Scientific publications and COVID-19 "research pivots" during the pandemic: An initial bibliometric analysis

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Working Paper [Version 3]

December 6, 2020 [with updated data appendix, April 29, 2022]

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Abstract

An examination is presented of scientific research publication trends during the global coronavirus (COVID-19) pandemic in 2020. After reviewing the timing of the emergence of the pandemic in 2020 and the growth of governmental responses, available secondary sources are used to highlight impacts of COVID-19 on scientific research. A bibliometric analysis is then undertaken to analyze developments in COVID-19 related scientific publications through to October of 2020 by broad trends, fields, countries, and organizations. Two publication data sources are used: PubMed and the Web of Science.

While there has been a massive absolute increase in PubMed and Web of Science papers directly focused on COVID-19 topics, especially in medical, biological science, and public health fields, this is still a relatively small proportion of publication outputs across all fields of science. Using Web of Science publication data, the paper examines the extent to which researchers across all fields of science have pivoted their research outputs to focus on topics related to COVID-19. A COVID-19 research pivot is defined as the extent to which the proportion of output in a particular research field has shifted to a focus on COVID-19 topics in 2020 (to date) compared with 2019. Significant variations are found by specific fields (identified by Web of Science Subject Categories). In a top quintile of fields, not only in medical specialties, biomedical sciences, and public health but also in subjects in social sciences and arts and humanities, there are relatively high to medium research pivots. In lower quintiles, including other subjects in science, social science, and arts and humanities, low to zero COVID-19 research pivoting is identified.

In a new Appendix to the paper, an updated analysis is provided through to mid-April 2022.

Citation

Shapira, P. “Scientific publications and COVID-19 “research pivots” during the pandemic: An initial bibliometric analysis,” *bioRxiv* 2020.12.06.413682; doi: https://doi.org/10.1101/2020.12.06.413682

Version Notes

Version 1: Original paper, completed on December 6, 2020; posted at *bioRxiv* on December 7, 2020.

Version 2: Minor grammar items corrected.

Version 3: Updated bibliometric analysis through to mid-April 2022 added on April 29, 2022, as new Appendix 2.

Introduction

This working paper takes an initial look at scientific research publication trends during the global coronavirus (COVID-19) pandemic.

To provide context, the paper first discusses the timing of the emergence of the pandemic in 2020 and the growth of governmental responses. Scientific research, as with other societal and economic activities across the globe, has been greatly impacted by COVID-19.

As one approach (of many possible approaches) to assessing COVID-19's effects on science, the paper analyzes developments in COVID-19 and all scientific publications in 2020 by broad trends, fields, countries, and organizations. Comparisons are made with the pre-COVID year of 2019. The paper also examines the extent to which researchers across all fields of science have pivoted their research outputs to focus on topics related to COVID-19.

Two publication data sources are used for the analyses presented in the paper: PUBMED and the Web of Science. A bibliometric search approach is applied to publication datasets from these two sources to identify COVID-19 relevant publications. The publication datasets and bibliometric search approach are described in a subsequent section of the paper.

Emergence of the pandemic and timing of government responses

In January 2020, the COVID-19 outbreak was declared a public health emergency of international concern by the World Health Organization (WHO).[1] In March 2020, WHO designated COVID-19 as a pandemic.[2] While early cases of COVID-19 were reported in January 2020, the worldwide rate of growth of reported cases began to accelerate from February 2020 (Figure 1). Reported COVID-19 cases continued to increase globally throughout 2020, reaching 45.7 million by the end of October 2020, and growing to over 61 million by the end of November 2020.[3] The number of countries reporting COVID-19 cases rose to 22 by the end of January 2020, rising to 58 by the end of February 2020. Just a month later, by the end of March 2020, COVID-19 cases were reported in 192 countries, rising to 212 by October 2020.[4]

Governments around the world have responded to the COVID-19 pandemic with a range of policy responses including workplace and school closings, requests and orders to stay at home,

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[1] WHO Director-General's statement on IHR Emergency Committee on Novel Coronavirus (2019-nCoV). 30 January 2020. World Health Organization. https://www.who.int/dg/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov).

[2] WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. World Health Organization. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

[3] Our World in Data, COVID-19 dataset, Oxford Martin Programme on Global Development, University of Oxford, and the Global Change Data Lab. https://github.com/owid/covid-19-data/tree/master/public/data (downloaded November 28, 2020).

[4] Calculated from Our World in Data, COVID-19 dataset, ibid. Reference to countries also includes territories and dependencies separately reporting COVID-19 cases.

controls on domestic and international travel, financial and economic support, and multiple healthcare and public health measures.[5] The Oxford COVID-19 Government Response Tracker (OxCGRT) indicates that some governments were undertaking policy responses in January 2020. However, the greatest surge worldwide in COVID-19 government responses occurred in March and April of 2020, continuing – with some fluctuations – throughout 2020, as measured by OxCGRT's global mean index values for COVID-19 government response for over 180 countries (Figure 1).[6]

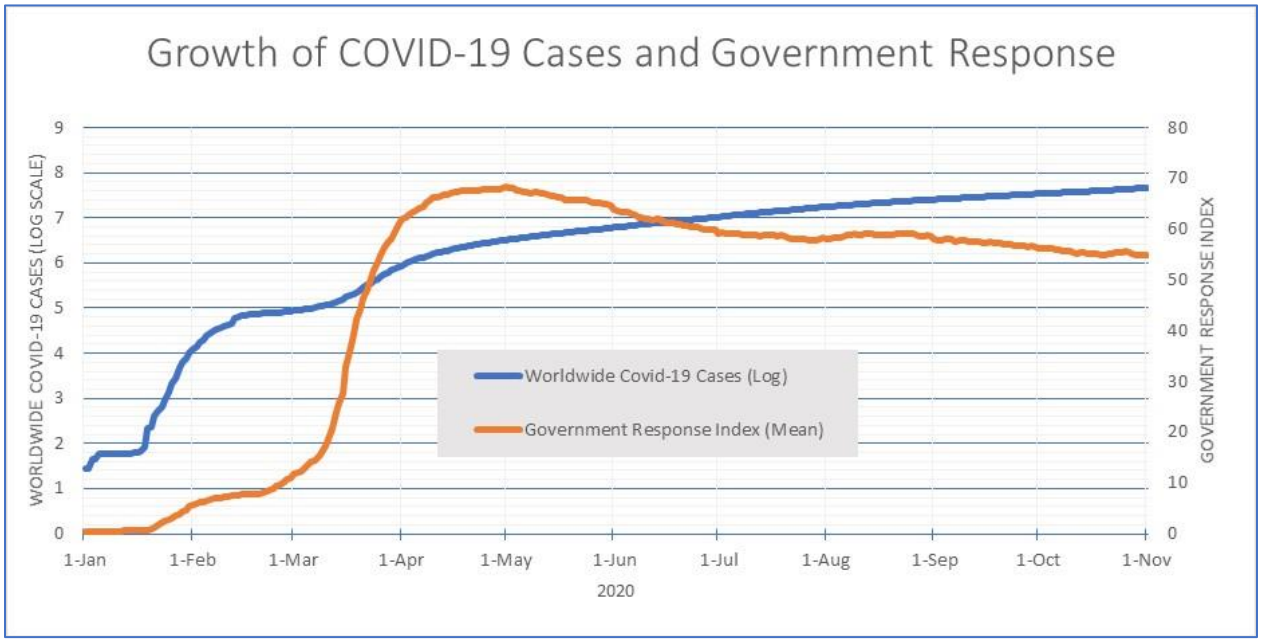

Figure 1. Calculated from Our World in Data, COVID-19 dataset (see footnote 4); and OxCGRT's global mean index values for COVID-19 government response (see footnote 6).

Implications of the COVID-19 pandemic on scientific research

Published reports and articles indicate that the COVID-19 pandemic has had multiple consequences for scientific research.

For scientists working directly on COVID-19 research, including in epidemiology, virology, testing and diagnosis, therapies and treatments, medical equipment, vaccine development, and public health responses, it has been a period of urgent focus with expectations of rapid results. Worldwide, scientists have been activated to respond to COVID-19, using both existing resources and a massive injection of

[5] Hale, T., Boby, T., Angrist, N., Cameron-Blake, E., Hallas, L., Kira, B., Majumdar, S., Petherick, A., Phillips, T., Tatlow, H, and Webster, S. Variation in Government Responses to COVID19. Version 9.0. Blavatnik School of Government Working Paper. 24 November 2020. https://www.bsg.ox.ac.uk/sites/default/files/2020-11/BSG-WP-2020-032-v9.pdf (accessed November 28, 2020).

[6] Our World in Data, OxCGRT COVID-19 Government Response dataset, https://github.com/owid/covid-19-data/tree/master/public/data/bsg (accessed November 28, 2020).

new R&D funds by research sponsors.[7,8] Research sponsors have shortened proposal review times and accelerated award processes for new COVID-19 R&D funding.[9] More than 175 new COVID-19 R&D programs and projects have been identified by OECD in in multiple locations (including in Europe, the US, Canada, Australia, China, Brazil, Russia and India).[10] Another estimate suggests that, since January 2020, more than $9 billion in government, philanthropic, and industry funding has been committed globally for COVID-19 R&D.[11] Much of this funding has gone to COVID-19 R&D by private companies, although universities and other public research organizations have also been supported, with the US being by far the largest sponsor, followed by Canada, Germany and the UK.[12]

The urgency of the pandemic and the extraordinary new R&D focus on COVID-19 has resulted in a massive increase in COVID-19 research publications. There has been a sharp growth in papers addressing COVID-19 topics, with US, Chinese, UK, and other European researchers anchoring the largest research networks.[13] There has been growth not only in peer-reviewed journal articles but also in preprints (non-peer reviewed, publicly available papers) that address COVID-19 topics, with new tools and databases emerging to track and sort these papers.[14] Cautions have been raised about the quality of COVID-19 "speed science," especially among non-reviewed preprints.[15] However, one early (April 2020) study found that more than three-quarters of the 11,686 COVID-19 papers identified at that point were journal papers (compared with preprint papers in repositories, many of which were pre-publication versions of papers in processes of journal submission).[16] The study noted that the three largest open-access repositories for COVID-19 papers were PMC and PubMed, medRxiv and BioRxiv.

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[7] OECD, Draft summary of the STIO-GSF Virtual workshop on "Mobilising science in response to COVID-19," 21 October 2020. Directorate for Science, Technology and Innovation, Committee for Scientific and Technological Policy, DSTI/STP/GSF/M(2020)2/ANN, Organisation for Economic Co-operation and Development, Paris. https://community.oecd.org/docs/DOC-184320 (accessed November 28, 2020).

[8] Lem, P. Grant 'repurposing' towards Covid-19 widespread. Research Professional News, August 10, 2020. https://www.researchprofessionalnews.com/rr-news-europe-universities-2020-8-grant-repurposing-towards-covid-19-widespread/

[9] Kaiser, J. NIH grapples with rush to claim billions in pandemic research funds. Science, June 3, 2020. http://doi.org/10.1126/science.abd1508.

[10] OECD, COVID19 Research funding worldwide (to 21 September 2020). Organisation for Economic Co-operation and Development, Paris. https://community.oecd.org/docs/DOC-171875 (accessed November 28, 2020).

[11] COVID-19 R&D Tracker. Policy Cures Research. https://www.policycuresresearch.org/covid-19-r-d-tracker (accessed November 28, 2020). This estimate is obtained from public funding announcements and press releases. Policy Cures Research notes that this is an incomplete estimate which does not include vaccine R&D and other R&D associated with the €7.4 billion ($8.8 billion) European Union Coronavirus Global Response and the more than $11.4 billion committed by the US Government to a range of agencies including BARDA (Biomedical Advanced Research and Development Authority). Chinese governmental COVID-19 R&D is not included, although the COVID-19 R&D Tracker does capture funding by some Chinese philanthropic and industrial organizations.

[12] COVID-19 R&D Tracker, ibid.

[13] Fry, C.V., Cai, X., Zhang, Y., and Wagner, C.S. Consolidation in a crisis: Patterns of international collaboration in early COVID-19 research. PLoS ONE, 2020, 15(7): e0236307. https://doi.org/10.1371/journal.pone.0236307.

[14] Brainard, J. New tools to tame pandemic paper tsunami, Science, May 29, 2020, 368 (6494), 924-924.

[15] Sharma, M., Scar, S., and Kelland, K. Coronavirus and the risks of 'speed
Science. 24 March 2020. World Economic Forum. https://www.weforum.org/agenda/2020/03/speed-science-coronavirus-covid19-research-academic (accessed October 23, 2020).

[16] Torres-Salinas, D., Robinson-Garcia, N., Castillo-Valdivieso, P.A. Open Access and Altmetrics in the pandemic age: Forescast analysis on COVID-19 literature. bioRxiv, posted April 26, 2020. https://doi.org/10.1101/2020.04.23.057307.

Meanwhile, particularly since March 2020 as governments expanded responses to curtail the spread of the pandemic, scientists in non-COVID-19 research domains have endured multiple disruptions to regular research work.[17,18,19] Research facilities, laboratories, and labs have been closed for long periods in many countries. Across all fields, large numbers of researchers have spent months working from home, using remote access where possible. The recruitment of doctoral and early career researchers (especially internationally) has slowed, where it was not suspended.[20] Research-related fieldwork and other travel has halted, while online video conferencing for team meetings, workshops and conferences has boomed. With school closures and social distancing, scientists with family and other caring responsibilities have faced added pressures, with effects on research productivity especially experienced by women.[21,22]

The closure of research facilities in 2020 resulted in benchwork, experiments and trials being stopped and the blocking of access to labs, instruments, and equipment. For example, more than 90% of labs at MIT were shut by March 20.[23] The only exemptions were for labs working with coronavirus research, expensive materials, and certain animal experiments. As elsewhere, researchers shifted to a virtual environment, including using (and publishing with) already available data, or reorienting projects to involve more simulation work. In some instances, new lab automation was introduced. However, remote working for many months has presented challenges. For non-COVID 19 cancer research, access to labs and samples, the pausing of patient enrolment on clinical trials, and face-to-face interactions with colleagues have been major concerns.[24] In contrast, for some other non-lab bound scientists, the worldwide slowdown or ceasing of human activities caused by the pandemic presented unique observational opportunities. New opportunities emerged to study impacts of reduced traffic, ocean

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[17] Council on Governmental Relations. Research Impact under COVID-19. August 25, 2020. Washington, DC. https://www.cogr.edu/sites/default/files/Research_COVID_August2020_COGR_FINAL.pdf (accessed September 3, 2020).

[18] Vitae. Covid-19 impact on researchers. Study commissioned by the Department for Business, Energy and Industrial Strategy, UK. October 12, 2020. Results reported at https://www.vitae.ac.uk/news/vitae-news-2020/impact-of-lockdown-on-researchers-in-uk (accessed November 29, 2020).

[19] Larkins, F., et al., Impact of the pandemic on Australia's research workforce. May 8, 2020. Research Brief. Australian Government, Chief Scientist. https://www.science.org.au/sites/default/files/rrif-covid19-research-workforce.pdf (accessed November 29, 2020).

[20] European Commission, Impact of Covid-19 on International Students in EE and OECD Member States. Inform #2. https://ec.europa.eu/home-affairs/sites/homeaffairs/files/00_eu_inform2_students_final_en.pdf (accessed November 29, 2020).

[21] Andersen, J.P., Nielsen, M.W., Simone, N.L., Lewiss, R.E., and Jagsi, R. Meta-Research: COVID-19 medical papers have fewer women first authors than expected. June 15, 2020. eLife 2020;9:e58807. https://doi.org/10.7554/eLife.58807.

[22] Myers, K.R., Tham, W.Y., Yin, Y., Cohodes, N., Thursby, J.G., Thursby, M.C., Schiffer, P., Walsh, J.T., Lakhani, K.R., and Wang, D. Unequal effects of the COVID-19 pandemic on scientists. Nature Human Behaviour, 4, 880–883 (2020). https://doi.org/10.1038/s41562-020-0921-y.

[23] Blanding, M. Research in the Time of COVID. Technology Review. October 20, 2020. https://www.technologyreview.com/2020/10/20/1009361/research-in-the-time-of-covid/ (accessed October 24, 2020).

[24] Institute for Cancer Research. Pandemic to delay cancer advances by nearly 18 months, researchers fear. November 30, 2020, London, https://www.icr.ac.uk/news-archive/pandemic-to-delay-cancer-advances-by-nearly-18-months-researchers-fear (accessed November 30, 2020).

shipping, pollution, noise, and other human activities on the environment, cities, and the natural world.[25,26]

Towards the middle and latter months of 2020, research labs began to re-open in a growing number of countries. In this phase of ramp-up, labs typically re-opened with capacity reductions or controlled shift work due to social distancing and other preventative measures.[27,2829] At the UK's Institute for Cancer Research, the proportion of time researchers spent in labs dropped from 53% pre-pandemic to 5% in lockdown, returning only to 34% many months later during phased access.[30]

The reopening of research labs for non-COVID-19 research has proceeded cautiously, even in locations, such as China, where the spread of COVID-19 has been controlled following the initial outbreak. In other countries, including in the UK and other parts of Europe, there have been phases of ramping-up of some research activities, followed by subsequent lockdowns in the Autumn of 2020.

The outlook for the large-scale rollout of safe and effective vaccines now appears optimistic for 2021. However, there remain uncertainties in many countries as to when labs can fully open, without social distancing, and when international travel will fully resume. Some work practices established in the pandemic may persist (including continued extensive use of virtual team working and virtual conferencing), while there are likely to be enduring impacts for many researchers in terms of lost experiments, reoriented topics, and career development.

Identifying COVID-19 publications: A bibliometric search approach

To provide an update to bibliometric studies undertaken earlier in the pandemic, the paper probes trends in COVID-19 publications and non-COVID-19 publications as far as is possible in 2020.

Complete publication data for the full year of 2020 is not available at the time of this analysis. Access is available for publication datasets through to September to November of 2020, allowing about 9 to nearly 11 months of publication data to be analyzed (depending on the database). Two publication databases are used. The first is the PubMed database, maintained by the National Center for Biotechnology Information at the US National Library of Medicine (NLM). This allows searches of more than 31 million journal records and abstracts in biomedical, health and related fields, including more than 8 million full-text records.[31] The second database is the Web of Science (WoS), maintained by

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[25] Ball, P. Why lockdown silence was golden for science. The Guardian, 20 June 2020. https://www.theguardian.com/science/2020/jun/20/why-lockdown-silence-was-golden-for-science (accessed June 21, 2020).

[26] Stokstad, E. Pandemic lockdown stirs up ecological research, Science, 28 August 2020, 369 (6506), 893.

[27] Grim, D. As labs move to reopen, safety worries abound. Science, 15 May 2020. 368 (6492), 690-691.

[28] JASON. Managing the Risk from COVID-19 During a Return to On-Site University Research. JSR-20-NS1. August 25, 2020. MITRE Corporation, VA.

[29] Working safely during coronavirus (COVID-19). Labs and research facilities. Department for Business, Energy & Industrial Strategy and Department for Digital, Culture, Media & Sport, UK. Updated 27 November 2020. https://www.gov.uk/guidance/working-safely-during-coronavirus-covid-19/labs-and-research-facilities (accessed November 29, 2020).

[30] Institute for Cancer Research, op. cit. (footnote 24).

[31] As of November 29, 2020, PubMed reports a total of 31,813,673 publication records (https://pubmed.ncbi.nlm.nih.gov/?term=%221800%3A2100%5Bdp%5D%22). Of these, 8,371,581 are free full text

Clarivate Analytics, which contains 78 million publication records from about 21,000 peer-reviewed journals in more than 250 fields of science, social science, and arts and humanities.[32] Both PubMed and WoS have worldwide coverage, although they predominantly contain English-language records.[33]

To identify COVID-19 records in PubMed, the following COVID-19 bibliometric search approach developed by Search Technology and Georgia Tech was used:[34]

- **PubMed**: "COVID-19"[All Fields] OR ("coronavirus"[MeSH Terms] OR "coronavirus"[All Fields]) OR "Corona virus"[All Fields] OR "2019-nCoV"[All Fields] OR "SARS-CoV"[All Fields] OR "MERS-CoV"[All Fields] OR "Severe Acute Respiratory Syndrome"[All Fields] OR "Middle East Respiratory Syndrome"[All Fields]

This search approach was applied to PubMed to obtain summary totals for COVID-19 records for all years. Additionally, for detailed analysis based on aggregations of individual records, the paper uses a publicly available database of COVID-19 PubMed records made available by Search Technology based on the above search approach. This database contained 56,463 COVID-19 records from PubMed published in 2020 through to September 22, 2020 (All documents).[35]

To identify COVID-19 records in WoS, the same bibliometric search approach was adapted for the WoS Advanced Search facility:

- **WoS**: TS=("COVID-19" OR Coronavirus OR "Corona virus" OR "2019-nCoV" OR "SARS-CoV" OR "MERS-CoV" OR "Severe Acute Respiratory Syndrome" OR "Middle East Respiratory Syndrome")

This search approach was applied to the WoS (Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI) refined by document types (article, early access, review, or proceedings paper). After capturing records and cleaning, this resulted in 44,022 COVID-19 WoS records, published 1969 through to October 24, 2020. Aggregated analysis was also undertaken for all WoS publication records (with same Indexes and document types, for 2020) downloading the summary results (but not individual records).

VantagePoint desktop text mining software was used for further processing and analysis of the two datasets containing the WoS and PubMed records.[36]

The next parts of the paper present analyses using the WoS and PubMed publication data. In interpreting these analyses, keep in mind the differences between the two databases. As noted, the WoS covers all fields of science, social science, and arts and humanities. The analysis that follows includes articles, early access, review, or proceedings papers from reviewed sources. Articles and

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(https://pubmed.ncbi.nlm.nih.gov/?term=%221800%3A2100%5Bdp%5D%22&filter=simsearch2.ffrft) from NLMs PubMed Central (full-text database of articles) and other sources.

[32] https://clarivate.com/webofsciencegroup/solutions/web-of-science-core-collection/. A search of the Web of Science (November 29, 2020) returns 78,153,527 publication records (Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED)

[33] Publications in languages other than English comprised 14.9% and 7.5% respectively of the total number of PubMed and WoS reported in footnotes 31 and 32.

[34] http://www.techminingforglobalgood.org/open-covid-19-research-for-analysis/.

[35] http://www.techminingforglobalgood.org/open-covid-19-research-for-analysis/ (accessed October 24, 2020).

[36] See: https://www.thevantagepoint.com/.

reviews comprise about 95% of the COVID-19 WoS dataset. Preprints and chapters in edited volumes are not included, and there is some lag (most relevant for 2020 data) in review and publication processes. PubMed is focused on biomedical, health and related fields, but there is a wider sweep in the records reported including Medline (containing publication records from evaluated journals), papers from other journals, chapters and preprints (the latter with less time lag in posting).

Growth of COVID-19 publications in 2020

Research related to various forms of coronavirus has been undertaken for several decades, with publication at a relatively low level, e.g. at around 150-200 annual publications in the late 1990s and early 2000s.[37] There was a spike in research publications with about 700 WoS and 4,000 PubMed publications over the 3-year 2003-2005 period, with the global emergence of severe acute respiratory syndrome (SARS), a distinct coronavirus (SARS-CoV). Subsequently, coronavirus-related publications continued at annual levels of around 650 and 760 in the WoS and PubMed in the 2006 to 2019 period.

The publication profile, of course, changed dramatically in 2020, with the rapid worldwide spread of COVID-19. The urgent focus of scientific attention generated by the pandemic, as noted earlier in this paper, has been associated with a massive increase in publication outputs on COVID-19 topics. From January to November 2020, more than 38,000 WoS and 78,000 PubMed publications were recorded. Reflecting the upward step in the volume of COVID-19 publications is a noticeable shift in 2020 in the proportion of all scientific publication efforts devoted to pandemic-related research. When compared with 2019, the share of COVID-19 publications in 2020 in all publications rose from 0.03% to 1.8% in the WoS and from 0.07% to 5.3% in PubMed (Figure 2).

On a month-by-month basis in 2020, COVID-19 research publications in PubMed began to accelerate in February and March 2020 (when the global extent of the pandemic was fully realized, and government responses heightened). There was a further increase in rate of PubMed COVID-19 outputs from April through to the Summer of 2020. (Figure 3.) This analysis is based on PUBMED records published in 2020 as of September 22, 2020. Publication tallies for more recent months are not completely captured. In other words, the apparent downward PubMed profile from August 2020 is based on incomplete record capture. More publications will be added in the more recent months when 2020 is more fully indexed (by the first part of 2021). WoS COVID-19 publications show comparable trends, except with a lower rate of take-off (than for PubMed publications) in Spring 2020. Again, the WoS dataset (containing COVID-19 publication records as of October 24, 2020) is not complete for more recent months.

[37] In 2000, there were 141 WoS and 151 PubMed publication recorded on coronavirus-related topics.

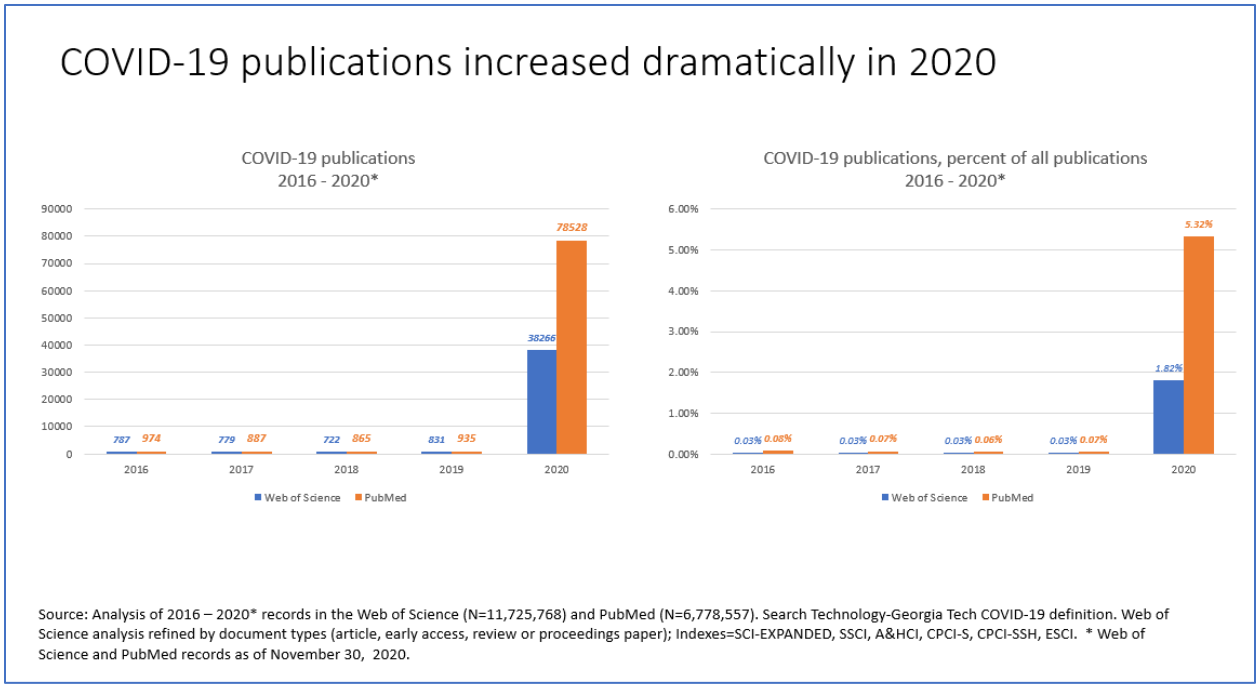


Figure 2

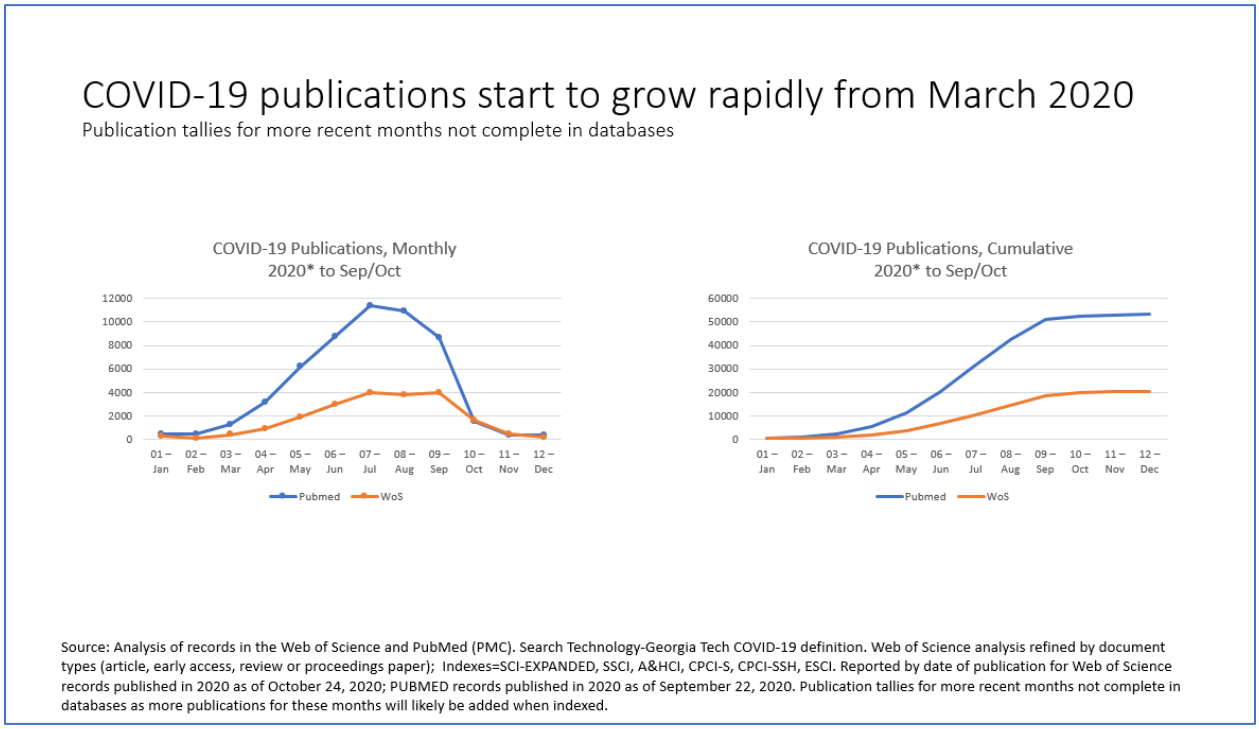


Figure 3

COVID-19 publications in 2020 by countries and organizations

By country, based on author affiliation location, for both WoS and PubMed COVID-19 research publications in 2020, the leading producer is the US, followed by China, the UK, and Italy (Figure 4). The

mid-size developed (OECD)[38] countries of France, Canada, Spain, Germany, and Australia comprise all but one among other locations in the top ten. India is positioned fifth by number of 2020 COVID-19 papers, with two other non-OECD countries – Brazil and Iran – placed eleventh and twelfth.

Based on WoS publications, the positioning of the US and China is reversed when publications across all fields is considered. The US contributed 29.1% of 2020 publications in the COVID-19 WoS dataset, compared with 22.3% of all WoS publications over the period January 2020 through to November 2020, a ratio of Covid-19 to all papers of 1.30.[39] The comparable numbers for China are 15.6% of COVID-19 WoS papers and 23.6% of all WoS papers, with a ratio of Covid-19 to all papers of 0.66. Understanding the reasons for this difference needs further investigation, but it probably reflects the strong and relatively larger base of biomedical research in the US and the influence of rapidly available added COVID-19 research funding. Additionally, it is important to note that China has published and made available a large volume of WoS (as well as PubMed) papers on COVID-19.

Among other countries, the UK, Italy, India and Canada published in 2020 (to date) a relatively larger share of COVID-19 WoS papers when compared with all WoS papers (ratios of 1.46, 2.43, 1.15, and 1.15 respectively). France and Germany are among countries publishing COVID-19 papers in 2020 at comparable or relatively lower rates when compared with all WoS papers (1.03 and 0.83 respectively). Authors affiliated with institutions in Russia published COVID-19 WoS papers at relatively lower rates when compared with all Russian WoS papers (ratio of 0.42).

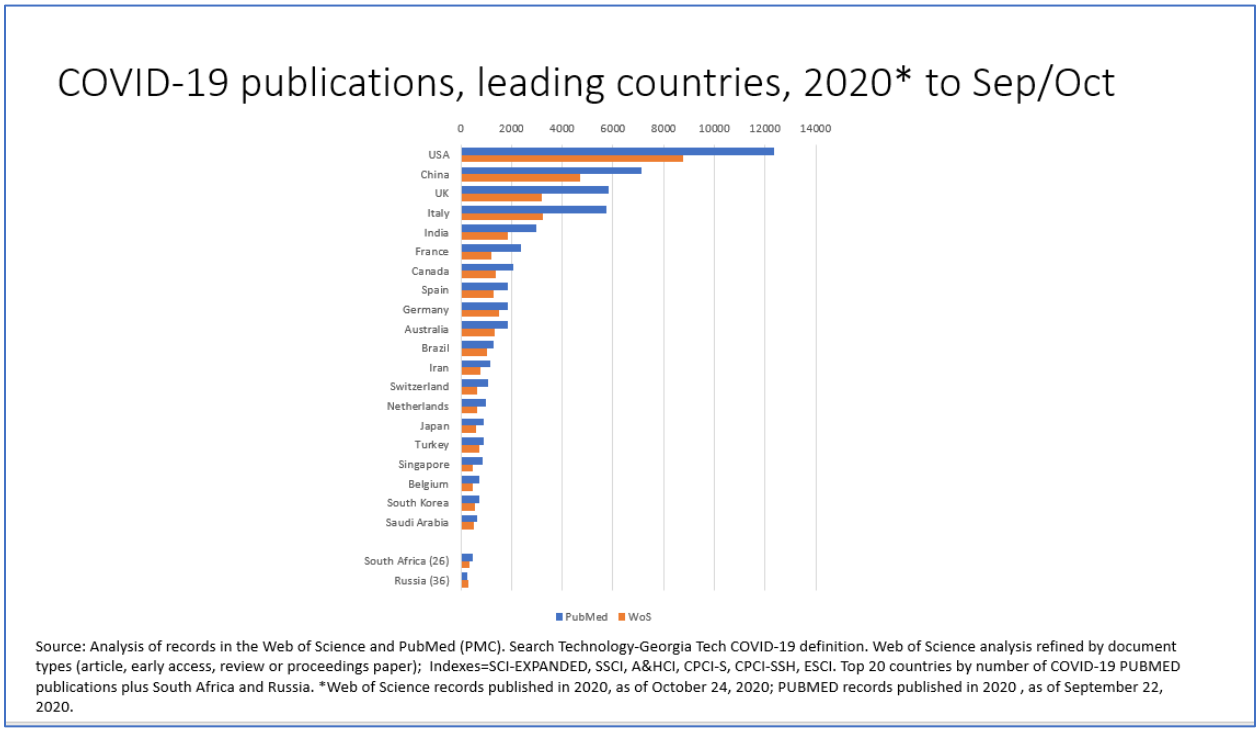


Figure 4

[38] Organisation for Economic Cooperation and Development.

[39] Comparison of COVID-19 WoS study dataset with aggregate WoS publications analyzed by countries (same indexes and document types) for January 1, 2020 - November 30, 2020 (N=2,199,639).

Researchers from a wide range of organizations (based on author affiliations) in multiple countries have been contributing to the rapid expansion of COVID-19 research papers in 2020. Of the top 20 organizations by PubMed COVID-19 publications in 2020 (to September 22), nine are based in the US, four in China, two in the UK, and one each in Singapore, Italy, India, Canada, and Iran (Figure 5). Mostly, the leading organizations are research universities and specialized medical research institutions, although there is notable representation from identifiable hospitals and clinics.[40] For WoS COVID-19 publications in 2020 (to October 24), organizations from fewer countries are represented in the top 20, but the top part of that list is comparable, led by eight organizations based in the US, six in China, and three in the UK (Figure 6).

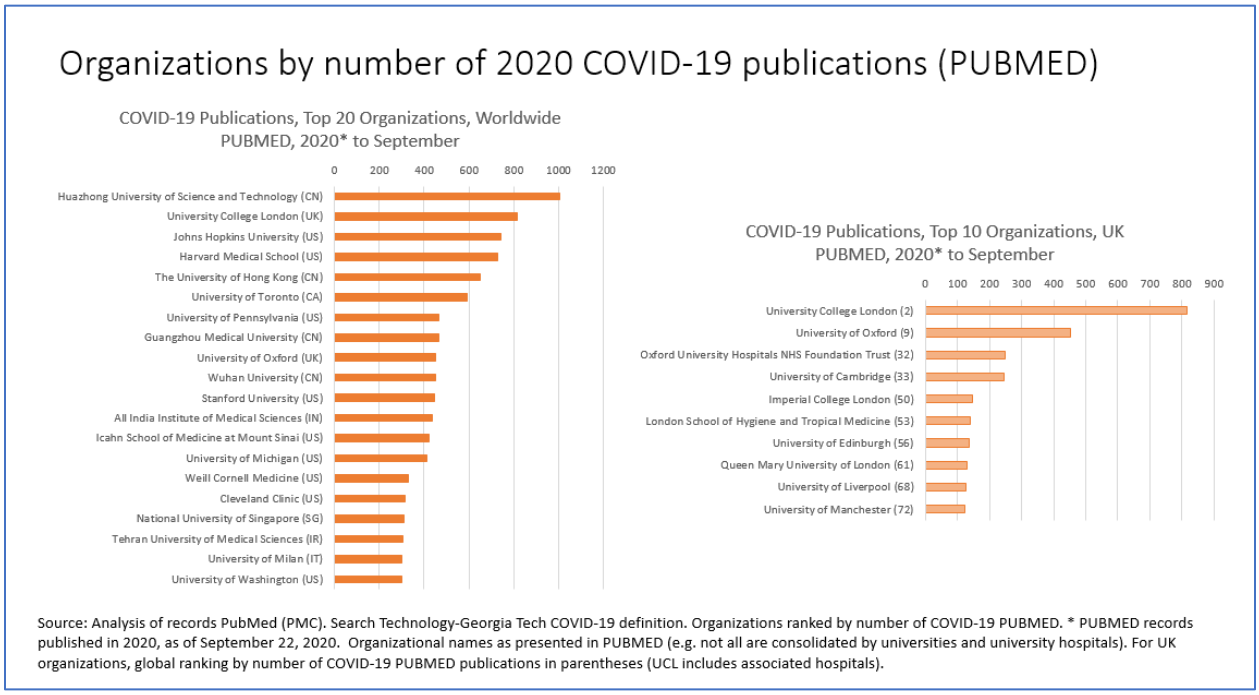


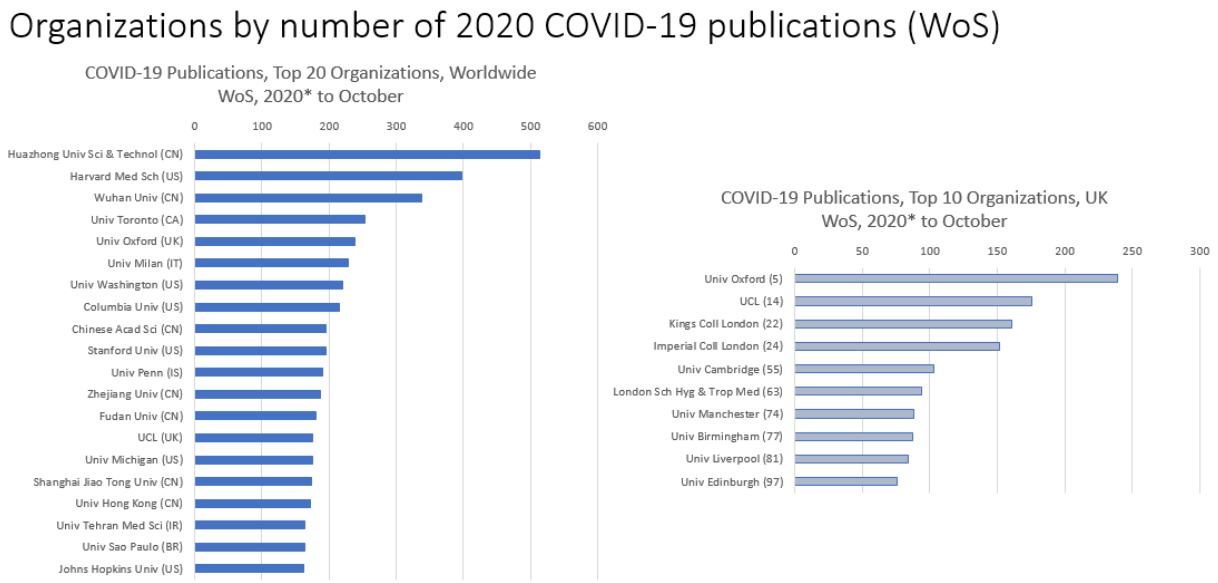
Figure 5

Huazhong University of Science and Technology (in Wuhan, Hubei province, China) is the leading publisher of both PubMed and WoS COVID-19 papers, by volume of papers. Wuhan University is tenth organization by PubMed COVID-19 papers and third by WoS COVID-19 papers, again by volume of output.[41] The University of Hong Kong is also a leading producer of PubMed COVID-19 outputs. Johns Hopkins University, the Harvard Medical School, the University of Toronto, and the University of

[40] In the top 100 COVID-19 publishing organizations by author affiliations in the PubMed dataset, 54 are indicated as universities, 25 as medical schools, 18 are hospitals or clinics, and 3 are national or public research organizations. However, organizations and affiliations can be intertwined. Hospitals and clinics are often associated with universities. In some cases, researchers will publish with a university or medical school or hospital affiliation (or a combination of two or more affiliations).

[41] Wuhan is the city where the first large scale outbreak of COVID-19 was identified. See: Novel Coronavirus – China, 12 January 2020, World Health Organization, https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/; C. Huang et al., Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China, The Lancet, January 24, 2020, https://doi.org/10.1016/S0140-6736(20)30183-5.

Pennsylvania in North America, and University College London and Oxford University in the UK, are leading producers of PubMed COVID-19 publications. These are all large research institutions with significant medical and public health research capabilities. By output of WoS COVID-19 papers, research institutions in China, North America, and Europe (the UK and Italy) comprise the top ten.[42]



Source: Analysis of records in the Web of Science. Search Technology-Georgia Tech COVID-19 definition. Web of Science analysis refined by document types (article, early access, review or proceedings paper); Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI. Organizations ranked by number of COVID-19 WoS publications. *Web of Science records published in 2020, as of October 24, 2020. Organizational names as presented in WoS (e.g. not all are consolidated by universities and university hospitals). For UK organizations, global ranking by number of COVID-19 WoS publications in parentheses.

Figure 6

COVID-19 Publications by Subject Categories

The journals included in the WoS publication database are classified by over 250 "subject categories."[43] These subject categories (SCs) are broadly equivalent to disciplines, but this is not a perfect match.[44] Journals can and do cover multiple fields of science. In the WoS scheme, journals (and the papers they publish) may be classified in up to 6 SCs, although about 60% of journals in WoS are classified in only one SC, with another 30% classified in two SCs.[45] Some journals are explicitly interdisciplinary. Reflecting this there are nine WoS SCs that are designated as multidisciplinary, including "Multidisciplinary Sciences" (which includes such journals as *Nature* and *Science* that publish across all fields of science).

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[42] While there are broad similarities in outputs of COVID-19 PubMed and WoS papers by organizational affiliations, detailed differences are also observable. Underlying reasons for these differences may include variations in organizational structure (e.g., university relationships with medical schools and affiliated hospitals) and disciplinary composition within each institution, topical foci, and distribution of publication outlets including by journal, peer reviewed and preprint placements.

[43] Web of Science Core Collection: Web of Science Categories. Clarivate. https://support.clarivate.com/ScientificandAcademicResearch/s/article/Web-of-Science-Core-Collection-Web-of-Science-Categories?language=en_US (accessed December 3, 2020).

[44] See: Milojević, S. Practical method to reclassify Web of Science articles into unique subject categories and broad disciplines. Quantitative Science Studies 2020 1:1, 183-206. https://doi.org/10.1162/qss_a_00014.

[45] Wang, Q., and Waltman, L. Large-scale analysis of the accuracy of the journal classification systems of Web of Science and Scopus. Journal of Infometrics, 2020, 10, 347-364. https://doi.org/10.1016/j.joi.2016.02.003.

The journal SC (or combination of SCs) is allocated to every paper in the journal, although individual papers within a particular journal may be varied in their subject matter. Additionally, as scientific fields evolve and novel fields form, new journals typically emerge. This presents classification challenges and lags, although SCs and constituent journals are periodically updated to reflect changes in fields, new fields, and repositioning of journals. While it is convenient and common to use WoS SCs to overview the distribution of published outputs by various scientific fields, these caveats about the classification scheme should be kept in mind.

To provide a basis over time for comparison, WoS COVID-19 publications are analyzed for two time periods: 2017-2019[46] and 2020 (through to October 24). (Figure 7.) In the earlier period, "Virology" was the leading SC category, with 562 coronavirus WoS publications, or 24.4%) of this SC's total from 2017 to 2019 (three complete years). In this earlier period, the second and third SCs by 562 coronavirus WoS publications were "Infectious Diseases" (354 publications) and "Microbiology" (285 publications). Together, more than half (52.1%)[47] of earlier period coronavirus outputs were classified in these three SCs, reflecting a research focus on the properties and microbiology of the virus itself.

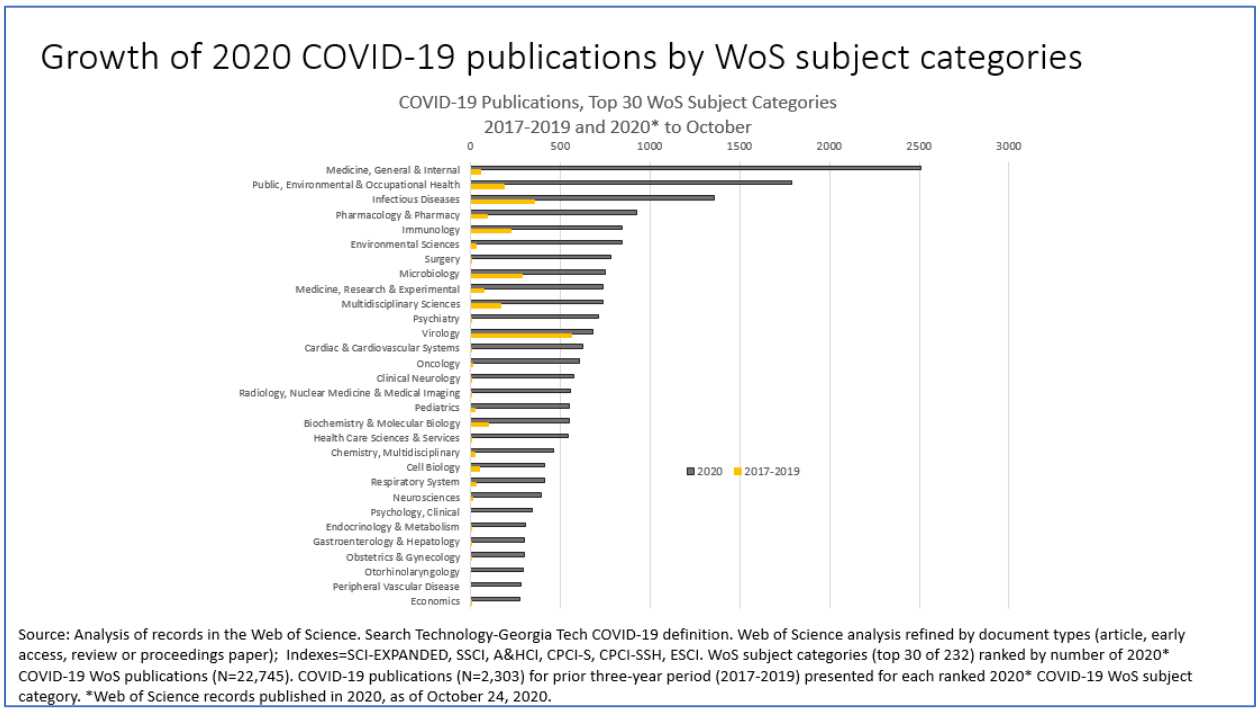

Figure 7

In 2020, the profile of COVID-19 research publications dramatically changed – with an upsurge in the volume of publications and engagement of scientists from a wider array of research fields. There was a massive increase in "Medicine, General & Internal" (over 2,500 WoS COVID-19 publications in 2020 to date, compared with just over 50 WoS coronavirus publications in the prior three-year period). Along with large increases of 2020 COVID-19 WoS publications in the SCs of "Public, Environmental &

[46] The 2017-2019 period was chosen to provide a recent comparison and to gather a reasonably sized dataset (N=2,303) across WoS SCs.

[47] Percentage totals by SCs add up to more than 100% reflecting articles in journals that are assigned two or more SCs.

Occupational Health," "Pharmacology & Pharmacy," "Environmental Sciences," "Surgery," and "Medicine, Research and Experimental," this represents an understandable and rapid broadening of COVID-19 research activities into the domains of treatment, therapy, contagion, and public health. Multiple other medical fields with little prior coronavirus research activity saw significant increases in 2020 COVID-19 WoS publications, including "Psychiatry," "Cardiac &, Cardiovascular Systems," "Oncology," "Clinical Neurology," "Radiology," "Nuclear Medicine & Medical Imaging," and "Pediatrics" (see Figure 7). The SCs of "Infectious Diseases," "Microbiology," and "Virology," as with "Immunology", "Biochemistry & Molecular Biology," and "Cell Biology", all saw surges in 2020 COVID-19 WoS publications as researchers further analyzed the nature and pathology of the virus and explored human impacts and responses. Research on vaccines is categorized across several SCs: the leading categories for COVID-19 WoS publications related to vaccines are "Immunology," "Virology", "Medicine, Research and Experimental," "Microbiology," and Biotechnology & Applied Microbiology."

COVID-19 Pivots in 2020 by Research Fields

With the urgency and global spread of the pandemic in 2020, scientists around the world have substantially expanded their COVID-19 research efforts. One outcome of this, as we have seen, is a massive increase in the volume of PubMed and WoS publications on COVID-19 topics. It is evident, from the analysis in the previous section of WoS subject categories, that researchers in medicine, biological sciences, and public health domains have greatly expanded COVID-19 publication outputs in 2020. The entry of "Economics" (at 30th place) in the top 30 SCs by number of WoS COVID-19 publications in 2020 (Figure 7) highlights COVID-19 research activity in the social sciences. This is comprehensible: while the global pandemic has caused tragic public health consequences and massive impacts on health care systems, it has resulted in huge effects worldwide across all aspects of life and human activity, economy, society, community, and government.

Given the scale and scope of the pandemic, scientists across a wide range of research fields will surely be interested in, and concerned about, the impacts and consequences of COVID-19 in its many and varied forms. Those interests and concerns may take different forms including policy and community engagement as well as reoriented or new research projects related to COVID-19 topics. Publication opportunities from these activities and projects likely varies across fields. As discussed earlier in this paper, large numbers of scientists not working directly on urgent COVID-19 medical, biological science, or public health topics have spent much of 2020 working from home or at reduced levels of access to their labs, field sites, or research subjects. This surely influences research paper productivity. In certain circumstances, output may increase, for example for scientists working directly on urgent COVID-19 topics or who have access to data that can be written up. We have clearly seen a massive increase in PubMed and WoS publications related to COVID-19. To an extent, this wave of new COVID-19 publications may have substituted for what would have been other outputs; or the urgency of the pandemic and the massive efforts of researchers (and perhaps a strong desire by some to be first to publish) may have generated increased publication productivity. In many other cases, there may be adverse effects on publication productivity, where research has slowed or paused or where researchers have been preoccupied with family or caring responsibilities, online teaching (where researchers also teach), crisis management, or suffered personal or family health impacts.

It is important for many reasons (including research management, researcher career development, and policy learning) to assess how research productivity, as measured by publication outputs, has been

affected during the pandemic, with comparison to pre-pandemic norms (and, of course, the post-pandemic era, when we reach that point). Such an analysis should account for field and institutional effects as well as potential differential effects by researcher gender, seniority, and roles. Any immediate (2020) analysis should also account for the significant variations in time lags to publication by journals in different fields[48] and the impact of the pandemic on journal peer review processes.[49]

However, 2020 is not yet complete (at the time of analysis and writing). Indeed, a complete record of publications for the full year of 2020 will only be available only in 2021, as some time needs to elapse before all prior period publications are recorded in indexes such as PubMed or WoS. Hence, it is not yet possible to undertake disaggregated and controlled measures of research publication output by quantity for the full year of 2020 compared with 2019 (or, indeed, for earlier years).

These caveats noted, it is nonetheless possible to assess COVID-19 research pivots not only for medical, biological science, or public health fields, but across *all* domains of science, social science, and the humanities. A COVID-19 research pivot is defined as the extent to which the proportion of output in a particular research field has shifted to a focus on COVID-19 topics in 2020 (to date) compared with 2019. COVID-19 research pivoting is calculated by measuring publication outputs on COVID-19 topics in a field as a percentage of all publication outputs in that field for 2019 and 2020, then subtracting the 2019 percentage from the 2020 percentage. This results in a COVID-19 "pivot point" index. This is a simple method, but it is effective in normalizing outputs for the yet not quite complete year of 2020. There are some fields (for example, "Virology") with a proportion of publication outputs captured by the COVID-19 bibliometric search term in 2019; the pivot point measure highlights the added extent to which the proportion of 2020 COVID-19 publication outputs increased over the prior year. Most research fields, however, had zero 2019 COVID-19 publication outputs; in this case, the pivot point measures the new extent to which research outputs in that field shifted to a COVID-19 focus in 2020, if at all.

The method is operationalized by applying the COVID-19 bibliometric search term to the full WoS online database as of October 24, 2020 (Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI) refined by document types (article, early access, review, or proceedings paper). For 2019, the total number of WoS records is 2,567,047, of which 828 are identified as COVID-19 publications. For 2020 (through to October 24), the total number of WoS records is 1,952,201, of which 30,143 are identified as COVID-19 publications. WoS subject categories (SCs) are used as a proxy for research fields. All 254 WoS SCs (as of October 2, 2020) are included in the analysis. (See Appendix for data table.)

Recall that not all 2020 publications are recorded yet (whether for papers with COVID-19 or non-COVID-19 topics). Whether a WoS publication count of about 1.9 million papers by the third week of October 2020 (or 2.1 million by the end of November 2020[50]) is significantly different from the comparable numbers at the same time in 2019 cannot be determined as that data is not available to the researcher

[48] Björk, B-C., and Solonon, D. The publishing delay in scholarly peer-reviewed journals. Journal of Infometrics, 2020, 7, 914-923, http://dx.doi.org/10.1016/j.joi.2013.09.001. Note: with the growth of preprints and early access, papers are increasingly publicly available and citable prior to official publication, see, for example: Haustein, S., Bowman, R., and Costas, R. When is an article actually published? An analysis of online availability, publication, and indexation dates. arXiv: 1505.00796, 2015. https://arxiv.org/abs/1505.00796.

[49] Journal peer review processes in 2020 have also been affected by the pandemic. Journals dealing with COVID-19 topics have seen huge increases in submissions, with peer reviewers under pressure to review quickly, while in other journal fields, editorial and review delays are reported. Elsevier, Review delays during coronavirus crisis,

[50] As reported in Figure 2.

(although that information would be available internally to the producer of the database). However, it can be observed that there has been an overall increase in the share of COVID-19 outputs in all WoS publications, increasing from 0.03% in 2019 to 1.5% in 2020 (to October 24).[51,52] This represents an absolute and significant increase of about 29,300 COVID-19 papers in 2020 (to October 24). Most published papers recorded in the WoS in 2020 are *not* COVID-19 related (i.e. the whole of science has not pivoted to COVID-19 research). Nonetheless, by specific SCs, there are substantial variations, with some fields (as defined by WoS subject categories) making noticeable COVID-19 research pivots, while in most fields there is a small or non-detectable COVID-19 research pivot.

To analyze the extent of the relative shift into COVID-19 research topics by individual scientific fields in 2020 (to October 24), the COVID-19 research pivot (*RP*) measure is calculated for each WoS SC. For the 254 SCs, key *RP* values are: maximum = 15.8; mean = 1.5; median = 0.6; and minimum = 0.0. An asymmetrical and skewed distribution is indicated, with a long right tail of low to zero *RP* values. To visualize the distribution, the ranked *RP* measures by SC are presented by quintiles. The top quintile is named as comprising "high to medium" pivots, the second and third quintiles as "medium to low" pivots, and the fourth and fifth quintiles as "low to zero" pivots. Percentages of SC COVID-19 related outputs are denoted as *cPC19* and *cPC20* for 2019 and 2020 (to October 24) respectively.

In the first quintile, the SC with the highest COVID-19 research pivot is "Virology" (*RP*=15.8; *cPC19*=3.0%; *cPC20*=18.8%). (Figure 8.) The second highest is "Medical Ethics" (*RP*=15.0, *cPC19*=0.0%; *cPC20*=15.0%). Rounding out the top ten SCs with highest relative COVID-19 research pivots are "Infectious Diseases" (*RP*=9.5), "Medicine General Internal" (*RP*=7.0), "Otorhinolaryngology" (*RP*=6.4), "Public Administration" (*RP*=6.3), "Critical Care Medicine" (*RP*=5.6), "Public Environmental & Occupational Health" (*RP*=5.5), "Emergency Medicine" (*RP*=5.3), and "Health Care Sciences Services" (*RP*=5.2). For only three of these ten SCs is *cPC19* > 0.0, indicating that most of these fields have made a new and rapid research pivot into COVID-19 in 2020. Additionally, while six of the top ten SCs with the highest *RP* rankings are in medical specialties (including emergency and critical care) and biological sciences, the other four are in fields of medical ethics, public administration, public health, and health care delivery, highlighting the wide-ranging implications of the pandemic taken up by researchers.

This pattern is replicated in the balance of the first quintile of high to medium *RPs*, with multiple medical specialties, biological sciences, and public health fields represented, alongside "Ethics," "Social issues," "Health Policy Sciences," "Social Sciences, Biomedical," and "Social Work." Other entries in the medium *RP* sections of the first quintile also include "Folklore", "Law", and "Women's Studies."[53]

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[51] The aggregated WoS publication numbers reported in this analysis are slightly lower than reported in Figure 2. The reason is that the subject category analysis in this section was undertaken with data as of October 24, 2020 (when WoS reported 1.95 million records), while Figure 2 is based on data from November 30, 2020 (when WoS reported 2.105 million records) 2020 (Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI) refined by document types (article, early access, review, or proceedings paper).

[52] The 2020 COVID-19 share of all WoS publications is lower than reported for PubMed (see earlier discussion and Figure 2). PubMed focus on medical, bioscience, and public health domains and includes preprints, while WoS primarily covers journals across all fields of science, social science, and the arts and humanities.

[53] These fields vary in size, with total SC publishing (in 2020) ranging from many thousands to a few hundred. While "Folklore" is the smallest field in the top quintile (*RP*=3.8, *cPC19*=0.0%; *cPC20*=3.8%), researchers in this field have published in 2020 on such subjects as myths and urban legends about coronavirus, and how the pandemic has affected museums and traditional folk crafts.

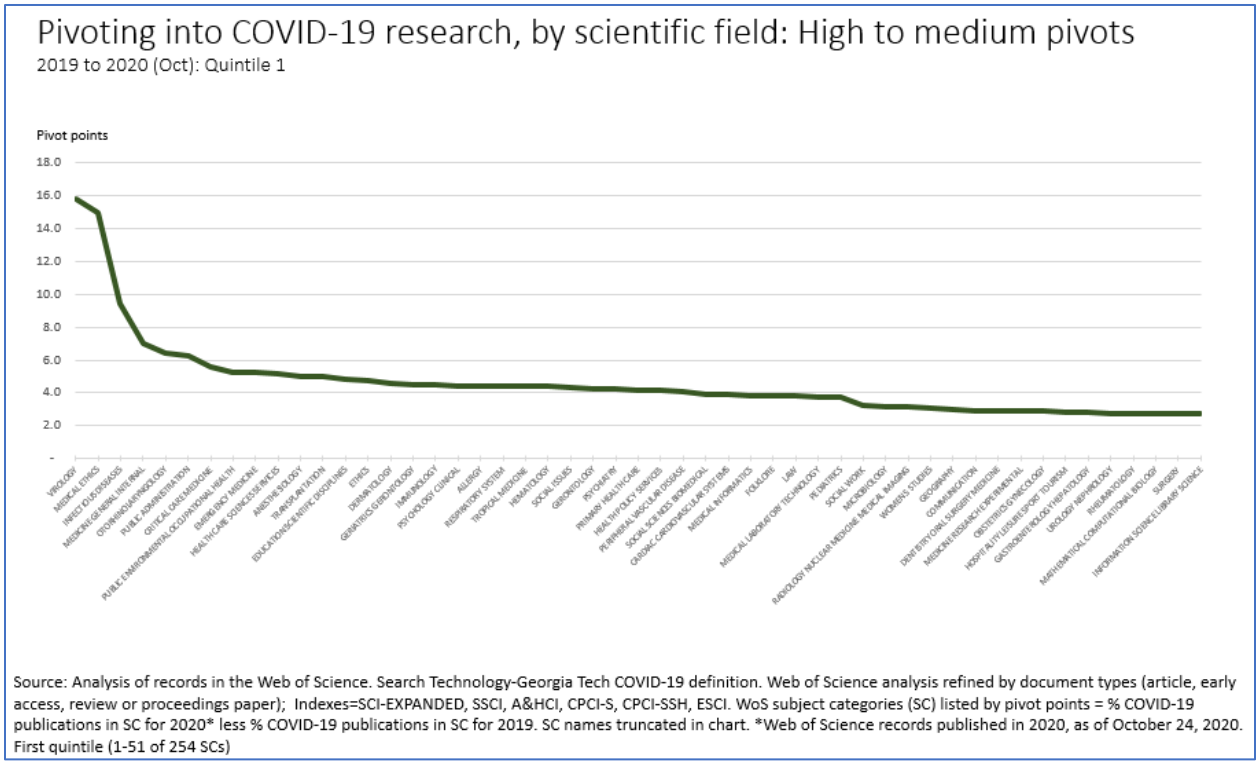


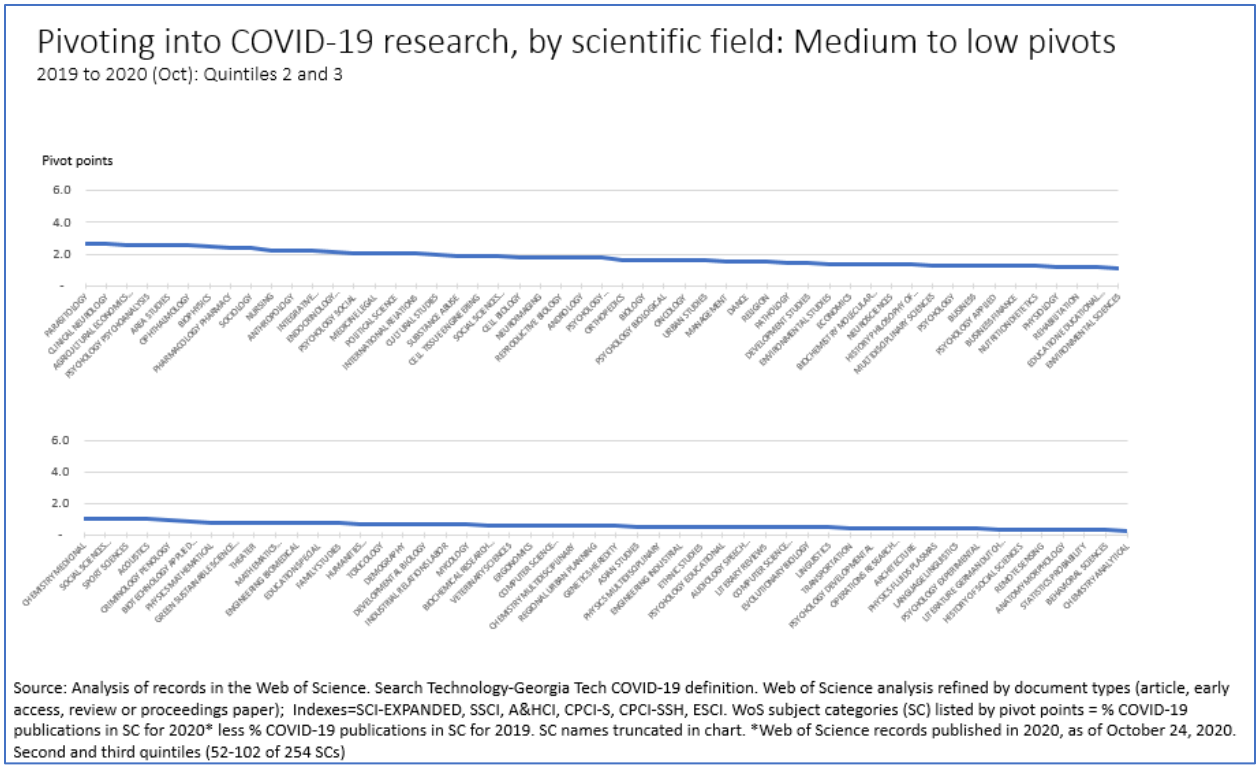
Figure 8

Of the 51 SCs in the first quintile, 35 (69%) are indexed in the WOS SCI, 15 (29%) in SSCI, and 1 (2%) in A&HCI.[54] In the first quintile, 2.7 < *RP* < 15.8 with a mean ($\bar{x}$) of 4.6.

The second and third quintiles ("medium to low" COVID-19 research pivots) also contain a mix of science, social science, and arts and humanities SCs. (Figure 9.) "Parasitology" (*RP*=2.7, *cPC19*=0.2%; *cPC20*=2.7%) and "Clinical Neurology" (*RP*=2.6, *cPC19*=0.0%; *cPC20*=2.6%) lead this intermediate set of quintiles, ranked 52 and 53 (of 254) respectively. The entries from SSCI and A&HCI in this set are led by "Area Studies" (*RP*=2.6, *cPC19*=0.0%; *cPC20*=2.6%) and "Cultural Studies" (*RP*=2.0, *cPC19*=0.0%; *cPC20*=2.0%). Although "Economics" is represented in 30th position by absolute number of COVID-19 publications (Figure 7), it is more moderately ranked (89 of 254) in terms of its relative COVID-19 research pivot (*RP*=1.4, *cPC19*=0.0%; *cPC20*=1.4%). Economics is one of the largest producers of SSCI WoS publications; however, even though 350 COVID-19 related papers were identified in 2020 (to October 24), this was a relatively small proportion of its total SC output (25,325) to the search date.

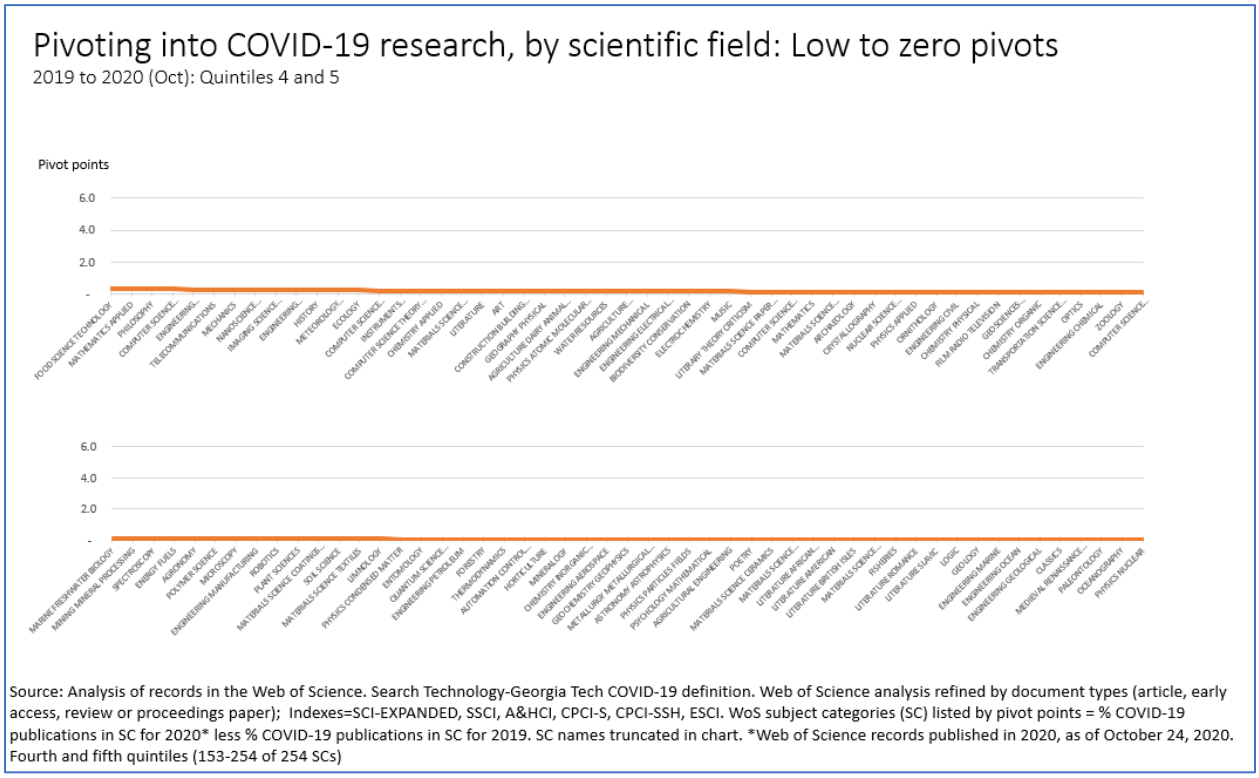
Of the 101 SCs in the second and third quintiles, 55 (54%) are indexed in SCI, 34 (34%) in SSCI, and 12 (12%) in A&HCI. In this medium to low set, 0.3 < *RP* < 2.7 ($\bar{x}$ = 1.2). In the last set, the fourth and fifth quartiles, there are 102 SCs, of which 76 (75%) are indexed in SCI, 7 (7%) in SSCI, and 19 (19%) in A&CHI. In this "low-to zero" set, 0.0 ≤ *RP* < 0.3 ($\bar{x}$ = 0.1). In 37 SCs in the lowest quintile, no COVID-19 related papers were identified out of more than 216,000 WoS publications for 2020 (to October 24). (Figure 10.) Again, note that publication data for 2020 is incomplete; researchers in these SCs may have preprints, papers or forthcoming and other COVID-19 research contributions not captured by this analysis.

[54] SCI=Science Citation Index; SSCI = Social Science Citation Index; A&HCI = Arts and Humanities Citation Index.



Source: Analysis of records in the Web of Science. Search Technology-Georgia Tech COVID-19 definition. Web of Science analysis refined by document types (article, early access, review or proceedings paper); Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI. WoS subject categories (SC) listed by pivot points = % COVID-19 publications in SC for 2020* less % COVID-19 publications in SC for 2019. SC names truncated in chart. *Web of Science records published in 2020, as of October 24, 2020. Second and third quintiles (52-102 of 254 SCs)

Figure 9



Source: Analysis of records in the Web of Science. Search Technology-Georgia Tech COVID-19 definition. Web of Science analysis refined by document types (article, early access, review or proceedings paper); Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI. WoS subject categories (SC) listed by pivot points = % COVID-19 publications in SC for 2020* less % COVID-19 publications in SC for 2019. SC names truncated in chart. *Web of Science records published in 2020, as of October 24, 2020. Fourth and fifth quintiles (153-254 of 254 SCs)

Figure 10

Concluding Comments

The analyses presented in this paper should be regarded as preliminary. In 2020, scientific research around the world has been massively impacted by the global COVID-19 pandemic; these impacts are still in progress and will likely continue well into 2021. The full consequences and implications of COVID-19 and the pandemic on science, researchers and research institutions will take some further time, possibly years, to be wholly comprehended.

The paper has used available secondary and bibliometric data to analyze one aspect of the pandemic's impacts on research, focusing on publication outputs (through to the September to November of 2020, depending on the databases used). Large-scale publication data is available in the PubMed and WoS database, although complete publication records for 2020 will not be available until the early parts of 2021. This caveat should be kept in mind, along with other limitations in using publication outputs to assess research performance, differences in content between PubMed and the WoS, and variations by fields and countries in approaches to publishing in sources that are recorded in these two publication databases.

The analysis finds a massive absolute increase in PubMed and Web of Science papers directly focused on COVID-19 topics, especially in medical, biological science, and public health fields, although this is still a relatively small proportion of publication outputs across all fields of science. Using Web of Science publication data, the paper examined the extent to which researchers across all fields of science have pivoted their research outputs in 2020 to focus on topics related to COVID-19. Significant variations are found by specific fields (identified by Web of Science Subject Categories). In a top quintile of fields – not only in medical specialties, biomedical sciences, and public health but also in subjects in social sciences and arts and humanities – there are relatively high to medium research pivots. In lower quintiles, including other subjects in science, social science, and arts and humanities, low to zero COVID-19 research pivoting is identified. It was noted that researchers may have preprints, papers or forthcoming and other COVID-19 research contributions not captured by the WoS analysis.

Appendix 1

Data table of WOS publications used to calculate 2020 (to October 24) COVID-19 research pivots. See next pages. Explanation of headings and data sources is at the end of the table.

Data Table for COVID-19 Research Pivot Calculations	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
SUBJECT CATEGORY (SC)	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
VIROLOGY	6601	201	3.0%	5703	1073	18.8%	15.8	1
MEDICAL ETHICS	936	0	0.0%	888	133	15.0%	15.0	1
INFECTIOUS DISEASES	18110	132	0.7%	15310	1559	10.2%	9.5	1
MEDICINE GENERAL INTERNAL	49975	17	0.0%	40534	2842	7.0%	7.0	1
OTORHINOLARYNGOLOGY	7592	0	0.0%	7036	453	6.4%	6.4	1
PUBLIC ADMINISTRATION	3891	1	0.0%	3819	240	6.3%	6.3	1
CRITICAL CARE MEDICINE	5819	2	0.0%	4878	274	5.6%	5.6	1
PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH	44853	80	0.2%	39714	2171	5.5%	5.3	1
EMERGENCY MEDICINE	4839	2	0.0%	4165	221	5.3%	5.3	1
HEALTH CARE SCIENCES SERVICES	17454	2	0.0%	15560	803	5.2%	5.1	1
ANESTHESIOLOGY	6213	0	0.0%	5339	269	5.0%	5.0	1
TRANSPLANTATION	4986	3	0.1%	4465	225	5.0%	5.0	1
EDUCATION SCIENTIFIC DISCIPLINES	10114	0	0.0%	6407	312	4.9%	4.9	1
ETHICS	3431	0	0.0%	2974	141	4.7%	4.7	1
DERMATOLOGY	9908	0	0.0%	10322	473	4.6%	4.6	1
GERIATRICS GERONTOLOGY	8633	0	0.0%	8051	362	4.5%	4.5	1
IMMUNOLOGY	27613	77	0.3%	23464	1112	4.7%	4.5	1
PSYCHOLOGY CLINICAL	11327	0	0.0%	10685	476	4.5%	4.5	1
ALLERGY	3230	2	0.1%	2859	129	4.5%	4.5	1
RESPIRATORY SYSTEM	11517	13	0.1%	10112	458	4.5%	4.4	1
TROPICAL MEDICINE	4475	7	0.2%	3434	157	4.6%	4.4	1
HEMATOLOGY	11848	5	0.0%	11254	501	4.5%	4.4	1
SOCIAL ISSUES	3174	0	0.0%	2700	116	4.3%	4.3	1
GERONTOLOGY	4848	0	0.0%	4354	186	4.3%	4.3	1
PSYCHIATRY	25184	1	0.0%	23241	984	4.2%	4.2	1
PRIMARY HEALTH CARE	1885	0	0.0%	1577	66	4.2%	4.2	1
HEALTH POLICY SERVICES	9055	4	0.0%	8491	357	4.2%	4.2	1
PERIPHERAL VASCULAR DISEASE	10671	0	0.0%	9530	387	4.1%	4.1	1
SOCIAL SCIENCES BIOMEDICAL	4284	0	0.0%	4070	160	3.9%	3.9	1
CARDIAC CARDIOVASCULAR SYSTEMS	24285	1	0.0%	22664	888	3.9%	3.9	1
MEDICAL INFORMATICS	7624	1	0.0%	5395	208	3.9%	3.8	1
FOLKLORE	277	0	0.0%	183	7	3.8%	3.8	1
LAW	11662	0	0.0%	7288	277	3.8%	3.8	1
MEDICAL LABORATORY TECHNOLOGY	3774	3	0.1%	3116	119	3.8%	3.7	1
PEDIATRICS	21278	11	0.1%	20081	761	3.8%	3.7	1
SOCIAL WORK	4894	0	0.0%	4646	150	3.2%	3.2	1
MICROBIOLOGY	26636	95	0.4%	22645	805	3.6%	3.2	1
RADIOLOGY NUCLEAR MEDICINE MEDICAL IMAGING	28828	1	0.0%	23277	729	3.1%	3.1	1
WOMEN'S STUDIES	3015	0	0.0%	2532	78	3.1%	3.1	1
GEOGRAPHY	8710	0	0.0%	7040	210	3.0%	3.0	1

Data Table for COVID-19 Research Pivot Calculations	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
SUBJECT CATEGORY (SC)	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
COMMUNICATION	9045	3	0.0%	7089	210	3.0%	2.9	1
DENTISTRY ORAL SURGERY MEDICINE	13330	0	0.0%	11308	327	2.9%	2.9	1
MEDICINE RESEARCH EXPERIMENTAL	36295	24	0.1%	31110	917	2.9%	2.9	1
OBSTETRICS GYNECOLOGY	16098	0	0.0%	14578	420	2.9%	2.9	1
HOSPITALITY LEISURE SPORT TOURISM	7611	0	0.0%	7073	202	2.9%	2.9	1
GASTROENTEROLOGY HEPATOLOGY	14830	1	0.0%	13666	384	2.8%	2.8	1
UROLOGY NEPHROLOGY	13074	0	0.0%	11810	328	2.8%	2.8	1
RHEUMATOLOGY	5906	1	0.0%	5231	146	2.8%	2.8	1
MATHEMATICAL COMPUTATIONAL BIOLOGY	10710	11	0.1%	7301	210	2.9%	2.8	1
SURGERY	46029	1	0.0%	42330	1167	2.8%	2.8	1
INFORMATION SCIENCE LIBRARY SCIENCE	8138	0	0.0%	5856	161	2.7%	2.7	1
PARASITOLOGY	6139	10	0.2%	5364	151	2.8%	2.7	2
CLINICAL NEUROLOGY	35934	0	0.0%	31697	836	2.6%	2.6	2
AGRICULTURAL ECONOMICS POLICY	2087	0	0.0%	1385	36	2.6%	2.6	2
PSYCHOLOGY PSYCHOANALYSIS	828	0	0.0%	618	16	2.6%	2.6	2
AREA STUDIES	5275	0	0.0%	4208	108	2.6%	2.6	2
OPHTHALMOLOGY	11695	1	0.0%	10565	270	2.6%	2.5	2
BIOPHYSICS	13335	11	0.1%	11694	302	2.6%	2.5	2
PHARMACOLOGY PHARMACY	54358	20	0.0%	46974	1150	2.4%	2.4	2
SOCIOLOGY	9674	0	0.0%	8186	194	2.4%	2.4	2
NURSING	13545	1	0.0%	11814	267	2.3%	2.3	2
ANTHROPOLOGY	5059	0	0.0%	3836	86	2.2%	2.2	2
INTEGRATIVE COMPLEMENTARY MEDICINE	4680	0	0.0%	4021	89	2.2%	2.2	2
ENDOCRINOLOGY METABOLISM	21829	0	0.0%	19452	427	2.2%	2.2	2
PSYCHOLOGY SOCIAL	5182	1	0.0%	4553	96	2.1%	2.1	2
MEDICINE LEGAL	2610	0	0.0%	2074	43	2.1%	2.1	2
POLITICAL SCIENCE	12328	1	0.0%	10550	216	2.0%	2.0	2
INTERNATIONAL RELATIONS	6677	0	0.0%	5211	106	2.0%	2.0	2
CULTURAL STUDIES	2412	0	0.0%	1927	38	2.0%	2.0	2
SUBSTANCE ABUSE	5302	0	0.0%	4566	88	1.9%	1.9	2
CELL TISSUE ENGINEERING	3459	0	0.0%	2759	53	1.9%	1.9	2
SOCIAL SCIENCES INTERDISCIPLINARY	15437	1	0.0%	11171	212	1.9%	1.9	2
CELL BIOLOGY	35833	19	0.1%	30911	580	1.9%	1.8	2
NEUROIMAGING	4020	0	0.0%	2808	51	1.8%	1.8	2
REPRODUCTIVE BIOLOGY	4672	0	0.0%	3842	69	1.8%	1.8	2
ANDROLOGY	818	0	0.0%	1007	18	1.8%	1.8	2
PSYCHOLOGY MULTIDISCIPLINARY	14271	0	0.0%	12331	218	1.8%	1.8	2
ORTHOPEDICS	16752	0	0.0%	15059	253	1.7%	1.7	2
BIOLOGY	18050	15	0.1%	13688	241	1.8%	1.7	2
PSYCHOLOGY BIOLOGICAL	1981	0	0.0%	1637	27	1.6%	1.6	2

Data Table for COVID-19 Research Pivot Calculations	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
SUBJECT CATEGORY (SC)	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
ONCOLOGY	53955	5	0.0%	48131	779	1.6%	1.6	2
URBAN STUDIES	5788	0	0.0%	4246	68	1.6%	1.6	2
MANAGEMENT	25339	1	0.0%	18229	291	1.6%	1.6	2
DANCE	345	0	0.0%	190	3	1.6%	1.6	2
RELIGION	8768	0	0.0%	5454	83	1.5%	1.5	2
PATHOLOGY	9145	5	0.1%	8159	124	1.5%	1.5	2
DEVELOPMENT STUDIES	4451	0	0.0%	3030	44	1.5%	1.5	2
ENVIRONMENTAL STUDIES	20934	0	0.0%	17470	246	1.4%	1.4	2
ECONOMICS	35537	1	0.0%	25325	350	1.4%	1.4	2
BIOCHEMISTRY MOLECULAR BIOLOGY	69885	53	0.1%	60269	876	1.5%	1.4	2
NEUROSCIENCES	44989	1	0.0%	37582	507	1.3%	1.3	2
HISTORY PHILOSOPHY OF SCIENCE	3407	0	0.0%	3197	43	1.3%	1.3	2
MULTIDISCIPLINARY SCIENCES	75344	48	0.1%	57678	795	1.4%	1.3	2
PSYCHOLOGY	8471	0	0.0%	6786	88	1.3%	1.3	2
BUSINESS	18197	0	0.0%	13820	179	1.3%	1.3	2
PSYCHOLOGY APPLIED	5951	0	0.0%	5520	71	1.3%	1.3	2
BUSINESS FINANCE	10446	0	0.0%	8385	106	1.3%	1.3	2
NUTRITION DIETETICS	17404	2	0.0%	14634	186	1.3%	1.3	2
PHYSIOLOGY	13911	2	0.0%	9969	126	1.3%	1.2	2
REHABILITATION	12005	0	0.0%	10231	125	1.2%	1.2	2
EDUCATION EDUCATIONAL RESEARCH	44277	1	0.0%	29614	361	1.2%	1.2	2
ENVIRONMENTAL SCIENCES	89252	14	0.0%	80916	946	1.2%	1.2	2
CHEMISTRY MEDICINAL	19162	17	0.1%	14005	167	1.2%	1.1	3
SOCIAL SCIENCES MATHEMATICAL METHODS	3262	1	0.0%	2856	31	1.1%	1.1	3
SPORT SCIENCES	13238	1	0.0%	10636	112	1.1%	1.0	3
ACOUSTICS	8572	0	0.0%	5239	54	1.0%	1.0	3
CRIMINOLOGY PENOLOGY	5031	0	0.0%	4875	47	1.0%	1.0	3
BIOTECHNOLOGY APPLIED MICROBIOLOGY	31936	33	0.1%	26572	259	1.0%	0.9	3
PHYSICS MATHEMATICAL	11151	0	0.0%	9372	78	0.8%	0.8	3
GREEN SUSTAINABLE SCIENCE TECHNOLOGY	28992	0	0.0%	22815	189	0.8%	0.8	3
THEATER	1167	0	0.0%	607	5	0.8%	0.8	3
MATHEMATICS INTERDISCIPLINARY APPLICATIONS	14524	2	0.0%	13276	105	0.8%	0.8	3
ENGINEERING BIOMEDICAL	22982	1	0.0%	13867	108	0.8%	0.8	3
EDUCATION SPECIAL	2278	0	0.0%	2230	17	0.8%	0.8	3
FAMILY STUDIES	4580	0	0.0%	4862	37	0.8%	0.8	3
HUMANITIES MULTIDISCIPLINARY	11664	0	0.0%	6647	50	0.8%	0.8	3
TOXICOLOGY	13244	0	0.0%	10786	81	0.8%	0.8	3
DEMOGRAPHY	1991	0	0.0%	1631	12	0.7%	0.7	3
DEVELOPMENTAL BIOLOGY	3944	2	0.1%	3636	28	0.8%	0.7	3
INDUSTRIAL RELATIONS LABOR	1928	0	0.0%	1594	11	0.7%	0.7	3

Data Table for COVID-19 Research Pivot Calculations	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
SUBJECT CATEGORY (SC)	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
MYCOLOGY	2034	0	0.0%	1482	10	0.7%	0.7	3
BIOCHEMICAL RESEARCH METHODS	16266	16	0.1%	12180	93	0.8%	0.7	3
VETERINARY SCIENCES	18478	116	0.6%	14599	188	1.3%	0.7	3
ERGONOMICS	2664	0	0.0%	2038	13	0.6%	0.6	3
COMPUTER SCIENCE INTERDISCIPLINARY APPLICATIONS	36522	2	0.0%	19824	127	0.6%	0.6	3
CHEMISTRY MULTIDISCIPLINARY	90858	11	0.0%	76817	495	0.6%	0.6	3
REGIONAL URBAN PLANNING	5281	0	0.0%	3710	23	0.6%	0.6	3
GENETICS HEREDITY	25647	12	0.0%	20531	134	0.7%	0.6	3
ASIAN STUDIES	1844	0	0.0%	1201	7	0.6%	0.6	3
PHYSICS MULTIDISCIPLINARY	28878	0	0.0%	19976	112	0.6%	0.6	3
ENGINEERING INDUSTRIAL	13928	0	0.0%	7761	43	0.6%	0.6	3
ETHNIC STUDIES	1950	0	0.0%	1647	9	0.5%	0.5	3
PSYCHOLOGY EDUCATIONAL	5430	0	0.0%	3502	18	0.5%	0.5	3
AUDIOLOGY SPEECH LANGUAGE PATHOLOGY	3468	0	0.0%	2729	14	0.5%	0.5	3
LITERARY REVIEWS	1864	0	0.0%	780	4	0.5%	0.5	3
COMPUTER SCIENCE INFORMATION SYSTEMS	66556	1	0.0%	36069	185	0.5%	0.5	3
EVOLUTIONARY BIOLOGY	6936	1	0.0%	5523	29	0.5%	0.5	3
LINGUISTICS	10584	0	0.0%	7142	36	0.5%	0.5	3
TRANSPORTATION	5473	0	0.0%	4247	21	0.5%	0.5	3
PSYCHOLOGY DEVELOPMENTAL	7648	0	0.0%	7221	35	0.5%	0.5	3
OPERATIONS RESEARCH MANAGEMENT SCIENCE	15663	0	0.0%	11419	55	0.5%	0.5	3
ARCHITECTURE	5248	0	0.0%	1946	9	0.5%	0.5	3
PHYSICS FLUIDS PLASMAS	11306	0	0.0%	8132	37	0.5%	0.5	3
LANGUAGE LINGUISTICS	9699	0	0.0%	5645	25	0.4%	0.4	3
PSYCHOLOGY EXPERIMENTAL	8675	0	0.0%	7494	32	0.4%	0.4	3
LITERATURE GERMAN DUTCH SCANDINAVIAN	509	0	0.0%	260	1	0.4%	0.4	3
HISTORY OF SOCIAL SCIENCES	1442	0	0.0%	1303	5	0.4%	0.4	3
REMOTE SENSING	15039	0	0.0%	8046	29	0.4%	0.4	3
ANATOMY MORPHOLOGY	2923	1	0.0%	2588	10	0.4%	0.4	3
STATISTICS PROBABILITY	14043	2	0.0%	11952	41	0.3%	0.3	3
BEHAVIORAL SCIENCES	7859	0	0.0%	5851	19	0.3%	0.3	3
CHEMISTRY ANALYTICAL	31466	4	0.0%	27607	88	0.3%	0.3	3
FOOD SCIENCE TECHNOLOGY	32788	1	0.0%	27999	85	0.3%	0.3	4
MATHEMATICS APPLIED	35159	2	0.0%	27917	85	0.3%	0.3	4
PHILOSOPHY	9808	0	0.0%	7447	22	0.3%	0.3	4
COMPUTER SCIENCE CYBERNETICS	8143	0	0.0%	2742	8	0.3%	0.3	4
ENGINEERING ENVIRONMENTAL	24842	3	0.0%	23686	71	0.3%	0.3	4
TELECOMMUNICATIONS	63215	0	0.0%	33197	95	0.3%	0.3	4
MECHANICS	31296	0	0.0%	24185	68	0.3%	0.3	4
NANOSCIENCE NANOTECHNOLOGY	50244	7	0.0%	41176	114	0.3%	0.3	4

Data Table for COVID-19 Research Pivot Calculations	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
SUBJECT CATEGORY (SC)	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
IMAGING SCIENCE PHOTOGRAPHIC TECHNOLOGY	12649	0	0.0%	5634	14	0.2%	0.2	4
ENGINEERING MULTIDISCIPLINARY	36437	1	0.0%	24927	61	0.2%	0.2	4
HISTORY	13600	0	0.0%	7902	19	0.2%	0.2	4
METEOROLOGY ATMOSPHERIC SCIENCES	16400	1	0.0%	13152	32	0.2%	0.2	4
ECOLOGY	23757	8	0.0%	18813	47	0.2%	0.2	4
COMPUTER SCIENCE ARTIFICIAL INTELLIGENCE	54052	2	0.0%	25793	56	0.2%	0.2	4
INSTRUMENTS INSTRUMENTATION	27165	0	0.0%	21826	43	0.2%	0.2	4
COMPUTER SCIENCE THEORY METHODS	67670	0	0.0%	17398	33	0.2%	0.2	4
CHEMISTRY APPLIED	21585	0	0.0%	19057	35	0.2%	0.2	4
MATERIALS SCIENCE BIOMATERIALS	10127	0	0.0%	8276	15	0.2%	0.2	4
LITERATURE	5158	0	0.0%	2769	5	0.2%	0.2	4
ART	4206	0	0.0%	1673	3	0.2%	0.2	4
CONSTRUCTION BUILDING TECHNOLOGY	17305	2	0.0%	13214	25	0.2%	0.2	4
GEOGRAPHY PHYSICAL	8189	0	0.0%	6802	12	0.2%	0.2	4
AGRICULTURE DAIRY ANIMAL SCIENCE	11033	8	0.1%	8541	21	0.2%	0.2	4
PHYSICS ATOMIC MOLECULAR CHEMICAL	17788	0	0.0%	14951	25	0.2%	0.2	4
WATER RESOURCES	20686	1	0.0%	16952	29	0.2%	0.2	4
AGRICULTURE MULTIDISCIPLINARY	10509	0	0.0%	7831	13	0.2%	0.2	4
ENGINEERING MECHANICAL	45063	0	0.0%	25409	41	0.2%	0.2	4
ENGINEERING ELECTRICAL ELECTRONIC	179052	1	0.0%	84907	137	0.2%	0.2	4
BIODIVERSITY CONSERVATION	7560	3	0.0%	6635	13	0.2%	0.2	4
ELECTROCHEMISTRY	17063	0	0.0%	12771	19	0.1%	0.1	4
MUSIC	2405	0	0.0%	1351	2	0.1%	0.1	4
LITERARY THEORY CRITICISM	1604	0	0.0%	711	1	0.1%	0.1	4
MATERIALS SCIENCE PAPER WOOD	2696	0	0.0%	2142	3	0.1%	0.1	4
COMPUTER SCIENCE HARDWARE ARCHITECTURE	17012	0	0.0%	5737	8	0.1%	0.1	4
MATHEMATICS	38372	3	0.0%	31754	46	0.1%	0.1	4
MATERIALS SCIENCE MULTIDISCIPLINARY	152759	4	0.0%	121138	166	0.1%	0.1	4
ARCHAEOLOGY	4858	0	0.0%	3061	4	0.1%	0.1	4
CRYSTALLOGRAPHY	7246	2	0.0%	5701	9	0.2%	0.1	4
NUCLEAR SCIENCE TECHNOLOGY	10893	0	0.0%	8798	11	0.1%	0.1	4
PHYSICS APPLIED	86080	4	0.0%	64216	82	0.1%	0.1	4
ORNITHOLOGY	1212	0	0.0%	818	1	0.1%	0.1	4
ENGINEERING CIVIL	32820	0	0.0%	24698	30	0.1%	0.1	4
CHEMISTRY PHYSICAL	77776	3	0.0%	66328	80	0.1%	0.1	4
FILM RADIO TELEVISION	1624	0	0.0%	894	1	0.1%	0.1	4
GEOSCIENCES MULTIDISCIPLINARY	33313	1	0.0%	26982	30	0.1%	0.1	4
CHEMISTRY ORGANIC	19781	4	0.0%	14842	18	0.1%	0.1	4
TRANSPORTATION SCIENCE TECHNOLOGY	10829	0	0.0%	6047	6	0.1%	0.1	4
OPTICS	50694	0	0.0%	28257	26	0.1%	0.1	4

Data Table for COVID-19 Research Pivot Calculations	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
SUBJECT CATEGORY (SC)	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
ENGINEERING CHEMICAL	47957	1	0.0%	40535	36	0.1%	0.1	4
ZOOLOGY	13607	5	0.0%	10558	13	0.1%	0.1	4
COMPUTER SCIENCE SOFTWARE ENGINEERING	23554	0	0.0%	10967	9	0.1%	0.1	4
MARINE FRESHWATER BIOLOGY	13665	0	0.0%	10975	9	0.1%	0.1	5
MINING MINERAL PROCESSING	5779	0	0.0%	3682	3	0.1%	0.1	5
SPECTROSCOPY	7539	0	0.0%	6175	5	0.1%	0.1	5
ENERGY FUELS	64777	0	0.0%	44850	36	0.1%	0.1	5
AGRONOMY	14009	0	0.0%	11445	9	0.1%	0.1	5
POLYMER SCIENCE	26079	0	0.0%	23082	18	0.1%	0.1	5
MICROSCOPY	1632	0	0.0%	1288	1	0.1%	0.1	5
ENGINEERING MANUFACTURING	16256	0	0.0%	8539	6	0.1%	0.1	5
ROBOTICS	11835	0	0.0%	4466	3	0.1%	0.1	5
PLANT SCIENCES	29671	1	0.0%	25771	17	0.1%	0.1	5
MATERIALS SCIENCE COATINGS FILMS	10572	0	0.0%	8627	5	0.1%	0.1	5
SOIL SCIENCE	6056	0	0.0%	5315	3	0.1%	0.1	5
MATERIALS SCIENCE TEXTILES	4576	0	0.0%	3834	2	0.1%	0.1	5
LIMNOLOGY	2301	0	0.0%	1969	1	0.1%	0.1	5
PHYSICS CONDENSED MATTER	36827	2	0.0%	30867	15	0.0%	0.0	5
ENTOMOLOGY	8165	0	0.0%	7028	3	0.0%	0.0	5
QUANTUM SCIENCE TECHNOLOGY	3069	0	0.0%	2596	1	0.0%	0.0	5
ENGINEERING PETROLEUM	4171	0	0.0%	2599	1	0.0%	0.0	5
FORESTRY	8031	0	0.0%	5889	2	0.0%	0.0	5
THERMODYNAMICS	20910	0	0.0%	15189	5	0.0%	0.0	5
AUTOMATION CONTROL SYSTEMS	28069	0	0.0%	13134	4	0.0%	0.0	5
HORTICULTURE	4716	0	0.0%	3405	1	0.0%	0.0	5
MINERALOGY	4482	0	0.0%	3541	1	0.0%	0.0	5
CHEMISTRY INORGANIC NUCLEAR	13862	0	0.0%	11231	3	0.0%	0.0	5
ENGINEERING AEROSPACE	8615	0	0.0%	4464	1	0.0%	0.0	5
GEOCHEMISTRY GEOPHYSICS	12757	0	0.0%	9240	2	0.0%	0.0	5
METALLURGY METALLURGICAL ENGINEERING	23790	0	0.0%	19462	4	0.0%	0.0	5
ASTRONOMY ASTROPHYSICS	24349	0	0.0%	17333	2	0.0%	0.0	5
PHYSICS PARTICLES FIELDS	14700	0	0.0%	10827	1	0.0%	0.0	5
PSYCHOLOGY MATHEMATICAL	865	0	0.0%	795	0	0.0%	0.0	5
AGRICULTURAL ENGINEERING	4691	0	0.0%	3698	0	0.0%	0.0	5
POETRY	207	0	0.0%	83	0	0.0%	0.0	5
MATERIALS SCIENCE CERAMICS	7862	0	0.0%	6908	0	0.0%	0.0	5
MATERIALS SCIENCE CHARACTERIZATION TESTING	4993	0	0.0%	3920	0	0.0%	0.0	5
LITERATURE AFRICAN AUSTRALIAN CANADIAN	189	0	0.0%	67	0	0.0%	0.0	5
LITERATURE AMERICAN	437	0	0.0%	204	0	0.0%	0.0	5
LITERATURE BRITISH ISLES	395	0	0.0%	243	0	0.0%	0.0	5

Data Table for COVID-19 Research Pivot Calculations SUBJECT CATEGORY (SC)	WoS Publications 2019			WoS Publications 2020*			Research pivot	Quintile
	Total	*c*	*cPC*	Total	*c*	*cPC*	*RP*	
MATERIALS SCIENCE COMPOSITES	8004	0	0.0%	5456	0	0.0%	0.0	5
FISHERIES	7923	0	0.0%	6644	0	0.0%	0.0	5
LITERATURE ROMANCE	2710	0	0.0%	1287	0	0.0%	0.0	5
LITERATURE SLAVIC	584	0	0.0%	257	0	0.0%	0.0	5
LOGIC	1233	0	0.0%	765	0	0.0%	0.0	5
GEOLOGY	4884	0	0.0%	2717	0	0.0%	0.0	5
ENGINEERING MARINE	3152	0	0.0%	1953	0	0.0%	0.0	5
ENGINEERING OCEAN	3268	0	0.0%	2189	0	0.0%	0.0	5
ENGINEERING GEOLOGICAL	8348	0	0.0%	7457	0	0.0%	0.0	5
CLASSICS	1202	0	0.0%	450	0	0.0%	0.0	5
MEDIEVAL RENAISSANCE STUDIES	1600	0	0.0%	684	0	0.0%	0.0	5
PALEONTOLOGY	3393	0	0.0%	2465	0	0.0%	0.0	5
OCEANOGRAPHY	9374	0	0.0%	6712	0	0.0%	0.0	5
PHYSICS NUCLEAR	7365	0	0.0%	4656	0	0.0%	0.0	5
TOTAL RECORDS	*2567047*	*828*		*1952201*	*30143*			

Source: Analysis of records in the Web of Science (WoS) Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI) refined by document types (article, early access, review or proceedings paper). Search Technology-Georgia Tech COVID-19 bibliometric definition (see text). *WoS records published in 2020, as of October 24, 2020.

Note: SC = WoS subject category (N=254); *c* = Coronavirus COVID-19 records; *cPC* = *c* as percentage of SC total; *RP* = COVID-19 research pivot (points) = % COVID-19 publications in SC for 2020* less % COVID-19 publications in SC for 2019. Sums of SC publication records exceed totals as publication records in WoS journals can be allocated more than one SC classification.

Appendix 2

This appendix provides an updated bibliometric analysis through to mid-April 2022. This updated was added on April 27, 2022.

The definition used for searching for research publications on COVID-19 topics remains the same as used in the original analysis. In addition to the Web of Science and PubMed, the appendix reports results from the Dimensions database of publications (https://www.dimensions.ai/). For discussion and calculation method of COVID-19 Research Pivot points, see text of main working paper.

Contents of Appendix 2

Table 1	Overall Publication Trends, Web of Science, Dimensions, and PubMed, 2019-2022*
Table 2	COVID 19 publications reported in the Web of Science (WoS), 2019-2022*
Table 3	COVID-19 Publications by Top 30 Publishing Countries, Web of Science (WoS), 2019-2022*
Table 4	COVID 19 publications (including preprints) reported in Dimensions, 2019-2022*

Sources and Notes

The tables in this appendix should be read in conjunction with these notes:

Note 1: Analysis of Web of Science (WoS) publication records,
Refined by: DOCUMENT TYPES: (ARTICLE OR PROCEEDINGS PAPER OR REVIEW OR EARLY ACCESS)
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years
GT COVID-19 Search Definition
"COVID-19" OR Coronavirus OR "Corona virus" OR "2019-nCoV" OR "SARS-CoV" OR "MERS-CoV" OR “Severe Acute Respiratory Syndrome” OR “Middle East Respiratory Syndrome”
WoS: Accessed April 19, 2022

Note 2: Analysis of Dimensions publication records
All records, including preprints
GT COVID-19 Search Definition
Dimensions: Accessed April 18, 2022

Note 3: Analysis of PMC (PubMed) publication records, National Library of Medicine
GT COVID-19 Search Definition
"COVID-19" OR Coronavirus OR "Corona virus" OR "2019-nCoV" OR "SARS-CoV" OR "MERS-CoV" OR “Severe Acute Respiratory Syndrome” OR “Middle East Respiratory Syndrome”
PubMed: Accessed April 20, 2022

* 2022 publications through to April 18-20, 2022 (See notes for exact end date by publication record source)

Appendix 2. Table 1

Overall Publication Trends, Web of Science, Dimensions, and PubMed, 2019-2022*

Database (publication records)	**2019**	**2020**	**2021**	**2022***
	thou.	thou.	thou.	thou.
Web of Science	2,669.2	2,864.6	3,064.3	759.4
Dimensions - all	5,812.4	6,535.8	6,541.7	1,681.4
of which: articles	*4,382.1*	*4,790.9*	*4,995.9*	*1,316.2*
preprints	*280.7*	*415.6*	*431.2*	*133.4*
PMC (PubMed)	545.9	720.7	757.4	179.6
Publication records with COVID-19 topics				
Web of Science	0.9	56.6	126.0	33.1
Dimensions - all	1.3	207.7	309.4	75.7
of which: articles	*1.2*	*160.8*	*251.0*	*61.7*
preprints	*0.1*	*37.3*	*28.1*	*6.4*
PMC (PubMed)	3.8	102.6	164.3	46.1
COVID-19 records as percentage of all publications				
Web of Science	0.0%	2.0%	4.1%	4.4%
Dimensions - all	0.0%	3.2%	4.7%	4.5%
of which: articles	*0.0%*	*3.4%*	*5.0%*	*4.7%*
preprints	*0.0%*	*9.0%*	*6.5%*	*4.8%*
PMC (PubMed)	0.7%	14.2%	21.7%	25.7%

Sources: See notes 1, 2, and 3.

* 2022 is a partial year, from January 1, 2022, through to mid-April 2022. For exact access date in April 2022, see relevant note.

Appendix 2. Table 2.
COVID 19 publications reported in the Web of Science (WoS), 2019-2022*

Source: See Note 1.

* 2022 publications through to April 19, 2022

[See next page for start of table]

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Virology	6604	7579	9155	2155	25493	203	1316	2601	799	4919	3.07%	17.36%	28.41%	37.08%	19.30%	14.29	11.05	8.67
Infectious Diseases	18541	22574	25462	5292	71869	145	2971	5847	1262	10225	0.78%	13.16%	22.96%	23.85%	14.23%	12.38	9.80	0.88
Medical Ethics	1042	1219	1559	414	4234	0	258	269	75	602	0.00%	21.16%	17.25%	18.12%	14.22%	21.16	(3.91)	0.86
Public Environmental Occupational Health	46654	58802	71905	19152	196513	81	4583	12213	3345	20222	0.17%	7.79%	16.98%	17.47%	10.29%	7.62	9.19	0.48
Primary Health Care	2681	3317	3152	512	9662	1	203	549	86	839	0.04%	6.12%	17.42%	16.80%	8.68%	6.08	11.30	(0.62)
Medicine General Internal	53300	65132	84678	18973	222083	17	5458	11175	2603	19253	0.03%	8.38%	13.20%	13.72%	8.67%	8.35	4.82	0.52
Immunology	27917	31905	37200	8537	105559	79	2104	5290	1549	9022	0.28%	6.59%	14.22%	18.14%	8.55%	6.31	7.63	3.92
Health Policy Services	9268	11612	14785	4129	39794	4	658	2013	626	3301	0.04%	5.67%	13.62%	15.16%	8.30%	5.62	7.95	1.55
Health Care Sciences Services	18186	22679	28976	7625	77466	3	1507	3818	1051	6379	0.02%	6.64%	13.18%	13.78%	8.23%	6.63	6.53	0.61
Critical Care Medicine	5915	6896	7028	1761	21600	2	550	940	225	1717	0.03%	7.98%	13.38%	12.78%	7.95%	7.94	5.40	(0.60)
Emergency Medicine	4876	6216	7202	1889	20183	2	485	819	152	1458	0.04%	7.80%	11.37%	8.05%	7.22%	7.76	3.57	(3.33)
Medical Informatics	8064	8853	7779	1733	26429	1	561	1075	199	1836	0.01%	6.34%	13.82%	11.48%	6.95%	6.32	7.48	(2.34)
Social Work	4884	6366	6897	2217	20364	1	333	789	282	1405	0.02%	5.23%	11.44%	12.72%	6.90%	5.21	6.21	1.28
Tropical Medicine	4592	5199	5242	989	16022	10	382	552	116	1060	0.22%	7.35%	10.53%	11.73%	6.62%	7.13	3.18	1.20
Public Administration	4082	5072	5204	1570	15928	1	377	507	147	1032	0.02%	7.43%	9.74%	9.36%	6.48%	7.41	2.31	(0.38)
Social Sciences Biomedical	4408	5169	6137	1840	17554	0	287	625	222	1134	0.00%	5.55%	10.18%	12.07%	6.46%	5.55	4.63	1.88
Respiratory System	11754	14040	14920	3440	44154	13	886	1508	327	2734	0.11%	6.31%	10.11%	9.51%	6.19%	6.20	3.80	(0.60)
Social Issues	3328	3839	4001	1079	12247	0	237	380	129	746	0.00%	6.17%	9.50%	11.96%	6.09%	6.17	3.32	2.46
Ethics	3491	4050	4365	1319	13225	0	298	386	121	805	0.00%	7.36%	8.84%	9.17%	6.09%	7.36	1.49	0.33
Medical Laboratory Technology	3822	4162	4239	1209	13432	3	246	419	142	810	0.08%	5.91%	9.88%	11.75%	6.03%	5.83	3.97	1.86
Psychology Multidisciplinary	14878	17168	22149	6289	60484	0	594	2341	694	3629	0.00%	3.46%	10.57%	11.04%	6.00%	3.46	7.11	0.47
Psychiatry	25637	30574	35578	9395	101184	1	1590	3417	1008	6016	0.00%	5.20%	9.60%	10.73%	5.95%	5.20	4.40	1.12
Allergy	3366	3723	4108	1107	12304	2	205	369	121	697	0.06%	5.51%	8.98%	10.93%	5.66%	5.45	3.48	1.95
Nursing	13558	15609	18081	4488	51736	1	474	1810	641	2926	0.01%	3.04%	10.01%	14.28%	5.66%	3.03	6.97	4.27
Microbiology	26803	33046	38427	8374	106650	95	1628	3393	784	5900	0.35%	4.93%	8.83%	9.36%	5.53%	4.57	3.90	0.53
Hospitality Leisure Sport Tourism	8085	9907	10303	3044	31339	0	285	1051	384	1720	0.00%	2.88%	10.20%	12.61%	5.49%	2.88	7.32	2.41
Communication	9734	10511	11430	2968	34643	3	491	1060	331	1885	0.03%	4.67%	9.27%	11.15%	5.44%	4.64	4.60	1.88
Gerontology	4894	6075	6638	2147	19754	0	251	581	232	1064	0.00%	4.13%	8.75%	10.81%	5.39%	4.13	4.62	2.05
Education Scientific Disciplines	12133	13696	12955	2745	41529	0	591	1199	362	2152	0.00%	4.32%	9.26%	13.19%	5.18%	4.32	4.94	3.93

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Transplantation	5091	5674	5887	1626	18278	3	300	490	154	947	0.06%	5.29%	8.32%	9.47%	5.18%	5.23	3.04	1.15
Psychology Social	5482	5733	7030	2045	20290	1	154	666	213	1034	0.02%	2.69%	9.47%	10.42%	5.10%	2.67	6.79	0.94
Geriatrics Gerontology	8678	11151	12921	3194	35944	0	518	971	338	1827	0.00%	4.65%	7.51%	10.58%	5.08%	4.65	2.87	3.07
Psychology Clinical	11493	13625	15773	4963	45854	0	647	1222	458	2327	0.00%	4.75%	7.75%	9.23%	5.07%	4.75	3.00	1.48
Anesthesiology	6236	7153	7133	2010	22532	0	421	564	137	1122	0.00%	5.89%	7.91%	6.82%	4.98%	5.89	2.02	(1.09)
Pediatrics	21671	26559	30694	8683	87607	11	1174	2337	767	4289	0.05%	4.42%	7.61%	8.83%	4.90%	4.37	3.19	1.22
Medicine Research Experimental	36754	43396	45265	9436	134851	27	1774	3739	1005	6545	0.07%	4.09%	8.26%	10.65%	4.85%	4.01	4.17	2.39
Hematology	11770	13876	14399	4117	44162	5	628	1150	339	2122	0.04%	4.53%	7.99%	8.23%	4.81%	4.48	3.46	0.25
Otorhinolaryngology	7810	9464	10507	2680	30461	0	565	732	166	1463	0.00%	5.97%	6.97%	6.19%	4.80%	5.97	1.00	(0.77)
Information Science Library Science	8619	9236	10001	2446	30302	0	408	796	244	1448	0.00%	4.42%	7.96%	9.98%	4.78%	4.42	3.54	2.02
Psychology Psychoanalysis	824	877	907	245	2853	0	26	89	16	131	0.00%	2.96%	9.81%	6.53%	4.59%	2.96	6.85	(3.28)
Industrial Relations Labor	2058	2309	2398	754	7519	0	91	180	66	337	0.00%	3.94%	7.51%	8.75%	4.48%	3.94	3.57	1.25
Women S Studies	3113	3361	3720	990	11184	0	163	237	78	478	0.00%	4.85%	6.37%	7.88%	4.27%	4.85	1.52	1.51
Substance Abuse	5356	6102	7321	2031	20810	0	160	516	187	863	0.00%	2.62%	7.05%	9.21%	4.15%	2.62	4.43	2.16
Peripheral Vascular Disease	11005	12705	13350	3394	40454	0	583	878	208	1669	0.00%	4.59%	6.58%	6.13%	4.13%	4.59	1.99	(0.45)
Mathematical Computational Biology	11275	11867	11994	2980	38116	11	380	939	215	1545	0.10%	3.20%	7.83%	7.21%	4.05%	3.10	4.63	(0.61)
Agricultural Economics Policy	2497	2754	3175	701	9127	0	90	233	46	369	0.00%	3.27%	7.34%	6.56%	4.04%	3.27	4.07	(0.78)
Rheumatology	6055	7222	8573	2538	24388	1	213	577	190	981	0.02%	2.95%	6.73%	7.49%	4.02%	2.93	3.78	0.76
Law	12721	13598	13090	2359	41768	0	692	841	143	1676	0.00%	5.09%	6.42%	6.06%	4.01%	5.09	1.34	(0.36)
Social Sciences Interdisciplinary	16340	17604	17535	4683	56162	1	489	1280	417	2187	0.01%	2.78%	7.30%	8.90%	3.89%	2.77	4.52	1.60
Business Finance	10930	12434	14488	3943	41795	0	335	975	317	1627	0.00%	2.69%	6.73%	8.04%	3.89%	2.69	4.04	1.31
Cardiac Cardiovascular Systems	24916	31103	34696	8832	99547	1	1429	1988	439	3857	0.00%	4.59%	5.73%	4.97%	3.87%	4.59	1.14	(0.76)
Education Educational Research	46410	43633	44629	11837	146509	3	1019	3421	1012	5455	0.01%	2.34%	7.67%	8.55%	3.72%	2.33	5.33	0.88
Sociology	10021	11010	11923	3299	36253	0	363	760	212	1335	0.00%	3.30%	6.37%	6.43%	3.68%	3.30	3.08	0.05
Pharmacology Pharmacy	55327	65438	75101	16689	212555	20	2080	4461	950	7511	0.04%	3.18%	5.94%	5.69%	3.53%	3.14	2.76	(0.25)
Environmental Studies	21611	26205	31625	8175	87616	1	587	1911	584	3083	0.00%	2.24%	6.04%	7.14%	3.52%	2.24	3.80	1.10
Economics	37331	40201	40555	10003	128090	1	1013	2724	724	4462	0.00%	2.52%	6.72%	7.24%	3.48%	2.52	4.20	0.52
Development Studies	4808	4332	4868	1292	15300	0	128	328	71	527	0.00%	2.95%	6.74%	5.50%	3.44%	2.95	3.78	(1.24)
International Relations	7256	7723	8051	2099	25129	0	232	500	132	864	0.00%	3.00%	6.21%	6.29%	3.44%	3.00	3.21	0.08

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Family Studies	4768	6738	7389	2351	21246	0	116	451	162	729	0.00%	1.72%	6.10%	6.89%	3.43%	1.72	4.38	0.79
Business	19812	24593	23759	6833	74997	0	584	1445	515	2544	0.00%	2.37%	6.08%	7.54%	3.39%	2.37	3.71	1.46
Cultural Studies	2615	2889	2833	784	9121	0	90	150	69	309	0.00%	3.12%	5.29%	8.80%	3.39%	3.12	2.18	3.51
Area Studies	5790	6345	6411	1614	20160	0	254	343	82	679	0.00%	4.00%	5.35%	5.08%	3.37%	4.00	1.35	(0.27)
Biophysics	13504	14510	13711	3298	45023	11	440	830	231	1512	0.08%	3.03%	6.05%	7.00%	3.36%	2.95	3.02	0.95
Dermatology	9979	11892	12272	4059	38202	0	395	598	289	1282	0.00%	3.32%	4.87%	7.12%	3.36%	3.32	1.55	2.25
Parasitology	6439	7503	7397	1329	22668	13	259	404	78	754	0.20%	3.45%	5.46%	5.87%	3.33%	3.25	2.01	0.41
Urology Nephrology	13241	15473	17211	4369	50294	0	508	900	258	1666	0.00%	3.28%	5.23%	5.91%	3.31%	3.28	1.95	0.68
Management	26819	28484	30546	9074	94923	1	596	1793	693	3083	0.00%	2.09%	5.87%	7.64%	3.25%	2.09	3.78	1.77
Political Science	12819	15304	15945	4556	48624	2	497	820	244	1563	0.02%	3.25%	5.14%	5.36%	3.21%	3.23	1.90	0.21
Multidisciplinary Sciences	77013	85305	86898	14451	263667	47	2074	5563	755	8439	0.06%	2.43%	6.40%	5.22%	3.20%	2.37	3.97	(1.18)
Medicine Legal	2629	2709	2762	689	8789	0	110	132	33	275	0.00%	4.06%	4.78%	4.79%	3.13%	4.06	0.72	0.01
Obstetrics Gynecology	16260	18956	20351	5252	60819	0	618	946	307	1871	0.00%	3.26%	4.65%	5.85%	3.08%	3.26	1.39	1.20
Demography	2249	2439	2845	853	8386	0	41	161	53	255	0.00%	1.68%	5.66%	6.21%	3.04%	1.68	3.98	0.55
Clinical Neurology	36806	43461	47161	12695	140123	0	1274	2255	719	4248	0.00%	2.93%	4.78%	5.66%	3.03%	2.93	1.85	0.88
Geography	9021	10267	10530	2698	32516	0	339	461	171	971	0.00%	3.30%	4.38%	6.34%	2.99%	3.30	1.08	1.96
Urban Studies	5999	6023	6364	1556	19942	0	129	341	106	576	0.00%	2.14%	5.36%	6.81%	2.89%	2.14	3.22	1.45
Endocrinology Metabolism	22104	25207	27219	6845	81375	0	774	1264	294	2332	0.00%	3.07%	4.64%	4.30%	2.87%	3.07	1.57	(0.35)
Gastroenterology Hepatology	15009	17703	20188	5253	58153	1	556	857	192	1606	0.01%	3.14%	4.25%	3.66%	2.76%	3.13	1.10	(0.59)
Transportation	6025	5985	6537	1295	19842	0	63	396	72	531	0.00%	1.05%	6.06%	5.56%	2.68%	1.05	5.01	(0.50)
Pathology	9099	10038	9729	2728	31594	5	226	493	118	842	0.05%	2.25%	5.07%	4.33%	2.67%	2.20	2.82	(0.74)
Integrative Complementary Medicine	4796	5729	6731	1036	18292	0	162	259	59	480	0.00%	2.83%	3.85%	5.69%	2.62%	2.83	1.02	1.85
Religion	9370	9672	9764	1958	30764	1	259	448	94	802	0.01%	2.68%	4.59%	4.80%	2.61%	2.67	1.91	0.21
Biology	18899	20663	23422	5659	68643	14	395	1102	262	1773	0.07%	1.91%	4.70%	4.63%	2.58%	1.84	2.79	(0.08)
Radiology Nuclear Medicine Medical Imaging	29566	31490	34554	9274	104884	2	1000	1398	309	2709	0.01%	3.18%	4.05%	3.33%	2.58%	3.17	0.87	(0.71)
Ophthalmology	11920	14337	16149	4120	46526	1	304	692	197	1194	0.01%	2.12%	4.29%	4.78%	2.57%	2.11	2.16	0.50
Environmental Sciences	97211	123224	141224	41335	402994	15	1962	6335	1911	10223	0.02%	1.59%	4.49%	4.62%	2.54%	1.58	2.89	0.14
Dentistry Oral Surgery Medicine	14006	15835	17628	4299	51768	0	418	725	165	1308	0.00%	2.64%	4.11%	3.84%	2.53%	2.64	1.47	(0.27)
Psychology	8844	9413	10403	3074	31734	0	185	426	186	797	0.00%	1.97%	4.09%	6.05%	2.51%	1.97	2.13	1.96

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Regional Urban Planning	5539	5115	6090	1658	18402	0	62	289	111	462	0.00%	1.21%	4.75%	6.69%	2.51%	1.21	3.53	1.95
Education Special	2430	2874	3245	864	9413	0	37	151	41	229	0.00%	1.29%	4.65%	4.75%	2.43%	1.29	3.37	0.09
Rehabilitation	12581	13755	14522	4078	44936	0	236	647	210	1093	0.00%	1.72%	4.46%	5.15%	2.43%	1.72	2.74	0.69
Surgery	46910	55784	61212	16809	180715	1	1559	2245	577	4382	0.00%	2.79%	3.67%	3.43%	2.42%	2.79	0.87	(0.23)
Nutrition Dietetics	17744	20438	25550	7210	70942	2	353	1080	272	1707	0.01%	1.73%	4.23%	3.77%	2.41%	1.72	2.50	(0.45)
Andrology	818	1317	1492	390	4017	0	22	59	15	96	0.00%	1.67%	3.95%	3.85%	2.39%	1.67	2.28	(0.11)
Psychology Applied	6209	7246	9056	2786	25297	0	114	347	142	603	0.00%	1.57%	3.83%	5.10%	2.38%	1.57	2.26	1.27
Folklore	310	361	321	57	1049	0	10	12	3	25	0.00%	2.77%	3.74%	5.26%	2.38%	2.77	0.97	1.52
Psychology Developmental	7917	8993	10123	3276	30309	0	78	439	204	721	0.00%	0.87%	4.34%	6.23%	2.38%	0.87	3.47	1.89
Biochemical Research Methods	16491	16829	17046	4130	54496	16	265	832	182	1295	0.10%	1.57%	4.88%	4.41%	2.38%	1.48	3.31	(0.47)
Theater	1419	1353	1061	156	3989	0	33	48	12	93	0.00%	2.44%	4.52%	7.69%	2.33%	2.44	2.09	3.17
Green Sustainable Science Technology	30563	39005	39257	9040	117865	0	549	1720	467	2736	0.00%	1.41%	4.38%	5.17%	2.32%	1.41	2.97	0.78
Cell Biology	36034	39977	40979	9898	126888	19	876	1598	443	2936	0.05%	2.19%	3.90%	4.48%	2.31%	2.14	1.71	0.58
Criminology Penology	5156	6472	7570	2290	21488	0	123	263	82	468	0.00%	1.90%	3.47%	3.58%	2.18%	1.90	1.57	0.11
Biochemistry Molecular Biology	70287	82208	91465	22953	266913	54	1472	3327	905	5758	0.08%	1.79%	3.64%	3.94%	2.16%	1.71	1.85	0.31
Chemistry Medicinal	19391	19680	21848	5071	65990	17	350	800	237	1404	0.09%	1.78%	3.66%	4.67%	2.13%	1.69	1.88	1.01
Anthropology	5297	5606	5624	1526	18053	1	176	168	37	382	0.02%	3.14%	2.99%	2.42%	2.12%	3.12	(0.15)	(0.56)
Ethnic Studies	2078	2352	2675	924	8029	0	44	86	39	169	0.00%	1.87%	3.21%	4.22%	2.10%	1.87	1.34	1.01
History Philosophy Of Science	3571	4335	5147	962	14015	0	86	149	55	290	0.00%	1.98%	2.89%	5.72%	2.07%	1.98	0.91	2.82
Cell Tissue Engineering	3638	3994	4286	1019	12937	0	79	153	28	260	0.00%	1.98%	3.57%	2.75%	2.01%	1.98	1.59	(0.82)
Biotechnology Applied Microbiology	32746	36996	38026	9791	117559	33	559	1375	352	2319	0.10%	1.51%	3.62%	3.60%	1.97%	1.41	2.10	(0.02)
Mycology	2049	2312	2907	692	7960	0	24	91	38	153	0.00%	1.04%	3.13%	5.49%	1.92%	1.04	2.09	2.36
Social Sciences Mathematical Methods	3386	3876	4296	1218	12776	1	52	137	55	245	0.03%	1.34%	3.19%	4.52%	1.92%	1.31	1.85	1.33
Literature African Australian Canadian	209	222	138	20	589	0	10	1	0	11	0.00%	4.50%	0.72%	0.00%	1.87%	4.50	(3.78)	(0.72)
Psychology Educational	5582	4560	5226	1471	16839	0	42	197	74	313	0.00%	0.92%	3.77%	5.03%	1.86%	0.92	2.85	1.26
Film Radio Television	1784	1601	1695	313	5393	1	13	60	26	100	0.06%	0.81%	3.54%	8.31%	1.85%	0.76	2.73	4.77
Computer Science Interdisciplinary Applications	43952	41051	40667	8660	134330	3	499	1646	310	2458	0.01%	1.22%	4.05%	3.58%	1.83%	1.21	2.83	(0.47)
Humanities Multidisciplinary	12715	13654	12526	1803	40698	1	189	460	82	732	0.01%	1.38%	3.67%	4.55%	1.80%	1.38	2.29	0.88

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Neurosciences	45643	50539	57499	13775	167456	1	828	1584	458	2871	0.00%	1.64%	2.75%	3.32%	1.71%	1.64	1.12	0.57
Reproductive Biology	4696	5522	5500	1320	17038	0	95	153	39	287	0.00%	1.72%	2.78%	2.95%	1.68%	1.72	1.06	0.17
Sport Sciences	14086	14707	16230	3973	48996	2	191	469	125	787	0.01%	1.30%	2.89%	3.15%	1.61%	1.28	1.59	0.26
Ergonomics	2964	3408	3458	700	10530	0	25	117	25	167	0.00%	0.73%	3.38%	3.57%	1.59%	0.73	2.65	0.19
Physiology	13990	13224	13372	3171	43757	2	207	385	88	682	0.01%	1.57%	2.88%	2.78%	1.56%	1.55	1.31	(0.10)
Mathematics Interdisciplinary Applications	14936	19057	20074	4239	58306	2	304	463	114	883	0.01%	1.60%	2.31%	2.69%	1.51%	1.58	0.71	0.38
Engineering Biomedical	24272	23095	22144	5482	74993	1	256	699	176	1132	0.00%	1.11%	3.16%	3.21%	1.51%	1.10	2.05	0.05
Oncology	54439	64675	71340	17596	208050	5	1088	1615	428	3136	0.01%	1.68%	2.26%	2.43%	1.51%	1.67	0.58	0.17
Veterinary Sciences	19490	22619	24347	5723	72179	118	299	506	131	1054	0.61%	1.32%	2.08%	2.29%	1.46%	0.72	0.76	0.21
Dance	345	322	201	33	901	0	5	7	1	13	0.00%	1.55%	3.48%	3.03%	1.44%	1.55	1.93	(0.45)
Psychology Biological	2012	2188	2368	615	7183	0	30	55	17	102	0.00%	1.37%	2.32%	2.76%	1.42%	1.37	0.95	0.44
Behavioral Sciences	8065	7886	8741	2025	26717	0	64	254	60	378	0.00%	0.81%	2.91%	2.96%	1.41%	0.81	2.09	0.06
Computer Science Information Systems	78185	76243	67230	15229	236887	1	749	2006	531	3287	0.00%	0.98%	2.98%	3.49%	1.39%	0.98	2.00	0.50
Audiology Speech Language Pathology	3476	3578	3984	793	11831	0	32	100	25	157	0.00%	0.89%	2.51%	3.15%	1.33%	0.89	1.62	0.64
Architecture	5782	4265	3280	625	13952	1	51	100	29	181	0.02%	1.20%	3.05%	4.64%	1.30%	1.18	1.85	1.59
Computer Science Cybernetics	10045	8616	7681	1454	27796	0	52	253	46	351	0.00%	0.60%	3.29%	3.16%	1.26%	0.60	2.69	(0.13)
Music	2676	2579	2462	458	8175	0	10	83	9	102	0.00%	0.39%	3.37%	1.97%	1.25%	0.39	2.98	(1.41)
Language Linguistics	10403	11728	11769	2266	36166	0	66	284	98	448	0.00%	0.56%	2.41%	4.32%	1.24%	0.56	1.85	1.91
Orthopedics	17289	20754	22697	5699	66439	0	350	363	100	813	0.00%	1.69%	1.60%	1.75%	1.22%	1.69	(0.09)	0.16
Neuroimaging	4024	3877	4352	1222	13475	0	74	60	25	159	0.00%	1.91%	1.38%	2.05%	1.18%	1.91	(0.53)	0.67
Genetics Heredity	25704	27597	28971	7435	89707	12	260	602	166	1040	0.05%	0.94%	2.08%	2.23%	1.16%	0.90	1.14	0.15
Asian Studies	2079	2080	2126	420	6705	0	34	26	17	77	0.00%	1.63%	1.22%	4.05%	1.15%	1.63	(0.41)	2.82
Engineering Industrial	14344	12950	12226	3739	43259	0	65	285	121	471	0.00%	0.50%	2.33%	3.24%	1.09%	0.50	1.83	0.91
Operations Research Management Science	18129	19367	19623	5229	62348	0	113	413	151	677	0.00%	0.58%	2.10%	2.89%	1.09%	0.58	1.52	0.78
Meteorology Atmospheric Sciences	16577	18749	20430	4869	60625	2	117	429	103	651	0.01%	0.62%	2.10%	2.12%	1.07%	0.61	1.48	0.02
Computer Science Artificial Intelligence	68680	63067	62962	12307	207016	3	485	1363	345	2196	0.00%	0.77%	2.16%	2.80%	1.06%	0.76	1.40	0.64
Physics Mathematical	11397	13310	12721	2641	40069	0	233	175	14	422	0.00%	1.75%	1.38%	0.53%	1.05%	1.75	(0.37)	(0.85)
Toxicology	13247	14567	15644	3880	47338	0	142	278	73	493	0.00%	0.97%	1.78%	1.88%	1.04%	0.97	0.80	0.10

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Chemistry Analytical	32351	36418	39337	10399	118505	4	177	816	231	1228	0.01%	0.49%	2.07%	2.22%	1.04%	0.47	1.59	0.15
Linguistics	11430	12152	12474	2976	39032	0	81	239	80	400	0.00%	0.67%	1.92%	2.69%	1.02%	0.67	1.25	0.77
Psychology Experimental	8822	9548	10932	2919	32221	0	38	200	92	330	0.00%	0.40%	1.83%	3.15%	1.02%	0.40	1.43	1.32
Statistics Probability	14497	16233	15967	4556	51253	2	100	288	126	516	0.01%	0.62%	1.80%	2.77%	1.01%	0.60	1.19	0.96
Computer Science Theory Methods	86460	54639	42856	9891	193846	0	424	1096	318	1838	0.00%	0.78%	2.56%	3.22%	0.95%	0.78	1.78	0.66
History Of Social Sciences	1459	1683	1695	560	5397	0	8	34	9	51	0.00%	0.48%	2.01%	1.61%	0.94%	0.48	1.53	(0.40)
Chemistry Multidisciplinary	92837	107167	117897	32018	349919	11	831	1886	546	3274	0.01%	0.78%	1.60%	1.71%	0.94%	0.76	0.82	0.11
Anatomy Morphology	2915	3276	3643	1139	10973	1	12	60	29	102	0.03%	0.37%	1.65%	2.55%	0.93%	0.33	1.28	0.90
Engineering Environmental	26244	33511	38668	10130	108553	3	162	641	195	1001	0.01%	0.48%	1.66%	1.92%	0.92%	0.47	1.17	0.27
Physics Multidisciplinary	29881	30270	29963	6348	96462	0	325	485	71	881	0.00%	1.07%	1.62%	1.12%	0.91%	1.07	0.54	(0.50)
Philosophy	10377	12051	12906	2322	37656	0	141	156	36	333	0.00%	1.17%	1.21%	1.55%	0.88%	1.17	0.04	0.34
Engineering Multidisciplinary	38136	38587	42268	10390	129381	1	181	726	200	1108	0.00%	0.47%	1.72%	1.92%	0.86%	0.47	1.25	0.21
Acoustics	8931	8837	10581	1586	29935	0	76	155	24	255	0.00%	0.86%	1.46%	1.51%	0.85%	0.86	0.60	0.05
Developmental Biology	3939	5240	7185	1317	17681	2	40	83	16	141	0.05%	0.76%	1.16%	1.21%	0.80%	0.71	0.39	0.06
Construction Building Technology	18506	20928	23065	6285	68784	2	50	385	109	546	0.01%	0.24%	1.67%	1.73%	0.79%	0.23	1.43	0.07
Art	4926	3669	3101	510	12206	0	21	67	3	91	0.00%	0.57%	2.16%	0.59%	0.75%	0.57	1.59	(1.57)
Computer Science Software Engineering	28014	25660	26551	6257	86482	0	88	440	110	638	0.00%	0.34%	1.66%	1.76%	0.74%	0.34	1.31	0.10
Evolutionary Biology	6974	7212	7871	1997	24054	1	52	96	22	171	0.01%	0.72%	1.22%	1.10%	0.71%	0.71	0.50	(0.12)
Food Science Technology	33293	39572	47764	13449	134078	2	200	564	165	931	0.01%	0.51%	1.18%	1.23%	0.69%	0.50	0.68	0.05
Literary Theory Criticism	1898	1641	1342	136	5017	0	4	10	19	33	0.00%	0.24%	0.75%	13.97%	0.66%	0.24	0.50	13.23
Transportation Science Technology	13748	13002	11821	2889	41460	0	24	196	48	268	0.00%	0.18%	1.66%	1.66%	0.65%	0.18	1.47	0.00
Literature	5441	5671	5333	740	17185	0	34	77	0	111	0.00%	0.60%	1.44%	0.00%	0.65%	0.60	0.84	(1.44)
History	14232	14839	14460	2537	46068	0	115	134	36	285	0.00%	0.77%	0.93%	1.42%	0.62%	0.77	0.15	0.49
Nanoscience Nanotechnology	51744	56817	59982	15812	184355	7	238	682	194	1121	0.01%	0.42%	1.14%	1.23%	0.61%	0.41	0.72	0.09
Water Resources	21311	24945	27245	7166	80667	1	69	312	106	488	0.00%	0.28%	1.15%	1.48%	0.60%	0.27	0.87	0.33
Instruments Instrumentation	28359	29929	35538	9083	102909	0	91	399	124	614	0.00%	0.30%	1.12%	1.37%	0.60%	0.30	0.82	0.24
Telecommunications	71424	67074	51861	9449	199808	0	294	725	144	1163	0.00%	0.44%	1.40%	1.52%	0.58%	0.44	0.96	0.13
Agriculture Dairy Animal Science	11952	13810	14115	2932	42809	11	51	155	27	244	0.09%	0.37%	1.10%	0.92%	0.57%	0.28	0.73	(0.18)

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Remote Sensing	15897	15323	15443	5999	52662	0	68	178	53	299	0.00%	0.44%	1.15%	0.88%	0.57%	0.44	0.71	(0.27)
Geography Physical	8386	9441	8534	1899	28260	0	37	96	23	156	0.00%	0.39%	1.12%	1.21%	0.55%	0.39	0.73	0.09
Imaging Science Photographic Technology	18014	17431	24233	5994	65672	0	60	247	48	355	0.00%	0.34%	1.02%	0.80%	0.54%	0.34	0.68	(0.22)
Agriculture Multidisciplinary	10772	13517	10579	2424	37292	0	76	101	20	197	0.00%	0.56%	0.95%	0.83%	0.53%	0.56	0.39	(0.13)
Chemistry Applied	21690	23840	26934	7783	80247	0	71	240	106	417	0.00%	0.30%	0.89%	1.36%	0.52%	0.30	0.59	0.47
Physics Fluids Plasmas	11386	10767	11797	2615	36565	0	69	111	10	190	0.00%	0.64%	0.94%	0.38%	0.52%	0.64	0.30	(0.56)
Materials Science Biomaterials	10946	11314	12300	2855	37415	0	31	125	35	191	0.00%	0.27%	1.02%	1.23%	0.51%	0.27	0.74	0.21
Computer Science Hardware Architecture	19292	18180	16779	2891	57142	0	55	191	43	289	0.00%	0.30%	1.14%	1.49%	0.51%	0.30	0.84	0.35
Biodiversity Conservation	8069	10139	10016	2520	30744	4	23	98	24	149	0.05%	0.23%	0.98%	0.95%	0.48%	0.18	0.75	(0.03)
Literature American	476	465	412	115	1468	0	0	3	4	7	0.00%	0.00%	0.73%	3.48%	0.48%	-	0.73	2.75
Electrochemistry	17183	16744	17581	4146	55654	0	36	177	46	259	0.00%	0.22%	1.01%	1.11%	0.47%	0.22	0.79	0.10
Mathematics Applied	39573	40701	43968	10847	135089	2	167	361	87	617	0.01%	0.41%	0.82%	0.80%	0.46%	0.41	0.41	(0.02)
Robotics	12922	13814	9434	2203	38373	0	25	135	14	174	0.00%	0.18%	1.43%	0.64%	0.45%	0.18	1.25	(0.80)
Literature British Isles	459	475	373	38	1345	0	1	5	0	6	0.00%	0.21%	1.34%	0.00%	0.45%	0.21	1.13	(1.34)
Materials Science Textiles	4595	4820	5504	1444	16363	0	22	32	17	71	0.00%	0.46%	0.58%	1.18%	0.43%	0.46	0.12	0.60
Engineering Civil	34847	37562	43232	12487	128128	0	51	334	154	539	0.00%	0.14%	0.77%	1.23%	0.42%	0.14	0.64	0.46
Ecology	24059	26410	27912	7328	85709	8	97	202	48	355	0.03%	0.37%	0.72%	0.66%	0.41%	0.33	0.36	(0.07)
Engineering Manufacturing	17097	15427	13218	4254	49996	0	39	117	50	206	0.00%	0.25%	0.89%	1.18%	0.41%	0.25	0.63	0.29
Engineering Electrical Electronic	202573	182585	155288	35953	576399	2	583	1399	346	2330	0.00%	0.32%	0.90%	0.96%	0.40%	0.32	0.58	0.06
Crystallography	7293	7568	7719	1779	24359	2	20	63	11	96	0.03%	0.26%	0.82%	0.62%	0.39%	0.24	0.55	(0.20)
Spectroscopy	7538	7888	7822	1972	25220	0	15	69	15	99	0.00%	0.19%	0.88%	0.76%	0.39%	0.19	0.69	(0.12)
Zoology	15291	17621	18869	4193	55974	9	34	151	23	217	0.06%	0.19%	0.80%	0.55%	0.39%	0.13	0.61	(0.25)
Automation Control Systems	37511	37791	26818	6939	109059	1	74	251	67	393	0.00%	0.20%	0.94%	0.97%	0.36%	0.19	0.74	0.03
Geosciences Multidisciplinary	36984	42461	42839	10622	132906	1	133	258	86	478	0.00%	0.31%	0.60%	0.81%	0.36%	0.31	0.29	0.21
Microscopy	1411	1327	1506	494	4738	0	2	6	8	16	0.00%	0.15%	0.40%	1.62%	0.34%	0.15	0.25	1.22
Energy Fuels	68323	71242	75519	18555	233639	0	110	556	106	772	0.00%	0.15%	0.74%	0.57%	0.33%	0.15	0.58	(0.16)
Forestry	8128	8792	9657	1925	28502	0	10	70	14	94	0.00%	0.11%	0.72%	0.73%	0.33%	0.11	0.61	0.00
Chemistry Organic	19839	19689	20121	4151	63800	4	43	127	33	207	0.02%	0.22%	0.63%	0.79%	0.32%	0.20	0.41	0.16
Engineering Chemical	48290	51249	60840	16052	176431	1	105	379	84	569	0.00%	0.20%	0.62%	0.52%	0.32%	0.20	0.42	(0.10)

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Materials Science Multidisciplinary	158435	172856	192055	52039	575385	4	352	1155	310	1821	0.00%	0.20%	0.60%	0.60%	0.32%	0.20	0.40	(0.01)
Physics Applied	98604	103517	106437	29018	337576	4	191	657	189	1041	0.00%	0.18%	0.62%	0.65%	0.31%	0.18	0.43	0.03
Physics Atomic Molecular Chemical	17836	19366	19016	4007	60225	0	56	105	21	182	0.00%	0.29%	0.55%	0.52%	0.30%	0.29	0.26	(0.03)
Mechanics	32179	32226	35137	8417	107959	0	106	173	44	323	0.00%	0.33%	0.49%	0.52%	0.30%	0.33	0.16	0.03
Mathematics	39203	43131	47831	12039	142204	3	81	265	66	415	0.01%	0.19%	0.55%	0.55%	0.29%	0.18	0.37	(0.01)
Literary Reviews	1890	1508	1330	104	4832	0	10	3	1	14	0.00%	0.66%	0.23%	0.96%	0.29%	0.66	(0.44)	0.74
Chemistry Physical	82132	88538	102758	28527	301955	3	180	535	138	856	0.00%	0.20%	0.52%	0.48%	0.28%	0.20	0.32	(0.04)
Literature Romance	2928	3044	2722	254	8948	0	3	18	4	25	0.00%	0.10%	0.66%	1.57%	0.28%	0.10	0.56	0.91
Materials Science Paper Wood	2702	2897	2721	760	9080	0	5	16	4	25	0.00%	0.17%	0.59%	0.53%	0.28%	0.17	0.42	(0.06)
Polymer Science	26197	30423	32627	9095	98342	0	41	166	40	247	0.00%	0.13%	0.51%	0.44%	0.25%	0.13	0.37	(0.07)
Plant Sciences	30478	35563	40831	10997	117869	1	60	183	51	295	0.00%	0.17%	0.45%	0.46%	0.25%	0.17	0.28	0.02
Marine Freshwater Biology	13834	15075	16325	4017	49251	0	16	78	17	111	0.00%	0.11%	0.48%	0.42%	0.23%	0.11	0.37	(0.05)
Agronomy	15002	18132	19822	5065	58021	0	24	86	18	128	0.00%	0.13%	0.43%	0.36%	0.22%	0.13	0.30	(0.08)
Psychology Mathematical	865	959	1031	337	3192	0	0	5	2	7	0.00%	0.00%	0.48%	0.59%	0.22%	-	0.48	0.11
Engineering Mechanical	47742	40640	38945	10869	138196	0	73	176	47	296	0.00%	0.18%	0.45%	0.43%	0.21%	0.18	0.27	(0.02)
Engineering Aerospace	9310	7968	8576	1768	27622	0	16	32	7	55	0.00%	0.20%	0.37%	0.40%	0.20%	0.20	0.17	0.02
Thermodynamics	21155	19774	23197	5936	70062	0	15	85	29	129	0.00%	0.08%	0.37%	0.49%	0.18%	0.08	0.29	0.12
Archaeology	5327	5383	5358	1038	17106	0	5	19	7	31	0.00%	0.09%	0.35%	0.67%	0.18%	0.09	0.26	0.32
Logic	1544	1748	1932	415	5639	0	1	8	1	10	0.00%	0.06%	0.41%	0.24%	0.18%	0.06	0.36	(0.17)
Poetry	228	226	149	7	610	0	1	0	0	1	0.00%	0.44%	0.00%	0.00%	0.16%	0.44	(0.44)	-
Engineering Marine	4281	4581	4753	1070	14685	0	3	17	4	24	0.00%	0.07%	0.36%	0.37%	0.16%	0.07	0.29	0.02
Optics	54641	50915	43661	8320	157537	0	62	148	38	248	0.00%	0.12%	0.34%	0.46%	0.16%	0.12	0.22	0.12
Materials Science Coatings Films	10593	10752	11953	3005	36303	0	7	38	10	55	0.00%	0.07%	0.32%	0.33%	0.15%	0.07	0.25	0.01
Fisheries	7938	9126	9146	2511	28721	0	8	24	11	43	0.00%	0.09%	0.26%	0.44%	0.15%	0.09	0.17	0.18
Nuclear Science Technology	11000	11586	11257	2494	36337	0	17	32	5	54	0.00%	0.15%	0.28%	0.20%	0.15%	0.15	0.14	(0.08)
Physics Condensed Matter	41398	43891	45581	12775	143645	2	39	131	40	212	0.00%	0.09%	0.29%	0.31%	0.15%	0.08	0.20	0.03
Mining Mineral Processing	6126	6231	5744	1572	19673	0	11	15	1	27	0.00%	0.18%	0.26%	0.06%	0.14%	0.18	0.08	(0.20)
Oceanography	9421	10652	10798	2084	32955	0	3	37	4	44	0.00%	0.03%	0.34%	0.19%	0.13%	0.03	0.31	(0.15)
Limnology	2267	2846	2849	752	8714	0	4	6	1	11	0.00%	0.14%	0.21%	0.13%	0.13%	0.14	0.07	(0.08)

Web of Science Categories	All publications					COVID-19 publications					COVID19 share of all WoS publications					Research pivot points		
	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019	2020	2021	2022*	2019-2022*	2019-2020	2020-2021	2021-2022*
Literature German Dutch Scandinavian	584	500	490	86	1660	0	1	1	0	2	0.00%	0.20%	0.20%	0.00%	0.12%	0.20	0.00	(0.20)
Agricultural Engineering	5123	6045	5598	946	17712	0	10	5	4	19	0.00%	0.17%	0.09%	0.42%	0.11%	0.17	(0.08)	0.33
Classics	1323	1227	992	197	3739	0	3	0	1	4	0.00%	0.24%	0.00%	0.51%	0.11%	0.24	(0.24)	0.51
Geochemistry Geophysics	14415	13906	16352	5849	50522	0	6	37	10	53	0.00%	0.04%	0.23%	0.17%	0.10%	0.04	0.18	(0.06)
Chemistry Inorganic Nuclear	13886	14209	15243	3616	46954	0	9	25	15	49	0.00%	0.06%	0.16%	0.41%	0.10%	0.06	0.10	0.25
Ornithology	1237	1387	1279	266	4169	0	1	2	1	4	0.00%	0.07%	0.16%	0.38%	0.10%	0.07	0.08	0.22
Quantum Science Technology	4970	3729	5066	1139	14904	0	4	7	3	14	0.00%	0.11%	0.14%	0.26%	0.09%	0.11	0.03	0.13
Horticulture	5499	5094	5366	1316	17275	0	4	9	3	16	0.00%	0.08%	0.17%	0.23%	0.09%	0.08	0.09	0.06
Mineralogy	4480	4755	5167	1328	15730	0	3	10	0	13	0.00%	0.06%	0.19%	0.00%	0.08%	0.06	0.13	(0.19)
Engineering Petroleum	4167	3632	4075	1521	13395	0	2	8	1	11	0.00%	0.06%	0.20%	0.07%	0.08%	0.06	0.14	(0.13)
Engineering Ocean	4221	4095	4863	960	14139	0	0	7	4	11	0.00%	0.00%	0.14%	0.42%	0.08%	-	0.14	0.27
Engineering Geological	9681	10688	10542	3060	33971	0	1	14	9	24	0.00%	0.01%	0.13%	0.29%	0.07%	0.01	0.12	0.16
Metallurgy Metallurgical Engineering	28071	30711	35821	9898	104501	0	17	41	15	73	0.00%	0.06%	0.11%	0.15%	0.07%	0.06	0.06	0.04
Soil Science	6106	6871	8222	2255	23454	0	6	7	2	15	0.00%	0.09%	0.09%	0.09%	0.06%	0.09	(0.00)	0.00
Entomology	8205	9750	10233	2789	30977	0	5	13	1	19	0.00%	0.05%	0.13%	0.04%	0.06%	0.05	0.08	(0.09)
Literature Slavic	658	656	520	37	1871	0	0	1	0	1	0.00%	0.00%	0.19%	0.00%	0.05%	-	0.19	(0.19)
Materials Science Composites	8264	7213	9108	2791	27376	0	2	7	4	13	0.00%	0.03%	0.08%	0.14%	0.05%	0.03	0.05	0.07
Medieval Renaissance Studies	1795	1668	1506	175	5144	0	1	1	0	2	0.00%	0.06%	0.07%	0.00%	0.04%	0.06	0.01	(0.07)
Materials Science Characterization Testing	5181	5690	6195	1637	18703	0	1	4	2	7	0.00%	0.02%	0.06%	0.12%	0.04%	0.02	0.05	0.06
Astronomy Astrophysics	24448	24274	25592	5957	80271	0	9	10	3	22	0.00%	0.04%	0.04%	0.05%	0.03%	0.04	0.00	0.01
Materials Science Ceramics	7950	8079	9252	2844	28125	0	1	3	3	7	0.00%	0.01%	0.03%	0.11%	0.02%	0.01	0.02	0.07
Geology	5115	4297	4778	1008	15198	0	1	2	0	3	0.00%	0.02%	0.04%	0.00%	0.02%	0.02	0.02	(0.04)
Paleontology	3535	3399	3873	754	11561	0	0	2	0	2	0.00%	0.00%	0.05%	0.00%	0.02%	-	0.05	(0.05)
Physics Nuclear	7514	7316	5654	779	21263	0	0	2	0	2	0.00%	0.00%	0.04%	0.00%	0.01%	-	0.04	(0.04)
Physics Particles Fields	14908	15651	14441	2739	47739	0	2	1	0	3	0.00%	0.01%	0.01%	0.00%	0.01%	0.01	(0.01)	(0.01)
			Thou.					*Thou.*										
TOTALS	2,669.2	2,864.6	3,064.3	759.4	9,357.4	0.86	56.6	126.0	33.1	216.7	0.03%	1.98%	4.11%	4.36%	2.32%	1.94	2.14	0.25

Appendix 2. Table 3.

COVID-19 Publications by Top 30 Publishing Countries, Web of Science (WoS), 2019-2022*

Country	COVID-19 publications *Thou.*	All WoS publications *Thou.*	COVID-19 share of all WoS publications
USA	55.0	1,899.1	2.90%
PEOPLES R CHINA	23.1	2,056.4	1.12%
UNITED KINGDOM	20.5	608.6	3.37%
ITALY	15.5	374.0	4.15%
INDIA	13.9	484.7	2.87%
GERMANY	10.0	522.9	1.91%
SPAIN	9.5	319.6	2.97%
CANADA	9.2	342.2	2.68%
AUSTRALIA	8.5	330.8	2.56%
BRAZIL	7.0	267.8	2.62%
TURKEY	6.6	183.4	3.62%
FRANCE	6.6	333.8	1.97%
SAUDI ARABIA	5.3	120.2	4.42%
IRAN	5.0	206.9	2.42%
JAPAN	4.7	376.2	1.26%
NETHERLANDS	4.2	191.8	2.17%
SOUTH KOREA	4.1	278.2	1.46%
SWITZERLAND	3.9	148.5	2.61%
POLAND	3.5	160.3	2.16%
PAKISTAN	3.2	94.4	3.42%
SOUTH AFRICA	2.8	83.5	3.38%
EGYPT	2.8	91.2	3.08%
RUSSIA	2.8	260.8	1.07%
BELGIUM	2.7	107.0	2.50%
SWEDEN	2.7	135.0	1.98%
MEXICO	2.4	85.4	2.85%
ISRAEL	2.4	71.1	3.41%
MALAYSIA	2.3	85.4	2.71%
PORTUGAL	2.2	87.3	2.48%
TAIWAN	2.2	120.8	1.79%

Source: See Note 1.

* 2022 publications through to April 19, 2022

Appendix 2. Table 4.

COVID 19 publications (including preprints) reported in Dimensions, 2019-2022*

Dimensions research field	Field code	All publications *Thou.*				COVID-19 publications *Thou.*				COVID-19 share of all publications				Research pivot points		
		2019	2020	2021	2022*	2019	2020	2021	2022*	2019	2020	2021	2022*	19-20	20-21	21-22*
Medical and Health Sciences	11	1240.5	1463.4	1526.2	403.7	0.7	113.2	149.5	37.9	0.05%	7.74%	9.79%	9.38%	7.68	2.06	-0.41
Studies in Human Society	16	162.8	192.1	206.5	48.9	0.0	10.2	17.9	4.4	0.01%	5.28%	8.69%	8.97%	5.27	3.40	0.28
Biological Sciences	6	358.4	406.9	439.3	127.0	0.4	8.5	11.6	3.2	0.10%	2.09%	2.63%	2.51%	1.99	0.54	-0.12
Psychology and Cognitive Sciences	17	181.4	197.6	220.4	56.8	0.0	7.8	15.3	3.9	0.01%	3.96%	6.94%	6.81%	3.95	2.99	-0.13
Information and Computing Sciences	8	373.8	408.0	450.4	112.1	0.0	6.7	14.1	3.5	0.01%	1.65%	3.12%	3.11%	1.65	1.47	-0.02
Economics	14	92.2	104.5	111.1	28.8	0.0	5.8	9.3	2.3	0.02%	5.54%	8.36%	7.83%	5.53	2.82	-0.54
Education	13	102.7	120.9	135.6	32.5	0.0	5.8	15.5	4.0	0.01%	4.77%	11.41%	12.28%	4.75	6.64	0.87
Commerce, Management, Tourism and Services	15	104.5	118.2	132.0	35.2	0.0	4.0	10.4	3.0	0.00%	3.40%	7.85%	8.58%	3.39	4.45	0.74
Engineering	9	660.6	700.6	762.8	251.5	0.0	2.9	6.0	1.8	0.00%	0.42%	0.79%	0.70%	0.42	0.37	-0.08
Mathematical Sciences	1	215.0	231.3	247.0	70.5	0.0	2.8	4.0	1.1	0.00%	1.20%	1.64%	1.54%	1.19	0.44	-0.10
Chemical Sciences	3	324.2	348.5	368.8	124.4	0.0	2.1	4.4	1.4	0.01%	0.59%	1.18%	1.11%	0.58	0.59	-0.07
Law and Legal Studies	18	49.7	57.4	62.9	11.5	0.0	2.0	3.1	0.5	0.00%	3.51%	4.96%	4.63%	3.51	1.45	-0.32
History and Archaeology	21	83.9	96.3	97.5	20.0	0.0	1.3	2.0	0.4	0.00%	1.37%	2.03%	1.84%	1.36	0.66	-0.19
Language, Communication and Culture	20	100.7	113.9	118.8	25.5	0.0	1.3	2.8	0.7	0.00%	1.14%	2.33%	2.89%	1.13	1.19	0.56
Philosophy and Religious Studies	22	57.9	62.6	65.6	14.2	0.0	1.2	1.7	0.3	0.00%	1.86%	2.61%	2.19%	1.86	0.75	-0.42
Physical Sciences	2	243.9	251.1	266.1	73.9	0.0	1.0	2.5	0.5	0.01%	0.41%	0.95%	0.69%	0.41	0.54	-0.26
Technology	10	99.2	99.9	102.3	26.6	0.0	1.0	1.7	0.5	0.01%	0.97%	1.65%	1.72%	0.95	0.68	0.07
Environmental Sciences	5	79.8	91.6	110.9	33.6	0.0	0.9	2.1	0.6	0.01%	1.00%	1.91%	1.70%	0.99	0.90	-0.21
Agricultural and Veterinary Sciences	7	72.5	82.7	90.7	27.6	0.1	0.9	1.2	0.2	0.17%	1.04%	1.34%	0.87%	0.87	0.30	-0.47
Built Environment and Design	12	30.4	35.9	42.6	14.4	0.0	0.8	2.4	0.9	0.00%	2.17%	5.52%	6.09%	2.17	3.35	0.58
Earth Sciences	4	92.4	100.0	112.6	36.0	0.0	0.4	0.8	0.2	0.00%	0.38%	0.67%	0.61%	0.38	0.29	-0.06
Studies in Creative Arts and Writing	19	20.0	21.1	22.5	4.7	0.0	0.3	0.8	0.2	0.02%	1.48%	3.47%	3.49%	1.46	1.99	0.02
Totals		5812.4	6535.8	6541.7	1681.4	1.3	207.7	309.4	75.7	0.02%	3.18%	4.73%	4.50%	3.16	1.55	-0.23

Source: See Note 2. * 2022 publications through to April 18, 2022