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Empirical analysis on the efficiency of masks and 70% alcohol in fighting Coronavirus: an analysis for the service sector

Análise empírica sobre a eficiência das máscaras e álcool 70% no combate ao Coronavírus: uma análise para o setor de serviços

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Abstract: In 2020, the Covid-19 pandemic began and several measures were established to contain the contagion of the disease, including the use of masks and 70% alcohol. In Brazil, the service sector suffered the greatest impact of the measures adopted and, in this context, the investigation aimed to verify whether the use of masks and 70% alcohol was effective in reducing the contamination of workers in this sector. When estimating the probability ratio, using the PNAD Covid 2020, the results show that the use of masks and 70% alcohol reduces the probability of contamination by 54.70%.

Keywords: Pandemic. Logit model. Odds Ratio.
JEL classification: I1; C25.

Resumo: Em 2020 o mundo iniciou a pandemia da Covid 19 e diversas medidas foram estabelecidas para a contenção da contaminação da doença, entre elas a utilização de máscaras e álcool 70%. No Brasil, o setor de serviços sofreu o maior impacto das medidas adotada e, nesse contexto, a pesquisa teve por objetivo verificar se o uso máscaras e álcool 70% foram efetivos na redução da contaminação de trabalhadores desse setor. Mediante a estimação da razão de chances, empregando a PNAD Covid de 2020, os resultados mostram que uso de máscaras e álcool 70% reduziam em 54,70% a probabilidade de contaminação.

Palavras-Chave: Pandemia. Modelo Logit. Razão de Chances.
Classificação JEL: I1; C25.

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1. Introduction

Covid-19 (SARS-CoV-2) was discovered at the end of December 2019 in the Whuan region of China. Over the weeks, the highly transmissible disease reached many other countries around the world, such as Italy, which had great difficulty in controlling Covid, as this disease mainly affects the elderly population, which is abundant in the country in question.

The first confirmed case of Covid in Brazil appeared only in February 2020; however, the imposition of decrees with the aim of restricting the movement of individuals began in March 2020. As the virus spread throughout the country, the application of more restrictive measures on the movement of people became the main tool in the fight against the spread of the disease, which could lead to a general collapse of the national health system.

In addition to restrictive measures on the movement of people, such as reduced business hours, a ban on the use of public spaces and a curfew, the decrees, which were mostly issued by city councils, also stipulated that establishments should generally provide 70% alcohol for hand hygiene and made the use of masks compulsory, both for the movement of people in public spaces and for entering establishments.

The use of 70% alcohol for hand hygiene and the adoption of the use of masks were great allies in combating the transmission of the Covid-19 virus to the general population. They were also crucial for the resumption of economic activity in all sectors, even if only partially. By employing the use of artifacts that reduced the likelihood of transmission of the virus between individuals, the detrimental impact of the antagonistic situation identified throughout the pandemic, in which restrictions aimed at maintaining distance ultimately hindered economic activity, was mitigated.

Using the framework presented above, the objective of this study is to verify the effectiveness of using 70% alcohol and a mask in reducing the rate of virus transmission in the service sector. To this end, an analysis will be presented using odds ratio estimates, which will seek to demonstrate the real impact of the use of the above artifacts in reducing contamination, specifically in the service sector.

2. Theoretical Framework

The Covid-19 pandemic, which became known to the world in December 2019, presented the entire planet with a relatively complex trade-off. In order to contain the spread of a virus that spreads at an exponential rate, several measures were needed to restrict the free movement of individuals in order to achieve social distancing. In turn, the drastic reduction in consumption across the planet due to the restrictive measures taken to contain the spread of Covid-19 has led to a deep global economic crisis.

Given this scenario, all countries were affected to some extent by the need to contain the spread of the Covid-19 virus. The result, according to World Bank estimates (BANCO MUNDIAL, 2021), was a 3.5% decline in global GDP in 2020. In turn, the

impact on emerging economies was also negative, but they presented a less pessimistic scenario with an average decline in GDP of 1.7% in 2020 (World Bank, 2021).

As for the Brazilian scenario, the results were not so optimistic, as the decline in GDP in 2020 was 4.1% (IBGE, 2021)[1]. This result was worsened by the need to apply numerous social distancing measures, from curfews, with the aim of limiting the hours that individuals could circulate, to cases of lockdown in the face of the worsening situation of contamination in certain regions of the country.

Among the sectors that make up the Brazilian economy, agriculture was the least affected, growing by 2.0% in 2020. This was due to production growth and productivity gains in agriculture. Soybean (7.1% growth) and coffee (24.4% growth) production helped the sector maintain its positive growth rate (IBGE, 2021). However, the impacts of the Covid-19 pandemic were not directly felt by this sector, as work in the field is dispersed and does not involve large crowds.

As for the industrial sector, it shrinks by 3.5% in 2020, with the civil engineering sector standing out (-7.0%). Some of the manufacturing sectors that contributed to the strong negative result were: metallurgy; clothing; other transport equipment; and motor vehicles. Therefore, it is observed that the reduced economic activity and social isolation ended up affecting the industry's performance in the country in 2020 (IBGE, 2021).

Nevertheless, the service sector suffered a 4.5% reduction in value added in 2020. The negative highlights were: other service activities; transport, storage and mail; administration, defense, public health and education and social security; and retail. The impact of the Covid-19 pandemic on Brazilian families is evident, through the area of other service activities, which shrank by 12.1%, with an emphasis on transportation. In turn, the result has a significant impact on the Brazilian economy due to the service sector's share of GDP, as this segment of the economy contributed with approximately 63% (R$ 4.7 trillion) of the country's GDP in 2020[2] (IBGE, 2021).

On the other hand, the service sector is to a large extent distributed among small businesses and presents a relevant link with other economic activities (Deloitte, 2020). Thus, the need to adapt to the pandemic scenario became a priority for the continuity of activities, so that, in addition to not harming service providers, such measures were necessary to avoid or at least mitigate negative effects on other actors in related sectors.

Faced with this complex scenario, the government, at various levels, has issued various decrees imposing restrictions to reduce the virus transmission levels. The spread of coronavirus can occur through direct contact with an infected agent, through droplets expelled through the mouth and nose, and also through indirect contact, in which the person

[1] The GDP forecast for 2021, as reported by the Central Bank of Brazil based on the IBC-Br, was estimated to increase by 4.5% (BCB, 2022).

[2] The contributions of the other sectors in the composition of GDP were:

- Agriculture: 6% (439.8 billion R$);
- Manufacturing: 18% (1.3 trillion R$);
- Taxes on Products Net of Subsidies: 13% (1 trillion R$).

touches an infected surface and puts their hands in contact with their mouth, eyes or nose (Fernandes *et al*., 2020; Silva *et al*., 2020).

In turn, coronavirus containment measures have included a number of restrictions. Among these, isolation of infected people and social distancing were some of the most basic containment measures taken by public authorities. Another relevant resource used during the pandemic was the lockdowns, which consist of the temporary closure of all establishments in a given region to reduce the circulation of individuals (fernandes *et al*., 2020).

In work environments, changes were necessary to maintain activities, even partially. Therefore, one of the first actions was to make workers aware of the new rules in order to reduce contact between them. To this end, rules were established regarding the minimum distance between individuals in the same environment, as well as the alternation of working days on the company premises. On the other hand, some activities do not require face-to-face contact, so it has become possible to adopt the remote working modality, thus contributing to the reduction of the contamination rate and also to the mitigation of the economic impact associated with the pandemic (Goddard, 2020; Hobbs, 2020).

However, despite all the measures mentioned above, two others stood out in commonly frequented environments with the possibility of crowding. The use of masks and frequent hand hygiene ultimately helped to reduce human contamination because it involved behavioral changes that were quickly adopted by society as a whole. Hand hygiene could be accomplished by washing hands for at least 20 seconds or by applying alcohol-based hand sanitizer. In turn, it became mandatory to wear masks when visiting all types of facilities in order to reduce direct contamination from droplets expelled from the mouth or nose of infected individuals (Fernandes *et al*., 2020; MINISTÉRIO DA SAÚDE, 2020a).

Such guidelines proved to be necessary because, despite the immediate removal and quarantine of individuals who test positive, the incubation period of the virus is on average 5 to 6 days, and the infected agent may present pre-symptomatic or even asymptomatic transmission. In the first scenario, approximately 48 hours before the onset of symptoms, the patient has the potential to transmit the virus to others. In asymptomatic cases, the virus can be transmitted even if the patient has no symptoms associated with the viral infection[3].

The effectiveness of mask use in controlling coronaviruses has been observed in a number of studies. Mitze *et al.* (2020) observed the evolution of Covid-19 contamination in different regions of Germany and its association with the use of face masks. The authors applied the synthetic control method, which is used as a tool to evaluate public policies. The Jena region, one of the first to introduce the use of masks, was considered the treated group of the sample, and other similar regions were used as controls. The results of the

[3] The main symptoms associated with SARS-CoV-2 include fever, cough and shortness of breath (ANVISA, 2020).

study showed that after the mandatory use of masks in the Jena region, the daily growth rate of new covid cases decreased by about 70% compared to the control group.

For Wang *et al.* (2020), the results were similar to the previous study. This research consisted of a cohort study in Beijing involving 335 people in 124 households, each of which had at least one person infected with the new coronavirus. Variables related to hygiene and care practices associated with transmission of the virus were analyzed, including the use of masks by families. Among the results found was that the use of masks by the infected person at the same time as the use of masks by other family members, even before the onset of symptoms, reduced the transmission of the new coronavirus by 79%. However, the use of masks by family members after the onset of symptoms did not show statistical significance in the study in question.

In turn, Morais *et al.* (2021) analyzed the efficiency of masks commonly used in Brazil during the Covid-19 pandemic. An aerosol particle generation system was used to test the filtration efficiency of 12 types of masks[4]. The conclusion of the study was that the use of masks is an effective measure in the fight against coronaviruses, as some of the models commonly used in Brazil showed a high level of filtration efficiency. The N95 mask had the highest filtration efficiency (0.98), while surgical masks were slightly less efficient (0.89). Among the non-professional models, the non-woven (NW) masks had the highest filtration efficiency (between 0.83 and 0.91).

Another tool to combat contamination by the new coronavirus is to clean your hands, as well as surfaces, using hand sanitizer. Kratzel *et al.* (2020) evaluated the effectiveness of inactivating the SARS-CoV-2 virus through the use of alcohol-based solutions. In this study, solutions were used that followed the World Health Organization (WHO) parameters, as well as alternative formulations with different concentrations of ethanol, glycerol, hydrogen peroxide, and isopropanol. The study showed that the original solutions presented by the WHO and the alternative formulations used in the tests were highly susceptible to the new coronavirus after 30 seconds of exposure.

Thus, we can observe several indications of the effectiveness of the use of masks and alcohol as inhibitors of contamination by the new coronavirus, which is the expected result of this study.

3. Methodology and Database

Given the presented context, the objective of this article is to evaluate whether the use of masks and 70% alcohol or higher reduces the probability of an individual employed in the service sector of being contaminated with Covid-19. The database used was the

[4] The aerosol particles used in the study ranged in size from 60 to 300 nm. The particle filtration efficiency was measured using the equation: $FE_{60-300} = 1 - \frac{\sum_{i=60}^{300} < C_{i,s} >}{\sum_{i=60}^{300} < C_{i,b} >}$, where $< C_{i,s} >$ and $< C_{i,b} >$ are the average particle concentrations in the masked and unmasked samples, respectively (MORAIS *et al*., 2021).

National Health Survey by the Sample of Covid Households (Pesquisa Nacional de Amostra de Domicílios Covid - PNAD COVID) with information for the month of November 2020.

The methodological strategy used was logistic regression, a binary categorical model in which the study variable or dependent takes the values 1 or 0, indicating the likelihood of the event occurring or not. According to Wooldridge (2010), using such a model, what will be obtained are qualitative results that indicate the $p(x)$ probability of the study variable (being contaminated) assuming the value of 1 for the success of that event or 0, for failure.

This $p(x)$ probability is generated using the equation:

$$p(x) \equiv P(y = 1|X) = g(X\beta) \quad (1)$$

Where:

X: set of explanatory variables used as factors that determine whether or not an individual is likely to work in the service sector. Among these variables are the use of a mask and 70% alcohol;

β: parameters to be estimated;

$g(X\beta)$: function that will be defined and shows that the probability needs to take values 0 and 1 $\forall$ X and β (Wooldridge, 2010).

The aim of using this methodology is to see if people who reported having masks and 70% alcohol in their homes and who worked in the service sector are less likely to be contaminated with Covid-19. This equation is given by the logit model which has a logistic accumulated distribution function as shown below:

$$G(z) = \frac{1}{1+e^{-z}} = \frac{e^{z}}{1+e^{-z}} \quad (2)$$

However, according to Wooldridge (2010), it is not possible to directly interpret the parameters generated by this model because it is not able to indicate the correct magnitude of the estimated parameters. However, the logit model is useful to show the importance of the relationship between the explanatory variables (X) used in the work with the probability of success of the event. To solve this problem, i.e., to have an estimate of how each explanatory variable affects the probability of success (working in the service sector and being contaminated), we also used the odds ratio. Using the odds ratio there will be an interaction between the occurrence of the success event ($y = 1$) as a function of the independent variables.

The method of generating the odds ratio is given by:

$$\frac{p}{1-p} = \frac{1+e^{z}}{1+e^{-z}} = \frac{1}{1+e^{-z}} \quad (3)$$

By linearizing equation (3), we obtain the result of the success of the event, i.e.:

$$L = \ln\left(\frac{1}{1-p}\right) = z \quad (4)$$

Where: L indicates the logit of the model.

The way to interpret the odds ratio is to compare it to unity, i.e., parameters greater than 1 increase the probability of individuals being contaminated, while parameters less than 1 decrease the probability. The probability value is given by subtracting the estimator from 1 (Wooldridge, 2010).

Table 1 lists the variables used in the work to define the empirical model. The proxy for prevention was defined as individuals who answered in the survey questionnaire that they had masks and 70% or more alcohol in their homes.

Table 1: Variables used in the research.

Variables	Description	Expected sign
Contaminated	Categorical: 1 for infected individuals who worked in the service sector; 0 otherwise	
Prevention	Categorical: 1 for individuals whose household had 70% alcohol or higher and masks; 0 otherwise	(-)
Race	Categorical: 1 for white[5] and 0 otherwise.	(+/-)
Man	Categorical: 1 for males and 0 otherwise.	(+/-)
Urban	Categorical 1 if resident in an urban area; 0 otherwise.	(+)
Age	Discrete: individual's age.	(+)
Advanced age	Discrete: individual's age squared.	(+/-)
Head of household	Categorical 1 for head of household; 0 otherwise.	(+)
CH1	Categorical: 1 for individuals who had no education; 0 otherwise.	(+)
CH2	Categorical: 1 for individuals who had completed higher education; 0 otherwise.	(-)
Workload 1	Categorical: 1 for individuals who work 20 to 40 hours per week; 0 otherwise.	(+)
Workload 2	Categorical: 1 for individuals who work more than 40 hours per week; 0 otherwise.	(+)

Source: Original work based on data from PNAD COVID 2020 (IBGE).

[5] The term "white" was used to refer to individuals who identified as such or as yellow, while "non-white" was used to describe those who identified as black, brown, or indigenous.

In the survey, the service sector was obtained by aggregating information on the main activity of the company that works, namely electricity and gas supply, water, sewerage and garbage collection, repair of motor vehicles and motorcycles, passenger transportation, transportation of goods, warehousing, postal and delivery services, accommodation (hotels, inns, etc.), food services (bars, restaurants, etc.), food services (bars, restaurants, etc.), catering (bars, restaurants, street vendors), information and communication (newspapers, radio and television, telecommunications and IT), banking, financial and insurance activities, real estate activities, legal activities, engineering, advertising and veterinary activities (professional, scientific and technical activities), temporary employment activities, security activities, cleaning activities, landscaping and tele-services, artistic, sporting and recreational activities, hairdressing, beauty and personal services.

Individuals who responded yes to contamination tests, whether they were blood tests taken from the finger, arm vein, or mouth and/or nose swabs, and who worked in the service sector were used as the dependent variable. Socio-economic variables were used to control for the factors that influence whether or not individuals work in the service sector. It is expected that there is an inverse relationship between the prevention and contamination variables, as indicated by Kratzel *et al*. (2020), Wang *et al*. (2020), and Morais *et al*. (2021).

3. Results and Discussion

In order to verify the effectiveness of measures to prevent coronavirus contamination in the service sector, as mentioned above, it will be analyzed whether the use of masks and 70% alcohol reduces the likelihood of workers in this sector being contaminated with the new virus.

Firstly, Table 2 presents a descriptive analysis of the variables used in the econometric model. As the majority of variables utilized were binary (i.e., yes/no), with the exception of age and advanced age, the resulting statistics ranged between 0 and 1. The total number of workers in this sector was 35,684 and the age variable had a value of 39.49, indicating that, on average, workers in the service sector at the time of the research were approximately 39 years old.

A large proportion of the individuals in the selected sample were men and lived in urban areas, as the average value of these variables was greater than 0.5. Conversely, non-whites and heads of households were not the majority, as the average presented was below 0.5. It is noteworthy that a considerable number of service sector workers had masks or alcohol 70% or higher in their homes, indicating that the guidelines issued by the Ministry of Health (Ministério da Saúde, 2020) were widely followed by the general public.

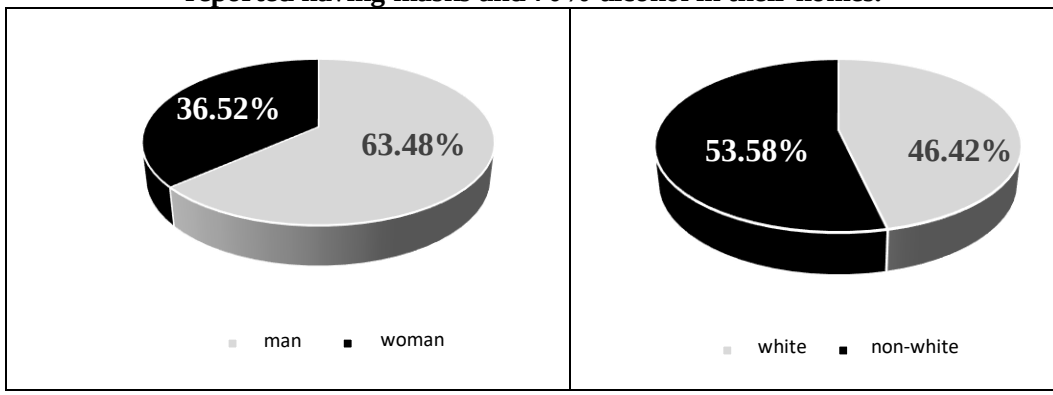
Table 2: Descriptive statistics of the variables used in the model

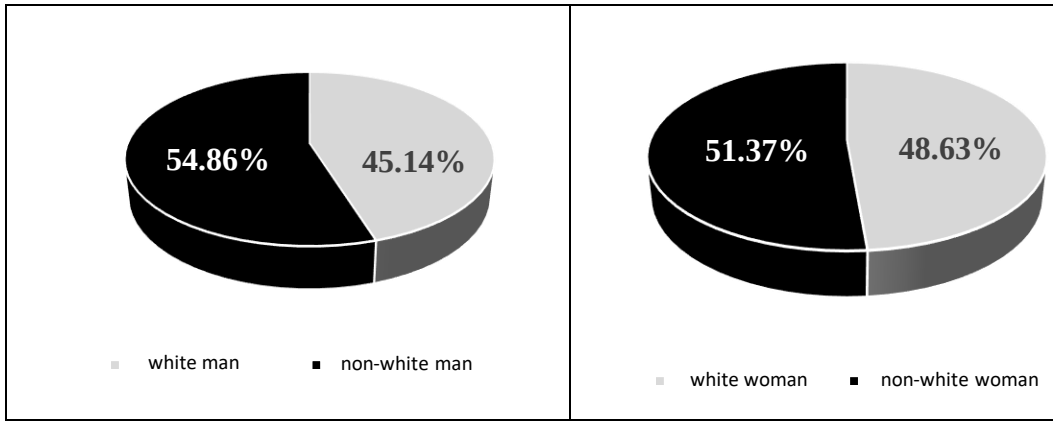
Variables	Average	Standard Deviation	Minimum	Maximum	Number of obs
Contaminated	0.049	0.216	0	1	35,684
Prevention	0.999	0.038	0	1	35,684
Race	0.464	0.499	0	1	35,684
Man	0.635	0.482	0	1	35,684
Urban	0.920	0.272	0	1	35,684
Age	39.49	12.85	14	89	35,684
Advanced age	1724.6	1088	196	7921	35,684
Head of household	0.463	0.499	0	1	35,684
CH1	0.008	0.087	0	1	35,684
CH2	0.181	0.385	0	1	35,684
Workload 1	0.474	0.499	0	1	35,684
Workload 2	0.357	0.479	0	1	35,684

Source: Original work.

To gain insight into the preventive measures taken by service sector workers, Figure 1 below illustrates the gender and race distribution of service sector workers who, at the time of the survey, reported having masks and 70% alcohol in their homes.

Figure 1: Gender and race distribution of workers in the service sector who reported having masks and 70% alcohol in their homes.





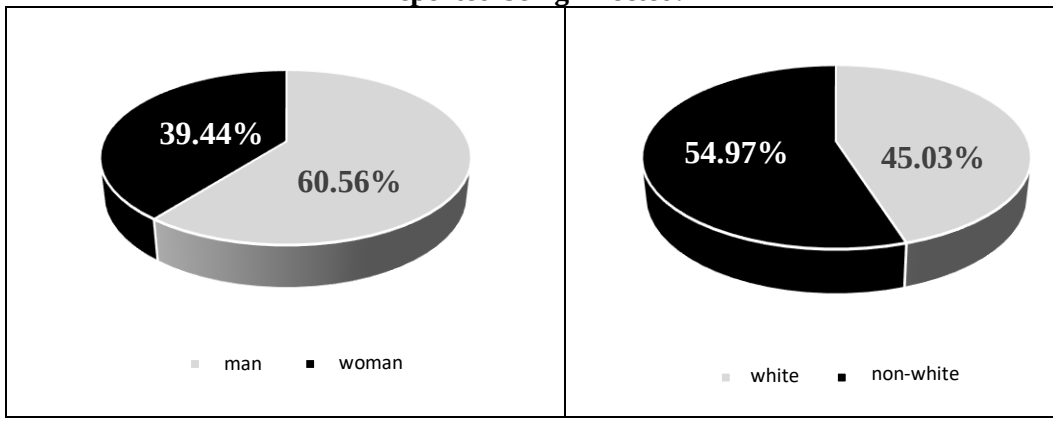
Source: Original work based on data from PNADC (2020).

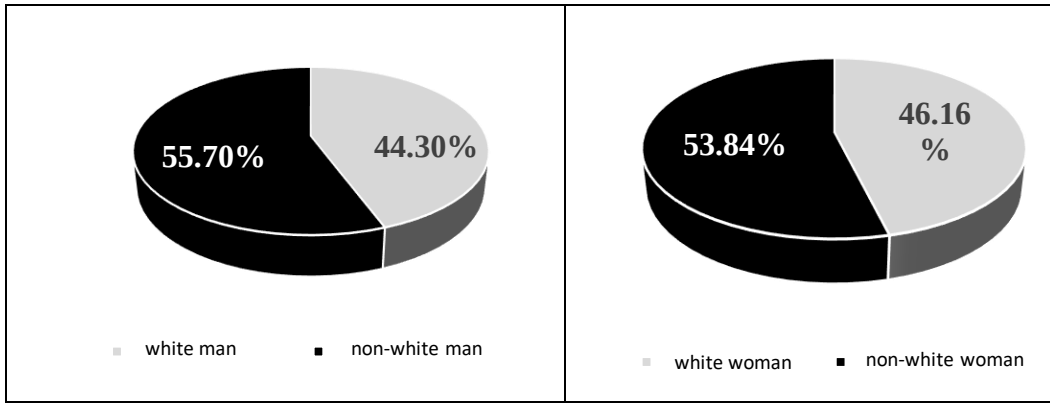
Figure 1 illustrates that among men and women employed in the service sector, the former group exhibited the highest proportion of individuals in possession of masks and 70% alcohol or more. Regarding the comparison between whites and non-whites, the latter demonstrated the highest prevalence of individuals with masks and 70% alcohol, representing 53.38% of the total sample.

A further analysis of white and non-white men revealed that non-white males demonstrated a higher level of preventive action, accounting for 54.84% of the sample, while white males represented 45.14%. The same behavior was observed among non-white and white women, with the former accounting for 51.37% and the latter for 48.63%.

Figure 2 shows the same group analysis, but now considering individuals who were infected with Covid-19 on the date of the survey.

Figure 2: Gender and race distribution of workers in the service sector who reported being infected.





Source: Original work based on data from PNADC (2020).

A comparison of the genders of those infected revealed that the majority were male. Specifically, 60.56% of all those infected in the service sector were men, while only 39.44% were women. In terms of race, non-white individuals constituted the majority of those infected, representing 54.97% of the total. This information indicates that the use of masks and 70-degree alcohol was not a guarantee of non-contamination at the time, as evidenced by the highest number of prevented individuals in Figure 1 belonging to this group.

A breakdown of the data by gender and race reveals that non-white men and women accounted for the majority of infections. Specifically, non-white men represented 55.70% of those infected, while non-white women accounted for 53.84%. These figures contrast with the respective proportions of white men and women, which were 38.84% and 39.44%.

However, to actually verify the prevention effect represented by having masks and 70% alcohol, Table 3 below presents the results of estimating the logistic model and odds ratio. By estimating this, we can see that workers in the service sector who were prevented, in accordance with the Ministry of Health guidelines (Ministério da Saúde, 2020), were less likely to be infected with the coronavirus.

As indicated in the methodology, through logistic regression, even though it is not possible to infer the value of the probability associated with the factor under analysis, it is possible to indicate the direction in which the independent, or explanatory, variable affects the dependent variable, which in this research are workers in the service sector infected with the disease.

As illustrated in the second column of Table 3, the logistic regression results indicate that the prevention variable, which measures the availability of 70% alcohol and masks in service sector households, had a negative and significant impact. This suggests that prevention measures were effective in reducing contamination in the service sector.

In terms of socio-economic characteristics, individuals who identified as white, were older, and worked normal hours or more than 40 hours a week were less likely to be in the service sector and become infected. Conversely, those who lived in urban areas, were

younger, and were heads of households were more likely to be in the service sector and become infected.

Table 3: Estimation result of the logit model and odds ratio

Variables	Logit	*Odds ratio*
Prevention	-0.7920*	0.4530***
Race	-0.1042**	0.9011**
Man	-0.0776	0.9254
Urban	0.3550***	1.4262***
Age	0.0607***	1.0626***
Advanced age	-0.0008***	0.9993***
Head of household	0.0862*	1.0901*
CH1	0.1643	1.1786
CH1	0.3628***	1.4373***
Workload 1	-0.3041***	0.7379***
Workload 2	-0.2509***	0.7782***
Constant	-3.4377***	0.0322***
Number of obs	35684	35684

Source: Original work.
Note: *** significant at 1%, ** 5% and * 10%.

Table 3, column 3, presents the estimated odds ratio model. As outlined in the methodology, the analysis of this model is based on unity. Therefore, variables above 1 positively affect the probability of the individual being in the reference group (workers contaminated with the virus in the service sector), while those below 1 have a negative impact (Wooldridge, 2010). To obtain the associated probability value for each variable, simply subtract 1 from the value obtained.

The results indicate that individuals in the service sector who are white and older are less likely to be infected with the new coronavirus. Specifically, being white reduces the likelihood by 9.89%, while being older reduces it by 0.07%. Conversely, the variables indicating residence in an urban area, age, and status as the head of household had a positive impact on the probability of being in the service sector and being infected, with respective probabilities of 42.62%, 6.26%, and 9.01%.

As demonstrated in the studies by Kratzel *et al.* (2020), Wang *et al.* (2020) and Morais *et al.* (2021), it is anticipated that individuals who adhered to health and safety standards, particularly those pertaining to personal care, such as the use of masks and the application of 70% alcohol or higher, would exhibit lower contamination rates. In the Brazilian service sector, according to this research, workers who used masks and 70º alcohol in their homes were 54.70% less likely to become infected with the new coronavirus.

As stated in the World Health Organization's bulletin (2020a), the spread of the novel coronavirus can be reduced by using masks and 70% alcohol, as well as other

measures such as social distancing to limit contact between infected and uninfected individuals.

The results of the research with individuals who followed the indicated prevention measures, especially in the service sector, align with the findings of Mitze *et al.* (2020), Wang *et al.* (2020) and Morais *et al.* (2021). They also meet the general recommendations of the WHO (OMS, 2020) and the Ministry of Health (Ministério da Saúde, 2020a, 2020b). It can be reasonably concluded that the measures taken to prevent and control the pandemic have been effective, particularly in the service sector, which relies heavily on face-to-face interactions and plays a significant role in the Brazilian economy, accounting for a considerable portion of the national GDP.

Thus, prevention measures, combined with other actions adopted, and also with the subsequent vaccination, were extremely important in reducing contamination, contributing to the end of the coronavirus pandemic in Brazil.

Conclusion

The objective of this study was to ascertain the efficacy of mask-wearing and 70% alcohol in combating the spread of the coronavirus, particularly within the service sector, which plays a pivotal role in the national economy and has been the most severely impacted by the pandemic.

As evidenced by the research, the global economy has faced significant challenges due to the rapid implementation of containment measures in response to the novel nature of the Coronavirus disease (Covid-19). This was done without sufficient information about the disease's potential for transmission and its associated risks. In response to the situation, governments around the world took action to restrict the free movement of people with the aim of reducing the risk of contamination through social distancing. However, this measure had a significant impact on the economy. Without the circulation of people and with several companies prohibited from opening their doors at certain times, a global economic crisis was generated, resulting in a 3.5% retraction in world GDP in 2020.

The Brazilian economy contracted by 4.1% in 2020, reflecting the challenging circumstances the country was facing at the time: balancing efforts to contain the spread of the virus with the risk of a significant economic downturn. In terms of sectors, agriculture was the only one to demonstrate positive growth during this period, with an increase of 2.0%. Conversely, manufacturing and services experienced a decline, with respective decreases of 3.5% and 4.5%. As anticipated, the decline in services was substantial, given that in-person operations are a key aspect of many activities and the restrictions on movement directly impacted these operations. This is evident in the sharp decline in activities such as transportation, warehousing, and mail.

In light of the aforementioned context, this study aimed to ascertain the efficacy of the measures proposed by the Ministry of Health (Ministério da Saúde, 2020b), namely the use of masks and 70% alcohol, in containing the spread of the pandemic within the service

sector, given that this is the sector where physical contact is most prevalent in terms of activity.

Our analysis of gender and race variables revealed that men and non-white individuals had greater access to these items (masks and 70% alcohol) compared to women and non-white individuals. Additionally, among workers in the service sector who were contaminated, the majority were non-white men and non-white women. In terms of socio-economic variables, our analysis revealed that workers in the sector who were white and older were less likely to be infected with the new coronavirus. Conversely, those who lived in urban areas, were heads of households, and had completed higher education were more likely to be infected.

The most notable outcome is in line with the Ministry of Health's (Ministério da Saúde, 2020b) guidelines and aligns with the findings of Kratzel *et al.* (2020), Wang *et al.* (2020) and Morais *et al.* (2021), and other similar studies: workers who prevented themselves from the disease through the use of masks and 70% alcohol were less likely to be infected with the disease, as the chances of being infected were 54.70% lower compared to workers who did not follow the guidelines.

This study contributes to the ongoing effort to determine the effectiveness of mask-wearing and 70% alcohol as a means of combating the spread of the novel coronavirus (Covid-19). For the service sector, which is characterized by frequent face-to-face contact, adherence to these guidelines has been empirically demonstrated to reduce the likelihood of contamination and transmission of the virus.

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