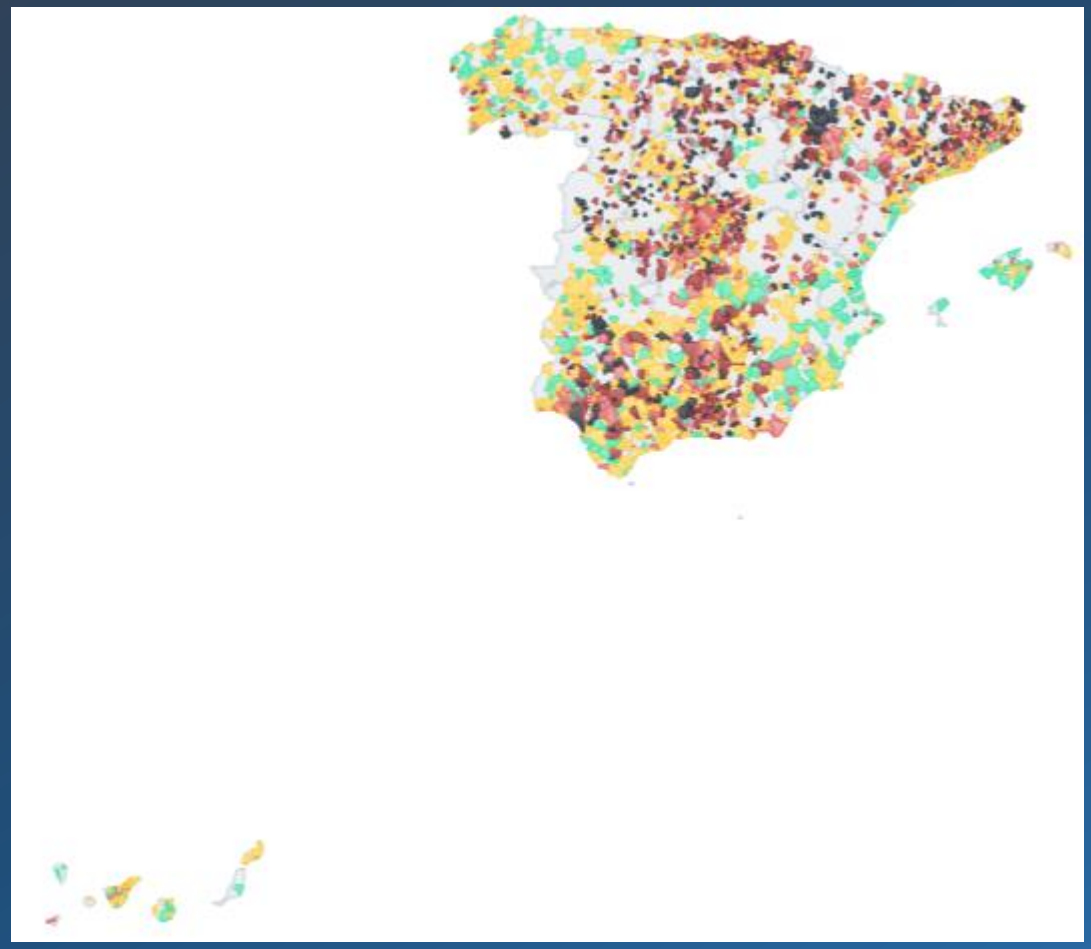
CASE STUDY:

COVID-19 MONITORING

SPAIN



ISSUE TO ADDRESS (MARCH-20)

Need for a real-time system to:

- **Visualize quickly the appearance of new cases**
  - ➔ *How many and where*
- **Monitor the evolution of the disease:**
  - ➔ Provide relevant indicators on a daily basis:
    - ⁜ *Based on Persons and on Tests*
    - ⁜ *In the whole territory and its Regions*
    - ⁜ *Granularity up to Postcode and Council*

And…

- **Forecast the evolution of the disease in the whole territory and its Regions**
  - ➔ *ICU/NON-ICU occupancy*
  - ➔ *Number of new positive cases (all ages and above 55)*
  - ➔ *Fatalities*
  - ➔ *Reproduction number (Rt)*
  - ➔ *Other indicators that eventually might appear.*
- **Allow taking decisions based on indicators and predictions/simulations**

Coverage

- National scope
  - ✓ Country divided in Regions each one with their own Health System
    - →*Lack of visibility on other Regions situation*
  - ✓ Tool to be used by all Regions
    - →→*Gain visibility on other territories*
- Restricted access
- Sistem fully implemented

HIERARCHI:
Country → Region → Province → Council → Postcode

Approach and steps taken

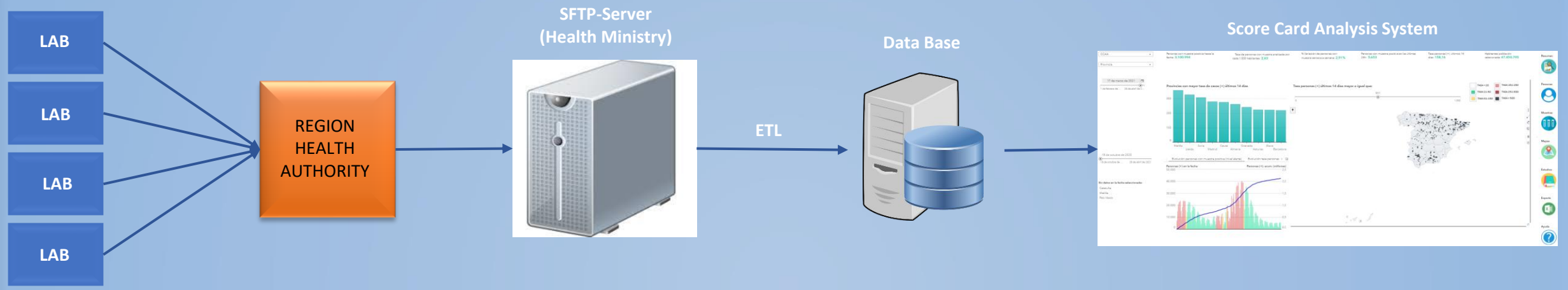
- Need for real-time, reliable information
- Existing system to compute cases but:
  - *Ment for individual patient follow-up throughout time*
  - *Not ment for global real-time follow-up*
  - *Updates not available quickly*
  - *No graphical capabilities*

- Need for a quick means of information transfer
- Options:
  1. *Directly from lab* *ucted*
     - ➔ many of
  2. *From Regions, be*

     collection from la
     - ➔ Regions can easily establish reporting routes from labs

Information requested:
- *person identification,*
- *date of birth,*
- *male/female sex,*
- *test type,*
- *test result,*
- *date of test.*

Approach and steps taken



- Perform tests
- Create files
- Send files to Health Authority in the Region

- Gathers files from labs
- Consolidates into single file
- Sends file to Health Ministry (daily)
- File format to be adapted at ETL time

- Receives files from regions

- Extracts, transforms and loads into DB
- Converts formats into normalized formats
- Detects duplicates and other errors and sends feedback to informers
- *Cross data with other DB to get geographical information*
- *Performs data pseudoanonymization*

- Allows statistical analysis of data
- Multiple perspectives
- Geolocalization
- Provides forecasts

CCAA

Provincia.

16 de mayo de 2021

1 de febrero de... 16 de mayo de ...

17 de diciembre de 2020

17 de diciembre d... 16 de mayo de 2021

Sin datos en la fecha seleccionada:

Personas con muestra positiva hasta la fecha: **3.483.951**

Tasa de personas con muestra analizada por cada 1.000 habitantes: **450,10**

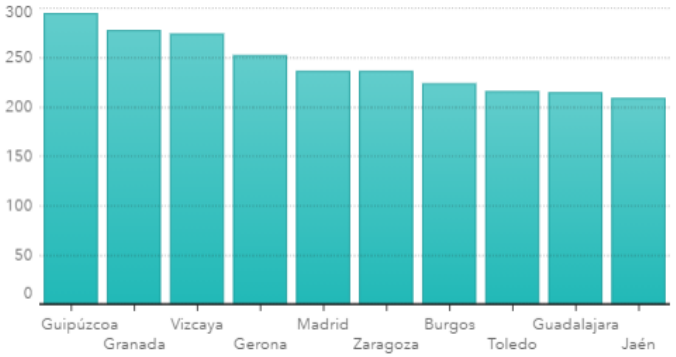
% Variación de personas con muestra semana a semana: **-20,43%**

Personas con muestra positiva en las últimas 24h: **1.676**

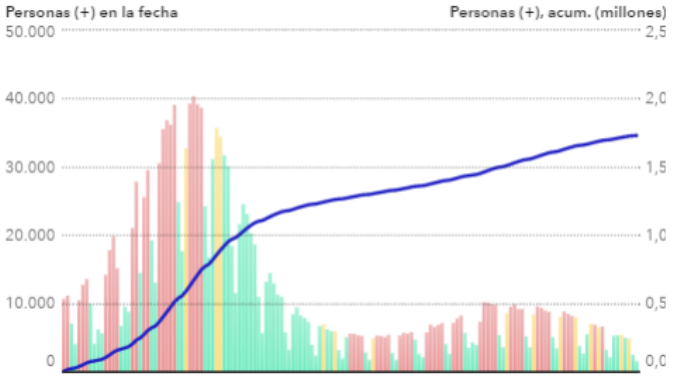
Tasa personas (+) últimos 14 días: **145,82**

Habitantes población selecionada: **47.450.795**

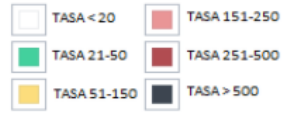
Provincias con mayor tasa de casos (+) últimos 14 días

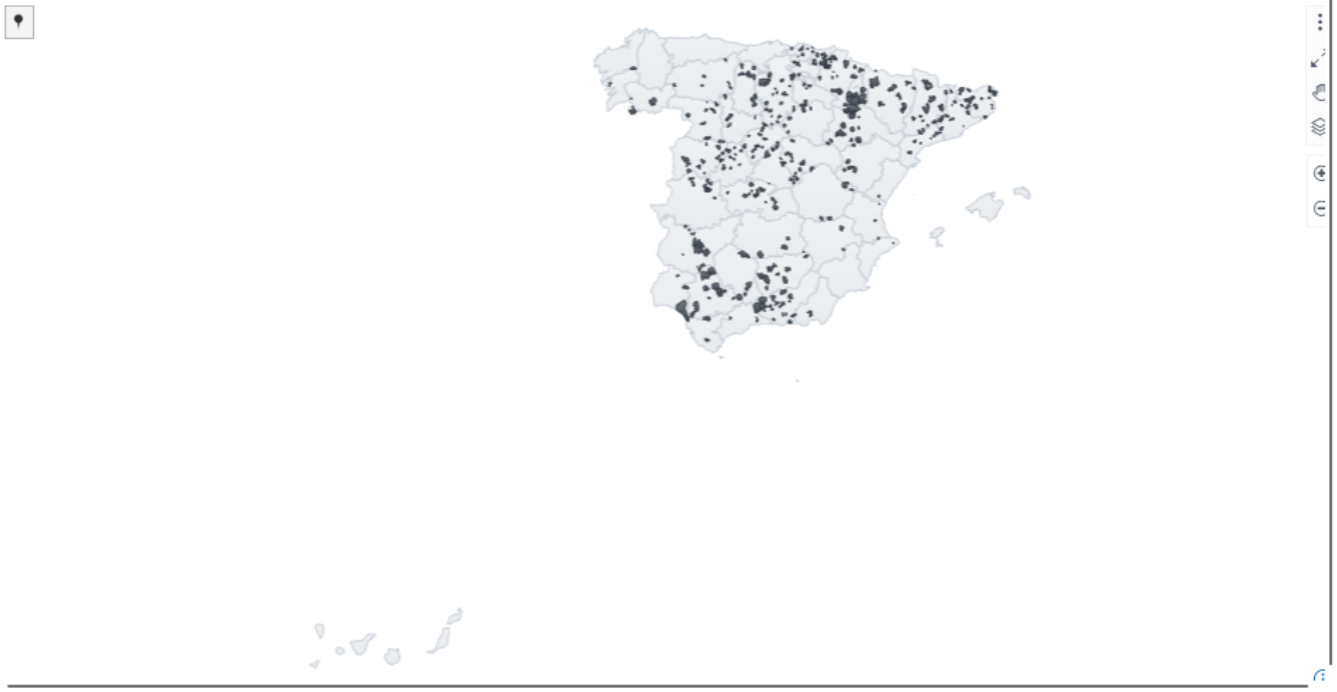


Evolución personas con muestra positiva (nivel alerta) | Evolución tasa personas



Tasa personas (+) últimos 14 días mayor o igual que:





Resumen

Personas

Muestras

Mapas

Estudios

Exports

Ayuda

Evolution to *Forecast & Simulation*

Statistical models do not fit well when random is present

We explore machine lerning type of technologies

- *Neural network technology*

The model is trained, in fact there are multiple models in place to fit different scenarios:

- *Big cities vs small cities,*
- *Places with large hospital capacity vs places with very reduced hospital capacity,…*

The model is enriched with new data to improve accuracy of predictions

- *Enrichment is done according to epidemiological criteria.*

Evolution to *Forecast & Simulation*

Other systems in place are also collecting data:

- *ICU/non ICU occupation*
- *Fatalities*
- *Cases detected at airports*
- *Vaccination process*
- *Etc.*

These data are incorporated in the system to implement forecast module

The system is also enriched with other data such as:

- *Meassurements in place (lock downs, etc.)*
- *Reproduction number*
- *Mobility*
- *Etc.*

All those are also taken as input for our system to provide forecast & simulation

[MSanidad] - Predicción a 27 Abril 2021

No UCI ocupadas COVID19 - Gráfico | UCI ocupadas COVID19 - Gráfico | Clúster | Exportación de datos

05/01/2021 5/2021
01/07/2020 26/05/2021

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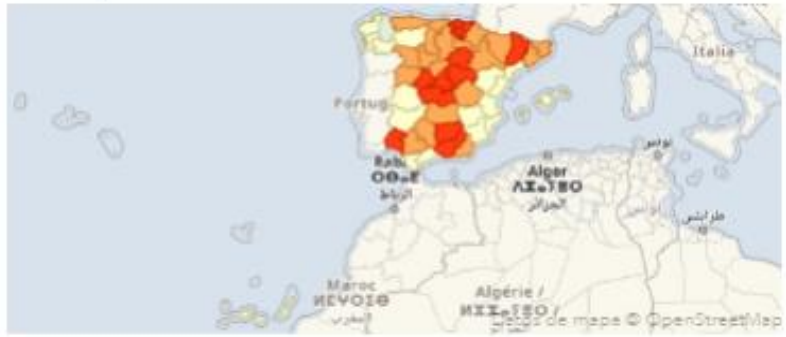
Provincia

Fecha próximo pico:
23/05/2021

% Error WAPE 5 días no UCI COVID:
4,38%

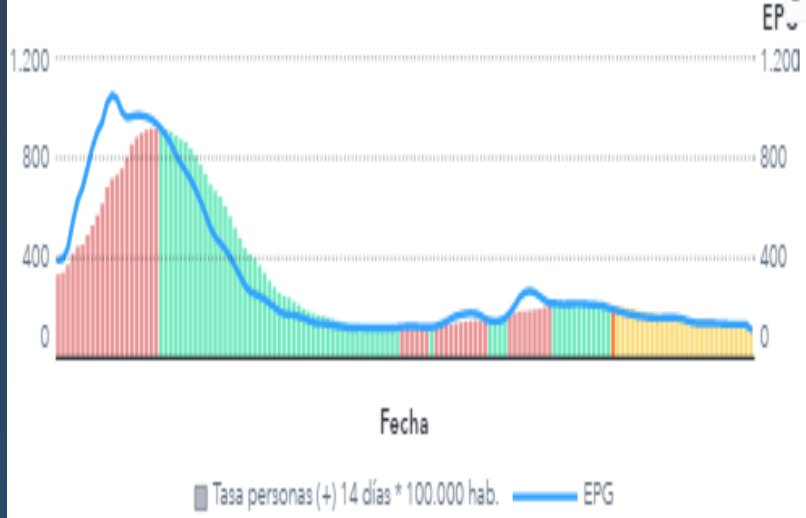
% Error RMSLE 5 días no UCI COVID:
4,71%

% Ocupación no UCI COVID en pico



Predicción NO UCI ocupadas COVID19 / NO UCI ocupadas COVID19

Tasa personas (+) 14 días * 100.000 hab. Rt>=1 Rt<1 Confirmación Predicción



Personas (+) COVID19 | Personas (+) COVID19 mayores de 55 años

Fallecimientos por COVID19

Tipo de error: %Error WAPE

Error a: 5 días

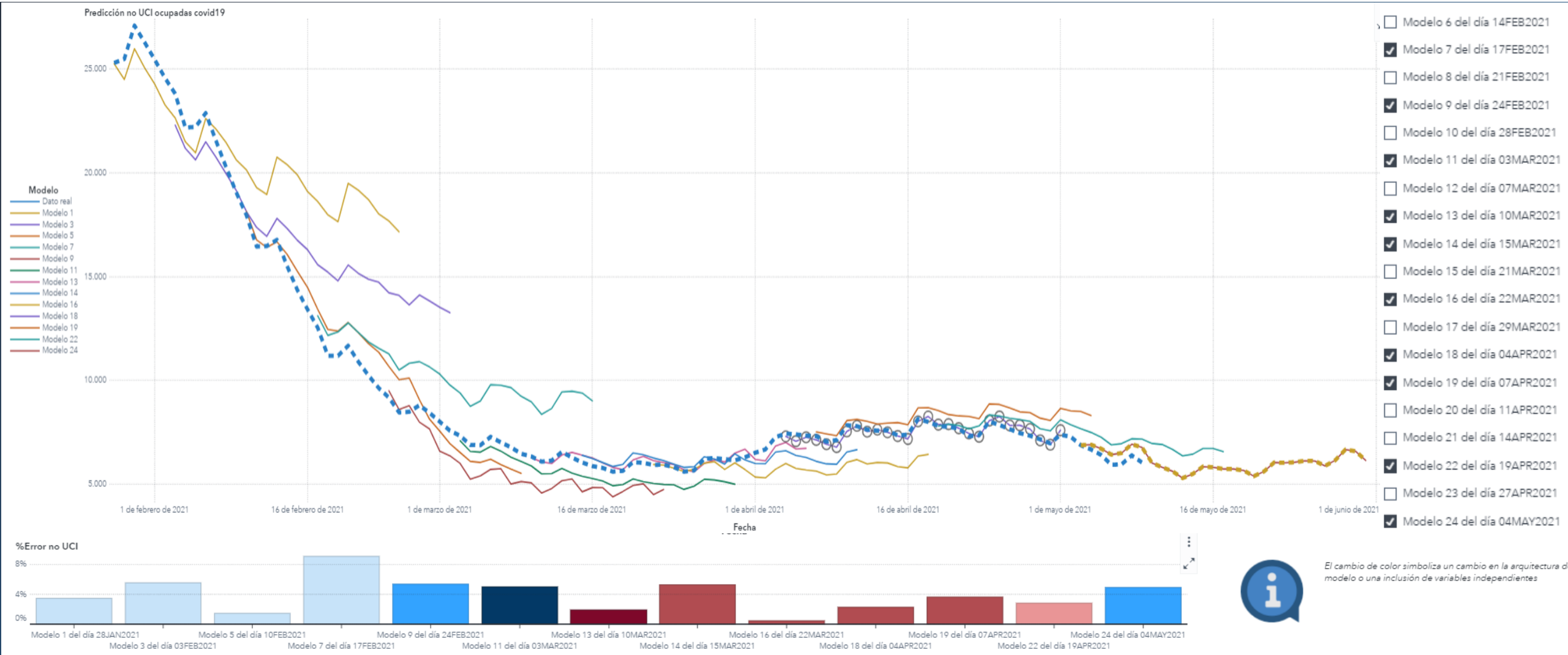
CCAA: CCAA

Provincia: Provincia

Total hospitales
574

%Hospitales que no informan
19,81%

Hospitales que no informan
114



El cambio de color simboliza un cambio en la arquitectura d
modelo o una inclusión de variables independientes

Problems encountered

Availability of

- *Postalcode i*
- *Council infor*
- *Mobility dat*

Personal data

- *Complex wh function)*

Need to impl

- *Demand to r*
- *Allow differe*

Lack of knowl

- *Machine lerr*
- *Epidemiolog*