

Predicciones sobre CoViD-19

Manuel Febrero-Bande

Dpt. de Estadística, Análisis Matemático y Optimización
Univ. de Santiago de Compostela

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DEPARTAMENTO DE ESTADÍSTICA,
ANÁLISE MATEMÁTICA E OPTIMIZACIÓN



- Predicciones

- Predicciones

Datos

Número de datos funcionales: 1877

Países/Regiones distintos incorporados: 90

Predicciones:

- ▶ España
- ▶ Andalucía
- ▶ Aragón
- ▶ Asturias
- ▶ Baleares
- ▶ Canarias
- ▶ Cantabria
- ▶ Cataluña
- ▶ Castilla-La Mancha
- ▶ Castilla y León
- ▶ C. Valenciana
- ▶ Extremadura
- ▶ Euskadi
- ▶ Galicia
- ▶ Madrid
- ▶ Murcia
- ▶ Navarra
- ▶ La Rioja
- ▶ Mod Lineal
- ▶ Mod NP
- ▶ Mod Aditivo

Horiz	Medida	FLM	NP	SAM
H1	σ_R^2	0.035	0.023	0.032
H1	$\sigma_R^2(rob.)$	0.022	0.006	0.02
H1	r^2	0.259	0.627	0.314
H2	σ_R^2	0.139	0.098	0.126
H2	$\sigma_R^2(rob.)$	0.075	0.025	0.068
H2	r^2	0.293	0.627	0.352
H3	σ_R^2	0.415	0.332	0.385
H3	$\sigma_R^2(rob.)$	0.203	0.069	0.188
H3	r^2	0.274	0.568	0.323

Nota. Los valores del r^2 son bajos pero en la muestra hay mucha heterocedasticidad y datos extraños de manera que no se dan las condiciones para estimar bien esta cantidad.

Tabla Modelo Lineal.

	Last	C:H1-lw	C:H1-fit	C:H1-up	C:H2-lw	C:H2-fit	C:H2-up
España	56188	56188	63289	71614	56188	70278	86862
Andalucía	3406	3477	3852	4228	3743	4488	5234
Aragón	1116	1156	1278	1401	1253	1496	1739
Asturias	841	865	958	1050	926	1109	1292
Baleares	660	713	785	858	785	929	1074
Canarias	784	817	903	989	880	1050	1220
Cantabria	671	726	801	875	839	986	1133
Cataluña	11592	12709	14010	15312	13967	16550	19132
Castilla.La.Mancha	3383	3547	3920	4292	3827	4566	5305
Castilla.y.León	3488	3695	4078	4462	4106	4867	5628
C..Valenciana	3200	3345	3702	4060	3601	4310	5019
Extremadura	969	1018	1125	1233	1104	1318	1531
Euskadi	3946	4059	4492	4926	4354	5213	6072
Galicia	1915	1989	2204	2419	2215	2641	3068
Madrid	17166	17301	19222	21142	17633	21445	25257
Murcia	596	628	695	761	680	811	943
Navarra	1411	1438	1593	1748	1533	1841	2148
La.Rioja	995	995	1097	1206	1017	1233	1449

Table: Previsión número de casos confirmados: Modelo lineal- Horizonte 1 y 2 días.

Tabla Modelo Aditivo.

	Last	C:H1-lw	C:H1-fit	C:H1-up	C:H2-lw	C:H2-fit	C:H2-up
España	56188	60064	64810	69557	65191	75355	85519
Andalucía	3406	3694	4004	4314	3862	4500	5138
Aragón	1116	1216	1313	1410	1340	1544	1748
Asturias	841	904	976	1048	976	1130	1283
Baleares	660	757	815	874	860	984	1107
Canarias	784	851	917	984	949	1091	1233
Cantabria	671	808	870	932	986	1115	1244
Cataluña	11592	12815	13825	14834	14185	16325	18464
Castilla.La.Mancha	3383	3639	3936	4233	3955	4586	5217
Castilla.y.León	3488	3905	4212	4519	4382	5030	5678
C..Valenciana	3200	3547	3844	4141	3787	4407	5028
Extremadura	969	1037	1127	1216	1078	1266	1454
Euskadi	3946	4246	4584	4922	4806	5529	6252
Galicia	1915	2096	2283	2470	2352	2731	3110
Madrid	17166	18017	19485	20953	19032	22161	25290
Murcia	596	630	683	736	678	790	902
Navarra	1411	1489	1612	1735	1592	1853	2113
La.Rioja	995	1031	1113	1195	1105	1282	1459

Table: Previsión número de casos confirmados: Modelo Aditivo - Horizonte 1 y 2 días.

Tabla Ratio Incremento Modelo Lineal.

	Last	RI:H1-lw	RI:H1-fit	RI:H1-up	RI:H2-lw	RI:H2-fit	RI:H2-up
España	0.180	0.000	0.126	0.275	0.000	0.251	0.546
Andalucía	0.132	0.021	0.131	0.241	0.099	0.318	0.536
Aragón	0.230	0.036	0.145	0.255	0.123	0.340	0.557
Asturias	0.079	0.029	0.138	0.248	0.101	0.318	0.535
Baleares	0.174	0.079	0.190	0.300	0.189	0.408	0.626
Canarias	0.193	0.042	0.151	0.261	0.122	0.339	0.556
Cantabria	0.315	0.083	0.193	0.303	0.250	0.469	0.688
Cataluña	0.167	0.096	0.209	0.321	0.205	0.428	0.650
Castilla.La.Mancha	0.217	0.049	0.159	0.269	0.131	0.350	0.568
Castilla.y.León	0.186	0.059	0.169	0.279	0.177	0.395	0.613
C..Valenciana	0.223	0.045	0.157	0.269	0.125	0.347	0.568
Extremadura	0.306	0.050	0.161	0.272	0.139	0.359	0.580
Euskadi	0.206	0.029	0.138	0.248	0.103	0.321	0.539
Galicia	0.158	0.038	0.151	0.263	0.156	0.379	0.602
Madrid	0.176	0.008	0.120	0.232	0.027	0.249	0.471
Murcia	0.249	0.054	0.165	0.276	0.140	0.360	0.581
Navarra	0.179	0.019	0.129	0.239	0.086	0.304	0.522
La.Rioja	0.072	0.000	0.103	0.212	0.022	0.239	0.456

Table: Previsión Ratio incremento casos confirmados: Modelo lineal- Horizonte 1 y 2 días.

Tabla Ratio Incremento Modelo No Paramétrico.

	Last	RI:H1-lw	RI:H1-fit	RI:H1-up	RI:H2-lw	RI:H2-fit	RI:H2-up
España	0.180	0.029	0.084	0.139	0.052	0.178	0.304
Andalucía	0.132	0.055	0.111	0.166	0.107	0.233	0.359
Aragón	0.230	0.047	0.102	0.158	0.102	0.228	0.354
Asturias	0.079	0.030	0.085	0.139	0.054	0.180	0.306
Baleares	0.174	0.084	0.139	0.194	0.185	0.310	0.436
Canarias	0.193	0.024	0.079	0.134	0.042	0.168	0.294
Cantabria	0.315	0.122	0.177	0.232	0.279	0.405	0.532
Cataluña	0.167	0.092	0.147	0.202	0.179	0.305	0.431
Castilla.La.Mancha	0.217	0.046	0.101	0.156	0.090	0.216	0.342
Castilla.y.León	0.186	0.076	0.131	0.186	0.145	0.271	0.397
C..Valenciana	0.223	0.218	0.274	0.329	0.460	0.586	0.712
Extremadura	0.306	0.045	0.100	0.155	0.077	0.203	0.328
Euskadi	0.206	0.024	0.079	0.134	0.042	0.168	0.294
Galicia	0.158	0.110	0.166	0.221	0.237	0.364	0.490
Madrid	0.176	0.012	0.067	0.122	0.016	0.141	0.267
Murcia	0.249	0.054	0.108	0.163	0.095	0.221	0.346
Navarra	0.179	0.030	0.085	0.140	0.055	0.180	0.306
La.Rioja	0.072	0.000	0.044	0.099	0.000	0.098	0.224

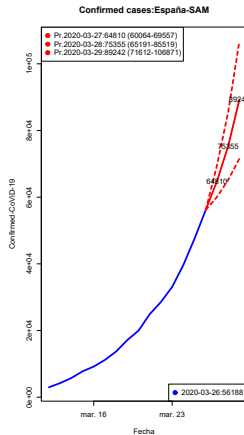
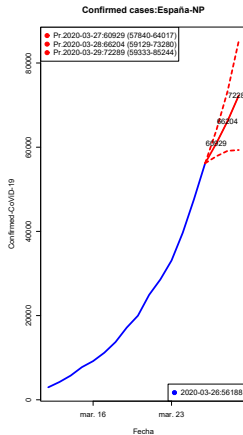
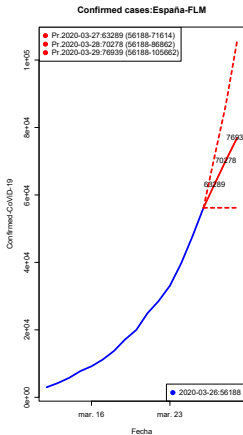
Table: Previsión Ratio incremento casos confirmados: Modelo No Paramétrico
- Horizonte 1 y 2 días.

Tabla Ratio Incremento Modelo Aditivo.

	Last	RI:H1-lw	RI:H1-fit	RI:H1-up	RI:H2-lw	RI:H2-fit	RI:H2-up
España	0.180	0.069	0.153	0.238	0.160	0.341	0.522
Andalucía	0.132	0.085	0.176	0.266	0.134	0.321	0.508
Aragón	0.230	0.090	0.177	0.264	0.200	0.383	0.566
Asturias	0.079	0.075	0.160	0.246	0.161	0.343	0.525
Baleares	0.174	0.146	0.235	0.323	0.303	0.490	0.677
Canarias	0.193	0.086	0.170	0.254	0.210	0.391	0.572
Cantabria	0.315	0.205	0.296	0.388	0.469	0.661	0.852
Cataluña	0.167	0.105	0.193	0.280	0.224	0.408	0.593
Castilla.La.Mancha	0.217	0.076	0.163	0.251	0.169	0.355	0.542
Castilla.y.León	0.186	0.119	0.207	0.296	0.256	0.442	0.628
C..Valenciana	0.223	0.108	0.201	0.294	0.183	0.377	0.571
Extremadura	0.306	0.070	0.162	0.254	0.113	0.307	0.500
Euskadi	0.206	0.076	0.162	0.247	0.218	0.401	0.584
Galicia	0.158	0.094	0.192	0.290	0.228	0.426	0.624
Madrid	0.176	0.050	0.135	0.221	0.109	0.291	0.473
Murcia	0.249	0.058	0.146	0.234	0.137	0.325	0.513
Navarra	0.179	0.055	0.142	0.229	0.128	0.313	0.497
La.Rioja	0.072	0.036	0.119	0.201	0.110	0.288	0.466

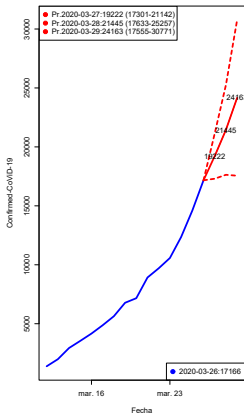
Table: Previsión Ratio incremento casos confirmados: Modelo Aditivo - Horizonte 1 y 2 días.

Confirmed cases: España

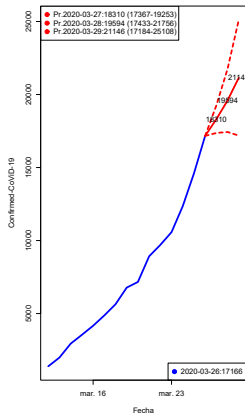


Confirmed cases: Madrid

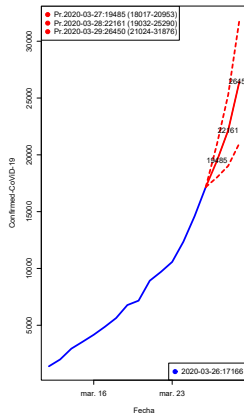
Confirmed cases:Madrid-FLM



Confirmed cases:Madrid-NP



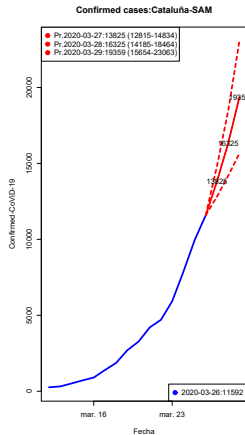
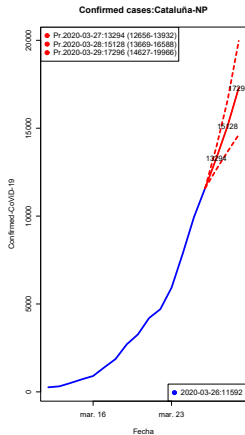
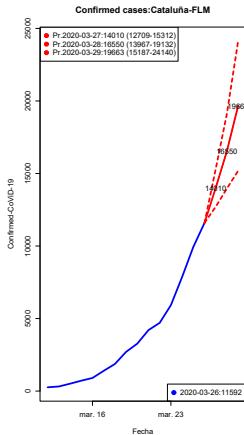
Confirmed cases:Madrid-SAM



◀ Confirmados

◀ Fallecidos

Confirmed cases: Cataluña

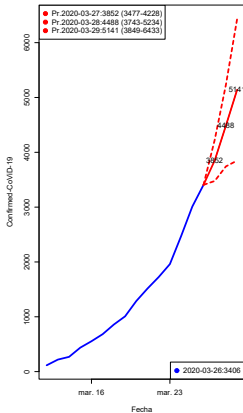


◀ Confirmados

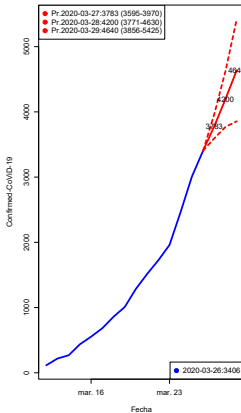
◀ Fallecidos

Confirmed cases: Andalucía

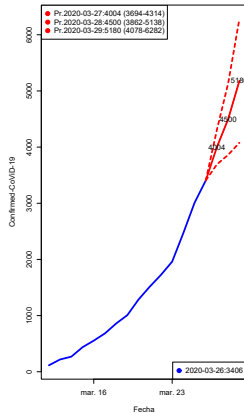
Confirmed cases:Andalucia-FLM



Confirmed cases:Andalucia-NP



Confirmed cases:Andalucia-SAM

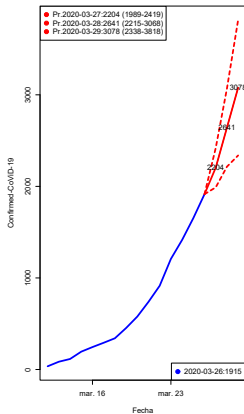


◀ Confirmados

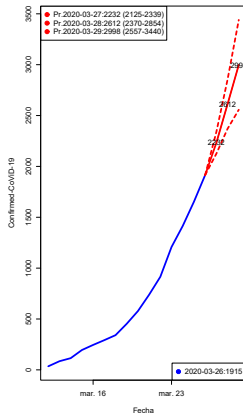
◀ Fallecidos

Confirmed cases: Galicia

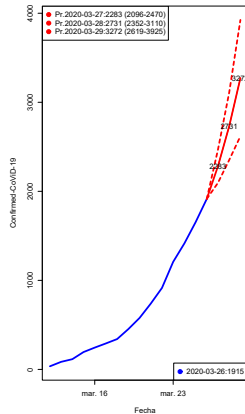
Confirmed cases:Galicia-FLM



Confirmed cases:Galicia-NP



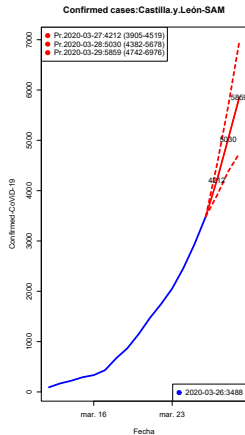
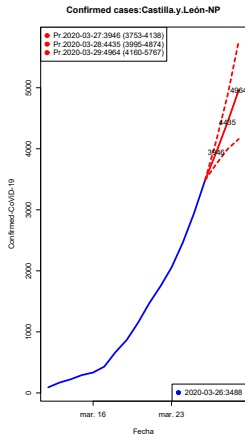
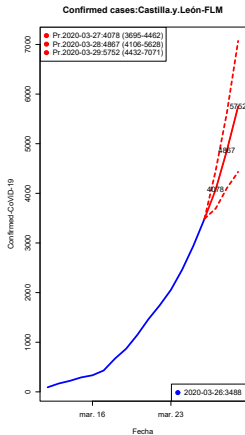
Confirmed cases:Galicia-SAM



◀ Confirmados

◀ Fallecidos

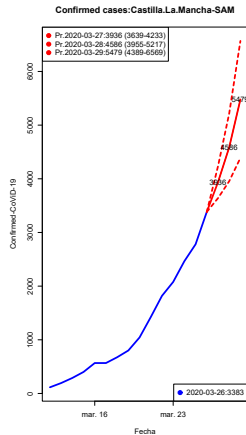
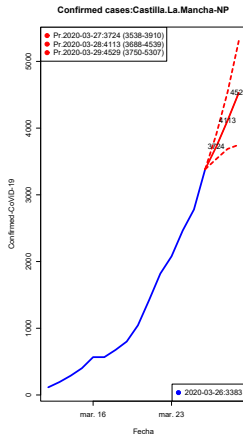
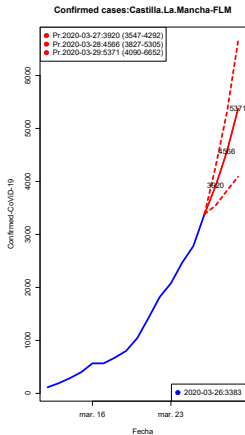
Confirmed cases: Castilla y León



◀ Confirmados

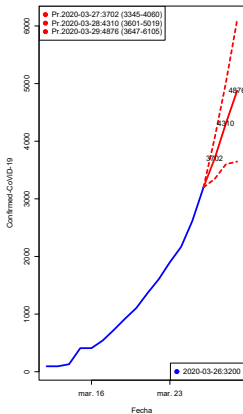
◀ Fallecidos

Confirmed cases: Castilla-La Mancha

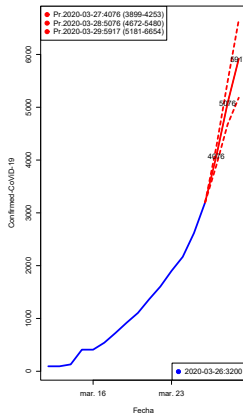

[◀ Confirmados](#)
[◀ Fallecidos](#)

Confirmed cases: C. Valenciana

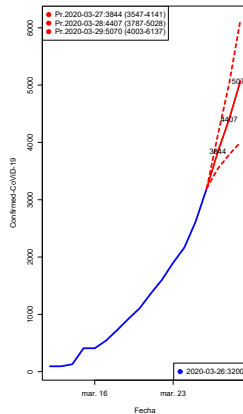
Confirmed cases:C..Valenciana-FLM



Confirmed cases:C..Valenciana-NP



Confirmed cases:C..Valenciana-SAM

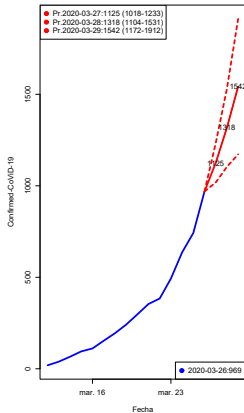


◀ Confirmados

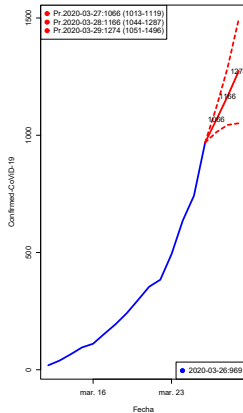
◀ Fallecidos

Confirmed cases: Extremadura

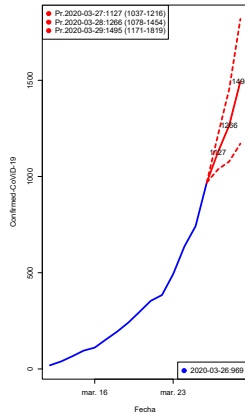
Confirmed cases:Extremadura-FLM



Confirmed cases:Extremadura-NP



Confirmed cases:Extremadura-SAM

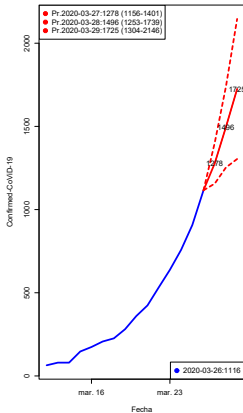


◀ Confirmados

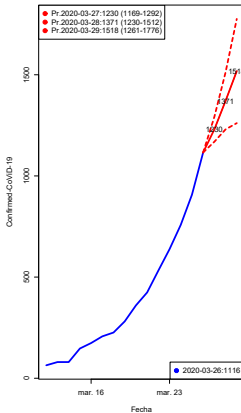
◀ Fallecidos

Confirmed cases: Aragón

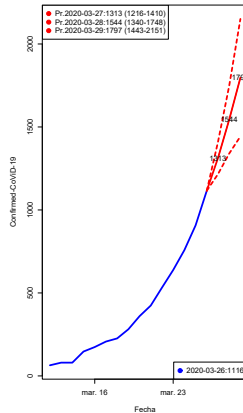
Confirmed cases:Aragón-FLM



Confirmed cases:Aragón-NP



Confirmed cases:Aragón-SAM

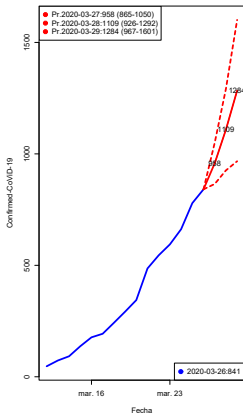


◀ Confirmados

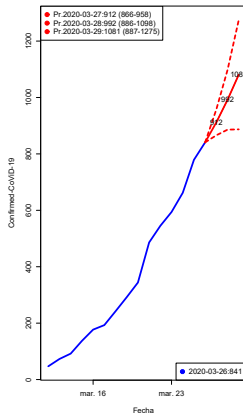
◀ Fallecidos

Confirmed cases: Asturias

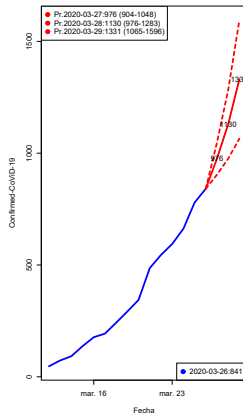
Confirmed cases:Asturias-FLM



Confirmed cases:Asturias-NP



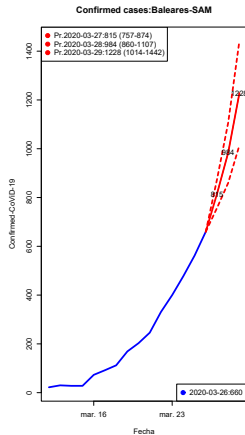
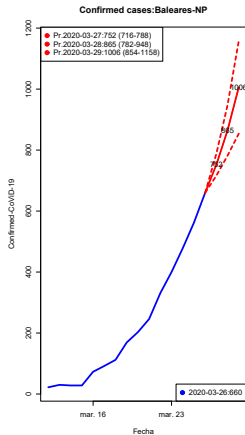
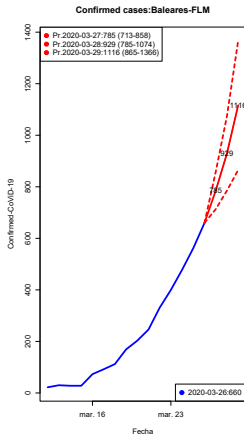
Confirmed cases:Asturias-SAM



◀ Confirmados

◀ Fallecidos

Confirmed cases: Baleares

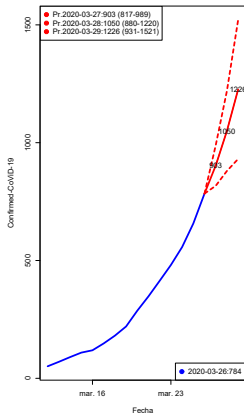


◀ Confirmados

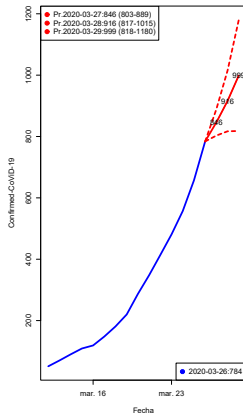
◀ Fallecidos

Confirmed cases: Canarias

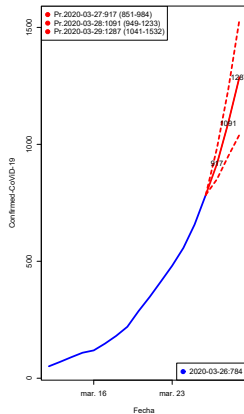
Confirmed cases:Canarias-FLM



Confirmed cases:Canarias-NP



Confirmed cases:Canarias-SAM

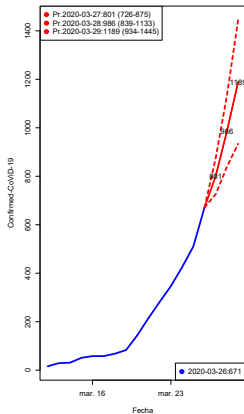


◀ Confirmados

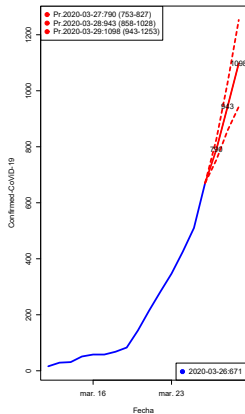
◀ Fallecidos

Confirmed cases: Cantabria

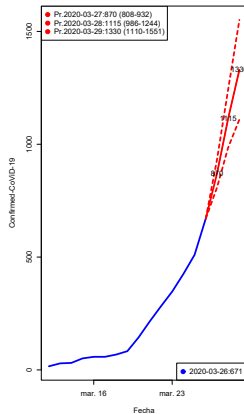
Confirmed cases:Cantabria-FLM



Confirmed cases:Cantabria-NP



Confirmed cases:Cantabria-SAM

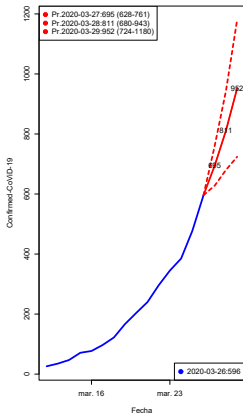


◀ Confirmados

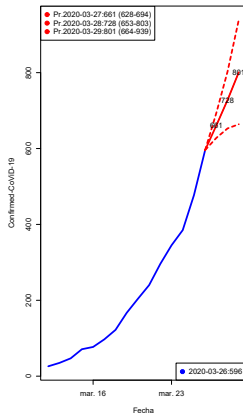
◀ Fallecidos

Confirmed cases: Murcia

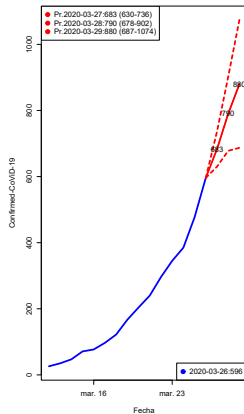
Confirmed cases:Murcia-FLM



Confirmed cases:Murcia-NP



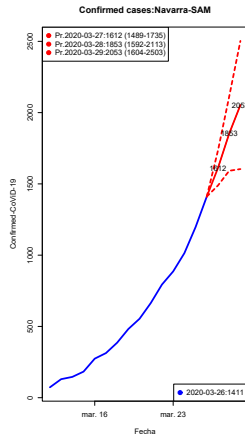
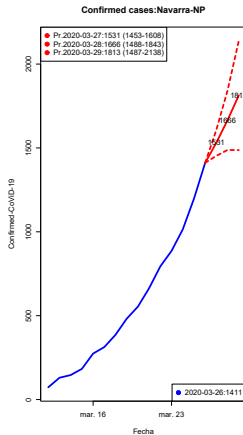
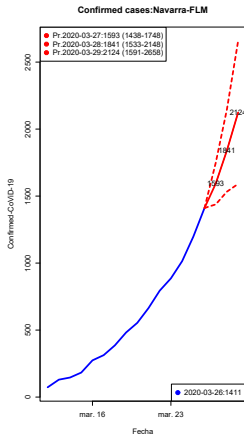
Confirmed cases:Murcia-SAM



◀ Confirmados

◀ Fallecidos

Confirmed cases: Navarra

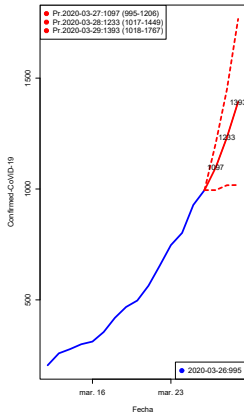


◀ Confirmados

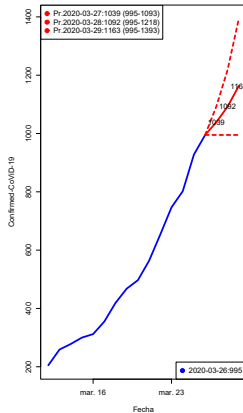
◀ Fallecidos

Confirmed cases: La Rioja

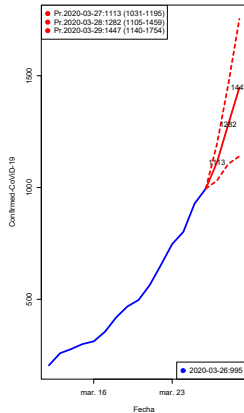
Confirmed cases:La.Rioja-FLM



Confirmed cases:La.Rioja-NP



Confirmed cases:La.Rioja-SAM



◀ Confirmados

◀ Fallecidos

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1 Casos Confirmados

- Predicciones

2 Fallecidos

- Predicciones

Modelos para fallecidos por CoViD-19

Número de datos funcionales: 1196

Países/Regiones distintos incorporados: 26

Predicciones:

▶ España

▶ Andalucía

▶ Castilla-La Mancha

▶ Castilla y León

▶ Cataluña

▶ Euskadi

▶ Madrid

▶ Mod Lineal

▶ Mod NP

▶ Mod Aditivo

Horiz	Medida	FLM	NP	SAM
H1	σ_R^2	0.066	0.06	0.062
H1	$\sigma_R^2(rob.)$	0.044	0.015	0.044
H1	r^2	0.214	0.413	0.261
H2	σ_R^2	0.183	0.179	0.165
H2	$\sigma_R^2(rob.)$	0.156	0.101	0.132
H2	r^2	0.339	0.467	0.4
H3	σ_R^2	0.475	0.504	0.432
H3	$\sigma_R^2(rob.)$	0.394	0.159	0.305
H3	r^2	0.375	0.454	0.429

Aunque los valores de r^2 son más altos que para el número de casos, la predicción para ciertas series se vuelve más caótica como efecto del número de datos y su alta dependencia.

Tabla Fallecidos Modelo Lineal.

	Last	F:H1-lw	F:H1-fit	F:H1-up	F:H2-lw	F:H2-fit	F:H2-up
España	4089	4441	5017	5593	4962	6013	7063
Andalucía	134	151	171	191	170	207	244
Castilla.La.Mancha	316	359	406	454	407	493	579
Castilla.y.León	206	237	268	299	273	329	384
Cataluña	672	817	915	1012	1022	1199	1376
Euskadi	180	187	211	236	201	246	292
Madrid	2090	2197	2495	2793	2357	2899	3442

Table: Previsión fallecidos: Modelo lineal- Horizonte 1 y 2 días.

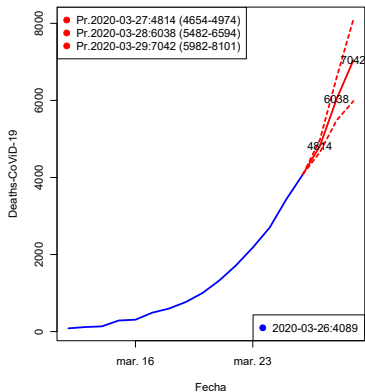
◀ Confirmados

◀ Fallecidos

	Last	R:H1-lw	R:H1-fit	R:H1-up	R:H2-lw	R:H2-fit	R:H2-up
España	0.191	0.138	0.177	0.216	0.341	0.477	0.613
Andalucía	0.184	0.226	0.265	0.305	0.480	0.616	0.752
Castilla.La.Mancha	0.201	0.260	0.299	0.337	0.515	0.650	0.785
Castilla.y.León	0.247	0.192	0.231	0.270	0.395	0.530	0.666
Cataluña	0.302	0.249	0.290	0.331	0.551	0.688	0.824
Euskadi	0.160	0.066	0.106	0.146	0.106	0.242	0.378
Madrid	0.145	0.140	0.179	0.218	0.195	0.331	0.466

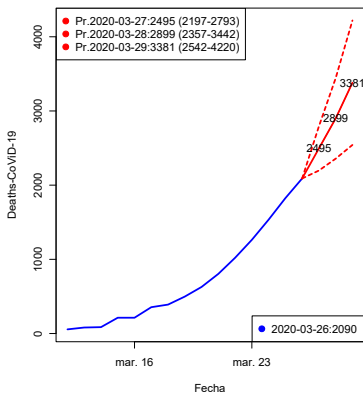
Table: Previsión Fallecidos Ratio incremento: Modelo No Paramétrico - Horizonte 1 y 2 días.

Deaths cases:España-NP

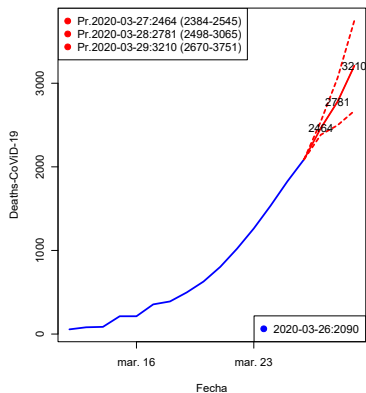


Fallecidos: Madrid

Deaths cases:Madrid-FLM



Deaths cases:Madrid-NP

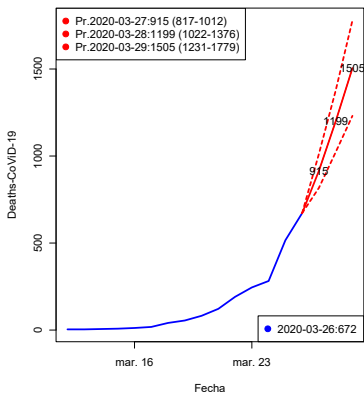


◀ Confirmados

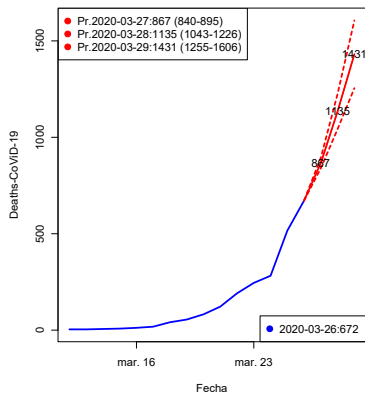
◀ Fallecidos

Fallecidos: Cataluña

Deaths cases:Cataluña-FLM



Deaths cases:Cataluña-NP

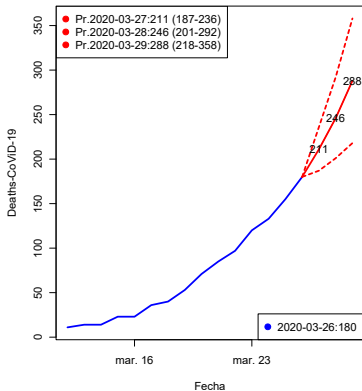


◀ Confirmados

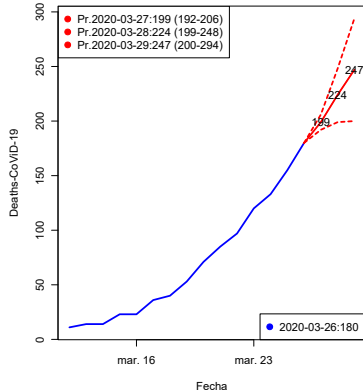
◀ Fallecidos

Fallecidos: Euskadi

Deaths cases:Euskadi-FLM



Deaths cases:Euskadi-NP

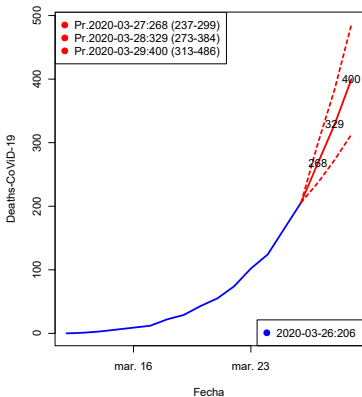


◀ Confirmados

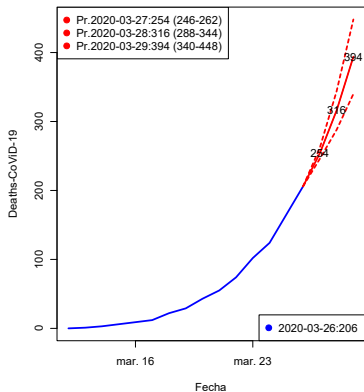
◀ Fallecidos

Fallecidos: Castilla y León

Deaths cases:Castilla.y.León-FLM



Deaths cases:Castilla.y.León-NP

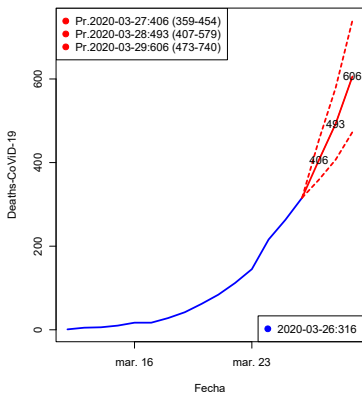


◀ Confirmados

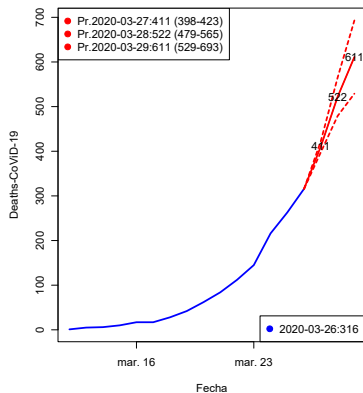
◀ Fallecidos

Fallecidos: Castilla-La Mancha

Deaths cases:Castilla.La.Mancha-FLM



Deaths cases:Castilla.La.Mancha-NP

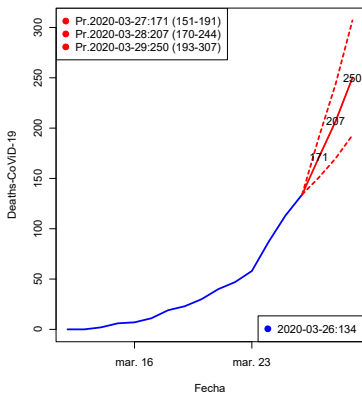


◀ Confirmados

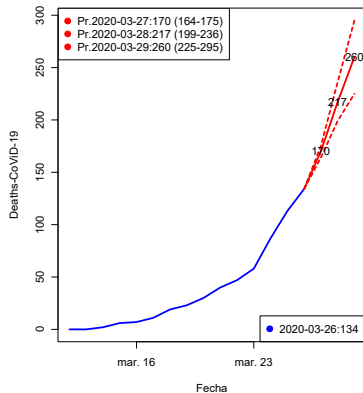
◀ Fallecidos

Fallecidos: Andalucía

Deaths cases:Andalucía-FLM



Deaths cases:Andalucía-NP



◀ Confirmados

◀ Fallecidos

Breve descripción del Modelo de predicción

Objetivo: Predecir ratio de incremento a 1, 2, o 3 días: $r^{(k)}(t) = \frac{x_{t+k} - x_t}{x_t + 1}$

Información usada: Pasado de esta variable a un retardo durante los últimos 15 días: $R^{(1)} = \{r^{(1)}(-14), \dots, r^{(1)}(0)\}$.

Datos para alimentar el modelo:

https://github.com/CSSEGISandData/COVID-19/tree/master/csse_covid_19_data/csse_covid_19_time_series/. Algunas series de tiempo (como el Cruise Ship) son filtrados por inconsistencia, presunta falta de veracidad o por valores bajos. En la predicción final se reconstruye el número de casos esperado.

Se construyen tres modelos funcionales de la regresión general: $r^{(k)}(0) = f(R^{(1)}) + \epsilon$ donde la diferencia radica en la forma de la función f

- Lineal: $f(R^{(1)}) = \int_{-14}^0 R^{(1)}(t) \beta(t) dt$
- NP: f es una estimación no paramétrica tipo núcleo.
- SAM: f es una combinación aditiva de funciones suaves de las componentes principales.