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COVID-19 CONTACT DYNAMICS IN MEDIUM SIZED CITIES INSIDE THE LEGAL AMAZON: ARAGUAÍNA (TO), IMPERATRIZ (MA) AND MARABÁ (PA)

DINÂMICA DE CONTÁGIO DA COVID-19 EM CIDADES MÉDIAS DA AMAZÔNIA LEGAL: ARAGUAÍNA (TO), IMPERATRIZ (MA) E MARABÁ (PA)

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Abstract

This work aims to demonstrate that three medium sized cities - Araguaína (TO), Imperatriz (MA) and Marabá (PA), located in the Legal Amazon, suffered a significant impact from the pandemic due to the spread of the virus following the flow of capital in the country. This impact was probably due to the characteristics of economic development linked to the production of *commodities*, which interconnect them with large national and international producing centers and consumers, independently of their capitals. To demonstrate the dynamics of dissemination, the occurrences of Acute Respiratory Syndrome for the three states (TO, MA and PA) as well as confirmed cases of COVID-19 were quantitatively analyzed for the cities studied and their respective capitals. The data made available by the Oswaldo Cruz Foundation and the Epidemiological Bulletins released by the State Health Secretariats and City Halls were collected. As a result, it was observed that the disease growth rates are higher in three cities, as they behave in a similar fashion with respect to the pandemic and differentiate to each other by the incidence of COVID-19 in their respective cities. It is argued that in a post-COVID-19 period, the characteristics of interconnection between the three cities must be valued, through public policies that promote the development of the region with a focus on reorganizing the city for its people.

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Resumo

O trabalho objetiva demonstrar que três cidades médias - Araguaína (TO), Imperatriz (MA) e Marabá (PA) -, situadas na Amazônia Legal, sofreram impacto significativo da pandemia em decorrência da propagação do vírus seguir o fluxo do capital no país. Esse impacto se deu provavelmente por apresentarem características de desenvolvimento econômico vinculadas à produção de *commodities*, que as interligam a grandes centros produtores e consumidores nacionais e internacionais, de maneira independente de suas capitais. Para demonstrar a dinâmica de disseminação, foram analisadas quantitativamente as ocorrências de Síndrome Respiratória Aguda para os três estados e de casos de COVID-19 confirmados para as cidades estudadas e suas respectivas capitais. Foram coletados os dados disponibilizados pela Fundação Oswaldo Cruz e os Boletins Epidemiológicos divulgados pelas Secretarias Estaduais de Saúde e Prefeituras. Como resultado, observou-se que as taxas de crescimento da doença são maiores nas três cidades, já que se comportam de forma parecida entre si com relação à pandemia e se diferenciam pela incidência da COVID-19 em suas respectivas capitais. Defende-se que num período pós-COVID-19 sejam valorizadas as características de interligação entre as três cidades através de políticas públicas que promovam o desenvolvimento da região com foco no reordenamento da cidade para as pessoas.

Palavras-Chave: COVID-19. Cidades Médias. Desenvolvimento. Amazônia Legal

Introduction

By 2020, the world was affected by the announcement and spread of a pandemic that would occupy the news and the imagination of people in high speed. The COVID-19 was identified in China in December 2019; in January 2020, the World Health Organization (WHO) declared an epidemic; in March, WHO recognized it as a pandemic. Rapidly spread, little known, with limited means of prevention and lack of scientific knowledge about treatment, it would be up to governments to work based on containment, mitigation, suppression and recovery. This should happen by means of quarantine, isolation and social distance, use of masks, hand washing, disinfection of environments and mapping of active cases in order to control the spread of the disease (WERNECK; CARVALHO, 2020).

Since the beginning of 2020, Brazil has taken measures of containment. In the first instance, they were carried out by the Ministry of Health and, subsequently, with the role of governors and mayors (OLIVEIRA *et al.*, 2020). In addition, there have been controversies and political upheavals that have plagued Brazil since then, such as exchanges of health ministers and a political crisis causing the lack of central coordination to assist states and municipalities in controlling the spread of the virus. Thus, the country saw itself until July 2020 as the second largest disseminator of the disease and deaths, second only to the United States.

In this context, it is understood that as the virus is transmitted between people through social circulation, being the transport infrastructures, such as highways, airports and waterways, the virus paths during the pandemic. In this logic, Guimarães *et al.* (2020) shows that outside the most densely populated areas, the BR-153, known as Belém-Brasília highway, is the route of spread of COVID-19 to regions of the country with poor access to health services and high social vulnerability. Such a route is important in propagation as it is an axis of magnetism of capital around the so-called mineral-agricultural frontier, attracting investments, labor and a fluctuating flow of people linked to the productive sectors (SANTOS, 2009). Also according to the authors, the route of COVID-19 was modeled by the capital flow in the country.

Within this perspective, the cities of Araguaína (TO), Imperatriz (MA) and Marabá (PA) are precisely in the center of the capital flow, setting a triangle with economic and social characteristics different from the region where they are located. These are medium-sized cities, with levels of access to privileged services, low social vulnerability and high connection with productive and consuming sectors and regions of the country and the world, via the export of commodities such as meat, grains, iron ore and cellulose. In addition, the three together form a triangle of multiple influences, serving as a reference for the entire region, although they still lack Public Policies for Regional Development

that enhance beneficial interactions between them. Thus, this text aims to demonstrate that the three medium sized cities located in the legal Amazon - Araguaína, Imperatriz and Marabá - were intensely impacted by the pandemic, with a higher progression than their respective reference capitals.

The three cities make up the Legal Amazon. SUDAM (2020) summarizes the states and the component regions of the Legal Amazon as: Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, Tocantins and part of Maranhão, in the region to the west of the 44° meridian. Such states and regions correspond to SUDAM's area of operation, according to the Complementary Law 124 (BRASIL, 2007).

Two factors justify this spatial cutout. Firstly, we highlight the point that Bertha Becker (2013), when studying the dynamics of what she calls "Amazonian city", identifies it as "polycentrism of cities", since the three are located in a border contact region between their respective states - Pará, Maranhão and Tocantins - and are located on the route of four highways among the most important for the region: Belém-Brasília Highway, Trans-Amazon Highway, Carajás Railroad and North-South Railroad. In the background, the REGIC/IBGE (2020) classifies the three cities as regional capitals C, and the ordering of the immediate and intermediate geographical regions, proposed by IBGE (2017), provides that the three cities prescribe both their intermediate and immediate respective areas of influence.

As a first research data, we also find a justification: the first cases of COVID-19 officially registered outside the cities of São Luís, Belém and Palmas, respectively the capitals of Maranhão, Pará and Tocantins, were in the municipalities of Imperatriz, Marabá and Araguaína.

To demonstrate the intersection of the mentioned medium sized cities and the pandemic situation in the region, the text will be presented in three parts, in addition to the introduction and final considerations, namely: the first, with the contextualization of the debate about the medium cities; the second, with a debate on the right of people to the city and access to health as a substantive freedom; last, follows the presentation of the research methodology and results.

Medium sized cities in the Legal Amazon: Araguaína (TO), Imperatriz (MA) and Marabá (PA)

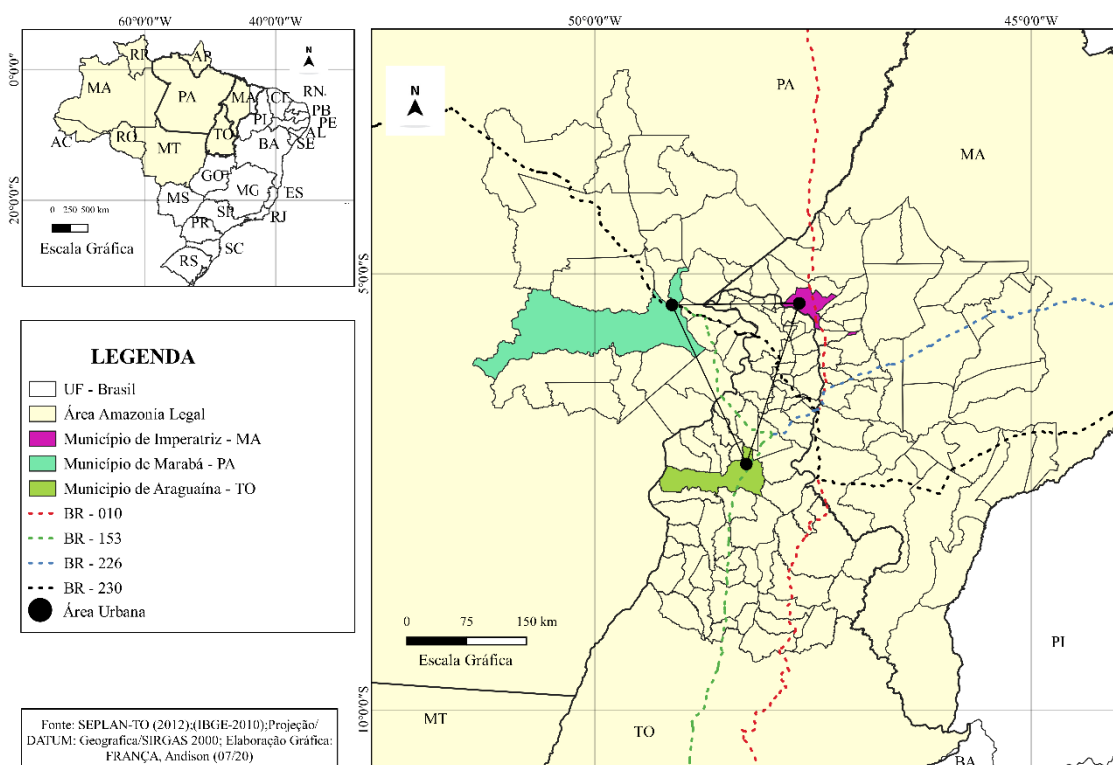
Discussions about medium-sized cities in Brazil begin between the second half of the 1970s and the first half of the 1980s. It is understood that the political-administrative framework is materialized in the Medium-sized Cities Program, which is characterized by differentiated managements: sometimes it is exclusive to the Brazilian government; sometimes it is mediated by the World Bank. The objective, according to Steinberger and Bruna (2001, p. 51), was "to benefit medium-sized cities that could meet the objectives outlined in the two national urban policies: that of the II PND and that of the Resolution of the CNDU". It is worth mentioning that such a Program is articulated from the perception of the need to reorganize the Brazilian urban hierarchy, as well as the migratory flows converging to the industrialization processes of the metropolises located in the southeastern region of Brazil (MATA; MOTTA, 2008).

In the aforementioned period, three vectors were formed around the proposals to reorganize the Brazilian urban hierarchy, two in a theoretical perspective and one in the field of empiricism: (1) The so-called polarization reversal (RIZZIERI, 1982), a theoretical perspective according to which the phenomenon of metropolization would be inherent to states in the process of development and that, after overcoming this stage, there would be a spontaneous movement towards medium-sized cities or regional urbanization centers; (2) The so-called "diseconomies of agglomeration" (AMORIM FILHO; SERRA, 2001) observed in the metropolises would translate into real estate costs and the displacement of the workforce, as well as by the intensification of damage to natural resources; (3) It appears that on the Brazilian coast there were more than 60% of the most populous Brazilian cities (ANDRADE; LODDER, 1979).

To support the implementation of the Medium-sized Cities Program, the definition for medium-sized cities by Steinberger and Bruna (2001, p. 51) was considered: "those that, due to their geographical position, population, socioeconomic importance and function in the urban hierarchy of macro-region and the country, constituted centers of strategic value for regional development". According to Sposito (2007, 2010), the unfolding of studies on medium-sized cities bring several new proposals, both demographic and systemic, based on the various functions performed in the respective regions in which they are inserted. Among them, the globalization of the economy is

pointed out, the flows connecting them to larger and smaller cities, as well as to other urban networks in which they do not participate spatially (SPOSITO, 2006, p. 147).

Map 1: Cutout of the three medium sized cities: Araguaína, Imperatriz and Marabá.



The perception of the previous map allows us to establish a first relationship between the cutout cities and the dissemination dynamics of COVID-19. Using the classification proposed by Sposito (2006), the possibilities of relationship with other cities and areas outside their local networks draw attention, allowing the construction of the working hypothesis of this article, that is: medium-sized cities in the Amazon region of expanding mineral-agricultural borders are linked to metropolitan markets in different Brazilian regions, as well as to urban references in the center of capitalism in the northern and eastern hemisphere, thus enabling a pattern of high speed and intensity of spread of the virus. This hypothesis corroborates the proposition of Guimarães *et al.* (2020, p. 135), concluding that "the country's economic organization shaped the direction, temporality and intensity of Covid-19 cases".

As a conceptual definition, the set of cities mentioned above is understood as "medium sized non-metropolitan cities", with a population of more than 100,000 inhabitants, the ability to articulate centrality of services and work in their regions and that are not capital or belong to regions of metropolitan areas (SANTOS, 2010, p. 103).

The literature contemplates discussions that understand them both as regional centers parameterized by connections with expressive road corridors and for their insertion in the national and international market of *commodities* (NOGUEIRA, 2013; SANTOS, 2017; SODRÉ; RAMIRES, 2017). Contextualizing with the estimated population for 2019 (IBGE, 2020), we have: Araguaína, with 180,470 inhabitants; Marabá, with 279,349 inhabitants; and Imperatriz, with 258,682 inhabitants. In the specific case of Araguaína, it is stated that the city acts from the expansion of the agricultural frontier, centralizing provision of services and commerce, constituting link between the region and other economic centers in Brazil and abroad (GOMES JR., 2014, p. 13).

Marabá follows a similar perspective, according to what the literature tells us. This city accentuates the complications arising from major development projects for the Amazon, highlighting the Great Carajás Project (PGC) and the international boom, at the beginning of the 21st century, of the price of raw material of mineral origin (MONTE-CARDOSO, 2018). The strong concentration of mining activities is central to social issues in which "specific moments in the local economy favored

migratory flows to the municipality, such as the peak of the steel industry in 2005”(CARVALHO; SOUZA, 2018, p. 118).

Imperatriz has a convergent nature to the two previous cities and its recent time frame is the installation of a cellulose processing industry. The officiality of the development discourse was instituted, linked only to the industrial matrix, in the view of Pantoja and Pereira (2019). The authors clarify that this discourse is representative of modernity and the impossibility of the state and municipality to think of other forms of development not linked to companies.

The three cities together form a triangle of mutual influence in the region (according to Map 1), configuring themselves as major driving forces for development and migratory attraction. In addition, they present average human development indexes according to the most recent data, from 2016 (FIRJAN, 2020a, 2020b, 2020c).

On the other hand, Marabá was the worst city in terms of sanitation in Brazil, among the large cities, according to the ranking of the Brazilian Association of Sanitary Engineering. The city was included in the “First steps towards universalization” category, with 127.77 points (ABES, 2020, p. 40). Imperatriz, with 270.62 points, is ranked 152 out of 170 among large municipalities within the category “commitment to universalization” (ABES, 2020, p. 38). Araguaína, in turn, reached 352.77 points, reaching the 96 position of 170 large municipalities, which places it as the best of the three cities in terms of sanitation, also within the category “commitment to universalization” (ABES, 2020, p. 36). The ABES ranking (2020) has 1857 Brazilian municipalities, which represents 33.33% of the total municipalities in the country. The justification for the absence of the other municipalities is the lack of data for the calculation of the global index.

It is necessary, therefore, a debate on the enhancement of regional development of these three references from a cutout of City for People, in which the capital works as a facilitator of access to substantive freedoms, not just as a regulator of the regional dynamics and, specifically, as the denominator of pandemic route in the region.

City for People: health as substantive freedom

The presented features about the three cities discussed here make believe that they can be understood from the perspective of the capitalist city, which sometimes behaves like a commodity itself and sometimes as a social product. In addition, it sums to the fact that they are located on the outskirts of a country that is itself inside the periphery of the world capital. Such a configuration shows a grave situation in the perspective of regional human development and its urbanization, since the put decision-making dictates are guided by economic value, thus having cities for the capital and not cities for people. In this case, it is necessary to think about the consequences of such a vision when the possibility of protecting people's lives against COVID-19 depends on decisions that confront the city's ordering through money. To close the production centers, the commerce and create conditions for the population to survive without selling their labor and production of surplus value is to invert the order placed, bringing forward the human being and not the capital.

The crossroads that the pandemic establishes are precisely this: how to prioritize the human being in cities designed and constituted to give alternative flows to capital and whose fronts of decision-making power were also constituted around this situation. In this logic of debate, Maricato (2015, p. 19) shows that cities can be seen “as a space for the reproduction of capital and the workforce”. In peripheral countries such as ours, this same capital and the State failed to provide minimum conditions for housing, food and living in society for its population. In this way, the urbanization of these cities occurred without the necessary attention to what would guarantee the quality of life and human preservation. Even in periods of high investment in social welfare policies such as those produced by leftist governments, the focus was major on the access and improvement of income, but minor in what it is offered to the community, such as transportation, health, education, sanitation, among others (MARICATO, 2013, 2015).

The equipping of the State by large economic groups throughout the history of Brazil, with its patrimonial project that treats it as a personal good (FAORO, 2001), raises the difficulties in constituting a city for people and, in times of health crisis, as we are living, in making decisions in line with the economic power. The understanding of the city as a capital is important in the relationships that are established in the understanding of health. Milton Santos, in his studies of health geography, established that the cause of the illness do not have only biological and climatic relations, but are directly influenced by the conditions of work, urban planning, access to goods and services, education, transport, urban systems, among others (JUNQUEIRA, 2009). In this

perspective, the crisis instituted by the pandemic cannot be understood only by the fatality of the spread of a virus with deadly characteristics, as it must be related to the vision of the city that is adopted and implemented (FARIA; BORTOLOZZI, 2009).

The medium-sized cities have characteristics that determine the citizenship of ordinary people removed from modernization and the city itself, preventing access to the most diverse factors that promote substantive freedoms. Thinking about the city through parameters that go beyond the financial is what Amartya Sen (2010) proposes by defending, as a factor promoting development, the constitution of elements that favor the functioning of capabilities that together, such as income, education and health, allow that people strengthen the power to make their own decisions.

The cities presented have their own attributes and others that are characteristic of the country in relation to health and the imposed pandemic: impact of social and educational inequalities on the reception system, that is, people with less social protection due to precarious jobs are also those with less access to quality education, which limits the understanding of the importance of health protection procedures. The geographical location in regions markedly with the worst levels of human development, of basic sanitation, increases exposure to disease-spreading agents, such as open sewage and ditches contaminating groundwater. This scenario constitutes weaknesses in the health system, ranging from primary care to activities of medium and high complexity, such as those being demanded in the treatment of COVID-19 (SIQUEIRA-BATISTA; SCHRAMM, 2005).

In this sense, the pandemic has managed to bring to the surface the debate about rethinking cities and their ability to promote access to substantive freedoms and, more specifically, how to develop health justice based on the complex equality proposed by Sen (2010, 2011), which involves several factors: access to education, demonstrated by the ability to care for oneself and the other, better handled by people with more schooling; reduction of material scarcity and access to income, since there is a two-way causal relationship between disease and poverty (WAGSTAFF, 2002); and universal access to basic sanitation. The contradictions posed by the capitalist system are wide open today by the health injustices exposed by the veins of the pandemic.

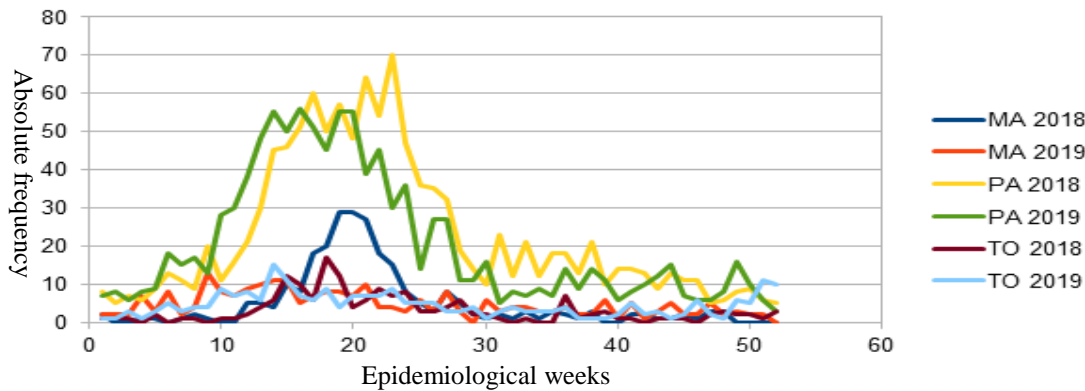
The complex equality proposed by Sen (2011) aims to reduce the contradictions posed by the social system through the equity analyzed by means of the individual's capacities and functioning, considering his freedom to choose the most diverse ways of life. The individual choices recommended by the author should be based on expanding their capacities through access to the most diverse social assets, such as health, education, happiness and income (SEN, 2008). In other words, the individual's ability to choose, autonomously, depends on the expansion of social access, in order to allow subjects to make decisions about the direction of their own lives, so that social inequalities do not diminish their ability to choose.

Considering the aspects defended by Sen (2008, 2010, 2011) and Maricato (2013, 2015), we understand that thinking about the health of the population is to broaden the spectrum in order to produce a City for People. Obviously, such a postulate does not exclude capital from the process, since it is an integral part, but it cannot come before human reasons, and must assist in the networks necessary to promote the complex justice that allows access to substantive freedoms. The architect Jan Gehl (2015), in this direction, discusses the human dimension of spaces and their attribute as living cities that privilege health, sustainability and safety.

Results: cases of SARS (Severe Acute Respiratory Syndrome)

In this section, the results related to the pandemic for the three municipalities and their capitals will be presented. The daily data for 2020 are for the period from January 1st to June 24th. Therefore, the capitals of the three cities were taken as a comparative reference and they were used for both the data of deaths from Severe Acute Respiratory Syndrome (SARS) and the confirmed cases reported by reports of each state.

In annual terms, the 2020 data are compared with similar periods in 2018 and 2019, as shown on the MonitoraCOVID-19 website (FIOCRUZ, 2020). Graph 1, as follows, shows the cases of SARS (Severe Acute Respiratory Syndrome) in Maranhão, Pará and Tocantins throughout the epidemiological weeks of 2018 and 2019.

Graph 1: SARS cases in 2018 and 2019 (MA, PA and TO)

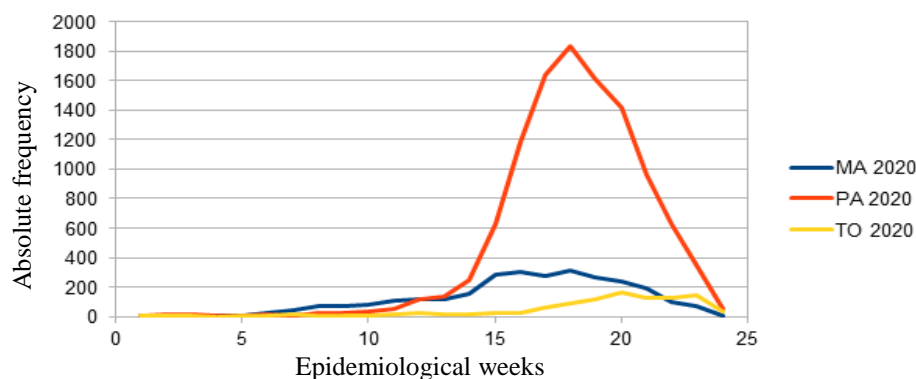
Source: research data.

It can be seen that the peak of cases in 2018 (dark blue curve) in Maranhão (29 occurrences) occurred in weeks 19 and 20, that is, from May 5 to 19, according to the epidemiological calendar of the Health Information System of Notification (MINISTRY OF HEALTH, 2017). This peak of SARS cases is expected from December to May in the Amazon region, in a phenomenon called Amazonian winter, due to the heavy annual rains in this period (SUSAM, 2020). There was a period with more rains than expected in the region in 2018 due to the occurrence of La Niña (PEGORIM, 2018), which may have modestly increased the number of cases of SARS. In the orange curve of Graph 1, there are cases of SARS in the state of Maranhão throughout 2019. Again, the peaks, with 13, 11 and 11 cases, occurred in weeks 9, 14 and 15, respectively, as expected for the Amazonian winter period.

In the yellow curve, cases of SARS contained in the state of Pará along 2018. In this case, the peaks occurred in the first half of the year, at weeks 17, 21 and 23 having, respectively, 60, 64 and 70 cases. In the green curve of the same graph, there are cases of SARS in Pará throughout 2019. The peaks for the state occurred again in the first half of the year, in weeks 14, 16, 19 and 20, with, respectively, 55, 56, 55 and 55 cases. It can be noticed again a slight effect of the phenomenon La Niña in 2018 to explain the difference in cases between 2018 and 2019. It can be observed that, in the yellow curve (2018), the peak for Pará occurred in the first half of the year in week 18, with 17 cases, confirming the trend of SARS in winter regions of the Amazon in the first half of the year.

The brown curve contains the cases of SARS in Tocantins state along 2018. In this context the peaks are before week 20. In 2019 (light blue curve), the peak occurred to the state in first half of the year, at week 14, with 15 cases. In the case of Tocantins, there is not significant difference between 2018 and 2019. The state, despite being part of the Brazilian Amazon, has only 9% of its territory and population within the Amazon biome, and is therefore largely outside the direct influence of the Amazonian winter (SILVA, 2007).

Graph 2, below, contains the cases of SARS in Maranhão, Pará and Tocantins until June 24, 2020, which corresponds to the 26th epidemiological week of this year.

Graph 2: SRAG cases in Maranhão, Pará and Tocantins (2020)

Source: research data.

In the orange curve, the cases of SARS in the state of Pará were along the 26 first epidemiological weeks of 2020. The peaks occurred in the first half of the period, at weeks 17, 18 and 19 and respectively 1635, 1838 and 1609 cases. The influence of COVID-19 can be seen to explain the difference in cases compared to 2018 and 2019. Still, it is clear that the number of cases in Pará, in approximate terms, is six times greater than in Maranhão and nine times greater than in Tocantins, when the peaks of the three curves are compared. In the dark blue curve of Graph 2, corresponding to data from Maranhão 2020, the peaks occurred in the first half of the year, in weeks 15, 16 and 19, with, respectively, 281, 300 and 269 cases. Despite the expected peak for the Amazonian winter period, there was an increase of approximately 10 times, probably due to the COVID-2019 pandemic. In the yellow curve of Graph 2, the cases of SARS in Tocantins state along the first 26 epidemiological weeks of 2020 are presented. The peaks occurred to the state in the first half of the year, in Weeks 20 and 23 with, respectively, 164 and 143 cases. COVID-19's influence in 2020 can again be seen to explain the case difference of approximately ten times compared to 2018 and 2019.

New cases of COVID-19

Table 1 below shows the growth rates of the number of new cases of COVID-19 in the cities of Araguaína-TO, Imperatriz-MA, Marabá-PA and their respective capitals: Palmas-TO, SãoLuís-MA and Belém-PA. The data series relating to these cities is presented since the beginning of the pandemic in each city until 24/06/2020. Then, the respective exponential regression equations were calculated, as well as the R^2 , which represents the adequacy of the exponential regression curves to the actual data. It is noteworthy that, among the several possible regression models, the most adequate in all cities was the exponential one, considering the R^2 index of adjustment to the curve. Cities are in decreasing order of growth rate in the number of new cases of COVID-19.

Table 1: COVID-2019 growth rates and adaptation (R^2) of the curve to the data

Cities	Growth rate of new cases (%)	Fit (R^2) of the curve to the data (%)	Beginning of the pandemic in the municipality	Peak dates in new case numbers	Peaks in the number of new cases (chronological order - 4 largest)
Araguaína-TO	6.02637	72.4066	3/27	5/26 5/30 6/5 6/8	183 172 187 165
Palmas-TO	4.5347	76.1225	3/19	6/16 6/18 6/20 6/23	66 50 76 72
Marabá-PA	5.9206	53.4361	3/23	6/4 6/9 6/12 6/13	205 361 321 231
Belém-PA	5.0296	56.3474	3/17	5/19 5/27 6/01 6/4	878 681 803 701
Imperatriz-MA	4.5905	51.3872	4/1	5/16 6/4 6/5 6/16	199 152 129 184
SãoLuís-MA	2.8849	30.5704	3/20	5/22 5/23 5/24 6/06	429 372 431 424

Source: research data.

The first premise that can be inferred from the data is that Araguaína, Imperatriz and Marabá have a higher rate of growth in new cases than their capital cities, demonstrating that the three cities were fully impacted by the pandemic, probably due to their specificities. In the case of Araguaína, it should be noted that the cases respond to the epidemiological weeks from 22 to 24,

approximately on the dates when the peak of SARS cases occurred in Tocantins, as shown in Graph 2. In the case of Belém, the peaks dates correspond to epidemiological weeks 21 to 23. In addition, there is a downward trend in Araguaína and Belém with weekly seasonality from the end of the Amazon winter in late May.

In the case of Imperatriz-MA, the peaks do not coincide with those of SARS in 2020 in Maranhão, but with cases of peaks in the average neighboring cities (Marabá-PA and Araguaína-TO), as shown in Table 2 (paired comparison between municipal averages). This result demonstrates, through the epidemic route, the regional interrelationship of the three cities, although the mitigation measures do not come in a coordinated way. As reported in a local newspaper in Imperatriz, the occupancy rate of Intensive Care Unit beds reserved for treatment of COVID-19 was 100% on 06/15/2020 (DINIZ, 2020). After this period, there was a significant decrease in the pandemic of official data in the city (NASCIMENTO, 2020). As there are reports of recurring agglomerations in mid-June (NASCIMENTO, 2020b), it can be questioned whether the drop in the official number was due to patients' home treatment, leading to underreporting or lack of testing.

In the context of the new cases of COVID-19 in Marabá-PA, the peaks of occurrences appear in the epidemiological weeks 23 and 24 of 2020. It is interesting to note that the frequency peaks came after the end of the lockdown, on 06/25 (G1 PARÁ, 2020; BARBOSA, 2020), at the state level, covering the 17 largest municipalities. This data can be explained by the incubation period of COVID-19, which lasts up to 14 days (CHADE, 2020).

Addressing the cases of COVID-19 in Palmas-TO, the peaks coincide with up to 14 days after the opening of local commerce in the cities of Palmas and Araguaína, on 06/08. The analysis of the cases of COVID-19 in São Luís-MA is: the peaks occurred approximately 15 days after the end of the lockdown, which would initially be in effect between May 5th and 15th of 2020 (PADIN, 2020). Then it was extended until 5/17. It is worth resuming here the idea of a city for the capital (MARICATO, 2015) since, despite the fact that cities decreed the closure of non-essential commerce at a certain moment, its opening represented in epidemic terms significant increases in the rates of spread of the virus. Even so, restrictive measures have not been taken again. The city of capital, that determines the reopening of the productive sectors, also do it, as people linked to higher layers of society have a smoother infection control/treatment, and may, therefore, resort to social isolation and if necessary, to better equipped health centers. At the opposite pole, the labor force is subject to collective transport and to the low capacity to provide personal protective equipment (masks, alcohol gel etc.), resulting from a low level of education, which makes it more difficult to understand the mechanisms of contamination and prevention. In short, money has more value than the life of ordinary people.

Proceeding to another type of analysis, to compare the series of each city with each other, in terms of the number of new cases of COVID-19 per day, t tests of difference between means for paired data were performed, using pairs of cities, considering the relations between the three with each other and with their respective capitals. The data were paired by date. The results of the comparisons are shown in Table 2, below. Differences between means were considered significant when the probability of significance (*p-value*) was inferior to 0.05, as is the standard for statistical studies in social sciences (HAIR *et al.*, 2009).

Table 2: Significant differences between time series

City pairs	Significance probability (p-value)	Is there a significant difference between the numbers of cases?
Araguaína-TO vs. Marabá-PA	0.7356	no
Araguaína-TO vs. Imperatriz-MA	0.7830	no
Araguaína-TO vs. Palmas-TO	0.0000	yes
Marabá-PA vs. Belém-PA	0.0000	yes
Marabá-PA vs. Imperatriz-MA	0.5828	no
Imperatriz-MA vs. SãoLuís-MA	0.0000	yes

Source: research data

As seen in Table 2, the only cities that had similar data from the beginning of the pandemic until 06/24/2020 were Imperatriz, Marabá and Araguaína. This phenomenon demonstrates the influence of the medium-sized cities on each other because of the proximity between them, adding to the evidence that the behavior of the pandemic differ from their respective capitals. This fact calls for actions that go beyond the geographic divisions of states and geographical regions and that coordinated actions at the intermunicipal level should be considered.

Final considerations: to think about post-COVID-19

The objective was to demonstrate the epidemic behavior of COVID-19 in the three medium-sized cities in the Legal Amazon, in Araguaína, Imperatriz and Marabá, considering their traits, such as being regional centers and maintaining economic activity, independent of their capitals with large national and international metropolises, among other factors. In addition, we worked with the hypothesis that they exercise mutual ascendance among themselves, according to their respective regions of immediate influence, making the spread of the virus also occur independently, since their preferred route is the one which follows the directions of capital in Brazil, as demonstrated by Guimarães *et al.* (2020). Thus, the fact that it is precisely in the three cities that the first cases of COVID-19 were confirmed in their respective states outside their capitals, combined with the fact that its spread occurred independently of the capitals, is relevant and demonstrates their economic forces and interrelation with the world.

Evidently, the pandemic has not spared any Brazilian region, but it must be considered that the ways of coping are not equitable in a highly unequal country with markedly poorer regions such as those studied. Although it is the case of towns with growth rates and accelerated development in demographic and economic terms, these resources are not reversed in favor of the majority of the population (PACÍFICO FILHO *et al.*, 2019). Thus, it is understood that the education policies of medium-sized cities, although had demonstrated the quality of decentralizing development regions, thus took shape considering only the appreciation of the capital, with few investments in improvement of quality of life. In a situation of virus spreading, these cities are just as vulnerable as state capitals, aggravating the fact that their health and pandemic containment structures are comparatively more fragile.

The propositions that are outlined for a post-COVID-19 moment, in our view, must follow the paths of the virus, that is, if it brings cities closer in the way of expanding the pandemic, it also offers elements of flows between cities. Thus, there should be two propositional fronts for the three cities and the region they share: (a) They should be seen together, as an extension to promote regional development, with improvements in their road, water and air connections, with strategic planning of health regions and their levels of complexity; there should be also programmed attention improving educational levels from existing public and private higher education networks and their intersections with basic education and planned investments in access to safe drinking water, collection and treatment of liquid and solid waste, in short, with a tactical jointly thinking of the region of triangulation of the three cities. (b) Such strategies for the development of cities and the region must be coupled with the debate about the city for people, in which the quality of life, the increase in substantive freedoms and the capacity for social participation are guided by the autonomy of thinking and deciding the life that one wants to live.

In this logic, the pandemic not only threw open the vulnerabilities of the region, but also has offered elements of understanding of possible recovery tracks, if found that if the virus trajectory is the same as the people's, there are flows noticeable among the three cities which must be valued as possible drivers of the exit from the crisis caused by the situation. It is the opportunity we have, after a crisis of severe proportions, to reshape our cities guided by an socio-human ethics that has the capital as support to constitute a city for people.

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