Mitigation measure of COVID-19 in the state of Sao Paulo

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Abstract. Brazil is a heterogeneous country both in terms of infrastructure and political opinions. As the federal government resisted applying mitigation measures to curb the COVID-19 spreading, it was up to the states to apply the measures. The state of Sao Paulo was bold enough to apply a quarantine in the early stages of the spreading. However, the government applied a homogeneous quarantine throughout the state. While this strategy is effective to slow the spreading it leads to longer quarantines and thus builds social tensions. As models and experts predict that the COVID-19 will the around for months, the universities face a golden opportunity to help decision-makers and have an impact on society.

Keywords. COVID-19; lockdown; control.

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1. Introduction

I am writing this short note from Brazil. I live in a university town in the countryside of the state of Sao Paulo, a near three hour drive to the city of Sao Paulo, the capital of the State. And yes, both the state and its capital have the same name. I have researched epidemic spreading for a while and thus have followed closely the COVID-19 spreading in the state of Sao Paulo.

Here is some useful information on the events and impact of the mitigation measures we have been through. Sao Paulo is the richest state of the Brazilian federation concentrating roughly one-third of the Brazilian GDP. Its capital, the city of Sao Paulo, has nearly 12 million inhabitants, and the greater Sao Paulo area about 20 million and concentrates about half of the state population. The infrastructure in Sao Paulo is far from uniform. A walk from the rich Paulista Avenue, at the heart of the city of Sao Paulo, will take you to a favela. In the same way, a quick drive from the city of Sao Paulo will take you from a rich to a poor city.

Carnival is a set of big festivities across Brazil. Here, things start to get interesting. It is worth noticing that Carnival took place nearly two months after the Chinese lockdown and happened in the same week that the Italian lockdown started. In 2020, Sao Paulo celebrated its largest Carnival with 15 million people traveling and joining street fairs [1].

2. Quick reactions and fast decisions

Brazil had its first official COVID-19 confirmed case on February 26th, the day Carnival finished. By March 20th, Sao Paulo had 110 cases, while the city of Sao Paulo concentrated nearly all cases [2]. Corona epidemics calls for fast decision making and quick implementations. Such decisions are bound to be incorrect as one overlooks important aspects due to the lack of time. On March 21 the Sao Paulo government declared a statewide quarantine. All shops and non-essential services were to close. Yes, the government applied the quarantine homogeneous across the whole state. Yes, this was against the recommendation of the federal government that resisted mitigation measures.

This move had an impact on the progression of the COVID-19. In early March the number of cases was doubling every 2.3 days and after the quarantine, this number went to about eight days. From June 30th to July 13th an estimate shows that only in the state of Sao Paulo three lives will be saved every 4 min [3] this had an impact protecting the state health care system.

3. Missed opportunities

Having our first confirmed case just after Carnival sounds too good to be true. Indeed, data suggest strong subnotification of cases in Brazil roughly 12 to 1 [4].
I cannot help but wonder for how long we had COVID-19 in the country. And it is an excellent exercise that estimates the impact of Carnival on the spreading of COVID-19.

Research shows that massive testing and isolation of infected individuals would help curbing the spreading in the early stage [5–8]. This was out of question in Sao Paulo as Brazil did not have enough test kits. This is a surprise per se, as we had three months between the Chinese lockdown and the Sao Paulo lockdown. We have missed this window of opportunity. Models suggest that a strong and short quarantine does not curb the spreading. It postpones the peak. The state of Sao Paulo did use this time to expand the number of critical care beds. But testing did not grow as it should.

4. Homogenous measures in a complex system

Two points are striking in the mitigation protocol: first, it was implemented against the federal government recommendation. Data show that the Sao Paulo government made a good decision [3]. Second, it was homogeneously applied to the whole state. In physics and mathematics, we have learnt that homogeneous measures are not digested well by heterogeneous systems. Here, mathematics can elucidate a bit of the scenario.

The way to go is to write equations that describe the spreading among cities taking into account daily travels between cities. We can then use mobility data to estimate flow between cities as well as the strength of infection and integrate this into a model [9]. Then, we adjust the equations to the data. This procedure describes the data well for about three weeks. Then mistakes may render the prediction irrelevant. This is fine as we can collect new data and update the predictions. These models can help predicting how long it would take for the number of cases in the countrysides to spike.

Estimates show that it would take around 50 days for the disease starting from the city of Sao Paulo to hit the countryside. That will be the number of days necessary for the countrysides to start having problems with the health system. This is a bit longer than the three weeks of the model horizon but it gives the idea of the order. Notice that 50 days is about half of the time that people are locked home. It is still a mystery why the government chose strict homogeneous measure.

5. Problem is around the corner

The number of cases in the Sao Paulo countryside is growing significantly now. People have been on lockdown for 110 days and are slowly getting anxious while many shops have permanently closed. There is a pressure to reopen the cities. This is a delicate issue as models suggest that a poorly planned reopening can render useless all efforts put in over three months to control the spreading. It is clear that we need good models integrated with data and allied with intelligent lockdown systems that predict when and to what extent a particular city should enter a mitigation protocol [9].

One thing that is not clear to me is why the research councils and societies and government constructed a small Manhattan project to tackle the spreading. Working on the topic, it has become a daily routine to see colleagues solving the same problem multiple times while other important issues are swept under the rug.

6. Conclusions

In the academy, analysing a problem from multiple angles and knowing the culture of the problem is a signal of a great scholar. Quick fixes are, therefore, not welcomed. The COVID-19 pandemic is likely to cause some ripples in this culture. I do not mean the proliferation of papers on epidemics spreading. I am thinking more towards the real impact that scholars can have on governments by the ability to provide fast solutions. While the reality is very heterogeneous, such as infrastructure, political opinions and economy, we also face a great opportunity to help the society by informing decision makers and politicians about possible solutions. And we give back to society the added value of our research.

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