

Daily report

11-01-2021

Analysis and prediction of COVID-19 for EU-EFTA-UK and other countries

Situation report 177

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With the financial support of



and



Foreword

The present report aims to provide a comprehensive picture of the **pandemic situation of COVID-19** in the EU countries, and to be able to foresee the situation in the next coming days. We provide some figures and tables with several **indexes and indicators** as well as an **Analysis** section that discusses a specific topic related with the pandemic.

As for the predictions, we employ an **empirical model**, verified with the evolution of the number of confirmed cases in previous countries where the epidemic is close to conclude, including all provinces of China. The model does not pretend to interpret the causes of the evolution of the cases but to permit the **evaluation of the quality of control measures made in each state** and a **short-term prediction of trends**. Note, however, that the effects of the measures' control that start on a given day are not observed until approximately 7-14 days later.

We show an individual report with 8 graphs and a summary table with the main indicators for different countries and regions. We are adjusting the model to **countries and regions** with at least 4 days with more than 100 confirmed cases and a current load over 200 cases.

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These reports are funded by the European Commission (DG CONNECT, LC-01485746)

PJC and MC received funding from "la Caixa" Foundation (ID 100010434), under agreement LCF/PR/GN17/50300003; CP, DL, SA, MC, received funding from Ministerio de Ciencia, Innovación y Universidades and FEDER, with the project PGC2018-095456-B-I00;

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Situation and highlights

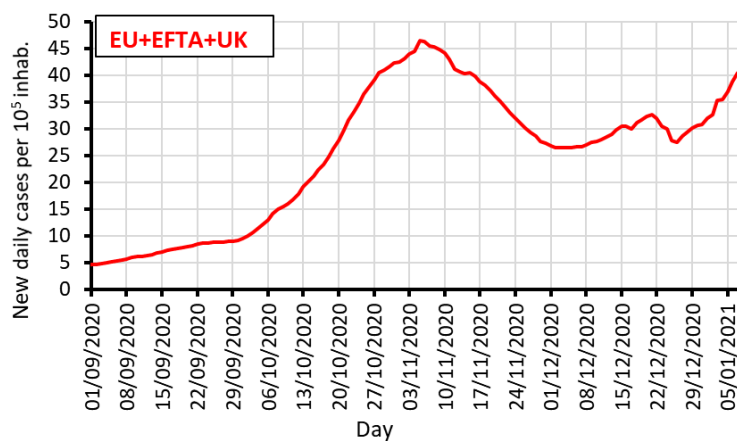
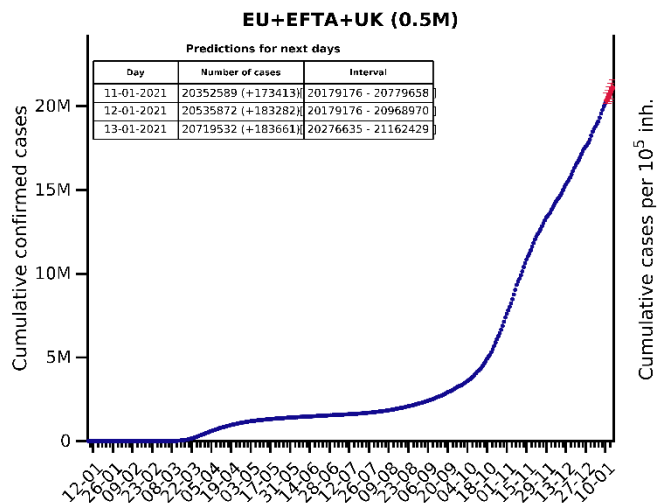
Global situation

The number of new daily cases is a good indicator to identify complex situations, it reacts faster to epidemic growth than incidences A_{14} . Observing the evolution of this indicator in the set of EU+EFTA+UK countries we observe with concern how since December 26 its value is increasing very rapidly. It is still more worrying that this growth starts from a quite high value.

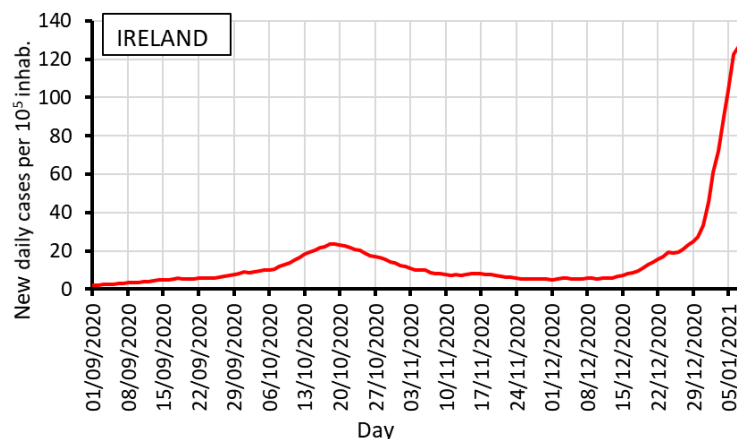
It should be noted that the graph on the right reflects the average behavior of about 528 million people, so it is a very solid reflection of what is happening. The causes of this increase can be multiple. On the one hand, its origin may trace back to a high level of social relations during Christmas holidays. On the other hand, the arrival of cold weather and also the expansion of virus variants with higher and more efficient transmission can be also behind these increases.

New daily cases per 10^5 inhab.

Ireland	127
Czech Republic	121
Slovenia	98
United Kingdom	88
Sweden	74
Portugal	73
Lithuania	68
Liechtenstein	59
Slovakia	54
Latvia	53
Estonia	47
Malta	45
Netherlands	43
Cyprus	42
Switzerland	42
EU+EFTA+UK	40
Spain	40
Denmark	31
Italy	28
France	27
Poland	25
Croatia	24
Germany	24
Austria	24
Romania	24
Luxembourg	24
Hungary	21
Belgium	17
Norway	15
Bulgaria	11
Greece	7
Iceland	5
Finland	5



We must set these possibilities in the context of what they tell us about Ireland, which has been an excellent example of pandemic control over the autumn. Ireland is currently the country where growth is fastest. New variant and relaxation can be both playing a role. If this is the case, it is likely that this new variant will be extended to other countries, so control and surveillance measures need to be stepped up. If the new variant is more contagious, the only way to deal with it is to further reduce contacts between people and increase detection and quarantines.



It is therefore necessary to start with the communication of these ideas to the public. Different countries can be in a similar situation than Ireland in a matter of weeks or a few months. Right now, we need to be aware of what is happening in Denmark, where the presence of the variant was already detected in the first weeks of December, and currently the epidemiological situation is improving. Tracking the evolution of Denmark is now absolutely key to guide us in the short-term evolution of the epidemics in Europe.

In the table we can see the number of new daily cases from each of the EU+EFTA+UK countries. Above 40, we find countries with an A_{14} greater than 500. Above 80, A_{14} above 1000. The time until the effect of vaccines can be observed might feel like an eternity.

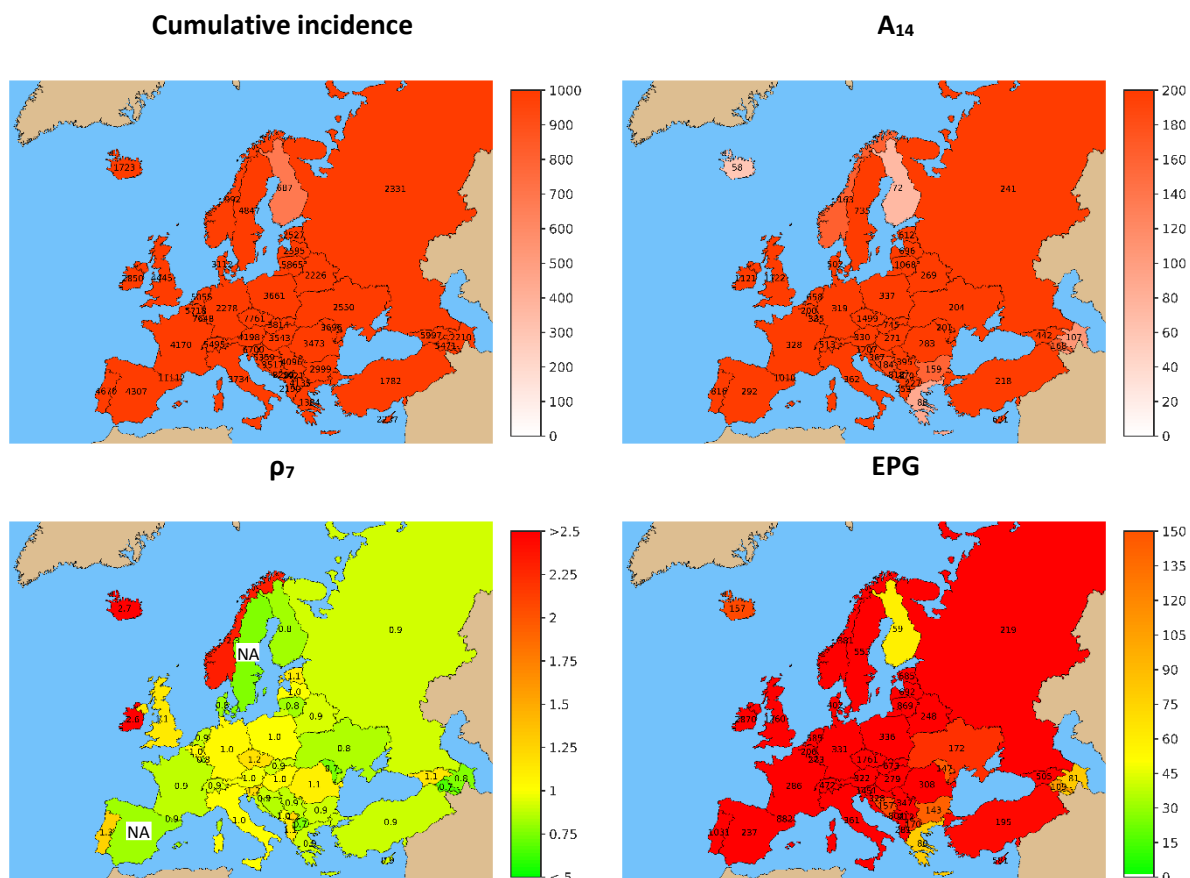
Highlights

- The situation of Ireland is extremely worrying, with an EPG close to 3,000. This is the result of a high incidence (A_{14} of 1,120 cases per 10^5 inh.) and a huge empiric reproduction rate (ρ_t close to 3).
- Czech Republic (1760), United Kingdom (1260) and Slovenia (1451) are situated at extremely high risk ($EPG > 1000$). Only Greece, Finland and Iceland remain at the safe zone, with an EPG below 100.

Situation and trends per country

Maps of current situation in EU countries. Colour scale is indicated in each legend.

- Cumulative incidence: total number of reported cases per 100,000 inhabitants
- A_{14} : Cumulative incidence last 14 days per 100,000 inhabitants (active cases)
- ρ_7 : Empiric reproduction number
- EPG: Effective Potential Growth ($EPG = A_{14} \cdot \rho_7$)



Tables of current situation in EU countries. Colour scale is indicated in each legend.

Incidence, mortality and epidemiological indexes.

Country	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Czech Republic	1,499.4	160,566	7,761.4	831,165	122.5	13,115	1.17	1,761	9
Slovenia	1,206.8	25,089	6,699.6	139,281	151.4	3,147	1.20	1,451	9
United Kingdom	1,121.6	761,404	4,444.8	3,017,413	119.1	80,868	1.12	1,260	9
Ireland	1,120.6	55,333	2,850.0	140,727	47.3	2,336	2.56	2,870	9
Lithuania	1,068.0	29,074	5,865.4	159,672	80.7	2,197	0.81	869	9
Liechtenstein	999.0	381	6,238.0	2,379	99.6	38	0.72	723	9
Portugal	815.9	83,191	4,670.0	476,187	75.5	7,701	1.26	1,031	9
Slovakia	745.2	40,686	3,813.6	208,209	53.4	2,918	0.90	673	9
Sweden	735.1	74,237	4,846.6	489,471	93.4	9,433	NA	NA	9
Latvia	696.3	13,133	2,595.3	48,952	43.4	818	0.99	692	9
Netherlands	657.8	112,714	5,055.4	866,235	71.8	12,307	0.89	585	9
Cyprus	631.1	7,620	2,237.2	27,011	12.2	147	0.92	581	9
Estonia	612.4	8,124	2,526.6	33,516	21.3	283	1.12	685	9
Switzerland	513.1	44,408	5,495.4	475,604	87.2	7,545	0.92	472	9
Denmark	501.9	29,073	3,111.8	180,240	26.6	1,542	0.80	402	9
Malta	488.1	2,155	3,260.4	14,396	52.8	233	1.48	721	9
Croatia	366.9	15,063	5,358.8	219,993	106.4	4,368	0.90	328	9
Italy	362.4	219,107	3,734.4	2,257,866	129.7	78,394	1.00	361	9
Poland	337.5	127,723	3,660.9	1,385,522	82.4	31,189	1.00	336	9
Luxembourg	335.5	2,100	7,648.2	47,876	84.7	530	0.81	273	9
Austria	330.3	29,751	4,198.2	378,110	73.4	6,614	0.98	322	9
France	328.1	214,160	4,169.7	2,721,692	103.0	67,217	0.87	286	9
Germany	319.5	267,669	2,277.9	1,908,527	48.2	40,343	1.04	331	9
Spain	291.8	137,202	4,307.3	2,025,560	109.9	51,690	NA	NA	9
Romania	283.0	54,442	3,473.4	668,202	86.2	16,592	1.09	308	9
Hungary	271.0	26,177	3,542.7	342,237	110.2	10,648	1.03	279	9
Belgium	199.5	23,123	5,718.0	662,694	172.9	20,038	1.03	206	9
Norway	163.4	8,860	992.2	53,792	8.7	471	2.33	381	9
Bulgaria	158.6	11,022	2,999.3	208,406	116.5	8,097	0.90	143	8
Greece	88.1	9,179	1,384.4	144,293	50.1	5,227	0.90	80	7
Finland	71.9	3,984	687.1	38,068	10.6	586	0.82	59	6
Iceland	57.7	197	1,723.1	5,880	8.5	29	2.72	157	7

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

Positivity indicators, comparing the increase among two last weeks (relative change).

Country	Cases (this week)			Tests (this week)			Positivity	
	Total	Incidence /10 ⁵ inh.	Relative change (%)	Total	Tests /10 ⁵ inh.	Relative change (%)	Value (%)	Relative change (%)
Germany	123679	149.0	-12.4	1057269	1273.5	-33.0	11.7	30.8
Italy	107750	178.5	14.0	777168	1287.6	-15.2	13.9	34.5
France	91615	136.7	7.6	1762110	2629.5	-41.8	5.2	85.0
Spain	79431	169.2	32.0	770094	1640.7	-9.5	10.3	45.9
Poland	61937	163.1	6.2	281988	742.6	17.2	22.0	-9.4
Netherlands	50699	293.4	-37.1	411094	2378.7	-17.4	12.3	-23.8
Sweden	41230	403.0	5.5	232114	2268.9	0.0	17.8	5.5
Portugal	30588	297.6	35.7	243899	2373.3	-3.4	12.5	40.5
Romania	22000	113.3	-18.9	87761	452.0	4.6	25.1	-22.5
Slovakia	20007	367.1	19.4	70194	1287.9	-5.4	28.5	26.2
Lithuania	15628	559.3	-12.6	69271	2479.1	-3.8	22.6	-9.2
Ireland	14993	305.7	103.9	154952	3159.6	50.3	9.7	35.7
Austria	13188	148.9	-13.0	127657	1441.0	-22.1	10.3	11.7
Denmark	12885	221.9	-39.8	538632	9277.0	-16.7	2.4	-27.7
Hungary	12182	124.7	5.6	85129	871.1	-11.6	14.3	19.4
Slovenia	10531	506.1	11.7	54169	2603.1	7.5	19.4	3.9
Belgium	8035	70.1	-32.6	180686	1577.3	-12.5	4.4	-22.9
Croatia	7712	189.2	-19.0	37287	914.7	-9.0	20.7	-10.9
Latvia	5659	294.7	-4.1	52364	2727.3	3.7	10.8	-7.5
Bulgaria	5335	76.2	-18.2	32509	464.4	20.5	16.4	-32.1
Cyprus	4317	492.9	119.2	62897	7180.9	20.1	6.9	82.6
Greece	4168	38.9	-14.2	149090	1390.2	0.4	2.8	-14.6
Estonia	3713	280.3	-7.5	29346	2215.1	-4.8	12.7	-2.8
Norway	3658	68.7	-14.6	119172	2236.6	-6.3	3.1	-8.9
Finland	1782	32.3	-9.8	68714	1245.3	-24.0	2.6	18.7
Luxembourg	1070	174.3	-40.0	39126	6373.4	-32.7	2.7	-10.8
Malta	656	132.9	-7.9	18197	3686.9	3.7	3.6	-11.2
Iceland	28	7.8	-66.7	9186	2573.2	-9.4	0.3	-63.2

Colour scale							
Worst	>150.0	>50%	Worst	0.0	-50%	>10%	>50%
Best	0.0	-50%	Best	>2000.0	>50%	0%	-50%

Table of current situation in some EU provinces. Colour scale is indicated in each legend.

Province	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
London	3,018.7	270,505	5,799.9	519,733	NA	NA	0.95	2,864	9
Lisbon	1,154.5	32,707	5,667.2	160,553	98.0	2,775	1.29	1,489	9
North Holland	569.8	16,255	5,224.3	149,049	63.1	1,800	0.85	484	9
Bern	480.3	4,971	4,499.2	46,567	73.5	761	0.89	426	9
Madrid	419.9	27,885	6,067.9	402,951	NA	NA	1.27	535	9
Lazio	377.3	22,182	3,077.3	180,915	71.0	4,176	1.02	384	9
Berlin	328.8	12,394	2,817.5	106,190	41.5	1,565	1.35	445	9
Wien	249.2	4,727	3,992.3	75,733	64.2	1,218	1.06	264	9
Brussels	242.0	2,923	6,909.9	83,471	217.1	2,622	1.47	356	9

Colour scale							
>150.0	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	0.0	0

⁽¹⁾ ρ_7 is evaluated from the 7-day rolling average in new cases. ⁽²⁾ EPG stands for Effective Growth Potential, which is the product of reported cumulative incidence of last 14 days per 10⁵ inhabitants by ρ_7 (empiric reproduction number). Biocom-Cov degree is an epidemiological situation scale based on the level of last week's mean daily new cases (<https://upcommons.upc.edu/handle/2117/189661>, <https://upcommons.upc.edu/handle/2117/189808>).

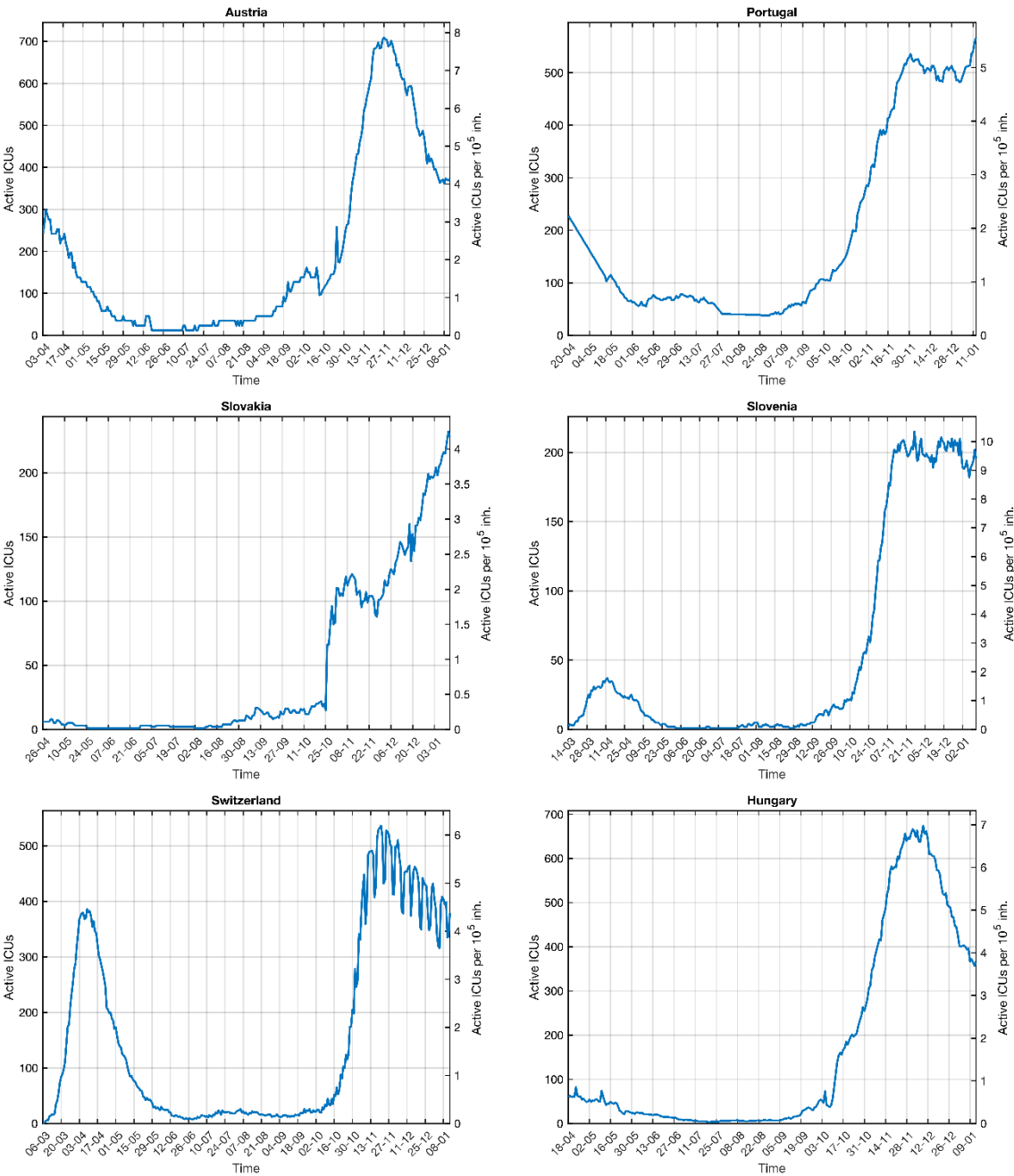
Situation of hospitalisations and ICUs in some EU countries. The analysis is done for those countries that report a historical series with current (active) number of patients in hospitals and ICUs¹. We provide:

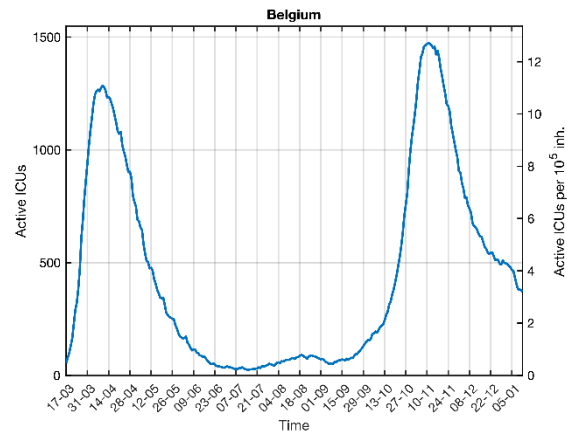
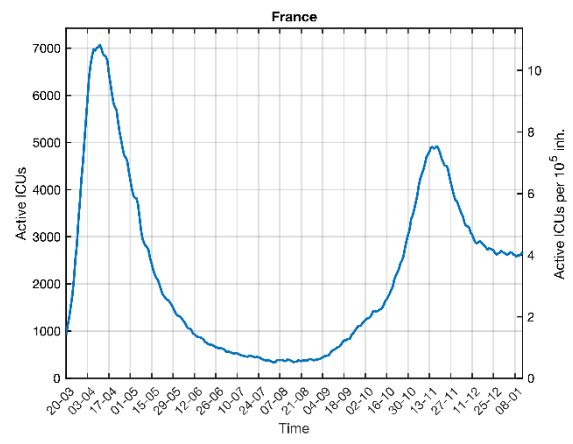
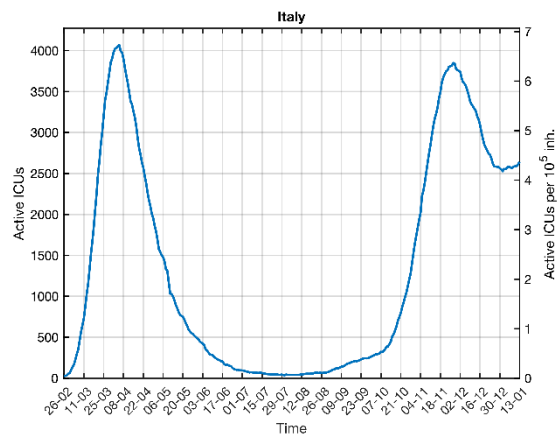
- Current active hospitalisations and patients in ICU per 100,000 inhabitants.
- Current absolute number of active hospitalisations and patients in ICU.
- Rate of occupation of curative care hospital beds by Covid-19 patients (data from Eurostat 2018²), only for hospitalisations.
- Current rate of occupation with regards to the maximum Covid-19 occupation reached in this pandemic.
- Weekly increase in Covid-19 patients in hospitals and ICUs.

¹ <https://github.com/ec-jrc/COVID-19>

² https://ec.europa.eu/eurostat/databrowser/view/hlth_rs_bds/default/table?lang=en

Evolution of of active ICUs in some EU countries.





Situation and trends in some European regions³

Table of current situation in the **Netherlands** by region. Colour scale is indicated in each legend.

Region	Reported data				Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Limburg	987.3	8,629	6,215.7	54,325	0.99	975	9
Overijssel	921.9	10,657	5,381.0	62,204	0.86	791	9
Gelderland	714.9	14,813	4,812.6	99,717	0.83	595	9
Flevoland	686.5	2,904	5,119.1	21,654	0.83	566	9
Drenthe	630.1	3,100	3,221.1	15,848	0.87	550	9
North Brabant	613.6	15,616	5,398.3	137,388	0.95	581	9
North Holland	569.8	16,255	5,224.3	149,049	0.85	484	9
Utrecht	567.9	7,423	5,545.1	72,475	0.84	475	9
South Holland	541.1	20,071	5,890.6	218,484	0.87	470	9
Zeeland	527.4	2,020	3,162.1	12,111	0.95	500	9
Groningen	523.5	3,052	3,012.0	17,560	0.94	493	9
Friesland	512.8	3,323	2,692.6	17,448	0.89	455	9

Colour scale					
>150.0	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	0.0	0

Table of current situation in **Switzerland** by region. Colour scale is indicated in each legend.

Region	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Ticino	811.6	2,865	7,189.2	25,378	240.8	850	0.76	614	9
Glarus	797.5	319	4,557.5	1,823	95.0	38	1.74	1,391	9
Schwyz	647.1	990	5,481.7	8,387	107.2	164	0.73	471	9
Appenzell Ausser rhoden	609.1	335	4,863.6	2,675	72.7	40	1.57	958	9
Lucerne	602.8	2,375	4,717.8	18,588	62.2	245	0.86	517	9
Zug	601.7	722	4,526.7	5,432	67.5	81	0.90	542	9
Jura	591.8	432	6,590.4	4,811	157.5	115	0.99	586	9
Zurich	569.1	8,758	4,907.3	75,523	65.4	1,006	0.87	495	9
St. Gallen	562.9	2,916	5,736.1	29,713	110.6	573	0.76	426	9
Nidwalden	562.8	242	3,758.1	1,616	30.2	13	0.94	531	9
Uri	552.8	199	4,250.0	1,530	88.9	32	1.09	602	9
Solothurn	546.8	1,367	4,662.0	11,655	91.2	228	1.16	636	9
Thurgau	526.8	1,454	4,727.9	13,049	89.9	248	0.91	480	9
Graubünden	501.0	992	4,477.8	8,866	75.3	149	0.82	411	9
Appenzell Innerrhoden	481.3	77	4,725.0	756	93.8	15	1.21	583	9
Bern	480.3	4,971	4,499.2	46,567	73.5	761	0.89	426	9
Neuchâtel	459.3	813	6,904.5	12,221	187.6	332	0.94	431	9
Obwalden	447.4	170	3,994.7	1,518	78.9	30	1.25	559	9
Aargau	445.7	3,022	4,513.0	30,598	73.6	499	0.49	220	9
Basel City	442.7	819	4,713.5	8,720	88.1	163	1.00	441	9
Basel Country	426.7	1,199	4,164.1	11,701	66.5	187	0.84	359	9
Vaud	419.5	3,352	7,427.8	59,348	103.4	826	0.94	395	9
Valais	413.5	1,435	7,723.1	26,799	177.8	617	0.56	232	9
Schaffhausen	379.7	281	4,317.6	3,195	74.3	55	1.37	518	9
Geneva	307.6	1,538	8,403.8	42,019	131.6	658	0.99	304	9
Fribourg	48.8	1,104	1,067.0	24,156	18.4	417	1.06	51	6

Colour scale					
>150.0	Worst	Worst	Worst	Worst	Worst
0.0	Best	Best	Best	Best	Best

³ <https://github.com/ec-jrc/COVID-19/tree/master/data-by-region>

Table of current situation in **Germany** by region. Colour scale is indicated in each legend.

Region	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Sachsen	771.3	31,438	3,818.1	155,627	101.3	4,130	0.90	693	9
Thüringen	585.0	12,502	2,414.9	51,606	63.4	1,354	0.97	570	9
Brandenburg	517.6	13,043	1,991.3	50,180	51.0	1,286	1.01	524	9
Sachsen-Anhalt	446.6	9,862	1,689.3	37,300	39.4	870	0.92	410	9
Bayern	336.0	43,950	2,728.8	356,922	60.5	7,913	0.92	311	9
Berlin	328.8	12,394	2,817.5	106,190	41.5	1,565	1.35	445	9
Hessen	303.0	18,986	2,406.5	150,790	56.1	3,513	0.88	266	9
Baden-Württemberg	284.2	31,458	2,362.1	261,487	50.4	5,575	0.88	251	9
Hamburg	282.0	5,356	2,142.5	40,687	43.2	820	0.99	279	9
Rheinland-Pfalz	275.4	11,252	1,969.4	80,449	43.6	1,780	1.04	286	9
Nordrhein-Westfalen	273.4	49,019	2,395.5	429,506	44.5	7,978	1.08	294	9
Saarland	260.4	2,578	2,212.1	21,900	54.8	543	1.49	388	9
Mecklenburg-Vorpommern	229.9	3,702	916.6	14,757	15.0	242	1.24	284	9
Niedersachsen	217.9	17,390	1,511.3	120,634	29.3	2,340	0.98	214	9
Schleswig-Holstein	176.5	5,100	990.4	28,624	19.2	554	1.09	193	9
Bremen	170.3	1,160	2,109.4	14,365	32.7	223	0.90	153	8

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

Situation and trends in other countries

Country	Reported data						Indexes		
	14-day attack rate /10 ⁵ inh.	Active cases (last 14 days)	Attack rate /10 ⁵ inh.	Cumulative cases	Mortality /10 ⁵ inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG ⁽²⁾	Biocom-Cov degree
Israel	978.4	84,687	5,560.7	481,306	42.0	3,631	1.20	1,173	9
United States of America	940.2	3,112,197	6,574.3	21,761,186	110.5	365,886	1.15	1,080	9
Colombia	355.4	180,861	3,450.2	1,755,568	89.3	45,431	1.13	400	9
Canada	285.3	107,675	1,707.2	644,348	44.3	16,707	1.06	303	9
Argentina	285.0	128,798	3,768.8	1,703,352	98.0	44,273	1.07	306	9
Belarus	269.3	25,446	2,226.3	210,368	15.9	1,507	0.92	248	9
Brazil	265.9	565,148	3,770.1	8,013,708	94.8	201,460	0.93	248	9
Russia	241.0	351,706	2,331.2	3,401,954	42.4	61,837	0.91	219	9
Turkey	217.9	183,745	1,781.8	1,502,780	26.8	22,631	0.90	195	9
Chile	205.8	39,348	3,336.1	637,742	89.1	17,037	1.10	226	9
Ukraine	203.6	89,037	2,549.6	1,115,026	45.2	19,767	0.84	172	8
Mexico	105.2	135,688	1,169.5	1,507,931	102.4	132,069	0.94	99	7
Iran	101.8	85,475	1,524.5	1,280,438	66.8	56,100	1.00	101	7
Qatar	96.1	2,769	5,056.2	145,672	8.5	246	1.03	99	7
Peru	72.6	23,925	3,122.3	1,029,471	115.7	38,145	0.96	70	7
Ecuador	62.8	11,075	1,248.9	220,349	80.4	14,177	1.01	63	6
Indonesia	40.8	111,549	299.2	818,386	8.8	23,947	1.08	44	6
Iraq	28.7	11,552	1,497.5	602,331	32.0	12,881	0.86	25	4
India	19.0	262,434	757.3	10,450,284	10.9	150,999	0.88	17	4
Philippines	15.3	16,792	443.3	485,797	8.6	9,398	0.99	15	3
Pakistan	13.6	30,035	226.1	499,517	4.8	10,598	0.99	13	3
Saudi Arabia	4.7	1,626	1,044.7	363,692	18.1	6,286	0.83	4	2

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

⁽¹⁾ ρ_7 is evaluated with the 7-day rolling average in new cases. ⁽²⁾ EPG stands for Effective Growth Potential, which is the product of reported cumulative incidence of last 14 days per 10⁵ inhabitants by ρ_7 (empiric reproduction number). Biocom-Cov degree is an epidemiological situation scale based on the level of last week's mean daily new cases (<https://upcommons.upc.edu/handle/2117/189661>, <https://upcommons.upc.edu/handle/2117/189808>).

Analysis: On the study of spatially distributed SIR models (IV). Intermediate social distance and formation of bubbles.

In the previous reports¹, we have discussed the generation of a simple model of epidemic propagation with global and localized social interactions. We have shown that making averages of the stochastic evolution is important to determine properly the key time scales. We also indicated that a social-distance grid can be a good representation of social connections/interactions.

In the last reports, we focused on two different types of social connections. The first one was a global interaction social system where everybody can get in touch or interact with any other. This is a false description of reality. However, it helped to describe our model together with its visualization. We had a limited situation that can be clearly associated with very strong multi-level interactions.

More important was our focus on partially formed bubble interaction. This is, we analysed the evolution in a system where every single member of society forms a perfect bubble with other 3 people but where these bubbles interact with each other. This is a system with **no perfect isolated bubble but with properly formed bubbles with continuous interactions**. In this framework, a person interacts with its four-person bubble, but other members of the surrounding interact with other people, but each one in a bubble. We think this is a **reasonable description of a society where strong confinement measures are taken but compulsory confinement at home is not required**.

We described how propagation in this situation is extremely difficult. Lower values of R_0 make propagation impossible but even for large R_0 the **propagation soon goes down to R_t around 1** as the epidemics can only advance as a front. In this framework, it is clear that **strong confinement measures that allow for some social interaction like food shopping, sport, short-visits should work to contain the epidemics**.

We focus, in this and subsequent reports, on **what happens in a more realistic scenario where there are social-distance measures but not very strict measures**. This is, people roughly follow a bubble, preventing interactions with people that are not known but do have a probability to interact in certain settings. In other words, we ask ourselves **what the behaviour of the epidemics is depending on how many interactions people have with people away from the inner circle but not with people very far away from it**. In the limit when interactions can be produced far away from short-distance contacts, we must recover the limit we discussed in the previous assessment.

Let us insist on **why we think this analysis is so important**. First, public health measures in all countries always address first the possibility of large infection chains in public spaces where a person that you do not know can infect you. We are talking about large gatherings in discos, parties, restaurants, stadiums... The second useful measure is to prevent gatherings of more than 10 people anywhere. This reduces a lot the long-range interactions of people. Second, these measures are very common right now in multiple European states. Finally, we propose to analyse precisely this situation where punctual long-distance interactions are not possible. With these restrictions, people can interact with a very close-group (family) or with a larger group of family and friends or with a larger one family/friends/work with different levels of connectivity with those that, in principle, close to you in terms of social distance.

We propose to model this kind of interaction structure with two different approaches. One, where all individuals behave roughly the same, and another where each individual behaves differently. We address in

¹ <https://upcommons.upc.edu/handle/2117/334981> , <https://upcommons.upc.edu/handle/2117/334961> , <https://upcommons.upc.edu/handle/2117/335074>

this assessment the situation where everyone behaves similarly with a given range of interaction set up by the measures.

Intermediate-range interactions

As we have explained, we discussed the cases of global interactions where everybody interacts with everybody with the same probability of infection, this corresponds to the global case shown in the last panel of Figure 1. There, the probability is small since the interactions are with a lot of individuals. On the other extreme are the diffusion interactions discussed in the previous report and shown in the first panel of Figure 1. The probability of infection is large, however, restricted only to the closest neighbours corresponding to the individuals with the higher social interactions.

Both limits are theoretically interesting but they are typically far away from the reality of an epidemic. To parametrize how different measures relax bubble confinement and set us away from both limit conditions, we define a Gaussian interaction among individuals which is regulated by the parameter σ which determines the thickness of the peak in Figure 1, see the expression of a Gaussian function:

$$P(x) = \frac{1}{2\pi\sigma} e^{-\frac{|x-x_0|^2}{2\sigma^2}}$$

The larger the parameter σ , which determines the range of the social interactions, the smaller the probability of infection with the other individuals. This relation must be introduced in order to keep constant the total probability of infection. Such reduction can be generally justified because the time employed with each contact has to be smaller if there are a lot of contacts and therefore the probability of a particular infection decreases.

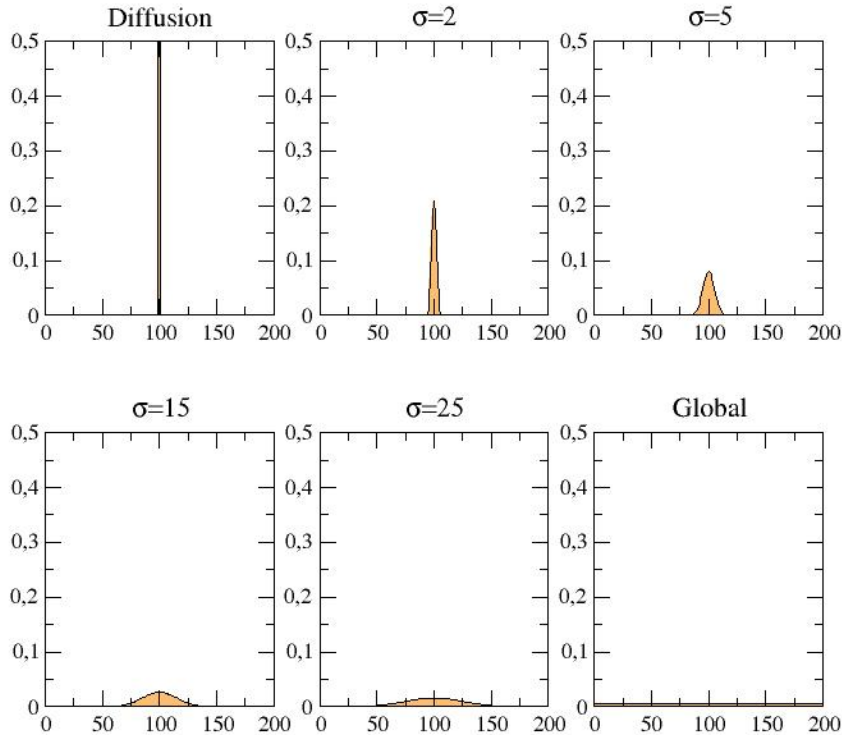


Figure 1: Probability of infection from an individual situated in the centre of a one-dimensional grid to the rest of individuals. Left panel corresponds to the diffusion limit where only first neighbours may be infected. Gaussian probabilities for different values of the social interactions σ are shown in the next four panels. Global limit is shown in the last panel corresponding to a constant probability of contagion. We employ the same $R=1$ in all the panels.

Note that we are employing $R=1$ in all the panels in Figure 1. We can increase this probability of infection basically with the multiplication by R of the functions depicted in Figure 1. Furthermore, we note that one has also to renormalize the functions shown in Figure 1 to remove the self-interactions, which is small in the case of large social-distance interactions but large in the case of short-distance interactions, we have conveniently renormalized the functions to account for such artefact.

The probabilities shown in Figure 1 are one dimensional to keep the normalizations equal to one also in the figure. Note that we are going to use two-dimensional simulations and consider a two-dimensional Gaussian function as it is shown in the previous equation. In figure 2 we show a **graphical explanation of the social distance**. Close to an individual are the relatives, and next to the friends or job colleagues, next, maybe neighbours which the individual meets occasionally. Each of such individuals has a different and growing social distance from the index individual.

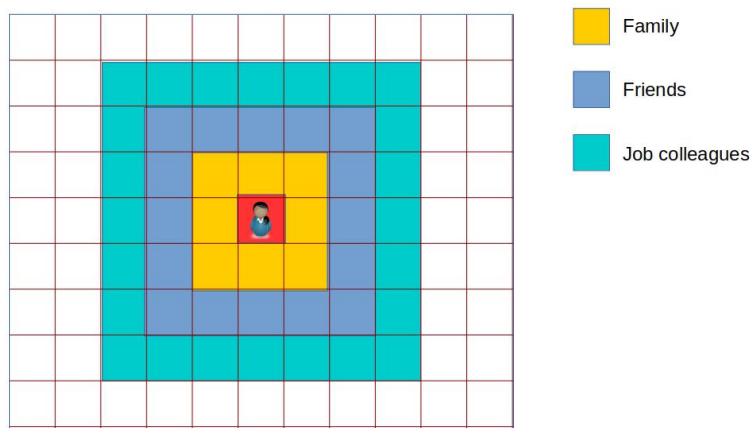


Figure 2. Sketch of the organization of the social interactions in a two-dimensional grid.

Method of the simulations with social interactions

It is important to explain now what is the structure of contacts and infections in our model. We begin with almost 100,000 susceptible individuals and with a small number of infected ones. There is a small probability of infection of each individual which is given by a probability of infection. For example, if $R_0 = 1.5$, then each infected individual can infect an average 1.5 individuals from the initial 100,000. However, the probability of contagion depends on the social proximity between the two individuals.

For each temporal step, we locate each of the infected individuals. For each infected one, we go through the whole grid and calculate the probability of infection (bigger if they are close in the social plane) for all the rest of the individuals using the expression of the Gaussian function shown in the equation. For each couple, we choose a random number and compare it with the probability of infection to check if they may be infected. The new individual will be infected if it was not previously infected (recovered) or if it is already infected, see a sketch of the algorithm in Figure 3.

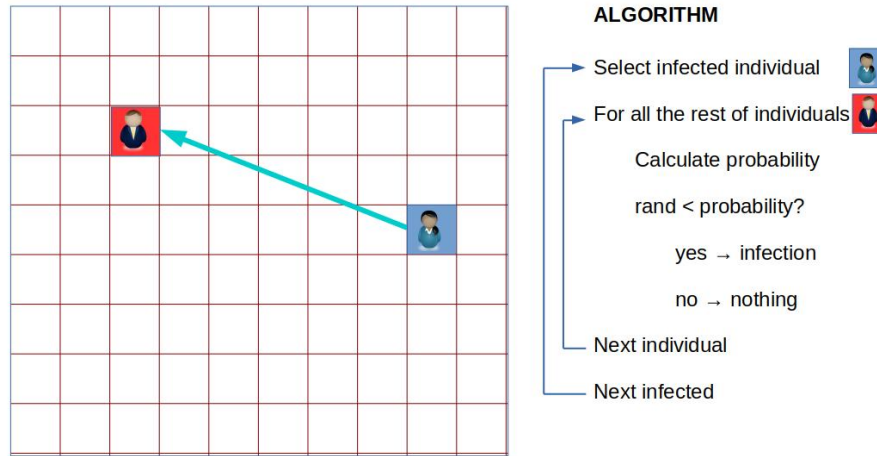


Figure 3. Sketch of the algorithm employed for each temporal step during the numerical simulation for the consideration of the social interactions in a two-dimensional grid.

Resulting dynamics with intermediate social interactions

We conclude this assessment by showing the **characteristic evolution (graphical) for different interaction ranges**. We include the Gaussian probability of infection in our simulator and show the evolution of the simple generic model discussed in the previous reports with such interactions. The obtained patterns are diverse and depend on the particular value of the length of the social interactions, given by the parameter σ . See different examples with three different values of the parameter σ in Figure 4.

- For small values of σ (smaller than 4), the patterns of the evolution are close to the observed behaviour in the diffusion limit and only interactions with socially close individuals happen and the epidemic propagates in a wave-like shape, as discussed in the previous report.
- For large values of the σ (larger than 10), the evolution of the epidemic after a shot transient is similar to a global probability of infections discussed in previous reports.
- For intermediate values of σ (larger than 4 and smaller than 10), the evolution is a mix of both previously discussed cases.

The differences of the three cases become evident in Figure 4. We will analyse in more detail these differences in the next assessment. We will show that the evolution of the cumulate cases resulting in the three simulations are qualitatively different although they share the same value of the parameter $R_0=1.5$. While for large σ corresponding a large number of contacts the number of cases increases rapidly and the herd immunity is achieved fast with an exponential explosion, the growth in the case of only close social interactions corresponding to small σ is much slower and it is good represented by linear growth.

In the next assessment, we will analyse in more detail these results and how they might change when different people have different behaviour.

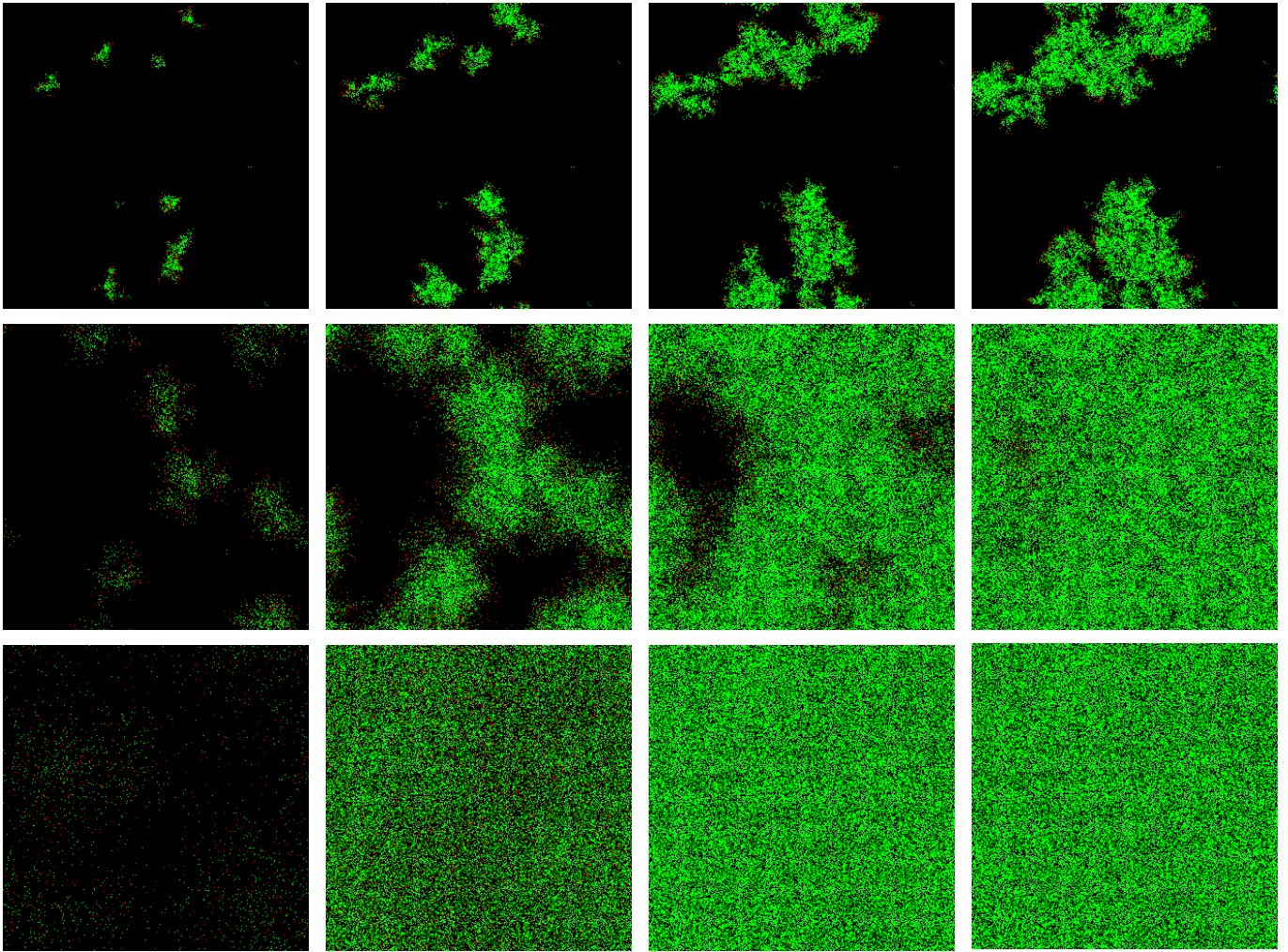
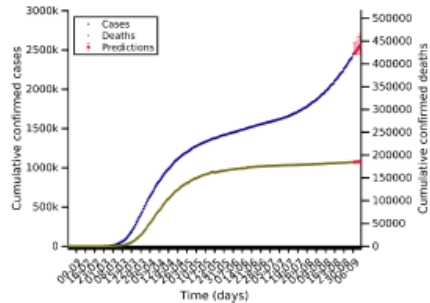


Figure 4: Four snapshots showing the evolution of three realizations of the stochastic equations of the SIR model with spatial Gaussian interaction for $N = 316 \times 316$ individuals distributed in a square grid with $R_0 = 1.5$ and different values of σ 2, 5 and 20. Red grid points and green grid points represent infected individuals and recovered individuals respectively. Snapshots correspond to time steps: 10, 20, 30 and 40.

Legend: Countries' reports details

Reported cumulative cases (blue) and deaths (brown), together with predictions (red)

EU+EFTA+UK 06-09-2020. Pop: 2632.4M. Cumulative incidence: 93/10⁵

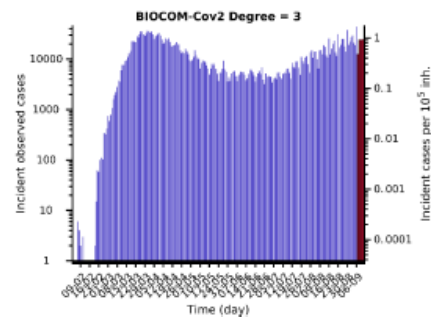
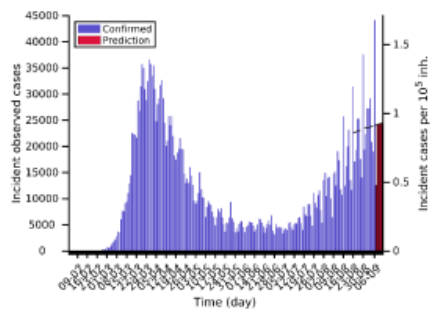


Predictions for next days		
Day	Number of cases	95% confidence interval
07-09-2020	2458958 (+125771)	[2440483 - 2584730]
09-09-2020	2508327 (+242708)	[2440483 - 2638990]
11-09-2020	2553358 (+244355)	[2440483 - 2702059]

Current indicators		
R_{eff}	SR	IFR
13	14	1.17%

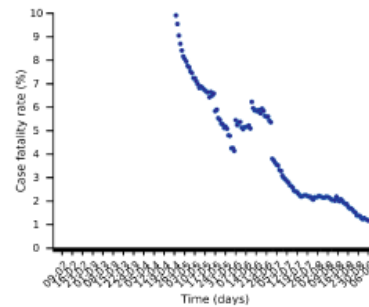
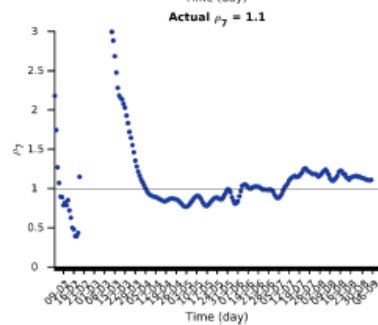
Predictions and indicators

Incident observed cases and predictions.



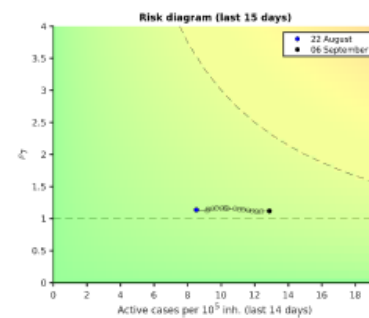
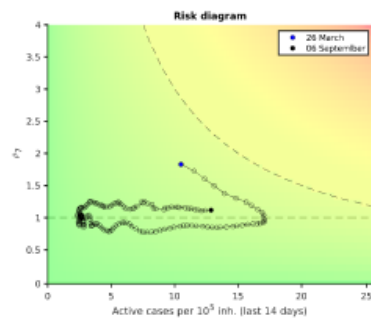
Incident observed cases in a logarithmic scale, with Biocom-Cov degree.

Evolution of empiric reproduction number R_T



Case fatality rate

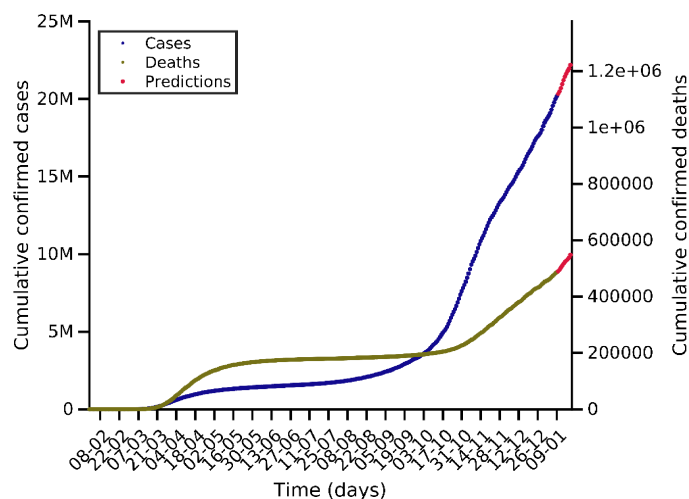
Risk diagram



Risk diagram of last 15 days

**(1) Analysis and prediction of COVID-19
for EU+EFTA+UK**

EU+EFTA+UK 09-01-2021. Pop: 527.9M. Cumulative incidence: 3823/10⁵

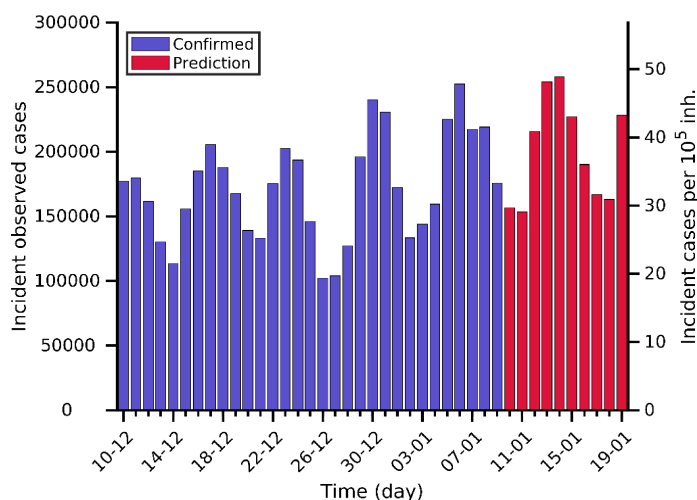


Predictions for next days

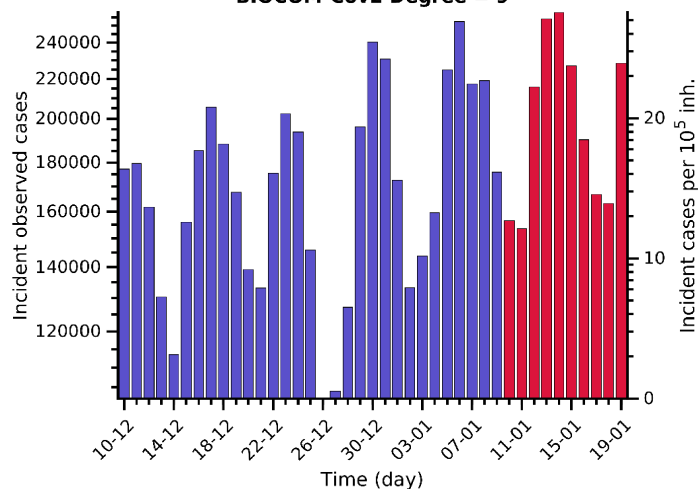
Day	Number of cases
12-01-2021	20705024 (+525848)
16-01-2021	21634360 (+1455184)
19-01-2021	22192507 (+2013331)

Current indicators

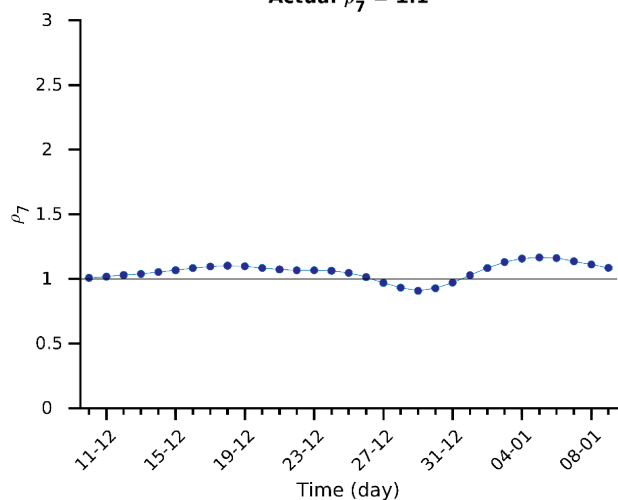
	A14	EPG	CFR	N7	D7
Today	492	534	2.53 %	198998	4159
A Week ago	435	471	2.44 %	171994	3675
Maximum	617	666	4.93 %	245448	4261



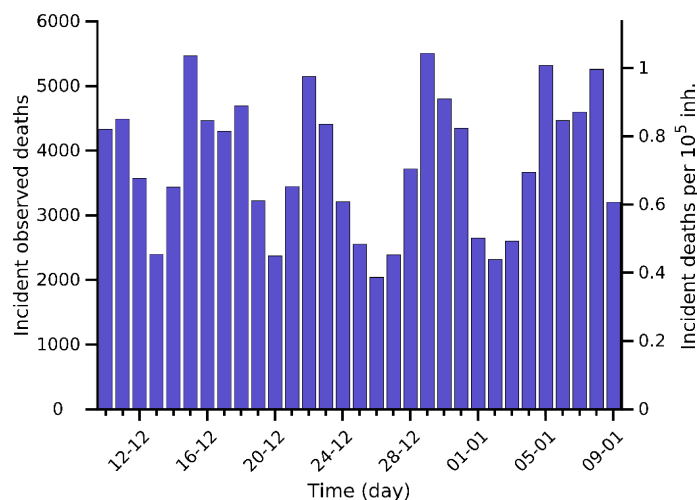
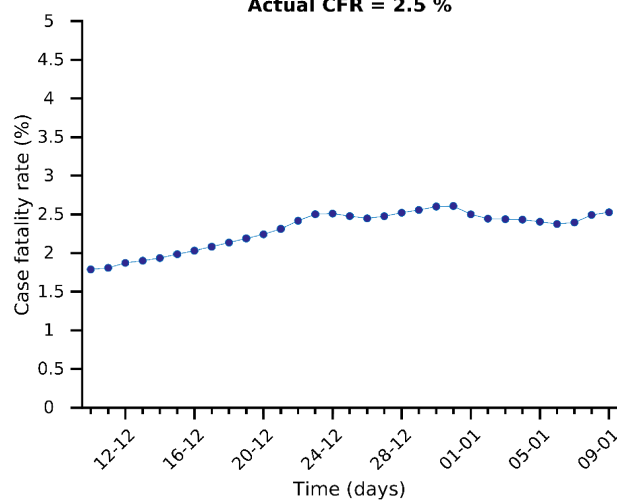
BIOCOM-Cov2 Degree = 9



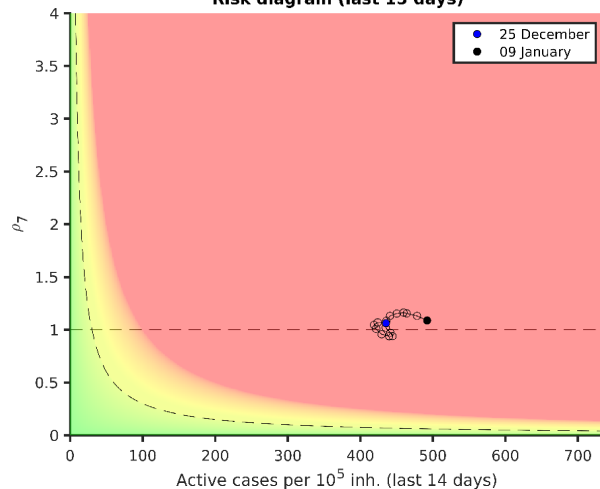
Actual $\rho_7 = 1.1$



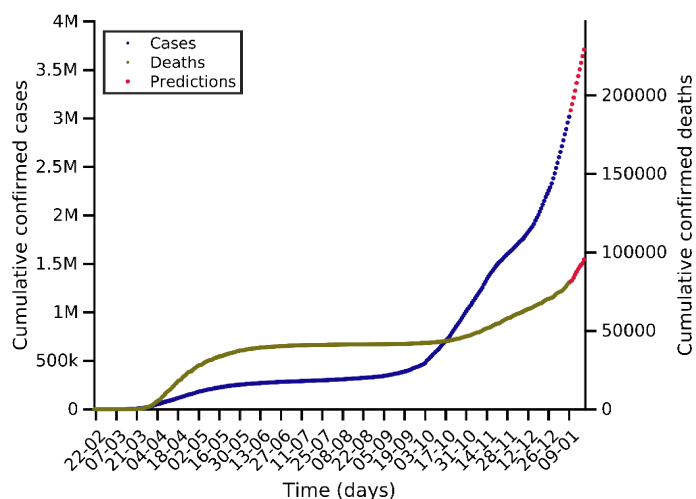
Actual CFR = 2.5 %



Risk diagram (last 15 days)



UK 09-01-2021. Pop: 67.9M. Cumulative incidence: 4445/10⁵

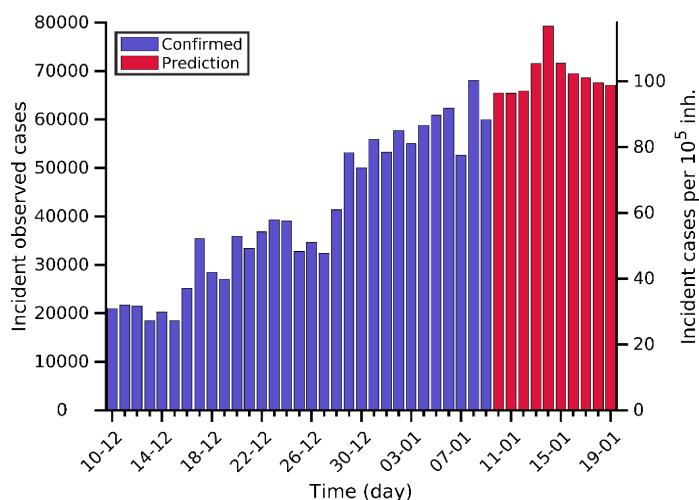


Predictions for next days

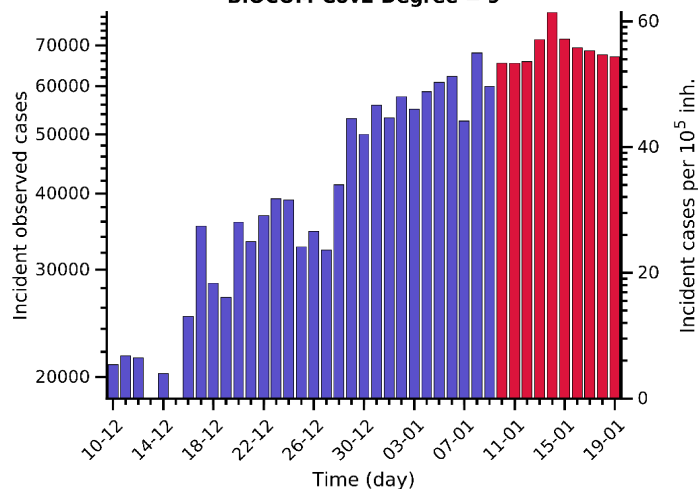
Day	Number of cases
12-01-2021	3214197 (+196784)
16-01-2021	3506188 (+488775)
19-01-2021	3709452 (+692039)

Current indicators

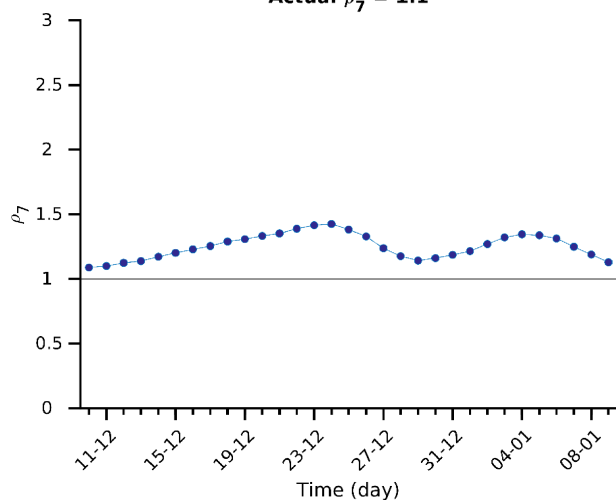
	A14	EPG	CFR	N7	D7
Today	1122	1266	3.51 %	59660	900
A Week ago	877	1114	3.32 %	49112	595
Maximum	1122	1329	4.92 %	59660	942



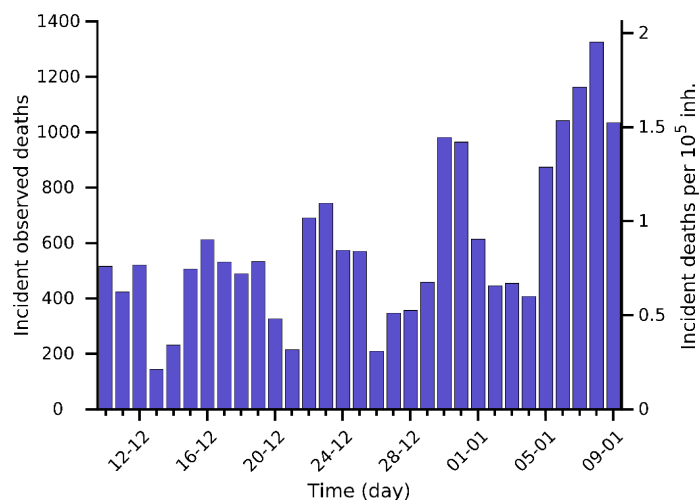
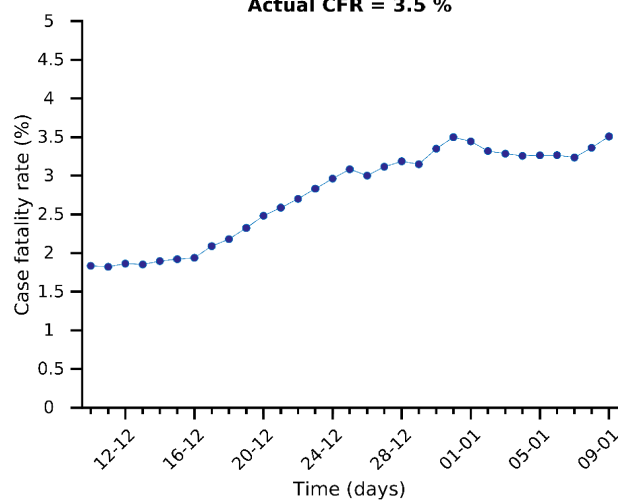
BIOCOM-Cov2 Degree = 9



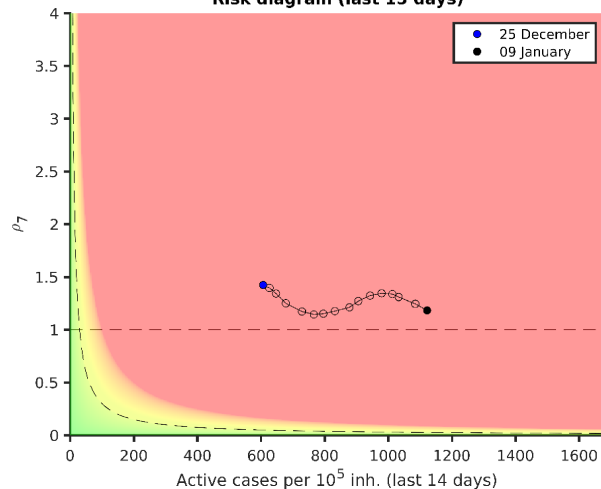
Actual $\rho_7 = 1.1$



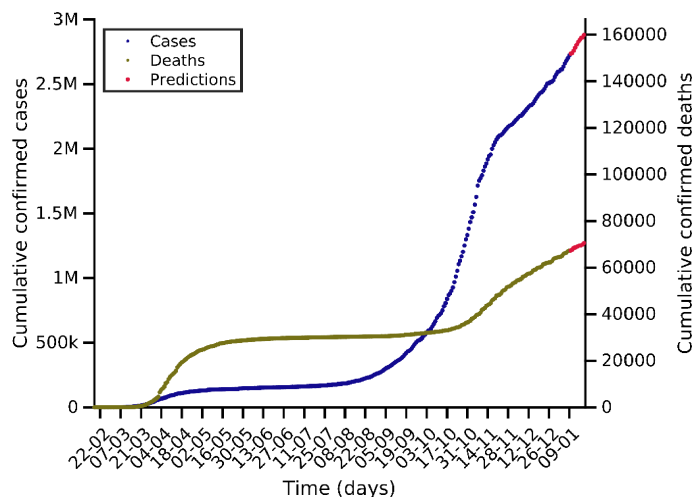
Actual CFR = 3.5 %



Risk diagram (last 15 days)



France 09-01-2021. Pop: 65.3M. Cumulative incidence: 4170/10⁵

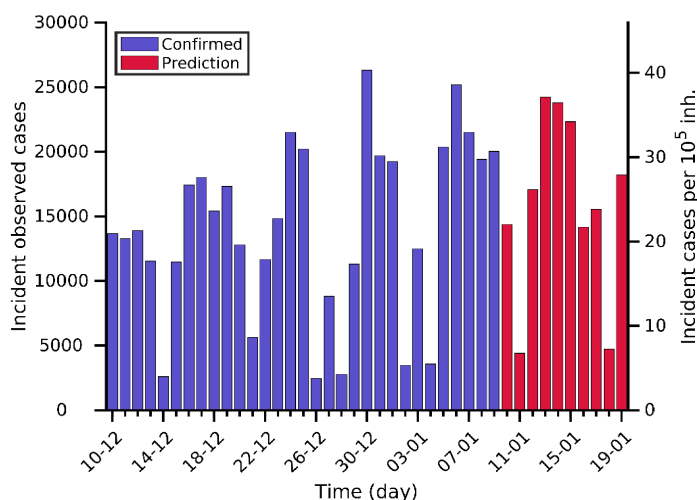


Predictions for next days

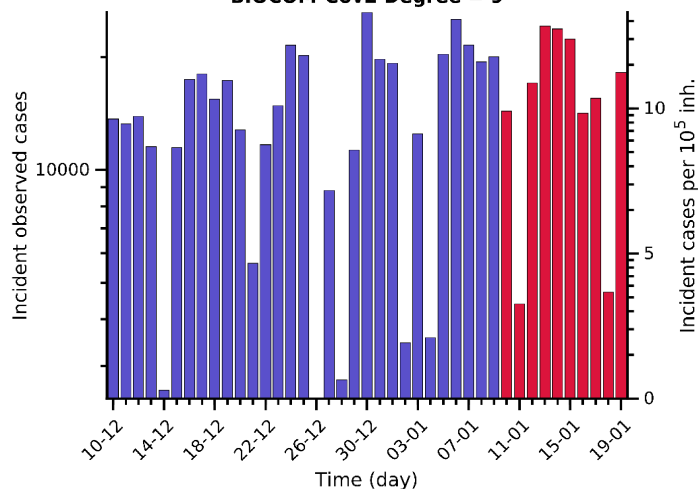
Day	Number of cases
12-01-2021	2757507 (+35815)
16-01-2021	2842025 (+120333)
19-01-2021	2880489 (+158797)

Current indicators

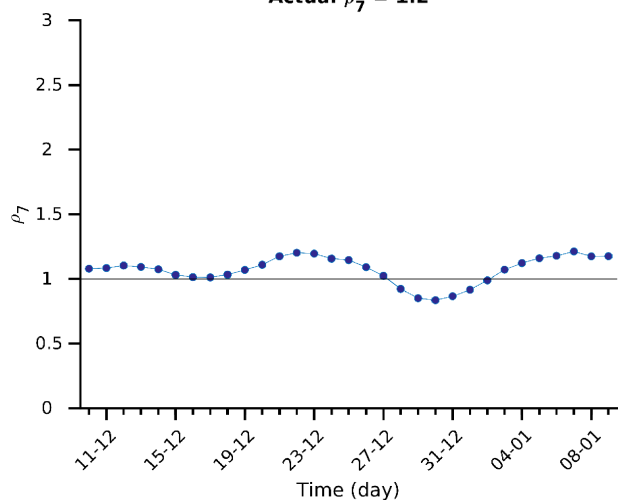
	A14	EPG	CFR	N7	D7
Today	328	386	2.84 %	17509	382
A Week ago	277	274	2.91 %	13085	335
Maximum	1009	1234	4.94 %	54650	1100



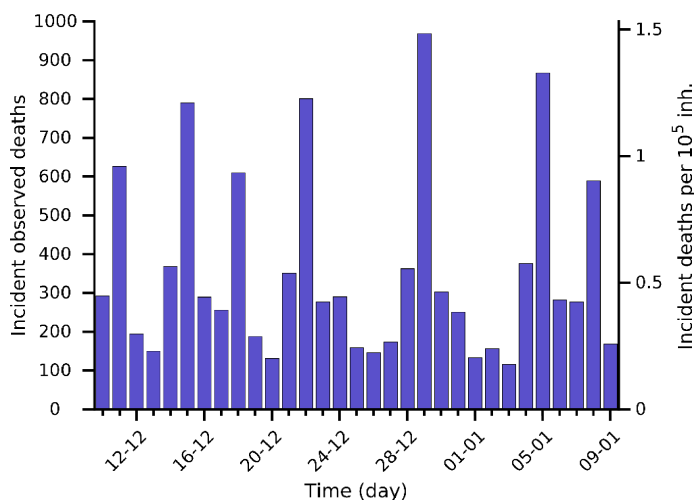
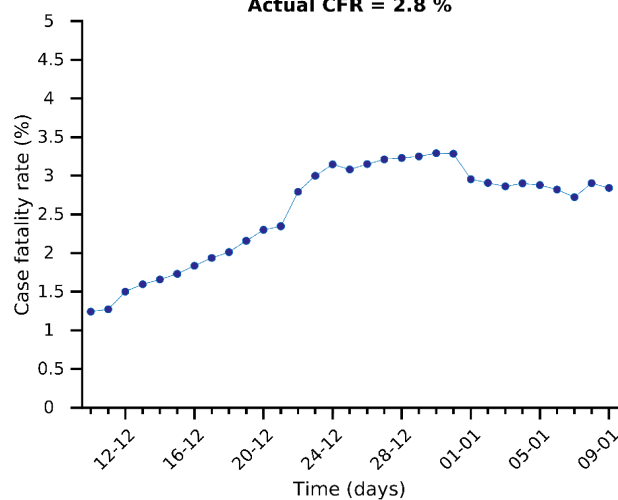
BIOCOM-Cov2 Degree = 9



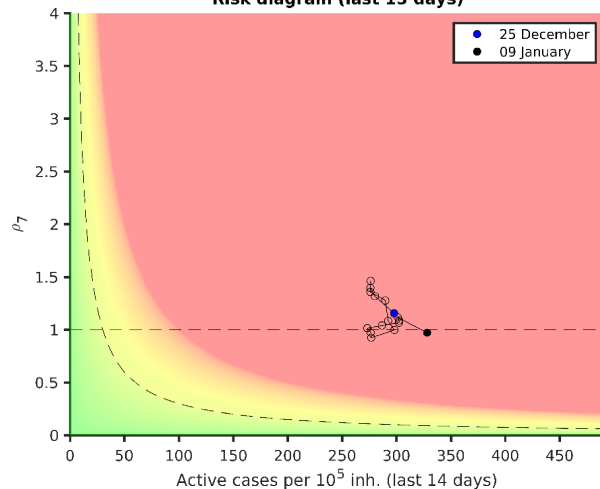
Actual $\rho_7 = 1.2$



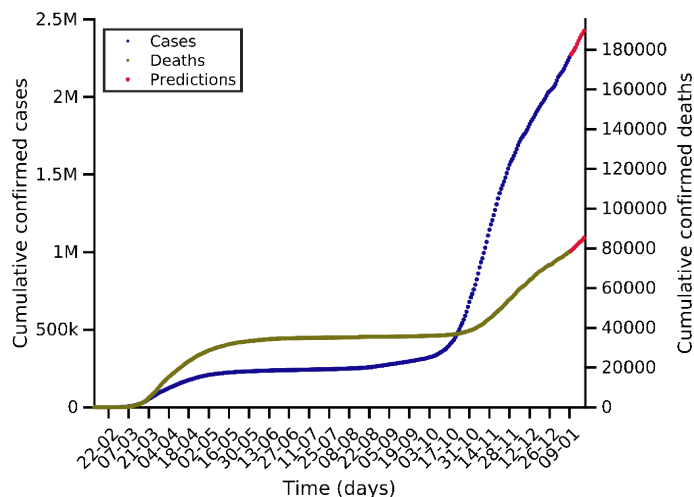
Actual CFR = 2.8 %



Risk diagram (last 15 days)



Italy 09-01-2021. Pop: 60.5M. Cumulative incidence: 3734/10⁵

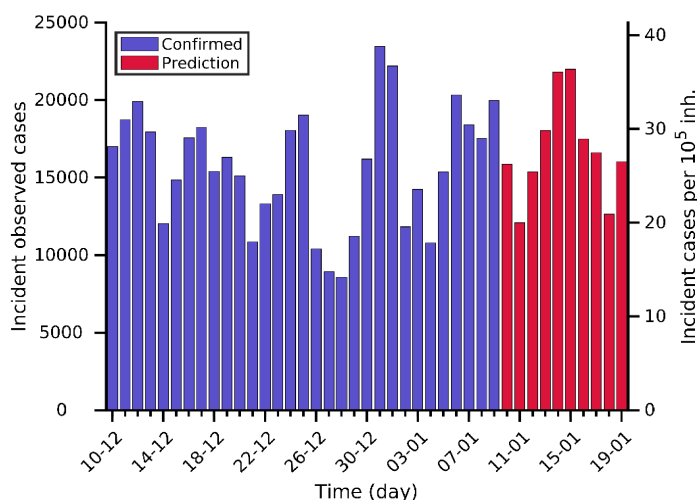


Predictions for next days

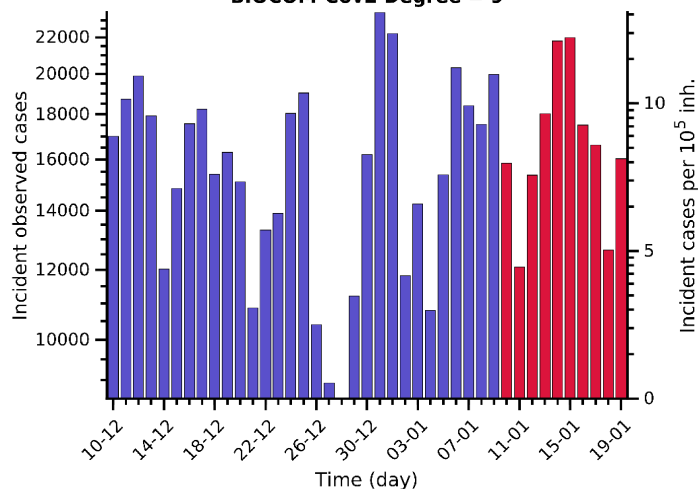
Day	Number of cases
12-01-2021	2301178 (+43312)
16-01-2021	2380487 (+122621)
19-01-2021	2425770 (+167904)

Current indicators

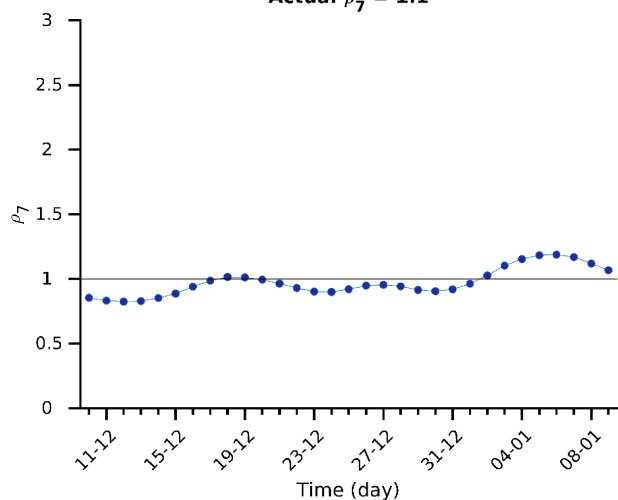
	A14	EPG	CFR	N7	D7
Today	362	387	2.97 %	16666	487
A Week ago	336	345	2.50 %	14635	481
Maximum	800	833	4.99 %	35073	822



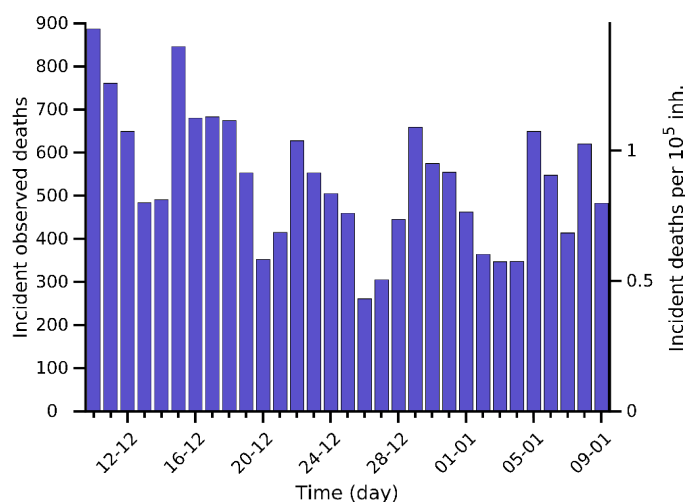
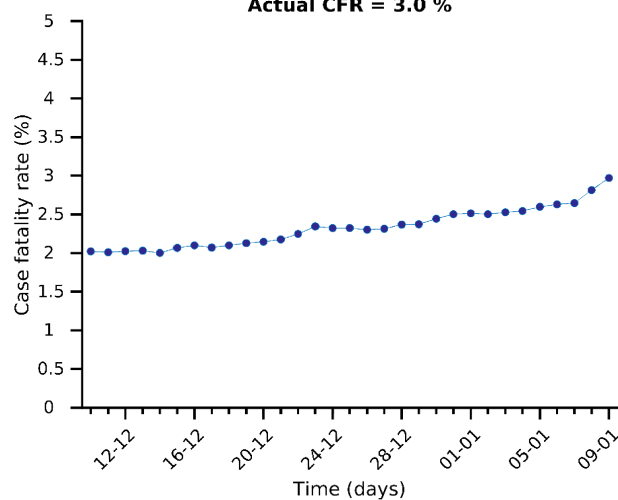
BIOCOM-Cov2 Degree = 9



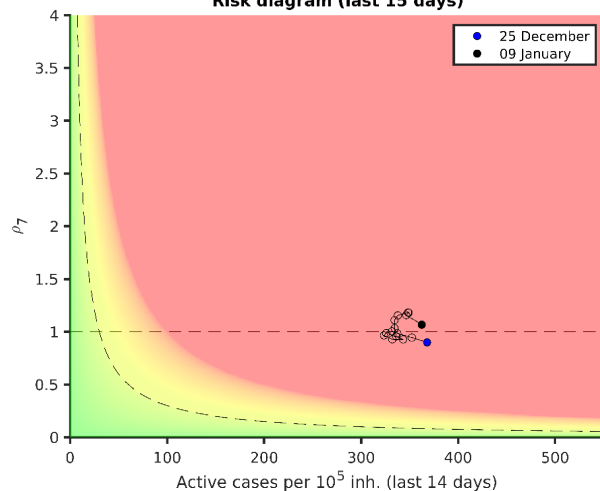
Actual $\rho_7 = 1.1$



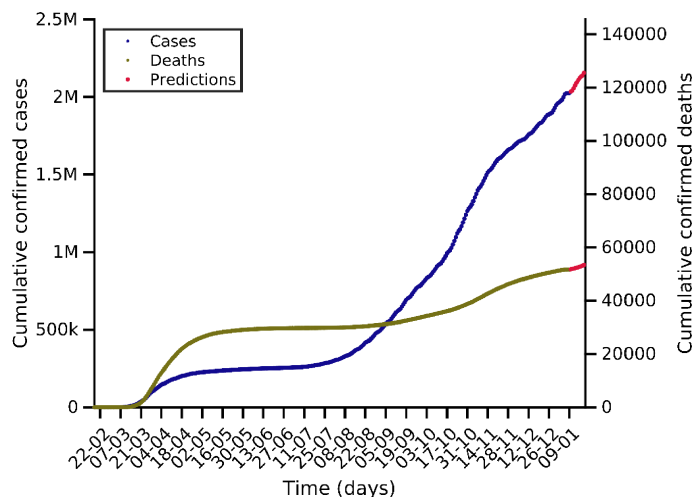
Actual CFR = 3.0 %



Risk diagram (last 15 days)



Spain 09-01-2021. Pop: 47.0M. Cumulative incidence: 4307/10⁵

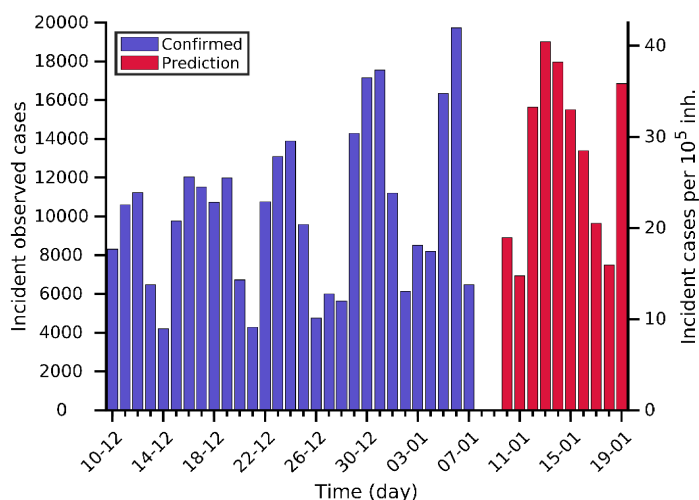


Predictions for next days

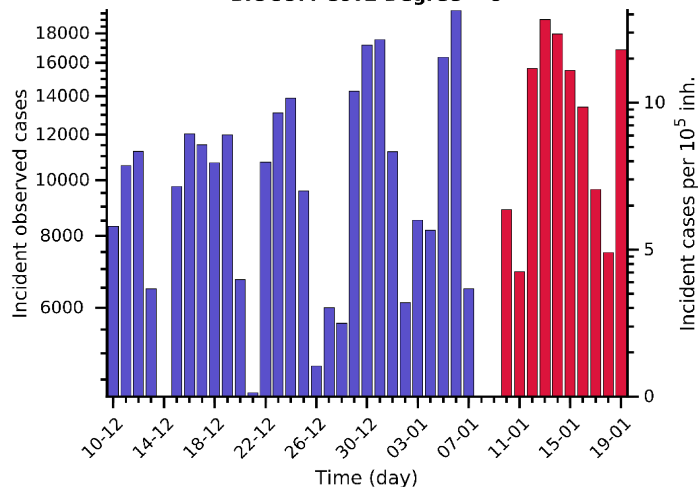
Day	Number of cases
12-01-2021	2057022 (+31462)
16-01-2021	2122899 (+97339)
19-01-2021	2156880 (+131320)

Current indicators

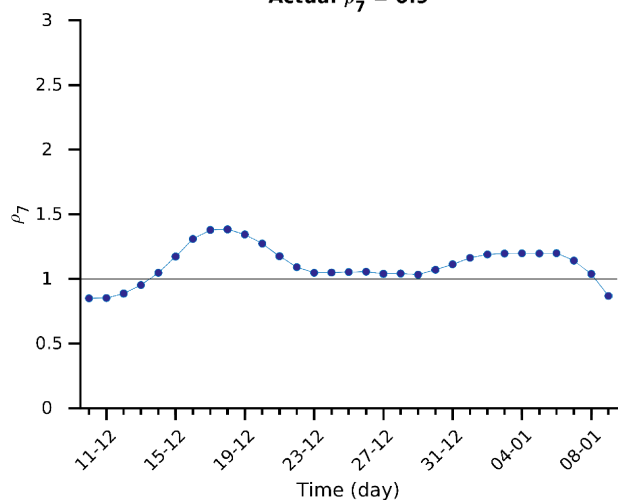
	A14	EPG	CFR	N7	D7
Today	292	253	1.02 %	8465	51
A Week ago	300	357	1.69 %	11136	116
Maximum	595	657	4.99 %	20654	877



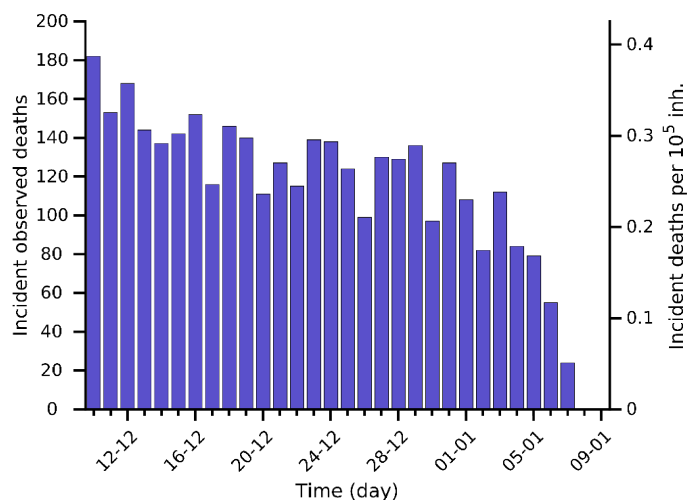
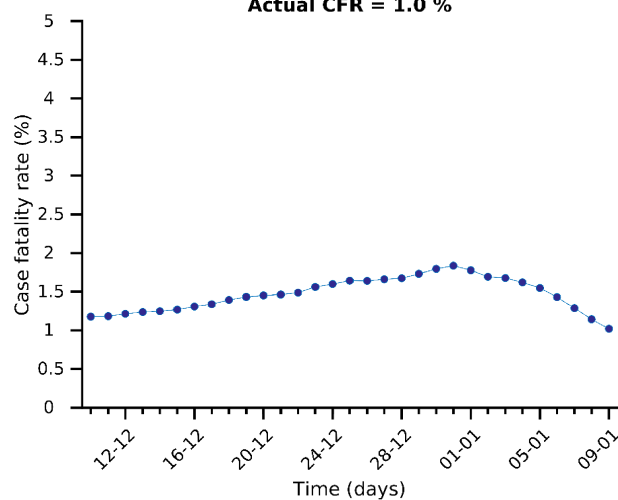
BIOCOM-Cov2 Degree = 9



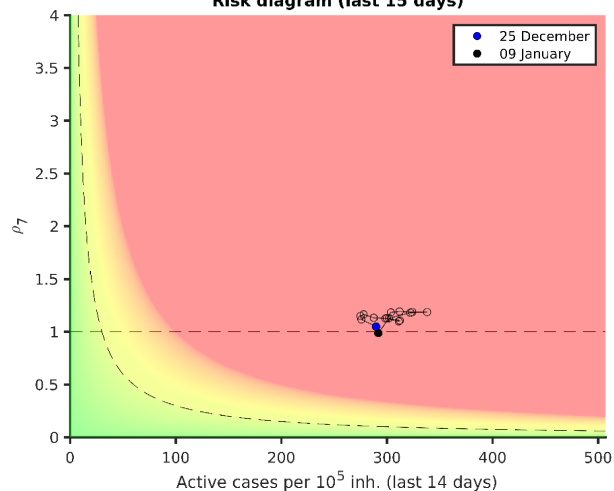
Actual $\rho_7 = 0.9$



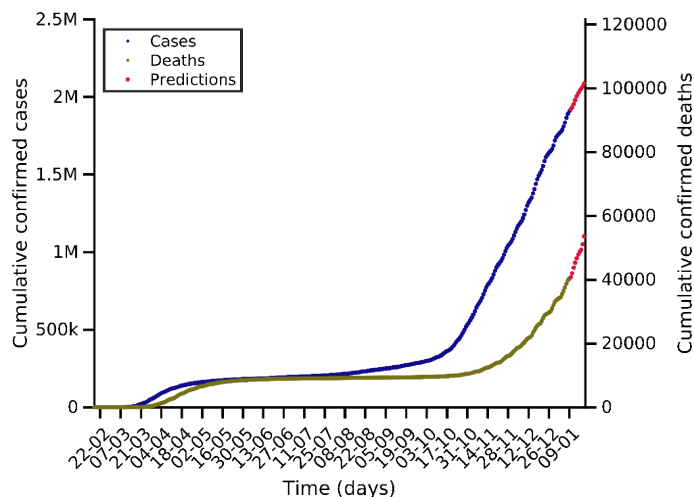
Actual CFR = 1.0 %



Risk diagram (last 15 days)



Germany 09-01-2021. Pop: 83.8M. Cumulative incidence: 2278/10⁵

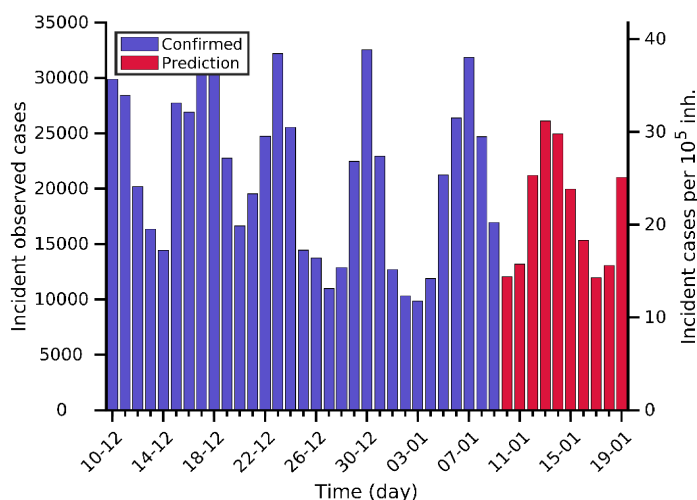


Predictions for next days

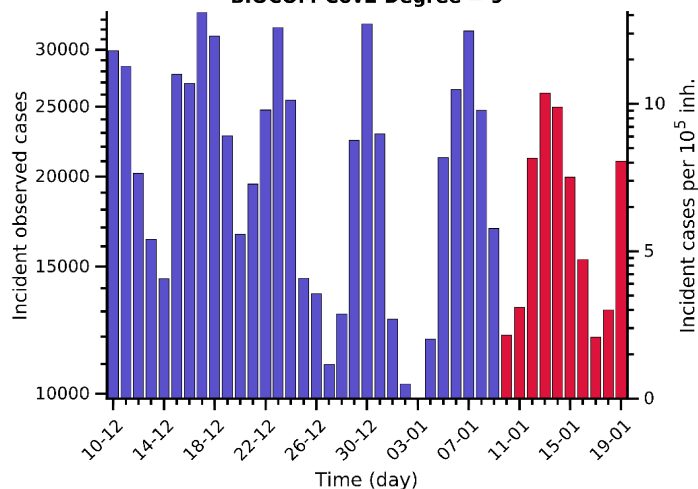
Day	Number of cases
12-01-2021	1954961 (+46434)
16-01-2021	2041338 (+132811)
19-01-2021	2087392 (+178865)

Current indicators

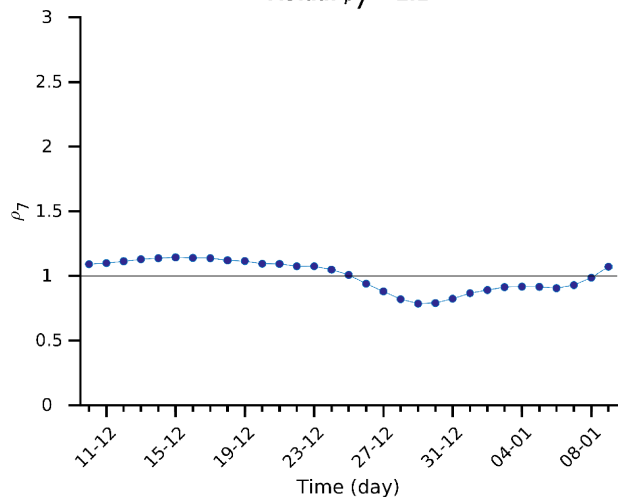
	A14	EPG	CFR	N7	D7
Today	319	342	3.27 %	20409	867
A Week ago	324	289	2.96 %	17830	642
Maximum	412	442	4.57 %	25851	867



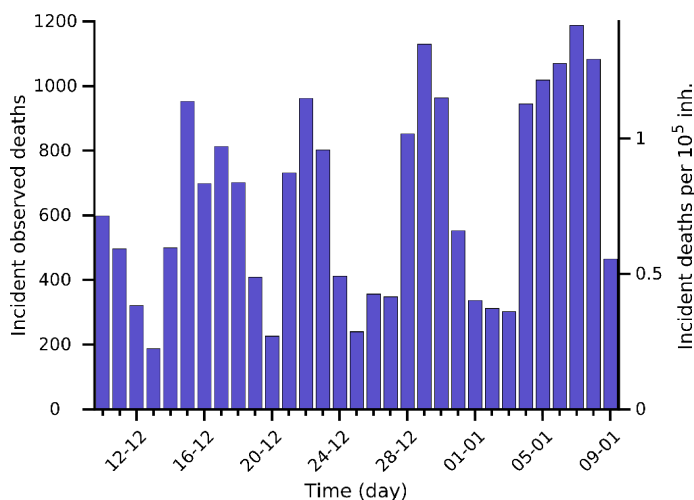
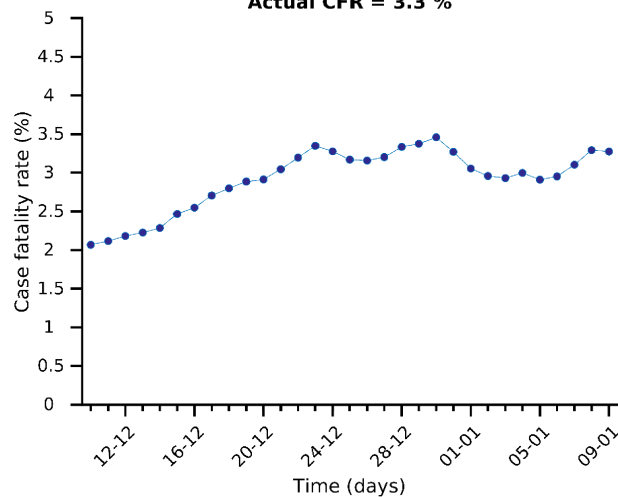
BIOCOM-Cov2 Degree = 9



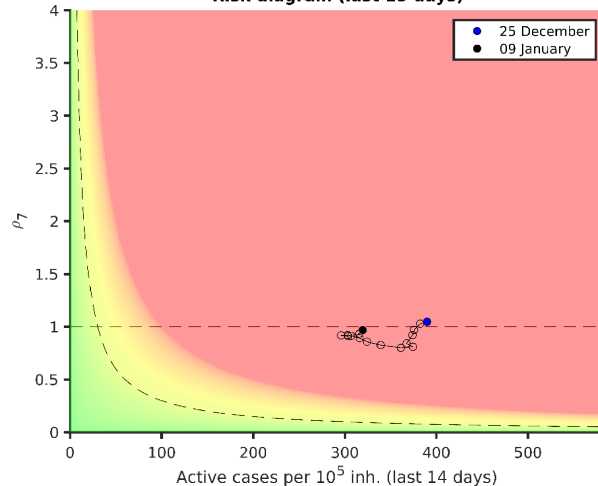
Actual $\rho_7 = 1.1$



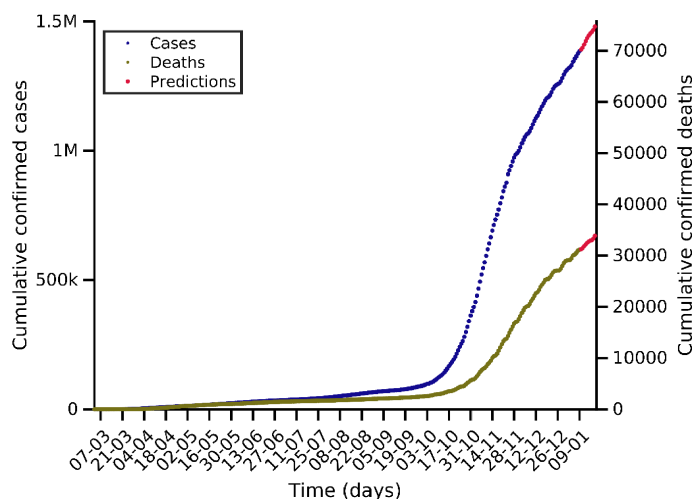
Actual CFR = 3.3 %



Risk diagram (last 15 days)



Poland 09-01-2021. Pop: 37.8M. Cumulative incidence: 3661/10⁵

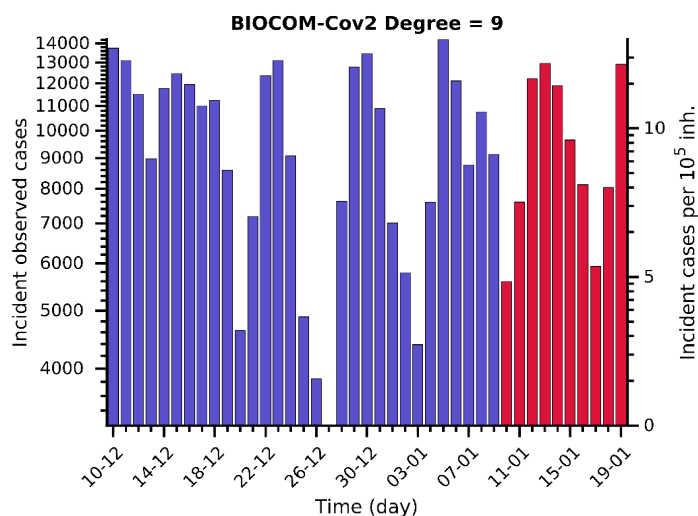
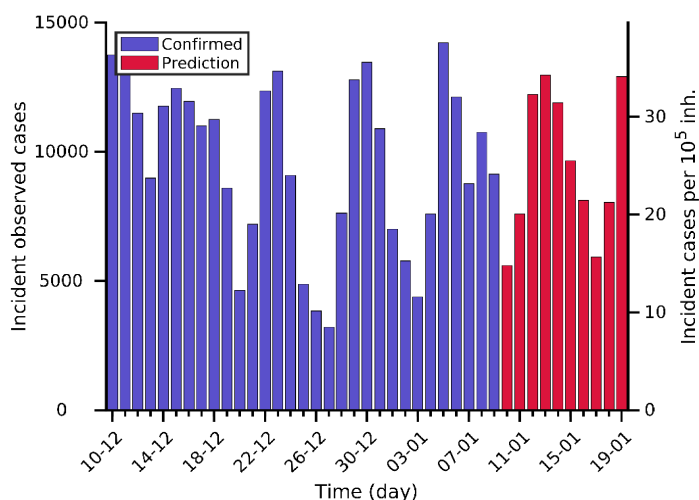


Predictions for next days

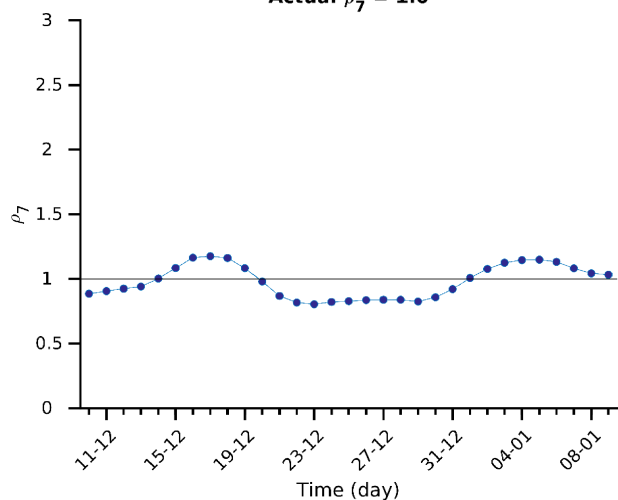
Day	Number of cases
12-01-2021	1410937 (+25415)
16-01-2021	1453561 (+68039)
19-01-2021	1480441 (+94919)

Current indicators

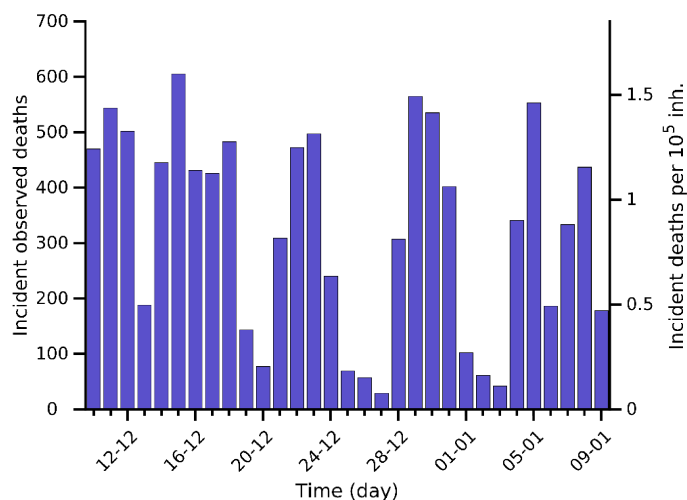
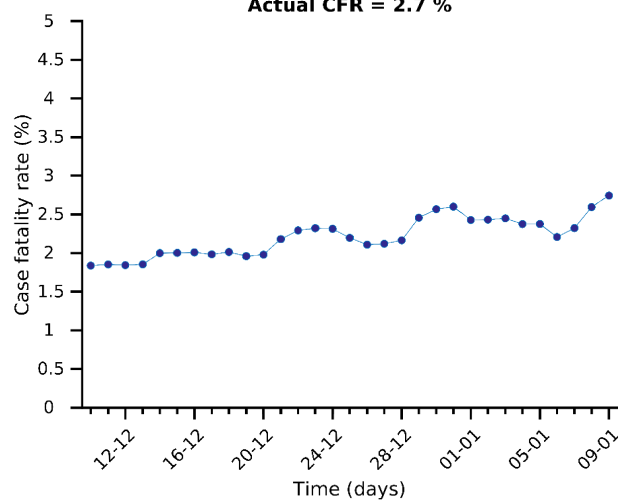
	A14	EPG	CFR	N7	D7
Today	337	348	2.74 %	9566	296
A Week ago	306	330	2.43 %	8680	286
Maximum	894	1023	5.00 %	25611	505



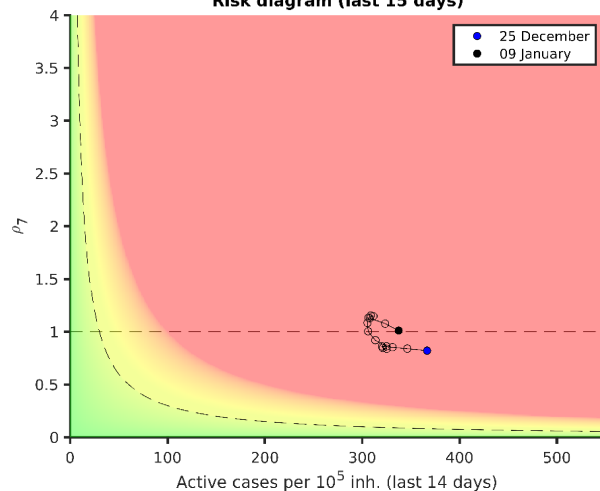
Actual $\rho_7 = 1.0$



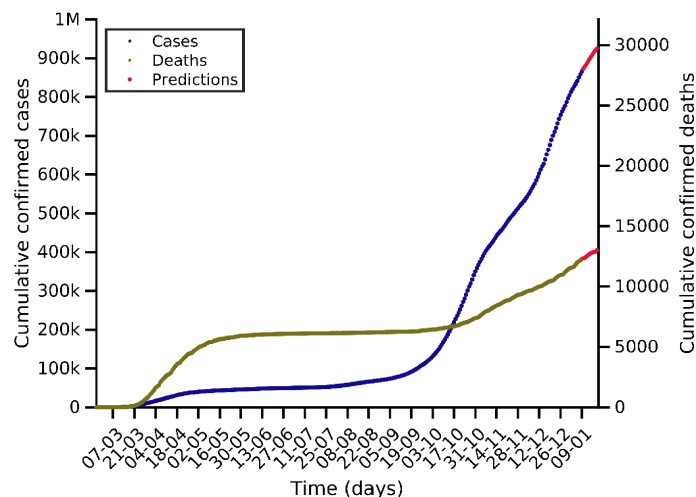
Actual CFR = 2.7 %



Risk diagram (last 15 days)



Netherlands 09-01-2021. Pop: 17.1M. Cumulative incidence: 5055/10⁵

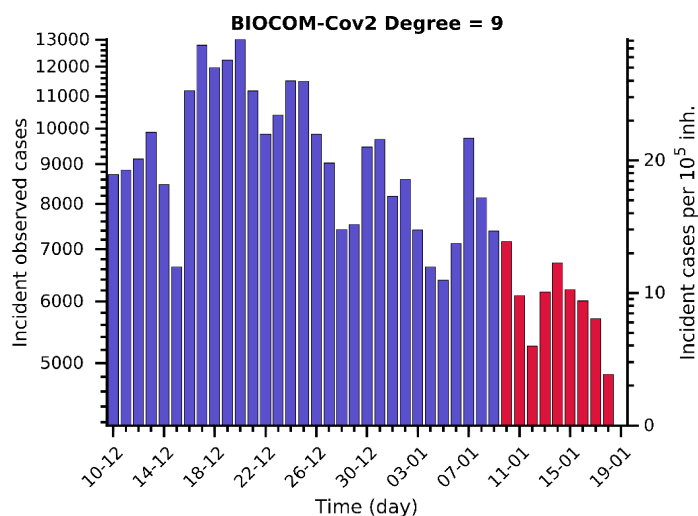
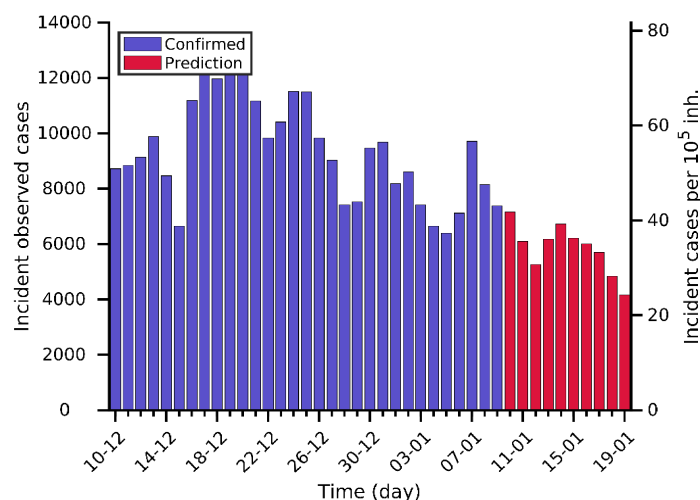


Predictions for next days

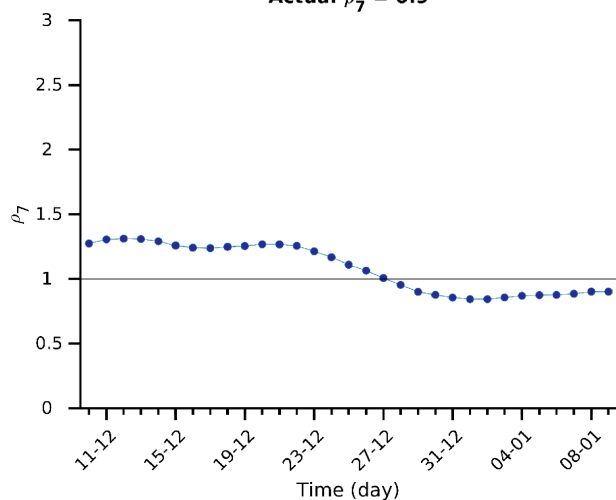
Day	Number of cases
12-01-2021	884760 (+18525)
16-01-2021	909877 (+43642)
19-01-2021	924573 (+58338)

Current indicators

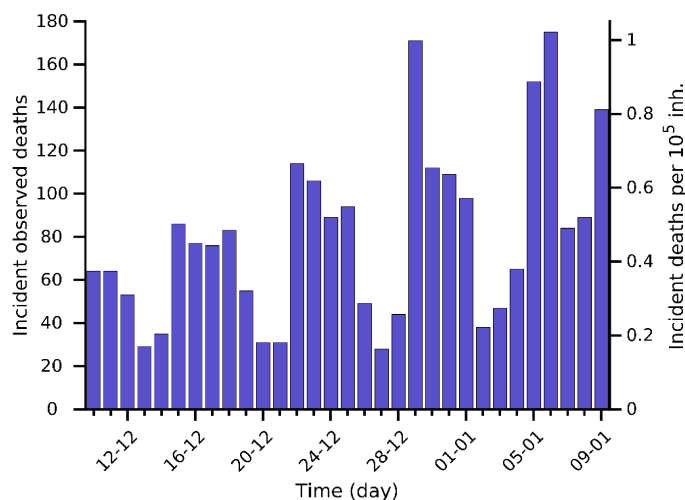
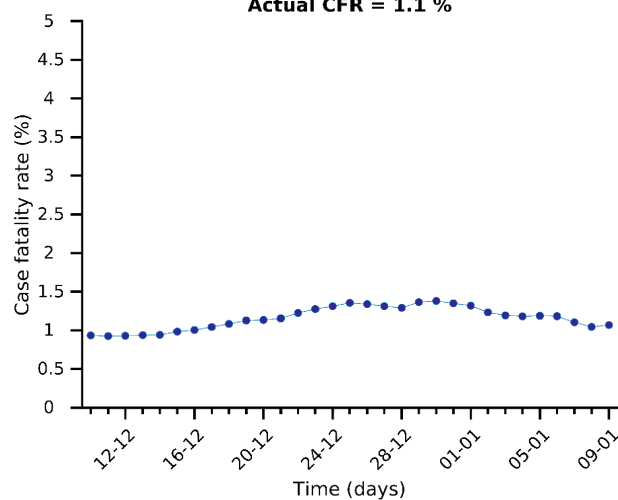
	A14	EPG	CFR	N7	D7
Today	658	593	1.07 %	7544	107
A Week ago	801	675	1.23 %	8558	86
Maximum	878	1030	5.00 %	11742	153



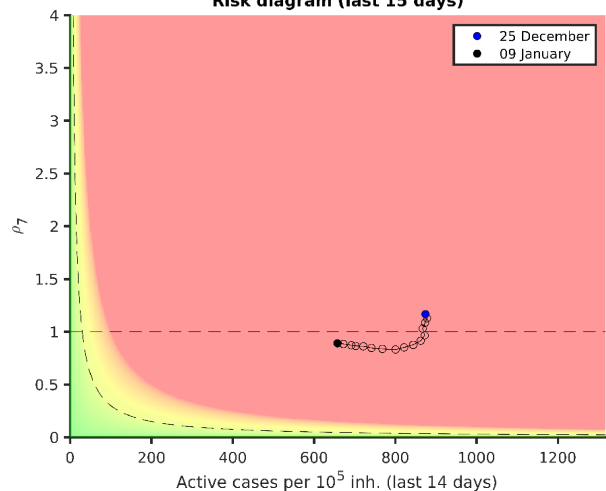
Actual $\rho_7 = 0.9$



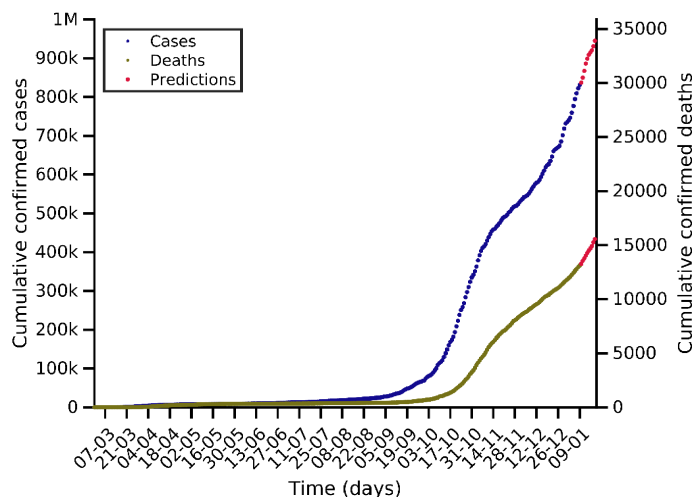
Actual CFR = 1.1 %



Risk diagram (last 15 days)



Czech Rep 09-01-2021. Pop: 10.7M. Cumulative incidence: 7761/10⁵

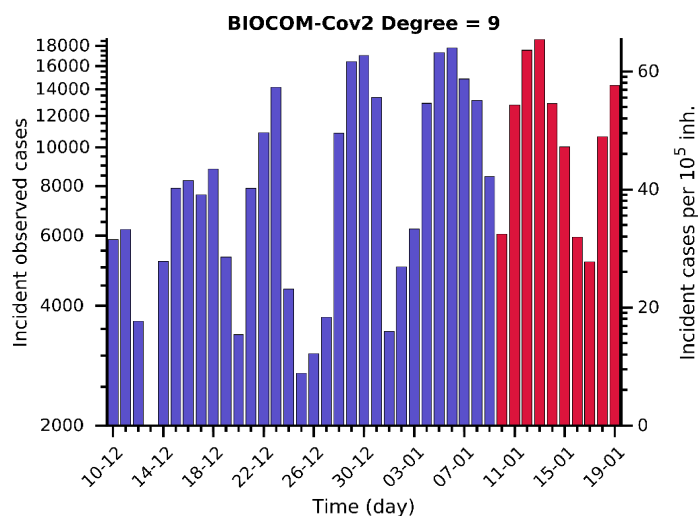
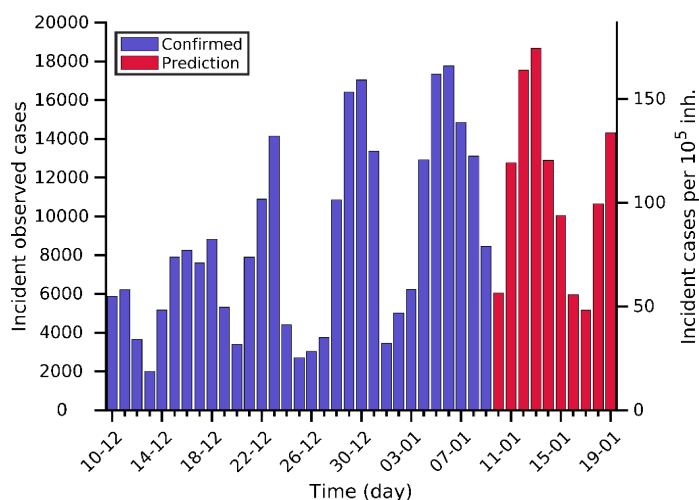


Predictions for next days

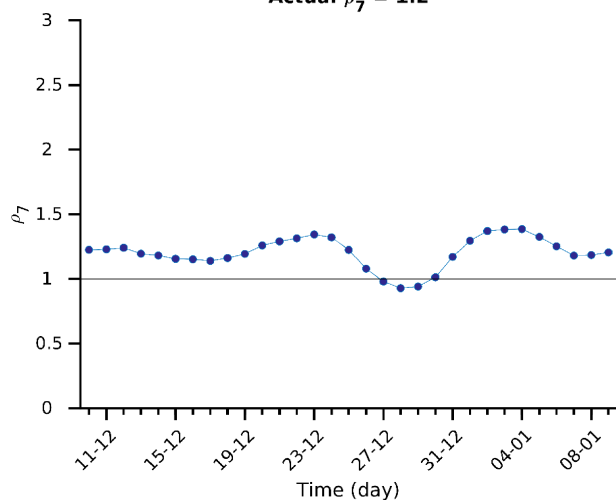
Day	Number of cases
12-01-2021	867538 (+36373)
16-01-2021	915102 (+83937)
19-01-2021	945217 (+114052)

Current indicators

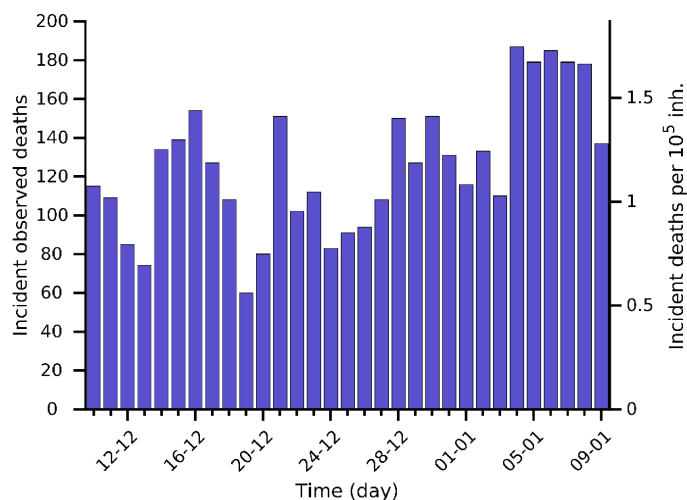
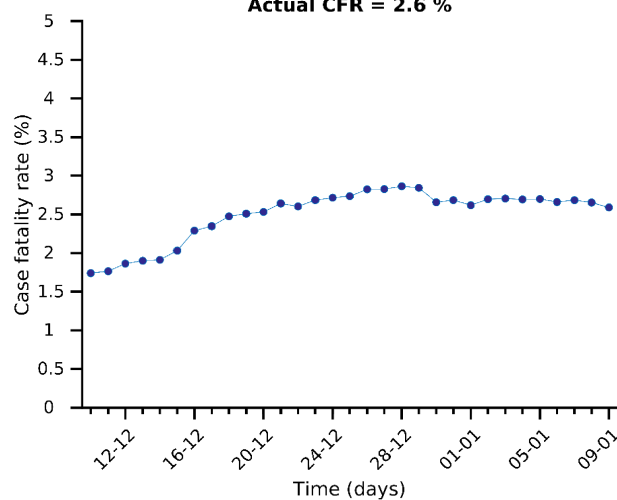
	A14	EPG	CFR	N7	D7
Today	1499	1807	2.59 %	12955	165
A Week ago	1086	1489	2.70 %	9983	131
Maximum	1586	1817	4.98 %	12955	210



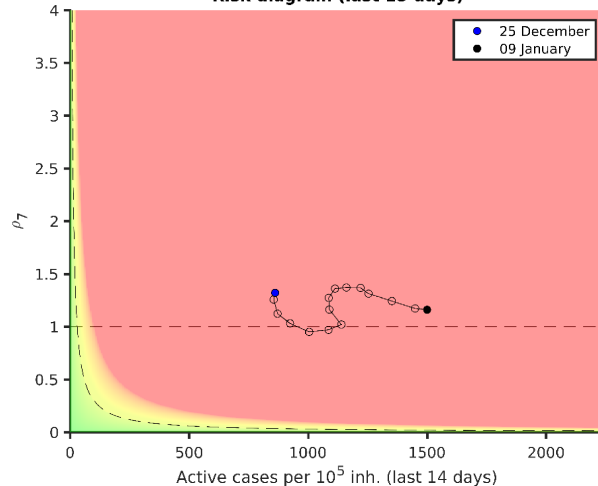
Actual $\rho_7 = 1.2$



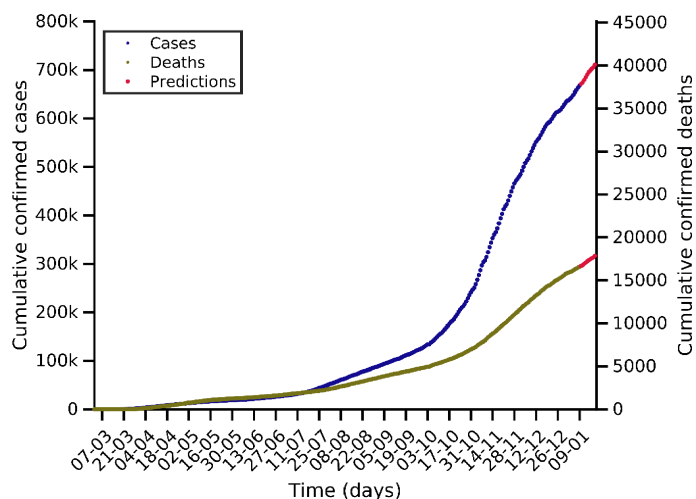
Actual CFR = 2.6 %



Risk diagram (last 15 days)



Romania 09-01-2021. Pop: 19.2M. Cumulative incidence: 3473/10⁵

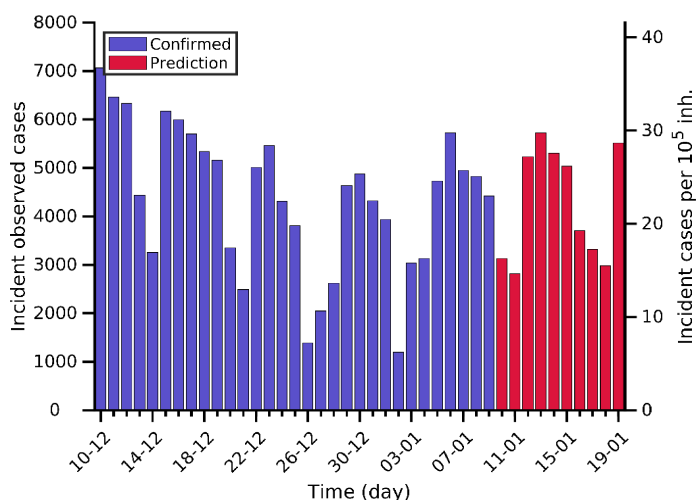


Predictions for next days

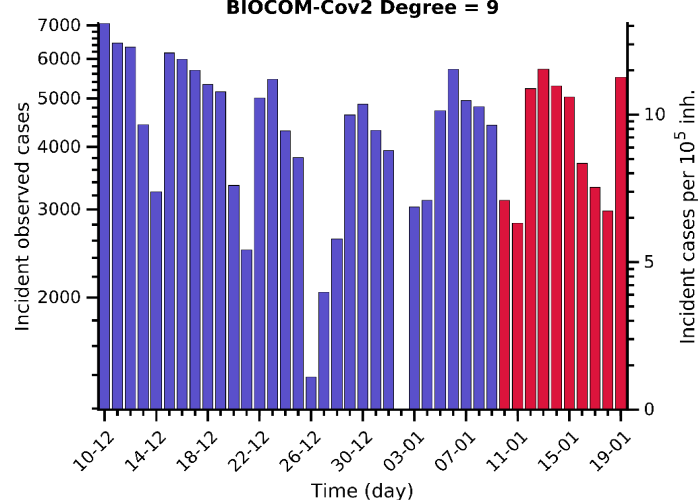
Day	Number of cases
12-01-2021	679384 (+11182)
16-01-2021	699158 (+30956)
19-01-2021	710972 (+42770)

Current indicators

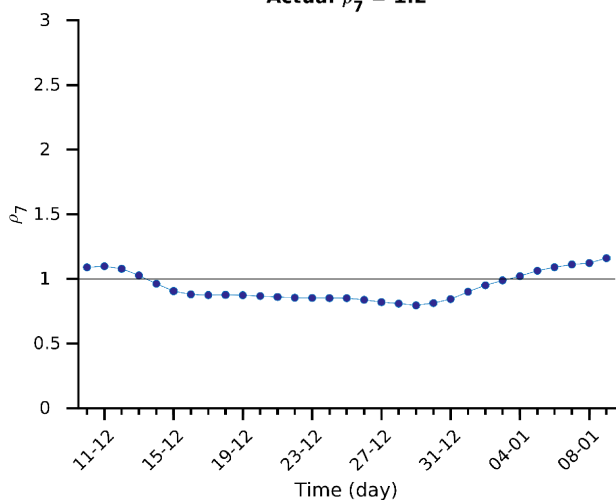
	A14	EPG	CFR	N7	D7
Today	283	328	1.86 %	4401	96
A Week ago	257	244	1.89 %	3376	116
Maximum	608	674	4.96 %	8521	167



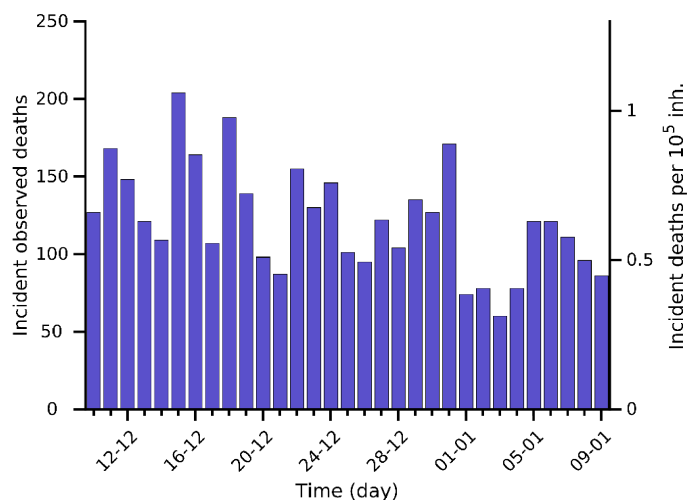
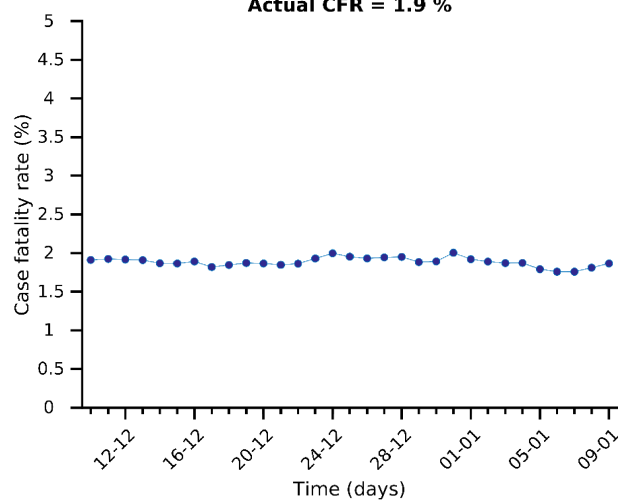
BIOCOM-Cov2 Degree = 9



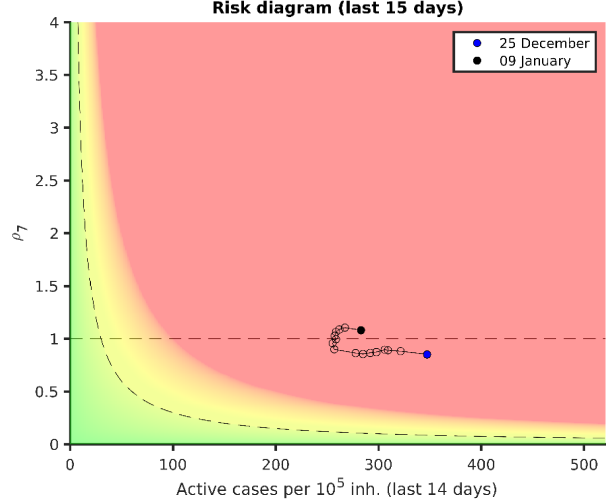
Actual $\rho_7 = 1.2$



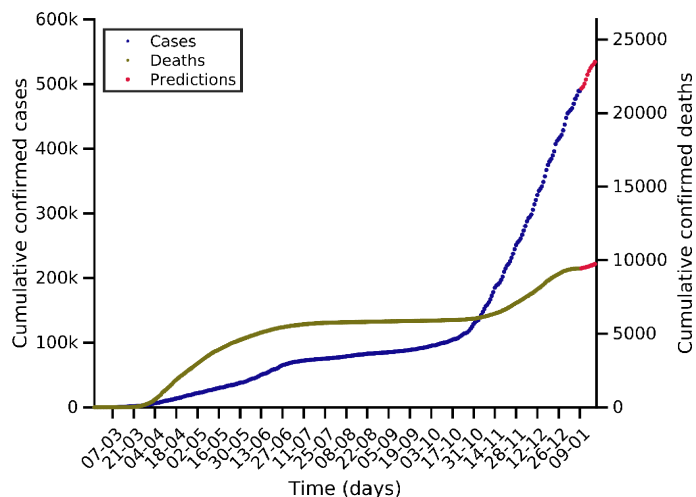
Actual CFR = 1.9 %



Risk diagram (last 15 days)



Sweden 09-01-2021. Pop: 10.1M. Cumulative incidence: 4847/10⁵

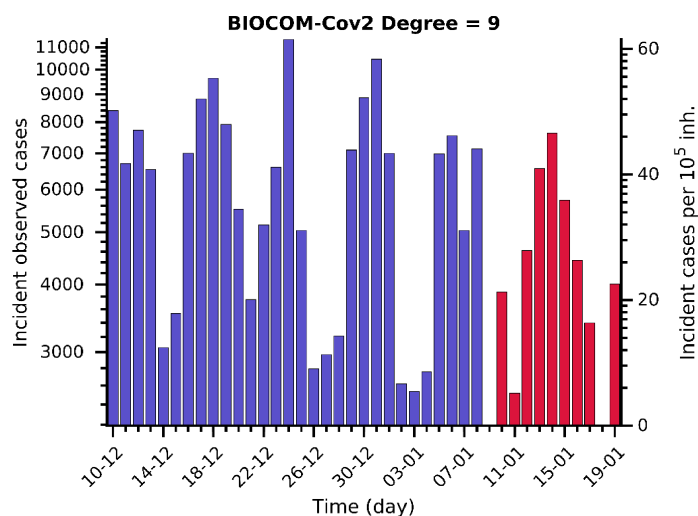
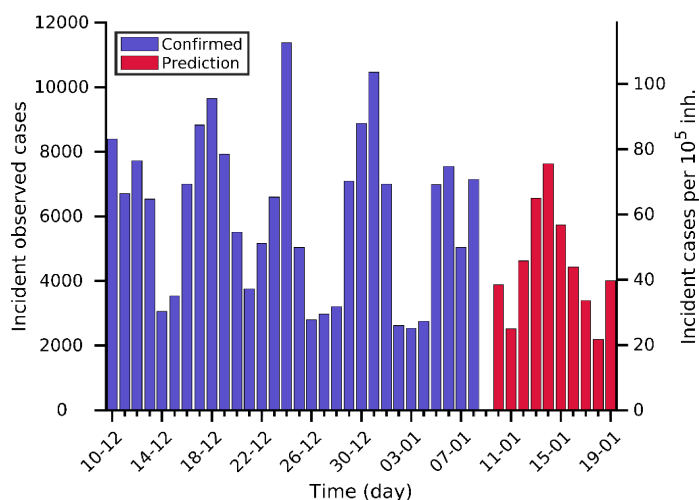


Predictions for next days

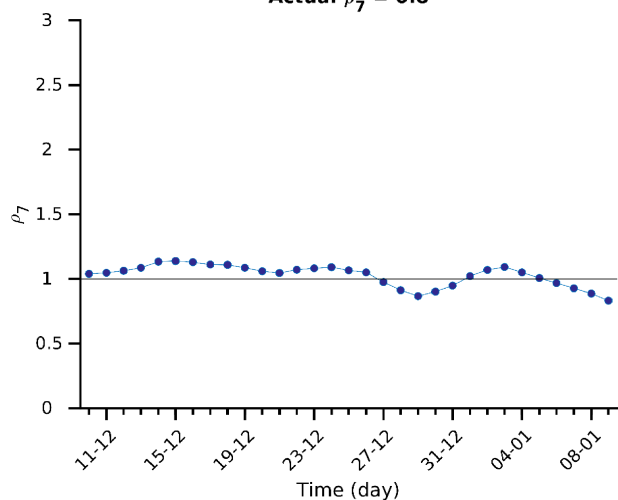
Day	Number of cases
12-01-2021	500491 (+11020)
16-01-2021	524856 (+35385)
19-01-2021	534453 (+44982)

Current indicators

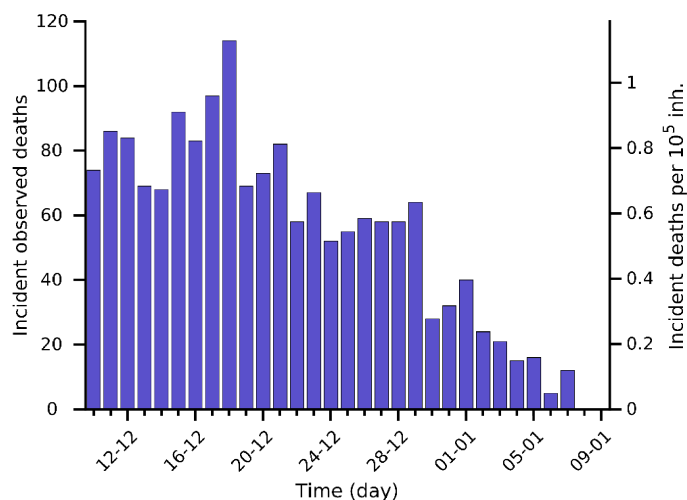
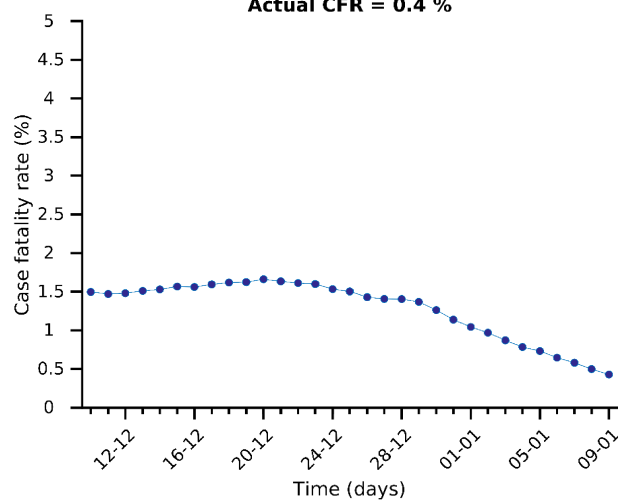
	A14	EPG	CFR	N7	D7
Today	735	611	0.43 %	4572	10
A Week ago	817	873	0.97 %	6033	43
Maximum	924	1008	4.87 %	7139	100



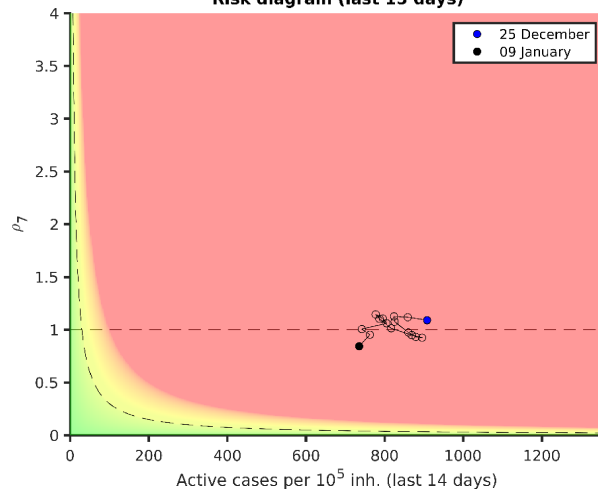
Actual $\rho_7 = 0.8$



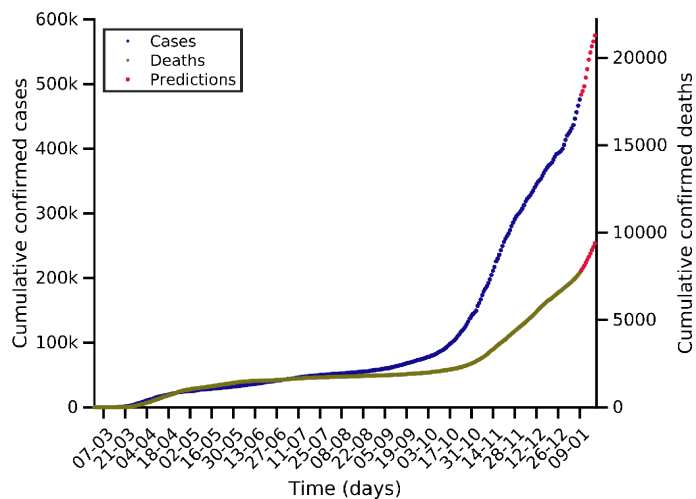
Actual CFR = 0.4 %



Risk diagram (last 15 days)



Portugal 09-01-2021. Pop: 10.2M. Cumulative incidence: 4670/10⁵

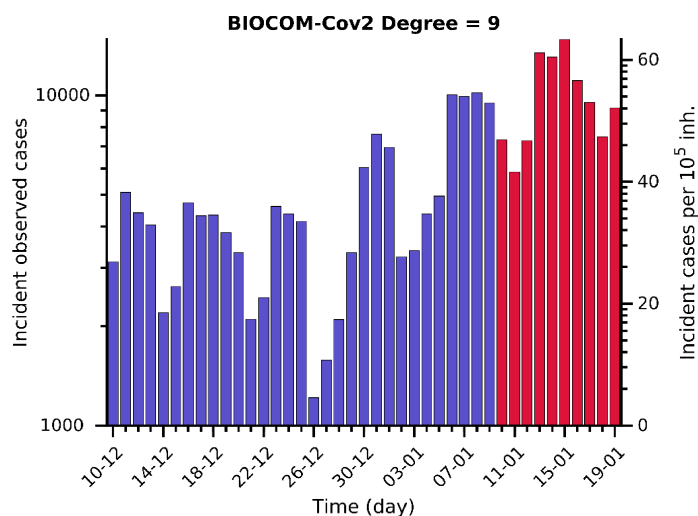
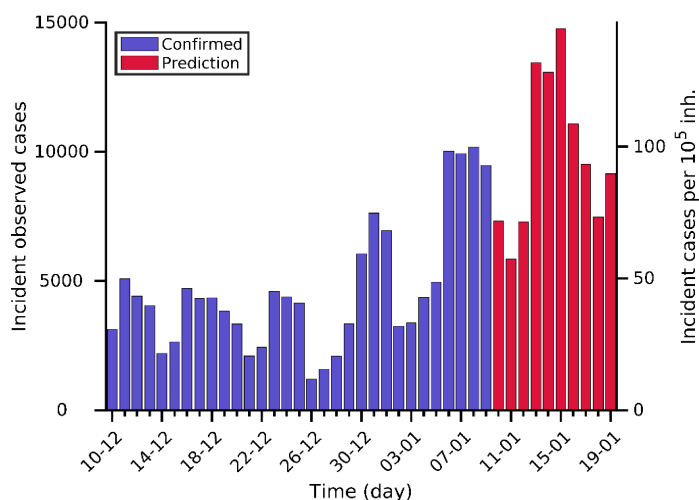


Predictions for next days

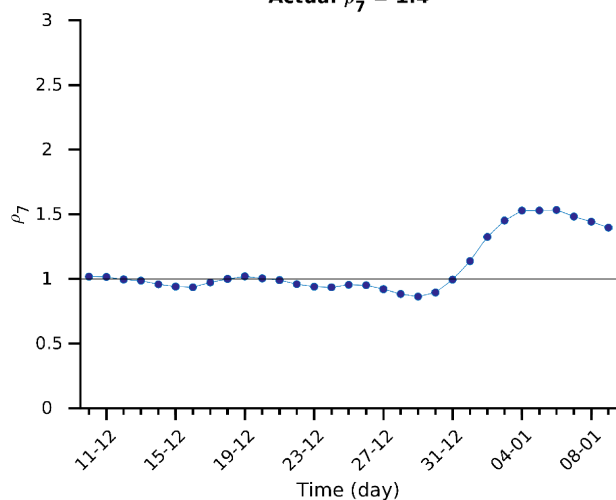
Day	Number of cases
12-01-2021	496639 (+20452)
16-01-2021	549001 (+72814)
19-01-2021	575143 (+98956)

Current indicators

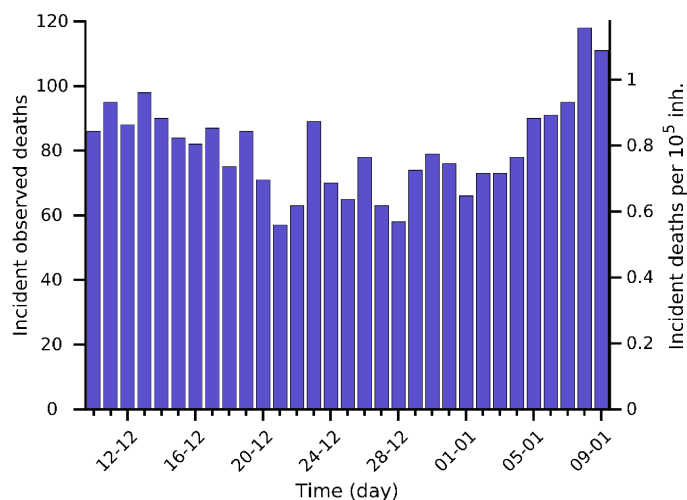
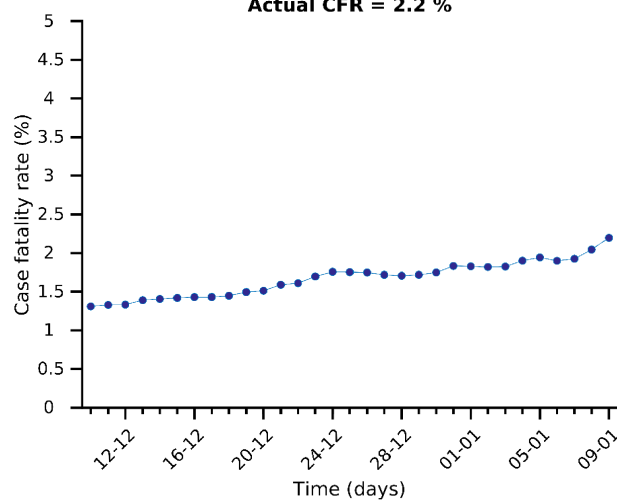
	A14	EPG	CFR	N7	D7
Today	816	1139	2.20 %	7474	94
A Week ago	521	690	1.82 %	4411	70
Maximum	816	1139	4.98 %	7474	94



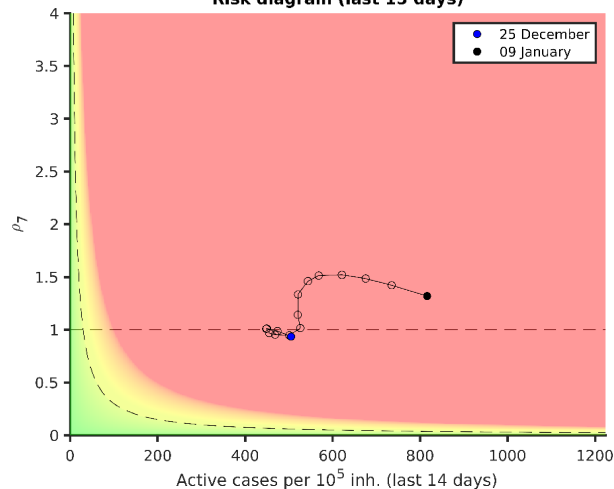
Actual $\rho_7 = 1.4$



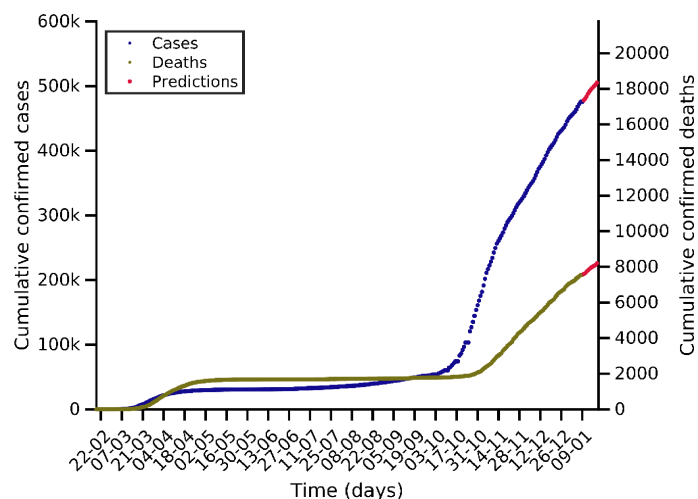
Actual CFR = 2.2 %



Risk diagram (last 15 days)



Switzerland 09-01-2021. Pop: 8.7M. Cumulative incidence: 5495/10⁵

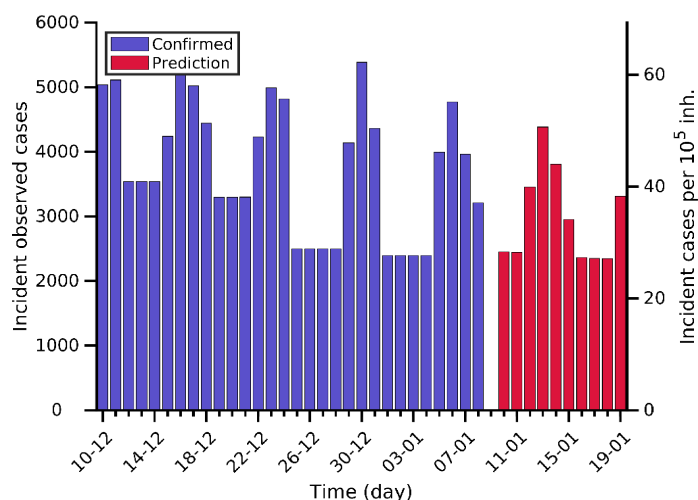


Predictions for next days

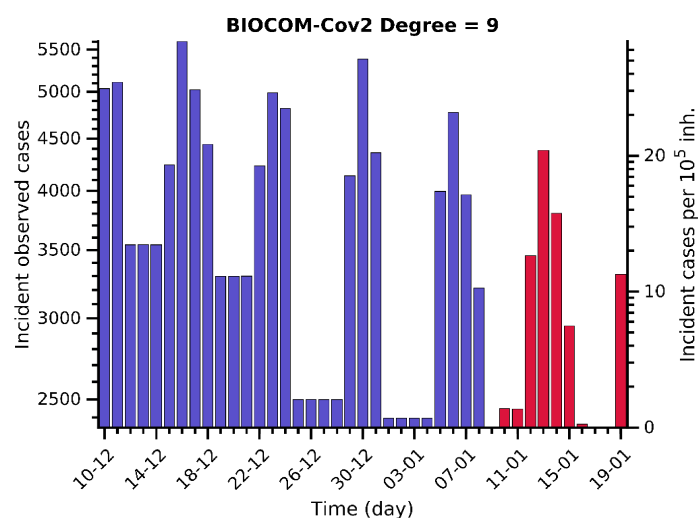
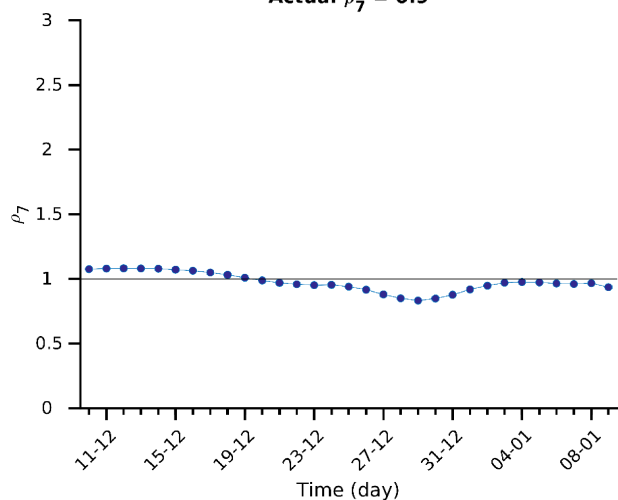
Day	Number of cases
12-01-2021	483954 (+8350)
16-01-2021	497453 (+21849)
19-01-2021	505464 (+29860)

Current indicators

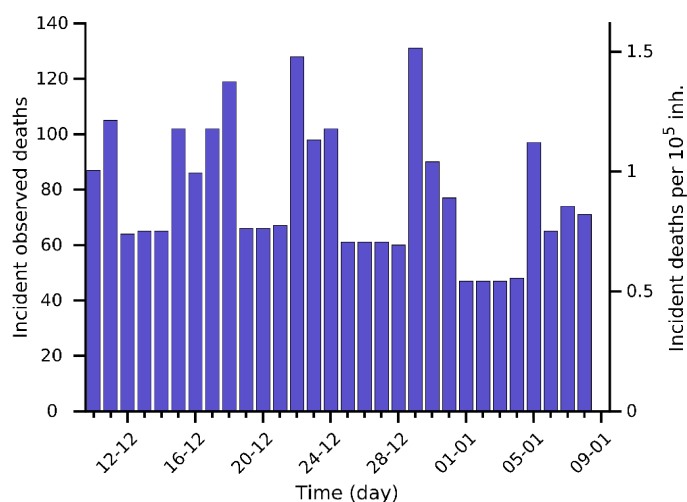
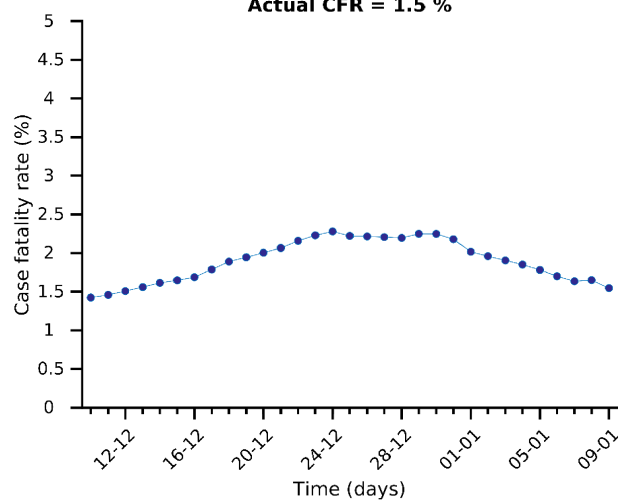
	A14	EPG	CFR	N7	D7
Today	513	480	1.55 %	2962	57
A Week ago	570	540	1.96 %	3382	73
Maximum	1379	3742	4.64 %	9281	96



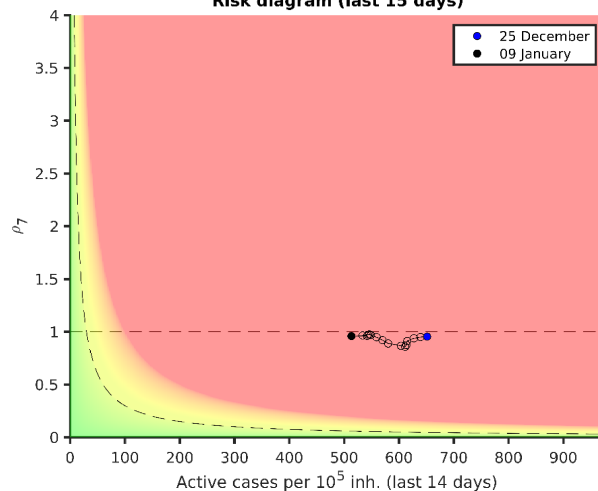
Actual $\rho_7 = 0.9$



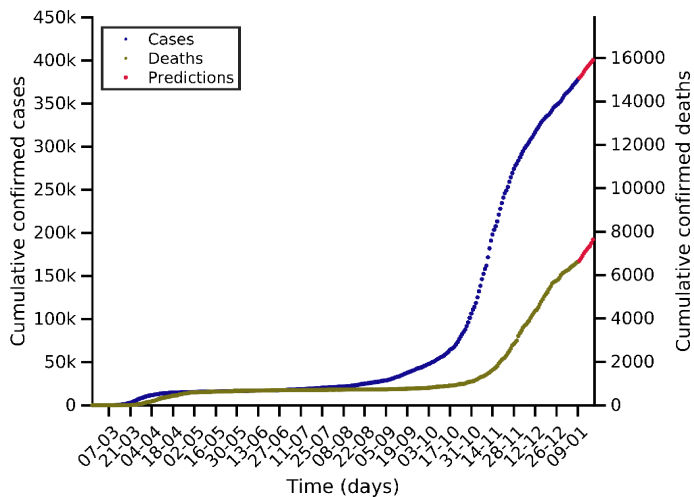
Actual CFR = 1.5 %



Risk diagram (last 15 days)



Austria 09-01-2021. Pop: 9.0M. Cumulative incidence: 4198/10⁵

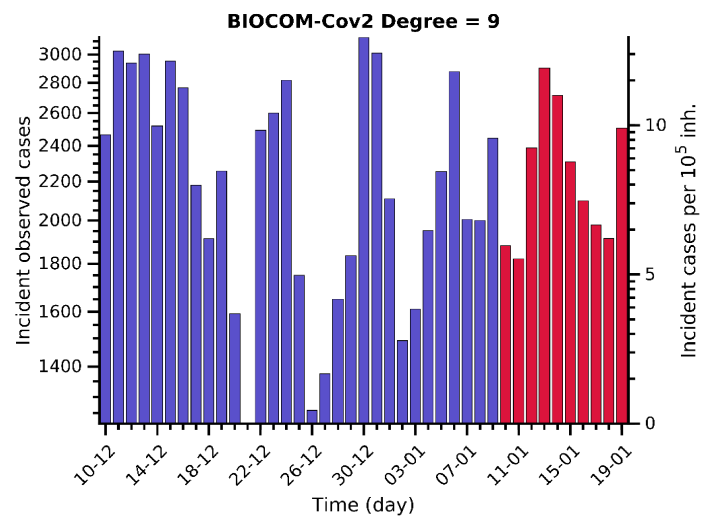
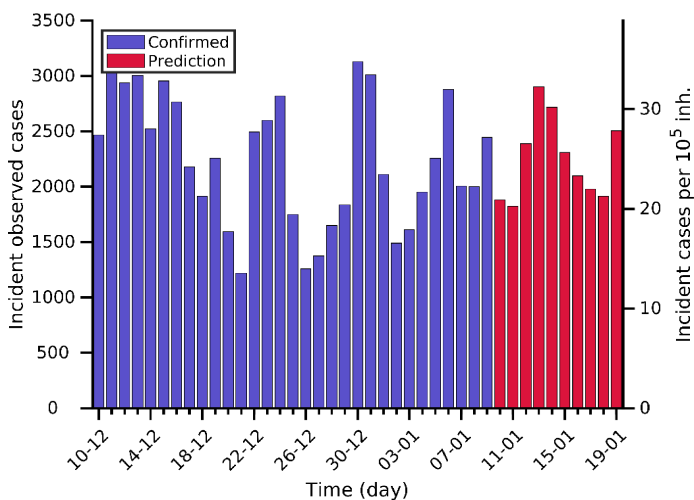


Predictions for next days

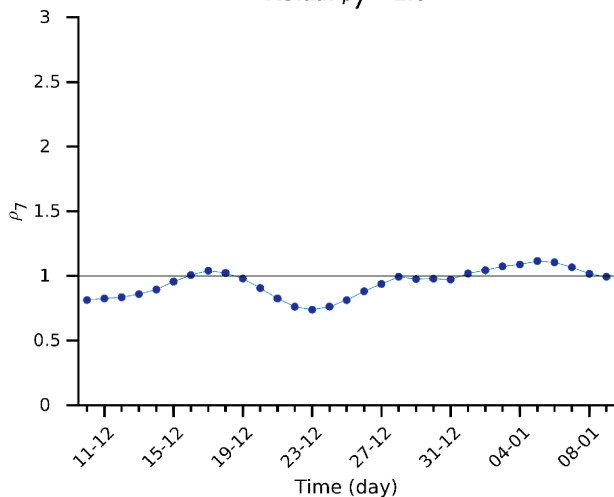
Day	Number of cases
12-01-2021	384201 (+6091)
16-01-2021	394228 (+16118)
19-01-2021	400627 (+22517)

Current indicators

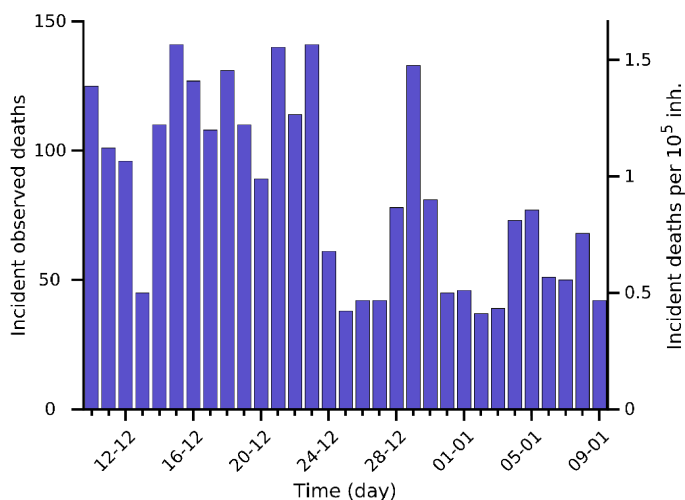
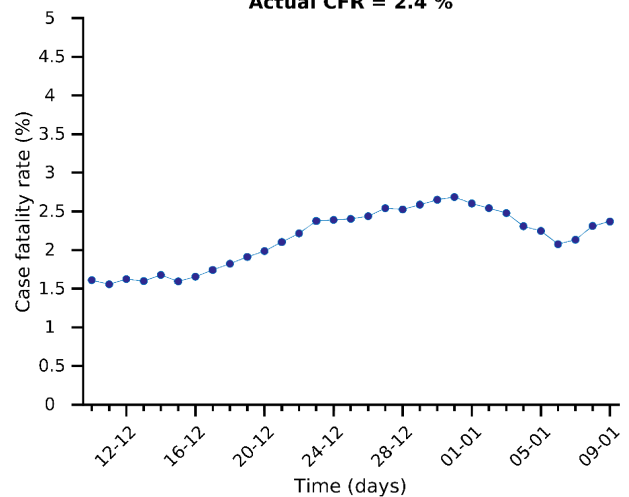
	A14	EPG	CFR	N7	D7
Today	330	328	2.37 %	2164	57
A Week ago	315	328	2.54 %	2086	66
Maximum	1067	1260	4.93 %	7489	122



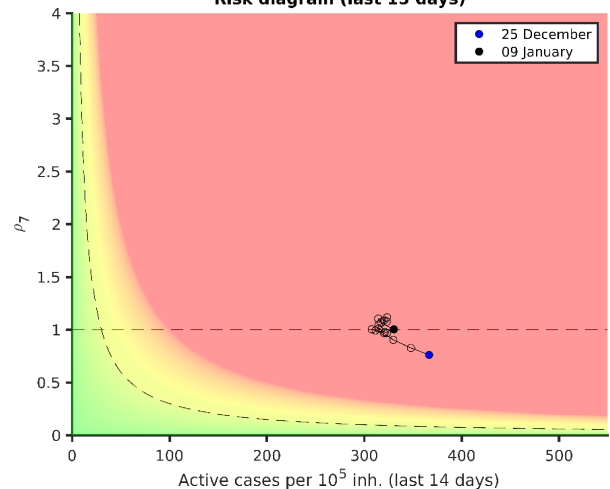
Actual $\rho_7 = 1.0$



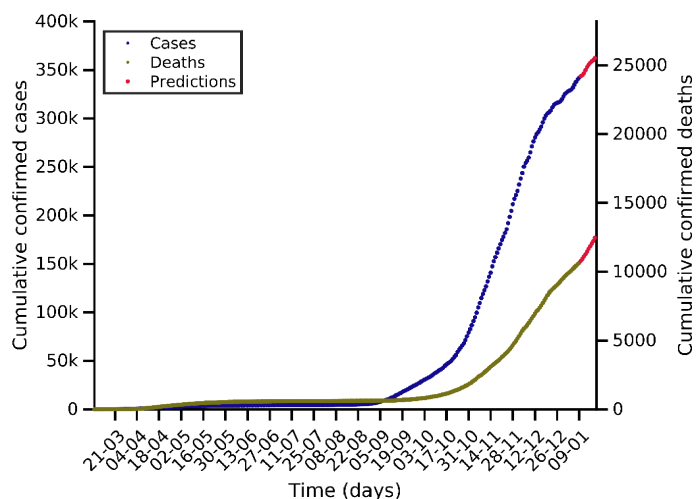
Actual CFR = 2.4 %



Risk diagram (last 15 days)



Hungary 09-01-2021. Pop: 9.7M. Cumulative incidence: 3543/10⁵

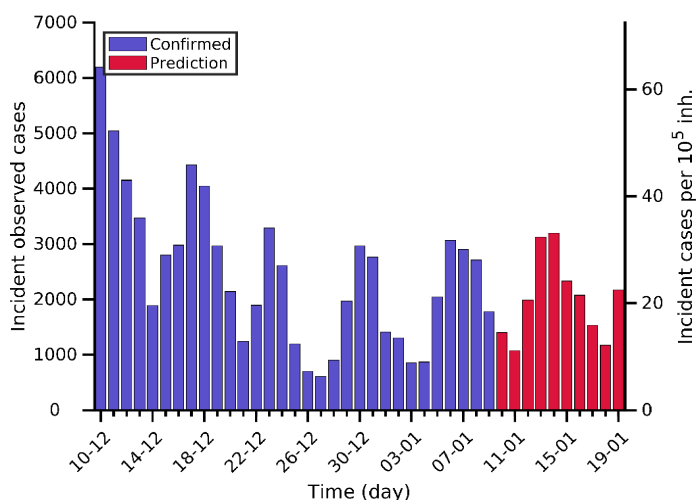


Predictions for next days

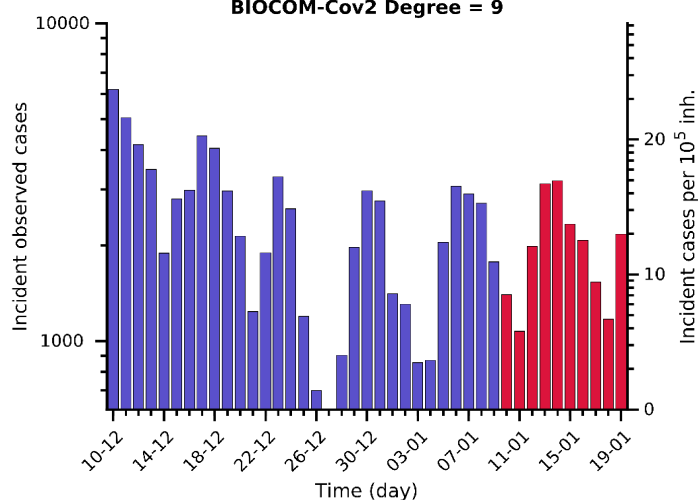
Day	Number of cases
12-01-2021	346702 (+4465)
16-01-2021	357435 (+15198)
19-01-2021	362311 (+20074)

Current indicators

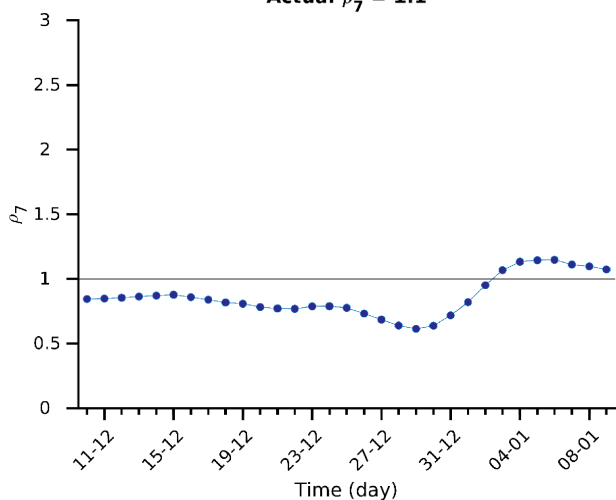
	A14	EPG	CFR	N7	D7
Today	271	291	3.04 %	2035	109
A Week ago	259	246	2.59 %	1705	120
Maximum	789	910	4.96 %	5685	176



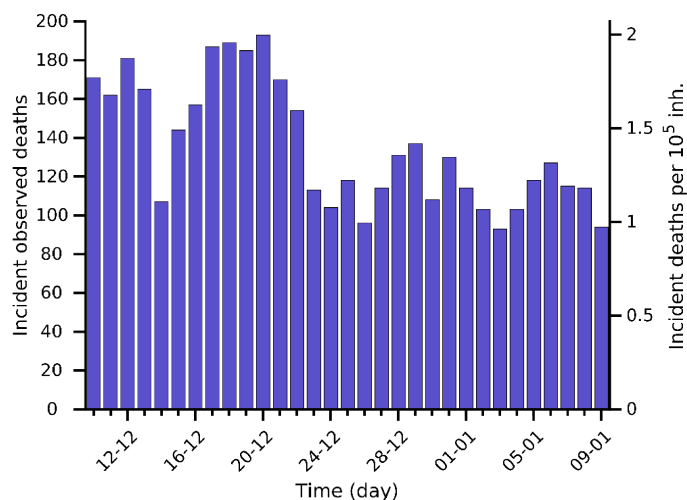
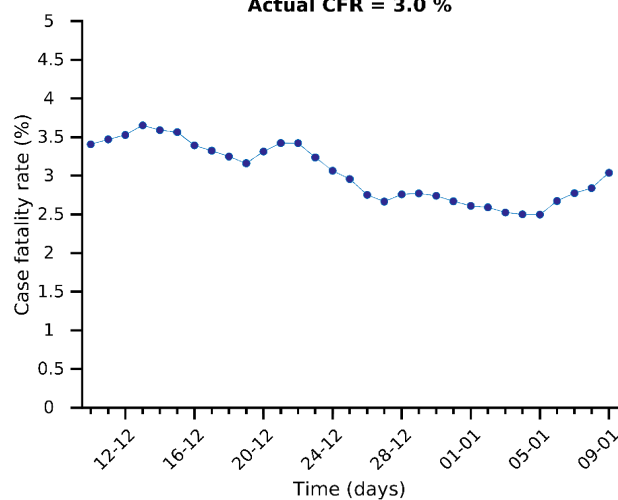
BIOCOM-Cov2 Degree = 9



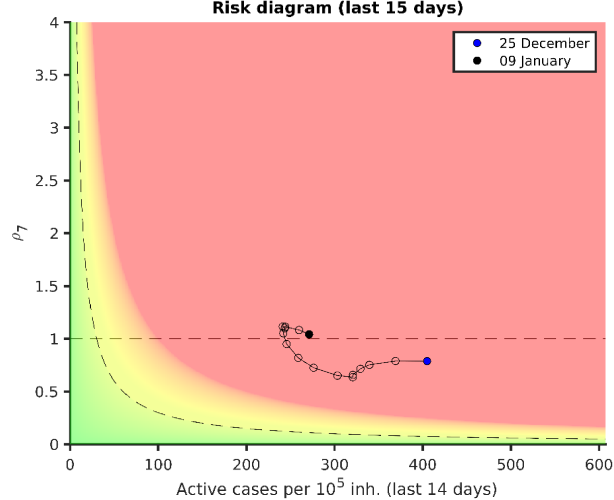
Actual $\rho_7 = 1.1$



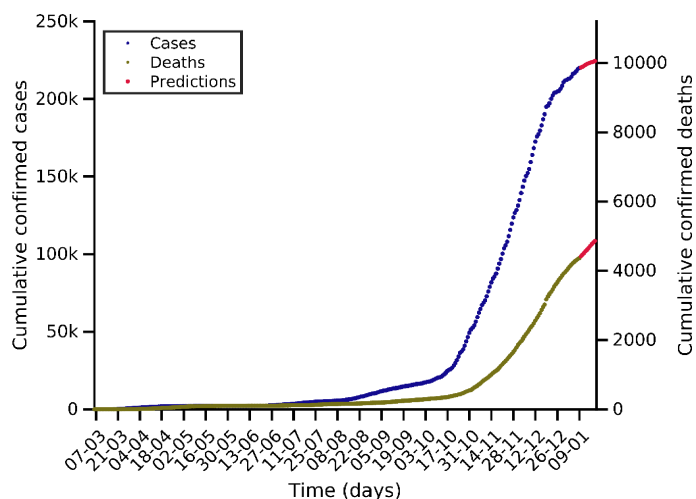
Actual CFR = 3.0 %



Risk diagram (last 15 days)



Croatia 09-01-2021. Pop: 4.1M. Cumulative incidence: 5359/10⁵

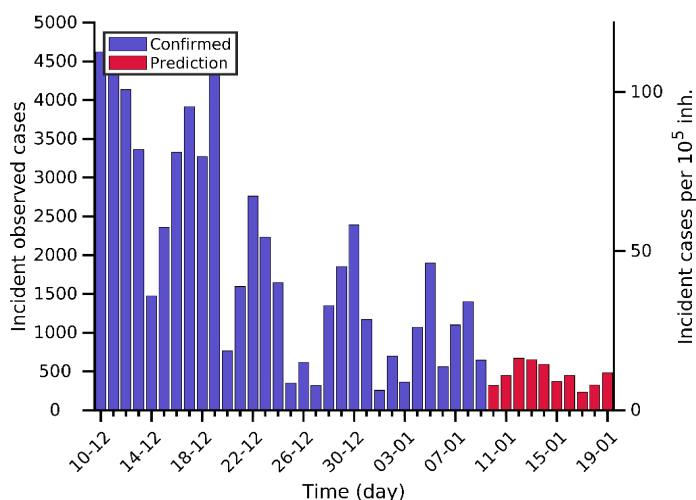


Predictions for next days

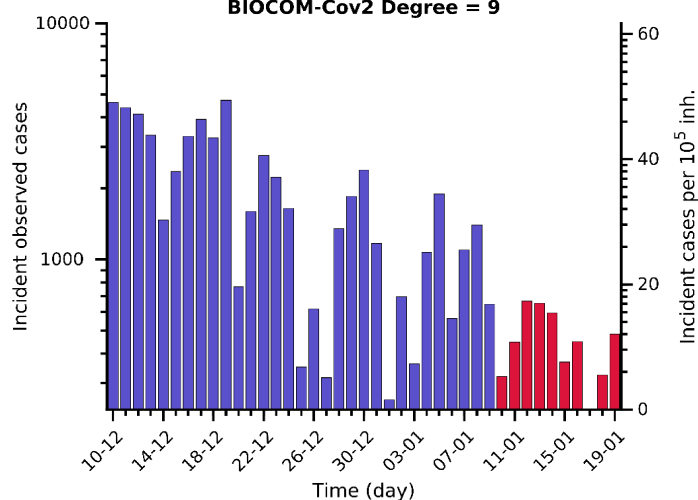
Day	Number of cases
12-01-2021	221427 (+1434)
16-01-2021	223488 (+3495)
19-01-2021	224527 (+4534)

Current indicators

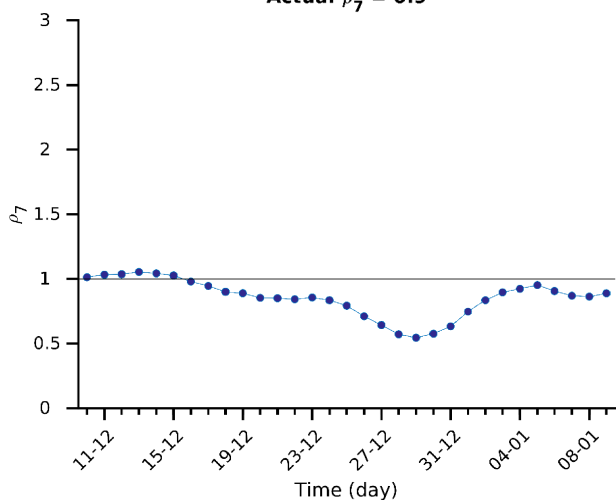
	A14	EPG	CFR	N7	D7
Today	367	326	1.47 %	1005	42
A Week ago	438	366	1.83 %	1147	57
Maximum	1200	1264	4.90 %	3648	89



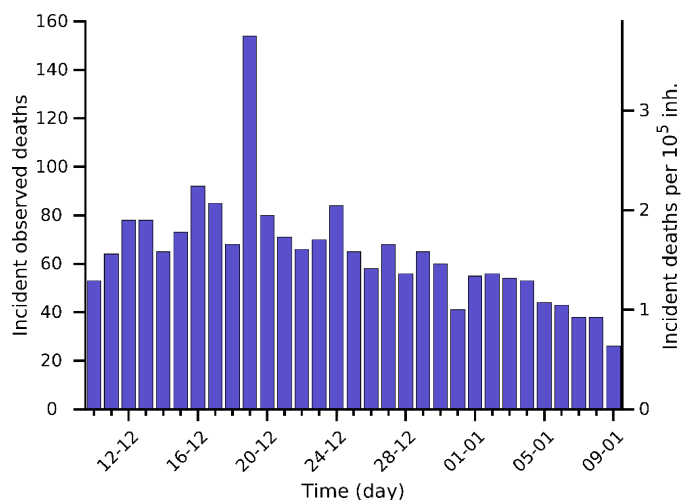
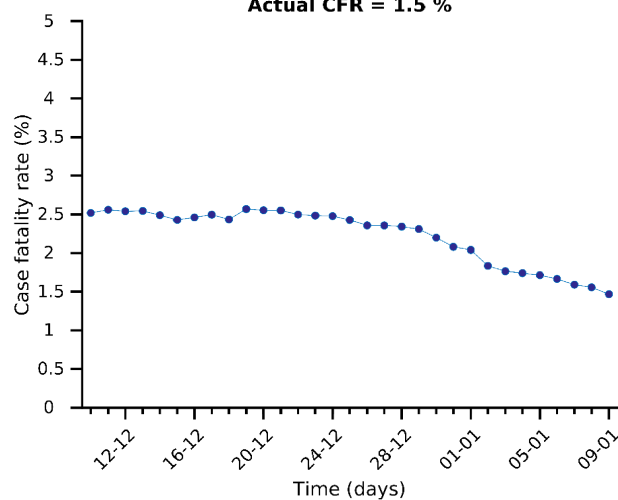
BIOCOM-Cov2 Degree = 9



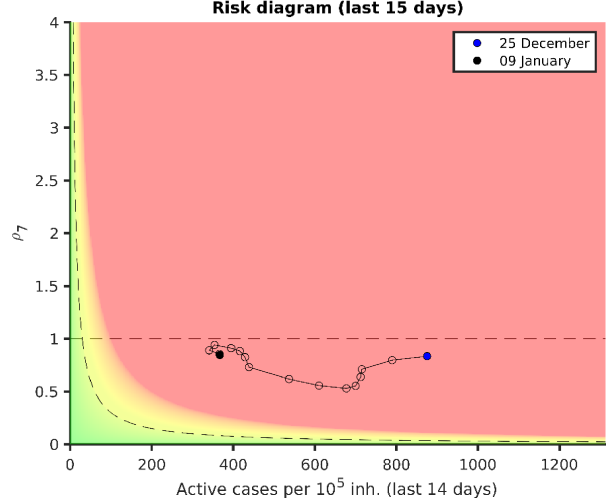
Actual $\rho_7 = 0.9$



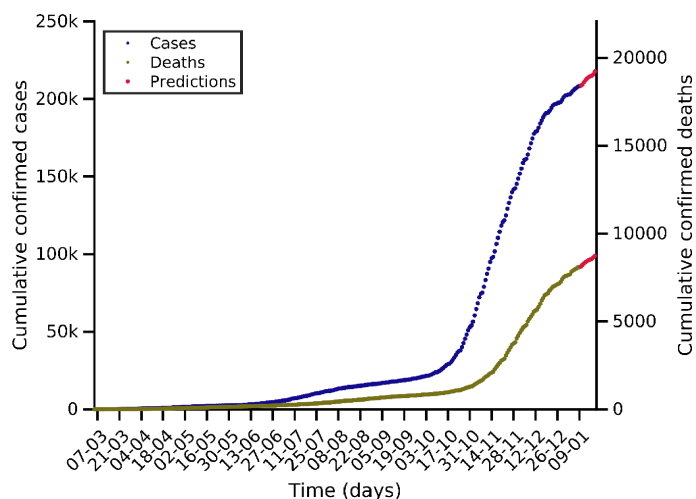
Actual CFR = 1.5 %



Risk diagram (last 15 days)



Bulgaria 09-01-2021. Pop: 6.9M. Cumulative incidence: 2999/10⁵

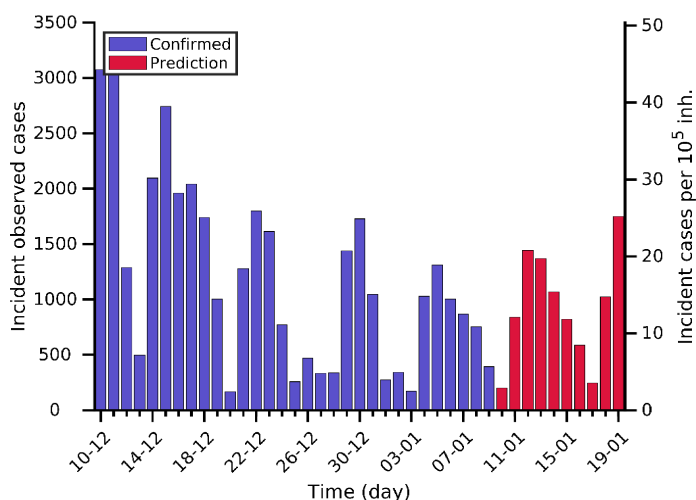


Predictions for next days

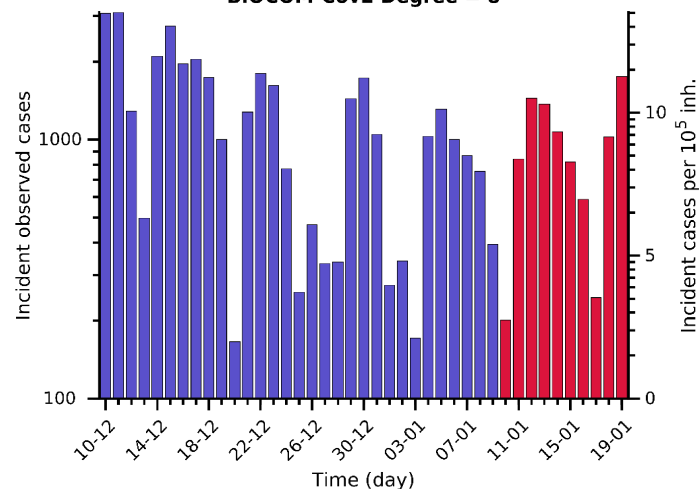
Day	Number of cases
12-01-2021	210891 (+2485)
16-01-2021	214737 (+6331)
19-01-2021	217756 (+9350)

Current indicators

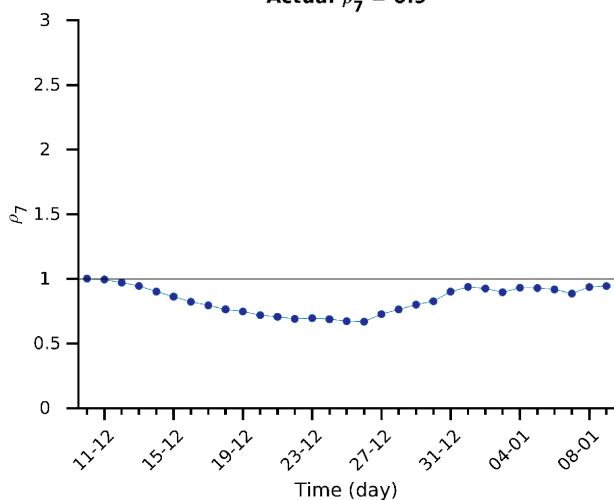
	A14	EPG	CFR	N7	D7
Today	159	150	3.23 %	789	65
A Week ago	171	158	2.94 %	785	74
Maximum	672	692	5.00 %	3387	140



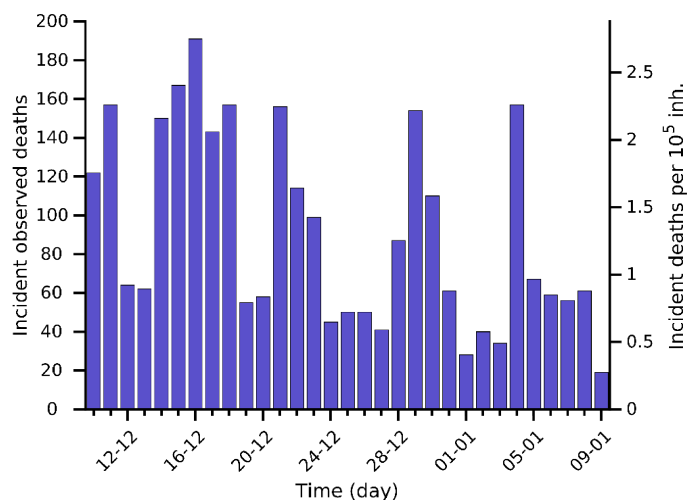
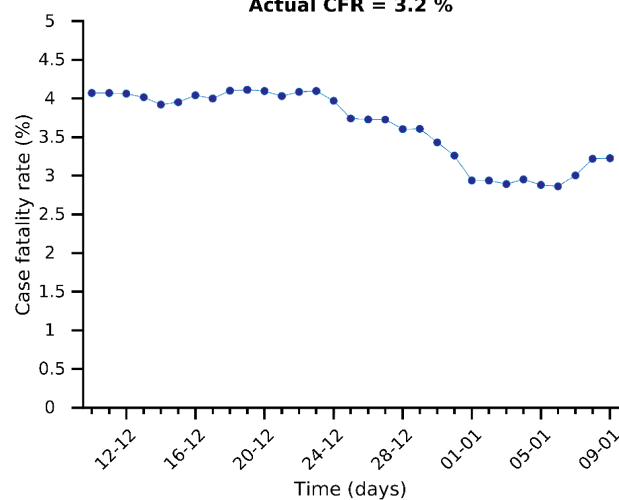
BIOCOM-Cov2 Degree = 8



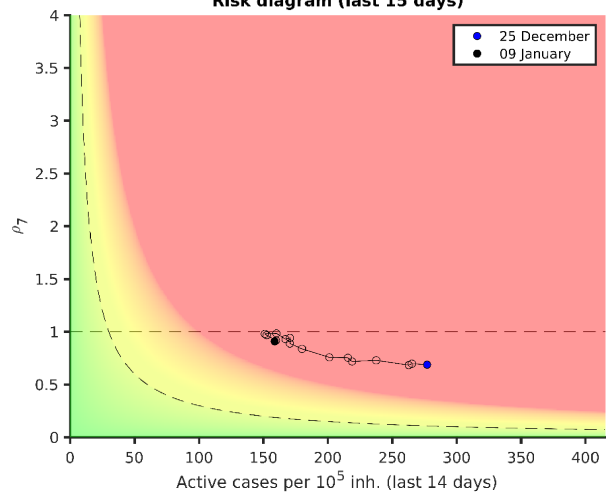
Actual $\rho_7 = 0.9$



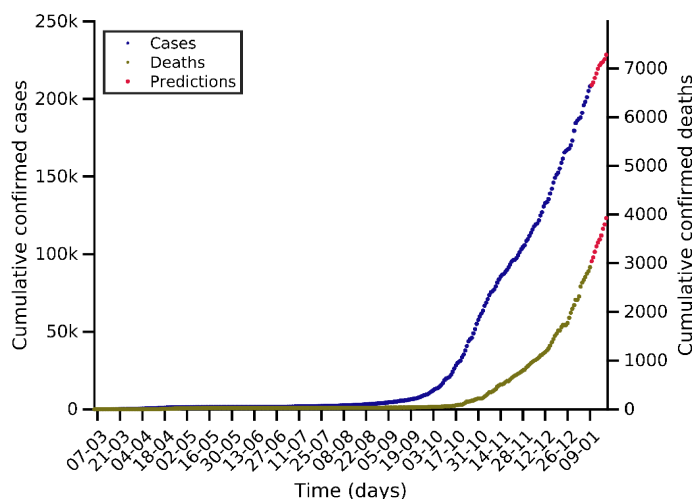
Actual CFR = 3.2 %



Risk diagram (last 15 days)



Slovakia 09-01-2021. Pop: 5.5M. Cumulative incidence: 3814/10⁵

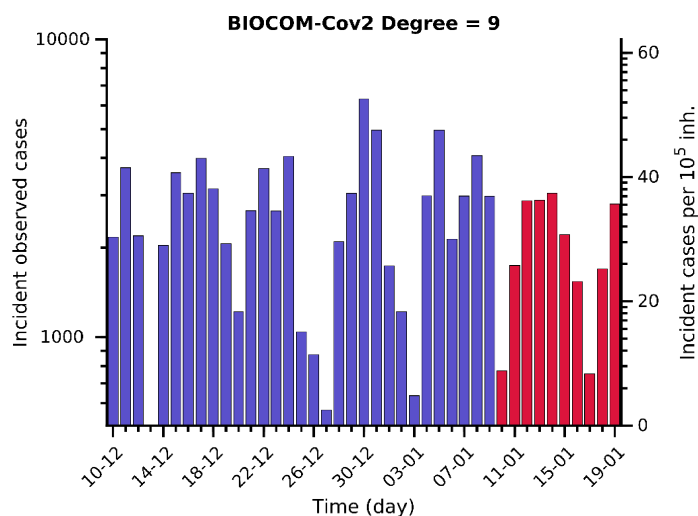
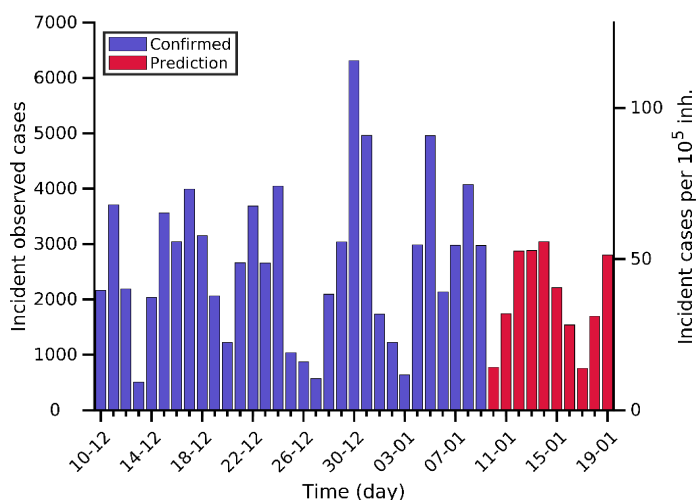


Predictions for next days

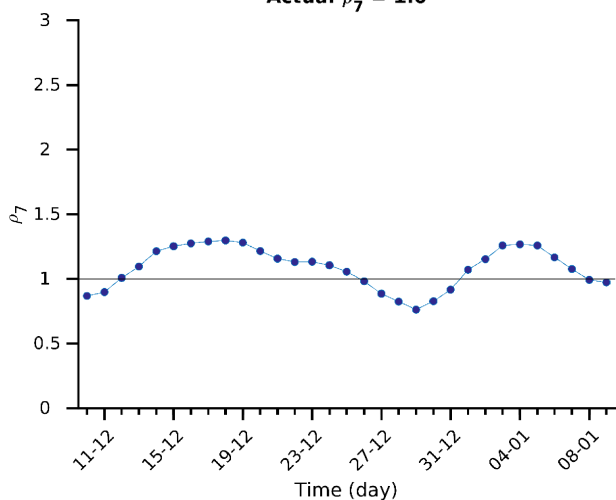
Day	Number of cases
12-01-2021	213593 (+5384)
16-01-2021	223271 (+15062)
19-01-2021	228524 (+20315)

Current indicators

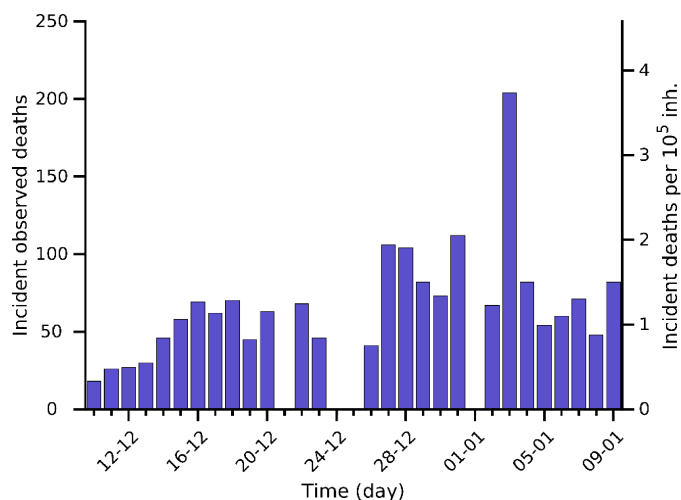
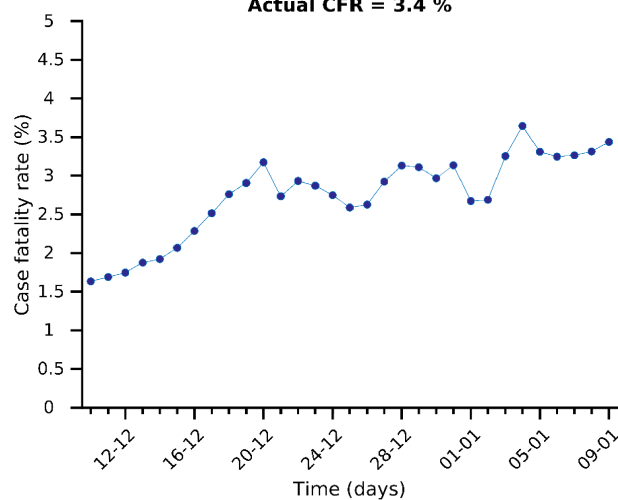
	A14	EPG	CFR	N7	D7
Today	745	725	3.44 %	2964	86
A Week ago	662	763	2.69 %	2849	78
Maximum	745	856	4.79 %	3260	92



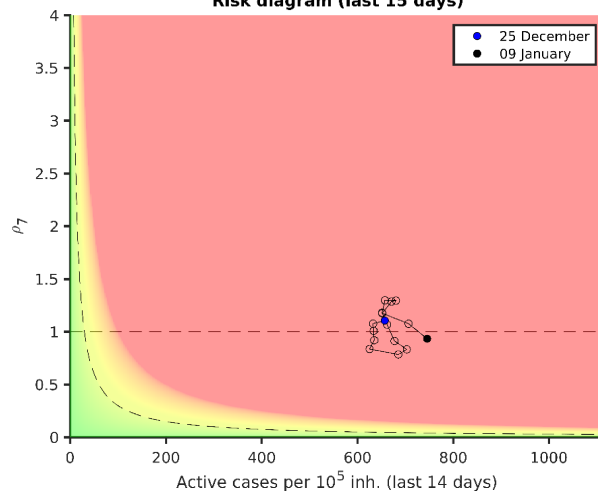
Actual $\rho_7 = 1.0$



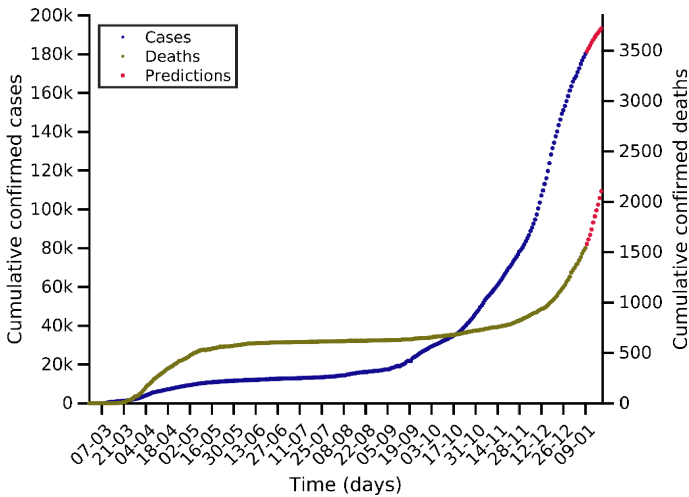
Actual CFR = 3.4 %



Risk diagram (last 15 days)

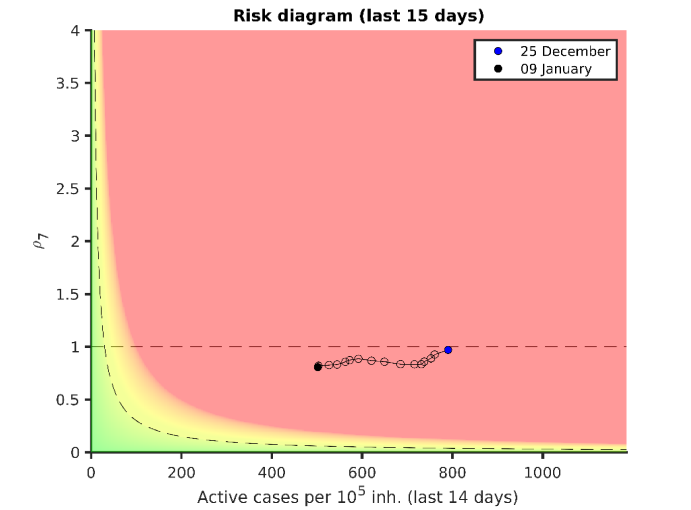
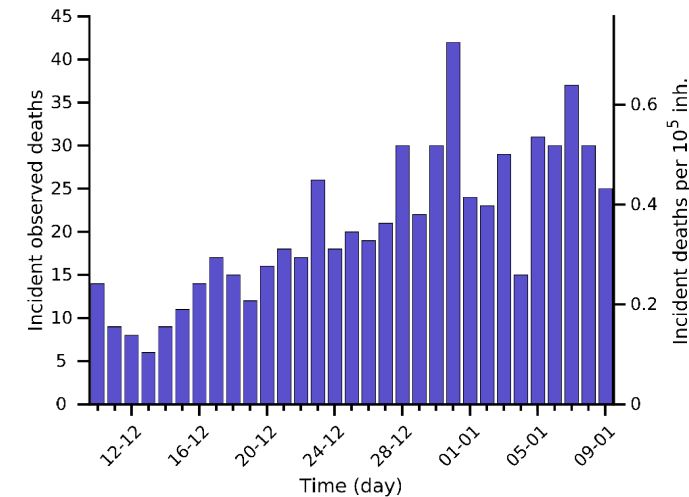
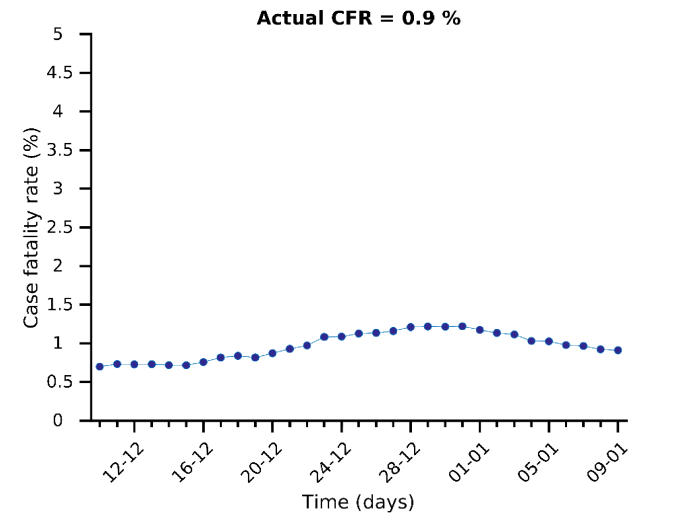
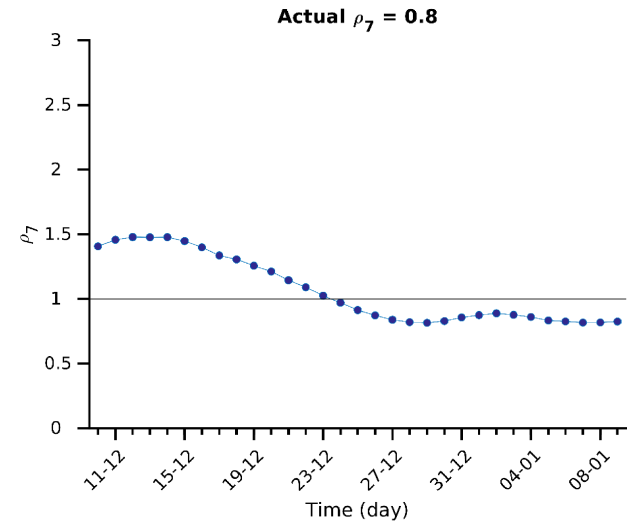
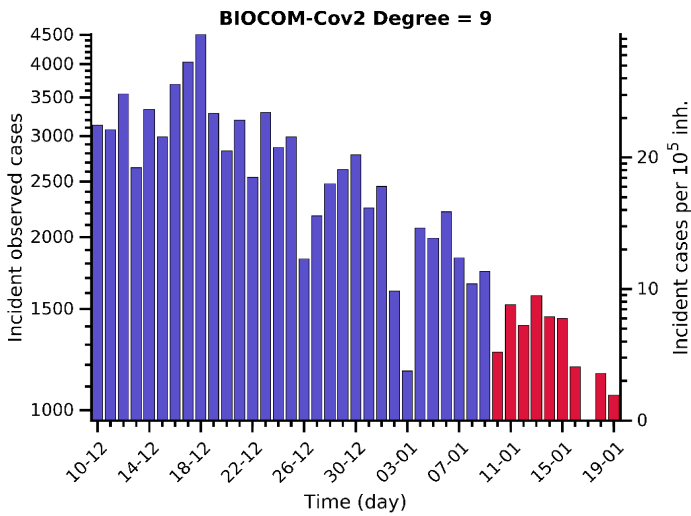
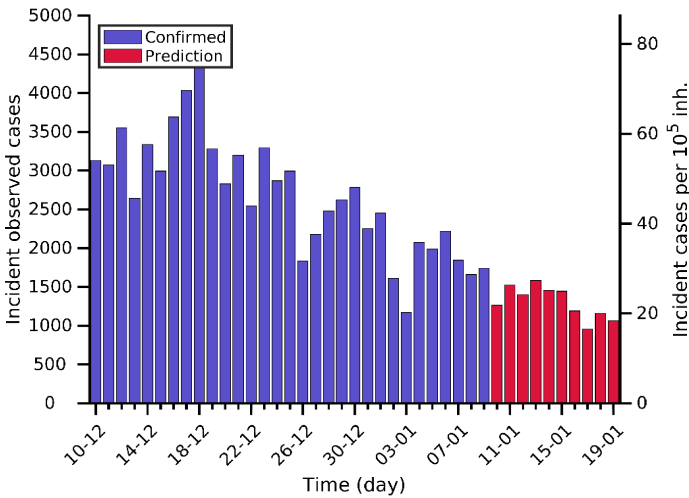


Denmark 09-01-2021. Pop: 5.8M. Cumulative incidence: 3112/10⁵

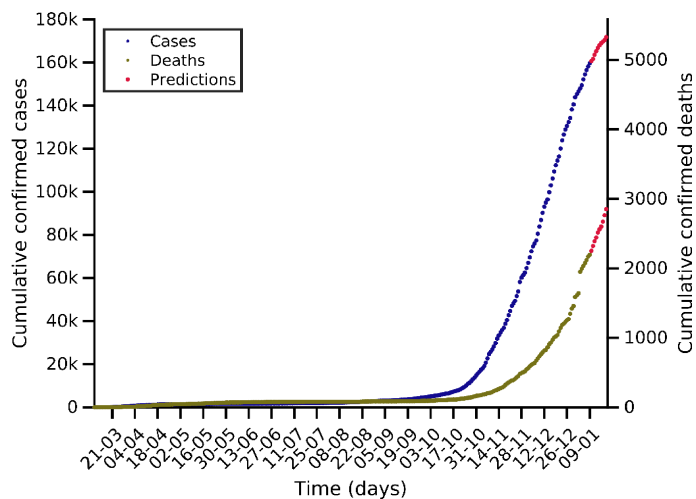


Predictions for next days	
Day	Number of cases
12-01-2021	184432 (+4192)
16-01-2021	190103 (+9863)
19-01-2021	193284 (+13044)

Current indicators					
	A14	EPG	CFR	N7	D7
Today	502	414	0.91 %	1814	28
A Week ago	620	551	1.13 %	2339	27
Maximum	796	937	4.41 %	3537	29



Lithuania 09-01-2021. Pop: 2.7M. Cumulative incidence: 5865/10⁵

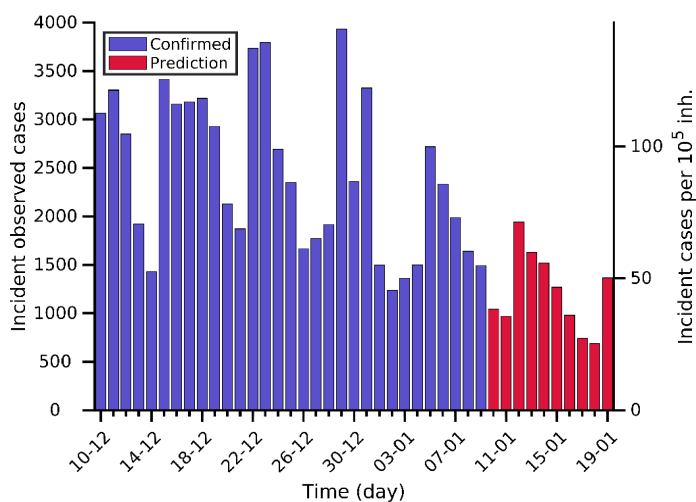


Predictions for next days

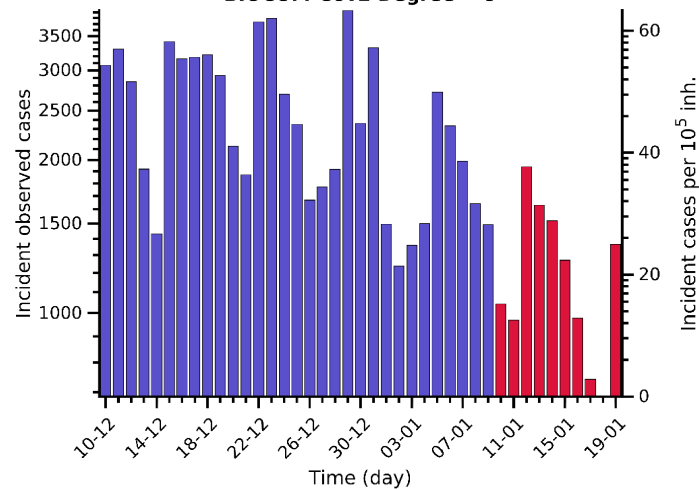
Day	Number of cases
12-01-2021	163624 (+3952)
16-01-2021	169021 (+9349)
19-01-2021	171813 (+12141)

Current indicators

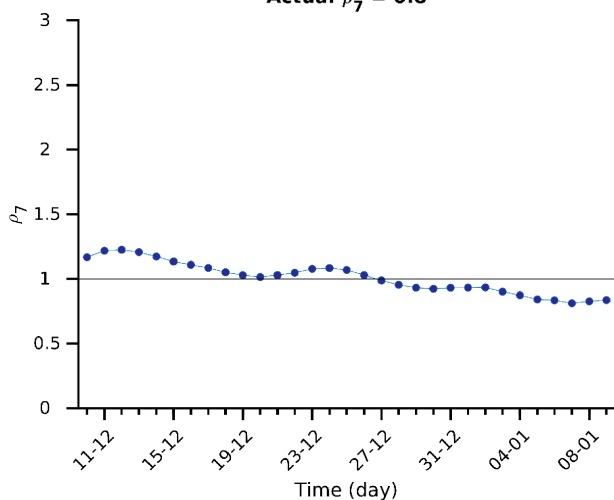
	A14	EPG	CFR	N7	D7
Today	1068	893	2.50 %	1862	79
A Week ago	1259	1176	1.90 %	2291	56
Maximum	1470	1584	4.93 %	2980	97



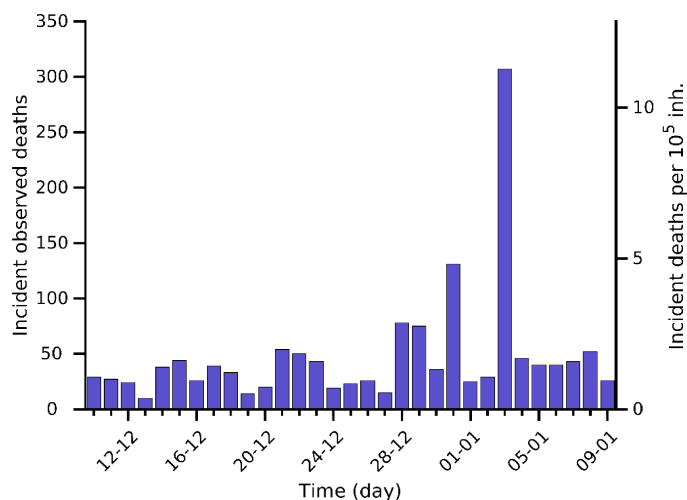
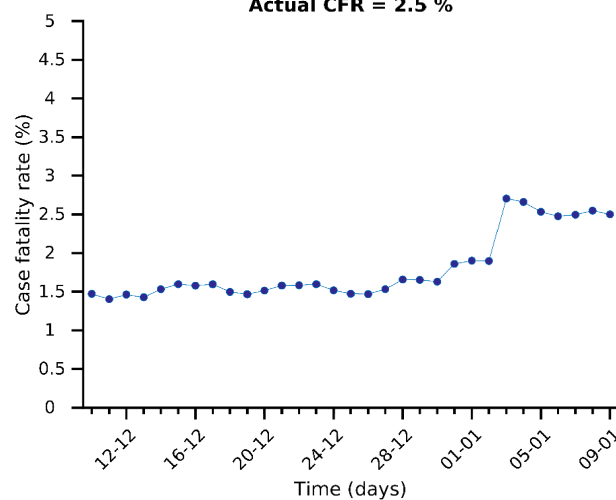
BIOCOM-Cov2 Degree = 9



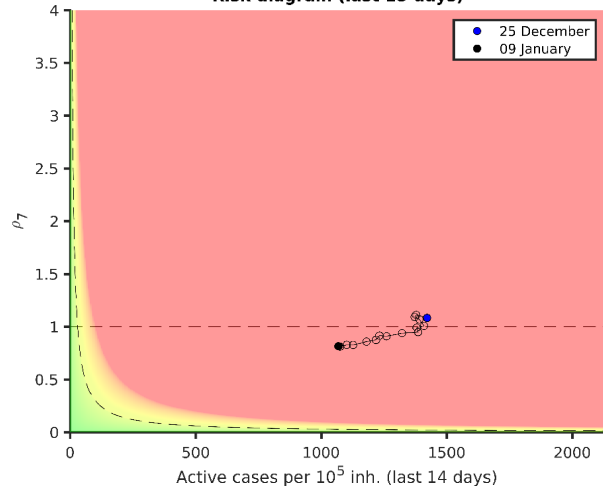
Actual $\rho_7 = 0.8$



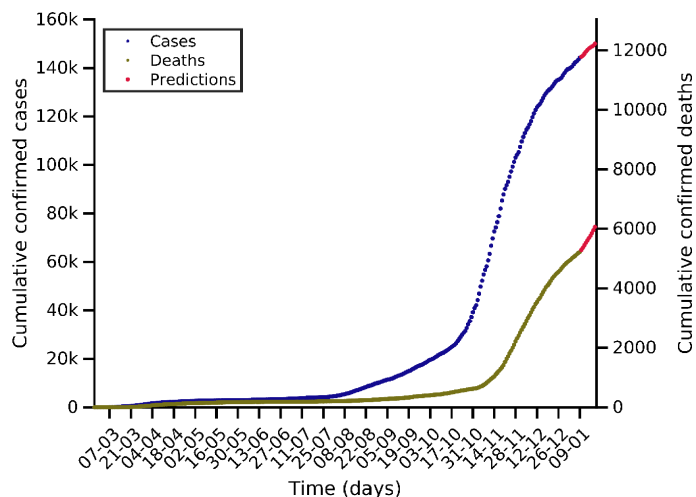
Actual CFR = 2.5 %



Risk diagram (last 15 days)



Greece 09-01-2021. Pop: 10.4M. Cumulative incidence: 1384/10⁵

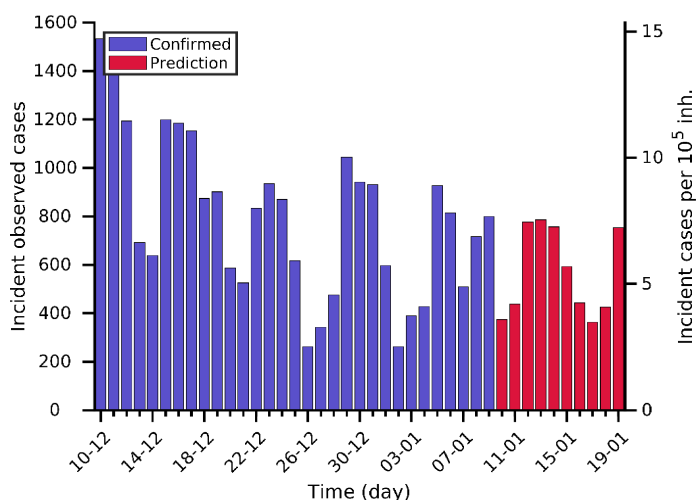


Predictions for next days

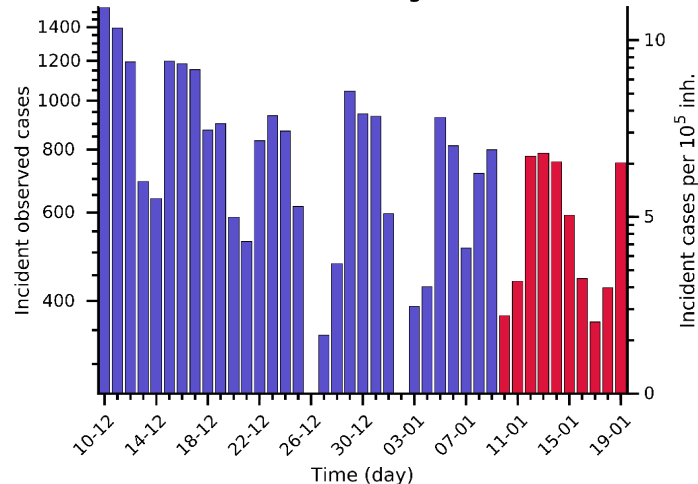
Day	Number of cases
12-01-2021	145881 (+1588)
16-01-2021	148461 (+4168)
19-01-2021	150003 (+5710)

Current indicators

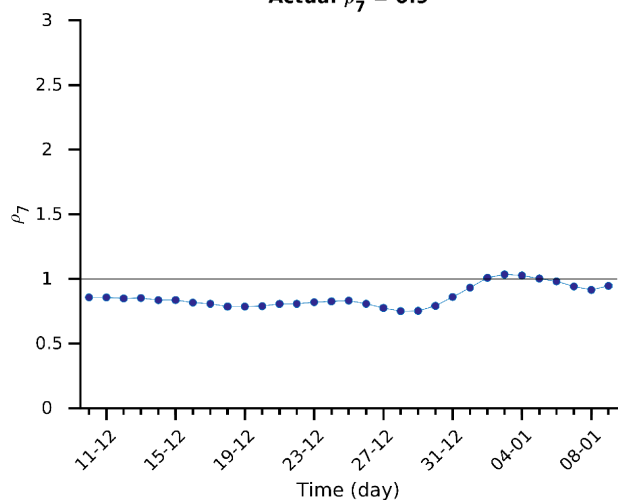
	A14	EPG	CFR	N7	D7
Today	88	83	4.23 %	655	44
A Week ago	88	89	3.94 %	656	53
Maximum	341	371	4.95 %	2673	101



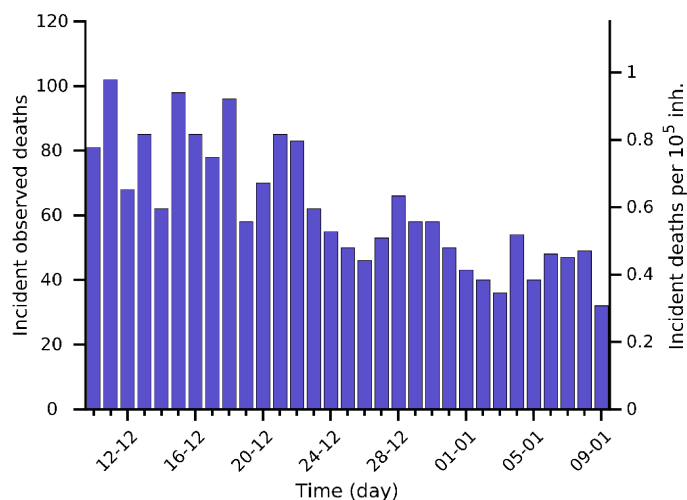
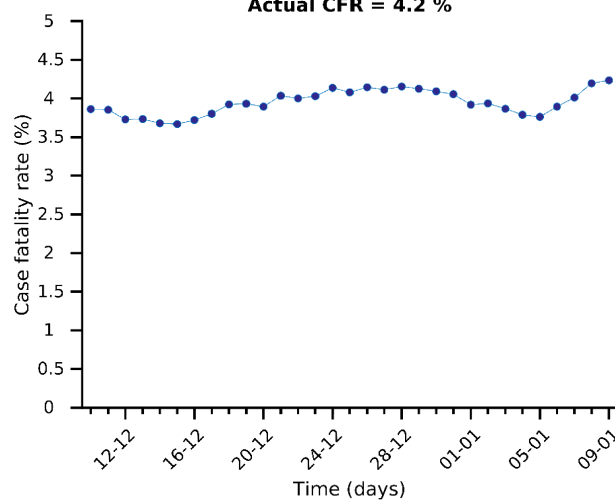
BIOCOM-Cov2 Degree = 7



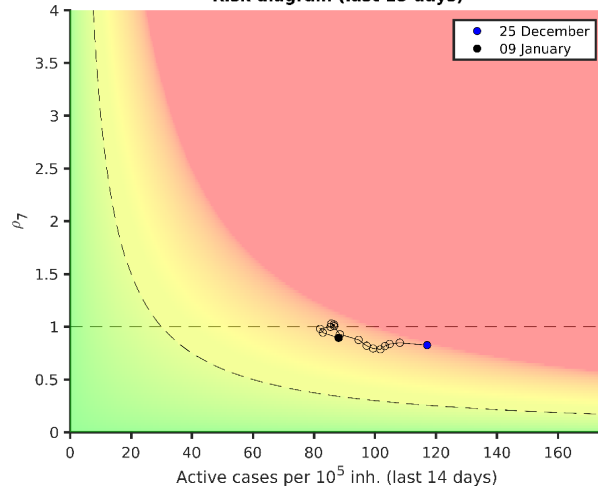
Actual $\rho_7 = 0.9$



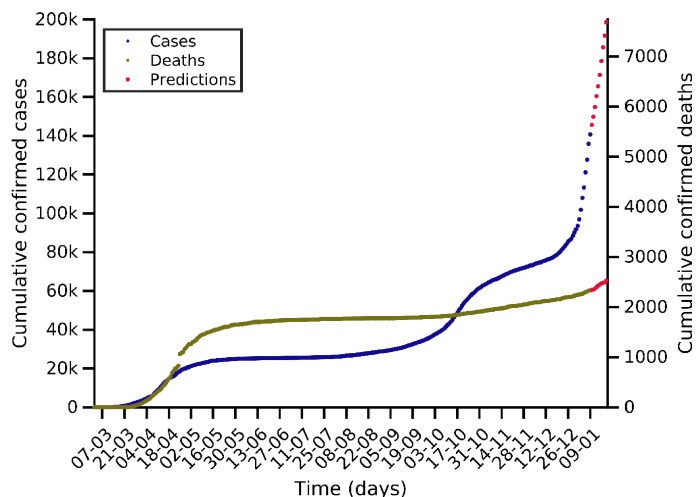
Actual CFR = 4.2 %



Risk diagram (last 15 days)



Ireland 09-01-2021. Pop: 4.9M. Cumulative incidence: 2850/10⁵

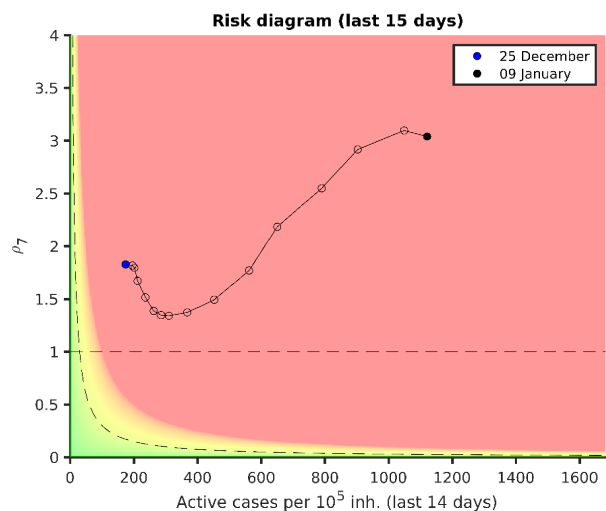
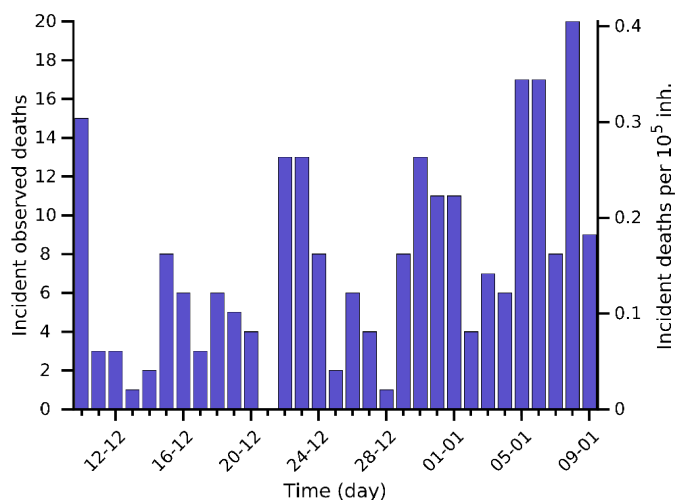
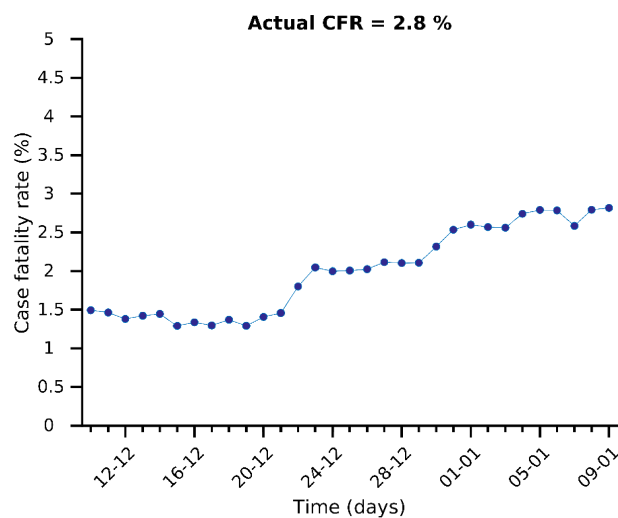
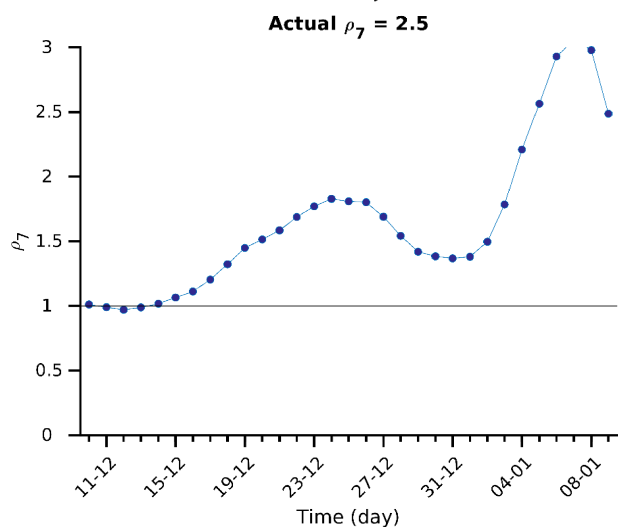
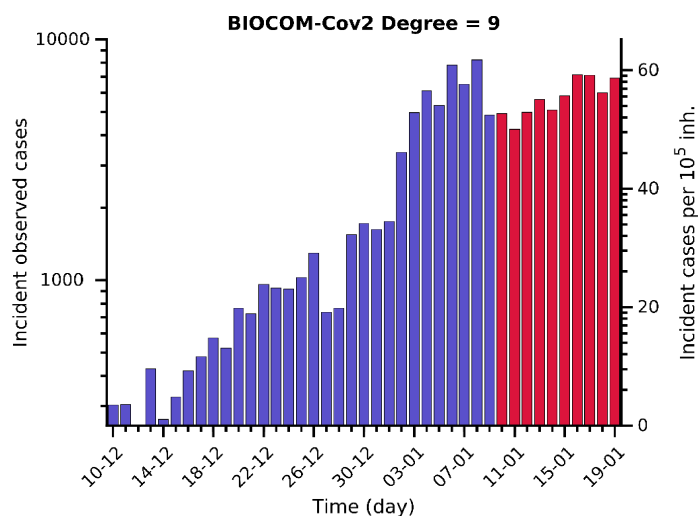
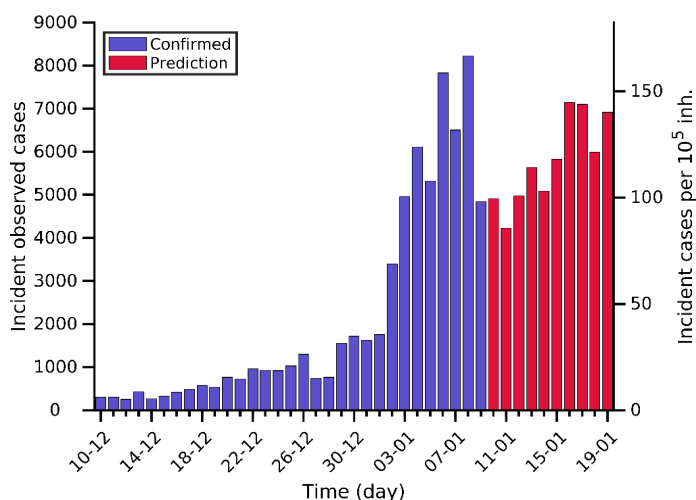


Predictions for next days

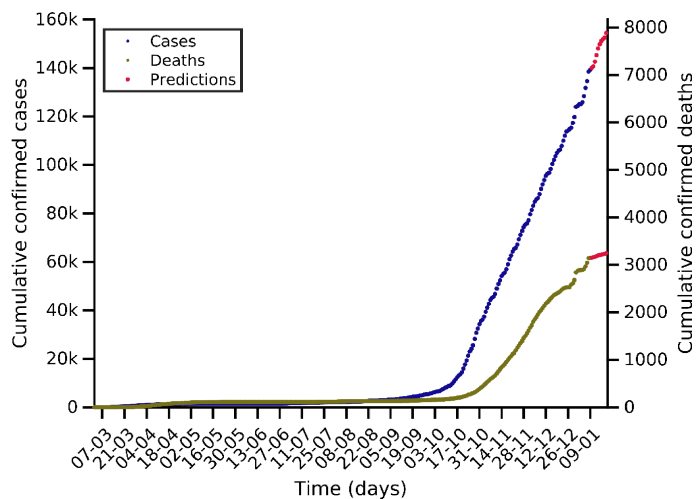
Day	Number of cases
12-01-2021	154850 (+14123)
16-01-2021	178548 (+37821)
19-01-2021	198556 (+57829)

Current indicators

	A14	EPG	CFR	N7	D7
Today	1121	2787	2.82 %	6257	12
A Week ago	368	550	2.57 %	1647	7
Maximum	1121	3123	4.93 %	6257	70



Slovenia 09-01-2021. Pop: 2.1M. Cumulative incidence: 6700/10⁵

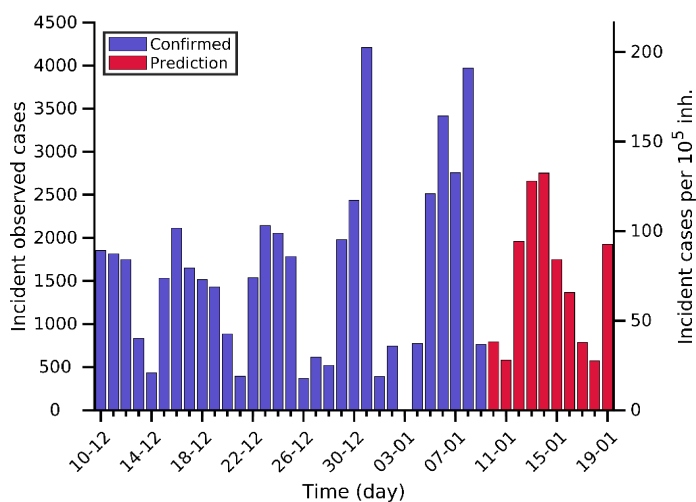


Predictions for next days

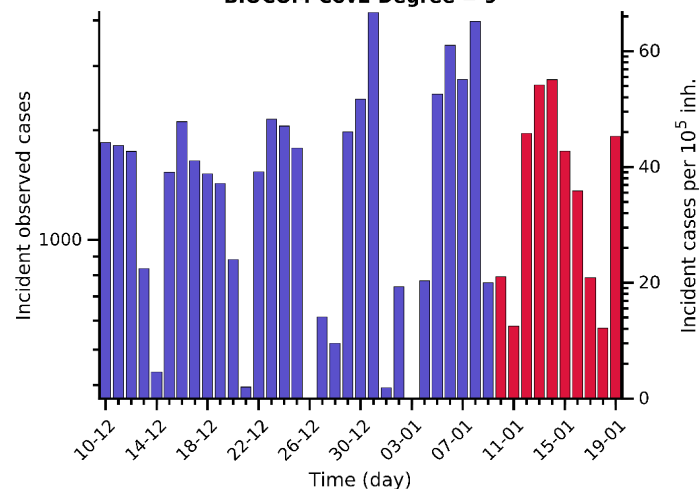
Day	Number of cases
12-01-2021	142616 (+3335)
16-01-2021	151146 (+11865)
19-01-2021	154431 (+15150)

Current indicators

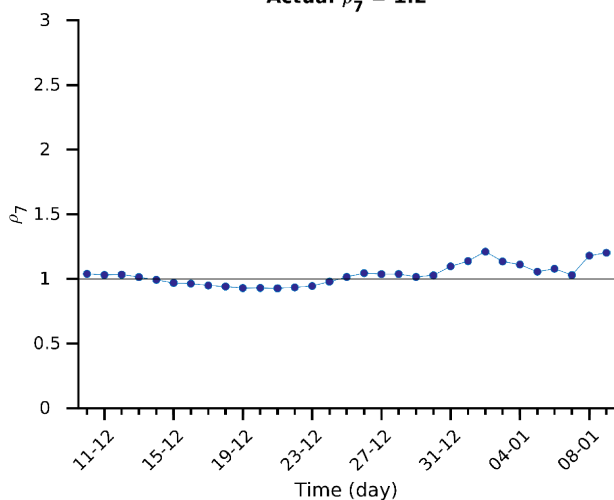
	A14	EPG	CFR	N7	D7
Today	1207	1451	3.05 %	2028	37
A Week ago	965	1168	2.30 %	1556	51
Maximum	1207	1569	4.99 %	2028	58



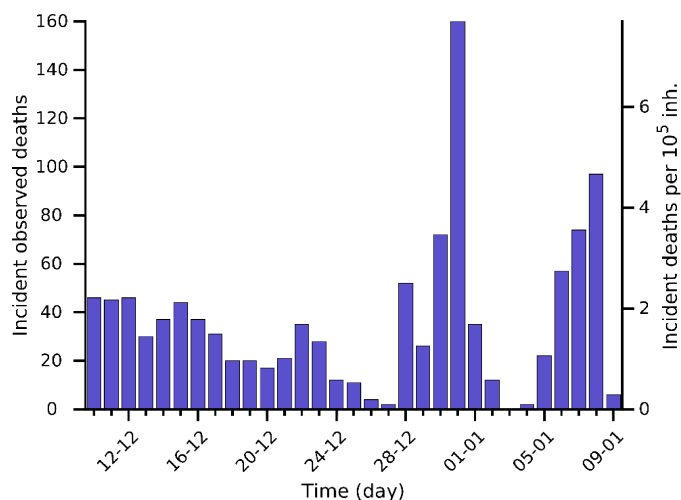
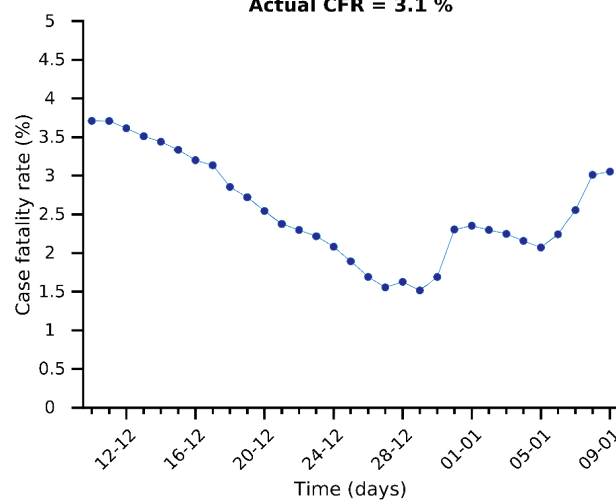
BIOCOM-Cov2 Degree = 9



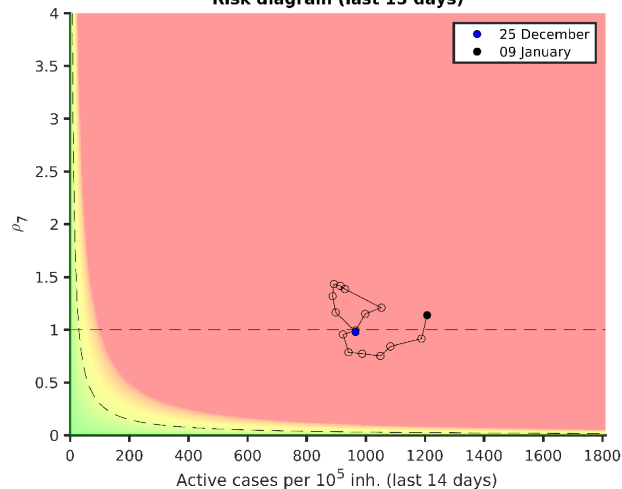
Actual $\rho_7 = 1.2$



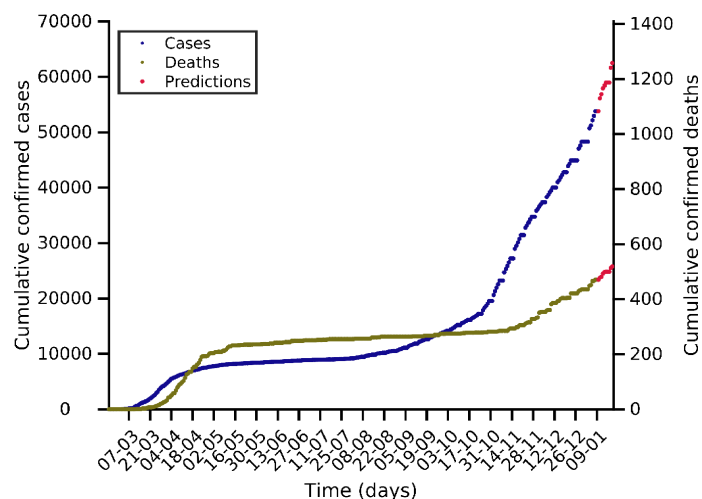
Actual CFR = 3.1 %



Risk diagram (last 15 days)



Norway 09-01-2021. Pop: 5.4M. Cumulative incidence: 992/10⁵

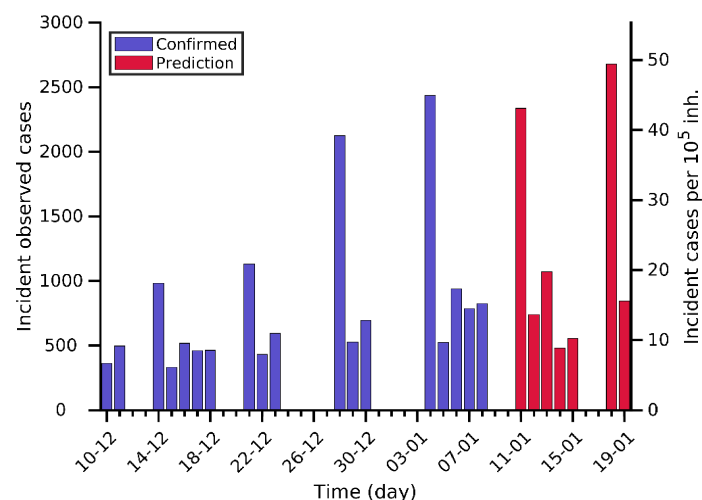


Predictions for next days

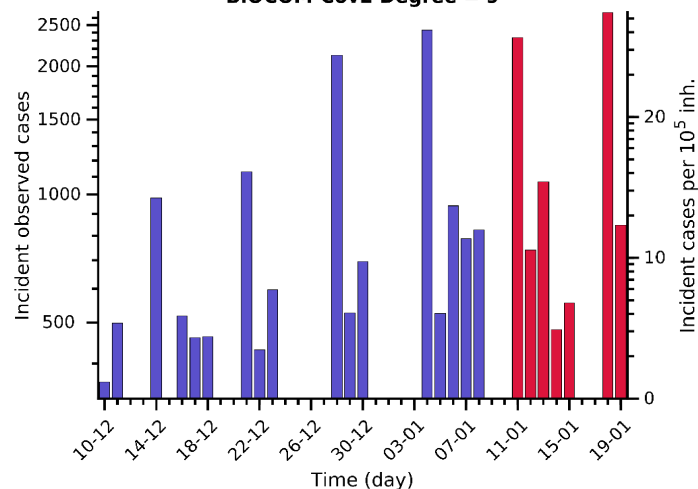
Day	Number of cases
12-01-2021	56868 (+3076)
16-01-2021	58975 (+5183)
19-01-2021	62500 (+8708)

Current indicators

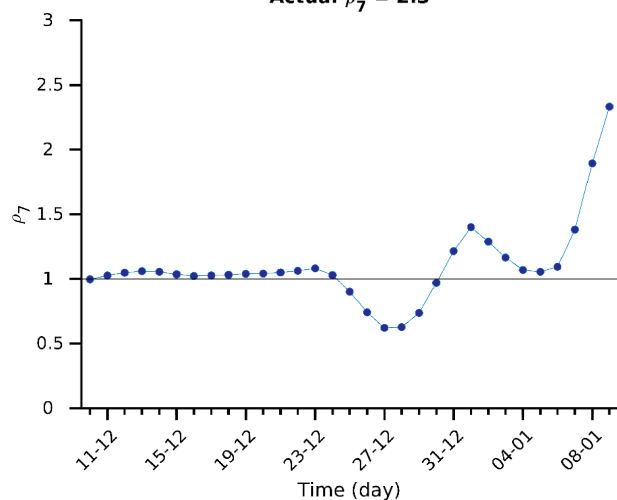
	A14	EPG	CFR	N7	D7
Today	163	381	0.93 %	788	5
A Week ago	102	131	0.61 %	478	2
Maximum	163	381	4.97 %	788	8



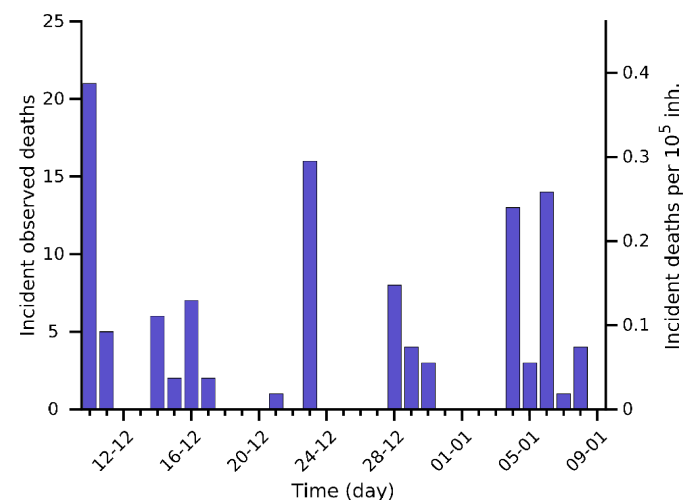
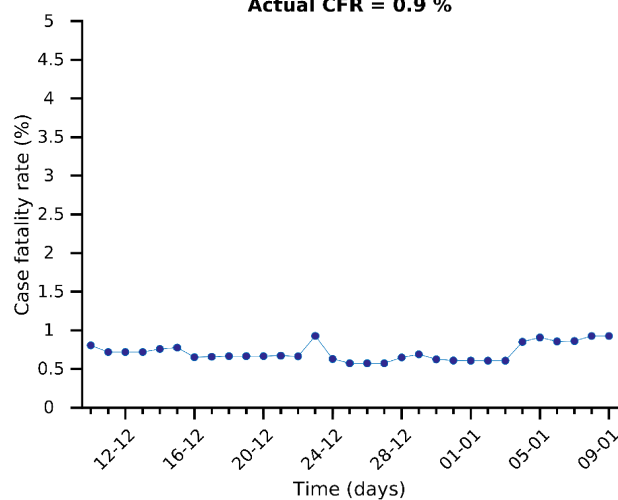
BIOCOM-Cov2 Degree = 9



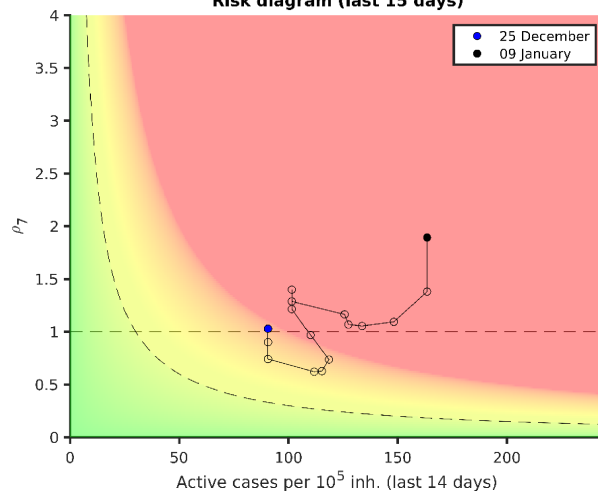
Actual $\rho_7 = 2.3$



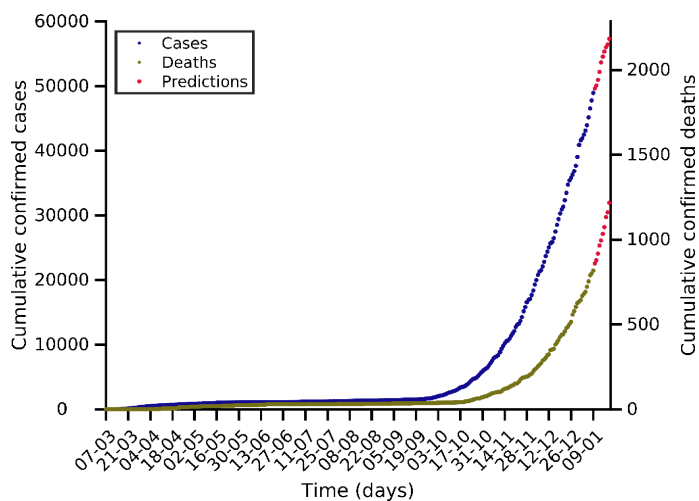
Actual CFR = 0.9 %



Risk diagram (last 15 days)



Latvia 09-01-2021. Pop: 1.9M. Cumulative incidence: 2595/10⁵

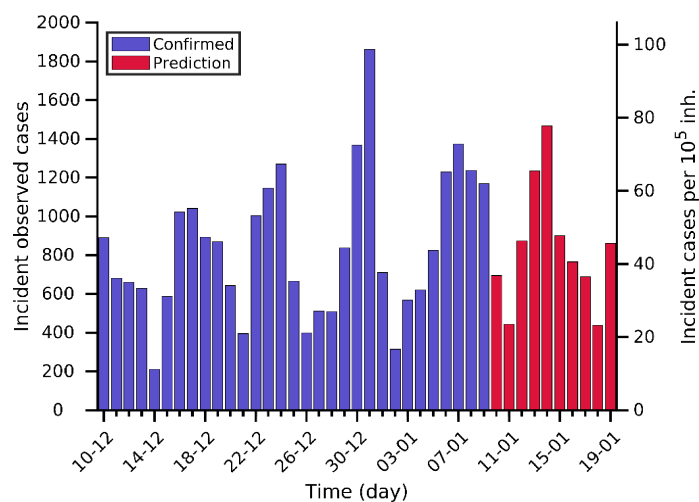


Predictions for next days

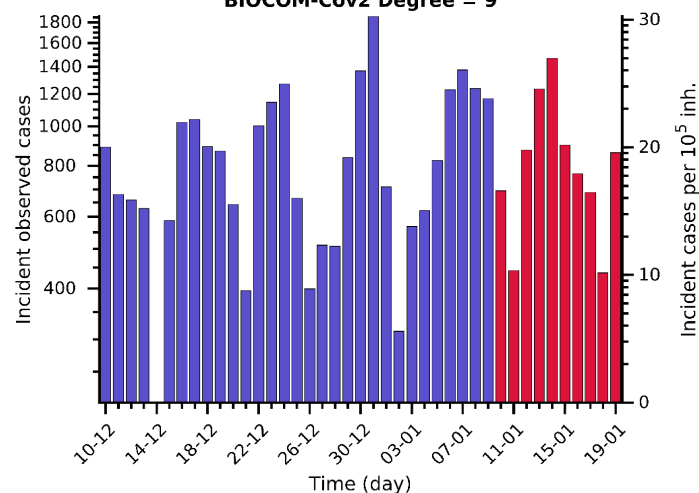
Day	Number of cases
12-01-2021	50965 (+2013)
16-01-2021	55333 (+6381)
19-01-2021	57320 (+8368)

Current indicators

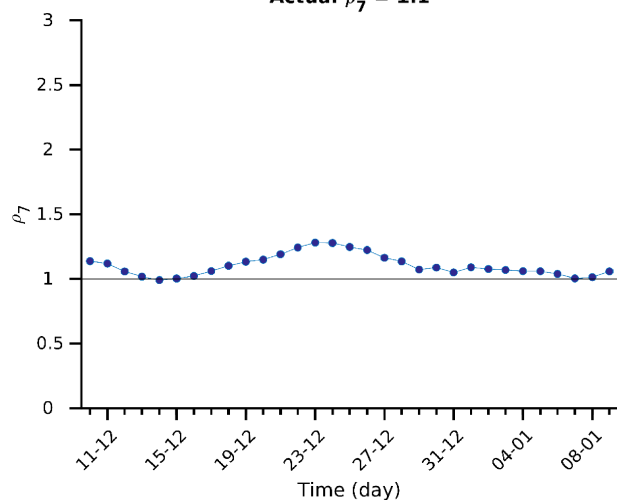
	A14	EPG	CFR	N7	D7
Today	696	737	3.19 %	1003	21
A Week ago	617	664	2.84 %	873	22
Maximum	696	748	4.88 %	1003	22



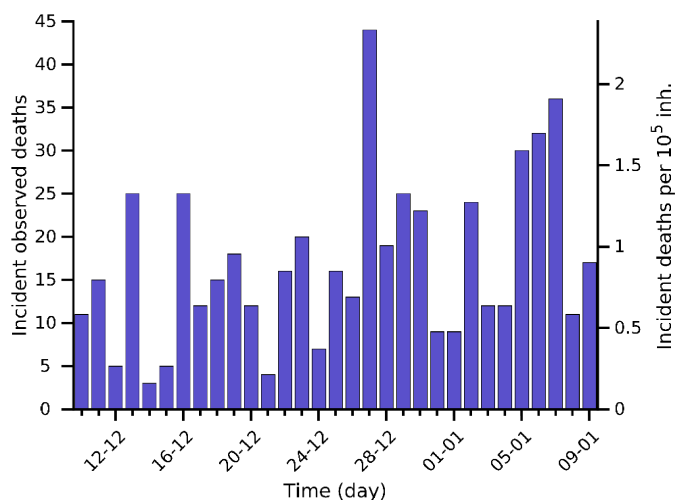
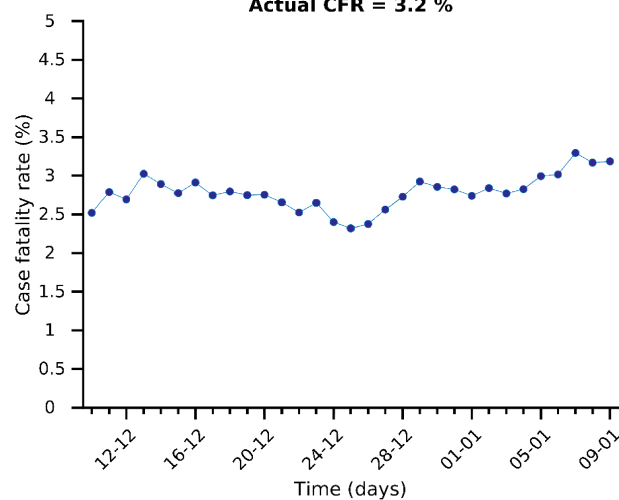
BIOCOM-Cov2 Degree = 9



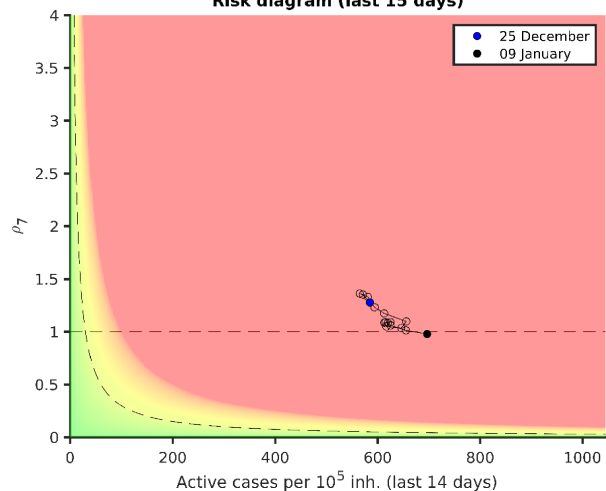
Actual $\rho_7 = 1.1$



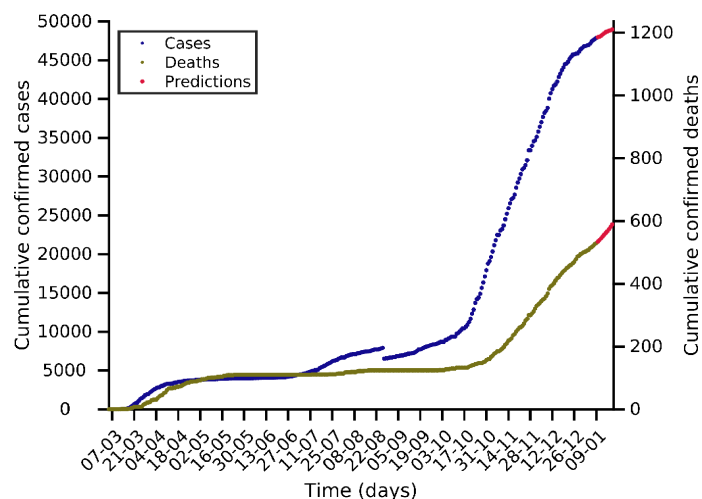
Actual CFR = 3.2 %



Risk diagram (last 15 days)



Luxembourg 09-01-2021. Pop: 0.6M. Cumulative incidence: 7648/10⁵

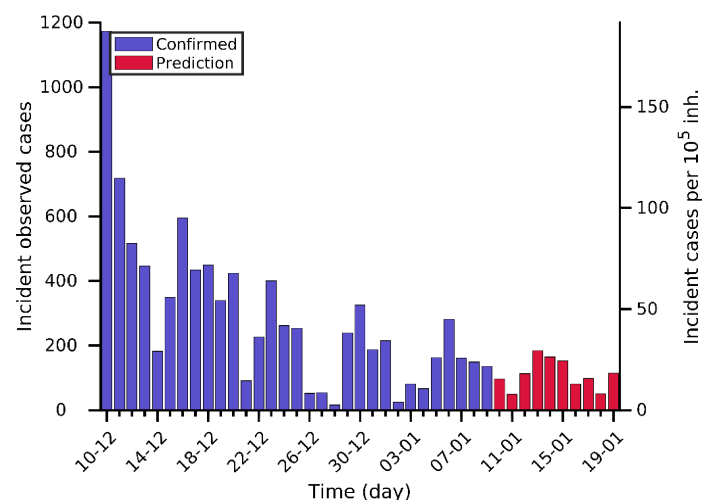


Predictions for next days

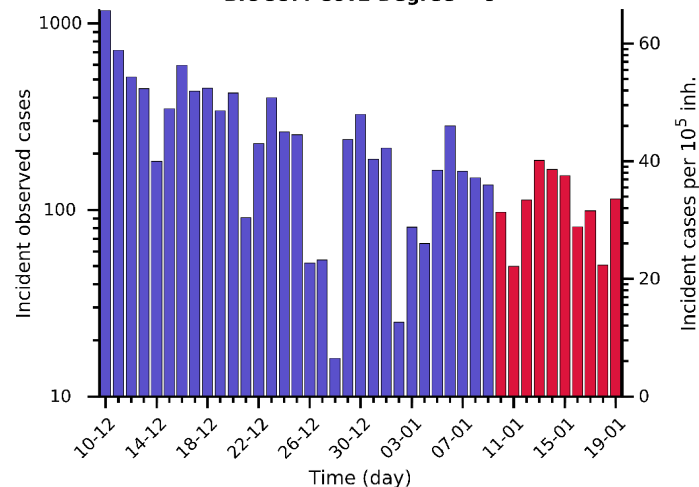
Day	Number of cases
12-01-2021	48136 (+260)
16-01-2021	48719 (+843)
19-01-2021	48983 (+1107)

Current indicators

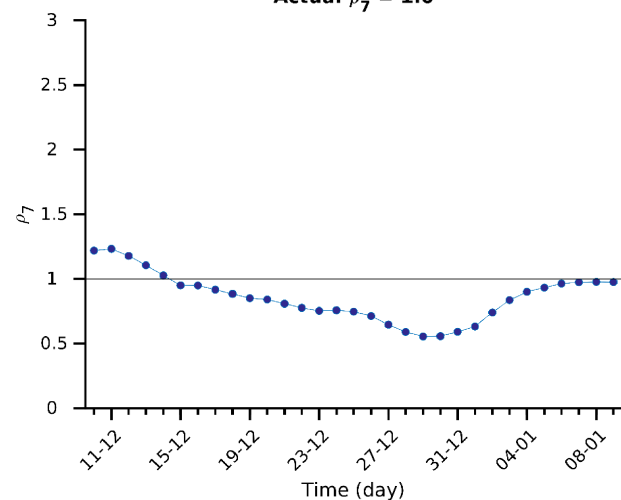
	A14	EPG	CFR	N7	D7
Today	335	327	0.85 %	148	4
A Week ago	443	328	0.80 %	152	5
Maximum	1431	3122	4.03 %	684	8



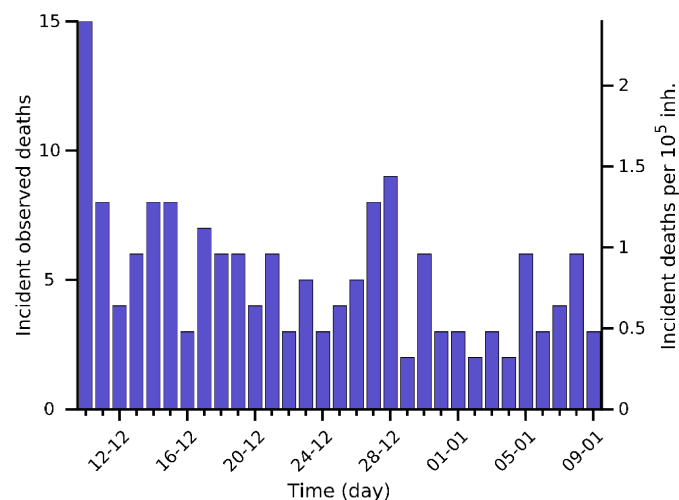
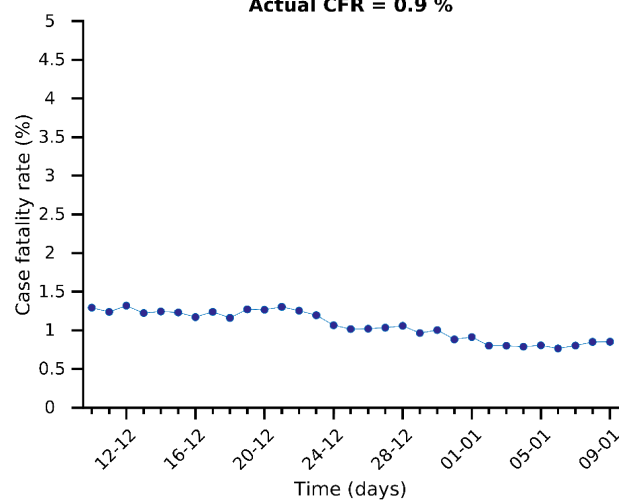
BIOCOM-Cov2 Degree = 9



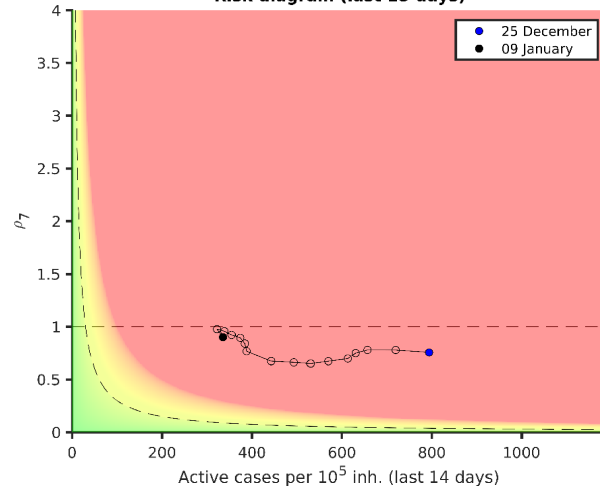
Actual $\rho_7 = 1.0$



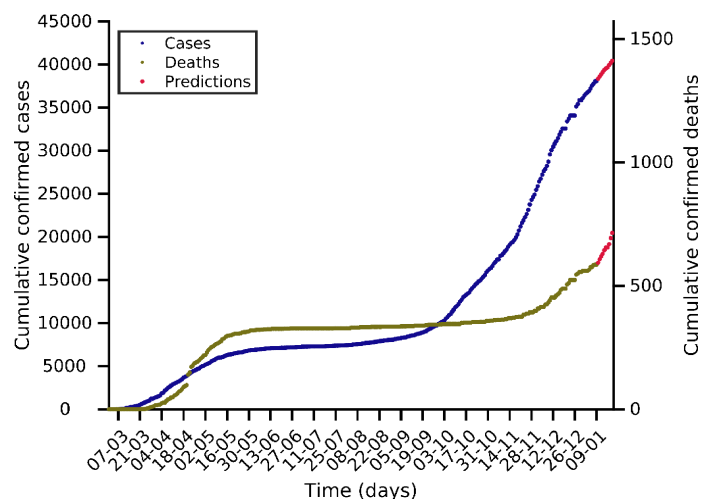
Actual CFR = 0.9 %



Risk diagram (last 15 days)



Finland 09-01-2021. Pop: 5.5M. Cumulative incidence: 687/10⁵

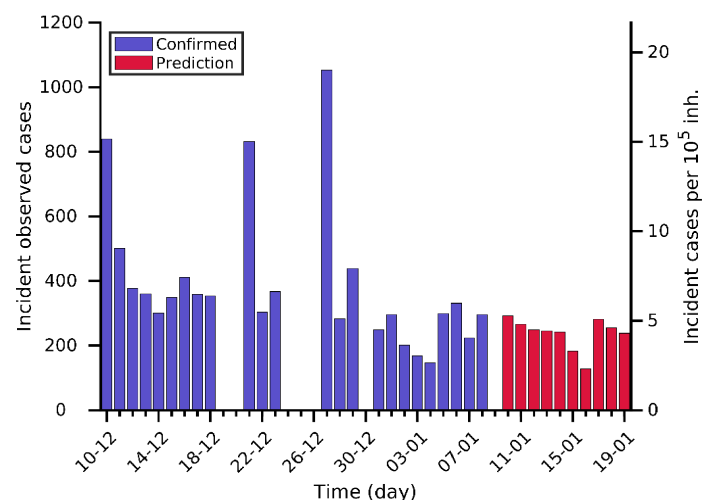


Predictions for next days

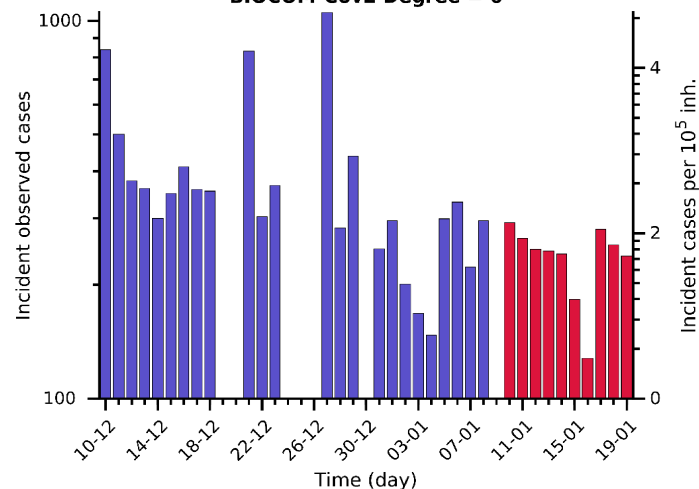
Day	Number of cases
12-01-2021	38874 (+806)
16-01-2021	39673 (+1605)
19-01-2021	40447 (+2379)

Current indicators

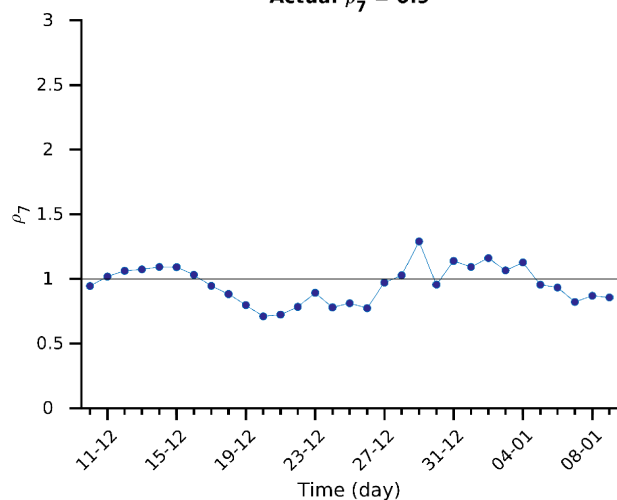
	A14	EPG	CFR	N7	D7
Today	72	62	1.16 %	209	4
A Week ago	73	84	1.17 %	360	5
Maximum	116	126	4.90 %	474	14



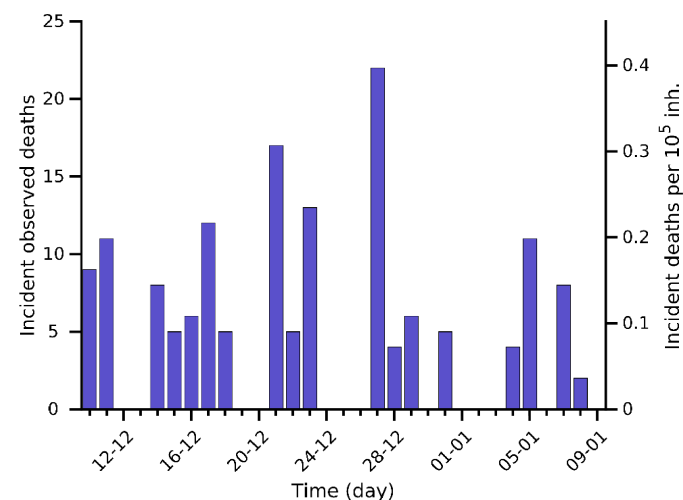
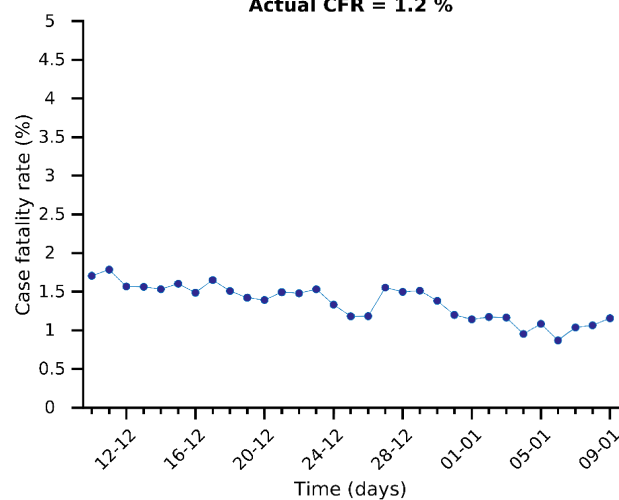
BIOCOM-Cov2 Degree = 6



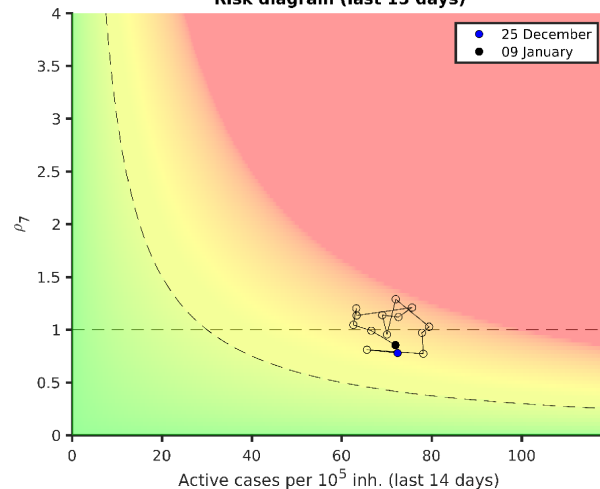
Actual $\rho_7 = 0.9$



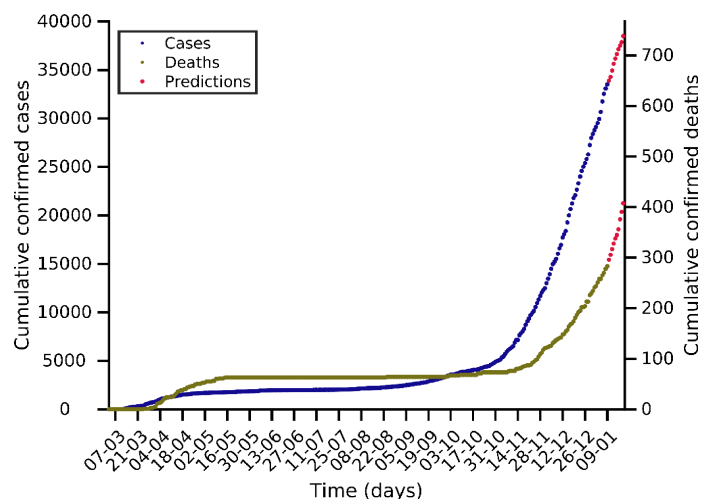
Actual CFR = 1.2 %



Risk diagram (last 15 days)



Estonia 09-01-2021. Pop: 1.3M. Cumulative incidence: 2527/10⁵

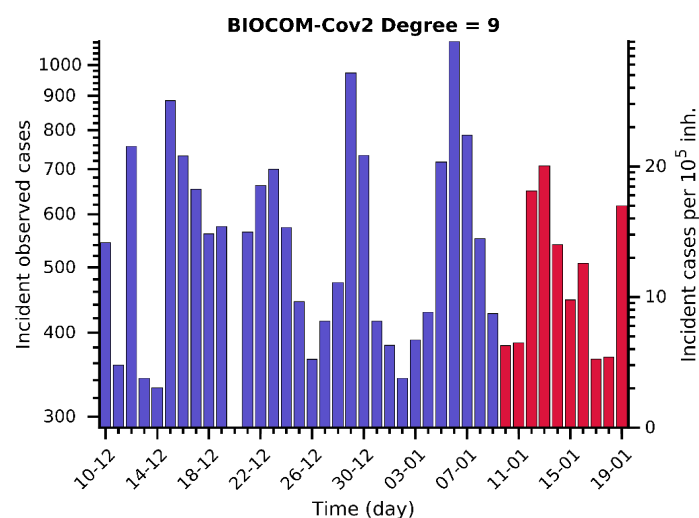
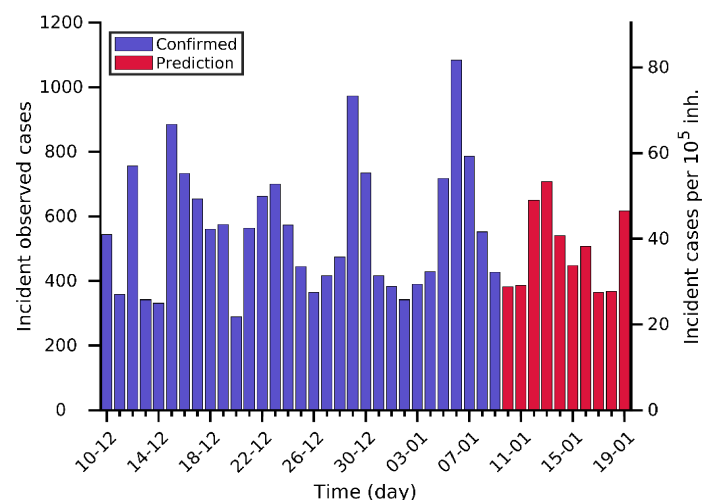


Predictions for next days

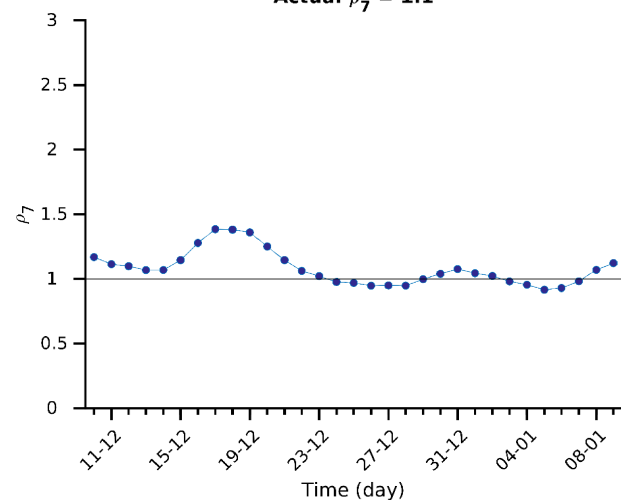
Day	Number of cases
12-01-2021	34934 (+1418)
16-01-2021	37137 (+3621)
19-01-2021	38487 (+4971)

Current indicators

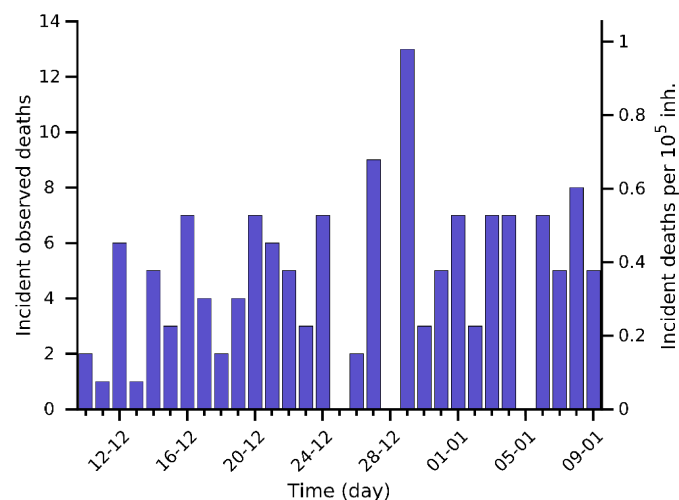
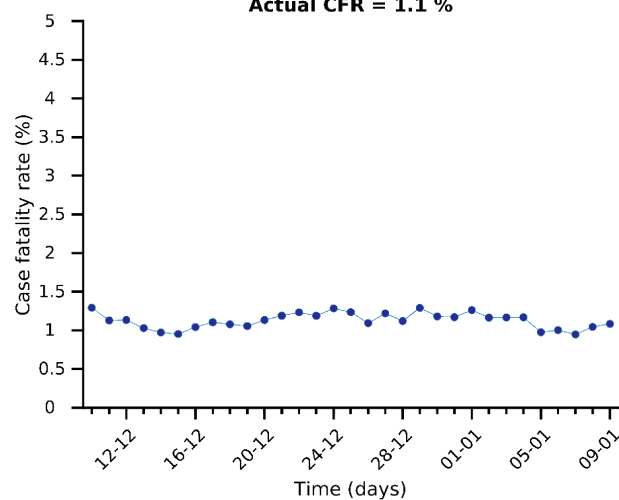
	A14	EPG	CFR	N7	D7
Today	612	687	1.08 %	626	6
A Week ago	553	566	1.16 %	534	6
Maximum	612	758	4.92 %	626	6



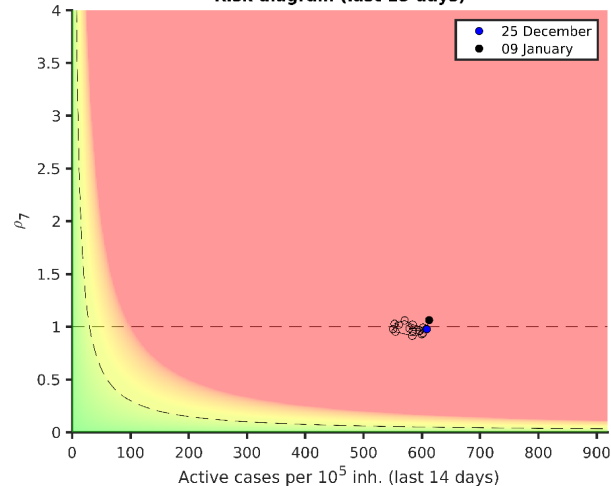
Actual $\rho_7 = 1.1$



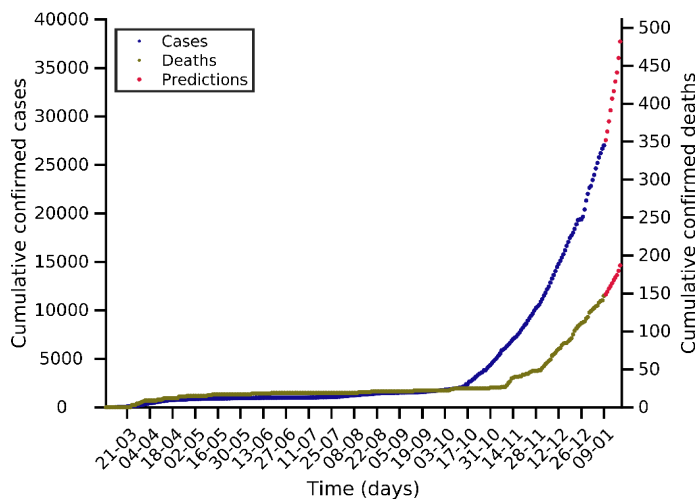
Actual CFR = 1.1 %



Risk diagram (last 15 days)



Cyprus 09-01-2021. Pop: 1.2M. Cumulative incidence: 2237/10⁵

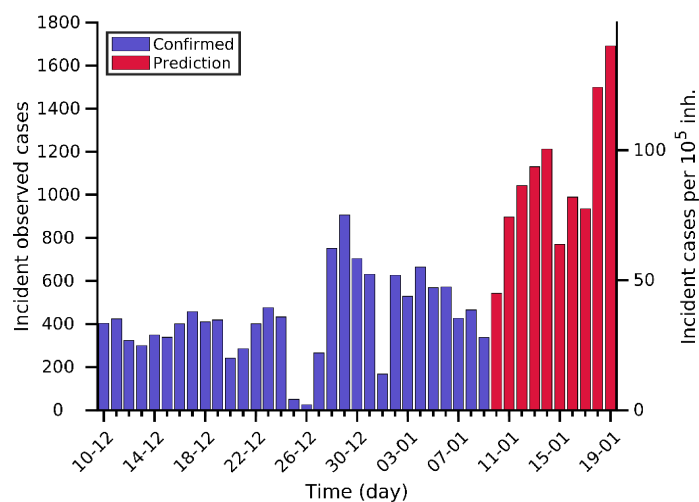


Predictions for next days

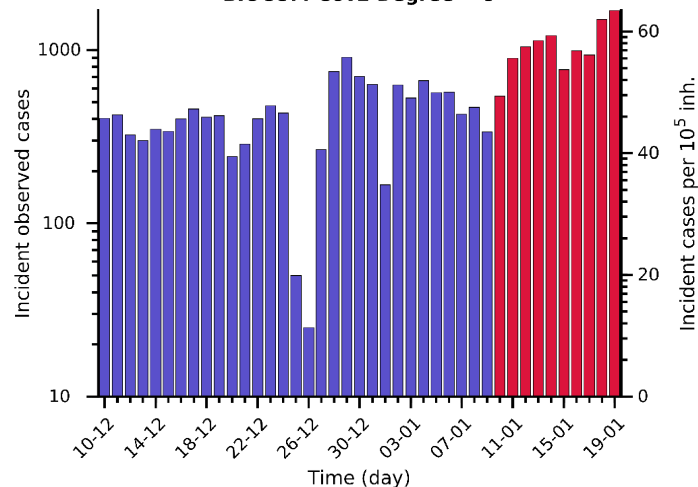
Day	Number of cases
12-01-2021	29495 (+2484)
16-01-2021	33599 (+6588)
19-01-2021	37726 (+10715)

Current indicators

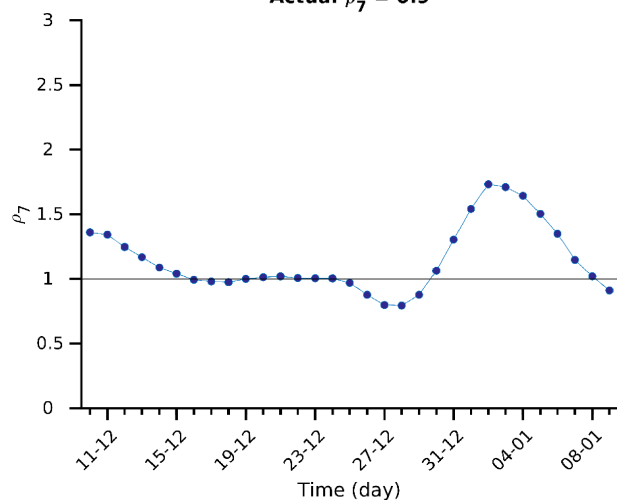
	A14	EPG	CFR	N7	D7
Today	631	575	0.68 %	509	3
A Week ago	494	856	0.88 %	579	3
Maximum	631	903	4.48 %	617	3



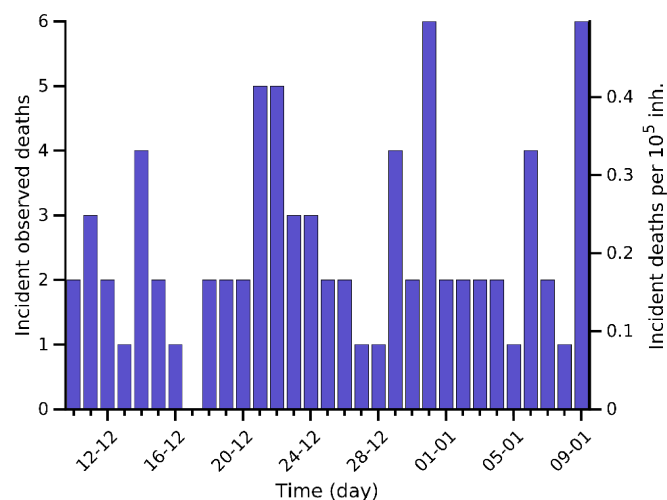
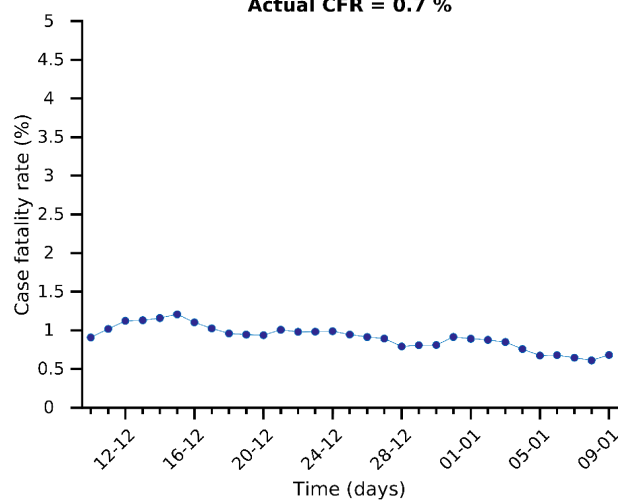
BIOCOM-Cov2 Degree = 9



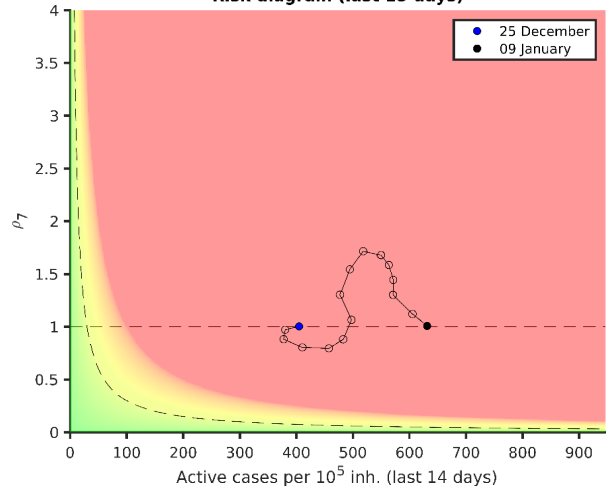
Actual $\rho_7 = 0.9$



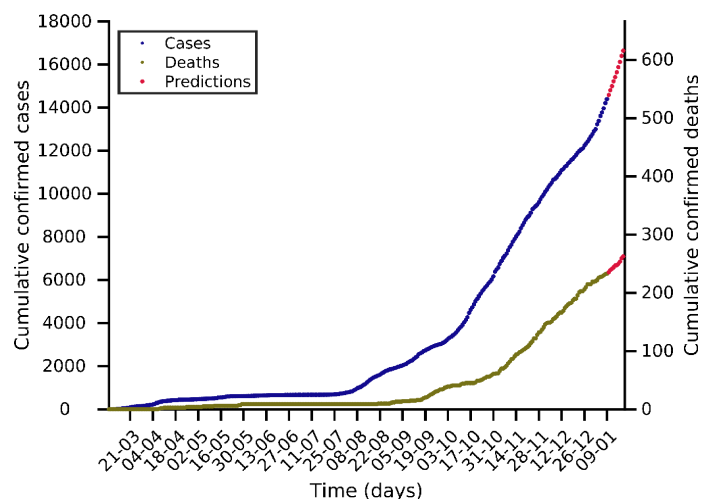
Actual CFR = 0.7 %



Risk diagram (last 15 days)



Malta 09-01-2021. Pop: 0.4M. Cumulative incidence: 3260/10⁵

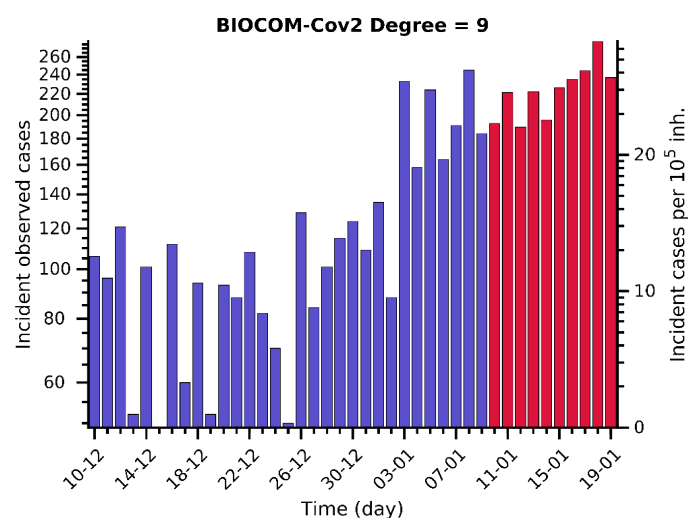
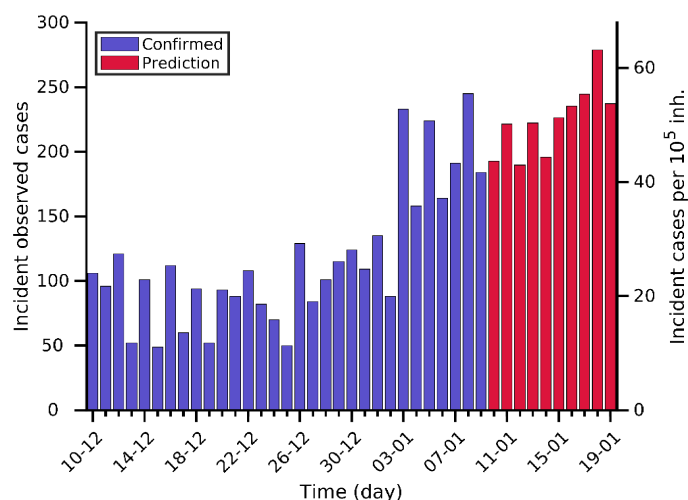


Predictions for next days

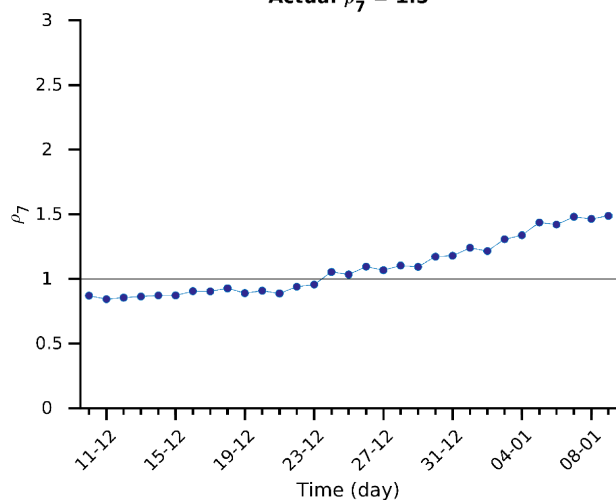
Day	Number of cases
12-01-2021	15000 (+604)
16-01-2021	15880 (+1484)
19-01-2021	16640 (+2244)

Current indicators

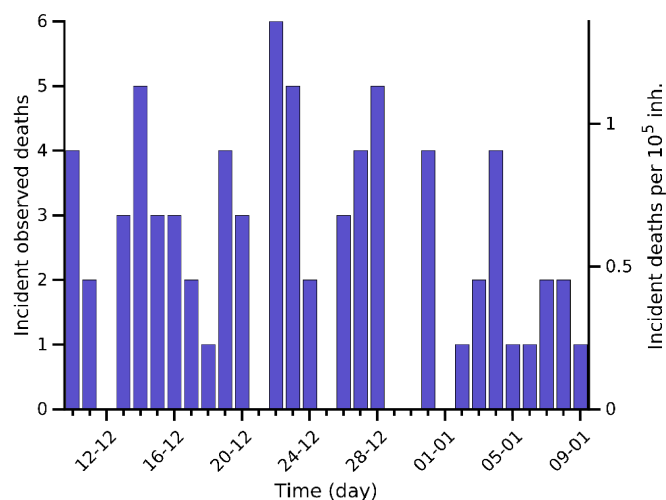
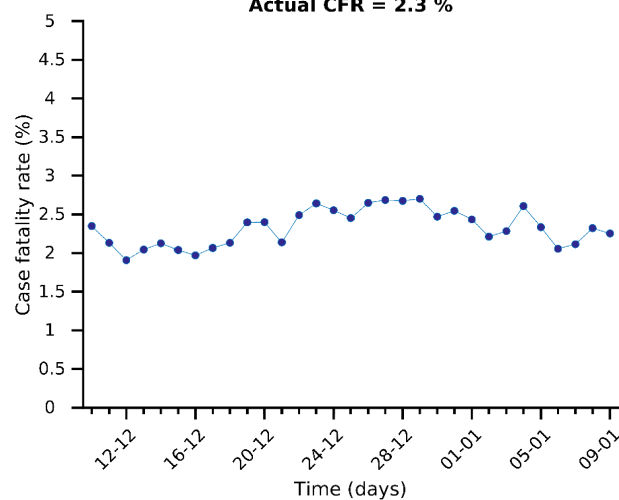
	A14	EPG	CFR	N7	D7
Today	488	726	2.25 %	200	2
A Week ago	312	379	2.21 %	108	2
Maximum	488	726	4.68 %	200	4



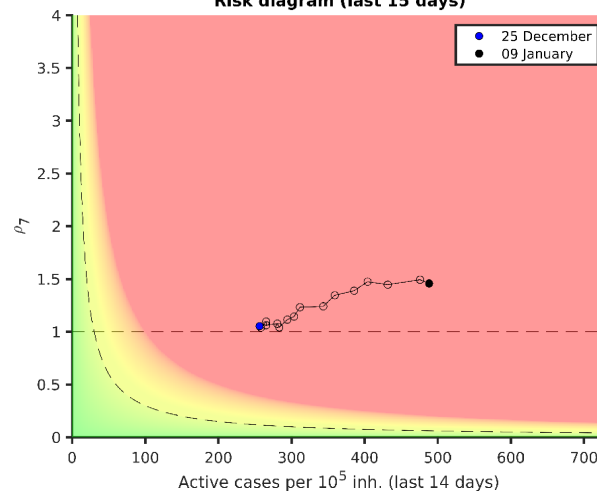
Actual $\rho_7 = 1.5$



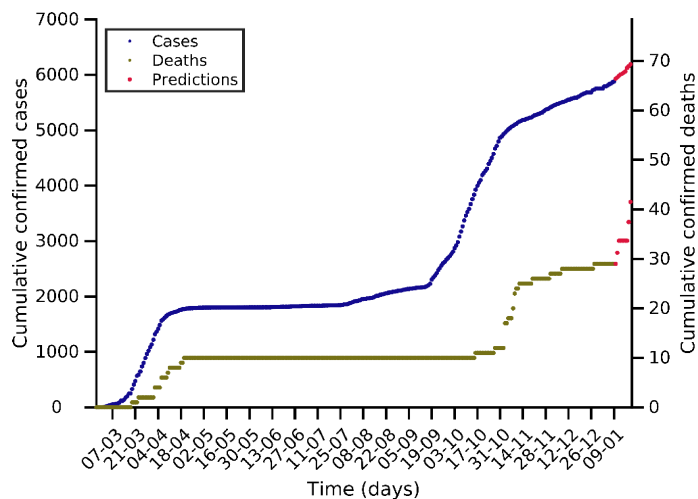
Actual CFR = 2.3 %



Risk diagram (last 15 days)



Iceland 09-01-2021. Pop: 0.3M. Cumulative incidence: 1723/10⁵

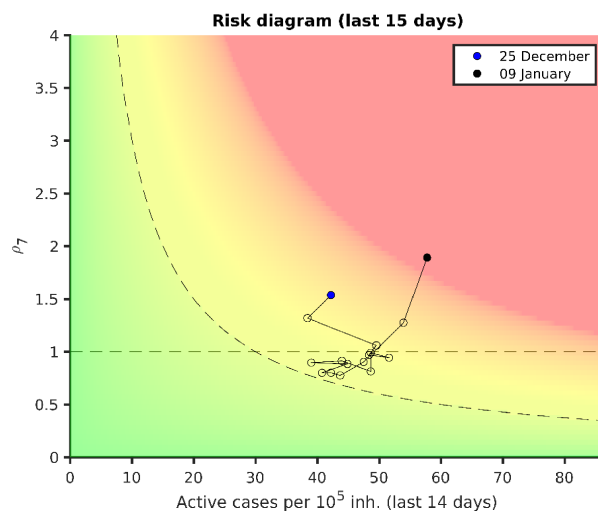
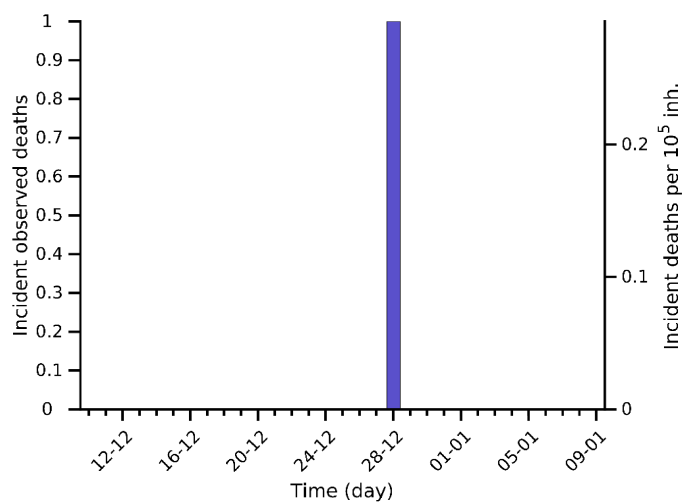
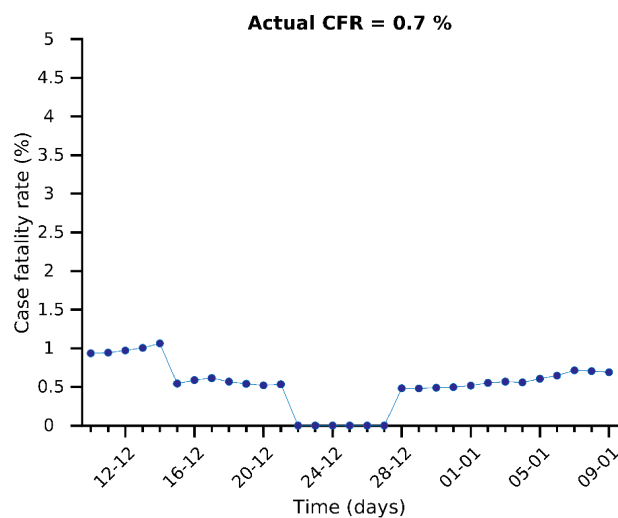
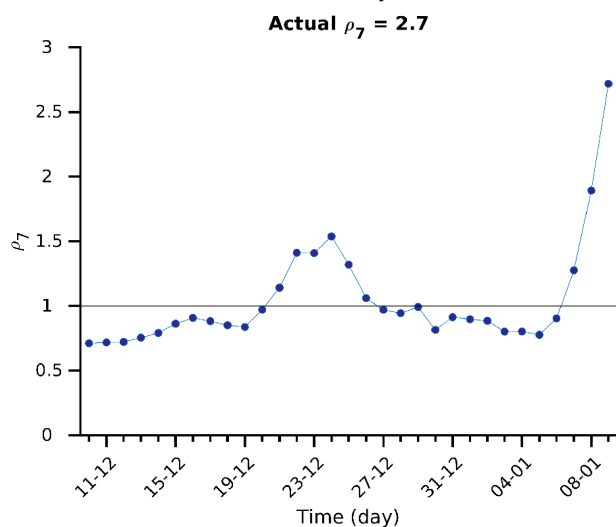
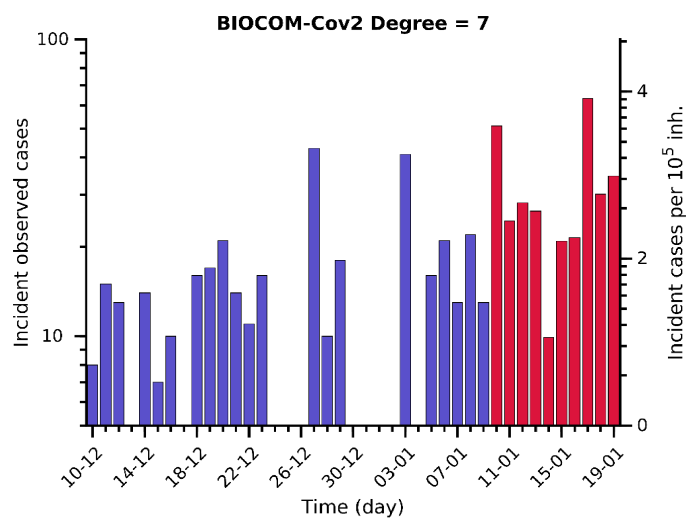
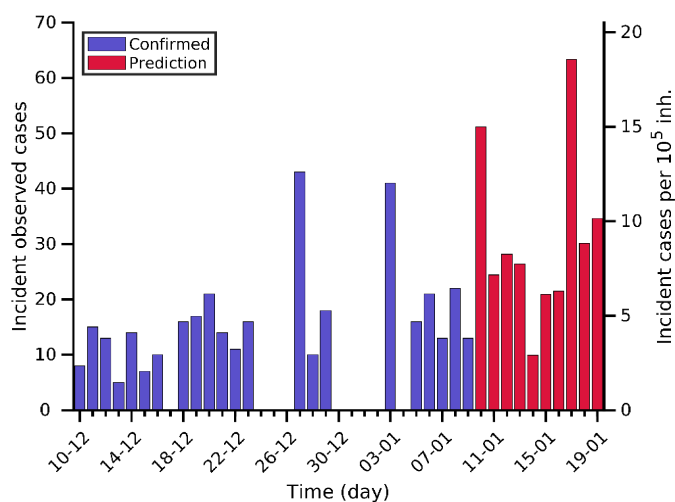


Predictions for next days

Day	Number of cases
12-01-2021	5984 (+104)
16-01-2021	6062 (+182)
19-01-2021	6191 (+311)

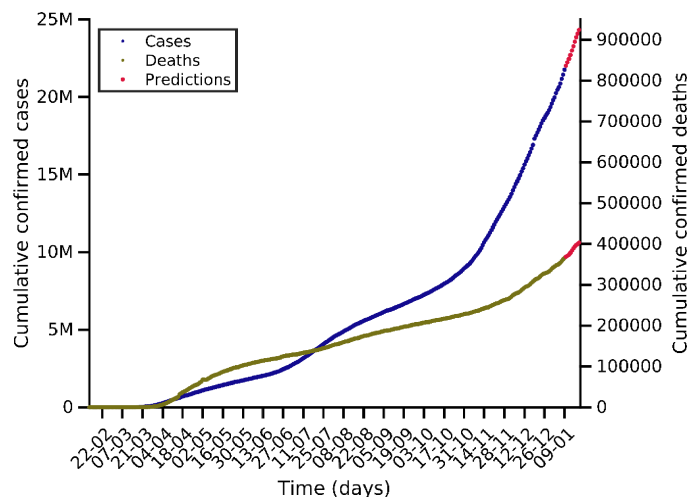
Current indicators

	A14	EPG	CFR	N7	D7
Today	58	157	0.69 %	18	0
A Week ago	39	34	0.55 %	10	0
Maximum	332	462	4.65 %	86	2



(2) Analysis and prediction of COVID-19 for other countries

USA 09-01-2021. Pop: 331.0M. Cumulative incidence: 6574/10⁵

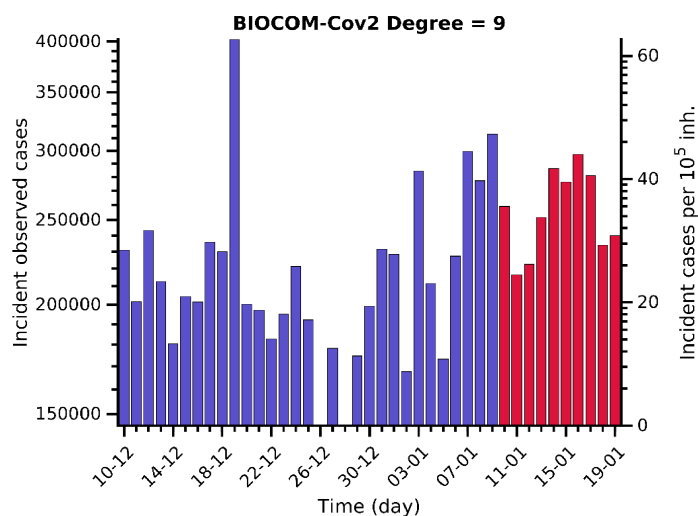
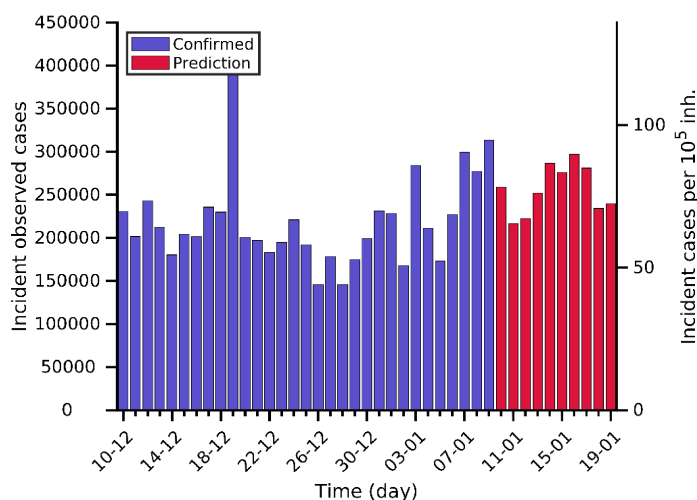


Predictions for next days

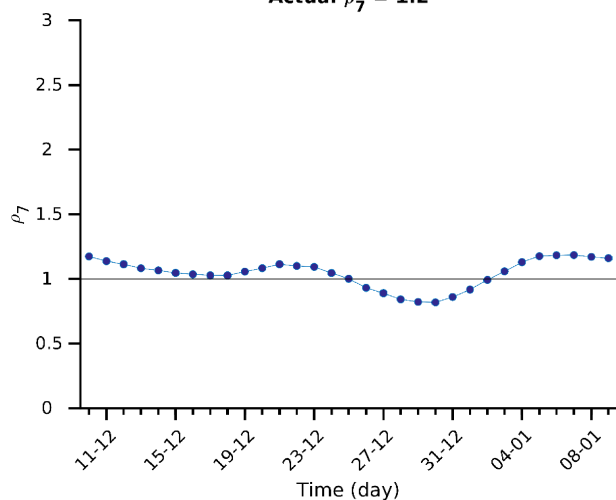
Day	Number of cases
12-01-2021	22459190 (+698004)
16-01-2021	23570878 (+1809692)
19-01-2021	24325819 (+2564633)

Current indicators

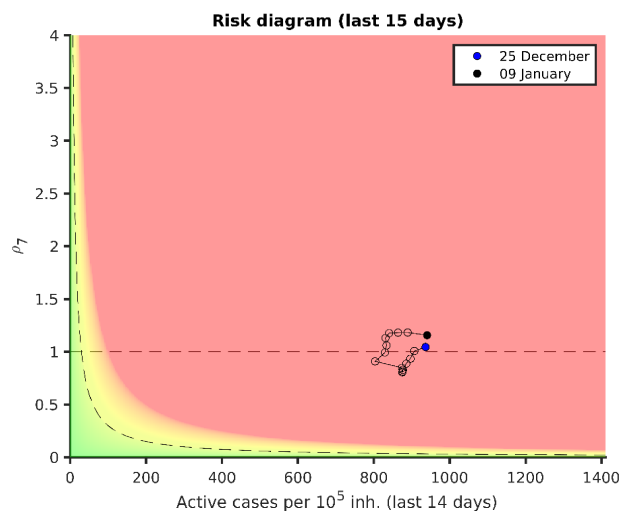
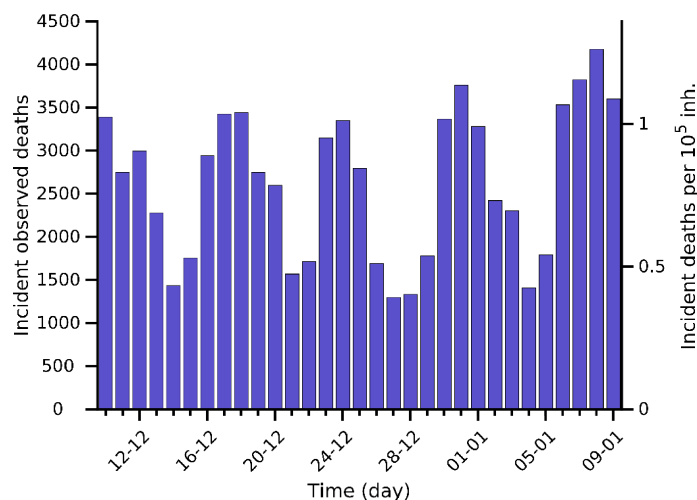
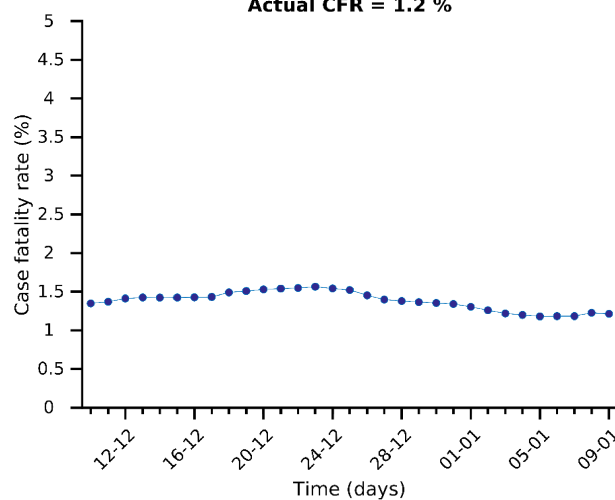
	A14	EPG	CFR	N7	D7
Today	940	1091	1.21 %	255253	2948
A Week ago	803	797	1.26 %	189346	2463
Maximum	949	2473	4.81 %	255253	2948



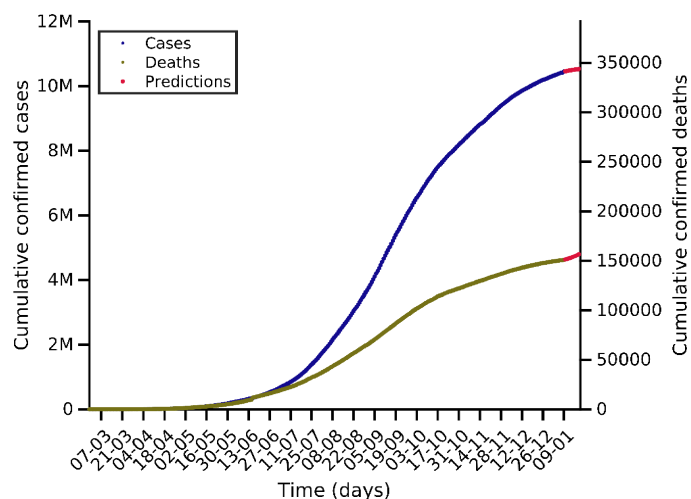
Actual $\rho_7 = 1.2$



Actual CFR = 1.2 %



India 09-01-2021. Pop: 1380.0M. Cumulative incidence: 757/10⁵

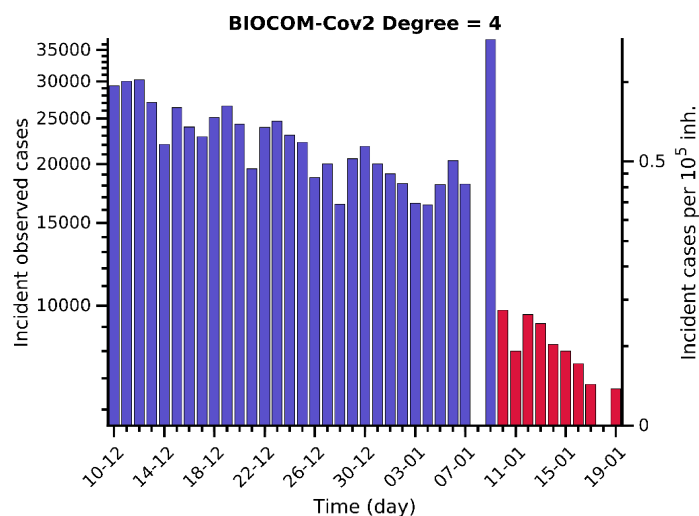
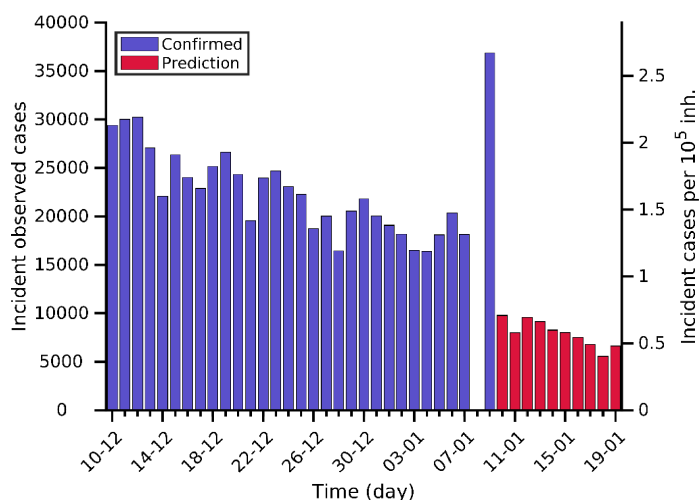


Predictions for next days

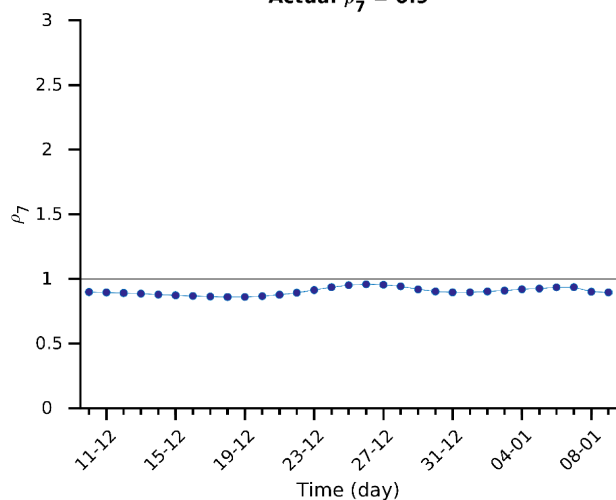
Day	Number of cases
12-01-2021	10477629 (+27345)
16-01-2021	10510570 (+60286)
19-01-2021	10529555 (+79271)

Current indicators

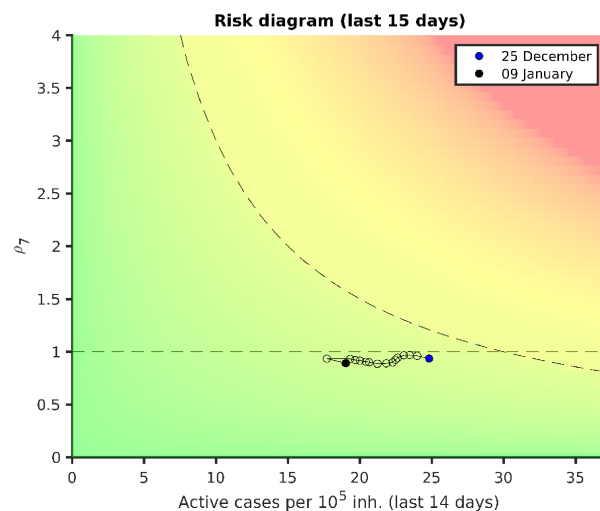
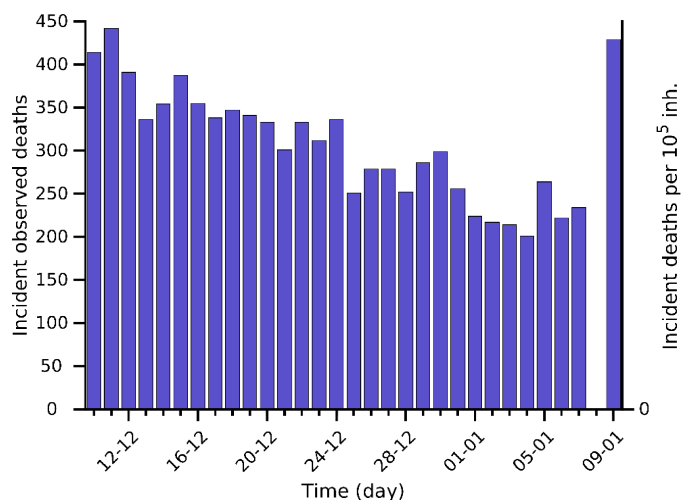
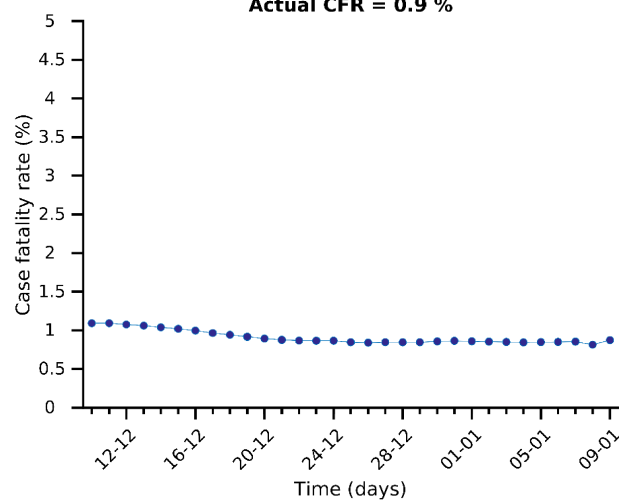
	A14	EPG	CFR	N7	D7
Today	19	17	0.87 %	18046	223
A Week ago	21	19	0.85 %	19445	259
Maximum	93	96	4.40 %	93199	1168



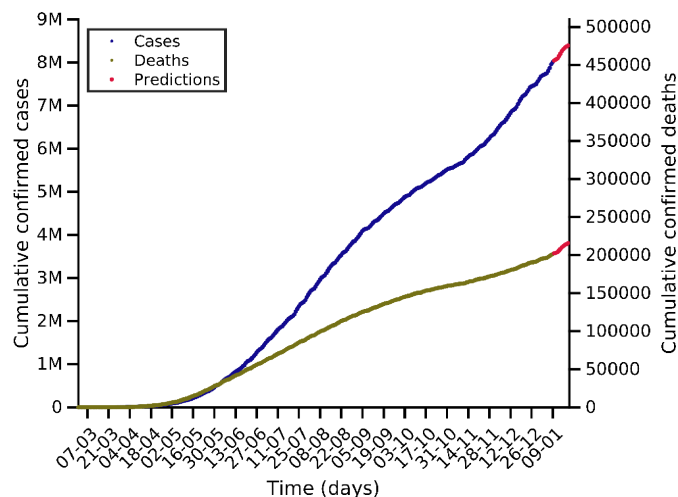
Actual $\rho_7 = 0.9$



Actual CFR = 0.9 %



Brazil 09-01-2021. Pop: 212.6M. Cumulative incidence: 3770/10⁵

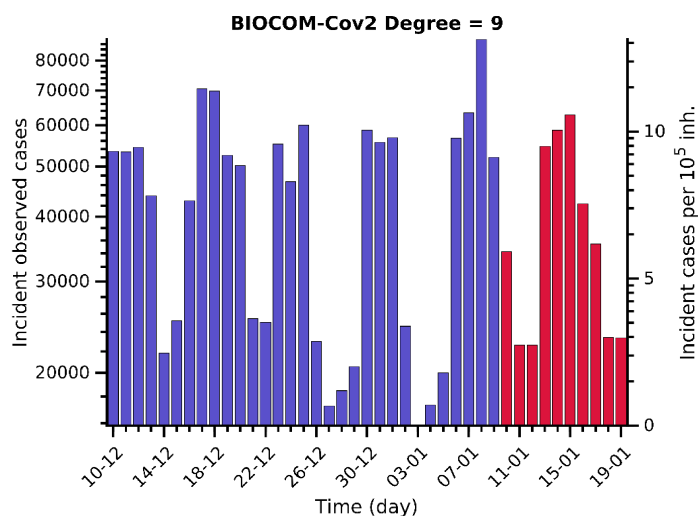
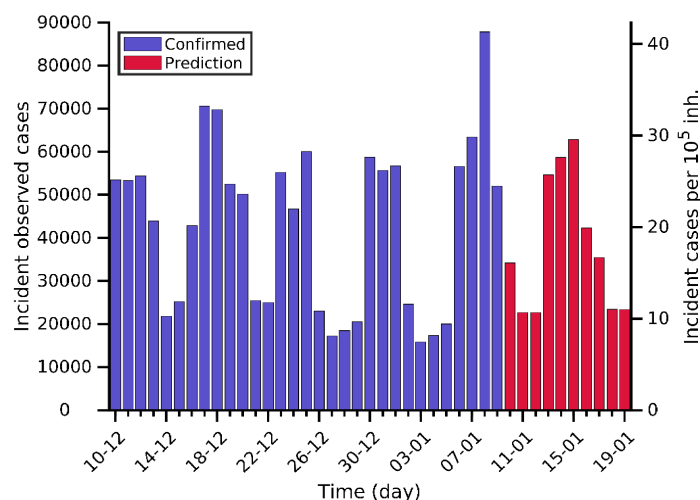


Predictions for next days

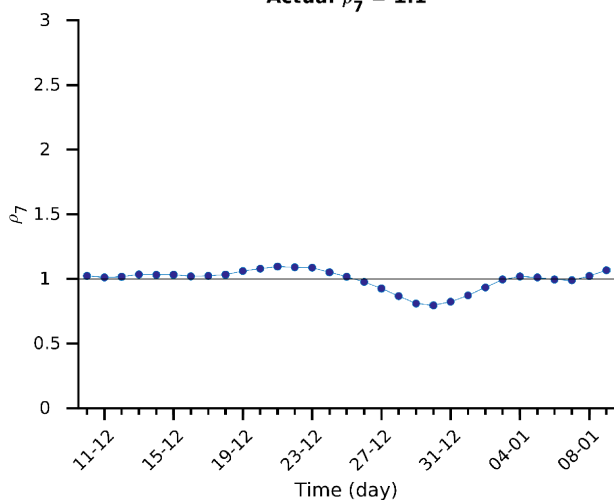
Day	Number of cases
12-01-2021	8093165 (+79457)
16-01-2021	8311693 (+297985)
19-01-2021	8393869 (+380161)

Current indicators

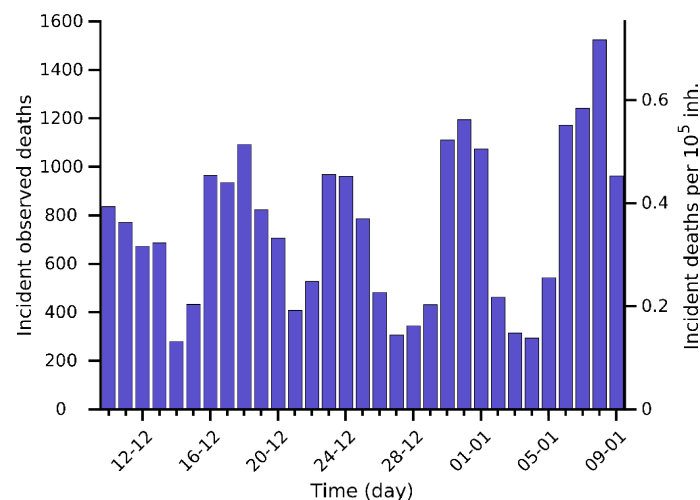
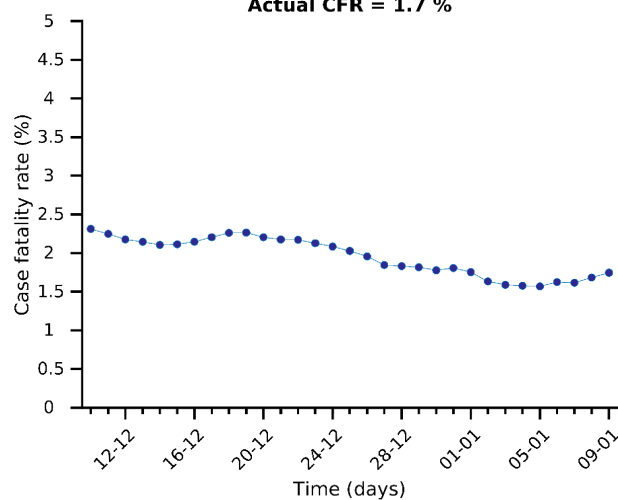
	A14	EPG	CFR	N7	D7
Today	266	284	1.74 %	44733	864
A Week ago	253	236	1.63 %	36003	703
Maximum	303	338	4.84 %	49827	1097



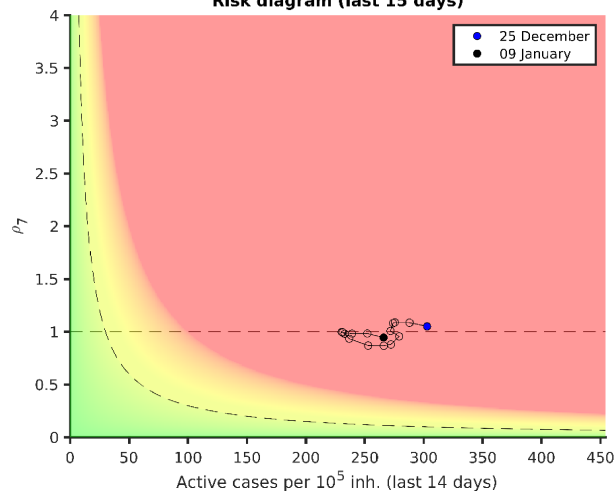
Actual $\rho_7 = 1.1$



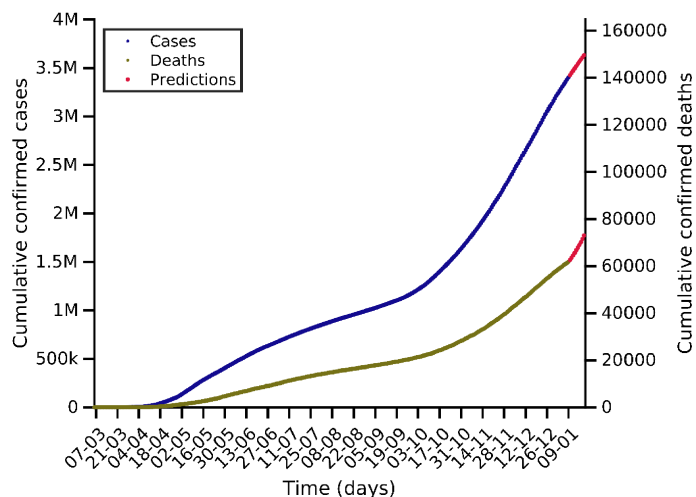
Actual CFR = 1.7 %



Risk diagram (last 15 days)



Russia 09-01-2021. Pop: 145.9M. Cumulative incidence: 2331/10⁵

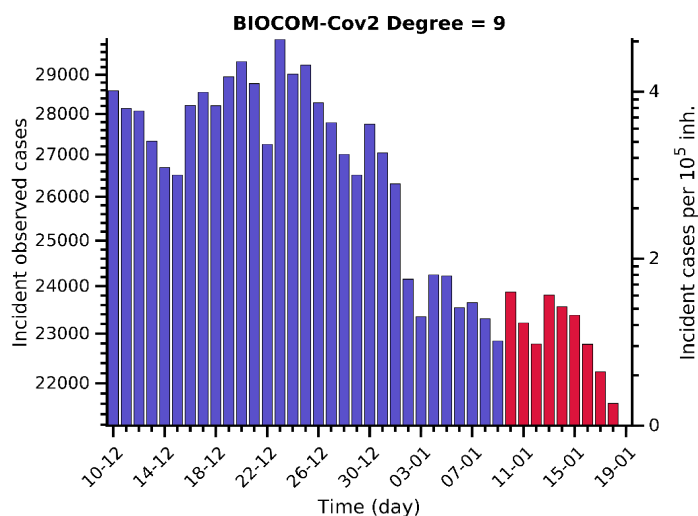
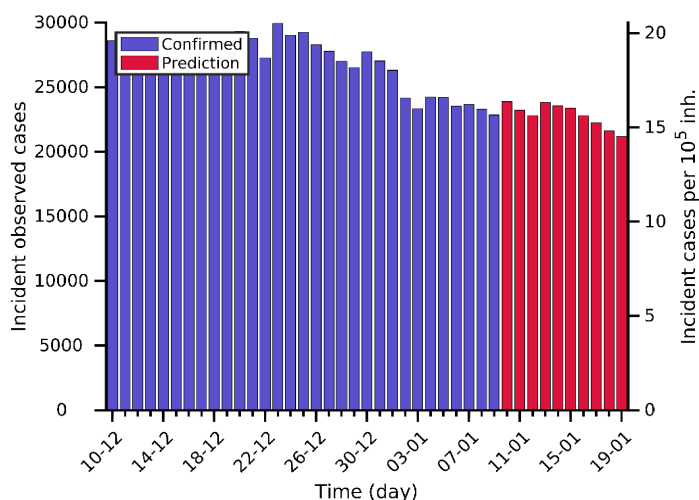


Predictions for next days

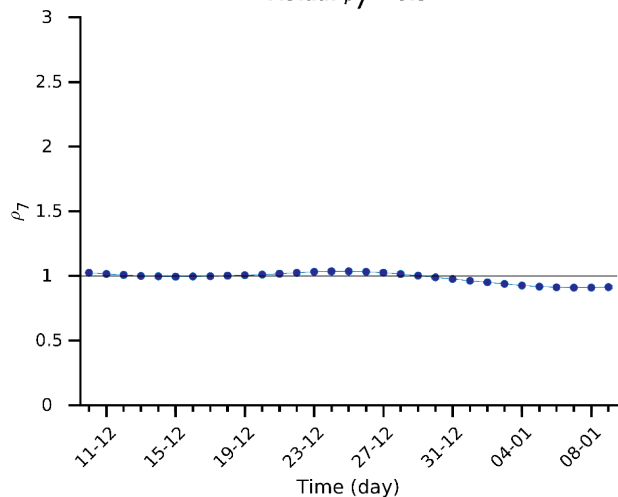
Day	Number of cases
12-01-2021	3471834 (+69880)
16-01-2021	3565368 (+163414)
19-01-2021	3630391 (+228437)

Current indicators

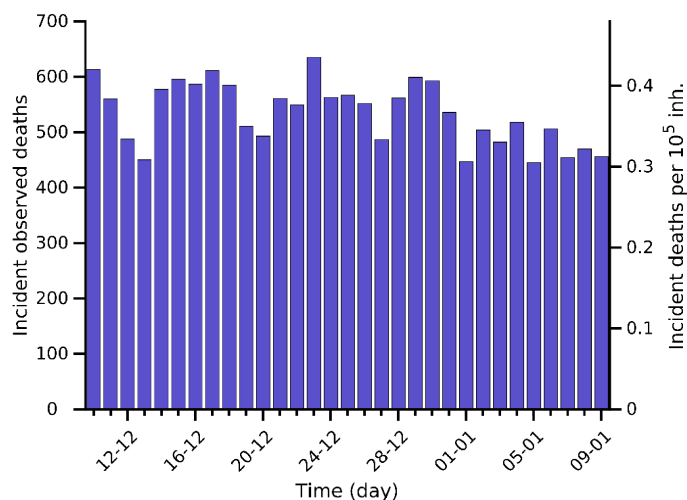
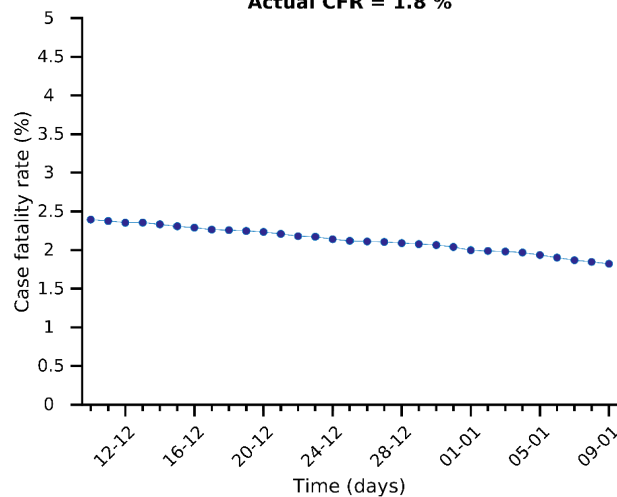
	A14	EPG	CFR	N7	D7
Today	241	220	1.82 %	23595	476
A Week ago	266	253	1.99 %	26648	533
Maximum	272	281	4.72 %	28934	566



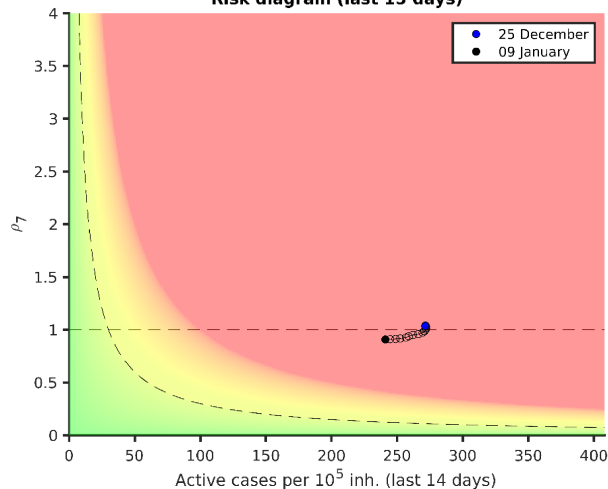
Actual $\rho_7 = 0.9$



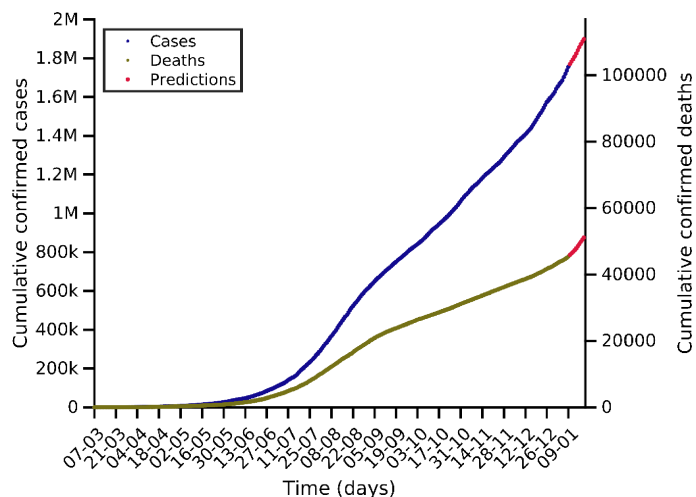
Actual CFR = 1.8 %



Risk diagram (last 15 days)



Colombia 09-01-2021. Pop: 50.9M. Cumulative incidence: 3450/10⁵

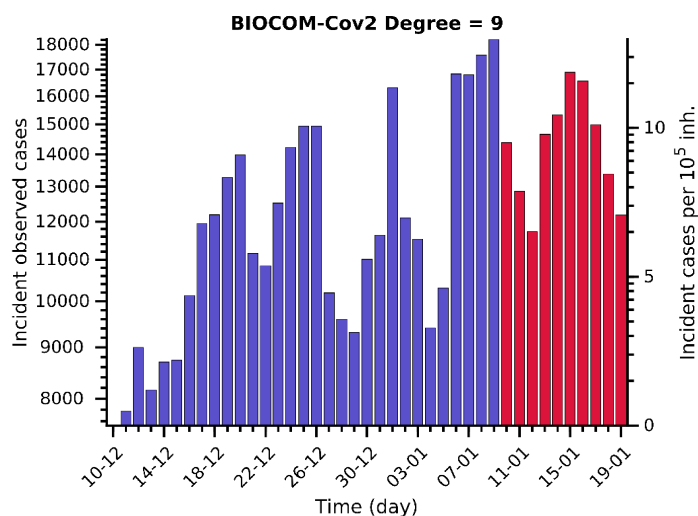
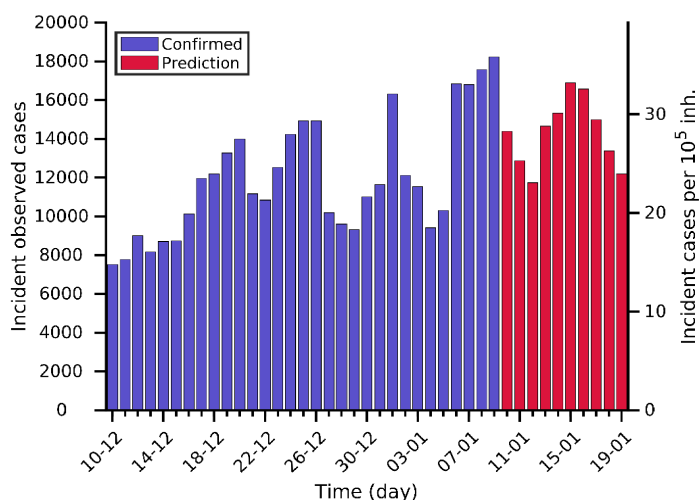


Predictions for next days

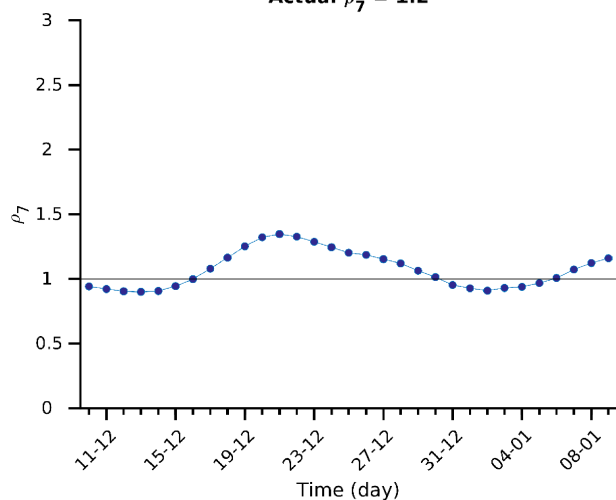
Day	Number of cases
12-01-2021	1794560 (+38992)
16-01-2021	1858000 (+102432)
19-01-2021	1898553 (+142985)

Current indicators

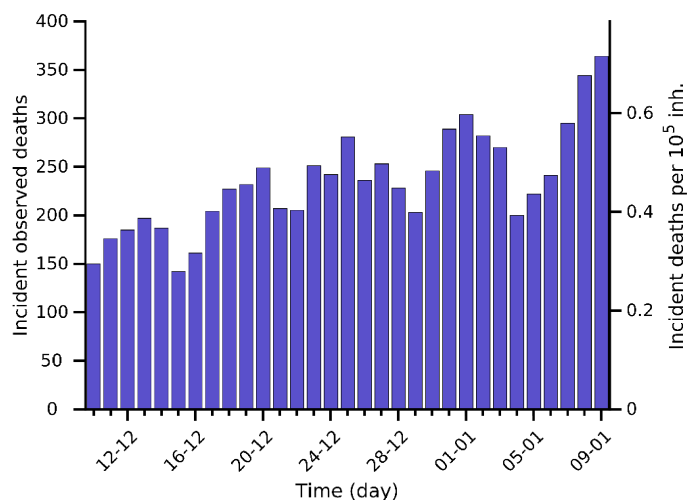
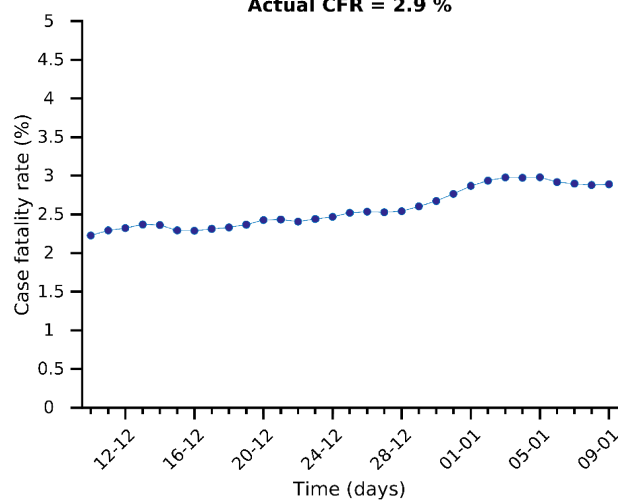
	A14	EPG	CFR	N7	D7
Today	355	412	2.89 %	14384	277
A Week ago	340	309	2.94 %	11453	258
Maximum	355	412	4.88 %	14384	326



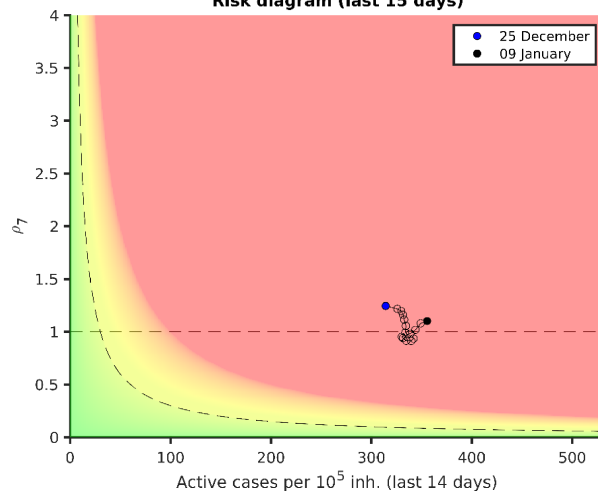
Actual $\rho_7 = 1.2$



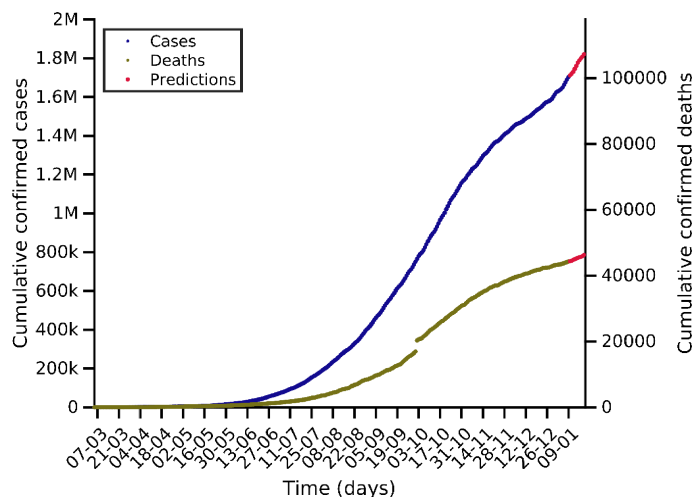
Actual CFR = 2.9 %



Risk diagram (last 15 days)



Argentina 09-01-2021. Pop: 45.2M. Cumulative incidence: 3769/10⁵

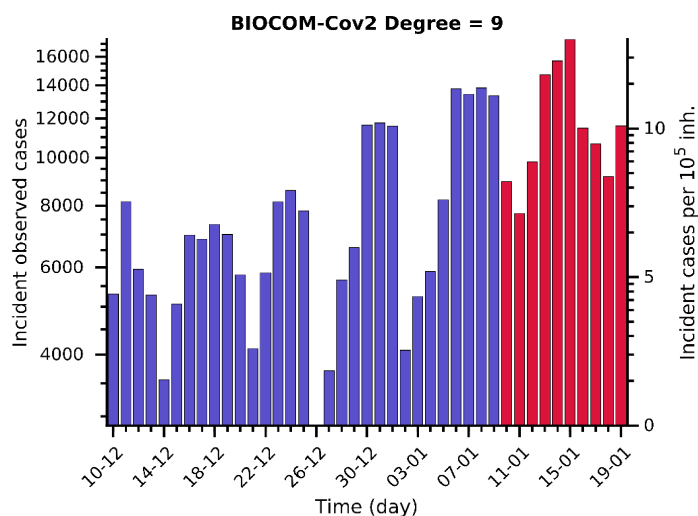
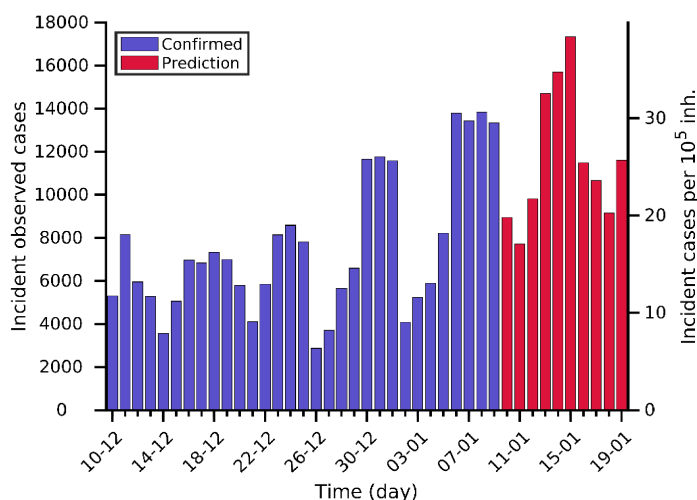


Predictions for next days

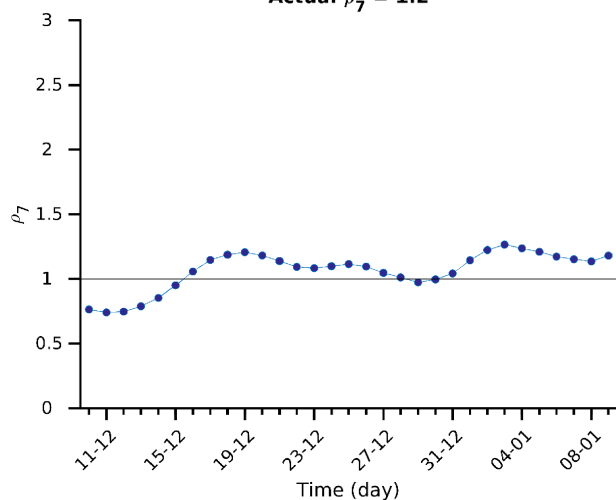
Day	Number of cases
12-01-2021	1729834 (+26482)
16-01-2021	1789086 (+85734)
19-01-2021	1820526 (+117174)

Current indicators

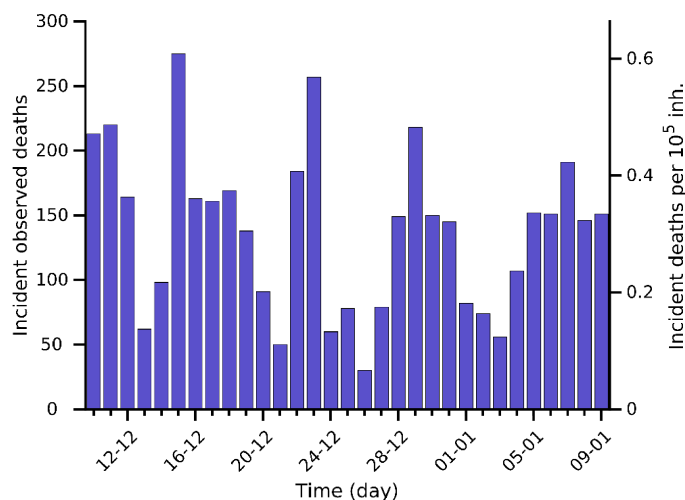
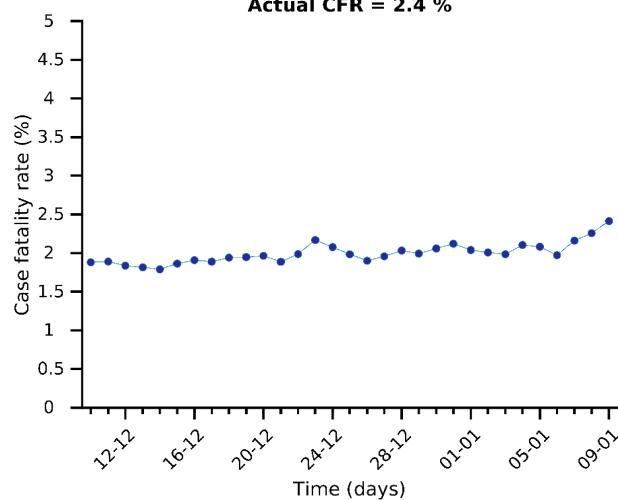
	A14	EPG	CFR	N7	D7
Today	285	336	2.41 %	10537	136
A Week ago	217	266	2.01 %	7863	128
Maximum	442	488	4.98 %	15051	789



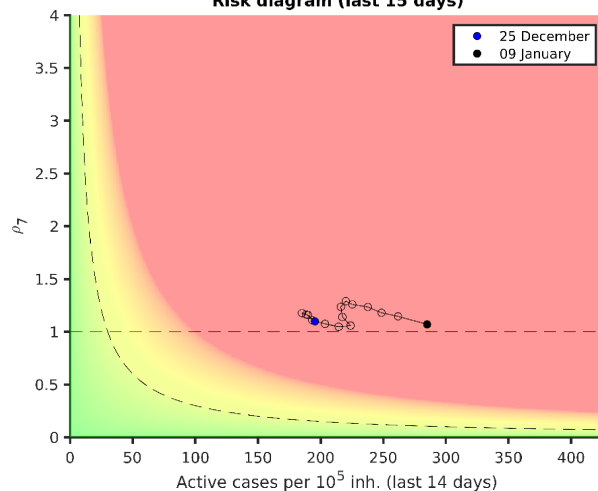
Actual $\rho_7 = 1.2$



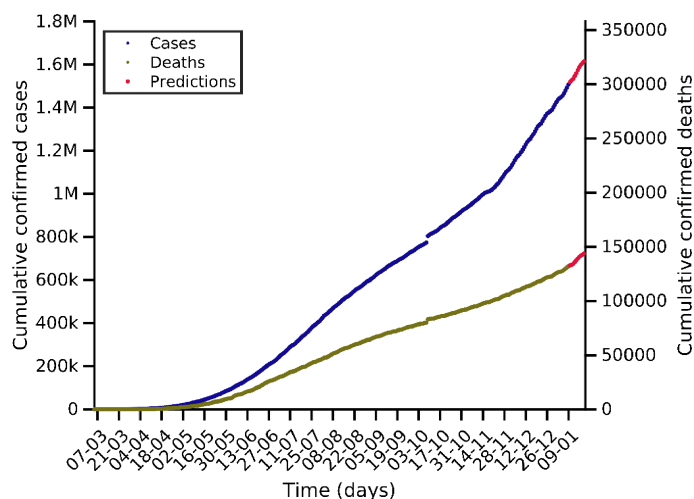
Actual CFR = 2.4 %



Risk diagram (last 15 days)



Mexico 09-01-2021. Pop: 128.9M. Cumulative incidence: 1170/10⁵

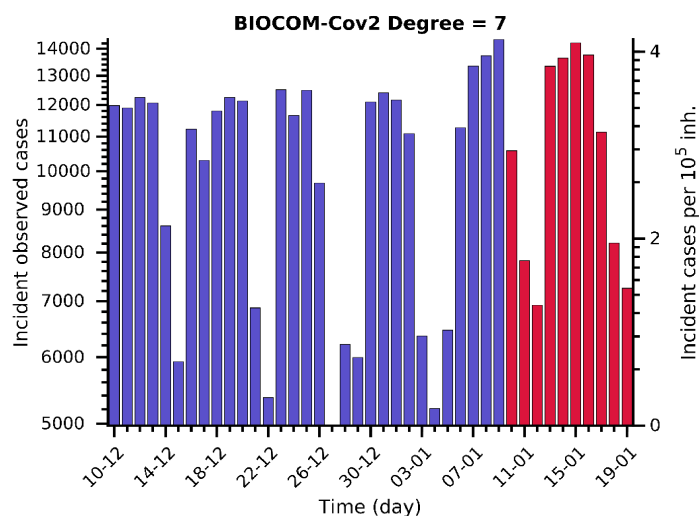
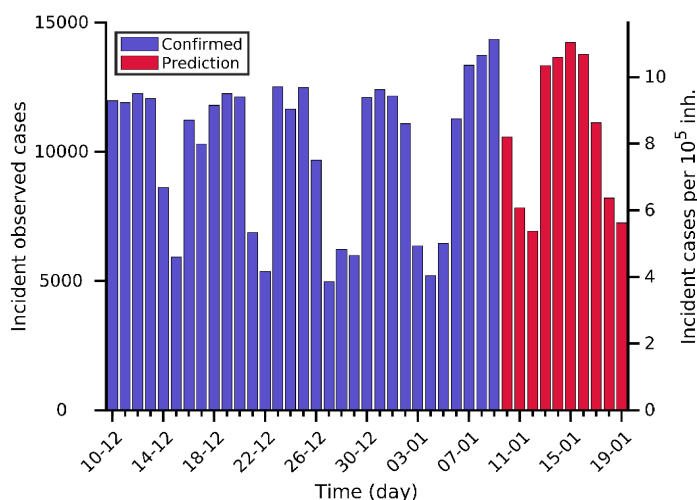


Predictions for next days

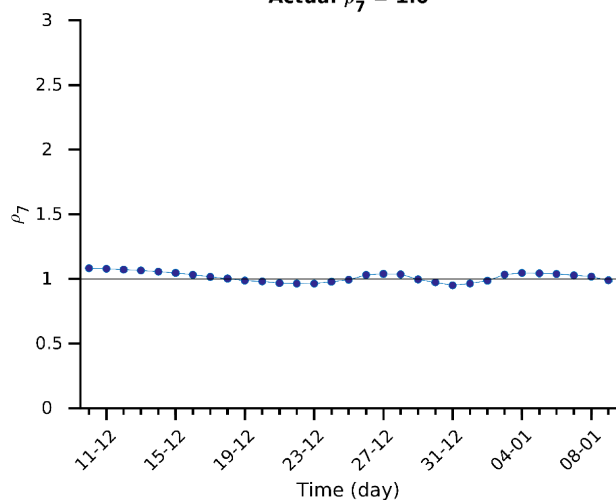
Day	Number of cases
12-01-2021	1533260 (+25329)
16-01-2021	1588246 (+80315)
19-01-2021	1614840 (+106909)

Current indicators

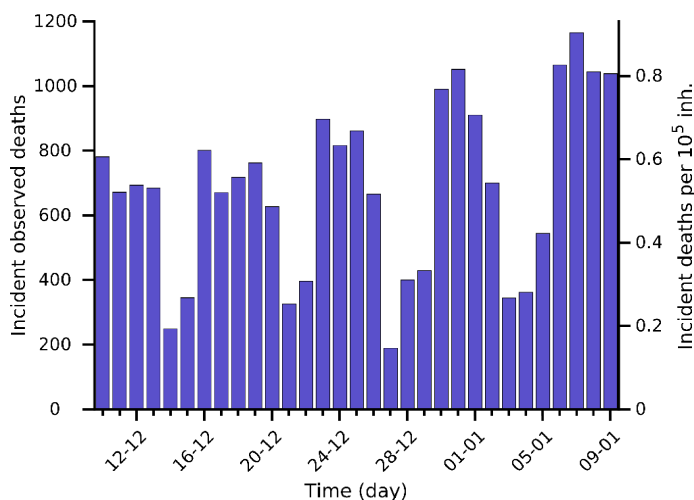
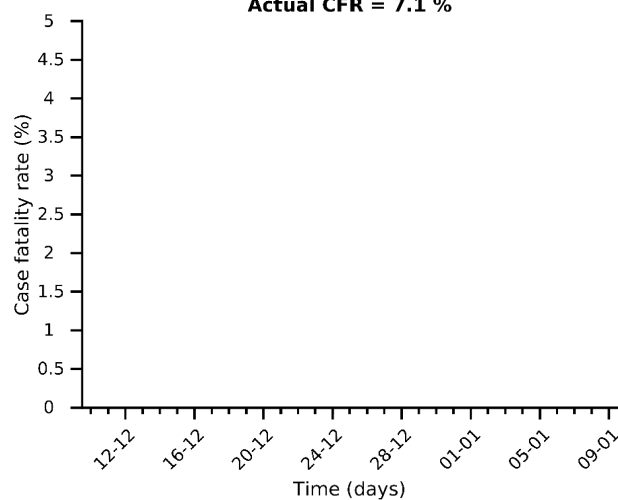
	A14	EPG	CFR	N7	D7
Today	105	104	7.07 %	10107	795
A Week ago	105	104	6.67 %	9277	667
Maximum	113	143	0.00 %	10599	800



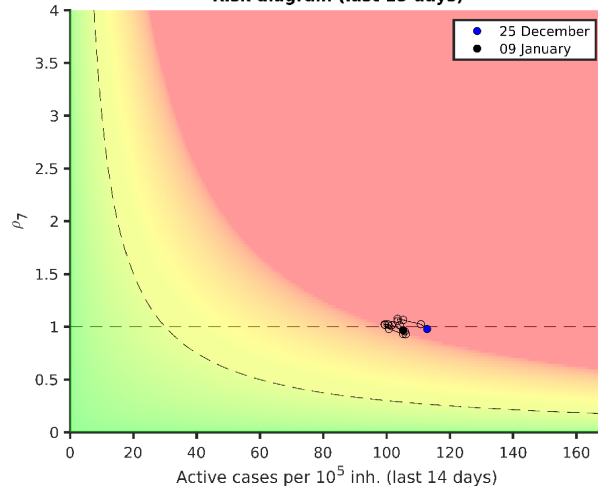
Actual $\rho_7 = 1.0$



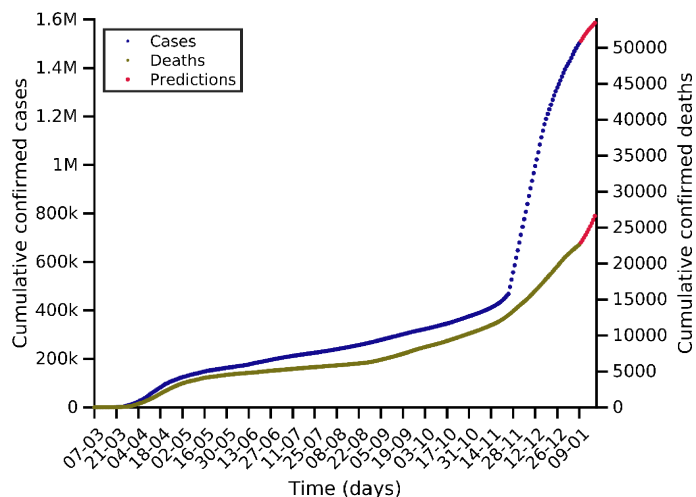
Actual CFR = 7.1 %



Risk diagram (last 15 days)



Turkey 09-01-2021. Pop: 84.3M. Cumulative incidence: 1782/10⁵

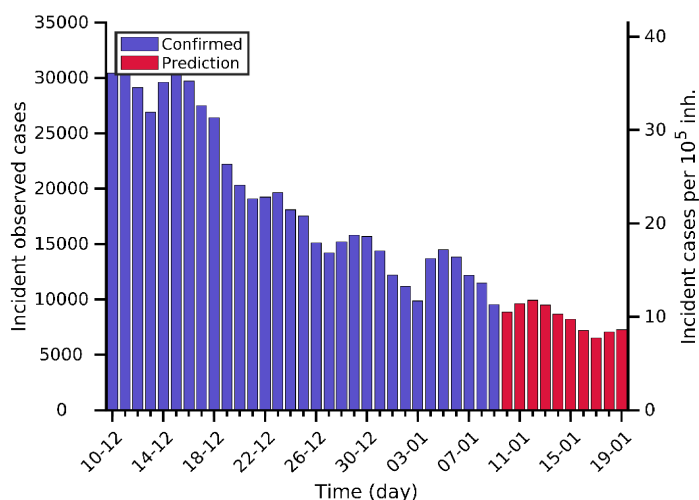


Predictions for next days

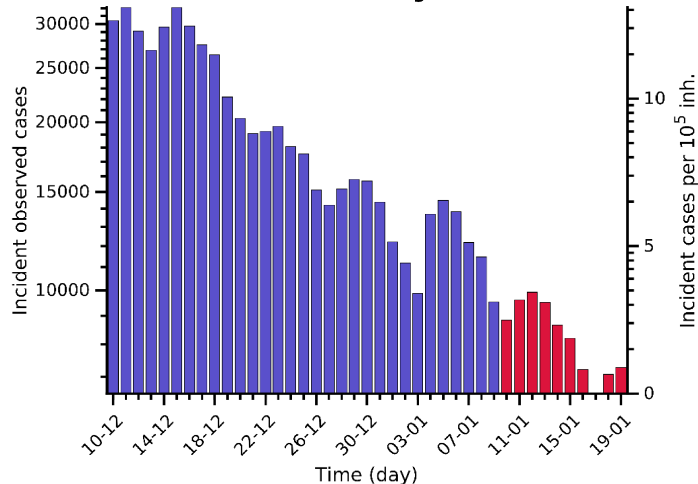
Day	Number of cases
12-01-2021	1531170 (+28390)
16-01-2021	1564756 (+61976)
19-01-2021	1585631 (+82851)

Current indicators

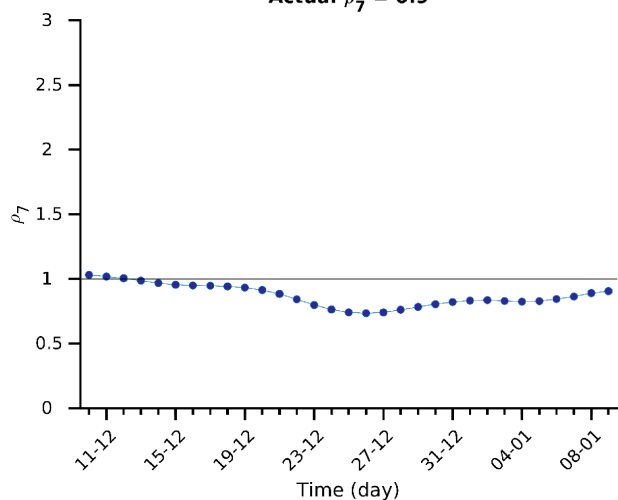
	A14	EPG	CFR	N7	D7
Today	218	197	0.73 %	12155	191
A Week ago	270	226	0.79 %	14095	239
Maximum	521	873	4.93 %	32096	255



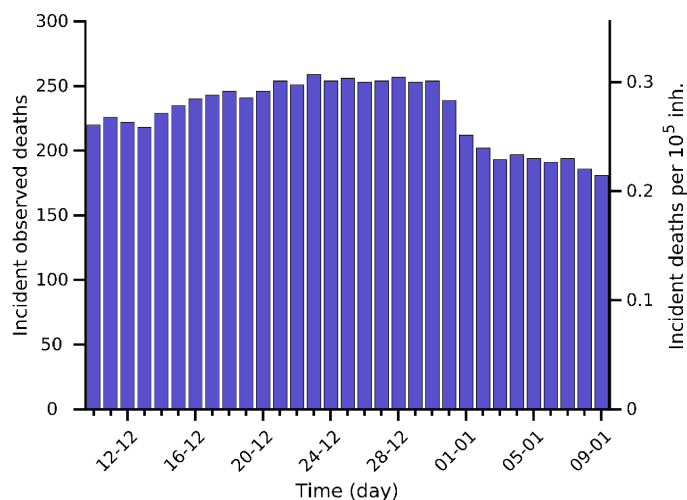
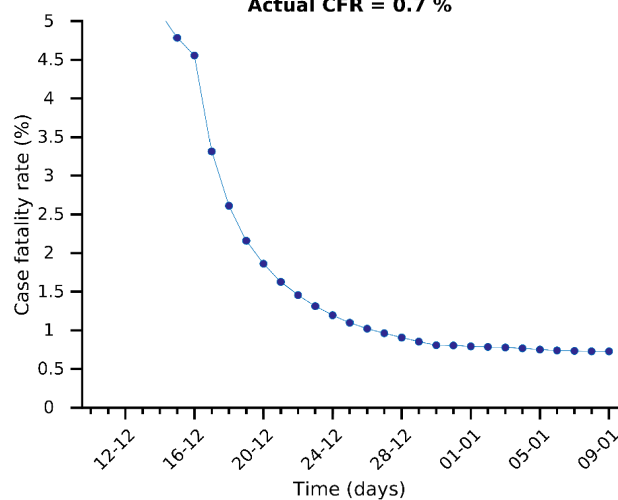
BIOCOM-Cov2 Degree = 9



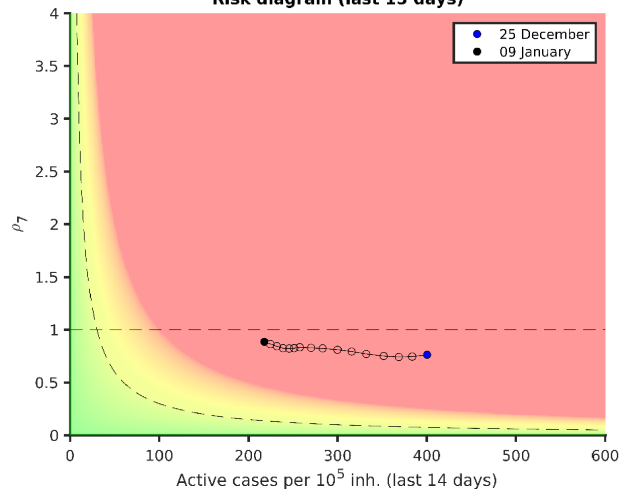
Actual $\rho_7 = 0.9$



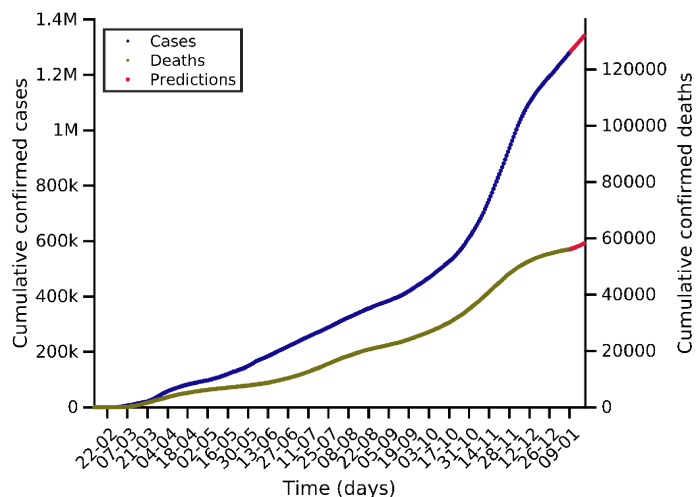
Actual CFR = 0.7 %



Risk diagram (last 15 days)



Iran 09-01-2021. Pop: 84.0M. Cumulative incidence: 1524/10⁵

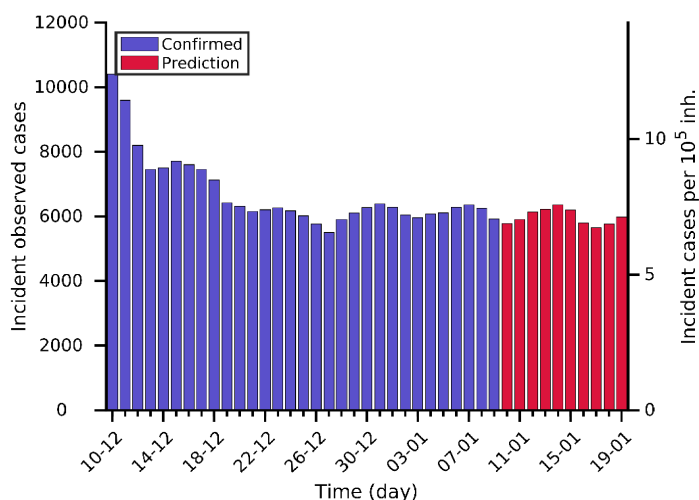


Predictions for next days

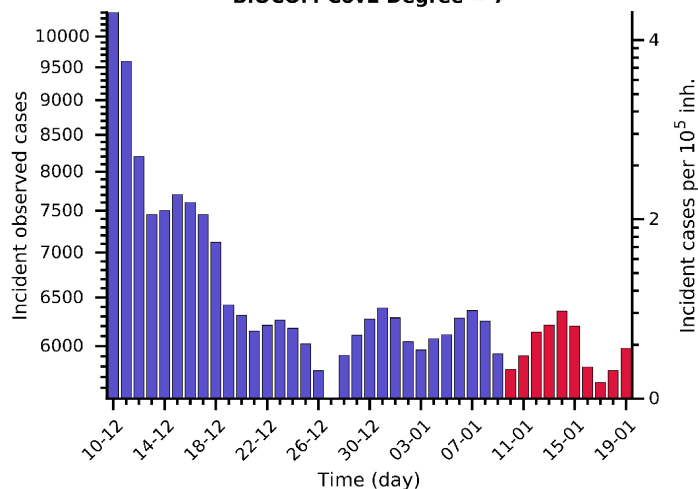
Day	Number of cases
12-01-2021	1298255 (+17817)
16-01-2021	1322822 (+42384)
19-01-2021	1340211 (+59773)

Current indicators

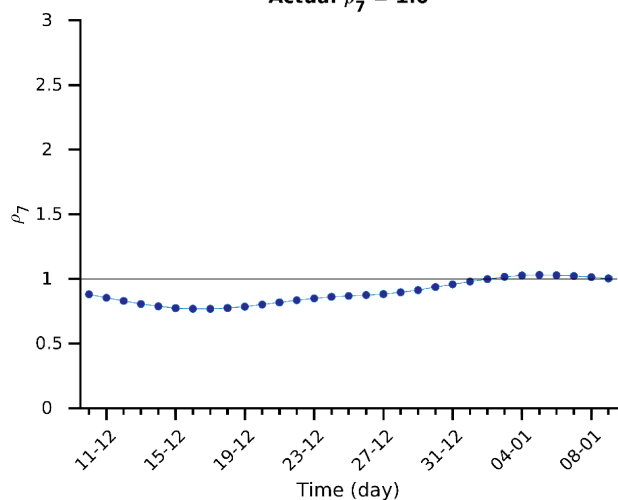
	A14	EPG	CFR	N7	D7
Today	102	102	1.24 %	6138	95
A Week ago	102	102	1.21 %	6073	123
Maximum	224	229	4.97 %	13630	473



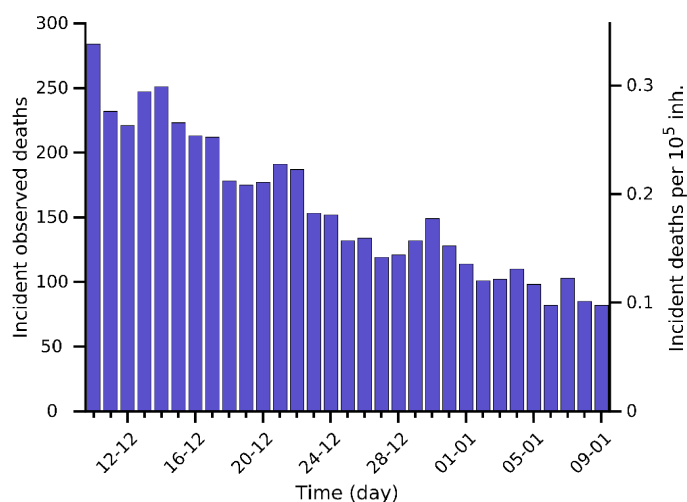
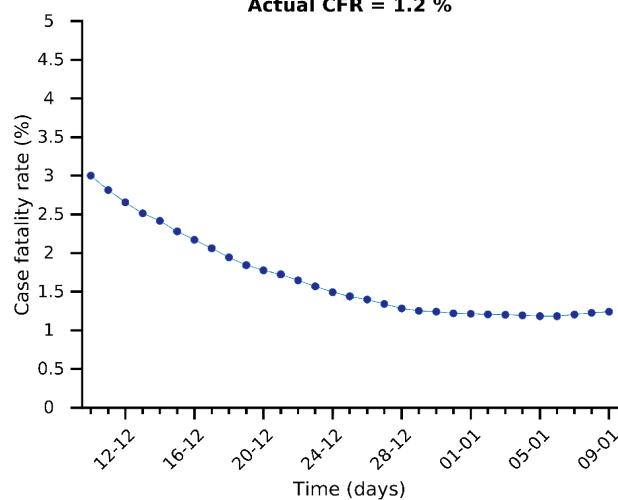
BIOCOM-Cov2 Degree = 7



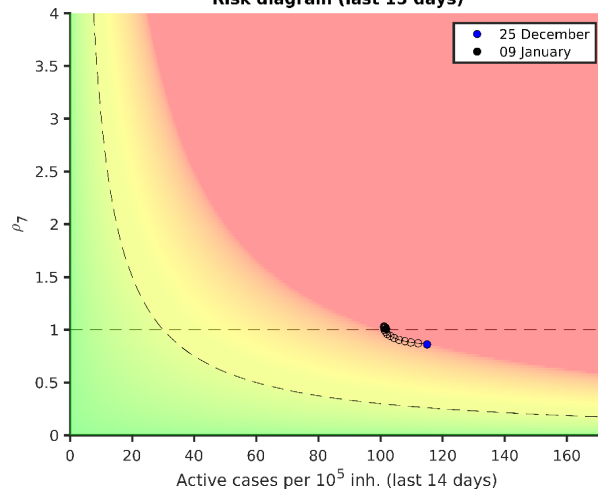
Actual $\rho_7 = 1.0$



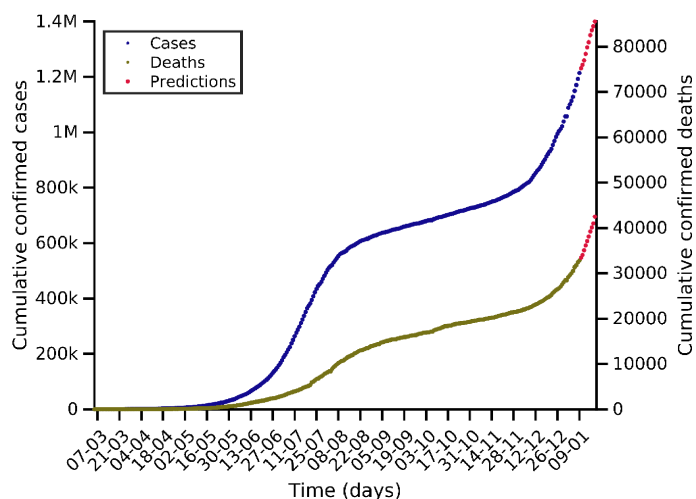
Actual CFR = 1.2 %



Risk diagram (last 15 days)



South Africa 09-01-2021. Pop: 59.3M. Cumulative incidence: 2047/10⁵

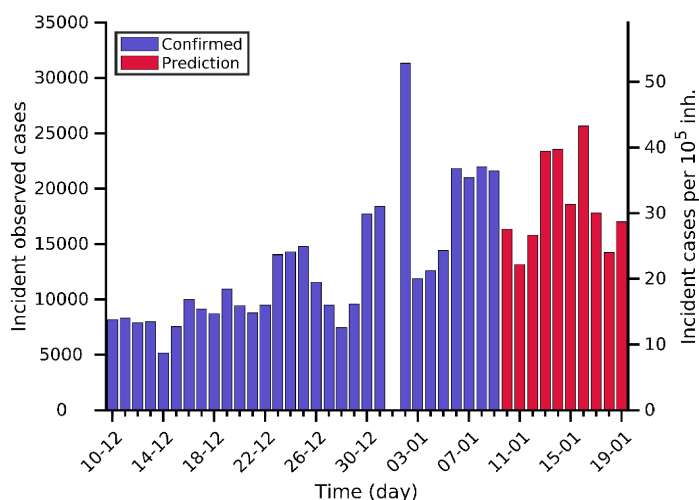


Predictions for next days

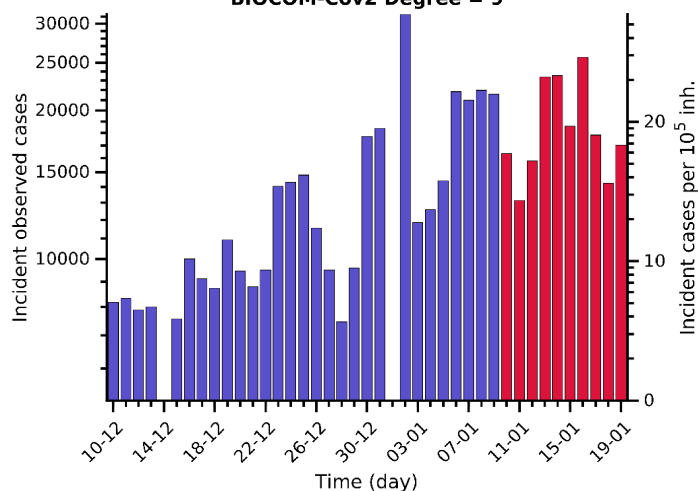
Day	Number of cases
12-01-2021	1259476 (+45300)
16-01-2021	1350676 (+136500)
19-01-2021	1399744 (+185568)

Current indicators

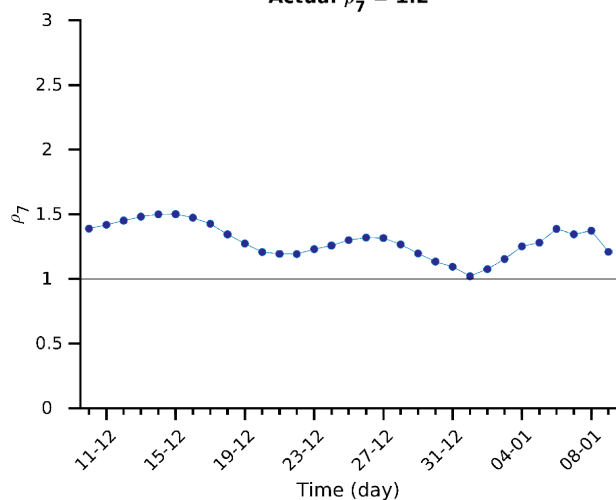
	A14	EPG	CFR	N7	D7
Today	370	447	6.18 %	17898	521
A Week ago	297	320	6.84 %	13425	379
Maximum	370	484	4.99 %	19287	565



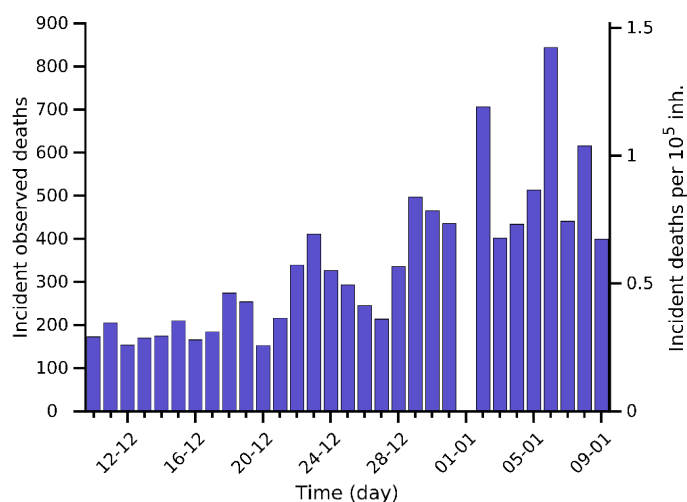
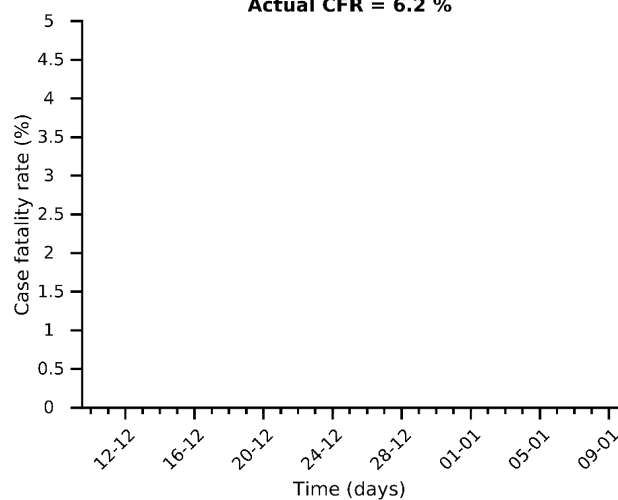
BIOCOM-Cov2 Degree = 9



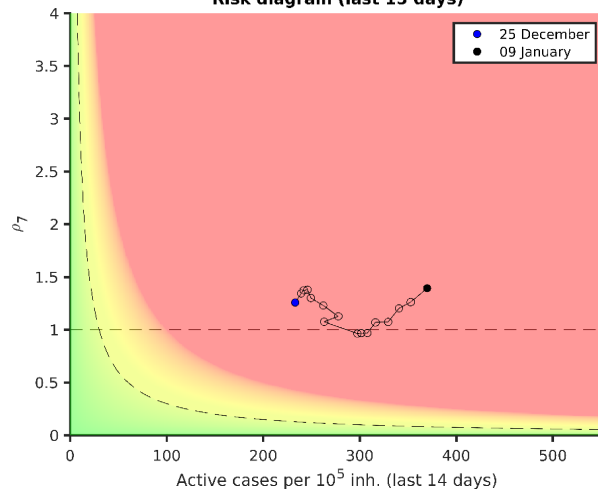
Actual $\rho_7 = 1.2$



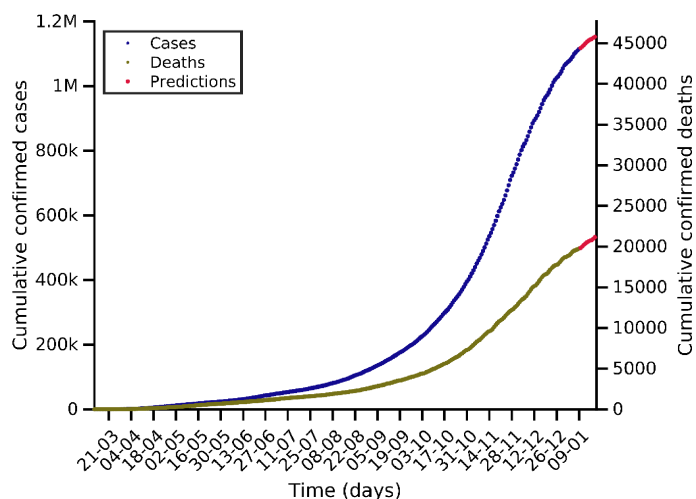
Actual CFR = 6.2 %



Risk diagram (last 15 days)



Ukraine 09-01-2021. Pop: 43.7M. Cumulative incidence: 2550/10⁵

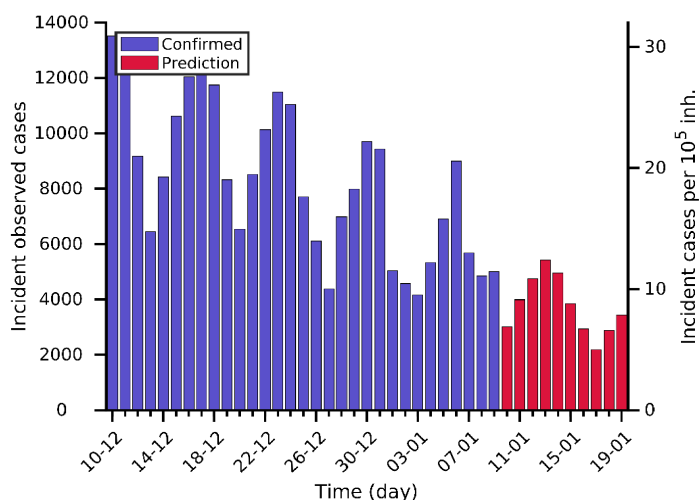


Predictions for next days

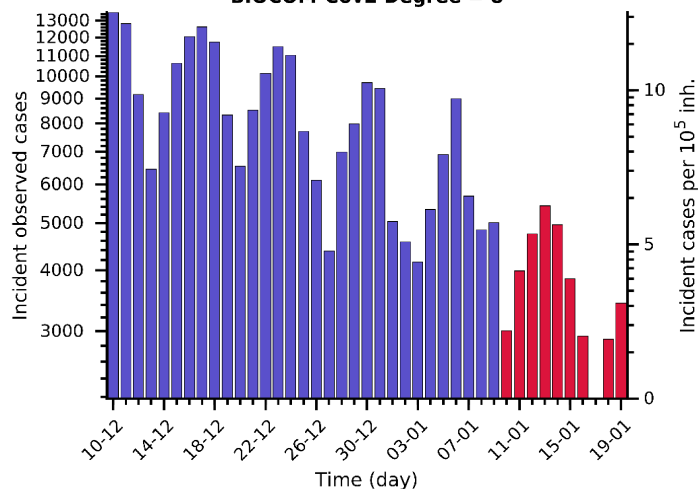
Day	Number of cases
12-01-2021	1126774 (+11748)
16-01-2021	1143933 (+28907)
19-01-2021	1152432 (+37406)

Current indicators

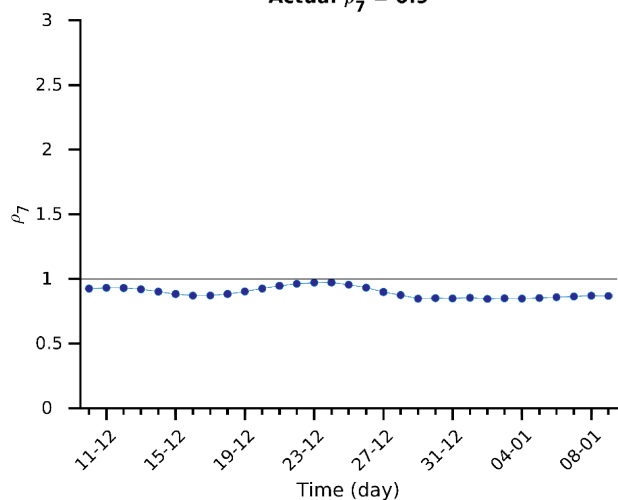
	A14	EPG	CFR	N7	D7
Today	204	177	1.32 %	5848	130
A Week ago	251	212	1.32 %	6872	154
Maximum	434	459	4.94 %	13991	225



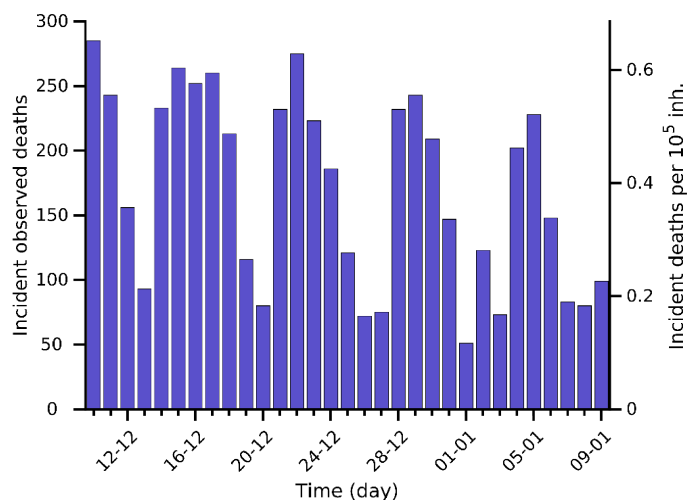
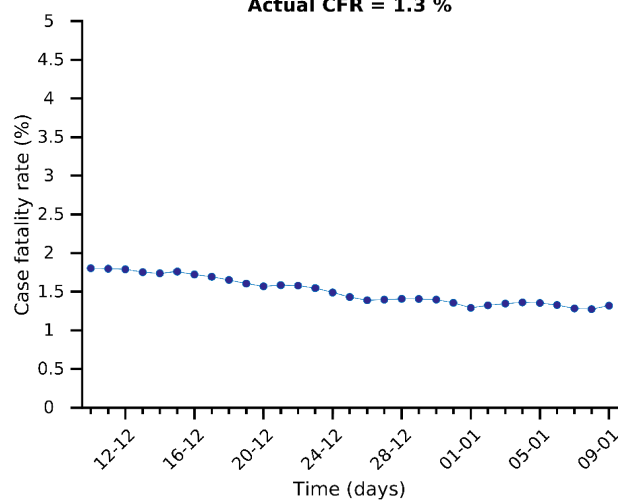
BIOCOM-Cov2 Degree = 8



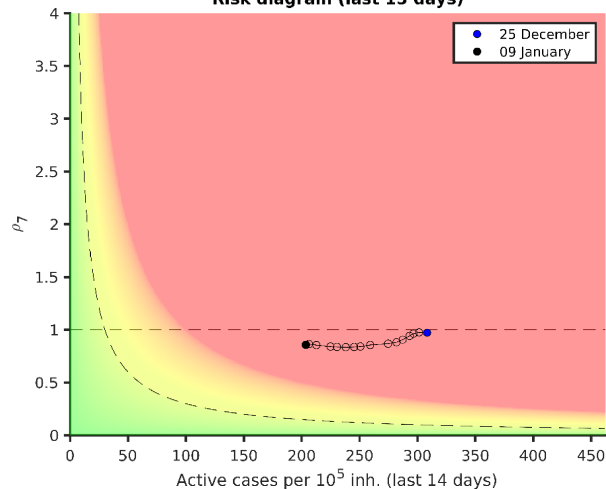
Actual $\rho_7 = 0.9$



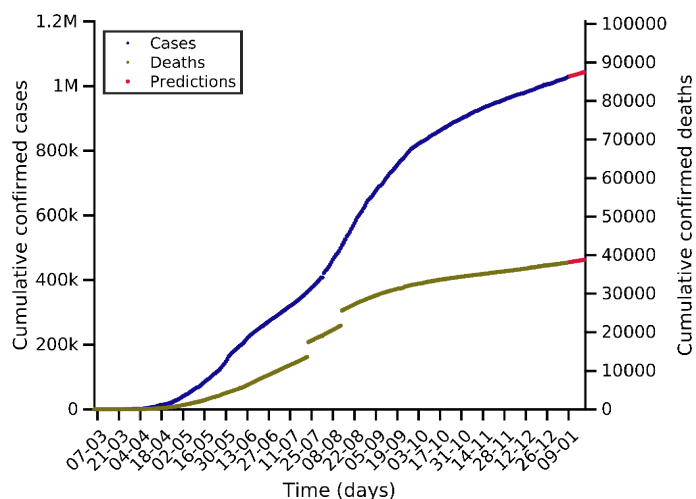
Actual CFR = 1.3 %



Risk diagram (last 15 days)



Peru 09-01-2021. Pop: 33.0M. Cumulative incidence: 3122/10⁵

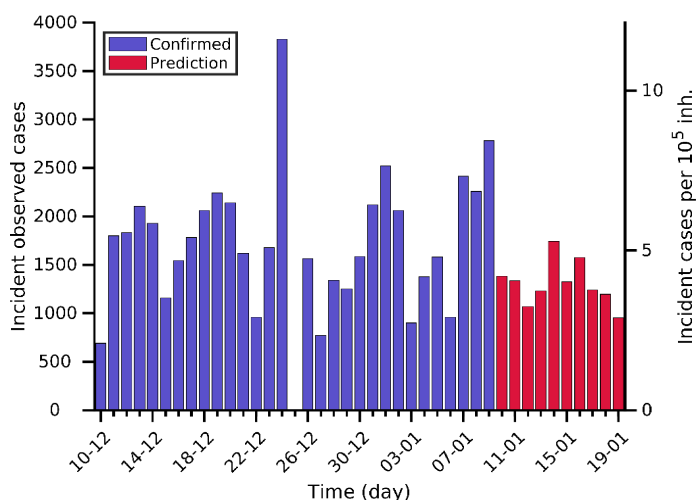


Predictions for next days

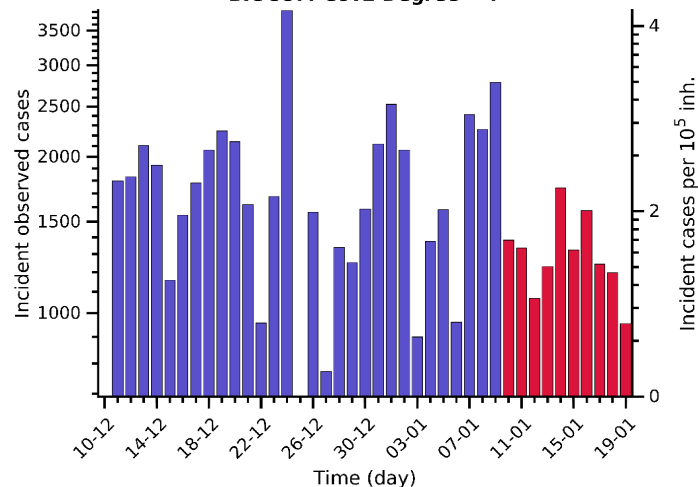
Day	Number of cases
12-01-2021	1033258 (+3787)
16-01-2021	1039133 (+9662)
19-01-2021	1042527 (+13056)

Current indicators

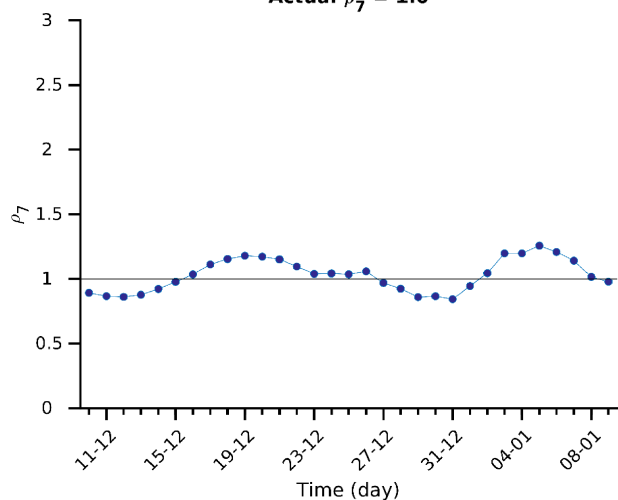
	A14	EPG	CFR	N7	D7
Today	73	71	3.39 %	1753	60
A Week ago	71	74	3.34 %	1665	51
Maximum	357	380	4.98 %	8552	747



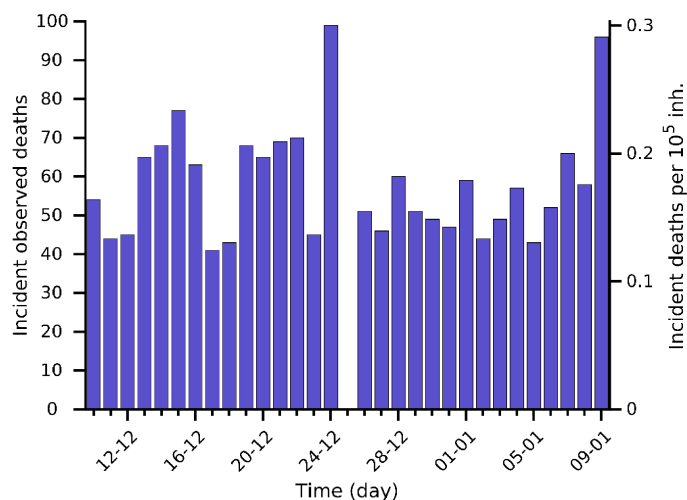
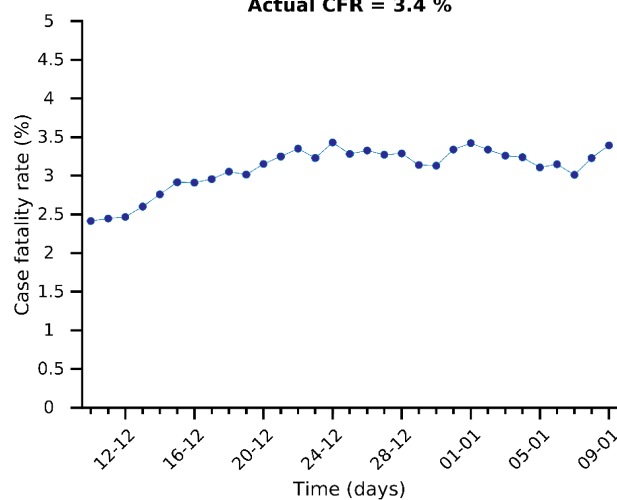
BIOCOM-Cov2 Degree = 7



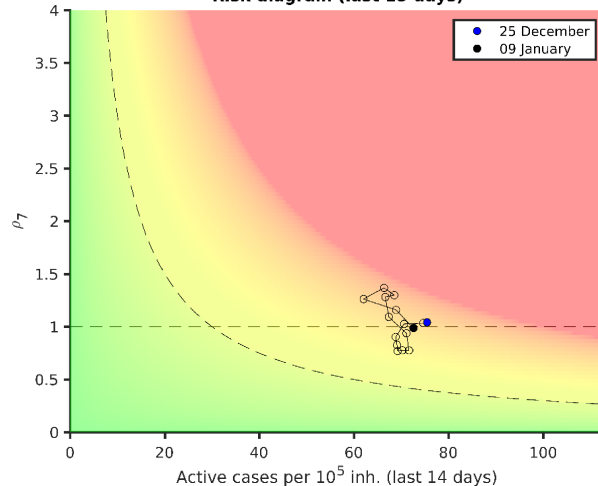
Actual $\rho_7 = 1.0$



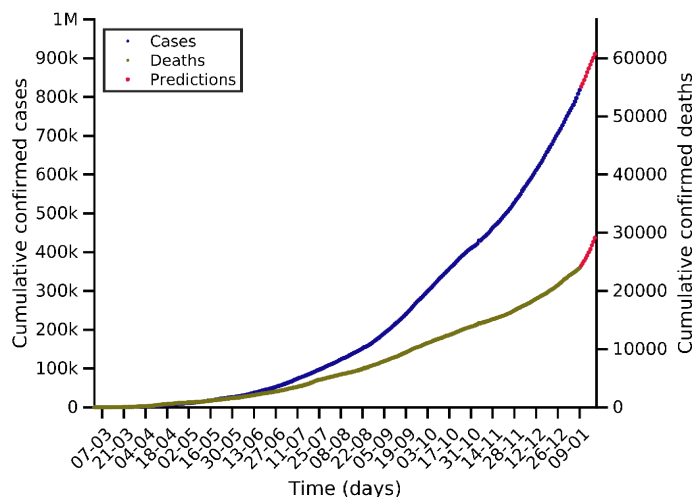
Actual CFR = 3.4 %



Risk diagram (last 15 days)



Indonesia 09-01-2021. Pop: 273.5M. Cumulative incidence: 299/10⁵

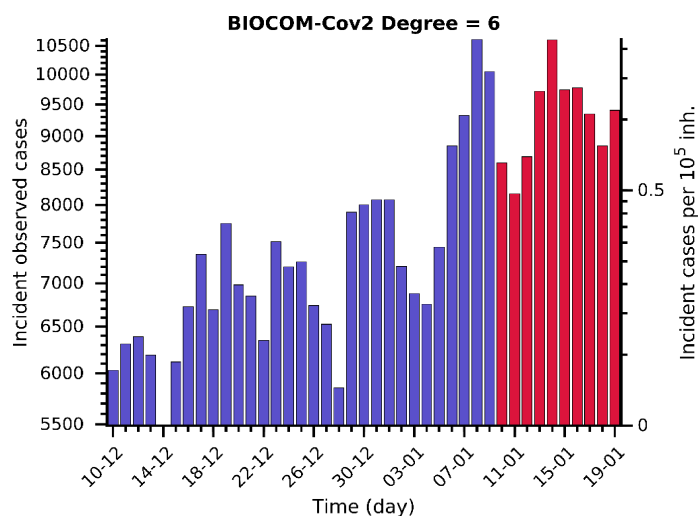
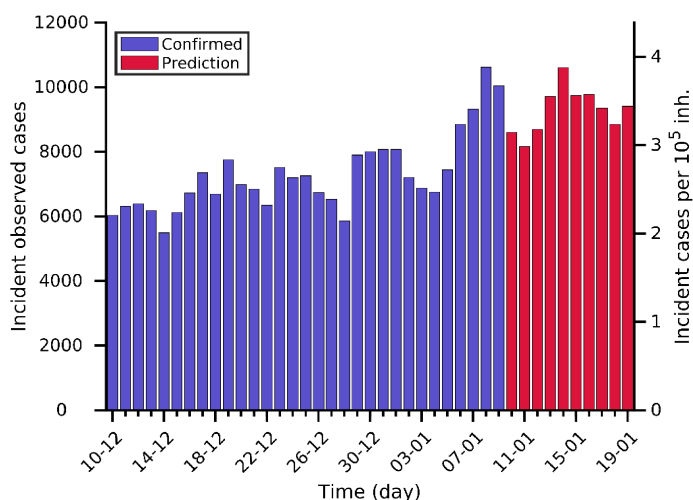


Predictions for next days

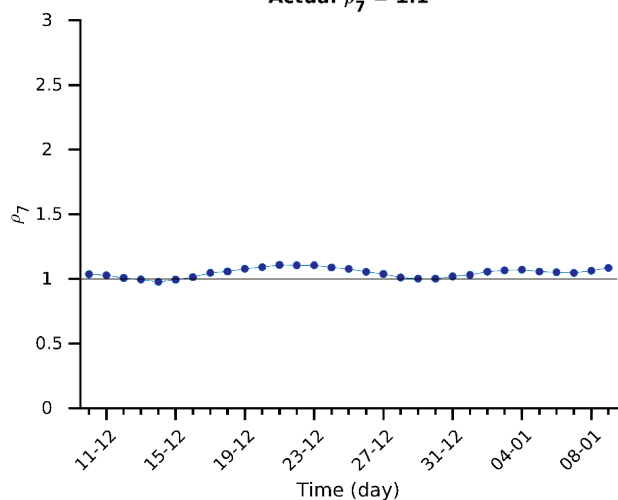
Day	Number of cases
12-01-2021	843829 (+25443)
16-01-2021	883673 (+65287)
19-01-2021	911277 (+92891)

Current indicators

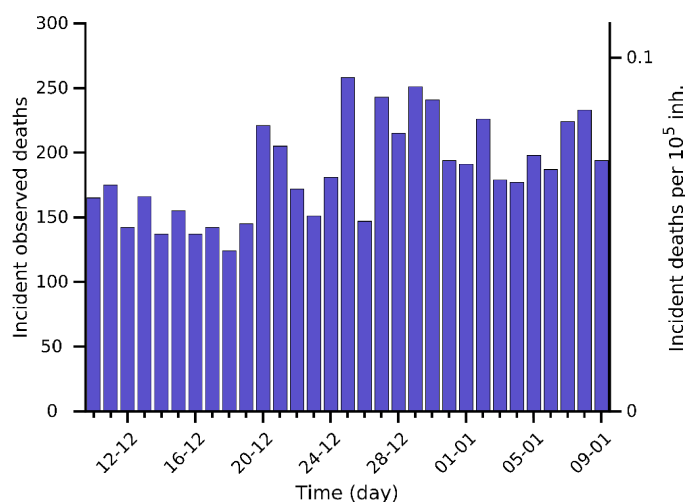
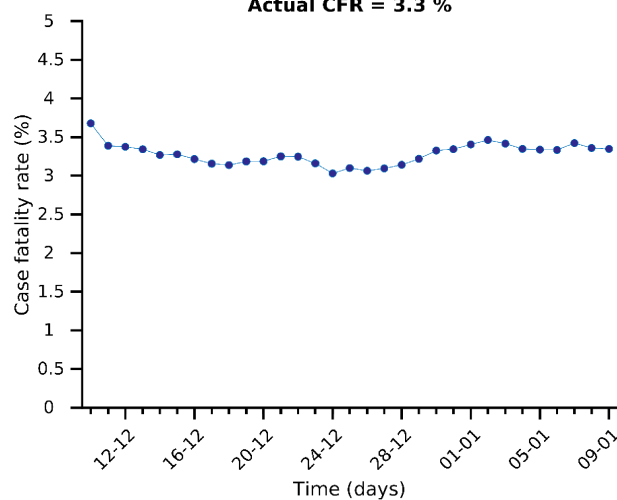
	A14	EPG	CFR	N7	D7
Today	41	44	3.35 %	8559	199
A Week ago	37	39	3.46 %	7377	223
Maximum	41	44	4.98 %	8559	223



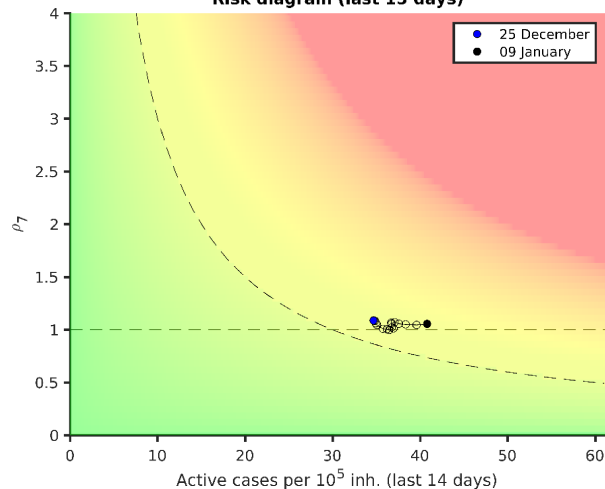
Actual $\rho_7 = 1.1$



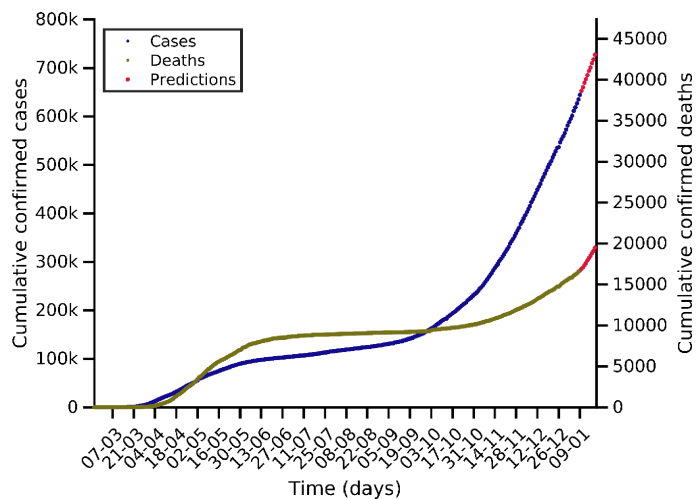
Actual CFR = 3.3 %



Risk diagram (last 15 days)



Canada 09-01-2021. Pop: 37.7M. Cumulative incidence: 1707/10⁵

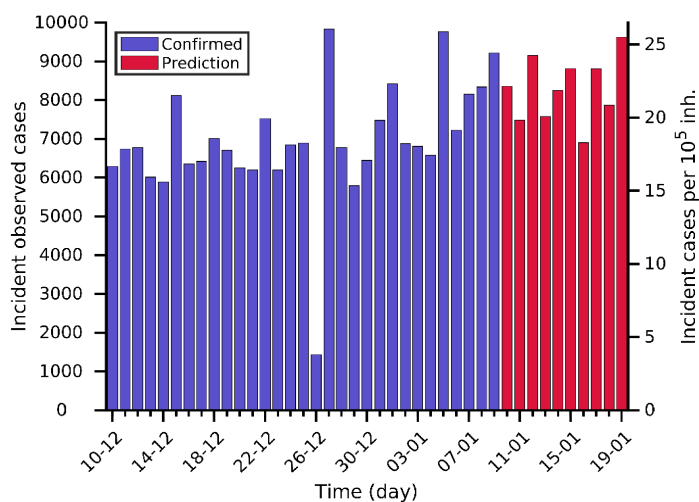


Predictions for next days

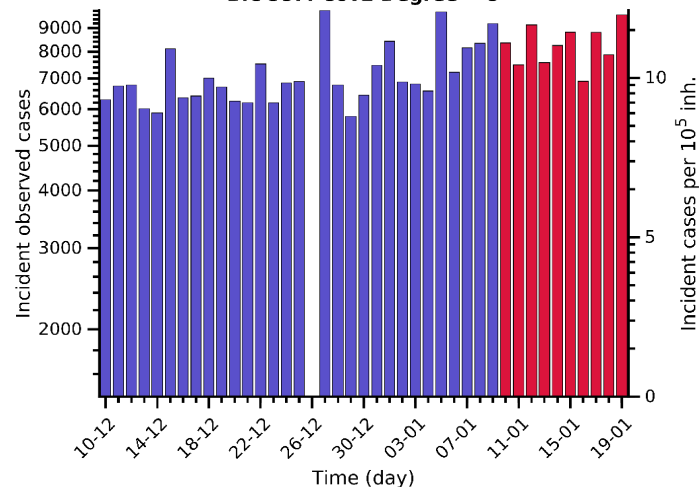
Day	Number of cases
12-01-2021	669337 (+24989)
16-01-2021	700874 (+56526)
19-01-2021	727174 (+82826)

Current indicators

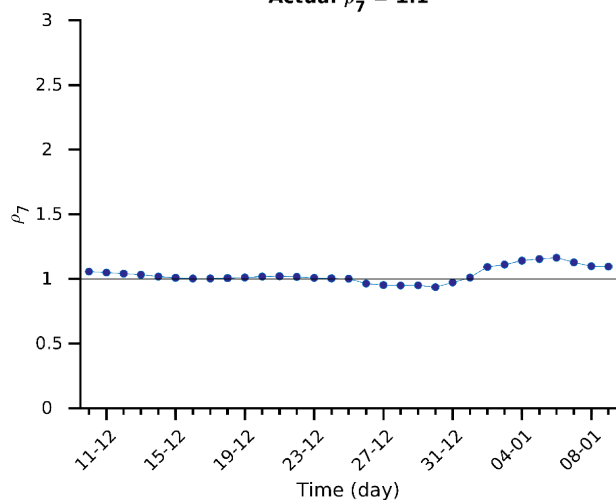
	A14	EPG	CFR	N7	D7
Today	285	313	2.14 %	8010	138
A Week ago	246	269	1.89 %	7372	146
Maximum	285	313	4.63 %	8010	178



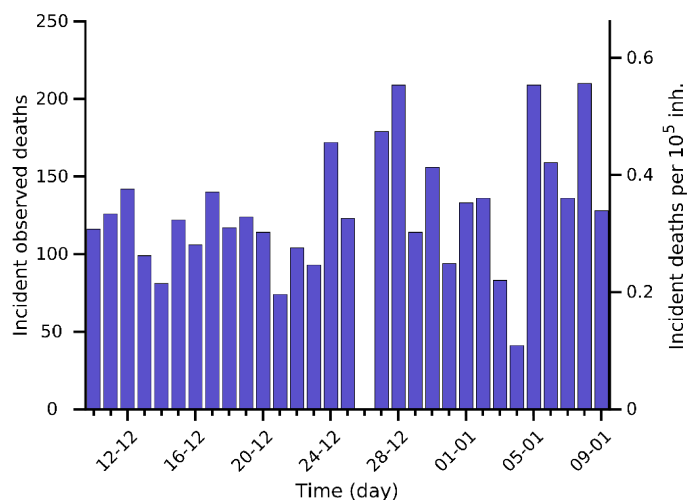
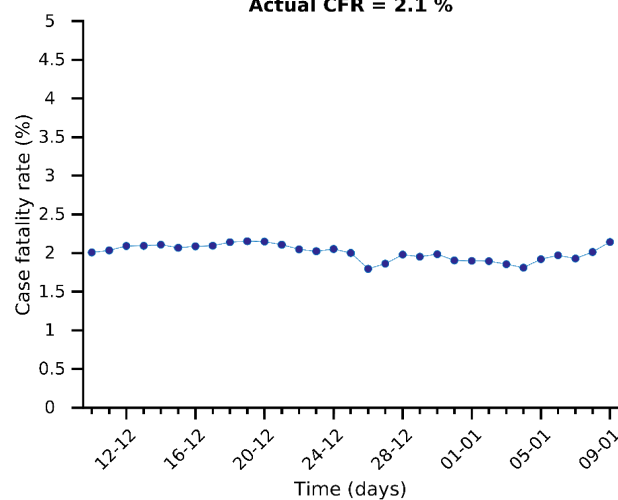
BIOCOM-Cov2 Degree = 9



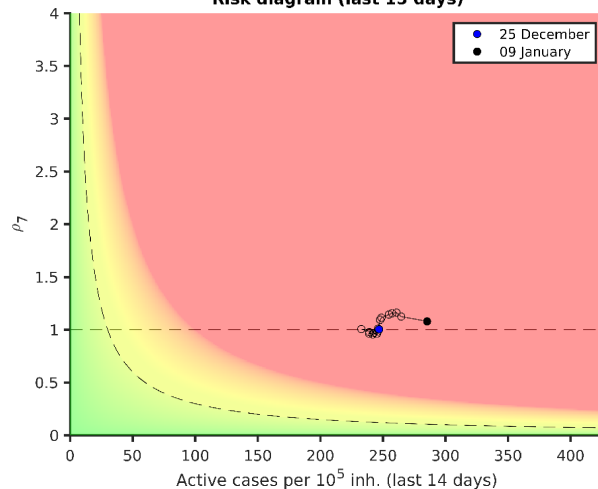
Actual $\rho_7 = 1.1$



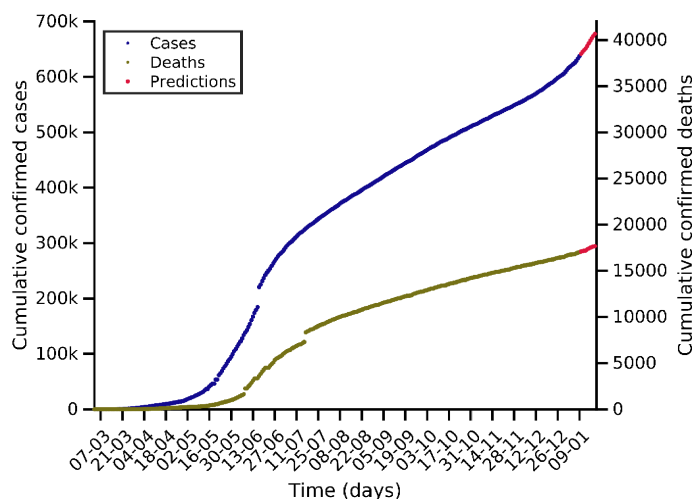
Actual CFR = 2.1 %



Risk diagram (last 15 days)



Chile 09-01-2021. Pop: 19.1M. Cumulative incidence: 3336/10⁵

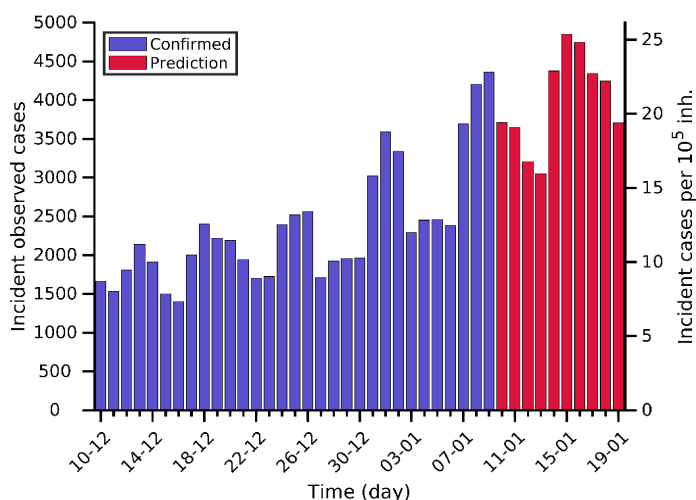


Predictions for next days

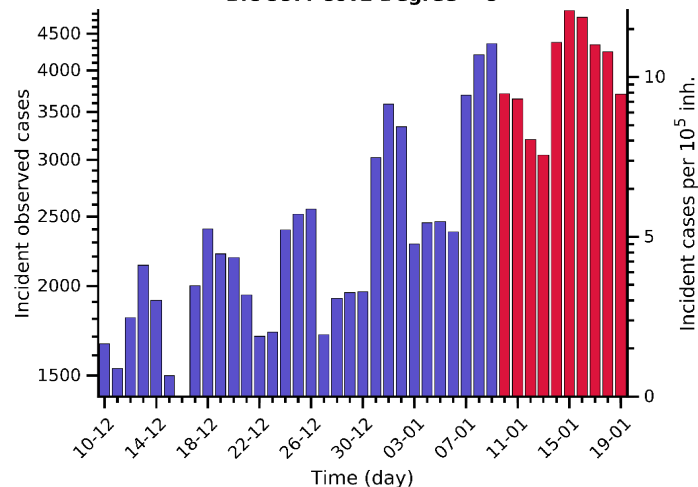
Day	Number of cases
12-01-2021	648308 (+10566)
16-01-2021	665330 (+27588)
19-01-2021	677625 (+39883)

Current indicators

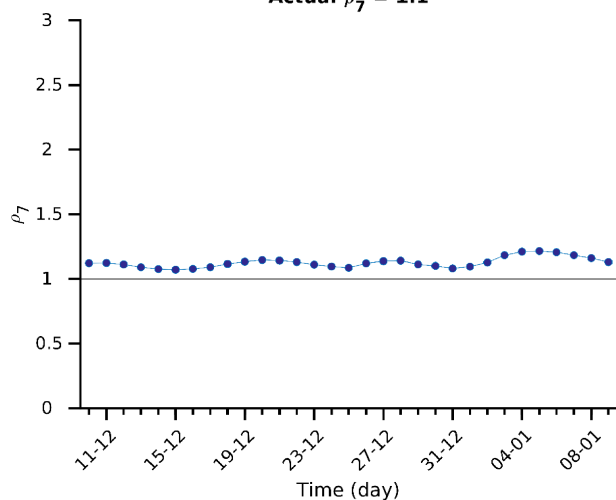
	A14	EPG	CFR	N7	D7
Today	206	233	2.56 %	3120	45
A Week ago	170	192	2.99 %	2501	46
Maximum	570	914	4.98 %	10305	241



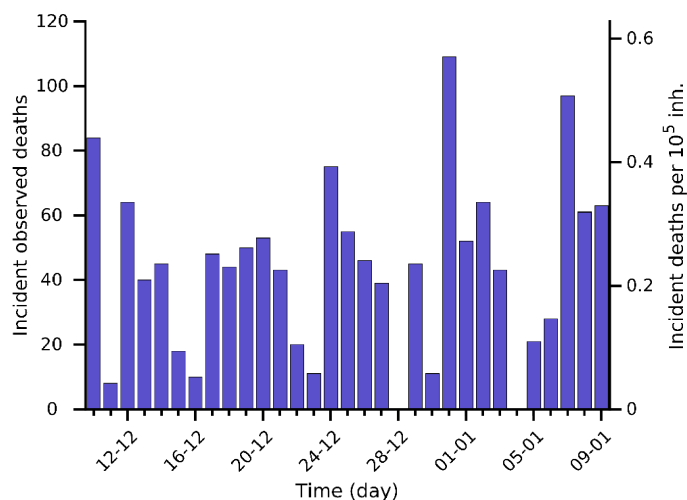
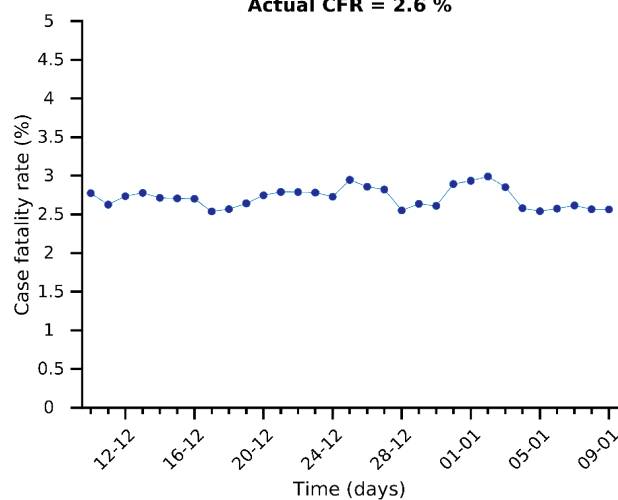
BIOCOM-Cov2 Degree = 9



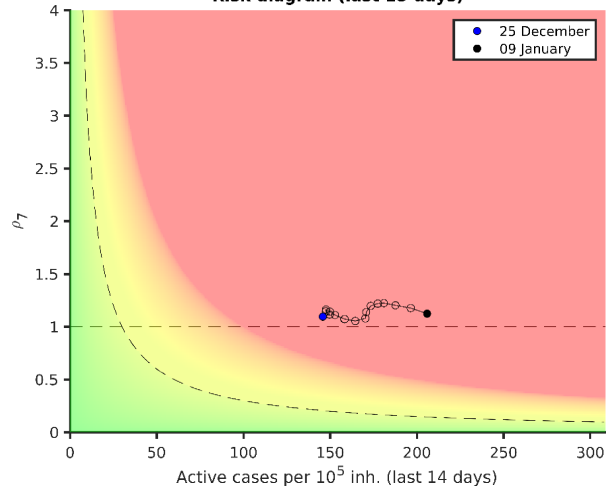
Actual $\rho_7 = 1.1$



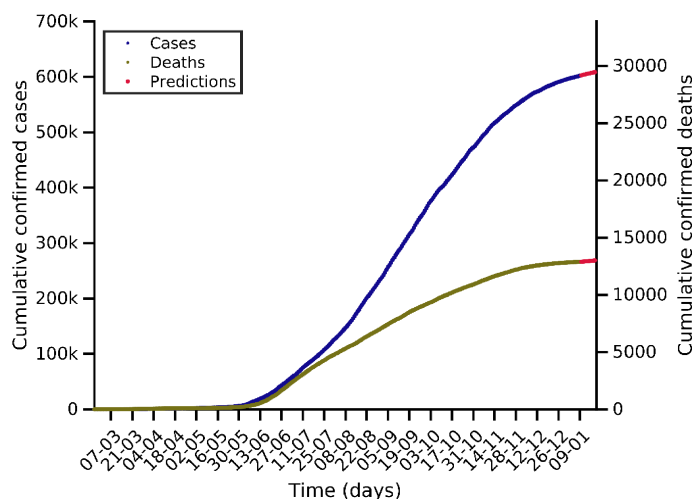
Actual CFR = 2.6 %



Risk diagram (last 15 days)



Iraq 09-01-2021. Pop: 40.2M. Cumulative incidence: 1497/10⁵

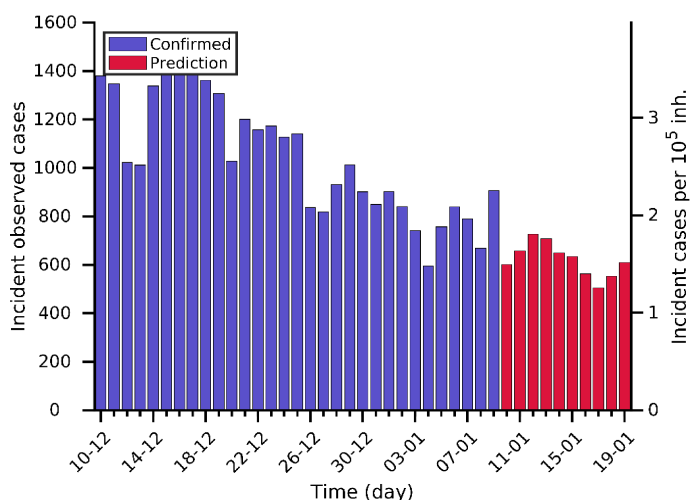


Predictions for next days

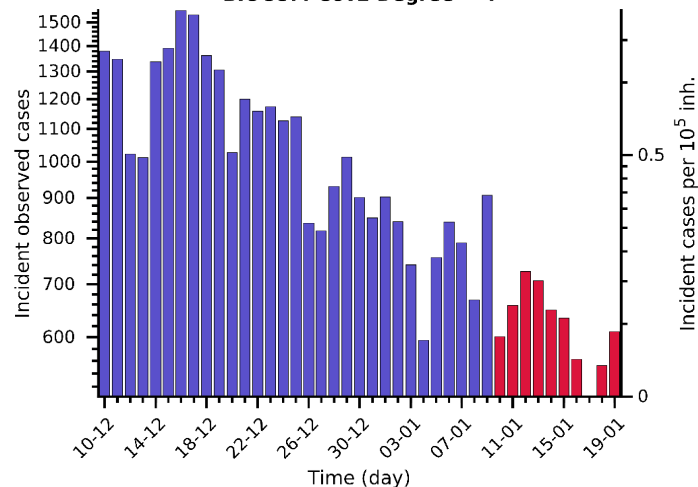
Day	Number of cases
12-01-2021	604317 (+1986)
16-01-2021	606871 (+4540)
19-01-2021	608539 (+6208)

Current indicators

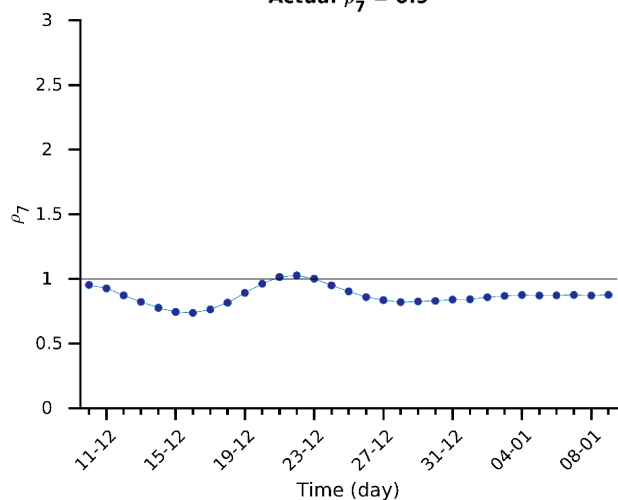
	A14	EPG	CFR	N7	D7
Today	29	25	0.55 %	757	7
A Week ago	35	30	0.60 %	893	9
Maximum	151	162	4.84 %	4505	106



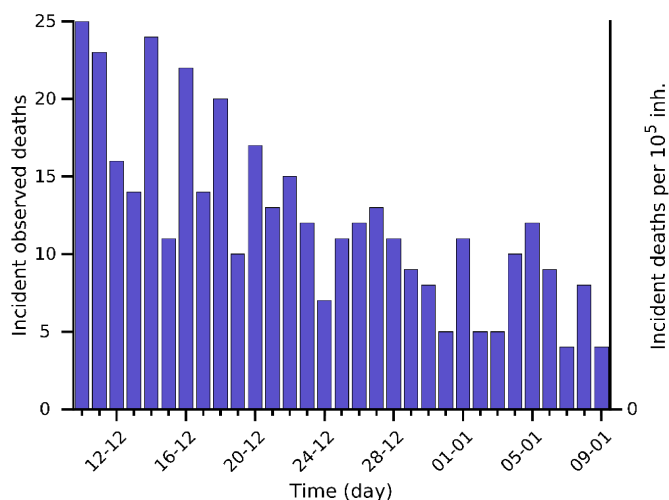
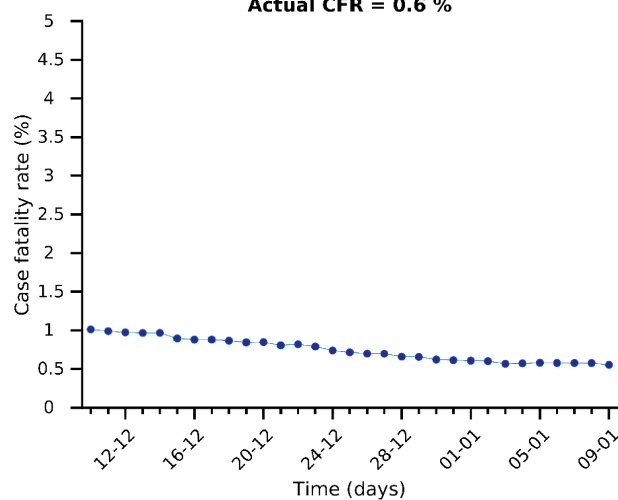
BIOCOM-Cov2 Degree = 4



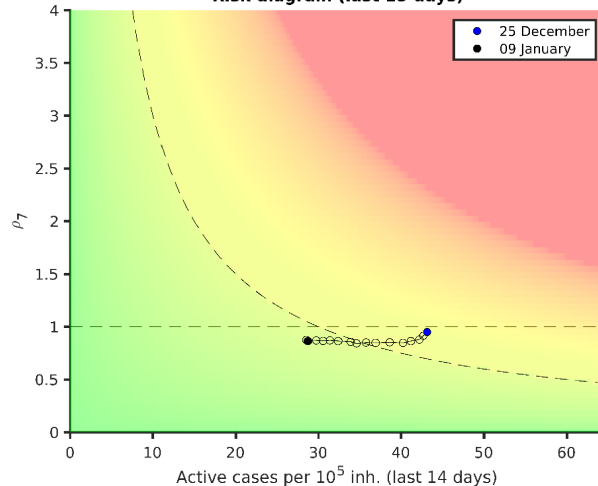
Actual $\rho_7 = 0.9$



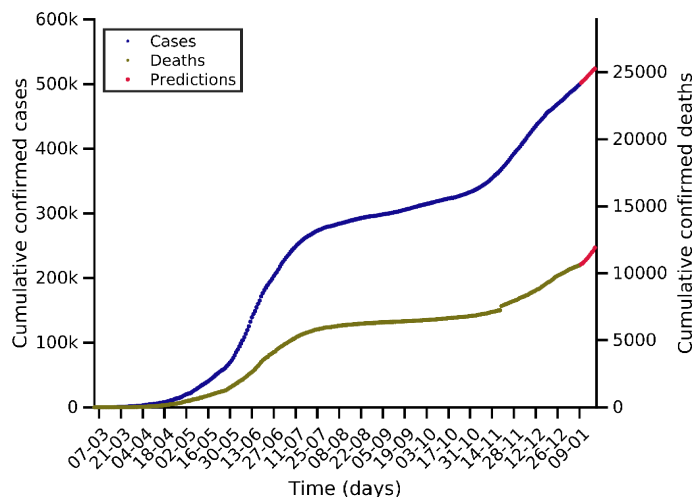
Actual CFR = 0.6 %



Risk diagram (last 15 days)



Pakistan 09-01-2021. Pop: 220.9M. Cumulative incidence: 226/10⁵

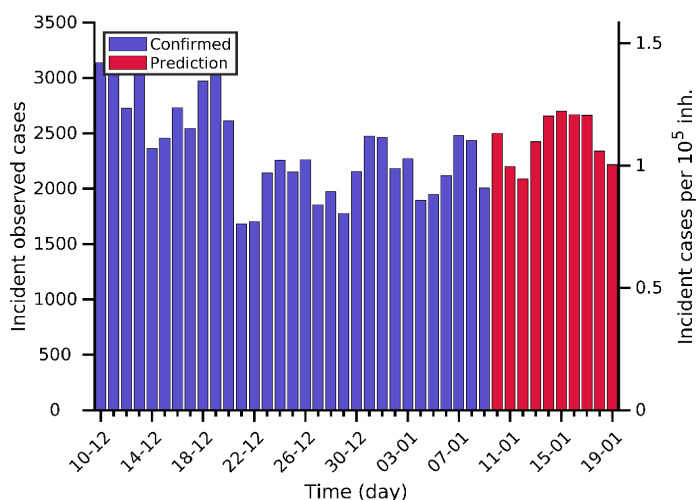


Predictions for next days

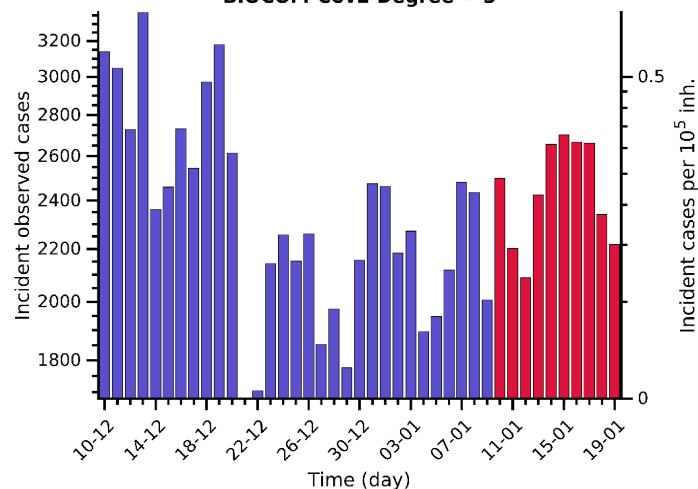
Day	Number of cases
12-01-2021	506306 (+6789)
16-01-2021	516755 (+17238)
19-01-2021	523976 (+24459)

Current indicators

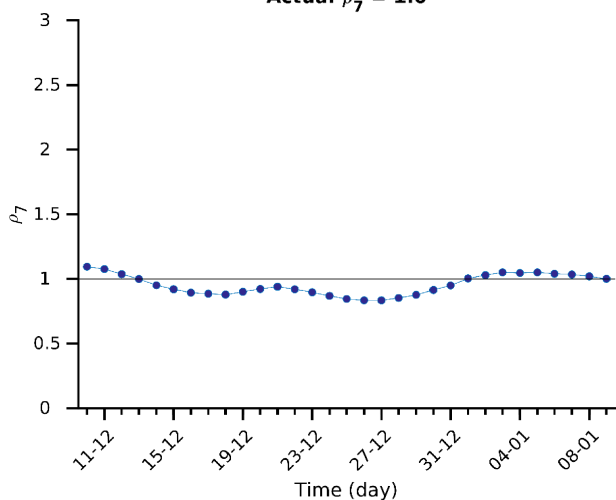
	A14	EPG	CFR	N7	D7
Today	14	14	1.89 %	2165	49
A Week ago	13	14	2.36 %	2126	63
Maximum	35	40	4.93 %	5865	124



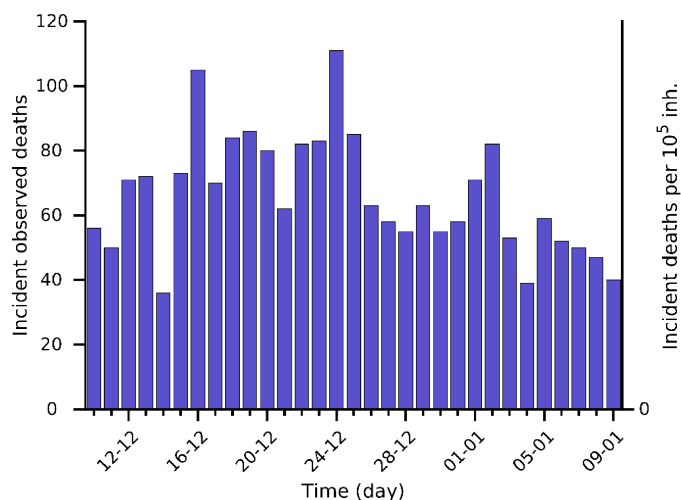
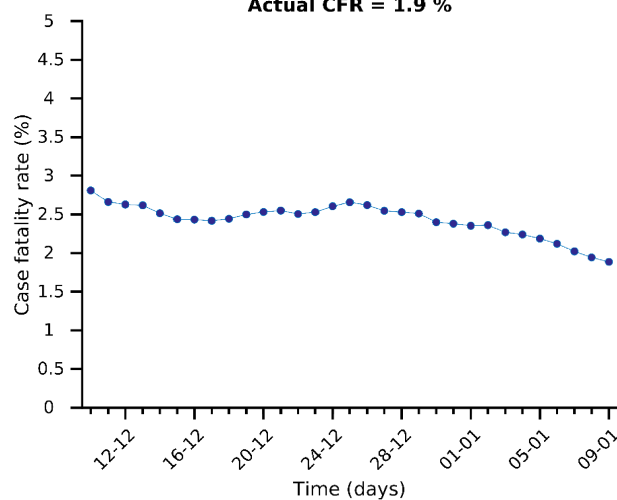
BIOCOM-Cov2 Degree = 3



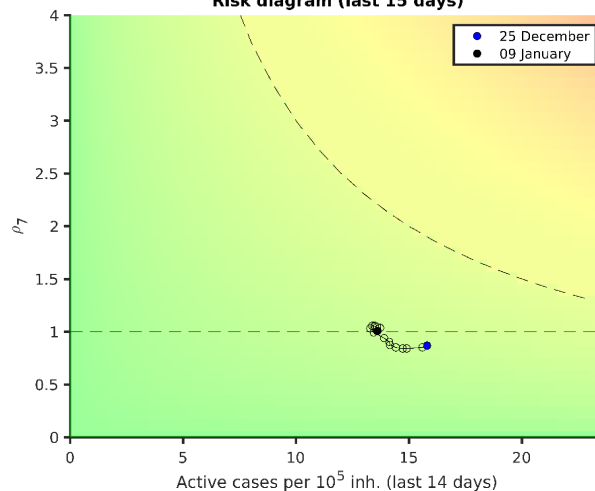
Actual $\rho_7 = 1.0$



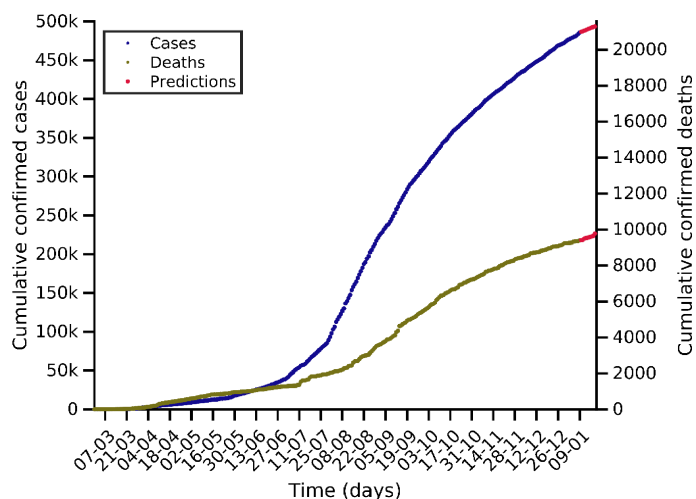
Actual CFR = 1.9 %



Risk diagram (last 15 days)



Philippines 09-01-2021. Pop: 109.6M. Cumulative incidence: 443/10⁵

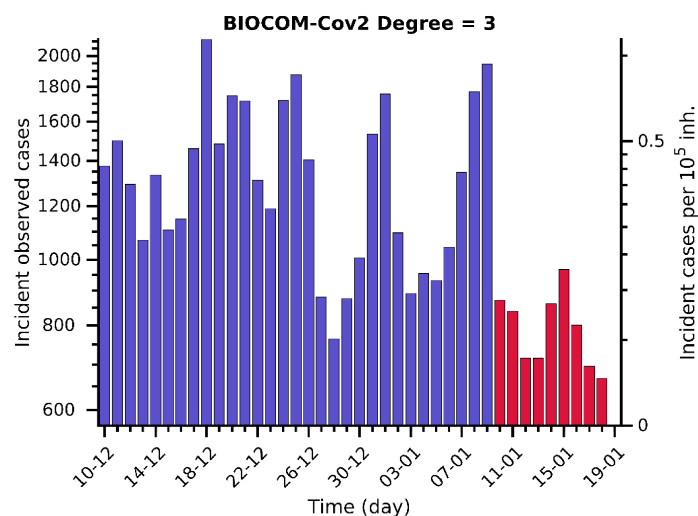
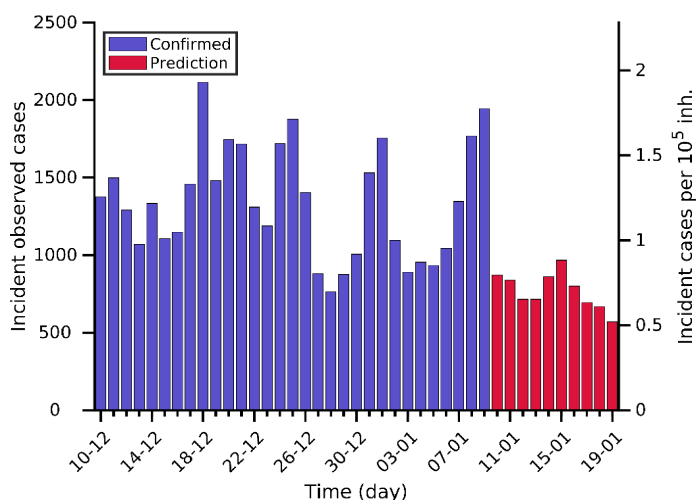


Predictions for next days

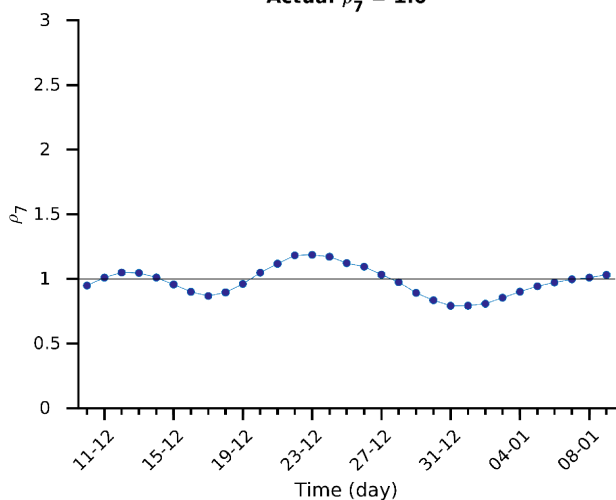
Day	Number of cases
12-01-2021	488224 (+2427)
16-01-2021	491569 (+5772)
19-01-2021	493502 (+7705)

Current indicators

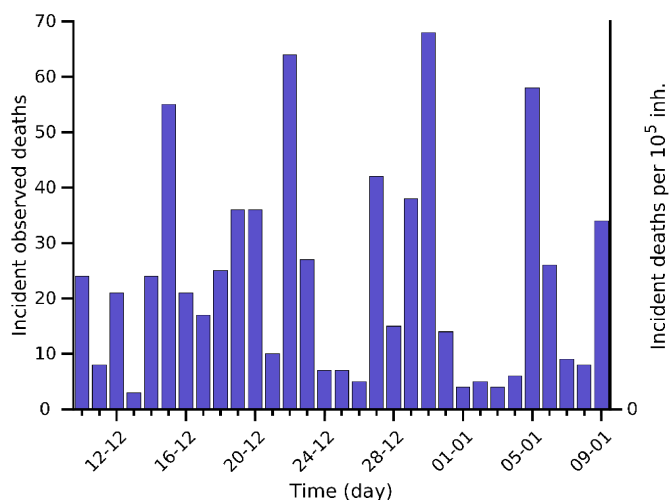
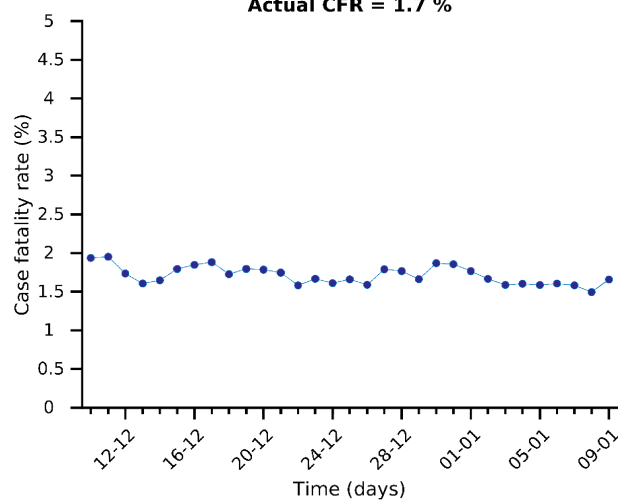
	A14	EPG	CFR	N7	D7
Today	15	16	1.66 %	1269	21
A Week ago	17	14	1.67 %	1130	27
Maximum	55	74	4.92 %	4477	107



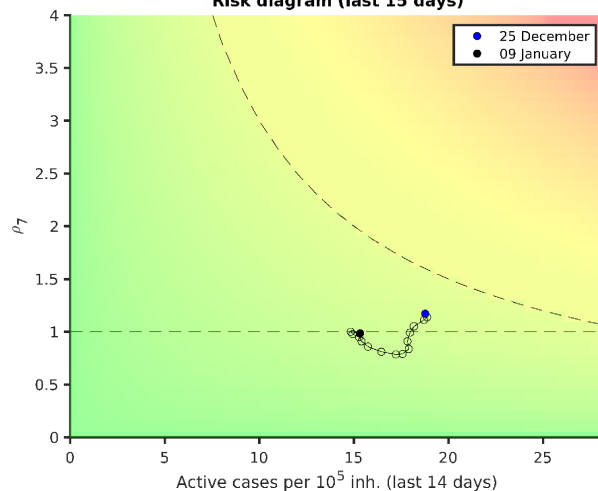
Actual $\rho_7 = 1.0$



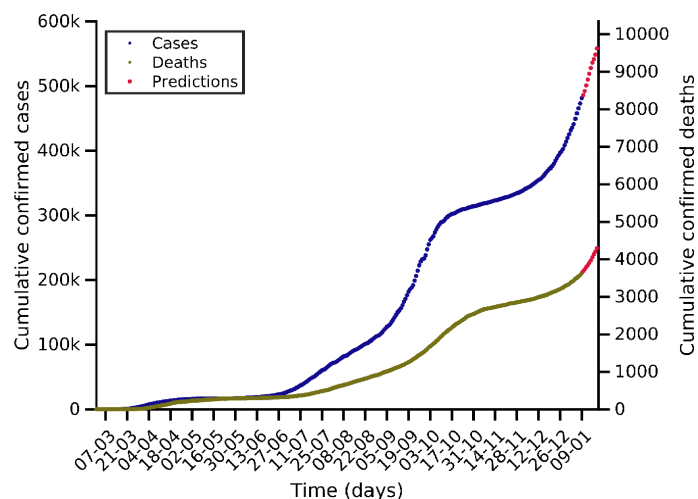
Actual CFR = 1.7 %



Risk diagram (last 15 days)



Israel 09-01-2021. Pop: 8.7M. Cumulative incidence: 5561/10⁵

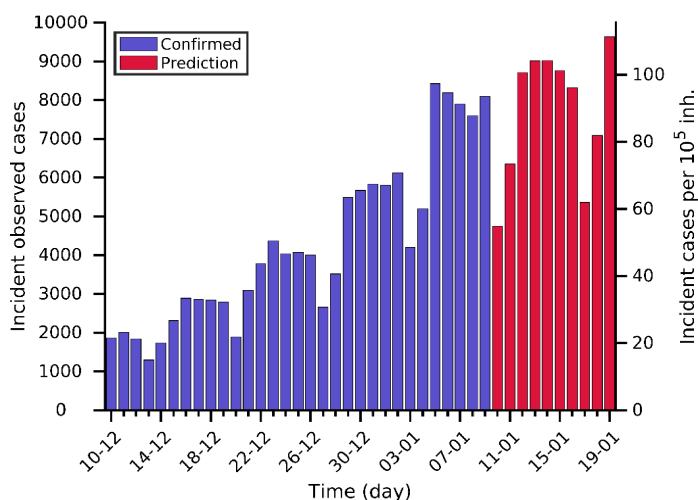


Predictions for next days

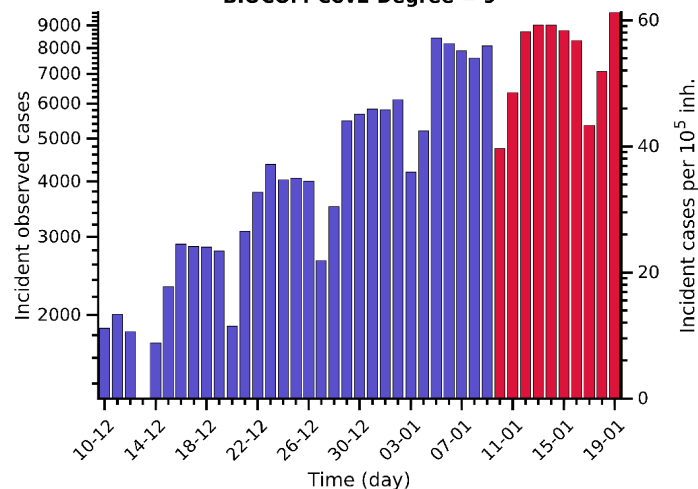
Day	Number of cases
12-01-2021	501119 (+19813)
16-01-2021	536235 (+54929)
19-01-2021	558317 (+77011)

Current indicators

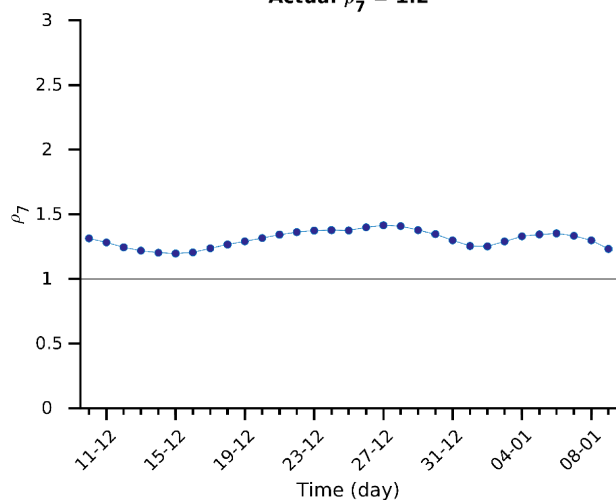
	A14	EPG	CFR	N7	D7
Today	978	1205	1.50 %	7086	36
A Week ago	697	872	1.48 %	5012	25
Maximum	978	1209	4.95 %	7086	39



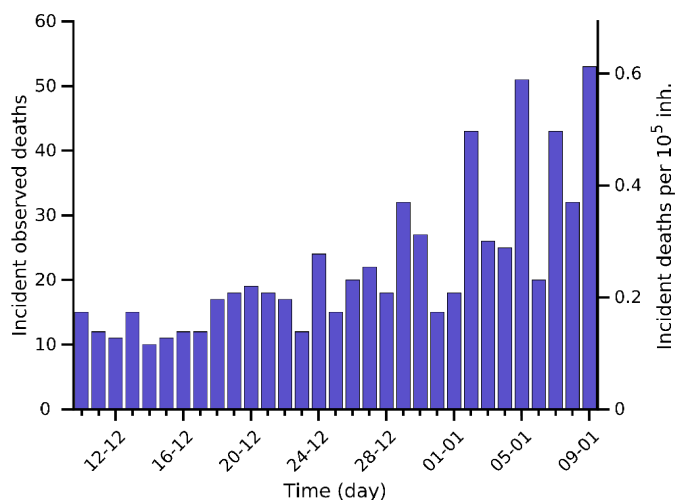
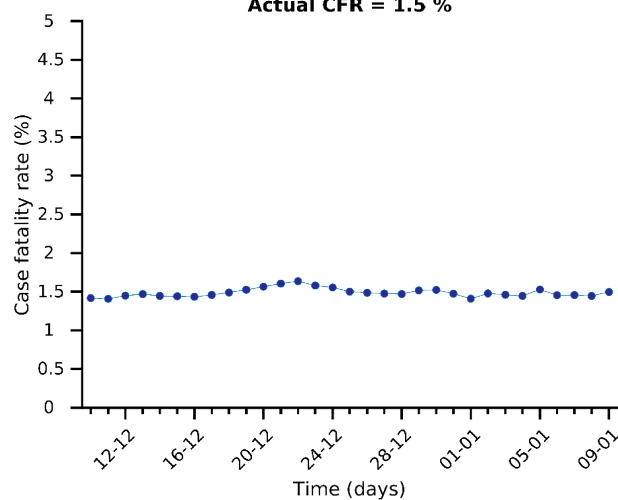
BIOCOM-Cov2 Degree = 9



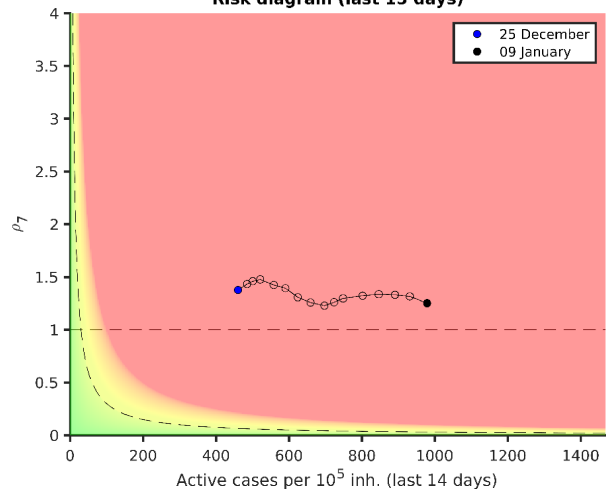
Actual $\rho_7 = 1.2$



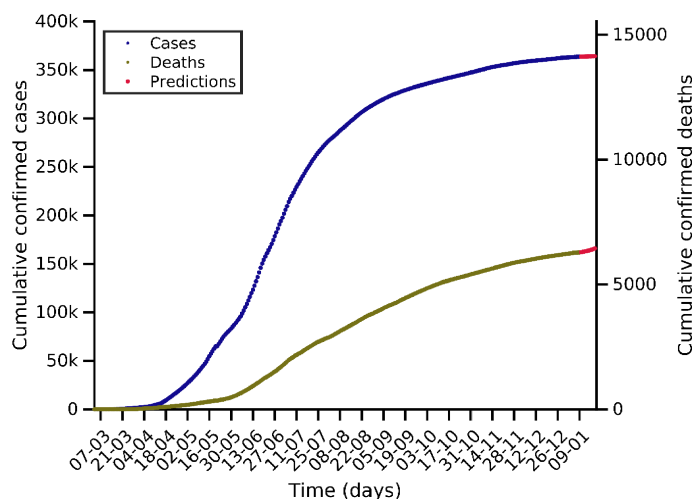
Actual CFR = 1.5 %



Risk diagram (last 15 days)



Saudi Arabia 09-01-2021. Pop: 34.8M. Cumulative incidence: 1045/10⁵

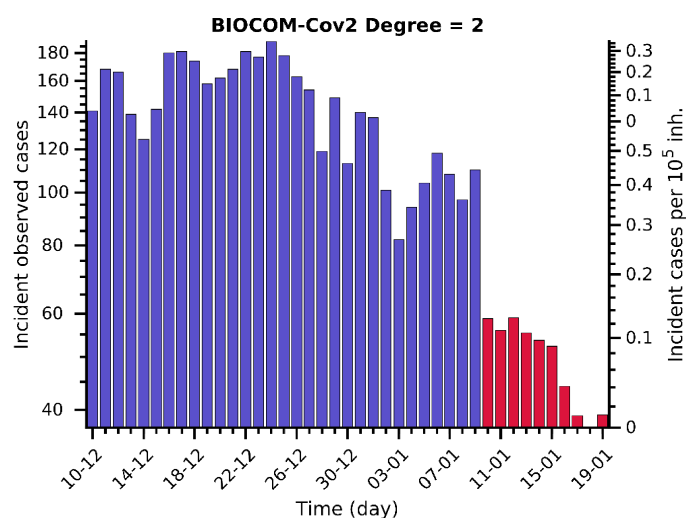
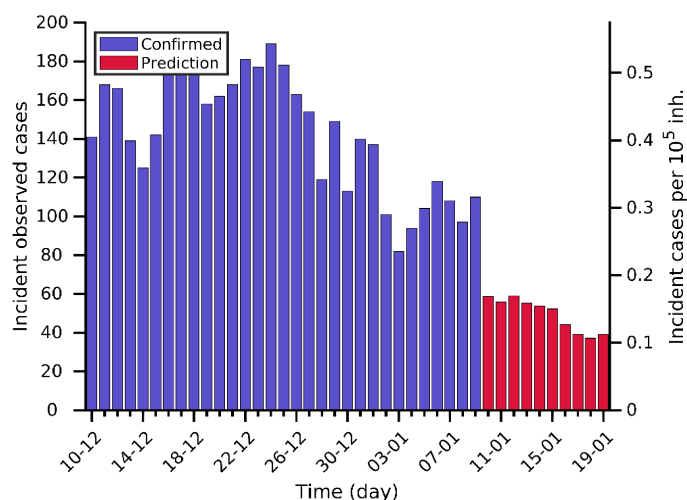


Predictions for next days

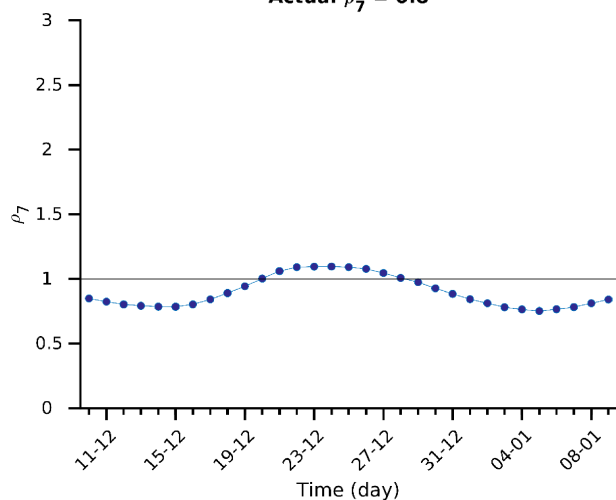
Day	Number of cases
12-01-2021	363866 (+174)
16-01-2021	364071 (+379)
19-01-2021	364186 (+494)

Current indicators

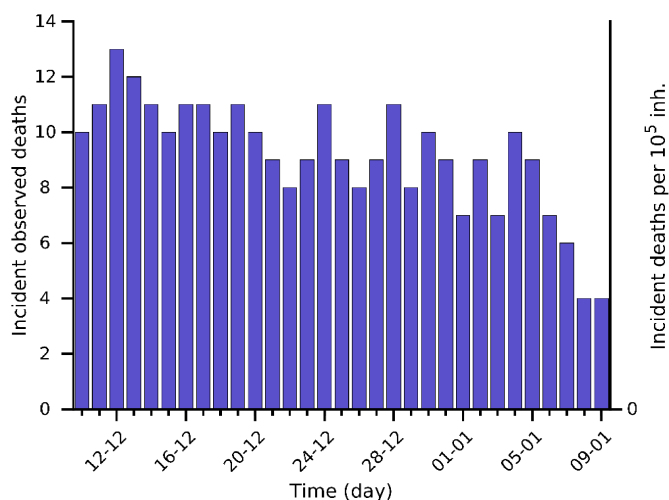
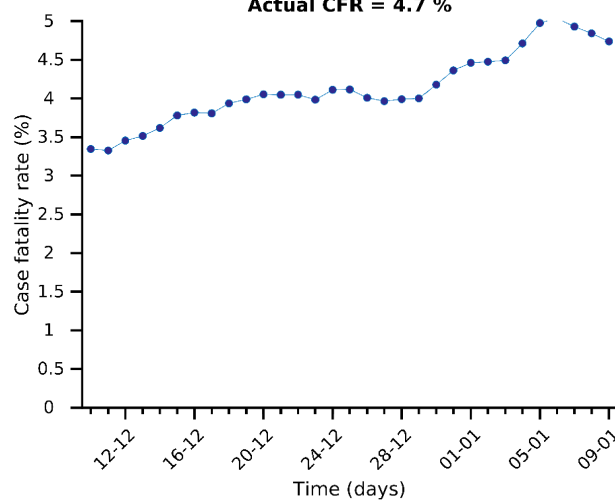
	A14	EPG	CFR	N7	D7
Today	5	4	4.74 %	102	7
A Week ago	6	5	4.47 %	130	9
Maximum	160	190	4.98 %	4418	53



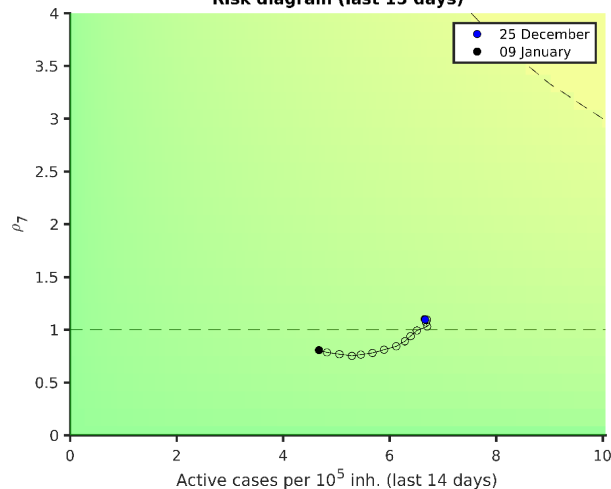
Actual $\rho_7 = 0.8$



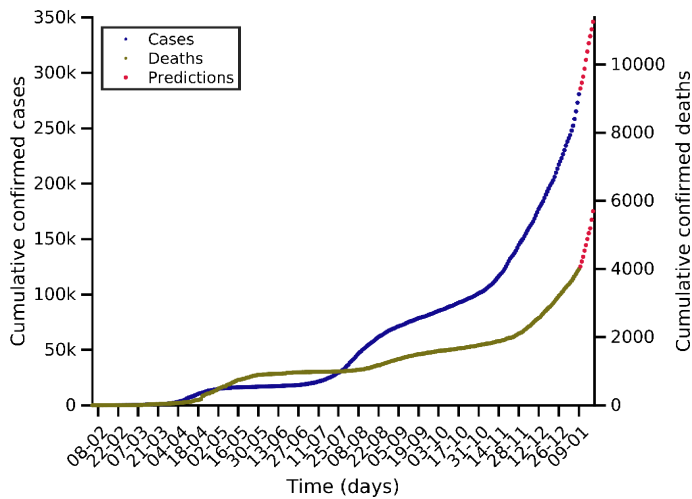
Actual CFR = 4.7 %



Risk diagram (last 15 days)



Japan 09-01-2021. Pop: 126.5M. Cumulative incidence: 222/10⁵

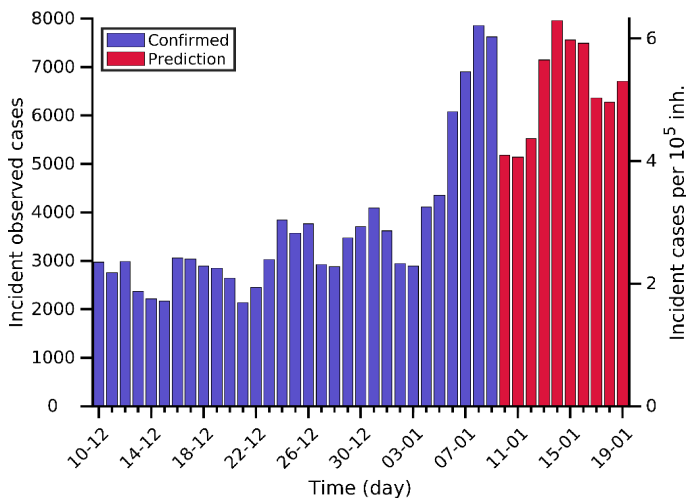


Predictions for next days

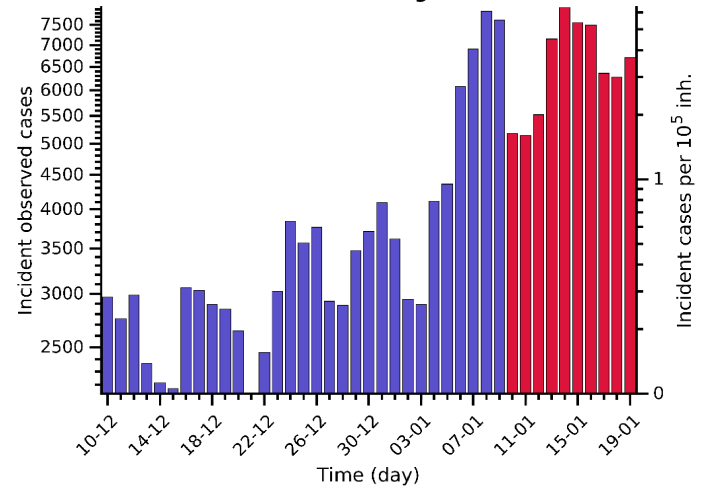
Day	Number of cases
12-01-2021	296617 (+15842)
16-01-2021	326771 (+45996)
19-01-2021	346116 (+65341)

Current indicators

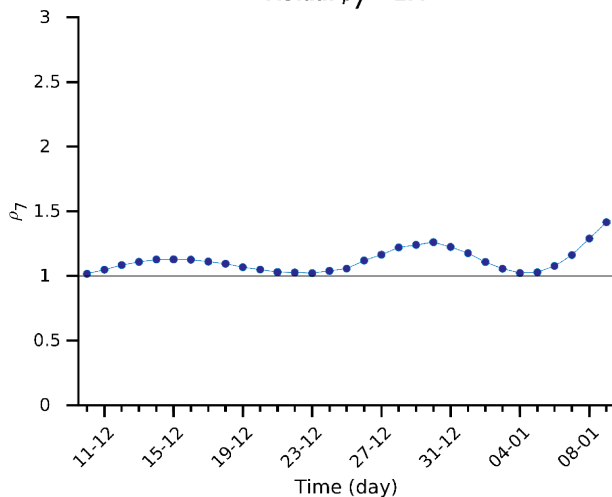
	A14	EPG	CFR	N7	D7
Today	50	71	2.19 %	5689	64
A Week ago	36	39	2.07 %	3377	48
Maximum	50	71	4.97 %	5689	64



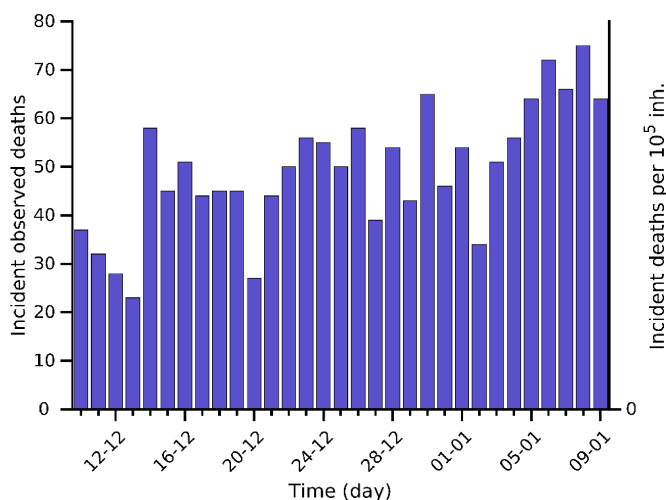
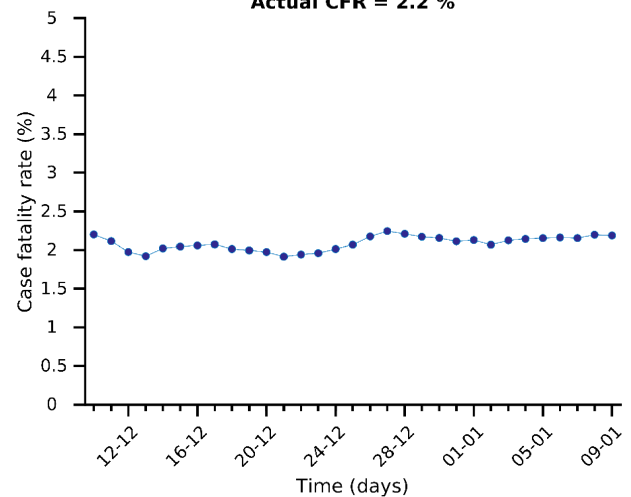
BIOCOM-Cov2 Degree = 6



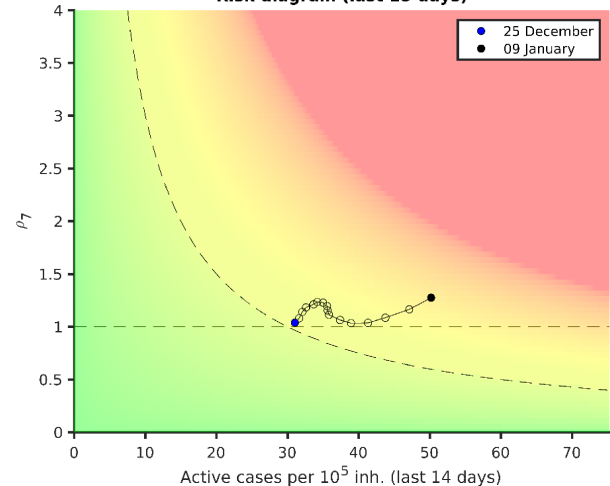
Actual $\rho_7 = 1.4$



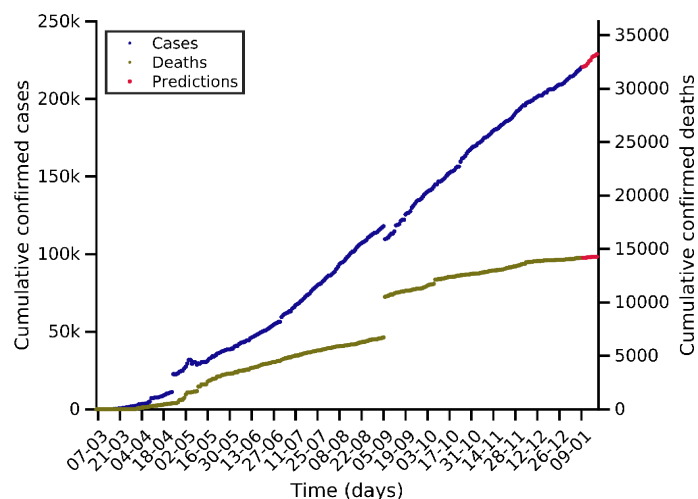
Actual CFR = 2.2 %



Risk diagram (last 15 days)



Ecuador 09-01-2021. Pop: 17.6M. Cumulative incidence: 1249/10⁵

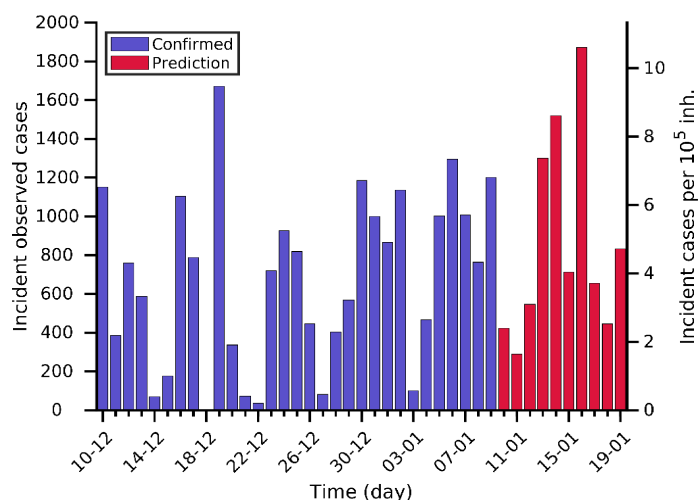


Predictions for next days

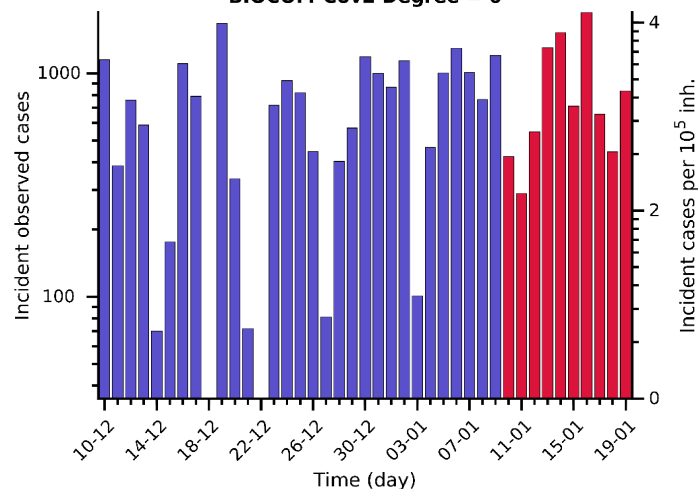
Day	Number of cases
12-01-2021	221608 (+1259)
16-01-2021	227011 (+6662)
19-01-2021	228942 (+8593)

Current indicators

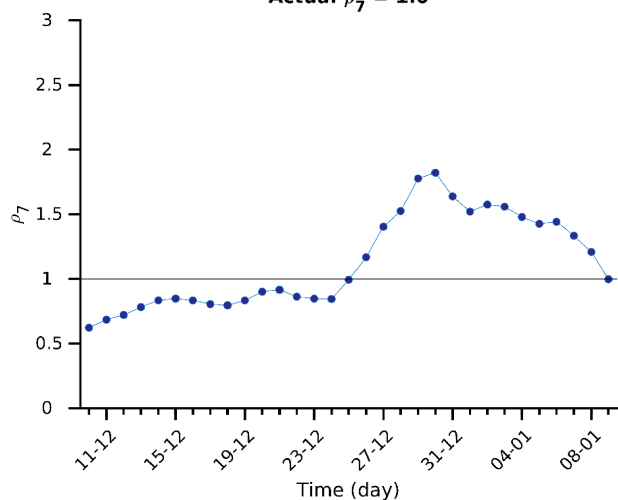
	A14	EPG	CFR	N7	D7
Today	63	63	2.19 %	834	17
A Week ago	49	77	1.05 %	748	10
Maximum	123	318	4.99 %	2038	587



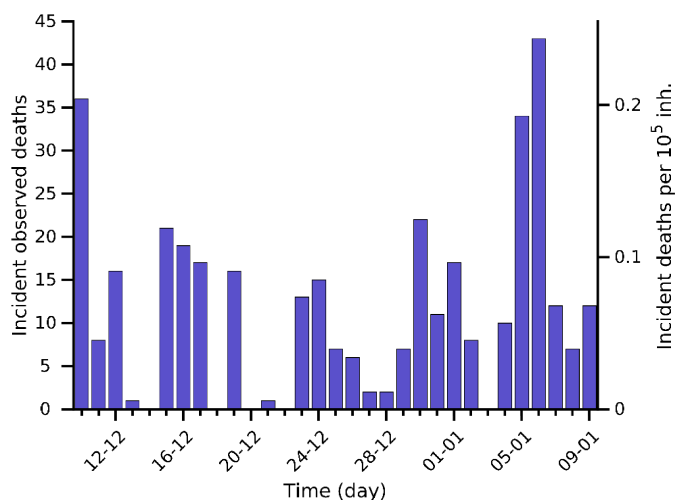
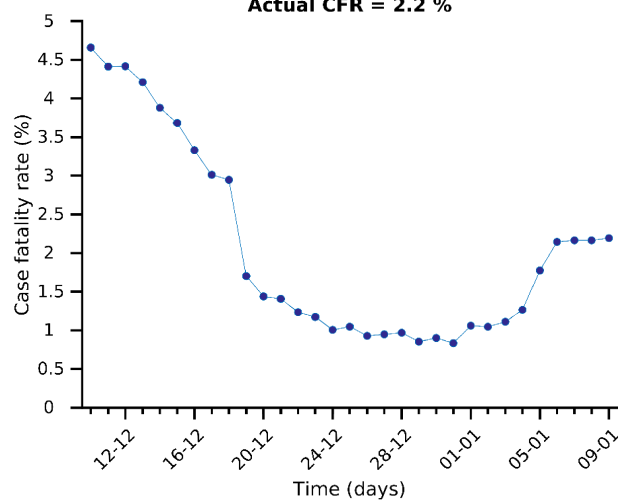
BIOCOM-Cov2 Degree = 6



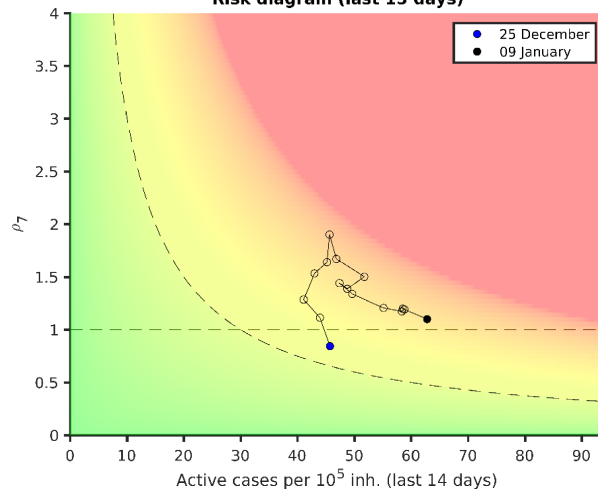
Actual $\rho_7 = 1.0$



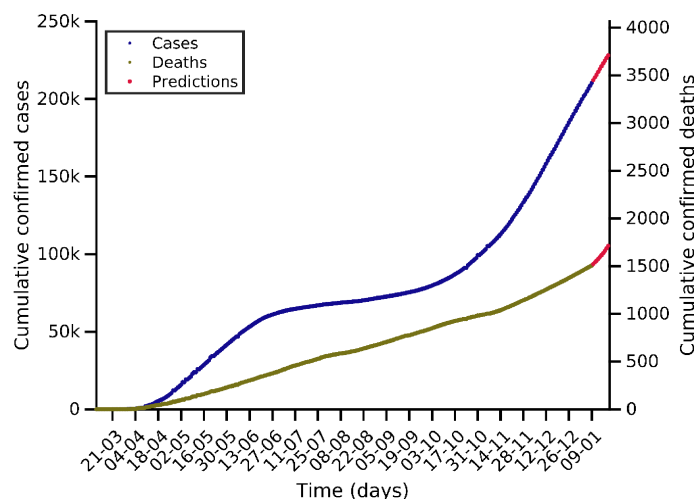
Actual CFR = 2.2 %



Risk diagram (last 15 days)



Belarus 09-01-2021. Pop: 9.4M. Cumulative incidence: 2226/10⁵

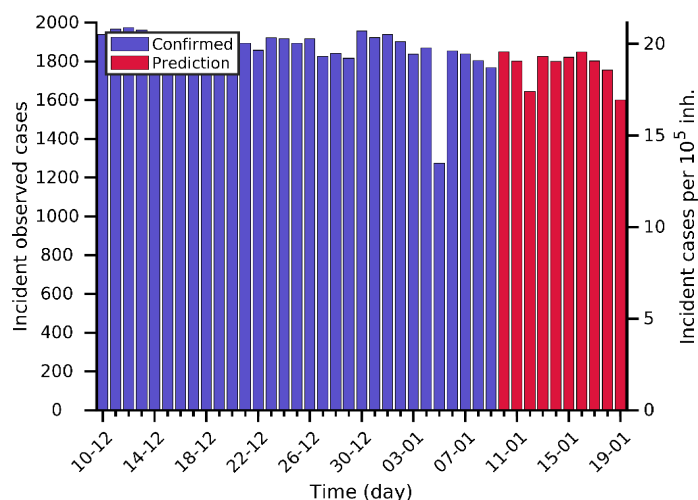


Predictions for next days

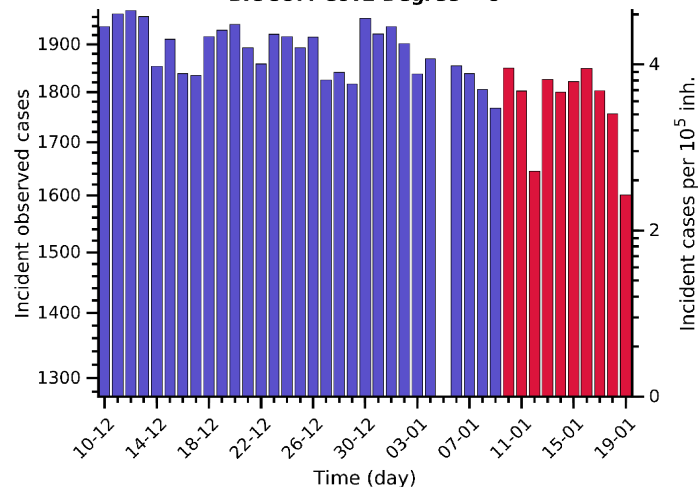
Day	Number of cases
12-01-2021	215665 (+5297)
16-01-2021	222961 (+12593)
19-01-2021	228120 (+17752)

Current indicators

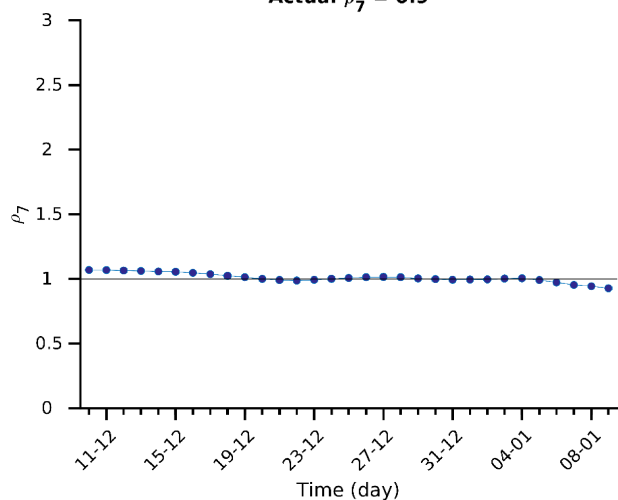
	A14	EPG	CFR	N7	D7
Today	269	250	0.50 %	1749	9
A Week ago	281	280	0.50 %	1886	9
Maximum	283	289	4.95 %	1922	10



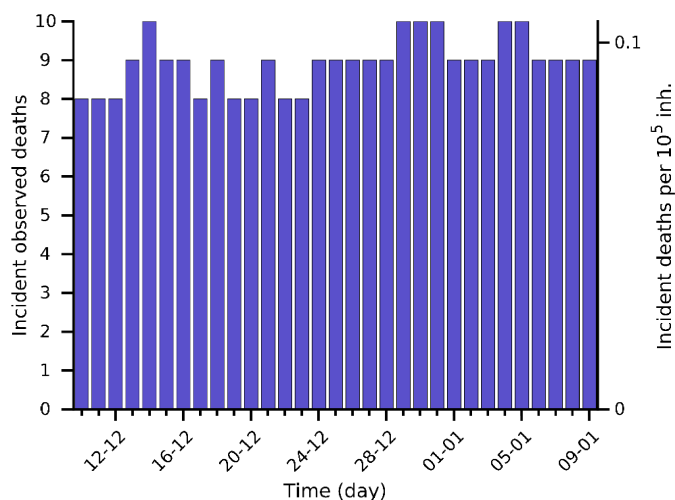
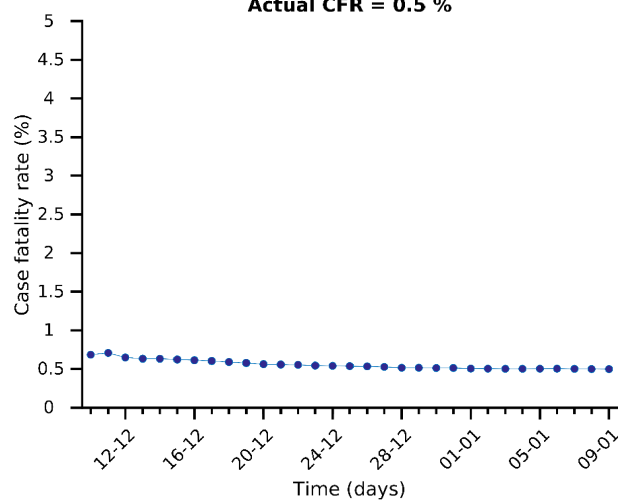
BIOCOM-Cov2 Degree = 9



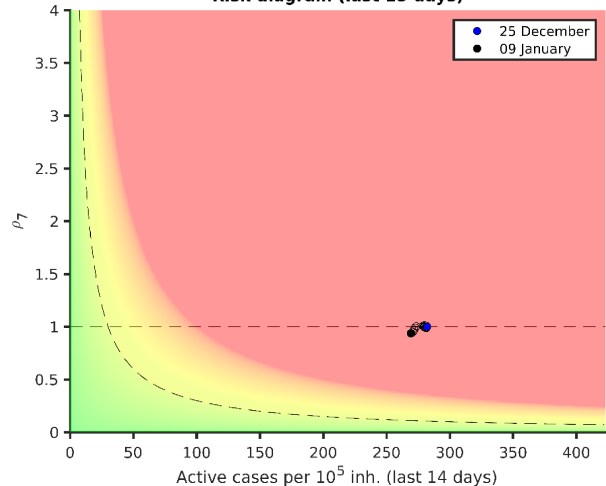
Actual $\rho_7 = 0.9$



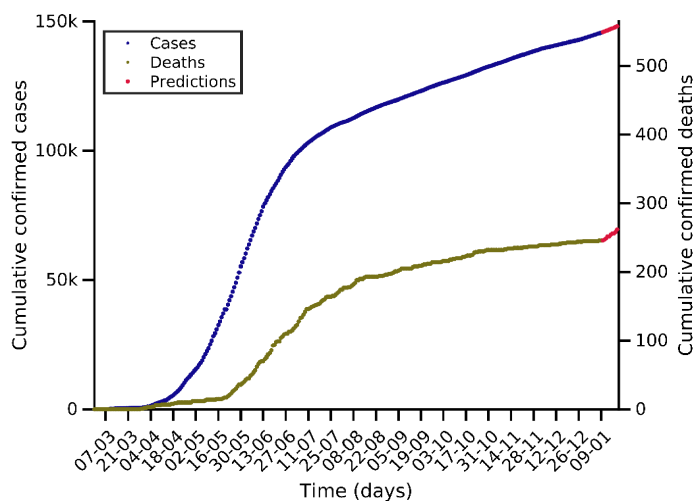
Actual CFR = 0.5 %



Risk diagram (last 15 days)



Qatar 09-01-2021. Pop: 2.9M. Cumulative incidence: 5056/10⁵

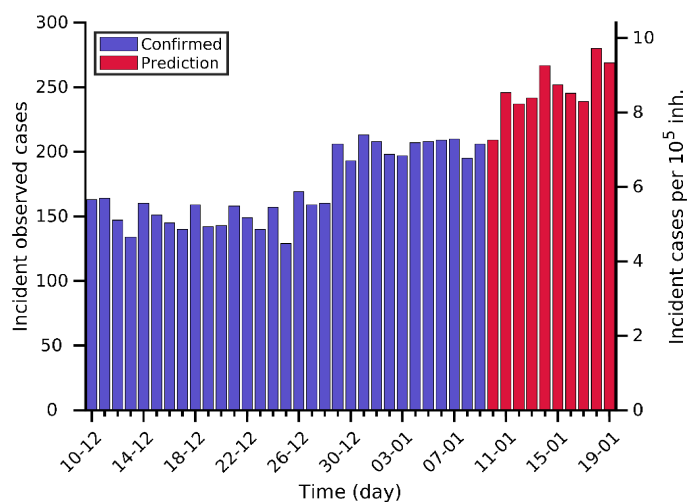


Predictions for next days

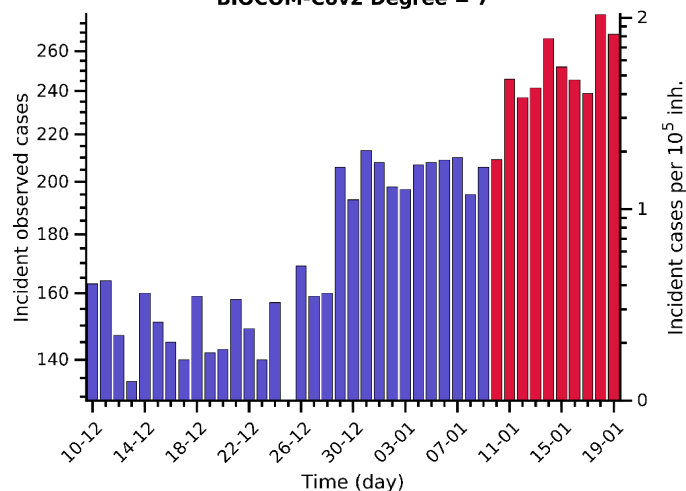
Day	Number of cases
12-01-2021	146364 (+692)
16-01-2021	147369 (+1697)
19-01-2021	148157 (+2485)

Current indicators

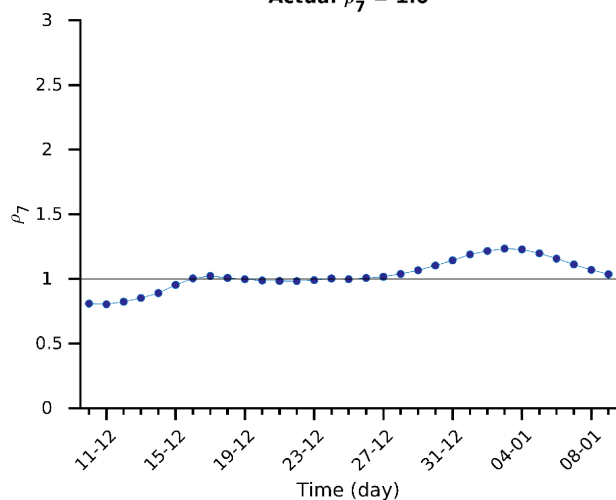
	A14	EPG	CFR	N7	D7
Today	96	100	0.10 %	205	0
A Week ago	83	101	0.09 %	191	0
Maximum	871	1080	4.55 %	1888	4



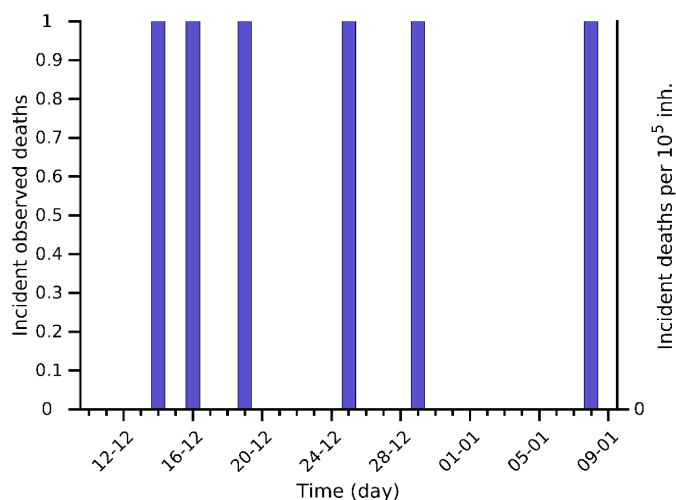
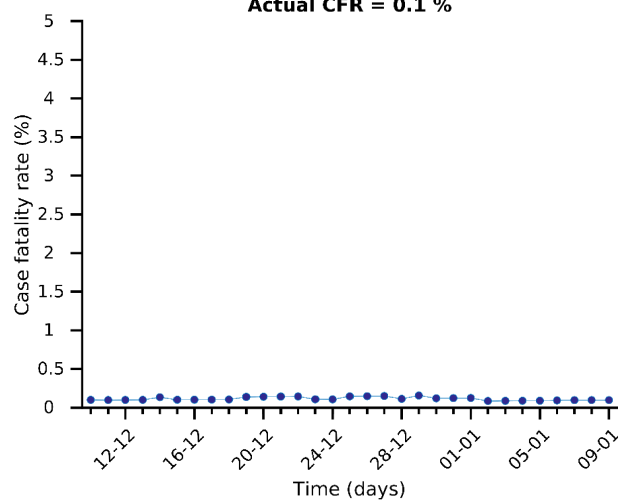
BIOCOM-Cov2 Degree = 7



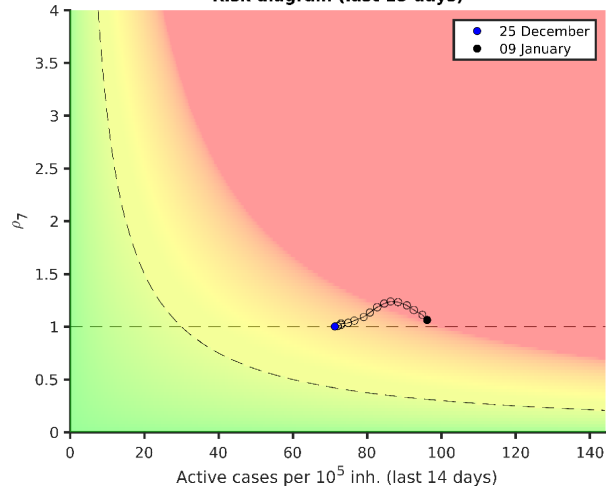
Actual $\rho_7 = 1.0$



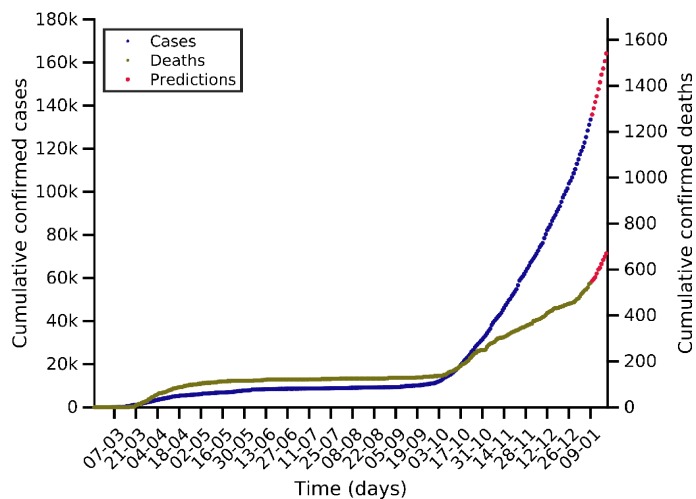
Actual CFR = 0.1 %



Risk diagram (last 15 days)



Malaysia 09-01-2021. Pop: 32.4M. Cumulative incidence: 413/10⁵

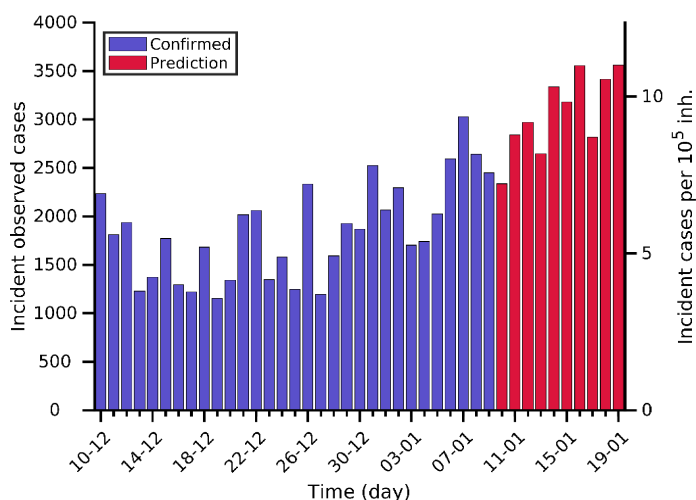


Predictions for next days

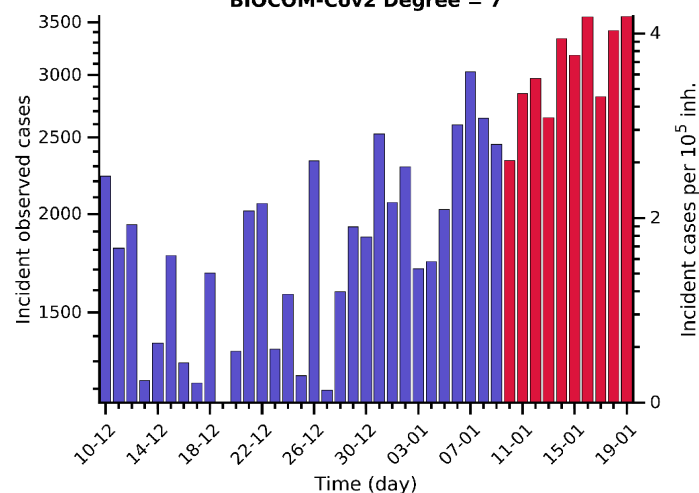
Day	Number of cases
12-01-2021	141706 (+8147)
16-01-2021	154428 (+20869)
19-01-2021	164222 (+30663)

Current indicators

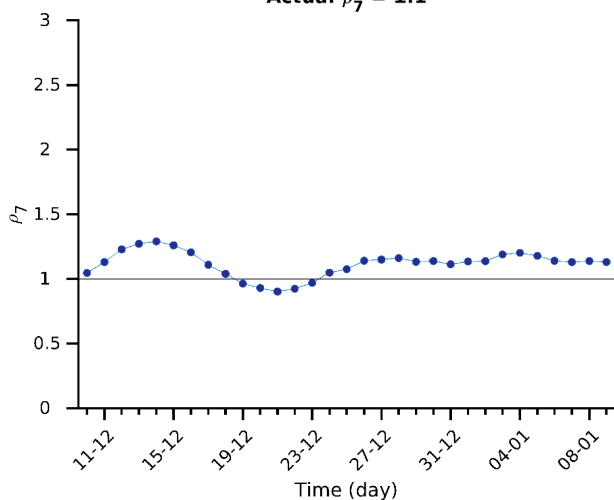
	A14	EPG	CFR	N7	D7
Today	92	104	0.44 %	2312	8
A Week ago	78	89	0.26 %	1925	5
Maximum	92	104	4.98 %	2312	9



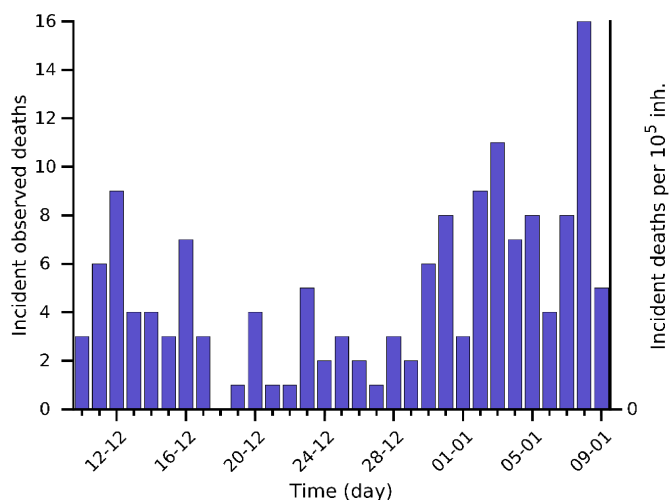
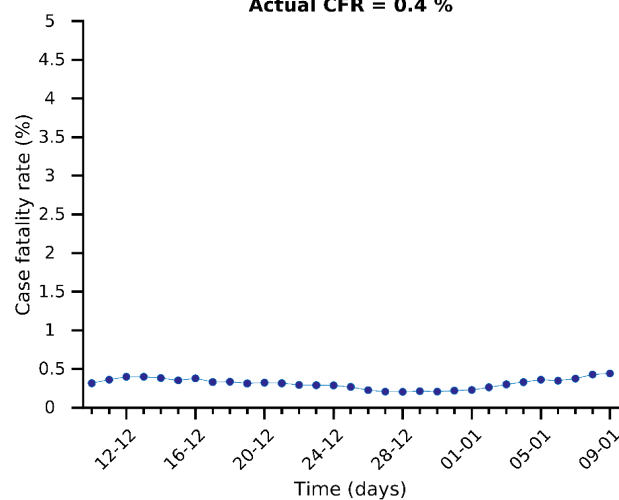
BIOCOM-Cov2 Degree = 7



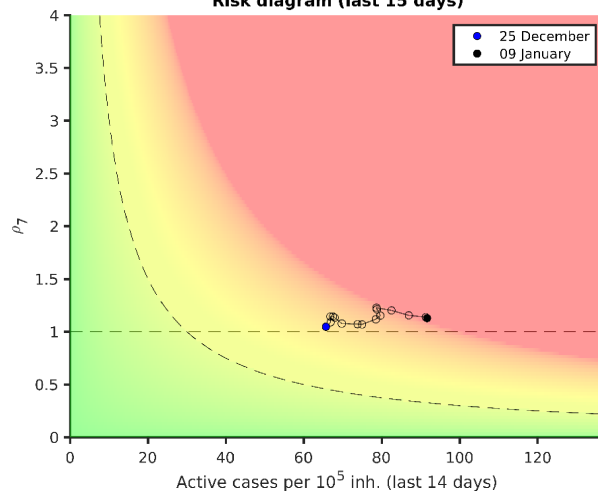
Actual $\rho_7 = 1.1$



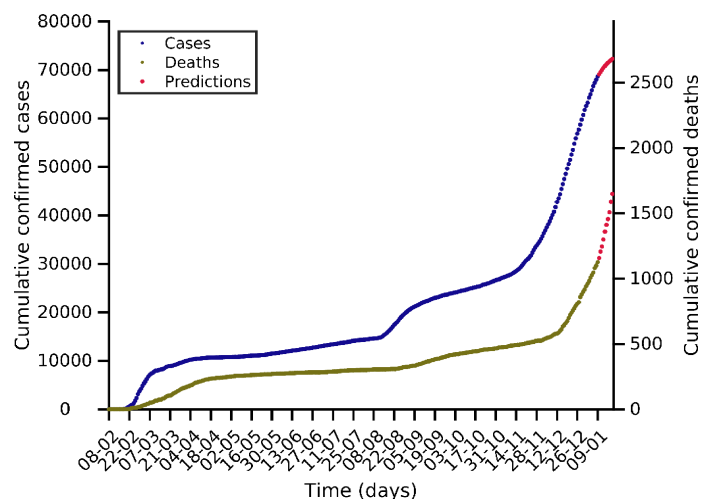
Actual CFR = 0.4 %



Risk diagram (last 15 days)



South Korea 09-01-2021. Pop: 51.3M. Cumulative incidence: 134/10⁵

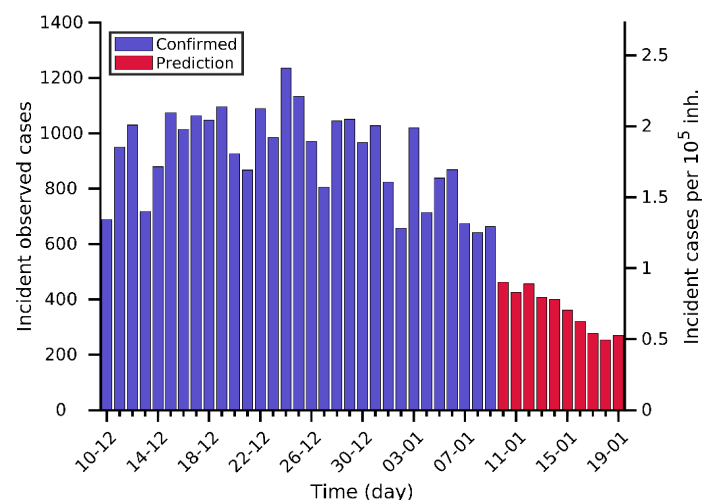


Predictions for next days

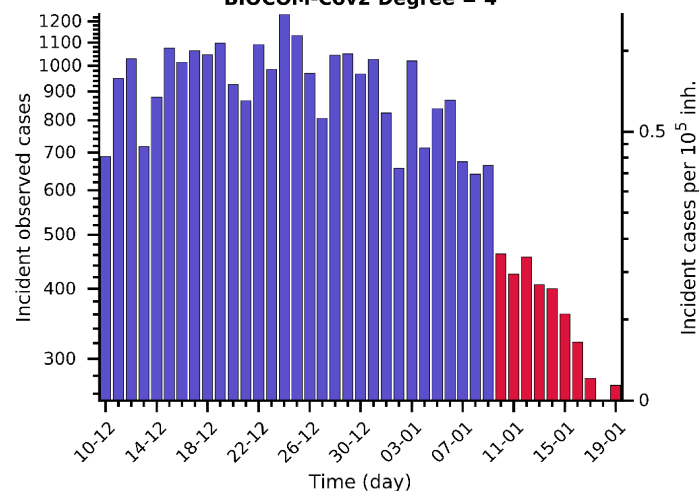
Day	Number of cases
12-01-2021	70006 (+1343)
16-01-2021	71495 (+2832)
19-01-2021	72294 (+3631)

Current indicators

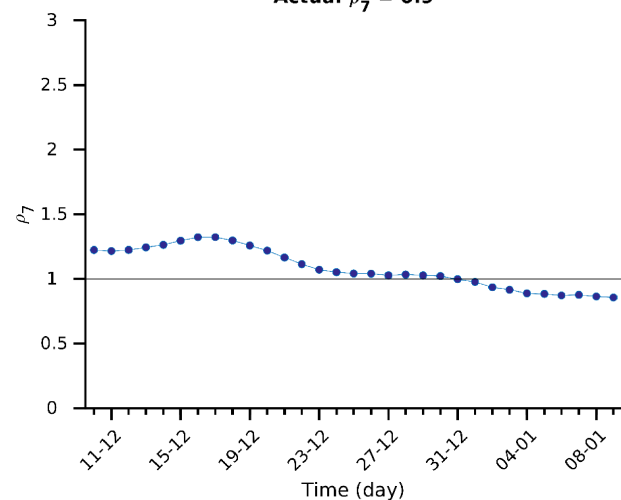
	A14	EPG	CFR	N7	D7
Today	23	20	2.62 %	774	23
A Week ago	26	25	3.20 %	911	22
Maximum	28	363	4.98 %	1048	23



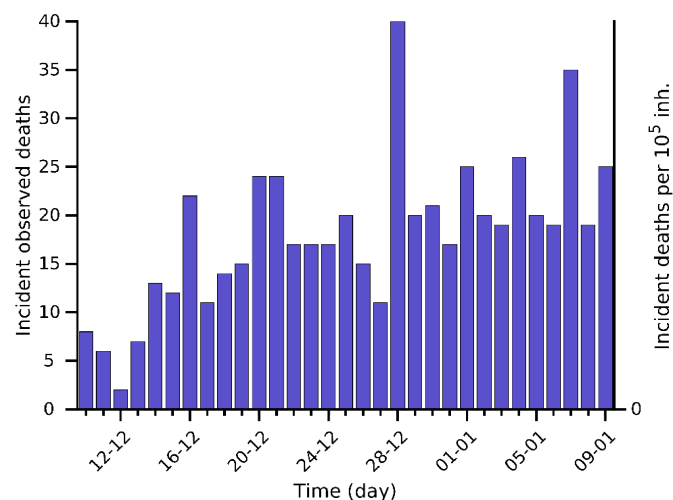
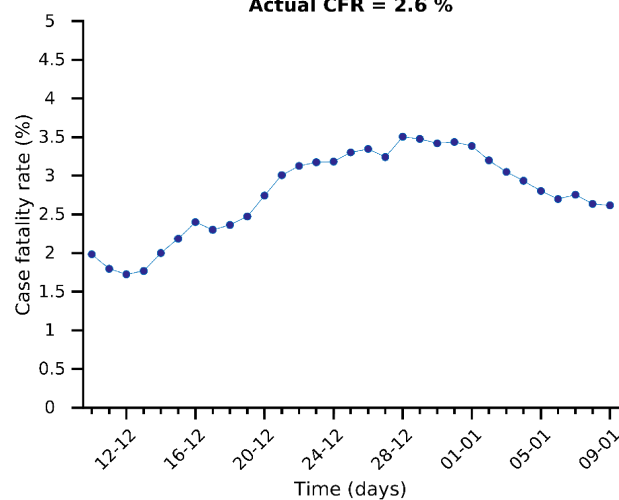
BIOCOM-Cov2 Degree = 4



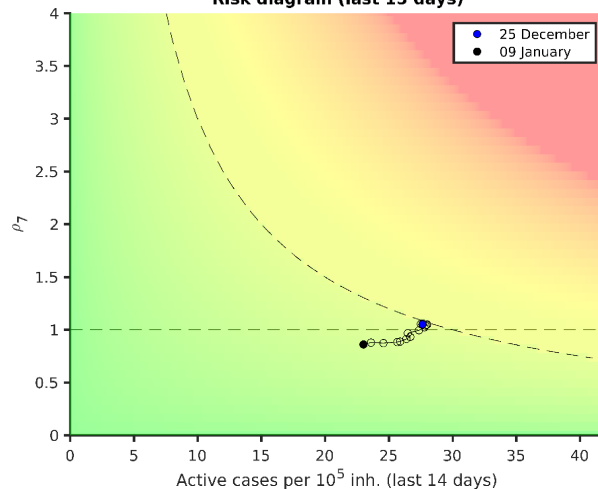
Actual $\rho_7 = 0.9$



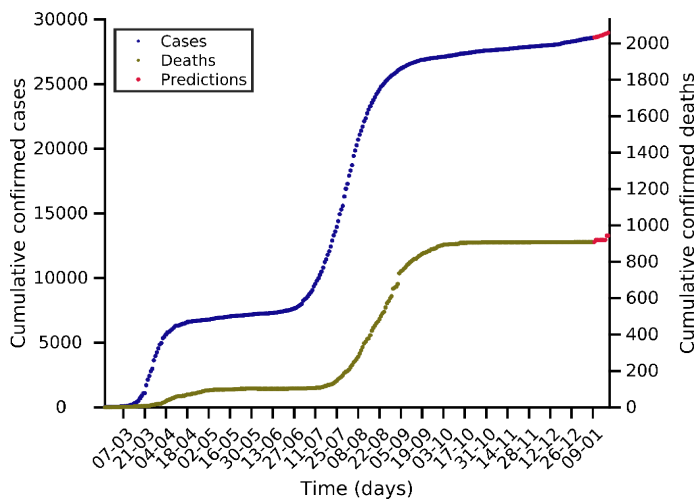
Actual CFR = 2.6 %



Risk diagram (last 15 days)



Australia 09-01-2021. Pop: 25.5M. Cumulative incidence: 112/10⁵

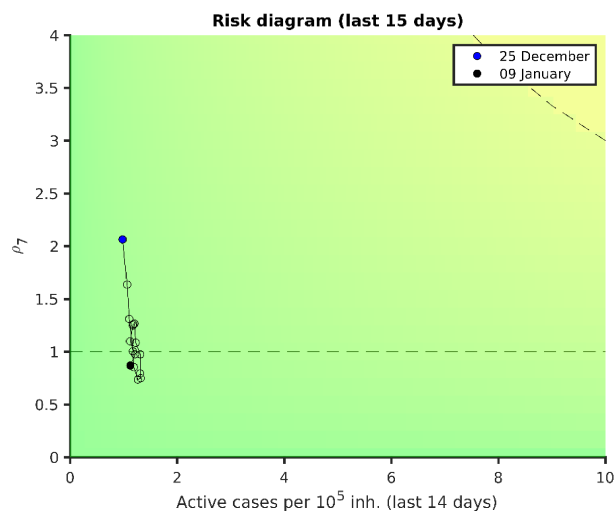
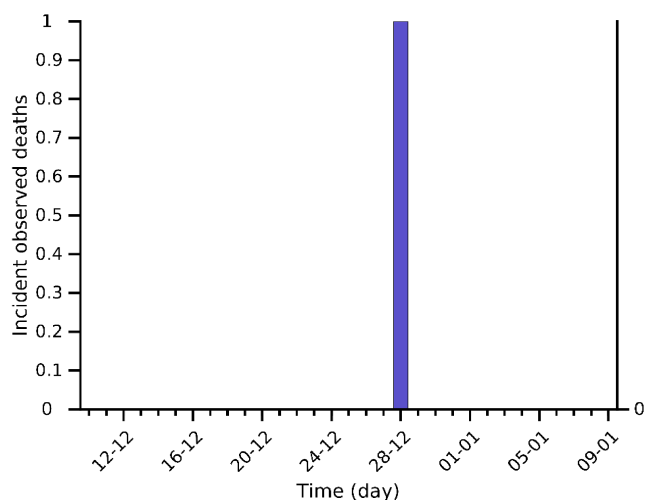
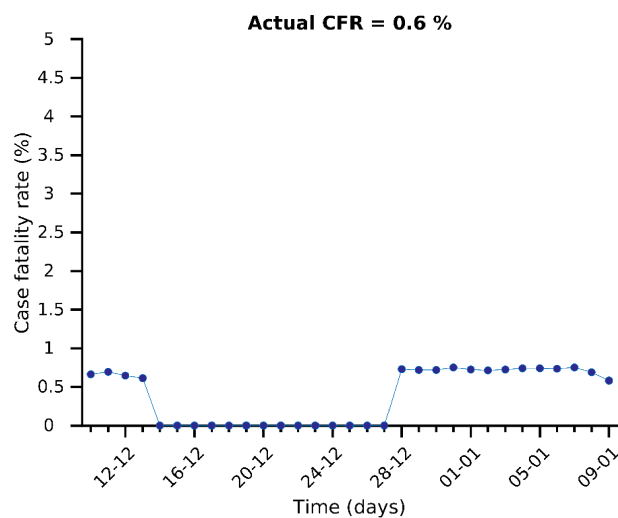
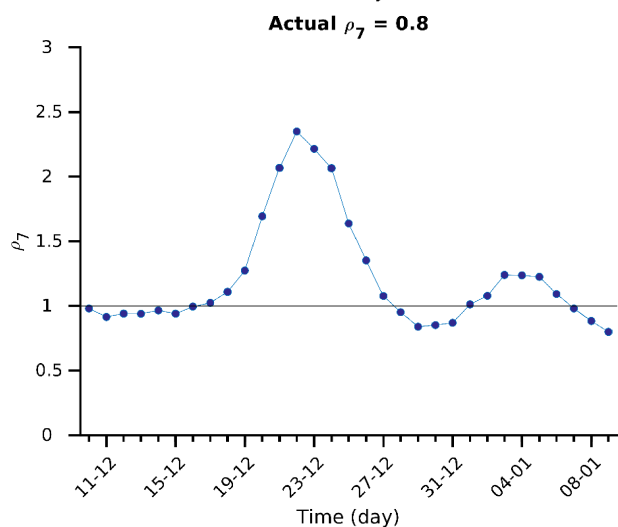
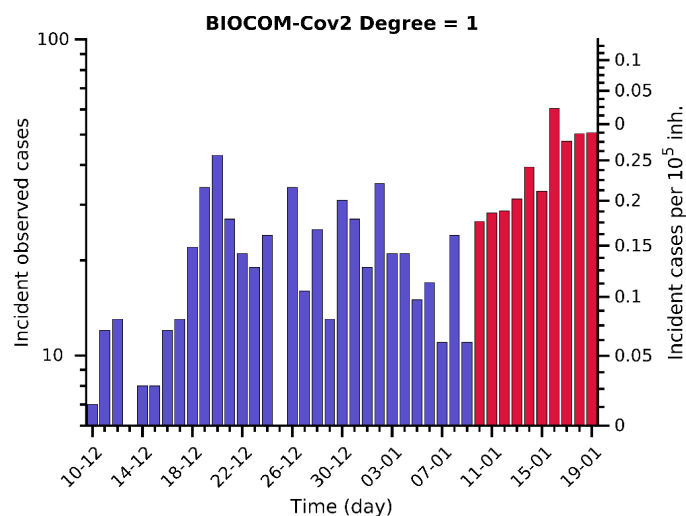
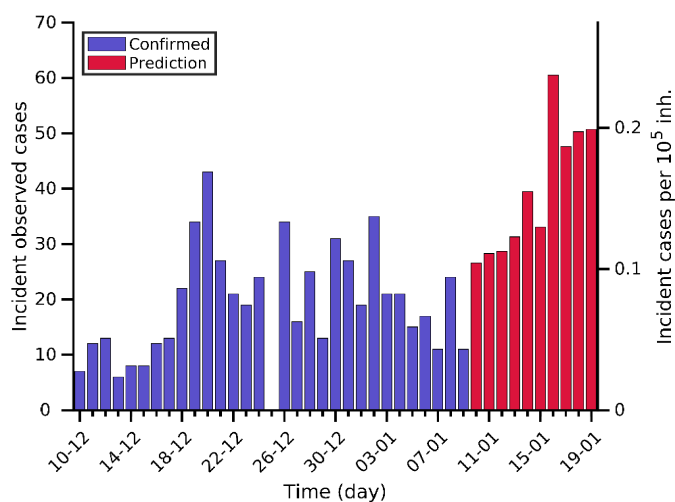


Predictions for next days

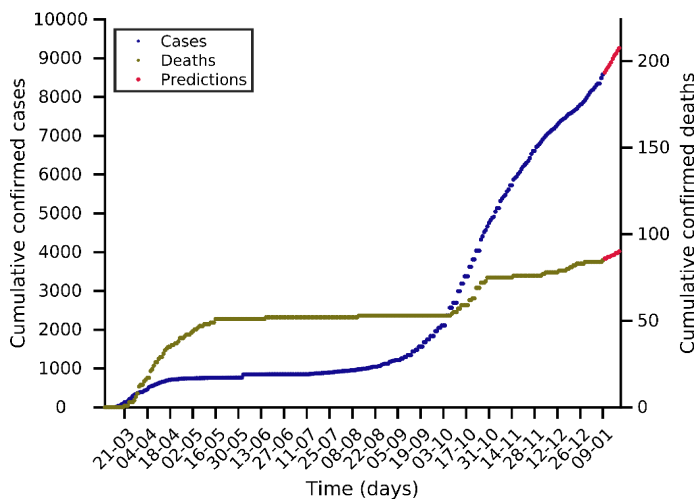
Day	Number of cases
12-01-2021	28666 (+84)
16-01-2021	28830 (+248)
19-01-2021	28978 (+396)

Current indicators

	A14	EPG	CFR	N7	D7
Today	1	1	0.58 %	17	0
A Week ago	1	1	0.71 %	24	0
Maximum	26	32	5.00 %	552	22



Andorra 09-01-2021. Pop: 0.1M. Cumulative incidence: 11112/10⁵

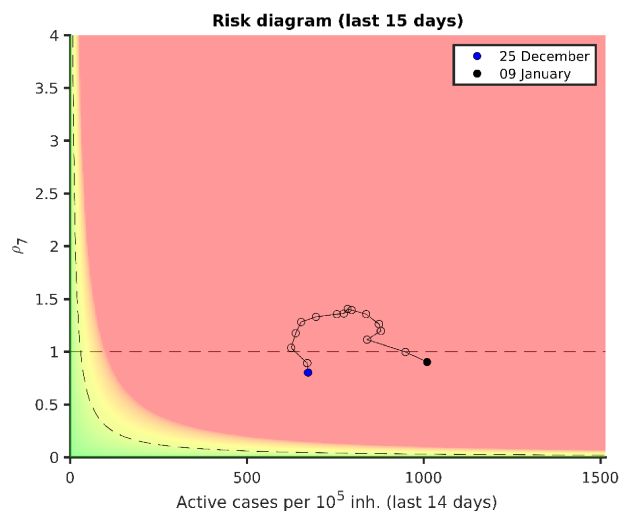
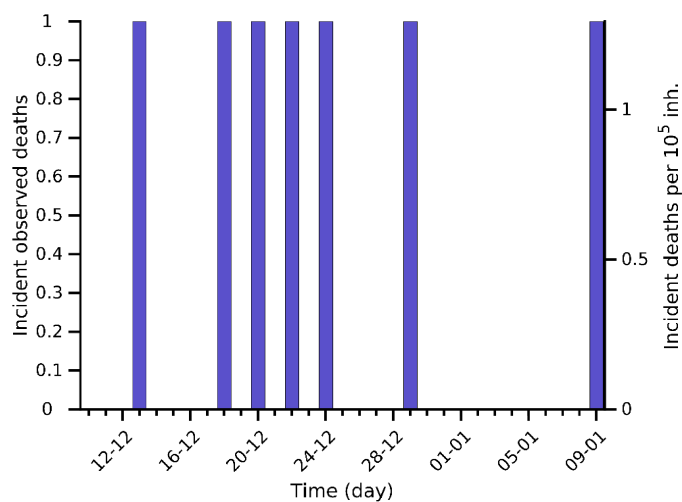
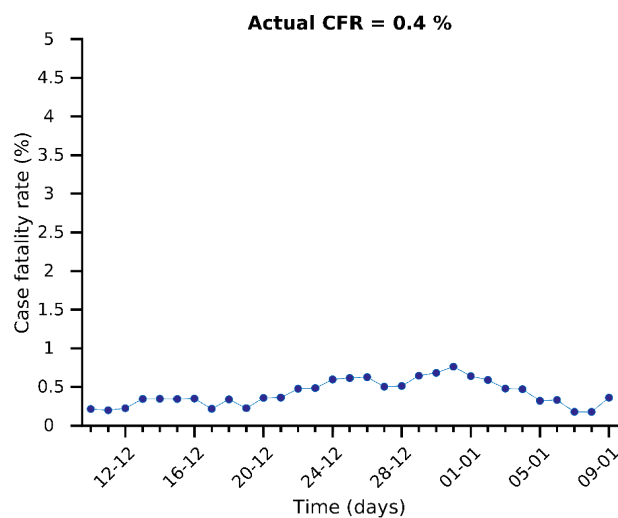
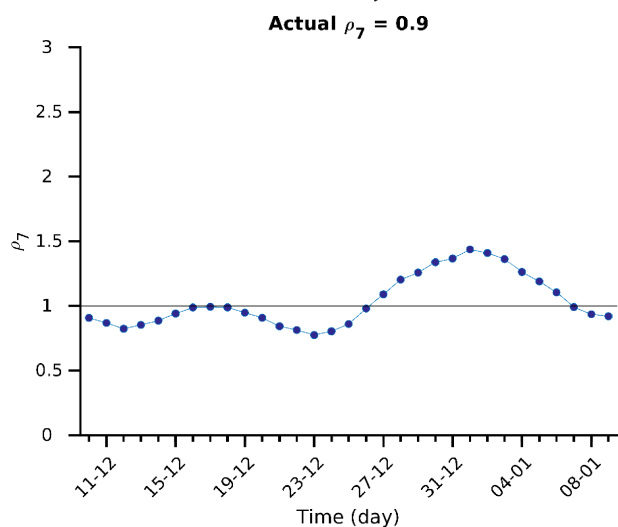
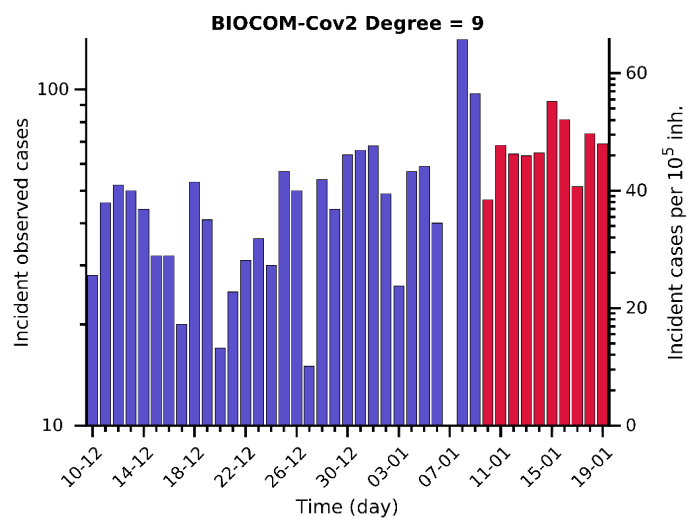
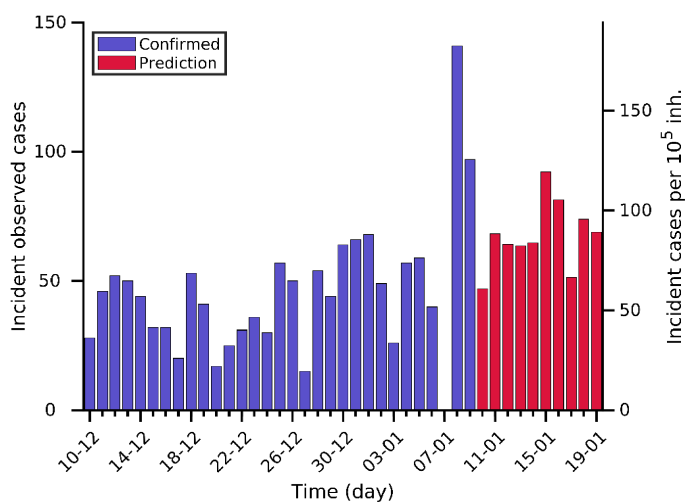


Predictions for next days

Day	Number of cases
12-01-2021	8765 (+179)
16-01-2021	9068 (+482)
19-01-2021	9262 (+676)

Current indicators

	A14	EPG	CFR	N7	D7
Today	1010	929	0.36 %	60	0
A Week ago	784	1105	0.59 %	51	0
Maximum	1874	10010	4.58 %	112	2



Methods

Methods

(1) Data source

Data are daily obtained from European Centre for Disease Prevention and Control (ECDC)² and country official sources (when indicated). Daily data comprise, among others: total confirmed cases, total confirmed new cases, total deaths, total new deaths. It must be considered that the report is always providing data from previous day. In the document we use the date at which the datapoint is assumed to belong, i.e., report from 15/03/2020 is giving data from 14/03/2020, the latter being used in the subsequent analysis.

(2) Data processing and plotting

Data are initially processed with Matlab in order to update timeseries, i.e., last datapoints are added to historical sequences. These timeseries are plotted for individual countries and for the UE+EFTA+UK as a whole:

- ✓ Number of cumulative confirmed cases
- ✓ Number of reported new cases
- ✓ Number of cumulative deaths

Then, two indicators are calculated and plotted, too:

- ✓ Case fatality rate: number of cumulative deaths divided by the number of cumulative confirmed cases, and reported as a percentage; it is an indirect indicator of the diagnostic level.
- ✓ ρ : this variable is related with the reproduction number, i.e., with the number of new infections caused by a single case. It is evaluated as follows for the day before last report ($t-1$):

$$\rho(t-1) = \frac{N_{new}(t) + N_{new}(t-1) + N_{new}(t-2)}{N_{new}(t-5) + N_{new}(t-6) + N_{new}(t-7)}$$

where $N_{new}(t)$ is the number of new confirmed cases at day t after applying a 7-day moving average to the new cases dataset, so that fluctuations (e.g., weekend effect) are smoothed.

(3) Classification of countries according to their epidemic level: the scale Biocom-Cov

Countries are assigned a degree in the discrete Biocom-Cov scale, which aims to facilitate a simple way of assessing the situation of the country. It is based on the level of daily new cases per 100,000 inhabitants as follows:

Pandemic degree	Daily new incident cases per 10 ⁵ inh.
0	0
1	0-0.1
2	0.1-0.5
3	0.5-1.25
4	1.25-2
5	2-3
6	3-5
7	5-8
8	8-14
9	>14

² <https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases>

(4) Fitting a mathematical model to data

Previous studies have shown that Gompertz model³ correctly describes the Covid-19 epidemic in all analysed countries. It is an empirical model that starts with an exponential growth but that gradually decreases its specific growth rate. Therefore, it is adequate for describing an epidemic wave that is characterized by an initial exponential growth but a progressive decrease in spreading velocity provided that appropriate control measures are applied. Once in the tail, predictions work but the meaning of parameters is lost.

Gompertz model is described by the equation:

$$N(t) = K e^{-\ln\left(\frac{K}{N_0}\right) \cdot e^{-a \cdot (t-t_0)}}$$

where $N(t)$ is the cumulated number of confirmed cases at t (in days), and N_0 is the number of cumulated cases the day at day t_0 . The model has two parameters:

- ✓ a is the velocity at which specific spreading rate is slowing down;
- ✓ K is the expected final number of cumulated cases at the end of the epidemic.

This model is fitted to reported cumulative cases of the UE and of countries that accomplish two criteria: 4 or more consecutive days with more than 100 cumulated cases, and at least one datapoint over 200 cases. Day t_0 is chosen as that one at which $N(t)$ overpasses 100 cases. If more than 15 datapoints that accomplish the stated criteria are available, only the last 15 points are used. The fitting is done using Matlab's Curve Fitting package with Nonlinear Least Squares method, which also provides confidence intervals of fitted parameters (a and K) and the R^2 of the fitting. At the initial stages the dynamics is exponential and K cannot be correctly evaluated. In fact, at this stage the most relevant parameter is a .

It is worth to mention that the simplicity of this model and the lack of previous assumptions about the Covid-19 behaviour make it appropriate for universal use, i.e., it can be fitted to any country independently of its socioeconomic context and control strategy. Then, the model is capable of quantifying the observed dynamics in an objective and standard manner and predicting short-term tendencies.

(5) Using the model for predicting short-term tendencies

The model is finally used for a short-term prediction of the evolution of the cumulated number of cases (3-5 days). The confidence interval of predictions is assessed with the Matlab function `predint`, with a 99% confidence level. These predictions are shown in the plots as red dots with corresponding error bar. For series longer than 9 timepoints, last 3 points are weighted in the fitting so that changes in tendencies are well captured by the model.

(6) Estimating non-diagnosed cases

Lethality of Covid-19 has been estimated at around 1 % for Republic of Korea and the Diamond Princess cruise. Besides, median duration of viral shedding after Covid-19 onset has been estimated at 18.5 days for non-survivors⁴ in a retrospective study in Wuhan. These data allow for an estimation of total number of cases, considering that the number of deaths at certain moment should be about 1 % of total cases 18.5 days before. This is valid for estimating cases of countries at stage II, since in stage I the deaths would be mostly

³ Madden LV. Quantification of disease progression. *Protection Ecology* 1980; **2**: 159-176.

⁴ Zhou et al., 2020. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*; March 9, doi: 10.1016/S0140-6736(20)30566-3

due to the incidence at the country from which they were imported. We establish a threshold of 50 reported cases before starting this estimation.

Reported deaths are passed through a moving average filter of 5 points in order to smooth tendencies. Then, the corresponding number of cases is found assuming the 1 % lethality. Finally, these cases are distributed between 18 and 19 days before each one.