Figures and Tables

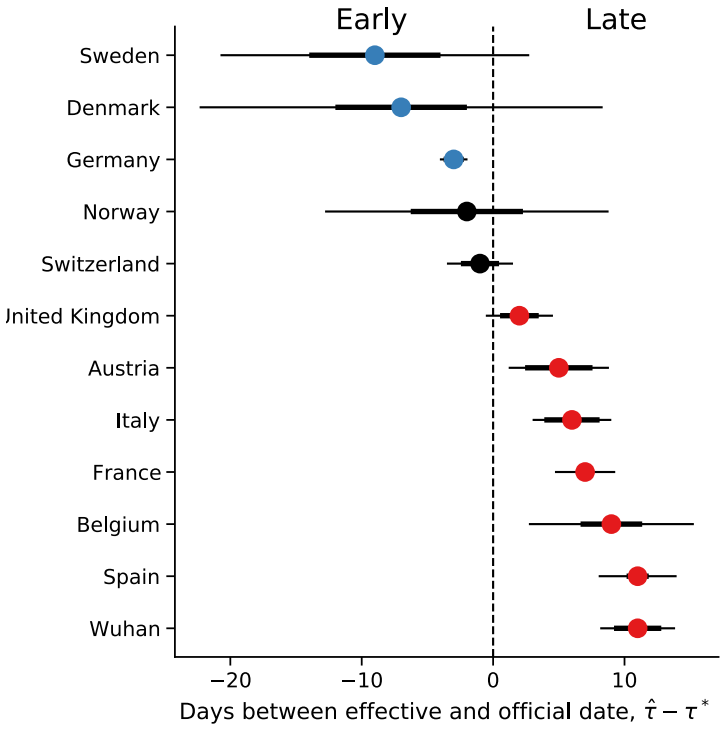

Figure 1: Official vs. effective start of non-pharmaceutical interventions. The difference between $\tau\hat{}$ the effective and τ^* the official start of NPIs is shown for different regions. The effective date is delayed in UK, Austria, Italy, France, Belgium, Spain, and Wuhan, China, compared to the official date (red markers). In contrast, the estimated effective dates in Sweden, Denmark, and Germany are earlier than the official dates (blue markers), although uncertainty is low only for Germany (i.e., zero is not included in 95% CI). The credible intervals for Sweden, Denmark, and Norway are especially wide, see text and Figure 3 for possible explanation. Here, $\tau\hat{}$ is the posterior median, see Table 2. τ^* is the last NPI date (Table 1). Thin and bold lines show 95% and 75% credible intervals, respectively. Figure S2 shows a similar summary when estimating $\tau\hat{}$ using case data up to Mar 28, 2020, rather then Apr 11.

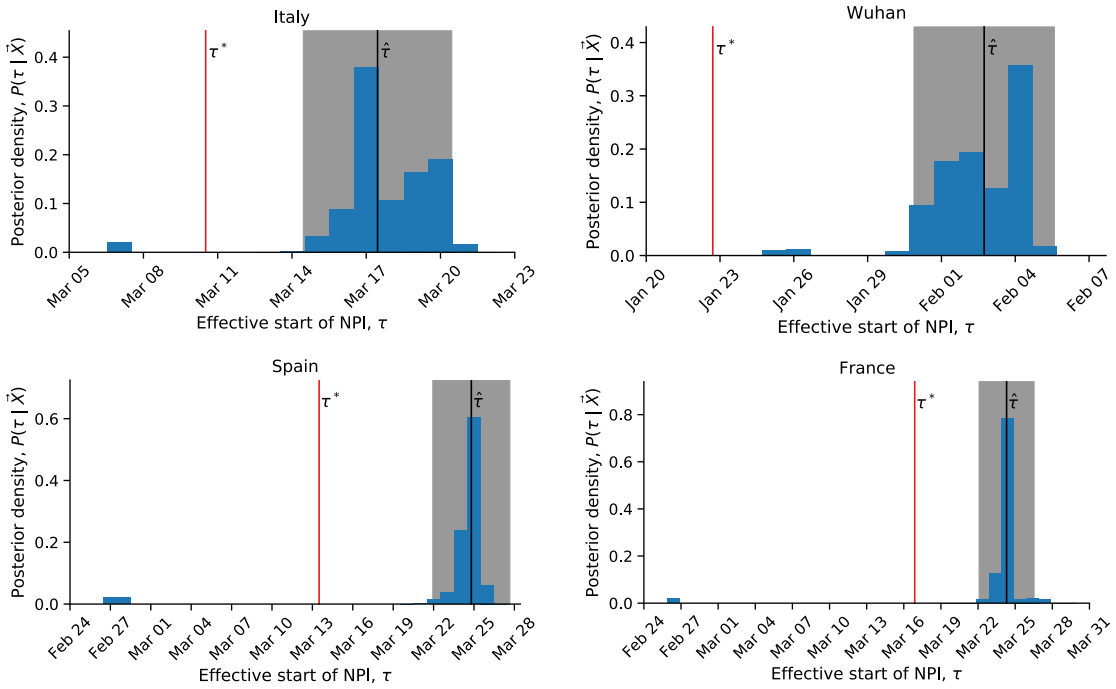

Figure 2: Late effect of non-pharmaceutical interventions. Posterior distribution of τ, the effective start date of NPI, is shown as a histogram of MCMC samples. Red line shows the official last NPI date τ*. Black line shows the estimate τˆ. Shaded area shows a 95% credible interval.

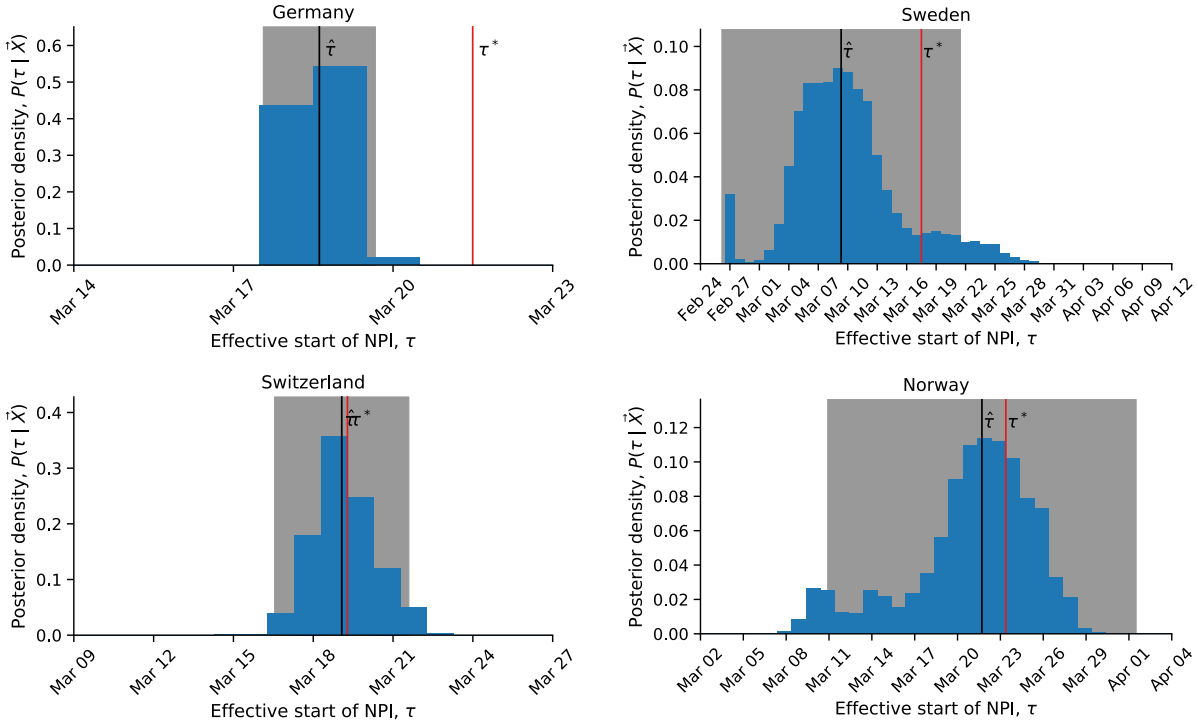

Figure 3: Early and exact effect of non-pharmaceutical interventions. Posterior distribution of τ, the effective start date of NPI, is shown as a histogram of MCMC samples. Red line shows the official last NPI date τ*. Black line shows the estimated τˆ. Shaded area shows a 95% credible interval.

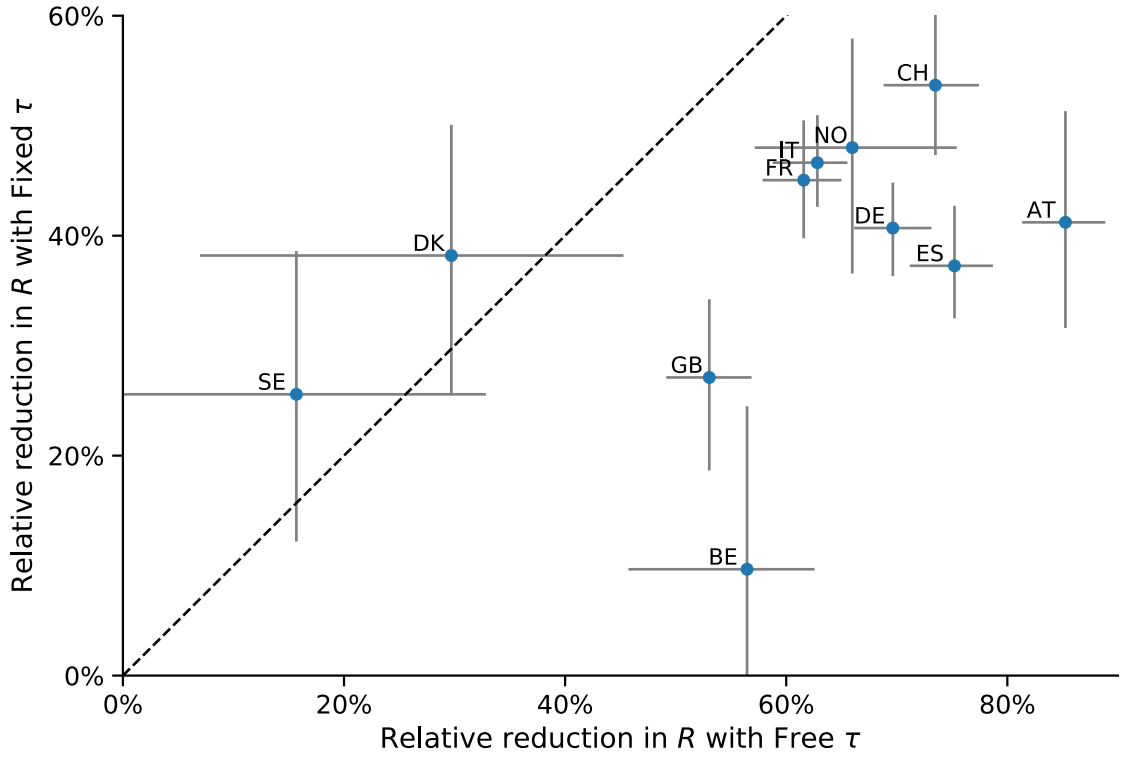

Figure 4: Impact of NPIs is under-estimated when assuming they start at the official date. Shown are estimates of the relative reductions in *R* (the effective reproduction number), which measures the impact of NPIs on disease transmission. The y-axis shows estimates when assuming the start of NPIs is fixed at the official date (fixed τ); the x-axis shows estimates when inferring the effective start of NPIs from the data (free τ). The dashed line shows a one-to-one correspondence. Markers and bars denote the posterior median and 50% credible intervals. The relative reductions in *R* are consistently lower for the fixed τ model (below the dashed line), except in Sweden and Denmark in which uncertainty is high.

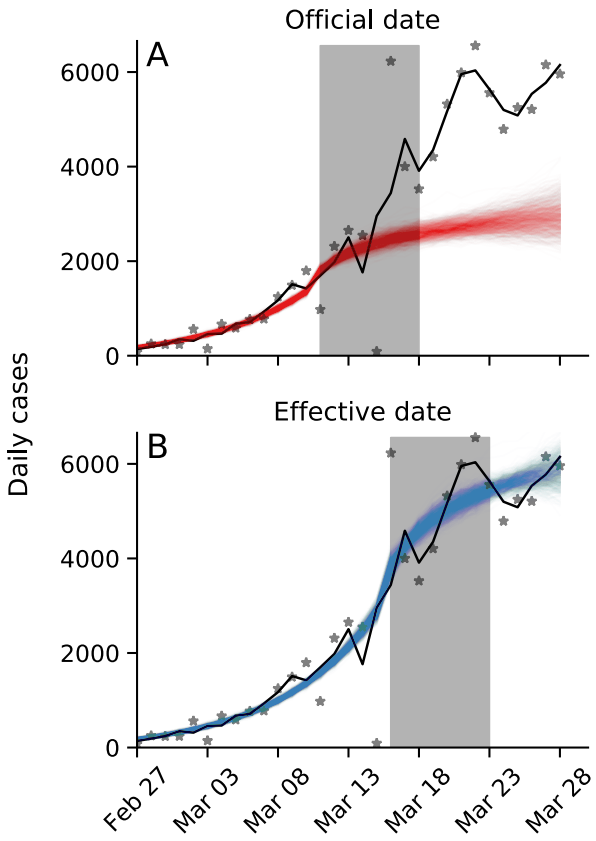

Figure 5: Late effective start of NPIs leads to under-estimation of daily confirmed cases. Real number of daily cases in Italy in black (markers: data; line: time moving average). Model posterior predictions are shown as coloured lines (1,000 draws from the posterior distribution). Shaded box illustrates a generation interval of seven days. **(A)** Using the official date τ^* for the effective start of the NPI, the model under-estimates the number of cases seven days after the start of the NPI. **(B)** Using the estimated date $\hat{\tau}$ for the effective start of the NPI, the model precisely estimates the number of cases seven days after the start of the NPI. Here, model parameters are best estimates for Italy (Table 2).

Country	First	Last
Austria	Mar 10 2020	Mar 16 2020
Belgium	Mar 12 2020	Mar 18 2020
Denmark	Mar 12 2020	Mar 18 2020
France	Mar 13 2020	Mar 17 2020
Germany	Mar 12 2020	Mar 22 2020
Italy	Mar 5 2020	Mar 11 2020
Norway	Mar 12 2020	Mar 24 2020
Spain	Mar 9 2020	Mar 14 2020
Sweden	Mar 12 2020	Mar 18 2020
Switzerland	Mar 13 2020	Mar 20 2020
United Kingdom	Mar 16 2020	Mar 24 2020
Wuhan	Jan 23 2020	Jan 23 2020

Table 1: Official start of non-pharmaceutical interventions. The date of the first intervention is for a ban of public events, or encouragement of social distancing, or for school closures. In all countries except Sweden, the date of the last intervention is for a lockdown. In Sweden, where a lockdown was not ordered during the studied dates, the last date is for school closures. Dates for European countries from Flaxman et al.[8], date for Wuhan, China from Pei and Shaman[16]. See Figure S1 for a visual presentation.

Country	τ^*	τ	$CI_{75\%}$	$CI_{95\%}$	Z	D	μ	β	α_1	λ	α_2	$E(0)$	$I_u(0)$	Δt
Austria	Mar 16	Mar 21	2.5658	3.8148	3.9102	3.6649	0.6407	1.1417	0.1308	0.1387	0.2261	151.1078	131.6623	2.1308
Belgium	Mar 18	Mar 27	2.3456	6.2773	3.9098	3.6152	0.4877	1.0762	0.2721	0.4388	0.2363	309.9114	426.9644	2.1756
Denmark	Mar 18	Mar 11	5.0053	15.3374	4.0957	3.5091	0.4161	1.0747	0.1470	0.6919	0.1867	324.6332	389.5076	2.2071
France	Mar 17	Mar 24	0.5068	2.2928	4.2159	3.1688	0.4863	1.0502	0.3726	0.3765	0.4168	422.6720	1362.5052	1.6717
Germany	Mar 22	Mar 19	0.7657	1.0508	3.3917	3.7166	0.6780	1.1515	0.1753	0.2664	0.4147	529.9397	387.1038	2.1516
Italy	Mar 11	Mar 17	2.1045	2.9945	4.1439	2.5550	0.5371	0.9932	0.5816	0.3860	0.4973	990.1942	1902.7806	1.6367
Norway	Mar 24	Mar 22	4.2700	10.7889	4.0476	3.1061	0.3885	1.0467	0.1536	0.3091	0.2320	478.0678	856.7700	1.9998
Spain	Mar 14	Mar 25	0.8415	2.9656	4.1392	3.3352	0.5974	1.1574	0.3640	0.2551	0.3050	310.0470	957.8280	1.6062
Sweden	Mar 18	Mar 09	4.9930	11.7493	4.0328	3.3962	0.3656	1.0457	0.1427	0.7237	0.3093	394.0202	543.5448	2.3755
Switzerland	Mar 20	Mar 19	1.4513	2.5140	3.9764	3.4425	0.6360	1.1543	0.1283	0.2481	0.2246	336.3842	328.7800	1.9891
United Kingdom	Mar 24	Mar 26	1.4721	2.5543	3.9654	3.6333	0.6414	1.1168	0.1212	0.4504	0.1737	422.8841	486.0467	2.0540
Wuhan, China	Jan 23	Feb 03	1.7984	2.8493	3.7326	3.6320	0.6057	1.1453	0.2754	0.1784	0.3511	597.8676	561.1586	2.4248

Table 2: Parameter estimates for different regions. See Eq. 1 for model parameters. All estimates are posterior medians. 75% and 95% credible intervals given for τ, in days. τ^* is the official last NPI date, see Table 1.