

ORIGINAL ARTICLE

## CHALLENGES IN PUBLIC PROCUREMENT OF PPE IN FEDERAL HOSPITALS IN RIO DE JANEIRO / BRAZIL DURING COVID-19

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Highlights:

- (1) Abusive prices associated with shortages of PPE were central problems in purchasing.
- (2) Importance of connection among buyers to act jointly and synergistically.
- (3) Fragility in productive capacity requires coordinated management measures.

### ABSTRACT

This study mapped hurdles and strategies in public procurement of Personal Protective Equipment (PPE), through a descriptive approach involving self-completion of an electronic survey instrument by personnel with purchasing experience from federal public hospitals in the municipality of Rio de Janeiro. The instrument covered the supply process: general characteristics, common problems, and strategies necessary to overcome difficulties in the procurement process of seven selected PPEs (apron, surgical mask, PFF2 or N95 respirator mask, cap, face shield, protective goggles, and slippers). We observed recurring procurement processes undertaken without tendering, in accordance to urgently passed legislation by the Brazilian government, that waived this obligation. High prices of PPEs and market shortages were the most usual problems, cited by over 80% of the respondents, especially for disposable surgical aprons and masks, and for filtering facepiece respirators (FFR) such as FFP2, and N95. Surge in demand associated with a disruption in global supply contributed to abusive prices. Negotiations with bidders, exchange of information between buyers and the search for alternative suppliers were the most important measures taken to tackle procurement problems. Difficulties in PPE procurement are a consequence of supply chain inadequacies as well as deficiencies in productive capacity in Brazil and worldwide. The mitigating actions employed in the face of procurement problems show the resilience of procurement systems.

**Keywords:** personal protective equipment; legislation; public procurement; unified health system; Covid-19.

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## INTRODUCTION

Due to the spread of the disease caused by the New Coronavirus (Sars-CoV-2), called Covid-19, the World Health Organization (WHO) declared a Public Health Emergency of International Concern in January 2020. Due to its rapid global spread, the WHO recognized the high severity of the disease and declared it a pandemic<sup>1</sup>. Covid-19 has triggered several difficulties in establishing responses, as it is a new transmissible disease, reinforcing the need for significant efforts to combat it. In this unprecedented and uncertain context, several stakeholders worldwide and in Brazil, such as scientists, public managers, and health professionals, have faced adversities in health, scientific-technological, economic, and policy fields<sup>2</sup>.

Modern societies depend on interconnected technological systems, which are exceeded by geographical, political, cultural, legal, and administrative limits in situations of crisis and disaster. This hampers public managers' actions to contain and manage a situation with cross-border characteristics, such as Covid-19.

The Organization for Economic Co-operation and Development highlighted that the Covid-19 pandemic has affected how governments plan and conduct (at different levels) their procurements, not only in the health sector. Furthermore, it endorsed that most countries were forced to reevaluate their existing purchasing structures, adding new exceptions to the standard for emergency acquisitions<sup>4</sup>. Similarly, the Brazilian government was forced to adopt measures to respond to the pandemic, such as relaxing public procurement rules<sup>5</sup> to smoothen the selection and adequate supply of health technologies in the Unified Health System (SUS) care networks, such as public hospitals.

Brazil had the highest number of cases and deaths in South America and a high Covid-19 transmission rate. São Paulo and Rio de Janeiro accounted for most cases and deaths in the country in 2020. Among other health technologies, Rio de Janeiro faced a shortage of PPE, besides several allegations of corruption in government procurement<sup>10</sup>.

In Brazil, the new Law on Public Procurement and Contracts<sup>6</sup>, Law N° 14.133 of April 1, 2021 – which replaced Law N° 8.666 of June 23, 1993 – came into full force on January 1, 2024. Public procurement is a legal administrative procedure that addresses how specific contracts are concluded in the public administration, which thus seeks a supplier that will offer the most advantageous conditions after demand from potentially interested parties<sup>7</sup>. This process must be followed by public bodies, such as federal public hospitals, which are the focus of this study.

Bidding is a mandatory act. It is a complex activity with extensive processes, requiring conceptual effort for its adequate completion. Health-related public procurement faces some difficulties in the country in conducting purchases, such as high prices – which requires effective monitoring of this component – besides transparency, delivery delays, and quality of materials<sup>8,9</sup>. Such problems, even more so in health crises, hamper public managers' decisions, such as employing effective coping strategies during purchases, which can impact the supply of health technologies, such as personal protective equipment (PPE).

Furthermore, purchasing medicines, medical materials and equipment, and PPE, among others, is essential to making these health technologies available in the Unified Health System (SUS) to inexorably reduce the adverse consequences to patients' and workers' health<sup>11</sup>. Thus, the technical-administrative and management sectors involved in procurement are also required to structure several actions to achieve adequate supply in the face of the health emergency and compelled to acquire new products, manage, and significantly increase the stocks of existing health technologies<sup>8</sup>.

Even considering the relevance of supply management in health, public procurements are often poorly explored in scientific literature although they are extremely sensitive and strategic for

successful health actions. Furthermore, this point becomes more critical when the context involves health emergencies.

An accelerated increase in the use of PPE was observed during the pandemic, which aims to preserve the quality of patient care, especially by protecting and ensuring the safety of health professionals in their respective work processes. This fact shed light on the importance of public health sector purchases to effectively mitigate shortages of supplies in their units and quickly support procurement processes.

As a result, some important issues arise as elements of investigation for management and public health. How were government purchases of PPE organized in the fight against the pandemic caused by the new coronavirus? What were the main challenges and responses to the difficulties identified during PPE purchases? Thus, this study aims to map the main problems in purchasing PPE in the public sector and the strategies employed to overcome them in the fight against Covid-19.

## METHODS

This exploratory and descriptive study was conducted with a self-administered electronic questionnaire on government procurement of selected PPE. Respondents with administrative procurement expertise and experience from public federal hospitals in Rio de Janeiro were invited and included. Professionals with less than one year of experience were excluded. A pilot phase was used to identify the need for adjustments to the questionnaire and thus improve data collection.

Respondents or hospitals were not identified. These facilities offer public health actions and services in the SUS and have administrative autonomy to conduct bidding procedures through their respective technical staff.

We should underscore that hospitals with different management levels have provided care to patients infected with Covid-19 in Rio de Janeiro, which required the acquisition of PPE. The federal government's health equipment may be linked to the Ministries of Health (MS), Education, or Defense. The research topic covered elements and information on the difficulties and overcoming strategies in public procurement. The selected PPE were apron, surgical mask, PFF2 or N95 respirator mask, cap, face shield, protective goggles, and slippers.

The electronic questionnaire's target audience consisted of workers whose contributions were based on their professional and institutional experience in procurement activities during the COVID-19 pandemic (March 2020 to August 2021). The invitation was sent (1) via social media (WhatsApp groups) and (2) by e-mail to professional e-mail groups.

The electronic questionnaire was prepared on the Google platform, made available from 08/30/2021 to 10/15/2021, and contained six sections with 24 questions:

- i. Respondents' general profile.
- ii. General data on the hospital and its internal organization to address the pandemic (whether a working group or internal committee was established to deal with the pandemic and data on the organization of purchases and procurement processes).
- iii. List of most recurring problems, based on a previously established list for each of the seven PPE types.
- iv. Use/basis of specific legislation related to public procurement to address COVID-19.
- v. Identification of measures adopted to address obstacles or problems during purchases.
- vi. Open field dedicated to comments and suggestions.

Depending on the type of question on the form, several predefined response options were available: exclusionary (multiple choice), multiple responses (allowing respondents to submit alternatives), or dichotomous (yes/no).

The list of obstacles and resolution measures/strategies was structured from an adaptation of the Technical Note from the National Council of Health Secretaries<sup>12</sup>, which listed problems in acquiring medicines. Furthermore, it was based on the experience accumulated by the study authors in public procurement management.

Each of the seven PPE items had a list of obstacles in multiple responses, allowing participants to select more than one alternative in the same question or combine different items in a specific response type. The measures to overcome the problems had the same characteristic of multiple response options without specifying which PPE it was.

The list of answer options in the questions was the very analytical categories. The data were tabulated from the database built in Microsoft Excel® software, adopting simple frequencies and percentages. All participants agreed to join by accepting the Informed Consent Registry. The Research Ethics Committee approved the study protocol under Opinion N° 4.864.113 of 07/23/2021.

## RESULTS

Seventeen respondents answered the questionnaire. The 31-40 years' age group was the most frequent, with a mean of 40.6 years. Around 70% had up to 10 years of experience in public procurement. Half were administrators, and the other half were professionals from different areas (archives, actuarial science, computer science, industrial design, nursing, public management, public administration, and logistics).

Most (82.4%) reported the existence of a crisis cabinet (committee, commission, or working group) or equivalent set up expressly to address the Covid-19 pandemic crisis in healthcare units.

The public procurement legislation implemented during the pandemic served as a basis for the implemented PPE procurement processes. We highlight Federal Law N° 13.979/2020 as it granted several flexibilities for executing public acquisitions, especially the competitive bidding waiver.

Just over half (9 out of 17) of the responses reported support for internal criteria established by the hospital unit regarding scheduling the amount of PPE requested from the procurement department. The other aspects related to scheduling (existing stock data, demand, historical consumption, WHO recommendations, and the disease's epidemiology) together were cited in 61.3% of the responses (Table 1).

Table 1 – PPE purchasing programming categories (how much had to be purchased) for conducting public procurement

Types of programming for PPE purchases	Total answers	%	%*
According to internal criteria defined by the unit: number of beds, attendances, and suspected cases	9	29	52.9
Calculation with stock information	6	19.4	35.3
Estimate according to historical consumption	5	16.1	29.4
According to guidelines recommended by documents published by the WHO, PAHO, and ANVISA	5	16.1	29.4
Cases of the disease (epidemiology)	3	9.7	17.6
Demand forecasting tools with preexisting data	1	3.2	5.9
I don't know	1	3.2	5.9
Other: A safety margin of 100% of the monthly demand was added in the first months	1	3.2	5.9
<b>Total</b>	<b>31</b>	<b>100</b>	<b>-</b>

%\*: Corresponds to the division of answers by the total number of respondents (17) multiplied by 100, with a sum greater than 100%.

Aprons, surgical masks, and PFF2 or N95 masks were the PPE that concentrated the highest percentage of procurement processes in the period studied, respectively, with 64.7%, 58.8%, and 52.9%. Approximately 60% of the responses reported holding more than seven competitions for each of the seven types of PPE analyzed from 03/2020 to 08/2021 (Table 2).

Table 2 – Type of personal protective equipment with three (03) or more acquisition processes from March/2020 to August/2021

Number of bidding processes (N= 17 respondents)	N	%	%*
3-4 processes	2	11.8	-
5-6 processes	4	23.5	-
6 processes	1	5.9	-
7 processes and above	10	58.8	-
<b>Three or more bidding processes (N= 45 responses)</b>			
Apron	11	24.4	64.7
Surgical mask	10	22.2	58.8
PFF2 or N95 mask	9	20.0	52.9
Hair cap	4	8.9	23.5
Face shield	3	6.7	17.6
Protective goggles	2	4.4	11.8
Slippers	2	4.4	11.8
Gloves	1	2.2	5.9
Procedure gloves	1	2.2	5.9
None	2	4.4	11.8

%\*: Corresponds to the division of column N by the total number of respondents (17) multiplied by 100, with a sum greater than 100%.

Considering the 378 consolidated responses for the seven PPE types, we observed that three macro-problems accounted for more than two-thirds, totaling 84.4%. These adversities involved (a) Financial issues (budgetary and pricing), (b) Purchases (cancellations, different quantities, changes of brands), and (c) Market (shortage of material and suppliers), as shown in Figure 1.

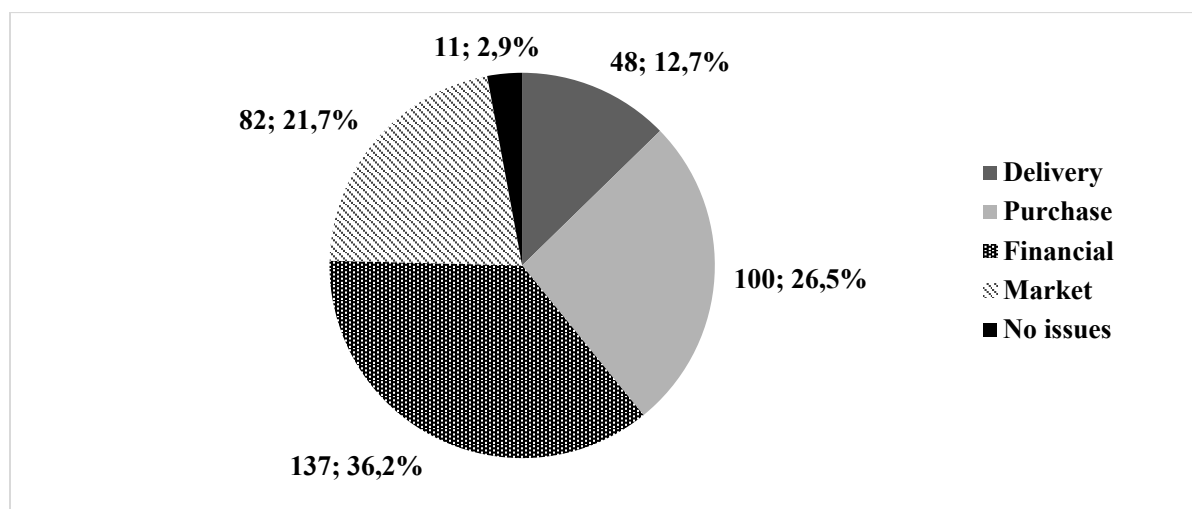


Figure 1 – Macro problems during the acquisition process of selected personal protective equipment.

When revealing in greater detail the problems in purchasing each highlighted PPE, like what was shown by the volume of acquisition processes (see Table 2), the same PPE, namely aprons, respirator masks (PFF2 or N95), and surgical masks, reported the highest volume of issues. As each PPE could include more than one problem, these together represented more than 60% of the 378 responses from participants (Table 3).

However, according to the respondents' experience, for all seven PPEs, three of the 15 obstacles or problems accounted for 45.0% of the responses, namely, "high prices" (18.3%), "shortage of material on the market" (16.1%), and "noncompliance with material specifications" (10.6%). Another notable issue was the "delay in delivery against the deadline established in the Notice", a limiting element for procurement planning (Table 3).

Table 3 – Main issues identified during the acquisition process of selected personal protective equipment

Issue categories (N=participants' responses)	Slippers		Surgical mask		PFF2/N95 mask		Face shield		Protective goggles		Apron		Hair cap		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Delay in delivery of material within the deadline established in the Notice	3	17.6	9	52.9	9	52.9	3	17.6	2	11.8	8	47.1	3	17.6	37	9.8
Contract cancellation	1	5.9	3	17.6	2	11.8	0	0	0	0	1	5.9	2	11.8	9	2.4
Deserted purchase	1	5.9	2	11.8	2	11.8	1	5.9	1	5.9	3	17.6	2	11.8	12	3.2
Delivery of material incompatible with the specification	0	0.0	2	11.8	3	17.6	1	5.9	0	0	3	17.6	2	11.8	11	2.9
Shortage of competing suppliers	2	11.8	2	11.8	4	23.5	3	17.6	3	17.6	4	23.5	3	17.6	21	5.6
Shortage of material on the market	6	35.3	11	64.7	13	76.5	4	23.5	7	41.2	13	76.5	7	41.2	61	16.1
Budgetary and/or financial limitations	1	5.9	2	11.8	1	5.9	1	5.9	1	5.9	5	29.4	1	5.9	12	3.2
Failure to meet material specifications	3	17.6	7	41.2	7	41.2	3	17.6	3	17.6	13	76.5	4	23.5	40	10.6
No issues	1	5.9	1	5.9	1	5.9	3	17.6	2	11.8	1	5.9	2	11.8	11	2.9
No purchase was made	1	5.9	1	5.9	1	5.9	1	5.9	1	5.9	0	0.0	1	5.9	6	1.6
High prices	7	41.2	11	64.7	14	82.4	7	41.2	8	47.1	14	82.4	8	47.1	69	18.3
Problems in price estimation	4	23.5	8	47.1	8	47.1	2	11.8	4	23.5	5	29.4	5	29.4	36	9.5
Poorly sized amounts	0	0.0	0	0.0	0	0.0	1	5.9	0	0.0	1	5.9	1	5.9	3	0.8
Request for price realignment from suppliers	2	11.8	4	23.5	6	35.3	1	5.9	1	5.9	3	17.6	3	17.6	20	5.3
Request for brand change by suppliers	3	17.6	6	35.3	8	47.1	1	5.9	2	11.8	6	35.3	4	23.5	30	7.9
<b>Grand total of responses</b>	<b>35</b>	<b>-</b>	<b>69</b>	<b>-</b>	<b>79</b>	<b>-</b>	<b>32</b>	<b>-</b>	<b>35</b>	<b>-</b>	<b>80</b>	<b>-</b>	<b>48</b>	<b>-</b>	<b>378</b>	<b>100</b>

Column % corresponds to the division of column N by the total number of respondents (17) multiplied by 100, with a sum greater than 100%.



According to the respondents' experience, the measures, actions, or arrangements to overcome obstacles related to acquisitions mainly involved "negotiations with companies", "search for new suppliers", and "exchange of information between buyers from public institutions", respectively 64.7%, 58.8%, and 58.8% (Table 4).

Table 4 – Actions or measures established to overcome problems during the acquisition of PPE in the fight against Covid-19

Actions or measures used to address acquisition problems (N= 72 answers)	N	%*
Warning to late companies	5	29.4
Exchanges between institutions	1	5.9
Search for new suppliers	10	58.8
Co-participation through IRP (Price Registration Intention) of other agencies	8	47.1
Purchases through ride-sharing	8	47.1
Negotiations with companies	11	64.7
Participation in shared purchases	7	41.2
Punishment of companies that do not deliver	5	29.4
Performance of other simultaneous emergency processes	7	41.2
Exchange of information between buyers of public institutions	10	58.8
<b>Grand total</b>	<b>72</b>	<b>-</b>

%; Corresponds to the division of column N by the total number of respondents (72) multiplied by 100, with a sum greater than 100%.

Other measures marked with percentages above 40% were "co-participation through the Intention to Register Prices (IRP) of other agencies", "piggyback acquisitions" (when a public agency that did not participate in the bidding process through IRP requests that the bidder and the supplier adhere to the price registration minutes in order to acquire a product/service), "participation in shared purchases", and "conducting other simultaneous emergency processes". Notably, one respondent mentioned the use of swaps (exchanges) between institutions as an exceptional procedure (Table 4).

Six respondents contributed comments or suggestions, especially related to actions to overcome obstacles. These can be highlighted as "importance of qualifying purchasing personnel/team", "the need to reduce politicization surrounding the pandemic", "forecast of the issue of price realignment for bidding legislation", and "improvement in management support systems, such as information systems".

## DISCUSSION

The study presented the obstacles purchasing professionals faced during the pandemic and the strategies developed to support managers in the procurement process. It also showed that the shortage of health products, such as PPE, strained purchases and boosted final prices.

However, the administrative management of public purchases needs to be conceived as a strategic activity since some decisions need to be made regarding quality, quantity, schedules, origin, and cost that must be strategically linked to the demanding areas during the process of implementing the acquisition action. Therefore, the challenge of establishing rapid responses and understanding the administrative procedure in the public sector for purchases must also be a focus of public health<sup>13</sup>. In other words, public health must be aware of the impact of expenses with purchasing health technologies, mainly on universal health systems, such as the SUS.

Respondents aged 30-40 with a degree in administration and 6-10 years of experience in procurement (about one-third of the respondents) were not decisive for a smooth or more agile procurement process during the pandemic. Although the length of service was measured, the



employment relationships involved were unclear. Since the hospitals surveyed were federal, the participation of statutory professionals may have been relevant, and the length of experience and/or training in the public sector may have facilitated the work process.

We observed a plural setup of purchasing teams, emphasizing administrators. This reinforces the importance of establishing dialogue between health workers from management and care teams. Pierantoni<sup>14</sup> recognizes the importance of other professionals from areas not necessarily correlated with the health care work conducted in the direct provision of care. This reinforces the intertwined transversality in management and care in health services.

Multidisciplinarity in management would also be decisive for the acquisition process quality, corroborated in the new Law on Tenders and Administrative Contracts, Law N°14.133/2021, which infers the need to create a planning team from different areas, namely, administrative (buyers) and care-related<sup>6</sup>. Heinritz and Farrell<sup>15</sup> argue that the purchasing function portrays the different actions involved in this technical-administrative activity, with several elements of materials administration, purchasing, and financial management. These points enumerate the complexity involved and the importance of engaging other health professionals, as portrayed by Pierantoni<sup>14</sup>.

Furthermore, we should underscore the establishment of Law N°13.979/2020, which promoted significant changes to public procurement, providing greater flexibility and agility during the pandemic. A study conducted in Saudi Arabia<sup>16</sup> showed that adversities, such as increased demand for PPE consumption, rising prices, and company bankruptcy, led to implementing flexibility measures for public procurement. This scenario converged with the global and Brazilian situation, which triggered the need to introduce legislative changes in the same direction. The intention was to establish prompt and agile responses to the situation, which led the legislator to allow for several exceptions not previously applied for implementing purchases.

Despite reports that most units had these institutional spaces, there was no broad participation of the purchasing team in the offices or working groups to define strategies to combat Covid-19. However, it is unclear whether other hierarchical levels, such as administrative management, formed this type of committee. This situation reflects the view of Infante and Santos<sup>17</sup>, who point out the problems in managing materials in hospital units resulting from the lack of integration in the production and logistics chain, which can be understood by the internal relationship between the care and administrative areas.

We observed a recurrence of procurement processes during the period, reflecting the need to use different PPE types to combat Covid-19. Also, the lack of consumption history in such an explosive consumption scenario hindered quantification and planning. At this point, the WHO and the National Health Surveillance Agency (Anvisa) developed guidelines and regulations to assist health services with supplies, including PPE, and calculations of estimated demands to support purchasing planning<sup>18,19</sup>.

A survey published by the Brazilian Ministry of Economy showed a significant variation in the volume of items acquired in the procurement processes from March to October 2020, from 3,600 to 11,500 items, such as procedure masks (surgical), PFF2 respirator masks, aprons, gloves, and 70% alcohol liquid and gel. This corresponds with the professionals' responses when asked about the need to conduct several processes to acquire PPE<sup>20</sup>.

Studies from other countries, such as Saudi Arabia, Bangladesh, and Ecuador, emphasize that the PPE types most purchased during the pandemic were precisely surgical masks, PFF2 respirator masks, and aprons, corroborating our findings. Moreover, they highlighted that the increased demand led to higher prices and product shortages, making their acquisitions even more complex, time-consuming, and repetitive<sup>16,21,22</sup>.

Additionally, several hardships in public procurement reinforce the known weaknesses of the Brazilian Health Economic-Industrial Complex, such as the shortage of raw materials and disruptions in the global supply chain of health supplies. The productive and technological base of the domestic market is below its capabilities regarding the production of PPE and other health technologies, given the dependence on international products<sup>23</sup>. Cohen and Rodgers<sup>24</sup>, who studied the US scenario, emphasize that a large part of the global PPE manufacturing process is concentrated in a few Asian countries such as China, South Korea, and Malaysia, given the low production costs and the quality of the products. However, these countries' production lines were harmed with the advance of the new coronavirus, triggering a global shortage.

Besides the suspended production in Asian countries, which led to product shortages, other factors created problems for the success of public procurement of PPE, such as the closure of borders by the United States of America to products from Europe and the cyclical effect of several flight cancellations. Such issues considerably weakened international logistics operations, driving up the prices of goods and the dollar hike, making public procurement in Brazil even more complex and challenging<sup>25,26</sup>.

Abusive PPE purchase prices often made acquisitions unfeasible due to the increased demand from the Covid-19 pandemic. For example, when estimating the price of procedure masks in Week 1 and after the procedural steps were completed in Week 2, their values had already been significantly adjusted, hampered their acquisition.

The mean cost of masks<sup>27</sup> hiked from R\$2.83 to R\$12.12 at the end of March 2020, a 328% increase within that month. The Institute of Applied Economic Research (Ipea) analyzed the price variation in two secondary databases, the Integrated System of General Services Administration and the Health Price Bank, between the third and fourth quarters of 2019 and the first quarter of 2020 for several PPE types. This Ipea study indicated a price increase of 61.9% for gloves and 121.3% for disposable masks between February and March 2020. Finally, the study presented some proposals that, in short, emphasized the importance of centralized purchases despite possible obstacles related to the accuracy of demand quantification and distribution to local units<sup>28</sup>.

Notably, the scarcity and abusive prices may have led to deserted purchases in several procurement processes, characterized by the fact that the bidding process did not include the presence or participation of suppliers. A reduced volume of deserted purchases may have occurred with the authorization to purchase the item with a value higher than that estimated by the established bidding rules<sup>29</sup>.

Given the abovementioned problems, some resolution strategies were applied and captured in the participants' responses, consistent with actions employed in other jurisdictions (countries). One of them was joint acquisitions with other agencies, known as shared purchases, which gather several agencies in a single process, whose responsible party will manage the price registration minutes; the other agencies will be co-participants in the acquisition or contracting of the item or group of items registered in the minutes, increasing the purchasing scale and bargaining power for lower prices<sup>28</sup>.

Shared purchases are made through co-participation by registering prices in the federal government's electronic systems. This process has been in place for almost a decade and has a planning effect, providing advantages and agility in PPE purchases. This strategy increases the capacity to negotiate with suppliers. It has also been applied in other contexts, such as Ukraine and European and Asian countries, resulting in lower costs, speed, and standardization. This form of purchasing reduces operating costs, with a smaller team required to bid and analyze the listed materials<sup>30-32</sup>.

Collaborative or joint purchasing would be a more effective tool for reducing costs and bringing innovation to public procurement through the incorporation of "multi-supplier framework

agreements". This scheme allows contacting another supplier if a supplier does not meet with a purchase order, targeting greater security of supply to buyers<sup>33</sup>.

Another measure mentioned was the search for new suppliers. The simplified regulatory mechanisms established by Anvisa<sup>34,35</sup> may have contributed to this sense. The Agency made the manufacturing, import, and acquisition of PPE more flexible and enabled companies from different sectors to seek new production areas to minimize their internal crisis. In addition, the Agency innovated in a market for health products (such as procedure masks, PFF2, and aprons) in high demand for sale<sup>36</sup>.

Another mechanism mentioned was information exchange between the network of buyers. Relationship standards and formal interaction structures are important, but information exchange is fundamental for management. This issue can generate organizational learning in scarce resources, where streamlining and improving the procurement process are autonomous actions and contribute to the success of purchases<sup>37</sup>. Although this interaction may have occurred informally, such "purchasing intelligence" elements reinforce the importance of connecting stakeholders working jointly and synergistically.

In summary, adopting mitigating and corrective strategies for problems was evident, often linked to autonomy in decision-making and proactivity on the part of buyers, who promoted negotiations and prospected for new suppliers.

Aljadeed et al.<sup>16</sup> advocate potential measures to implement changes in procurement policies, such as mandatory disclosure of information, a platform to assist managers in analyzing suppliers, and internal incentives for national production. Costa and Dias<sup>38</sup> argue that it is impossible to think that the buyer is only concerned with completing an acquisition without critically analyzing the entire process and the impact of this operation against other processes in the institutions' production chain.

That said, the WHO has made recommendations that involve forecasting consumption needs and rational use of PPE, monitoring and controlling orders to limit waste, centralizing supplies to avoid duplicate stocks, and ensuring adherence to materials management rules. It also sheds light on the flow of the supply chain, in which attention is given to everything from production to delivery, including monitoring and distributing PPE. This measure aims to prioritize its accessibility for health services<sup>39</sup>.

Our study has some limitations. One of them refers to the universe of participants who contributed with the answers since the situation of purchasing professionals working in federal hospitals in Rio de Janeiro does not represent other Brazilian realities, a country with continental dimensions and a federalism characterized by the participation of municipal and state spheres, which can evidence very different contexts.

Administrative and economic diversity can reflect very different contexts, even at the federal level. Therefore, we cannot generalize the responses to the entire country or even a single municipality. Additionally, self-completion of the questionnaire, if respondents had some difficulties interpreting it, could be another obstacle. However, efforts were made to overcome this limitation through a pilot study and validation of responses with other studies.

## FINAL CONSIDERATIONS

The article is innovative in portraying little-explored issues to qualify administrative management in the SUS. Its results show that the explosive demand for PPE resulting from the pandemic triggered abusive prices and production shortages, generating several issues in the execution of purchases. These issues reflect the Brazilian and global supply chain and production capacity weaknesses.

However, the countless obstacles pointed out by buyers were often beyond their control due to the chaotic situation brought about by the Covid-19 pandemic. The text sheds light on the need for public management to be prepared for crises when several measures must be taken to address the situation.

The pandemic has also exposed inadequacies in countries' logistics systems, consistent with the underlying vulnerabilities of the Brazilian and global healthcare supply chains. Through its representatives, the State should pay greater attention to implementing rapid responses to crises, especially public health crises, which could affect the world in the future. Such actions must involve several stakeholders and different economic, public policy, social, health, and scientific sectors.

An in-depth look at the challenges of purchasing PPE during the Covid-19 pandemic provides an opportunity for future research to prepare the country to address extreme events and health crises, as has already been observed. In this sense, we cite new studies on governance, health, industrial economic complex, disasters, and public health emergencies.

Despite difficulties, the mitigating actions clearly show the procurement systems' resilience. In the end, they also form part, albeit indirectly, of the actions to combat the pandemic, thus evidencing their impact on policies, care, and the management of health services.

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