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Chapter

Loss of Employment and Reduction of Income during the COVID-19 Pandemic in the Maranhão State, Brazil

Bruno Luciano Carneiro Alves de Oliveira

Abstract

To estimate the prevalence and factors associated to the loss of employment and reduction of income during the covid-19 pandemic in the state of Maranhão, Brazil. A population-based household survey was performed, from October 19 to 30, 2020. The estimates considered clustering, stratification and non-response. The sample selection was carried out in three stages (stratum, census tracts and households). After systematic analysis, thirty sectors were selected in each stratum, totaling 150 sectors, with the number of households in each sector set at 34 households, totaling 5,100 households and one inhabitant per household (resident for at least six months and with 1-year-old or more) selected by simple random sample. To this research were analyzed 3,297 inhabitants among 18 and 64 years old. The Loss of employment and income from the pandemic was questioned. Descriptive analysis (weighted frequency) and Pearson's chi-square test were performed to verify univariate association between independent variables and the outcome ($p < 0.05$). The prevalence of loss of employment and income was 12.1% (95%CI 10.5–13.7%), but another 39.7% (95% CI 37.3–42.1%) were already out of the market before the pandemic. This loss was statistically greater among residents of the largest and wealthiest cities in the state (stratum with the state capital: 22.7%; 95% CI 18.8–27.2; and in cities with more than 100 thousand inhabitants: 12.4%; 95% CI 9.9–15.6), male (14.3%; 95% CI 11.9–17.3; $p = 0.037$), middle-aged adults between 30 and 49 years (15.3%; 95% CI 12.8–18.2; $p = 0.001$), medium level (15.3%; 95% CI 12.9–18.1; $p = 0.003$) and higher education (14.4%; 95% CI 9.4–21.5; $p = 0.003$) and users of public transportation (14.6%; 95% CI 12.4–17.2; $p = 0.005$), and among those who received this aid was much higher (50.4%; 95% CI 33.2–67.4; $p = 0.001$). The results showed a relevant prevalence of loss of work and income in Maranhão and its association with individual and contextual factors. They revealed the groups and contexts most affected socioeconomically by the pandemic and that should deserve special attention from public income transfer strategies.

Keywords: unemployment, social conditions, coronavirus infections, survey, Brazil

1. Introduction

The COVID-19 pandemic has forced different governments to adopt measures to restrict social mobility in order to reduce the transmission of the SARS-CoV-2 virus,

which generates an exponential volume of cases and deaths. Globally, 116,902,939 cases and 2,594,721 deaths were registered until March 8, 2021. USA, India and Brazil are among the three countries with the highest number of cases and deaths, with Brazil being the country with the highest rate of fatal cases and the second with the highest overall mortality rate [1].

On the other hand, such measures directly impacted the dynamics of the local and global economies. This pandemic represents a real challenge to the maintenance and growth of economies. One of its effects was the large volume of population that lost jobs or their sources of income, causing a reduction in their individual and family earnings [2, 3].

These same governments tried to provide alternative economic responses through an income transfer policy focused on particular groups that represented the distribution of emergency financial aid to supplement the income and consumption affected by their populations by the pandemic [4]. Brazil is one of the emerging countries that spent the most on this pandemic, only comparable to some high-income countries. Until December 2020, around 10% of GDP (Gross Domestic Product) was committed to this income policy, even with an internal fiscal scenario that has deteriorated since 2014 [2, 4].

However, within the country, in locations historically with greater socioeconomic and health deprivation, such aid did not erase all the impacts of job loss and income reduction, since the socioeconomic conditions in these places were no longer as favorable before COVID-19. Nationally, it is estimated that around 24.5 million workers with a formal contract signed wage reduction agreements or suspended employment contracts with the pandemic in 2020 [5].

Located in the most impoverished region of Brazil (northeastern region), Maranhão state presented an important volume of these workers affected by the pandemic. In 2020, this state had about 7.1 million inhabitants distributed in an area similar to the size of Italy [6]. However, little has been achieved to estimate the real size of this group of workers or their associated characteristics, given the large number of them in underemployment (without labor guarantees) that already existed before the pandemic. Therefore, the individual and contextual characteristics of these most affected groups are not yet known. However, a good opportunity to try to answer these questions can be given through a population-based survey conducted in August 2020 on the epidemiological and socioeconomic impacts of this pandemic on the population of the Maranhão state.

Therefore, this study used this available and public database to estimate the prevalence and factors associated with job loss and income reduction during the COVID-19 pandemic in the Maranhão state, Brazil. This is expected to identify the population groups most impacted by job loss and income reduction in a context of a pandemic in Maranhão state and to generate information for public interventions that meet the demands of these different social groups.

2. Methodology

2.1 Study area and population

Cross-sectional study with data from the population-based home serological survey entitled "Prevalence of infection by the SARS-CoV-2 virus in Maranhão state, Brazil", carried out in cooperation between the Federal University of Maranhão and the Maranhão state Department of Health in the period October 19 to 30, 2020. The municipalities of Maranhão were divided into five strata, according to the 2019 IBGE municipal population size [6] Grande Ilha, less than 20,000

inhabitants, from 20,000 to 100,000 inhabitants, more than 100,000 inhabitants, and the city of Imperatriz (second largest in population and economy in the state). The Big Island included the capital São Luís and three neighboring cities.

2.2 Sample

To calculate the sample size, the prevalence of SARS-CoV-2 infected was estimated in the first survey carried out in the Maranhão state [7]. In each stratum, the sample size calculation was estimated using the following equation:

$$n = \frac{N}{N-1} * P * Q * \frac{1}{CV^2 * P^2 * \frac{P*Q}{N-1}}, \quad (1)$$

The letter N represents the population in each stratum, P the prevalence and CV the coefficient of variation of the expected prevalence estimates within the strata. A design effect of 2 was considered. The study sample was 5,001 individuals: 872 in Stratum 1 (four municipalities), 1,236 in Stratum 2 (122 municipalities), 612 in Stratum 3 (85 municipalities), 1,022 in Stratum 4 (five municipalities) and 1,021 in Stratum 5 (one municipality).

The sample selection was carried out in three stages. In the first, in each stratum, census sectors were selected. In the second, within sectors, households. In the third, within the household, only one resident individual.

In each stratum the selection of sectors was obtained from a systematic random sample, proportional to the number of permanent private households. Thirty sectors were selected, totaling 150 sectors. Sectors with less than 200 households in the 2010 census were grouped with others, respecting the continuity of these sectors, so that each grouped sector had at least 200 households. The number of sectors and households was obtained from the 2010 Demographic Census [8].

The selection of households in each of the 150 sectors or clusters was obtained by a systematic sample. The number of households in each sector or group was set at 34, totaling 5,100 households. Within each household, an individual was selected from a simple random sample, totaling 5,100 individuals. This selection was made from a list of eligible residents constructed at the time of the interview (resident for at least six months at home and with a year old or older). The final sample of the survey reached a response rate of 65.4% (n = 4,630 individuals). However, for this study, only the adult population between 18 and 64 years was considered because it is considered that this would be the population expected to have already entered the labor market. Thus, the study population was 3,297 people. The final sample weight considered the three stages of selection and the response rate.

2.3 Data collection

The data were collected through the application of a questionnaire and collection of 5 mL of blood from the randomly selected individual. Data registration was performed in an application from a mobile device, using the *EpiCollect* platform [9]. Serology data were not used in this analysis.

2.4 Study variables

In this study, the outcome variable was job loss or income reduction during the covid-19 pandemic. Job?". The possible answers were "yes", "no" and "do not know" and do not apply (in cases where the person did not work before the pandemic).

A set of independent variables was used. The socioeconomic and demographic variables were: sex, age group in years (18–39, 40–59, ≥ 60), color/race (white, mixed race, black), education (up to complete elementary school II, complete high school, complete higher education)), family income (in reais, Brazilian currency) (<1,000, from 1,000 to <2,000, ≥ 2,000), possession of a health plan (yes, no), religion (Catholic, evangelical, does not have, others), number of residents in the household (1, 2, ≥ 3) and use of public transport during the pandemic (no, yes). Those related to the labor market after the emergence of the pandemic were: continues with face-to-face work (yes, no, did not work outside the home), remote work even if partial (yes, no, did not work), received *Bolsa Família aid* (social benefices) (yes, no), received emergency aid (yes, no) and received unemployment insurance benefits (yes, no, did not work). To health was the frequency of symptoms possibly related to covid-19 (no symptoms, 1 to 2, ≥ 3).

2.5 Análise Estatística

Statistical analysis was performed using the software Stata® version 14, considering the characteristics of the complex sample plan and the weighting of the sample. The prevalence of job loss or income reduction during the new coronavirus pandemic and 95% confidence intervals (95% CI) were estimated according to the independent variables, using Pearson's chi-square test to verify the univariate association between them, at the 5% significance level.

2.6 Ethical approval

Ethical approval was obtained from the Research Ethics Committee of the Carlos Macieira Hospital of the Maranhão State Health Secretariat under CAAE number 34708620.2.0000.8907. An informed consent form was provided by the participants.

3. Results

The prevalence of respondents who suffered loss of work or reduced income during the pandemic of the new coronavirus in the Maranhão state was 12.1% (95% CI: 10.5–13.7). However, the proportion of adults who were already out of the labor market even before the pandemic was also quite high (39.7%; 95% CI: 37.3–42.1) (**Figure 1**).

Table 1 shows the prevalence of job loss or reduced income according to socioeconomic and demographic characteristics of the interviewees. It was found that this loss was statistically (p = 0.001) greater among residents of Grande Ilha (stratum that has the state capital) (22.7%; 95% CI 18.8–27.2) and in cities with more of 100 thousand inhabitants (12.4%; 95% CI 9.9–15.6) than among cities with less than 20,000 inhabitants (6.3%; 95% CI 4.5–8.7). The loss of work and income was also statistically higher among males (14.3%; 95% CI 11.9–17.3; p = 0.037), middle-aged adults between 30 and 49 years old (15.3%; 95% CI 12.8–18.2; p = 0.001), with medium level (15.3%; 95% CI 12.9–18.1; p = 0.003) and higher education level (14.4%; 95% CI) % 9.4–21.5; p = 0.003) and users of public transportation (14.6%; 95% CI 12.4–17.2; p = 0.005). For the other socioeconomic and demographic characteristics, the prevalence of the study followed values close to the state estimate, but without statistical association (p > 0.05) (**Table 1**).

When considering the prevalence of job loss or income reduction according to the receipt of government financial aid due to the pandemic, it was found that there
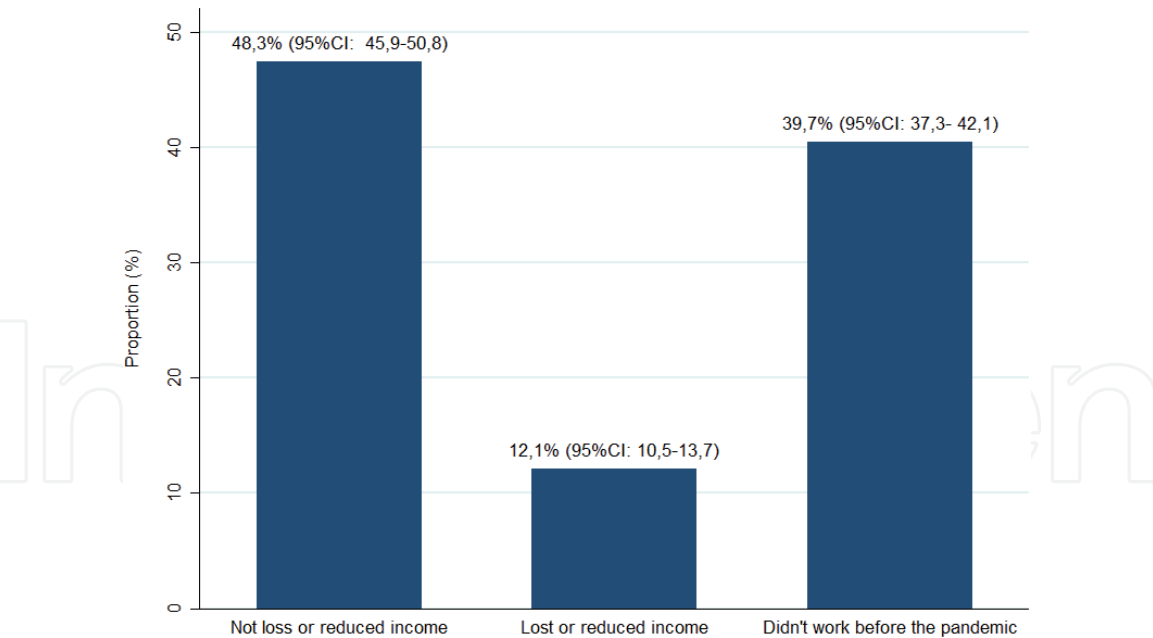
Figure 1.
Prevalence of loss of employment or income reduction during the new coronavirus pandemic in the Maranhão state, Brazil, 2020.

Variables	Loss of employment or income reduction				p^*
	Yes		No		
	%	95%IC	%	95%IC	
Total	**12.1**	**10.5–13.7**	**88.9**	**86.3–89.5**	
Groups (Regions) of municipalities					
< 20,000 inhabitants	6.3	4.5–8.7	93.7	91.3–95.5	*0.001*
20,000 to 100,000 inhabitants	8.5	6.4–11.3	91.5	88.7–93.6	
> 100,000 inhabitants	12.4	9.9–15.6	87.6	84.5–90.1	
Imperatriz	8.1	5.8–11.1	91.9	88.9–94.2	
Big Isla[1] (Including the capital São Luís)	22.7	18.8–27.2	77.3	72.8–81.2	
Sex					
Female	10.9	9.2–13.0	89.1	87.0–90.9	*0.037*
Male	14.3	11.9–17.3	85.7	82.8–88.1	
Age groups (years)					
18–29	9.4	7.1–12.4	90.6	87.6–92.9	*0.001*
30–49	15.3	12.8–18.2	84.7	81.8–87.2	
50–64	8.8	6.9–11.2	91.2	88.8–93.1	
Self-reported skin color/race[2]					
White	11.9	8.4–16.7	88.1	83.4–91.6	*0.35*
Brown	11.4	9.7–13.4	88.6	86.6–90.3	
Black	13.5	10.2–17.7	86.5	82.3–89.8	
Head of the household's schooling (years)[3]					
Primary/Lower secondary II	8.9	7.2–11.0	91.1	89.0–92.8	*0.003*
Upper secondary	15.3	12.9–18.1	84.7	81.9–87.1	
Tertiary	14.4	9.4–21.5	85.6	78.5–90.7	

Variables	Loss of employment or income reduction				p^*
	Yes		No		
	%	95%IC	%	95%IC	
Total	**12.1**	**10.5–13.7**	**88.9**	**86.3–89.5**	
Monthly family income (Brazilian Real (R$)[3]					
< 1000	10.4	7.9–13.7	89.6	86.3–92.2	*0.36*
1000 a < 2000	11.9	9.9–14.2	88.1	85.8–90.1	
>2000	13.4	10.5–16.9	86.6	83.1–89.5	
Has a health plan					
No	11.4	10.0–13.0	88.6	87.0–90.0	*0.07*
Yes	18.4	11.0–29.1	81.6	70.9–89.0	
Number of residentes in the house					
1	10.7	7.4–15.2	89.3	84.4–92.6	*0.46*
2	10.8	8.6–13.6	89.1	86.4–91.4	
≥3	12.4	10.6–14.6	87.6	85.4–89.4	
Used public transport during the pandemic					
No	10.1	8.3–12.3	89.9	87.6–91.7	*0.005*
Yes	14.6	12.4–17.2	85.4	82.8–87.6	

*Pearson's chi-square test.
[1]Includes the Capital São Luís.
[2]Yellow and indigenous races are excluded due to low frequency.
[3]n different from 3.297.

Table 1.
Prevalence of loss of employment or income reduction during the new coronavirus pandemic according to socioeconomic and demographic characteristics of respondents in the serological survey in Maranhão state, Brazil, 2020.

Variables	Loss of employment or income reduction				p^*
	Yes		No		
	%	95%IC	%	95%IC	
Receveid bolsa família (social benefices)					
No	12.5	10.6–14.6	87.5	85.4–89.4	*0.44*
Yes	11.2	9.0–13.9	88.8	86.1–90.1	
Receveid emergency aid					
No	10.1	7.8–13.0	89.9	87.0–92.3	*0.072*
Yes	13.2	11.4–15.3	86.8	84.7–88.6	
Receveid unemployment insurance					
No	13.8	11.8–16.1	86.2	83.9–88.3	*0.001*
Yes	50.4	33.2–67.4	49.6	32.6–66.7	

*Pearson's chi-square test.

Table 2.
Prevalence of loss of employment or income reduction during the new coronavirus pandemic according to receiving government financial aid due to the pandemic of respondents in the serological survey in Maranhão state, Brazil, 2020.

Variables	Loss of employment or income reduction				p^*
	Yes		No		
	%	95%IC	%	95%IC	
Frequency of symptoms possibly related to covid-19[1]					
No symptoms	8.6	6.9–10.6	91.4	89.4–93.1	*0.005*
One to two symptoms	15.1	9.3–23.5	84.9	76.5–90.7	
Three or more symptoms	14.6	12.4–17.2	85.4	82.8–87.6	

*Pearson's chi-square test.
[1]The following symptoms were considered: fever, chills, sore throat, cough, dyspnea, anosmia, ageusia, diarrhea, nausea/vomiting, headache, fatigue, and myalgia. They were classified into: no symptoms; one or two symptoms, provided they were not anosmia/hyposmia or ageusia/dysgeusia; three or more symptoms (including anosmia/ hyposmia or ageusia/dysgeusia).

Table 3.
Prevalence of loss of employment or income reduction during the new coronavirus pandemic according to frequency of symptoms possibly related to covid-19 (no symptoms, 1 to 2, ≥ 3) due to the pandemic of respondents in the serological survey in Maranhão state, Brazil, 2020.

was only a statistically significant association with the receipt of unemployment insurance (p = 0.001). The prevalence of loss of work or income among those who received this aid was much higher (50.4%; 95% CI 33.2–67.4; p = 0.001) than those who did not receive it (13.8%; 95% CI % 11.8–16.1; p = 0.037) (**Table 2**).

The prevalence of loss of job or income was statistically higher (p = 0.005) among people who reported the presence of symptoms associated with infection with the SARS-CoV-2 virus than among asymptomatic individuals. Adults with one or two symptoms (15.1%; 95% 9.3–23.5) and three or more symptoms (14.6%; 95% CI% 12.4–117.2) reported a higher prevalence than those without symptoms (8.6%; 95% CI% 6.9–10.6) (**Table 3**).

4. Discussion

The results have since indicated an important impact of the new coronavirus pandemic on the labor market and on adult income levels in the state of Maranhão. This volume of new people with reduced income was added to the large volume of people who were already out of the job market even before the pandemic, exposing the precariousness of local income levels and the depth that the economic crisis caused by the new coronavirus may have generated in living and health conditions. There was a profile of residents more economically impacted by the pandemic, as the loss of employment and income was greater in large and more populous cities. Among male people, middle-aged, of medium and high schooling, public transport users, and adults who had more symptoms associated with the COVID-19 clinic. Yet, despite the state having instituted targeted cash transfer mechanisms during the pandemic to compensate for the loss of income from the pandemic, a relevant portion of adults did not receive such aid, which may have further aggravated the socioeconomic and health situation of these people with the pandemic.

Globally, the COVID-19 pandemic has devastated a large volume of lives, leading to job loss, income, emotional distress and worsening physical and mental health [2–4]. It also led to increased costs in several sectors, with depleted health systems, financial markets and society in general. The rapid spread of the virus has produced a dramatic risk of strangulation of health systems in the affected countries, regardless of their socio-economic development stage [10].

Brazil is a country with a very high risk of contamination and the virus has been producing a high number of cases and deaths, especially in the northeast region and its most impoverished states such as the state of Maranhão, because the pandemic tends to generate more cases among more vulnerable populations, and states and municipalities whose socioeconomic status, hygiene and sanitation are deficient [7]. In the economic field, the effects of the COVID-19 pandemic have had serious socioeconomic impacts, exposing the vulnerability of Brazilian states and municipalities [2].

In response to the transmission characteristic of the SARS-CoV-2 virus, restrictive measures of social mobility and consumption impacted, together with the pandemic itself, the labor market with more relevant negative repercussions between people and cities with insertion in the market or social structure and consume power. In this study, it was observed that the richest and most populous cities in the state and people with higher education were the ones that suffered the most from this loss of work or income. However, it was observed that in poor contexts such as Maranhão, there was already a relevant proportion of people already outside the labor market even before the pandemic [2–4].

The impact of the pandemic was not felt equally by all social groups in the state. Middle-aged adults and public transport users were also the most affected by the loss of jobs and income, suggesting that the income power of these subjects was no longer high before the pandemic, as they depended on public transport services and were in the beginning of their working life phase. Soon the effects of the pandemic may have amplified the socioeconomic difficulties between them beyond this current phase of life and reaching the family circuit.

The Brazilian government has instituted focused income transfer policies for groups that have declared themselves out of jobs or income with the pandemic. Emergency Aid, instituted by Law No. 13,982, of 2020, is one of the biggest initiatives of the Federal Government to minimize the economic effects of the coronavirus pandemic for the most vulnerable part of the population, among them the beneficiaries of the Bolsa Família Program and those enrolled in the Single Registry for Social Programs of the Federal Government, citizens who already had some type of relationship with social assistance policies. In addition to these, the benefit also covers informal, self-employed and individual small business. However, in this study it was found that a portion of about 15.0% of the adults evaluated did not receive such assistance even though they had the characteristics to receive it, indicating the failure of governments to positively reach the groups most in need of this economic support.

Epidemics such as that of COVID-19 are characterized as perverse phenomena, since they affect a series of factors involved in the health status and quality of life of an individual, including environment, living conditions, social and economic reality. For this reason, this pandemic has consequences for the functioning of the global economy, generating a world crisis that demands ample emergency strategies and very well-articulated the different local realities, so that this collective action can minimize the effects of the pandemic problem [2–5].

This study pointed out that adults who had symptoms associated with the covid-19 clinic had a higher prevalence of job and income loss. Such results may suggest that these adults were more exposed to infection due to the characteristic of the work they had, which demanded greater performance in the environment outside the home. Furthermore, it is likely that job loss has induced new job-seeking behavior among these adults, which may have exposed them to a greater risk of infection with SARS-CoV-2, and thus a higher prevalence of symptoms associated with this condition. Interviewee profile.

This finding reflects the characteristics of health prior to the pandemic in the state and that insertion in the labor market and income can have a protective effect on health. Particularly in Maranhão state, previous research indicates that social inequalities in the general situation of life and health are more adverse than in other states in the country and in the Brazilian Northeast. From the point of view of the state, there are still marked differences between its territories, with cities in the state with Human Development Index (HDI) among the worst in the country and similar to countries like Haiti, Laos, Yemen and Madagascar [11].

These results have limitations. Cross-sectional studies may have difficulties in establishing the direction of the associations. However, the variables associated in this study were, for the most part, demographic. It becomes consistent to assume that the loss of work and income depends more on them than the other way around. Income was not associated with the outcome. This finding differs from other studies [3]. Such difference may be due to the fact that in Maranhão the income levels do not differ so much in the population. The way information on the use of public transport was collected during the pandemic may incur a memory bias, as respondents had to remember about this behavior. Likewise, symptoms were investigated through recall, according to the month in which they were experienced. However, symptoms frequency was investigated based on those more associated with covid-19 diagnosis – anosmia/hyposmia or ageusia/dysgeusia [7].

The survey used in this research has already occurred with the almost complete reopening of the economy after the first wave of cases. and not at the peak of the pandemic. It is possible that these income conditions have changed over time. Despite these limitations. The results come from a representative sample from all of Maranhão, considering the diversity of the population sizes of their cities.

5. Final considerations

The results showed a relevant prevalence of loss of employment and income in Maranhão state and its association with individual, contextual and clinics factors. They revealed the groups and contexts most affected socioeconomically by the pandemic and which should deserve special attention from public income transfer strategies. The socioeconomic vulnerability prior to the pandemic in the state points to the need for continuous actions that increase the entry and permanence in the labor market, maximizing the socioeconomic benefits and the collective health of better levels of income and satisfaction with one's life when inserted in the market. of work and consumption.

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