



Effects of de-escalation phases on inter-province mobility patterns during June 2020 in Spain based on mobile phone data

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# Executive summary

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# Introduction

## Scope and Objectives

The aim of this document is to describe the effect of the de-escalate measures performed by the Spanish government during June 2020 on the mobility patterns between provinces in Spain.

## Motivation

Big data obtained from geolocated devices, such as smartphones, can be used to analyze the impact of COVID-19 on mobility patterns [[1]](#_Zhou,_C.,_Su,)[[2]](#_Oliver,_N.,_Lepri,) between provinces in Spain. This data can provide insights into how the virus is affecting people's movement between different areas of the country. For example, by tracking the movement of individuals over time, it may be possible to identify changes in the number of people traveling between provinces, as well as changes in the destinations that people are traveling to [[3]](#_Romanillos,_G.,_García-Palomares,). This information can be used to understand the impact of the virus on regional mobility and to inform public health interventions. Additionally, analyzing mobility patterns can help identify trends and changes in behavior over time, which can provide valuable information for policymakers and researchers as they work to contain the spread of virus in future social emergencies.

## Structure of the document

The document is structured as follows:

* Section 1 defines the main concepts and terms used throughout the document.
* Section 2 provides an overview of the methodology used in the project.
* Section 3 describes and discusses the results of the data analysis,
* Section 4 summarizes the main conclusions and discusses future research directions.

## Glossary of Terms

## Acronyms and Abbreviations

# Case study, data and methodology

## Study area and phases

The selected study area covers all the provinces in Spain. Aggregation of provinces into autonomous communities are performed in some analysis to provide a better understanding of the mobility dynamics. This aggregation is remarked on the analysis where it has been applied.

Regarding the time frame, the project analyzes the impact of the de-escalate measures performed during June 2020, when most of the autonomous communities transitioned between the phases of lockdown. Two different weeks have been chosen to compare the mobility pattern of June 2020:

* Week of 14-20 February is used as reference week for the mobility patterns with normal activity prior to COVID-19 before the state of alarm.
* Week of 4 - 11 May is used as reference week for the mobility patterns during the state of alarm. Although this week is not during the most restrictive phase of the quarantine, it has been chosen as some of the mobility restrictions were lifted.

It must be noted that a 4-phase transition plan to the New Normal was established on April 28th. The details of this transition plan can be found in [[4]](#_Spanish_government._(2020,). To understand the results obtained, transition phase of the provinces decreed by the Government of Spain must be defined. Figure 1 shows the evolution of de-escalate phases in Spain provinces from May 11th to June 21st, when all the provinces reach the new normality phase. Table 1 shows the dates of the study weeks, relating them to the de-escalation phases indicated in Figure 1.

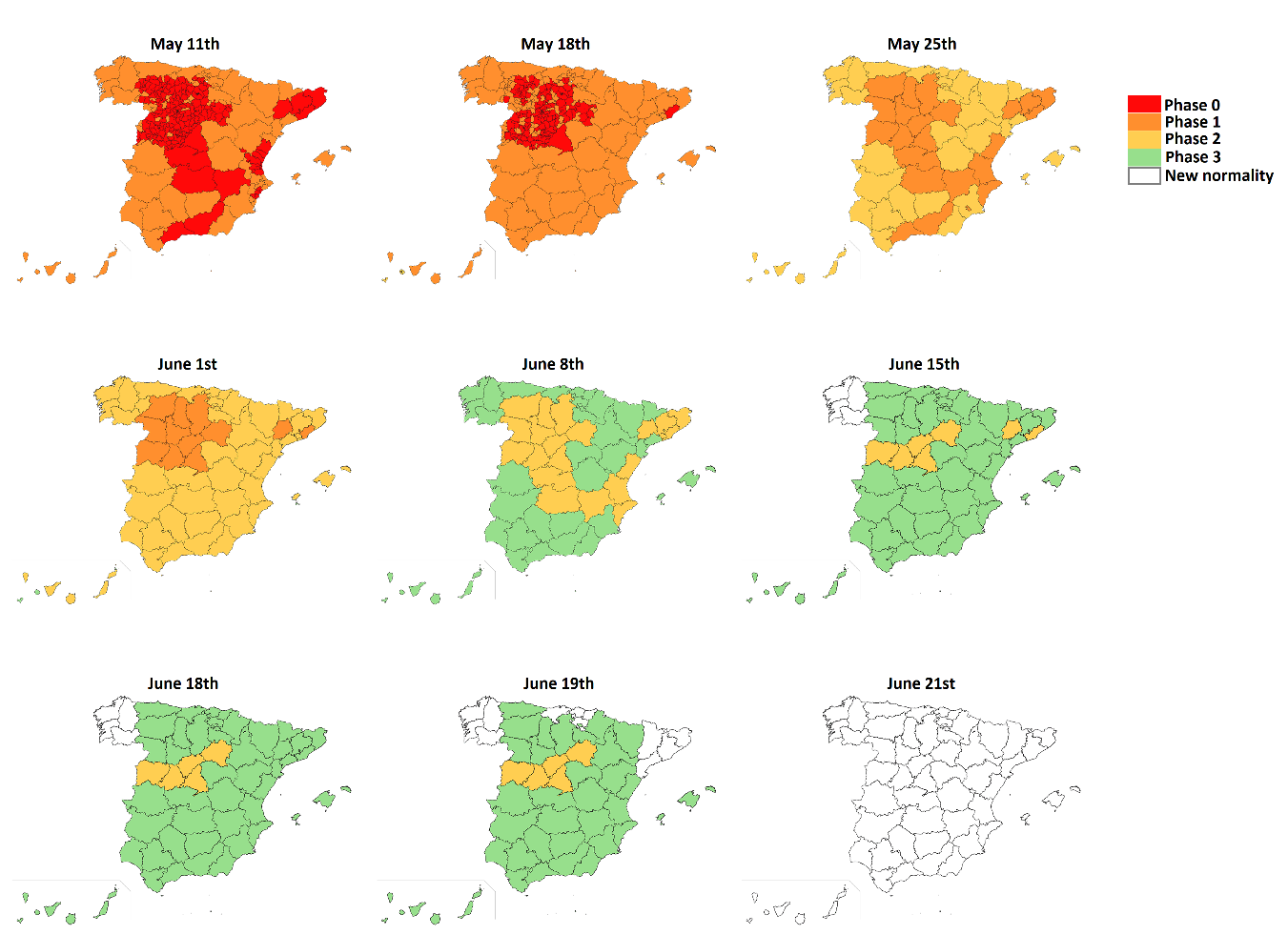


Figure 1. De-escalate phases in Spain, colored by provinces.

|  |  |  |
| --- | --- | --- |
| **Study weeks** | **Dates** | **Corresponding phase** |
| W0 | 14-20 February | Reference week for normal activity prior to COVID-19, before the state of alarm. |
| W1 | 4-11 May | Second reference week for normal activity during COVID-19, during the state of alarm. |
| W2 | 1-7 June | First week of June 2020, where most provinces are in phase 2 and general mobility is not allowed. |
| W3 | 8-14 June | Second week of June 2020, where most provinces enters phase 3 and general mobility is allowed. |
| W4 | 15-21 June | Third week of June 2020, where all provinces transition between phase 2 or 3 to new normality phase. |
| W5 | 22-28 June | Fourth week of June 2020, where all provinces are in new normality phase. |

Table 1. Study weeks, dates and correspondence with the de-escalation phases

## Data sources

The data sets on which this study is based are described below:

1. **Mobile phone records**. This data for the extraction of mobility indicators. It consists of a set of records of mobile phone antennas which, once anonymized, comply with current data protection regulations. This data set is provided by the Spanish ministry of transport, mobility and urban agenda [[5]](#_Spanish_Government._(n.d.).).
2. **Territorial boundaries**.
3. **Data on State of Alarm phases and measures**. They come from the Royal Decree of the Ministry of the Presidency of the Government of Spain published in the Official State Gazette [[4]](#_Spanish_government._(2020,_1).

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