AQR

UBIREA
Institut de Recerca en Economia Aplicada Regional i Pública

Universitat de Barcelona

Has the socioeconomic situation of the territory affected the spread of COVID-19?

Regional Quantitative Analysis Research Group (AQR–UB)

AQR COVID-19 / #3

Barcelona, April 19th 2020

BACKGROUND

During the month of March and the beginnings of April 2020, the epidemic of COVID-19 was transmitted exponentially to the population of Catalonia, with a slowdown in subsequent days possibly associated with the implementation of population confinement.

The increasing availability of data on the spread of the disease with territorial detail is making it possible to monitor the spatial distribution of the epidemic and link its incidence with various characteristics of the territories.

In the case of Catalonia, since the end of March, the Catalan Agency for Quality and Health Assessment (AQuAS) has been providing maps of the number of positive cases of COVID-19, and the corresponding rate per 10,000 inhabitants, both in the case of municipalities such as the Basic Health Areas (BHA). This has allowed analysing relationships between the geographical distribution of COVID-19 and some factors of interest, such as the income level of the population in the different territories. In this sense, the greater relative number of infections in the municipalities and BHA with a lower income level compared to those with a higher income has had repercussions not only in the Catalan and Spanish press but also in the international media[i].

The implications of the relationship between the spread of COVID-19 and, in general terms, the socioeconomic level of the population in the different territories is important enough to perform a detailed analysis. In fact, several studies have shown how the spatial variation in the spread and impact of other infectious diseases, such the intensity of the spread of COVID-19 and a synthetic index of the socioeconomic situation of each BHA provided by the Department of Health of the Government of Catalonia.

OBJECTIVE

This brief research note aims to synthesize the evidence obtained in the analysis of the relationship between the spread of COVID-19 in the Catalan population disaggregated at the BHA level and the socioeconomic level of their population, controlled by the effect that other factors may have, to a greater or lesser extent, on the spread of the epidemic in each territory.

The existing evidence referring to other pandemics suggests that the spread of the disease could vary between different groups of the population depending on social and economic characteristics. Given the spatial segregation of these groups, a different degree of incidence of COVID-19 must be expected according to the characteristics of the BHA. As an example, it can be assumed that the disease spreads more rapidly and intensely in those places that concentrate the least well-off population, in which a high share of population works in activities where interactions with other people are frequent and intense, and those that tend to use public transport regularly.

This note summarizes some of the results on the analysis of the geographical distribution of COVID-19 in Catalonia that is being carried out by researchers from the AQR Research Group of the UB (http://www.ub.edu/ aqr/). Special emphasis is placed on considering geographic and territorial aspects, facts of special interest in the research for the group.

The detailed results that have been used in this note are available to the interested reader.

Josep Lluís Carrión-i-Silvestre, Alicia García, Enrique López-Bazo, Rosina Moreno, Raul Ramos, Vicente Royuela and Jordi Suriñach have participated in the preparation of this note.

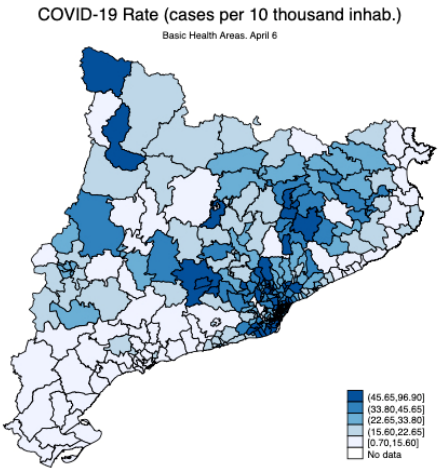
Likewise, it can be argued that self-prevention and protection measures would have been less common where, the evidence obtained from previous epidemics of similar characteristics and using the previous reasoning, we may argue the possibility that the spread of SARS-CoV-2 has been lower in places with a higher incidence of unemployment or, in more general terms, with less labor participation (given the lower level of interaction with other people).

COVID-19 SPREAD AND SOCIOECONOMIC SITUATION

A first step in studying the relationship between socioeconomic status and the spread of the disease is the comparison of the geographical distribution of these two variables. With respect to the first, Figure 1 shows the spatial distribution of the COVID-19 positive case rate (using PCR tests) for 10,000 inhabitants, based on the data collected by AQuAS. It can be appreciated that, as has been revealed in various media, the distribution of the disease is not uniform throughout the Catalan territory.

Regarding the socioeconomic situation, it must be said that in the case of BHA, there is not enough detailed information on the factors mentioned above (for example, per capita income or the unemployment rate). However, the database with statistical information for these territorial units, compiled and prepared by the Department of Health of the Government of Catalonia, does include a socioeconomic index for BHAs, built by combining several indicators. Specifically, this index combines information from three categories of pharmaceutical copay (percentages of exempt population, with incomes less than € 18,000 per year, and with incomes greater than € 100,000 per year), the percentage of the population occupied with manual occupations, population aged 16 years and over with insufficient educational level, the rate of premature mortality, and the rate of avoidable hospitalizationsiii. Higher values of the index indicate a higher level of deprivation, while the socioeconomic situation is better in BHA with low values of the index.

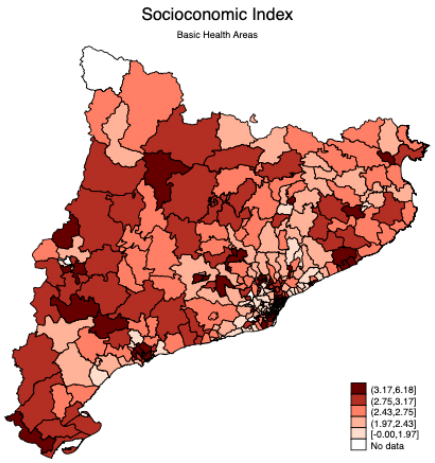
Figure 1.



Source: Own elaboration based on data from the Health Department of the Government of Catalonia and AQuAS

The distribution of the index value in BHA is shown in Figure 2, from which we cannot deduce any clear spatial pattern. In fact, the index values confirm the marked differences within the Barcelona metropolitan area, as well as the marked contrast between BHA close in the space. In any case, the comparison of the maps in Figures 1 and 2 does not allow us to derive any clear relationship between the incidence of the disease and the degree of socioeconomic deprivation. In this sense, the data reproduced in Table 1 suggest that the relationship between both magnitudes could be more complex than expected. The top 10 BHA with the lowest index values (least deprivation) are shown in the upper block, while the 10 with the highest values (higher deprivation) are reproduced in the lower block. Despite the fact that, in general, infection rates are higher in the 10 BHA with the highest deprivation level (with an average of 36 cases per 10,000 inhabitants) and lower in those that occupy the 10 privileged positions in the index (average of 27 cases per 10,000 inhabitants), interesting exceptions are observed. On the one hand, the two BHA of Sant Cugat del Vallès with a high socioeconomic index show a spread of SARS-CoV-2 clearly above the rest of the BHA group with less deprivation. On the other hand, Constantí, 6 km from Tarragona, and the BHA of Mataró, both with a very high degree of deprivation, have an incidence of the disease well below the rest of their group.

Figure 2.



Source: Own elaboration based on data from the Health Department of the Government of Catalonia and AQuAS

Table 1. COVID-19 case rate per 10,000 inhab. According to degree of deprivation

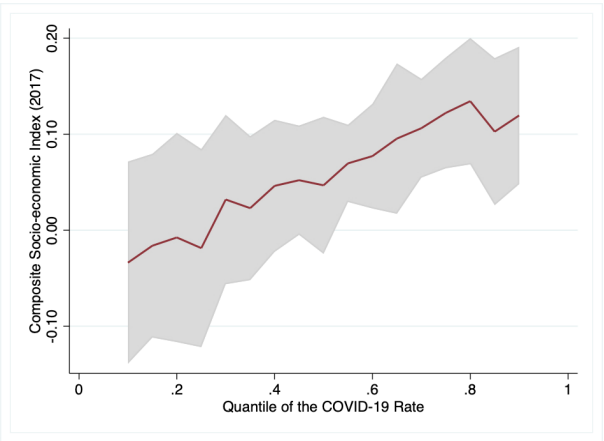
Basic Health Area	SocioEcon Index	COVID-19 Rate
Barcelona 5C - Sarrià	0	25,0
Barcelona 5D-Vallvidrera-Les Planes	0	26,5
Barcelona 5A - Marc Aureli	0,05	20,9
Sant Cugat del Vallès-2	0,09	36,4
Barcelona 5B - Sant Elies	0,18	21,0
Sant Cugat del Vallès-3	0,20	36,2
Barcelona4B - Les Corts-Pedralbes	0,24	24,5
Barcelona 5E - Sant Gervasi	0,42	22,6
Barcelona 4C - Les Corts-Helios	0,50	27,8
Sant Just Desvern	0,54	31,6
Badalona 7B - La Salut	4,46	38,0
Badalona 7A - Gran Sol	4,46	50,4
Badia del Vallès	4,49	35,9
Constantí	4,53	13,6
El Prat de Llobregat 3 - Dr, Pujol Capç.	4,64	51,9
Barcelona 8H - Ciutat Meridiana	4,75	42,9
Sant Adrià Del Besòs 2 - La Mina	4,89	26,0
Mataró 6 - Ronda Gatassa	5,10	18,6
Sabadell 7 - La Serra	5,29	45,6
Badalona 5 - Sant Roc	6,18	36,1

Note: Own elaboration based on data from the Health Department of the Government of Catalonia. The values are reproduced by the BHA with less and more degree of deprivation according to the socioeconomic index.

To clarify whether there is a relationship between the socioeconomic situation of BHA and the spread of the virus in their population, a multiple regression analysis has been performed where, in addition to the socioeconomic index, we control for by the potential influence of population density, the meteorological and pollution conditions, and a set of demographic, morbidity, and living conditions. The estimated effect is positive, confirming that the incidence of the disease increased with the level of deprivation: an additional point in the index would be associated with an increase of around 4% in the COVID-19 rate. However, the estimated effect is only statistically significant in some of the specifications (for example, when the density effect is ignored). In other words, it cannot be guaranteed that the socioeconomic situation has had a key effect on the spread of the coronavirus when taking into account the effect of other related factors.

In a complementary way, the effect of the socioeconomic situation throughout the distribution of the infection rate has been explored, by means of quantile regressions. The objective in this case is to check whether the effect of socioeconomic conditions varies depending on the intensity of the disease, conditioned by the other factors. The estimate of the effect of the deprivation index to deciles of the conditional distribution of the disease rate in BHA is reproduced in Figure 3. An increasing trend in the impact of deprivation is observed. In fact, the effect is not statistically significant for low-medium incidence rates. But for higher rates, the results suggest that the level of socioeconomic deprivation could have had a positive and statistically significant impact. This result is consistent with very high levels of disease spread in, for example, BHA within the Barcelona metropolitan area that traditionally have populations with a high degree of socioeconomic deprivation.

Figure 3.



Note: Own elaboration based on data from the Health Department of the Government of Catalonia. Estimation of the effect of the socioeconomic index in the deciles of the conditional distribution of the COVID-19 case rate per 10,000 inhabitants.

CONCLUSION

Although the evidence obtained so far cannot be given as conclusive, the results point to a complex relationship between the spread of COVID-19 and the socioeconomic situation of the territories. Although it cannot be said that the effect of a greater or lesser degree of deprivation has significantly affected the incidence of the disease in a mean or representative BHA, it could have had an effect in those BHA with high incidence rates, when the effect of other conditioning factors is considered. If confirmed, this circumstance would imply an additional penalty that the territories with the most socioeconomic deprivation would be suffering. Likewise, it is a factor to take into account when preparing preventive and palliative measures in the event of outbreaks of the disease that could occur in the coming months.

In conclusion, we think that the importance of the issue considered in this research note requires further analysis. For example, using data from the Catalan municipalities it would be possible to explore the relationship between disposable income per capita, and other variables of interest such as unemployment, in the spread and incidence of the epidemic. The results will be the subject of another communication in the coming days.

Regional Quantitative Analysis Research Group (AQR)

University of Barcelona

Faculty of Economics and Business

Departament of Econometrics, Statistics and Applied Economics

Av. Diagonal 690, 08034 Barcelona

Contact: aqr@ub.edu

www.ub.edu/aqr

[i] As an example, see https://www.reuters.com/article/health-coronavirus-innercity/feature-poor-city-dwellers-run-greatest-coronavirus-risk-idUSL8N2BV2HD

[ii] See, for example, Grantz K.H.et al (2016) Disparities in influenza mortality and transmission related to sociodemographic factors within Chicago in the pandemic of 1918. Proc. Natl. Acad. Sci., 113(48), 13839-13844 i Suhrcke et al (2011) The impact of econonomic crises on communicable disease transmission and control: A systematic review of the evidence. PLoS ONE 6(6) e20724.

[iii] For more detail see Ruiz-Muñoz et al (2018) Indicadors bàsics de salut per ABS. Guia per realitzar l'informe de salut per ABS. Barcelona: Departament de Salut de la Generalitat de Catalunya.