

The impact of COVID-19 on global health journals: an analysis of impact factor and publication trends

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To cite: He J, Liu X, Lu X, et al. The impact of COVID-19 on global health journals: an analysis of impact factor and publication trends. *BMJ Global Health* 2023;**8**:e011514. doi:10.1136/bmjgh-2022-011514

Handling editor Seye Abimbola

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bmjgh-2022-011514>).

JXH and XLL are joint first authors.

Received 11 December 2022
Accepted 9 March 2023



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ABSTRACT

Background COVID-19 has affected research productivity across all areas of knowledge. Current evidence suggests that COVID-19 has had a blockbuster effect on journal impact factors (JIFs) and publication trends, while little is known on global health journals.

Methods Twenty global health journals were included to analyse the impact of COVID-19 on their JIFs and publication trends. Indicator data, including numbers of publications, citations, articles with different types, etc, were extracted from journal websites and Web of Science Core Collection database. The JIFs from 2019 to 2021 were simulated for longitudinal and cross-sectional analyses. Interrupted time-series analysis and non-parametric tests were applied to assess whether COVID-19 had decreased non-COVID-19 publications from January 2018 to June 2022.

Results In 2020, 615 out of 3223 publications were COVID-19 related, accounting for 19.08%. The simulated JIFs of 17 out of 20 journals in 2021 were higher than those in 2019 and 2020. Notably, 18 out of 20 journals had a decrease in their simulated JIFs after excluding COVID-19-related publications. Moreover, 10 out of 20 journals decreased their monthly numbers of non-COVID-19 publications after the COVID-19 outbreak. For all the 20 journals as a whole, after the COVID-19 outbreak in February 2020, the total number of non-COVID-19 publications significantly decreased by 14.2 compared with the previous month ($p=0.013$), and since then, on average, the publications had decreased by 0.6 per month until June 2022 ($p<0.001$).

Conclusions COVID-19 has impacted the structure of COVID-19-related publications, the JIFs of global health journals and their numbers of non-COVID-19 publications. Although journals may benefit from increased JIFs, global health journals should avoid relying on a single metric. More follow-up studies including more years of data with a combination of metrics should be conducted to generate more robust evidence.

INTRODUCTION

The COVID-19 outbreak, caused by SARS-CoV-2, has resulted in extensive impact globally. Scientific research in almost all disciplines has been undertaken to address the global

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Global health journals have played a special role in disseminating global health research, and COVID-19 is undoubtedly one of the most challenging global health issues.
- ⇒ COVID-19 has a significant impact on journal impact factors (JIFs) and publication numbers of infectious and medical journals.

WHAT THIS STUDY ADDS

- ⇒ COVID-19 has impacted the structure of publication types of global health journals; in particular, COVID-19-related editorial materials and letters published in 2020 accounted for a higher proportion of publications than that of non-COVID-19 editorial materials and letters.
- ⇒ Most global health journals have benefited from a higher JIF driven by publishing COVID-19-related articles.
- ⇒ For most global health journals, COVID-19-related publications are found to have a squeezing effect on non-COVID-19 publications.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Global health journals should not rely too much on the improvement of single metrics like JIF for journal development.
- ⇒ In future pandemic outbreak setting, global health journals should balance publication structure and numbers of pandemic and non-pandemic-related publications.

pandemic challenge.^{1–3} In particular, health-care services experienced severe stresses and shortages that may have necessitated academic research for solutions, and demand for research around medications and vaccines against COVID-19 intensified.^{4–7} Besides, due to the interruption of fieldwork and laboratory experiments, many researchers were able to spend more time finishing their manuscripts.⁸ As a result, research productivity across all areas of knowledge has been generated and poured into international journals

in the form of COVID-19-related publications. From 1 January to 31 December 2020, a total of 53 348 publications from Scopus database focused on seven major research domains related to COVID-19: vaccination, diagnosis, treatment, symptoms, risk factors, nutrition and economy.⁹ A subsequent explosion of related international research collaboration and articles was observed as well in the first months of the COVID-19 pandemic.¹⁰ As of 28 June 2022, a total of 75 724 publications using 'COVID-19' and 'medical research' as keywords in all fields were extracted from Web of Science (WoS) database. Current literature has announced that COVID-19 may have led to decreased number of non-COVID-19 publications and reduced funds on traditional health research.^{11 12} However, the trend of non-COVID-19 publications in international journals before and after the COVID-19 outbreak is poorly understood. Moreover, it is unknown whether the number of non-COVID-19 publications has been consistently decreasing in all types of journals.

The growth in the number of COVID-19-related publications may have a blockbuster effect on journal impact factors (JIFs) yearly released by Clarivate. The JIF is a ratio between the number of citations received in a given year by documents published in a journal during the 2 previous years, divided by the number of citable items published in that journal over the 2 previous years.¹³ As a quantitative indicator, it is widely used to evaluate a journal's impact.¹⁴ Two key factors affecting the magnitude of JIF are the number of publications and citations according to the calculation formula.¹⁵ Impressively, until 28 June 2022, the number of citations for a retrospective cohort study on clinical course and risk factors associated with mortality among adults with COVID-19 in Wuhan conducted by Zhou *et al* and published in *Lancet* was 13 049.¹⁶ On the same date, the 2021 Journal Citation Reports (JCR) reported the new JIFs for almost 13 000 journals. Notably, the JIF of *Lancet* sharply increased from 79.323 in 2020 to 202.731 in 2021, which might be due to a surge of highly cited COVID-19-related publications. Therefore, it is necessary to explore what the JIFs of journals would look like if no COVID-19-related publications were published.

Several studies have been conducted to assess the impact of COVID-19 on the number of non-COVID-19 publications in areas such as pathology, clinical research and ophthalmology.^{17–20} The influence on increasing JIFs due to COVID-19 has been documented in some infectious disease journals and medical journals of highest rank or even beyond.^{11 21–23} It is noted that global health research initiatives have been increasing for the last two decades.²⁴ As global health journals play a paramount role in disseminating specific global health research, a number of COVID-19-related publications have been published since early 2020. This, however, may have an impact on JIFs and the number of non-COVID-19 publications, and little evidence is known about the situation among global health journals. Hence, the purpose of this

study is to explore the exact impact of COVID-19 on JIFs and publication trends of global health journals.

METHODS

Study design

In this study, JIFs and publication numbers were selected as the main indicators to assess the impact of COVID-19 on global health journals. We chose global health journals that were included in the WoS Core Collection database to make up our study sample. Two types of simulated JIFs were generated. First, since some journals may not acquire a formal JIF in any of the years 2019–2021, the JIFs in 2019–2021 of the selected journals were all simulated based on WoS formula for a longitudinal analysis. Second, all their new JIFs in 2021 were recalculated after excluding COVID-19-related publications for a cross-sectional analysis. Besides, an interrupted time-series analysis (ITSA)²⁵ was applied to analyse data from January 2018 to June 2022 for assessing whether COVID-19 had decreased the number of non-COVID-19 publications monthly. As COVID-19-related publications first appeared in global health journals in February 2020,^{26 27} and that the WHO declared COVID-19 as a public health emergency of international concern in 30 January 2020,²⁸ we set February 2020 as the starting point of the intervention (the COVID-19 outbreak). ITSA was conducted among non-COVID-19 publications on two levels: the aggregate publications of all the selected journals and the publications for each individual journal. Our analysis framework is shown in [figure 1](#).

Global health journal selection criteria

The list of global health journals was extracted from two resources. First, we conducted the search by using 'global health' as a keyword in JCR to get relevant journals on 28 June 2022. Second, we adopted the lists of global health journals reported in two studies by *Lancet Global Health* and *BMJ Global Health*, both of which are leading global health journals.^{24 29} A journal was removed if it is not an Emerging Sources Citation Index or SSCI (Social Sciences Citation Index) or SCIE (Science Citation Index Expanded) journal, or it ceased to exist after the year of 2019. The selection process is shown in [figure 2](#). In total, 20 journals were included in our analysis: *Annals of Global Health*, *BMJ Global Health*, *Bulletin of the World Health Organization*, *Clinical Epidemiology and Global Health*, *Global Health Action*, *Global Health Epidemiology and Genomics*, *Global Health Promotion*, *Global Health Research and Policy*, *Global Health-Science and Practice*, *Global Mental Health*, *Global Public Health*, *Globalization and Health*, *International Health*, *International Journal of Health Science (IJHS)*, *Journal of Epidemiology and Global Health*, *Journal of Global Health*, *Lancet Global Health*, *Lancet Planetary Health*, *Pathogens and Global Health*, *Tropical Medicine & International Health*.

Indicators

The primary indicators were the JIFs and the monthly numbers of non-COVID-19 publications. According

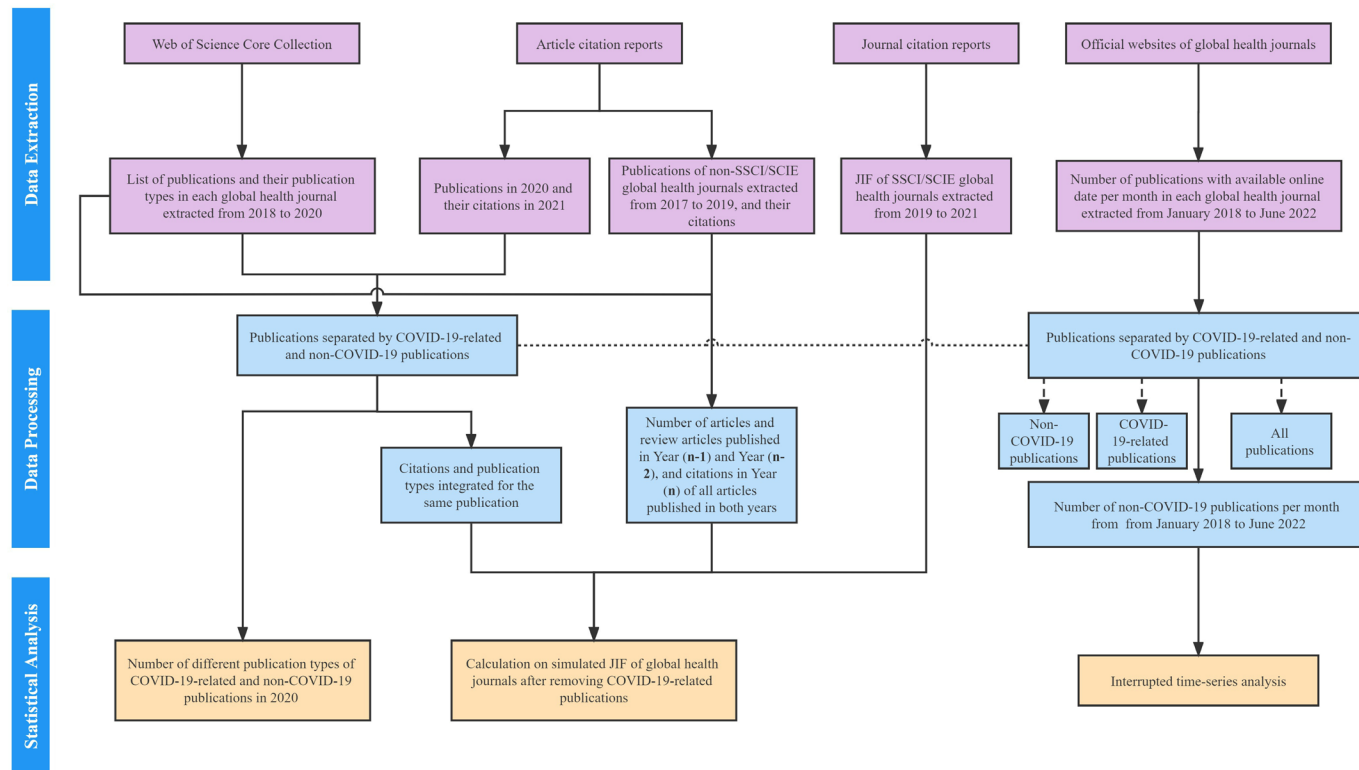


Figure 1 The analysis framework for JIFs and non-COVID-19 publications of global health journals. JIF, journal impact factor; SCIE, Science Citation Index Expanded; SSCI, Social Sciences Citation Index.

to the calculation formula,¹⁵ citable publications are restricted to articles and review articles in the denominator by document type. In order to simulate the JIFs, the number of articles, reviews articles and citations for publications needed to be extracted from WoS citation reports. As for the non-COVID-19 publications, we distinguished them from COVID-19-related publications by title. Accordingly, the monthly numbers of overall publications and COVID-19-related publications were included in our study as well.

$$JIF = \frac{\text{Citations in JCR Year (n) to publications published in Year (n-2)+Year (n-1)}}{\text{Number of citable publications in Year (n-2)+Year (n-1)}}$$

Data extraction

The data in our study were extracted from three website resources in WoS database, including JCR, Citation Reports, and WoS Core Collection and journal websites. The journal characteristics and their actual JIFs from 2019 to 2021 were extracted from JCR. The number of citations for publications was extracted from Citation Reports by two independent researchers (JXH and MLZ). The list of publications by title, publication type, the number of articles and the number of review articles during January 2018–June 2022 were extracted from WoS Core Collection and journal websites by three independent researchers (JXH, XLL and MLZ). Publications were categorised into article, review article, editorial material, letter, meeting abstract, book review, news item and correction. All publications were screened according to their titles, abstracts and full texts by three researchers

independently (JXH, XLL and MLZ) to differentiate the COVID-19-related and non-COVID-19 publications. Specifically, we extracted the published online date for each publication from each journal website. For each publication, the publication type was extracted to demonstrate the distribution of COVID-19-related and non-COVID-19 publications. To ensure the quality and accuracy of the extracted publications, an additional cross-check was conducted by JXH, XLL and MLZ by randomly selecting 20% of all the publications.

Statistical analysis

Descriptive statistics included the constituent ratio of publication types of COVID-19-related and non-COVID-19 publications in 2020, the number of monthly non-COVID-19 publications before (January 2018–January 2020) and after (February 2020–June 2022) the COVID-19 outbreak, the monthly COVID-19-related publications and overall publications after (February 2020–June 2022) the COVID-19 outbreak, which were presented as median (IQR). The difference in simulated JIFs between each journal with and without COVID-19-related publications, and the changes of the simulated JIFs from 2019 to 2021, whether the COVID-19-related publications exist or not in 2020, were further considered as descriptive statistics and presented as percentages. Non-parametric test (Mann-Whitney U test) was used to compare the changes of the monthly number of non-COVID-19 publications before and after the COVID-19

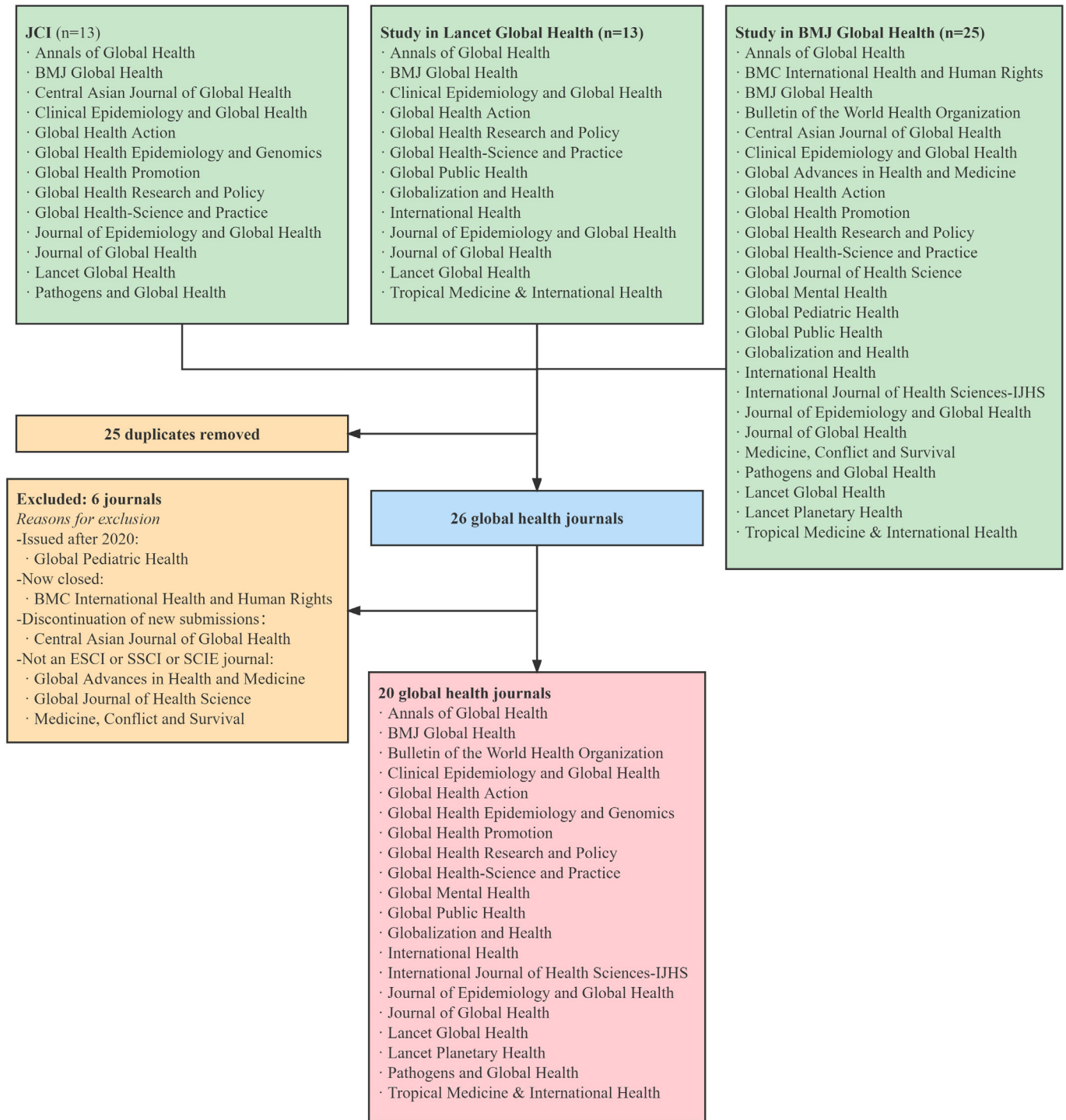


Figure 2 Selection process of global health journals. ESCI, Emerging Sources Citation Index; JCI, Journal Citation Index; SCIE, Science Citation Index Expanded; SSCI, Social Sciences Citation Index.

outbreak. ITSA with ordinary least squares segmented liner regression was used to estimate slope change before and after the COVID-19 outbreak and the level of change at the intervention of the outbreak to assess the impact of COVID-19 on non-COVID-19 publications.³⁰ We used the Cumby-Huizinga general test and autocorrelation plots (up to lag order=6) to assess for autocorrelation and Newey-West SEs to account for autocorrelation. STATA V.14 was used to conduct the ITSA. The simulation of

JIFs was manually conducted in Excel 2016 by two independent researchers (JXH and MLZ) to ensure accuracy. The STATA code and extracted raw data are presented in online supplemental appendices 1 and 2.

RESULTS

The characteristics of the included 20 global health journals are summarised in online supplemental table 1. The

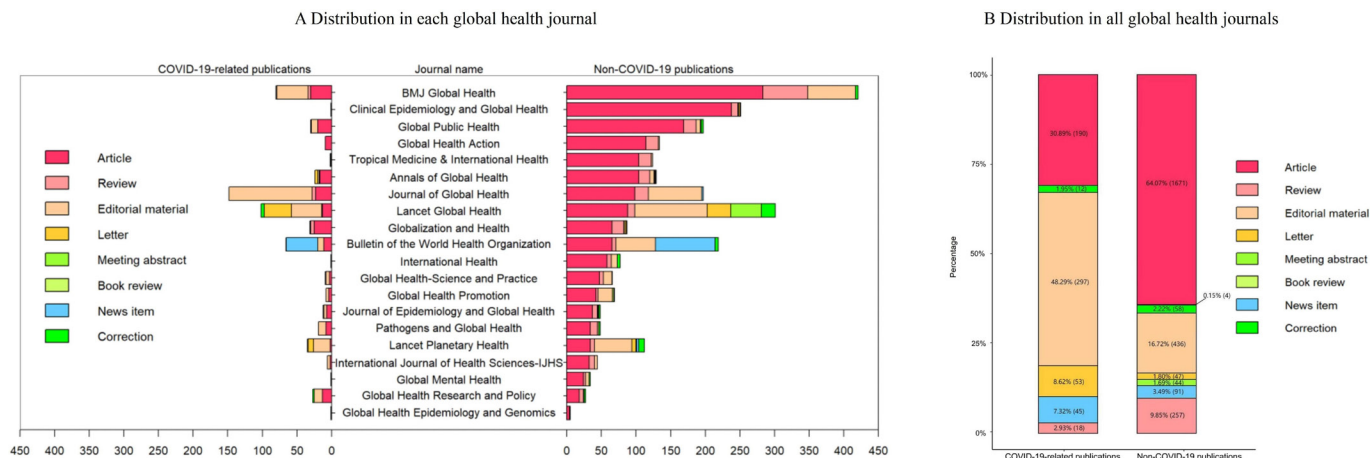


Figure 3 Distribution for different publication types of COVID-19-related and non-COVID-19 publications in global health journals in 2020: (A) distribution in each global health journal, (B) distribution in all global health journals.

year to launch the first issue among these journals varied, with the earliest in 1907 (*Pathogens and Global Health*) and the latest in 2017 (*Lancet Planetary Health*). The majority of these journals were SSCI/SCIE (16 out of 20) and founded in developed countries (17 out of 20). First electronic JCR year of each global health journal showed huge time span, and six journals obtained their JCR in 2020. Total citations from 2021 also differed substantially among them, and *Lancet Global Health* (22 156 times) had the highest citations, followed by *Bulletin of the World Health Organization* (21 791 times) and *BMJ Global Health* (9641 times). In terms of article processing charge (APC), four global health journals (*Bulletin of the World Health Organization*, *Global Health Research and Policy*, *Global Health-Science and Practice*, and *Pathogens and Global Health*) charged no APC, and the remaining ones charged between \$30 (*IJHS*) and \$5500 (*Lancet Global Health* and *Lancet Planetary Health*).

In 2020, the total number of COVID-19-related publications was 615 (19.08%) and the number of non-COVID-19 ones was 2608 (80.92%). **Figure 3A,B** demonstrates the distribution of COVID-19-related and non-COVID-19 publications in 2020 according to publication type, which is associated with the simulated JIFs in 2021. Obviously, regarding the publication type distribution of COVID-19-related publications (**figure 3A**), the proportion of ‘editorial material’ and ‘letter’ types was higher in *BMJ Global Health*, *Journal of Global Health*, *Lancet Global Health* and *Lancet Planetary Health* than that of ‘article’ type. However, the proportion of ‘article’ type was higher than that of ‘editorial material’ and ‘letter’ types in *Globalization and Health*. Compared with the non-COVID-19 publications in all journals (**figure 3B**), 350 COVID-19-related editorial materials and letters were published in 2020, accounting for 56.91% of the overall publications. It was much higher than that for non-COVID-19 publications (18.52%).

As presented in **figure 4**, for the SSCI/SCIE journals, the actual JIFs extracted from JCR (17 out of 20) were mostly higher than our simulated JIFs from 2019 to 2021.

The trends of the actual and simulated JIFs were mostly (17 out of 20) ascending from 2019 to 2021. Compared with the simulated JIFs with COVID-19-related publications, the simulated JIFs without COVID-19-related publications were classified into four categories: JIFs decreased by more than 20% (*BMJ Global Health*, *Global Health Epidemiology and Genomics*, *Global Health Research and Policy*, *Global Public Health*, *Globalization and Health*, *Journal of Global Health*, *Lancet Global Health*, *Lancet Planetary Health*, *Pathogens and Global Health*, and *Tropical Medicine & International Health*); JIFs decreased by 10%–20% (*Bulletin of the World Health Organization*, *Global Health Action*, *Global Health-Science and Practice*, and *Journal of Epidemiology and Global Health*); JIFs decreased by less than 10% (*Annals of Global Health*, *Global Health Promotion*, *International Health* and *IJHS*); and JIFs increased by less than 5% (*Clinical Epidemiology and Global Health* and *Global Mental Health*). Especially, the change of the simulated JIFs of *Globalization and Health* was the highest (−4.442% to −46.09%), followed by *Journal of Global Health* (−2.999% to −39.73%), *Tropical Medicine & International Health* (−1.429% to −38.29%) and *Lancet Global Health* (−12.854% to −33.58%). The average change of the simulated JIFs, considering whether the COVID-19-related publications existed or not in 2020, fluctuated the most for *Globalization and Health*, which had the highest change from 91.11% to 37.00%, followed by *Journal of Global Health*, which changed from 53.53% to 18.33%.

Table 1 shows that generally, the overall monthly number of non-COVID-19 publications for all the included journals increased slightly by one publication (from 172 to 173) before and after the COVID-19 outbreak. Moreover, the average monthly numbers of COVID-19-related publications and overall publications after the COVID-19 outbreak were 58 and 230, respectively. Four journals, namely *Annals of Global Health Journal*, *Global Health Action*, *Global Health Promotion*, and *Globalization and Health*, kept the constant monthly number of non-COVID-19 publications before and after the COVID-19 outbreak. According to the monthly number of overall publications among the

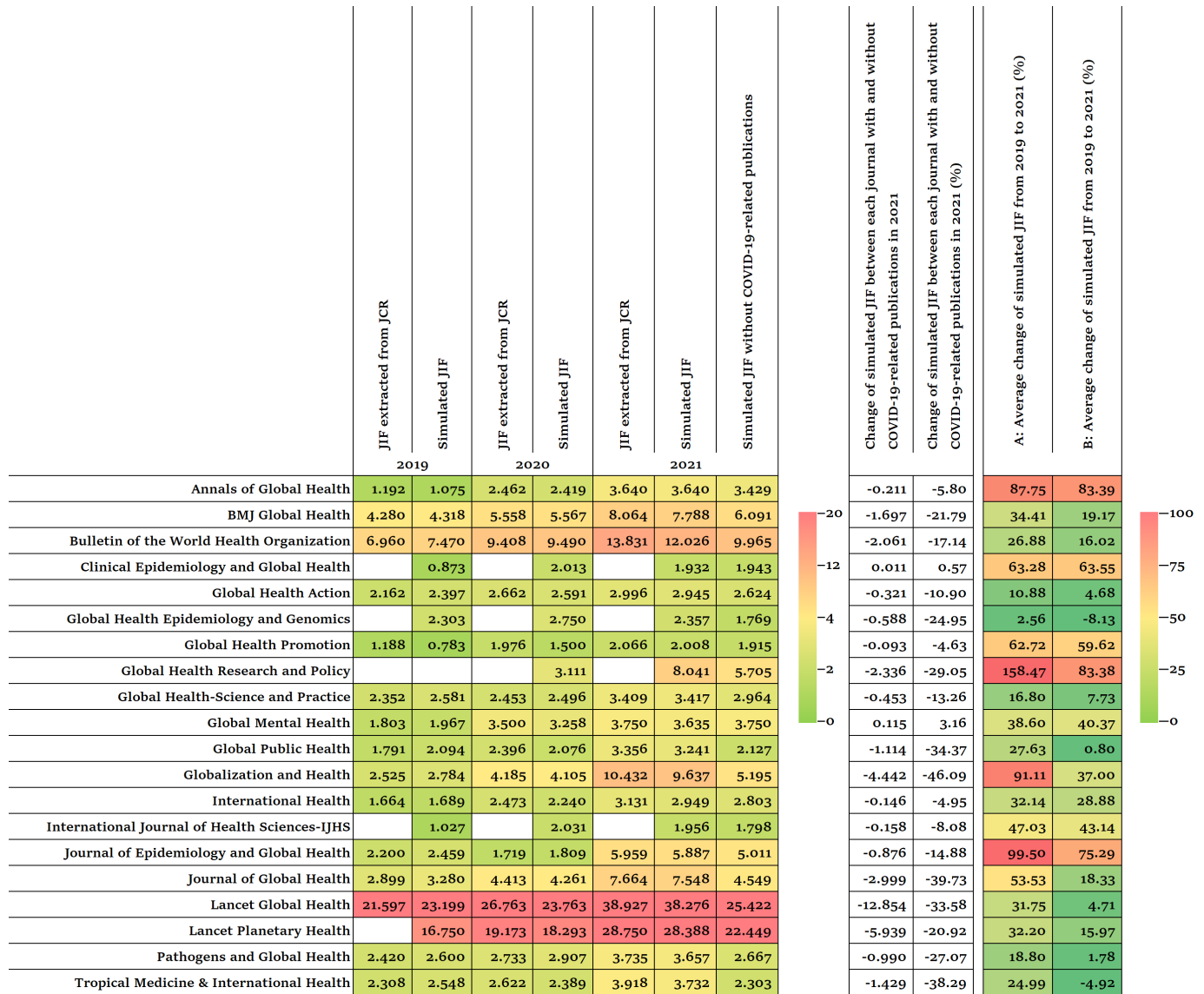


Figure 4 JIF extracted from JCR, simulated JIF and simulated JIF without COVID-19-related publications for each global health journal from 2019 to 2021 JCR year. ESCI journals do not have actual JIFs from JCR and they are blank in the above figure. Publications in 2017 from *Global Health Research and Policy* and their citations were unavailable from WoS, resulting in absence of simulated JIF in 2019. The difference between A and B classifications according to the simulated JIFs from 2019 to 2021 is that, in B, the COVID-19-related publications were taken out of consideration in 2020. ESCI, Emerging Sources Citation Index; JCR, Journal Citation Reports; JIF, journal impact factor; WoS, Web of Science.

four journals, except *Global Health Action*, the other three journals increased the publications after the COVID-19 outbreak. Six journals, namely *BMJ Global Health*, *Clinical Epidemiology and Global Health*, *Global Health-Science and Practice*, *Global Public Health*, *Journal of Epidemiology and Global Health*, and *Journal of Global Health*, increased their monthly number of non-COVID-19 publications after the COVID-19 outbreak. Specifically, *BMJ Global Health* had the highest monthly number of non-COVID-19 publications (35) after the COVID-19 outbreak ($p < 0.001$). The remaining 10 journals decreased their monthly number of non-COVID-19 publications after the COVID-19 outbreak. Specifically, the decreased monthly number of non-COVID-19 publications in *Bulletin of the World Health Organization*, *Global Health Epidemiology and Genomics*,

Global Health Research and Policy, *IJHS* and *Lancet Global Health* was statistically significant ($p < 0.05$). Besides, the monthly number of overall publications among these journals changed slightly. Regarding the COVID-19-related publications after the COVID-19 outbreak among all the journals, *Annals of Global Health* and *Journal of Global Health* had the highest numbers (10 and 8 publications), while *Global Health Action* and *Global Health Epidemiology and Genomics* had nearly no COVID-19-related publications.

Figure 5 presents the aggregated numbers of publications, including overall publications, non-COVID-19 publications and COVID-19-related publications. As for the included journals, except *IJHS* and *Global Health-Science and Practice*, before the COVID-19 outbreak, the

Table 1 Number of publications in global health journals before and after the COVID-19 outbreak from January 2018 to June 2022 per month

No	Journal name	Before the COVID-19 outbreak (January 2018–January 2020)		After the COVID-19 outbreak (February 2020–June 2022)		Overall publication number per month Median (IQR)	P value
		Non-COVID-19/overall publication number per month Median (IQR)	Non-COVID-19 publication number per month Median (IQR)	COVID-19-related publication number per month Median (IQR)	Overall publication number per month Median (IQR)		
1	<i>Annals of Global Health</i>	8 (0.5–15.5)	8 (5–13)	2 (1–3)	11 (7–14)	0.801	–
2	<i>BMJ Global Health</i>	25 (20–31)	35 (30.5–40.5)	11 (8–15.5)	48 (40–51.5)	<0.001*	↑
3	<i>Bulletin of the World Health Organization</i>	10 (9–11)	8 (6–10)	2 (1–4)	11 (9.5–12)	0.004*	↓
4	<i>Clinical Epidemiology and Global Health</i>	9 (7–13)	15 (8–20.5)	4 (3–7)	21 (11–26)	0.044*	↑
5	<i>Global Health Action</i>	10 (8–13)	10 (5.5–15.5)	0 (0–1)	10 (5.5–16)	0.889	–
6	<i>Global Health Epidemiology and Genomics</i>	1 (0–2)	0 (0–0.5)	0 (0–0)	0 (0–1)	0.012*	↓
7	<i>Global Health Promotion</i>	3 (1–4.5)	3 (2–3)	1 (0–2)	5 (2–8)	0.203	–
8	<i>Global Health Research and Policy</i>	3 (3–3)	2 (1–3)	2 (1–3)	4 (3–4.5)	0.018*	↓
9	<i>Global Health-Science and Practicet</i>	17 (13–23)	18.5 (14.25–23.75)	2 (1–3)	21.5 (16.5–25.75)	<0.001*	↑
10	<i>Global Mental Health</i>	3 (2–4)	2 (2–4)	1 (0–1)	3 (2–4.5)	0.816	↓
11	<i>Global Public Health</i>	10 (6–14)	13 (8–16.5)	2 (1–4)	14 (9–20)	0.234	↑
12	<i>Globalization and Health</i>	8 (4.5–12)	8 (5–9)	2 (1.5–6)	10 (7–15)	0.295	–
13	<i>International Health</i>	8 (6.5–12)	6 (3–8.5)	1 (0–2)	7 (5–9.5)	0.030*	↓
14	<i>International Journal of Health Science (IJHS)†</i>	10 (10–15)	7 (5–8)	1 (0–2)	8 (7–9)	0.748	↓
15	<i>Journal of Epidemiology and Global Health</i>	1 (0–5.5)	2 (1–3.5)	2 (1–3)	5 (2.5–6)	0.602	↑
16	<i>Journal of Global Health</i>	10 (5–16)	12 (9.5–17)	8 (5.5–16.5)	24 (17–34.5)	0.147	↑
17	<i>Lancet Global Health</i>	27 (23–33.5)	22 (18–25.5)	6 (4–8)	26 (24.5–34)	0.006*	↓
18	<i>Lancet Planetary Health</i>	10 (8.5–11.5)	10 (7–12)	2 (1–3.5)	12 (10.0–13.5)	0.427	–
19	<i>Pathogens and Global Health</i>	4 (3–5)	3 (1.5–5)	2 (1–3.5)	5 (3–7)	0.327	↓
20	<i>Tropical Medicine & International Health</i>	12 (8–13)	9.5 (6–15)	1 (0–1)	10 (7–15.5)	0.247	↓
Total§		172 (160–192.5)	173 (163–196.5)	58 (44–70.5)	230 (217–250.5)	0.883	↑

* means a statistical significance at 95% level.

†The changes of the monthly number of non-COVID-19 publications before and after the COVID-19 outbreak were divided into three categories, including increased (↑), constant (–) and decreased (↓) number of publications.

‡The median number of monthly non-COVID-19 publications only in specific months rather than each month for *Global Health-Science and Practice*.

§We excluded the number of publications from the *IJHS* and the *Global Health-Science and Practice* for the aggregated publications since the *IJHS* publishes relevant articles every 2 months and the *Global Health-Science and Practice* only publishes articles in specific months, so we could not retrieve the published online date for each publication.

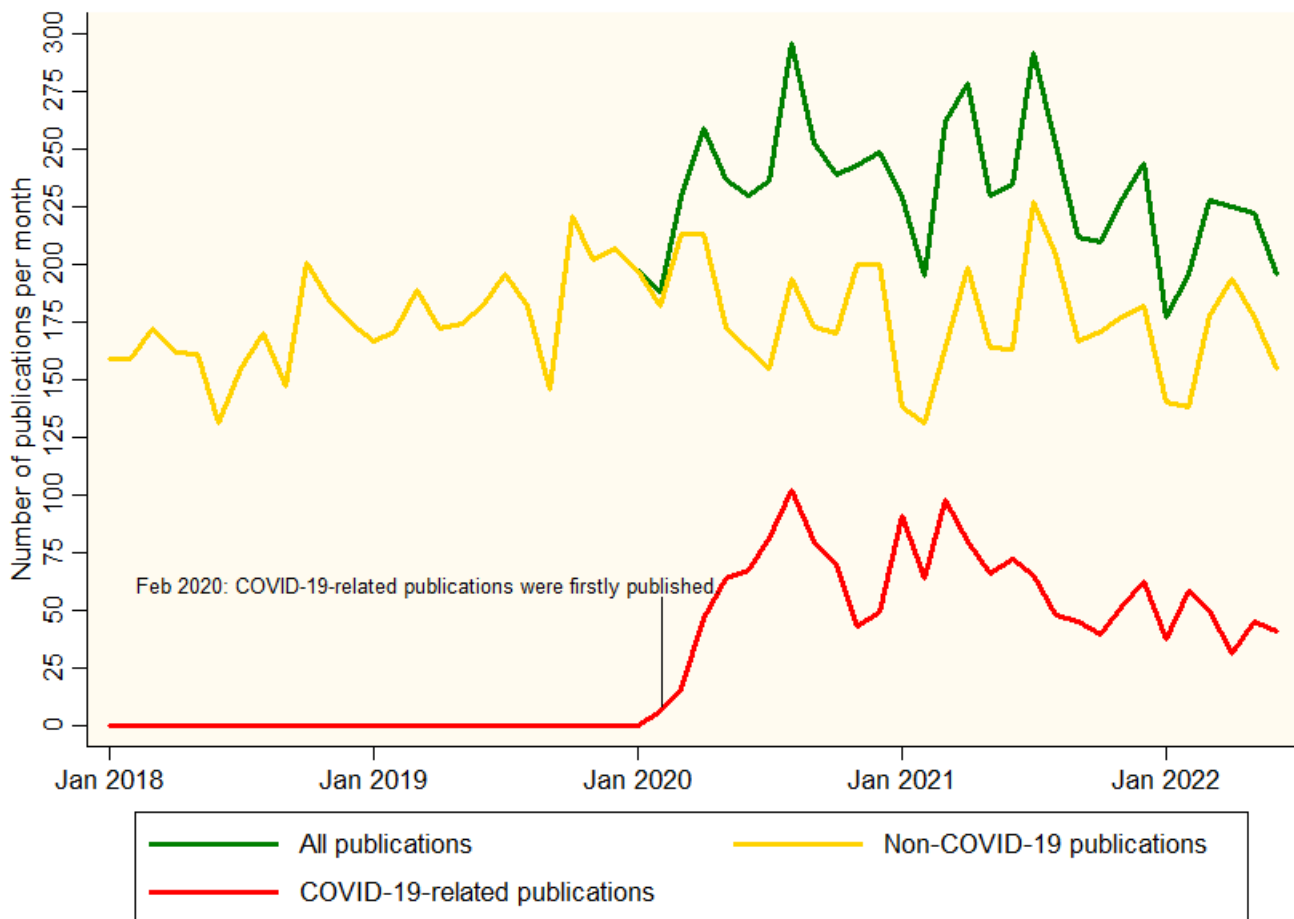


Figure 5 The aggregated numbers of publications from January 2018 to June 2022 for global health journals. We excluded the number of publications from the *International Journal of Health Sciences* and the *Global Health-Science and Practice* journals for the aggregated publications since the former publishes articles every 2 months, and the latter only publishes papers in specific months, so we could not retrieve the published online date for each publication.

number of aggregated non-COVID-19 publications increased by 1.8 publications per month ($p<0.001$). For all the 20 journals as a whole, after the COVID-19 outbreak in February 2020, the total number of non-COVID-19 publications significantly decreased by 14.2 compared with the previous month ($p=0.013$), and since then, on average, the publications had decreased by 0.6 per month until June 2022 ($p<0.001$). The specific results for each journal are presented in online supplemental table 2. **Figure 6A** shows the increasing number of non-COVID-19 publications before the COVID-19 outbreak and the decreasing number of non-COVID-19 publications after the COVID-19 outbreak according to the slopes. Four journals significantly contributed to the decreasing number of non-COVID-19 publications, while three journals significantly increased the number of non-COVID-19 publications after the COVID-19 outbreak (**figure 6** and online supplemental table 2). Specifically, the changes in the number of non-COVID-19 publications before and after the COVID-19 outbreak in *Annals of Global Health*, *BMJ Global Health*, *Journal of Epidemiology*

and *Global Health*, *Journal of Global Health*, *Global Health Epidemiology and Genomics*, *IJHS* and *Lancet Planetary Health* were -0.43 publication ($p=0.036$), -0.56 publication ($p=0.037$), -0.41 publication ($p<0.001$), -0.62 publication ($p=0.017$), 0.06 publication ($p=0.039$), 0.36 publication ($p<0.001$) and 0.40 publication ($p<0.001$), respectively. The results of the autocorrelation for non-COVID-19 publications among the journals are shown in online supplemental figure 1.

DISCUSSION

Our study found that the simulated JIFs in 2021 among 17 out of 20 global health journals were increasing compared with the previous years (2019 and 2020), which is consistent with the findings of Gonzalez-Hermosillo and Roldan-Valadez in dermatology journals.²³ The simulated JIFs without COVID-19-related publications were mostly lower than the ones with COVID-19-related publications, though the changes were in different levels. These findings indicate that the COVID-19 pandemic has impacted

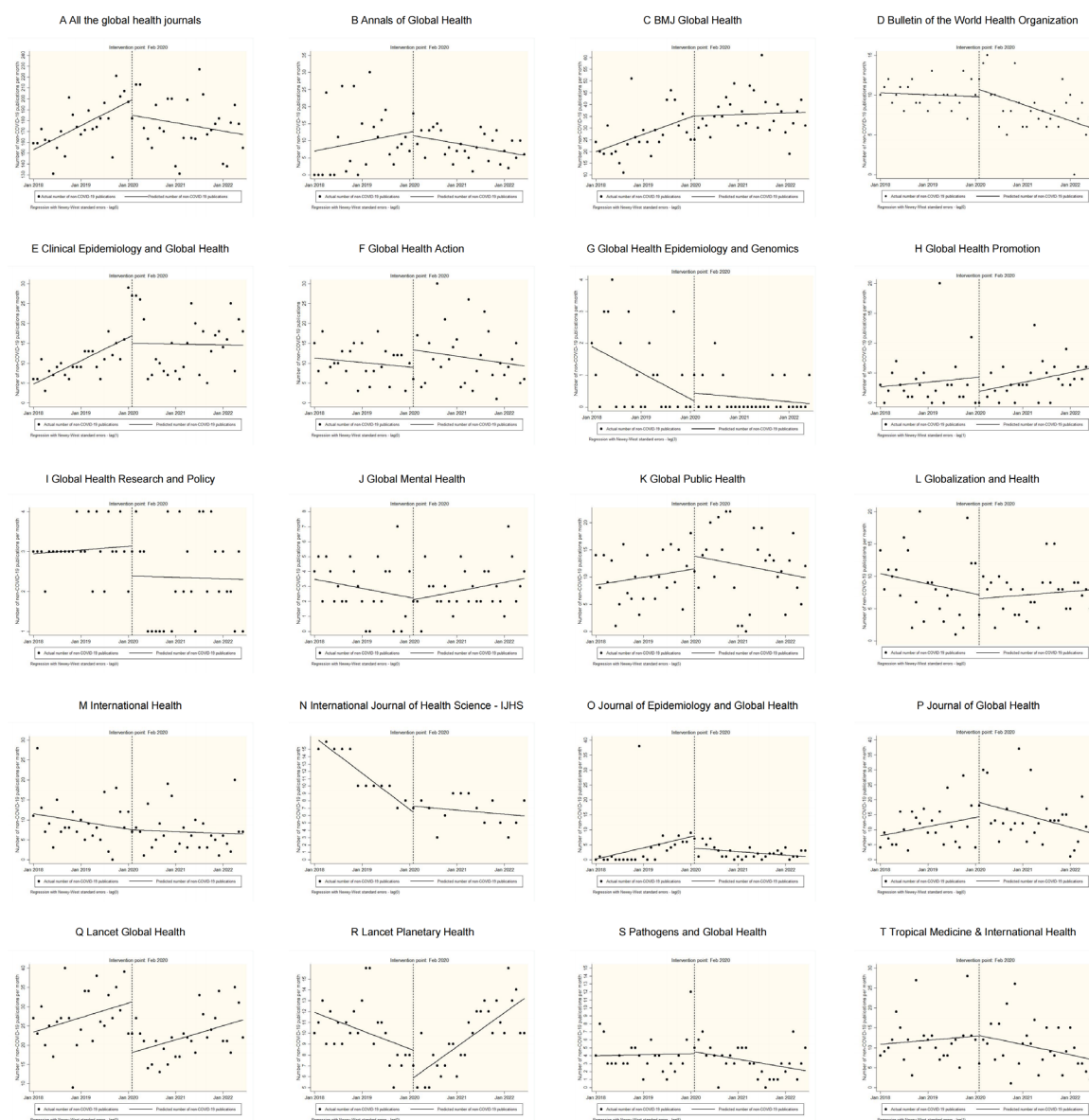


Figure 6 Trends of non-COVID-19 publications in global health journals due to COVID-19 from January 2018 to June 2022. We excluded the number of publications from the *Global Health-Science and Practice* for the interrupted time-series analysis since it only publishes the papers in specific months for a year and the interval of time issued is not equal. (A) All the included global health journals; (B) *Annals of Global Health*; (C) *BMJ Global Health*; (D) *Bulletin of the World Health Organization*; (E) *Clinical Epidemiology and Global Health*; (F) *Global Health Action*; (G) *Global Health Epidemiology and Genomics*; (H) *Global Health Promotion*; (I) *Global Health Research and Policy*; (J) *Global Mental Health*; (K) *Global Public Health*; (L) *Globalization and Health*; (M) *International Health*; (N) *International Journal of Health Science - IJHS*; (O) *Journal of Epidemiology and Global Health*; (P) *Journal of Global Health*; (Q) *Lancet Global Health*; (R) *Lancet Planetary Health*; (S) *Pathogens and Global Health*; (T) *Tropical Medicine & International Health*.

the JIFs of the journals. With its unique hot feature as a pandemic, the number of publications and citations are greatly affected by COVID-19-related publications, and the explosive growth of COVID-19-related publications was regarded as the biggest explosion of scientific literature ever in science,³¹ which is particularly evident for global health journals with huge changes of JIFs in our study. The main reason is that many of the COVID-19-related publications are highly cited, which significantly boosted the JIFs. For example, as to three highly cited

papers published in *Lancet Global Health* in 2020,^{32–34} the respective numbers of citations in 2021 were 320, 277 and 542. Their total number of citations (1139) accounted for around 36.31% of the overall citations (3137) in 2021.

The increased JIFs may benefit global health journals from attracting more manuscripts to submit, increasing international impact and securing more funds.³⁵ Some researchers think that the rapid increase of JIFs is a disruptive phenomenon for bibliometrics.³⁶ Pursuing temporal interest, rather than quality, journals can get

a better ranking based on inflated JIFs in journal lists, which may increase the chance of speculative behaviours in academia and publishing.³⁷ Besides, considering the technical imperfections of JIF, such as asymmetry between numerator and denominator, journal self-citations, length of citation window and skewness of citation distributions, it is risky to rely too much on a single research metric with abstract construction, calling for comprehensive evaluation to measure journal development.^{38 39}

Interestingly, we found that the COVID-19 pandemic had impacted the structure of publication types of global health journals. Three hundred fifty COVID-19-related editorial materials and letters were published in 2020, accounting for 56.91% of the overall publications. It was much higher than that for non-COVID-19 publications (18.52%), and this is consistent with other studies.^{11 40} A substantial proportion of editorial materials, letters and other types related to COVID-19 have been published, which decreased the denominators of JIFs but generated citation number. Moreover, the hot topic feature of the 'original article' and 'review article' related to COVID-19 increased the numerator and further boosted the JIFs. A study has shown that journals focusing on raising a JIF can lead to the decrease of content in some specific publication types.⁴¹ Similarly, global health journals could have participated 'artificially' in the inflation of JIFs by publishing more editorial materials and letters. Besides, this unusual structure of publication type during COVID-19 may not only dilute the original data published on this disease, but also reflect the possibility of affecting the quality of COVID-19-related research, which may possibly lead to exaggerated information and non-evidence-based measures in the early stage of COVID-19.⁴²⁻⁴⁴ However, considering the unknown nature of new disease in the early stage of COVID-19, this unusual phenomenon should not be criticised.⁴⁵ We are of the opinion that types other than 'research article' and 'review article' are important in providing other directions that could be explored, so their contribution is significant and should be encouraged.

Similar to Raynaud *et al* who estimated the dynamics of non-COVID-19 publications in 10 high-impact medical and infectious disease journals from January 2019 to January 2020,¹¹ we found that some journals maintained the number of non-COVID-19 publications while integrating COVID-19-related publications and thus increased the overall number of publications after the COVID-19 outbreak; some journals decreased the number of non-COVID-19 publications while integrating COVID-19-related publications with constant number of overall publications. Differently, we further found that six journals (*BMJ Global Health*, *Clinical Epidemiology and Global Health*, *Global Health-Science and Practice*, *Global Public Health*, *Journal of Epidemiology and Global Health*, and *Journal of Global Health*) increased the monthly number of non-COVID-19 publications with the increased monthly number of overall publications after the COVID-19 outbreak. This indicates that global health journals

responded differently to the COVID-19 pandemic in disseminating the publications. At the fast-spreading early stage of the COVID-19 outbreak, researches related to COVID-19, such as virology, clinical, medical and social researches, were rapidly disseminated for the purpose of forming guidelines to treat the patients, and understand the nature and possible impact of COVID-19.^{1 17 46-48} Meanwhile, increasing funding has been allocated to research related to COVID-19.⁴⁹ Therefore, it is understandable that some global health journals (especially those without APCs) decreased the number of non-COVID-19 publications after the COVID-19 outbreak and thus had a squeezing effect on the non-COVID-19 publications. However, the scientific standards and quality control need to be maintained when the number of COVID-19-related publications increases and the journals speed up COVID-19-related publications.^{11 50-52} Besides, not all the global health journals substantially disseminated COVID-19-related publications. For example, both *Global Health Action* and *Global Health Epidemiology and Genomics* had very limited number of COVID-19-related publications. This may indicate that some global health journals have their own topic preferences.

Our findings from ITSA demonstrate that, in general, the overall trend of non-COVID-19 publications in global health journals is decreasing after the COVID-19 outbreak, and *Annals of Global Health*, *BMJ Global Health*, *Journal of Epidemiology and Global Health*, and *Journal of Global Health* significantly contributed to the decreasing trend. In our results, *BMJ Global Health* had the highest number of COVID-19-related publications, followed by *Journal of Global Health*, which further supported the squeezing effect of COVID-19-related publications on the non-COVID-19 publications in the above four journals. Such finding is consistent with that of Shan *et al*, who explored the trends of non-COVID-19 publications in six leading medical journals (JIF >20) during the peak of the COVID-19.⁵³

Our study has some other implications. First, as for the SSCI/SCIE global health journals, the actual JIFs extracted from JCR are mostly higher than our simulated JIFs. We used the calculation of JIF proposed by WoS. However, some inconsistency was found among the number of citations, review articles or articles generated by JCR citation reports. It is almost impossible for us to generate the same JIFs following the JIF calculation formula. Ideally, more information from WoS regarding JIF calculation could be made accessible. Second, like the findings reported in *Lancet Global Health*²⁴ and *BMJ Global Health*,²⁹ most of the global health journals are operated by publishers from developed countries and they charge APCs. It is thus plausible that despite that some discount or full waiver policies are available, this might constitute a hindrance in publishing research from less funded entities. A more innovative, equitable and affordable charging policy could be explored. Third, in future pandemic outbreak setting, global health journals should balance publication structure

and number of pandemic and non-pandemic-related publications.

Limitations

Our study has some limitations. First, due to research feasibility, we only simulated the JIFs of global health journals only before and after the COVID-19 outbreak from 2019 to 2021. Given that citations change over time, more follow-up citations phenomenon will accumulate as well. To further track the follow-up impact, a similar research (another new study) to include more years of data will be helpful. Second, in this study, we mainly used the JIFs and publication numbers for the measurements. A combination of metrics can be explored for further empirical investigations, and more indicators, such as Journal Citation Index, h-index and Altmetric, can be further analysed quantitatively. Third, in this study, we did not quantify the impact of each publication type on JIF, which can be further explored in another follow-up study. Fourth, as publication priorities could be similar or completely different, including journals of the same or different publishers or families in our study, this could have potentially affected the results in terms of comparison. More explorations can be made in the future.

CONCLUSIONS

The COVID-19 pandemic has impacted the structure of COVID-19-related publication types, the JIFs of global health journals and their number of non-COVID-19 publications at different levels. It is necessary to pay attention to the structure of publication types, scientific standards and quality control when the number of COVID-19-related publications is increasing. Further, for some global health journals, a squeezing effect of COVID-19-related publications against non-COVID-19 publications is found. Although global health journals may benefit from the increased JIFs, they shall avoid relying on single metrics for journal development. More follow-up studies including more years of data with a combination of metrics can be conducted to generate more robust evidence.

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Acknowledgements We are very grateful to the three reviewers for their detailed insightful comments, which are very helpful in improving the quality of this article.

Contributors HL is the guarantor of the whole study. HL, JXH and XLL conceptualised and designed the study. JXH, XLL and MLZ implemented the study and extracted the data. JXH, XLL and CLJ analysed the data. JXH and XLL interpreted the data. JXH and XLL wrote the draft of the manuscript following the

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Funding This research is funded by a journal development grant from Wuhan University (413100103).

Competing interests None declared.

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

Patient consent for publication Not required.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplemental information.

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