

How Summertime Citizens Mobility Can Impact the Number of New COVID19 Positive Cases. The Italian Case Study

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Background: The unexpected COVID19 pandemic asks for understanding whether and how the citizens mobility can impact the COVID19 spread, in order to estimate the numbers of positive new cases and to predict potential new waves of SARS-CoV2 pandemic. In [1] and [2], the authors studied how data analytics can help local and central authorities to manage the COVID19 spread, and the authors identified the correlation between the geographical spread of SARS-CoV2 with goods and transportation routes in the Lombardy region.

Objectives: In this study, we try to correlate the variation (%) of new COVID19 positive cases with citizens mobility, near several Place Categories of each Italian region, in the summertime frame: July 3rd, 2020 – August 14th, 2020. A correlation (or a non-correlation) between the two variables can support authorities to actively monitor (or not) this kind of citizens mobility, in order to promptly react with policies that can mitigate the pandemic risk.

Methods: We used the Google Community Mobility Data [3] to collect the changes (against a common average baseline) of visitors near to the following Place Categories: (1) Retails-Freetime, (2) Public Transport Stations, (3) Parks, and (4) Workplaces. For a more precise definition of the adopted baseline and categories, please visit [3]. Figure 1 shows the summary of the Google mobility variation (%) for all the Italian regions and for the four Google Place categories. We compared this changes in mobility to the variation (%) of new positive COVID19 cases for each Italian region. This variation is the sum (in the timeframe July 3rd, 2020 – August 14th, 2020) of all the daily variations (%) computed as: $(new_daily_cases / total_detected_cases) * 100$. The regional daily cases are freely available at the official dataset reported by the Italian Civil Protection Department [4]. Figure 2 reports the aggregated variation in the number of new COVID19 positive cases.

We computed the Pearson's correlation coefficient for the two variables under analysis as:

$$correl_index(x, y) = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}}$$

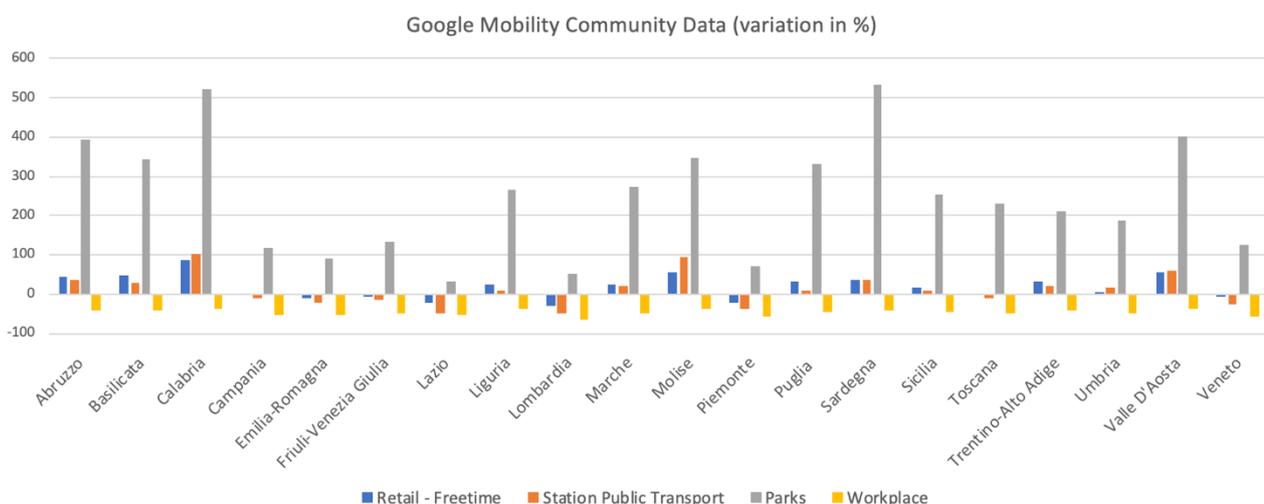


Figure1. Citizens Mobility variations for the Italian Regions

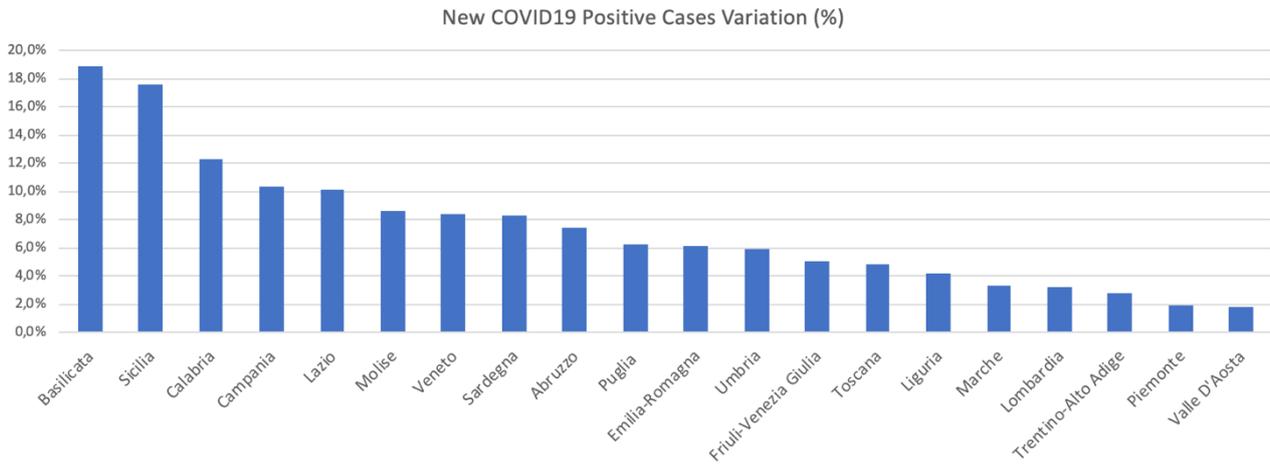


Figure2. New COVID19 Positive Cases (%) in the summertime frame: July 3rd, 2020 – August 14th, 2020

Results: Figure 3 shows, for the four Google place categories and for each Italian region, the set of datapoints *changes in mobility vs. new cases*. For example, in the scatter chart “Retail vs. % New Cases”, where we plot the 20 Italian regions, the highest (Y-axis) datapoint indicates the region “Basilicata” where we observe a change in *retail mobility* = +46% and a *new cases* increase = +18.9%. The leftmost (X-axis) datapoint indicates the region “Lombardy” where we observe a change in *retail mobility* = -31% and a *new cases* increase = +3.3%. As observable, we were not able to find statistical correlations between the two variables (i.e., changes in mobility vs. new cases) for none of the four place categories. Starting from these preliminary results, it seems that an increase (or decrease) in citizens mobility for the four analyzed place categories does not impact the increase (or decrease) of new COVID19 positive cases. The correlation indexes for the four place categories span from a minimum value of 0.215 (as for the category Public Transport) to a maximum value of 0.265 (as for the category Retail-Freetime).

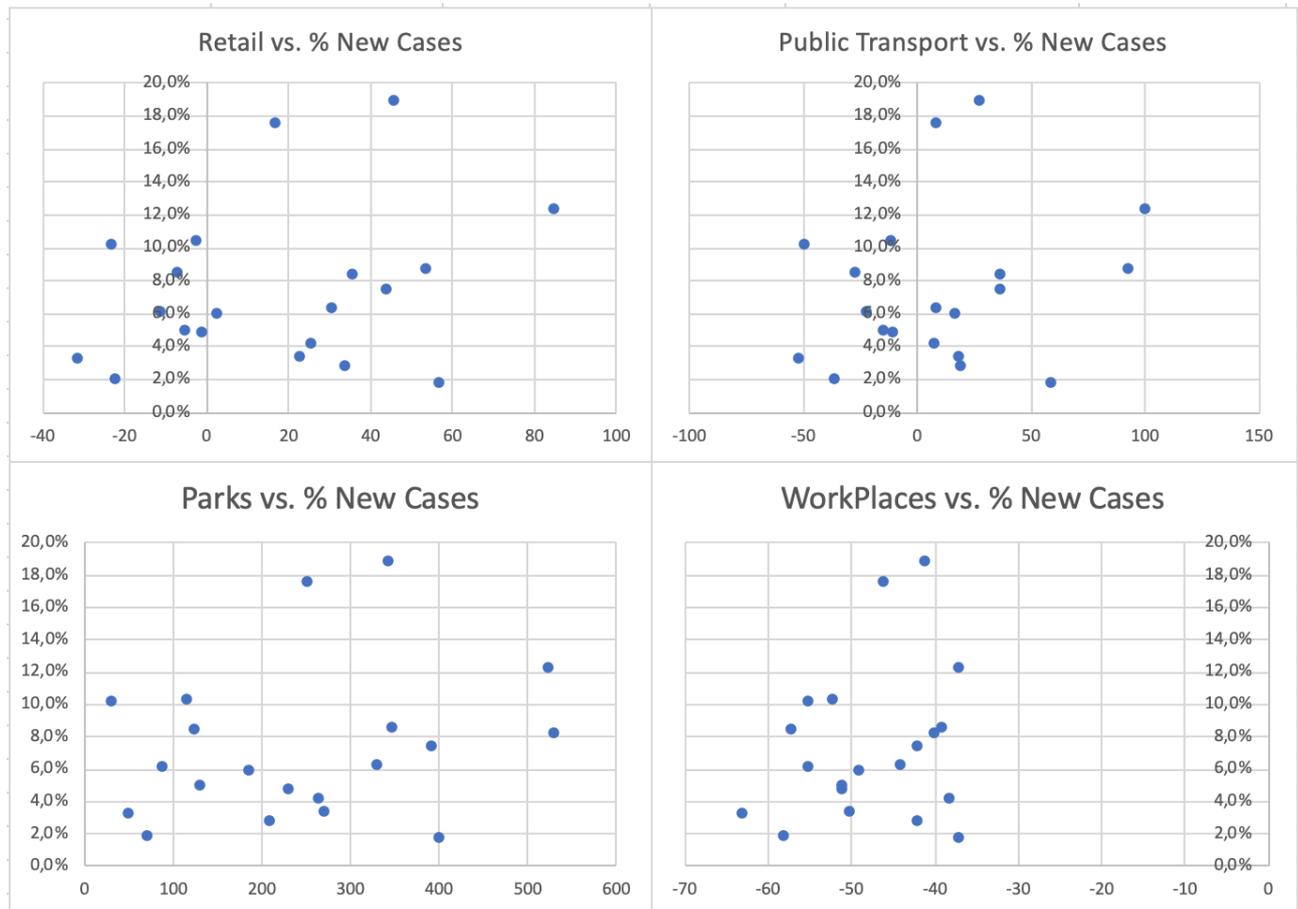


Figure3. Correlation Scatter Charts for the four Place Categories: Retail-freetime, Public Transport, Parks, Workplaces

Conclusion: The detected correlation indexes are very low, thus indicating that no correlations between summertime citizens mobilities and the new positive cases, at a regional level, are available. Authorities can focus on observing and monitoring other sources of mobility (such as goods and transport routes), instead of actively analyzing these four place categories, where no correlations have been detected. The authors will extend this work by studying additional timeframes.

References

- [1] D. Tosi, A. Campi. *How Data Analytics and Big Data can Help Scientists in Managing COVID-19 Diffusion: A Model to Predict the COVID-19 Diffusion in Italy and Lombardy Region*. Int. Journal of Medical Internet Research. In press. 2020.
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- [3] Google Community Mobility Data. Online available: www.google.com/covid19/mobility/
- [4] COVID19 Official Dataset Italian Civil Department. Online available: <https://github.com/pcm-dpc/COVID-19>