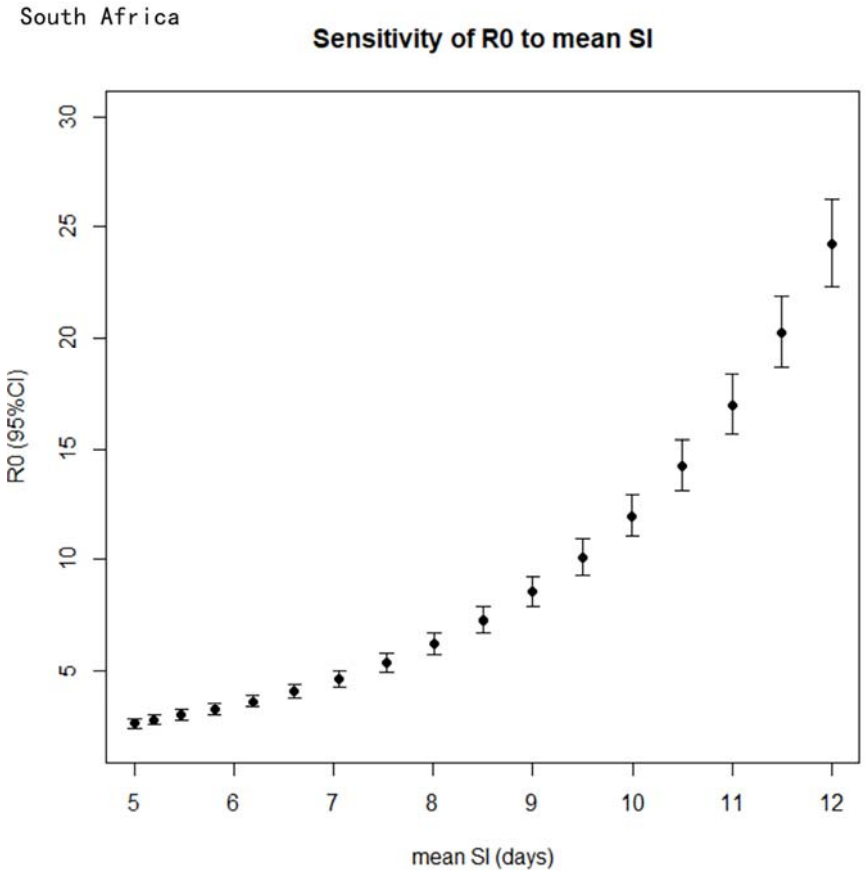

Figure 12. Sensitivity analysis of the reproduction number to the choice of the serial interval distribution in South Africa

Basic reproduction numbers were computed using different mean serial interval parameters. 95% confidence intervals are shown as vertical bars.

References

1 D, C. *et al.* The early phase of the COVID-19 outbreak in Lombardy, Italy. *arXiv*, doi:https://arxiv.org/abs/2003.09320v1 (Submitted on 20 Mar 2020).

2 Abbott, S. *et al.* Temporal variation in transmission during the COVID-19 outbreak. *Centre for Mathematical Modelling of Infectious Diseases*, doi:https://cmmid.github.io/topics/covid19/current-patterns-transmission/global-time-varying-transmission.html (2020).

3 Obadia, T., Haneef, R. & Boëlle, P. Y. The R0 package: a toolbox to estimate reproduction numbers for epidemic outbreaks. *BMC Med Inform Decis Mak* **12**, 147, doi:10.1186/1472-6947-12-147 (2012).