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Are Mobility and COVID-19 Related? A Dynamic Analysis for Portuguese Districts

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Abstract: In this research work, we propose to assess the dynamic correlation between different mobility indices, measured on a daily basis, and the new cases of COVID-19 in the different Portuguese districts. The analysis is based on global correlation measures, which capture linear and non-linear relationships in time series, in a robust and dynamic way, in a period without significant changes of non-pharmacological measures. The results show that mobility in retail and recreation, grocery and pharmacy, and public transport shows a higher correlation with new COVID-19 cases than mobility in parks, workplaces or residences. It should also be noted that this relationship is lower in districts with lower population density, which leads to the need for differentiated confinement policies in order to minimize the impacts of a terrible economic and social crisis.

1. Introduction

The numbers of COVID-19 cases, both infections and casualties, are increasing daily all over the world, and concerns about their effects show no decrease. Even with the start of vaccination programs, it has not been possible to break the advance of the numbers, primarily because the speed of vaccination is asymmetric in different countries, but also because, contrarily to some respiratory diseases in the past, the spread between countries was higher [1–3]. With various negative economic and financial effects (see References [4–10]), COVID-19 also has several other consequences in people's lives, such as fear and depression [11,12], suicide trends [13] or in mental health [14,15].

The substantial effects of COVID-19 are related to the lockdowns that countries had to impose to control the spread of the disease. According to Reference [16], human behavior, among other factors, could contribute to respiratory viral infections, even more in a context where the superspreading conditions are not fully known [17]. However, it is crucial to reduce the number of social contacts, as complete vaccination programs are absent or not yet fully developed, and social-distancing measures could be the key in helping to solve the problem [18].

The spread of COVID-19 could be related to several factors. For example, Reference [19] identified several of these factors in assessing community risk factors in Catalonia, Spain, such as air pollution, population density, demographic and socioeconomic conditions, or even land use. In addition to these factors, which could affect the incidence of the disease in a general way, the authors also identify other factors related to the possible individual prevalence of the disease, such as the existence of comorbidities.

The existence of social contacts could be proxied by mobility data [20], with frameworks such as Google's Community Mobility Reports (CMR) being able to measure that