

## Article

# COVID-19 Pandemical Period: Issues and Strategies to Make Sustainable Socialization and Recreation for Elderly People in Long-Term Care Institutions

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**Abstract:** The usual lives have been changed since the COVID-19 Outbreak took place. Elderly people suffer as much as others and their lives have been impacted a lot. This paper aims to analyze the social network use and the recreation and socialization activity participation before and after the COVID-19 pandemical appearance in long-term care institutions. In the empirical side of this research, the authors of this paper sent an email questionnaire to long-term care institutions located in Rio de Janeiro city, Brazil. In the theoretical side of this research, an investigation was carried out through the scientific databases. Data were analyzed using the programming languages Python, Excel, and IBM SPSS Statistics. As a result, this paper shows an apparent increase in social network use and a drop in recreation and socialization activity participation after the COVID-19 pandemical appearance in long-term care institutions. The presented findings are the first step, which can be part of future studies analyzing the potential growth in social network use among elderly people by comparing elderly residents with non-residents in the long-term care institutions.



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**Keywords:** COVID-19; industry 4.0; elderly care; healthcare; recreation and socialization activity; social network; long-term care

## 1. Introduction

Elderly people are also users of the internet. According to the Brazilian Institute for Geography and Statistics (IBGE) [1], in 2018, around 2.3 million people aged 60 or over accessed the internet for the first time in Brazil [2]. It is important to realize that the Brazilian population is ageing, so, attention should be given to the potential internet access growth of the elderly group, which currently represents around 31.1% [2]. The ageing population is also boosting the demand for long-term care (LTC) institutions.

According to the Brazilian National Health Surveillance Agency ANVISA [3], LTC institutions are governmental and non-governmental institutions designed to provide comprehensive residential care with conditions of freedom and dignity [3].

This paper aims to analyze social network use and the recreation and socialization activity participation before and after the coronavirus (COVID-19) pandemic in elderly care institutions located in Rio de Janeiro city, Brazil. As an emerging country, data raised in Brazil can serve as a base to understand the COVID-19 phenomenon in other emerging countries. This paper has six sections, including this introductory one. Section two brings the theoretical background, section three presents the materials and methods, section four presents the results and discussions, and the final section concludes and presents the prospects for future studies.

## 2. Theoretical Background

The Theoretical background section brings theoretical support for this research by analyzing 37 papers found in the scientific databases. The section has two parts: “The elderly care institutions” and “industry 4.0” and “healthcare.”

### 2.1. The Long-Term Care Institutions

Since the beginning of the millennium, Brazil was already a country of old people [4]. According to data provided by the Brazilian Institute for Geography and Statistics, in 2060, the number of elderly people will increase in the Brazilian population, which can be more than the younger population, according to index provided by the IBGE [2].

Brazil could reach more than 30 million elderly people and could be the country with the sixth higher elderly population. The main reason for this increase is due to the demography, technological advance, and fertility rate decrease [5]. The long-term care institutions take care of elderly people of both genders aged 60 and over with residential characteristics, as a collective place, giving them a kind of freedom, dignity, and socialization, where elderly people can stay for a long time with adequate physical structure that can promote socialization. Its aim is the development of a relationship closer to the family environment as well as social interaction between the elderly people and people in the community [6].

The first LTC institution had to provide elderly soldiers with a decent and quiet life. Later LTC institutions are an alternative place which take care of people that tend to be naturally more dependent, fragile, and often bear debilitating diseases, such as Alzheimer’s, which generates a great burden on the caregiver [7].

In Brazil, there is no consensus on what LTC institutions are. This is because they originate from asylums and were initially intended for people with no money, who needed shelter, and had no possibility to stay with families or charities due to the lack of public policies. The lack of policies justifies the absence of financial resources and homelessness that are among the most important reasons to the LTC institutions, as well as the fact that the majority of the Brazilian LTC institutions are philanthropic (65.2%) [8]. In Creutzberg et al. [9], there was a trend in the growth of the demand for the LTC institutions in Brazil, although policies prioritize the family as the main signatory of care for the elderly.

With the appearance of the COVID-19 pandemic and the required social isolation to avoid the contagion, a great part of the LTC institution’s residents started suffering from depression, anxiety, worsening dementia, failure to thrive, feeling of despair, and cognitive decline [10–18]. Office et al. [19] described that many efforts were made to keep the residents engaged and one of them was the phone call program, developed by volunteers, which aimed to overcome health problems caused by social isolation.

Several countries have introduced different strategies to combat the COVID-19 pandemic in elderly people [20]. For example, Italy divided the elderly into four groups: the ones that are not able to express their will; the ones who, due to varying degrees of incapacitation, have their own legal guardian; the incapacitated ones without legal representatives; and the ones who, due to the law, have appointed their own trustee [20]. With this strategy, the Italian Health Ministry has protected and sped the vaccination among the elderly people in the country.

### 2.2. The Industry 4.0 and Healthcare

The industry 4.0, also called the Fourth Industrial Revolution, encompasses a broad system of advanced technologies, such as artificial intelligence, robotics, the internet of things, and cloud computing, that are changing production methods and business models in Brazil and around the world [21]. The concept of industry 4.0 is based on the integration of several innovative technologies, revolutionizing the way processes are carried out in organizations. It has caused impacts and changes in the current production model and work dynamics, as well as causing adaptations in labor systems [22]. Its effects and impacts in Brazil are numerous. The industry 4.0 has proposed a new production reality, where everything within an industry will be connected to make the best decision-

making regarding production, cost, and safety [22]. The industry 4.0 has been presenting technologies that contribute to system improvement in waste, rework, unnecessary discards terms [23], and understanding customers' preferences better [24].

The highlight goes to the healthcare sector. Santos et al. [25], Laplante & Laplante [26], Wolf & Scholze [27], Mariano et al. [28], Kumari et al. [29], Dau et al. [30], Javaid et al. [31], Arthur-Holmes et al. [32], and Aceto et al. [33] discussed the connection between industry 4.0 and the healthcare sector. Santos et al. [25] presented a new m-service architecture, by using radio frequency (RFID) identification tags structured around the internet of things. The expectation is to establish a remote medication control. Caceres et al. [34] showed the concept of e-health. According to them, the use of industry 4.0 principles improves gaps in the traditional healthcare. Aceto et al. [33] added that the industry 4.0 phenomenon is growing in the healthcare sector and a transition to e-health has already started. The authors affirmed that the healthcare sector is boosted by the growth of the population and that the expectation is to improve service quality with the use of industry 4.0 principles. Following this idea, Branger & Pang [35] observed the combination of technological concepts within the healthcare sector. The results were concepts such as pervasive healthcare (*p*-health), ubiquitous healthcare (*u*-health), mobile health (*m*-health), telecare, and telemedicine that will bring extraordinary change to the healthcare sector in the coming years. Scavarda et al. [36] added that modalities, such as e-health, m-health, e-business, m-learning, and m-business, can promote perspectives for new learning and new business. For Laplante & Laplante [24], Elhoseny et al. [37], Kumari et al. [29], and Graham & Jones [38], the adoption of technologies as cloud computing and IoT is a challenge for the healthcare sector. Monteiro et al. [39] added that the healthcare centers must discuss the technological challenges involved in the strategy. For Rocha et al. [40], the dissemination of the mobile internet has contributed to new possibilities for transmitting information and transforming the patient-healthcare professional relationship. The new possibilities allow the exchange of diagnostic parameters in a remote and real-time manner. Laplante & Laplante [24] added that there are applications of industry 4.0, especially IoT, that promise to improve patient experience and optimize workflow and resources use. For Monteiro et al. [39], Dias et al. [41], Scavarda et al. [42], and Arcidiacono and Pieroni [43], the application of technological concepts can improve the healthcare quality of services for patients. Wolf & Scholze [27], Barbosa et al. [44], Dias et al. [45], and Azevedo et al. [46] affirmed that these technologies can provide structures that are more efficient.

The industry 4.0 will provide innovative technologies to fight against the COVID-19 pandemic according to Javaid et al. [33,47,48]. It includes technologies that are destined for PPE (Personal Protection Equipment) confection, such as gloves and mask, to conduct medical diagnosis, to communicate [31], and to produce the 3D-printed protective face shield [49,50].

Smith et al. [51] strengthened this idea, affirming that telehealth use was reinforced after the COVID-19 pandemics appearance and Belzunegui-Eraso et al. [52] affirmed that the teleworking adoption is a response to the requirements of the COVID-19 threat, while Arthur-Holmes et al. [32] added that tools, such as m-health and e-health, became a reality in the pandemic and post-pandemic period. The World Health Organization (WHO) outlines recommendations for the surveillance of the COVID-19 in humans. Among the recommendations are to restrict contact; to do hygiene procedures, such as washing hands frequently; and to avoid being in crowded places [53,54]. COVID-19 is a disease caused by the SARS-CoV-2 coronavirus, which presents a clinical picture that varies from asymptomatic infections to severe respiratory conditions [55]. Javaid et al. [31] affirmed that the COVID-19 pandemic affected almost all countries and made a significant change in healthcare institutions and treatment systems. The restriction of contact is also among the recommendations of the National Front for Strengthening Elderly Care Institutions, a front created to meet the needs of LTC institutions due to the COVID-19 pandemic [54]. The front advice is that contact between the residents in LTC institutions and loved ones should be encouraged through social networking [55]. Humans are social in nature and one of the

ways of characterizing is through social network interaction [56]. Rockcontent [57] added that social media use facilitates interpersonal relationships.

### 3. Materials and Methods

In the empirical part, the authors of this paper sent an email questionnaire to the 65 LTC institutions located in the Rio de Janeiro city. All the LTC institutions agreed to take part in the investigation and have their data published without revealing the institution's name and the name of the professional who answered the questionnaire (Appendix A). The institutions received a thank you email (Appendix B). To bring the theoretical support for this research, the authors of this paper developed a survey in a scientific database considering the terms: elderly care, industry 4.0, and healthcare. This search expression found 152 papers, of which, 37 were selected to compose this paper. There was no limitation to year of publication for this sample and the congress papers were also included. The 37 selected papers were read, analyzed, and summarized.

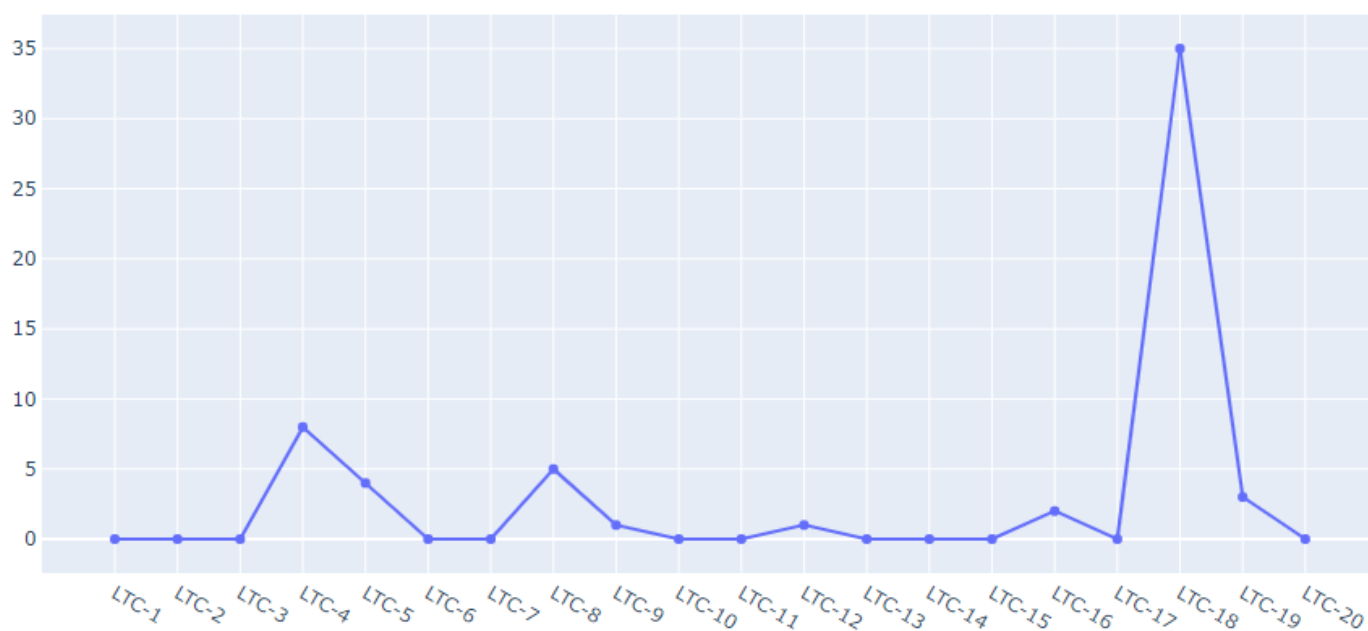
#### *The Empirical Research*

In the empirical stage of this paper, the 65 long-term institutions from Rio de Janeiro city, Brazil, received an email questionnaire with six questions (Appendix A). The LTC institutions' names were obtained through a list from the Open University of the Third Age (UNATI) from the Rio de Janeiro State University (UERJ) [58]. Based on this list, the authors of this paper called the institutions to get their emails. On 15 May 2020, the authors of this paper sent the emails, and due to the low return rate, the email send period was extended until 25 May 2020. The questions considered the LTC institution's capacity, the number of residents, the social network use, the residents' participation in recreational and socializing activity, and the recycling practices before and after the COVID-19 pandemics appearance. The questions also inquired the number of infected, suspected, and deaths from the COVID-19 in the institutions. For this paper, the authors analyzed the questions related to the use of social networks and recreational and socializing activity participation. The methodology used the high-level programming languages: Python, Excel, and IBM SPSS Statistics to reach the conclusions. The statistical evaluation used IBM SPSS Statistics for Windows (Version 22.0. Armonk, NY, USA: IBM Corporation). The descriptive analyses were made by descriptive statistics (proportions, rates, minimum, maximum, mean, median, standard deviation, and coefficient of variation-CV). The comparison of repeated measures was performed using a non-parametric approach, using the Wilcoxon's test, while the McNemar test was used for repeated categorical variables. The statistical significance assumed a 5% level.

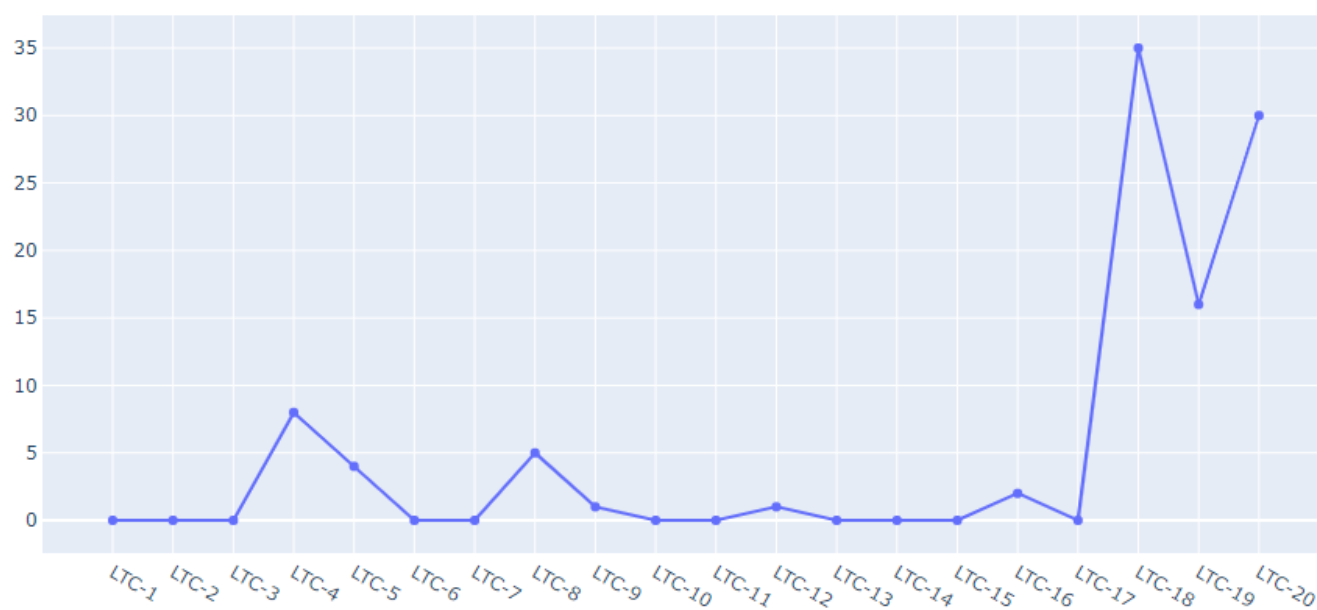
From the 65 surveyed institutions, 41.5% (27 LTC institutions) returned the inquiry. Thirty-two percent of the institutions answered the questionnaire (21 LTC institutions), 4.6% (3 LTC institutions) said that they could not answer due to the lack of time, and 4.6% (3 LTC institutions) requested for further information but ended up not returning afterwards. One of the institutions put "zero" for all answers, because of this fact, the data of this institution was not considered. The results of this paper comprised a sample of the 20 LTC institutions.

### 4. Results and Discussions

This section presents the findings of the research, and it is based on questions 4A, 4B, 5A, and 5B from the email questionnaire sent to the elderly care institutions (Appendix A). The questions refer to social network use and recreational and socializing activity participation by residents before and after the COVID-19 pandemics appearance. Questions 4A and 4B were "How many residents used the social network before the COVID-19?" and "How many residents use the social network after the COVID-19 pandemics appearance?", respectively (see Figures 1 and 2).



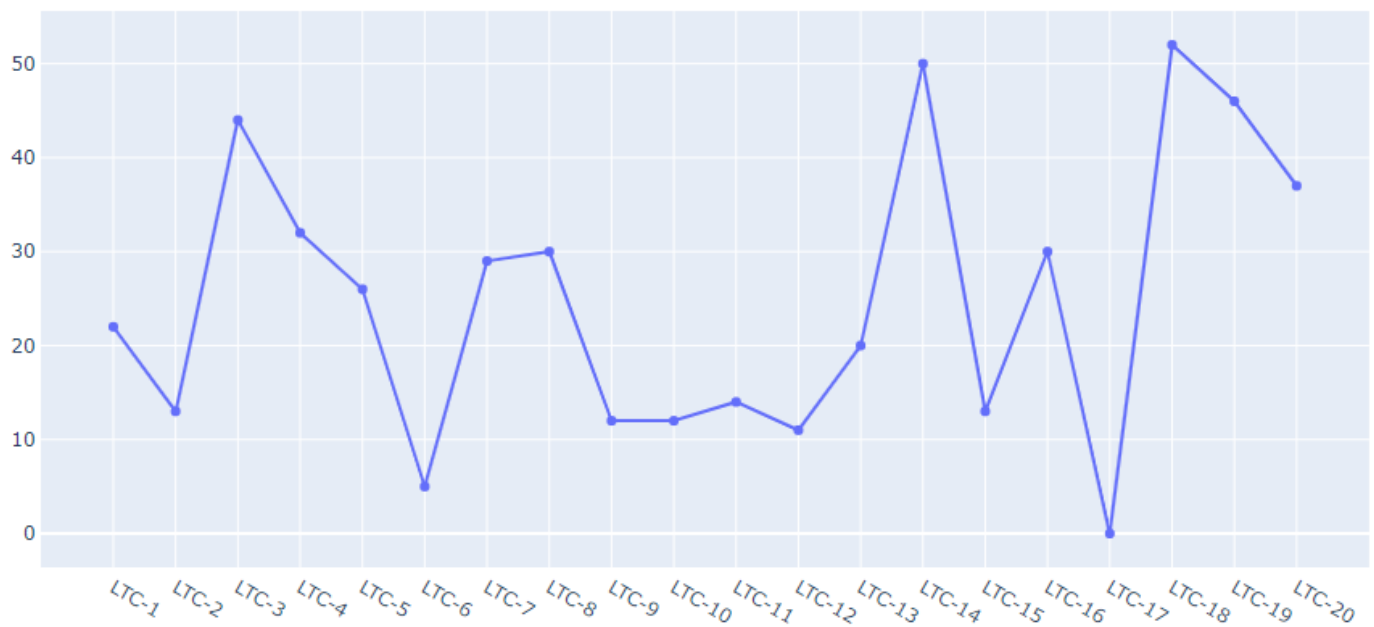
**Figure 1.** The number of residents using social networking before the COVID-19 pandemic.



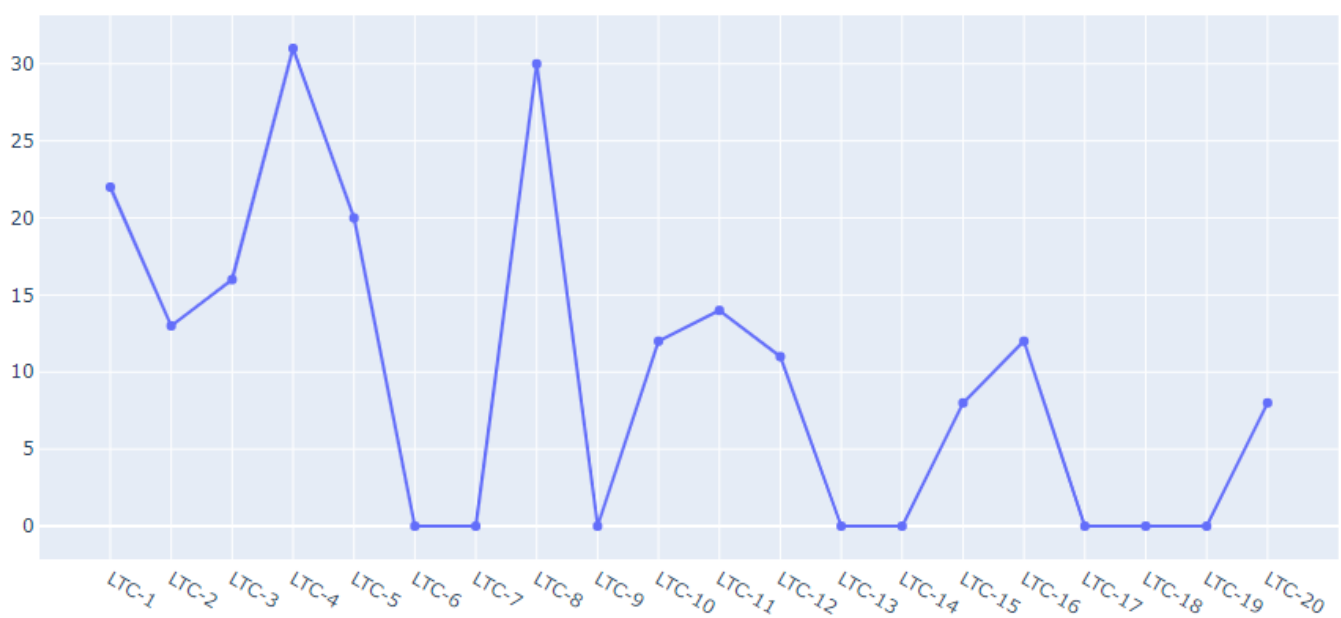
**Figure 2.** The number of residents using social networking after the COVID-19 pandemic.

The number of people who had used social networks in elderly care institutions had high variability ( $CV > 0.4$ ) in the range of 0 to 35 people, both before and after the COVID-19 pandemic appearance. The average was 24.90 people before the pandemic and 9.85 people after the COVID-19 pandemic appearance. Comparing the number of people who had used social networks before and after the appearance of the COVID-19 pandemic using Wilcoxon's test resulted in a  $p$ -value = 0.180. In total, the institutions had 59 residents using social networks before the pandemic and 102 residents using social networks after the COVID-19 pandemic appearance. The overall increase in the number of residents who had used social networks was 72.88%. The global percentage of residents who used social networks before the pandemic was 9.31% which became 15.87% after the COVID-19 pandemic appearance.

Questions 5A and 5B were “How many residents participated in recreational and socializing activity before the COVID-19?” and “How many residents participate in recreational and socializing activity after the COVID-19 pandemics appearance?”, respectively (see Figures 3 and 4).



**Figure 3.** The number of residents participating in recreational and socializing activities before the COVID-19 pandemic.

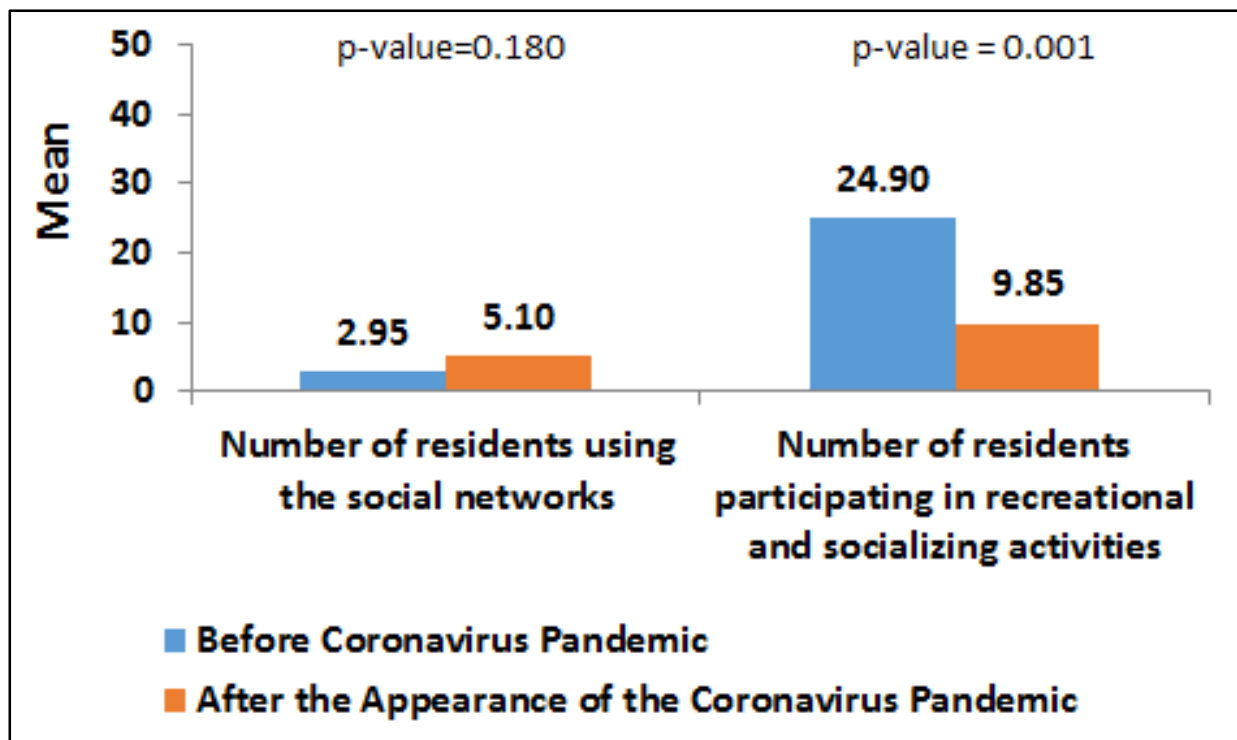


**Figure 4.** The number of residents participating in recreational and socializing activities after the COVID-19 pandemic.

The number of people who have participated in recreational and socializing activities in elderly care institutions had high variability ( $CV > 0.4$ ) at both times before the pandemic (range from 0 to 52 people) and after the COVID-19 pandemics appearance (range from 0 to 31 people). The average was 2.95 people before the pandemic and 5.10 people after the COVID-19 pandemics appearance. By comparing the number of people who had partici-



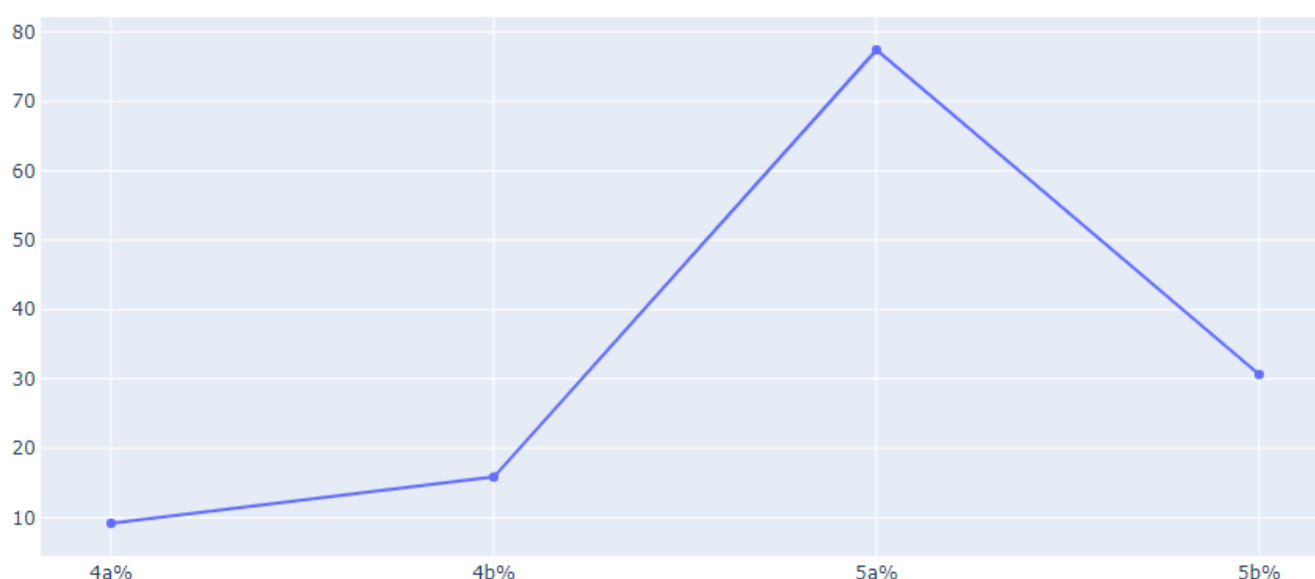
pated in recreational and socializing activity before and after the COVID-19 pandemical appearance, Wilcoxon's test resulted in a  $p$ -value = 0.001. In total, the institutions had 498 residents participating in recreational and socializing activity before the pandemic and 197 residents participating in recreational and socializing activity after the COVID-19 pandemical appearance. The overall decrease in the number of residents who had participated in recreational and socializing activities was 60.44%. The global percentage of residents who participated in recreational and socializing activities before the COVID-19 pandemic was 78.55%, which became 15.87% after the COVID-19 pandemical appearance. Figure 5 shows the comparison between the number of people who had used social networks and the number of people who had participated in recreational and socializing activities before and after the COVID-19 pandemical appearance.



**Figure 5.** The number of residents using social networks and the number of residents participating in recreational and socializing activities before and after the COVID-19 pandemic.

Figure 6 summarizes, in percentage terms, the two issues raised by this research: the social network use and the number of residents participating in recreational and socializing activity before and after the COVID-19 pandemical appearance.

This paper shows that a few elderly people have surrendered to technology. This fact can be attributed to the lack of condition of the LTC institutions in offering access to the technology and the physical condition of the elderly. Many residents suffer from dementia and other age-related illnesses that make it difficult to access the technology, which might be surpassed with the technology's advancements.



**Figure 6.** The percentage of questions 4A, 4B, 5A, and 5B before and after the COVID-19 pandemic.

According to the LTC institutions, every resident used to take part in the recreational and socializing activities, but due to the COVID-19 pandemics appearance, with a minimum distance of one or two meters between them, the activities had to be adapted to reduce the residents time in common areas and to avoid the use of shared material. As for socialization activities, it is possible to notice that there had been extremely strict care on the part of the LTC institutions regarding this practice. Several institutions indicated that they tried to continue with the recreational and socializing activities; however, using groups with a maximum of eight people per shift and always maintaining the proper distance. The strategy was contemplated even in the LTC institutions where there were no cases or suspected contamination, which demonstrates adequate professional care with the residents. Table 1 shows the main statistics on the number of residents using social networks and the number of residents participating in recreational and socializing activities in elderly care institutions before and after the COVID-19 pandemics appearance.

**Table 1.** The main number of residents using social networks and the number of residents participating in recreational and socializing activity statistics.

Variable	Minimum	Maximum	Median	Mean	Standard Deviation	Sum	Coefficient Variation
The number of residents using the social networks before Coronavirus	0	35	0.0	2.95	7.85	59	2.66
The number of residents using the social networks after the appearance of the Coronavirus pandemic	0	35	0.0	5.10	10.19	102	2.00
The number of residents participating in recreational and socializing activities before the Coronavirus pandemic	0	52	24.0	24.90	15.25	498	0.61
The number of residents participating in recreational and socializing activities after the appearance of the Coronavirus pandemic	0	31	9.5	9.85	10.16	197	1.03

The linear progression for the residents' participation in recreational and social activity was around 92.7% (see Figure 7). It means that after the end of the COVID-19 pandemic, the expectation of resuming their participation in recreation and social activity was 92.7%.



## SUMMARY RESULTS

Regression Statistics	
Multiple R	0.962870078
R-Square	0.92718788
R-square adjusted	0.923282934
Std error	11.63965666
Observations	21

ANOVA					
	df	SQ	MQ	F	F signification
Regression	1	3274565899,00000000	3274565899,00000000	2416981884,00000000	0.00000000000292765
Residuals	19	2574150534,00000000	1354816071,00000000		
Total	20	3531980952,00000000			

	Coefficients	Std error	Stat t	P-value	95%lower	95%higher	Less than 95.0%	Over 95.0%
Intersection	0.362478186	280217291,00000000	0.129356109	0.898435451	-5502537119,00000000	622749349,00000000	-5502537119,00000000	622749349,00000000
Recreative and Social Activities	0.387939717	0.024953275	1554664557,00000000	0.00000000000292765	0.335711913	0.440167521	0.335711913	0.440167521

**Figure 7.** The linear progression for the residents' participation in recreational and social activity.

The linear progression for the use of social networks was around 86.1% (see Figure 8). This means that after the end of the COVID-19 pandemic, the possibility of using social networks again was 86.1%.

SUMMARY RESULTS								
Regression Statistics								
Multiple R	0.928065277							
R-Square	0.861305159							
R-square adjusted	0.854005431							
Std error	8.925879343							
Observations	21							
ANOVA								
	df	SQ	MQ	F	F signification	F signification		
Regressions	1	9400.530595	9400.531	117.9914	1.36638E-09	1.000000001		
Residual	19	1513.755119	79.67132					
Total	20	10914.28571						
	Coefficients	Std error	Stat t	P-value	95% lower	95% higher	Less than 95.0%	Over 95.0%
Intersection	1.270481115	2.097173212	0.605806	0.551812	-3.118952865	-2.118952865	-3.118952865	5.659915094
Networks use before	1.502710988	0.138340802	10.86238	1.37E-09	1.213160361	2.213160361	1.213160361	1,792261615

**Figure 8.** The linear progression for social network use.

## 5. Conclusions and Future Work

The number of people who used social networks and the number of people who participated in recreational and socializing activities present high variability within these 20 elderly care institutions. The statistics show an increase in the number of residents using social networks ( $p$ -value 0.180) and a decrease in the number of residents participating in recreational and socializing activities ( $p$ -value 0.001). The change in the way of socialization shows that the activity is fundamental to maintaining sustainable relationships inside and outside the LTC institutions, allowing the internal elderly to be in touch with their loved ones.

The authors of this paper point out that social networks can be used to ease the suffering caused by the social withdrawal and that there is a potential market in LTC institutions for this service. The lack of social network use in elderly care institutions is due to factors inherent to elderly age and the impossibility of the institutions to offer the service.

For future studies, the expectation is to analyze the potential growth in social network use among elderly people by comparing the elderly residents and non-residents in the elderly care institutions and to verify which technologies would favor this growth. Moreover, the authors of this paper plan to expand this investigation to other Brazilian states and to other emerging countries and to add demographic information about the LTC institutions that responded to the survey.

**Author Contributions:** Conceptualization, A.S. and A.D.; methodology, A.D., A.S., A.F.; software, A.D., A.F.; validation, A.S., A.D. and A.d.C.R.; formal analysis, I.S.; investigation, A.D.; resources, I.S.; data curation, A.d.C.R.; writing—original draft preparation, A.D.; writing—review and editing, A.d.C.R.; visualization, A.F.; supervision, A.S.; project administration, I.S.; funding acquisition, A.F. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** This study was conducted according to the parameters established by the ethics committee of the Federal University of Rio de Janeiro (Brazil) through the number 32959020.9.0000.5285. Opinion number: 4476475.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Acknowledgments:** To the LTC institutions that, despite their activities, collaborated with our study and to all the professionals that worked hard trying to reduce the impacts of COVID-19 in elderly care institutions.

**Conflicts of Interest:** The authors declare that there is no conflict of interest with the topic addressed.

## Appendix A

Dear Long-Term Care Institution

I am a doctoral degree student at the Federal Center for Technological Education Celso Suckow da Fonseca—CEFET/RJ. I research the coronavirus pandemic (COVID-19) associated with elderly people living in elderly care institutions and I invite you to participate in the study by answering the questions below. This study aims to help better understand what is happening in the LTC institutions and your response in the shortest possible time will help to share the data. If you need, you can send an email (missdias@gmail.com) or call (21-999525855) me. Thank you!

I authorize the results of this study to be presented and published in events and magazines, knowing that my name and my institution will be kept strictly confidential.  
( ) Yes No ( )

1a-What is the capacity of your elderly care institution before the COVID-19 pandemic?

1b-What is the capacity of your elderly care institution after the COVID-19 pandemical appearance?

2a-What is the number of residents at the elderly care institution before the COVID-19 pandemic?

2b-What is the number of residents at the elderly care institution after the COVID-19 pandemical appearance?

3a-What is the number of infected with COVID-19?

3b-What is the number of suspected cases with COVID-19?

3c-What is the number of deaths from COVID-19?

4a-How many residents used the social network before the COVID-19 pandemic?

4b-How many residents use the social network after the COVID-19 pandemical appearance?

5a-How many residents participated in recreational and socializing activities before the COVID-19 pandemic?

5b-How many residents participate in recreational and socializing activities after the COVID-19 pandemical appearance?

6a-Did your elderly care institution practice recycling before the COVID-19 pandemic?  
( ) Yes No ( )

6b-Does your elderly care institution practice recycling after the COVID-19 pandemical appearance?

( ) Yes No ( )

## Appendix B

Dear Long-Term Care Institution

Thank you very much for your contribution. Your participation was extremely important for our research. You will receive the results of the study soon.

Best regards,

The Authors

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