

*May 25th 2020*

# FACING THE VIRUS INITIATIVE

## REPORT #1

**FEEDBACK ON MOBILITY  
DURING THE COVID-19  
PANDEMIC**



# TRAVEL SLOWLY RESUMES AFTER LOCKDOWN WAS RESPECTED FOR SEVERAL WEEKS

During several months, France has been living under the policies announced by the government to fight the Covid-19 pandemic. These policies have had a strong impact on the mobility of individuals. In this report, we aim to analyze and quantify this impact and to draw some observations that we hope can help the policy makers, in particular during the current post-lockdown period.

Our analysis is based on a set of anonymized and aggregated data sets provided by Facebook, encoding movement, density and co-location of the social network users. Performed at the departmental, national and supranational (European) scales, it shows a severe drop in

all movement indicators. For instance, the movement of French people was reduced by nearly 80% during the lockdown compared to a pre-lockdown reference period spanning 45 days prior to the lockdown for movement maps, and 90 days for density maps. This drop has been followed by a slow and smooth recovery throughout the lockdown period. A week after the first measures were put in place to ease the lockdown, the rate of mobility remains moderate. At the European level, we highlight some differences on the effects of the implemented public policies. We also point out some regional disparities, particularly in terms of density and connectivity.

## About Facing the Virus:

Facing the Virus is an open scientific initiative launched by researchers from Université PSL (Dauphine - PSL, ENS - PSL, MINES Paris Tech - PSL), CNRS and Inria, accompanied by a sponsorship from the company Emerton Data, with the aim of contributing to general knowledge about the Covid-19 outbreak as well as to help define public policies for crisis management.

A key issue addressed by Facing the Virus is how to leverage mobility data in the modeling of the outbreak dynamics. To complement the health data provided by public authorities, the Initiative gathers additional data, provided by private companies (including Facebook and Roofstreet), which enable the monitoring of the evolution of mobility according to its various characteristics.

Facing the Virus pays close attention to ensuring that the use of data is carried out with respect for fundamental rights and freedoms and in no way aims to identify individual behavior. The initiative does not collect any personal data and only processes statistical summaries of mobility data.

# DEPARTURES AND ARRIVALS

Facebook data confirms a population exodus from mountainous departments (notably, Savoie and Hautes-Alpes) and Paris, after the announcement of containment measures. A week after the easing of these measures, Paris has still not yet recovered its whole population nor become fully functional, suggesting a predominant tendency towards work from home..

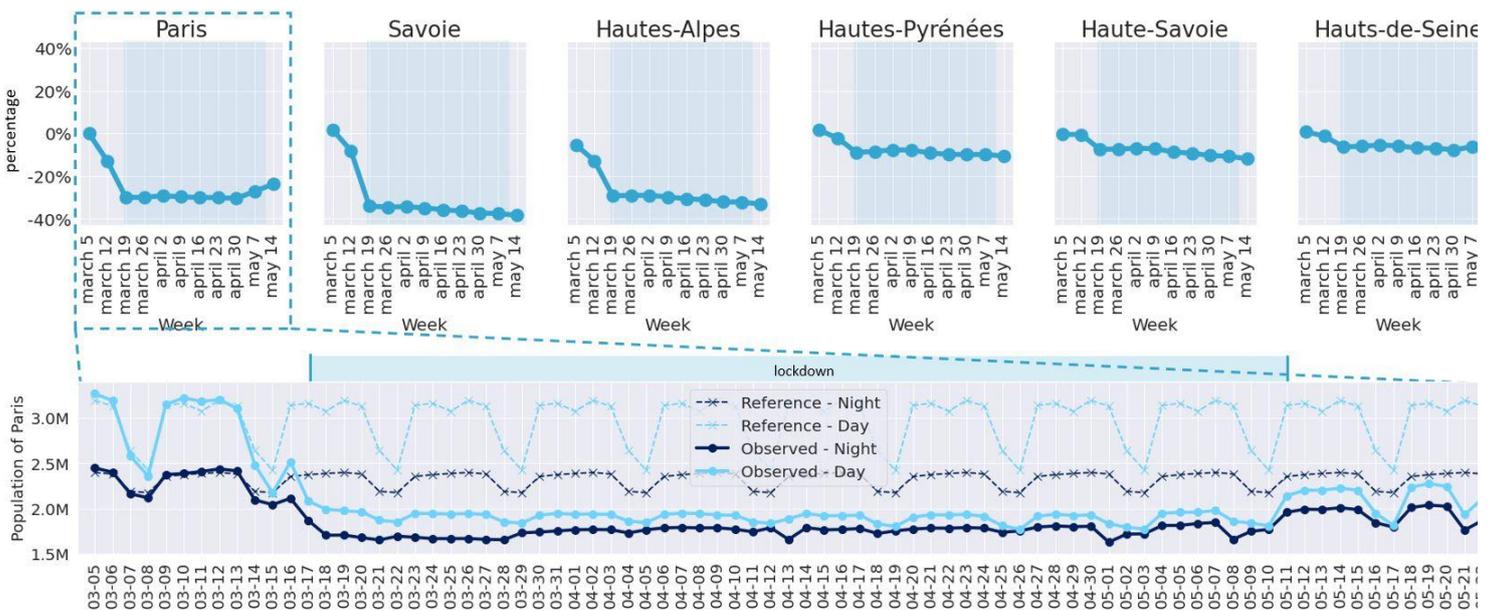
**70%**

*Parisian population spending the night on-site under the lockdown*

**80%**

*Population of Paris spending the night on-site after the lockdown*

Variation in population density, with a focus on the departments where the largest drops have been observed.



The total Parisian population spending the night on-site (dark blue curve) has decreased by 30%. This rate is significantly higher than the 17% published by Orange at the end of March. The difference could be explained by intrinsic bias affecting the data (age, network coverage, etc.). Following the easing of the lockdown, the population spending the night in Paris has increased slightly, to reach a level which is still 20% lower than the one of the reference period (the 90-day period prior to lockdown).

A closer look at Paris reveals a drop in the population on weekends and public holidays.

The curve in light blue represents the total residential population, also depicted by the dark blue curve, and the flow of travel from other departments, including commuter movement. The difference between the two blue curves is a good proxy to quantify the recovery of economic activity outside of work from home. This recovery is still relatively moderate a week after the end of lockdown. It is about 22% compared to the period before lockdown, which suggests a significant adoption of work from home in the Paris region.

# MOVEMENT BETWEEN FRENCH DEPARTMENTS

The lockdown had a significant impact on French medium and long-range trips (i.e. beyond the departmental borders)

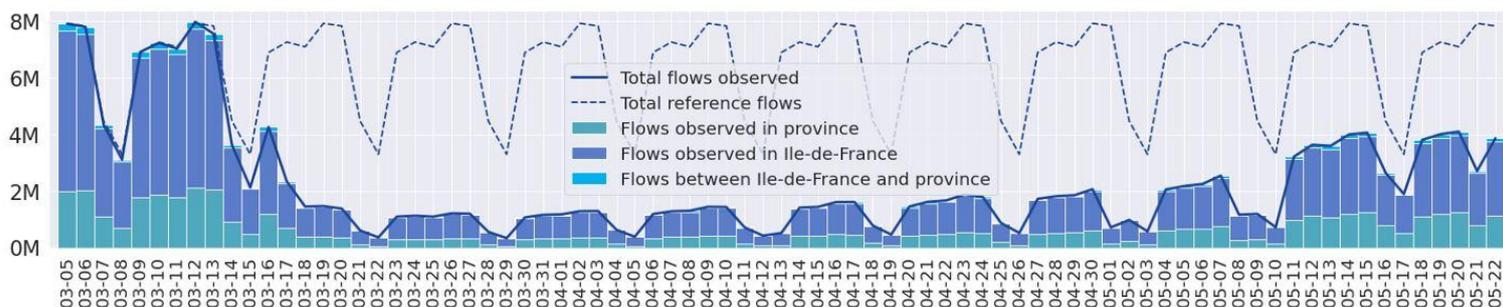
## 80%

*Drop in movement under lockdown*

## 50%

*Usual movement since the easing of lockdown*

## Daily movement between departments



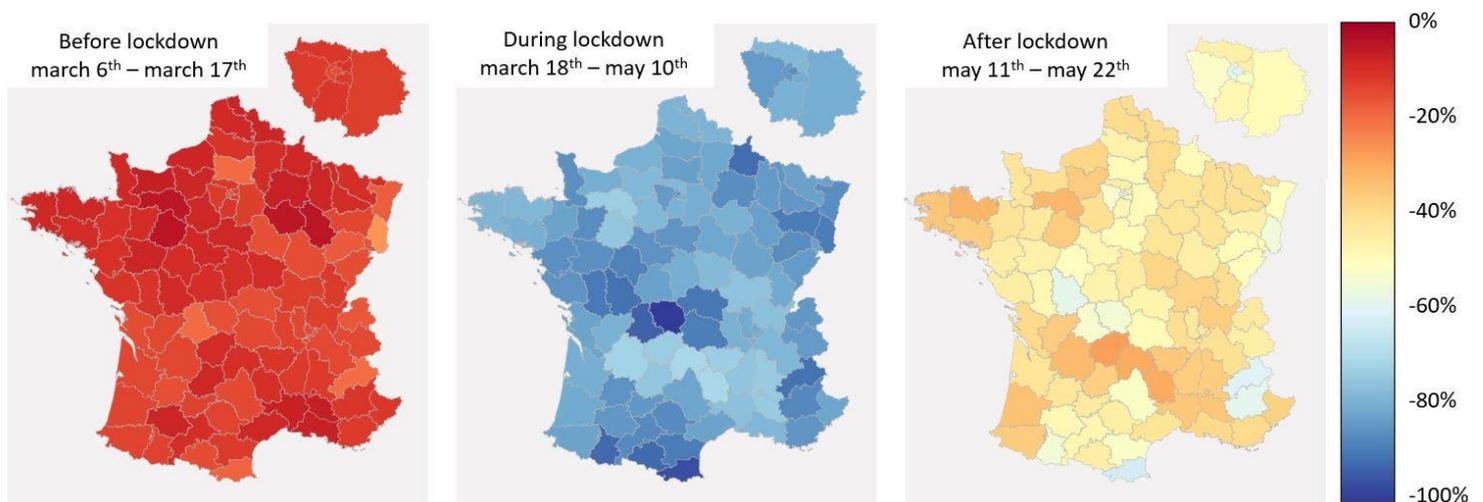
Lockdown restrictions have had a very significant effect on medium- and long-distance travel. Compared with the reference period (from February 1st to March 5th), the flow of travellers between departments dropped by around 80%, following the announcement of the lockdown on March 17th, with an initial drop of around 40%, already visible on March 16th. During lockdown, the usual weekly trend, with the flow of travel significantly less strong during weekends, remained clearly marked. The public holidays of the period (April 13th, May 1st and May 8th) also resulted in an additional significant reduction in the amount of travel. These observations suggest that the residual share of trips during lockdown, which was, on average, about 20% of the level recorded during the reference period, was largely

related to professional activities. Over the entire lockdown period (from March 17th to May 10th), there was also a slow upward trend, with an increase in the volume of residual mobility flows of almost 75% between the beginning and the end of lockdown. The first week after lockdown marks a clear increase in the volume of movements, observable as of May 11th, with a slow increase throughout the two weeks that follow. However, the amount of trips reached at the end of the week of May 18th remains low, at around half the level observed during the reference period.

# MOVEMENT BETWEEN FRENCH DEPARTMENTS

Analysis of each département reveals a fairly homogeneous situation throughout the country, both during lockdown and during the first week after it.

Decrease in movement between departments, compared to the level observed in each department during the reference period



The detailed data concerning each department shows a fairly homogeneous decrease in the flow of travel, both during lockdown and in the two weeks after its easing. There is no marked regional trend, nor any observable difference linked to the classification ("green" and "red" regions) established by the post-lockdown strategy put in place on March 11th. The significant regional trends concern Brittany, where the number of trips between departments remained comparatively high throughout the period, and, conversely, the Île-de-France region, where the reduction in mobility was particularly

significant. Within the French regions, the most significant reductions have been observed in the departments corresponding to the major metropolitan areas, with levels remaining comparatively low in departments such as Rhône (Lyon) or Haute Garonne (Toulouse), and particularly low in Paris.

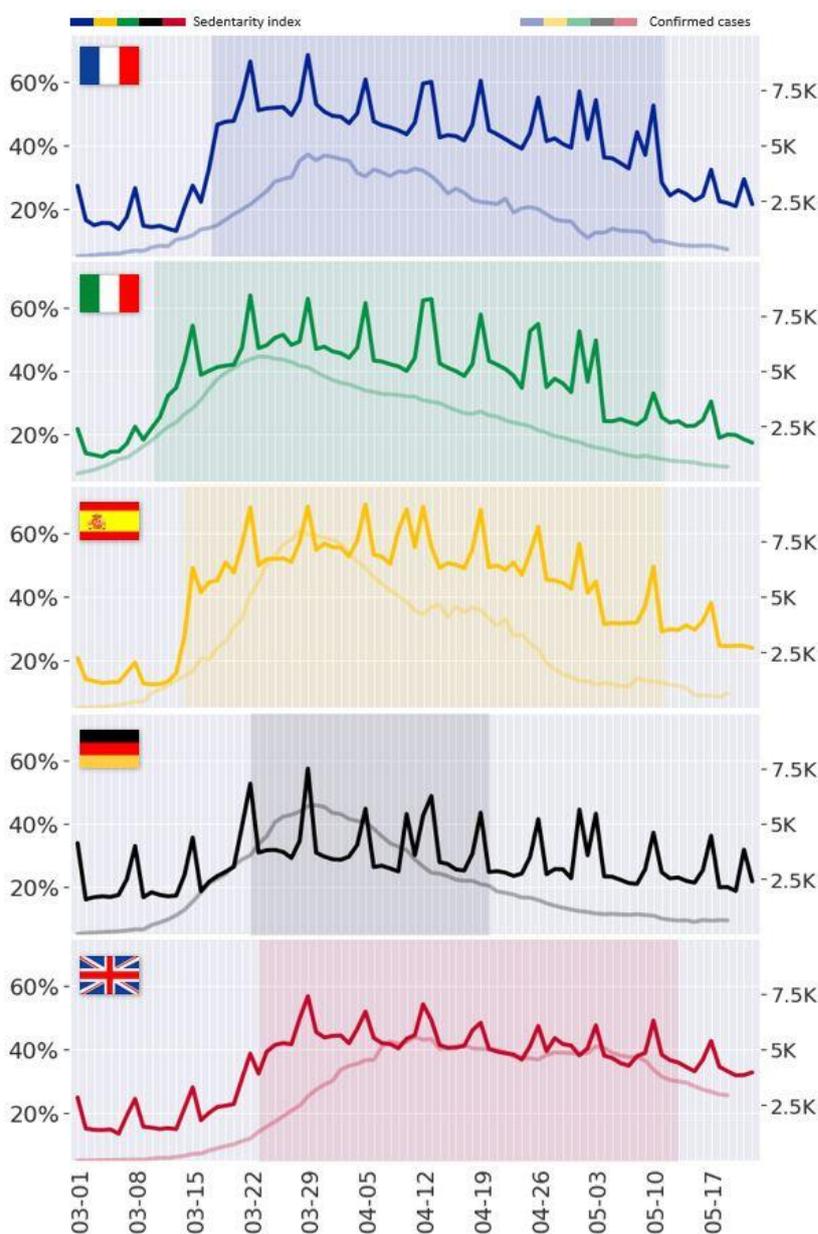
# LOCKDOWN IN FRANCE AND EUROPE

The different confinement measures taken across European countries have had a strong impact in the number of residents staying close to home.

# 50 %

*Sedentariness (Stay Near Home) index in Europe during lockdown*

## Changes in the sedentary behavior index in some European countries



It is possible to estimate an index of sedentariness, dubbed the Stay Near Home index by Facebook, in each country by computing the ratio between the number of people spending their day within a square of 600 meters by 600 meters and the number of people having travelled longer distances.

In France, Italy, and Spain, this index goes from around 15% to 50% for working days. Peak values of around 60% are observed on weekends, and especially on Sundays. The tendency towards sedentariness progressively decreases during the lockdown period as a slight decrease of the index values shows. The first measured put in place to ease the lockdown lead to an important reduction in sedentariness but the index values remain around 25%, namely ten points higher than in the period prior to the lockdown. The index in the United Kingdom presents a similar behavior but the values observed are around ten points lower than in the three other countries during the lockdown phase. In the case of Germany, lockdown measures seem to have led to a more moderate sedentariness than in other countries.

25 %

*Sedentariness index in France in the first week of de-confinement*

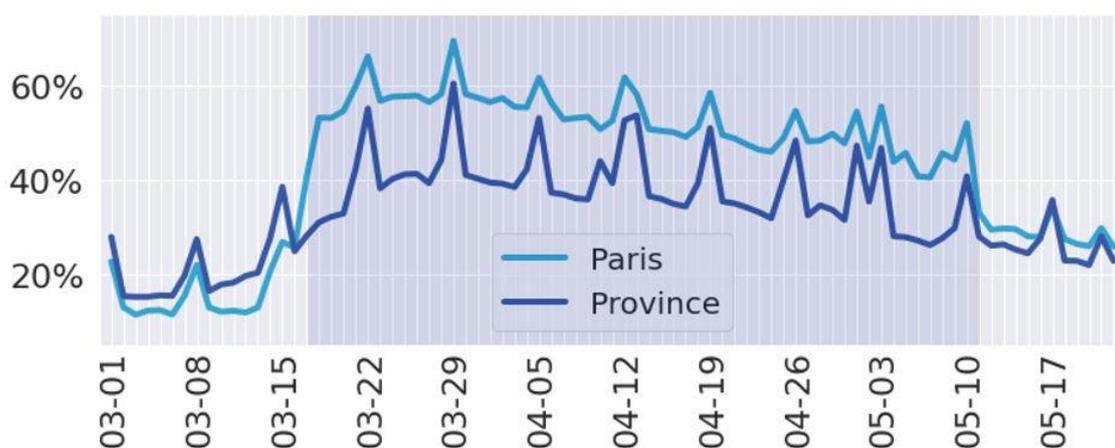
# LOCKDOWN IN FRANCE AND EUROPE

The overwhelming trend towards sedentariness in France during lockdown has been easing since May 11th.

If we consider the daily count of confirmed cases provided by John Hopkins University, we observe that the peak in infections is reached around 10 to 20 days after the beginning of the lockdown in each country. Spain is the country with the highest peak, with more than 7500 new cases in one single day. The United Kingdom is the country where the peak has lasted the longest time. The number of confirmed cases decreases at a rate that depends on each country.

Pays	Début du confinement (échelle nationale)	Entrée en vigueur des premières mesures de déconfinement
France	17-mars	11-mai
Italie	10-mars	04-mai
Espagne	14-mars	04-mai
Allemagne	22-mars	20-avr
Royaume-Uni	23-mars	13-mai

Changes in the sedentariness index in Paris and in regional areas



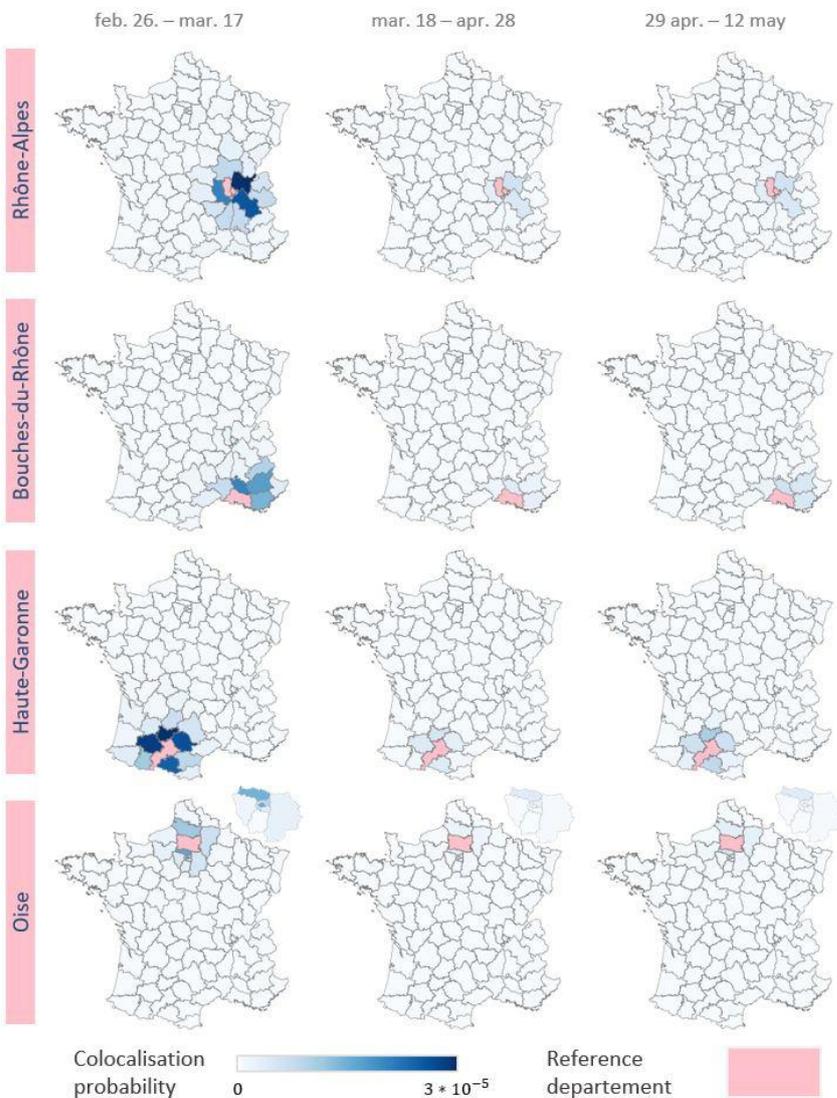
We can study the tendency towards sedentariness not only nationally but locally as well. The above graph compares Paris to regional areas, and we can again observe the strong impact that lockdown measures had during the period which appears with a slightly darker shade. However, we note values 15

points higher in Paris than in regional areas during the lockdown which may simply stem from the nature of our sedentariness index. This difference between Paris and regional areas suddenly disappears after the first day of end of lockdown. (May 11th).

# PROXIMITY NETWORK AND CO-LOCATION FACTORS

The analysis of the co-location factors of some French departments with the rest of the territory allows us to assess the importance of the connections between geographical areas.

Evolution of the co-location factor between different french departments.



## 80 to 85 %

*Drop in the co-location factor between March 10th and March 24th.*

The close ties between the Lyon area and surrounding region before the lockdown are clearly visible. The same phenomenon can be observed in Haute-Garonne around Toulouse. For the Marseille area and Oise, the connections are less strong and concern a narrower surrounding area.

For most pairs of departments, the co-location factor drops drastically (from 80% to 85%) from the week of March 10 to the week of March 24, then increases slowly in the following weeks.

The impact of this drop on the spread of the virus between departments is even more important when the population of these departments decreases at the same time. The amount of contact is proportional to the co-location factor and to the density of the populations at hand.

As a result of the lockdown, the drop in individual mobility has greatly reduced the average number of contacts per person: by a factor of 5 if we refer to the co-location factor but probably much more if we take social distancing into account.

### Co-location factor :

The probability that two individuals from two departments would be in the same 600m area within the time of any given minute. The factor impacts the number of infections among residents of a department A caused by a contagious person living in a department B. This number, which is essential for epidemiological models, determines the spatial spread of the epidemic.



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