

BMJ Open Impact of the COVID-19 pandemic on psychotropic prescribing: a systematic review

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ABSTRACT

Objectives The global prevalence of mental health disorders has risen significantly since the beginning of the COVID-19 pandemic. The pandemic has additionally caused disruption to mental health services, leading to a shift from in-person to remote service delivery. Given its long-term impact, it has become critical to evaluate whether changes in health delivery during the pandemic have had an effect on prescribing patterns for commonly prescribed psychotropic drugs. This study aims to assess the impact of the COVID-19 pandemic on changes in psychotropic prescribing patterns in adults, as well as differences in prescribing in different healthcare delivery approaches across various geographical contexts.

Design and eligibility requirements Systematic review of cohort, interrupted time-series and cross-sectional studies examining prescribing trends for at least one commonly prescribed psychotropic drug during and after COVID-19 in accessing care remotely or face to face between 1 January 2020 and 17 June 2022.

Data sources MEDLINE, EMBASE, CINAHL, HMIC and PsycINFO databases were searched in addition to citation chaining of relevant reviews.

Extraction and analysis Study screening, data extraction and quality assessment were completed by two independent reviewers. The PECO strategy was used to devise the systematic review and findings were synthesised narratively.

Results 16 studies were eligible for inclusion. Studies documenting changes in psychotropic prescribing trends provided very conflicting findings. There were no stark differences in prescribing outcomes between different healthcare delivery methods (ie, face-to-face consultations vs remote consultations). A noteworthy finding was that the prescribing rate of benzodiazepines was higher in women than men. No particular trends were observed for the prescription rates of hypnotics, antidepressants or antipsychotics.

Conclusions Findings support mixed trends in the prescription of psychotropic medications in a range of settings, hindering conclusive statements on COVID-19's impact on prescribing. In areas where remote consultations are in use, more comprehensive research is required to assess the safety of prescribing in these settings to inform public health policy and assess if the observed trends in our systematic review persist over time (given the increased consideration of remote and

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study considered the limitations of previous studies, which included insufficient search results due to the omission of key drug names in the search methodology.
- ⇒ This study incorporated full comprehensive pharmacological terms and broad keywords to ensure search results contained studies examining the prescription rates of older psychotropic medications that are still in use, as well as new psychotropic medications that have been newly introduced into care settings.
- ⇒ There were no geographical constraints in our search strategy which may have limited the generalisability of the findings to individual geographical regions.
- ⇒ This study did not consider children and adolescents.

telehealth care in delivering services), particularly the safe and effective deployment of these services.

INTRODUCTION

Mental health disorders are one of the leading causes of the global disease burden.¹ COVID-19 has had deleterious effects on mental health, and precautionary measures have inevitably contributed to an increase in the reported symptoms of emotional disturbance, insomnia, anxiety, depression and post-traumatic stress disorder.² The emergence of COVID-19 amid an existing global mental health crisis has prompted widespread concerns regarding mental health ramifications, both in terms of immediate psychological effects and long-term social consequences.³ Research has shown that the pandemic has triggered a 25% increase in the prevalence of anxiety and depression disorders worldwide. An additional 53.2 and 76.2 million anxiety and depression diagnoses, respectively, have been made since the beginning of the pandemic,³ with the

prevalence of mental health disorders expected to climb during the current postpandemic period.⁴

The pandemic has also posed an unparalleled challenge to healthcare delivery. The implementation of various mandated public health initiatives necessitated health facilities and institutions to adjust the ways in which their organisations and practises deliver services.⁵ Consequently, these adjustments substantially hindered individuals' ability to access primary and mental health services. A survey conducted in May 2020 revealed that 22% of individuals with mental health issues in the UK had their appointments cancelled, and 40% did not have any access to care.⁶ In addition, following the introduction of remote consultations, approximately two million fewer general practitioner (GP) consultations were made in March 2020 compared with March 2019. The provision of mental health services and psychiatric care has undergone a re-evaluation in response to the crises presented by the global pandemic.^{5 6} The prevailing approach to outpatient mental healthcare has witnessed a noteworthy shift from traditional face-to-face consultations towards remote modalities, predominantly mediated by telephone or videoconferencing technologies largely due to the pandemic.⁷

With previous research highlighting a yearly rise in antidepressant prescriptions that is consistent with seasonality patterns it was anticipated that during the pandemic, increased exposure to variables exacerbating mental health disorders would lead to a rise in the diagnosis of mental health disorders and subsequent prescriptions of psychotropics.^{8–10} Conversely, access to psychiatric drugs was disrupted due to changes in healthcare delivery, drug shortages or clinician prescribing behaviour.^{11 12} The impact of the pandemic on prescription patterns, however, remains a contentious subject, with divergent findings. Some studies report an increase in psychotropic prescriptions since the start of the pandemic.^{13–16} Other studies, however, do not report any changes in psychotropic prescribing patterns in health service delivery or other factors induced by the pandemic.^{17–21}

To date, there has been a surge in primary research into the impact of the COVID-19 pandemic on prescribing trends for various psychiatric drugs. However, no systematic reviews have been published that consolidate the results of these studies. Given the pandemic's long-term implications, it is crucial to investigate whether changes in healthcare services have had some impact on prescribing patterns to guide healthcare policy and promote safe prescribing. Thus, this systematic review endeavours to determine whether the COVID-19 pandemic has affected psychotropic medication prescribing patterns and whether these changes coincide with changes in healthcare delivery.

METHODS

Eligibility criteria

A research protocol (online supplemental material 1) was prepared in advance to minimise the risk of bias. A systematic review of the existing literature was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.²² Studies were required to compare prescription trends for at least one psychotropic medicine during the COVID-19 pandemic with prescribing patterns prior to the pandemic. In this analysis, we defined 'before' the pandemic as any time frame preceding December 2019, 'during' as any time frame that was associated with the lockdown measures in the relevant country, and 'after' as any time frame that was associated with the lifting of lockdown and restrictions in the relevant countries.^{23 24} Studies that examined prescribing rates of any medication during the pandemic without identifying the medication under discussion were excluded. To assess the impact of changes in healthcare delivery during the pandemic on psychotropic prescribing patterns, the review included studies comparing remote consultations, or mixed approaches, to face-to-face consultations. Studies that assessed the impact of remote consultations exclusively prior to the COVID-19 pandemic were excluded. Moreover, research that employed an unsuitable study design, did not provide adequate detail on study methodology or non-English language studies were excluded. Further details on the eligibility criteria are provided in online supplemental material 2.

Search strategy

This study's search strategy considered the limitations of previous studies,^{13–20} which included insufficient search results due to the omission of key drug names in the search methodology. The present study's search methodology incorporated full comprehensive pharmacological terms in addition to broad keywords such as 'antipsychotics', with the aim of maximising the scope and depth of the search results. Key search terms yielded numerous results, the inclusion of common typical antipsychotics, atypical antipsychotics, selective serotonin reuptake inhibitors (SSRIs), tricyclics, serotonin-norepinephrine reuptake inhibitors, antianxiety medications, stimulants and mood stabilisers yielded the maximum quantity of relevant studies. This ensured that the search results displayed studies examining the prescription rates of older psychotropic medications that are still in use, as well as new psychotropic medications that have been newly introduced into care settings.

Electronic databases MEDLINE, EMBASE, CINAHL, HMIC and PsycINFO were searched; the search period was set from 1 January 2020 to the date of search (17 June 2022) in order to incorporate studies analysing psychotropic prescribing patterns after the first confirmed case of COVID-19. To avoid misclassification issues, the constraints for 'English only' and 'human only' were not defined at this point and were detected manually.

In addition to searching the above databases, citation chaining was also conducted. Preprints via Europe PMC and ongoing studies via the WHO International Clinical Trials Registry Platform were also searched. A full list of the search strategy is available in online supplemental material 3.

Data extraction, quality assessment and synthesis

EndNote is a commonly utilised software for managing duplicates of extracted articles. Covidence is a new online platform that streamlines the review process of comparing included and excluded articles conducted by two independent reviewers. Search results were exported to EndNote

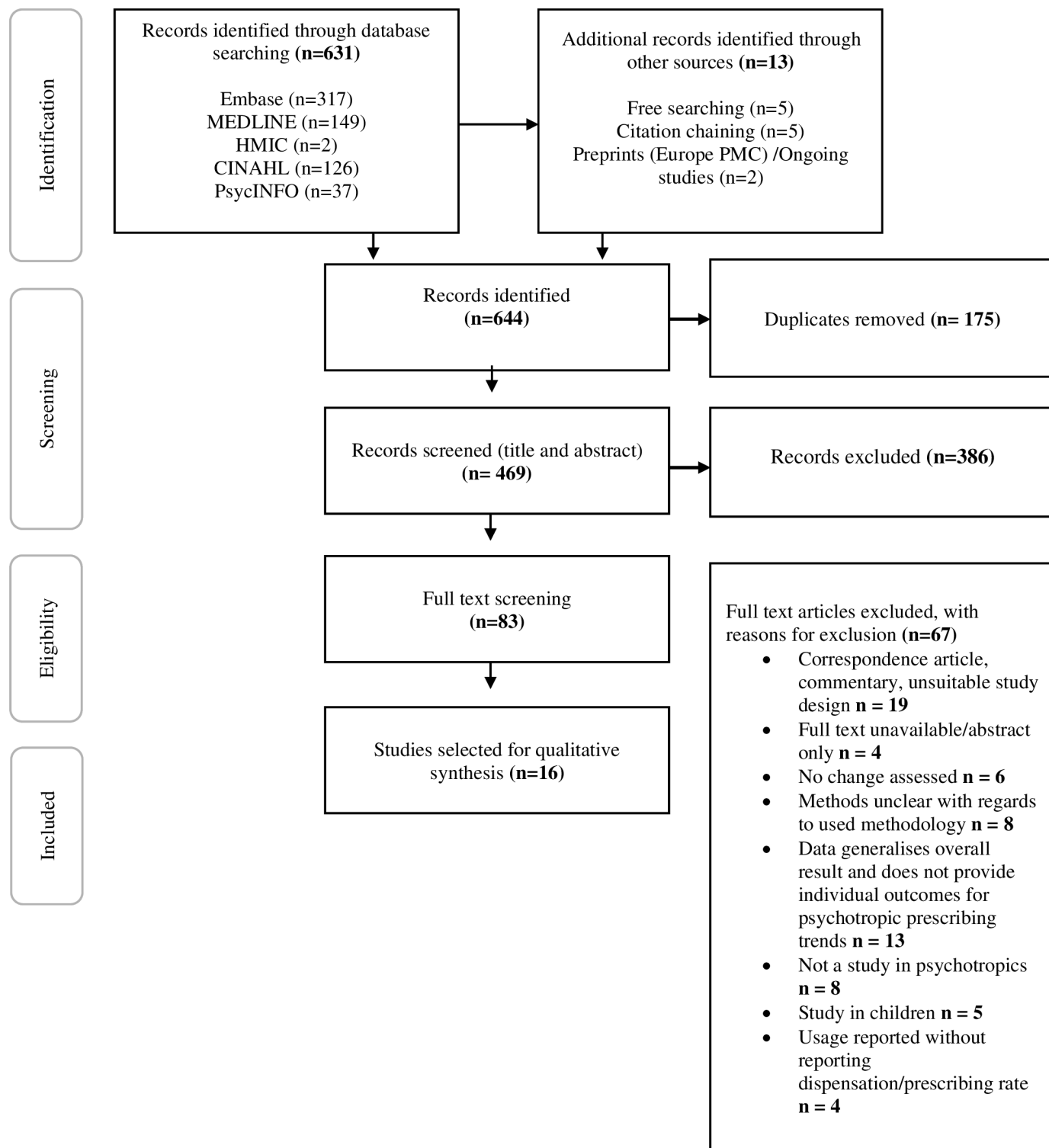


Figure 1 PRISMA flow chart detailing the studies that were identified using the search strategy, the number of publications that were evaluated for eligibility, the studies that were included or omitted and the justifications for each. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

whereby duplicates were identified and removed. Studies were then screened using Covidence by two reviewers independently (SM and MLEA). In instances where discrepancies arose between the reviewers, a consensus was reached within the review group. Relevant studies were then subjected to full-text screening after the initial assessment of their title and abstract. Following the initial title and abstract screening, relevant studies were selected for full-text review.

A standardised data extraction form was used to collect: bibliographic information, study design, study location, sample size, indication of psychotropic medication use, reported changes in prescribing, indication of confounder control, primary outcomes and consultation type. Following the form's pilot, two reviewers (KID and SM) independently extracted data. The 95% CIs for continuous data were reported together with the appropriate p values, SD and SE, where possible. To mitigate confirmation bias, in cases where studies' methodology or results had missing data, the corresponding author of the respective studies was contacted.

The quality of the included studies was assessed using the Quality Assessment Tool for Observational Cohort and Cross-Sectional studies by the National Heart, Lung and Blood Institute.²⁵ Two reviewers (SM and MLEA) carried out the quality assessment independently. The quality assessments were compared and reviewed and any disagreements were resolved through collective discussion. Studies were assessed for study design, drug categories (hypnotics, benzodiazepines, antidepressants and antipsychotics) and the form of healthcare consultation evaluated in the study. Based on a critical analysis of these factors individually, each study was assigned a score out of 14. The final study quality report was divided into three categories. Studies receiving Y (yes) of 60% or more were given a quality rating of 'good,' those receiving Y (yes) response of 40% or more were given a rating of 'fair,' and studies receiving Y (yes) response of less than 40% were given a quality rating of 'poor'.

In light of the significant heterogeneity among the studies and data available, it was deemed inappropriate to pool and combine the results for a meta-analysis. Therefore, a narrative approach was used to synthesise the findings of the review.

Patient and public involvement

Patients and/or public were not involved in this research.

RESULTS

Search results

The search resulted in the identification of 644 studies in total. Following the removal of duplicates and thorough evaluation of the titles and abstracts, 83 studies were found to be eligible for full-text screening. A total of 16 studies met the review criteria and were included. The full PRISMA flow chart can be seen in [figure 1](#).

Study characteristics

Seven studies analysed the prescribing trends of psychotropics in Europe,^{15 19 26–30} eight studies assessed trends in North America^{13 17 18 31–35} and one examined changes in psychotropic prescribing in Australia.³⁶ All studies assessed prescribing trends during the pandemic and changes in prescribing patterns using data from previous years for comparison. All studies were observational, including four cross-sectional,^{15 17 29 30} six interrupted time-series^{19 27 31 33–35} and six cohort studies.^{13 18 26 28 30 32}

All studies collected data from health administrative databases to examine trends in psychotropic prescribing patterns before, during and after the pandemic. Results were expressed as changes in the percentage or slope/degree of psychotropic prescriptions. [Tables 1 and 2](#) in the main text and in online supplemental table 1 present the characteristics and outcomes of all included studies.

Quality assessment

All studies clearly stated their objectives, data collection sources and outcome measures while some studies produced more specific outcome measures based on the type of psychotropic rather than a broad estimate of psychotropic prescription trends. Eight studies met all but two of the criteria, indicating good methodological quality and low bias susceptibility. Four studies failed to address up to six of the exploratory questions, resulting in medium methodological quality. Finally, four studies were deemed to have inadequate methodological quality since they failed to comply with more than six of the specified exploratory questions. The majority of studies demonstrated that confounding variables were not appropriately adjusted for. These variables include but are not limited to, a history of prior mental health issues and the severity and duration and severity of such pre-existing disorders. The quality assessment is presented in online supplemental material 4.

Changes in hypnotic prescribing rates

Studies undertaken in the USA indicated declines in hypnotic prescribing,^{13 17} however, Wolfshlag *et al* study in Sweden reported an increase in hypnotic prescriptions during and after the COVID-19 pandemic. Their findings reveal an increase in monthly hypnotic prescriptions even after the peak of the pandemic in March 2020 with an increase in prescribing trend ($\beta=+3589\pm2351$, $p=0.137$).¹⁹ In contrast, Hirschrift *et al* revealed that prescriptions for hypnotics declined by 3.5% ($p<0.001$) in patients enrolled in the Kaiser Permanente Northern California integrated healthcare system between 3 December 2019 and 3 March 2020. When prior-year trends were taken into consideration, younger (18–45 years) and middle-aged individuals (46–64 years) had stable hypnotic fills, whereas elderly adults (above 65 years) showed a notable decrease (–3.5%, ($p<0.001$)) in hypnotic fills.¹⁷ Milani *et al* reported minor changes in monthly prescribing trends. In males and females, hypnotic prescriptions decreased by 0.003% and 0.005%, respectively.¹³ Similarly, this study

Table 1 Characteristics of studies

Study (author, year)	Country	Time period	Study design	Population	Mean age	Female, %	Sample size
Balestrieri <i>et al.</i> , ²⁶ 2021	Italy	March 2019–June 2019 and March 2020–June 2020	Retrospective cohort	Clinical administrative databases of the Health Agencies of Italy	Lockdown period (2019): 44.7 (n=1649, SD=17.1, p=0.185) Lockdown period (2020): 45.5 (n=1075, SD=17.6, p=0.185) Post-lockdown period (2019): 50.4% (n=499, p=0.622) Post-lockdown period (2020): 49.3% (n=433, p=0.622)	Lockdown period (2019): 50.1% (n=786, p=0.392) Lockdown period (2020): 48.3% (n=499, p=0.392) Post-lockdown period (2019): 50.4% (n=499, p=0.622) Post-lockdown period (2020): 49.3% (n=433, p=0.622)	NR
Campitelli <i>et al.</i> , ³¹ 2021	Canada	March 2017–September 2020	Interrupted time-series	Health administrative databases for residents of all nursing homes	83.4 (SD=10.8)	68.9	75 850–76 549
De Dios <i>et al.</i> , ³² 2021	USA	January 2019–December 2020	Retrospective cohort	Bamboo Health Prescription Drug Monitoring Programme	NR	NR	NR
Downs <i>et al.</i> , ³³ 2021	USA	January 2020–May 2020	Interrupted time-series	Texas Prescription Monitoring programme	NR	NR	NR
Estrela <i>et al.</i> , ²⁷ 2022	Portugal	January 2018–March 2021	Interrupted time-series	System of Information and Monitoring of the Portuguese NHS public-access platform	Not reported	Not reported	17 255 033
Hirschtritt <i>et al.</i> , ¹⁷ 2021	USA	December 2017–June 2020	Cross-sectional-quasi-experimental difference-in-difference design	Kaiser Permanente Northern California electronic health records	49.8 (SD=17.9)	52.9 (n=1,273,133)	2 405 824
Kisely <i>et al.</i> , ³⁶ 2022	Australia	April–May 2020	Retrospective cohort	National Pharmaceutical Benefits Scheme	44.36 (SD=15.02, median=43, IQR=33–54, range=18–97, p=0.0797)	45.4% (p=0.3163)	7873
Leong <i>et al.</i> , ³⁴ 2022	Canada	January 2015–December 2020	Interrupted time-series	Manitoba Health, Seniors and Active Living registry	38.9 (SD=23.4)	50.3 (n=701 368)	1 394 885
Miron <i>et al.</i> , ²⁸ 2022	Romania	March 2019–March 2021	Retrospective cohort	Clinical Hospital of Psychiatry and Neurology database	44.4 (SD=8.3, p=0.4121)	73.4 (p=0.0728)	218
Milani <i>et al.</i> , ¹³ 2021	USA	January 2018–March 2021	Cohort	Clinformatics Data Mart (complete enrolment)	56.2 (SD=19.8, median=59.0 IQR=39.0–72.0)	51.3	17 255 033
Naqvi <i>et al.</i> , ¹⁵ 2021	UK	January 2020–January 2021	Cross-sectional	Cornwall (rural) and London (urban) intellectual disability services in England	39.0 (median=37, range=19–84) (London) 43.0 (median=43, range=20–78) (Cornwall)	40.71 (London) 28.87 (Cornwall)	1200
Rabeea <i>et al.</i> , ³⁰ 2021	UK	January 2019–August 2020	Cross-sectional	Prescription Cost Analysis NHS database	NR	NR	NR
Ferro Urriegen <i>et al.</i> , ²⁹ 2022	Spain	April 2018–March 2021	Cross-sectional	Geriatric units (GU) and psychogeriatric units (PU) in nursing homes	GU (n=511) 85.75 (SD=8.44) PSU (n=163) 83.94 (SD=8.93)	GU (n=372) 72.5 PSU (n=114) 69.9	674

Continued

Table 1 Continued							
Study (author, year)	Country	Time period	Study design	Population	Mean age	Female, %	Sample size
Wolfschlag <i>et al</i> , ¹⁹ 2021	Sweden	January 2018–December 2020/January 2021	Interrupted time-series	Scania pharmacy database	NR	NR	NR
McKee <i>et al</i> , ¹⁸ 2021	Canada	January 2019–December 2020	Retrospective observational	IQVIA Canadian Longitudinal Prescription database	Not reported	Not reported	NR
Ying <i>et al</i> , ³⁵ 2023	Canada	December 2018–January 2020 and February 2020–March 2021	Interrupted time-series analysis	Alberta Health's Pharmaceutical Information Network	NR	NR	NR
NHS, National Health Service; PSU, psychogeriatric units.							

found no statistically significant differences in hypnotic prescription rates in younger (18–49 years) and middle-aged adults (50–64 years), but unlike Hirschtritt *et al*s, those over the age of 65 years did not show any statistical changes in prescribing patterns after the pandemic’s onset. In contrast to the previous study, which was limited to Northern California, Milani *et al* sample provides for a more geographically diversified population, covering all 50 states.^{13 17}

Changes in benzodiazepine prescribing rates

Some studies revealed increasing rates of benzodiazepine prescribing in Italy and the USA.^{26 32} Balestrieri *et al* reported an increase of 7.7% (p<0.001) in benzodiazepine prescribing in face-to-face settings after the lockdown. This study reported a 37.5% drop in mental health consultations during the lockdown period and a decrease of 17.9% following lockdown.²⁶ Likewise, de Dios *et al* reported that in the US sample, there was a 2% (p<0.001) rise in benzodiazepines in both remote and face-to-face settings when comparing the January to March 2019 period to the same time frame in 2020.³² However, four American studies found a decline in the dispensing/prescribing of this medicine.^{13 17 33 34} According to Downs *et al*, there was a considerable decrease in benzodiazepine prescriptions following implementation of an executive order restricting non-essential or elective procedures (β=−1982, 95% CI −3712.43 to −252.14). A study examining a study population in Northern California found similar results; prescription fills for benzodiazepines declined by 3.6% (p<0.001) between December 2019 and March 2020. Unlike hypnotic prescription patterns, which indicated that different age groups experienced varied trends, this study found that all adult age groups experienced relatively similar drops in benzodiazepine fills.¹⁷ In contrast, a study in Sweden similarly reported an increase in benzodiazepine prescriptions in the Scania (region in Sweden) population; prescriptions for this drug had already been declining in recent years.¹⁹ Ferro Uriguen *et al* also noted a substantial drop in benzodiazepine prescriptions and dispensing in Spain during the pandemic period, though the actual observed decrease in benzodiazepine prescriptions was far less than predicted.²⁹

Changes in antipsychotic prescribing rates

The majority of studies, including those conducted in Australia, Canada, the USA, Romania, the UK and Spain, observed a decline in antipsychotic prescribing during the pandemic. When compared with other psychotropic prescribing patterns, antipsychotic prescribing, along with antidepressant prescribing, saw the greatest reduction across various countries. Miron *et al* assessed changes in yearly prescribing rates and reported the greatest reduction in antipsychotic prescriptions; a 48.3% decrease in second-generation antipsychotic long-acting injectable antipsychotics (LAIs) prescriptions were reported following the announcement and the associated restrictions of the pandemic,²⁸ though the statistical

Table 2 Prescribing trends in remote, face-to-face and mixed approach settings

Study	Drug	Outcome measures	Result
Prescribing rates in remote settings			
Wolfschlag <i>et al</i> , ¹⁹ (Sweden)	Antidepressants, benzodiazepines, stimulants, hypnotics, mood stabilisers	Change in monthly psychotropic prescribing rate (slope)	Increase in antidepressants ($\beta=+22\,053\pm14\,805$, $p=0.146$) Increase in psychostimulant ($\beta=+3947\pm2301$, $p=0.096$) Increase in hypnotics ($\beta=+3589\pm2351$, $p=0.137$) Increase in anxiolytic benzodiazepines ($\beta=+803\pm1065$, $p=0.456$)
Prescribing rates in face-to-face settings			
Balestrieri <i>et al</i> , ²⁶ (Italy)	Antipsychotics, benzodiazepines, antidepressants	Change in yearly psychotropic prescribing rate (%)	During lockdown: Increase in antipsychotics (+5.2% $p<0.001$) Increase in benzodiazepines (+4.1% $p=0.02$) Decrease in antidepressants (-3.1% $p=0.004$) Post-lockdown: Increase in antipsychotics (+3.9% $p=0.01$) Increase in benzodiazepines (+7.7% ($p<0.001$)) Antidepressant trend constant ($p=0.01$) (+0.1% ($p=0.934$))
Ferro Uriguen <i>et al</i> , ²⁹ (Spain)	Antipsychotics, benzodiazepines, antidepressants and antiepileptics	Change in monthly psychotropic prescribing rate (%)	Geriatric units decrease in antipsychotics (-2.22%; 95% CI -3.15 to -1.28; $p<0.001$) Decrease in benzodiazepines (-5.49%; 95% CI -6.92 to -4.06; $p<0.001$) Decrease in antidepressants (-5.23%; 95% CI -6.37 to -4.09; $p<0.001$) Decrease in antiepileptics (-1.17%; 95% CI -1.56 to -0.78; $p<0.001$) Psychogeriatric units decrease in antipsychotics (-3.48%; 95% CI -4.32 to -2.64; $p<0.001$) Decrease in benzodiazepines (-7.33%; 95% CI -9.08 to -5.58; $p<0.001$) Increase in antidepressants (+3.17%; 95% CI 1.49, 4.86; $p<0.001$) Increase in antiepileptics (+2.60%; 95% CI 1.76, 3.44; $p<0.001$)
Prescribing patterns in remote and face-to-face settings			
De Dios <i>et al</i> , ³² (USA)	Benzodiazepines	Change in yearly psychotropic prescribing rate (%)	Increase in benzodiazepines (+2.0%, SE=0.25, $t=-10.0$, $p<0.001$)
Hirschtritt <i>et al</i> , ¹⁷ (SA)	Antidepressants, benzodiazepines, hypnotics, trazodone, mood stabilisers, stimulants, statins	Change in weekly psychotropic prescribing rate (%)	Increase in antidepressants (+1.5%, $p<0.001$) Increase in trazadone (+5.8%, $p<0.001$) Decrease in benzodiazepines (-3.6%, $p<0.001$) Decrease in hypnotics (-3.5%, $p<0.001$)
Kisely <i>et al</i> , ³⁶ (Australia)	Oral or long-acting injectable antipsychotics	Change in yearly psychotropic prescribing rate (%)	Decrease in antipsychotics (-3.5%, $p=0.69$)
Naqvi <i>et al</i> , ¹⁵ (SA)	Antidepressants, antipsychotics	Change in yearly psychotropic prescribing rate (%)	Individuals with autism spectrum disorder (ASD) (London) Increase in antipsychotics (+5.69%) Increase in antidepressants (+10.86%) Individuals with ASD (Cornwall) Decrease in antipsychotics (-0.16%) Decrease in antidepressants (-0.48%) Individuals with attention-deficit hyperactivity disorder (ADHD) (London) Decrease in antipsychotics (+4.59%) Decrease in antidepressants (-1.25%) Individuals with ADHD (Cornwall) Increase in antipsychotics (+12.50%) No change antidepressants (0.0%) Individuals with no intellectual disability (London) Increase in antipsychotics (+9.33%) Increase in antidepressants (+9.35%) Individuals with no intellectual disability (Cornwall) Increase in antipsychotics (+1.34%) Decrease in antidepressants (-4.17%)

significance of these findings is unclear. The outcomes of the study in Romania revealed that risperidone LAI was the only drug that reported an increase in its prescription trend, although statistically insignificant.²⁸ Increases were reported in the prescription trend of antipsychotics in a single study in the UK; a 9.3% and 1.3%¹⁵ increase in the prescription rate of the drug was recorded among individuals with no intellectual disability in London and Cornwall, respectively.¹⁵ Prescription rates among people with autism increased by 5.7% in London, conversely, a 0.2% decrease was observed in those with autism in Cornwall.¹⁵ This distinction, however, was not constant among those with attention-deficit hyperactivity disorder (ADHD). Antipsychotic prescription rates fell by 4.6% in London and increased by 12.5% in Cornwall in populations with ADHD,¹⁵ though the statistical significance of these findings is unclear. In contrast, a Canadian study of nursing home residents found a significant increase in the prescribing trend of this drug ($B=0.051$, $SE=0.010$, $p<0.01$). In this sample, the absolute difference in observed vs projected in the final week of the pandemic period was greatest for antipsychotics.³¹ Italy likewise observed an increase in prescriptions for this medicine, with a 5.2% ($p<0.001$) increase during the lockdown and a 3.9% ($p=0.01$) increase after the lockdown in face-to-face settings. Though this study was not conducted in nursing homes.²⁶

Changes in antidepressant prescribing rates

During and after the peak of the pandemic, the majority of studies indicated decreases in antidepressant prescribing patterns (online supplemental table 1); 5 out of 11 studies reported an increase in overall prescribing,^{15 17 19 26 31} while 6 studies report an increase.^{15 26 27 29 34 36} A study in the USA observed a 1.5% ($p<0.001$) increase in weekly antidepressant prescribing. Hirschtritt *et al* also found that antidepressant fills increased significantly in this North California population between mid-February and late March compared with the previous year's time period. Older individuals showed to have fewer antidepressant fills when compared with other adult age groups.¹⁷ According to Naqvi *et al*'s study on the impact of the pandemic on psychotropic prescribing in adults with intellectual disabilities, antidepressant prescription rates increased by 10.9% among those living with autism residing in London but decreased by 0.5% in those with autism residing in Cornwall. The study also found that prescribing patterns for this medication in individuals without intellectual disabilities increased by 9.4% and decreased by 4.2% in London and Cornwall, respectively.¹⁵

Two studies that examined prescribing trends in face-to-face settings revealed that this medicine was being prescribed less frequently. The study by Balestrieri *et al* discovered a 3.1% decrease in the annual prescribing rate of antidepressants in Italy during the lockdown, though statistically insignificant. Interestingly, data retrieved from Lombardy's mental health departments during the lockdown period revealed a significant decline in

psychiatric visits, although post-lockdown prescription patterns were comparable to the previous year.²⁶ Ferro Uriguen *et al* study employing data from a Spanish population indicated a 5.2% ($p<0.001$) decline in monthly antidepressant prescriptions in geriatric units, whereas prescribing rates for the drug surged by 3.2% ($p<0.001$) in psychogeriatric units. The study also found that trazodone and SSRIs were the most prescribed antidepressants in these settings. One study found variations in monthly prescribing trends in remote settings.²⁹ Wolfschlag *et al* found that antidepressant prescription rates in Sweden also continued to decrease after the pandemic was declared ($\beta=+22053\pm14805$, $p=0.146$).¹⁹

Prescribing trends in remote, face-to-face and mixed approach settings

Here we evaluated whether there was obvious difference in prescribing trends and behaviours in face-to-face consultations and remote consultations or both (mixed-approach settings). All studies in the USA reported decreases in prescription fills for hypnotics in addition to benzodiazepines ($p<0.001$), while a single study in the UK reported increases in antipsychotics and antidepressants in settings where remote and face-to-face consultations were used in tandem.¹⁵ Other studies conducted in Europe reported statistically significant increases and decreases in benzodiazepines in face-to-face setting, respectively.^{26 29} There was no significant variation in prescribing trends between remote, face-to-face and mixed approach settings, and no evident trend for a specific group of psychiatric medicines was found.

DISCUSSION

Summary of principal findings

To the authors' knowledge, this is the first systematic review assessing the impact of the pandemic on psychotropic prescribing trends across different healthcare settings and geographical context. The findings show varying results among studies examining changes in benzodiazepine, antipsychotic and antidepressant prescribing patterns, with geographical location within and between countries, healthcare context and consultation mode contributing to these discrepancies. There was also no significant variation in prescribing patterns between remote, face-to-face and mixed approach settings and no distinctive trends were detected for a specific group of psychiatric medicines. Despite the WHO publishing a 'wake up call' to encourage countries to strengthen their mental health services due to an increase in the global prevalence of anxiety, depression and insomnia during the pandemic,³⁷ the majority of studies showed a drop in antipsychotic and antidepressant prescriptions.

Discussion of findings and implications of selected studies

Despite the stated overall decreases in prescribing, women were prescribed more benzodiazepines, hypnotics and antipsychotics than males, demonstrating the possible

existence of gender-specific disparities.³⁴ These increases in prescriptions to women in both the Milani *et al* and Leong *et al* investigations warrant further exploration; in line with other literature, these findings could imply that the pandemic has heightened gender differences in mental health.^{13 34} A recently published paper (outside the time frame of this review) conducted a nationwide analysis in England, comparing the prescribing trends of psychotropic agents from different classes with major physical health medications before and after the onset of the lockdown periods. The authors revealed that psychotropic prescribing increased, with hypnotics/anxiolytics rising by 0.2% (EAG=−2.3%) and antidepressants decreasing by −0.2% (EAG=5.0%). There was no net difference for antipsychotics (EAG=2.8%), although a temporary increase in antipsychotic prescribing occurred in the early pandemic period. For the main antidepressants prescribed in England such as sertraline, mirtazapine, venlafaxine, fluoxetine and citalopram, prescribing decreased during the main pandemic period compared with historical trends. These findings are in keeping with this review. Analyses from this review also support the idea that regional segmentation may impact the likelihood of developing mental health conditions^{38–44} and consequently changes in prescribing patterns. Given the limited studies comparing the general population and other special groups, further research is warranted to explore the impact of segmentation. A study in the UK presented data on prescribing trends in people without intellectual disabilities who lived in Cornwall and London; London experienced a significant increase in antidepressant prescriptions, while Cornwall observed the opposite.¹⁵ Though reasoning behind these differences need to be investigated thoroughly, these observed differences could be partly due to Cornwall having less strict social restrictions than London; patients and caregivers may have suffered less interruption in their everyday lives, allowing them to retain a stable mental state.⁴⁴ All other included studies did not specifically address vulnerable populations, highlighting the need for further research, especially concerning intellectual disability.

In addition, despite finding no significant differences in prescribing patterns between remote, face-to-face and mixed approaches, declines in benzodiazepine prescriptions^{19 34} and increases in stimulant prescriptions^{19 36} were documented in two out of three studies that evaluated remote prescribing. There was also a minimal decrease in general psychotropic prescribing in remote settings when compared with face-to-face settings, although studies on mixed healthcare consultations generally show no changes in prescribing. The observed decreases could be associated with the assumption that healthcare professionals were cautious to start new medications due to clinical safety concerns and the inability to detect side effects via telehealth consultations.^{44 45} The decline could also be attributed to the cancellation of routine office visits as well as concerns regarding accessing health institutions during the height of the pandemic, indicating a large care

gap for patients who are unable to acquire their prescriptions. Managing the use of telehealth modalities beyond the pandemic will require an in-depth study and understanding of the effects of face-to-face and virtual consultations on prescribing patterns. The results of this study indicate that prescribing may be a crucial consideration when choosing a consultation modality, perhaps even more so with new prescription starts. It is crucial to note that the choice of telehealth modality may be influenced by a variety of intricate aspects that need to be researched in tandem with the impacts of the pandemic on the administration of psychotropic medications. Future studies may examine how decision-making criteria for psychotropic prescriptions in both face-to-face and remote contexts affect prescribing behaviour by physicians.⁴⁶

An interrupted time-series analysis examining the impact of the COVID-19 pandemic on mental health visits to primary care physicians in nine countries (Argentina, Australia, Canada, China, Norway, Peru, Singapore, Sweden and the USA) revealed a notable rise in visit rates following the onset of the pandemic. Variations in these trends were observed, particularly among European nations, Australia and other regions, reflecting likely influences from historical accessibility patterns. This study provides evidence for anxiety and depression as prominent factors which contributed to the escalation in mental health service consumption during the pandemic period.⁴⁷ The literature surrounding the remote prescribing of psychotropics is insufficient to draw credible conclusions regarding its safety. Previous research evaluating the safety of remote prescribing of antibiotics report the quality and safety are equivalent to in-person consultations, with similar guideline-concordant prescribing between both methods of healthcare consultations.⁴⁸ However, more evidence is needed to conclude the safety of remote prescribing for mental health patients and determine whether patient drug consumption management in remote consultations is as effective as in face-to-face consultations. Furthermore, it was observed that follow-up visits after remote consultations were not documented in the few studies that investigated remote prescribing of psychotropics. Follow-up visits after remote consultations are frequently required, depending on the advice of the physicians and the needs of the patients. Though it should be noted that a high follow-up rate does not immediately correspond with incompetent management during first consultations, this information could be used to begin discussions about the usefulness and cost-effectiveness of remote consultations.^{48 49} Future research should try to collect this data, as well as data on symptom resolution as an endpoint, to assess whether remote consultations and remote prescribing are viable modes of health consultation in specific geographical regions.

Limitations

The findings of this study aid the understanding of the potential impact of the pandemic on changes in prescribing patterns in different regions, as well as the

factors that may have driven these changes. Given that COVID-19 is a new area of research, it was anticipated that significantly fewer studies would be obtained; nonetheless, we gathered comprehensive studies allowing for more meaningful analysis. Although this study has many strengths, its limitations must be acknowledged.

While additional subgroup analysis would have added further granularity to this review, this was not possible given the high heterogeneity (eg, differences in measured outcomes and the time of measured outcomes) of the included studies. Much of the included study data was derived from health administration and pharmaceutical databases, which combine prescribing data from nursing homes, hospitals, GPs and psychiatrists; changes in prescribing rates could not be traced back to the setting in which prescribing practises occurred. Moreover, we were unable to compare studies by certain time periods within the overall COVID-19 period as this varied for each study and country/region. Furthermore, in certain studies, it was difficult to determine what the psychiatric medicine was prescribed for. For example, SSRIs can be used to treat anxiety, depression or both in some circumstances; we were unable to identify whether there was a higher prevalence of some mental health conditions based on the volume of drug dispensations.⁵⁰ Children/adolescents were not considered as it is beyond the scope of this review. This population group requires exploration, particularly around ease and ability in use of digital technologies. One in every seven 10–19 years old has a mental condition, accounting for nearly 13% of the global disease burden in this age range,⁵¹ excluding this population groups decreases the generalisability of these findings to those below 18 years of age.

Furthermore, inclusion of studies written in English has an impact on the study's external validity. Studies conducted in English are more likely to originate from western countries, thus studies from low-income and middle-income country (LMIC) which may have valuable insights may have been inevitably excluded.⁵² With an increasing rate of reported mental health disorders in LMICs and lower income countries,⁵³ coupled with decreasing quality of care in these settings,⁵⁴ it is critical that these countries become producers of research or secure the necessary funding to conduct research from national and international organisations. Finally, it is worth noting that, while high-income countries were obtained, many of these studies focused their research on a specific region of the respective country. Therefore, it might not be appropriate for the outcomes to be extrapolated to other regions, especially in countries that have an imbalance of urban and rural settings. The fact that there were no geographical constraints in our search acted as both a strength and a drawback. Geographical heterogeneity may necessitate regional follow-up

evaluations. These reviews are necessary to make the findings more generalisable to the individual country or location.⁵⁵ Furthermore, it should be noted that the data we currently have is interim in nature, given its short duration and unique relevance to the pandemic. To comprehend the complete impact of the pandemic on mental health and prescribing we will require in-depth observations. Lastly, as some studies simply explored internet delivered cognitive-behavioural therapy (CBT) in psychiatry, and others with head-to-head comparisons of internet versus face-to-face CBT, further research on the modes of delivery of CBT and prescribing is warranted.

CONCLUDING REMARKS

The results of our study provide evidence for both increasing and decreasing trends in the utilisation of psychotropic medications across various health-care settings, thereby preventing us from definitively asserting that alterations in healthcare delivery methods, such as the increased adoption of telehealth modalities, have exerted a substantial influence on prescribing patterns. In areas where remote consultations have yet to be implemented, extensive study is warranted to inform public health policies, encompassing the practical and suitable implementation of these services.

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Patient consent for publication Not applicable.

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Research Protocol

Introduction and Rationale
Mental and substance use disorders are now the leading causes of disability and major contributors to the global health-related burden, with the impact of the Coronavirus disease 19 (COVID-19) further adding to this calamity.¹ The appearance of COVID-19 in the midst of a global mental health crisis has prompted many concerns regarding mental health ramifications, both in terms of immediate psychological effects and long-term social consequences.² The initial outbreak of the virus brought uncertainty, mass lockdowns, and economic recession, all of which have inevitably contributed to an upsurge in suicide and suicide-related mental diseases.³ COVID-19 has had deleterious effects on mental health, with studies reporting spikes in the rates of depression, post-traumatic stress disorder, insomnia, and anxiety.⁴ The global burden of depression and anxiety disorders has increased significantly and disproportionately in the third year of the COVID-19 pandemic, especially impairing the mental health of women and children.¹ According to a recent analysis published in The Lancet, the pandemic has resulted in a significant increase in the incidence of depression and anxiety disorders worldwide in 2020, with an additional 53.2 million anxiety cases and 76.2 million major depressive disorder (MDD) cases.⁵ According to published findings, employing telemedicine to provide mental health access during the pandemic via videoconferencing technologies has resulted in an increase in anxiety and insomnia medications such as benzodiazepine, implying that telemedicine is linked to lower attrition and improvement in depression symptoms in patients receiving teletherapy. Health outcomes may be impacted by changes in healthcare delivery and, as a result, changes in psychiatric medication prescribing.⁶ Due to the drastic increase in telehealth consultations during the pandemic, evaluating its impact on primary care prescribing is crucial for planning future telehealth use beyond COVID-19. This systematic review aims to summarise the evidence the impact of changes in health-care delivery on prescription patterns in a range of mental disorders in various settings.

Review question
1. Did the pandemic have an impact on changes in psychotropic prescribing across benzodiazepines, antidepressants, antipsychotics and hypnotics? 2. Do remote and face-to-face consultations have differing prescribing rates? 3. Are these differences stable across a variety of contexts/countries?

Objectives
1. To assess the impact of the pandemic on prescribing rates of psychotropic drugs (antidepressants, anti-anxiety medications, stimulants, antipsychotics, and mood stabilizers). 2. To compare mental health prescribing rates between remote and face-to-face consultations.

METHODS

Eligibility criteria	
Include	Exclude
Study assesses prescribing patterns during Covid-19 for at least one psychotropic drug, including antidepressants, anti-anxiety medications, stimulants, antipsychotics, and mood stabilizers	Studies assessing prescribing rates of any drug without including data on psychotropic medications.

Measures the effect of remote and face-to-face, consultations on prescription patterns during COVID-19	Only measures effect of remote consultations before COVID-19. Or only studies the effect of the pandemic on remote consultation rate without providing psychotropic prescribing rate in remote settings
Studies assessing prescribing patterns after January 2020	Studies assessing psychotropic prescribing patterns before January 2020
Observational and experimental i.e., RCTs	Systematic reviews, meta-analysis, traditional and narrative reviews
Adults aged 18 and over (males and females of all ethnicities and race)	Studies conducted in children and studies in animals
Change in trend/ rate reported as percentage of slope	Studies which do not contain enough information to identify used methodologies
No restriction of geographical location	Exclude videos, conference proceedings, podcasts, abstracts, letters
Availability (free) through PubMed, MEDLINE, Embase, PsycINFO, HMIC, CINAHL or Imperial Library	Studies publish in a language other than English
Studies conducted in English	

Search strategy/ search string
Concept one 'antipsychotic agent' OR 'psychotropic drug' OR 'psychotropic' OR 'benzodiazepine' OR 'thioridazine' OR 'propylamine' OR 'prescription drug' OR 'alprazolam' OR 'sertraline' OR 'citalopram' OR 'fluoxetine' OR 'lorazepam' OR 'trazodone' OR 'escitalopram' OR 'duloxetine' OR 'bupropion' OR 'venlafaxine' OR 'lamotrigine' OR 'amphetamine' OR 'dextroamphetamine' OR 'methylphenidate' OR 'lorazepam' OR 'buspirone' OR 'propranolol' OR 'clonazepam' OR 'chlordiazepoxide' OR 'oxazepam' OR 'atenolol' OR 'clorazepate' OR 'diazepam' OR 'alprazolam' OR 'clomipramine' OR 'amoxapine' OR 'amitriptyline' OR 'desipramine' OR 'nortriptyline' OR 'doxepin' OR 'trimipramine' OR 'imipramine' OR 'protriptyline' OR 'citalopram' OR 'escitalopram' OR 'fluvoxamine' OR 'paroxetine' OR 'fluoxetine' OR 'sertraline' OR 'aripiprazole' OR 'clozapine' OR 'ziprasidone' OR 'risperidone' OR 'quetiapine' OR 'olanzapine' OR 'chlorpromazine' OR 'perphenazine' OR 'trifluoperazine' OR 'thiothixene' OR 'molindone' OR 'thioridazine' OR 'haloperidol' Concept two 'Coronavirus Infection' OR 'Pandemic' OR 'COVID-19' OR 'SARS-CoV-2' Concept three 'prescribe' OR 'practice pattern' OR 'pattern' OR 'trend' OR 'dispense'.

Data management
Endnote and Covidence
Databases searched
PubMed, MEDLINE, Embase, PsycINFO, HMIC, and CINAHL Medical archives

Hand searching
Free search in Google Scholar
Free search the BMJ, BMC, the Lancet, JAMA, Oxford academic etc.,

Citation chaining
Papers identified through bibliography of similar systematic reviews:

Contact with experts/stakeholders
Yes

Quality assessment
NHBLI tool for Observational and Cohort studies

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Supplementary Table 2: Eligibility criteria

Include	Exclude
Study assesses prescribing patterns during COVID-19 for at least one psychotropic drug, including antidepressants, anti-anxiety medications, stimulants, antipsychotics and mood stabilisers.	Studies assessing prescribing rates of any drug without including data on psychotropic medications.
Measures the effect of remote and face-to-face consultations on prescribing patterns during COVID-19.	Only measures effect of remote consultations before COVID-19, or only studies the effect of the pandemic on remote consultation rate without providing psychotropic prescribing rate in remote settings.
Studies assessing prescribing patterns after January 2020.	Studies assessing psychotropic prescribing pattern before January 2020.
Observational and experimental i.e., RCTs	Systematic reviews, meta-analysis, qualitative studies, traditional and narrative reviews.
Adults aged 18 and over (males and females of all ethnicities and race).	Studies conducted in children and studies in animals.
Change in trend/rate reported as percentage of slope.	Studies which do not contain enough information to identify used methodologies.
No restriction of geographical location	Exclude videos, conference proceedings, podcasts, abstracts, letters.
Studies conducted in English	Studies published in a language other than English
Availability (free) through MEDLINE, Embase, PsycINFO, HMIC, CINAHL or Imperial Library	

Supplementary Material 2: List of search terms

Concept 1: Psychotropic	'Antipsychotic agent' or 'psychotropic drug' or 'psychotropic' or 'benzodiazepine' or 'thioridazine' or 'propylamine' or 'prescription drug' or 'alprazolam' or 'sertraline' or 'citalopram' or 'fluoxetine' or 'lorazepam' or 'trazodone' or 'escitalopram' or 'duloxetine' or 'bupropion' or 'venlafaxine' or 'lamotrigine' or 'amphetamine' or 'dextroamphetamine' or 'methylphenidate' or 'lorazepam' or 'buspirone' or 'propranolol' or 'clonazepam' or 'chlordiazepoxide" or 'oxazepam' or 'atenolol' or 'clorazepate' or 'diazepam' or 'alprazolam' or 'clomipramine' or 'amoxapine' or 'amitriptyline' or 'desipramine' or 'nortriptyline' or 'doxepin' or 'trimipramine' or 'imipramine' or 'protriptyline' or 'citalopram' or 'escitalopram' or 'fluvoxamine' or 'paroxetine' or 'fluoxetine' or 'sertraline' or 'aripiprazole' or 'clozapine' or 'ziprasidone' or 'risperidone' or 'quetiapine' or 'olanzapine' or 'chlorpromazine' or 'perphenazine' or 'trifluoperazine' or 'thiothixene' or 'molindone' or 'thioridazine' or 'haloperidol'
Concept 2: COVID-19	'Coronavirus infection' or 'pandemic' or 'COVID-19' or 'SARS-Cov-2'
Concept 3: Prescribing	'prescribe' or 'practice pattern' or 'pattern' or 'trend' or 'dispense'
Final search string	("Psychotropic" OR "Antipsychotic" OR "benzodiazepine*" OR "thioridazine*" OR "antidepressant*" OR "mood stabilizer*" OR "anxiolytic*" OR "stimulant*" OR "anxiolytic*" OR "mood stabilizer*" OR "hypnotic*" OR "anticonvulsant*" OR "psychostimulant" OR "sedative" OR "hypnotic") AND ("pandemic*" OR "COVID-19" OR "SARS-Cov-2") AND ("prescrib*" OR "practise pattern" OR "pattern*" OR "trend*" OR "dispense*")

Supplementary Material 4: Quality Assessment of Selected Studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Overall
Balestrieri et al., 2021	Y	Y	Y	Y	Y	Y	Y	NR	N	Y	Y	CD	NR	N	Good
Campitelli et al., 2021	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	CD	NR	N	Good
De Dios et al., 2021	Y	Y	Y	Y	N	Y	Y	NR	N	N	N	CD	NR	N	Poor
Downs et al., 2021	Y	Y	Y	Y	N	Y	Y	NR	NR	N	N	CD	NR	N	Poor
Estrela et al., 2021	Y	Y	Y	CD	Y	Y	Y	NR	N	N	N	CD	NR	Y	Fair
Hirschtritt et al., 2021	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	CD	NR	N	Good
Kisely et al., 2022	Y	Y	N	Y	Y	Y	Y	NR	N	Y	Y	CD	NR	Y	Good
Leong et al., 2022	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	CD	NR	N	Good
McKee et al., 2021	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	NR	NR	N	Good
Milani et al., 2021	Y	Y	CD	Y	Y	Y	Y	NR	N	N	Y	CD	NR	N	Fair
Miron et al., 2022	Y	Y	Y	Y	Y	Y	Y	NR	N	N	N	CD	NR	N	Fair
Naqvi et al., 2022	Y	Y	NR	Y	Y	Y	Y	NR	N	Y	Y	CD	NR	N	Good
Rabeea et al., 2021	Y	Y	N	Y	N	Y	Y	NR	N	N	N	CD	NR	N	Poor
Urighuen et al., 2022	Y	Y	NR	Y	Y	Y	CD	NR	Y	N	N	CD	NR	N	Fair
Wolfschlag et al., 2021	Y	Y	Y	Y	N	Y	Y	NR	Y	N	Y	CD	NR	N	Poor
Ying et al., 2022	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	NR	NR	N	Good

Answering codes: Y = Yes, N = No, CD = Cannot Determine, NR = Not Reported
Categorisation for quality rating: >60% Y = Good, >50% Y = Fair, <40% Y = Poor
NHLBI Proposed Criteria⁵⁶: Q1. Was the research question or objective in this paper clearly stated? Q2. Was the study population clearly specified and defined? Q3. Was the participation rate of eligible persons at least 50%? Q4. Were all the subjects selected or recruited from the same or similar populations (including the same period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants? Q5. Was a sample size justification, power description, or variance and effect estimates provided? Q6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured? Q7. Was the timeframe sufficient (at least 2019-2020) so that one could reasonably expect to see an association between exposure (COVID-19) and outcome (prescribing) if it existed? Q8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)? Q9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? Q10. Was the exposure(s) assessed more than once over time? Q11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? Q12. Were the outcome assessors blinded to the exposure status of participants? Q13. Was loss to follow-up after baseline 20% or less? Q14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)? (All criteria from NHLBI Quality Assessment Tool²⁵)

Supplementary Table 1: Prescription trend reported in selected studies

Study (Author, year)	Type of drug	Consultation type	Outcome measures	Psychotropic prescription/dispensation rate/trend reported	Quality assessment score
Balestrieri et al., [26] (Italy)	Antipsychotics, benzodiazepines, antidepressants	Face to Face	Change in yearly psychotropic prescribing rate (%)	During lockdown: Increase in antipsychotics (+ 5.2% P<0.001) Increase in benzodiazepines (+4.1% P=0.02) Decrease in antidepressants (-3.1% P=0.004) Post lockdown: Increase in antipsychotics (+3.9% P=0.01) Increase in benzodiazepines (+7.7%(P<0.001) Antidepressant trend constant (P=0.01) (+0.1% (p=0.934)	Good
Campitelli et al., [31] (Canada)	Antipsychotics, antidepressants, anticonvulsants	Not reported	Change in weekly psychotropic prescribing rate (slope change) (parameter estimate [β], standard error [SE])	Increase in antipsychotics (β = 0.051; SE = 0.010; P < 0.001)) Increase in benzodiazepine (β = 0.026; SE = 0.003; P <0 .001) Increase in antidepressants (β = 0.046; SE = 0.013; P < 0.001) Increase in trazadone (β = 0.033; SE = 0.010; P < 0.001) Increase in anticonvulsant (β = 0.014; SE = 0.006; P = 0.03)	Good
De Dios et al., [32] (United States)	Benzodiazepine	Both	Change in yearly psychotropic prescribing rate (%)	Increase in benzodiazepines (+2.0%, SE = 0.25, t = -10.0, P<0.001)	Poor
Downs et al., [33] (United States)	Benzodiazepine	Remote	Change in monthly psychotropic prescribing rate (slope)	Decrease in benzodiazepines (β = −1982, 95% CI = −3712.43, −252.14)	Poor
Estrela et al., [27] (Portugal)	Anxiolytics, sedatives, hypnotics (combined analysis) and antidepressants	Not reported	Change in monthly psychotropic prescribing rate (slope) in males and females	Increase in anxiolytics, sedatives, hypnotics in males (18-64yrs) (β = 27129.40, 95%CI [-3468.68; 57727.48]) Increase in anxiolytics, sedatives, hypnotics in males (65-74yrs) (β = 13162.11, 95%CI [4929.03; 21395.18]) Increase in anxiolytics, sedatives, hypnotics in females (18-64yrs) (β = 45887.32, 95%CI [-23833.17; 115607.81]) Increase in anxiolytics, sedatives, hypnotics in females (65-74yrs) (β = 40328.93, 95%CI [17743.87; 62913.98]) Increase in anxiolytics, sedatives, hypnotics in elderly males (β = 14582.46, 95%CI [6863.67; 22301.26]) Increase in anxiolytics, sedatives, hypnotics in elderly females (β = 55986.34, 95%CI [34033.34; 77939.34])	Fair

				Decrease in antidepressants in males (18-64yrs) (β = -37988.11, 95%CI [-73488.17; -2488.06]) Decrease in antidepressants in males (65-74yrs) (β = -18402.10, 95%CI [-33121.97; -3682.23]) Decrease in antidepressants in females (18-64yrs) (β = -91526.60, 95%CI [-201911.88, 18858.67] 1156313.525; 389112.141]) Decrease in antidepressants in females (65-74yrs) (β = -24970.70, 95%CI [-61175.54; 11234.14]) Decrease in antidepressant in elderly males (β = -17232.59, 95%CI [-31880.87; -2584.30]) Decrease in antidepressant in elderly females (β = -22566.81, 95%CI [-59314.21; 14180.60])	
Hirschtritt et al., [17] (United States)	Antidepressants, benzodiazepines, hypnotics, trazodone, mood stabilisers, stimulants, statins	Both	Change in weekly psychotropic prescribing rate (%)	Increase in antidepressants (+1.5%, P<0.001) Increase in trazadone (+5.8%, P<0.001) Decrease in benzodiazepines (-3.6%, P<0.001) Decrease in hypnotics (-3.5%, P<0.001)	Good
Kisely et al., [36] (Australia)	Oral or long- acting injectable antipsychotics	Both	Change in yearly psychotropic prescribing rate (%)	Decrease in antipsychotics (-3.5%, P=0.69)	Good
Leong et al., [34] (Canada)	Antidepressants, anxiolytics, antipsychotics	Not reported	Change in quarter-year psychotropic prescribing correlation coefficient in males and females (Q2 = April-June 2020) (Q3= July- September 2020) (Q4 = October- December 2020)	Antidepressant Q2 (Females) -1.14, SE 0.35, P=0.004 Antidepressant Q2 (Males) -0.76 SE 0.26, P = 0.009 Antidepressant Q3 (Females) -0.097, SE 0.36, P=0.79 Antidepressant Q3 (Males) -0.32, SE 0.27, P=0.25 Antidepressant Q4 (Females) 1.25, SE 0.36, P=0.003 Antidepressant Q4 (Males) 0.29, SE 0.27, P=0.29 Anxiolytics Q2 (Females) -1.04, SE 0.19, P<0.0001 Anxiolytics Q2 (Males) -0.64, SE 0.23, P=0.01 Anxiolytics Q3 (Females) -0.35, SE 0.19, P=0.08 Anxiolytics Q3 (Males) -0.38, SE 0.23, P=0.12 Anxiolytics Q4 (Females) -0.93, SE 0.19, P=0.0001 Anxiolytics Q4 (Males) -0.60, SE 0.23, P=0.19	Good

				Antipsychotics Q2 (Females) -0.05, SE 0.12, P=0.64 Antipsychotics Q2 (Males) -0.06, SE 0.11, P=0.56 Antipsychotics Q3 (Females) 0.06, SE 0.12, P=0.6 Antipsychotics Q3(Males) -0.03, SE 0.11, P=0.77 Antipsychotics Q4 (Females) 0.52, SE 0.12, P=0.0004 Antipsychotics Q4 (Males) 0.17, SE 0.11, P=0.13	
Miron et al., [28] (Romania)	Antipsychotics	Not reported	Change in yearly psychotropic prescribing rate (%)	Decrease in overall SGA-LAIs prescriptions (-48.3%)	Fair
Milani et al., [13] (United States)	Benzodiazepine, Z-hypnotic, SSRI or SNRI	Not reported	Change in monthly psychotropic prescribing rate (slope)	Decrease in benzodiazepines (Male) (-0.01%) Decrease in benzodiazepines (Female) (-0.03%) Decrease in Z-hypnotics (Male) (-0.003%) Decrease in Z-hypnotics (Female) (-0.005%) Decrease SSRI and SNRI (Male) (-0.05%) Decrease SSRI and SNRI (Female) (-0.01%)	Fair
Naqvi et al., [15] (United Kingdom)	Antidepressants, antipsychotics	Both	Change in yearly psychotropic prescribing rate (%)	Individuals with Autism Spectrum Disorder (ASD) (London) Increase in antipsychotics (+5.69%) Increase in antidepressants (+10.86%) Individuals with Autism Spectrum Disorder (ASD) (Cornwall) Decrease in antipsychotics (-0.16%) Decrease in antidepressants (-0.48%) Individuals with Attention-Deficit Hyperactivity Disorder (ADHD) (London) Decrease in antipsychotics (+4.59%) Decrease in antidepressants (-1.25%)	Good

				Individuals with Attention-Deficit Hyperactivity Disorder (ADHD) (Cornwall) Increase in antipsychotics (+12.50%) No change antidepressants (0.0%) Individuals with no intellectual disability (London) Increase in antipsychotics (+9.33%) Increase in antidepressants (+9.35%) Individuals with no intellectual disability (Cornwall) Increase in antipsychotics (+1.34%) Decrease in antidepressants (-4.17%)	
Rabeea et al., [30] (United Kingdom)	Antidepressants (including SSRI, tricyclics, monoamine-oxidase inhibitors)	Not reported	Prescription items dispensed	Prescription items dispensed (millions): Jan - Aug 2019: SSRI: 26.55 Tricyclic and related antidepressants: 11.24 Monoamine-oxidase inhibitors: 0.03 Other antidepressants: 11.27 Jan - Aug 2020: SSRI: 27.82 Tricyclic and related antidepressants: 11.45 Monoamine-oxidase inhibitors: 0.01 Other antidepressants: 12.26	Poor
Uriguen et al., [29] (Spain)	Antipsychotics, benzodiazepines, antidepressants and antiepileptics	Face to Face	Change in monthly psychotropic prescribing rate (%)	Geriatric units Decrease in antipsychotics (-2.22%; 95% CI -3.15, -1.28; P<0.001) Decrease in benzodiazepines (-5.49%; 95% CI -6.92, -4.06; P<0.001) Decrease in antidepressants (-5.23%; 95% CI -6.37, -4.09; P<0.001) Decrease in antiepileptics (-1.17%; 95% CI -1.56, -0.78; P<0.001) Psychogeriatric units Decrease in antipsychotics (-3.48%; 95% CI -4.32, -2.64; P<0.001) Decrease in benzodiazepines (-7.33%; 95% CI -9.08, -5.58; P<0.001)	Fair

				Increase in antidepressants (+3.17%; 95% CI 1.49, 4.86; P<0.001) Increase in antiepileptics (+2.60%; 95% CI 1.76, 3.44; P<0.001)	
Wolfschlag et al., [19] (Sweden)	Antidepressants, benzodiazepines, stimulants, hypnotics, mood stabilisers	Remote	Change in monthly psychotropic prescribing rate (slope)	Increase in antidepressants (β = +22053 $\pm$ 14805, P=0.146) Increase in Psychostimulant (β = +3947 $\pm$ 2301, P=0.096) Increase in Hypnotics (β = +3589 $\pm$ 2351, P=0.137) Increase in Anxiolytic benzodiazepines (β = +803 $\pm$ 1065, P=0.456)	Poor
McKee et al., [18] (Canada)	Long-acting injectable antipsychotic	Not reported	Monthly rate of LAI new starts	In females, n (%): COVID awareness period (n =4459): 1535 (34.4) Primary COVID escalation period (n =4518): 1636 (36.2) COVID maintenance period (n =4500): 1599 (35.5) Second COVID escalation period (n =4434): 1560 (35.2) Pre-COVID Comparator Period (n =4303): 1504 (35.0) In males, n (%): COVID awareness period (n =4459): 2924 (65.6) Primary COVID escalation period (n =4518): 2882 (63.8) COVID maintenance period (n =4500): 2901 (64.5) Second COVID escalation period (n =4434): 2874 (64.8) Pre-COVID Comparator Period (n =4303): 2799 (65.0)	Good
Ying et al., [35] (Canada)	Benzodiazepines , SNRIs, stimulants, antipsychotics, mood stabilisers	Not reported	Rate of change of psychotropic prescriptions dispensed in immediate effect of COVID (B2) and post-COVID (B3) periods (slope)	Benzodiazepines: Diazepam: B2 (β =0.123, P=0.806), B3(β =0.049, P=0.463) Lorazepam: B2 (β =4.637, P=0.180), B3(β =-0.224, P=0.620) Midazolam: B2 (β = -0.005, P=0.916), B3(β =0.007, P=0.249) Oxazepam: B2 (β =0.290, P=0.007), B3(β =0.001, P=0.947) Temazepam: B2 (β =1.828, P=0.053), B3(β =-0.149, P=0.224) SNRI: Atomoxetine: B2(β = 0.000, P= 0.999), B3 (β = -0.028, P= 0.317) Stimulant:	Good

	Dexamphetamine: B2 (β = 1.566, P= 0.067) B3, (β = -0.165 P= 0.141) Lisdexaphetamine: B2 (β = 0.451, P= 0.845) B3, (β = -0.281, P= 0.362) Methylphenidate: B2 (β =-1.588, P= 0.514) B3, (β = -0.067, P= 0.834)
	Atypical antipsychotics:
	Aripiprazole: B2 (β = 1.585, P= 0.332) B3, (β = -0.448, P= 0.047) Asenapine: B2 (β = 0.039, P= 0.219) B3, (β = 0.001, P= 0.728)
	Clozapine: B2 (β = -0.156, P= 0.844) B3, (β = -0.187, P= 0.085) Olanzapine: B2 (β = 0.761, P= 0.669) B3, (β = -0.503, P= 0.042) Paliperidone: B2 (β =0.331, P= 0.325) B3, (β = 0.042, P= 0.352) Quetiapine: B2 (β =3.890, P= 0.423) B3, (β = -1.018, P= 0.122) Risperidone: B2 (β = 0.835, P= 0.672) B3, (β = -0.514, P= 0.060)
	Typical antipsychotics:
	Haloperidol: B2 (β = 0.105, P= 0.654) B3, (β = -0.025, P= 0.426) Loxapine: B2 (β = -0.279, P= 0.019) B3, (β = 0.032, P= 0.040) Zuclopenthixol: B2 (β = -0.117, P= 0.437) B3, (β = -0.035, P= 0.089)
	Mood stabilisers:
	Carbamazepine: B2 (β = 1.872, P= 0.089) B3, (β = -0.301, P= 0.043) Lithium: B2 (β = 0.691, P= 0.161) B3, (β = -0.055, P= 0.397) Valproic acid: B2 (β = 1.065, P= 0.514) B3, (β = -0.528, P= 0.022)