How fully anonymized and aggregated mobile positioning data can help in tracking and controlling the COVID-19 pandemic

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Abstract. Due to an unprecedented agreement with the European Mobile Network Operators (MNOs) the Joint Research Centre (JRC) of the European Commission was in charge of collecting and analyze data (from 17 operators and 22 European member states plus Norway) to provide scientific evidence to policy makers in order to face the COVID-19 pandemic. Despite the data being of different granularity in time and space, after normalization and integration, a set of indicators and digital products were made available to modelers in, e.g., epidemiology and economics. It was also possible to measure the impact of human mobility on the early stages of the Sars-Cov-2 outbreak, to test how effective were containment measures in reducing the deadly effects of the pandemic, to highlight mobility patterns that go beyond administrative borders and to produce an early-warning system to track potential new hotbeds during the so-called second wave of COVID-19.

Introduction

The coronavirus disease 2019 (COVID-19) rapidly expanded throughout the world during the first quarter of 2020, reaching pandemic status on 11 March.
Against this backdrop, on 8 April the European Commission asked European Mobile Network Operators (MNOs) to share anonymised and aggregated mobile positioning data to face the COVID-19 pandemic with the aim of: *i)* understanding the spatial dynamics of the epidemics; quantify the impact of physical distancing measures; *iii)* feed epidemiological and *iv)* economics models to estimate the impact of the different interventions.

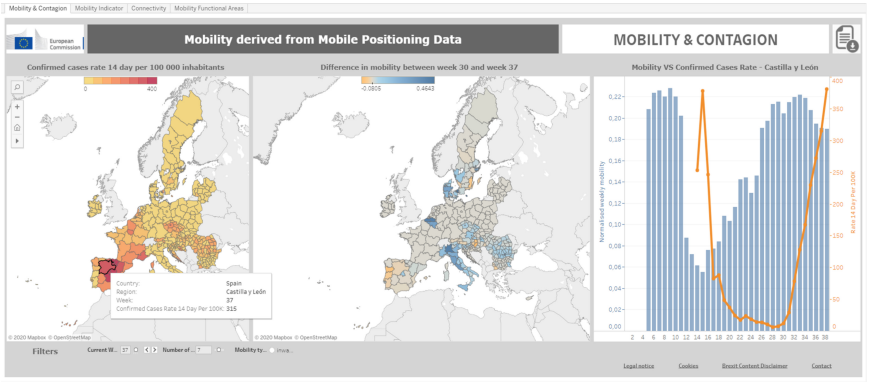

Figure 1: Mobility and Contagion in Europe through the JRC Mobility Visualitazione Platform.

Results and Discussion

For Italy and France it was possible to show that mobility can explain up to 92% of the initial spread of the virus, while it has a slow decay effect after lockdown measures, meaning that mobility restrictions seem to have effectively contribute to save lives. It also emerges that the typical lagged positive effect of reduced human mobility on reducing excess deaths is around 14-20 days. An analogous analysis relative to Spain, for which data from an IgG SARS-Cov-2 antibody screening study were available, confirms the findings [1].
The harmonized indicators derived from the MNOs data have also been used to study the impact of COVID-19 confinement measure on mobility in Europe. It is found that a large proportion of the change in mobility patterns can be explained by these measures across Europe. It is also shown how mobility and the infection reproduction number R_t correlated over time [2].
It will be also introduced the concept of data-driven Mobility Functional Areas (MFAs) as geographic zones with high degree of inter-mobility exchanges. Compared to *ad hoc* case studies and costly survey analyses, the MFAs are based on high resolution mobile positioning data. The MFAs can also be useful to inform targeted re-escalation policy responses in cases of future COVID-19 outbreaks avoiding national lockdowns [3].

References

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[2] Santamaria, C., Sermi, F., Spyratos, S., Iacus, S.M., Annunziato, A., Tarchi, D., Vespe, M. Cooler A. S. (2020), Measuring the Impact of COVID-19 Confinement Measures on Human Mobility using Mobile Positioning Data. A European Regional Analysis, forthcoming on *Safety Science*.
[3] Iacus, S.M., Santamaria, C., Sermi, F., Spyratos, S., Tarchi, D., Vespe, M. Cooler A. S. (2020), Data-Driven Mobility Functional Areas to Inform EU Policies and COVID-19, *submitted*.