Evaluating the effect of interregional mobility on the spread of COVID-19 cases in Chile

Keywords: Mobility, COVID-19, epidemic control, telecom data, Chile

Extended Abstract

The pandemic caused by the SARS-CoV-2 virus has led all countries to implement measures to reduce international and domestic mobility in order to avoid an accelerated growth of COVID-19 cases. These restrictions have high social and economic costs [1], and Chilean authorities have implemented dynamic measures focused on specific geographical areas to address these concerns[2]. This research evaluates the effect of interregional mobility restrictions in Chile using a novel methodology that provides -almost- real-time insights for epidemic control.

The data for this research come from public and private sources, including eXtended Detail Records (XDR) from a major telecom company and official data on confirmed cases and deaths from COVID-19 in Chile. The XDR data is used to estimate interregional mobility with the digital traces of users [3], while the COVID-19 public data is used to estimate the prevalence and incidence for each region. These inputs are adjusted using a Bayesian framework from a prior study [4] that considers the underascertainment of reported cases.

The findings indicate the importance of considering a Case Fatality Ratio (CFR) for each region due to the heterogeneous demographics of Chile. Additionally, estimations of underascertainment of cases show that in most regions, reporting improved as the epidemic progressed, except for the Metropolitan Region where almost half of Chile's inhabitants reside.

To characterize interregional mobility in Chile and compare the effects of restrictions, three 10-day-long scenarios are studied: a base scenario representing business-as-usual mobility (BAU), an initial measures scenario when the first restrictions were implemented, and a total lockdown scenario. The study found that the measures taken to restrict interregional mobility had a substantial effect on the number of cases and risk rating for most of the regions with available data. Total lockdown restrictions had a major impact on reducing imported cases despite only a slight decrease in mobility compared to the scenario of initial interventions. These mobility changes among the three studied scenarios can be appreciated in Figure 1.

Santiago Region had the highest case rate and was the source of most cases for the majority of regions, nevertheless, it presented a low-risk rating as a consequence of interregional traveling. This highlights its main influence over the spread of COVID-19 for the rest of the country, even though it maintained a controlled proportion of imported cases. The risk rating, Rt estimates, imported cases and recommended mobility measures for First Interventions and Total Lockdown scenarios for each region can be appreciated in Figure 2.a and Figure 2.b.

The methodology developed for this research can be used as a tool to gain new insights into the spread of the virus in a regional context and build effective policy decisions with a delay of data and results below than a day.

References

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Figures

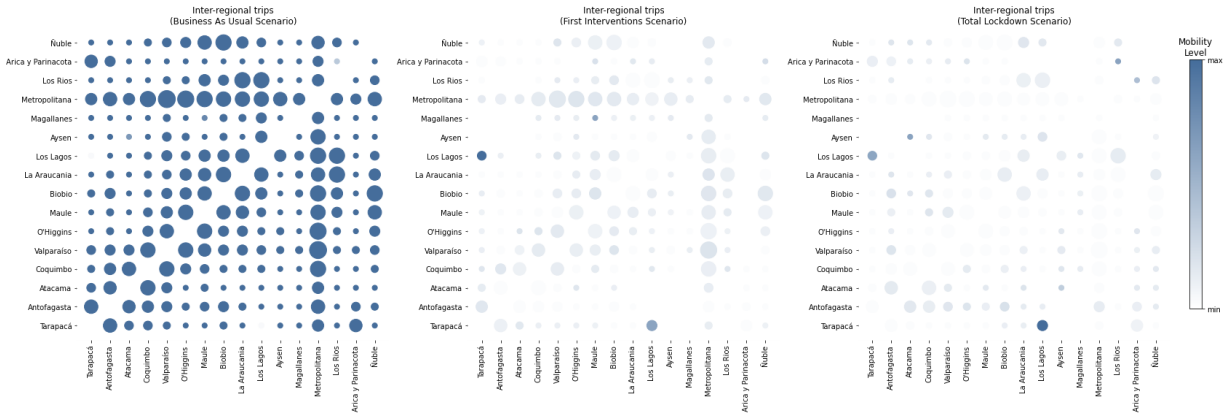

Figure 1: Origin-destination mobility matrix for the three scenarios

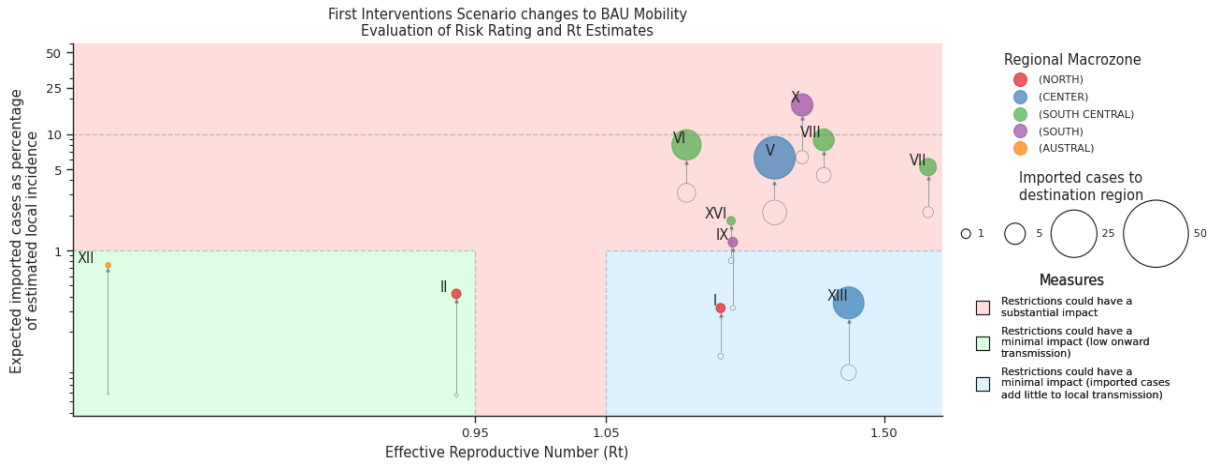

Figure 2.a: Risk Rating vs. Rt Estimates for First Interventions scenario

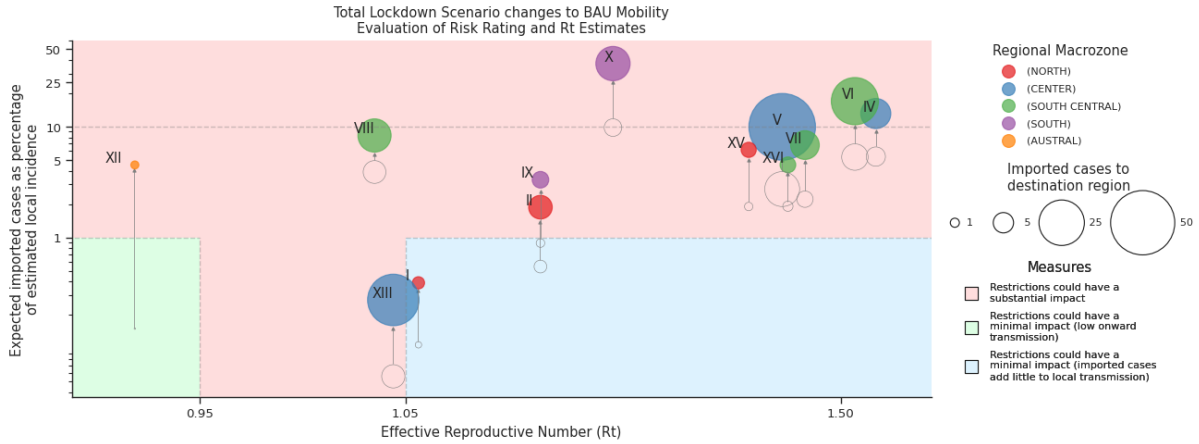

Figure 2.b: Risk Rating vs. Rt Estimates for Total Lockdown scenario