# Trajectory Mapping Results

**Analysis Europe10 300 particles**

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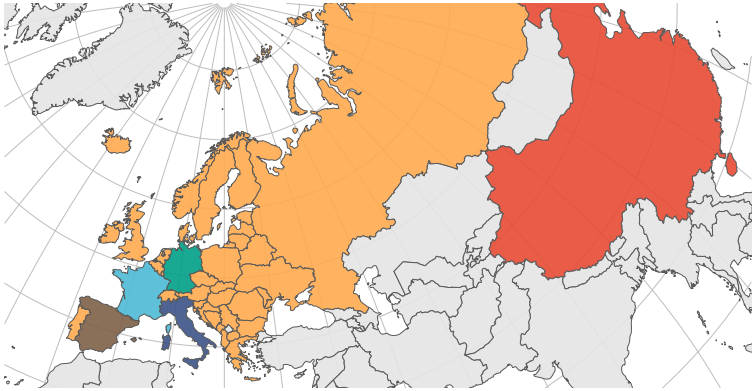
22 March, 2021

# Deme configuration



| deme | division | country | region | exclude_country | min_date | max_date |
|---|---|---|---|---|---|---|
| China | | China | Asia | | 2019-12-24 | 2020-01-23 |
| France | | France | Europe | | 2020-01-23 | 2020-03-08 |
| Germany | | Germany | Europe | | 2020-01-28 | 2020-03-08 |
| Italy | | Italy | Europe | | 2020-01-29 | 2020-03-08 |
| OtherEuropean | | | Europe | France,Germany,Italy,Spain | 2020-01-29 | 2020-03-08 |
| Spain | | Spain | Europe | | 2020-02-24 | 2020-03-08 |

**Table 2:** Total number of cases reported to ECDC on March 8, 2020

| deme | c19od | ecdc | owid |
|---|---|---|---|
| China | 80904 | 80768 | 80222 |
| France | 963 | 613 | 948 |
| Germany | 902 | 684 | 799 |
| Italy | 6007 | 4636 | 5883 |
| OtherEuropean | 2184 | 1561 | 1760 |
| Spain | 1136 | 764 | 500 |

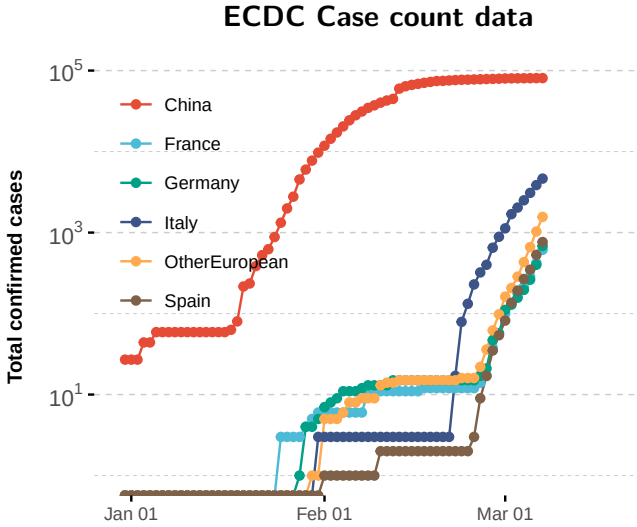



**Figure 1:** ECDC case counts for each deme from the beginning of the pandemic to March 8, 2020

# Epidemic trajectory data

From the Stochastic Trajectory Mapping analysis, we sample with importance sampling one epidemic trajectory per set of parameters + typed node tree from the set of simulated trajectories.

The processing of the trajectory data includes the generation of two different datasets:

- `states`: We have the total number of inferred cases by trajectory, deme and time.
- `events`: We have each event that happened in a epidemic trajectory, with its type (origin, birth, death or migration), the source/destination deme and time.

# Epidemic trajectory data

We use the events dataset to compute quantities of interest:

- `B`: transmissions (births) events
- `D`: becoming unifectious (deaths) events
- `IM`: migrations into the deme
- `OM`: migrations out of the deme
- `S`: sampling events
- `O`: origin
- `in_pop`: origin + transmissions + incoming migrations
- `out_pop`: deaths + outgoing migration + sampling events
- `active_pop`: origin + transmissions + incoming migrations - (deaths + outgoing migration + sampling events)

# Epidemic trajectory data

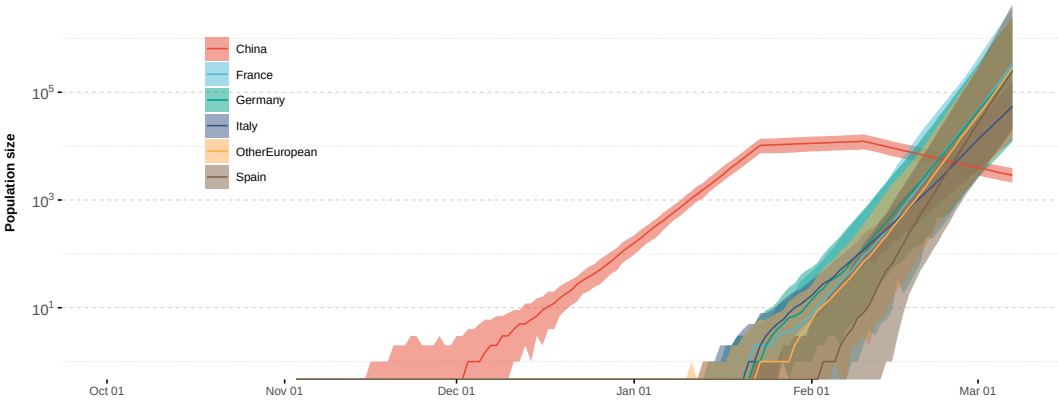
**Table 3:** Trajectories dataset

| traj | var | deme | partner | date | value | cumvalue |
|---|---|---|---|---|---|---|
| 1 | active_pop | China | | 2019-11-29 | 1 | 1 |
| 1 | in_pop | China | | 2019-11-29 | 1 | 1 |
| 1 | O | China | | 2019-11-29 | 1 | 1 |
| 1 | active_pop | China | | 2019-11-30 | 1 | 2 |
| 1 | B | China | | 2019-11-30 | 1 | 1 |

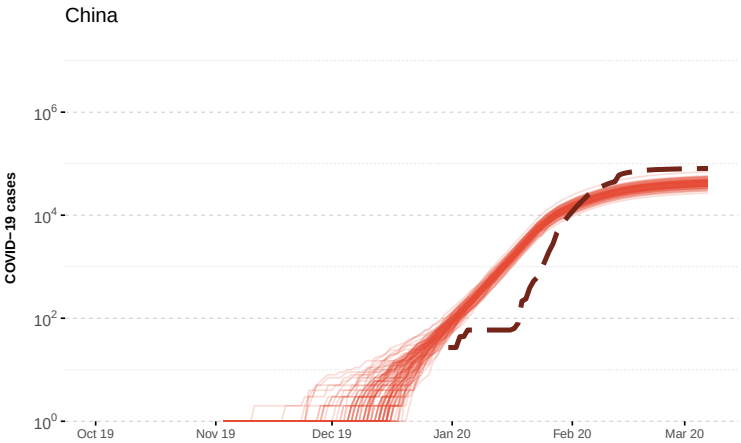
To have a feasible time of analysis of the epidemic trajectories we take a random subsample of 500 trajectories.

To facilitate visualization and summarise the results, we take a grid time of 1 day and summarise the number of events that day as the sum of the events in the corresponding time interval; and the number of inferred cases as the maximum of the interval.

# Summarised epidemic trajectories

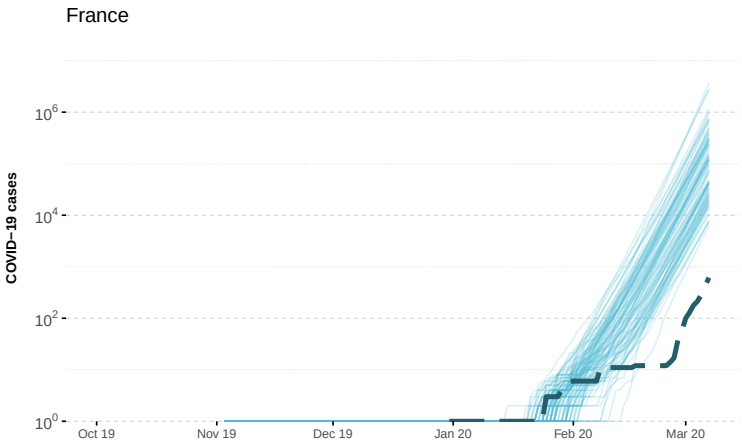


# Inferred case counts - China



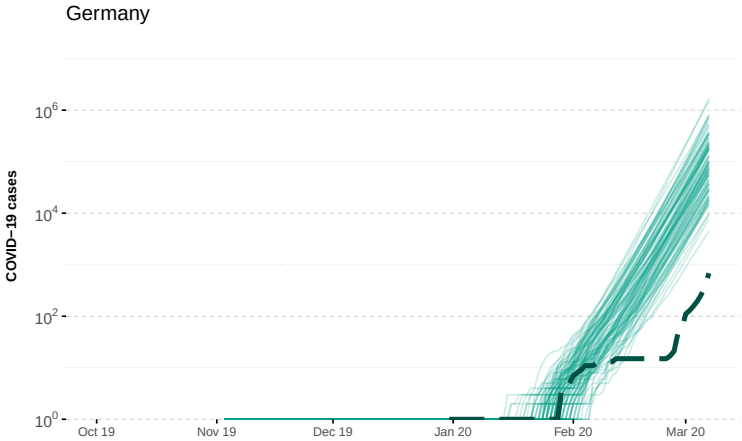

| *var* | D |
|---|---|
| *deme* | China |
| *l95_cumvalue* | 29697 |
| *h95_cumvalue* | 55959 |
| *median_cumvalue* | 42514.5 |
| *mean_cumvalue* | 42510.62 |
| *total_confirmed* | 80768 |
| *ltimes* | 0.37 |
| *htimes* | 0.69 |
| *mtimes* | 0.53 |

# Inferred case counts - France



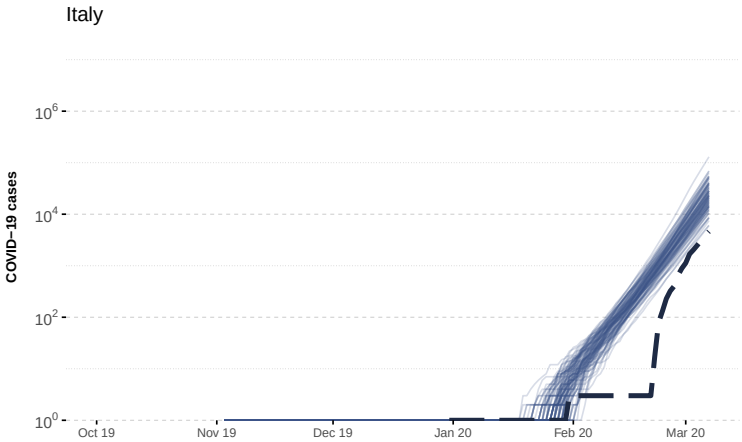

| *var* | D |
|---|---|
| *deme* | France |
| *l95_cumvalue* | 6346 |
| *h95_cumvalue* | 1027122 |
| *median_cumvalue* | 98153.5 |
| *mean_cumvalue* | 272263.5 |
| *total_confirmed* | 613 |
| *ltimes* | 10.35 |
| *htimes* | 1675.57 |
| *mtimes* | 160.12 |

# Inferred case counts - Germany



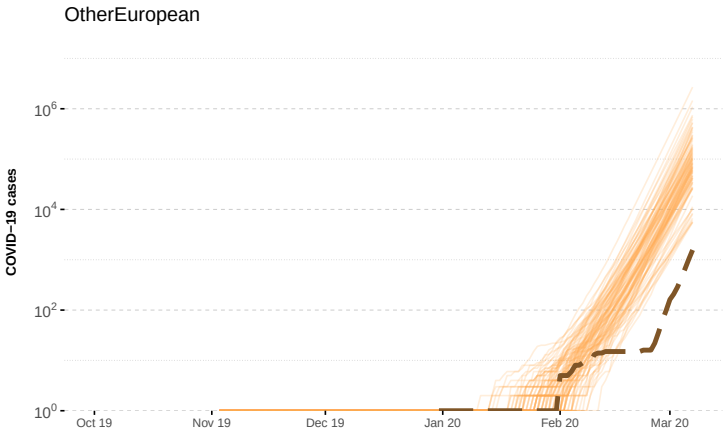

| *var* | D |
|---|---|
| *deme* | Germany |
| *l95_cumvalue* | 4474 |
| *h95_cumvalue* | 755948 |
| *median_cumvalue* | 88391 |
| *mean_cumvalue* | 186982.6 |
| *total_confirmed* | 684 |
| *ltimes* | 6.54 |
| *htimes* | 1105.19 |
| *mtimes* | 129.23 |

# Inferred case counts - Italy



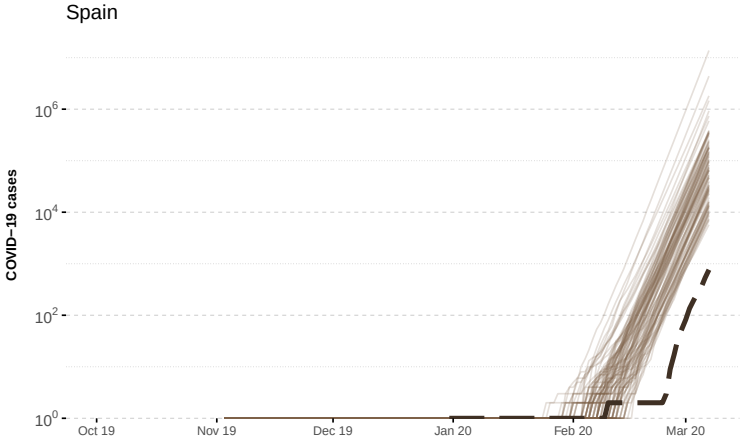

| *var* | D |
|---|---|
| *deme* | Italy |
| *l95_cumvalue* | 6018 |
| *h95_cumvalue* | 55151 |
| *median_cumvalue* | 22822 |
| *mean_cumvalue* | 26966.13 |
| *total_confirmed* | 4636 |
| *ltimes* | 1.3 |
| *htimes* | 11.9 |
| *mtimes* | 4.92 |

# Inferred case counts - OtherEuropean



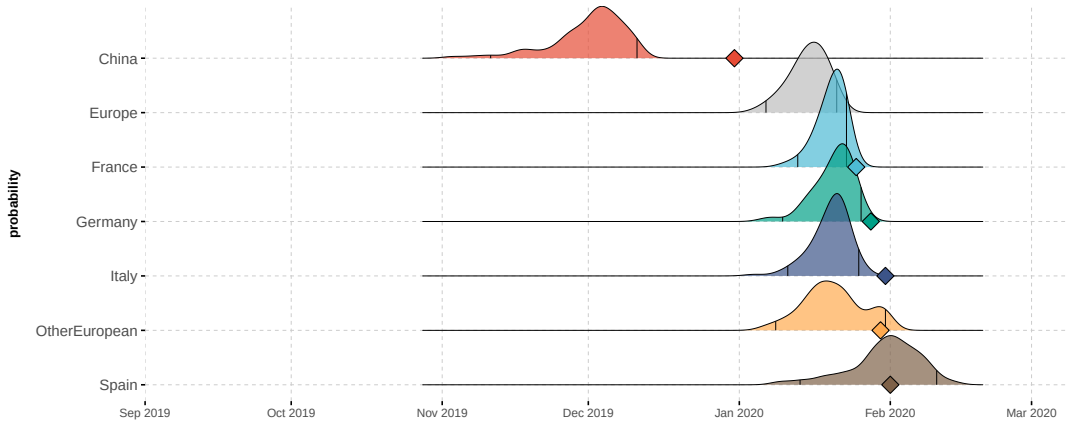

| *var* | D |
|---|---|
| *deme* | OtherEuropean |
| *l95_cumvalue* | 5507 |
| *h95_cumvalue* | 695816 |
| *median_cumvalue* | 81533.5 |
| *mean_cumvalue* | 182092 |
| *total_confirmed* | 1561 |
| *ltimes* | 3.53 |
| *htimes* | 445.75 |
| *mtimes* | 52.23 |

# Inferred case counts - Spain

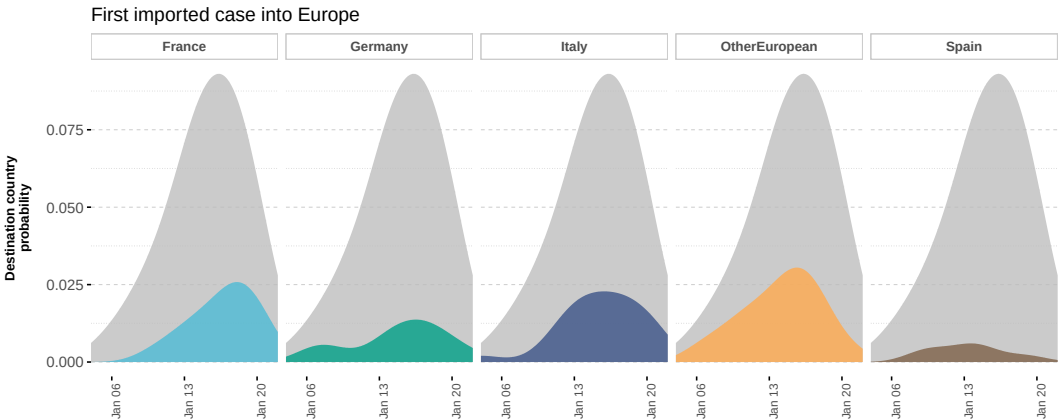



| *var* | D |
|---|---|
| *deme* | Spain |
| *l95_cumvalue* | 5718 |
| *h95_cumvalue* | 924839 |
| *median_cumvalue* | 65295.5 |
| *mean_cumvalue* | 328947.4 |
| *total_confirmed* | 764 |
| *ltimes* | 7.48 |
| *htimes* | 1210.52 |
| *mtimes* | 85.47 |

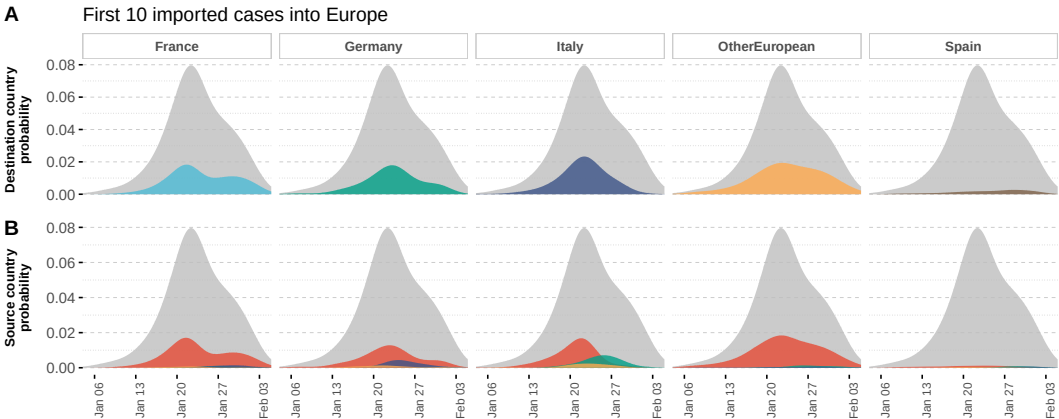
# First introduction



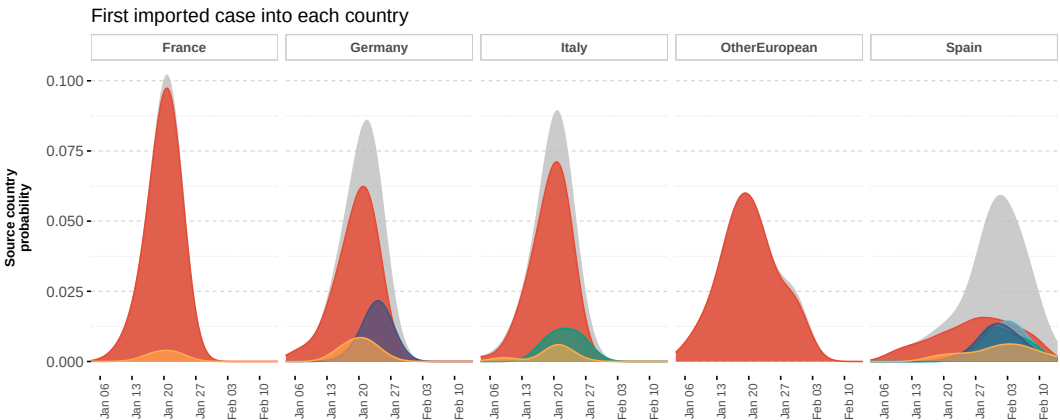
# First introduction into Europe, location



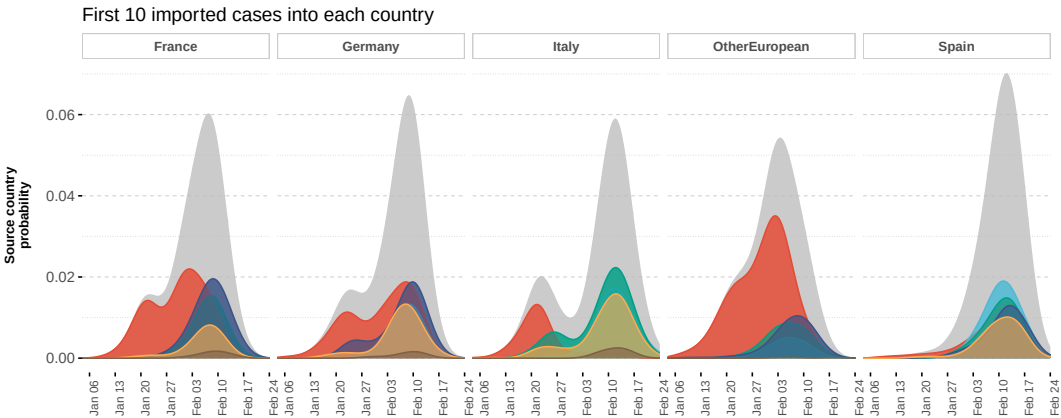
# First 10 introductions into Europe, location



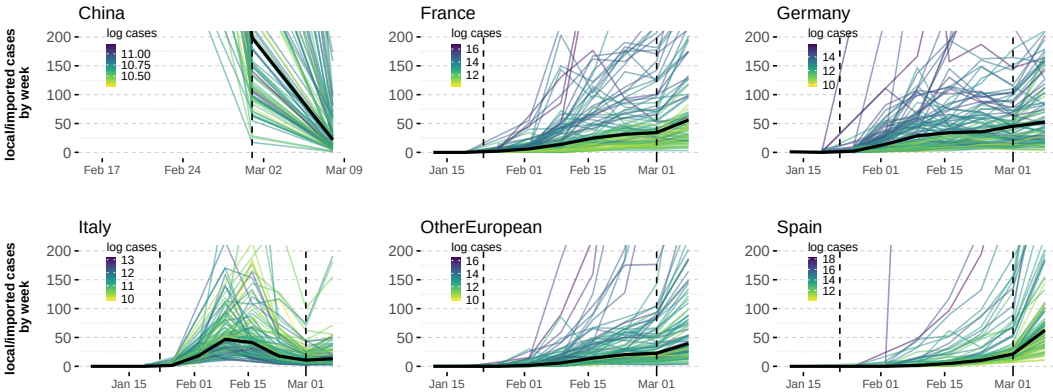
# First introductions into each country, source

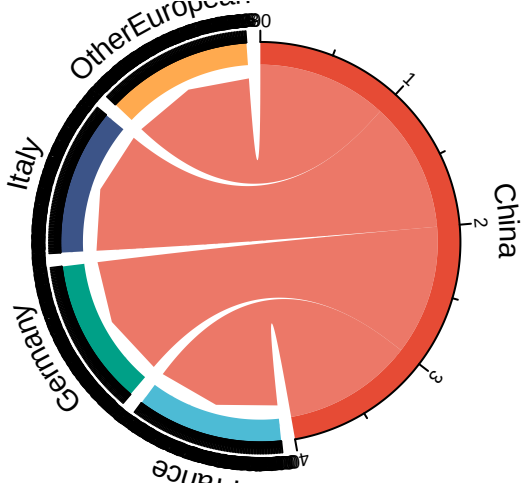


# First 10 introductions into each country, source



# Local transmission vs imported cases

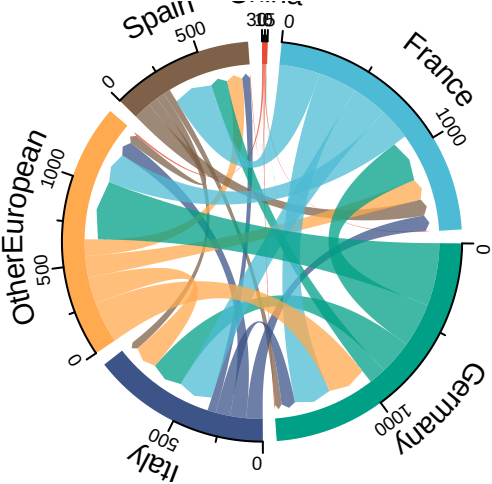



Migrations - Period 1
OtherEuropean
Italy
Germany
France
China
0
1
2
3
4

```
## NULL
```

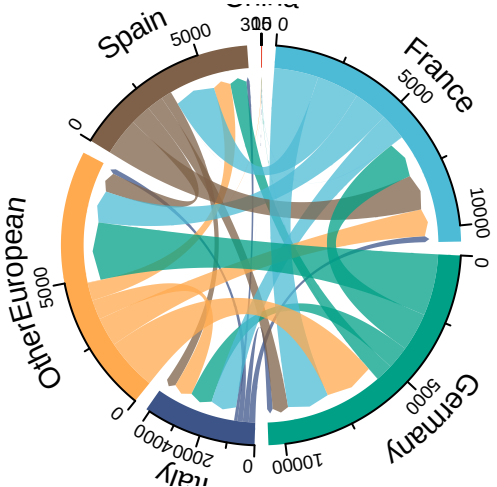
```
## NULL
```

## Migrations - Period 2




## NULL

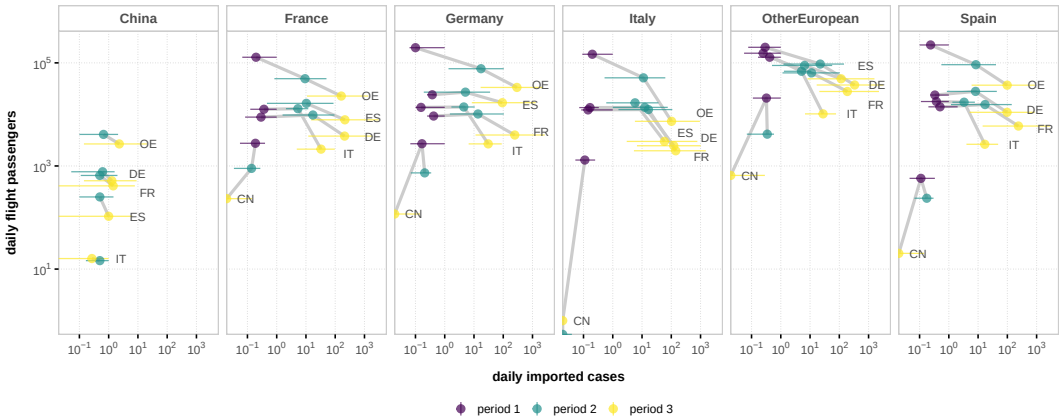
## NULL


Migrations - Period 3
Spain
5000
0
France
5000
10000
0
Germany
5000
10000
0
Italy
2000
4000
0
OtherEuropean
5000
0

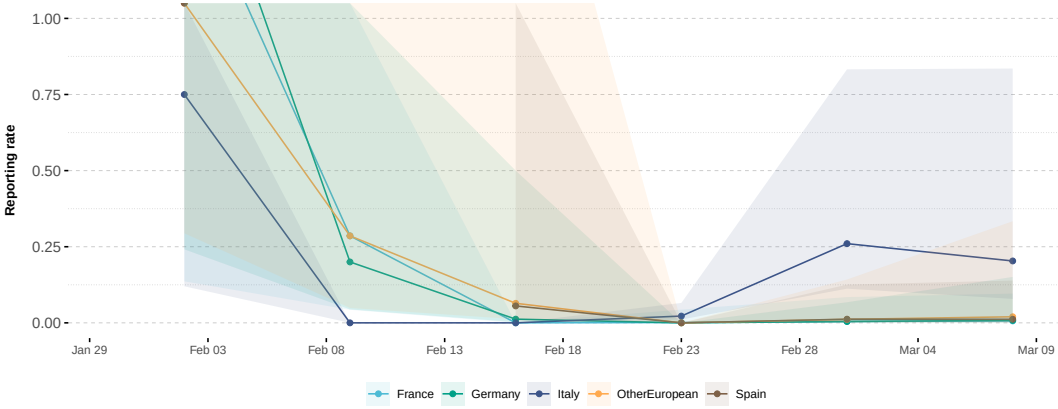
## NULL

## NULL

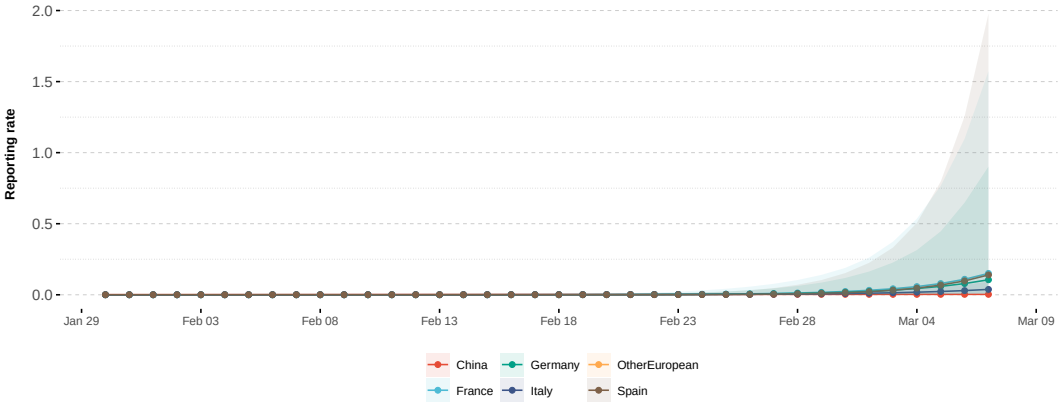
# Daily flight passengers vs daily imported cases



# Weekly confirmed cases proportion



# Weekly incidence population



# Events timing