Why do we need to stay home? A scientific analysis

The context of the pandemic

We are concerned that there is still a lot of misinformation regarding the pandemic we are facing. Government measures in Colombia are insufficient in light of the studies of researchers worldwide, and they seem to ignore the sensitivity of the matter in terms of public health.

We find it especially worrying that the statistics shared with the community only include the number of diagnosed individuals. In the country we are forgetting that there is a very high underreporting of this number. It is estimated that in China about 86% of those infected were not documented, including those with very mild symptoms – easily confused with a common cold – or even those who were asymptomatic, which is in itself even more serious, since studies have shown that individuals who show no symptoms can effectively spread the virus (see the article in Science [Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2)](#)).

From this study's conclusions, it is clear that the spread of the virus was facilitated and is facilitated by the large number of undocumented cases, that is, people infected with the virus who can't be identified by the health system and who propagate it without realizing it. In this sense, the WHO's call to all countries to increase the number of tests and to identify as many carriers as possible can be understood ([Alocución de apertura del Director General de la OMS en la rueda de prensa sobre la COVID-19 celebrada el 18 de marzo de 2020](#))

China's case shows that quarantine is highly effective when the situation begins to spiral out of control. Another example is South Korea and all the measures applied by its government – among which is to carry out mass diagnostic tests on its citizens, whether or not they have symptoms – which helped to an early diagnosis and even to detect those without, taking preventive isolation measures and thus containing the spread. It is worth mentioning that in the case of South Korea, the population took the government's recommendations on self-isolation measures seriously, which ultimately helped to avoid the need to order a quarantine for the entire country.

In contrast to these two countries, we find the cases of Italy and Spain, which did not take measures to contain the virus on time and are now in serious difficulties. Italy is changing statistics by reporting 475 deaths in 24 hours, surpassing what happened during the outbreak in China. Additionally, the rates of mutation and adaptation of the virus must be taken into account, as evidenced by its evolutionary dynamics (https://nextstrain.org/ncov). There are now studies that report the existence of two strains of the virus:

- The initial strain of China, which is the mildest and to which the contagion cases of that country during December belong
- The modified February strain, which has spread throughout Milan, and has been listed as more aggressive than the previous one

According to epidemiological data from China, to date a mortality rate of less than 1.0% is reported for an age range between 0 and 59 years of age, but this mortality grows rapidly, with 3.6%, 8%, and 14.8% for age ranges of 60 to 69, 70 and 79, and over 80 years, respectively ([Our World in Data - COVID-19](#)).

The Colombian Scenario

The first case of coronavirus (COVID-19) reported in China was on November 17, 2019. A worrying event for Colombians, which is linked to the virus's dispersal dynamics, is the Colombiatex fair. The event was carried out from January 21 to 23, 2020; 22 countries participated, including China (with 4 companies), Italy (with 22 companies), Spain (with 16 companies), the United States (with 16 companies), and Colombia (with over 300 companies), among others (https://colombiatex.inexmoda.org.co/es/listado-de-expositores/). Additionally, several Colombian fashion entrepreneurs participated in *Fashion Week Madrid 2020*, which took place from January 28 to February 02, and in *Milan Fashion Week*, which took place from February 18 to 24, 2020. Although participating in these events is very important for our entrepreneurs and the industry surrounding fashion, it puts us in a very vulnerable epidemiological scenario.

What does the above mean? The viral strain that originated in China is very likely to have reached Colombian soil in January, and to have been dispersed among the participants of Colombiatex and/or in airports, airplanes, tourist sites, etc., and later, Colombian businessmen who went to Madrid and Milan, upon returning to the country in February, without any precautions or quarantine, came back with the improved viral strain. It is not surprising that our epidemiological peak is much higher. Particularly in Medellín, the hotel occupancy rate was quite high in the months of January and February ([SITUR: Sistema de Indicadores Turísticos de Medellín](#)).

If we add to the above the fact of finding substantial press information (see for example: [El Heraldo: "Los turistas italianos que están en Cartagena no tienen síntomas de coronavirus](#); [El Tiempo: Joven con coronavirus violó cuarentena en Bogotá y voló a Cartagena](#)) that states that migratory controls for people coming from Europe were not rigorously carried out, limited to the verification of the physiological symptoms of the disease and not to the detection of the virus, coupled with citizen indiscipline of not respecting the measures of preventive isolation, we set up a risk scenario.

Our country, as of today March 20, has 128 confirmed cases of COVID-19 (see [Coronavirus (COVID - 2019) en Colombia](#)), of which 82 are imported from other countries – that is, they were contracted outside of the country and upon arrival in Colombia, and already installed in their homes, they began to present symptoms. The remaining 44 cases correspond to associated cases – that is, they were infected by contact with these imported cases – and

we have 2 cases in which the transmission chain is being studied. It is also important to note that Colombia has only carried out some 4,000 tests to date.

In a study carried out by professors Tatiana González Pérez and Luis Perdomo Hurtado, from the Autonomous University of Manizales (UAM), it was determined that Colombia is one of the countries with the largest number of confirmed cases in the shortest time (see [Colombia, país con mayor número de casos covid-19 en menor tiempo](#)). The following important conclusions of their work are highlighted:

- Although in Latin America cases do not exceed 300 people in any country, the outbreak of cases has been faster compared to the other countries that have been analyzed
- The rhythm in each country is different. In Spain and Italy, the disease had increased gradually until the 20th day of its appearance, but after this there was a sudden increase in the outbreak
- Colombia is the country that has had the greatest number of cases in the shortest time. In other words, on the 11th day of the outbreak in Colombia (as of March 17) we had 57 confirmed cases; on the 11th day in other countries such as Italy there were 3 cases, 8 cases in the United States, 20 cases in Brazil, and 17 confirmed cases in Ecuador. (Source data from "Johns Hopkins Coronavirus Resource Center" and from the "Instituto Nacional de Salud de Colombia INS").
- Although the outlook is turning difficult, in Colombia we have the possibility of implementing measures in time. The experience that China leaves us is that the key to contain an outbreak is to reduce the rate at which cases grow, and that is only achieved with social isolation, for example, a quarantine
- This information should be used as scientific evidence to take decisive action and to call upon municipal and departmental authorities to increase the mitigation measures

According to the known records from China, it is estimated that only 14% of the infected population displays symptoms. We can then expect that there are a total of 914 cases in Colombia, since 14% of 914 is 128 (reported symptomatic cases). Therefore, we would have close to 786 undiagnosed cases that, although they do not present symptoms, they can transmit the virus. We are in a delicate situation that we can and should anticipate.

So far, in Colombia reporting and diagnostic channels have been enabled for those who show symptoms to be tested. However, this means that the asymptomatic infected person will never call, precisely because they do now present symptoms, and will instead continue transmitting the virus without knowing it. We must understand that, until we take measures like those adopted by South Korea for **mass diagnosis**, undiagnosed cases will continue to spread the virus. It is necessary to establish more drastic diagnostic and control measures for those entering the country and for those moving within it, so that, for their well-being and that of everyone, we can control the outbreak of COVD-19 in our country. In fact, the National Government has called to order regarding the measures to be taken and to centralize decisions; however, local news broadcasts report that there is an atmosphere of concern because local rulers are trying to contain something invisible and unknown, since

without **mass diagnostic** measures (see for example the [carta del rector de la UdeA al INS](#)) and subsequent **preventive isolation**, we will continue without knowing how the virus is really spreading, with the risk of ending up with a scenario like the one being experienced in Europe (see [Washington Post: Why outbreaks like coronavirus spread exponentially, and how to "flatten the curve"](#)). In fact, in that continent they are already adopting preventive measures to diagnose those who are asymptomatic (see [World Economic Forum: Could this be the way to eliminate COVID-19 faster?](#)).

An epidemiological model

Using the SEIRV epidemiological model, based on the article proposal: [A mathematical model for the novel coronavirus epidemic in Wuhan, China](#), the call for self-care, preventive isolation, and mass diagnosis can be dramatically illustrated. In the following three figures we show the parameters fitted to the exponential growth curve (figure 1) and two scenarios of the epidemiological model. Figure 2 shows the behavior of the epidemic assuming that social containment measures are adopted from the first day. Figure 3 shows a scenario where no action is taken, and the epidemic is allowed to continue at its natural rate.
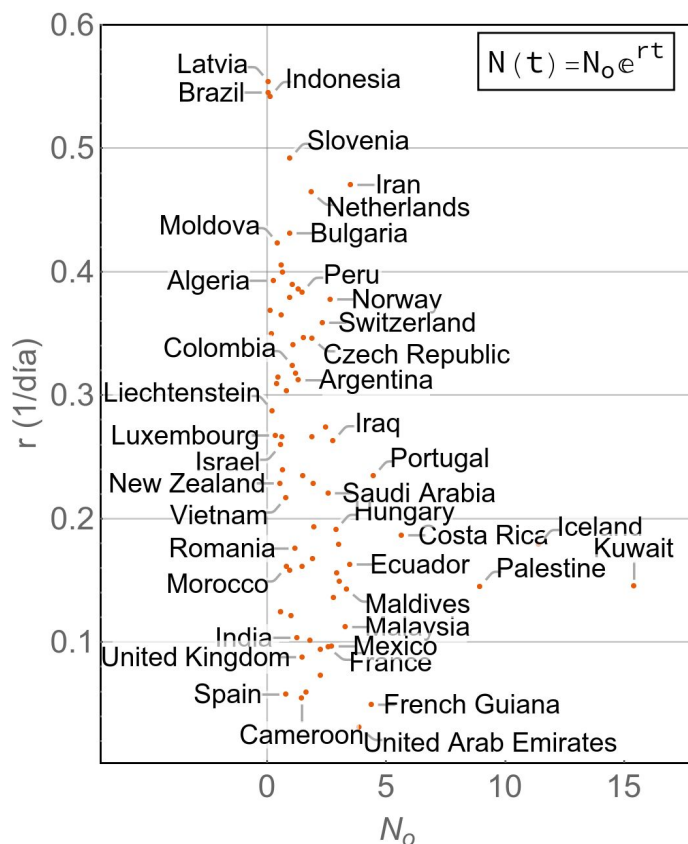

Figure 1. Parameters of exponential growth in the first 10 days of registration of the population of diagnosed patients for each country. The parameter r is called the exponential growth rate. N_0 is the initial number of individuals predicted by the exponential growth model. The exponential growth of the first days of the epidemic is shown in the following figure.
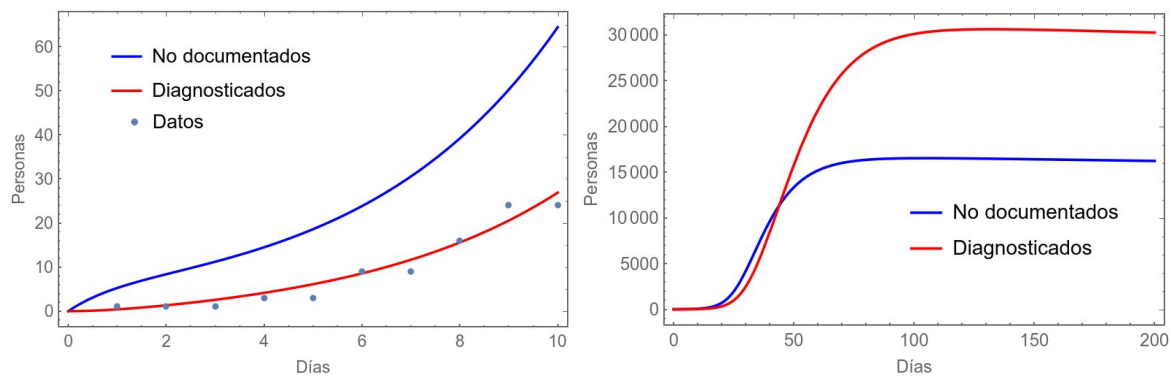
Figure 2. Results of the SEIRV simulation for the Colombian case in a propagation control scenario using isolation and quarantine measures. In the graph on the left we see the behavior of the epidemic of the number of diagnosed and undocumented cases in the first 10 days. The data reported by the National Institute of Health are shown as points. It is possible to see the exponential growth behavior in the first days. To the right, we see the dynamics of the epidemic after 200 days. The maximum is reached at 100 days, with approximately 30,000 sick people.
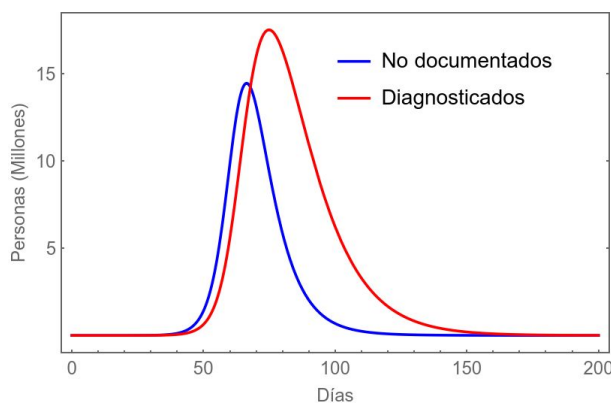
Figure 3. SEIRV simulation for the Colombian case in a scenario where no control measures are taken against the spread of the epidemic. In this scenario, we would have 17.4 million sick people at 74 days.

Final thoughts

With this document we want to invite all Colombians to adopt **preventive self-isolation** measures. The information that we have collected and the models that we have designed are intended to provide meaningful information in the construction of an informed opinion that allows every one of us, as inhabitants of this planet, to make the decisions available to us to face this pandemic in a conscious and solidary way. Today we have the opportunity to acknowledge the fragility of the human species and to value life to the extent it deserves. The most generous act we can do today is to care for each other, understanding the

enormous power that small efforts have when they are added, in the same way that South Korean citizens did.

References

Repository with the simulations performed and reference information

- https://github.com/Camilo-HG/COVID-19

Agent-based modelling to understand contagion

- Washington Post: Why outbreaks like coronavirus spread exponentially, and how to "flatten the curve"

Information in Colombia

- Coronavirus (COVID - 2019) en Colombia
- Colombia, país con mayor número de casos covid-19 en menor tiempo

Scientific documents

- Informe Técnico Coronavirus - Ministerio de Sanidad Español - Fecha 17/Marzo/2020
- A mathematical model for the novel coronavirus epidemic in Wuhan, China,

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Conflict of interests

The contributors to this document declare that they have no conflicts of interest.