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Temporal Trends in Forgoing Healthcare Assistance Throughout the Covid-19 Pandemic in Individuals with Chronic Conditions

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Abstract

OBJECTIVE: To examine trends in forgoing healthcare assistance among individuals with Non-Communicable Chronic Diseases (NCDs) and health issues during the COVID-19 pandemic.

METHODS: This panel study used data from the PAMPA cohort (Prospective Study About Mental and Physical Health), which includes adults (≥18 years old) living in Rio Grande do Sul, Brazil. From June 2020 to June 2023, participants were annually asked whether they had avoided seeking healthcare. They were also asked whether they had received a medical diagnosis of any of the following NCDs or health conditions/risk factors: hypertension, asthma, high LDL cholesterol, back pain, depression, or multimorbidity. Poisson regression with robust variance adjustment was used to assess the association between forgoing healthcare and the presence of NCDs/health issues. Variance-weighted least squares regression was performed for trend analysis.

RESULTS: The prevalence of forgoing healthcare was 37.4% (95% CI: 34.2–40.8) in wave one, 36.0% (95% CI: 33.6–38.5) in wave two, 36.2% (95% CI: 34.1–38.4) in wave three, and 22.0% (95% CI: 20.3–23.9) in wave four. A linear decrease in the prevalence of forgoing healthcare was observed across waves 1 to 4 among individuals who self-reported high LDL cholesterol, multimorbidity, hypertension, and depression. In the adjusted analysis, back pain, depression, and multimorbidity were consistently associated with forgoing healthcare in all study waves.

CONCLUSION: Among individuals with NCDs and health issues, there was a decreasing trend in forgoing healthcare during the study period. Action plans targeting people with NCDs and health conditions are essential during pandemics to ensure that health systems can address their ongoing needs.

INTRODUCTION

Noncommunicable chronic diseases (NCDs) encompass many persistent conditions stemming from various causes (1). The clinical progression of these conditions changes over time and can involve periods of exacerbation resulting in adverse health outcomes for those affected (1).

Approximately 41 million deaths occur annually worldwide due to NCDs, accounting for 71% of all deaths (3). In the year 2017, in Brazil, as in other countries, NCDs represent the primary health challenge, contributing to 75% of total mortality (4). NCDs demand a spectrum of interventions and a continuous care from mild to more intensive approaches, including lifestyle changes such as dietary habits and regular physical exercise (2).

During the COVID-19 pandemic, the epidemiological scenario propelled the adoption of social distancing measures to contain the virus and the reorganization of healthcare services, prioritizing care for individuals infected with SARS-CoV-2 (5). As a result, individuals with NCDs had their care deprioritized (6,7). These measures may have hindered access to health services for individuals with NCDs (8). Some

data indicate an overall drop of approximately one-third in seeking medical care (9–11), especially among people with pre-existing health issues and at high-risk populations (9,11).

The absence of continuous care can lead to irreversible consequences for individuals with NCDs/health issues, which may encompass various levels of disability, significant complications, and frequent hospitalizations, resulting in avoidable healthcare costs, a decreased quality of life, and mortality (12,13). Therefore, this study aimed to verify the trends in forgoing healthcare assistance according to NCDs/ health issues and the association between NCDs and forgoing healthcare assistance.

METHODS

This is a panel study with data from the PAMPA cohort (Prospective Study About Mental and Physical Health), a longitudinal study with adults living in Rio Grande do Sul, Southern Brazil. The ethics board approved the study from the Physical Education Faculty (Universidade Federal de Pelotas, Brazil; CAAE: 31906920.7.0000.5313). We used data from four waves of data collection, as follows: wave (w1) that occurred between June and July 2020, wave 2 (w2), December 2020 and January 2021, wave 3 (w3), June and July 2021, and wave 4 (w4), June and July 2022.

Participants

The participants were individuals (≥18 years old) living in Rio Grande do Sul. The interview was conducted using a self-administered questionnaire. The interviewers shared the questionnaire link via WhatsApp, Facebook, Instagram and SMS messages. More details about study design and recruitment can be found elsewhere (14).

Outcome

The outcome variable was constructed based on responses to two sequential questions in wave 1. Initially, all participants were asked: “Did you need any healthcare service (in-person or virtual) DURING THE SOCIAL ISOLATION MEASURES?” Only those who answered “yes” were directed to the following question: “DURING THE SOCIAL ISOLATION MEASURES, have you avoided seeking in-person medical care for an existing health problem even if required?”

Participants who answered “yes” to the second question were classified as having forgoing healthcare assistance. Individuals who did not need healthcare services during the period were not included in the outcome analysis.

In **waves 2 and 3**, the only change was in the wording of the first part of the second question, which referred to a different time period: instead of “during the social isolation measures,” it said *“in the past six months.”* In **wave 4**, the question referred to *“the past two weeks.”*

Participants were asked if they had a medical diagnosis of the following NCDs/ health issues: Systemic arterial hypertension (SAH), Diabetes, High LDL cholesterol, cancer, arthritis, osteoarthritis, fibromyalgia,

asthma/bronchitis, back pain, heart disease, depression and memory problems. However, for this analysis, we focused on the most prevalent ones, which are: SAH, asthma, high LDL cholesterol, back pain and depression.

The following covariates were used to adjust for possible confounding: sex (male/female), age (in complete years), skin color (white, yellow, Asian/black; brown; indigenous), marital status (with a partner/without a partner), and educational level (high school or lower, university degree [graduated], and postgraduate [specialization, master, PhD).

Statistical Analysis

Data were analyzed using the Stata 16.1 statistical package. Prevalence rates and 95% confidence intervals (95%CI) were calculated for the form, type, and reasons for forgoing healthcare assistance. Poisson regression with robust variance adjustment was used to evaluate the relationship between forgoing healthcare assistance and NCDs/.

For trend analysis, variance-weighted least squares regression was performed to estimate the variation in prevalence for each period (by wave) in percentage points (p.p.). All positive annual variation estimates with a p-value < 0.05 indicate an increasing trend and a decreasing trend when the annual variation is negative. All data were stratified by the four waves of the pandemic (w1, w2, w3, and w4).

The absolute difference of the outcome according to the independent variables between the following years (waves) was carried out: w1/w4, w2/w3, and w2/w4, to identify possible effects of the scenario of each wave of the pandemic. The level of significance was 5%.

RESULTS

Table 1 shows the prevalence of form, type, and reasons for seeking healthcare assistance from w1 to w4. The prevalence of demand for service or professional was 35.8%, 59.1%, 63.3%, and 41.2% in the w1, w2, w3, and w4, respectively. Private services and face-to-face approach were highly used in all waves. In w1, the prevalence of face-to-face approach was 85.5%, and the main reasons for attendance were vaccination (22.9%) and existing health condition (29.2%). In w2, the reasons for demand were disease (pain, fever, diarrhea, or others) (14.3%) and existing health problem (11.3%); in the w3 vaccination (14.0%) and existing health problem (14.2%) and in the w4 diseases (19.6%) and follow up with a psychologist, nutritionist or other health professional (18.8%).

There was a decreasing trend in forgoing healthcare assistance. The highest reductions in the prevalence were observed in individuals with high LDL cholesterol (-8.1p.p.), multimorbidity (-6.8p.p.), hypertension (-6.6p.p.), and depression (-5.0p.p.) (Table 2).

Figure 1 shows a -12.4p.p. and -14.2p.p., respectively (W4-W1 and W4-W3) in the prevalence of the outcome. According to hypertension, there is a drop of -18.6p.p. (w4-w1) and 18.6p.p. (w4-23) and high cholesterol -19.9p.p. (w4-w1) and -20.0p.p. (w4-w3).

In the crude analysis, compared to individuals without NCDs, the NCDs associated with the outcome in w1 were back pain (PR 1.24, 95%CI 1.02;1.49), depression (PR 1.42, 95%CI 1.19;1.69) and multimorbidity (PR 1.44, 95%CI 1.20; 1.71), in w2 SAH (PR 1.19, 95%CI 1.0; 1.40), high cholesterol (PR 1.30, 95%CI 1.21;1.51), back pain (PR 1.25, 95%CI 1.09; 1.43), depression (PR 1.58, 95%CI 1.38; 1.80), and multimorbidity (PR 1.81, 95%CI 1.56; 2.11), in w3 SAH (PR 1.29, 95%CI 1.13; 1;47), asthma (PR 1.25, 95%CI 1.08; 1.43), high LDL cholesterol (PR 1.28, 95%CI 1.13; 1.46), back pain (PR 1.39, 95%CI 1.24; 1.57), depression (PR 1.73, 95%CI 1.55; 1.96) and multimorbidity (PR 1.85, 95%CI 1.61; 2.13) and in w4, asthma (PR 1.08, 95%CI 1.21; 1.79), back pain (PR 1.63 95%CI 1.38; 1.92), depression (PR 1.63, 95%CI 1.38; 1.92) and multimorbidity (PR 1.78, 95%CI 1.50; 2.10) (Table 3).

In the adjusted analysis, compared to individuals without NCDs, the NCDs associated with the outcome in w1 were hypertension(PR 1.29, 95%CI 1.00; 1.66), back pain (PR 1.26, 95%CI 1.03; 1.52), depression (PR 1.41, 95%CI 1.18; 1.69) and multimorbidity (PR 1.18, 95%CI 1.10; 1.27), in w2 high cholesterol (PR 1.33 95%CI 1.14; 1.56), depression (PR 1.57, 95%CI 1.37; 1.81) and multimorbidity (PR 1.12 95%CI 1.08; 1.16), in w3 hypertension (PR 1.27, 95%CI 1.10; 1;47), asthma (PR 1.25, 95%CI 1.08; 1.43), high LDL cholesterol (PR 1.27, 95%CI 1.11; 1.45), back pain (PR 1.39, 95%CI 1.23; 1.58), depression (PR 1.68, 95%CI 1.49; 1.88) and multimorbidity (PR 1.18, 95%CI 1.15; 1.21) and in w4, asthma (PR 1.33, 95%CI 1.09; 1.62), back pain (PR 1.60, 95%CI 1.34; 1.90), depression (PR 1.59, 95%CI 1.35; 1.88) and multimorbidity (PR 1.15, 95%CI 1.11; 1.20) (Table 4).

Table 5 shows the prevalence of reasons for avoidance of seeking healthcare assistance according to all NCDs." in the periods from w1 to w4. In w1, they were "fear of contracting the new coronavirus" (72.6%), "Obtained medical care at a distance" (7.8%) and financial reasons (7.2%). In w2 and w3, "fear of contracting the new coronavirus (11.2% and 12.5%), financial reasons (3.8% and 4.9%) and service unavailable (3.1% and 3.0%). In w4, financial reasons (26.2), unavailable service (13.4%), and difficulty in traveling to the place of care (7.8%).

DISCUSSION

Forgoing healthcare assistance decreased over time according to all NCDs/health issues, specifically on those with high LDL cholesterol, multimorbidity, hypertension, and depression. The NCDs related to the outcome were: in w1 (hypertension, back pain, depression, and multimorbidity), in w2 (high LDL cholesterol, back pain, depression, and multimorbidity), in w3 (hypertension, asthma, high LDL cholesterol, back pain, depression, and multimorbidity) and w4 (asthma, back pain, depression, and multimorbidity). According to all NCDs, the main reasons for avoiding healthcare assistance were fear of COVID-19, financial problems, and unavailable services.

Evidence has shown disruptions in service provision for NDCs and difficulties in utilizing services for this population (15–17). There was a collapse of the Brazilian public health service called Serviço Único de Saúde (SUS) (between March and July, 2020), with simultaneous needs as a priority in meeting the demands of patients with COVID-19 and low attention to care services for patients with NCDs, such as

prevention, early diagnosis, tracking, treatment, and rehabilitation (18,19). In line with our findings, a study on preventive services in Brazil showed that non-urgent medical consultations decreased by 1.4 times compared to the pre-pandemic period, indicating that people stopped seeking medical care (20).

However, with the evolution of the epidemiological situation of COVID-19 and the start of vaccination, non-essential services began to operate again (in January, 2021) (21, 22), which may have influenced the reduction in the prevalence of the outcome. It is plausible to argue that the aforementioned factors may have had a more significant impact in the context of W3 (June and July 2021), where individuals with more severe conditions refrained from seeking health services.

In W4, there was a notable resurgence in demand for healthcare services, coinciding with an overall improvement in the COVID-19 pandemic. This period was characterized by widespread vaccination efforts and, consequently, a significant reduction in morbidity, hospitalization rates, and deaths related to COVID-19 (23–25).

Our results indicate a tendency towards reducing percentage points in the outcome from W4 to the W1 evaluated. The first wave of the SARS-CoV-2 virus pandemic in Brazil occurred from February 23 to July 25, 2020 (26). During this period, there was a need to restructure health systems, and as a result, people may not have sought medical care due to the limited availability of services unrelated to COVID-19 (18)

Despite the decreasing trend, similar values can be identified in W2 and W3. This similarity can be explained because it occurred during the same period as the second wave of the SARS-CoV-2 virus in Brazil, which was considered the longest and deadliest, spanning from November 8, 2020 (46th epidemiological week of 2020) to April 10, 2021 (51st epidemiological week), with the number of deaths three times higher (26).

However, the decreasing trend is likely related to the onset of the COVID-19 vaccination campaign in Brazil on January 17, 2021 (27). This initiative boosted the demand for healthcare services, especially among individuals with NCDs, who were prioritized for vaccination (28). Finally, in the analysis of W4, an improvement in the scenario, possibly associated with the decline of the third wave of the SARS-CoV-2 virus in Brazil on May 21, 2022 (26), may have encouraged people to seek more healthcare services.

Some diseases showed a considerable reduction in outcomes compared to others. Social distancing can induce changes in behavioral patterns, including decreased physical activity and increased consumption of tobacco and alcoholic beverages (29). These factors can aggravate or contribute to the emergence of adverse health conditions, such as high LDL cholesterol levels, multimorbidity, and hypertension.

Regarding the main reasons for avoiding seeking healthcare assistance, studies show that vulnerable individuals were more afraid of COVID-19 and avoided seeking health services, such as the study carried out in Spain, where individuals with a high fear of COVID-19 were at least six times more likely not to visit a dental service (30) and in Italy, individuals with acute myocardial infarction (AMI) were more likely to be

afraid of COVID-19, compared to those without AMI (31). A study carried out in Brazil found that individuals with depressive symptoms were related to fear of COVID-19 (32).

As a result of unavailable services, individuals also stopped seeking them. The study in the Americas region showed that more than 50% of countries reported a lack of NCDs guidelines in this scenario, and only 34% of NCDs outpatient services were functioning normally (33). In addition to fear of COVID-19 and unavailable services, one of the most reported reasons for avoiding seeking healthcare services was financial reasons. Poverty and unemployment in Brazil worsened at the beginning of the pandemic, affecting around 20% of Brazilian families (34), which may have influenced the avoidance of seeking healthcare assistance.

However, the results found in this study should be interpreted considering their limitations and strengths. First, our study may present selection bias due to the non-probabilistic sample. Second, we used a self-administered questionnaire, which may be more prone to response bias. However, our study presents strengths such as data on NCDs and avoidance of use of health services in different waves of the COVID-19 pandemic.

CONCLUSION

There was a decreasing trend in the outcome avoidance of seeking healthcare assistance according to all NCDs, mostly on high LD cholesterol, multimorbidity, back pain, hypertension, and depression. NCDs prevention and treatment services have been severely disrupted since the start of the COVID-19 pandemic. An NCDs action plan is needed for pandemic situations so that health systems and individuals with NCDs can meet the emerging demand. Individuals with NCDs who do not have adequate monitoring are at greater risk of developing negative health outcomes. Therefore, health services must be prepared for future pandemics, avoiding future losses in the lives of individuals with NCDs.

ABBREVIATIONS LIST

NCDs: Noncommunicable Chronic Diseases

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

SAH: Systemic Arterial Hypertension

LDL: Low-Density Lipoprotein

PR: Prevalence Ratio

95%CI: 95% Confidence Interval

PAMPA: Prospective Study About Mental and Physical Health

SUS: Sistema Único de Saúde (Unified Health System in Brazil)

w1: Wave 1 (June and July 2020)

w2: Wave 2 (December 2020 and January 2021)

w3: Wave 3 (June and July 2021)

w4: Wave 4 (June and July 2022)

PR: Prevalence Ratio

CAAE: Research Ethics Committee Approval Code

Declarations

AUTHOR CONTRIBUTIONS:

YPV was responsible for the study conception, methodology, formal data analysis, original draft writing, review and editing, and project administration. JSF contributed to the study conception, methodology, formal data analysis, and review and editing of the manuscript. JQSR was responsible for data curation, formal data analysis, and review and editing. CNS contributed to investigation, data curation, and review and editing of the manuscript. NF assisted with methodology and review and editing. FMD was responsible for data curation and review and editing. LSS contributed to review and editing of the manuscript. NS contributed to data curation and review and editing. ELC participated in the review and editing of the manuscript. FFR was responsible for review and editing, as well as funding acquisition. IAP contributed to the review and editing of the manuscript. MPF contributed to review and editing. AJR also participated in the review and editing of the manuscript. MCS was responsible for review and editing of the manuscript and study supervision.

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DATA AVAILABILITY

Datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate

This research involves human participants and was carried out in accordance with the relevant guidelines and regulations of the Declaration of Helsinki and this study protocol was approved by Physical Education Faculty (Universidade Federal de Pelotas, Brazil; CAAE: 31906920.7.0000.5313. This research complied with the specific resolution of the National Health Council (466/2012) and informed consent was obtained from all subjects in accordance with the resolution of the Free and Informed Consent Term of the National Health Council.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

References

1. World Health Organization. Noncommunicable Diseases. 2019; Available from: https://www.who.int/gho/ncd/mortality_morbidity/en/
2. BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Diretrizes para o cuidado das pessoas com doenças crônicas nas redes de atenção à saúde e nas linhas de cuidado prioritárias / Ministério da Saúde, Secretaria de Atenção à. Brasília; 2013. 28 p.
3. World Health Organization. Noncommunicable diseases country profiles 2018 [Internet]. 2018. Available from: https://apps.who.int/iris/handle/10665/274512.
4. Malta DC, França E, Abreu DMX, Perillo RD, Salmen MC, Teixeira RA, et al. Mortality due to noncommunicable diseases in Brazil 1990 to 2015, according to estimates from the Global Burden of Disease study. Sao Paulo Med J [Internet]. 2017 Jun;135(3):213–21. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-31802017000300213&lng=en&tlng=en
5. Silva LLS da, Lima AFR, Polli DA, Razia PFS, Pavão LFA, Cavalcanti MAF de H, et al. Social distancing measures to combat COVID-19 in Brazil: characterization and epidemiological analysis by state. Cad Saude Publica [Internet]. 2020;36(9). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2020000905003&tlng=pt
6. Di Giulio GM, Mendes IM, Campos FDR, Nunes J. Risk governance in the response to global health emergencies: understanding the governance of chaos in Brazil's handling of the Covid-19 pandemic. Health Policy Plan [Internet]. 2023 May 17;38(5):593–608. Available from: https://academic.oup.com/heapol/article/38/5/593/7130239
7. Luciani S, Caixeta R, Chavez C, Ondarsuhu D, Hennis A. What is the NCD service capacity and disruptions due to COVID-19? Results from the WHO noncommunicable disease country capacity

survey in the Americas region. BMJ Open [Internet]. 2023 Mar 1 [cited 2023 May 27];13(3):e070085. Available from: https://bmjopen.bmj.com/content/13/3/e070085

8. Al-Qudimat AR, Al Darwish MB, Elaarag M, Al-Zoubi RM, Rejeb MA, Ojha LK, et al. COVID-19 effect on patients with noncommunicable diseases: A narrative review. Heal Sci Reports [Internet]. 2023 Jan 15;6(1). Available from: https://onlinelibrary.wiley.com/doi/10.1002/hsr2.995
9. Moynihan R, Sanders S, Michaleff ZA, Scott AM, Clark J, To EJ, et al. Impact of COVID-19 pandemic on utilisation of healthcare services: a systematic review. BMJ Open [Internet]. 2021 Mar 16;11(3):e045343. Available from: https://bmjopen.bmj.com/lookup/doi/10.1136/bmjopen-2020-045343
10. Olmastroni E, Galimberti F, Tragni E, Catapano AL, Casula M. Impact of COVID-19 Pandemic on Adherence to Chronic Therapies: A Systematic Review. Int J Environ Res Public Health [Internet]. 2023 Feb 21;20(5):3825. Available from: https://www.mdpi.com/1660-4601/20/5/3825
11. Yonemoto N, Kawashima Y. Help-seeking behaviors for mental health problems during the COVID-19 pandemic: A systematic review. J Affect Disord [Internet]. 2023 Feb;323:85–100. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0165032722013039
12. World Health Organization. Global status report on noncommunicable diseases 2010. Geneva; 2011.
13. Schmidt MI, Duncan BB, e Silva GA, Menezes AM, Monteiro CA, Barreto SM, et al. Chronic noncommunicable diseases in Brazil: burden and current challenges. Lancet [Internet]. 2011 Jun;377(9781):1949–61. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673611601359
14. FETER N, CAPUTO EL, DORING IR, LEITE JS, CASSURIAGA J, REICHERT FF, et al. Longitudinal study about the impact of COVID-19 pandemic in a southern Brazilian state: the PAMPA cohort. An Acad Bras Cienc [Internet]. 2022;94(2). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0001-37652022000300708&tlng=en
15. Malta DC, Gomes CS, Silva AG da, Cardoso LS de M, Barros MB de A, Lima MG, et al. Uso dos serviços de saúde e adesão ao distanciamento social por adultos com doenças crônicas na pandemia de COVID-19, Brasil, 2020. Cien Saude Colet [Internet]. 2021 Jul;26(7):2833–42. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-81232021000702833&tlng=pt
16. Yadav UN, Rayamajhee B, Mistry SK, Parsekar SS, Mishra SK. A Syndemic Perspective on the Management of Noncommunicable Diseases Amid the COVID-19 Pandemic in Low- and Middle-Income Countries. Front Public Heal [Internet]. 2020 Sep 25;8. Available from: https://www.frontiersin.org/article/10.3389/fpubh.2020.00508/full
17. Chang AY, Cullen MR, Harrington RA, Barry M. The impact of novel coronavirus COVID-19 on noncommunicable disease patients and health systems: a review. J Intern Med [Internet]. 2021 Apr 27;289(4):450–62. Available from: https://onlinelibrary.wiley.com/doi/10.1111/joim.13184
18. Afkar M, Rezanejad Asl P, Mahdavi Hezaveh A, Akrami F, Riazi-Isfahani S, Peykari N, et al. The Effect of the COVID-19 Pandemic on Noncommunicable Disease Prevention and Management Services in

the Primary Health Care System of Iran. Med J Islam Repub Iran [Internet]. 2022 Dec 30 [cited 2023 May 27];36. Available from: https://pubmed.ncbi.nlm.nih.gov/36908938/

19. MELO CML DE, SILVA GAS, MELO ARS, FREITAS AC DE. COVID-19 pandemic outbreak: the Brazilian reality from the first case to the collapse of health services. An Acad Bras Cienc [Internet]. 2020;92(4). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0001-37652020000700904&tlng=en
20. de Oliveira MM, Fuller TL, Gabaglia CR, Cambou MC, Brasil P, de Vasconcelos ZFM, et al. Repercussions of the COVID-19 pandemic on preventive health services in Brazil. Prev Med (Baltim) [Internet]. 2022 Feb;155:106914. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0091743521004874
21. Neiva MB, Carvalho I, Costa Filho E dos S, Barbosa-Junior F, Bernardi FA, Sanches TLM, et al. Brazil: the emerging epicenter of COVID-19 pandemic. Rev Soc Bras Med Trop [Internet]. 2020;53. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0037-86822020000100369&tlng=en
22. Santos CVB dos, Valiati NCM, Noronha TG de, Porto VBG, Pacheco AG, Freitas LP, et al. The effectiveness of COVID-19 vaccines against severe cases and deaths in Brazil from 2021 to 2022: a registry-based study. Lancet Reg Heal - Am [Internet]. 2023 Apr;20:100465. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2667193X2300039X
23. Ministério da Saúde. Agência Nacional de Saúde Suplementar. Mapa Assistencial da Saúde Suplementar ano-base 2022. 2022;
24. World Health Organization. Coronavirus disease (COVID-19) Weekly Epidemiological Updates and Monthly Operational Updates. 2022. 2022; Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports
25. Percio J, Cabral CM, Fantinato FFST, de Assis DM, Guzmán-Barrera LS, de Araújo WN. Effect of vaccination against Covid-19 one year after its introduction in Brazil. Trop Dis Travel Med Vaccines [Internet]. 2022 Nov 18;8(1):25. Available from: https://tdtmvjournal.biomedcentral.com/articles/10.1186/s40794-022-00183-5
26. Moura EC, Cortez-Escalante J, Cavalcante FV, Barreto IC de HC, Sanchez MN, Santos LMP. Covid-19: evolução temporal e imunização nas três ondas epidemiológicas, Brasil, 2020–2022. Rev Saude Publica [Internet]. 2022 Nov 18;56:105. Available from: https://www.revistas.usp.br/rsp/article/view/205194
27. Brasil. Ministério da Saúde. Programa Nacional de Imunizações – PNI [Internet]. Brasília; 2021. [Internet]. 2021 [cited 2023 Sep 11]. Available from: https://www.gov.br/saude/pt-br/coronavirus/vacinas/pni %0A
28. Brasil. Ministério da Saúde. Portaria GAB/SVS nº 28, de 3 de setembro de 2020. Institui a Câmara Técnica Assessora em Imunização e Doenças Transmissíveis. Diário Oficial da União: seção 1, [Internet]. 4/10/2020. 2020. Available from: https://www.in.gov.br/en/web/dou/-/portaria-gab/svs-n-28-de-3-de-setembro-de-2020-27508261.

29. Malta DC, Szwarcwald CL, Barros MB de A, Gomes CS, Machado ÍE, Souza Júnior PRB de, et al. A pandemia da COVID-19 e as mudanças no estilo de vida dos brasileiros adultos: um estudo transversal, 2020. Epidemiol e Serviços Saúde [Internet]. 2020;29(4). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S2237-96222020000400315&tlng=pt
30. González-Olmo MJ, Ortega-Martínez AR, Delgado-Ramos B, Romero-Maroto M, Carrillo-Diaz M. Perceived vulnerability to Coronavirus infection: impact on dental practice. Braz Oral Res. 2020 May;34:e044.
31. Marotta M, Gorini F, Parlanti A, Chatzianagnostou K, Mazzone A, Berti S, et al. Fear of COVID-19 in Patients with Acute Myocardial Infarction. Int J Environ Res Public Health [Internet]. 2021 Sep 18;18(18):9847. Available from: https://www.mdpi.com/1660-4601/18/18/9847
32. Meller FO, Schäfer AA, Quadra MR, Demenech LM, Paludo S dos S, da Silva PA, et al. Fear of Covid-19 and health-related outcomes: results from two Brazilian population-based studies. Psychiatry Res [Internet]. 2022 Jul;313:114596. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0165178122002062
33. Luciani S, Caixeta R, Chavez C, Ondarsuhu D, Hennis A. What is the NCD service capacity and disruptions due to COVID-19? Results from the WHO noncommunicable disease country capacity survey in the Americas region. BMJ Open [Internet]. 2023 Mar 2;13(3):e070085. Available from: https://bmjopen.bmj.com/lookup/doi/10.1136/bmjopen-2022-070085
34. NEVES JA, MACHADO ML, OLIVEIRA LD de A, MORENO YMF, MEDEIROS MAT de, VASCONCELOS F de AG de. Unemployment, poverty, and hunger in Brazil in Covid-19 pandemic times. Rev Nutr [Internet]. 2021;34. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-52732021000100201&tlng=en

Tables

Table 1. Prevalence of form, type, and reasons for demand of health services or professional in individuals from Rio Grande do Sul in different periods of the COVID-19 pandemic.

	W1 (%)	W2 (%)	W3 (%)	W4 (%)
N	**(2300)**	**(2754)**	**(3249)**	**(2524)**
Demand for service or professional	35.8	59.1	63.3	41.2
Consultation type				
Face-to-face	85.5	92.0	93.0	91.4
Online	14.5	8.0	7.0	8.6
Service type				
Public	X	18.3	17.9	20.5
Private	X	63.0	57.0	67.5
Mixed	X	18.7	25.1	12.0
Reasons for seeking service				
Vaccination	22.9	2.9	14.0	3.7
Pre-existing health problem	28.2	11.3	14.2	X
Scheduled return home	9.0	6.1	8.4	X
Symtoms of flu or sore throat	6.5	7.0	8.1	X
Acute disease (pain, fever, diarrhea or others)	X	14.3	X	19.6
Complementay diagnostic exam (blood, urine and imaging)	X	X	X	12.2
Follow up with a psychologist, nutritionist or other health professional	X	X	X	18.8

W1: Waiver one; W2: Waiver two; W3: Waiver three; W4: Waiver four

X: The data was not collected in this waiver.

Table 2: Trend (%) of forgoing healthcare assistance according to NCDs, in individuals from Rio Grande do Sul in different periods of the COVID-19 pandemic.

NCDs	W1	W2	W3	W4	Variation per wave [a] (p.p)	p value[b]	Linear trend
Total/General	34.4	36.0	36.2	22.0	-5.8	<0.001	Decreasing
SAH	43.9	41.4	43.9	25.3	-6.6	<0.001	Decreasing
Asthma	37.0	40.0	43.1	30.2	-3.0	<0.001	Decreasing
High LDL cholesterol	43.3	44.2	43.4	23.4	-8.1	<0.001	Decreasing
Back Pain	43.6	41.5	44.4	30.5	-4.5	<0.001	Decreasing
Depression	47.0	47.2	50.0	32.6	-5.0	<0.001	Decreasing
Multimorbidity	46.4	45.3	45.1	29.0	-6.8	<0.001	Decreasing

a) Variation per wave in percentage points (p.p).

b) Vwls p-value

W1: Waiver one; W2: Waiver two; W3: Waiver three; W4: Waiver four

Table 3: Crude analysis of forgoing healthcare assistance according to NCDs in individuals from Rio Grande do Sul in different periods of the COVID-19 pandemic.

	W1	W2	W3	W4
	PR (CI 95%)	PR (CI 95%)	PR (CI 95%)	PR (CI 95%)
SAH				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	1.22 (0.98;1.51)	**1.19 (1.01;1.40)**	**1.29 (1.13;1.47)**	1.18 (0.96;1.45)
Asthma				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	0.99 (0.76;1.29)	1.14 (0.96;1.34)	**1.25 (1.08;1.43)**	**1.42 (1.21;1;79)**
High LDL cholesterol				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	1.19 (0.96;1.48)	**1.30 (1.12;1.51)**	**1.28 (1.13;1.46)**	1.08 (0.88;1.32)
Back Pain				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.24 (1.02;1.49)**	**1.25 (1.09;1.43)**	**1.39 (1.24;1.57)**	**1.63 (1.38;1.92)**
Depression				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.42 (1.19;1.69)**	**1.58 (1.38;1.80)**	**1.73 (1.55;1.96)**	**1.79 (1.53;2.11)**
Multimorbidity				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.44 (1.20;1.71)**	**1.81 (1.56;2.11)**	**1.85 (1.61;2.13)**	**1.78 (1.50;2.10)**

PR: prevalence ratio

W1: Waiver one; W2: Waiver two; W3: Waiver three; W4: Waiver four

Table 4: Adjusted analysis of avoidance of seeking healthcare assistance according to NCDs in individuals from Rio Grande do Sul in different periods of the COVID-19 pandemic.

	W1	W2	W3	W4
	PR (CI 95%)	PR (CI 95%)	PR (CI 95%)	PR (CI 95%)
SAH				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.29 (1.00;1.66)**	1.19 (0.99;1.42)	**1.27 (1.10;1;47)**	1.17 (0.93;1.46)
Asthma				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	0.97 (0.74;1.27)	1.13 (0.95;1.34)	**1.25 (1.08; 1.43)**	**1.33 (1.09;1.62)**
High LDL cholesterol				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	1.23 (0.97;1.54)	**1.33 (1.14;1.56)**	**1.27 (1.11; 1.45)**	1.05 (0.86;1.29)
Back Pain				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.26 (1.03;1.52)**	**1.26 (1.09;1.46)**	**1.39 (1.23;1.58)**	**1.60 (1.35;1.90)**
Depression				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.41 (1.18;1.69)**	**1.57 (1.37;1.81)**	**1.68 (1.49;1.88)**	**1.59 (1.35; 1.88)**
Multimorbidity				
No	Reference (1.0)	Reference (1.0)	Reference (1.0)	Reference (1.0)
Yes	**1.18 (1.10; 1.27)**	**1.12 (1.08;1.16)**	**1.18 (1.15;1.21)**	**1.15 (1.11;1.20)**

Adjusted for sex, age, marital status, skin color and education

PR: prevalence ratio

W1: Waiver one; W2: Waiver two; W3: Waiver three; W4: Waiver four

Table 5: Prevalence of forgoing healthcare assistance in individuals from Rio Grande do Sul in different periods of the COVID-19 pandemic.

Reason	W1 (%)	W2 (%)	W3 (%)	W4 (%)
Fear of contracting the new coronavirus	72.6	11.2	12.5	6.3
Financial reasons	7.2	3.8	4.9	26.2
Difficulty in commuting to the place of care	4.6	2.1	2.5	7.8
Obtained medical care at a distance (telemedicine, assistance via telephone call, WhatsApp, among others)	7.8	1.7	2.3	2.2
Service unavailable	X	3.1	3.0	13.4

W1: Waiver one; W2: Waiver two; W3: Waiver three; W4: Waiver four

Figures

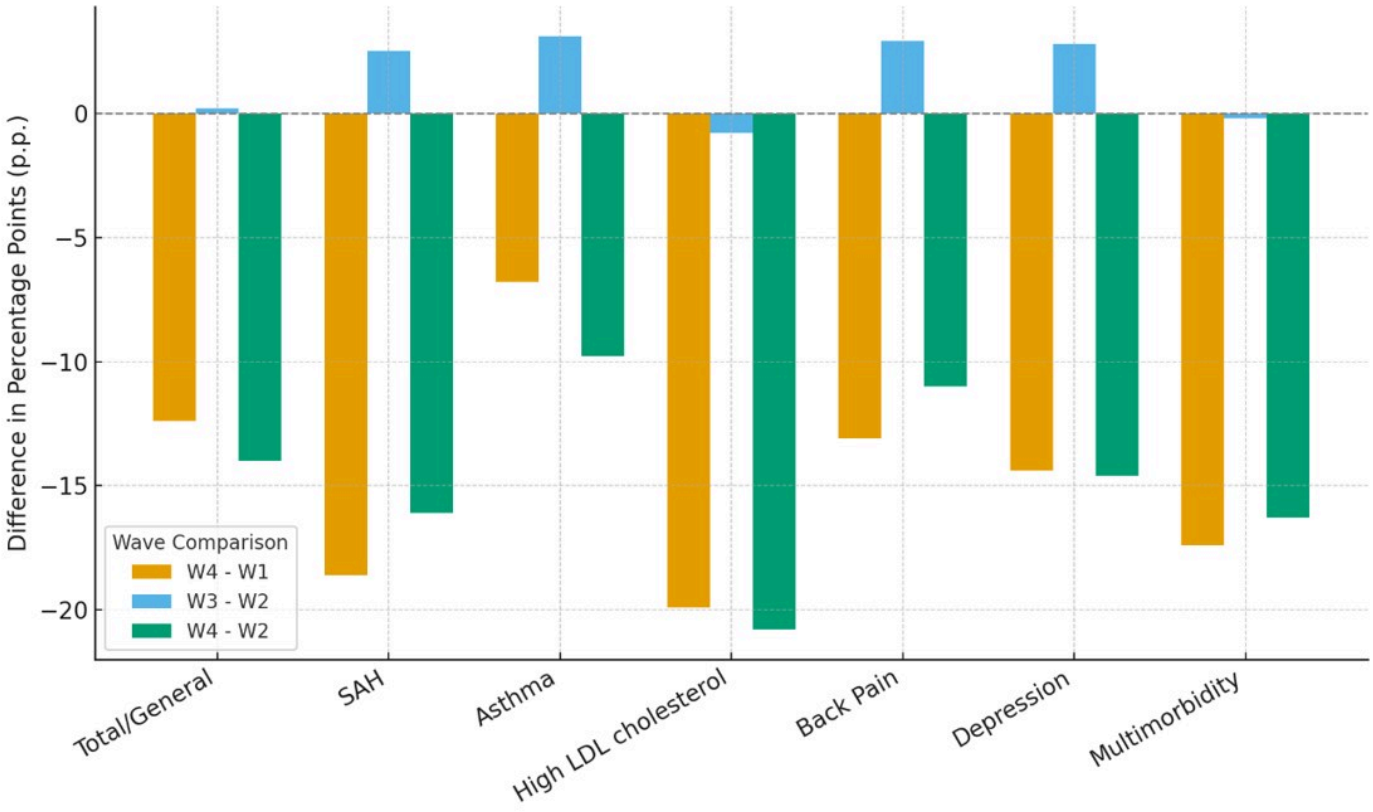


Figure 1

Differences in the prevalence (in p.p.) of forgoing healthcare assistance between pandemic waves (W1–W4, W2–W3, and W2–W4) according to Chronic Diseases in Rio Grande do Sul, Brazil.

Supplementary Files

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