

# Psychiatric ward admissions during the COVID-19 pandemic in Canton of Ticino (Swiss Confederation) and the province of Como (Italy): a comparison between two different systems of care and outbreak response strategies

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## Abstract

The aim of the study was to estimate the effect of the COVID-19 pandemic and response policies on the psychiatric ward admissions in the hospitals referring to the ASST Lariana (province of Como, Italy) and the Hospital of Mendrisio (Canton of Ticino, Switzerland), two similar territories that belong to countries that dealt differently with the pandemic. We compared the two territories for type of admission (voluntary vs. compulsory), the Stringency Index (SI) and the country's number of admission in Intensive Care Units (ICU). We found a significant reduction in the psychiatric ward admission in the lockdown period in both territories, even in periods with milder lockdown measures. The admission rate's reduction in the ASST Lariana was significantly associated with the ICU admissions ( $p < 0.001$ ). In the Hospital of Mendrisio, admissions included a weekly seasonality, were significantly correlated with SI ( $p = 0.001$ ) and period (pre-pandemic and pandemic;  $p < 0.001$ ) and we observed also a significant reduction of compulsory admission that is influenced both by the stringency index ( $p < 0.001$ ) and period ( $p < 0.001$ ). The differences between the two territories seem influenced by the different mental health systems.

## Introduction

The COVID-19 pandemic has led to a worsening of the mental health status,<sup>1,2</sup> with a significant increase in rates of depression and anxiety disorders, which are also risk factors for suicide behavior.<sup>3-6</sup> Some authors<sup>7,8</sup> pointed out that lockdown could lead to short and medium-long term psychological distress. Moreover, patients in psychiatric care could find more difficult to schedule follow-up face to face visits and be less compliant towards the prescribed psychotropic drugs.<sup>9,10</sup> However, to evaluate the more severe burden of pandemic and lockdown on mental health status, the investigation of psychiatric hospitalizations is an essential index, since it is well known that patients with psychiatric comorbidity are linked with longer hospitalization also in internal medicine wards.<sup>11</sup> Surveys carried out during the first wave of the pandemic<sup>3,6,12-19</sup> showed a reduction in the overall number of psychiatric ward admissions, but not for compulsory admissions<sup>3,6,12-15,17,20</sup> and in high acuity units;<sup>16</sup> by contrast, in a survey carried out in Sweden (where lockdown measures were lighter),<sup>21</sup> the number of hospitalizations during the pandemic overlapped that of the pre-

vious years. In studies investigating the post-lockdown period and the following waves of the pandemic (with the consequent of new restrictions), the number of admissions either reached (without exceeding) the numbers of pre-pandemic period,<sup>6,15,17,21,22</sup> or remained slightly lower.<sup>19,20,23</sup> However, none of these studies compared data from two or more different countries. The aim of our study was to estimate the effect of the COVID-19 pandemic response policies on the psychiatric ward admissions in the hospitals referring to the ASST Lariana (province of Como, Italy) and the Hospital of Mendrisio (Canton of Ticino, Switzerland). We compared two similar territories for extension, culture, wealth, climate, and gastronomy, that belong to countries that dealt with the pandemic with a different approach.

## Materials and Methods

This is a historical retrospective observational study. This manuscript follows the RECORD reporting guidelines for observational studies using routinely collected health data. We obtained from the administrative databases which have coverage for inpatient care, the admission counts from all the psychiatric wards referring to the province of Como (ASST Lariana) and the Canton of Ticino (Hospital of Mendrisio) between the period March 1<sup>st</sup> 2020–February 28<sup>th</sup> 2022. The Province of Como has a population of 594,941 inhabitants<sup>24</sup> in the north of the Lombardy region of Italy; the ASST-Lariana include all the three psychiatric wards (Como, Cantù and Menaggio) of the catchment area with a total of 43 beds (0.72 beds/10000 inhabitants). The Canton of Ticino is the only Italian speaking canton of Swiss Confederation with a population of 350,986<sup>25</sup> inhabitants. The hospital of Mendrisio covers half of the psychiatric beds of the catchment area, with 146 beds/350,986 inhabitants (over 292 beds in Ticino). The two territories are very similar for extension, culture, wealth, climate, and gastronomy, but belongs to different countries.

Italy and Switzerland used different lockdown measures for the pandemic. In fact, between March 9<sup>th</sup> and May 3<sup>rd</sup> 2020 (first wave), the Italian Government imposed a national lockdown, restricting the movements of the population except for certified needs such as work and health circumstances, and the temporary closure of non-essential services, productive activities and businesses. Then, there was partial return to the workplace, shops and restaurants reopened, though schools, gyms and theaters remained closed. Students returned at school gradually during the scholastic year 2020–2021. By contrast, in Switzerland, the restrictions in the whole were limited to non-essential services, while productive activities and businesses remained open, even in the first wave of the pandemic. Schools remained closed only between March 16<sup>th</sup> and May 8<sup>th</sup>, 2020. Records information included type of admission (voluntary vs. compulsory), the stringency index that is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 =strictest).<sup>26</sup> If policies vary at the subnational level, the index shows the response level of the strictest subregion, and the country's admission records in Intensive Care Units (ICU). Data about daily ICU patients in Italy was obtained from official GitHub repository of "Protezione Civile".<sup>27</sup> Data about ICU patients in Switzerland were obtained from the federal office of public health and reported and commented by the canton physician office of the canton of Ticino.<sup>28</sup> Daily Stringency Index in the two countries was downloaded from <https://ourworldindata.org>.<sup>29</sup>

Ethical approval was not required for this study as it was

conducted on cumulative daily admissions counts and data freely available on the internet from state register or research institutions. All analysis and data manipulation were conducted using R version 4.2.1. Source code and data will be available upon request.

## Statistical analysis

The presented data are in the form of time-series daily rate. While count and rate data typically follow a Poisson distribution, it can't be assumed count at a given day  $t$  is independent from count at day  $t+1$ . In addition, in this type of data there may be also form of seasonality. To account for both potential autocorrelation and or seasonality we hypothesized an autoregressive Poisson model for time-series<sup>30</sup> with the following functional structure for both ASST Lariana and Hospital of Mendrisio:

$$v_t = \mu + \beta' Z + \alpha' v^* + \eta' X \quad (1)$$

where  $v_t = g(\lambda_t) = \log \lambda_t$ , with  $\lambda_t = E(Y_t | F_{t-1}) = \text{Var}(Y_t | F_{t-1})$  for the Poisson assumption  $Y_t | F_{t-1} \sim \text{Poisson}(\lambda_t)$  where  $F_t$  is the history of the joint process  $\{Y_t, \lambda_t, X_{t+1} : t \in \mathbb{N}\}$ ,  $\mu$  is the intercept,  $\beta' = [\beta_1, \dots, \beta_k, \dots, \beta_k]$  vector of autoregressive coefficients of the  $i_k$ -th order,  $Z = [Z_{t-1}, \dots, Z_{t-i_k}, \dots, Z_{t-i_k}]'$  vector of the transformed observations  $Z_{t-i_k} = \mathbb{E} Y_{t-i_k} = \log(Y_{t-i_k} + 1)$ ,  $\alpha' = [\alpha_1, \dots, \alpha_i, \dots, \alpha_L]$  vector of the transformed conditional means of the  $j$ -th order  $v^* = [v_{t-j_1}, \dots, v_{t-j_b}, \dots, v_{t-j_L}]'$  where  $v_{t-j_i} = g(\lambda_{t-j_i}) = \log(\lambda_{t-j_i})$ ,  $\eta' = [\eta_1, \dots, \eta_p, \dots, \eta_p]$  vector of the coefficients relative to the  $P$  co-variables  $X = [X_1, \dots, X_p]'$ . We considered models with all the possible combinations of three coefficients for autocorrelation and seasonality: the first and the seventh autoregressive order and the seventh order conditional mean. Then we selected the best combination of three possible covariates: the stringency index, the national count of ICU patients and the period of exposure (pre-pandemic vs. pandemic).

As we supposed that data are either significantly correlated and/or present a significant seasonality, we decided to statistically compare models with and without the introduction of the corresponding parameters. As some models in the comparison are not nested, we couldn't use the likelihood ratio tests. In fact, likelihood ratio test is valid only when comparing nested model. We selected the best model according to the lowest Bayesian Information Criterion (BIC), an alternative to the likelihood ratio test for comparing different models even if they are non-nested. We implemented the following selection strategy, divided into two major steps: i) the first step to choose which order include for the autoregressive model and/or the conditional mean among all the possible combinations; ii) the second step to choose the best combination of covariates. The best model at the first step moved up the second step. The best model at the second step was then selected as the final model and used for parameters estimates. This strategy allowed us to account for potential autocorrelation and seasonality before selecting the covariates of interest to include in the final models. The covariates of interest were subjected to the selection process in the second step because we didn't assume that a model with all of them was best fitting the data. In other words, we didn't give for granted that neither all nor any of them was useful in predicting the daily count of admission. The selection process was conducted independently for the two areas of interest, for overall and compulsory treatment. Therefore, a total of four final models was obtained: one for overall admissions in Como, one for overall admission in Canton Ticino, one for compulsory treatment in Como and one for compulsory treatment in Canton Ticino.

## Results

According to BIC, the final model for overall admissions in ASST Lariana was the autocorrelated Poisson model of the seventh order with seventh order seasonality and ICU patients as the only covariate (BIC: 3994); the final model for overall admissions in the Hospital of Mendrisio was the autocorrelated Poisson model of the seventh order with seventh order seasonality and Stringency Index and Period (pre-pandemic vs pandemic) as covariates (BIC: 4947); the final model for compulsory admissions in ASST Lariana was the null model (BIC: 1111); the final model for compulsory admissions in Hospital of Mendrisio was the autocorrelated Poisson model of the seventh order with seventh order seasonality and Stringency Index and Period (pre-pandemic vs pandemic) as covariates (BIC: 3671). Parameters estimates, standard errors, confidence intervals and p-values are reported in Table 1.

According to the model selected for overall psychiatric admissions in ASST Lariana, the increase of 1 point rate in ICU patients is associated with a decrease in the daily rate of psychiatric

admissions of about 1.3% (rate-ratio: 0.9872, CI: 0.9826-0.9917,  $p < 0.0001$ ). Restricting to compulsory treatments, no autocorrelation, seasonality or covariates was included in the model through the process. This suggests that compulsory treatments follow a Poisson random distribution with mean 0.1841 (CI: 0.1599 – 0.2107) compulsory admissions per day.

This is confirmed by the fact that the sample variance of the daily compulsory treatment (0.1741) was quite similar to the sample mean as expected by a sample distributed like a Poisson random variable.

According to the selected model for the overall psychiatric admissions in Mendrisio Hospital, the increase of 1 point in the Stringency Index is associated with an increase in the number of psychiatric admissions of 0.02% (rate ratio: 1.0002 CI: 1.00008 – 1.00037,  $p < 0.00019$ ). Although statistically significant, the effect was very small. The pandemic period was associated with a reduction of about 0.68% (rate ratio: 0.9932, CI: 0.9892 - 0.9972,  $p < 0.0001$ ) psychiatric admissions compared with the pre-pandemic period.

**Table 1. Parameter (exponentiated) estimates for the four selected models: admissions and compulsory admissions in ASST Lariana and Mendrisio Hospital. Exponentiated parameters correspond to estimated rate-ratio.**

ASST Lariana overall admissions (n = 1097 days, N = 2792 total admissions)					
	Estimate (exp)	Std. error	CI Lower (exp)	CI Upper (exp)	p-value
$\mu$ (Intercept)	0.0234 -10.237	0.01037	0.00309 -10.031	0.04375 -10.447	0.01197
$\beta_7$ (7th ord. autocorr.)	0.1373 -11.471	0.02174	0.09464 -10.993	0.17986 -11.971	<0.0001
$\alpha_7$ (weekly seasonality)	0.8240 -22.796	0.02769	0.76972 -21.592	0.87826 -24.067	<0.0001
$\eta_2$ (ICU pts rates)	-0.0129 (0.9872)	0.00234	-0.01751 (0.9826)	-0.00833 (0.9917)	<0.0001
Mendrisio Hospital overall admissions (n = 1097 days, N = 5781 total admissions)					
$\mu$ (Intercept)	0.0000 -10.000	0.0062	-0.0122 (0.9879)	0.0122 -10.122	0.5000
$\beta_7$ (7th ord. autocorr.)	0.0396 -10.404	0.0102	0.0195 -10.197	0.0596 -10.615	<0.0001
$\alpha_7$ (weekly seasonality)	0.9604 -26.128	0.0120	0.9370 -25.522	0.9839 -26.748	<0.0001
$\eta_1$ (Stringency Index)	0.0002 -10.002	0.0001	0.0001 -10.001	0.0004 -10.004	<0.0001
$\eta_3$ (Period)	-0.0068 (0.9932)	0.0021	-0.0109 (0.9892)	-0.0028 (0.9972)	<0.0001
ASST Lariana compulsory admissions (n= 1097 days, N = 202 total admissions)					
$\mu$ (Intercept)	-16.921 (0.1841)	0.0704	-18.332 (0.1599)	-15.573 (0.2107)	<0.0001
Mendrisio Hospital compulsory admissions (n= 1097 days, N = 2095 total admissions)					
$\mu$ (Intercept)	0.0000 -10.000	0.0066	-0.0130 (0.9871)	0.0130 -10.131	0.5000
$\beta_7$ (7th ord. autocorr.)	0.0365 -10.372	0.0140	0.0091 -10.091	0.0640 -10.661	0.0045
$\alpha_7$ (weekly seasonality)	0.9635 -26.208	0.0173	0.9296 -25.335	0.9973 -27.110	<0.0001
$\eta_1$ (Stringency Index)	0.0006 -10.006	0.0002	0.0003 -10.003	0.0009 -10.009	0.00023
$\eta_3$ (Period)	-0.0192 (0.9809)	0.0063	-0.0316 (0.9689)	-0.0069 (0.9931)	0.0011

According to the model selected for compulsory psychiatric admissions in Mendrisio Hospital the increase of 1 point in the Stringency Index is associated with an increase of the number of psychiatric admissions of 0.06% (rate ratio: 1.0006, CI: 0.00026 – 0.00093,  $p=0.00023$ ). Although statistically significant, the effect was quite small. The pandemic period was associated with a reduction of about 1.9% (rate ratio: 0.9809, CI: 0.9689 – 0.9931,  $p=0.0011$ ) compulsory treatments compared with the pre-pandemic period. Figures 1 and 2 shows observed and estimated admissions rates for the four models.

## Discussion

In line with previous findings,<sup>19,20,23</sup> we found a reduction in both the territories of interest of psychiatric ward admissions, in the whole study period (regardless of the restriction measures). The improvement in coping strategy of severe psychiatric patients in critical periods<sup>31,32</sup> and more similar condition to the general populations could improve the mental health of the more severe patients, along with the increase of patients and family's support.<sup>18</sup> Moreover, the reduction of Emergency Room (ER) admissions for psychiatric disorders<sup>3,4,33</sup> in the lockdown period attributable to the fear of the contagion,<sup>34</sup> especially in older people,<sup>35</sup> could also delay the diagnosis of new onset psychiatric disorders. A multicen-

ter study carried out in Italian ERs,<sup>35</sup> in line with this hypothesis, found a 50% reduction of admissions also for non psychiatric patients, especially for less severe reasons (white and green codes) while no changes were found for the most severe reasons (red codes). On the other hand, our results are in contrast with recent surveys carried out in Italy<sup>36,37</sup> and in Switzerland,<sup>38</sup> that found a slight increase of psychiatric assessments in ER in the months following the first lockdown. However, in these studies, psychiatric referrals involved mainly people without a history of psychiatric disorders and who not required hospitalizations.

Our study led to different results in the two territories of interest, even if we applied the same methodology of selection for the same model with same covariates as candidates.

In the province of Como, the trend in overall psychiatric admissions was better explained by an autoregressive model of the seventh order, which included a weekly (seven days) seasonality and the rate of national Intensive Care Units admissions as the only covariate among the hypothesized candidates. Thirteen percent of psychiatric ward in Lombardy (that in Italy are positioned in the general hospitals) were temporary converted in intensive and non-intensive non psychiatric care COVID unit.<sup>6,13,18</sup> More specifically, in the province of Como, the psychiatric ward in the Hospital of Cantù was temporary closed, with reduction of the beds in the entire province, and consequently, along with the fear of the contagion, a reduction of availability for new admissions.<sup>12</sup> In fact, in line with

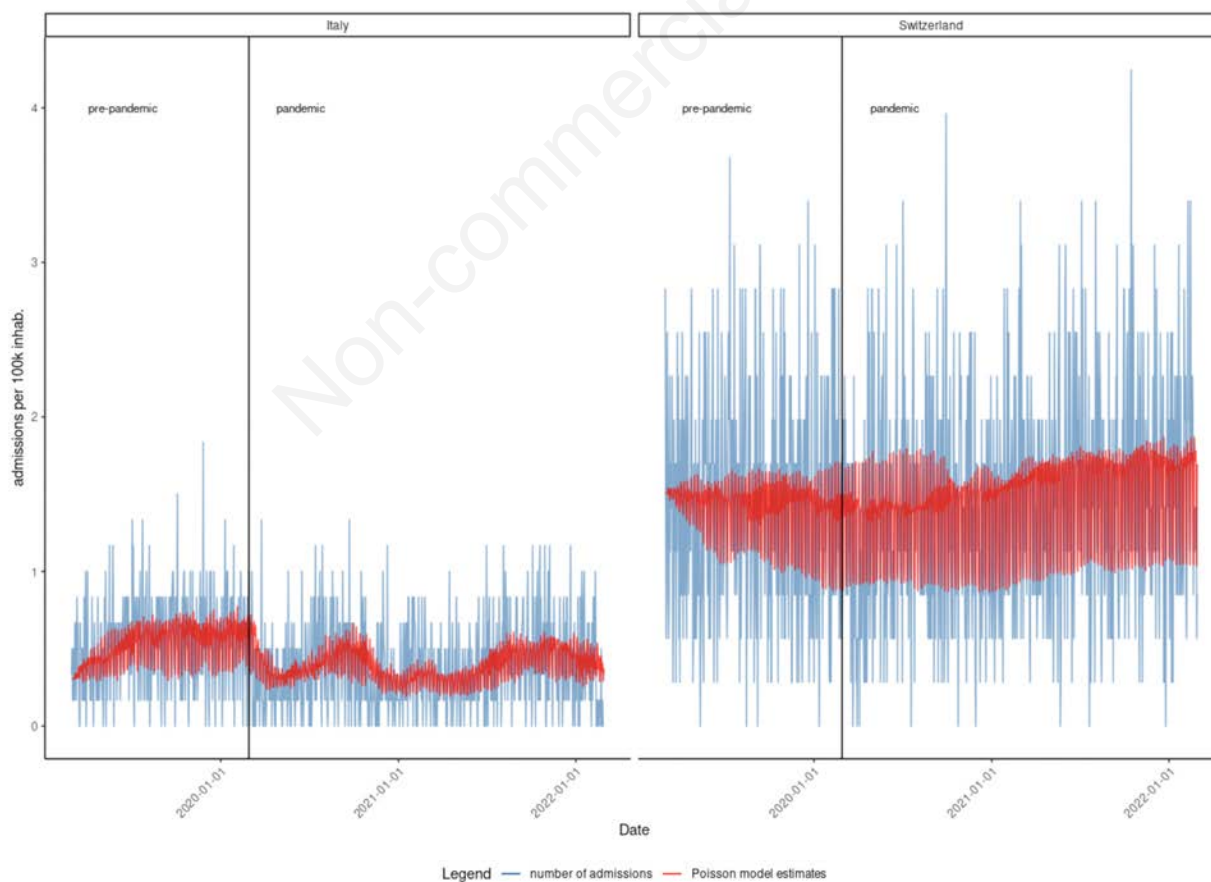


Figure 1. Estimated (red line) and observed (blue line) admissions for each day per 100000 inhabitants.

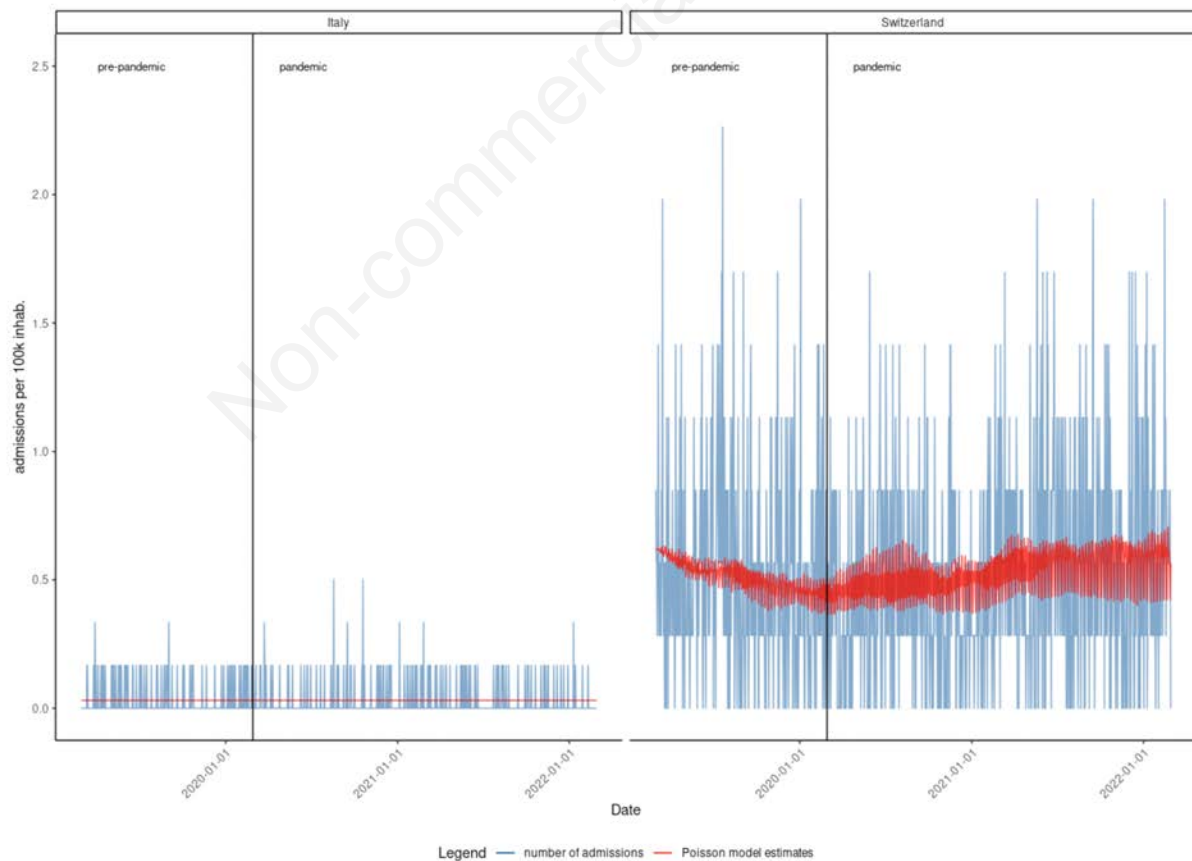


other studies carried out in Italy;<sup>6,15,17</sup> we found a significant reduction in voluntary admissions while the number of compulsory admissions remained stable; that mean an “increased threshold” for inpatient admissions and only the more severe patients keep being admitted to the psychiatric wards.<sup>16</sup> Moreover, compulsory admissions did not either show any autocorrelation or seasonality, nor seemed to be significantly influenced by any covariates. By contrast, in the Canton of Ticino the trend in both overall and compulsory psychiatric admissions was better explained by an autoregressive model of the seventh order, which included a weekly (seven days) seasonality, but not the rate of national Intensive Care Units admissions. The effect of both covariates was small but statistically significant and with opposite sign. In the Canton of Ticino, there has not been a reduction of beds in psychiatric wards. We observed an even more significant effect of the pandemic period on compulsory admissions. Having as main referrer the general hospital and in particular the emergency rooms (50% of admissions, rising to 70% for compulsory admissions), the impact of the restrictive measures, adopted for access to general hospitals, was more evident. In the CPC in the Canton of Ticino, around 40% of all admissions are compulsory, and, among them, 25% are due to drug/alcohol intoxication; moreover, about half of the compulsory admissions are linked (as first or second diagnosis) to an addiction disorder. Many authors<sup>21,23,39</sup> found a significant reduction of psychiatric ward admission for patients with a primary diagnosis of

addiction disorders during all the waves of the COVID-19 pandemic. For these reasons, the Canton of Ticino, we can speculate that the reduction of the psychiatric demand, especially for patients with a primary diagnosis of addiction disorders during all the waves of the COVID-19 pandemic, could be associated with a reduction of inpatient, especially for compulsory admissions. Another interesting finding of our study is that the crude rate of compulsory admission in the province of Como are much lower than those in the Canton of Ticino, regardless of the pandemic and the lockdown. These data led a further reflection: in Italy the rules for a compulsory admission (need of hospital care, care refusal) and the procedures (a proposal and validation signed by different physicians and ordinance signed by the mayor) are very rigid, compared to Switzerland, where it is sufficient the decision of a physician, regardless of his/her specialization (psychiatry or other), to make a compulsory inpatient admission executive. Our results may thus reflect very important differences in the Mental Healthcare Systems, Psychiatric Services organization, governmental measures between the two countries that seem to play an even more significant role to our results than the pandemic itself, restriction measures, fear and feelings about the risk of contagion in the general population, economic consequences and mass-media response.

### Strengths and limitations

To our knowledge, this is the first study to apply the same methodology to two different countries. In contrast with previous



**Figure 2.** Estimated (red line) and observed (blue line) compulsory admissions for each day per 100000 inhabitants, Compulsory admission estimate in Italy appear as a straight-line as it is described by a Poisson random variable (or the null model).

studies, we applied a model that allowed us to account for daily admissions instead of cumulative admissions in longer periods (weeks or months) and therefore to obtain estimates for the effect of interests accounting for both autocorrelation and seasonality. This study has several limits: first of all, the recruitment involved only of the number of admissions into the hospitals and is not representative of the entire psychiatric population. Then, we did not consider any data about length of stay, sociodemographic variables (age, ethnicity, marital, housing and economic status), diagnosis and disorder severity or pharmacological treatment. We expect, in line with the current literature, a significant reduction in elderly,<sup>6,21,40</sup> addiction disorders<sup>21,23,39</sup> and in mood disorders<sup>14,17</sup> and a general increase of length of stay.<sup>6,14</sup>

## Conclusions

In conclusion, we found a significant reduction of the overall admission in psychiatric wards in both province of Como and Canton of Ticino, while the reduction for compulsory admission was significant only in the Canton of Ticino. The differences between the two territories seem influenced more for the different mental health systems than for the differences in the severity of the pandemic and of the restrictions imposed by the countries.

## References

1. COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet* 2020;398:1700-12.
2. Fiorillo A, Sampogna G, Giallonardo V, et al. Effects of the lockdown on the mental health of the general population during the COVID-19 pandemic in Italy: Results from the COMET collaborative network. *Eur Psychiatry* 2020;63:e87.
3. Ambrosetti J, Macheret L, Folliet A, et al. Impact of the COVID-19 pandemic on psychiatric admissions to a large Swiss emergency department: an observational study. *Int J Environ Res Public Health* 2021;18:1174.
4. Balestrieri M, Rucci P, Amendola D, et al. Emergency psychiatric consultations during and after the COVID-19 lockdown in Italy. A multicentre study. *Front Psychiatry* 2021;12:697058.
5. Berardelli I, Sarubbi S, Rogante E, et al. The impact of the COVID-19 pandemic on suicide ideation and suicide attempts in a sample of psychiatric inpatients. *Psychiatry Res* 2021;303:114072.
6. Boldrini T, Girardi P, Clerici M, et al. Italian Network for Research on Mental Health during COVID-19 Pandemic. Consequences of the COVID-19 pandemic on admissions to general hospital psychiatric wards in Italy: Reduced psychiatric hospitalizations and increased suicidality. *Prog Neuropsychopharmacol Biol Psychiatry* 2021;110:110304.
7. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet* 2020;395:912-20.
8. Moser DA, Glaus J, Frangou S, Schechter DS. Years of life lost due to the psychosocial consequences of COVID-19 mitigation strategies based on Swiss data. *Eur Psychiatry* 2020;63:e58.
9. Öngür D, Perlis R, Goff D. Psychiatry and COVID-19. *JAMA* 2020;324:1149-50.
10. Stein DJ, Naslund JA, Bantjes J. COVID-19 and the global acceleration of digital psychiatry. *Lancet Psychiatry* 2022;9:8-9.
11. Pini S, Benvenuti A, Pacciardi B, et al. Characteristics of psychiatric comorbidities in emergency medicine setting and impact on length of hospitalization: A retrospective study. *Emerg Care J* 2022;18:10216.
12. Butler M, Delvi A, Mujic F, et al. Reduced activity in an inpatient liaison psychiatry service during the first wave of the COVID-19 pandemic: Comparison with 2019 data and characterization of the SARS-CoV-2 positive cohort. *Front Psychiatry* 2021;12:619550.
13. Carpiello B, Tusconi M, Zanalda E, et al. Executive Committee of The Italian Society of Psychiatry. Psychiatry during the Covid-19 pandemic: a survey on mental health departments in Italy. *BMC Psychiatry* 2020;20:593.
14. Fasshauer JM, Bollmann A, Hohenstein S, et al. Impact of COVID-19 pandemic on involuntary and urgent inpatient admissions for psychiatric disorders in a German-wide hospital network. *J Psychiatr Res* 2021;142:140-3.
15. Jagadheesan K, Danivas V, Itrat Q, et al. COVID-19 and psychiatric admissions: An observational study of the first six months of lockdown in Melbourne. *Psychiatry Res* 2021;300:113902.
16. Kim HK, Carvalho AF, Gratzler D, et al. The impact of COVID-19 on psychiatric emergency and inpatient services in the first month of the pandemic in a large urban mental health hospital in Ontario, Canada. *Front Psychiatry* 2021;12:563906.
17. Panariello F, Longobardi S, Cellini L, et al. Psychiatric hospitalization during the two SARS-CoV-2 pandemic waves: New warnings for acute psychotic episodes and suicidal behaviors. *World J Psychiatry* 2021;11:1095-105.
18. Piccinelli MP, Bortolaso P, Wilkinson GD. Rethinking hospital psychiatry in Italy in light of COVID-19 experience. *World J Virol* 2022;11:73-81.
19. Rømer TB, Christensen RHB, Blomberg SN, et al. Psychiatric admissions, referrals, and suicidal behavior before and during the COVID-19 pandemic in Denmark: A time-trend study. *Acta Psychiatr Scand* 2021;144:553-62.
20. Bollmann A, Hohenstein S, Pellissier V, et al. Utilization of in- and outpatient hospital care in Germany during the Covid-19 pandemic insights from the German-wide Helios hospital network. *PLoS One* 2021;16:e0249251.
21. Hamlin M, Ymerson T, Carlsen HK, et al. Changes in psychiatric inpatient service utilization during the first and second waves of the COVID-19 pandemic. *Front Psychiatry*, 2022;13:829374.
22. Grimshaw B, Chaudhuri E. Mental-health-related admissions to the acute medical unit during COVID-19. *Clin Med (Lond)* 2021;21:e77-e79.
23. Sidana A, Goel V, Kaur S. Impact of the COVID-19 pandemic on psychiatric hospitalization in a tertiary care hospital of northern India. *Prim Care Companion CNS Disord* 2021;23:21m02936.
24. ISTAT. Available from: <http://dati.istat.it/Index.aspx?QueryId=18460>
25. Swiss Confederation. Federal office for statistics. Available from: <https://www.bfs.admin.ch/bfs/de/home/statistiken>
26. Hale T, Angrist N, Hale AJ, et al. Government responses and COVID-19 deaths: Global evidence across multiple pandemic waves. *PLoS One* 2021;16:e0253116.
27. GITHUB. COVID-19 Monitoring service. Available from: <https://github.com/pcm-dpc/COVID-19>

28. Swiss Confederation. Federal Office of Public Health. COVID-19. Available from: <https://www.covid19.admin.ch/it/epidemiologic/case>
29. Our World in Data. Available from: <https://ourworldindata.org>
30. Liboschik T, Konstantinos F, Roland F. tscount: An R package for analysis of count time series following generalized linear models. *J Statistical Software* 2017;82:1-51.
31. Dohan FC. Wartime changes in hospital admissions for schizophrenia. A comparison of admission for schizophrenia and other psychoses in six countries during World War II. *Acta Psychiatr Scand* 1966;42:1-23.
32. Haker H, Lauber C, Malti T, Rössler W. Is there an impact of global and local disasters on psychiatric inpatient admissions? *Eur Arch Psychiatry Clin Neurosci* 2004;254:330-4.
33. Beghi M, Ferrari S, Brando, et al. Effects of lockdown on emergency room admissions for psychiatric evaluation: an observational study from 4 centres in Italy. *Int J Psychiatry Clin Pract* 2021;30:1-5.
34. Bojdani E, Rajagopalan A, Chen A, et al. COVID-19 Pandemic: Impact on psychiatric care in the United States. *Psychiatry Res* 2020;289:113069.
35. Giostra F, Mirarchi MG, Farina G, et al. Impact of COVID-19 pandemic and lockdown on emergency room access in Northern and Central Italy. *Emerg Care J* 2021;17:9705.
36. Beghi M, Ferrari S, Biondi L, et al. Mid-term psychiatric consequences of the COVID-19 pandemic: a 4 months observational study on emergency room admissions for psychiatric evaluation after the (first) lockdown period in Italy. *Soc Psychiatry Psychiatr Epidemiol* 2022;57:1283-9.
37. Beghi M, Brandolini R, Biondi L, et al. Effects after the lockdown on emergency room admissions for psychiatric evaluation: An observational study from the province of Forlì-Cesena, Italy. *Emerg Care J* 2021;17:9827.
38. Ambrosetti J, Macheret L, Folliet A, et al. Psychiatric emergency admissions during and after COVID-19 lockdown: short-term impact and long-term implications on mental health. *BMC Psychiatry* 2021;21:465.
39. McCarron RH, Swann P, Artingstall J, et al. Factors in psychiatric admissions: Before and during the COVID-19 pandemic. *Clin Neuropsychiatry* 2021;18:270-7.
40. Tromans S, Chester V, Harrison H, et al. Patterns of use of secondary mental health services before and during COVID-19 lockdown: Observational study. *BJPsych Open* 2020;6:e117.

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