

In-Person and Teleconsultation Services at a National Hospital in Peru: A Time Series Analysis of General and Psychiatric Care Amid the COVID-19 Pandemic

Jeff David Huarcaya Victoria, David Villarreal-Zegarra, Jackeline García-Serna, Piero Segovia-Bacilio, Nikol Mayo-Puchoc, Alba Navarro-Flores

Submitted to: JMIR Mental Health
on: October 25, 2023

Disclaimer: © The authors. All rights reserved. This is a privileged document currently under peer-review/community review. Authors have provided JMIR Publications with an exclusive license to publish this preprint on its website for review purposes only. While the final peer-reviewed paper may be licensed under a CC BY license on publication, at this stage authors and publisher expressly prohibit redistribution of this draft paper other than for review purposes.

Table of Contents

Original Manuscript.....	5
---------------------------------	----------

Preprint
JMIR Publications

In-Person and Teleconsultation Services at a National Hospital in Peru: A Time Series Analysis of General and Psychiatric Care Amid the COVID-19 Pandemic

Jeff David Huarcaya Victoria¹; David Villarreal-Zegarra²; Jackeline García-Serna²; Piero Segovia-Bacilio²; Nikol Mayo-Puchoc²; Alba Navarro-Flores²

¹Universidad Privada San Juan Bautista Ica PE

²Instituto Peruano de Orientación Psicológica Lima PE

Corresponding Author:

Jeff David Huarcaya Victoria
Universidad Privada San Juan Bautista
Ica
Ica
PE

Abstract

Background: The COVID-19 pandemic produced a global reduction in healthcare accessibility for patients with and without this infection, which was particularly burdening for those with chronic conditions as patients with a mental health condition. Peru was greatly affected by the pandemic, presenting a collapsed healthcare system conducting to the world's highest per capita mortality rate due to COVID-19.

Objective: Understanding the trends in healthcare utilization, and in mental health care use would provide insights into the pandemic response and future directions for recovery.

Methods: This is an observational study from a national hospital in Lima, Peru. We analysed data on user care in all the services and in psychiatric services, for the period May 2019 to December 2022. Data were calculated for users served per month, and the number of users seen monthly in mental health services, as well as sociodemographic variables, were sex (female or male), age (from 0 to more), type of medical appointment (regular or additional), and modality of care (presential or teleconsultations). An interrupted time series regression model was conducted to assess the number of outpatient medical and psychiatric consultations. Subgroup analyses were performed according to service modality, i.e., overall, telemonitoring/tele-consultations only or face-to-face only for all service users and for mental health service users.

Results: A total of 1,515,439 participants were included (females, 56.8%), and only 22.8% of all visits involved telemedicine. The total monthly outpatient visits were reduced significantly compared to the expected projection ($p=0.000$) at the beginning of the pandemic with a later monthly increment of 298.7 users. Face-to-face interventions were significantly reduced at the beginning, and progressively recovered through the following months. Telemedicine use presented an initial increment and subsequent reduction of use by the end of the pandemic. A similar trend was found in mental health units.

Conclusions: During the pandemic years, healthcare utilization both in general and in psychiatric services significantly decreased, mostly at the beginning of the pandemic (March 2020). No significant trends were found in both cases across the pandemic times. Telemedicine attentions during this context increased significantly in general and mental-health users.

(JMIR Preprints 25/10/2023:53980)

DOI: <https://doi.org/10.2196/preprints.53980>

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**

Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.

No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**

Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v

Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <http://www.jmir.org/2018/12/e123456/>



Original Manuscript

In-Person and Teleconsultation Services at a National Hospital in Peru: A Time Series Analysis of General and Psychiatric Care Amid the COVID-19 Pandemic

Authors

David Villarreal-Zegarra ^{1,2}
Jackeline García-Serna ²
Piero Segovia-Bacilio ²
Nikol Mayo-Puchoc ²
Alba Navarro-Flores ^{2,3}
Jeff Huarcaya-Victoria ^{4,5}

Affiliation

¹ Universidad César Vallejo, Escuela de Medicina. Trujillo, Peru.

² Instituto Peruano de Orientación Psicológica, Lima, Peru.

³ Georg-August-Universität Göttingen, International Max Planck Research School for Neurosciences, Göttingen, Germany.

⁴ Escuela Profesional de Medicina Humana, Universidad Privada San Juan Bautista, Filial Ica, Peru.

⁵ Unidad de Investigación, Departamento de Psiquiatría, Hospital Nacional Guillermo Almenara Irigoyen, EsSalud, Lima, Peru.

Email

David Villarreal-Zegarra	davidvillarreal@ipops.pe
Jackeline García-Serna	jackelinegarcia@ipops.pe
Piero Segovia-Bacilio	piero.segovia@unmsm.edu.pe
Nikol Mayo-Puchoc	nikol.mayo@ipops.pe
Alba Navarro-Flores	alba0736@gmail.com
Jeff Huarcaya-Victoria	jeff.huarcaya@upsjb.edu.pe

ORCID

David Villarreal-Zegarra	https://orcid.org/0000-0002-2222-4764
Jackeline García-Serna	https://orcid.org/0000-0001-9260-1505
Piero Segovia-Bacilio	https://orcid.org/0000-0003-4343-7467
Nikol Mayo-Puchoc	https://orcid.org/0000-0002-6182-7605
Alba Navarro-Flores	https://orcid.org/0000-0001-8415-619X
Jeff Huarcaya-Victoria	https://orcid.org/0000-0003-4525-9545

Corresponding author

Jeff Huarcaya-Victoria

Email: jeff.huarcaya@upsjb.edu.pe



Declarations

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of data and materials

The data used and/or analyzed in the current study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate

Our study was approved by the Institutional Research Ethics Committee of the Guillermo Almenara Irigoyen National Hospital (N°245 CIEI-IOIyD-GRPA-ESSALUD-2023).

Consent for publication

Not applicable.

Authors' contributions

David Villarreal-Zegarra: Conceptualization, Methodology, Software, Formal Analysis, Data Curation, Writing-Review & Editing, Visualization, Supervision

Jackeline García-Serna: Conceptualization, Methodology, Formal Analysis, Writing - Original Draft

Piero Segovia-Bacilio: Conceptualization, Formal Analysis, Writing - Original Draft

Nikol Mayo-Puchoc: Conceptualization, Writing-Review & Editing

Alba Navarro-Flores: Conceptualization, Writing-Review & Editing

Jeff Huarcaya-Victoria: Conceptualization, Investigation, Data Curation, Writing-Review & Editing, Supervision

Declaration of Competing Interest

The authors report no conflict of interest when conducting the study, analysing the data, or writing the manuscript. TYP developed the first version of the study for his thesis. However, their involvement in the next steps of publication was limited. NIM and DVZ wrote the final version of the manuscript restructured the analysis and updated the search.

Abstract

Background: The COVID-19 pandemic produced a global reduction in healthcare accessibility for patients with and without this infection, which was particularly burdening for those with chronic conditions as patients with a mental health condition. Peru was greatly affected by the pandemic, presenting a collapsed healthcare system conducting to the world's highest per capita mortality rate due to COVID-19. Understanding the trends in healthcare utilization, and in mental health care use would provide insights into the pandemic response and future directions for recovery, therefore this study analyses the trends of outpatient medical and psychiatric consultations during the COVID-19 pandemic in a national hospital in Peru.

Methods: This is an observational study from a national hospital in Lima, Peru. We analyzed data on user care in all the services and in psychiatric services, for the period May 2019 to December 2022. Data were calculated for users served per month, and the number of users seen monthly in mental health services, as well as sociodemographic variables, were sex (female or male), age (from 0 to more), type of medical appointment (regular or additional), and modality of care (in-person or teleconsultations). An interrupted time series regression model was conducted to assess the number of outpatient medical and psychiatric consultations. Subgroup analyses were performed according to service modality, i.e., overall, telemonitoring/tele-consultations only or face-to-face only for all service users and for mental health service users.

Results: A total of 1,515,439 participants were included (females, 56.8%), and only 22.8% of all visits involved telemedicine. The total monthly outpatient visits were reduced significantly compared to the expected projection ($P=0.000$) at the beginning of the pandemic with a later monthly increment of 298.7 users. Face-to-face interventions were significantly reduced at the beginning, and progressively recovered through the following months. Telemedicine use presented an initial increment and subsequent reduction of use by the end of the pandemic. A similar trend was found in mental health units.

Conclusions: During the pandemic years, healthcare utilization both in general and in psychiatric services significantly decreased, mostly at the beginning of the pandemic (March 2020). No significant trends were found in both cases across the pandemic times. Telemedicine attentions during this context increased significantly in general and mental-health users.

Keywords: healthcare utilization, mental health use, COVID-19

Background

During the COVID-19 pandemic, the number of medical consultations unrelated to the pandemic was significantly displaced to focus on containing the spread of the infection [1]. Healthcare systems faced the great challenge of adapting to the growing medical care demand of treating COVID-19 patients while continuing to provide care for patients with other conditions, for whom fewer and fewer resources were available [2]. Particularly, outpatient clinics experienced reductions in their utilization use during this time, which mostly resulted from the decrease in scheduled medical visits and the temporary suspension of some services in many health centers [3]. This context produced an impact in patients' health, especially those with chronic conditions and those needing continuous follow-up sessions, and large economic losses [4].

In low- and middle-income countries, where access to medical care was already limited, the Pandemic represented a challenge mostly impossible to contained [5, 6], and the prevalence of other public health problems such as malnutrition, malaria, tuberculosis, and HIV/AIDS rose to unprecedented levels [7, 8]. The case of Peru portrays an example of unmet healthcare needs during the pandemic under the context of a severely unprepared but otherwise upper-middle income country. With hospitals composed of poor infrastructure, limited medical supplies, and outdated technology since the past decades [9], the healthcare system in Peru completed its collapse during the Pandemic, presenting the highest mortality rate per capital, low rates of immunization and highly frequency of infections in healthcare providers [10, 11]. The consequence of this situation was the worsening of the outcomes of patients with chronic and non-communicable disorders [12].

An important group of chronic patients included patients with psychiatric disorders. For them, various aspects of the pandemic (fear of contagion, de novo diagnosis, loss of loved ones) combined with the deficient response for healthcare provision, generated an increment in the incidence and worsening of cases [13]. In Peru, mental health and substance abuse disorders are among the most burdensome conditions [14]. Following COVID-19 pandemic, there has been an increase in the prevalence of moderate depressive symptoms and in the proportion of cases treated with mild depressive symptoms [15-17].

An alternative to containing this high demand of patients was presented by telemedicine and other digital technologies, which changed the impact on the accessibility and quality of care [18, 19]. Lack of access to technology poses a significant problem, as many patients lack access to telemedicine and other forms of virtual medical care utilized during the pandemic.

Therefore, it is essential to explore how the utilization of outpatient medical consultation has been impacted by the COVID-19 pandemic in these countries to identify effective solutions to address current and future challenges in healthcare delivery. In this regard, this study will focus on the analysis of the utilization of outpatient medical and psychiatric consultations during the COVID-19 pandemic in a Social Security hospital in Peru, using a time-series analysis methodology to examine trends and patterns of service utilization from 2019 to 2022.

Methods

Study design

Our study has an observational design and utilized data from the Hospital Guillermo Almenara Irigoyen Hospital in Lima, Peru.

Setting

The study was conducted at the Hospital Guillermo Almenara Irigoyen (HNGAI), a tertiary referral center and highly complex healthcare facility located in Lima, Peru. HNGAI holds a prominent

position within the healthcare system of Peru, being one of the largest hospitals under the Social Security system in terms of bed capacity, with a total of 960 hospital beds. It serves as a comprehensive medical institution catering to a broad range of medical specialties, including psychiatry.

The hospital's significance and scope of services are evident from its designation as a Specialized Health Institute III-2, the highest level bestowed by the Ministry of Health of Peru on hospital establishments. With a catchment population of 1,547,840 individuals covered by social insurance, HNGAI plays a vital role in providing healthcare services to a substantial portion of the population.

As a tertiary referral center, HNGAI assumes the responsibility of managing a diverse range of medical conditions, from routine ailments to highly complex and specialized cases. Its comprehensive capabilities and expertise make it a preferred choice for patients seeking specialized medical care.

Data on user care in all services from the HNGAI, including psychiatric services (adult psychiatry, child and adolescent psychiatry, addictive behaviors and day hospital) provided by the Psychiatry Department was used. The data were extracted from "ExplotaDatos system", generated by the Social Health Insurance EsSalud, for the period 1 May 2019 to 31 December 2022.

Participants

The number of consultations considered for the study came from all hospital services, including psychiatric services. Of these, women who consulted accounted for 56.8% and 56.7% before and during the pandemic, and participants ranged in age from 12 to over 65 years. Participants with their own health insurance accounted for 70.4% and 72.7% before and during the pandemic, as well as 80.7% and 88.4% of participants accessed care through a regular medical appointment and the rest through an additional one; mental health care services accounted for 5.5% and 6.6% before and after the pandemic. Finally, telemonitoring and teleconsultation care accounted for 0% and 33.5% before and during the pandemic, respectively.

Variables

Users served per month

Defined as the number of users served in all services during a month by means of in-person and telemonitoring or teleconsultation.

Number of users seen monthly in mental health services

Defined as the number of users attended to in the mental health services (adult psychiatry, child and adolescent psychiatry, addictive behaviors, and day hospital) by means in-person and telemonitoring or teleconsultation.

Sociodemographic covariates

The sociodemographic variables were sex (female or male), age (from 0 to more), type of medical appointment (normal or additional), and modality of care (telemonitoring or teleconsultations).

Statistical analysis

Descriptive analyses were performed on users seen from May 2019 to December 2022, with data collected monthly. Sociodemographic variables were analyzed for all medical consultations, including those carried out by psychiatric services. We used interrupted time series regression

models, a quasi-experimental approach, to assess the number of outpatient medical and psychiatric consultations made after the passage of the pandemic by COVID-19. This involved analyzing trends and patterns of service utilization from May 2019 to December 2022. The latter did not include care provided by the psychology service. The estimated impact of the pandemic on total outpatient medical and psychiatric consultations was assessed in terms of change in level (intercept) and change in slope of prevalence across the time series before, during and after the pandemic. Subgroup analyses were performed according to service modality, i.e., overall, telemonitoring/teleconsultations only or face-to-face only for all service users and for psychiatric service users.

Ethics

We did not access any individual personal data, nor did we have contact with participants as it was secondary data and anonymous. The data was accessed on request and we did not collect primary data, so there was no ethical risk. Our study was approved by the Institutional Research Ethics Committee of the Guillermo Almenara Irigoyen National Hospital (N°245 CIEI-IOIyD-GRPA-ESSALUD-2023).

Results

Participants

A total of 1,515,439 participants were attended as outpatients between May 2019 and December 2022. During this period, most of the participants were females (56.8%; $n=860,062$), working-age adults (51.3%; $n=777,236$), health insurance holders (72.0%, $n=1,090,925$), who had scheduled regular medical appointments (86.0%; $n=1,302,988$). Only 22.8% of all outpatient visits involved telemonitoring or teleconsultation ($n=345,605$). Table 1 shows the characteristics of the participants before the pandemic and during the pandemic for all users and users in mental health services.

The most common mental health problems diagnoses in users of psychiatric services were schizophrenia, schizotypal and delusional disorders (F20-F29), affective disorders (F30-F39), and anxiety, stress-related and somatoform disorders (F40-F48). An extended list of the mental health diagnoses is presented in table 2.

Number of users in all services

Figure 1A shows that the total number of users seen per month in outpatient care across all services decreased significantly at the beginning of the pandemic (March 2020), as there was a decrease of -35,226.4 users seen compared to what was expected in that month ($p=.000$; -38558.3 to -31894.6). However, an upward trend was observed during the pandemic, with a monthly increase of 289.7 users across all services ($p=.012$; 67.2 to 512.2). On the other hand, the number of users served at the beginning of the pandemic remained the same as that measured in the month before the start of the pandemic (February 2020).

The number of users served by telemonitoring, and teleconsultation was almost zero before the pandemic (see Figure 1B). Subsequently, there was an increase in the middle of the pandemic and a decrease in the last months of the evaluation. Still, no significant trend was found in the number of users visited per month by telemonitoring and teleconsultation alone ($p=.132$).

The number of users served by face-to-face care per month was significantly reduced at the beginning of the pandemic (see Figure 1C), as a reduction of -42001.9 users served was found compared to what was expected in that month ($p=.000$; -46934.2 to -37069.6). However, there was no significant trend in the number of users seen per month for face-to-face care alone ($p=.585$). Table 3 presents the coefficients of the time series analysis.

Number of users in psychiatric services

Figure 2A shows that the number of outpatients seen per month in the four psychiatric services was significantly reduced at the start of the pandemic (March 2020). The reduction was -1550.3 fewer users seen than expected for that month ($p=.000$; -1818.2 to -1282.3). On the other hand, the number of users seen per month increased during the pandemic, but no significant trend was found ($p=.091$). The number of users receiving telemonitoring and teleconsultation in the four psychiatric services per month was shown in Table 2B. However, the time series analysis did not converge, so it was not possible to assess whether there were significant changes (see Table 3).

There was a significant reduction at the level of face-to-face user visits per month in the four psychiatric services at the beginning of the pandemic (see Figure 2C). The reduction was -1755.2 users compared to the expected number for that month ($p=.000$; -2139.2 to -1371.2). On the other hand, no significant trend was found during the pandemic for the number of face-to-face visits per month only ($p=.669$).

Discussion

Main findings

During the first months of the pandemic, the number of users of health services decreased and gradually increased. Before the pandemic, medical care through telemonitoring and teleconsultation was almost non-existent, it increased during the pandemic but decreased in the last months of the evaluated time. On the other hand, the number of users attending face-to-face, telemonitoring and teleconsultation modalities during the pandemic did not show significant differences in the months of evaluation. Regarding patients seen in psychiatric services, we found that the number of outpatients decreased significantly at the beginning of the pandemic and then increased progressively. Face-to-face visits per month were significantly reduced in all four mental health services.

Comparison with other studies

At the beginning of the pandemic, we found an overall reduction of healthcare utilization. A systematic review conducted until August 2020, regarding health care utilization including 20 countries, found that it was reduced in one third of them. Eighty-one primary studies reported 143 estimates and concluded in a mean reduction in 28% of admissions and 31% of new diagnosis [1]. In Peru, the mandatory confinement was established on March 2020, lasting approximately 3 months [20] period in which the population was not allowed to leave their homes except for emergencies.

In the middle of the pandemic, we found a progressive but slow increment in the care utilization. A study using a time series design assessing the effect of the pandemic on 31 health services in 9 countries (low-income=2, lower-middle income=3, upper-middle income=3, and high-income=2) found that total outpatient visits decreased between 9% and 40% and remained below expectations at the end of 2020 [21]. A scoping review analyzing the changes in medical care access, found that among 38 studies (from Europe, Asia and Africa), 33 reported a statistically significant reduction in service use. Similarly, the studies reported possible barriers to healthcare access, including the limited supplies and personnel to care for non-COVID patients, as well as the increase in waiting times. A potential explanation for this slow increment in Peru, as well as other Latin American countries, could be provided by a survey reporting that around 66% of the Peruvian participants attempted self-medication during the pandemic [22]. Part of the population also presented barriers such as fear of contagion and the stigma of being diagnosed with COVID-19, as well as financial difficulties [23]. Even if during and after the first phase of restriction the number of cases were not increasing, then these maintained low rates of utilization were suggested to be due to the fear of contagion, sanctions related to outside mobilization, reduced access to medical centers, prioritization

to COVID-19 cases among others [24]. We found that at the end of the pandemic, the overall healthcare utilization rates increased to a level close to the values one year before the pandemic started, but now with a new group of attentions conducted via telemedicine. Similarly, a study in the UK found that, after the release of the social restriction measures, the frequency of the utilization of healthcare returned to levels that were not significantly different that the pre-pandemic utilization [25].

Regarding psychiatric services utilization, we found a reduction during the beginning of the pandemic that improved progressively towards the end of this context. Amidst the pandemic, Peru was submerged in chaos because of various factors including a debilitated health care system, political mismanagements, and poor attainments to the social restrictions [11]. This scenario impacted the mental health of the population, as showed that high levels of perceived stress were present in the general Peruvian population [26]. A time-series analysis of the diagnosis of depression in Peru showed that the number of new patients incremented 0.17% monthly after the beginning of the pandemic [15].

In the US, during the initial months of the pandemic, there was a significant 50% reduction in face-to-face mental health encounters. However, the utilization of telehealth services played a pivotal role in the swift restoration of service delivery. This uptake of telehealth, accounting for approximately 47.9% of average monthly encounters, facilitated the timely provision of mental health care despite the limitations imposed by the pandemic [27]. In another study, it has been reported that the COVID-19 pandemic resulted in a significant decrease of more than 50% in in-person mental health care utilization rates among commercially insured adults. Rates of various mental health disorders, including anxiety disorders, bipolar disorder, and adjustment disorders, showed declines during the pandemic. In contrast, there was a substantial increase of 16-20 times in telehealth service utilization. Combining both in-person and telehealth services, there was an overall increase in care observed for anxiety, and adjustment disorders. These findings highlight the impact of the pandemic on mental health care delivery and the potential of telehealth in providing accessible services during times of crisis [28].

In the domain of psychiatric services, there was a discernible decline of 12% per week in visits to psychiatric emergency wards observed during the initial phase of social distancing measures implemented from March to May 2020 [29]. In France, an analysis in the number of medical admissions in a Psychiatric Ward found that compared to 2019, they were reduced in 2020 by 18%, which was increased to 42% during the first lock down; while the number of patients admitted to the emergency ward was reduced 20% and 56% respectively [30]. A study in Italy showed that 25% of their communitarian mental health centers reduced their access hours [31]. On the other hand, a Peruvian study found that community mental health centers were able to regain service capacity and fill the service gap created by the health crisis nine months after the COVID-19 pandemic [32].

In Peru, telemedicine and in-person healthcare showed a similar trend compared to other countries of the region. In many Latin-American countries, efforts to establish a telemedicine system produced positive results, as they reduced the overload of hospitals, reduced waiting times and provided access to patients living in remote areas [33]. A study conducted in an emergency department in Argentina showed that telemedicine consultations increased up to a peak during the first lockdown period of the first year of the COVID-19 pandemic (March 2020). In turn, it reduced progressively and was replaced by face-to-face interventions, but remained at a stable value above the pre-pandemic trend [34]. It is worth noticing that most of the teleconsultations were conducted without technical complications. Telemedicine in our context has been supported by a legal framework since 2017, and after the pandemic outbreak, it was included as part of several regulations of the Ministry of Health and the Peruvian College of Medicine, showing the interest in the establishment and refinement of these technologies in health [35]. The transition of mental health services to telemedicine as a response to the high patient demand has demonstrated that synchronous digital interventions facilitate the continuity of care [36]. Not only do they reduce the geographic limitations of the patient

or therapist including the long hours of mobilization common in Lima [36].

But they also reduce stigma because they can occur in a more private setting, they can be delivered by trained healthcare providers (not only physicians), and they could reduce costs [37]. A survey of psychologists in the US showed an 85% increase in the use of telemedicine after the pandemic, and they projected that at least 35% of their work would involve telemedicine after the pandemic [38]. In addition, they mentioned that telemedicine use by psychologists was positively influenced (a) by being female; (b) having training in that field, and treating patients with anxiety, partners' or women's complaints; and (c) by working in a rural area, treating patients with antisocial personality disorder or doing rehabilitation or psychometry work. Although telemedicine offers several advantages, the values and preferences of patients and therapists need to be taken into consideration for improving utilization rates and easing the in-person demand for care.

Our study found that during the pandemic there was a reduction in mental health services in the last months of 2022, possibly due to a lower use of teleconsultations within the health system evaluated after the lifting of the COVID-19 pandemic. This may be because the implementation of mental health teleconsultations was uneven in the Peruvian context since professionals did not have exclusive equipment for their use and there was an overload of care, making it difficult to obtain medical appointments for teleconsultations [39]. In addition, mental health patients preferred face-to-face care to teleconsultation care [40]. All these elements may have influenced the potential decrease in mental health teleconsultations after the health emergency had passed.

Public health implications

These results show that the reduction in healthcare utilization during the pandemic reveals the fragility of the healthcare system, which were not only unprepared for a pandemic but also for providing care in a regular context [41]. This calls for an improvement of the structure of the healthcare system, such as improving the surveillance system, the specialization of professionals for emergency situations and disasters, strengthening the relationships between the scientific and the medical institutions, and communitarian engagement [42].

The use of telemedicine as a potential intervention to ease the overload of hospitals and healthcare centers has been a highlight of the pandemic response, taking note of the needed strategies for its implementation including the proper training regarding these topics of relevant stakeholders [43]. Future studies could focus on the trends of health care utilization that showed significant compensation with telemedicine, which was virtually non-existent before, amid the middle period of the pandemic, but with progressive reduction (without disappearing) towards the last analysis period.

In addition, we invite policymakers and health intelligence teams to use our findings as a starting point for the development of health policy and regulation to strengthen teleconsultation in mental health and care in general. Considering that in Peru, the implementation of teleconsultation was bumpy because many health professionals did not have the equipment to carry out the consultations, there was a lack of training in the use of teleconsultation platforms, and there was limited access to the Internet in the care centers themselves [39, 44]. Additionally, telemedicine users remained present after the end of the pandemic, which shows that the demand for these services is present even in a low resource setting as Peru. Authors from countries of similar backgrounds could learn from our positive experience with telemedicine, and we encourage the implementation of these technologies based on a framework that considers its barriers and facilitators [37]. Our findings can also be used to assess the post-pandemic recovery of the health system.

Limitations and strengths

This study presents several strengths. First, we present data from a major national reference hospital in Lima, Peru using a time series analysis of trends in utilization. We included all patients receiving care during a broad time period, including most of the entire duration of the pandemic. The sample size was of more than 1.5 million patients, and we obtained additional data on mental health utilization given of its high burden in Peru. A rigorous methodology including advanced statistical methods were used to analyses the trends of healthcare utilization across these years. On the other hand, these results are limited to a national hospital in Lima and are not generalizable to other areas of the country or region. Further determinants of the variability of healthcare utilization need to be explored, as demographic, epidemiologic, or clinical factors. Therefore, we believe that further studies should assess whether care differed by specific age group, gender, educational level, or clinical variables that may have prevented participants from accessing care.

Conclusions

In this time-series analysis of a national hospital in Peru during the Pandemic years (March 2020 to December 2022), we analyzed data from 1.5 million patients. We found that healthcare face-to-face utilization was significantly decreased at the beginning of the pandemic (March 2020) in the outpatient clinic, as well as the number of patients attending mental health care services. No significant trends were found in both groups across the pandemic times, however, an increment in the number of users of mental health services per month was observed. Among all the users, a trend of monthly increment of utilization was observed during the pandemic. Telemedicine interventions were basically non-existent before the pandemic, however consultations during this context increased significantly in general and for mental-health users. At the end of the study period, the telemedicine services in mental health remain having users. This could point out to the presence of demand of users interested in these interventions which were not available before the pandemic. Further follow up evaluations could measure the long-term feasibility of this intervention as an option to improve mental health access in the country. The utilization decreased over the following months, as evidenced by the number of users served in healthcare services at the hospital, and to the number of teleconsultation users in all services. In times of emergency, the availability of easy-to access care services and the implementation of digital health services showed to be of utmost important. These results exemplify the impact of the national COVID-19 lockdown on healthcare utilization in Peru. Governmental and key decision-makers are encouraging to make efforts to respond promptly to health needs and to learn from these experiences, to aid the population in future health emergencies.

References

1. 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*. 2021 Mar 16;11(3):e045343. PMID: 33727273. doi: 10.1136/bmjopen-2020-045343.
2. Hangartner N, Di Gangi S, Elbl C, Senn O, Bisatz F, Fehr T. Impact of the COVID-19 pandemic on emergency outpatient consultations and admissions of non-COVID-19 patients (ECCO)-A cross-sectional study. *PloS one*. 2022;17(6):e0269724. PMID: 35687575. doi: 10.1371/journal.pone.0269724.
3. Sim B, Nam EW. The Impact of COVID-19 Pandemic on Outpatient Visits for All-Cause and Chronic Diseases in Korea: A Nationwide Population-Based Study. *International journal of environmental research and public health*. 2022 May 6;19(9). PMID: 35565068. doi: 10.3390/ijerph19095674.
4. Provenzano DA, Sitzman BT, Florentino SA, Buterbaugh GA. Clinical and economic strategies in outpatient medical care during the COVID-19 pandemic. *Regional anesthesia and pain*

medicine. 2020 Aug;45(8):579-85. PMID: 32475827. doi: 10.1136/rapm-2020-101640.

5. Malik MA. Fragility and challenges of health systems in pandemic: lessons from India's second wave of coronavirus disease 2019 (COVID-19). *Global health journal* (Amsterdam, Netherlands). 2022 Mar;6(1):44-9. PMID: 35070474. doi: 10.1016/j.glohj.2022.01.006.

6. Bong CL, Brasher C, Chikumba E, McDougall R, Mellin-Olsen J, Enright A. The COVID-19 Pandemic: Effects on Low- and Middle-Income Countries. *Anesthesia and analgesia*. 2020 Jul;131(1):86-92. PMID: 32243287. doi: 10.1213/ane.0000000000004846.

7. Di Gennaro F, Occa E, Ramirez L, Marotta C, Segala FV, Santana J, et al. Malaria, HIV and Malnutrition among Internally Displaced People in Mozambique During COVID-19 Pandemic: Results from a Community-Based Intervention. *Annals of global health*. 2022;88(1):106. PMID: 36561539. doi: 10.5334/aogh.3969.

8. Foo C, Shrestha P, Wang L, Du Q, García-Basteiro AL, Abdullah AS, et al. Integrating tuberculosis and noncommunicable diseases care in low- and middle-income countries (LMICs): A systematic review. *PLoS Med*. 2022 Jan;19(1):e1003899. PMID: 35041654. doi: 10.1371/journal.pmed.1003899.

9. Soto A. [Barriers to effective care in the referral hospitals of Peru's Ministry of Health: serving patients in the 21st century with 20th century resources]. *Rev Peru Med Exp Salud Publica*. 2019 Apr-Jun;36(2):304-11. PMID: 31460645. doi: 10.17843/rpmesp.2019.362.4425.

10. Chafloque-Vásquez RA, Pampa-Espinoza L, Celis Salinas JC. Seroprevalencia de COVID-19 en trabajadores de un hospital de la Amazonía peruana. *Acta Médica Peruana*. 2020;37(3):390-2. doi: <http://dx.doi.org/10.35663/amp.2020.373.1050>

11. Herrera-Añazco P, Uyen-Cateriano A, Mezones-Holguin E, Taype-Rondan A, Mayta-Tristan P, Malaga G, et al. Some lessons that Peru did not learn before the second wave of COVID-19. *The International journal of health planning and management*. 2021 May;36(3):995-8. PMID: 33595137. doi: 10.1002/hpm.3135.

12. Pesantes MA, Lazo-Porras M, Cárdenas MK, Diez-Canseco F, Tanaka-Zafra JH, Carrillo-Larco RM, et al. [Healthcare challenges for people with diabetes during the national state of emergency due to COVID-19 in Lima, Peru: primary healthcare recommendations]. *Rev Peru Med Exp Salud Publica*. 2020 Dec 2;37(3):541-6. PMID: 33295559. doi: 10.17843/rpmesp.2020.373.5980.

13. Lindert J, Jakubauskiene M, Bilsen J. The COVID-19 disaster and mental health-assessing, responding and recovering. *European journal of public health*. 2021 Nov 9;31(Supplement_4):iv31-iv5. PMID: 34751367. doi: 10.1093/eurpub/ckab153.

14. Alva-Diaz C, Huerta-Rosario A, Molina RA, Pacheco-Barrios K, Aguirre-Quispe W, Navarro-Flores A, et al. Mental and substance use disorders in Peru: a systematic analysis of the Global Burden of Disease study. *Journal of Public Health*. 2022 2022/03/01;30(3):629-38. doi: 10.1007/s10389-020-01341-9.

15. Villarreal-Zegarra D, Reátegui-Rivera CM, Otazú-Alfaro S, Yantas-Alcantara G, Soto-Becerra P, Melendez-Torres GJ. Estimated impact of the COVID-19 pandemic on the prevalence and treatment of depressive symptoms in Peru: an interrupted time series analysis in 2014–2021. *Social psychiatry and psychiatric epidemiology*. 2023 2023/03/08. doi: 10.1007/s00127-023-02446-8.

16. Huarcaya-Victoria J, Barreto J, Aire L, Podestá A, Caqui M, Guija-Igreda R, et al. Mental Health in COVID-2019 Survivors from a General Hospital in Peru: Sociodemographic, Clinical, and Inflammatory Variable Associations. *International Journal of Mental Health and Addiction*. 2021 2021/09/28. doi: 10.1007/s11469-021-00659-z.

17. Huarcaya-Victoria J, Alarcon-Ruiz CA, Barzola-Farfán W, Cruzalegui-Bazán C, Cabrejos-Espinoza M, Aspilcueta-Montoya G, et al. One-year follow-up of depression, anxiety, and quality of life of Peruvian patients who survived COVID-19. *Qual Life Res*. 2022 Aug 8;1-11. PMID: 35939252. doi: 10.1007/s11136-022-03208-w.

18. Aragona M, Barbato A, Cavani A, Costanzo G, Mirisola C. Negative impacts of COVID-19

lockdown on mental health service access and follow-up adherence for immigrants and individuals in socio-economic difficulties. *Public health*. 2020 Sep;186:52-6. PMID: 32771661. doi: 10.1016/j.puhe.2020.06.055.

19. Sharma MS, De Maio M, Young K, Santopietro J. Transformation of Outpatient Psychiatry. *The Psychiatric clinics of North America*. 2022 Mar;45(1):57-69. PMID: 35219442. doi: 10.1016/j.psc.2021.11.003.

20. Giraldo EB. COVID-19 in Peru. *Indian journal of psychiatry*. 2020 Sep;62(Suppl 3):S498-s501. PMID: 33227059. doi: 10.4103/psychiatry.IndianJPsychiatry_1045_20.

21. Arsenault C, Gage A, Kim MK, Kapoor NR, Akweongo P, Amponsah F, et al. COVID-19 and resilience of healthcare systems in ten countries. *Nat Med*. 2022 Jun;28(6):1314-24. PMID: 35288697. doi: 10.1038/s41591-022-01750-1.

22. Mejia CR, Ruiz-Aquino M, Garcia-Arteta G, Ramos G, Astete-Pérez I, Pineda-Cáceres M, et al. Factors associated with the use of medicines and self-medication during the COVID-19 pandemic in 12 Latin American countries. *Heliyon*. 2024 Jan 15;10(1):e22299. PMID: 38173506. doi: 10.1016/j.heliyon.2023.e22299.

23. Pujolar G, Oliver-Anglès A, Vargas I, Vázquez ML. Changes in Access to Health Services during the COVID-19 Pandemic: A Scoping Review. *International journal of environmental research and public health*. 2022 Feb 3;19(3). PMID: 35162772. doi: 10.3390/ijerph19031749.

24. Mental Health and Substance Use. The impact of COVID-19 on mental, neurological and substance use services. Geneva: World Health Organization; 2020.

25. Chen S, She R, Qin P, Kershenbaum A, Fernandez-Egea E, Nelder JR, et al. The Medium-Term Impact of COVID-19 Lockdown on Referrals to Secondary Care Mental Health Services: A Controlled Interrupted Time Series Study. *Frontiers in psychiatry*. 2020;11:585915. PMID: 33324258. doi: 10.3389/fpsyt.2020.585915.

26. Boluarte-Carbajal A, Navarro-Flores A, Villarreal-Zegarra D. Explanatory Model of Perceived Stress in the General Population: A Cross-Sectional Study in Peru During the COVID-19 Context. *Frontiers in psychology*. 2021;12:673945. doi: 10.3389/fpsyg.2021.673945.

27. Zhu JM, Myers R, McConnell KJ, Levander X, Lin SC. Trends In Outpatient Mental Health Services Use Before And During The COVID-19 Pandemic. *Health affairs (Project Hope)*. 2022 Apr;41(4):573-80. PMID: 35377763. doi: 10.1377/hlthaff.2021.01297.

28. McBain RK, Cantor J, Pera MF, Breslau J, Bravata DM, Whaley CM. Mental Health Service Utilization Rates Among Commercially Insured Adults in the US During the First Year of the COVID-19 Pandemic. *JAMA health forum*. 2023 Jan 6;4(1):e224936. PMID: 36607697. doi: 10.1001/jamahealthforum.2022.4936.

29. Bruckner TA, Huo S, Huynh M, Du S, Young A, Ro A. Psychiatric Emergencies in Los Angeles County During, and After, Initial COVID-19 Societal Restrictions: An Interrupted Time-Series Analysis. *Community mental health journal*. 2023 May;59(4):622-30. PMID: 36509936. doi: 10.1007/s10597-022-01043-4.

30. Perozziello A, Sousa D, Aubriot B, Dauriac-Le Masson V. Use of mental health services in the aftermath of COVID-19 waves: a retrospective study conducted in a French Psychiatric and Neurosciences University Hospital. *BMJ Open*. 2023 Feb 23;13(2):e064305. PMID: 36822810. doi: 10.1136/bmjopen-2022-064305.

31. Carpiello B, Tusconi M, Zanalda E, Di Sciascio G, Di Giannantonio M. Psychiatry during the Covid-19 pandemic: a survey on mental health departments in Italy. *BMC psychiatry*. 2020 Dec 16;20(1):593. PMID: 33327940. doi: 10.1186/s12888-020-02997-z.

32. Villarreal-Zegarra D, Segovia-Bacilio P, Paredes-Angeles R, Vilela-Estrada AL, Cavero V, Diez-Canseco F. Provision of community mental health care before and during the COVID-19 pandemic: A time series analysis in Peru. *International Journal of Social Psychiatry*. 2023. doi: 10.1177/00207640231185026.

33. Camacho-Leon G, Faytong-Haro M, Carrera K, Molero M, Melean F, Reyes Y, et al. A

Narrative Review of Telemedicine in Latin America during the COVID-19 Pandemic. Healthcare (Basel, Switzerland). 2022 Jul 22;10(8). PMID: 35893183. doi: 10.3390/healthcare10081361.

34. Grande Ratti MF, Frid SA, Rodriguez P, Pollan JA, Rovegno L, Esteban JA, et al. Impact of COVID-19 Pandemic on Telehealth and In-Person Visits: Implications from an Emergency Department in Argentina. Studies in health technology and informatics. 2022 Jun 6;290:377-9. PMID: 35673039. doi: 10.3233/shti220100.

35. Curioso WH, Galán-Rodas E. El rol de la telesalud en la lucha contra el COVID-19 y la evolución del marco normativo peruano. Acta Médica Peruana. 2020;37(3):366-75.

36. Li HA-O, Glecia A, Kent-Wilkinson A, Leidl D, Kleib M, Risling T. Transition of Mental Health Service Delivery to Telepsychiatry in Response to COVID-19: A Literature Review. (1573-6709 (Electronic)).

37. Villarreal-Zegarra D, Alarcon-Ruiz CA, Melendez-Torres GJ, Torres-Puente R, Navarro-Flores A, Caverio V, et al. Development of a Framework for the Implementation of Synchronous Digital Mental Health: Realist Synthesis of Systematic Reviews. JMIR mental health. 2022 Mar 29;9(3):e34760. PMID: 35348469. doi: 10.2196/34760.

38. Pierce BS, Perrin PB, Tyler CM, McKee GB, Watson JD. The COVID-19 telepsychology revolution: A national study of pandemic-based changes in U.S. mental health care delivery. The American psychologist. 2021 Jan;76(1):14-25. PMID: 32816503. doi: 10.1037/amp0000722.

39. Paredes-Angeles R, Caverio V, Vilela-Estrada AL, Cusihuaman-Lope N, Villarreal-Zegarra D, Diez-Canseco F. Telehealth in community mental health centers during the COVID-19 pandemic in Peru: A qualitative study with key stakeholders. SSM - Mental Health. 2024 2024/06/01;5:100287. doi: <https://doi.org/10.1016/j.ssmmh.2023.100287>.

40. Cusihuaman-Lope N, Vilela-Estrada AL, Caverio V, Villarreal-Zegarra D, Diez-Canseco F. Experiences of users and family members on the care received at community mental health centers in Lima and Callao during the COVID-19 pandemic. Rev Peru Med Exp Salud Publica. 2023 Jul-Sep;40(3):278-86. PMID: 37991031. doi: 10.17843/rpmesp.2023.403.12717.

41. Vargas A, Cubas Benavides F, León-Jiménez F, Cubas S. La nueva pandemia y la verdadera crisis del sistema de salud en el Perú. Revista Medica Herediana. 2021;32(2):132-3. doi: <http://dx.doi.org/10.20453/rmh.v32i2.3988>

42. Castro Baca ÁM, Villena Pacheco AE. La Pandemia del COVID-19 y su repercusión en la salud pública en Perú. Acta Médica Peruana. 2021;38(3):161-2. doi: <http://dx.doi.org/10.35663/amp.2021.383.2227>

43. Appleton R, Barnett P, Vera San Juan N, Tuudah E, Lyons N, Parker J, et al. Implementation strategies for telemental health: a systematic review. BMC Health Serv Res. 2023 Jan 25;23(1):78. PMID: 36694164. doi: 10.1186/s12913-022-08993-1.

44. Mayo-Puchoc N, Bejarano-Carranza J, Paredes-Angeles R, Vilela-Estrada AL, García-Serna J, Cusihuaman-Lope N, et al. Paper promises: Peruvian frontline health workers' perspectives on mental health policies during COVID-19. Health policy and planning. 2023 Nov 16;38(Supplement_2):ii3-ii13. PMID: 37995267. doi: 10.1093/heapol/czad055.

Tables

Table 1. Sociodemographic characteristics of the participants in all services.

	All user served (n=1,515,439)		Psychiatric services (n=95,301)	
	Before the pandemic n (%)	During the pandemic n (%)	Before the pandemic n (%)	During the pandemic n (%)
Sex				
Female	275,444 (56.8)	584,618 (56.7)	12,747 (47.4)	34,534 (50.5)
Male	209,550 (43.2)	445,827 (43.3)	14,169 (52.6)	33,851 (49.5)
Age (categories)				
0-12	53,984 (11.1)	94,521 (9.2)	4,756 (17.7)	9,424 (13.8)
13-17	14,500 (3.0)	30,97 (3.0)	2,911 (10.8)	8,509 (12.4)
18-64	234,214 (48.3)	543,022 (52.7)	13,741 (51.1)	37,067 (54.2)
65 to more	182,296 (37.6)	361,932 (35.1)	5,508 (20.5)	13,385 (19.6)
Family relationship to the insured				
Others	143,695 (29.6)	280,819 (27.3)	12,929 (48.0)	33,838 (49.5)
Holder	341,299 (70.4)	749,626 (72.7)	13,987 (52.0)	34,547 (50.5)
Type of medical appointment				
Normal	391,604 (80.7)	911,384 (88.4)	20,180 (75.0)	60,565 (88.6)
Additional	93,390 (19.3)	119,061 (11.6)	6,736 (25.0)	7,820 (11.4)
Telemonitoring/Teleconsultations				
No	484,964 (100)	684,87 (66.5)	26,916 (100)	39,300 (57.5)
Yes	30 (0)	345,575 (33.5)	0 (0)	29,085 (42.5)

Note: n= number, %=Percentage of column. The lockdown started on 16 March 2020.

Table 2. Psychiatric diagnoses in psychiatric services (n=95,301).

	Before the pandemic n (%)	During the pandemic n (%)
F00-F09: Organic mental disorders including symptomatic disorders	2,548 (9.5)	5,622 (8.2)
F10-F19: Mental and behavioural disorders due to psychoactive substance use	2,051 (7.6)	4,635 (6.8)
F20-F29: Schizophrenia, schizotypal and delusional disorders	5,262 (19.5)	14,553 (21.3)
F30-F39: Mood (affective) disorders	4,797 (17.8)	13,132 (19.2)
F40-F48: Neurotic, stress-related and somatoform disorders	4,297 (16)	11,017 (16.1)
F50-F59: Behavioural syndromes associated with physiological disturbances and physical factors	236 (0.9)	812 (1.2)
F60-F69: Adult personality and behavioural disorders	656 (2.4)	1,637 (2.4)
F70-F79: Mental retardation	504 (1.9)	1,197 (1.8)
F80-F89: Developmental psychological disorders	2,306 (8.6)	5,471 (8.0)
F90-F98: Behavioural and emotional disorders often occurring in childhood and adolescence	3,485 (12.9)	5,639 (8.2)
F99-F99: Mental disorder not specified	0 (0)	0 (0)
Other diagnoses	774 (2.9)	4,670 (6.8)

Note: n= number, %=Percentage of column. The lockdown started on 16 March 2020.

Table 3. Interrupted time series regression analysis for the number of users served.

		Coefficients		p	95%CI	
All user served	Overall	Pre intervention slope	675.5	0.000	531.5	819.5
		Change in intercept	-35226.4	0.000	-38558.3	-31894.6
		Change in slope (Interaction)	289.7	0.012	67.2	512.2
		Intercept	43513.7	0.000	42827.2	44200.2
		Post intervention linear trend	965.2	0.000	812.0	1118.5
	Only Telemonitoring/Teleconsultations	Pre intervention slope	-0.8	0.034	-1.6	-0.1
		Change in intercept	6775.5	0.009	1777.9	11773.0
		Change in slope (Interaction)	206.3	0.132	-64.8	477.5
		Intercept	6.7	0.013	1.5	11.9
		Post intervention linear trend	205.5	0.133	-65.7	476.7
	Only in-person	Pre intervention slope	676.4	0.000	532.1	820.6
		Change in intercept	-42001.9	0.000	-46934.2	-37069.6
		Change in slope (Interaction)	83.4	0.585	-222.7	389.4
		Intercept	43507.0	0.000	42818.3	44195.8
		Post intervention linear trend	759.7	0.000	506.5	1013.0
Psychiatric services	Overall	Pre intervention slope	23.2	0.172	-10.5	56.8
		Change in intercept	-1550.3	0.000	-1818.2	-1282.3
		Change in slope (Interaction)	31.2	0.091	-5.3	67.6
		Intercept	2471.0	0.000	2326.6	2615.5
		Post intervention linear trend	54.4	0.000	42.8	65.9
	Only Telemonitoring/Teleconsultations	Pre intervention slope	0.0	.	.	.
		Change in intercept	204.9	.	.	.
		Change in slope (Interaction)	39.4	.	.	.
		Intercept	0.0	.	.	.
		Post intervention linear trend	39.4	.	.	.
	Only in-person	Pre intervention slope	23.2	0.172	-10.5	56.8
		Change in intercept	-1755.2	0.000	-2139.2	-1371.2
		Change in slope (Interaction)	-8.2	0.669	-46.9	30.5
		Intercept	2471.0	0.000	2326.6	2615.5
		Post intervention linear trend	14.9	0.073	-1.4	31.3

Note: Intercept: The number of users served at the beginning of the study period. Pre-intervention slope: The previous trend of the number of users served. Change in intercept: Change in the number of users served at the beginning of the COVID-19 lockdown. Change in slope (Interaction): Change in the trend of the number of users served over the time after March 2020. Autocorrelation in lag(1) was considered.

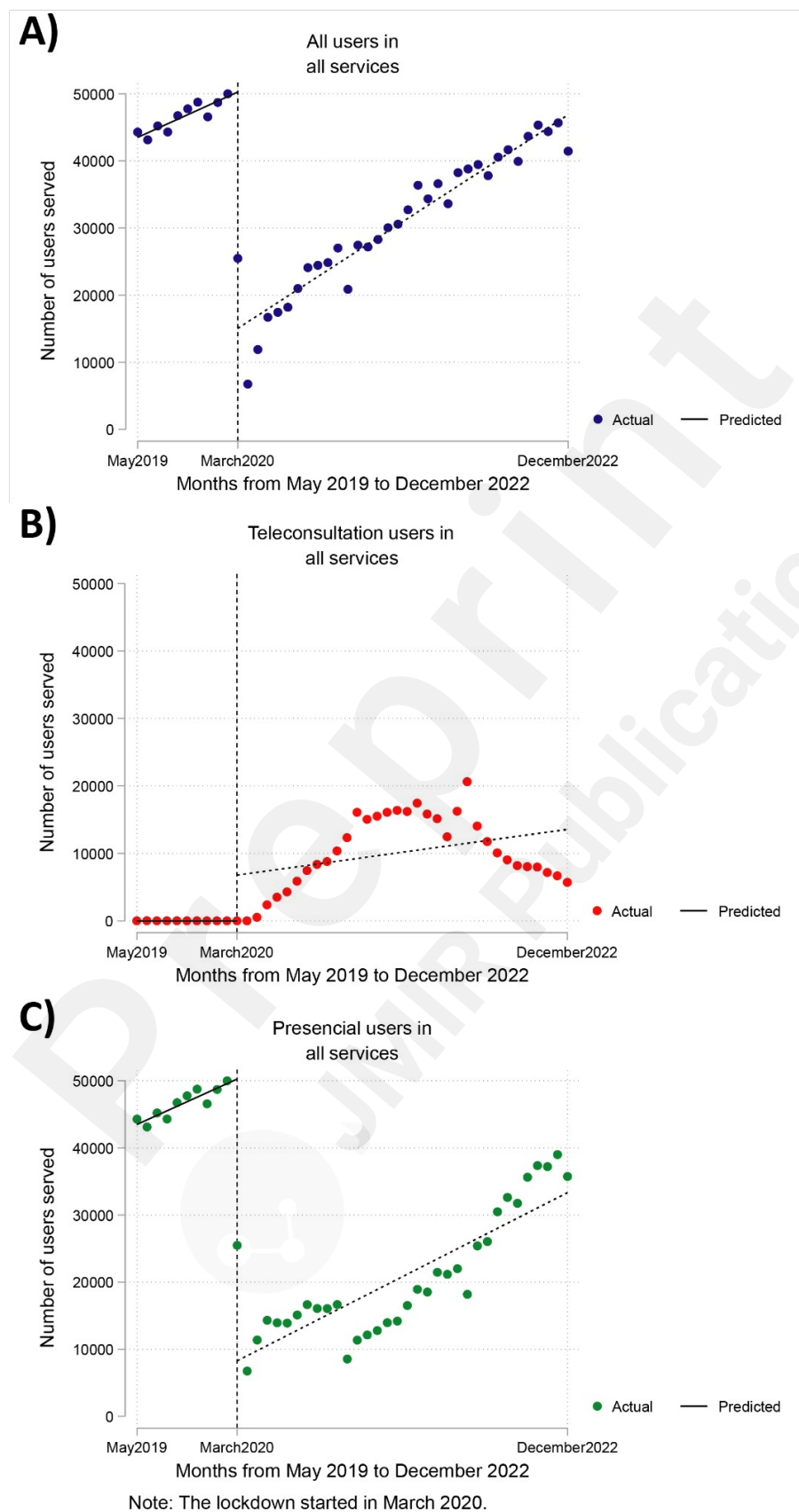


Figure 1. Interrupted time series analysis for the number of users served per month in all services between May 2019 and December 2022.

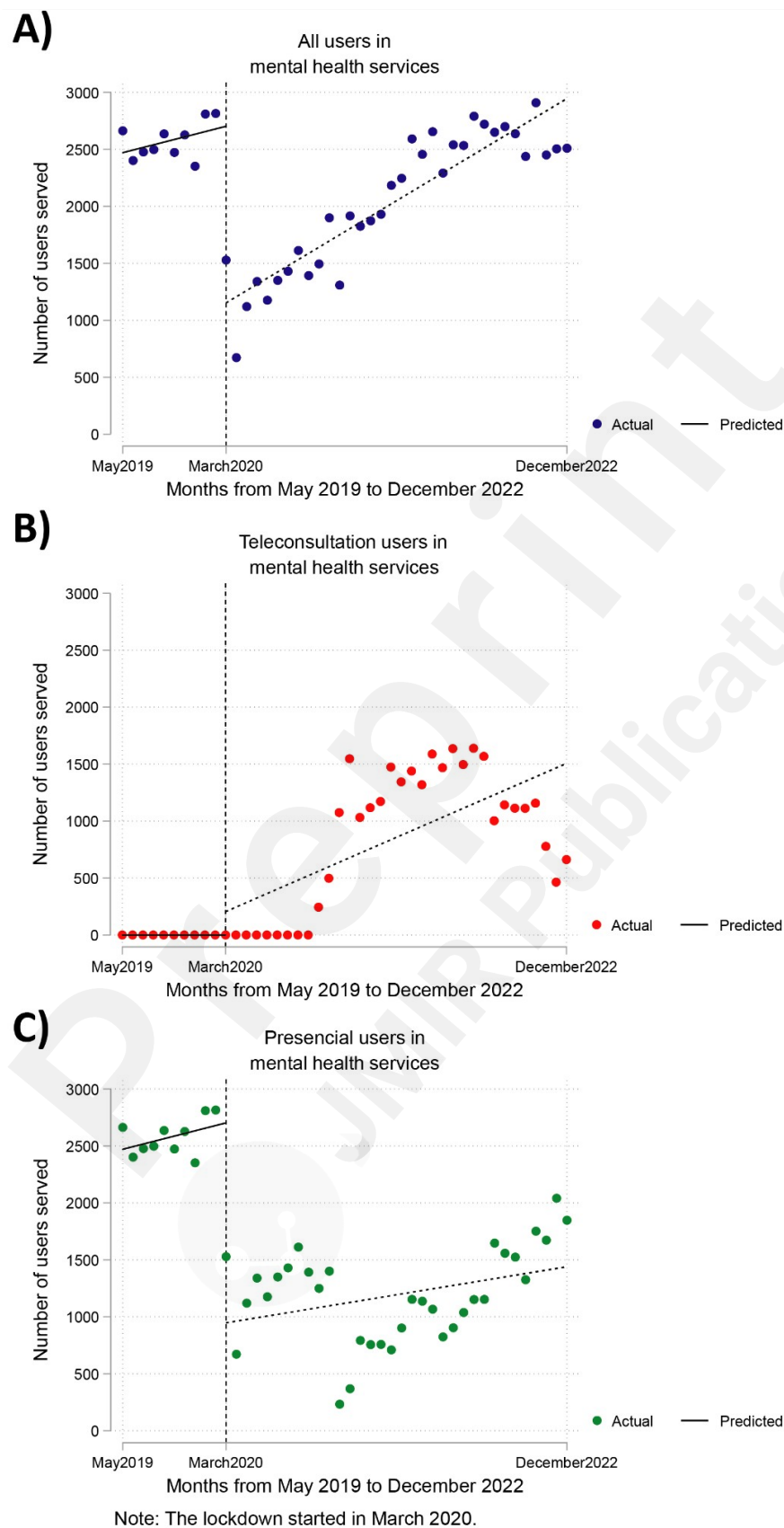


Figure 2. Interrupted time series analysis for the number of users served per month in all psychiatric services between May 2019 and December 2022.