The impact of COVID-19 on psychiatric illness severity and care delivery: A real-world data study

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BACKGROUND

- The emergence of the COVID-19 pandemic exacerbated many determinants of poor mental health, including food and housing insecurities, financial difficulties, and racial/ethnic disparities.[1]
- The pandemic also altered the way mental health care is delivered, with an exponential increase in teleconsultations with healthcare practitioners.[2]
- Utilizing real-world data generated from de-identified electronic health records (EHR) may improve our understanding of the link between COVID-19 and psychiatric disorders.[3]
- **Objective:** To evaluate the impact of the pandemic on psychiatric illness severity and care delivery amongst patients with mental health disorders.

METHOD

Design: Retrospective study performed using EHR data (Figure 1)
Inclusion criteria:
- CGI-S analysis
  - ≥ 2 outpatient visits in 2019/2020 (i.e., 1st Mar 2019 to 28th Feb 2020), AND
  - ≥ 2 outpatient visits in 2020/2021 (i.e., 1st Mar 2020 to 28th Feb 2021)
  - Resulting cohort: n=7,529 patients
- Care delivery analysis
  - ≥ 1 visit in 2019/2020 AND ≥ 1 visit in 2020/2021, AND
  - First-recorded visit before 31st May 2019 (to select for follow-up visits only)
  - Resulting cohort: n=10,172 patients

Analysis:
- Two within-subject analyses were conducted to compare outcomes between the 2 time points: 2019/2020 and 2020/2021
  - Illness severity was measured using Clinical Global Impression – Severity (CGI-S) scale, and was compared using McNemar's test
  - Healthcare service utilization (i.e., no. of visit types) was compared using chi-squared tests

DATA SOURCE

NeuroBlu™ database

| 50+ million rows of patient data | 560K+ Patients | 20+ years Longitudinal Data |

Structured Data

- Outcome Measures (e.g., CGI-S, GAF)
- Diagnosis Codes (ICD-9, ICD-10)
- Prescription Data
- Patient Demographics
- Emergency Department, inpatient & outpatient data across the same patients in 20 of 25 clinics

153K Substance-related Disorders	68k Bipolar Disorders	63k Adjustment Disorders	54k ADHD
129K Major Depressive Disorder	46k PTSD	29k Personality Disorders / 24k Conduct Disorders	
	43k Generalized Anxiety Disorder	15k Panic Disorder / 15k Schizophrenia	

Figure 1. NeuroBlu Database overview

Unstructured Data

Mental Status Examination (MSE)
- Categorized notes on patient's function, appearance and mood at a visit
- Holmusk developed >30 advanced Neural Network models to predict structured labels from MSE
- Created >300 psychiatry specific labels in collaboration with clinicians to track disease progression over time

External Stressors
- Social, relational and occupational events that may affect the patient's mental health

Data Source of US Health Facilities

De-identified EHR data were obtained from U.S. mental health services that use the MindLinc EHR system. The data were analysed in NeuroBlu, a secure Trusted Research Environment (TRE) that enables data assembly and analysis using an R/Python code engine.

Figure 2. State specific data source for NeuroBlu
(● Current data ● Upcoming data)

RESULTS

CGI-S analysis
- In 2019/2020, the mean CGI-S was 3.72 and the median was 4.0; in 2020/2021, the mean CGI-S was 3.69 and the median was 4.0.
- Figure 3 presents the distribution of CGI-S scores in 2019/2020 and 2020/2021, and it was found that CGI-S scores across the two time-points were significantly different (McNemar's test = 297, p <.001).
- Between 2019/2020 and 2020/2021, 25.3% of patients had higher CGI-S scores (deterioration), 38.1% had no change, and 36.6% had lower CGI-S scores (improvement) amongst 7,529 patients included in the cohort.

Care delivery analysis
- There was a significant decrease in face-to-face visits, including outpatient, inpatient, and emergency room visits between 2019/2020 and 2020/2021. There was also a significant increase in telehealth consultations between the two time points (Figure 4 & Table 1).
- Table 1 presents chi-square test comparisons of visit types between 2019/2020 and 2020/2021.

Figure 3. Distribution of CGI-S scores in 2019/2020 and 2020/2021 recorded for patients with mental health disorders (n=7,529)

DISCUSSION

- This study provided a large-scale real-world analysis of the impact of COVID-19 on psychiatric illness severity and changes in care delivery.
- The majority of the cohort experienced improvements or no change in illness severity.
- We found a significant decrease in face-to-face services, and a significant increase in telehealth consultations.
- These findings are aligned with the current literature that has shown both improvements and the worsening of psychiatric symptoms during the first wave of COVID-19.[4]
- However, most studies found that patients with pre-existing psychiatric diagnoses experienced worsening of symptoms at the onset of the pandemic.[4,5]
- Our data may not have captured the full extent of changes in illness severity as global lockdowns were occurring to reduce the spread of COVID-19, and existing patients may or may not have attended follow-up visits with their clinicians given the uncertainty and unpredictability of the pandemic.
- COVID-19 has also seen the rise of healthcare services adapting to ensure continuity of care and identification of new cases of mental ill health particularly in high-risk populations.[6]
- A national online survey of licensed psychologists in the United States reported a 12-fold increase in teleconsultations during the pandemic (7% to 86%), with 67% of psychologists conducting all their clinical work virtually.[2]
- The increase in telehealth consultations from our data supports the rise in adoption of technology to deliver care.

Limitations
- Our data does not represent outcomes of patients who may have utilized other services during the COVID-19 pandemic.
- Additionally, the decrease in types of visits may be partly due to lockdowns and reduced mobility, especially when vaccinations were not yet available.
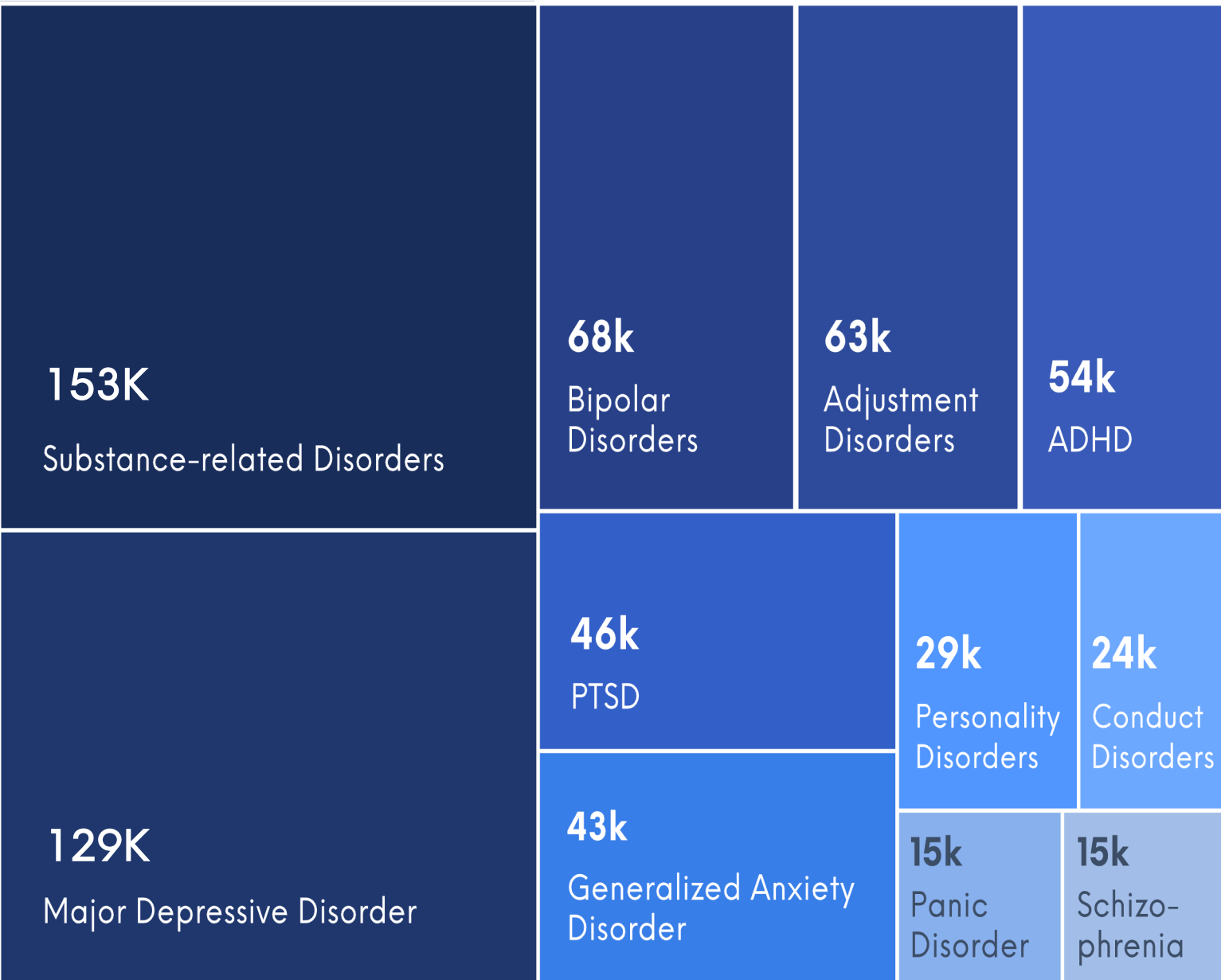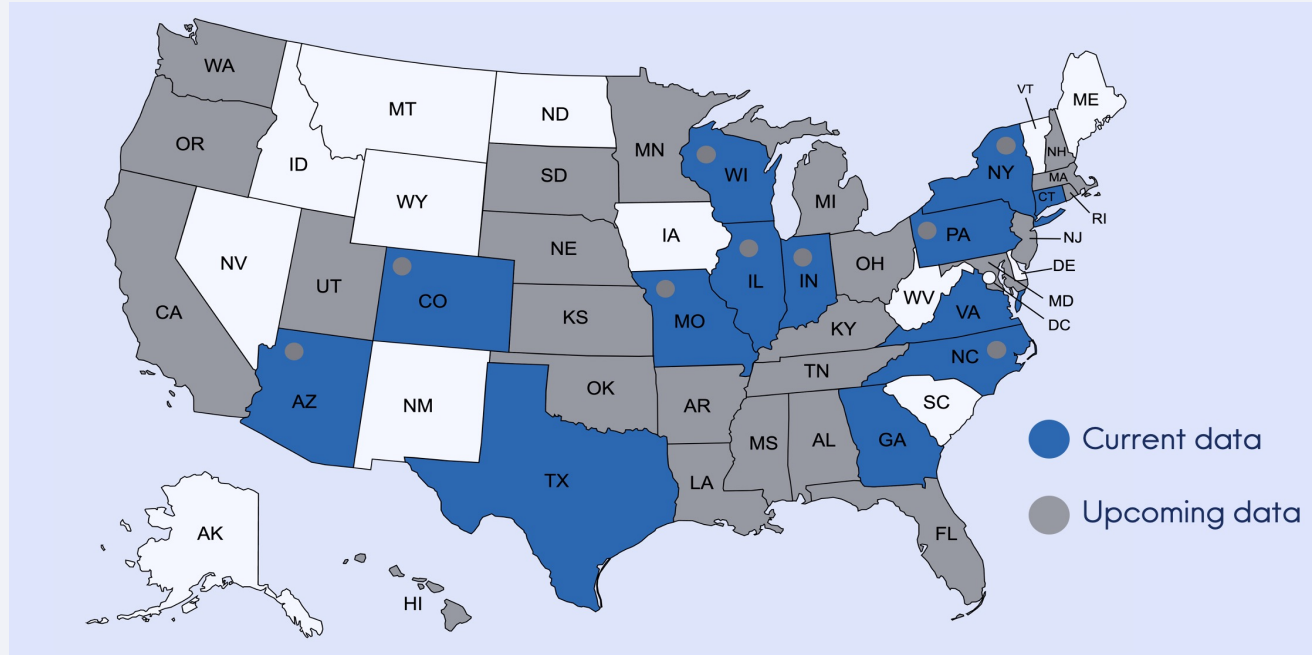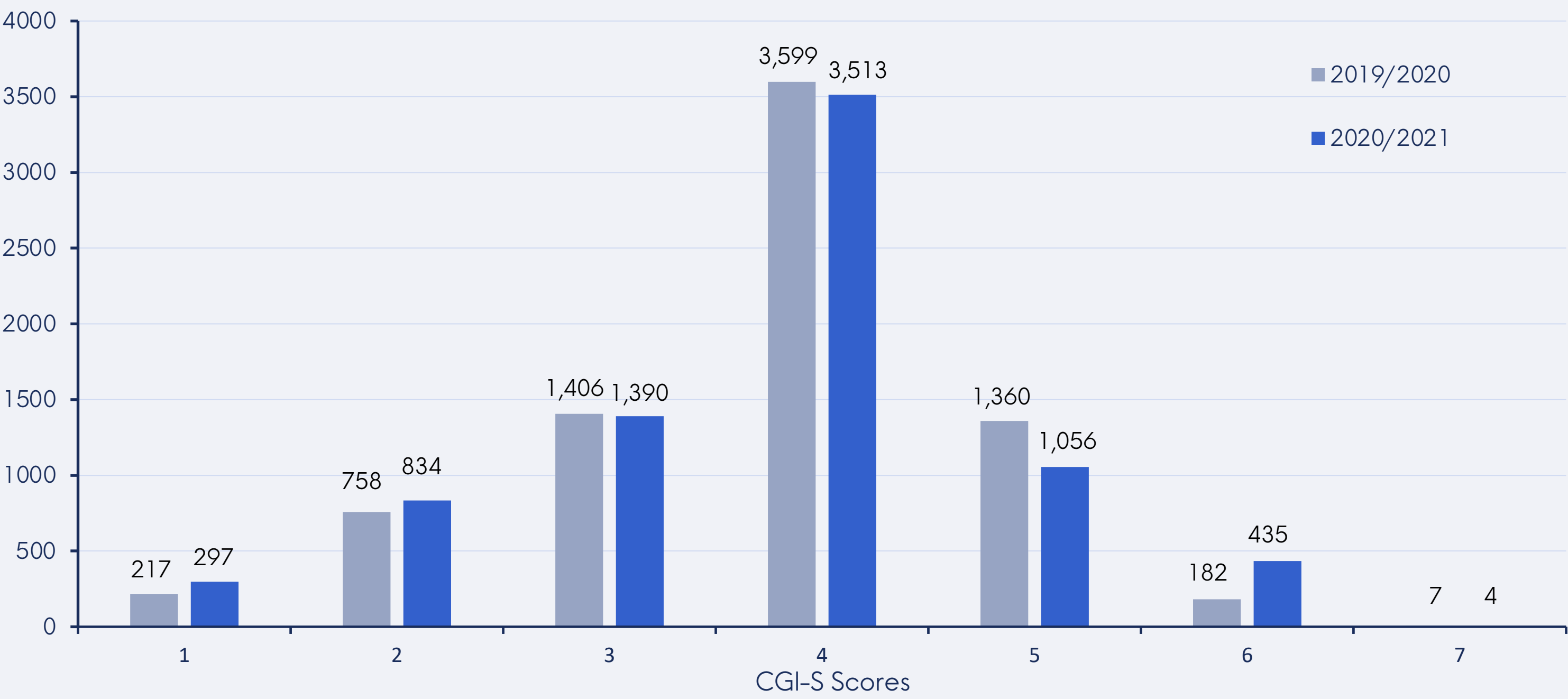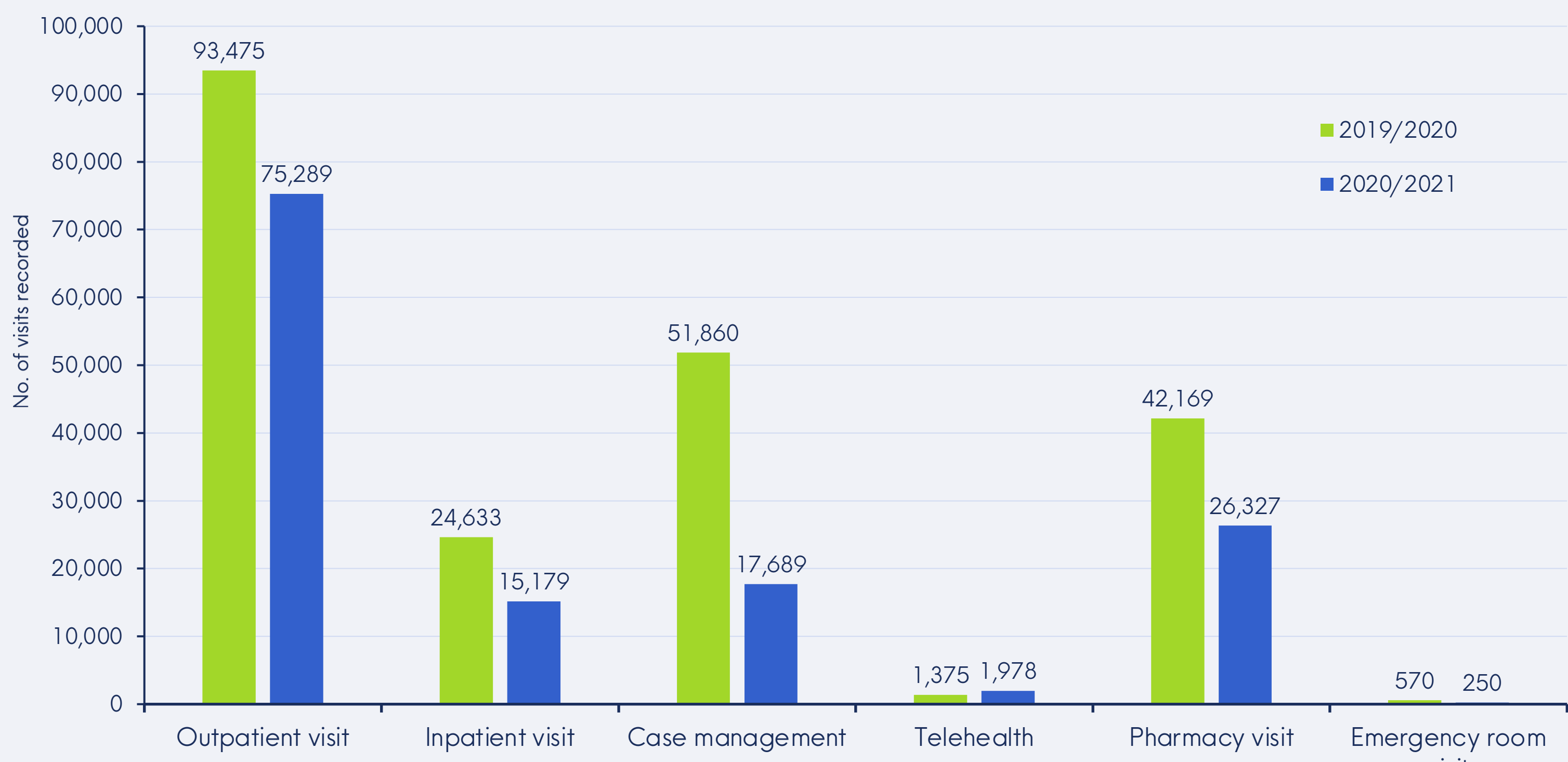
Figure 4. Distribution of healthcare service utilisation in 2019/2020 and 2020/2021 for patients with mental health disorders (n=10,172)
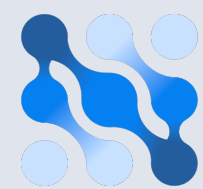
Table 1. Differences in the proportion of healthcare service utilisation between 2019/2020 and 2020/2021 of patients with mental health disorders analyses using Chi-square analyses

Types of visit	2019/2020	2020/2021	X² (p)
Outpatient visit, n (%)	93,475 (43.7)	75,289 (51.3)	2084.69 (<.001)
Inpatient visit, n (%)	24,633 (11.5)	15,179 (10.4)	119.37 (<.001)
Case management, n (%)	51,860 (24.2)	17,689 (12.1)	8282.32 (<.001)
Telehealth, n (%)	1,375 (0.6)	1,978 (1.4)	471.20 (<.001)
Pharmacy visit, n (%)	42,169 (19.7)	26,327 (24.8)	173.91 (<.001)
Emergency room visit, n (%)	570 (0.3)	250 (0.2)	35.27 (<.001)
Total visits	214,082	146,172	

Note: Total frequency of visits is more than cohort size as patients can have multiple visits to the healthcare provider.

Conflicts of Interest: All authors report current employment with Holmusk Technologies, Inc. RP reports equity ownership in Holmusk Technologies, Inc

References:
[1] Abrams, E. M., Greenhawt, M., Shaker, M., Pinto, A. D., Sinha, I., & Singer. A. (2022). The COVID-19 pandemic: adverse effects on the social determinants of health in children and families. Annals of Allergy, Asthma & Immunology, 128(1), 19-25.
[2] Pierce, B. S., Perrin, P. B., Tyler, C. M., McKee, G. B., & Watson, J. D. (2021). The COVID-19 telepsychology revolution: A national study of pandemic-based changes in US mental health care delivery. American Psychologist, 76(1), 14.
[3] Taquet, M., Luciano, S., Geddes, J. R., & Harrison, P. J. (2021). Bidirectional associations between COVID-19 and psychiatric disorder: retrospective cohort studies of 62 354 COVID-19 cases in the USA. The Lancet Psychiatry, 8(2), 130-140.
[4] Cost, K. T., Crosbie, J., Anagnostou, E., Birken, C. S., Charach, A., Monga, S., ... & Korczak, D. J. (2022). Mostly worse, occasionally better: impact of COVID-19 pandemic on the mental health of Canadian children and adolescents. European child & adolescent psychiatry, 31(4), 671-684.
[5] Vindegaard, N., & Benros, M. E. (2020). COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. Brain, behavior, and immunity, 89, 531-542.
[6] Moreno, C., Wykes, T., Galderisi, S., Nordentoft, M., Crossley, N., Jones, N., ... & Arango, C. (2020). How mental health care should change as a consequence of the COVID-19 pandemic. The Lancet Psychiatry, 7(9), 813-824.

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