

Supplement

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Code is available at: <https://github.com/epiforecasts/model-structure-evaluation>.

1 Model characteristics

Table 1: Model characteristics contributing to the European COVID-19 Forecast Hub, by method used, number of countries targeted, and number of forecasts contributed.

Model	Method	Country Targets	Case forecasts	Death forecasts
AMM-EpiInvert	Statistical	Multi-country	2788 (1.3%)	
CovidMetrics-epiBATS	Statistical	Single-country	343 (0.2%)	
DSMPG-bayes	Semi-mechanistic	Multi-country	760 (0.4%)	
EuroCOVIDhub-baseline	Statistical	Multi-country	13082 (6.3%)	13040 (6.3%)
FIAS_FZJ-Epi1Ger	Mechanistic	Single-country	264 (0.1%)	264 (0.1%)
GoeWroc-BaseBayes	Semi-mechanistic	Single-country	12 (0%)	
HZI-AgeExtendedSEIR	Mechanistic	Single-country	382 (0.2%)	382 (0.2%)
ICM-agentModel	Agent-based	Single-country	334 (0.2%)	334 (0.2%)
IEM_Health-CovidProject	Mechanistic	Multi-country	7710 (3.7%)	7708 (3.7%)
ILM-EKF	Semi-mechanistic	Multi-country	11998 (5.8%)	11961 (5.8%)
ITWW-county_repro	Semi-mechanistic	Single-country	650 (0.3%)	600 (0.3%)
Imperial-DeCa	Semi-mechanistic	Multi-country		571 (0.3%)
Imperial-RtI0	Semi-mechanistic	Multi-country		571 (0.3%)
Imperial-sbkp	Semi-mechanistic	Multi-country		571 (0.3%)
JBUD-HMXK	Mechanistic	Multi-country	1324 (0.6%)	1324 (0.6%)
KITmetricslab-bivar_branching	Statistical	Single-country	8 (0%)	
Karlen-pypm	Mechanistic	Multi-country	3208 (1.5%)	3186 (1.5%)
LANL-GrowthRate	Semi-mechanistic	Multi-country	3692 (1.8%)	3696 (1.8%)
LeipzigIMISE-SECIR	Mechanistic	Single-country	16 (0%)	16 (0%)
MIMUW-StochSEIR	Mechanistic	Single-country	76 (0%)	76 (0%)
MIT_CovidAnalytics-DELPHI	Mechanistic	Single-country	348 (0.2%)	500 (0.2%)
MOCOS-agent1	Agent-based	Single-country	386 (0.2%)	386 (0.2%)
MUNI-ARIMA	Statistical	Multi-country	10979 (5.3%)	11314 (5.4%)
MUNI-LaggedRegARIMA	Statistical	Multi-country		736 (0.4%)
MUNI-VAR	Statistical	Multi-country	976 (0.5%)	976 (0.5%)
MUNI_DMS-SEIAR	Mechanistic	Single-country	224 (0.1%)	200 (0.1%)
PL_GRedlarski-DistrictsSum	Mechanistic	Single-country	378 (0.2%)	
RobertWalraven-ESG	Statistical	Multi-country	9190 (4.4%)	10465 (5%)
SDSC_ISG-TrendModel	Statistical	Multi-country	1756 (0.8%)	1744 (0.8%)
UB-BSLCoV	Statistical	Single-country	96 (0%)	96 (0%)
UC3M-EpiGraph	Agent-based	Single-country	94 (0%)	
ULZF-SEIRC19SI	Mechanistic	Single-country	249 (0.1%)	249 (0.1%)
UMass-MechBayes	Mechanistic	Multi-country		5948 (2.9%)
UMass-SemiMech	Semi-mechanistic	Multi-country	1888 (0.9%)	1904 (0.9%)
UNED-PreCoV2	Statistical	Single-country	147 (0.1%)	147 (0.1%)
UNIPV-BayesINGARCHX	Statistical	Multi-country	426 (0.2%)	
USC-SIkJalpha	Mechanistic	Multi-country	12900 (6.2%)	12688 (6.1%)
UpgUmibUsi-MultiBayes	Semi-mechanistic	Single-country	99 (0%)	99 (0%)
bisop-seirfilter	Mechanistic	Single-country	32 (0%)	32 (0%)
bisop-seirfilterlite	Mechanistic	Multi-country	336 (0.2%)	336 (0.2%)
epiMOX-SUIHTER	Mechanistic	Single-country	134 (0.1%)	134 (0.1%)
epiforecasts-EpiExpert	Other	Multi-country	945 (0.5%)	948 (0.5%)
epiforecasts-EpiExpert_Rt	Other	Multi-country	404 (0.2%)	404 (0.2%)
epiforecasts-EpiExpert_direct	Other	Multi-country	394 (0.2%)	392 (0.2%)
epiforecasts-EpiNow2	Semi-mechanistic	Multi-country	8843 (4.3%)	7721 (3.7%)
epiforecasts-weeklygrowth	Statistical	Multi-country	5971 (2.9%)	
itwm-dSEIR	Mechanistic	Single-country	406 (0.2%)	406 (0.2%)
prolix-euclidean	Semi-mechanistic	Multi-country	800 (0.4%)	800 (0.4%)

2 Trend identification

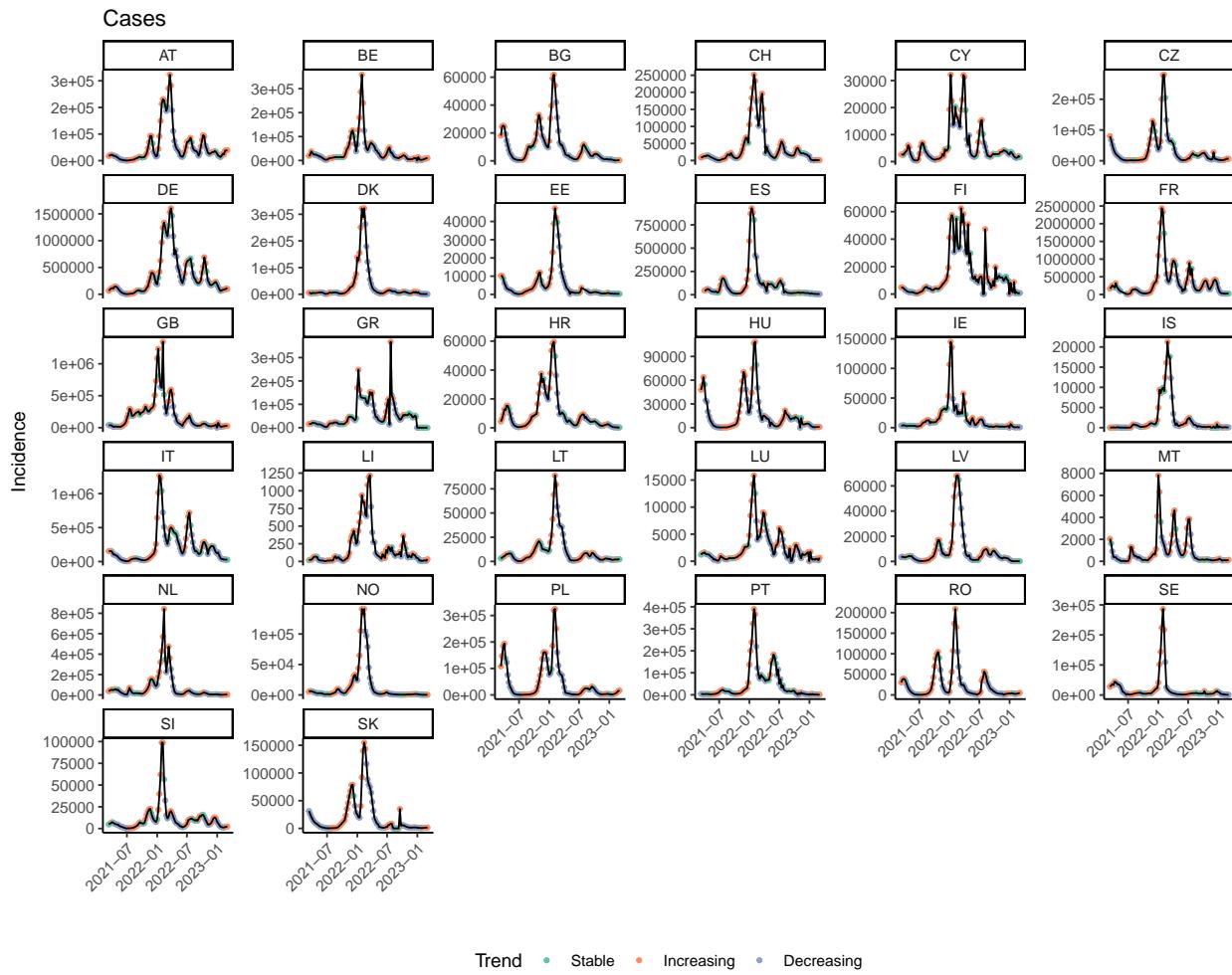


Figure 1: Trends (cases)

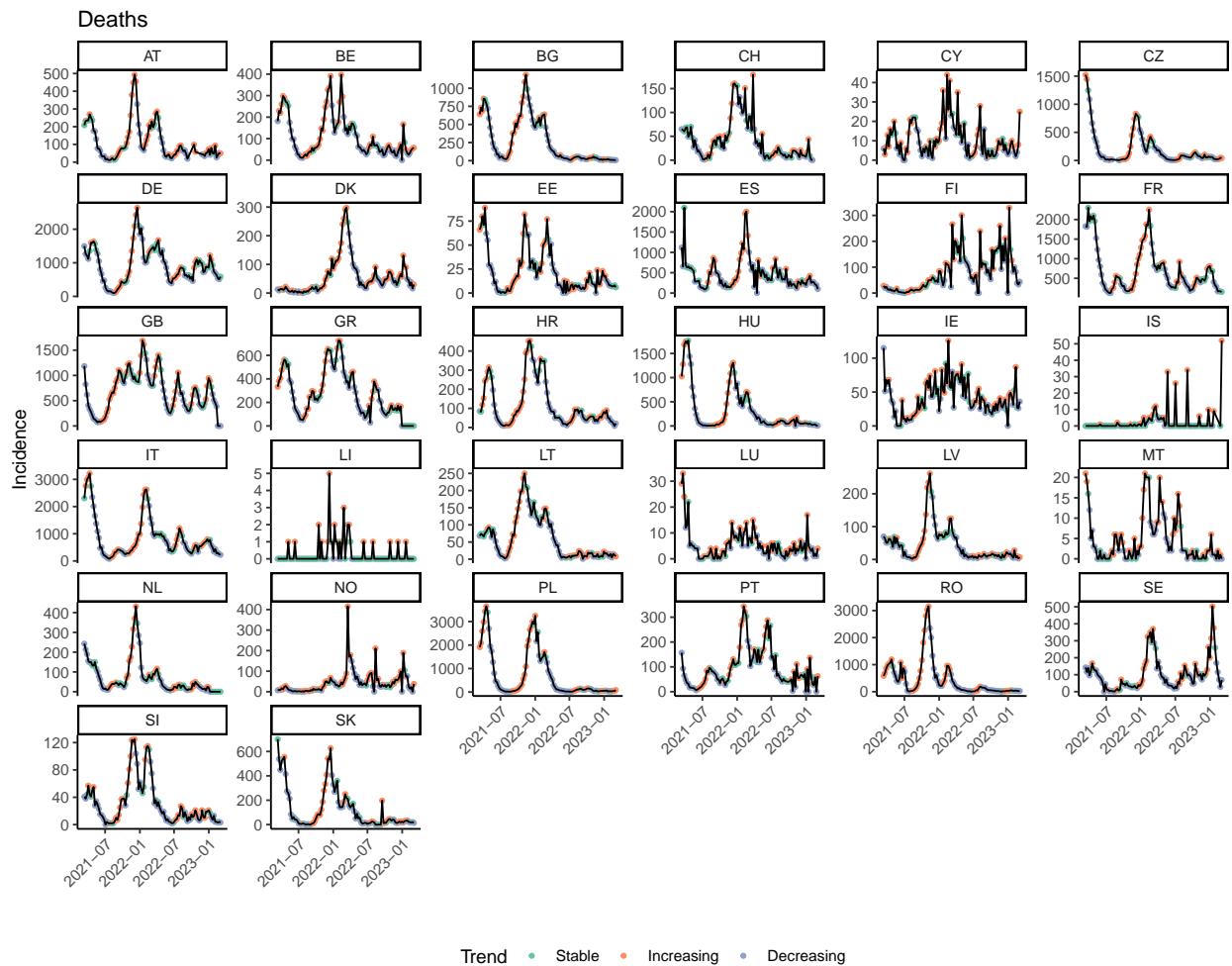


Figure 2: Trends (deaths)

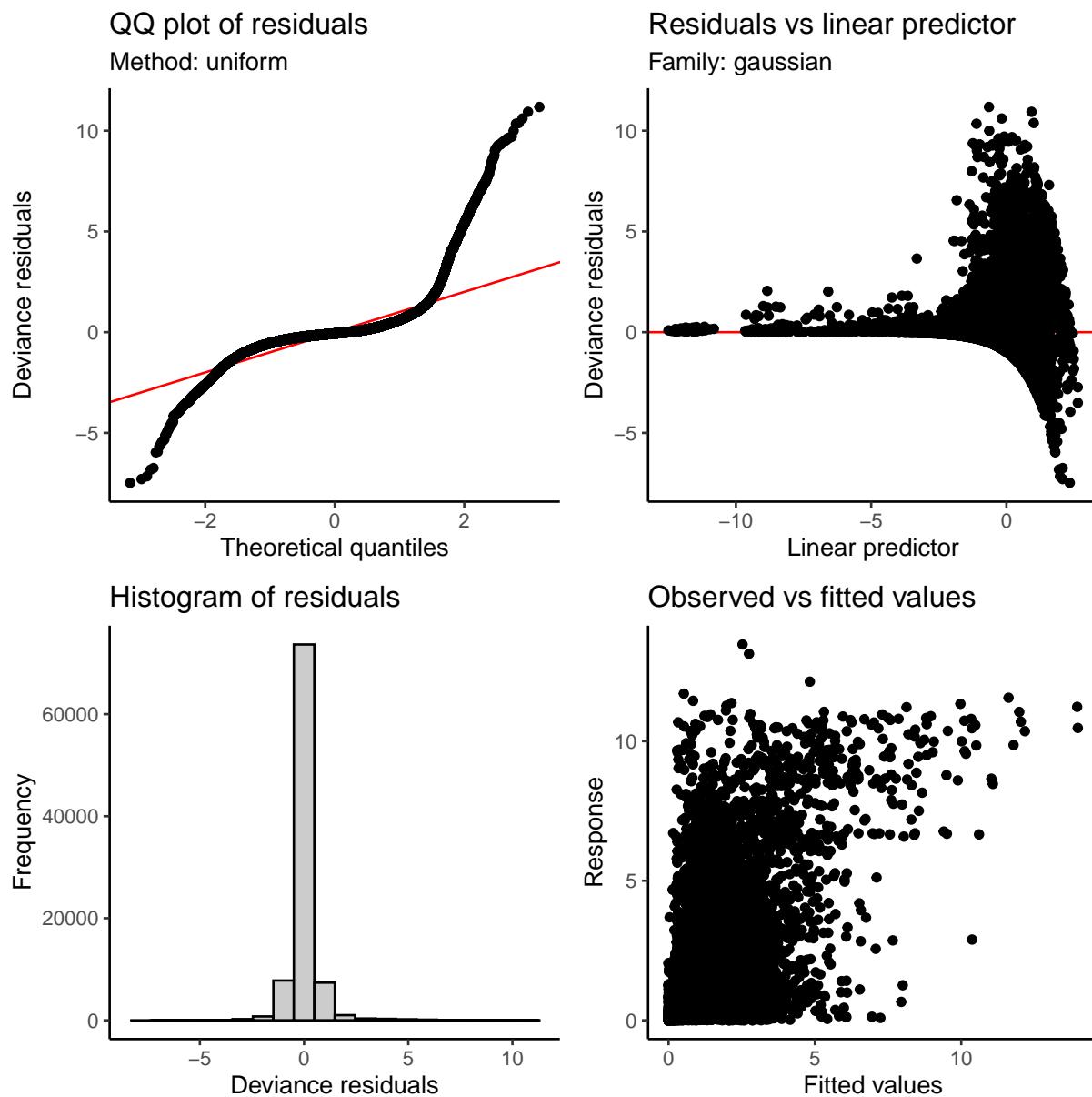
3 Model fitting

3.1 Model formula

\sim , wis, s(Method, bs = "re") + s(CountryTargets, bs = "re") + s(Trend, bs = "re") + s(location, bs = "re") + s(time, by = location, k = 40) + s(Horizon, k = 3, by = Model, bs = "sz") + s(Model, bs = "re")

3.2 Model diagnostics

3.2.1 Cases



3.2.2 Deaths

