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The impact of community pharmacies on equity in access to professional rapid antigen testing for SARS-CoV-2 in Portugal

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ABSTRACT

Introduction: Amid the COVID-19 pandemic, various public health measures were adopted to reduce the transmission risk, including the full reimbursement of SARS-CoV-2 professional rapid antigen detection tests (Ag-RDT) conducted in clinical pathology laboratories, community pharmacies (CPs), and other authorized entities. This study aimed to assess the impact of integrating CPs into the Portuguese National Health Service (NHS) testing strategy on the capacity of professional Ag-RDT delivery, and to compare the equity in testing access with and without CPs participation.

Methods: This analytical cross-sectional study assessed the impact of adding CPs into the testing strategy based on two main outcomes by municipality: (i) average distance (in Kilometres) of the population to the nearest Ag-RDT site; and (ii) the average number of weekly hours available to testing per 1,000 inhabitants, as of January 31, 2022. Two scenarios were considered: with and without CPs. Access inequalities were evaluated using Lorenz curves and Gini coefficients. A subgroup inequality analysis was conducted based on three socio-demographic indicators: population density, aging index, and per capita purchasing power index.

Results: A total of 1,369 (65.1 %) pharmacies and 735 (34.9 %) laboratories and other entities provided free Ag-RDT to the population. The average distance to the nearest Ag-RDT location was 3.7 km, which decreased to 1.8 km with the inclusion of CPs. Overall, there were 11.5 weekly hours per 1,000 inhabitants available for testing with CPs, compared to 2.1 h without CPs ($p < 0.0001$). The Gini coefficient for distance distribution decreased from 0.50 to 0.42 with CPs inclusion (-16.8 %). For the distribution of weekly hours, the Gini coefficient decreased from 0.42 to 0.26 (-38.6 %). The reduction was higher in municipalities with lower population density (-43.3 %), higher aging index (-51.3 %), and lower per capita purchasing power index (-54.6 %).

Conclusions: Pharmacies play a crucial role in mitigating geographical and socioeconomic inequalities in healthcare access. Without CPs, the provision of Ag-RDT services would result in significant territorial gaps, exacerbating disparities among already vulnerable population groups.

1. Introduction

Not everyone has been impacted in the same way, to the same degree, or to the same level of severity by the COVID-19 pandemic (Mahler et al., 2022). Numerous factors, including access to testing, household characteristics, biological susceptibility and infectiousness, lockdowns, and social distancing measure, among others, are known to affect COVID-19 transmission (Liu et al., 2022; Pereira et al., 2021). These factors often vary by socioeconomic status, thereby driving disparities in COVID-19 infection rates across socioeconomic groups. Disadvantaged populations within countries face a disproportionately higher risk of contracting COVID-19 (Benita et al., 2022; World Health Organization (WHO), 2020a).

Numerous public health and social measures were enacted

Abbreviations: Ag-RDT, Rapid antigen detection tests; CPs, community pharmacies; NHS, National Health Service; POCT, point-of-care testing.

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throughout the pandemic to mitigate virus transmission and reduce morbidity and mortality (Paulo et al., 2023; World Health Organization (WHO), 2020b). Optimal policy design and implementation of these measures, with a focus on mitigation of disparities, were recommended to effectively tackle the pandemic (World Health Organization (WHO), 2020a).

In Portugal, the measures adopted included testing and tracing policies, with the government fully reimbursing the cost of the SARS-CoV-2 professional Ag-RDT to ensure equal access for all citizens (Portugal. Ministério da Saúde, 2021a). A key aspect of a successful testing strategy is ensuring geographic access to testing sites to achieve higher coverage and reduce existing disparities, particularly given the disproportionate impact of COVID-19 on vulnerable population groups (Almendra et al., 2021). Initially, point-of-care testing (POCT) was conducted at clinical pathology laboratories and later extended to CPs through voluntary contractual agreement with the NHS. This expansion was facilitated by temporary reduction or elimination of legal barriers due to the pandemic (Klepser et al., 2021; Portugal. DGS/INFARMED/INSA, 2021; Portugal. Ministério da Saúde. Direção Geral da Saúde., 2022).

Countries incorporated CPs into their national testing strategies to enhance accessibility, simplify logistics and improve efficiency (Risanger et al., 2021). This measure increased the number and geographic distribution of available testing sites; however, the impact of this public policy on addressing disparities was not assessed. Thus, this study aimed to evaluate the impact in the capacity of professional Ag-RDT offered by the integration of CP into the NHS testing strategy, and to compare the inequalities in access to testing, with and without CPs' participation, globally and stratified by subgroups of the population.

2. Methods

An analytical cross-sectional study was conducted using the 278 municipalities of mainland Portugal as observation units. The number and type of testing sites included in the study were those registered with the Portuguese Health Regulation Entity (Entidade Reguladora da Saúde) for professional Ag-RDT testing (Portugal. DGS/INFARMED/INSA, 2021) and reimbursed by the NHS, such as CPs, laboratories, and other health-related facilities (e.g., dental clinics), as of January 31, 2022. The list of these entities was obtained from the National Authority of Medicines and Health Products, I.P (Infarmed) website (INFARMED - National Authority of Medicines and Health Products, 2022), categorized into two groups (CPs, laboratories and other entities), and mapped across the 278 municipalities based on their GPS coordinates.

The impact of CPs inclusion in the testing strategy was measured using two accessibility measures: the difference in the average distance in kilometres (km) of the population to the nearest testing facility, and the difference in the average number of weekly testing hours per 1000 inhabitants, by municipality. Access inequalities were assessed using concentration curves (Lorenz curves) and Gini coefficients (Lee, 1997) for two scenarios: professional Ag-RDT with and without the integration of CPs.

2.1. Accessibility measures

The linear distances of the population to the nearest testing facility were calculated using grided geographical information on population density per squared km (Km^2) in Portugal ("GEOSTAT initiative - GISCO - Eurostat," n.d.) and the spatial location of the nearest testing site obtained from the Infarmed website (INFARMED - National Authority of Medicines and Health Products, 2022). Each cell in the grid is georeferenced and retains the population density information for that location. All calculations were performed in R software using the World Geodetic System 1984 (WGS 1984 or EPSG:4326) and considered the geographical delimitation of the territory at municipal, district, and national levels (excluding the autonomous regions of Madeira and Azores islands). Results were summarized by municipality.

The testing schedule for each authorized testing site was consulted on the corresponding online page (accessed from 8 to 25 February 2022) and summarized to determine the average number of weekly hours available for testing per 1000 inhabitants by municipality. For laboratories and other entities, the official schedule for Ag-RDT was used when available. If no official information was available, the average hours of service provided by the other registered locations was adopted. For CPs, the weekly official schedule reported to Infarmed was assumed, as no specific schedule for Ag-RDT testing was available. If not available, the minimum opening hours legally required for CPs were adopted.

Nonparametric Wilcoxon rank-sum test was used to compare paired differences of the average number of testing facilities, the average distances of the population to the nearest testing facility and the average weekly hours per 1000 inhabitants, by municipality, with and without the participation of CPs. The significance level adopted was α=0.05.

2.2. Inequality measures

For the construction of the Lorenz curves, the municipalities were sorted in ascending order based on accessibility levels, determined by average distance from the population to the nearest testing facility and by the cumulative average hours of access to professional Ag-RDT per 1000 inhabitants. Then, the cumulative percentage of accessibility measure against the accumulated percentage of the population was then plotted in a curve, to make it easier to evaluate the inequality in access distribution. The closer the curve is to the diagonal (which represents perfect equality), the better is the equity in access. Then, the Gini coefficient was used to synthesize the information on inequality obtained by the Lorenz curves (Lee, 1997). The Gini coefficient is widely used to assess income inequality; however, it can be used to measure inequality of any distribution on a scale from 0 (perfect equality) to 1 (perfect inequality), where higher values indicate higher inequality.

Given the territorial asymmetries in Portugal, a subgroup inequality analysis was performed, considering three socio-demographic indicators:

i) population density, calculated as the number of inhabitants per km^2, considering the resident population in 2021 (Statistics Portugal, 2022a);
ii) aging index, defined as the ratio between the number of people in the population over 65 years of age and the number of people aged between 0 and 14 years (Statistics Portugal, 2022b);
iii) per capita purchasing power, which reflects the ability to purchase goods and services by municipality) (Statistics Portugal, 2022c).

For this analysis, the national average of each indicator was used as a reference, and municipalities were categorized as either below or above this average. The Gini coefficient was then computed for these two groups of municipalities.

All analysis were performed using SAS Enterprise Guide V7.15 and R software.

3. Results

3.1. Accessibility

On January 31, 2022, there were 679 laboratories and 56 other entities (n = 735) performing professional Ag-RDT for the diagnosis of SARS-CoV-2 in mainland Portugal, covering 69.1 % of the 278 municipalities. Additionally, with the participation of 1369 CPs (48.9 % of 2802 pharmacies), covering 88.8 % of municipalities, the total number of testing facilities increased to 2104, resulting in 95.7 % municipality coverage. Overall, the average number of testing facilities per municipality increased from 2.6 to 7.6, a 2.9-fold increase ($p < 0.0001$)

Table 1
Ag-RDT for the diagnosis of SARS-CoV-2 in mainland Portugal, for laboratories and other entities, pharmacies, on January 31, 2022.

	Laboratories and other entities	Pharmacies	Total	P-value for difference*
Testing facilities, N (%)	735 (34.9)	1369 (65.1)	2104 (100)	–
Municipalities covered, N (%)	192 (69.1)	247 (88.8)	266 (95.7)	–
Number of testing facilities /municipalities, (mean)	2.6	4.9	7.6	<0.0001
Proportion of resident Population covered, (%)	90.7	97.4	99.3	–
Average distance to facilities, (km)	3.7	2.3	1.8	<0.0001
Average weekly hours /1000 inhabitants, (h)	2.1	9.4	11.5	<0.0001

* Comparison between the results from Laboratories and other entities and the results with participation of pharmacies (total).

(Table 1).

Furthermore, municipalities with pharmacies performing Ag-RDT accounted for 97.4 % of the population of mainland Portugal. With the participation of CPs, the average distance to the nearest testing facility decreased from 3.7 km to 1.8 km ($p < 0.0001$), and the average number of weekly hours per 1000 inhabitants of access increased from 2.1 to 11.5 (5.5 times higher) ($p < 0.0001$).

Figs. 1–3 illustrate the geographic distribution, on a municipality level, of the location of the testing facilities authorized to perform Ag-RDT, the average distance of the population to the nearest testing facility, and the average number of hours of access to these sites per 1000 inhabitants, respectively. The results are displayed for laboratories and other entities, CPs, and the total number of authorized entities as of January 31, 2022. The greatest impact in terms of reducing distances and increasing available testing hours was observed in the inland regions of mainland Portugal.

3.2. Disparities impact

Fig.4a displays the Lorenz curves for the average distances (km) of the population to the nearest testing site, and Fig. 4b shows the Lorenz curves for the hours of access per 1000 inhabitants in scenarios with and without the CPs. The findings reveal that 40 % of the population experienced similar average distances to the nearest testing facility, regardless of CPs inclusion. However, beyond this threshold, the gap between the concentration curves widens, indicating higher equity in access when CPs are included. This is visually depicted by the curve aligning closer to the diagonal, representing perfect equality in access (Fig. 4a). In terms of access hours per 1000 inhabitants, inequality is more pronounced between the presence and absence of CPs. For instance, without CPs, 50 % of the population accesses only 20 % of the available hours, whereas with CPs, the same proportion accessed approximately 33 % of

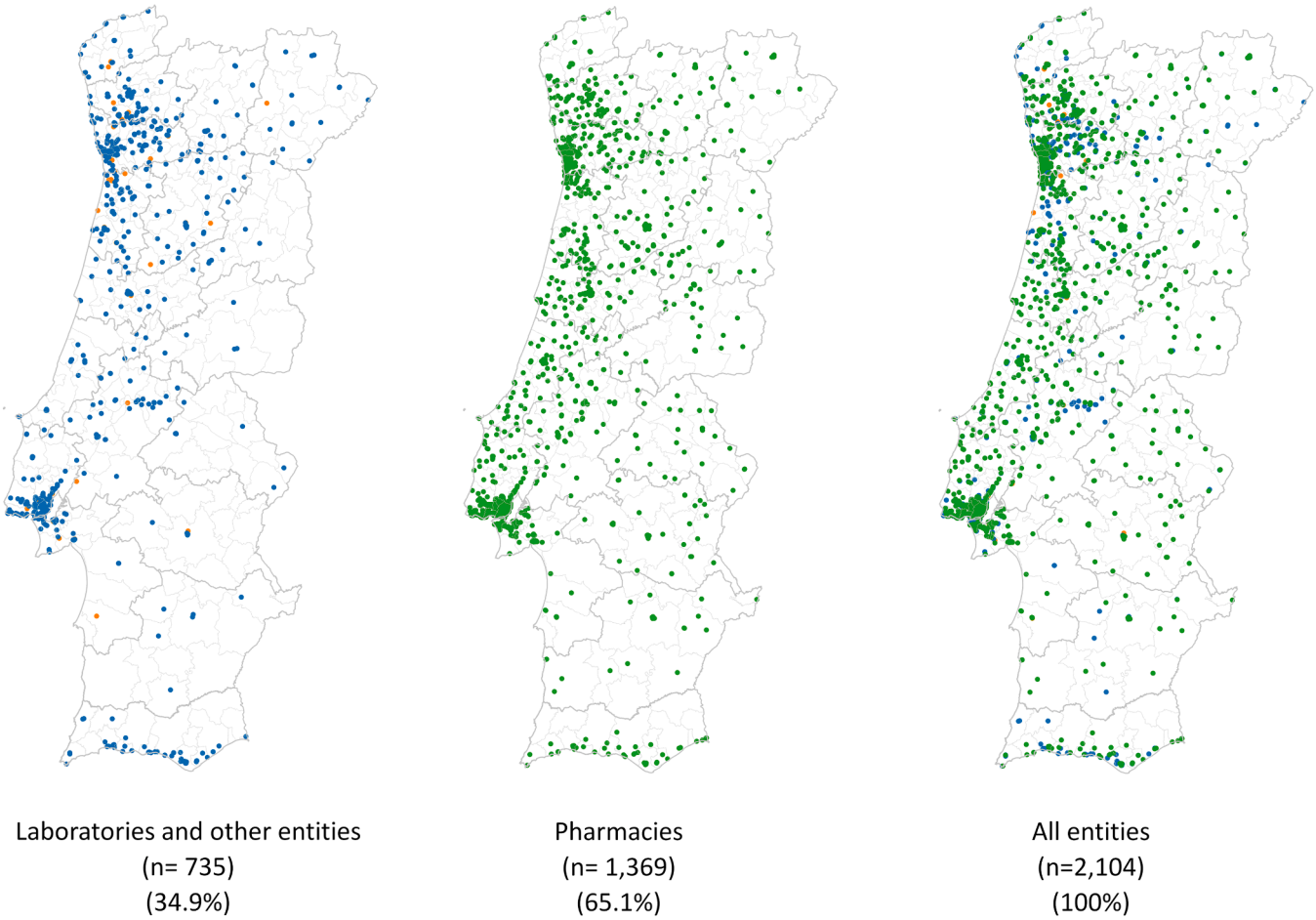

Fig. 1. Geographic distribution of testing facilities authorized to perform professional Ag-RDT, covered by the exceptional and temporary regime of reimbursement by the NHS, by entity and municipality, in mainland Portugal on January 31, 2022.
Note: There were 2802 CPs in mainland Portugal of which 1369 were authorized to perform Ag-RDT.

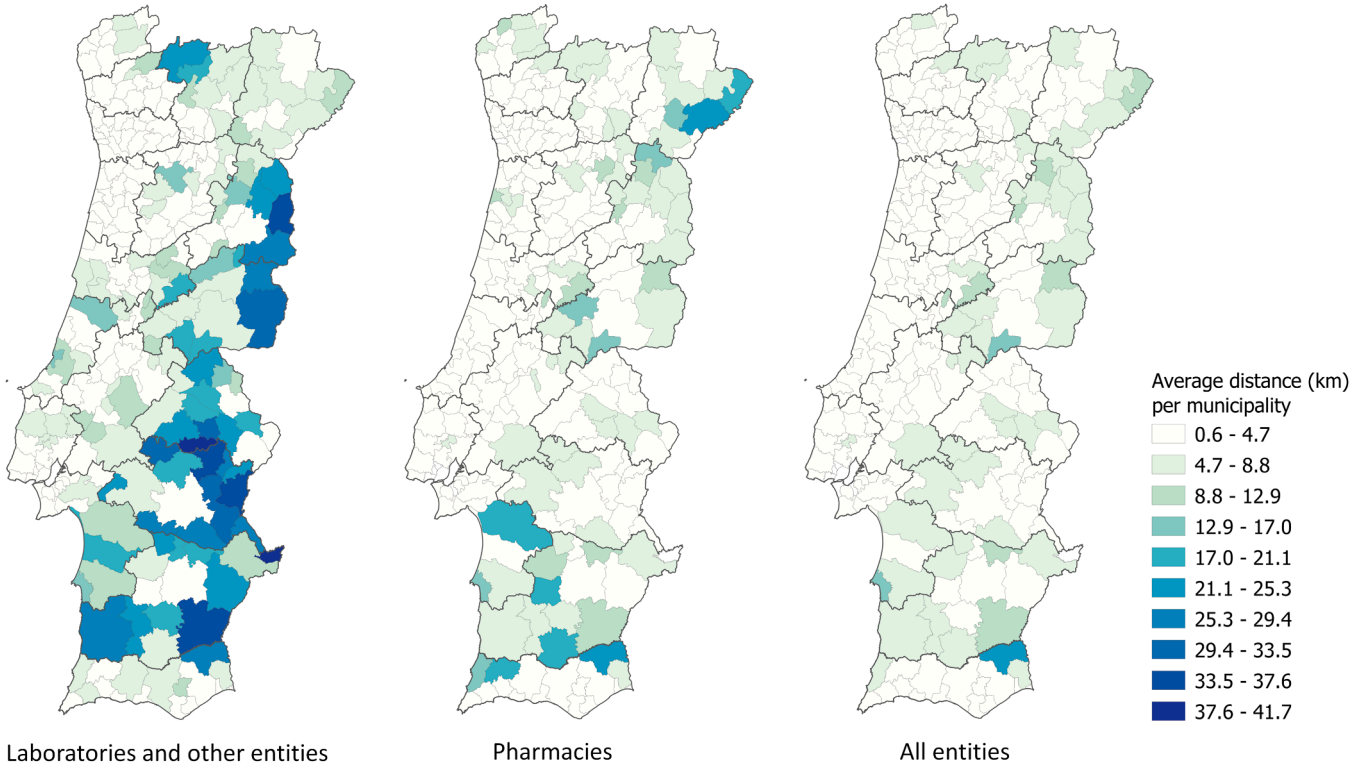

Fig. 2. Average distance (Km) of the population to the nearest site authorized for professional Ag-RDT, covered by the exceptional and temporary regime of reimbursement by the NHS, by entity and municipality, in mainland Portugal on January 31, 2022.

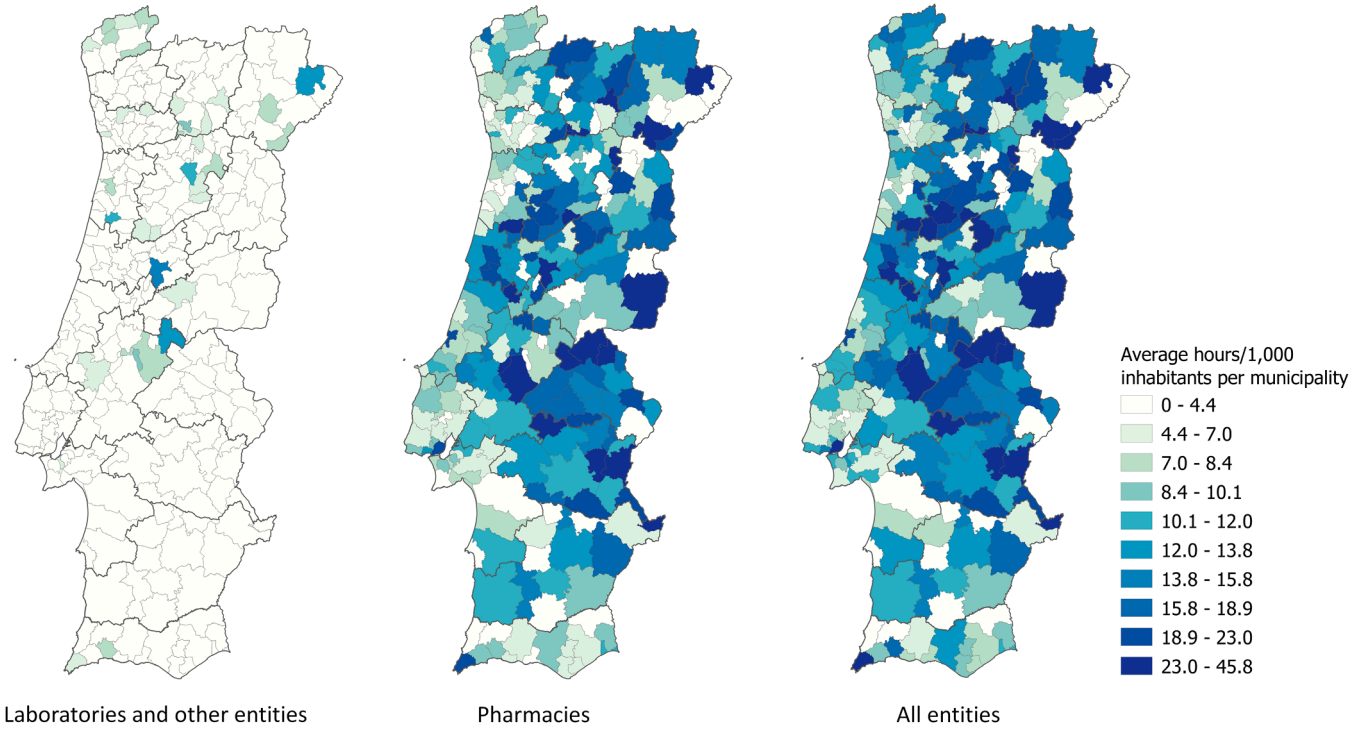

Fig. 3. Average number of hours of access/1000 inhabitants to the facilities authorized for professional Ag-RDT, covered by the NHS reimbursement scheme, by entity and municipality, in mainland Portugal on January 31, 2022.

the available hours (Fig. 4b).

The Gini coefficient indicates that the inclusion of CPs led to a reduction of 16.8 % in the inequality level regarding the average distance of the population to the nearest testing facility, with the Gini coefficient decreasing from 0.50 to 0.42. This reduction was particularly significant in the municipalities characterized by less favourable socio-demographic indicators, including lower population density (−38.1 %), a higher aging index (−32.2 %), and lower per capita purchasing

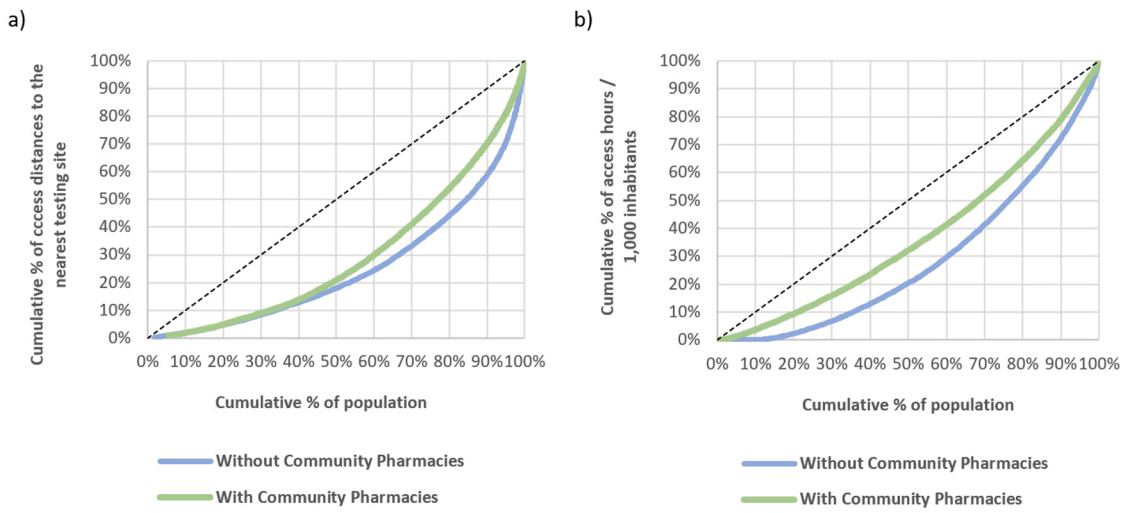

Fig. 4. a) Concentration of the average distances (Km) of the population to the nearest site authorized for Ag-RDT, covered by the NHS reimbursement scheme, with and without community pharmacies; b) concentration of access hours per 1000 inhabitants in sites authorized for Ag-RDT, covered by the NHS reimbursement scheme, with and without pharmacies.

power (−15.2 %) (Table 2).

The inclusion of CPs also resulted in a 38.6 % decrease (from 0.42 to 0.26) in the Gini coefficient for the average number of hours of access. This reduction in inequalities was particularly pronounced in municipalities with less favourable socio-demographic conditions. Specifically, there was a decrease in the Gini coefficient of 43.3 %, 51.3 % and 54.6 % in municipalities with lower population density, higher aging rates, and lower per capita purchasing power, respectively (Table 2).

4. Discussion

This study shows that the inclusion of CPs in the provision of professional Ag-RDT services during the COVID-19 pandemic significantly increased access by expanding the national territorial coverage. This expansion was achieved through a significant increase in the number of available testing facilities (mean per municipality from 2.6 to 7.6), leading to a substantial reduction in the average distance to the nearest Ag-RDT location for the population (from 3.7 to 1.8 km), as well as in an increase in the average weekly access hours for testing (2.1 to 11.5 per 1000 inhabitants). Moreover, this integration substantially reduced access inequalities in terms of geographic distance and hours of access per 1000 inhabitants per week, as evidenced by an improvement in the Gini coefficient. Notably, the improvement in the Gini coefficient was particularly pronounced in municipalities with less favourable socio-demographic conditions, such as below-average per capita purchasing power and population density, and an above-average aging index.

Throughout the COVID-19 pandemic, mass testing and contact tracing were pivotal in ensuring an effective crisis response and in mitigating the disease's impact. Central to this effort was the government's rapid establishment of testing sites for individuals and the subsequent tracing of contacts following positive results (Risanger et al., 2021). Additionally, the market introduction of SARS-CoV-2 professional Ag-RDT, characterized by high sensitivity and specificity, and rapid results, significantly increased testing capacity and diagnostic speed (Portugal. Ministério da Saúde. Direção Geral da Saúde., 2022; Risanger et al., 2021).

The government's decision to expand reimbursed professional Ag-RDT services to CPs strengthened the existing network, resulting in increased overall coverage and testing capacity. This expansion was facilitated by several advantages of CPs, including a skilled workforce, adequate infrastructure, good accessibility, extensive geographical coverage, and extended opening hours (Gouveia et al., 2016; Risanger et al., 2021). Specifically, with the involvement of CPs, the percentage of municipalities with at least one testing site increased from 69.1 % to

Table 2
Gini coefficient of the average distance (km) of the population to the nearest testing facility and of the access hours per 1000 inhabitants, with and without pharmacies, for mainland Portugal and for subgroups of municipalities.

	Mainland Portugal	Population Density		Ageing index		Purchasing power per capita	
		Municipalities below average	Municipalities above average	Municipalities below average	Municipalities above average	Municipalities below average	Municipalities above average
Gini coefficient of the average distance							
Without pharmacies	0.50	0.41	0.36	0.37	0.47	0.48	0.38
With pharmacies	0.42	0.26	0.34	0.36	0.32	0.41	0.37
Variation (%)	**−16.8 %**	**−38.1 %**	**−7.6 %**	**−1.4 %**	**−32.2 %**	**−15.2 %**	**−4.1 %**
Gini coefficient of access hours per 1000 inhabitants							
Without pharmacies	0.42	0.47	0.30	0.35	0.51	0.59	0.37
With pharmacies	0.26	0.27	0.22	0.24	0.25	0.27	0.25
Variation (%)	**−38.6 %**	**−43.3 %**	**−27.9 %**	**−30.7 %**	**−51.3 %**	**−54.6 %**	**−33.9 %**

Note: The testing sites include all entities authorized to carry out Ag-RDT, covered by the NHS reimbursement scheme. The municipalities were grouped as being below or above the national average for each of the indicators.

95.7 %, with 74 municipalities relying exclusively on CPs to provide testing services. Nonetheless, 19 municipalities offered testing solely through other entities, while 12 lacked any professional Ag-RDT testing sites. It is important to highlight that the provision of this service was voluntary and required compliance with specific technical, human and logistical requirements that some CPs, particularly those in smaller municipalities, were unable to meet. Reimbursement for public health interventions is acknowledged as a key factor in expanding the scope of practice for community pharmacists (Mumbi et al., 2024). While the increase in reimbursement for the Ag-RDT service from €10 to €15 per test in November 2021 (Portugal. Ministério da Saúde, 2021b) contributed to a rise in the number and geographic distribution of pharmacies providing this service (Romano et al., 2023), the increase may still fall short of covering the costs of the necessary adaptations, particularly for CPs striving to maintain their routine operations alongside this new service.

Importantly, CPs had a significant impact in reducing the average distance to the nearest Ag-RDT location and increasing the mean available hours for testing per 1000 inhabitants in the inner, older and less populated municipalities of mainland Portugal, as observed in Figs. 2 and 3. These findings highlight the essential role of CPs in providing comprehensive professional Ag-RDT services and reveal substantial coverage gaps that would exist without the participation of CPs.

Expanding COVID-19 testing to CPs not only addressed possible gaps in capacity but also provided better access for hard-to-reach and at-risk communities (Risanger et al., 2021). The need for convenient and equitable testing access to mitigate the already negative impacts of COVID-19 on the most vulnerable population groups, is reinforced in several studies (Benita et al., 2022; Berger et al., 2020). The role of CPs in Portugal in improving access and reducing inequalities has been previously described, within the context of the national Portuguese needle exchange programme (Gouveia et al., 2016). The authors also found that the participation of CPs significantly increased access to this programme and substantially reduced access inequality at the regional level, as evidenced by the application of the Gini coefficient.

The beneficial impact of CPs on the population, emphasizing their proximity, convenient location, and extended operating hours, has been extensively discussed in various studies, as these attributes are crucial for facilitating access to preventive health care services and other public health programs (Berenbrok et al., 2022; Bevan et al., 2021; Gubbins et al., 2017; Maidment et al., 2021; San-Juan-Rodriguez et al., 2018). Some authors, emphasize the importance of CPs in reaching individuals who may not otherwise have access to healthcare services (San-Juan-Rodriguez et al., 2018). Others highlight that CPs can offer key services and should play a more relevant role in public health initiatives, such as COVID-19 testing, population screenings, and vaccination, which should be endorsed and supported by decision makers (Berenbrok et al., 2022; Maidment et al., 2021).

In a recent scoping review aimed at understanding the factors that facilitate and hinder the acceptability and uptake of testing by the population, authors identified several logistical barriers on both sides (Bevan et al., 2021). Their findings suggest that the logistical organization of testing, including transportation to test sites, booking systems, sample extraction methods, and turnaround times, plays an important role in test-seeking behaviour. Moreover, practical access to testing was found to be especially important for vulnerable groups (Bevan et al., 2021).

Furthermore, Gubbins et al. (2017), in a comprehensive literature review, emphasized the importance of CPs in the context of POCT for infectious diseases. They highlighted CPs as a means to facilitate collaboration between pharmacists, public health professionals, and prescribers, ultimately improving the health of the populations they serve (Gubbins et al., 2017). In this context, it is plausible to assume that CPs can also play a pivotal role in the POCT screening and management of other acute infectious diseases, such as oropharyngeal infections or uncomplicated urinary tract infections. This support in diagnosis and treatment has the potential to improve access to care, especially in more deprived regions, and reduce avoidable visits to general practitioners or hospital emergency departments (Essack et al., 2020; Mantzourani et al., 2022; Page et al., 2021; Swart et al., 2024).

Additionally, as accessible healthcare points, CPs can aid in the screening and early detection of other infectious disease, such as human immunodeficiency virus, hepatitis B, and C. This enhances the promotion of early diagnosis, counselling, and referral when necessary (Kelling et al., 2016).

Importantly, considering the positive outcomes achieved with the national COVID-19 testing initiative, CPs demonstrated their potential to serve as strategic partners to the NHS not only in crisis situations but also in national health policies. In the future, with greater engagement and cooperation with public health authorities, CPs can play a significant role in reducing disparities in access to population-based screening campaigns, such as for colorectal cancer screening (Le Duc-Banaszuk, 2023) or Helicobacter pylori screening on dyspepsia (Papastergiou et al., 2020).

National initiatives in Portugal, developed with the collaboration of CPs, such as the Portuguese needle exchange programme (Gouveia et al., 2016), the provision of professional Ag-RDT services, and since 2023, the free seasonal influenza and COVID-19 vaccination for those aged 60 years or more (Teixeira Rodrigues et al., 2024), underscores the significant role CPs play in public health. These efforts, along with international examples of expanding publicly funded services provided by CPs - such as the Minor Ailments Assessment and Prescribing in Canada (Canadian Pharmacists Association, 2021), colorectal cancer screening in France (Le Duc-Banaszuk, 2023), influenza vaccination programs in the United Kingdom (NHS England, 2023), France (Czech et al., 2020; République Française, 2024), Canada (Canadian Pharmacists Association, 2021), Ireland (HSE Ireland, 2023), and since 2023, Portugal (Portugal. Ministério das Finanças e Saúde, 2023) - highlight the valuable contribution that CPs make to these programs and the well-being of the population.

4.1. Strengths and limitations

To the best of our knowledge, this research represents the first attempt to assess the impact on equity in access to professional Ag-RDT through the inclusion of CPs in the NHS national testing strategy. The insights gained from this study can be invaluable for informing future reviews of public health policies with higher recognition of CPs as healthcare providers, allocation of new competencies, and increased involvement in funded national POCT programs. Moreover, we used the Gini coefficients in the disparities impact analysis, as this is one of the most common measures of inequality, and it has been widely used to quantify and compare health inequities for a range of different health outcomes, including socioeconomic inequalities in the distribution of COVID-19 (Mishra et al., 2022).

Nonetheless, the extent of the results should be read with caution. Firstly, while the distances to the nearest testing facilities were calculated as straight-line measurements, it should be noted that real-world factors such as geographical obstacles (e.g., rivers or mountains) may affect actual travel distances. Nonetheless, these distances serve as a proxy for the population's access to testing sites. Additionally, the geographical information regarding population density per squared km was based on estimates from the 2011 National Census, with updates available until 2015. Although this data may not be the most current, it remains a valuable resource for understanding the present situation.

Second, it's important to note that, regarding CPs, due to the lack of specific timing information for testing, we assumed the pharmacy's official operating hours. If these were unavailable, we used the minimum hours stipulated by law. Since pharmacies generally have longer public opening hours compared to clinical laboratories, this may have led to an overestimation of the indicator. However, to validate this method of assigning workload, we contacted several pharmacies, which

confirmed that testing was conducted throughout their entire business hours.

5. Conclusion

This research demonstrates the significant positive impact of integrating CPs into the Portuguese NHS testing strategy for SARS-CoV-2. The inclusion of CPs has substantially increased testing capacity and accessibility while improving equity in testing access across different demographic groups. Notably, the integration of CPs has led to a considerable reduction in the average distance to testing sites and a significant increase in weekly testing hours available per 1000 inhabitants. These findings underscore the importance of leveraging CPs to enhance the efficiency, accessibility, and equity of national POCT services. Moving forward, continued collaboration between public health authorities and CPs can be valuable, particularly in addressing disparities in access to various POCT services among more vulnerable populations.

6. Ethics approval

Not applicable. This manuscript does not contain clinical studies or patient-level data. Data on testing units and GPS coordinates were obtained from the publicly accessible online platform of the Portuguese National Authority of Medicines and Health Products, I.P. (INFARMED); therefore, no access authorization was required.

CRediT authorship contribution statement

José Guerreiro: Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Sónia Romano:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization. **Inês Teixeira:** Writing – review & editing, Methodology, Investigation. **Klára Dimitrovová:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Rúben Pereira:** Writing – review & editing, Methodology. **António Teixeira Rodrigues:** Writing – review & editing, Methodology, Conceptualization. **Ema Paulino:** Writing – review & editing, Conceptualization.

Declaration of competing interest

All authors are researchers at CEFAR/Infosaúde, the research centre of the Portuguese National Association of Pharmacies.

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Data availability

Data will be made available on request.

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