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Increased use of mental health services among young adults in the aftermath of Covid-19 waves. Results from a retrospective study conducted in a French Psychiatric & Neurosciences University Hospital.

Anne Perozziello¹, Daniel Sousa², Béatrice Aubriot³, Valerie Dauriac-Le Masson²

¹ Cellule épidémiologie, GHU Paris Psychiatrie & Neurosciences

² Département d'Information Médicale, GHU Paris Psychiatrie & Neurosciences

³ Commission Médicale d'Etablissement, GHU Paris Psychiatrie & Neurosciences

Corresponding author: Anne PEROZZIELLO – GHU Paris Psychiatrie et Neurosciences – 1 rue Cabanis, 75014 PARIS - a.perozziello@ghu-paris.fr

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Abstract (276 words)

Objective: The Covid-19 pandemic and the restrictive measures taken to prevent its propagation had profound effects on mental health and well-being, especially in children and young adults (< 25 years old). This study aimed to analyse the medium and long-term impact of the Covid-19 pandemic on the use of the mental health services, by age groups.

Setting: This study was conducted in the Groupe Hospitalier Universitaire (GHU) Paris Psychiatry and Neurosciences. We used the medical and administrative information system databases of patients, between 2019 and 2021.

Outcome measures: We reported three indicators: the number of new patient attending outpatient clinics, the number of emergency department visits, and the number of hospital admissions (full-time).

Methods: We considered the weekly number of each indicator, for all patients and by age groups. The 2020 and 2021 data were compared to the same period in 2019. The evolution

of the indicators over the 3 years was analysed with interrupted time-series analysis based on negative binomial regression.

Results: All three indicators showed a dramatic decrease during the first lockdown period (March 2020) especially for the youngest. In 2021, the activity resumed but without reaching its pre-pandemic level. However, the decrease was not significant between the pre-pandemic and since the beginning of the pandemic for young adults (15-25 years old). They also had a higher level of mental health services use in 2021, compared to 2019 : +12% of new patients at the outpatient clinics, +17% of emergency department visits, and +2% of hospital admissions.

Conclusions: The Covid-19 pandemic has had severe consequences on populations' mental health, especially among young people, which seem to persist months after the end of restrictive measures.

Strengths and limitation of this study

- Our study was based on systematically collected medical care data provided by the GHU Psychiatry and Neurosciences facilities, over a 3-year period, covering a time before, during and after the Covid-19 pandemic. This large dataset allowed us to describe robust tendencies regarding the use of mental healthcare.
- The GHU Psychiatry and Neurosciences facilities covers a large area (13 of the 20 Parisian arrondissements are linked to the GHU), so our study represents the use of care by a large sample of the population.
- The main limitation is the absence of information on care outside the hospital, such as private practitioners, including psychiatrists, psychologists, and general practitioners, or other support services, such as helplines.
- From our data, we were not able to distinguish remote medical consultations (telemedicine) from face-to-face outpatient appointments and so could not analyse the proportion of remote consultations in the activity. We need to understand these

51 changes in providing mental health care and evaluate the therapeutic value and
52 patient satisfaction regarding remote medical appointments.

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Context

The Covid-19 pandemic and the restrictive measures taken to prevent its propagation (lockdown, curfews, quarantines, movement restrictions etc.) were associated with increased prevalence of major depressive symptoms and anxiety disorders[1–3]. Fear of infection, social media and news exposure, and the consequences of the lockdown (boredom, social isolation, stress, sleeping disorders, pandemic-related uncertainty, loneliness etc.) have had detrimental effects on the mental health and well-being among the population. These effects were more pronounced in some groups, especially children and young adults (< 25 years old)[4–8]. Several studies reported a higher prevalence of mental health problems in young people than older adults[1,9–13]. School and university closures, lack of social interactions and activities, and for students, being confined in small or uncomfortable spaces, away from their families, have worsened the negative effect of Covid-19 on mental health[1,8,14].

In the meantime, the pandemic and the unprecedented measures decided in many countries have led to a drastic decrease in contacts with mental healthcare systems[15–20]. In France, two studies showed a sharp reduction in emergency service visits. The first study, conducted in three psychiatric emergency services in Paris and its suburbs, estimated that during the first weeks of the first lockdown in France (March 17 to May 11, 2020), the number of visits decreased by 54.8% as compared with the same period in 2019[21]. This decrease was statistically significant for the 16-24 years old (-64.4%). The study by Pham et al. analysed the activity of one of the largest Parisian psychiatric emergency services, reporting a significant reduction in visits during the first lockdown as compared with the same period in 2019 (10.8 consultations a day vs 26.4 in 2019)[22]. The authors suggested that patients might have avoided hospitals because of fear of being infected or being sanctioned for not complying with movement restrictions. Moreover, the entire healthcare system was disrupted during the first months of the pandemic, with reduced access to medical facilities and prioritised admissions for severe cases[23].

Therefore, patients faced difficulties accessing appropriate care during this period, which raised fears of a possible psychiatric outbreak post-lockdown and a strong increase in care needs[14,24]. However, despite the lifting of containment measures, the use of healthcare services has returned to pre-pandemic levels, with no substantial increase[25]. Several studies demonstrated an improvement in mental health among the general population after the lifting of the lockdown and a decrease in anxiety and depressive disorders[10,26]. Yet, these findings do not apply evenly across age groups. After intensely experiencing the adverse effects of the lockdown, young people showed persistent depressive and anxiety symptoms and suicidal ideation etc., months after the easing of most restrictions related to Covid-19[26–30].

At the Groupe Hospitalier Universitaire (GHU) Psychiatry and Neurosciences in Paris, a drastic reduction in mental health services use was reported during the first lockdown period, in spring 2020. However, few studies analysed the medium and long-term impact of the Covid-19 pandemic on mental health care use. This study analysed the use of the GHU mental healthcare services between 2019 and 2021, comparing the period before and the period after the “first wave” of Covid-19 (March 2020) for all patients and by age groups.

Material and methods

We conducted a retrospective study of data collected from the GHU medical and administrative information system, which includes inpatients’ discharge summaries and outpatients’ visits for all patients presenting at one of the GHU medical facilities. The GHU Psychiatry and Neurosciences in Paris is the main provider of mental healthcare in the Paris area, with 170 medical services. The GHU represents a catchment area of 1.6 million Parisians.

Patient data are systematically collected in electronic medical records. The physician in charge of the information system extracted weekly data from January 1, 2019 to December 31, 2021 for all patients without exclusion, and summarised by age groups. We analysed

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2
3 106 data on the number of new patients at the outpatient clinic, number of visits to the emergency
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5 107 department, and number of hospital admissions (full-time).
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8 108 The first wave of the Covid-19 pandemic in France started in March 2020. During the first
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10 109 lockdown, from March 17 to May 11, 2020, the government imposed a mandatory home
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12 110 lockdown, with strict restrictions on movement outside the household. Schools and
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14 111 universities as well as non-essential public places, including restaurants, cafés, and cinemas,
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16 112 were closed. On May 11, the lockdown ended, but some measures remained to control the
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18 113 spread of the virus. Social distancing, compulsory mask-wearing (indoor and outdoor),
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20 114 limitations on gatherings, overnight curfew, and teleworking was supported when possible.
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22 115 Primary and middle schools reopened, but high schools and universities remained closed
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24 116 until September 2020, when a “blended model” took place, mixing on-line courses and in-
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26 117 presence classes. The critical increase in the number of cases since the end of the summer
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28 118 led to a second wave and a reinstatement of restrictions: closure of non-essential businesses
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30 119 (including bars and restaurants) and overnight curfew, and a second lockdown, from October
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32 120 30 to December 15, 2020. After that, public policies promoted measures to reduce the
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34 121 transmission of Covid-19, including a curfew (until January 2021), teleworking, and remote
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36 122 courses in higher education institutions, until mid-2021, when vaccination was made
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38 123 available to the whole population.
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42 124 **Patient and public involvement**
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45 125 Patients and/or the public were not involved in the design, or conduct, or reporting, or
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47 126 dissemination plans of this research.
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50 127 **Statistical analyses**
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53 128 We considered the weekly number of new patients presenting at the GHU outpatient clinics,
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55 129 emergency department visits, and hospital admissions for all patients and by age groups.
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57 130 The 2020 and 2021 data were compared to the same period in 2019. The evolution of the
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59 131 aforementioned indicators was analysed with interrupted time-series analysis based on
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negative binomial regression. The first period, defined as “pre-pandemic,” was from January 1, 2019 to March 15, 2020 (T1), and the second, “since the pandemic,” started the week of the first lockdown, March 17, 2020, and lasted to December 31, 2021 (T2). Seasonality was examined by introducing the week number in the regression models and was kept in the final model analysing the number of new patients at outpatient clinics and hospital admissions but did not improve model estimators for the analysis of emergency visits. Percentages of evolution were obtained by exponentiating the regression model coefficients. All statistical analyses were performed with Stata v17 (StataCorp., College Station, TX).

Results

1. New patients attending outpatient clinics

The number of new patients attending outpatient clinics markedly decreased during 2020 as compared with 2019 (-17%) because of the pandemic and the restrictive measures taken to prevent its transmission (Figure 1; Table 1). Therefore, during the first lockdown (March-May 2020), the number of new patients decreased by 71% as compared with the same period in 2019 (Table 1). However, the number of new patients was not reduced (+8%) during the second lockdown (October-December 2020). The activity resumed in 2021 but without achieving the pre-pandemic level (-6% as compared with 2019). The number of new patients remained significantly reduced, by 9.6% ($p=0.003$), in T2 versus T1.

However, we observed disparities between age groups. The strongest decrease in number of new outpatients in 2020 was for the youngest patients, < 15 years old (-25%), and the oldest, > 65 years old (-25%) (Table 1). The first lockdown had a substantial impact on the number of young people attending outpatient clinics, with an 84% decrease in number of patients < 15 years old and a 72% decrease in those aged 15 to 24 years old as compared with the same period in 2019. During the second lockdown, children < 15 years showed a strong increase (+38%). After this period, outpatient consultations resumed but without reaching the 2019 level, except for the number of new patients from age 15 to 24 years, which was higher

in 2021 than 2019 (+12%). In addition, among young people (<25 years old), the number of new outpatients did not significantly decrease over the two periods, before (T1) and since the first pandemic wave (T2). Among those aged 15-24 years, the number of new outpatients increased between T1 and T2 but not significantly (+2.9%, p=0.480) (Figure 1; Table 1). For those > 25 years old, the number of new patients was significantly lower at T2 than T1.

Age group, years	2019	2020	Evolution 2019-2020	2021	Evolution 2019-2021	First lockdown (March 17-May 11, 2020)	Second lockdown (Oct. 30-Dec. 15, 2020)	Comparison of T1 and T2*	P value
[0-15[	1412	1054	-25%	1362	-4%	-84%	38%	-9.7%	0.069
[15-25[	1735	1549	-11%	1949	12%	-72%	-3%	+2.9%	0.480
[25-45[	3058	2549	-17%	2813	-8%	-69%	3%	-10.4%	0.001
[45-65[	1954	1641	-16%	1645	-16%	-65%	12%	-15.6%	<0.001
[65 et +]	701	529	-25%	612	-13%	-62%	-11%	-17.2%	<0.001
All patients	8922	7363	-17%	8424	-6%	-71%	8%	-9.6%	0.003

Table 1: Evolution of number of new patients attending the GHU outpatient clinics in 2020 and 2021 as compared with the same period in 2019, by age groups

T1: Jan. 1, 2019 to March 15, 2020. T2: March 16, 2020, to Dec. 31, 2021
*Exponentiated coefficient (p-value) from the negative binomial regression analysis

Figure 1: Number of new patients per week attending the outpatient clinics between 2019 and 2021

2. Emergency department visits

Psychiatric emergency department visits decreased by 20% in 2020 compared to 2019, especially during the first lockdown (-56%) (Table 2). The number of visits decreased with increasing age, from a 58% decrease among people 15 to 24 years old to a 48% decrease among those > 65 years old. Conversely, during the second lockdown, the reduction was greater for the oldest people (-26% as compared with the same period in 2019) than for the youngest (-8%). The number of emergency visits was lower in 2021 than in 2019, except for those aged 15-24 years, with an increase of 17%. We found an increasing trend in number of

emergency visits by young adults (15-24 years old) since the beginning of 2021, which was steeper during the second semester (Figure 2). Relative to the pre-pandemic period (T1), emergency visits significantly decreased after the first Covid-19 wave (T2) (-9.2%, $p=0.001$) for all age groups except young adults (15-24 years old), with no significant difference between the two periods (-0.8% $p=0.846$) (Table 2).

Table 2: Evolution of emergency department visits in 2020 and 2021, compared to the same period in 2019, by age groups

Age group, years*	2019	2020	Evolution 2019-2020	2021	Evolution 2019-2021	First lockdown (March 17-May 11, 2020)	Second lockdown (Oct. 30-Dec. 15, 2020)	Comparison of T1 and T2 **	P value
[15-25[	2681	2184	-19%	3137	17%	-58%	-8%	-0.8%	0.846
[25-45[	4180	3268	-22%	3946	-6%	-57%	-7%	-11.8%	<0.001
[45-65[	2007	1644	-18%	1811	-10%	-56%	-18%	-13.7%	<0.001
[65 et +]	460	377	-18%	403	-12%	-48%	-26%	15.1%	0.006
All patients	9402	7528	-20%	9370	0%	-56%	-10%	-9.2%	0.001

T1: Jan. 1, 2019 to March 15, 2020. T2: March 16, 2020, to Dec. 31, 2021

* Because of the small number of patients aged 0-15 years, they were not included in the analysis

** Exponentiated coefficient (p-value) from the negative binomial regression analysis

Figure 2: Number of emergency department visits per week between 2019 and 2021

3. Number of hospital admissions (full-time)

The number of hospital admissions decreased by 18% in 2020 as compared with 2019 (Table 3). The first lockdown was associated with more of a reduction (-42%) than the second lockdown (-21%). The number of admissions was lower in 2021 than 2019, except for young adults (15 to 24 years old), with a 2% increase. Between the two periods (T1 and T2), the number of hospital admissions decreased by 15.5% ($p<0.001$), and this reduction was significant across all age groups. Figure 3 confirms that the level of hospital admissions was lower during 2021 than in the pre-pandemic period.

Table 3: Evolution of hospital admissions (full-time) in 2020 and 2021, compared to the same period in 2019

Age group, years*	2019	2020	Evolution 2019-2020	2021	Evolution 2019-2021	First lockdown (March 17-May 11, 2020)	Second lockdown (Oct. 30-Dec. 15, 2020)	Comparison of T1 and T2 **	P value
[15-25[	2355	1987	-16%	2409	2%	-49%	-21%	-7.8%	0.004
[25-45[	5404	4345	-20%	4480	-17%	-37%	-26%	-17.9%	<0.001
[45-65[	4068	3373	-17%	3553	-13%	-40%	-11%	-14.2%	<0.001
[65 et +]	1592	1321	-17%	1296	-19%	-51%	-30%	-21.9%	<0.001
All patients	13696	11233	-18%	11988	-12%	-42%	-21%	-15.5%	<0.001

T1: Jan. 1, 2019 to March 15, 2020. T2: March 16, 2020, to Dec. 31, 2021

* Because of the small number of patients aged 0-15 years, they were not included in the analysis

** Exponentiated coefficient (p-value) from the negative binomial regression analysis

Figure 3: Number of hospital admissions (full-time) per week between 2019 and 2021

Discussion

The use of mental healthcare services at the GHU Psychiatry and Neurosciences decreased significantly in 2020 and has not yet reached its pre-pandemic level despite resuming in 2021. However, the trend was different for young adults aged 15 to 24 years, with more new outpatients (+12%), more visits to the emergency department (+17%), and more hospital admissions (+2%) in 2021 than 2019. For all other age groups, the frequency of care seeking was still lower in 2021 than 2019, especially among the oldest patients (> 65 years old).

Several French studies reported similar findings: diminished healthcare use in 2021 than in the pre-pandemic period, except for the youngest patients. In its weekly report dated September 21, 2021, The French national public health agency (Santé Publique France) reported an increase in 2021 in number of emergency department visits for suicidal ideation and behaviour and mood disorders among children (0-17 years old) and young adults (18-24 years old) as compared with the previous 3 years. In addition, the emergency general practitioner service (SOS Médecins) reported more medical consultations for anxiety or depressive disorders among young adults in 2021 than in the previous 3 years (+30% for anxiety and +48% for depressive symptoms)[27]. Meanwhile, medical consultations for adults (> 25 years old) reached the pre-pandemic level only in July 2021. Another survey (EpiCov),

conducted by the French Institute of Medical Research (INSERM) and the French direction of Research, Studies, Evaluations and Statistics (DREES), reported an improvement in mental health among the general population from March 2020 to November 2020, except for young people (< 25 years old)[28]. Among them, the prevalence of depressive symptoms was still higher in November 2020 than in 2019 (+3 points for minor depressive symptoms and + 6 points for major depressive disorders) but was lower or stable for all other age groups. The situation seems to be more concerning for young women (15-24 years old), with a 23.7% prevalence of minor depressive symptoms in November 2020 but 10.7% in 2019. This survey also reported that 5.0% of participants aged 15-24 years old declared having suicidal thoughts over the past 12 months. This proportion decreased with increasing age.

This reduction in mental healthcare use in the aftermath of Covid-19–related restrictive measures was also observed in other countries. In the United Kingdom, despite a progression in number of new referrals and patients hospitalised after the lifting of lockdown (May 2020), the numbers were still substantially lower than before the pandemic[16,31]. Similarly, face-to-face contacts with community mental healthcare services remained lower than before the lockdown, several months after the lifting of restrictions. In contrast, the number of non-face-to-face contacts showed a sizeable increase, which highlights the need to assess the role of telemedicine to manage mental health disorders and monitor patients during and outside of pandemics[16,32].

Regarding the persistency of psychiatric disorders among young adults, months after the easing of Covid-19 restrictions, it seems crucial to ensure access to appropriate care and continuity of care for youth. The pandemic deeply affected the well-being of an age group already known to be vulnerable to mental health problems, as several studies reported before the Covid-19 crisis[33–36]. Adolescents and young adults have undergone many pandemic-related difficulties, with prolonged home-schooling and the need to study remotely for an entire academic year and with the closure of usual recreation areas (bars, cinemas, nightclubs etc.), not being able to have their normal social routine with friends[13]. Moreover,

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246 restrictions led to officious festive gatherings, during which there was a higher risk of excess
247 (substance use, risky behaviours) and potential abuse[37]. Some studies found home
248 lockdown associated with an increase in domestic violence and ill treatment, with children
249 more at risk in the absence of protective factors, such as access to trusted adults outside the
250 household, school professionals, and friends[38,39].

251 Furthermore, disruption of care or difficulty in accessing medical care could lead to more
252 severe presentations of psychiatric disorders or worsen pre-existing conditions. Previous
253 work showed a resurgence of serious clinical conditions post-lockdown, including increased
254 suicidal ideation and behaviour, and involuntary hospital admissions[20,26]. In addition, the
255 number of suicide attempts among the youngest, including children ≤ 15 years old, has
256 increased substantially since the end of the first Covid-19 wave as compared with previous
257 years[40,41].

258 Our study was based on systematically collected medical care data provided by the GHU
259 Psychiatry and Neurosciences facilities, over a 3-year period, covering a time before, during
260 and after the Covid-19 pandemic. This large dataset allowed us to describe robust
261 tendencies regarding the use of mental healthcare. Moreover, the GHU Psychiatry and
262 Neurosciences facilities covers a large area (13 of the 20 Parisian arrondissements are
263 linked to the GHU), so our study represents the use of care by a large sample of the
264 population. The main limitation is the absence of information on care outside the hospital,
265 such as private practitioners, including psychiatrists, psychologists, and general practitioners.
266 Individuals with minor mental health problems could also have been referred to other support
267 services, such as helplines. Furthermore, we were not able to distinguish remote medical
268 consultations (telemedicine) from face-to-face outpatient appointments and so could not
269 analyse the proportion of remote consultations in the activity. We need to understand these
270 changes in providing mental health care and evaluate the therapeutic value and patient
271 satisfaction regarding remote medical appointments.

272 To conclude, the Covid-19 pandemic and the associated restrictive measures used to control
273 the spread of the virus have had severe consequences on populations' mental health,
274 especially among young people. More worrying is the persistence of psychiatric disorders in
275 this age group, months after the end of restrictions. Further studies are needed to assess the
276 psychological complications associated with the Covid-19 pandemic among young people
277 and to capture the use of mental health care to ensure that this age group benefits from
278 appropriate care.

279 **Acknowledgments:** This study used the GHU activity data, systematically recorded for any
280 contact with a GHU medical facility. All data were completely anonymised and did not
281 mention patients' information, except for their age.

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288 **Patient consent for publication:** Not required

289 **Provenance and peer review:** Not commissioned; externally peer reviewed.

290 **Contributors:** The study was planned by AP and VLM. Data extraction was performed by
291 VLM, data analyses by AP. All authors participated to results interpretation and approved the
292 final manuscript.

293 **Data sharing:** The data that support the findings are available from the corresponding
294 author, upon reasonable request.

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6 418 Note: The weeks of the first (March 17 to May 11, 2020) and second (Oct. 30 to Dec. 15,
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8 419 2020) lockdowns are presented on the graph in orange and yellow, respectively
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11 420 Figure 1: Number of new patients per week attending the GHU outpatient clinics between
12 421 2019 and 2021. All new patients on the left and new patients aged 15-24 years old on the
13 422 right.

14 423 Figure 2: Number of emergency department visits per week between 2019 and 2021. All
15 424 patients on the left and patients aged 15-24 years old on the right.

16 425 Figure 3: Number of hospital admissions (full-time) per week between 2019 and 2021. All
17 426 patients on the left and patients aged 15-24 years old on the right.
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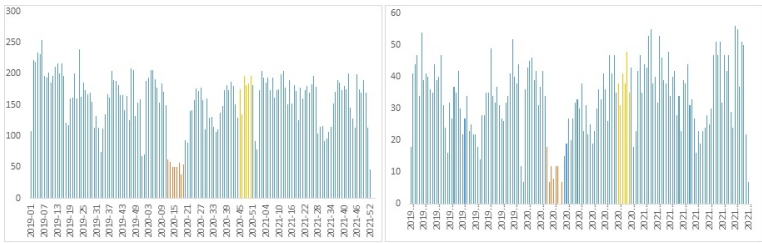


Figure 1: Number of new patients per week attending the GHU outpatient clinics between 2019 and 2021. All new patients on the left and new patients aged 15-24 years old on the right.

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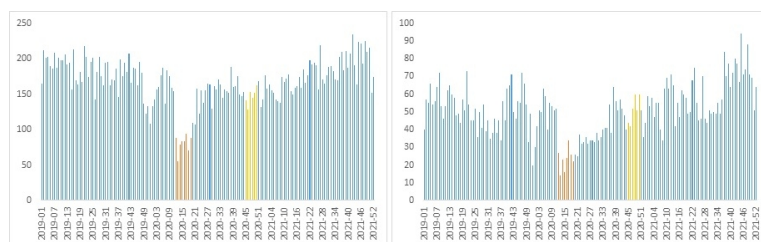


Figure 2: Number of emergency department visits per week between 2019 and 2021. All patients on the left and patients aged 15-24 years old on the right.

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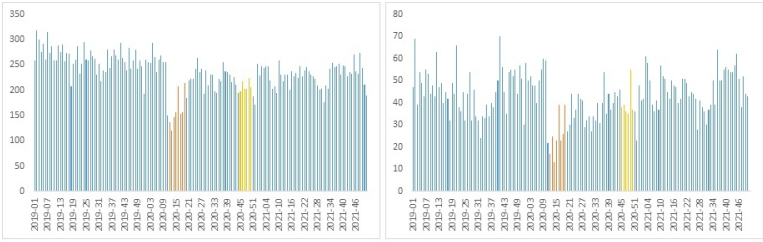


Figure 3: Number of hospital admissions (full-time) per week between 2019 and 2021. All patients on the left and patients aged 15-24 years old on the right.

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The RECORD statement – checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data.

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Title and abstract					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 1	RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and time/place within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	Page 1-2
Introduction					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 4		
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 5		
Methods					
Study Design	4	Present key elements of study design early in the paper	Page 5		
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 5-6		

Participants	6	<p>(a) <i>Cohort study</i> - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up</p> <p><i>Case-control study</i> - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls</p> <p><i>Cross-sectional study</i> - Give the eligibility criteria, and the sources and methods of selection of participants</p> <p>(b) <i>Cohort study</i> - For matched studies, give matching criteria and number of exposed and unexposed</p> <p><i>Case-control study</i> - For matched studies, give matching criteria and the number of controls per case</p>	Page 5	<p>RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.</p> <p>RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.</p> <p>RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.</p>	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Page 6	RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	NA
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 6		

Bias	9	Describe any efforts to address potential sources of bias	NA		
Study size	10	Explain how the study size was arrived at	NA		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	Page 6		
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> - If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> - If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	Page 6-7		
Data access and cleaning methods		..		RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population.	Page 5

				RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	NA
Results					
Participants	13	(a) Report the numbers of individuals at each stage of the study (<i>e.g.</i> , numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram	NA	RECORD 13.1: Describe in detail the selection of the persons included in the study (<i>i.e.</i> , study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	
Descriptive data	14	(a) Give characteristics of study participants (<i>e.g.</i> , demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) <i>Cohort study</i> - summarise follow-up time (<i>e.g.</i> , average and total amount)	NA		
Outcome data	15	<i>Cohort study</i> - Report numbers of outcome events or summary measures over time <i>Case-control study</i> - Report numbers in each exposure	Page 8-9-10		

		category, or summary measures of exposure <i>Cross-sectional study</i> - Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA		
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	Page 8-9-10		
Discussion					
Key results	18	Summarise key results with reference to study objectives	Page 10		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	Page 12
Interpretation	20	Give a cautious overall interpretation of results considering objectives,	Page 11		

		limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 12		
Other Information					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 13		
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Page 13

*Reference: Benchimol EI, Smeeth L, Guttman A, Harron K, Moher D, Petersen I, Sørensen HT, von Elm E, Langhin SM, the RECORD Working Committee. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine* 2015; in press.

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Use of mental health services in the aftermath of Covid-19 waves: a retrospective study conducted in a French Psychiatric & Neurosciences University Hospital.

Anne Perozziello¹, Daniel Sousa², Béatrice Aubriot³, Valerie Dauriac-Le Masson²

¹ Cellule épidémiologie, GHU Paris Psychiatrie & Neurosciences

² Département d'Information Médicale, GHU Paris Psychiatrie & Neurosciences

³ Commission Médicale d'Etablissement, GHU Paris Psychiatrie & Neurosciences

Corresponding author: Anne PEROZZIELLO – GHU Paris Psychiatrie et Neurosciences – 1 rue Cabanis, 75014 PARIS - a.perozziello@ghu-paris.fr

Word count: 4072

Keywords: mental health; COVID-19; psychiatry; health services use; young adults

Abstract (296 words)

Objective: The Covid-19 pandemic and the restrictive measures taken to prevent its propagation had profound effects on mental health and well-being, especially in children and young adults (< 25 years old). This study aimed to analyse the medium and long-term impact of the Covid-19 pandemic on the use of the mental health services, by age groups and gender.

Design: We conducted a retrospective study using the medical and administrative information system databases of patients, between 2019 and 2021.

Setting: This study was conducted in the Groupe Hospitalier Universitaire (GHU) Paris Psychiatry and Neurosciences.

Outcome measures: We reported three indicators: the number of new patients attending outpatient clinics, the number of emergency department (ED) visits, and the number of hospital admissions.

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Methods: We considered the weekly number of each indicator, by age groups and by gender. We also collected the reasons of ED visits and hospital admissions. The 2020 and 2021 data were compared to the same period in 2019. The evolution of the indicators over the 3 years was analysed with interrupted time-series analysis.

Results: All three indicators showed a dramatic decrease during the first lockdown period (March 2020) especially for the youngest. In 2021, the activity resumed but without reaching its pre-pandemic level. Moreover, mental health care seeking was significantly lower since the beginning of the pandemic compared to the pre-pandemic period for all age groups, except for young women (< 25 years old). Among them, there was a higher level of mental health services use in 2021, compared to 2019: +20% of new patients at the outpatient clinics, +39% of ED visits, and +17% of hospital admissions.

Conclusions: The Covid-19 pandemic has had severe consequences on populations' mental health, especially among young women, which seem to persist months after the end of restrictive measures.

Strengths and limitation of this study

- Our study was based on a large dataset of systematically collected medical care data over a 3-year period, allowing us to describe tendencies on time before, during and after the Covid-19 pandemic.
- The GHU Psychiatry and Neurosciences facilities cover a large area (13 of the 20 Parisian arrondissements are linked to the GHU), so our study sample represents the use of mental healthcare services by the Parisian population.
- The main limitation is the absence of information on care outside the hospital, such as private practitioners, including psychiatrists, psychologists, and general practitioners, or other support services, such as helplines.

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Context

The Covid-19 pandemic and the restrictive measures taken to prevent its propagation (lockdown, curfews, quarantines, movement restrictions etc.) were associated with increased prevalence of major depressive symptoms and anxiety disorders[1–3]. Fear of infection, social media and news exposure, and the consequences of the lockdown (boredom, social isolation, stress, sleeping disorders, pandemic-related uncertainty, loneliness etc.) have had detrimental effects on the mental health and well-being among the population. These effects were more pronounced in some groups, especially children and young adults (< 25 years old)[4–8]. Several studies reported a higher prevalence of mental health problems in young people than older adults[1,9–13]. School and university closures, lack of social interactions and activities, and for students, being confined in small or uncomfortable spaces, away from their families, have worsened the negative effect of Covid-19 on mental health[1,8,14].

In the meantime, the pandemic and the unprecedented measures decided in many countries have led to a drastic decrease in contacts with mental healthcare systems[15–20]. In France, two studies showed a sharp reduction in emergency department (ED) visits. The first study, conducted in three psychiatric ED in Paris and its suburbs, estimated that during the first weeks of the first lockdown in France (March 17 to May 11, 2020), the number of visits decreased by 54.8% as compared with the same period in 2019[21]. This decrease was statistically significant for the 16-24 years old (-64.4%). The study by Pham et al. analysed the activity of one of the largest Parisian psychiatric ED, reporting a significant reduction in visits during the first lockdown as compared with the same period in 2019 (10.8 consultations a day vs 26.4 in 2019)[22]. The authors suggested that patients might have avoided hospitals because of fear of being infected or being sanctioned for not complying with movement restrictions. Moreover, the entire healthcare system was disrupted during the first months of the pandemic, with reduced access to medical facilities and prioritised admissions for severe cases[23].

Therefore, patients faced difficulties accessing appropriate care during this period, which raised fears of a possible psychiatric outbreak post-lockdown and a strong increase in care needs[14,24]. However, despite the lifting of containment measures, the use of healthcare services has returned to pre-pandemic levels, with no substantial increase[25]. Several studies demonstrated an improvement in mental health among the general population after the lifting of the lockdown and a decrease in anxiety and depressive disorders[10,26]. Yet, these findings do not apply evenly across age groups. After intensely experiencing the adverse effects of the lockdown, young people showed persistent depressive and anxiety symptoms and suicidal ideation etc., months after the easing of most restrictions related to Covid-19[26–29].

At the Groupe Hospitalier Universitaire (GHU) Psychiatry and Neurosciences in Paris, a drastic reduction in mental health services use was reported during the first lockdown period, in spring 2020. However, few studies analysed the medium and long-term impact of the Covid-19 pandemic on mental health care use. This study analysed the use of the GHU mental healthcare services between 2019 and 2021, comparing the period before and the period after the “first wave” of Covid-19 (March 2020) for all patients, by age groups and by gender. We also described reasons of ED visits and hospital admissions over the period.

Material and methods

We conducted a retrospective study of data collected from the GHU medical and administrative information system, which includes inpatients' discharge summaries and outpatients' visits for all patients presenting at one of the GHU medical facilities. The GHU Psychiatry and Neurosciences in Paris is the main provider of mental healthcare in the Paris area, with 170 medical services. The GHU represents a catchment area of 1.6 million Parisians.

Patient data are systematically collected in electronic medical records. The physician in charge of the information system extracted weekly data from January 1, 2019 to December

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104 31, 2021 for all patients without exclusion. We analysed data on the number of new patients
105 at the outpatient clinic, number of visits to the ED, and number of hospital admissions (full-
106 time), summarised by age groups, by gender and by diagnosis categories from the
107 International Classification of Diseases 10th Revision (ICD-10) for psychiatric disorders.
108 Suicidal ideation and suicide attempts were identified separately, by year, as the number of
109 events per week was low. Non-psychiatric diagnoses (symptoms, health hazards, etc.) were
110 grouped under a different category.

111 The first wave of the Covid-19 pandemic in France started in March 2020. During the first
112 lockdown, from March 17 to May 11, 2020, the government imposed a mandatory home
113 lockdown, with strict restrictions on movement outside the household. Schools and
114 universities as well as non-essential public places, including restaurants, cafés, and cinemas,
115 were closed. On May 11, the lockdown ended, but some measures remained to control the
116 spread of the virus. Social distancing, compulsory mask-wearing (indoor and outdoor),
117 limitations on gatherings, overnight curfew, and teleworking was supported when possible.
118 Primary and middle schools reopened, but high schools and universities remained closed
119 until September 2020, when a “blended model” took place, mixing on-line courses and in-
120 presence classes. The critical increase in the number of cases since the end of the summer
121 led to a second wave and a reinstatement of restrictions: closure of non-essential businesses
122 (including bars and restaurants) and overnight curfew, and a second lockdown, from October
123 30 to December 15, 2020. After that, public policies promoted measures to reduce the
124 transmission of Covid-19, including a curfew (until January 2021), teleworking, and remote
125 courses in higher education institutions, until mid-2021, when vaccination was made
126 available to the whole population.

127 **Patient and public involvement**

128 Patients and/or the public were not involved in the design, or conduct, or reporting, or
129 dissemination plans of this research.

130 Statistical analyses

131 We considered the weekly number of new patients presenting at the GHU outpatient clinics,
132 ED visits, and hospital admissions for all patients, by age groups, by gender and diagnoses
133 for ED visits and hospital admissions. The 2020 and 2021 data were compared to the same
134 period in 2019. The evolution of the aforementioned indicators was analysed with interrupted
135 time-series analysis based on negative binomial regression. The first period, defined as “pre-
136 pandemic,” was from January 1, 2019 to March 15, 2020 (T1), and the second, “since the
137 pandemic,” started the week of the first lockdown, March 17, 2020, and lasted to December
138 31, 2021 (T2). Seasonality was examined by introducing the week number in the regression
139 models and was kept in the final model analysing the number of new patients at outpatient
140 clinics and hospital admissions but did not improve model estimators for the analysis of ED
141 visits. Percentages of evolution were obtained by exponentiating the regression model
142 coefficients. We also described weekly evolution of reasons of ED visits and hospital
143 admissions by disease categories. All statistical analyses were performed with Stata v17
144 (StataCorp., College Station, TX).

145 Results

146 1. New patients attending outpatient clinics

147 The number of new patients attending outpatient clinics markedly decreased during 2020 as
148 compared with 2019 (-17%) because of the pandemic and the restrictive measures taken to
149 prevent its transmission (Figure 1; Table 1). Therefore, during the first lockdown (March-May
150 2020), the number of new patients decreased by 71% as compared with the same period in
151 2019 (Table 1). However, the number of new patients was not reduced (+8%) during the
152 second lockdown (October-December 2020). The activity resumed in 2021 but without
153 achieving the pre-pandemic level (-6% as compared with 2019). The number of new patients
154 remained significantly reduced, by 9.6% ($p=0.003$), in T2 versus T1.

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3 155 However, we observed disparities between age groups. The strongest decrease in number of
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5 156 new outpatients in 2020 was for the youngest patients, under 15 years of age (-25%), and
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7 157 the oldest, > 65 years old (-25%) (Table 1). The first lockdown had a substantial impact on
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9 158 the number of young people attending outpatient clinics, with an 84% decrease in number of
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11 159 patients aged under 15 years and a 72% decrease in those aged 15 to 24 years old as
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13 160 compared with the same period in 2019. During the second lockdown, children < 15 years
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15 161 showed a strong increase (+38%) as well as young women aged 15 to 24 years old (+9%).
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17 162 After this period, outpatient consultations resumed but without reaching the 2019 level,
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19 163 except for the number of girls under 15 (+6% in 2021 as compared with 2019) and patients
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21 164 from age 15 to 24 years, with +20% of young women presenting for the first time at the
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23 165 clinics and +4% of young men (Figure 2). In addition, among young people (<25 years old),
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25 166 the number of new outpatients did not significantly decrease over the two periods, before
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27 167 (T1) and since the first pandemic wave (T2), with even an increase of new outpatients
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29 168 among young women (aged 15-24 years), but not statistically significant (+8.1%, p=0.082).(
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31 169 Table 1). For those > 25 years old, the number of new patients was significantly lower at T2
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33 170 than T1.
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37 171 Table 1: Evolution of the number of contacts with mental healthcare services provided by the
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39 172 GHU Psychiatry and Neuroscience in 2020 and 2021, as compared with the same period in
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41 173 2019, by age groups and gender
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Number of new patients attending the GHU outpatient clinics									
Age group, years	2019	2020	Evolution 2019- 2020	2021	Evolution 2019- 2021	First lockdown (March 1- May 11, 2020)	Second lockdown (Oct. 30- Dec. 15, 2020)	Comparison of T1 and T2*	P value
0-14	1412	1054	-25%	1362	-4%	-84%	38%	-9.7%	0.069
0-14 women	463 (33%)	356 (34%)	-23%	490 (36%)	6%	-72%	19%	-0.7%	0.908
0-14 men	949 (67%)	698 (66%)	-26%	872 (64%)	-8%	-89%	52%	-14.3%	0.014
15-24	1735	1549	-11%	1949	12%	-72%	-3%	+2.9%	0.480
15-24 women	928 (53%)	883 (57%)	-5%	1109 (57%)	20%	-72%	9%	8.1%	0.082
15-25 men	807 (47%)	666 (43%)	-17%	840 (43%)	4%	-72%	-15%	-2.8%	0.526
25-44	3058	2549	-17%	2813	-8%	-69%	3%	-10.4%	0.001
25-44 women	1600 (52%)	1276 (50%)	-20%	1378 (49%)	-14%	-70%	-11%	-15.0%	<0.001

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25-44 men	1458 (48%)	1273 (50%)	-13%	1435 (51%)	-2%	-67%	21%	-5.5%	0.133
45-64	1954	1641	-16%	1645	-16%	-65%	12%	-15.6%	<0.001
45-64 women	1062 (54%)	885 (54%)	-17%	842 (51%)	-21%	-67%	9%	-19.2%	<0.001
45-64 men	892 (46%)	756 (46%)	-15%	803 (49%)	-10%	-63%	15%	-11.1%	0.006
65 et +	701	529	-25%	612	-13%	-62%	-11%	-17.2%	<0.001
65 et + women	1062 (64%)	885 (67%)	-17%	842 (61%)	-21%	-64%	-7%	-17.2%	0.004
65 et + men	447 (36%)	352 (33%)	-21%	371 (39%)	-17%	-59%	-17%	-17.5%	0.011
All patients	8922	7363	-17%	8424	-6%	-71%	8%	-9.6%	0.003
All patients women	4540 (51%)	3774 (51%)	-17%	4215 (50%)	-7%	-69%	2%	-10.3%	<0.001
All patients men	4382 (49%)	3589 (49%)	-18%	4209 (50%)	-4%	-72%	15%	-8.8%	0.013

Number of emergency department visits

Age group, years*	2019	2020	Evolution 2019- 2020	2021	Evolution 2019- 2021	First lockdown (March 17-May 11, 2020)	Second lockdown (Oct. 30- Dec. 15, 2020)	Comparison of T1 and T2 **	P value
15-24	2681	2184	-19%	3137	17%	-58%	-8%	-0.8%	0.846
15-24 women	1313 (49%)	1086 (50%)	-17%	1825 (58%)	39%	-64%	-9%	12.7%	0.032
15-25 men	1368 (51%)	1098 (50%)	-20%	1312 (42%)	-4%	-52%	-7%	-13.7%	<0.001
25-44	4180	3268	-22%	3946	-6%	-57%	-7%	-11.8%	<0.001
25-44 women	1683 (40%)	1320 (40%)	-22%	1633 (41%)	-3%	-52%	-10%	-10.6%	0.004
25-44 men	2497 (60%)	1948 (60%)	-22%	2313 (59%)	-7%	-60%	-4%	-12.6%	<0.001
45-64	2007	1644	-18%	1811	-10%	-56%	-18%	-13.7%	<0.001
45-64 women	928 (46%)	714 (43%)	-23%	869 (48%)	-6%	-58%	-16%	-13.9%	0.001
45-64 men	1079 (54%)	930 (57%)	-14%	942 (48%)	-13%	-55%	-19%	-13.6%	0.001
65 et +	460	377	-18%	403	-12%	-48%	-26%	-15.1%	0.006
65 et + women	279 (61%)	233 (62%)	-16%	245 (61%)	-12%	-51%	-17%	-16.0%	0.020
65 et + men	181 (39%)	144 (38%)	-20%	158 (39%)	-13%	-42%	-41%	-13.6%	0.118
All patients	9402	7528	-20%	9370	0%	-56%	-10%	-9.2%	0.001
All patients women	4245 (45%)	3382 (45%)	-20%	4611 (49%)	9%	-57%	-12%	-4.4%	0.195
All patients men	5157 (55%)	4146 (55%)	-20%	4759 (51%)	-8%	-56%	-9%	-13.1%	<0.001

Number of hospital admissions

Age group, years*	2019	2020	Evolution 2019- 2020	2021	Evolution 2019- 2021	First lockdown (March 17-May 11, 2020)	Second lockdown (Oct. 30- Dec. 15, 2020)	Comparison of T1 and T2 **	P value
15-24	2355	1987	-16%	2409	2%	-49%	-21%	-7.8%	0.004
15-24 women	1104 (47%)	850 (43%)	-23%	1289 (54%)	17%	-58%	-25%	-1.0%	0.807
15-25 men	1251 (53%)	1137 (57%)	-9%	1120 (46%)	-10%	-40%	-18%	-13.6%	<0.001
25-44	5404	4345	-20%	4480	-17%	-37%	-26%	-17.9%	<0.001
25-44 women	2127 (39%)	1710 (39%)	-20%	1830 (41%)	-14%	-42%	-18%	-16.5%	<0.001
25-44 men	3277 (61%)	2635 (61%)	-20%	2650 (59%)	-19%	-34%	-31%	-18.7%	<0.001
45-64	4068	3373	-17%	3553	-13%	-40%	-11%	-14.2%	<0.001
45-64 women	1984 (49%)	1584 (47%)	-20%	1732 (49%)	-13%	-42%	-8%	-16.1%	<0.001
45-64 men	2084 (51%)	1789 (53%)	-14%	1821 (51%)	-13%	-37%	-13%	-12.5%	<0.001
65 et +	1592	1321	-17%	1296	-19%	-51%	-30%	-21.9%	<0.001
65 et + women	969 (61%)	834 (63%)	-14%	824 (64%)	-15%	-47%	-30%	-19.0%	<0.001
65 et + men	623 (39%)	487 (37%)	-22%	472 (36%)	-24%	-58%	-29%	-26.5%	<0.001
All patients	13696	11233	-18%	11988	-12%	-42%	-21%	-15.5%	<0.001

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All patients women	6319 (46%)	5079 (45%)	-20%	5806 (48%)	-8%	-46%	-19%	-14.1%	<0.001
All patients men	7377 (54%)	6154 (55%)	-17%	6182 (52%)	-16%	-38%	-23%	-16.6%	<0.001

T1: Jan. 1, 2019 to March 15, 2020. T2: March 16, 2020, to Dec. 31, 2021
* Because of the small number of patients aged 0-15 years, they were not included in the analysis
** Exponentiated coefficient (p-value) from the negative binomial regression analysis

Figure 2: Number of healthcare contacts per week, between 2019 and 2021, for patients aged 15-24 years old

2. Emergency department visits

Psychiatric ED visits decreased by 20% in 2020 compared to 2019, especially during the first lockdown (-56%) (Table 1) when the number of visits decreased with increasing age, from a 58% decrease among people 15 to 24 years old to a 48% decrease among those > 65 years old. Conversely, during the second lockdown, the reduction was greater for the oldest people (-26% as compared with the same period in 2019) than for the youngest (-8%). The number of ED visits was lower in 2021 than in 2019, except for women aged 15-24 years, with an increase of 39%. As shown on figure 2, there was an increasing trend in number of ED visits by young adults (15-24 years old) since the beginning of 2021, which was steeper during the second semester. Relative to the pre-pandemic period (T1), emergency visits significantly decreased after the first Covid-19 wave (T2) (-9.2%, p=0.001) for all age groups except among young women (15-24 years old), with a significant increase between the two periods (+12.7% p=0.032) (Table 1). ED visits for neurotic disorders increased in all age groups between 2019 and 2021 (supplementary material 1) and among young adults (15-24 years old), visits related to mood disorders strongly increased between 2019 and 2021 (+44%) (figure 3). Disorders due to psychoactive substances use only increased among patients under 45 years old (+10% among 15-24 years old and +4% among 25-44 years old). In reverse, ED visits for schizophrenic and personality disorders were lower in 2021 compared to 2019 in all age groups. Visits due to suicidal ideations or suicide attempts made by young adults slightly increased in 2021 compared with 2019 (+18%, data not shown) but this figure must be interpreted cautiously as the frequency of events was very low.

Figure 3: Number of healthcare contacts per week, between 2019 and 2021, for mood disorders among patients aged 15-24 years old.

3. Number of hospital admissions (full-time)

The number of hospital admissions decreased by 18% in 2020 as compared with 2019 (Table 1). The first lockdown was associated with more of a reduction (-42%) than the second lockdown (-21%). The number of admissions was lower in 2021 than 2019, except for young women (15 to 24 years old), with a 17% increase. Between the two periods (T1 and T2), the number of hospital admissions decreased by 15.5% ($p < 0.001$), and this reduction was significant across all age groups, but not for young women (15 to 24 years old) with almost no difference in the number of hospital admissions between T1 and T2 (-1.0%, $p = 0.807$). Hospital admissions decreased steeply for the oldest (+65 years old) with more than a quarter less admissions in T2 compared to T1 among men in this age group (-26.5%). Figure 1 confirms that the level of hospital admissions was lower during 2021 than in the pre-pandemic period. Regarding reasons of hospital admissions, there was an increase between 2019 and 2021 of mood disorders in all age groups except among the oldest (65 years old and over) (supplementary material 2) (Figure 3) while the number of hospital admissions related to schizophrenia was lower in 2021 compared to 2019 in all age groups. There was also a strong increase (+20%) of young adults (15-24 years old) admitted for disorders related to substance use disorders. In reverse, admissions for suicidal ideation or attempted suicides of young aged 15-24 were lower in 2020 and 2021, compared to 2019 (-25% and -8%, data not shown).

Discussion

The use of mental healthcare services at the GHU Psychiatry and Neurosciences decreased significantly in 2020 and has not yet reached its pre-pandemic level despite resuming in

2021. However, the trend was different for young women aged 15 to 24 years, with a strong increase in mental health services use : +20% of new outpatients, +39% of visits to the ED and +17% of hospital admissions in 2021 as compared with 2019. There was also an increase in the number of young men presenting at the clinic for the first time in 2021 (+4% compared to 2019). For all other age groups, the frequency of care seeking was still lower in 2021 than 2019, especially among the oldest patients (> 65 years old). Our results showed also a strong increase in 2021, compared to 2019, of care seeking related to mood and neurotic disorders among 15-24 years old.

Several French studies reported similar findings: diminished healthcare use in 2021 than in the pre-pandemic period, except for the youngest patients, and an increase of depressive and anxiety symptoms in this age group. The French national public health agency (Santé Publique France) reported an increase in 2021 in number of ED visits for suicidal ideation and behaviour and mood disorders among children (0-17 years old) and young adults (18-24 years old) as compared with the previous 3 years[30]. In addition, the emergency general practitioner service (SOS Médecins) reported more medical consultations for anxiety or depressive disorders among young adults in 2021 than in the previous 3 years. Another survey (EpiCov), conducted by the French Institute of Medical Research (INSERM) and the French direction of Research, Studies, Evaluations and Statistics (DREES), reported an improvement in mental health among the general population from March 2020 to November 2020, except for young people (< 25 years old)[31]. Among them, the prevalence of depressive symptoms was still higher in November 2020 than in 2019 (+3 points for minor depressive symptoms and + 6 points for major depressive disorders) but was lower or stable for all other age groups. The situation seems to be more concerning for young women (15-24 years old), with a 23.7% prevalence of depressive symptoms and a 13.4% prevalence of major depressive disorders in November 2020, but respectively 10.7% and 3.7% in 2019. This survey also reported that 5.0% of participants aged 15-24 years old declared having suicidal thoughts over the past 12 months, more frequently reported by young women (6.4%)

than young men (3,6%).. Several studies from other countries also reported a higher prevalence of depressive symptoms and anxiety disorders among young adults in the aftermath of the pandemic, especially young women, confirming the adverse impact of the pandemic on their mental health [32–34].

The reduction in mental healthcare use after the Covid-19–related restrictive measures was also observed in other countries. In the United Kingdom, despite a progression in number of new referrals and patients hospitalised after the lifting of lockdown (May 2020), the numbers were still substantially lower than before the pandemic[16,35]. In contrast, the number of non-face-to-face contacts showed a sizeable increase, which highlights the need to assess the role of telemedicine to manage mental health disorders and monitor patients during and outside of pandemics[16,36].

In our study, there was a strong reduction of mental healthcare seeking among the eldest (over 65 years old), which was also described in other studies[25,37]. Older people may have avoided health services during the Covid-19 pandemic, because of quarantining requirements and fear of infection, and that it may have discouraged them to seek care for their mental health, even after the lifting of restrictive measures. Moreover, some older people who lived alone may encounter difficulties to access health services as usual. Eventually, the fact that the pandemic had a less adverse impact on older people cannot be excluded, as several studies reported lower levels of anxiety and depression among seniors[10,33,34,38].

Regarding the persistency of psychiatric disorders among young adults, months after the easing of Covid-19 restrictions, it seems crucial to ensure access to appropriate care and continuity of care for youth. The pandemic deeply affected the well-being of an age group already known to be vulnerable to mental health problems, as several studies reported before the Covid-19 crisis[39–42]. Adolescents and young adults have undergone many pandemic-related difficulties, with prolonged home-schooling and the need to study remotely

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3 279 for an entire academic year and with the closure of usual recreation areas (bars, cinemas,
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5 280 nightclubs etc.), not being able to have their normal social routine with friends[13]. Moreover,
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7 281 restrictions led to officious festive gatherings, during which there was a higher risk of excess
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9 282 (substance use, risky behaviours) and potential abuse[43]. Some studies found home
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11 283 lockdown associated with an increase in domestic violence and ill treatment, with children
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13 284 more at risk in the absence of protective factors, such as access to trusted adults outside the
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15 285 household, school professionals, and friends[44,45].
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19 286 Furthermore, disruption of care or difficulty in accessing medical care could lead to more
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21 287 severe presentations of psychiatric disorders or worsen pre-existing conditions. Previous
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23 288 work showed a resurgence of serious clinical conditions post-lockdown, including increased
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25 289 suicidal ideation and behaviour, and involuntary hospital admissions[20,26]. In addition, the
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27 290 number of suicide attempts among the youngest, including children ≤ 15 years old, has
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29 291 increased substantially since the end of the first Covid-19 wave as compared with previous
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31 292 years[46,47].
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35 293 Our study was based on systematically collected medical care data provided by the GHU
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37 294 Psychiatry and Neurosciences facilities, over a 3-year period, covering a time before, during
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39 295 and after the Covid-19 pandemic. This large dataset allowed us to describe robust
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41 296 tendencies regarding the use of mental healthcare. Moreover, the GHU Psychiatry and
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43 297 Neurosciences facilities covers a large area (13 of the 20 Parisian arrondissements are
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45 298 linked to the GHU), so our study represents the use of care by a large sample of the
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47 299 population. The main limitation is the absence of information on care outside the hospital,
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49 300 such as private practitioners, including psychiatrists, psychologists, and general practitioners.
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51 301 Individuals with minor mental health problems could also have been referred to other support
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53 302 services, such as helplines. Furthermore, we were not able to distinguish remote medical
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55 303 consultations (telemedicine) from face-to-face outpatient appointments and so could not
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57 304 analyse the proportion of remote consultations in the activity. We need to understand these
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59 305 changes in providing mental health care and evaluate the therapeutic value and patient
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satisfaction regarding remote medical appointments. Eventually, low frequencies of admissions for suicidal attempts or ideation prevented us to perform a weekly evolution analysis.

To conclude, the Covid-19 pandemic and the associated restrictive measures used to control the spread of the virus have had severe consequences on populations' mental health, especially among young women. More worrying is the persistence of psychiatric disorders among the youngest, months after the end of restrictions. Further studies are needed to assess the psychological complications associated with the Covid-19 pandemic among young people and to capture the use of mental health care to ensure that this age group benefits from appropriate care.

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Competing interests: None declared.

Ethics approval: French national regulation authorities allow hospitals to use medical and administrative information collected through the Programme de médicalisation des systèmes d'information (PMSI), for the purposes of research, studies, or evaluation in the health field, as long as the reference methodologies for health research are respected (MR005). The PMSI database gather retrospective data from administrative and medical files. All data extracted from the PMSI database were completely anonymous. According the French and European laws, there is no requirement for informed consent for this category of study, informing the patient of their right to oppose to the use of their data is sufficient.

Patient consent for publication: Not required

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332 **Contributors:** The study was planned by AP and VLM. Data extraction was performed by

333 VLM and DS, data analyses by AP. BA, AP and VLM All authors participated to results

334 interpretation and approved the final manuscript.

335 **Data sharing:** The data that support the findings are available from the corresponding

336 author, upon reasonable request.

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For peer review only

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474 **Figure legend:**

475 Figure 1: Number of healthcare contacts per week, between 2019 and 2021, for all patients.
476 Figure 2: Number of healthcare contacts per week, between 2019 and 2021, for patients aged
477 15-24 years old.
478 Figure 3: Number of healthcare contacts per week, between 2019 and 2021, for mood
479 disorders among patients aged 15-24 years old.

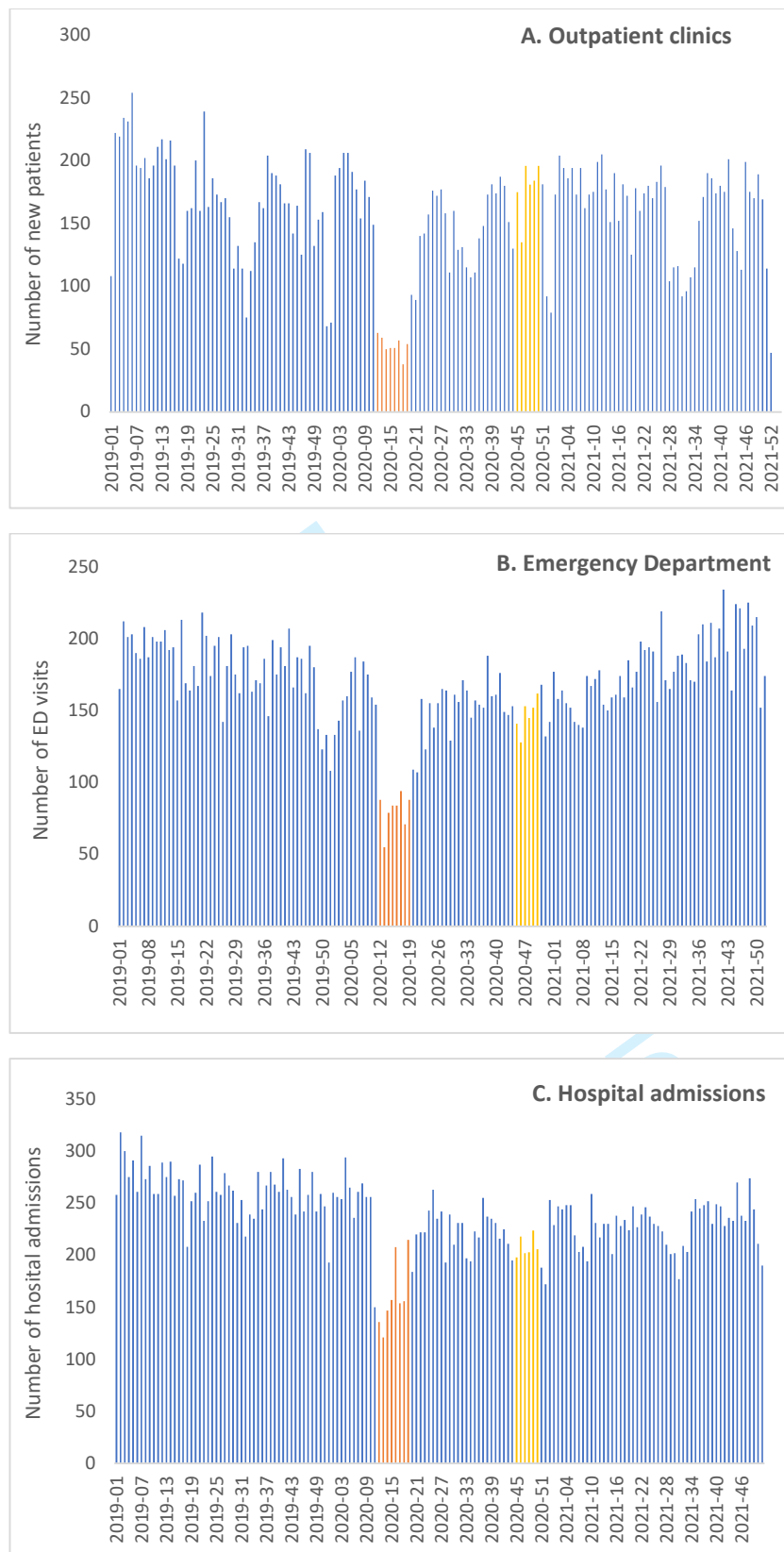


Figure 1: Number of healthcare contacts per week, between 2019 and 2021, for all patients. A. Number of new patients per week attending the GHU outpatient clinics; B. Number of emergency department visits per week; C. Number of hospital admissions per week. The weeks of the first (March 17 to May 11, 2020) and second (Oct. 30 to Dec. 15, 2020) lockdowns are presented on the graph in orange and yellow, respectively.

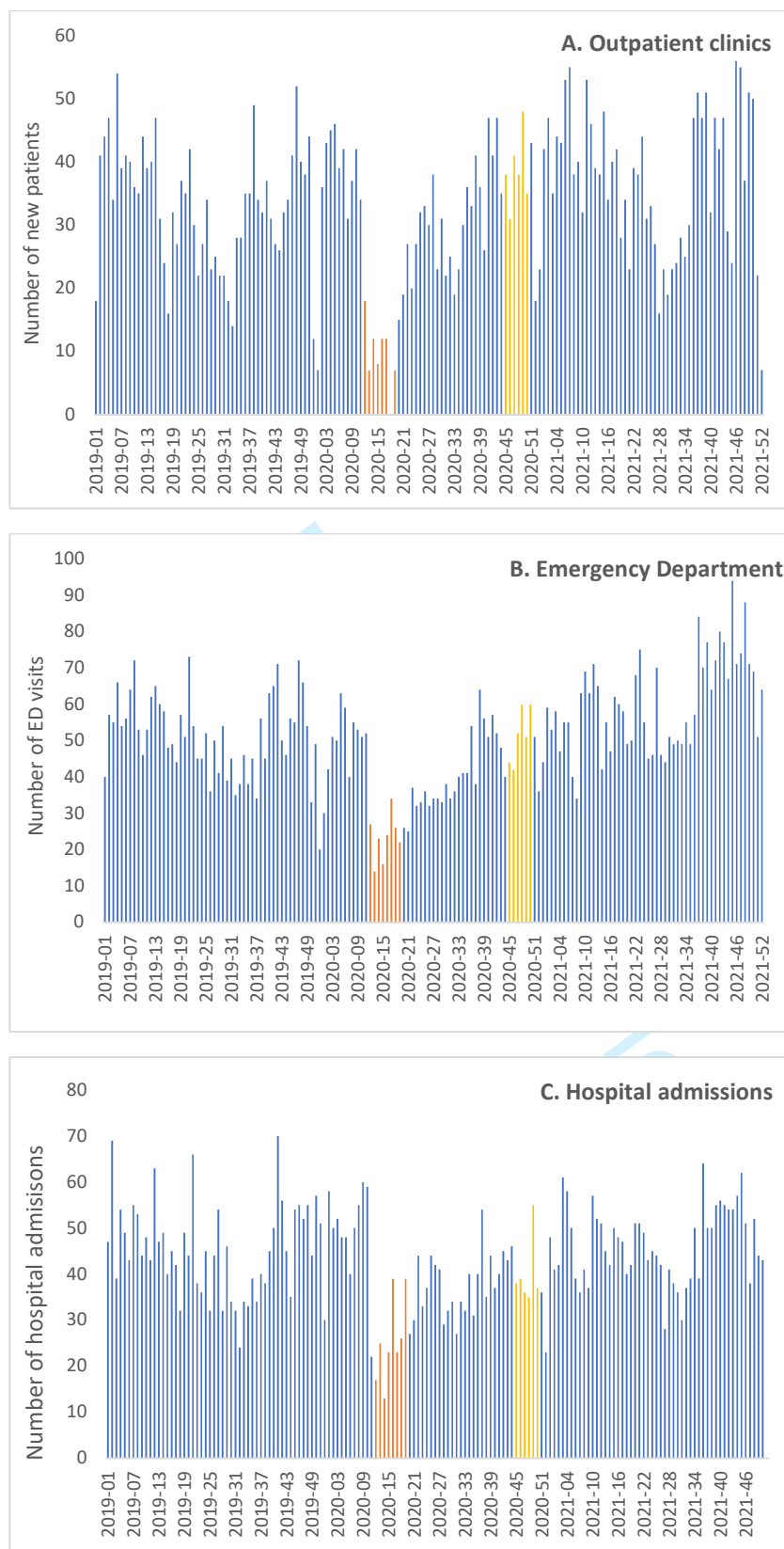


Figure 2: Number of healthcare contacts per week, between 2019 and 2021, for patients aged 15-24 years old. A. Number of new patients per week attending the GHU outpatient clinics; B. Number of emergency department visits per week; C. Number of hospital admissions per week. The weeks of the first (March 17 to May 11, 2020) and second (Oct. 30 to Dec. 15, 2020) lockdowns are presented on the graph in orange and yellow, respectively.

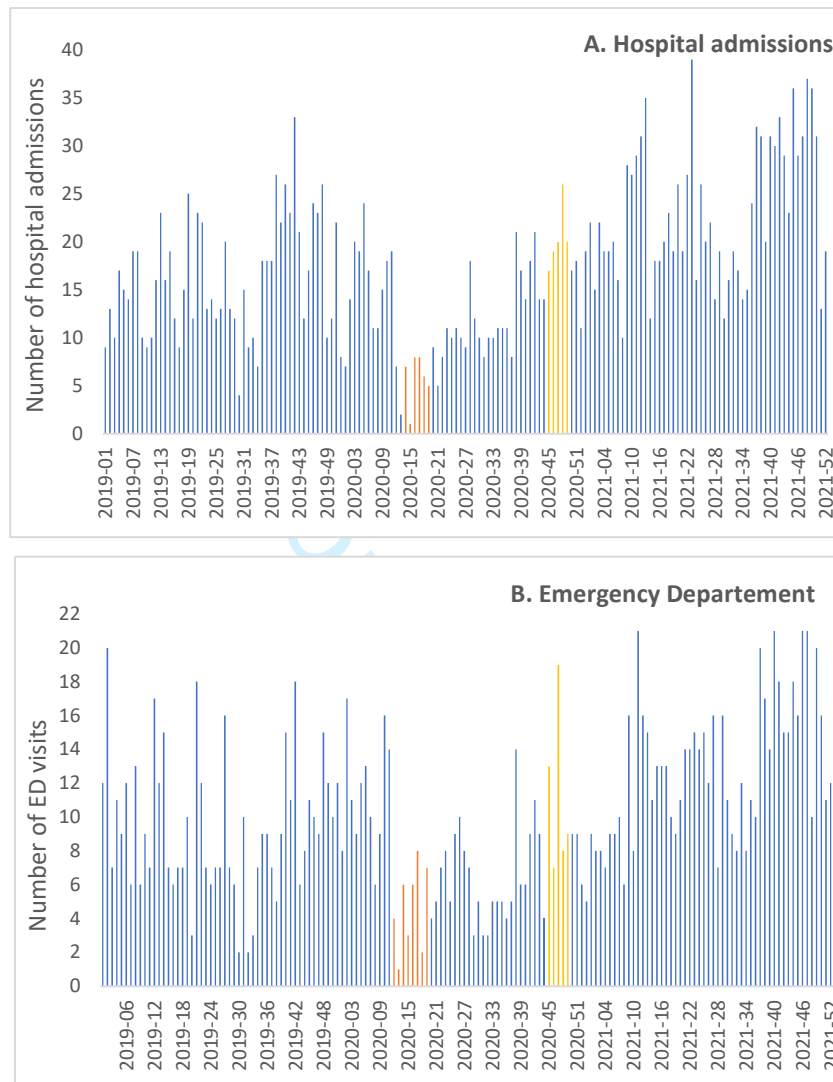


Figure 3: Number of healthcare contacts per week, between 2019 and 2021, for mood disorders among patients aged 15-24 years old. A. Number of hospital admissions per week; B. Number of emergency department visits per week. The weeks of the first (March 17 to May 11, 2020) and second (Oct. 30 to Dec. 15, 2020) lockdowns are presented on the graph in orange and yellow, respectively.

Supplementary material 1: Frequencies and proportions of emergency visits according to diagnosis by age groups and year, between 2019 and 2021

Table S1.1: Frequencies and proportions of emergency visits of 15-24 years old according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019-2020	2021		Evolution 2019-2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	83	3%	88	4%	6%	91	3%	10%
Schizophrenia, schizotypal and delusional disorders	456	17%	363	17%	-20%	395	13%	-13%
Mood [affective] disorders	839	31%	687	31%	-18%	1209	39%	44%
Neurotic, stress-related and somatoform disorders	528	20%	502	23%	-5%	752	24%	42%
Behavioural syndromes associated with physiological disturbances and physical factors	68	3%	51	2%	-25%	85	3%	25%
Disorders of adult personality and behaviour	286	11%	196	9%	-31%	252	8%	-12%
Behavioural and emotional disorders (childhood and adolescence onset)	126	5%	132	6%	5%	103	3%	-18%
Non-psychiatric disorders	295	11%	165	8%	-44%	250	8%	-15%
Total patients	2681		2184			3137		

Table S1.2: Frequencies and proportions of emergency visits of 25-44 years old according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019-2020	2021		Evolution 2019-2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	267	6%	231	7%	-13%	277	7%	4%
Schizophrenia, schizotypal and delusional disorders	1118	27%	868	27%	-22%	959	24%	-14%
Mood [affective] disorders	1304	31%	1037	32%	-20%	1335	34%	2%
Neurotic, stress-related and somatoform disorders	804	19%	686	21%	-15%	883	22%	10%
Behavioural syndromes associated with physiological disturbances and physical factors	53	1%	30	1%	-43%	37	1%	-30%
Disorders of adult personality and behaviour	242	6%	144	4%	-40%	131	3%	-46%
Behavioural and emotional disorders (childhood and adolescence onset)	27	1%	28	1%	4%	38	1%	41%
Non-psychiatric disorders	365	9%	244	7%	-33%	286	7%	-22%
Total patients	4180		3268			3946		

Table S1.3: Frequencies and proportions of emergency visits of 45-64 years old according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019- 2020	2021		Evolution 2019- 2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	154	8%	127	8%	-18%	98	5%	-36%
Schizophrenia, schizotypal and delusional disorders	613	31%	447	27%	-27%	474	26%	-23%
Mood [affective] disorders	738	37%	611	37%	-17%	684	38%	-7%
Neurotic, stress-related and somatoform disorders	238	12%	223	14%	-6%	294	16%	24%
Behavioural syndromes associated with physiological disturbances and physical factors	10	0%	7	0%	-30%	13	1%	30%
Disorders of adult personality and behaviour	65	3%	50	3%	-23%	35	2%	-46%
Behavioural and emotional disorders (childhood and adolescence onset)	11	1%	12	1%	9%	9	0%	-18%
Non-psychiatric disorders	178	9%	167	10%	-6%	204	11%	15%
Total patients	2007		1644			1811		

Table S1.4: Frequencies and proportions of emergency visits of 65 years old and over according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019- 2020	2021		Evolution 2019- 2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	12	3%	12	3%	0%	11	3%	-8%
Schizophrenia, schizotypal and delusional disorders	85	18%	75	20%	-12%	77	19%	-9%
Mood [affective] disorders	249	54%	198	53%	-20%	217	54%	-13%
Neurotic, stress-related and somatoform disorders	66	14%	54	14%	-18%	76	19%	15%
Behavioural syndromes associated with physiological disturbances and physical factors	7	2%	4	1%	-43%	2	0%	-71%
Disorders of adult personality and behaviour	3	1%	7	2%	133%	1	0%	-67%
Non-psychiatric disorders	38	8%	27	7%	-29%	19	5%	-50%
Total patients	460		377			403		

Supplementary material 2: Frequencies and proportions of hospital admissions according to diagnosis by age groups and year, between 2019 and 2021

Table S2.1: Frequencies and proportions of hospital admissions of 15-24 years old according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019- 2020	2021		Evolution 2019- 2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	71	3%	70	4%	-1%	85	4%	20%
Schizophrenia, schizotypal and delusional disorders	624	26%	546	27%	-13%	490	20%	-21%
Mood [affective] disorders	490	21%	399	20%	-19%	679	28%	39%
Neurotic, stress-related and somatoform disorders	170	7%	147	7%	-14%	161	7%	-5%
Behavioural syndromes associated with physiological disturbances and physical factors	69	3%	48	2%	-30%	42	2%	-39%
Disorders of adult personality and behaviour	178	8%	169	9%	-5%	194	8%	9%
Behavioural and emotional disorders (childhood and adolescence onset)	145	6%	115	6%	-21%	133	6%	-8%
Non-psychiatric disorders	608	26%	493	25%	-19%	625	26%	3%
Total patients	2355		1987			2409		

Table S2.2: Frequencies and proportions of hospital admissions of 25-44 years old according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019- 2020	2021		Evolution 2019- 2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	315	6%	258	6%	-18%	319	7%	1%
Schizophrenia, schizotypal and delusional disorders	1903	35%	1534	35%	-19%	1562	35%	-18%
Mood [affective] disorders	958	18%	809	19%	-16%	1005	22%	5%
Neurotic, stress-related and somatoform disorders	210	4%	150	3%	-29%	163	4%	-22%
Behavioural syndromes associated with physiological disturbances and physical factors	78	1%	44	1%	-44%	47	1%	-40%
Disorders of adult personality and behaviour	228	4%	194	4%	-15%	158	4%	-31%
Behavioural and emotional disorders (childhood and adolescence onset)	52	1%	78	2%	50%	55	1%	6%
Non-psychiatric disorders	1660	31%	1278	29%	-23%	1171	26%	-29%
Total patients	5404		4345			4480		

Table S2.3: Frequencies and proportions of hospital admissions of 45-64 years old according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019- 2020	2021		Evolution 2019- 2021
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	230	6%	210	6%	-9%	185	5%	-20%
Schizophrenia, schizotypal and delusional disorders	1408	35%	1124	33%	-20%	1067	30%	-24%
Mood [affective] disorders	898	22%	845	25%	-6%	1145	32%	28%
Neurotic, stress-related and somatoform disorders	105	3%	92	3%	-12%	91	3%	-13%
Behavioural syndromes associated with physiological disturbances and physical factors	13	0%	14	0%	8%	7	0%	-46%
Disorders of adult personality and behaviour	73	2%	83	2%	14%	65	2%	-11%
Behavioural and emotional disorders (childhood and adolescence onset)	19	0%	12	0%	-37%	11	0%	-42%
Non-psychiatric disorders	1322	32%	993	29%	-25%	982	28%	-26%
Total patients	4068		3373			3553		

Table S2.4: Frequencies and proportions of hospital admissions of 65 years old and over according to diagnosis, between 2019 and 2021

	2019		2020		Evolution 2019- 2020	2021		Evolution 2019- 2020
	Freq.	%	Freq.	%		Freq.	%	
Mental and behavioural disorders due to psychoactive substance use	38	2%	24	2%	-37%	22	2%	-42%
Schizophrenia, schizotypal and delusional disorders	344	22%	287	22%	-17%	299	23%	-13%
Mood [affective] disorders	703	44%	664	50%	-6%	553	43%	-21%
Neurotic, stress-related and somatoform disorders	36	2%	31	2%	-14%	45	3%	25%
Behavioural syndromes associated with physiological disturbances and physical factors	3	0%	3	0%	0%	1	0%	-67%
Disorders of adult personality and behaviour	15	1%	12	1%	-20%	15	1%	0%
Behavioural and emotional disorders (childhood and adolescence onset)	6	0%	4	0%	-33%	2	0%	-67%
Non-psychiatric disorders	447	28%	296	22%	-34%	359	28%	-20%
Total patients	1592		1321			1296		

The RECORD statement – checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data.

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Title and abstract					
	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 1	RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and time/place within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	Page 1-2
Introduction					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 4		
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 5		
Methods					
Study Design	4	Present key elements of study design early in the paper	Page 5		
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 5-6		

Participants	6	<p>(a) <i>Cohort study</i> - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up</p> <p><i>Case-control study</i> - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls</p> <p><i>Cross-sectional study</i> - Give the eligibility criteria, and the sources and methods of selection of participants</p> <p>(b) <i>Cohort study</i> - For matched studies, give matching criteria and number of exposed and unexposed</p> <p><i>Case-control study</i> - For matched studies, give matching criteria and the number of controls per case</p>	Page 5	<p>RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.</p> <p>RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.</p> <p>RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.</p>	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Page 6	RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	NA
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 6		

Bias	9	Describe any efforts to address potential sources of bias	NA		
Study size	10	Explain how the study size was arrived at	NA		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	Page 6		
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> - If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> - If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	Page 6-7		
Data access and cleaning methods		..		RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population.	Page 5

				RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	NA
Results					
Participants	13	(a) Report the numbers of individuals at each stage of the study (<i>e.g.</i> , numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram	NA	RECORD 13.1: Describe in detail the selection of the persons included in the study (<i>i.e.</i> , study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	
Descriptive data	14	(a) Give characteristics of study participants (<i>e.g.</i> , demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) <i>Cohort study</i> - summarise follow-up time (<i>e.g.</i> , average and total amount)	NA		
Outcome data	15	<i>Cohort study</i> - Report numbers of outcome events or summary measures over time <i>Case-control study</i> - Report numbers in each exposure	Page 8-9-10		

		category, or summary measures of exposure <i>Cross-sectional study</i> - Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA		
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	Page 8-9-10		
Discussion					
Key results	18	Summarise key results with reference to study objectives	Page 10		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	Page 12
Interpretation	20	Give a cautious overall interpretation of results considering objectives,	Page 11		

		limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 12		
Other Information					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 13		
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Page 13

*Reference: Benchimol EI, Smeeth L, Guttman A, Harron K, Moher D, Petersen I, Sørensen HT, von Elm E, Langh SM, the RECORD Working Committee. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine* 2015; in press.

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