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Research Article

Limited Temporary Effect of Several Social Relaxation Events on the COVID-19 Series: An Analysis Based on Primary Data

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Abstract

The relaxation of restrictive measures imposed by the COVID-19 pandemic allowed a gradual resumption of human activities, although the influence of each measure on the COVID-19 series is not consensual. We analyzed the effects of sequential reopening events during COVID-19 pandemic based in 76,419 SARS-CoV-2 RT-PCR tests performed from April 2020 to January 2021 in Rio de Janeiro metropolitan area, Brazil. A statistically significant increase in cases after 3-4 weeks of reopening measures, followed by a drop for a similar period, indicated that such events resulted in temporary and non-cumulative effects. A second peak in November was preceded by measures of social relaxation of a high level of agglomeration in confined spaces, including an election campaign. Post-opening events provoked different impacts on cases, but showing limited temporary effect. It is possible that other factors, including the exhaustion of social distancing and the appearance of new SARS-CoV-2 strains may have also influenced this second wave.

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Keywords

SARS-CoV-2; COVID-19; Social Distancing; Diagnosis

Abbreviations

COVID-19: Coronavirus Disease 2019; SARS-COV-2: Severe Acute Respiratory Syndrome Coronavirus-2

Introduction

Several authors have assessed the impact of social relaxation events in the COVID-19 pandemic. In general, the proposed analyzes are based on projections by epidemiological models, shorter follow-up periods or using data from government databases [1-3]. Such information is crucial, providing projections on the pandemic in different scenarios. However, model projections can be conflicting or do not correspond to the observed reality [4,5]. Also, most of the COVID-19 studies based their models on different assumptions about the virus [6]. On the other hand, primary data can provide a closer approximation to reality, although they are time consuming and carried out a posteriori [7].

Some studies suggest that social relaxation events involving mixing of different groups (e.g., bars, pubs, restaurants) and also large gatherings (e.g., concerts, shows, protests) increase the risk of SARS-CoV-2 transmission [2,8]. On the other hand, small cohesive gatherings involving less than 10 persons are considered less harmful [1]. It is clear that such assertions have grey zones, depending on the model adopted.

Rio de Janeiro is the second most populated metropolitan area in Brazil, characterized by its high population density, huge variation in income and access to health services. In mid-March 2020, the state adopted contingency measures that intensified as the pandemic unfolded, gradually reopening circulation from May 5 (epidemiological week, EW, 20) onward. This study allowed us to identify which events did or did not impact the series of SARS-CoV-2 and their temporality.

Methods

We assess trends in cases of SARS-CoV-2 considering the opening events implemented over ten months of COVID-19 pandemic [April/2020 (EW17) to January/2021 (EW4)]. To this end, we rely on the temporal analysis of 76,419 RT-PCR tests for SARS-CoV-2 (Allplex™2019-nCoV Assay-Seegene Inc., Seoul, Korea) applied in residents and workers of the metropolitan

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area of Rio de Janeiro. Until the closing of this article, schools were not yet fully functioning and vaccination campaigns were yet to begin. Mandatory use of masks remained unchanged for the entire period studied.

Statistical analyzes included Rt data over 41 EW, considering the number of positive, negative and total cases in the database. Official data for the metropolitan area were plotted considering deaths by COVID-19. The Chi-square test for trend was used to verify fluctuations in frequencies over a set of weeks. Clusters were performed every three weeks, considering the delay between the onset of the first symptoms and confirmed cases. The SPSS statistical software (version 25.0, SPSS Inc., Chicago, IL, USA) was used for all the calculations. The study was approved by the University Hospital Ethical Committee of the Fluminense Federal University (register 30926020.2.0000.5243).

Results

It was possible to observe an increase with a significant trend of cases (EW20-22) ($p < 0.05$) and (EW 29-31, EW 41-43, EW 44-46) ($p < 0.01$) and a decrease (EW 38-40, EW 50-52, EW 53-4/2021), indicating that social relaxation measures resulted in temporary and non-cumulative effects (Table 1). The temporal sequence points to a peak of SARS-CoV-2 detection after 3 to 4 weeks of social relaxation, followed by a drop for a similar period. Official deaths peaked in May, the beginning of the pandemic, and in the second wave in December. Between these periods, deaths remained relatively stable, despite several reopening measures (Fig. 1).

Lifting social restrictions that included the first opening after quarantine (EW20); gyms, beauty salons, barber shops and hotel services (EW30); large outdoor events (EW41); social events in closed spaces such as parties, birthdays, weddings, shows and concerts (EW45), coexisting with a national election campaign (EW40 to EW48), were associated with an upward trend in the set of weeks following these events. Interestingly, the opening of bars, pubs and restaurants, intercity transportation and religious activities with limited capacity (EW23), as well as social events respecting the limit of 1/3 of the total capacity and movie theatres with 2 meter distancing (EW34), were not associated with a significant increase in SARS-CoV-2 detection (Table 1).

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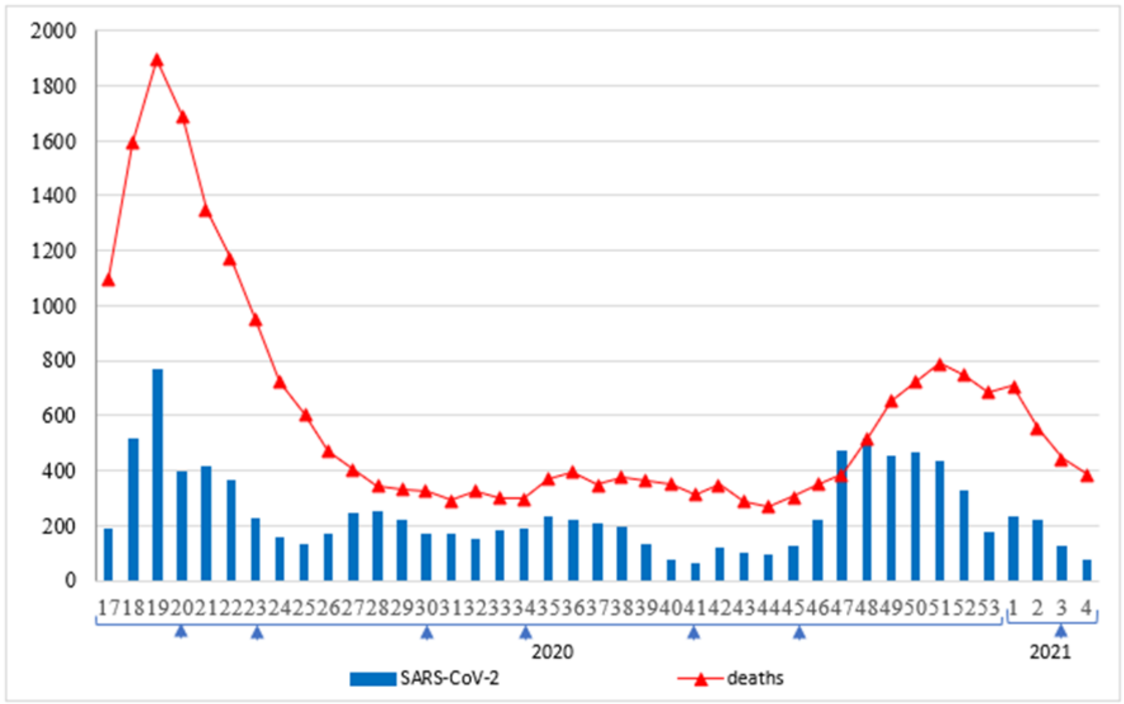

Figure 1: Temporal trend of cases and official deaths by COVID-19 in the metropolitan region of Rio de Janeiro (arrows correspond to the opening dates).

Epidemiological Week[1]	A[2]	Chi Square	P-value[3]
20, 21, 22	88,31	12,47	0,0004
23, 24, 25	-14,7	0,68	0,41
26, 27, 28	-26,39	36,2	0,17
29, 30, 31	124,2	36,9	<0,0001
32, 33, 34	16,35	0,89	0,34
35, 36, 37	-26,96	27,81	0,16
38, 39, 40	-88,95	27,81	<0,0001
41, 42, 43	51,27	15,13	<0,0001
44, 45, 46	116,32	48,87	<0,0001
47, 48, 49	-30,46	1,21	0,87
50, 51, 52	-144,63	31,03	<0,0001
53,1, 2, 3, 4	-255,09	53,00	<0,0001

[1]The epidemiological weeks in bold correspond to the opening dates; [2]A>0: increasing trend; A<0: decreasing trend; [3]significant values are in bold.

Table 1: Trend analysis of SARS-CoV-2 detection per epidemiological week in the metropolitan area of Rio de Janeiro-Brazil.

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Discussion

Unlike some authors, our data showed that most social relaxing events had a limited effect on SARS-CoV-2 cases [1-3,9]. However, our study is in line with a large ecological study that reported a drop in cases of COVID-19 even after two months of opening bars, restaurants and pubs [6]. It is possible that the population continued to adhere to the protection measures against infection, in addition to restrictions imposed on opening hours, number of regulars and distancing between groups.

We also corroborate the results obtained by a modeling study that pointed to a delay of 2 to 3 weeks in the increase of cases after reopening, which was confirmed by the trend analysis [1]. Even if the effect in the series of SARS-CoV-2 is temporary, being aware of the 6 to 8-week interval between the lifting of social distancing for a detectable increase in deaths is crucial for adjustments to the available health network [2,8].

After November (EW 45), however, we observed a significant increase in cases and deaths (a "second wave"), also seen across the country. Although we cannot pinpoint the specific cause, the release of festive and social events of high agglomeration in closed places such as cinema and theater rooms, parties, birthdays, concerts, etc., in concomitance with the national electoral campaign, may have been crucial. In addition, the increased flexibility of the quarantine in several states and municipalities in Brazil, favored physical isolation rates returned to pre-pandemic levels [10].

Not least, the emergence of SARS-CoV-2 variants were detected in the state at the time, although its transmissibility has not been proven to be major [11]. Even in this most dramatic scenario, after about 3 weeks, cases started to fall as previously, even without the imposition of a lockdown. The reasons for this temporal pattern are not entirely clear but are probably due to characteristics of the transmission dynamics of the virus, network of social contacts, environment, immunity, and others [12,13].

Our study has limitations. Variations in testing availability, groups and geographical areas, also cause artificial variations in frequency of viral detection. The opening of schools was not evaluated because it remained closed during the study. Also, municipalities had some flexibility in decision-making, which can interfere with the accuracy of the data.

The resumption of activities during the COVID-19 pandemic must be judicious, and take into account the possible impacts on the increase in cases and deaths, as well as the economic and social need of the population, especially in more vulnerable areas [14]. This study based in primary data reinforce model studies that indicate that reopening events have different effects on the COVID-19 series, although the type of event is still a matter of debate. It is possible that the attitude of residents towards the pandemic, through continued wearing of masks, taking personal precautions, testing for COVID-19 and keeping social distancing, added to the

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adhesion of commercial establishments is the key factor to reduce risk of transmission in public places [6].

Conclusion

It is still unclear which events significantly impact the pandemic. Our study provides valuable data on the case series of SARS-CoV-2 after a sequence of social relaxation events, which can be useful for decision making. This real-world investigation is sensitive in detecting fluctuations in the occurrence of cases, and we believe it can be used in conjunction with studies based on model projections for a more balanced analysis of the pandemic scenario.

Author Contributions

AK inspired the hypothesis of propagation of COVID-19 through different immune surveillance of population groups. SZ conducted the proper mathematical analysis to investigate the AK hypothesis and performed the mathematical part of this manuscript. KK and JL gave their expertise in reviewing and editing this manuscript. All activities: conceptualization, methodology, analysis, validation, investigation, writing up the original manuscript, reviewing, supervision and administration were performed by AK. SZ, KK and JL.

Conflicts of Interests

The authors declare no conflicts of interest.

Ethics Approval

The study was approved by the University Hospital Ethical Committee of the Fluminense Federal University (register 30926020.2.0000.5243).

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