Preliminary findings on the associations between mental health indicators and social isolation during the COVID-19 pandemic

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Summary

Aim: Our study investigates associations between social isolation and indicators of general mental health, well-being, depression, anxiety, loneliness, and stress in Brazilian adults. Variables to measure aspects to ease the isolation impact (ease-isolating variables) were also included.

Method: 539 Brazilian adults were recruited by convenience from March 25 to April 07, 2020. We administered a questionnaire on isolation behaviors during the COVID-19 pandemic, the WHO-5, the GHQ-12, the CLA, the GAD-7, the PSS-10, and the CES-D. To analyze data, we relied upon the network analysis approach.

Results: COVID-19 isolation variables showed positive relationships with mental health indicators, and ease-isolating variables presented mixed associations with mental health indicators. For instance, satisfaction with the quality of social interactions connected strongly and positively with the well-being variable, while negatively with loneliness and general psychological symptoms.

Conclusions: Our hypotheses were partially confirmed. We can conclude that the damage to mental health associated with social isolation during the pandemic can be minimized by maintaining satisfactory interpersonal relationships. We have three direct recommendations: mental health professionals should (a) elaborate strategies that contemplate the use of virtual tools to alleviate depressive feelings resulting from isolation, (b) give particular attention to risk groups that are most impacted by the isolation imposed by a pandemic situation and may suffer from loneliness, and (c) consider anxiety control strategies for the anxiogenic adverse reaction generated by the worldwide alert in times of disease outbreaks.

containment measures, social distancing, pandemics, psychological symptoms

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a viral infection that has become the focus of attention worldwide due to its rapid spread and the number of deaths registered in a short period. The disease was first reported in Wuhan, China's province, in December 2019, and in March 2020, the World Health Organization declared its pandemic [1]. Since then, the COVID-19 has spread to at least 213 countries, with more than four million confirmed cases, with about 320.000 deaths and almost two million people recovered (data from April 30, 2020). The mortality rate is

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variable across countries, with a mutual concern that the peak in the curve overloads health systems, causing even more lethality than expected. The countries most affected so far, besides China, are the United States, Russia, Spain, Italy, United Kingdom, Brazil, and Italy [2].

Along with the physical symptoms of COVID-19 (e.g., cough, fever, pneumonia), studies have reported negative outcomes on mental health. These outcomes go beyond those diagnosed, reaching people who are suffering multiple general prejudices of this threatening and unstable moment [e.g., 3, 4]. Increased depressive and anxious symptoms, as well as high rates of stress, were observed in samples impacted by the COVID-19 pandemic, indicating the possibility of medium and long-term impacts on the mental health of both infected and not infected people [5-10]. Empirical evidence from previous events, such as the Ebola outbreak [11-13], Severe acute respiratory syndrome [SARS; 14], and the Acquired immunodeficiency syndrome [AIDS;15], indicate the increase in symptoms of depression, anxiety, and symptoms of post-traumatic stress disorder (PTSD) in the population, extended in subsequent years to the outbreak.

Essential containment measures seem to add risks to mental health. One of the major containment measures adopted by WHO [1] is the social isolation, focusing on flattening the virus contamination curve [16-20]. It includes actions such as closing non-essential public places (e.g., stores, bars), as well as recommendations to avoid crowds and also smaller social events. The social isolation is under investigation during COVID-19, showing negative associations with mental health by increasing levels of stress, depression, and anxiety, with expectations that it will last after the pandemic [21].

An Italian study examined associations between forced social isolation and negative outcomes on people's mental health [22]. The results indicated that more time of isolation and worst local structure to spend isolation contributed to higher levels of mental health-related problems. According to [23], the COVID-19 pandemic is likely to increase the anxiety levels of populations affected by the disease, and these levels will tend to be even higher in places where lockdown measures have been adopted. Negative impacts of social isolation on mental health have also been observed in events before the pandemic, including a decrease in psychological well-being, an increase in the feeling of discomfort, especially in women and the elderly [24], as well as increased levels of anxiety, depression, and stress [14, 25, 26, 27].

This study was conducted in Brazil. The country has been seen as a case where the pandemic still has an increasing curve, while in other countries, the curve has already peaked and is now decreasing. Probably part of the aggravation of the situation in Brazil is related to the government stance, most to the Brazilian president, Jair Bolsonaro [28]. Our study investigates associations between social isolation and indicators of general mental health, well-being, depression, anxiety, loneliness, and stress in Brazilian adults. For social isolation, we included variables that measure isolation due to COVID-19 (COVID-19 isolation variables) and variables to measure aspects to ease isolation impact (ease-isolating variables). We elaborated two hypotheses for this study: h1) COVID-19 isolation variables will show positive associations with general psychological symptoms, depression, anxiety, loneliness and stress [29, 30], while negative associations with well-being indicators [29, 30]; and, h2) ease-isolation variables will show positive associations with well-being indicators, while negative associations with general psychological symptoms, depression, anxiety, loneliness, and stress.

METHODS

Participants

The sample consisted of 539 Brazilian adults recruited by convenience from March 25 to April 07, 2020. The inclusion criterion was age ≥ 18 years. A sensitivity analysis using G*Power [31] suggests that with N = 539, we have power = .99 to detect a correlation of r = |0.18| (p = .05, two-tailed). The participants' age varied between 18 and 76 years (M = 37.04; SD = 12.91), the majority being women (75.7%), from the southeast region (50.9%), and public server (27.3%) and private employer (21.3%). We also examined the presence of risk factors (e.g., chronic lung disease, diabetes) in the groups, and 28% of participants reported

being part of one or more risk groups. Details on the sample demographics are presented in Table 1.

Table 1. Demographic characteristics of the sample.

Age	Mean (SD)	37.4 (12.91)					
	Min-Max	18-76					
sex		Female	Male	Other			
	Raw	408	130	1			
	%	75,7	24,1	0.2			
Psychiatry Diagnosis		No	Yes				
	Raw	395	144				
	%	73.3	26.7				
Risk factors to COVID-19		No	One	More than one			
	Raw	388	116	35			
	%	72.0	21.5	6.5			
Number of people living with		Alone	1 or 2	3 or 4	5 or above		
	Raw	77	235	205	22		
	%	14.3	43.6	38.0	4.1		
Brazil´s region		South	Southwest	North	Northeast	Middle-west	Outside
	Raw	97	275	12	40	87	28
	%	18	51.2	2.2	7.4	16.1	5.2
Work		Public server	Private employee	Unemployed	Self-employed	Other	
	Raw	147	115	84	77	116	
	%	27.3	21.3	15.6	14.3	21.5	

MEASURES

Questionnaire on Isolation behaviors during the COVID-19 pandemic

We elaborated a survey to measure behaviors related to isolation during the COVID-19 pandemic. The questionnaire is composed by seven items, in two major fronts: COVID-19 isolation variables, including, (1) number of days in isolation, (2) if the person is part of the risk group for COVID-19, (3) if the person is practicing social distancing during the COVID-19 pandemic, and (4) level of concern with the current situation in the country due to COVID-19; and Ease-isolation variables, comprising (5) number of days with virtual interactions; (6) number of days with face-to-face interactions, and (7) level of satisfaction with current interpersonal relationships.

Five well-being index [WHO-5; 32]

The WHO-5 captures emotional well-being and was developed from the World Health Organization-Ten Well-Being Index It was conceptualized as a unidimensional measure that contains five positively worded items: "I have felt cheerful and in good spirits;" "I have felt calm and relaxed;" "I have felt active and vigorous;" "I woke up feeling fresh and rested;" and "My daily life has been filled with things that interest me." The degree to which the positive feelings were present in the last two weeks is scored on a 6-point Likert scale ranging from 0 (not present) to 5 (constantly present). The raw scores are transformed to a score from 0 (worst thinkable well-being) to 100 (best thinkable well-being). The test showed good psychometric indicators [33], and internal consistency reliability α = .92 in our study.

General Health Questionnaire [GHQ-12; 34]

The 12-Item General Health Questionnaire (GHQ-12) consists of 12 items, each one assessing the severity of a mental symptom over the past few weeks using a 4-point Likert-type scale (from 0 to 3). The score was used to generate a total score ranging from 0 to 36. The positive items were corrected from 0 (always) to 3 (never) and the negative ones from 3 (always) to 0 (never). The scale presented good psychometric indicators [35, 36], and internal consistency reliability α = .90 in our study.

UCLA loneliness scale [UCLA; 37]

The UCLA consists of 20 items to be answered using a four-point Likert scale, ranging from "nothing" to "frequently". The respondent should indicate how often he feels alone in social activities. The psychometric indicators of the UCLA are good [38], and internal consistency reliability α = .94 in our study.

Generalized Anxiety Disorder 7 [GAD-7; 39]

The GAD-7 and GAD-2 were designed for use in primary care patients. The GAD-7 consists of a self-report questionnaire that allows for the rapid detection of GAD. Subjects are asked if they were bothered by anxiety-related problems over the past two weeks by answering seven items on a 4-point scale. The GAD-7 showed good psychometric indicators [40, 41], and internal consistency reliability α = .92 in our study.

Perceived Stress Scale [PSS-10; 42]

This scale is a self-report instrument that evaluates the level of perceived stress during the last month, and consists of 14 items with a 5-point response scale (0 = never, 1 = almost never, 2 = once in a while, 3 = often, 4 = very often). The total score of the PSS is obtained by reversing the scores of items 4, 5, 6, 7, 9, 10, and 13 (in the following manner: 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0) and subsequently adding the 14 item scores. A higher score indicates a higher level of mental illness. The psychometric indicators of the PSS-10 are good [43], and internal consistency reliability α = .88 in our study.

Center for Epidemiological Studies – Depression [CES-D; 44]

The CES-D consists of 20 items and is scored from 0 (never) to 3 (daily) based on the frequency of depressive symptoms reported in the past week. Total CES-D score range from 0 (no depressive symptoms) to 60 (most frequent/severe depressive symptoms). The scale presented good psychometric indicators [45, 46], and internal consistency reliability α = .84 in our study.

PROCEDURE

The procedures of this study complied with the provisions of the Declaration of Helsinki regarding research on Human participants. All participants signed an informed consent form before participating. Data collection was performed online via Google Forms. We shared the research link on the social media website Facebook and via WhatsApp, inviting individuals to participate and relying on the snowball strategy to reach a more substantial number of participants.

Data Analysis

To investigate the relationship between social isolation variables and mental health indicators, we relied upon the network analysis approach [47]. The algorithm Fruchterman-Reingold [48] was used, a force-directed layout algorithm that considers a force between any two nodes. The nodes represent the constructs (e.g., depression, anxiety), and the edges represent the connection between the nodes. The idea is to minimize the energy of the system by moving the nodes and changing the forces between them, leaving at the core of the network the nodes with high associations, and in the peripheral zone, the nodes with low associations [49]. The associations were conducted using partial correlations, estimating the connection between two nodes considering the influence of all other components of the network. We used the least absolute shrinkage and selection operator (LAS-

SO). The LASSO method uses a way to penalize the model and prevent spurious associations from visually and statistically polluting the network. The penalty parameter used in this method is cross-validation, in which very weak associations and which do not add relevant information are reduced to zero. The figure generated by the analysis only shows the most consistent associations. The nodes represent each measure, and edges represent the strength of the relationship, where thicker edges show stronger relationships and thinner edges, weaker relationships. We conducted the analyses in JASP 0.9.

RESULTS

The connections between the variables are shown in Figure 1, and the weights of the connection are presented in Table 2.
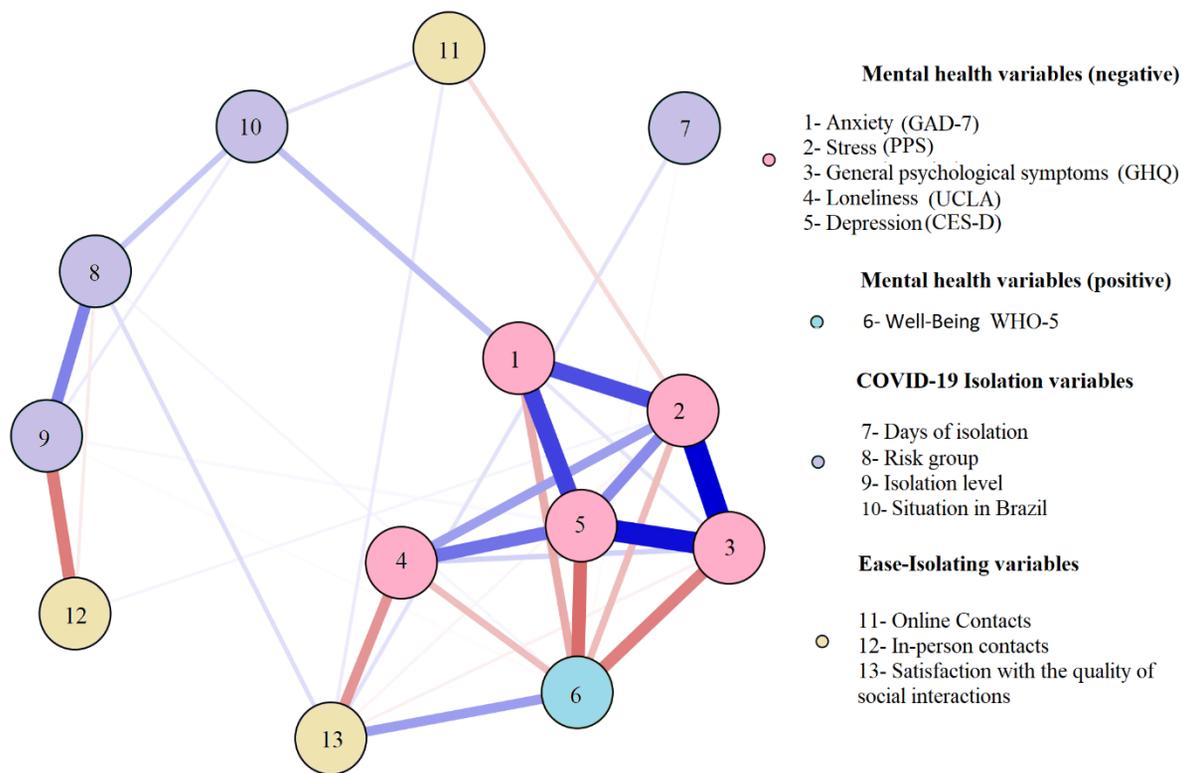

Mental health variables (negative)

1- Anxiety (GAD-7)
2- Stress (PPS)
3- General psychological symptoms (GHQ)
4- Loneliness (UCLA)
5- Depression (CES-D)

Mental health variables (positive)

6- Well-Being WHO-5

COVID-19 Isolation variables

7- Days of isolation
8- Risk group
9- Isolation level
10- Situation in Brazil

Ease-Isolating variables

11- Online Contacts
12- In-person contacts
13- Satisfaction with the quality of social interactions

Figure 1. Connections between isolation variables and mental health indicators.

Table 2. Weights of the connections.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1	0												
2	.25	0											
3	.04	.36	0										
4	0	.14	.06	0									
5	.27	.17	.34	.20	0								
6	-.12	-.10	-.18	-.10	-.21	0							
7	0	0	0	0	0	.01	0						
8	0	0	0	0	0	.01	0	0					
9	0	0	.003	0	.01	-.01	0	.18	0				

10	.09	0	0	0	0	0	0	.08	.03	0			
11	0	-.05	0	0	0	0	0	0	0	.04	0		
12	0	.01	0	0	0	0	0	-.03	-.19	0	0	0	
13	0	-.02	-.02	-.15	0	.14	.04	.05	0	0	.03	0	0

Note: 1 = Anxiety (GAD-7); 2= Stress (PSS); 3= General psychological symptoms (GHQ); 4 = Loneliness (UCLA); 5 = Depression (CES-D); 6= Well-being (WHO-5); 7 = Days of isolation; 8 = Risk group; 9 = Isolation level; 10 = Situation in Brazil; 11= Online Contacts; 12= In-person contacts; 13 = Satisfaction with the quality of social interactions.

COVID-19 isolation variables showed positive relationships with mental health indicators. For instance, the risk group variable connected with loneliness, level of isolation with depression, and concern with the situation of COVID-19 in Brazil with anxiousness. Besides, we observed an unexpected absence of a relationship of days of isolation with the positive and negative mental health indicators. Likewise, the ease-isolating variables showed expected associations, such as satisfaction with the quality of social interactions connected strongly and positively with the well-being variable, while strongly and negatively with the loneliness, and negatively with general psychological symptoms; the number of online interactions shown a negative connection with stress, and in-person contact an unexpected positive connection with stress.

It is important to note that satisfaction with the quality of social interactions was the isolation variable with the highest number of connections with mental health indicators. Besides, looking at some of the COVID-19 isolation variables connections, being part of a risk group was positive-
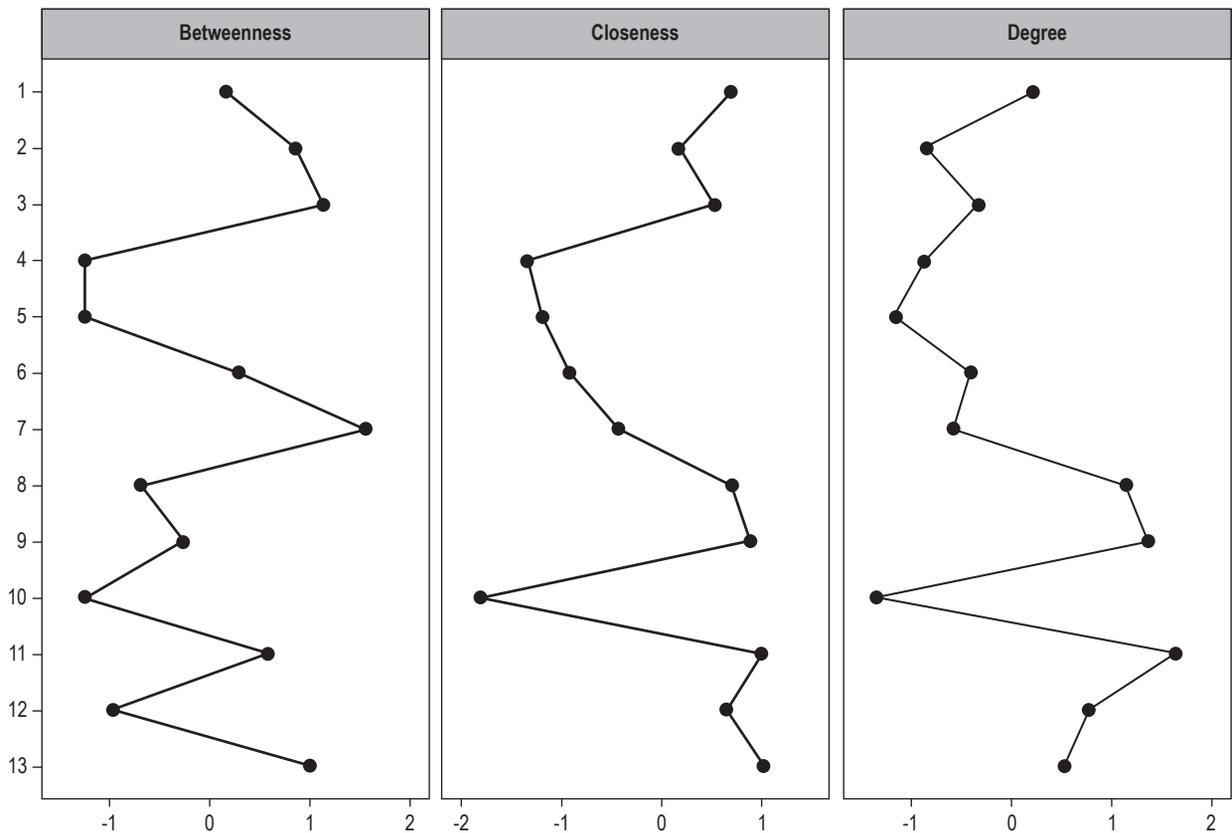

Figure 2. Centrality measures.

Note: Note: 1= Loneliness (UCLA); 2 = Situation in Brazil; 3 = Satisfaction with the quality of social interactions; 4 = In-person contacts; 5 = Online Contacts; 6 = Isolation level; 7 = Risk group; 8 = General psychological symptoms (GHQ); 9 = Stress (PPS); 10 = Days of isolation; 11= Depression (CES-D); 12 = Well-Being (WHO-); 13 = Anxiety (GAD-7).

ly connected to practicing social isolation and with concern about the COVID-19 situation in Brazil. For the mental health indicators, we observed positive connections between all the variables that indicate psychological symptoms, as well as negative association with well-being variable. Figure 2 presents the centrality measures.

The centrality measures indicated that the most central isolation variables in the network were interpersonal relationship satisfaction and risk group. Symptoms of depression, anxiety, and stress were the most central mental health variables.

DISCUSSION

Countries around the world, including Brazil, have adopted isolation measures to contain the spread of COVID-19. Evidence indicates that, despite their effectiveness [16-20], social isolation measures are associated with damage to people's mental health [21, 22]. We aimed to verify the initial impact of social isolation due to COVID-19 on the mental health of Brazilian adults, specifically depression, anxiety, loneliness, and stress. Additionally, we included variables measuring aspects to ease isolation impact. Our hypotheses were partially confirmed, as we observed some expected positive associations between COVID-19 isolation variables and psychological symptoms, while some negative connections between ease-isolating variables and psychological symptoms.

Concerning our first hypothesis, variables indicating psychological symptoms were sparingly positively associated with variables used to measure isolation due to COVID-19. These findings support our hypothesis and previous evidence indicating that the COVID-19 containment measure related to social isolation may favor psychological symptoms [21-23], as already observed in previously studied outbreaks [14, 25-27, 50]. Depression symptoms were predominantly associated with isolation, as well as loneliness were associated with risk group variable. The threatening situation generated by the pandemic feasibly explains these findings, as well as the greater restrictions that accompany groups of risks. Besides, the association between anxiousness symptoms with the situation of COV-

ID-19 in Brazil variable follows previous evidence showing anxiety directly related to general worry [51, 52]. Moreover, the population in Brazil is beginning to be hit more widely with the pandemic [2], which is undoubtedly an anxiogenic situation.

We also noticed that the number of days in isolation was unexpectedly unconnected to psychological symptoms. Given this unexpected finding, we considered two explanatory alternatives. First, the momentum of the pandemic in Brazil when data were collected should be considered. Although with expectations of a peak and incentives for isolation, it was still more partial and initial social isolation, with no extreme forced measures for lockdown. And second, the positive association between perception of current interpersonal and days of isolation indicate social support as a factor correlated with adhering and spending isolation time. The social support as a protective factor to the presence of psychological symptoms may be the explanation for the absence of association between days of isolation and psychological symptoms. We suggest future investigations to address this hypothesis.

On the subject of the second hypothesis, we can understand that satisfaction with current interpersonal relationships and time spent interacting online are aspects that seem to prevent psychological symptoms in times of social isolation and favor well-being. We especially have drawn attention to the level of satisfaction with the social interactions that showed strong associations with lower levels of loneliness and general psychological symptoms, as well as with higher levels of well-being. Our findings indicate that maintaining satisfying social relationships, even at a distance (e.g., video conferencing), is a means to lessen the impact of social isolation on feelings of loneliness and on exacerbating psychological symptoms. Online social interactions also seem to prevent psychological symptoms, as it shows a negative association with stress. The internet can operate as an essential tool in the current situation, allowing social interactions in time, and helping in the management of psychological symptoms [53]. Our findings reaffirm the WHO recommendation [1] regarding the maintenance and expansion of the contact network using social media, given the need for social isolation.

Based on the study's findings, we can conclude that the damage to mental health associated with social isolation during the pandemic can be minimized by maintaining satisfactory interpersonal relationships. These relationships can be preserved through the use of digital technology. Besides, we recommend attention to the levels of depression, loneliness, and anxiety. Symptoms of depression are associated with high levels of isolation, concern with the pandemic with anxiety symptoms, and risk group with feelings of loneliness. Based on these findings, we have three direct recommendations. Mental health professionals should (a) elaborate strategies that contemplate the use of virtual tools to alleviate depressive feelings resulting from isolation, (b) give particular attention to risk groups that are most impacted by the isolation imposed by a pandemic situation and may suffer from loneliness, and (c) consider anxiety control strategies for the anxiogenic adverse reaction generated by the worldwide alert in times of disease outbreaks. Furthermore, we can only hope political leaders in Brazil review their current posture towards the COVID-19 pandemic, and based on robust scientific evidence, adopt the best strategies that focus on the psychological and physical well-being of the population.

Our data collection was carried out at the beginning of the adoption of the containment measures in Brazil. Consequently, our findings were maybe milder compared to studies where data were collected after a more extended period of social isolation. The main limitations of this study should be noted. First, social isolation was assessed with only one item for each indicator, which may have restricted the coverage of behaviors; second, many people were not yet practicing social isolation, both because of the pandemic and because of the divergent indications of the federal government; third, indicators of symptoms of post-traumatic stress and suicide were not collected, which we recommend for future studies based on previous evidence [54, 55]; and fourth, the design used in this study (i.e., cross-sectional) does not allow establishing causal associations, therefore, in future studies, longitudinal studies should be conducted to investigate possible causal relationships.

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