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Patients' Nonattendance in Outpatient Specialist Consultations: A National Cohort Analysis of a Health System

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Background: Analyzing patients' nonattendance at medical appointments helps address an issue impacting the management and sustainability of health systems globally, providing valuable insights for healthcare managers. This study aims to identify factors at both patient and health system levels that contribute to understanding missed appointments.

Methods: The analysis was conducted using data from secondary care consultations within the Brazilian Unified Health System between April 2018 and March 2020. Primary care includes general medical consultations, while secondary care involves specialized services provided by doctors with advanced expertise. We examined demographic factors (age, sex, race/color, socioeconomic level) and health system practices (waiting time, hospitalization, distance to service, medical specialty, and severity of clinical condition) to assess their impact on patient attendance. A weighted analysis and receiver operating characteristic (ROC) analysis were applied to determine the relative risk of nonattendance.

Findings: Of 5,003,159 consultations, 435,523 (8.7%) were missed. Nonattendance was highest among patients facing long distances to the service (13.3%, [RRR] 1.227), younger age (16–30 years: 11.8%, [RRR] 1.041), and waiting times (>30: 10.9%, [RRR] 1.738). Socially vulnerable patients were more likely to miss appointments (9.6%, [RRR] 1.055) compared to less vulnerable groups (8.6%). Practice-level factors had a slightly greater impact on nonattendance (ROC: 0.621) than patient-level factors (ROC: 0.5674). The overall predictive model achieved a C statistic of 0.6228, resulting in a fair predictive ability. However, the model showed only modest prediction of no-shows, indicating the need for more detailed data to improve accuracy. Gauging which group suffers the highest risk of nonattendance was a secondary goal of this analysis.

Interpretation: Young, socially vulnerable patients with long commutes and extended waiting times are at higher risk of nonattendance. Effective management of these risk factors and targeted preventive actions are essential to reduce absenteeism and improve health system efficiency.

Keywords: absenteeism, health policy, medical appointment, health management

Introduction

The nonattendance of patients at medical appointments poses significant challenges to the management and sustainability of health systems worldwide, affecting clinical and economic outcomes.[1–5]

Missed appointments reduce service provider productivity, increase costs, and extend waiting times, creating further inefficiencies.[1] McQueenie et al[2] found that missed appointments are a significant marker for all-cause mortality, particularly in patients with mental health issues.

Ellis et al[3] observed that 46% of patients did not attend at least one scheduled appointment in the period of their study and 19% did not attend more than two consultations. This finding was based on a national retrospective cohort analysis

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using data from primary care from the United Kingdom's National Health Service (NHS), examining a population of more than half a million patients. This study, when observing that the consultations missed by patients have financial implications for health systems, highlighted the need to investigate nonattendance from the perspective of the interface between consultations of primary and secondary health services with attention to aspects of social vulnerability.

The study by Ellis et al[3] recognizes the possibility for greater characterization of patients in the interface between primary and secondary care. The authors point out that

> Future research will report on diagnoses, outcomes, social vulnerability, and health-care utilisation across the primary-care and secondary-care interface to allow further characterisation of patients, understanding of service provision, and development of appropriate interventions.

Williamson et al[4] identified that frequent non-attendees of primary care also have higher rates of hospital care utilization, showing a consistent pattern of "missingness". Philpott-Morgan et al[5] emphasized the need for future studies to explore the clinical, behavioral, and psychosocial domains contributing to nonattendance to create targeted interventions.

Several authors[6–19] have studied the nonattendance of medical consultations in secondary services and identified factors that influence this pattern of behavior; the majority focused on pathologies or specific medical specialties, with specific determinants of the evolution of diseases. However, these factors cannot be generalized to the wide range of treated health conditions at this level of healthcare without addressing the interface between primary and secondary services.

From the cited studies, it is possible to extract that the integrated performance of primary and secondary health services, with regard to complementing care for the same patient, requires the effective commitment of this patient to treatment continuity so that the opportunity for treatment is effectively taken. Based on this, we consider that it is important for the system to develop mechanisms that allow it to monitor this condition and intervene when something is not adequate, such as whether the patient does not attend the scheduled appointment in secondary care.

This study aimed to understand the nonattendance of patients at secondary care consultations, focusing on the interface with referrals from primary care to identify factors that characterize this behavior. We analyzed variables at both patient and health system levels to propose improvements for better clinical and economic outcomes in national health systems.

To achieve this, we selected Brazil's Unified Health System (SUS), which operates through a hierarchical service network. SUS has a robust referral system between primary care, which handles general consultations, and secondary care, which provides specialized medical services.[20,21] SUS offers comprehensive data on completed and missed consultations, making it ideal for this analysis.

As one of the largest health systems globally in terms of population coverage and service provision, SUS offers insights that could benefit other countries. The Pan American Health Organization (PAHO/WHO) considers SUS

> a mandatory reference for a nation committed to universal health, participatory public management, and a source of knowledge for the Region of the Americas and countries from other latitudes.[22]

Methods

To carry out this national cohort analysis, data collected between April 1, 2018, and March 30, 2020, were extracted using proprietary software from SUS. The main software was the regulation system (SISREG), which controls appointment scheduling and allows the recording of absences. Another important software was the outpatient information system (SIA), which records all consultations carried out by SUS for remuneration for the service provided and the strategic planning of the system. This second software allowed us to compare the sample size extracted from SISREG in relation to the universe of consultations carried out by SUS in the same period.

We confirm that all data accessed in this study complied with the relevant data protection and privacy regulations, in accordance with national and institutional guidelines. The data used were anonymized, and no identifiable personal information was disclosed, ensuring compliance with privacy standards and ethical guidelines.

The SISREG data represent part of what was effectively accomplished in consultations in secondary care in Brazil during the considered period of 2 years. Secondary care refers to specialized medical services provided after a referral from primary care, where patients are directed to specialists or advanced healthcare services. SIA recorded 241,676,886 consultations in secondary care in the period, while we could extract a total of 5,003,159 (2.1%) from SISREG.

This sample is explained by the fact that no record of all consultations exists within SISREG and by the clipping of the study, which considered only consultations originating from primary care demand and disregarded other origins since the objective of the study was to analyze the interface between these levels of attention. The relevance of the sample is based on the representation of 100% of Brazilian states and more than 50% of municipalities, enabling a factor analysis that considers the immense diversity of the Brazilian territory in its social, economic, cultural and geographic aspects.

It is important to note that the focus of the study was on consultations that, although scheduled, were not performed due to the absence of patients. These data do not compose the SIA because they are from consultations that were never carried out and, therefore, were only registered in SISREG. The number of absences in the period was 435,523 consultations, which represents 8.7% of the total sample of 5,003,159 consultations scheduled in secondary care without consideration of medical specialty.

Patient data collected for analysis included demographic (gender, age, race/color), socioeconomic (inclusion in the Bolsa Família program), logistic (commuting between municipalities), and clinical characteristics (severity, waiting times, the occurrence of hospitalization, and type of medical specialty of the consultation) to identify factors that contributed to missed appointments in secondary care.

Relative Risk Ratios (RRRs) were calculated by dividing the incidence of nonattendance in each group by that in the reference group. For example, in the case of waiting time, the reference group consisted of patients with shorter waiting times (0–1 days), and the relative risk was calculated for patients who had to wait more than 30 days. The study controlled for other demographic and socioeconomic factors using logistic regression models, ensuring that the RRRs presented account for confounding variables.

We employed the undersampling technique to balance the data set, as there was a large discrepancy between the number of patients who attended versus those who missed their appointments. This method reduced the size of the category of patients who attended, ensuring that the analysis gave equal weight to both outcomes (attendance and nonattendance). While other techniques, such as zero-inflated regression models, could have been applied, undersampling was chosen due to its simplicity and effectiveness in handling class imbalance, allowing for a clearer analysis of the factors contributing to nonattendance.

Receiver Operating Characteristic (ROC) analysis was applied to assess the predictive ability of the models. This methodology is appropriate for this study because it allows for the evaluation of the model's overall ability to distinguish between patients who attend and those who miss appointments, providing an objective measure of prediction accuracy (C statistic). Given the size of the dataset, the ROC curve offers a robust method for comparing the performance of different predictive factors and identifying the most influential variables.

Ellis et al[3] observed that nonattendance at primary care consultations is strongly associated with patients of low socioeconomic status, considering the Scottish Index of Multiple Deprivation (SIMD). For this analysis, in the context of Brazil, we used the Bolsa Família program of the Brazilian federal government, which aims to transfer income to families in situations of social vulnerability to fight hunger and promote access to health actions among other factors and offer health, education, and social assistance. Families are selected from a set of social indicators capable of establishing situations of social and economic vulnerability.[23]

SISREG data were analyzed to ensure that each scheduled appointment considered for this study had a record of attended (confirmed) or missed (absence). This information was recorded in the system by each health service after the date and time scheduled for patient care. Appointments that did not contain the presence or absence record were pending in the system and were removed from the study.

Another important factor is that the usage of this system is not mandatory at the national level; therefore, we only considered those places that adhered to its implementation. Although other systems in Brazil capture this sort of information, no platform exists that unifies this data.

Data Analysis

In a first analysis, the objective was to understand the proportion of absence and attendance of patients at consultations in secondary care based on patient level factors, including (i) age, (ii) sex, (iii) race/color (classification model adopted by the Brazilian Institute of Geography and Statistics [IBGE]), and (iv) socioeconomic status (considering patients enrolled or not in the Bolsa Família program), and at the health system practice level, including (v) waiting time (number of days between the date of referral for consultation in secondary care and the date scheduled for care), (vi) occurrence of hospitalization (in the period between 2018 and 2020, observing whether in a recent period, before or after the consultation, the patient required hospitalization), (vii) distance (considering whether the consultation would be held in the same municipality where the patient resides or in a different municipality, also observing if there was a need for migration between states), (viii) type of medical specialty of the consultation (clinical or surgical), and (ix) the severity of the disease (considering a scale of severity in four ascending levels, adopted by the software that provided the data).

Then, the relative risk of a patient missing an appointment in secondary care was investigated independently, considering each level of stratification of the observed variables, followed by the receiver operating characteristic (ROC) analysis, considering the variables grouped at the patient and practice levels, aiming at the most precise targeting of possible intervention actions that can mitigate the problem.

For the relative risk investigation, a weighted basis was generated of a random character that sought to approximate the representativeness of the main variable – the patient's absence or attendance at the consultation – correcting the discrepancy between the opposite values of the variable. Starting from a base of 5,003,159 consultations with 435,523 (8.7%) missed appointments, we arrived at a weighted basis of 847,325 consultations with 435,523 (51%) missed appointments. Figure 1 shows the results of each variable analyzed.

We had no intention to predict the possibility of missing appointments individually or collectively given the characteristics of the study's scope. The focus on the interface between primary and secondary care does not reveal the reality of serial consultations for the continuity of treatment of patients. In general, after a first evaluation visit and ordering tests, the patient returns for diagnostic confirmation, treatment prescription, and guidance for continuity in primary care.

Results

The largest representativeness of the sample considering the variables at the patient level was in the age group 46–60 years with 1,341,680 (26.8%), female with 3,120,596 (62.4%), white with 2,391,789 (52.3%), and not beneficiaries of the Bolsa Família program with 4,637,241 (92.7%). In the variables related to the practice of the health system, the greatest representativeness were patients who waited more than 30 days for the consultation with 2,065,186 (41.3%), who live in the same city where the consultation was performed with 4,413,577 (88.2%), who were not recently hospitalized with 4,075,728 (81.5%), who had consultations in clinical specialties with 4,588,336 (91.7%), and who had conditions of low severity or considered elective with 3,659,656 (73.1%).

The results were analyzed in two groups of variables. The first group, called "sociodemographic variables", included factors such as age, sex, race/color, and socioeconomic status. The second group, initially described as "practice-level variables", more accurately refers to the clinical circumstances of the consultation request, including waiting time, recent hospitalization, distance to the service, and severity of the condition.

In the bivariate analyses, each predictor was evaluated individually to determine its association with nonattendance. These results serve as a foundation for the subsequent multivariable analyses, where predictors were combined to create more complex models, including the first model - sociodemographic variables, and the second model - clinical circumstances, and the full model. This distinction was made to identify the independent contributions of each group of variables.

The goal of the predictive model was to maximize the ability to predict nonattendance. While the individual effect estimates of each predictor are relevant, the primary focus is on improving the overall predictive accuracy of the model, as reflected by the C statistic and other performance metrics.

The analysis of absences considered their frequency among the total absenteeism and the relationship between absences and attendance, the latter being more significant in identifying which categories have the highest relative risk

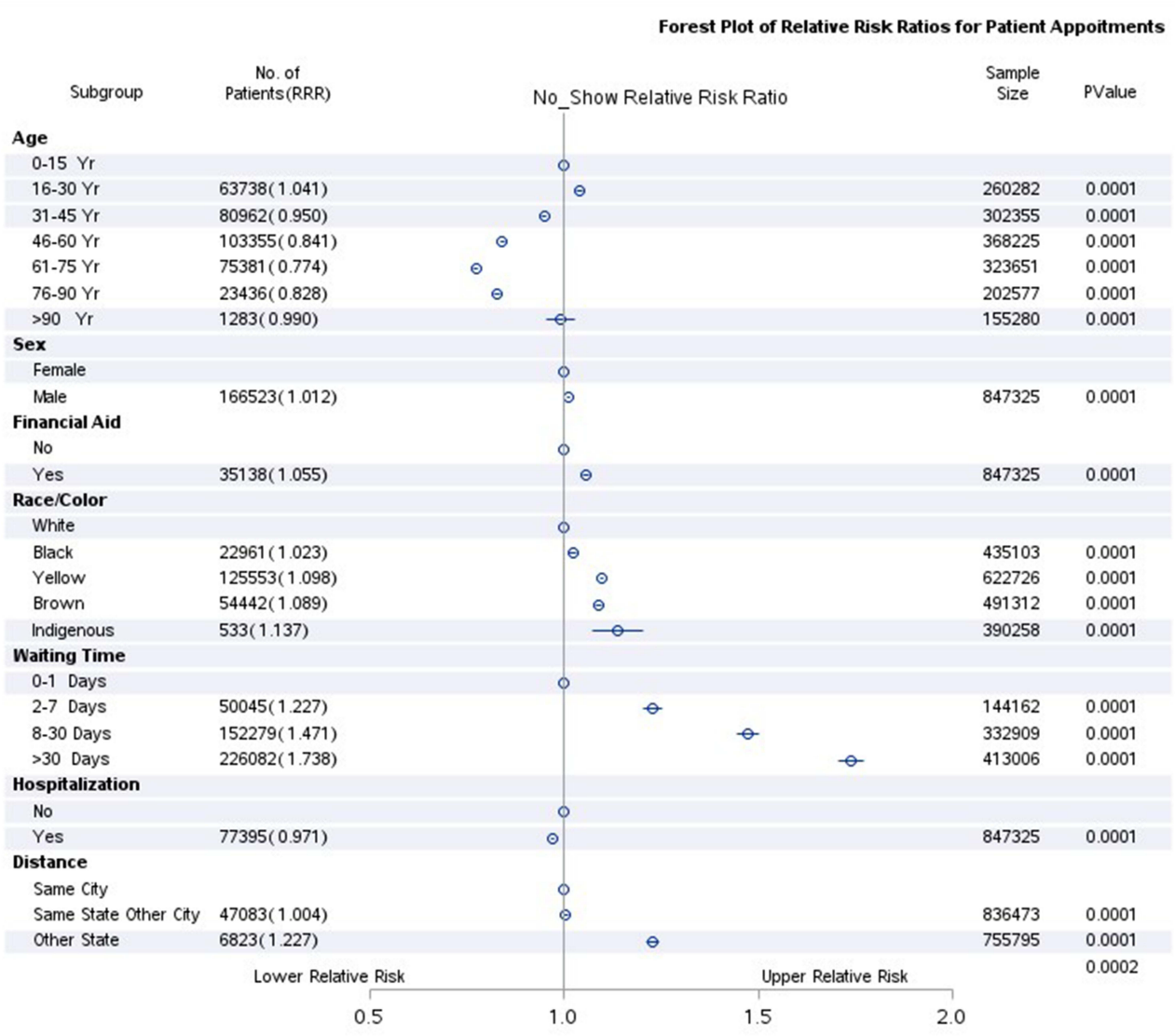

Figure 1 Relative risk ratio (RRR) of occurrence of failure to consult in secondary care, by independent variable.

ratio (RRR) for absenteeism. As for age, the highest percentage of absences was in the age group 16–30 years (11.8%, [RRR] 1.041), while the lowest was in the age group 61–75 years (6.6%, [RRR] 0.774). Men had a slightly higher percentage of absences than women (8.8%, [RRR] 1.012, versus 8.6%). Regarding race/color, the highest occurrence of absences was among Indigenous people (9.9%, [RRR] 1.137), while white people had the lowest (8.0%). Regarding the beneficiaries of the Bolsa Família program, considered a social vulnerability, those who receive the benefit showed higher rates of missed appointments (9.6% [RRR] 1.055, versus 8.6%). Table 1 shows the results of each variable analyzed.

At the level of health system practice, patients who needed to wait more than 30 days for care were most likely to miss appointments (10.9%, [RRR] 1.738), while those who have almost immediate care, in the 0–1-day range, were the least likely (4.3%). Concerning distance, patients who needed to move between different states were significantly more absent (13.3%, [RRR] 1.227)—this is the highest rate of absences in the entire data set. In contrast, 8.6% of patients served in the city where they resided missed appointments. Patients with a history of recent hospitalization were less likely to miss appointments (8.3%, [RRR] 0.971, versus 8.8%), as were patients with surgical specialties compared to clinical specialties (8.4%, [RRR] 0.979, versus 8.7%). The result regarding the severity of the disease points to a lower

Table 1 Variables at the Patient Level Between Missed Appointments and Attendance

Variable/Situation	No-Show (*n* = 435,523)	Attendance (*n* = 4,567,636)	Total (*n* = 5,003,159)
Age (years)			
0–15	87,366 (20.1%) (10.7%)	731,060 (16.0%) (89.3%)	818,426 (16.4%) (100%)
16–30	63,738 (14.6%) (11.8%)	478,441 (10.5%) (88.2%)	542,179 (10.8%) (100%)
31–45	80,964 (18.6%) (9.6%)	759,851 (16.6%) (90.4%)	840,815 (16.8%) (100%)
46–60	103,355 (23.7%) (7.7%)	1,238,325 (27.1%) (92.3%)	1,341,680 (26.8%) (100%)
61–75	75,381 (17.3%) (6.6%)	1,060,459 (23.2%) (93.4%)	1,135,840 (22.7%) (100%)
76–90	23,436 (5.4%) (7.5%)	288,088 (6.3%) (92.5%)	311,524 (6.2%) (100%)
>90	1,283 (0.3%) (10.1%)	11,412 (0.3%) (89.9%)	12,695 (0.3%) (100%)
Total	435,523 (100%) (8.7%)	4,567,636 (100%) (91.3%)	5,003,159 (100%) (100%)
Sex*			
Female	268,984 (61.8%) (8.6%)	2,851,612 (62.4%) (91.4%)	3,120,596 (62.4%) (100%)
Male	166,523 (38.2%) (8.8%)	1,715,961 (37.6%) (91.2%)	1,882,484 (37.6%) (100%)
Total	435,507 (100%) (8.7%)	4,567,573 (100%) (91.3%)	5,003,080 (100%) (100%)
Race/Color**			
White	190,751 (48.4%) (8.0%)	2,201,038 (52.6%) (92.0%)	2,391,789 (52.3%) (100%)
Black	22,961 (5.8%) (8.4%)	251,842 (6.0%) (91.6%)	274,803 (6.0%) (100%)
Brown	54,442 (13.8%) (9.3%)	529,049 (12.7%) (90.7%)	583,491 (12.7%) (100%)
Yellow	125,559 (31.9%) (9.5%)	1,196,382 (28.6%) (90.5%)	1,321,941 (28.9%) (100%)
Indigenous	533 (0.1%) (9.9%)	4,847 (0.1%) (90.1%)	5,380 (0.1%) (100%)
Total	394,246 (100%) (8.6%)	4,183,158 (100%) (91.4%)	4,577,404 (100%) (100%)
Financial Aid***			
No	400,385 (91.9%) (8.6%)	4,236,856 (92.8%) (91.4%)	4,637,241 (92.7%) (100%)
Yes	35,138 (8.1%) (9.6%)	330,780 (7.2%) (90.4%)	365,918 (7.3%) (100%)
Total	435,523 (100%) (8.7%)	4,567,636 (100%) (91.3%)	5,003,159 (100%) (100%)

Notes: The data is n (%) (%). The first % refers to the column and the second % refers to the row. The groupings are based on missed appointments (no-show) and consultations (attendance), during the two-year period informed in SISREG. *Records with an "undefined" value resulted in 79 fewer records for this variable. **Categorization adopted by the Brazilian Institute of Geography and Statistics (IBGE). Records with an "undefined" value resulted in 425,755 fewer records for this variable. ***Beneficiary of the *Bolsa Família* program.

percentage of absences among elective cases (8.0%, [RRR] 0.859) and the highest percentage of absences among emergency cases (10.8%). Table 2 shows the results of each variable analyzed.

For the RRR calculation, we used the under-sampling technique to balance the data set, reducing the size of the category that was in abundance—in this case, the population of patients who attended the consultations. As a result, we reached a base of 847,325 consultations with 435,523 (51.4%) absences and 411,823 (48.6%) attendances. This analysis, as expected, indicated a higher risk for the categories that had a higher proportion of absences in relation to attendance when considering each variable. Based on this same basis, we constructed the ROC curve by comparing the aggregation of variables at the patient level and health system practice to reach the following values: practice level (0.6021) and

Table 2 Practice-Level Variables Between Missed Appointments and Attendance

Variable/Situation	No-Show (*n* = 435,523)	Attendance (*n* = 4,567,636)	Total (*n* = 5,003,159)
Waiting Time (in days)*			
0–1	7,101 (1.6%) (4.3%)	157,528 (3.4%) (95.7%)	164,629 (3.3%) (100%)
2–7	50,050 (11.5%) (5.8%)	808,465 (17.7%) (94.2%)	858,515 (17.2%) (100%)
8–30	152,281 (35.0%) (8.0%)	1,762,165 (38.6%) (92.0%)	1,914,446 (38.2%) (100%)
>30	226,091 (51.9%) (10.9%)	1,839,095 (40.3%) (89.1%)	2,065,186 (41.3%) (100%)
Total	435,523 (100%) (8.7%)	4,567,253 (100%) (91.3%)	5,002,776 (100%) (100%)
Distance			
Same City	381,615 (87.6%) (8.6%)	4,031,962 (88.3%) (91.4%)	4,413,577 (88.2%) (100%)
Same State Other City	47,085 (10.8%) (8.7%)	491,114 (10.7%) (91.3%)	538,199 (10.8%) (100%)
Other State	6,823 (1.6%) (13.3%)	44,560 (1.0%) (86.7%)	51,383 (1.0%) (100%)
Total	435,523 (100%) (8.7%)	4,567,636 (100%) (91.3%)	5,003,159 (100%) (100%)
Hospitalization**			
No	358,127 (82.2%) (8.8%)	3,717,601 (81.4%) (91.2%)	4,075,728 (81.5%) (100%)
Yes	77,396 (7.8%) (8.3%)	850,035 (8.6%) (91.7%)	927,431 (8.5%) (100%)
Total	435,523 (100%) (8.7%)	4,567,636 (100%) (91.3%)	5,003,159 (100%) (100%)
Medical Specialty			
Clinical Specialty	400,651 (92.0%) (8.7%)	4,187,685 (91.7%) (91.3%)	4,588,336 (91.7%) (100%)
Surgery Specialty	34,872 (8.0%) (8.4%)	379,951 (8.3%) (91.6%)	414,823 (8.3%) (100%)
Total	435,523 (100%) (8.7%)	4,567,636 (100%) (91.3%)	5,003,159 (100%) (100%)
Severity of the Disease***			
Emergency	31,396 (7.2%) (10.8%)	259,379 (5.7%) (89.2%)	290,775 (5.8%) (100%)
Urgency	60,384 (13.9%) (10.4%)	518,607 (11.3%) (89.6%)	578,991 (11.6%) (100%)
Nonurgent Priority	50,493 (11.6%) (10.7%)	423,244 (9.3%) (89.3%)	473,737 (9.5%) (100%)
Elective	293,250 (67.3%) (8.0%)	3,366,406 (73.7%) (92.0%)	3,659,656 (73.1%) (100%)
Total	435,523 (100%) (8.7%)	4,567,636 (100%) (91.3%)	5,003,159 (100%) (100%)

Notes: The data is n (%) (%). The first % refers to the column and the second % refers to the row. The groupings are based on missed appointments (no-show) and consultations (attendance), during the two-year period informed in SISREG. *Records with a negative value resulted in 383 fewer records for this variable. **Recent hospitalization in the period before or after the consultation, during the years 2018, 2019, and 2020 informed in the SUS hospital information system (SIH). ***Categorization adopted by SISREG.

patient level (0.5674). These values indicate the variables at the level of health system practice have a greater influence on the occurrence of missed appointments. Figure 2 presents the graphical representation of the ROC curve.

Discussion

SUS deals daily with a large volume of information on the practice, a study with only 2.1% of specialized medical consultations offers a volume of more than 5 million events for analysis in a period of two years. The percentage of 8.7% of absences compared to attendances can be considered low when compared to other studies on the topic.

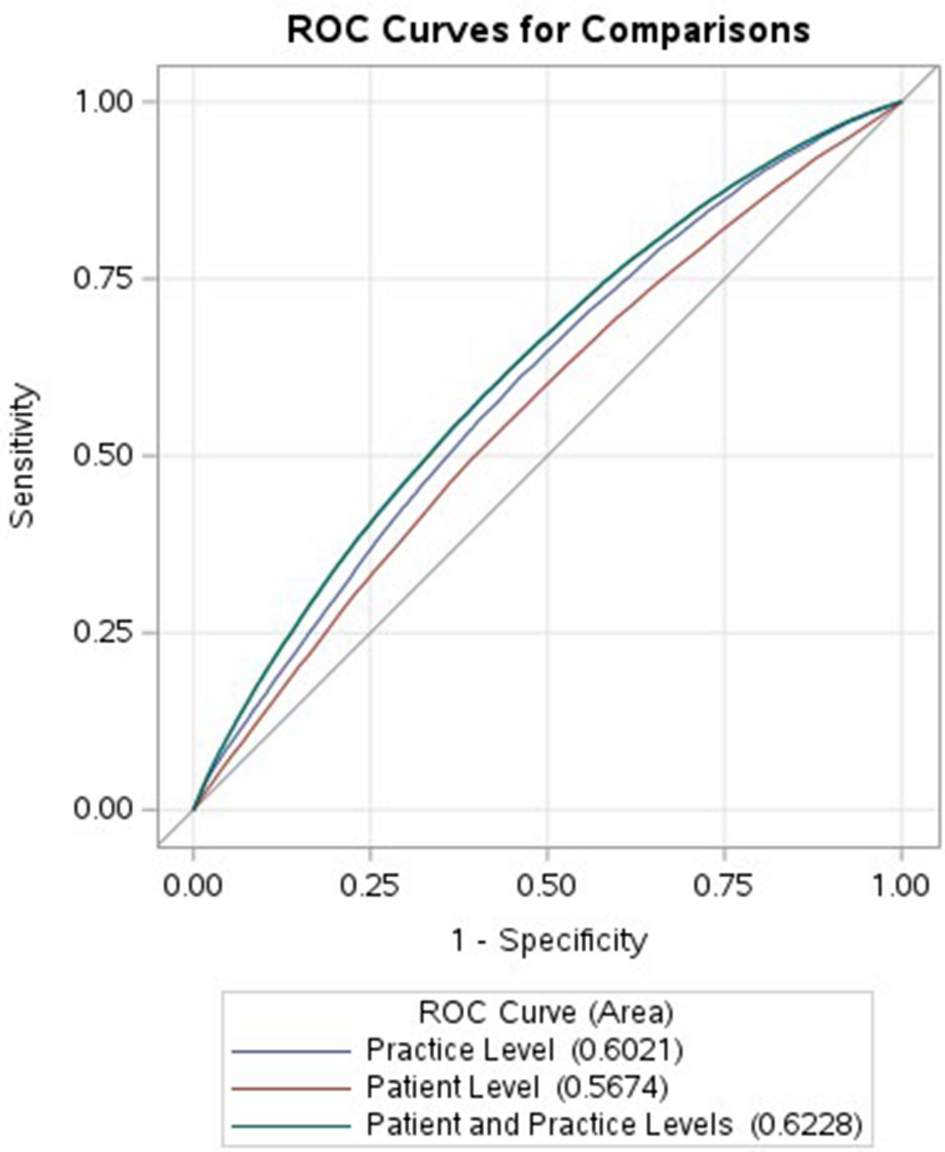

Figure 2 Receiver operating characteristic (ROC) analysis, considering the variables grouped at the patient and practice levels.

Ellis et al[3] conducted a national retrospective cohort analysis using data from the UK NHS and noted that 46% of patients missed one or more consultations and 19% missed more than two consultations over a three-year period in primary care. Altogether, 12.1% of the consultations were missed in this period. Our study differs from this since we investigate missed consultations in secondary care. It is noteworthy that Ellis et al[3] pointed out the importance of studies that address the interface between primary and secondary care to allow greater characterization of patients.

The study results reveal that, although second model - clinical circumstances - was more predictive than first model - sociodemographic factors, the overall level of prediction achieved was modest, with a C statistic of 0.6228. This level of accuracy suggests that, while the model can identify some risk factors for nonattendance, it does not predict robustly enough for large-scale interventions. To achieve a higher predictive level, such as a C statistic of 0.75, more detailed and comprehensive data would be needed.

The analysis of the factors associated with absences at the patient level reveals the need for special attention to the youngest (up to 30 years old) and the oldest patients (over 90 years old), as the highest percentages of absences reside in

these ranges. These results are consistent with the findings of Ellis et al[3] in the context of the UK NHS: patients aged 16 to 30 years or over 90 years were significantly more likely to miss several appointments.

We can infer that one of the reasons for younger patients, especially young adults, to be less involved with healthcare is due to practical difficulties in the daily life of economically active people and the low impact of the symptoms of the diseases on their lives. Eades et al[6] reported that patients who participated in a study about nonattendance at diabetes consultations pointed out the practical barriers, the low perceived value of the consultations, and the feeling that diabetes had little impact on their lives as the main reasons for the lack of attendance. We understand that this same perception can be extrapolated and understood as factors associated with the greater propensity of young adults to miss appointments.

The situation of Indigenous patients also deserves special attention, since it involves cultural issues related to the specific beliefs and customs of the Indigenous population in addition to the difficulties related to displacement when dealing with Indigenous villagers. This population segment has received special attention from the health system in Brazil with dedicated and exclusive primary services. However, when they need specialized care, they share the same service offered to the entire population.

The findings related to socially vulnerable groups, particularly those with lower socioeconomic status, are consistent with previous research. As mentioned, socially vulnerable groups, including those benefiting from social programs like Bolsa Família, were more likely to miss appointments. These findings align with the broader literature on the challenges faced by low-income populations in accessing healthcare services. Chapman and Machado (2021)[24] explored barriers such as transportation difficulties, conflicting work schedules, and family obligations, all of which may contribute to the higher rates of nonattendance observed in this study. Additionally, psychosocial factors like Adverse Childhood Experiences (ACES) and personal mastery have been shown to influence health-seeking behaviors in vulnerable populations, potentially exacerbating the challenge of maintaining consistent healthcare engagement.

Regarding ethnicity, Ellis et al[3] reported the exclusion of this variable from their study due to the low level of records; however, Takyi et al[7] reported the largest percentage of patients who did not attend the appointments (44%) belonged to the Asian minority ethnic group (BAME). Our study confirms this finding, considering that Indigenous people are a minority ethnic group in Brazil and were most likely to miss appointments.

Another relevant factor observed in the results at the patient level is that the most vulnerable population from a socioeconomic point of view is significantly more likely to miss an appointment, which confirms one of the main findings of Ellis et al.[3]

At the system level, the waiting time proved to be decisive as well as the longest distances to the service location, factors that also confirm the findings of Ellis et al.[3] These factors deserve special attention from managers as they are the ones who can monitor cases more closely and mitigate the occurrence of absences.

In the context of Brazil, the geographic distribution of healthcare facilities and the long distances many patients must travel to access secondary care further compound these barriers. Waiting times, as observed in this study, were a significant factor influencing nonattendance, with those waiting longer for appointments more likely to miss them. These geographic and logistical challenges, combined with the aforementioned socioeconomic barriers, highlight the need for targeted interventions to support vulnerable populations in maintaining their healthcare appointments.

Brazil is a vast territory, making it a challenge to assure equality when supplying specialized healthcare services. It is common for patients to have to travel to a different city to access a service. This factor refers to the need for a logistical organization of transport since an important part of the population is vulnerable and may not have enough capital to cope with such displacement.

The waiting time factor can be mitigated not only by structural actions in the system, which could reduce this time (our base revealed waiting times of more than 2,000 days), but by monitoring actions of these patients with effective monitoring of primary care until attendance at the secondary level is completed.

Brazil has adopted the Family Health Strategy (ESF), which provides home visits from healthcare professionals and the monitoring of chronic patients, the elderly, children, and pregnant women, among others. This strategy needs to be activated to act in cases of long waiting periods, not only to keep the patient properly oriented and treated but also to assess the need to maintain specialized care after a long period of waiting. It is common for cases to evolve into acute

conditions requiring care within a hospital environment, which means patients are no longer involved with the distant scheduled appointment.

Another important factor that leads to greater involvement of patients is the cases of recent hospitalization and surgical cases. This is due to the complexity of the disease of these patients, who are certainly affected to a greater degree by the symptoms of their diseases and are more sensitive to therapeutic and medical follow-ups.

The greater occurrence of absences in urgent cases can be understood from the characteristics of the consultations that make up this analysis. Although the registration system accepts the indication of urgency and emergency in referral for consultation, it is worth considering that this classification points to the need for immediate intervention. However, this data set does not refer to consultations in urgent and emergency environments but in outpatient clinics of clinical specialties, which host previously scheduled appointments.

This scenario points to the possible migration of this patient profile, categorized as urgent and emergency, for care in a hospital or emergency room given the characteristics of such cases, as they cannot wait for their appointment to be scheduled. This situation differs from the findings of Williamson et al[4] who do not support the hypothesis that patients who miss multiple GP appointments use ED services as a proxy, and points to the need to expand the study.

Conclusion

Some factors can be considered to mitigate nonattendance at consultations. In the analyzed scenario, there is a clear need for interventions in the logistics of long-distance travel, as well as monitoring consultations for children and elderly patients over 90 years old, who often require a companion. The needs of these patients, along with those of their caregivers, should be addressed. Socioeconomically disadvantaged patients also require closer monitoring, which, in Brazil, can be facilitated through visits by the professionals of the Family Health Strategy (ESF).

Philpott-Morgan et al[5] identified various reasons for missed appointments, such as forgetfulness, lack of awareness of the appointment, feeling unwell, administrative errors, work commitments, and transport difficulties. The authors concluded that proactive interventions like phone or text message reminders may fail if not targeted at specific patient cohorts or clinical factors.

Another important factor is the need for close monitoring of cases with long waiting times, whether due to structural or clinical issues. These cases should be carefully managed, not only to prevent nonattendance but also to ensure proper medical follow-up in primary care and prevent the uncontrolled progression of disease, which may lead to emergency care.

This study contributes to the organization of health systems by proposing specific actions to control nonattendance in secondary care, considering the interface with primary care referrals. It provides valuable information for structuring strategies at both the patient and system levels.

However, several methodological limitations must be acknowledged. First, the study relied on data from the SUS regulation system (SISREG), which only records a portion of the total consultations in secondary care and did not capture all relevant patient data, such as individual health history or psychosocial factors. The use of undersampling, while effective for balancing the dataset, may have reduced the granularity of the analysis by limiting the number of attendance cases. Furthermore, the absence of a unified national system capturing all consultations in Brazil presents a challenge to obtaining a more representative sample of the healthcare system as a whole.

Additionally, one limitation of this study is the focus on individual variables without fully exploring the intersection of demographic and cultural factors, such as low income, ethnicity, age, and travel distance. While the Bolsa Família program was used as a proxy for social vulnerability and poverty, further analysis could examine how these factors interact to influence nonattendance.

Future research should aim to address these limitations by incorporating more detailed and comprehensive datasets that account for a broader range of sociodemographic, cultural, and clinical factors. Additionally, exploring the reasons behind missed appointments for specific groups, such as the elderly, children, and patients with urgent conditions, could lead to targeted interventions that reduce nonattendance and improve the overall efficiency of healthcare services.

Ethics

This study was approved by the National Research Ethics Commission, CONEP, under Opinion no. 5,864,314.

Disclosure

The authors report no conflicts of interest in this work.

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