Inequalities in unmet need for health care services and medications in Brazil: a decomposition analysis

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Summary

Background Unmet need is a metric used to assess the performance of health care systems throughout the world. One of the primary objectives of the Brazilian health care system is to identify ways to improve the health outcomes of all citizens. To accomplish this challenging goal, the health care system in Brazil will need to identify and eliminate barriers and provide timely and adequate access to health care services to all.

Methods This study assessed the performance of the Brazilian health care system by focusing on the unmet need for health care services and medications. We evaluated the Brazilian National Health Survey data collected in 2013 and 2019 to determine the magnitude of socioeconomic-related inequalities associated with unmet health care needs. Primary contributing factors were identified via decomposition analysis of the calculated concentration indices (CInds).

Findings Despite the availability of universal health care, 3.8% and 7.5% of the population in Brazil reported unmet needs for health care services and medications, respectively in the 2019 survey. Although the overall unmet need for medications remained unchanged between 2013 and 2019, CInd analysis revealed significant pro-poor inequalities with respect to unmet needs for both health care services and medications. The overall magnitude of these inequalities was higher in the poorer regions of the country. The use of private health insurance as well as individual health and socioeconomic status contributed significantly to the inequalities associated with unmet needs for health care services and medication throughout Brazil.

Interpretations Policy interventions should focus on improving access to health care services, extending coverage to include pharmaceuticals, and targeting both financial and non-financial barriers to obtaining care, particularly those experienced by the poor and vulnerable populations in Brazil.

Funding None.

Keywords: Brazil; Unmet need; Access to healthcare; Equality of access

Introduction

Timely and effective access to health care and affordable essential medications present ongoing challenges to the goal of achieving universal health coverage in many low- and middle-income countries.[1] Both financial and non-financial barriers to access can impede the appropriate use of health care services and may lead to poorer overall health.[2] Moreover, substantial inequalities regarding access to health care services and medication clearly exist even in countries that provide universal health care coverage. In these cases, the unmet need for health care services is typically most pronounced in the most economically disadvantaged populations. Thus, a careful analysis of unmet needs is an essential first step toward the design of policies focused on reducing health care inequalities.[2–5]

Brazil presents a unique setting in which to analyse inequalities in access to health care services. Brazil is currently one of the most economically-unbalanced countries in the world (Gini index of 48.9 in 2020).[6]

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Research in context

Evidence before this study
We employed the search terms "Brazil" and "unmet need" and "health care" and "medications" to identify relevant English and Portuguese language publications in PubMed and Google Scholar. We identified only one descriptive study that systematically assessed unmet needs and their correlates in Brazil between the years 1998 and 2008. Other studies were based solely on data that were not nationally representative and/or that highlighted unmet needs for specific health services or specific source of medication access.

Added value of this study
We evaluated results from two Brazilian National Health Surveys (*Pesquisa Nacional de Saúde* [PNS]) that spanned the years 2013–2019 with a focus on unmet needs for health care services and medications. We examined the impact of private health insurance and socioeconomic inequalities on the extent of the inequalities observed that focused on unmet needs for both health care services and medication. We also explored the evolution of unmet needs for medication

between the years 2013 and 2019 at both national and regional levels.

Implications of all the available evidence
Although Brazil currently offers universal health care coverage, in the 2019 survey, 3.8% and 7.5% of the population reported unmet needs for both health care services and medication, respectively. Moreover, the percentage of the population experiencing unmet needs specifically for medication remained unchanged between 2013 and 2019. Individuals reporting unmet needs are heavily concentrated in the poorest segments of the population and the most economically-deprived regions of Brazil. The use of private health care insurance and socioeconomic disparities exacerbate these inequalities. Policy interventions might focus on improving coverage and access to critical pharmaceuticals while targeting financial and non-financial barriers to obtaining health care services, particularly for the poor and most vulnerable Brazilians.

Furthermore, while Brazil supports a single-payer, publicly funded national health service known as the Unified Health System or *Sistema Único de Saúde* (SUS), over half of the total expenditure on health care comes from private sources.[7]

The SUS is a taxpayer-funded public health care system that provides services at all levels free of charge at the point of delivery. The system has achieved significant gains over the past 30 years; improvements in both coverage and access to health care services have resulted in better health outcomes overall.[8] Primary health care programming that covers over 60% of the population represents a central component of the national health service; it has improved the health of the Brazilian population[9–11] and reduced health inequalities.[12] However, while everyone is covered by the SUS, 28.5% of the population (primarily individuals with higher incomes who are formally employed and residing in urban centers) remains covered by one or more private health insurance schemes.[13] Additionally, and despite significant advances, access to specialized care remains a major shortfall in the public health care sector and long waiting times persist.[8]

Access to medication in Brazil has undergone significant changes in the past several years. In theory, public health facilities in Brazil can provide access to pharmaceuticals listed in the National List of Essential Drugs at no charge to the patient. However, in reality, access to medication is frequently constrained by rationing resulting from limited and intermittent stocks. Most private health insurance programs available in Brazil do not cover the costs of prescription drugs; individuals carrying private insurance need to cover the

cost of medication out-of-pocket. In 2006, Brazil initiated a government-funded program that subsidizes the purchase of some medications (e.g., anti-diabetic and anti-hypertensive drugs) from retail pharmacies. Recent reports suggest that this program has been largely successful in reducing avoidable hospitalizations due to diabetes.[14] However, catastrophic health care expenditures, specifically related to the purchase of necessary medication, remain a major cause of financial hardship. This mainly affects low-income households[15] with pronounced regional disparities.[16]

The highly-fragmented nature of Brazil's health care system and persistent regional disparities remain major barriers to more equitable access to health care services.[17] Brazil has large geographical variations with respect to the distribution of infrastructure, human resources, access to medication, and coverage by its national health care programs.[16,18–20] These geographical variations in the supply of health care resources coupled with the aforementioned two-tiered (public *versus* private) financing system lead to disparities in both access to and quality of health care as well as protection from financial risk.[17,21] Results from previous studies suggest that the limited availability of health care providers, infrastructure, and pharmaceuticals in underserved areas remains among the major challenges. Likewise, the financial burden associated with seeking care (e.g., transportation costs) represents an additional barrier to access.[22,23]

Existing evidence suggests that the inequalities in unmet health care needs largely reflect the overall socioeconomic inequalities in Brazil. In the only published study that systematically assessed unmet needs

for health care in Brazil, Osorio et al.[24] reported a decrease in the percentage of the population facing unmet needs from 3.5% in 1998 to 2.9% in 2008, mostly due to issues related to costs and affordability. By contrast, another more recent study focused on access to medicines through the public health system reported an increase in the proportion of people who did not obtain any medication from the public system between 2013 and 2019.[25] Other studies focused on unmet needs for specific health services (e.g., mental health, access to pharmaceuticals) and/or presented findings that were not limited to health care in Brazil[23,26,27] (see Appendix Table A1 for further details).

Thus, the goal of this study was to evaluate the unmet need for medications (years 2013 through 2019) and health care services (in 2019 only). As part of this study, we planned to determine the link between unmet needs and their relevant determinants, notably, the impact of co-existing private health insurance as well as the socioeconomic and geographical disparities within the population of Brazil.

Methods
Data
In this study, we examined data from both the 2013 and 2019 Brazilian National Health Surveys (*Pesquisa Nacional de Saúde* [PNS]). The survey was conducted by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* [IBGE]) in partnership with the Ministry of Health using a complex probabilistic sample design that was clustered in three stages. Microdata provided by IBGE includes all information needed to account for the sampling design, including weights adjusted for non-response rates and population projections.[13,28]

The survey sample was designed to be representative at the national level as well as within major regions (South, Southeast, North, Northeast, and Midwest) and other subnational levels. The survey includes a wide array of socioeconomic characteristics and information on health status as well as the utilisation of health care services by all members of the sampled households. Questions focused on lifestyle as well as diagnosis and treatment of chronic diseases were answered by a single, randomly selected household member who was at least 18 years of age in 2013 and at least 15 years of age in 2019. Thus, in order to include variables related to the prevalence of chronic diseases as predictors, our sample for this analysis was restricted to individuals 18 years of age and older.

Unmet need for health care services and medications
We computed two measures of unmet need, specifically (1) the unmet need for health care services and (2) the unmet need for medications. A dichotomous variable representing an unmet need for health care services was constructed based on the response to the survey question that asked respondents who sought health care in the past two weeks whether or not they were successful in obtaining it. Two groups of respondents were considered to have unmet needs for health care services, including those who sought healthcare but were unable to obtain services on the first attempt and those who did not seek health care when it was needed. We considered that individuals did not seek care when it was needed for one or more of the following reasons: (1) insufficient funds to cover the costs; (2) health care services were too far away and/or other difficulties involving transportation; (3) incompatible service times; (4) service takes too long to arrange; (5) the specialist needed was unavailable; (6) belief that he/she was not entitled to care; (7) no one was available to accompany him/her to the appointment; (8) did not care for the professionals working at the facility; (9) an ongoing strike among health care service personnel; or (10) other. However, we note that the questions were worded somewhat differently in the two versions of the survey (2013 *versus* 2019). Because they may have an impact on the comparability of the results obtained, we limited this part of the analysis to the 2019 survey only. Additional details on the procedure for creating the main dependent variables are included in Appendix 2. Similarly, a dichotomous variable representing an unmet need for medications was generated based on the survey question that asked if respondents were able to obtain all medications prescribed at their previous health care visit. This question was administered in both years of the survey (2013 and 2019).

We performed a secondary analysis of the results obtained from respondents that reported unmet needs for health care services or medications. Specifically, we identified four variables that captured the reasons for not seeking or receiving health care services and/or an inability to obtain medications. These four variables include affordability (cost of the services and/or drugs), availability (availability and accessibility of services, distance or transportation problems, and availability of appropriate health care personnel), personal reasons (no one available to accompany him or her, personal beliefs), and other reasons. Additional details are included in Appendix 2).

Statistical analysis
We performed a CInd analysis to examine the extent of inequality with respect to these unmet needs. For the variables of interest (unmet needs for health care services and medications and underlying reasons), we generated CInd values and performed a decomposition analysis to (1) estimate the extent of the inequalities associated with unmet needs for health care and medications, and (2) to identify and evaluate the main

contributors to this issue. The CInd is a value that ranges from −1 to +1, with negative values representing a situation in which inequalities are more prevalent among those with lower socioeconomic status (i.e., pro-poor) and positive values representing inequalities that are "pro-rich" with respect to the outcome variable. The standard methods used to calculate CInd values are limited by critical shortcomings, for example, the "bounds issue" associated with bivariate variables. For example, equal CInds determined for two regions that have different mean rates of utilisation of a given service will reflect different levels of inequality to access; this is because the mean of the distribution introduces limits to the possible CInd values.[29] Thus, when quantifying the magnitude of socioeconomic-related inequality in cases of unmet need, we applied the correction for binary variables suggested by Erreygers.[30] With this correction, the CInds derived in this analysis satisfied the four properties that have been identified as desirable when evaluating binary variables. In our study, this translates to (1) a small transfer in health status from a richer to a poorer individual translates into a pro-poor change in the CInd (and *vice versa*); (2) inequality indicators for unmet and met needs are mirror images of one another; (3) an equal increment of health for all individuals has no impact on the index; and (4) linear transformation of the health variable has no impact on the value of the index. Additional details that describe the CInd analysis are included in Appendix 3.

We then performed a decomposition analysis of the CInd to identify contributors to the inequality in unmet needs. Building on the theoretical framework proposed by Andersen,[31] the independent variables used in the decomposition analysis were assembled into three major groups to capture predisposing factors (e.g., age, gender), enabling factors (e.g., socioeconomic status, having private health insurance, regional disparities in healthcare infrastructure), and need factors (overall health status, non-communicable diseases). The inclusion of variables indicating the region and urban/rural area of residence was necessary to account for all non-observable factors that vary across geographical and urban/rural regions in Brazil that might have an impact on unmet needs for health care and medications

(e.g., regional disparities in health care infrastructure or general living standards in the place of residence). Inclusion of these variables serves to attenuate any omitted variable bias introduced by non-observable factors that vary at the regional or the urban/rural levels. Further details and a description of the entire set of variables are provided in Appendix 4.

Ethical clearance
This study is a secondary analysis based on data available in the public domain. No ethical clearance was needed nor sought.

Role of the funding source
None.

Results
The results shown in Table 1 summarise our two main variables of interest, the unmet need for health care services and the unmet need for medications. In 2019, 7.5% of the population reported an unmet need for medications (95% confidence interval [CI], 6.7%–8.4%) which was higher than the 3.8% that reported an unmet need for health care services (95% CI, 3.6%–4.0%). When we evaluated the unmet need for health care services by its derived variables, we found those who searched for health care services but were unable to obtain them on their first attempt accounted for only 0.6% of this value (95% CI, 0.5%–0.7%); most of the unmet need (3.2%; 95% CI, 3.0%–4.0%) represented those who did not seek health care services when they were needed. These results are summarized in Appendix Table A2. Interestingly, the unmet need for medications remained virtually unchanged between 2013 (7.8%; 95% CI, 6.8%–8.9%) and 2019 (7.5%; 95% CI, 6.7%–8.4%). The remaining variables used in this analysis are summarized and discussed in Appendix 4 and Table A3.

Disaggregation of these results by socioeconomic status (Appendix Figs. A1 and A2) provides some explanation for these findings. When analysed over time

	2013			2019		
	Mean (%)	95% CI	No. observations	Mean (%)	95% CI	No. observations
Unmet needs[a]						
• For health care services				3.8	3.6–4.0	83,927
• For medication	7.8	6.8–8.9	6222	7.5	6.7–8.4	8722

Notes: The findings presented include the means (percent of observations) and 95% confidence intervals (CIs) for all outcome variables associated with unmet health care needs. The number (no.) of observations related to unmet need for medications is based on prescriptions for medication provided during the previous two weeks. The number (no.) of observations related to unmet needs for health care services is the total number of adults (18 years old and older). [a]An unmet need for health care services represents the fraction of individuals who were unable to obtain care on their first attempt as well as those who did not seek care when it was needed. An unmet need for medication represents the fraction of individuals who were unable to obtain all drugs prescribed. *Sources*: PNS 2013, PNS 2019, and the authors' calculations.

Table 1: Unmet needs for health care services and medications in Brazil in 2013 and 2019.

(2013–2019), we found that while unmet needs for medications decreased among the respondents in the highest income quintile, its prevalence has increased among respondents in the lowest income quintile. Of note, these findings were not as clear in comparisons of individuals in other income quintiles. For example, while the unmet need for medications had declined over time among those in the second-lowest income quintile, this need has increased for those in the third and fourth quintiles. The changes observed across income quintiles offset one another and thus suggest a minimal change in the overall prevalence of the unmet need for medications over time. Furthermore, as shown in Appendix Fig. A2, unmet needs for health care services and medications reported in the 2019 survey are generally concentrated among those in the lower-income quintiles. However, we note that the prevalence of unmet needs for medications also remains high among those in the third income quintile.

The results shown in Table 2 display Erreygers-corrected CInds. Appendix Fig. A3 includes the concentration curves for each of the two variables of interest. As noted above, a CInd with a negative coefficient represents a situation in which inequalities are more prevalent among those with lower socioeconomic status (i.e., pro-poor). By contrast, a positive coefficient represents an unequal distribution of the outcome variable in a direction that is pro-rich. Our analysis of the data collected in 2019 revealed unmet needs for both health care services and medications that were skewed significantly in the pro-poor direction with Erreygers-corrected CInds of –0.035 (95% CI -0.040 to –0.030) and –0.024 (95% CI, –0.044 to –0.005) respectively. These CInd values also reveal an unmet need for medications that has increased in magnitude over time (2013 and 2019), although the results for 2013 did not achieve statistical significance.

Fig. 1 presents the results of the decomposition analysis of the CInds determined from the results of the 2019 survey. More specifically, the data presented in this figure document the relative contribution of each explanatory variable that contributes to the overall concentration index. (The full set of results is reported in Appendix Table A4). The results of decomposition analysis revealed that private health insurance and health status are the two main contributors to inequality of unmet needs. We found that the use of private health insurance contributed 40% and 73% to the overall inequality in unmet needs for health care services and medications, respectively. By contrast, differences in health status account for only 23% and 18% of these inequalities, respectively. We also found that socioeconomic status can explain 32% of the inequalities associated with unmet needs for health care services while contributing only 2% to the inequalities associated with medications. The contributions of all other variables (notably, those listed as predisposing variables) were comparatively limited compared to those discussed above.

Our analysis of these data also permitted us to identify some of the reasons provided by those who did not seek health care services and/or were unable to obtain medications. Appendix Fig. A4 provides a snapshot of the reasons reported for these unmet needs categorized by income quintiles; Appendix Tables A5 and A6 capture the mean values and the results of a CInd analysis. We found that individuals in the lowest income quintile were more likely to report affordability barriers in accessing health care services and/or obtaining medications (CInd, –0.091; 95% CI, –0.130 to –0.051 and CInd, –0.108, 95% CI, –0.175 to –0.040, respectively). Individuals in the highest income groups were more likely to report other reasons for not seeking health care services and/or obtaining medications. Interestingly, limited availability of health care services and/or medications was reported frequently and to a nearly equal extent across all income quintiles. By contrast, limited availability of medications had a higher impact on the lowest-income groups.

We also used the results of decomposition analysis to examine the unequal distribution of unmet needs across five designated regions of Brazil. The main results of this analysis are shown in Table 3. When considering unmet needs for health care services, our regional-level results are consistent with the findings obtained for the entire country. Our analysis of the 2019 survey revealed statistically significant inequalities in unmet needs for health care services that primarily affected those with

	2013			2019		
	CInd	95% CI	No. observations	CInd	95% CI	No. observations
Unmet needs[a]						
•For health care services				–0.035***	–0.040 to –0.030	83,927
•For medications	–0.018	–0.042–0.006	6222	–0.024**	–0.044 to –0.005	8722

Notes: The findings presented include the Erreygers-corrected concentration indices (CInds) and 95% confidence intervals (CIs) for all outcome variables associated with unmet health care needs; *p < 0.1. **p < 0.05. ***p < 0.01. [a]An unmet need for health care services represents the fraction of individuals who were unable to obtain care on their first attempt as well as those who did not seek care when it was needed. An unmet need for medication represents the fraction of individuals who were unable to obtain all drugs prescribed. *Sources*: PNS 2013, PNS 2019, and the authors' calculations.

Table 2: Erreygers-corrected CInds for unmet needs for health care services (2019) and medications (2013 and 2019).
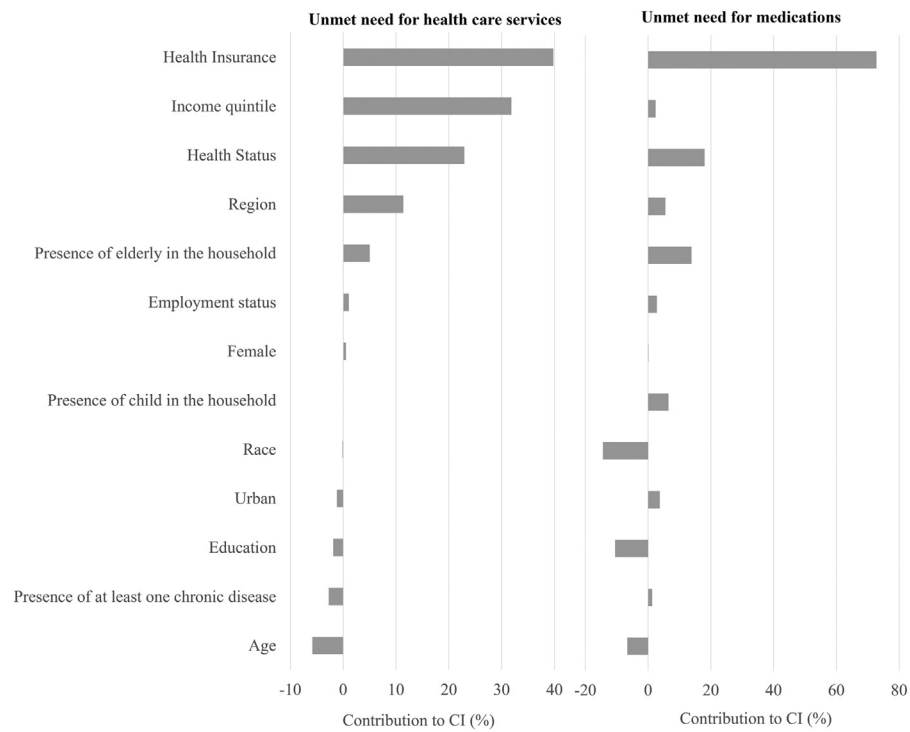
Fig. 1: Decomposition of the CInds reveals factors that contribute to unmet needs for health care services and medications (2019).

	2013			2019		
	CInd	95% CI	No. observations	CInd	95% CI	No. observations
Unmet needs[a]						
(a) for health care services						
Brazil				−0.035***	−0.040 to −0.030	83,927
South				−0.015***	−0.023 to −0.008	11,275
North				−0.034***	−0.049 to −0.020	12,341
Northeast				−0.032***	−0.042 to −0.023	30,699
Southeast				−0.026***	−0.034 to −0.018	19,432
Midwest				−0.036***	−0.049 to −0.023	10,180
(b) for medications						
Brazil	−0.018	−0.042 to 0.006	6222	−0.024**	−0.044 to −0.005	8772
South	−0.038	−0.091 to 0.015	1046	−0.036*	−0.078 to 0.005	1315
North	−0.015	−0.071 to 0.040	921	−0.066**	−0.120 to −0.012	1184
Northeast	−0.005	−0.041 to 0.031	1750	−0.021	−0.050 to 0.008	2929
Southeast	0.004	−0.040 to 0.049	1743	−0.011	−0.047 to 0.024	2285
Midwest	−0.053**	−0.099 to −0.007	762	−0.024	−0.066 to 0.018	1059

Notes: The findings presented include the Erreygers-corrected concentration indices (CInds) and standard errors (SE) for all outcome variables associated with unmet health care needs; *p < 0.1. **p < 0.05. ***p < 0.01. [a]An unmet need for health care services represents the fraction of individuals who were unable to obtain care on their first attempt as well as those who did not seek care when it was needed. An unmet need for medication represents the fraction of individuals who were unable to obtain all drugs prescribed. *Sources*: PNS 2013, PNS 2019, and the authors' calculations.

Table 3: Erreygers-corrected CInds for unmet needs for (a) health care services and (b) medications by region.

lower socioeconomic status. The magnitude of the CInd representing the unmet need for health care services is lower in the South compared to all other regions in the country. We also identified a statistically significant pro-poor inequality in the unmet need for medications in the North. Results from the Midwest suggest an improvement over time from a statistically significant pro-poor inequality in 2013 to differences from the 2019

survey that did not achieve statistical significance. This result was further confirmed by disaggregation of the prevalence of unmet needs by region (Appendix Fig. A5). This latter analysis suggested that the national level 2019 results for inequalities associated with access to medications were driven largely by disparities in the North. The decomposition of the CInds on a region-by-region basis (Appendix Fig. A6) confirmed these results and also permitted us to conclude that differences in socioeconomic status (particularly in the North, in the case of unmet need for medications), use of private health insurance, and individual health status increase inequalities in the unmet need for health care services in favour of the wealthy.

Discussion

The main objective of this study was to analyse inequalities associated with unmet needs and factors contributing to access to health care services and medications in Brazil. The data used in this study were from a nationally representative survey conducted in 2013 and 2019. The results of our analysis revealed that inequalities in unmet needs for both health care services and medications with primary impact on the poor. Moreover, the results from the decomposition analysis revealed that enabling factors (e. g., socioeconomic status and the use of private health insurance) and need factors (e.g., poor health) are the most significant contributors to these inequalities. This result was confirmed by our analysis of the underlying factors contributing to these unmet needs. This analysis revealed that the poorest individuals in the population were those who most frequently cited affordability as the reason that health care services and medication needs remained unmet. Finally, our results are consistent when re-evaluated at the sub-national level. Specifically, we found that the magnitude of unmet need for health care services and medications is particularly large in the Northern region of the country in which socioeconomic factors were identified as the largest contributors to the inequality with respect to the unmet need for medications.

While our results are largely comparable, our results on the prevalence of unmet needs are slightly higher than those described in a previous publication.[24] This may be driven in part by the use of a different instrument (the National Household Sample Survey) in these previous analyses. Nonetheless, our results are consistent with the findings reported in other Latin American countries. A large study that included results from 27 countries throughout the Americas measured unmet needs and concluded that those in the poorest groups are more likely to experience barriers to access to health care services due to financial reasons, availability of resources, geographic access, and acceptability.[32] Previous assessments of unmet needs for health care services,

particularly among the poor, have revealed that the Brazilian universal health system remains challenged due to ongoing barriers to access, unequal supply of health services, and even lack of information regarding the availability of health care services.[33] Collectively, these results suggest that there remain significant challenges to providing equitable access to health care in both low- and middle-income countries and that these problems might persist even after the establishment of a large publicly funded national health system that provides universal health care coverage to all.

Our results focused on the unmet needs for medications complement those reported by the National Survey on Access, Use and Promotion of Rational Use of Medicines in Brazil (PNAUM), which was a national household survey carried out between 2013 and 2014 that explored access to and use of essential medicines prescribed to adults to treat chronic non-communicable diseases (NCDs).[34] Among the findings from this earlier study, ~5.7% of all Brazilians who were aware of their medical diagnoses and who had received a prescription for appropriate treatment reported that they were unable to obtain all medications prescribed by the physician during the previous 30 days.[35] These outcomes were reported most frequently in the Northeast and among those who were most severely affected by their disease. Studies that focused on access to medications for specific NCDs found heterogeneity in unmet needs based on individual diagnoses, with values ranging from 2.1% for hypertension,[36] and 2.2% for diabetes[37] to 8.5% for chronic respiratory disease.[38] Collectively, these results suggest that the prevalence of unmet needs for medications among those with NCDs is lower than the prevalence of overall unmet needs reported by the entire population of Brazil. This might reflect the successful implementation of national policies designed to supply medicines for NCDs at no cost.[14] However, our findings also highlight persistent regional inequalities and high prevalence of unmet needs for some specific conditions.

As noted above, the results of our analysis at the regional level are consistent with those emerging at the national level, and both point to significant inequalities in unmet needs for both, health care services and medications specifically in the North when compared to the rest of the country. This is likely to be a result of both economic and health care-related factors. The North is the largest region in Brazil yet is among the lowest among all regions in the country with respect to socioeconomic development. In terms of the Gross Regional Product (GRP) per capita, the North is in fourth place among the five designated regions; the GRP of the North trails those of the Midwest, South, and Southeast.[39] Moreover, the heavy concentration of unmet need for health care services in the North region may be also due to the difficulties involving the number of health professionals who choose to practice in this region, geographical accessibility to an SUS pharmacy,

the poor infrastructure of the primary health care units, and difficulties with transportation of both health care teams and patients.[22,27,40]

The results of our analysis also revealed that the unmet need for medications remained unchanged between 2013 and 2019 and that this finding was driven by an interplay between the socioeconomic and geographical disparities described above. In other words, while the unmet need for medications diminished somewhat among those who were comparatively wealthy, it increased among those who remain poor; these results ultimately offset one another. This increase in unmet needs for medications among the poor was exacerbated by the existing geographical inequalities, which are particularly pronounced in the North. The extent of this increase outweighed some of the improvements reported in other regions (e.g., the Midwest). As discussed in the paragraphs above, the North is the poorest region in Brazil and experiences significantly worse health outcomes largely due to problems related to access to health care services.[41]

We also found that unmet needs for health care services and medications were further exacerbated by access to private health insurance. As private health insurance is available only to those with the ability to pay and is largely related to employment status, its use tends to be unequally distributed and heavily concentrated among the wealthier members of a given population. Hence, the advantage that it provides to those who can afford it may exacerbate inequalities in access to health care services compared to those who must rely solely on publicly-available services. This situation leads to an implicit two-tier system in which the wealthy have "double coverage" by both SUS and private health insurance, whereas the poorer individuals rely solely on SUS. The case of Brazil reveals the difficulties when attempting to offer adequate care and timely services to all at no cost at the point of care. For example, data from PNS for 2019 suggest that up to a fifth of the individuals with private health insurance still rely on health care services provided through the public health system.

Results focused on inequalities in unmet needs for health care and medications during this period are particularly relevant because our survey was performed during a time of major economic recession and increased poverty rates nationwide. In 2019, the Gross Domestic Product (GDP) per capita was 6.8% lower (in adjusted currency values) than in 2013. At the same time, the unemployment rate grew from 7% in 2013 to 11.9% in 2019. During this period, the poverty headcount ratio at $3.2 (2011 PPP (Purchasing Power Parity)) per day grew from 8% to 10%.[6] Our results suggest that inequalities in unmet need for medications also grew during this interval. Collectively, these results suggest that barriers to accessing needed medications in Brazil grew among those with lower income during this economic downturn. Nevertheless, efforts to ascertain the direct impact of the economic recession on unmet needs will require additional analysis using alternative data and methodological approaches that exceed the scope of the current work.

Additionally, institutional reforms and public spending restrictions implemented in Brazil during this period may have increased the division between public and private health financing and thus led to increased inequities.[7] World Bank reported that public health expenditures in Brazil decreased from 44.52% of total health expenditure in 2013 to 40.74% in 2019.[6] Considering that the use of private insurance was identified as the largest contributor to inequalities in unmet need for health care services and medication, this represents a concerning trend that might exacerbate future health-related inequalities.

This study has some specific limitations. First, Andersen's behavioural model of health services utilisation[31] which was employed to categorise the covariates used in this analysis exhibits only limited capacity to generalize results.[42] However, despite this limitation, and acknowledging that various factors may contribute to the search for health care, this model provides a framework that permits us to consider many of these factors and their interrelationships. The Andersen model also offers additional guidance in interpreting results by identifying the factors that contribute to income-related inequalities in health care. Second, given its nature, the CInd and decomposition analysis facilitates the acquisition of correlational as opposed to causal inference. Third, socioeconomic inequalities measured by the CInd (e.g., income distribution) represent only a partial approach to this complex issue, as there are other potentially relevant factors, including race and sex, that are not considered. However, the decomposition analysis assessed the contributions of other factors, including age, race, sex, area of residence, and the presence of one or more non-communicable diseases to the observed socioeconomic inequalities. Given the availability of question on unmet need in the analysed surveys, only the datasets for 2013 and 2019 were used in this analysis. Finally, a comparison of our results with those presented in international studies focused on unmet needs and that used survey data based on individuals' own assessments[2] reveals some important conceptual differences. For example, our final derived variable of unmet need for health care services and medications considers only events of the previous two weeks rather than the previous 12 months and entails an implicit concept of health need as opposed to a more explicit question focused on the receipt of treatment or medications as needed. However, despite these limitations, this paper presents an all-encompassing analysis of the inequalities in the unmet need for health care services and medications in Brazil in 2019 and the evolution of the unmet need for medications from 2013 to 2019. Our study also identifies the factors that provide

the strongest contributions and documents the relevance of private health insurance as the main driver of these inequalities in the unmet need for health care services and medications, even within the context of universal health coverage.

Conclusion

Our findings reveal that there remain inequalities in unmet needs for health care services and medications in Brazil. Collectively, our results support the view that efforts to achieve equality in the delivery of health care services and access to medications should be ongoing and remain important policy concerns. Our findings also have implications for policy development in other middle-income countries that provide universal health care coverage. First, our findings are consistent with the results reported by several Organization for Economic Co-operation and Development (OECD)-aligned countries and the Americas that have achieved universal or near-universal health care coverage for their populations. Specifically, OECD findings reveal that inequalities in access to health care services persist over time despite increases in health care expenditures and investments directed at expanding infrastructure.[2,3,32,43–45] Second, our findings revealed that more Brazilians reported unmet needs for medications compared to health care services, notably those who are among the poor and disadvantaged populations. Therefore, policy interventions should focus on extending coverage for pharmaceutical needs and might target both financial and non-financial barriers to obtaining health care services, particularly among the poor and vulnerable individuals residing in the lower-resourced regions of the country.[46] Future research will be needed to meet the challenge of monitoring the evolution of unmet needs for health care services and medications as well as identifying their determinants.

Contributors
MC, ZN, MM, and EM envisaged the study. MC conducted the data work, which was verified by MM and ZN. MC, ZN, and MM drafted the manuscript under the overall supervision of EM. All authors read the final version of the manuscript.

Data sharing statement
The PNS 2013 and 2019 data are publicly available at https://www.ibge.gov.br/estatisticas/sociais/saude/9160-pesquisa-nacional-de-saude.html?=&t=downloads. The dataset creation plan for this study and the underlying analytic code are available from the corresponding author upon request.

Declaration of interests
We declare no competing interests (MC, ZN, MM, EM).

Appendix A. Supplementary data
Supplementary data related to this article can be found at https://doi.org/10.1016/j.lana.2022.100426.

References

1 United Nations. Transforming our world: the 2030 agenda for sustainable development. *70th Session of the United Nations General Assembly, 21 October 2015*. New York: UN; 2019. Available from: http://www.un.org/en/ga/search/view_doc.asp?symbol=A/%20RES/70/1. Accessed April 20, 2022.

2 Organization for Economic Cooperation and Development. *Unmet needs for health care: comparing approaches and results from international surveys*. Paris: OECD; 2020. Available from: http://www.oecd.org/health/health-systems/Unmet-Needs-for-Health-Care-Brief-2020.pdf. Accessed June 20, 2022.

3 Devaux M. Income-related inequalities and inequities in health care services utilisation in 18 selected OECD countries. *Eur J Health Econ*. 2015;16(1):21–33.

4 Kassouf AL, McKee M, Mossialos E. Early entrance to the job market and its effect on adult health: evidence from Brazil. *Health Pol Plann*. 2001;16(1):21–28.

5 De La Torre A, Nikoloski Z, Mossialos E. Equity of access to maternal health interventions in Brazil and Colombia: a retrospective study. *Int J Equity Health*. 2018;17(1):43. https://doi.org/10.1186/s12939-018-0752-x.

6 World Bank. World development indicators. https://databank.worldbank.org/source/world-development-indicators; 2022. Accessed August 16, 2022.

7 Rocha R, Furtado I, Spinola P. Financing needs, spending projection, and the future of health in Brazil. *Health Econ*. 2021;30(5):1082–1094. https://doi.org/10.1002/hec.4241.

8 Castro MC, Massuda A, Almeida G, et al. Brazil's unified health system: the first 30 years and prospects for the future. *Lancet*. 2019;394(10195):345–356.

9 Mrejen M, Rocha R, Millett C, Hone T. The quality of alternative models of primary health care and morbidity and mortality in Brazil: a national longitudinal analysis. *Lancet Reg Health Am*. 2021;4:100034. https://doi.org/10.1016/j.lana.2021.100034.

10 Hone T, Saraceni V, Medina Coeli C, et al. Primary healthcare expansion and mortality in Brazil's urban poor: a cohort analysis of 1.2 million adults. *PLoS Med*. 2020;17(10):e1003357.

11 Rocha R, Soares RR. Evaluating the impact of community-based health interventions: evidence from Brazil's family health program. *Health Econ*. 2010;19(S1):126–158.

12 Hone T, Rasella D, Barreto ML, Majeed A, Millett C. Association between expansion of primary healthcare and racial inequalities in mortality amenable to primary care in Brazil: a national longitudinal analysis. *PLoS Med*. 2017;14(5):e1002306.

13 IBGE. *Pesquisa nacional de saúde, 2019: Informações sobre domicílio, acesso e utilização dos serviços de saúde*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística – IBGE; 2020. https://biblioteca.ibge.gov.br/visualizacao/livros/liv101748.pdf. Accessed August 16, 2022.

14 Américo P, Rocha R. Subsidizing access to prescription drugs and health outcomes: the case of diabetes. *J Health Econ*. 2020;72:102347. https://doi.org/10.1016/j.jhealeco.2020.102347.

15 Araujo EC, Coelho BDP. Measuring financial protection in health in Brazil: catastrophic and poverty impacts of health care payments using the latest national household consumption survey. *Health Syst Reform*. 2021;7(2):e1957537.

16 Miranda VIA, Schafer AA, Tomasi CD, Soratto J, de Oliveira Meller F, Silveira MPT. Inequalities in access to medicines for diabetes and hypertension across the capitals in different regions of Brazil: a population-based study. *BMC Publ Health*. 2021;21(1):1–8.

17 Bossert T, Blanchet N, Sheetz S, Pinto D, Cali J, Perez Cuevas R. *Comparative review of health system integration in selected countries in Latin America*. Washington, DC: Inter-American Development Bank; 2014. https://publications.iadb.org/publications/english/document/Comparative-Review-of-Health-System-Integration-in-Selected-Countries-in-Latin-America.pdf. Accessed August 16, 2022.

18 França GV, Restrepo-Mendez MC, Maia MFS, Victora CG, Barros AJ. Coverage and equity in reproductive and maternal health interventions in Brazil: impressive progress following the implementation of the unified health system. *Int J Equity Health*. 2016;15(1):1–12.

19 Facchini LA, Piccini RX, Tomasi E, et al. Evaluation of the effectiveness of primary health care in south and northeast Brazil: methodological contributions. *Cad Saúde Pública*. 2008;24:s159–s172.

20 Pinto LF, Giovanella L. The family health strategy: expanding access and reducing hospitalizations due to ambulatory care sensitive conditions (acsc). *Ciência Saúde Coletiva*. 2018;23:1903–1914.

21 Andrade MV, Noronha KV MdS, Menezes RdM, et al. Desigualdade socioeconômica no acesso aos serviços de saúde no brasil: um estudo comparativo entre as regiões brasileiras em 1998 e 2008. *Econ Apl.* 2013;17(4):623–645.

22 Garnelo L, Parente RCP, Puchiarelli MLR, Correia PC, Torres MV, Herkrath FJ. Barriers to access and organization of primary health care services for rural riverside populations in the Amazon. *Int J Equity Health.* 2020;19(1):54.

23 Garcia-Subirats I, Vargas I, Mogollón-Pérez AS, et al. Barriers in access to healthcare in countries with different health systems. A cross-sectional study in municipalities of central Colombia and north-eastern Brazil. *Soc Sci Med.* 2014;106:204–213.

24 Osorio RG, Servo LMS, Piola SF. Unmet health care needs in Brazil: an investigation about the reasons for not seeking health care. *Ciência Saúde Coletiva.* 2011;16(9):3741–3754.

25 Boing A, Bof de Andrade F, Bertoldi A, et al. Prevalências e desigualdades no acesso aos medicamentos por usuários do Sistema Único (in Portuguese). *Cad Saúde Pública.* 2022. https://doi.org/10.1590/0102-311XPT114721 (Prevalence rates and inequalities in access to medicines by users of the Brazilian Unified National Health System in 2013 and 2019).

26 Fatori D, Salum GA, Rohde LA, et al. Use of mental health services by children with mental disorders in two major cities in Brazil. *Psychiatr Serv.* 2019;70(4):337–341.

27 Matta SR, Bertoldi AD, Emmerick ICM, Luiza VL. Barriers to access to medicines for non-communicable diseases for patients using the Brazilian Unified Health System (SUS). *Braz J Pharmaceut Sci.* 2021;57. https://www.scielo.br/j/bjps/a/fMLzRYmGHZRxGK KRRyQZytk/?format=pdf&lang=en. Accessed August 16, 2022.

28 IBGE. Pesquisa nacional de saúde: 2013. percepção do estado de saúde, estilos de vida e doenças crônicas. Brasil, grandes regiões e unidades da federação. (in Portuguese) (National Health Survey: 2013. Perception of health status, lifestyles and chronic diseases. Brazil, major regions and federation units). https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?id=291110&view=detalhes; 2014. Accessed August 16, 2022

29 Wagstaff A. The bounds of the concentration index when the variable of interest is binary, with an application to immunization inequality. *Health Econ.* 2005;14(4):429–432.

30 Erreygers G. Correcting the concentration index. *J Health Econ.* 2009;28(2):504–515.

31 Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* 1995;36(1):1–10.

32 Báscolo E, Houghton N, Del Riego A. Leveraging household survey data to measure barriers to health services access in the Americas. *Rev Panam Salud Publica.* 2020;44:e100. https://doi.org/10.26633/RPSP.2020.100.

33 Szwarcwald CL, Souza-Júnior PR, Damacena GN. Socioeconomic inequalities in the use of outpatient services in Brazil according to health care need: evidence from the world health survey. *BMC Health Serv Res.* 2010;10(1):1–7.

34 Mengue SS, Bertoldi AD, Boing AC, et al. National survey on access, use, and promotion of rational use of medicines (PNAUM): household survey component methods. *Rev Saude Publica.* 2016;50(suppl 2):4s. https://doi.org/10.1590/S1518-8787.2016050006156.

35 Oliveira MA, Luiza VL, Tavares NU, et al. Access to medicines for chronic diseases in Brazil: a multidimensional approach. *Rev Saude Publica.* 2016;50(suppl 2):6s. https://doi.org/10.1590/S1518-8787.2016050006161.

36 Mengue SS, Bertoldi AD, Ramos LR, et al. Access to and use of high blood pressure medications in Brazil. *Rev Saude Publica.* 2016;50(suppl 2):8s. https://doi.org/10.1590/S1518-8787.2016050006154.

37 Meiners M, Tavares N, Guimarães L, et al. Access and adherence to medication among people with diabetes in Brazil: evidences from PNAUM. Acesso e adesão a medicamentos entre pessoas com diabetes no Brasil: evidências da PNAUM. *Revista brasileira de epidemiologia = Braz J Epidemiol.* 2017;20(3):445–459. https://doi.org/10.1590/1980-5497201700030008.

38 Leal LF, Bertoldi AD, Menezes A, et al. Indicação, acesso e utilização de medicamentos para doenças respiratórias crônicas no Brasil: resultados da Pesquisa Nacional sobre Acesso, Utilização e Promoção do Uso Racional de Medicamentos no Brasil (PNAUM), 2014. *Cad Saúde Pública.* 2018;34(10):e00208217. https://doi.org/10.1590/0102-311X00208217 [Indication, access, and use of medicines for chronic respiratory diseases in Brazil: results from the National Survey on Access, Utilisation, and Promotion of Rational Use of Medicines in Brazil (PNAUM), 2014].

39 IBGE. *Sistema de Contas regionais: brasil 2019.* Brazil: Regional Accounts System; 2019 (in Portuguese). https://biblioteca.ibge.gov.br/visualizacao/livros/liv101873informativo.pdf. Accessed August 16, 2022

40 Scheffer M, Cassenote A, Guerra A, et al. *Demografia Médica no Brasil.* São Paulo: Universidade de São Paulo; 2020. https://www.passeidireto.com/arquivo/105672501/demografia-medica-2020-9-dez-1. Accessed August 16, 2022.

41 Rocha R, Camargo M, Falcao L, Silveira M, Thomazinho G. A Saúde na Amazônia Legal: evolução Recente e Desafios em Perspectiva Comparada. https://amazonia2030.org.br/wp-content/uploads/2021/11/A-Saude-na-Amazonia-Legal.pdf; 2021. Accessed August 16, 2022.

42 Aday LA, Andersen RM. Health care utilisation and behavior, models of. In: *Encyclopedia of Biostatistics.* Wiley Online Library; 2005. vol. 4 https://onlinelibrary.wiley.com/doi/10.1002/0470011815.b2a4a010.

43 Thomson S, Sagan A, Mossialos E. *Private Health Insurance: History, Politics and Performance.* Cambridge: Cambridge University Press; 2020.

44 Mossialos E, Thomson SM. Voluntary health insurance in the European Union: a critical assessment. *Int J Health Serv.* 2002;32(1):19–88. https://doi.org/10.2190/K6BP-3H1R-L41M-HVGE.

45 King D, Mossialos E. The determinants of private medical insurance prevalence in England, 1997-2000. *Health Serv Res.* 2005;40(1):195–212. https://doi.org/10.1111/j.1475-6773.2005.00349.x.

46 Mossialos E, Walley T, Mrazek M. Regulating pharmaceuticals in Europe: an overview. In: Mossialos E, Walley T, Mrazek M, eds. *Regulating pharmaceuticals in Europe: striving for efficiency, equity and quality.* Berkshire: Open University Press; 2004.