

Association between COVID-19 and self-harm: a nationwide retrospective ecological spatiotemporal study in metropolitan France

Maëlle Baillet, Marielle Wathelet, Antoine Lamer, Camille Frévent, Thomas Fovet, Fabien D'Hondt, Charles-Edouard Notredame, Guillaume Vaiva, Michael Génin

Submitted to: JMIR Public Health and Surveillance
on: September 14, 2023

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Maëlle Baillet^{1,2} MD, MSc; Marielle Wathelet^{3,4,5} MD; Antoine Lamer^{4,1,2} PhD; Camille Frévent¹ PhD; Thomas Fovet³ MD, PhD; Fabien D'Hondt^{3,5} PhD; Charles-Edouard Notredame³ MD; Guillaume Vaiva³ Prof Dr Med; Michael Génin¹ PhD

¹Univ. Lille, CHU Lille, ULR 2694 - METRICS: Évaluation des technologies de santé et des pratiques médicales, Lille, France Lille FR

²Univ. Lille, UFR 3S, Faculté Ingénierie et Management de la Santé, Lille, France Lille FR

³Univ. Lille, INSERM, CHU Lille, U1172 - Lille Neuroscience & Cognition, F-59000 Lille, France Lille FR

⁴F2RSM Psy - Fédération régionale de recherche en psychiatrie et santé mentale Hauts-de-France, Saint-André-Lez-Lille, France. Saint-André-Lez-Lille FR

⁵Centre National de Ressources et de Résilience Lille-Paris, Lille, France Lille FR

Corresponding Author:

Michael Génin PhD

Univ. Lille, CHU Lille, ULR 2694 - METRICS: Évaluation des technologies de santé et des pratiques médicales, Lille, France
1 place de Verdun, Faculté de Médecine, Pôle Recherche, CERIM
Lille
FR

Abstract

Background: The COVID-19 pandemic has not been associated with increases in suicidal behaviour at the national, regional, or county level. However, previous studies were not conducted on a finer scale or adjusted for ecological factors. Our objective was to assess the fine-scale spatiotemporal association between self-harm and COVID-19 hospitalizations, while considering ecological factors.

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Results: Compared with a smoothed SIR of 1, smoothed SIRs from 1 to 3, from 3 to 4 and greater than 4 for COVID-19 hospital admissions were associated with a subsequent increase in hospital admissions for self-harm, with a time lag of 2 to 4 months, 4 months, and 6 months, respectively.

Conclusions: A high SIR for hospital admissions for COVID-19 was a risk factor for hospital admission for self-harm some months after the epidemic peaks. This finding emphasizes the importance of monitoring and seeking to prevent suicide attempts outside the epidemic peak periods.

(JMIR Preprints 14/09/2023:52759)

DOI: <https://doi.org/10.2196/preprints.52759>

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Original Manuscript

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Results: Compared with a smoothed SIR of ≤ 1 , smoothed SIRs from 1 to 3, from 3 to 4 and greater than 4 for COVID-19 hospital admissions were associated with a subsequent increase in hospital admissions for self-harm, with a time lag of 2 to 4 months, 4 months, and 6 months, respectively.

Conclusions: A high SIR for hospital admissions for COVID-19 was a risk factor for hospital admission for self-harm some months after the epidemic peaks. This finding emphasizes the importance of monitoring and seeking to prevent suicide attempts outside the epidemic peak periods.

Keywords: Self-harm; COVID-19; spatiotemporal analysis; ecological regression; Data reuse

Introduction

The COVID-19 pandemic, which emerged in late 2019, swiftly evolved into a global crisis, prompting unprecedented measures such as lockdowns. Historically, epidemics and containment measures have been linked to adverse mental health outcomes [1]. As expected, early investigations in China revealed a surge in psychiatric disorders among COVID-19 survivors and in the general population [2].

The occurrence of mental health disorders, coupled with the impact of the pandemic on risk factors of suicide such as social isolation, precariousness, or reduced access to mental healthcare, has raised concerns about a potential rise in suicidal behaviours due to the Covid-19 pandemic [3,4]. The appearance of warning signs, such as increased consumption of psychotropic medications, has further heightened concerns on this subject [5,6]. Furthermore, cases of suicide deaths have already been observed during similar previous events such as during the Spanish flu in 1918-1919 or during the severe acute respiratory syndrome outbreak in Hong Kong in 2003 [7].

Despite these different elements on which the concerns are based, the literature has not reported consistent evidence between the COVID-19 pandemic and suicidal behaviour and/or self-harm. For instance, in France, Jollant et al. found a decrease in the number of hospital

admissions for self-harm from January to August 2020 (compared for the same period in 2019) at the county level [8]. Several studies of the whole of 2020 and even some of early 2021 have led to contradictory results. In some countries, there was no obvious increase in suicidal behaviour and self-harm after the onset of the crisis, relative to previous years [9,10]. In others (such as Japan), several studies found an initial decrease in suicide rates during the first months of the crisis and then an increase during the second half of 2020 (corresponding to the period between two lockdowns), before a return to the pre-pandemic level in early 2021 [11]. Finally, the most recent systematic review, including 34 studies, did not indicate a significant change in suicide rates during the COVID-19 pandemic. The pooled suicide rate in the studied period before the pandemic was 11.38 per 100,000 (95% CI 9.35-13.42) and in the period during the pandemic was 10.65 per 100,000 (95% CI 8.61-12.68) [12].

However, the majority of these studies were carried out at the national level and some focused on particular metropolitan regions [11] or a single region [10]. The use of these large-scale geospatial units potentiates the risk for ecological fallacy [13]. Spatio-temporal correlation analysis, conducted at a fine-scale and accounting for local socio-economic factors and temporal trends in COVID-19 incidence, are lacking [14]. Indeed, given the heterogeneity across geographic regions, a nuanced examination of spatiotemporal suicide patterns, incorporating ecological variables such as social deprivation, urbanicity, and access to care, is imperative [15,16].

Therefore, our study aims to fill this gap by conducting a comprehensive ecological analysis to assess the fine-scale spatiotemporal association between hospital admissions for self-harm and COVID-19, while considering ecological factors such as social deprivation, living alone, accessibility to primary care, and urbanicity.

Methods

Study setting and data

This retrospective, observational study involved patients over the age of 10 hospitalized in a medical, surgical or obstetrics ward for self-harm from January 2019 to December 2021 and/or for COVID-19 from March 2020 to December 2021 in metropolitan France (mainland France and Corsica, an area covering a total of 543,940 km² and 57,249,208 inhabitants aged 10 and over in 2018) [16]. A hybrid spatial unit described in previous work, was used to divide metropolitan France into 5,535 spatial units [17]. The time unit was the month.

Hospital stays were identified and extracted from the French national hospital discharge database (Programme de médicalisation des systèmes d'information, PMSI), which included details of all stays in the country's public- and private-sector hospitals. In the PMSI, a unique national identifier for each patient enables all their hospital stays to be chained together. At the hospital stay level, the database contains information on the date of admission, the date of discharge, and sociodemographic variables (such as the patient's age, sex, and place of residence). For each stay, the principal diagnosis (i.e. the reason for admission) and associated diagnoses (corresponding to the patient's comorbidities) are also collected. The diagnoses are documented according to the French version of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD10). Although only self-harm and COVID-19 requiring hospital admission can be identified, they correspond to what can reasonably assume to be the most serious cases.

Regarding self-harm, all hospital stays that included ICD10 codes X60 through X84 for associated diagnoses in the 2019, 2020 or 2021 databases were included. We considered these associated diagnosis codes only because the PMSI does not allow them to be used for the principal diagnosis. Regarding COVID-19, all hospital stays including ICD10 codes U0710, U0711, U0714 and U0715 as the principal diagnosis in the 2020 or 2021 databases were included. Code U0712 was not included because it corresponds to asymptomatic COVID-19 and therefore was assumed not to be severe. Code U0713 was not included because it (i) corresponds to examinations related to the COVID-19 outbreak and (ii) can only be used as an associated diagnosis.

The exclusion criteria were hospital stays (i) with an invalid anonymous code (making it impossible to chain together stays for a given patient), (ii) with an admission date identical to the discharge date of a previous stay (corresponding to a hospital transfer, for example), (iii) with a year of admission earlier than 2019 for self-harm and March 2020 for COVID-19 (since the stays are included in a database according to their year of discharge, and the codes for COVID-19 appeared in February 2020 only), (iv) corresponding to recurrent stays in the same month for self-harm and at any time for COVID-19, (v) by patients under 10 years of age and, (vi) with an invalid zip code or one corresponding to a French overseas region or dependency (making it impossible to identify the spatial unit).

Since we measured monthly incidences, we considered all recurrent stays for self-harm for the same patient during the same month as hospital readmissions after previous self-harm, and so this situation was not considered to be an incident case. In contrast, it was considered that all hospital readmissions of the same patient for COVID-19 were related to the first stay, since repeat infections were rare during this period [18]. All hospital readmissions of the same patient for COVID-19 were therefore not considered to be incident cases. For each stay ultimately selected, we extracted the patient's sex, five-year age group, and geographic code of the place of residence.

Ecological variables

The ecological variables considered were social deprivation, accessibility to a GP, urbanicity and living alone. These ecological factors were chosen because they are known to be risk factors for suicidal behaviour at the population level [19,20].

Social deprivation was estimated via the French Deprivation Index (FDep, issued by the French National Institute of Statistics and Economic Studies, INSEE), which considers the median income, the percentage of people with a high school leaving certificate, the percentage of manual and office workers, and the unemployment rate at the spatial unit level [19]. The FDep corresponds to the first component in a principal component analysis of these four variables: the higher the FDep index, the greater the degree of social deprivation within the spatial unit.

Access to a GP was evaluated using the Localized Potential Accessibility (LPA, an indicator developed by the French Directorate for Research, Studies, Evaluation and Statistics (DREES)), calculated as the number of accessible consultations/visits per standardized population: the higher the LPA index, the greater the patients' access to a GP [20].

Urbanicity was estimated by evaluating the percentage of artificialized surfaces in each spatial unit, as recorded in the Corine Land Cover database [21]. We considered level 1, which corresponds to the main categories of land use identified on a global scale: urban features, industrial, commercial and transport units, mines, dumps, construction sites, and artificial, non-agricultural green areas.

Living alone was defined as the ratio between the number of single-person households in the spatial unit and the total number of households in the spatial unit, according to the data reported by the INSEE [16].

All variables were obtained for 2018 - the most recent year for which all were available. Since the spatial unit was the commune (municipality) in all cases, the data were aggregated at the spatial unit level by using the population-weighted average. The study's reference population was

that corresponding to people aged 10 years and over living in metropolitan France in 2018, according to data from the INSEE.

Statistical analyses

Firstly, we calculated the monthly incidence rates of hospital admission for self-harm (from 2019 to 2021) and for COVID-19 (from March 2020 to 2021) in metropolitan France. The numerator corresponded to incident cases (i.e. new cases of self-harm and COVID-19 in metropolitan France), and the denominator corresponded to the reference population. The incidence rates by five-year age group and by sex were also calculated over the same period.

Spatio-temporal modelisation of self-harm and COVID-19 incidences. In order to describe the spatio-temporal patterns of incidence of self-harm and COVID-19, we have specified a hierarchical Bayesian model that is commonly used in disease-mapping [22,23]. Two separate models were considered for the incidence of self-harm and the incidence of COVID-19, respectively. In each model, the number of incident cases is modelled by a Poisson distribution in which the mean is a function of i) the expected number of incident cases, calculated by indirect age and gender standardisation, using France as the reference population; ii) several random effects capturing temporal and spatial patterns of incidence and their interactions. We fitted several spatio-temporal models with no covariates, including respectively the spatial random effect and all combinations of temporal random effects and spatio-temporal interactions. The model with the best fit was chosen as the one minimizing the Watanabe-Akaike information criterion (WAIC). To describe the spatio-temporal patterns, we reported the smoothed spatio-temporal Standardized incidence ratio (SIR) for each spatial unit and month over the period March 2020 to December 2021.

In terms of interpretation, a spatiotemporally smoothed SIR for hospital admissions for self-harm less than 1 or greater than 1 corresponds to under- or over-incidence, respectively, relative to the national monthly incidence in 2019. A smoothed SIR for COVID-19 hospital admissions lower than 1 and greater than 1 corresponds to an incidence below and above the national average, respectively, relative to the national average monthly incidence from March 2020 to December 2021. Mathematical formulations of the model, prior specifications and model choice criterion are detailed in Multimedia Appendix 1.

Ecological regressions. To assess the association between hospital admissions for self-harm and those for COVID-19, we performed an ecological regression, i.e. an extension of the previous modelling framework in which one or more covariates are included in the model as fixed effects. The effect of each covariate on hospital admission for self-harm was assessed by using the exponential of the coefficient associated with the covariate (the relative risk) and its Bayesian 95% credibility interval (BCI). The smoothed SIRs for hospital admissions for COVID-19 were transformed into classes: [0-1], (1-2], (2-3], (3-4], >4. The reference class was class [0-1], which corresponded to below-average incidence relative to the whole study area and study period. Firstly, the SIRs for hospital admissions for self-harm were modelled by including the discretized smoothed SIRs of hospital admissions for COVID-19 calculated earlier as the only covariate. Given that COVID-19 might have had a time-lagged effect on hospital admissions for self-harm, lags ranging from 0 to 6 months were tested. Secondly, the ecological variables were included in the ecological regression by using forward selection on the basis of the WAIC.

All models were estimated using the integrated nested Laplace approximation (INLA) approach [24]. All analyses were carried out using RStudio (R Core Team, 2022, version 4.2.2) and the R-INLA package [25,24].

Ethics approval

The present observational study reused data from a national hospital discharge database. In France, this type of study does not require approval by an independent ethics committee. The study complied with the French government's MR005 reference methodology, which governs access to PMSI data by healthcare institutions.

Results

Flowchart

A total of 241,178 stays for self-harm were extracted (97,476 between January 2019 and February 2020, and 143,702 between March 2020 and December 2021) (Figure 1). For COVID-19, 426,182 hospital stays were extracted.

National trends in the monthly incidence rate

Concerning self-harm, a drop in the incidence rate was observed in February 2019, April 2020, and December 2021, with values of 10.25/100,000 inhabitants, 9.64/100,000 inhabitants, and 10.03/100,000 inhabitants, respectively (Figure 2). The incidence rate of self-harm in March to December 2020 was lower than in the same period in 2019 (9.64 to 11.50/100,000 inhabitants, vs 11.60 to 13.05/100,000 inhabitants, respectively). The incidence rate of hospital admissions for self-harm peaked in May 2019 and May 2021, with values of 13.05/100,000 inhabitants and 13.53/100,000 inhabitants, respectively. Concerning the COVID-19 incidence rate, there were three main peaks in March 2020, November 2020 and April 2021, with values of 76.65/100,000 inhabitants, 69.74/100,000 population, and 76.19/100,000 inhabitants, respectively.

The incidence rate of hospital admissions for self-harm was higher for women than for men in all age groups (see Figure 3). The difference was greatest in the 10-29-year-old age group. A decrease in the incidence rate of hospital admissions for self-harm in all groups was observed to varying degrees in March and April 2020. There was an increase in the incidence rate of hospital admissions for self-harm in 2021 among young women aged 10 to 29 but not in the other age groups of women or among men. In the group of women aged 10 to 29, the incidence rate also decreased in the months of July and August in all years. Regarding COVID-19, the incidence rate of hospital admissions was higher in men in all age groups. This incidence rate also increased with age, and the difference between men and women was greatest during periods with the high incidence rates.

Spatiotemporal models

Based on the selected models, the changes over time in the SIRs for self-harm and COVID-19 are presented in Multimedia Appendix 4, which also shows the timeline of the various health measures. The SIR for hospital admissions for self-harm appeared to be roughly stable at the spatial level over time. In contrast, there was more spatial and temporal variation in SIR for COVID-19 hospital admissions. The increase in the SIRs for COVID-19 hospital admissions coincided with the implementation of health measures, such as confinement. Conversely, the decrease in the SIRs coincided with the end of these measures.

Assessment of the fine-scale spatiotemporal association between hospital admissions for self-harm and hospital admissions for COVID-19

Compared with the reference class (a SIR lower than or equal to 1, i.e. spatiotemporal units with a below-average incidence rate for hospital admission for COVID-19 over the study period), several smoothed COVID-19 SIR classes greater than 1 had a statistically significant association

with hospital admissions for self-harm over the study period (March 2020 to December 2021) (Figure 4). At 2 months, a statistically significant effect was present in SIR classes (1-2) (1.021 [1.002-1.041]), (2-3) (1.045 [1.018-1.073]) and (3-4) (1.039 [1.003-1.075]). At 3 months, a statistically significant effect was present in SIR classes (1-2) (1.028 [1.009-1.047]), (2-3) (1.067 [1.040-1.094]), (3-4) (1.039 [1.003-1.075]) and >4 (1.039 [1.001-1.079]). At 4 months, a statistically significant effect was present in SIR classes (1-2) (1.034 [1.014-1.053]), (2-3) (1.044 [1.016-1.071]), and (3-4) (1.065 [1.028-1.102]). At 5 months, a statistically significant effect was present for class (3-4) (1.038 [1.002-1.075]). Lastly, at 6 months, a statistically significant effect was present for classes (3-4) (1.044 [1.008-1.080]) and >4 (1.057 [1.018-1.096]). No statistically significant effects were present at 0 or 1 months.

Ecological factors associated with hospital admission for self-harm incidence.

In ecological regressions (Figure 5), a high FDep (i.e. high social deprivation), a high proportion of living alone, and a high LPA were identified as risk factors for the incidence rate of hospital admission for self-harm, whatever the time lag; for example, the relative risks [95% BCI] were 1.091 [1.074-1.107], 1.069 [1.055-1.083] and 1.030 [1.015-1.045] respectively with 4-month lag (the model with the lowest WAIC: 267055.88). For the smoothed COVID-19 SIR, a statistically significant effect persisted in SIR class (2-3] at 2 months (1.038 [1.011-1.065]). At 3 months, a statistically significant effect persisted in SIR classes (1-2] (1.024 [1.005-1.044]) and (2-3] (1.060 [1.033-1.088]). At 4 months, a statistically significant effect persisted in SIR classes (1-2] (1.029 [1.010-1.049]), (2-3] (1.037 [1.009-1.064]), and (3-4] (1.054 [1.018-1.092]). No statistically significant effect persisted at 5 months. At 6 months, a statistically significant effect persisted in SIR class >4 (1.043 [1.005-1.083]).

Discussion

Principal Results

In the present study of data from metropolitan France, we studied the national monthly incidence rate of hospital admissions for self-harm from January 2019 to December 2021 and the rate for COVID-19 from March 2020 to December 2021. Regarding hospital admissions for self-harm, we observed a decrease in incidence rates from March 2020 to December 2020 (relative to the same period in 2019). In general, the incidence rates for hospital admissions for self-harm were higher among women. The effect was especially marked in the 10-29 age group and less marked in the 50-69 age group. The incidence rates were higher in women aged 10 to 29 years in all periods of interest. Moreover, this was the only class with a high incidence rate at the end of 2020, compared with the same period in 2019. Our spatiotemporal analyses of hospital admissions for self-harm showed that there were no clear spatial variations over time in the SIR. For COVID-19 hospital admissions, the SIR showed spatial and temporal variations consistent with the implementation of health measures. Social deprivation, living alone, and GP accessibility prior to the pandemic were risk factors for hospital admissions for self-harm. After adjustment for these ecological variables, the relationship between hospital admissions for self-harm and those for COVID-19 was not statistically significant when contemporaneous variations or a one-month lag were modelled. In contrast, hospital admissions for COVID-19 were associated with an increase in hospital admissions for self-harm when a 2- to 6-month lag was modelled. It appeared that the time lag between hospital admissions for COVID-19 and those for self-harm was dependent on the SIR for COVID-19. Thus, a COVID-19 incidence 1 to 3 times the average over the study period and over the area (i.e. a SIR from 1 to 3), 3 to 4 the average (SIR from 3 to 4) and at 4 times or more the average (SIR >4) were respectively risk factors for self-harm hospital admission 2 to 4 months later, 4 months later and 6 months later, compared with the reference below-average incidence rate (SIR ≤ 1).

Comparison with Prior Work

Concerning the change in the incidence rate of hospital admissions for self-harm in metropolitan France between 2019 and 2020, the decrease observed in our study is consistent with previous studies in the field [8–10,26]. The predominance of hospital admissions for self-harm in women had already been observed in France by Chan-Chee between 2008 and 2017 [27]. Moreover, this incidence rate predominated in young women aged 15 to 19 years in a manner consistent with the results of our study in which we find a predominance of the incidence rate in young women aged 10 to 29 years. Regarding the increase in the incidence rate of hospital admissions for self-harm for young women aged 10 to 29 years from the end of 2020, different studies have also found this effect in young women aged 10 to 18 years [9,28]. Appendix 3 shows in more detail the change in the incidence rate among young people aged 10 to 29 in our study and shows that this increase was also predominant among young women aged 15 to 19 and 10 to 14.

To our knowledge, the incidence rate of hospital admissions for self-harm in France had not yet been studied at such a fine spatiotemporal scale. In 2018, Chan-Chee studied hospital admissions for self-harm in short-term care facilities between 2008 and 2017 at a regional and annual scale [27]. In our study, the spatiotemporal distribution of hospital admissions for self-harm was spatially disparate but appeared to be rather stable at the temporal scale with a predominance of hospital admissions for self-harm, particularly in the North of France and in Bretagne (western tip of France). These results are consistent with the results published by Chan-Chee [27]. Concerning the spatiotemporal evolution of hospital admissions for COVID-19, the spatiotemporal distribution was more disparate. However, it was consistent with the chronology of the health measures implemented by the government.

Social deprivation, living alone, and accessibility to a GP in 2018 were risk factors of hospital admission for self-harm. Social deprivation [11] and social isolation [29] were already known to be risk factors for suicidal behaviours in the pre-COVID-19 period. Their effect therefore appeared to persist during the pandemic. General practitioners have an important role in suicide prevention [30]. However, the effect of GP accessibility on suicidal behaviours has not - to the best of our knowledge - been studied previously. Surprisingly, we found that access to a GP was associated with an increased risk of self-harm; this might be because the majority of suicide attempts involve by voluntary drug self-administration [31]. Having access to a GP would give access to prescription medications [32]. This association might also be biased by confounding factors, since GP accessibility is usually higher in an urban environment. We did not find that urbanicity was a risk factor for hospital admission for self-harm - possibly because of its collinearity with access to a GP [15].

In the present study, we assessed the fine-scale spatiotemporal association between hospital admissions for self-harm and COVID-19 and then adjusted the results for ecological variables known to be risk factors. The reference class was below-average hospital admission for COVID-19 over the study period and the study area ($SIR \leq 1$). On average, a SIR for hospital admission for COVID-19 from 1 to 3 was a risk factor and ranged from 2.4% to 6.0% vs. the reference class for hospital admissions for self-harm, with a lag of 2 to 4 months. A COVID-19 SIR from 3 to 4 was a risk factor (5.4%) vs. the reference class for hospital admissions for self-harm, with a lag of 4 months. Lastly, a COVID-19 SIR greater than 4 was a risk factor (4.3%) vs. the reference class for hospital admissions for self-harm, with a lag of 6 months. Hence, the higher the COVID-19 SIR, the longer the time lag to hospital admissions for self-harm. To the best of our knowledge, our study is the first to have looked at the average association between the SIRs for COVID-19 hospital admissions and self-harm hospital admissions. Although many studies have found a decrease in self-harm in 2020-2021 vs. 2019 [8–10,26], we evidenced a positive fine-scale association between hospital admissions for COVID-19 and those for self-harm over the 2020-2021 period, with a lag of several months. One can hypothesize that COVID-19 impacted the occurrence of self-harm with a time lag, due to the above-mentioned direct and indirect consequences of the pandemic – notably an increase in mental health disorders in COVID-19 survivors and in the general population. Alternatively, one can hypothesize that COVID-19 did not have an impact on suicide attempts but that it reduced access to healthcare (due to lockdowns and/or fear of being contaminated in hospital). In that case, the delayed appearance of admission for self-harm would simply reflect the return to a normal situation, i.e. the lifting of confinement and restrictions, the decongestion of care services, and hospital admission for a suicide attempt rather than staying at home.

Implications and perspectives

The findings of our study carry significant implications for public health policy and suicide prevention strategies in the context of a pandemic. The key implications of our study is the need for dynamic and adaptive suicide prevention strategies. Indeed, despite the overall decrease in hospital admissions for self-harm observed nationwide in 2020 compared to 2019, we found that hospital admissions for COVID-19 hotspots were associated with a delayed increase in hospital admissions for self-harm, with a lag of 2 to 6 months. Furthermore, our findings highlight the importance of addressing underlying social determinants of mental health, such as social deprivation and social isolation, which were identified as risk factors for hospital admissions for self-harm. Overall, this underscores the importance of proactive surveillance and targeted interventions to mitigate the impact of epidemic peaks on mental health outcomes, particularly suicidal behaviors. This may involve deploying resources and support services to at-risk areas, investing community-based interventions that promote social connectedness and provide support to vulnerable populations [33]. In addition to large-scale interventions, public policies must thus be implemented in the territories,

consistent with local specificities, in order to reduce both suicidal behaviours and geographic disparities [34]. Fine-scale spatial analysis are thus necessary to identify at-risk areas and target prevention efforts, especially in health crisis contexts where resources are likely to be limited.

In addition to targeted interventions, there is a critical need for ongoing research to deepen our understanding of the complex relationship between the COVID-19 pandemic and mental health outcomes. Future studies should explore the underlying mechanisms driving the observed association between COVID-19 incidence and subsequent self-harm admissions, including the role of psychological distress, access to mental health services, and stigma surrounding help-seeking behaviors. Moreover, given the observed increase in hospital admissions for self-harm among adolescent girls in 2021, there is a pressing need for research focused on understanding and addressing the unique mental health challenges faced by this demographic group [35]. Spatial-temporal studies offer an analytical framework to better understand the geographical and temporal variations in suicidal behaviors, including the observed increase in suicide among young girls during the COVID-19 crisis. These studies can help identify geographic clusters where suicide rates among young girls have disproportionately increased during the COVID-19 crisis, provide an analysis of temporal trends to assess the long-term impact of the pandemic, and explore the social determinants of suicidal behaviours among girls. This may include factors such as social isolation, family stress, economic hardships, and access to mental health services. Coupled with qualitative research, this could help understanding the phenomenon and provide tailored solutions to address it.

Strengths

Our study had several strengths. It is the first to have evaluated the (i) distribution of hospital admissions for self-harm and for COVID-19 in France on a fine spatiotemporal scale, and (ii) different time lags in the average association between these two variables. The spatiotemporal distribution of hospital admissions for self-harm and for COVID-19 were analysed using a robust statistical method, with adjustment for spatial and temporal autocorrelations. In the BYM spatiotemporal model for hospital admissions for self-harm, the reference was the number of cases expected with the same incidence as before the pandemic in 2019. The fine-scale analysis enabled us to reduce sources of ecological biases. Lastly, we adjusted the models for ecological variables known to be risk factors for hospital admission for self-harm.

Limitations

Our study also had some limitations. The COVID-19 incidence and the ecological variables were assessed on the territory scale, and so the associations highlighted in this study cannot therefore be considered at the individual level. The PMSI database does not contain data on patients who are self-harming but are not hospitalized. Hence, self-harm may have been underestimated, particularly in the context of COVID-19. Indeed, one can hypothesize that the patients who would normally have been hospitalized were not hospitalized (due to a lack of hospital resources) or that patients feared contamination and were less likely to attend the emergency department. Thus, we assumed that patients hospitalized for self-harm and/or for COVID-19 presented the most severe forms of these conditions. Although, the codes X60 to X84 are regularly used in the literature to identify self-harm, they can be only associated diagnoses and so might have been less well coded than the other types of diagnoses; this might have led to underestimation. Another limitation related to the PMSI database concerned the difficulty in distinguishing successive hospital admissions for the same self-harm incident from hospital admission for a new self-harm incident. We decided to select only the first self-harm incident in the monthly at the individual level but we could not be certain that this was a new self-harm incident and not a follow-up admission for a previous self-harm incident. These

PMSI-related limitations cannot be circumvented, and there is no national-scale cohort that would allow us to take all the self-harm incidents into account. We therefore thus assume that the results of the present study provide an initial estimate. Last, the data on the ecological variables came from 2018, i.e. before the pandemic period; however, more recent data were not available. If the health crisis had had an impact on these variables, it would not have been taken into account in the present study. Social isolation is a significant risk factor for suicidal behavior. Social isolation cannot be reduced to living alone and involves other components such as frequency of contact with family or friends, participation in group activities, etc. However, due to the ecological variables available to us, we were only able to use the fact of living alone to approach social isolation.

Conclusions

Our results showed that despite the nationwide decrease in hospital admissions for self-harm in 2020 (compared with 2019), the frequency of hospital admission for COVID-19 in the space-time unit was a risk factor for subsequent hospital admission for self-harm. The time lag between the two types of admission ranged from 2 to 6 months; the higher the SIR for hospital admission for COVID-19, the greater the time lag to a hospital admission for self-harm. Our results show that it is important to monitor and seek to prevent suicide attempts away from epidemic peaks. Future research should focus on the spatiotemporal changes in self-harm (compared with 2019) and particularly on the situation among adolescent girls, given the observed increase in hospital admissions for self-harm in this group in 2021.

Conflicts of Interest

The study was funded by the French government via the DREES. The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The authors were funded by their own institutions (see affiliations), which equally had no role in the analyses or the writing of this report.

Contributors

Maëlle Baillet wrote the original draft and conducted the formal analyses. Michaël Génin and Antoine Lamer supervised the analyses.

Michaël Génin and Marielle Wathélet conceptualized the research goals. All authors contributed to the discussion, read the manuscript, and approved it.

Abbreviations

BCI: Bayesian 95% credibility interval

BYM: Bayesian hierarchical Poisson model

DREES: French Directorate for Research, Studies, Evaluation and Statistics

Fdep: French Deprivation Index

GP: general practitioner

ICD10: International Statistical Classification of Diseases and Related Health Problems, 10th Revision

INSEE: French National Institute of Statistics and Economic Studies

LPA: Localized Potential Accessibility

PMSI: in French, Programme de médicalisation des systèmes d'information, French national hospital discharge database

SIRs: standardized incidence ratios

WAIC: Watanabe-Akaike information criterion

Figures

Figure 1. Flowchart hospital stays for self-harm (a) and COVID-19 (b). DROM-COM : Department Overseas Region and Overseas Collectivity.

Figure 2. Changes in the monthly incidence rate of hospitalizations for self-harm from January 2019 to December 2021 (a) and for COVID-19 from March 2020 to December 2021 (b).

Figure 3. Changes in the monthly incidence rate of hospitalizations for self-harm from January 2019 to December 2021 (a) and COVID-19 from March 2020 to December 2021 (b) by age group and sex. yo : years old ; Jan : January ; Feb : February ; Mar : March ; Apr : April ; Jun : June ; Jul : July ; Aug : August ; Sep : September ; Oct : October ; Nov : November ; Dec : December.

Figure 4. Associations between hospitalization SIR for COVID19 and hospitalizations for self-harm with different lags between the two types of hospitalizations (0 to 6 months). For example, a 3-month lag is the SIR of COVID-19 hospitalizations at time T to assess the IRs of self-harm hospitalizations at T+3 months. RR: Relative Risk; BCI: Bayesian Credibility Intervals; SIR: Standardized Incidence Ratio; WAIC: Watanabe - Akaike information criterion.

Figure 5. Ecological regression assessing the association between smoothed COVID-19 SIRs, ecological variables, and hospitalizations for self-harm with different lags (0 to 6 months). For example, a 3-month lag is the SIR of COVID-19 hospitalizations at time T to assess the SIRs of self-harm hospitalizations at T+3 months. FDep: French Deprivation Index; LPA:Localized Potential Accessibility; SA:Suicide Attempt; RR: Relative Risk; BCI: Bayesian Credibility Interval; SIR: Standardized Incidence Ratio; WAIC : Watanabe - Akaike information criterion.

References

1. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet Elsevier*; 2020 Mar 14;395(10227):912–920. PMID:32112714
2. Xiong J, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, Chen-Li D, Iacobucci M, Ho R, Majeed A, McIntyre RS. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders* 2020 Dec 1;277:55–64. doi: 10.1016/j.jad.2020.08.001
3. Moitra M, Santomauro D, Degenhardt L, Collins PY, Whiteford H, Vos T, Ferrari A. Estimating the risk of suicide associated with mental disorders: A systematic review and meta-regression analysis. *J Psychiatr Res* 2021 May;137:242–249. PMID:33714076
4. Gunnell D, Appleby L, Arensman E, Hawton K, John A, Kapur N, Khan M, O'Connor RC, Pirkis J, Appleby L, Arensman E, Caine ED, Chan LF, Chang S-S, Chen Y-Y, Christensen H, Dandona R, Eddleston M, Erlangsen A, Gunnell D, Harkavy-Friedman J, Hawton K, John A, Kapur N, Khan M, Kirtley OJ, Knipe D, Konradsen F, Liu S, McManus S, Mehlum L, Miller M, Moran P, Morrissey J, Moutier C, Niederkrotenthaler T, Nordentoft M, O'Connor RC, O'Neill S, Page A, Phillips MR, Pirkis J, Platt S, Pompili M, Qin P, Rezaeian M, Silverman M, Sinyor M, Stack S, Townsend E, Turecki G, Vijayakumar L, Yip PS. Suicide risk and

- prevention during the COVID-19 pandemic. *The Lancet Psychiatry* Elsevier; 2020 Jun 1;7(6):468–471. PMID:32330430
5. Levaillant M, Wathélet M, Lamer A, Riquin E, Gohier B, Hamel-Broza J-F. Impact of COVID-19 pandemic and lockdowns on the consumption of anxiolytics, hypnotics and antidepressants according to age groups: a French nationwide study. *Psychol Med* 2023 May;53(7):2861–2867. PMID:34904556
 6. Reger MA, Stanley IH, Joiner TE. Suicide Mortality and Coronavirus Disease 2019—A Perfect Storm? *JAMA Psychiatry* 2020 Nov 1;77(11):1093–1094. doi: 10.1001/jamapsychiatry.2020.1060
 7. Yip PSF, Cheung YT, Chau PH, Law YW. The impact of epidemic outbreak: The case of severe acute respiratory syndrome (SARS) and suicide among older adults in Hong Kong. *Crisis: The Journal of Crisis Intervention and Suicide Prevention* Germany: Hogrefe Publishing; 2010;31(2):86–92. doi: 10.1027/0227-5910/a000015
 8. Jollant F, Roussot A, Corruble E, Chauvet-Gelinier J-C, Falissard B, Mikaeloff Y, Quantin C. Hospitalization for self-harm during the early months of the COVID-19 pandemic in France: A nationwide retrospective observational cohort study. *Lancet Reg Health Eur* 2021 Jul;6:100102. PMID:34557830
 9. Steeg S, Bojanić L, Tilston G, Williams R, Jenkins DA, Carr MJ, Peek N, Ashcroft DM, Kapur N, Voorhees J, Webb RT. Temporal trends in primary care-recorded self-harm during and beyond the first year of the COVID-19 pandemic: Time series analysis of electronic healthcare records for 2.8 million patients in the Greater Manchester Care Record. *EClinicalMedicine* 2021 Nov;41:101175. PMID:34746726
 10. Matsumoto R, Motomura E, Fukuyama K, Shiroyama T, Okada M. Determining What Changed Japanese Suicide Mortality in 2020 Using Governmental Database. *J Clin Med* 2021 Nov 7;10(21):5199. PMID:34768719
 11. Rehkopf DH, Buka SL. The association between suicide and the socio-economic characteristics of geographical areas: a systematic review. *Psychol Med* 2006 Feb;36(2):145–157. PMID:16420711
 12. da Cunha Varella AP, Griffin E, Kashan A, Kabir Z. Suicide rates before and during the COVID-19 pandemic: a systematic review and meta-analysis. *Soc Psychiatry Psychiatr Epidemiol* 2024 Feb 14; PMID:38353739
 13. Morgenstern H. Uses of ecologic analysis in epidemiologic research. *Am J Public Health* 1982 Dec;72(12):1336–1344. PMID:7137430
 14. Rezaeian M, Dunn G, Leger SS, Appleby L. Ecological association between suicide rates and indices of deprivation in the north west region of England: the importance of the size of the administrative unit. *J Epidemiol Community Health* 2006 Nov;60(11):956–961. PMID:17053284
 15. Satherley R-M, Hazell CM, Jones CJ, Hanna P. A Systematic Review of the Effects of Urban Living on Suicidality and Self-Harm in the UK and Ireland. *J Urban Health* 2022 Jun;99(3):385–408. PMID:35378716

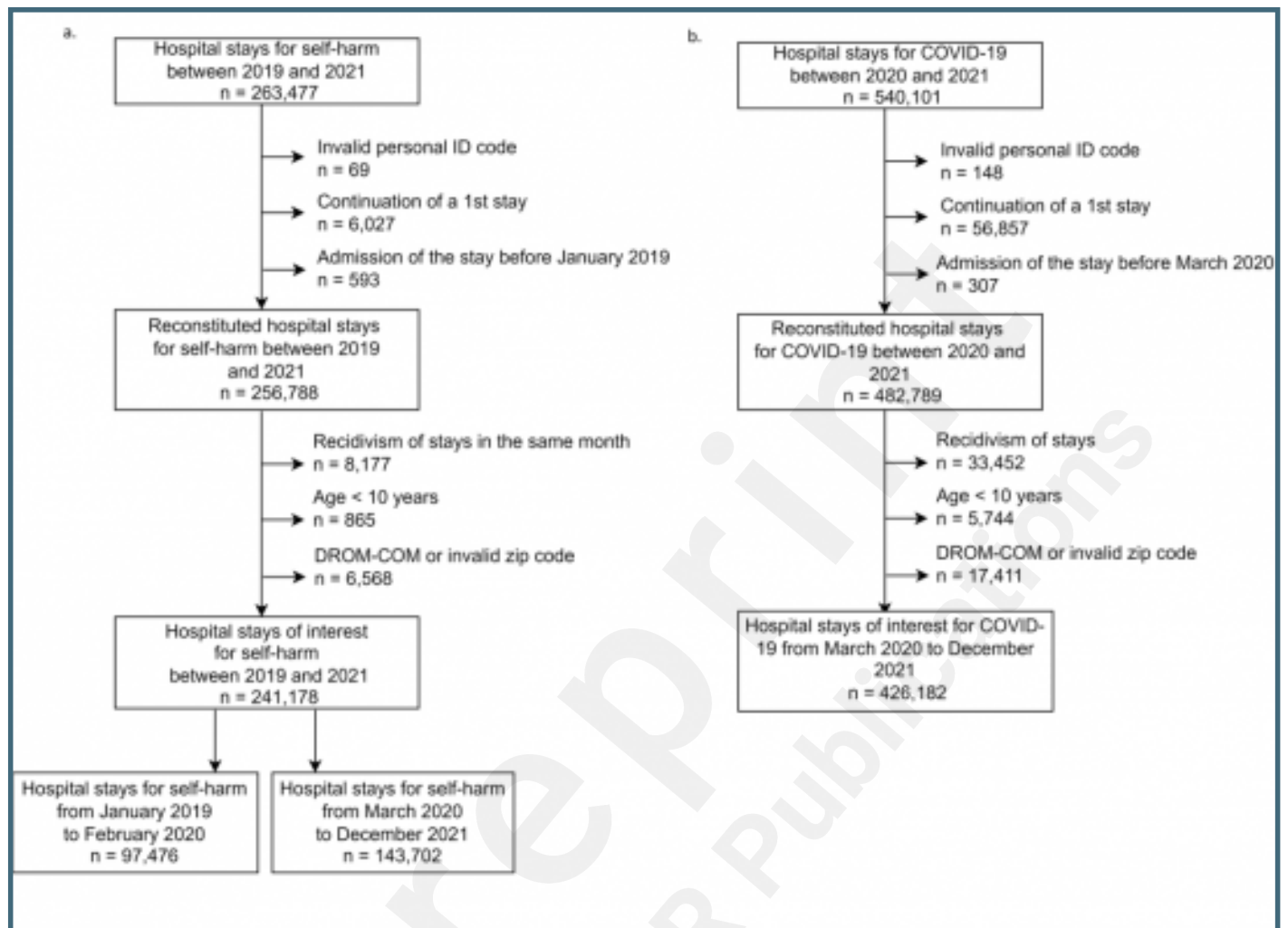
16. Homepage - Insee - National Institute of Statistics and Economic Studies. Available from: <https://www.insee.fr/en/accueil> [accessed Mar 8, 2024]
17. Ghenassia A, Beuscart JB, Ficheur G, Occelli F, Babykina E, Chazard E, Genin M. A generic method for improving the spatial interoperability of medical and ecological databases. *International Journal of Health Geographics* 2017 Oct 3;16(1):36. doi: 10.1186/s12942-017-0109-5
18. Sotoodeh Ghorbani S, Taherpour N, Bayat S, Ghajari H, Mohseni P, Hashemi Nazari SS. Epidemiologic characteristics of cases with reinfection, recurrence, and hospital readmission due to COVID-19: A systematic review and meta-analysis. *J Med Virol* 2022 Jan;94(1):44–53. PMID:34411311
19. Pernet C, Delpierre C, Dejardin O, Grosclaude P, Launay L, Guittet L, Lang T, Launoy G. Construction of an adaptable European transnational ecological deprivation index: the French version. *J Epidemiol Community Health* 2012 Nov;66(11):982–989. PMID:22544918
20. Barlet M, Coldefy M, Collin C, Lucas-Gabrielli V. L'accessibilité aux médecins généralistes libéraux : plus faible en milieu rural. *Pour Paris: GREP*; 2012;214(2):29–40. doi: 10.3917/pour.214.0029
21. CORINE Land Cover | Données et études statistiques. Available from: <https://www.statistiques.developpement-durable.gouv.fr/corine-land-cover-0> [accessed Mar 8, 2024]
22. Besag J, York J, Mollié A. Bayesian image restoration, with two applications in spatial statistics. *Ann Inst Stat Math* 1991 Mar 1;43(1):1–20. doi: 10.1007/BF00116466
23. Knorr-Held L, Best NG. A Shared Component Model for Detecting Joint and Selective Clustering of Two Diseases. *Journal of the Royal Statistical Society Series A: Statistics in Society* 2001 Jan 1;164(1):73–85. doi: 10.1111/1467-985X.00187
24. Rue H, Martino S, Chopin N. Approximate Bayesian inference for latent Gaussian models by using integrated nested Laplace approximations. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 2009;71(2):319–392. doi: 10.1111/j.1467-9868.2008.00700.x
25. R: The R Project for Statistical Computing. Available from: <https://www.r-project.org/> [accessed Mar 8, 2024]
26. John A, Eyles E, Webb RT, Okolie C, Schmidt L, Arensman E, Hawton K, O'Connor RC, Kapur N, Moran P, O'Neill S, McGuinness LA, Olorisade BK, Dekel D, Macleod-Hall C, Cheng H-Y, Higgins JPT, Gunnell D. The impact of the COVID-19 pandemic on self-harm and suicidal behaviour: update of living systematic review. *F1000Res* 2021 Jun 17;9:1097. PMID:33604025
27. Chan-Chee C. Les hospitalisations pour tentative de suicide dans les établissements de soins de courte durée : évolution entre 2008 et 2017 / Hospitalizations for attempted suicide in acute care facilities in France: Trends between 2008 and 2017.
28. Yard E, Radhakrishnan L, Ballesteros MF, Sheppard M, Gates A, Stein Z, Hartnett K, Kite-Powell A, Rodgers L, Adjemian J, Ehlman DC, Holland K, Idaikkadar N, Ivey-Stephenson A,

- Martinez P, Law R, Stone DM. Emergency Department Visits for Suspected Suicide Attempts Among Persons Aged 12-25 Years Before and During the COVID-19 Pandemic - United States, January 2019-May 2021. *MMWR Morb Mortal Wkly Rep* 2021 Jun 18;70(24):888–894. PMID:34138833
29. McClelland H, Evans JJ, Nowland R, Ferguson E, O'Connor RC. Loneliness as a predictor of suicidal ideation and behaviour: a systematic review and meta-analysis of prospective studies. *J Affect Disord* 2020 Sep 1;274:880–896. PMID:32664029
30. Mann JJ, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, Hegerl U, Lonnqvist J, Malone K, Marusic A, Mehlum L, Patton G, Phillips M, Rutz W, Rihmer Z, Schmidtke A, Shaffer D, Silverman M, Takahashi Y, Varnik A, Wasserman D, Yip P, Hendin H. Suicide prevention strategies: a systematic review. *JAMA* 2005 Oct 26;294(16):2064–2074. PMID:16249421
31. Fossi LD, Debien C, Demarty A-L, Vaiva G, Messiah A. Suicide reattempt in a population-wide brief contact intervention to prevent suicide attempts: The Vigilans program, France. *Eur Psychiatry* 2021 Jul 16;64(1):e57. PMID:34266505
32. Graetz N, Preston SH, Peele M, Elo IT. Ecological factors associated with suicide mortality among non-Hispanic whites. *BMC Public Health* 2020 Sep 3;20(1):1339. PMID:32883238
33. Alegría M, NeMoyer A, Falgas I, Wang Y, Alvarez K. Social Determinants of Mental Health: Where We Are and Where We Need to Go. *Curr Psychiatry Rep* 2018 Sep 17;20(11):95. PMID:30221308
34. Kassem AM. Spatial Clustering of Suicide and Associated Community Characteristics, Idaho, 2010–2014. *Prev Chronic Dis* 2019;16. doi: 10.5888/pcd16.180429
35. Wong BH-C, Cross S, Zavaleta-Ramírez P, Bauda I, Hoffman P, Ibeziako P, Nussbaum L, Berger GE, Hassanian-Moghaddam H, Kapornai K, Mehdi T, Tolmac J, Barrett E, Romaniuk L, Davico C, Moghraby OS, Ostrauskaite G, Chakrabarti S, Carucci S, Sofi G, Hussain H, Lloyd ASK, McNicholas F, Meadowcroft B, Rao M, Csábi G, Gatica-Bahamonde G, Ögütü H, Skouta E, Elvins R, Boege I, Dahanayake DMA, Anderluh M, Chandradasa M, Girela-Serrano BM, Uccella S, Stevanovic D, Lamberti M, Piercey A, Nagy P, Mehta VS, Rohanachandra Y, Li J, Tufan AE, Mirza H, Rozali F, Baig BJ, Noor IM, Fujita S, Gholami N, Hangül Z, Vasileva A, Salucci K, Bilaç Ö, Yektaş Ç, Cansız MA, Aksu GG, Babatunde S, Youssef F, Al-Huseini S, Kılıçaslan F, Kutuk MO, Pilecka I, Bakolis I, Ougrin D. Self-Harm in Children and Adolescents Who Presented at Emergency Units During the COVID-19 Pandemic: An International Retrospective Cohort Study. *J Am Acad Child Adolesc Psychiatry* 2023 Feb 16; PMID:36806728

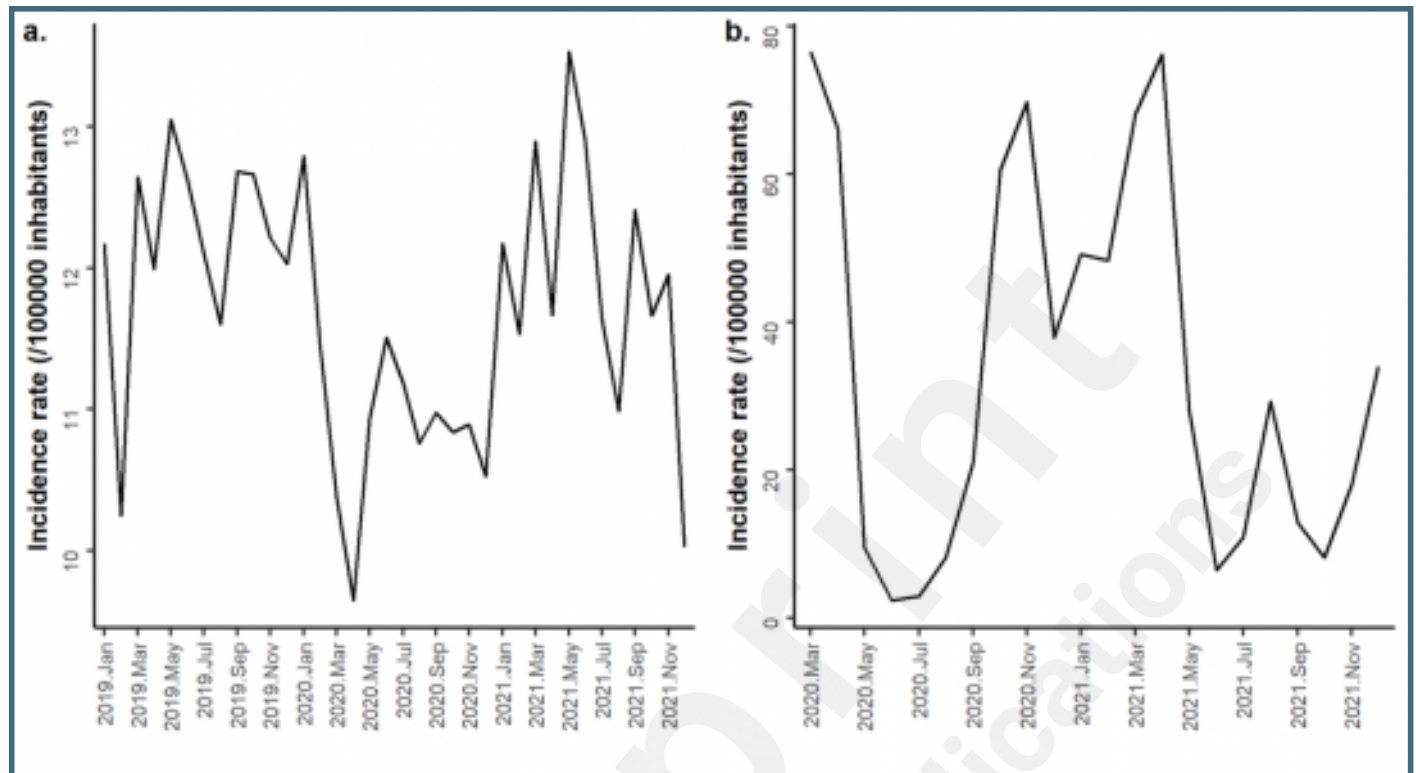
Supplementary Files

Figures

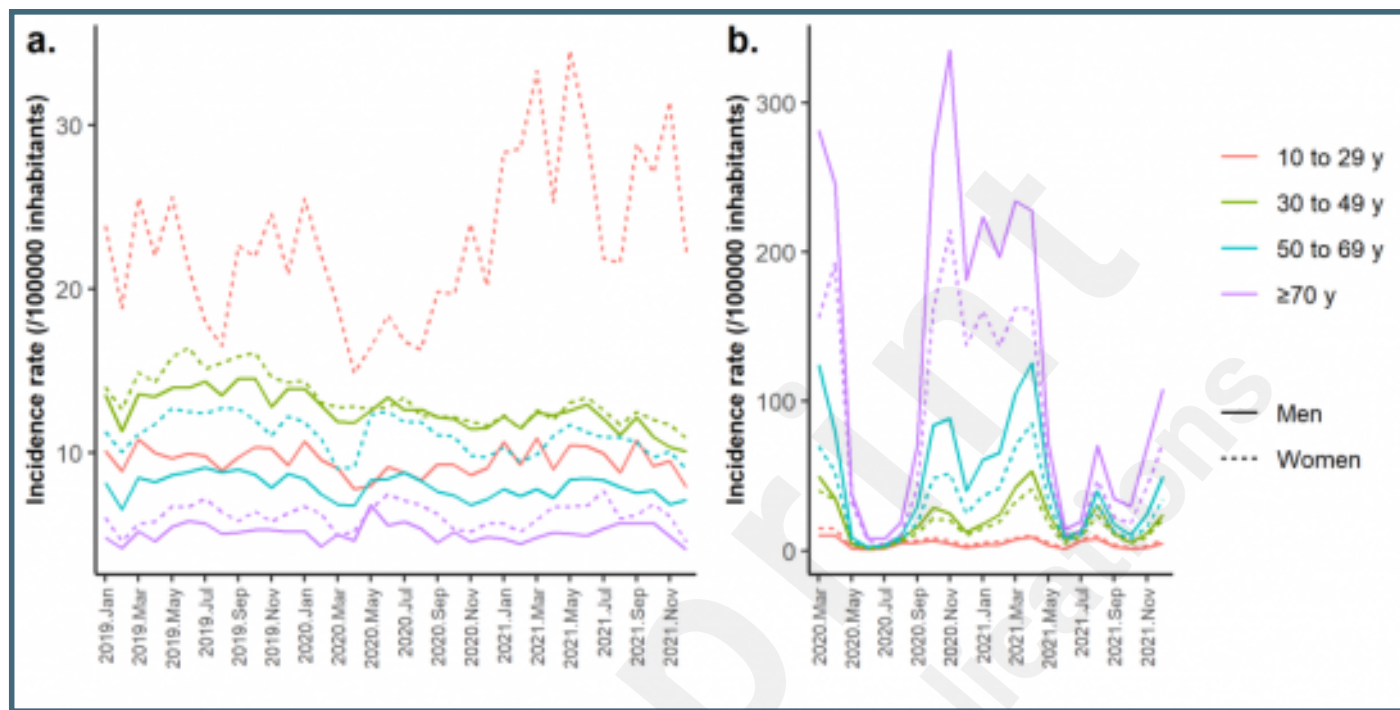
Flowchart hospital stays for self-harm (a) and COVID-19 (b). DROM-COM : Department Overseas Region and Overseas Collectivity.



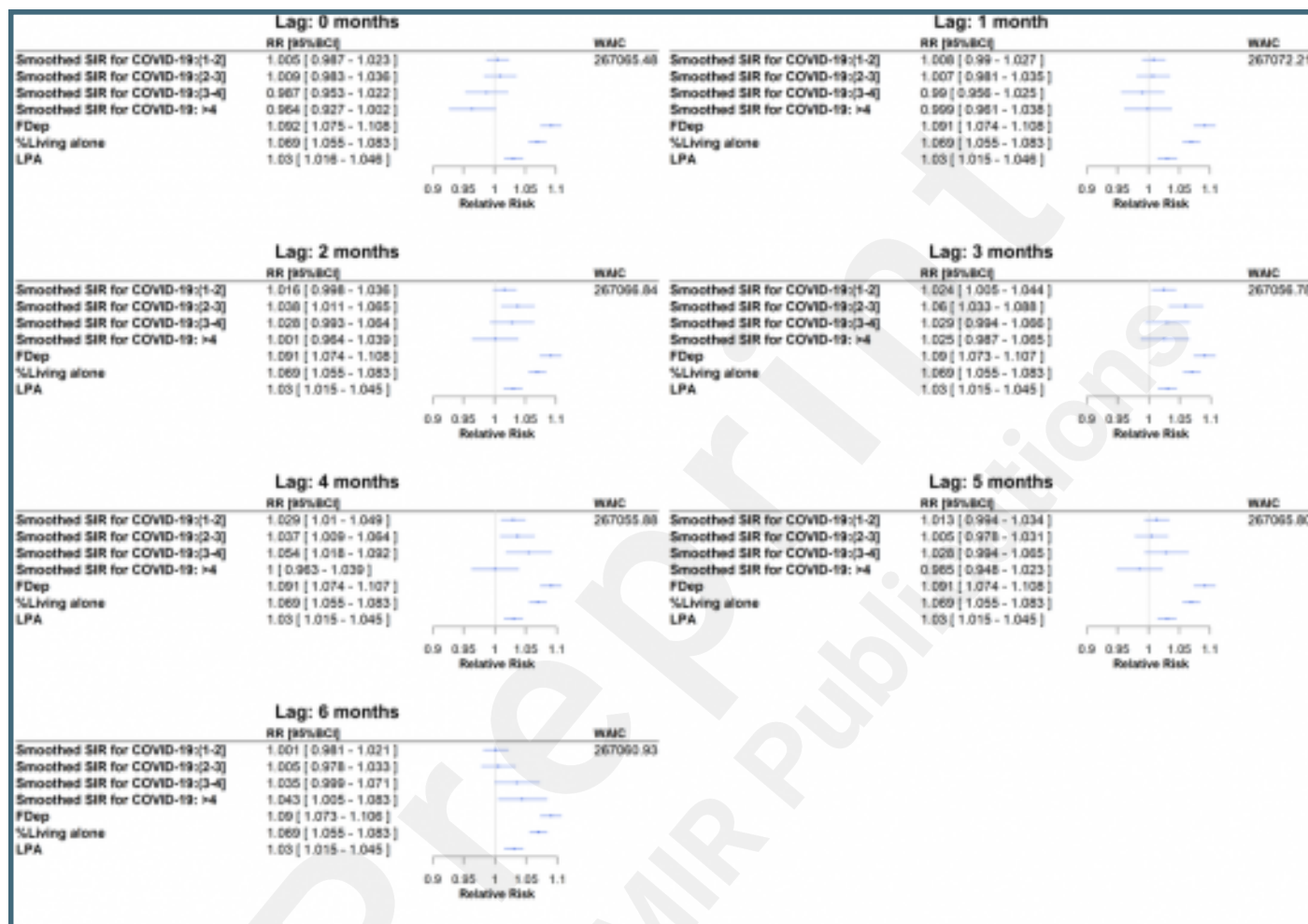
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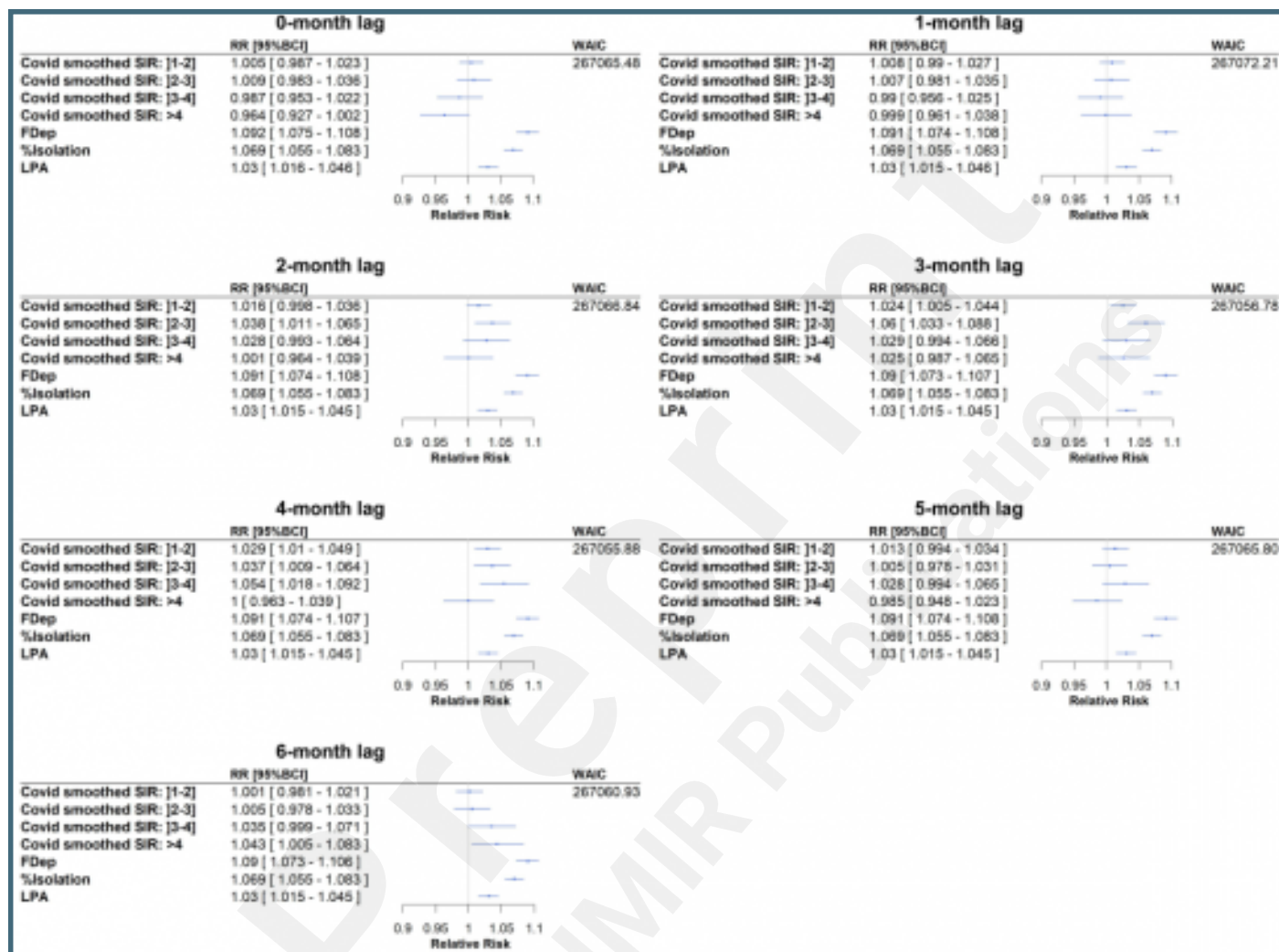
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Associations between hospitalization SIR for COVID19 and hospitalizations for self-harm with different lags between the two types of hospitalizations (0 to 6 months). For example, a 3-month lag is the SIR of COVID-19 hospitalizations at time T to assess the IRs of self-harm hospitalizations at T+3 months. RR: Relative Risk; BCI: Bayesian Credibility Intervals; SIR: Standardized Incidence Ratio; WAIC: Watanabe - Akaike information criterion.



Ecological regression assessing the association between smoothed COVID-19 SIRs, ecological variables, and hospitalizations for self-harm with different lags (0 to 6 months). For example, a 3-month lag is the SIR of COVID-19 hospitalizations at time T to assess the SIRs of self-harm hospitalizations at T+3 months. FDep: French Deprivation Index; LPA:Localized Potential Accessibility; SA:Suicide Attempt; RR: Relative Risk; BCI: Bayesian Credibility Interval; SIR: Standardized Incidence Ratio; WAIC : Watanabe - Akaike information criterion.



Multimedia Appendixes

Spatiotemporal models and ecological regression.

URL: <http://asset.jmir.pub/assets/c72e6cedf00782daedba385bde7b2367.docx>

The value of the WAIC for different models of hospital admissions for self-harm and for COVID-19.

URL: <http://asset.jmir.pub/assets/0700a24200af7cb2b934b2b28ae5e6da.docx>

Changes in the incidence rate of hospital admissions for self-harm from January 2019 to December 2021, in people aged between 10 and 29.

URL: <http://asset.jmir.pub/assets/9289ba876a5250fade24bb525eec1990.docx>

Timeline of the distribution of SIRs for self-harm and COVID-19 with a timeline representing the implementation of health measures by month.

URL: <http://asset.jmir.pub/assets/0b019ffa7d8535bec322b13c8ea46de3.mp4>