The rapid, massive infection of the scientific literature and authors by COVID-19

John P.A. Ioannidis (1,2), Maia Salholz-Hillel (2), Kevin W. Boyack (3), Jeroen Baas (4)

(1) Departments of Medicine, of Epidemiology and Population Health, of Biomedical Data Science, and of Statistics, and Meta-Research Innovation Center at Stanford (METRICS), Stanford University, Stanford, California, USA

(2) Meta-Research Innovation Center Berlin (METRIC-B), QUEST, Berlin Institute of Health, Berlin, Germany

(3) SciTech Strategies, Inc., Albuquerque, New Mexico, USA

(4) Research Intelligence, Elsevier B.V., Amsterdam, the Netherlands

Address correspondence to: John P.A. Ioannidis, Stanford Prevention Research Center, Medical School Office Building, Room X306, 1265 Welch Road, Stanford CA 94305, USA. E-mail: jioannid@stanford.edu

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Conflicts of interest

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ABSTRACT

Importance: COVID-19 is a major global crisis and the scientific community has been mobilized to deal with this crisis.

Objective: To estimate the extent to which the scientific workforce in different fields has been engaged publishing papers relative to the COVID-19 pandemic.

Design, setting, and participants: We evaluated Scopus (data cut, December 1, 2020) for all indexed published papers and preprints relevant to COVID-19. We mapped this COVID-19 literature in terms of its authors across 174 subfields of science according to the Science Metrix classification. We also evaluated the extent to which the most influential scientists across science (based on a composite citation indicator) had published COVID-19-related research. Finally, we assessed the features of authors who published the highest number of COVID-19 publications and of those with the highest impact in the COVID-19 field based on the composite citation indicator limited to COVID-19 publications.

Main outcomes and measures: Publishing scientists (authors) and their published papers and citation impact.

Results: 84,180 indexed publications were relevant to COVID-19 including 322,279 unique authors. The highest rates of COVID-19 publications were seen for authors classified in Public Health and in Clinical Medicine, where 11.3% (6,388/56,516) and 11.1% (92,570/833,060) of authors, respectively, had published on COVID-19. Almost all (173/174) subfields (except for Automobile Design & Engineering) had some authors publishing on COVID-19. Among active scientists at the top 2% of citation impact, 15,803 (13.3%) had published on COVID-19 in their publications in the first 11 months of 2020.
The rates were the highest in the fields of Clinical Medicine (27.7%) and Public Health (26.8%). In 83 of the 174 subfields of science, at least one in ten active, influential authors in that field had authored something on COVID-19. 65 authors had already at least 30 (and up to 133) COVID-19 publications each. Among the 300 authors with the highest composite citation indicator for COVID-19 publications, 26 were journalists or editors publishing news stories or editorials in prestigious journals; most common countries for the remaining were China (n=77), USA (n=66), UK (n=27), and Italy (n=20).

**Conclusions and relevance:** The scientific literature and publishing scientists have been rapidly and massively infected by COVID-19 creating opportunities and challenges. There is evidence for hyper-prolific productivity.
The acute crisis of COVID-19 has led to a major effort by the scientific community to generate evidence about the new coronavirus and its pandemic. Here, we dissect the way that COVID-19 has spread like a rapid, widespread infection in the scientific literature and among researchers, as more and more papers and authors have focused on this exciting, timely topic. We aim to understand which scientific areas and which types of scientists have been most mobilized by the pandemic, and we discuss the implications of this rapid “covidization” of the research enterprise.

METHODS

We used a copy of the Scopus database1 extracted on December 1, 2020. COVID-19 publications have been specified as those returned by the query: TITLE-ABS-KEY(sars-cov-2 OR "coronavirus 2" OR "corona virus 2" OR covid-19 OR {novel coronavirus} OR {novel corona virus} OR 2019-ncov OR covid OR covid19 OR ncovid-19 OR "coronavirus disease 2019" OR "corona virus disease 2019" OR corona-19 OR SARS-nCoV OR ncov-2019) AND PUBYEAR > 2018. We further filtered the dataset using the Elsevier International Center for the Study of Research (ICSR) Lab infrastructure to publications indexed (loaded) in Scopus in 2020 only, and with a publication year of 2020 or greater. In order to evaluate publication dates by month, we have used the publication month and year where available. When publication month was not available, and when the publication date exceeded the indexing date, we used the indexing date. This accounts, for example, for cases where an article is published today, but the official journal issue is due later. Our evaluation is targeted at the date at which publications became available to the public rather than official publication dates.
We further focused on the 2,759,916 authors who have a Scopus-indexed publication in the first 11 months of 2020 and who have also authored in their entire career at least 5 Scopus-indexed papers classified as articles, reviews or conference papers. This allows exclusion of authors with limited presence in the scientific literature as well as some author IDs that may represent split fragments of the publication record of some more prolific authors.

**Field classification**

All authors were assigned to their most common field and subfield discipline of their career. We used the Science Metrix classification of science, which is a standard mapping of all science into 21 main fields and 174 subfield disciplines.\(^2,3\)

**Influential scientists**

We also examine how COVID-19 has affected the publication portfolio of researchers whose work has the largest citation impact in the literature. On the one hand, these scientists are already well established and thus may have less need or interest to venture into a new field. On the other hand, these scientists are also more productive and competitive, therefore they may be faster in moving into a rapidly emerging, new important frontier. We used the career-long statistics calculated with the Scopus database of November 1, 2020, using the code as provided with the supplemental data recently published for the most cited authors across science.\(^4-6\) Each author has been assigned to a main field and main subfield based on the largest proportion of publications across fields and analysis is restricted to the top 2\% authors per Science Metrix subfield. We have developed a composite citation indicator\(^4,5\) and accordingly 140,885 scientists can be classified as being in the top 2\% of their main subfield discipline based on the citations.
that their work received in 2019. Of those, 118,916 were active and had published at least 1 paper also in 2020.

**Topics of prominence**

In order to visualize the growth and spread of the COVID-19 scientific literature across scientific fields and over time, we used a circle of scientific fields that has been previously developed and which places the 333 Scopus journal categories sequentially around the perimeter of a circle. There are 27 high-level categories that are placed first and ordered in a manner that emerges naturally from a meta-analysis of the layouts of other science maps created using multiple databases and methods. Each of the 27 categories is assigned a separate color. The remaining 306 lower-level journal categories are then ordered within the corresponding high-level categories using factor analyses based on citation patterns. Each of the 333 journal categories thus has a fixed position on the perimeter of the circle.

The full Scopus citation graph of well over 50 million articles and 1 billion citation links was used to cluster articles into over 90,000 topics using established methods. Each topic is assigned a position within the circle based on triangulation of the positions of its constituent papers, each of which takes on the positional characteristics of its journal category. Topics are colored by their dominant journal category and area-sized proportionally based on the number of objects (e.g., papers, authors) being counted for the particular analysis. This circle of science and topic visualization are used in Elsevier’s SciVal tool. For the display of authors per topic, we have assigned authors to one topic by taking the topic with the highest proportion of publications per author.
Prolific authors and authors with high citation impact of their COVID-19 publication record

We also mapped the most prolific authors of the published COVID-19 corpus and the authors whose COVID-19 publications to-date had had the highest citation impact.

For prolific productivity, we ranked the authors according to decreasing number of COVID-19 published items. We show detailed data on extremely prolific authors with over 30 COVID-19 published items to-date.

Citation impact was assessed with the previously proposed citation indicator\textsuperscript{4-6} that combines information on 6 indices: total citations, Hirsch h-index, Schreiber hm-index, citations to single-authored papers, citations to first- or single-authored papers, and citations to first-, single- or last-authored papers. This avoids focusing simply on a single traditional metric such as citations, where it is expected that the authors of the earliest highly-cited papers would practically monopolize the top of the list, even if they had published a single paper and they were co-authors among many other authors. Self-citations are excluded from all calculations.\textsuperscript{5,6} We present descriptive data on the institution, country and two most common scientific subfields (per Science Metrix classification) for the top-300 authors in that list.

We avoid comparisons based on statistical tests, as the analyses presented here were aimed to be descriptive and exploratory.

RESULTS

COVID-19 papers and authors

As of December 1, 2020, Scopus classified 84,180 papers as relevant to COVID-19, which accounts for 2.8\% of the 2,986,038 papers across all science published and
indexed in Scopus in the first 11 months of 2020. The 84,180 published items were
classified by Scopus as articles (43,965, 52%), letters (13,757, 16%), reviews (9,302,
11%), notes (6,647, 8%), editorials (5,833, 7%), preprints from ArXiv, BioRxiv and
ChemRxiv (2,027, 2%), conference papers (906, 1%), and other items (1,743, 2%).

The overall share of COVID-19 papers has steadily increased over time and has
exceeded 3.7% among papers published in November 2020. The 84,180 COVID-19 papers
include 322,279 unique authors (with different Scopus IDs), amounting to 4.5% of the
7,102,710 author IDs who have published at least 1 paper of any type and on any topic in
2020. Most common countries of these 322,279 authors were USA (n=63,777), China
(n=40,539), Italy (n=25,044), UK (n=21,755), India (n=13,524) and Spain (n=12,784)
accounting for a total of 177,423 authors (55%). China had more authors involved in
COVID-19 papers until May, but USA surpassed China afterwards.

Among the 2,759,916 authors who have published anything that is Scopus-indexed
in the first 11 months of 2020 and who have also authored in their entire career at least 5
Scopus-indexed papers that are classified as articles, reviews or conference papers, by the
end of November 2020, 144,403 of these authors (5.2%), had at least one published and
indexed COVID-19 paper.

Scientific fields and subfields

Among the 2,959,916 authors, at the field level the highest “infection” rates with
COVID-19 publications were seen in authors whose main field in their career had been
Public Health and in Clinical Medicine: 11.3% (6,388/56,516) and 11.1%
(92,570/833,060) of authors in these two fields, respectively, were “infected” by the end of
November. However, authors “infected” with COVID-19 were seen across all 21 major

fields. The lowest percentage was seen in the field of Physics & Astronomy (0.7%), from which even 1,779 authors had their work “infected” by COVID-19. At the subfield discipline level, the highest “infection” rate of authors was seen (Table 1) in Emergency and Critical Care Medicine (26.3%). However, “infection” rates were higher than 10% (i.e. at least one in ten authors in that field had authored something on COVID-19) in 32 subfield disciplines and higher than 5% (at least one in twenty authors) in 71 subfield disciplines. Almost all (173/174) subfields (except for Automobile Design & Engineering) had some authors publishing on COVID-19. Supplementary Table 1 gives detailed data for COVID-19 “infection rates” of authors across all subfield disciplines.

27% of the authors published their COVID-19 research primarily in a subfield discipline that was not among the top 3 subfield disciplines where they had published most commonly during their career. Sometimes the fields of expertise of authors seemed remote from COVID-19, e.g. an expert on solar cells publishing on COVID-19 in healthcare personnel. Even experts specializing in their past work on very remote disciplines such as fisheries, ornithology, entomology or architecture had published on COVID-19.

Influential scientists and COVID-19 publications

Influential scientists were even more likely to be “infected” with COVID-19 (Supplementary Table 2). Among the 118,916 influential scientists active in publishing in 2020, 15,803 (13.3%) had been “infected” by COVID-19 in their publications in the first 11 months of 2020. The “infection” rate was the highest in the fields of Clinical Medicine (27.7%) and Public Health (26.8%). Among subfield disciplines, the highest “infection” rate of such active, influential authors was seen (Table 2) in Emergency & Critical Care Medicine (58.1%), Allergy (50.2%) and Virology (48.0%). However, “infection” rates
were higher than 10% (i.e. at least one in ten authors in that field had authored something on COVID-19) in 83 of 174 subfield disciplines across science and higher than 5% (at least one in twenty authors) in 116 subfield disciplines.

**Topics of prominence**

Figure 1 shows the growth and spread of COVID-19 papers, authors of COVID-19 papers, and high-impact authors of COVID-19 papers (those who belong to the top-2% of impact, as discussed previously) across scientific topics. As shown, there is a strong response of the literature and of the scientific workforce in some specific thematic areas, but there is also increasing and substantial involvement of scientists and respective publications, even in remote topics.

**Productivity for COVID-19 publications**

A total of 1,560 author IDs in Scopus had 10 or more Scopus-indexed published items. Setting a threshold of at least 15, 20, 25, and 30 items, the number of such extremely prolific authors was 483, 216, 107, and 67. Table 2 shows the 65 authors with the highest productivity (30 or more COVID-19 published items indexed in Scopus; 2 authors had their papers split in two ID profiles each, which we merged). Of these 65 authors, 3 were BMJ news journalists, one was an anonymous Lancet editorial column, and one was an audio interview editor at the New England Journal of Medicine. Among the remaining 60 scientists, the most common countries were Italy (n=10), China (n=9), USA (n=8), Hong Kong (n=6), India (n=5), and UK (n=5).

**Authors with highest citation impact for COVID-19 publications**

Supplementary Table 3 shows the characteristics of COVID-19 authors ranked with the highest citation impact based on the composite citation indicator for their COVID-
19-related publications. Among the 300 authors with the highest composite citation indicator scores, 26 were journalists or editors publishing news stories or editorials in their high-impact general medical or science journals. Most common countries for the remaining authors were China (n=77), USA (n=66), UK (n=27), Italy (n=20), Hong Kong (n=11), and India (n=11). Of the 274 scientists, Microbiology was one of their top 2 publishing Science Metrix subfields for 89 (32.5%), followed by General & Internal Medicine (n=59, 21.5%), Virology (n=53, 19.3%), and Immunology (n=35, 12.8%).

DISCUSSION

Approximately 2.8% of the scientific literature published in the first 11 months of 2020 and more than 4% of all scientists publishing in that period were “infected” in their published work by COVID-19. The relative proportion of COVID-19 papers increased rapidly over time. The most influential scientists across science were even more commonly engaged with COVID-19 research. Roughly one in seven active, influential scientists quickly added or adjusted their publishing portfolio to include COVID-19. Scientists in some scientific fields were highly engaged with COVID-19 work, with rates exceeding 1 in 10 for scientists publishing in Clinical Medicine and Public Health, and exceeding 1 in 4 when the most influential scientists working in these fields were considered. Some subfields have even more massive involvement of scientists in COVID-19 work. However, almost every single subfield had some scientists publishing on COVID-19. The spread of COVID-19 interests across the map of science was rapid and extensive.

Our data probably even underestimate the explosive growth of COVID-19-related work, since some papers are published but not yet indexed, while some others have been released only as preprints (a popular method of disseminating information in the COVID-
and most COVID-19 preprints appear in medRxiv, a repository not yet covered by Scopus. Probably over 100,000 COVID-19 papers are published in 2020. Undoubtedly many more papers will continue to be published in 2021 and beyond. Therefore, while 4.5% of the publishing scientific community and 13.3% of the most influential scientists had already authored COVID-19 publications at the time of our analysis, these proportions may become much larger in the future.

Many authors had published an astonishingly large number of COVID-19 items, and 65 had published 30 or more in such minimal time. Given delays in indexing, these numbers may underestimate the hyper-prolific productivity. The concentration of hyper-prolific authors in countries like China, Hong Kong, and Italy may be related to the early outbreak of the pandemic in these countries, as well as prevalent co-authorship practices in these countries. Importantly, meritorious productivity versus sloppiness is difficult to disentangle without examining each case in depth.

We also addressed the citation impact of authors for their COVID-19 work. The top ranks included many journalists and editors who publish many news stories and editorials in their highly visible general medical and science journals. This news/editorial function may be helpful. These published items may be readily used for citations, as they are often published well in advance of the scientific work to which they refer. However, the quality, standards and validity of rapidly deployed non-peer-reviewed items is unknown. Flashy news, media, and editorializing may be prominent during the pandemic. It is unknown whether non-peer-reviewed news stories and in-house editorials in major journal help against the “infodemic” or sometimes contribute to make things worse. Excluding journalists and editors of prestigious journals, the key countries of
the authors with the highest composite citation indicator tended to be similar to the countries of the most prolific authors. A few subfields accounted for the lion’s share of the authors with the highest composite citation indicator.

The rapid response of the scientific community to the COVID-19 crisis is largely a welcome phenomenon. Many scientists quickly focused their attention to an urgent situation and an entirely new pathogen and disease. This demonstrates that the scientific community has sufficient flexibility to shift attention rapidly to major issues. Much was swiftly learned on COVID-19. On the other hand, the quality of the published work was not assessed in our analysis, but several evaluations raise concerns about many of the COVID-19 publications being of low quality.\textsuperscript{17-19} Massive productivity has been described in the pre-COVID era, as affecting researchers across many fields\textsuperscript{20} and may be also a feature for COVID-19 research. Extreme productivity would be worrisome if it sacrifices quality.

The spread of COVID-19 publications in topics and authors traditionally working beyond key relevant disciplines further testifies the great attractiveness of COVID-19 as a field of investigation. The favorable aspect of this expansion is the ability to bring in specialists with expertise in diverse fields, thus fostering interdisciplinarity in a multi-dimensional crisis. However, if many scientists have ventured to work and publish in areas where they lack fundamental expertise, their contributions may be problematic or outright erroneous.

Furthermore, there has been a rapid mobilization of funding into COVID-19 research, with some areas, e.g. vaccine development, earmarked for urgent work. This may have worked as an additional attractor of scientists to this rapidly expanding field.
However, urgency does not guarantee good quality and robustness. Much of the produced publication record may not be very informative and some may be fundamentally flawed. Flaws go beyond retractions, which account for <0.1% of published COVID-19 work.\textsuperscript{21,22}

Certain limitations should be discussed. First, current Scopus data have high precision and recall (98.1% and 94.4%, respectively)\textsuperscript{1}, but some authors may be split in two or more records and some ID records may include papers from two or more authors. These errors may affect single authors but are unlikely to affect the overall picture obtained in these analyses. Second, field and subfield classification follows a well-known established method, though published items are not precisely categorizable in scientific fields. Third, data on citation impact of COVID-19 authors are too early to appraise with confidence, and the ranking of specific scientists is highly tenuous and can quickly change with relatively small changes in citation counts. The bigger picture of author characteristics rather than specific names should be the focus of these data. Fourth, since many COVID-19 accepted papers and preprints are not yet indexed in Scopus, fields with slower publication and indexing may be relatively under-represented in the analyses.

As the pandemic matures, the science of COVID-19 should also mature. Important remaining questions can be raised about the extent and duration of this “covidization” of research. Will scientists continue to flock from different disciplines into COVID-19 research? What consequences might this have for other areas of important investigation – could non-COVID-19 topics be unfairly neglected? Is the response proportional to the magnitude of the crisis? What is the validity and utility of all these publications? Tracking both the pandemic and the scientific response to the pandemic will be useful to make
decisions about planning for the growth, reallocation of interest, and old-versus-new priorities for science.
Table 1. Subfields with highest rates of authors publishing on COVID-19*

| Subfield                              | Number of authors | Authors with COVID-19 paper(s) | %   | Number of influential authors | Influential authors with COVID-19 paper(s) | %   |
|---------------------------------------|-------------------|--------------------------------|-----|-------------------------------|--------------------------------------------|-----|
| Emergency & Critical Care Medicine    | 12620             | 3317                           | 26.3% | 516                          | 300                                        | 58.1% |
| Anesthesiology                        | 11874             | 2712                           | 22.8% | 608                          | 196                                        | 32.2% |
| Applied Ethics                        | 1956              | 432                            | 22.1% | 87                           | 39                                         | 44.8% |
| Virology                              | 23307             | 4633                           | 19.9% | 1030                         | 494                                        | 48.0% |
| Allergy                               | 5408              | 1023                           | 18.9% | 271                          | 136                                        | 50.2% |
| Respiratory System                    | 20245             | 3740                           | 18.5% | 939                          | 428                                        | 45.6% |
| Epidemiology                          | 2965              | 521                            | 17.6% | 160                          | 60                                         | 37.5% |
| General & Internal Medicine           | 37069             | 6271                           | 16.9% | 1853                         | 744                                        | 40.2% |
| Surgery                               | 30363             | 4898                           | 16.1% | 1394                         | 489                                        | 35.1% |
| Geriatrics                            | 3585              | 574                            | 16.0% | 168                          | 76                                         | 45.2% |
| Otorhinolaryngology                   | 11754             | 1724                           | 14.7% | 533                          | 184                                        | 34.5% |
| Cardiovascular System & Hematology    | 61073             | 8916                           | 14.6% | 2729                         | 1062                                       | 38.9% |

*the subfields shown are those with the highest proportions of authors with COVID-19 papers among all authors. See Methods for definition of being an influential author.
Table 2. Extremely prolific authors with at least 30 COVID-19 publications indexed in Scopus by December 1, 2020

| AUTHOR                        | INSTITUTION                                                      | COUNTRY    | COVID-19 ITEMS |
|-------------------------------|------------------------------------------------------------------|------------|----------------|
| Wiwanitkit, Viroj             | Hainan Medical University                                       | China      | 133            |
| Mahase, Elisabeth             | BMJ                                                              |            | 129            |
| Iacobucci, Gareth             | BMJ                                                              |            | 105            |
| Rodriguez-Morales, Alfonso J. | Universidad Tecnológica de Pereira                              | Colombia   | 89             |
| Lippi, Giuseppe               | Università degli Studi di Verona                                 | Italy      | 87             |
| Rimmer, Abi                   | BMJ                                                              |            | 69             |
| Dhama, Kuldeep                | Indian Veterinary Research Institute                             | India      | 65             |
| Goldust, Mohamad              | Universitätsspital Basel                                         | Switzerland| 55             |
| Joob, Beuy                    | Sanitation 1 Medical Academic Center                             | Thailand   | 50             |
| Henry, Brandon M.             | Cincinnati Children's Hospital Medical Center                    | USA        | 48             |
| Rezaei, Nima                  | Tehran University of Medical Sciences                            | Iran       | 48             |
| Zhong, Nanshan                | Guangzhou Medical University                                    | China      | 47             |
| Liu, Lei                      | Second Affiliated Hospital of Southern University of Science and Technology| China      | 46             |
| Raoult, Didier                | Aix Marseille Université                                         | France     | 45             |
| Lechien, Jerome R.            | Universitat de Barcelona                                         | Spain      | 45             |
| Hasan, Syed Shahzad           | The University of Newcastle, Australia                           | Austria    | 45             |
| Baden, Lindsey                | Brigham and Women's Hospital                                    | USA        | 44             |
| Buonsenso, Danilo             | Fondazione Policlinico Universitario Agostino Gemelli           | Italy      | 43             |
| Kow, Chia Siang               | International Medical University                                 | Malaysia   | 43             |
| Lu, Hongzhou                  | Fudan University                                                 | China      | 42             |
| Chan, Jasper Fuk Woo          | The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases | Hong Kong | 42             |
| Harky, Amer                   | Liverpool Heart and Chest Hospital                              | UK         | 42             |
| Sausssez, Sven                | Université de Mons                                               | Belgium    | 41             |
| To, Kelvin Kai Wang           | The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases | Hong Kong | 40             |
| Rubin, Eric J.                | Harvard T.H. Chan School of Public Health                       | USA        | 40             |
| Lotti, Torello                | Università degli Studi di Roma La Sapienza                      | Italy      | 39             |
| Sahu, Kamal Kant              | Saint Vincent Hospital Worcester                                 | USA        | 38             |
| Fabbrocini, Gabriella         | Università degli Studi di Napoli Federico II                    | Italy      | 38             |
| Landoni, Giovanni             | IRCCS San Raffaele Scientific Institute                         | Italy      | 38             |
| The Lancet                    | The Lancet                                                       |            | 37             |
| Bruno, Raffaele               | Università degli Studi di Pavia                                 | Italy      | 37             |
| Morrissey, Stephen            | New England Journal of Medicine                                  |            | 37             |
| Sah, Ranjit                   | Tribhuvan University Teaching Hospital                          | Nepal      | 36             |
| Zangrillo, Alberto            | IRCCS San Raffaele Scientific Institute                         | Italy      | 35             |
| He, Daihai                    | Hong Kong Polytechnic University                                | Hong Kong  | 35             |
| Sheng, Jifang                 | The State Key Laboratory for Diagnosis and Treatment of Infectious Diseases | China    | 35             |
| Name                      | Institution                                                                 | Location | Page |
|---------------------------|------------------------------------------------------------------------------|----------|------|
| Yuen, K. Y.               | The University of Hong Kong Li Ka Shing Faculty of Medicine                  | Hong Kong| 34   |
| Zhao, Shi                 | Chinese University of Hong Kong                                             | Hong Kong| 34   |
| Bonilla-Aldana, D. Katterine | Universidad Tecnológica de Pereira                                         | Colombia| 34   |
| Greninger, Alexander L.   | University of Washington, Seattle                                           | USA      | 34   |
| Nau, Jean Yves            | Haschich                                                                    | Switzerland| 34 |
| Plebani, Mario            | Azienda Ospedaliera Di Padova                                              | Italy    | 33   |
| Bragazzi, Nicola L.       | Università degli Studi di Genova                                            | Italy    | 33   |
| Gostin, Lawrence O.       | Georgetown Law                                                              | USA      | 32   |
| Young, Barnaby Edward     | Tan Tock Seng Hospital                                                      | Singapore| 32 |
| Hopkins, Claire           | Guy's and St Thomas' NHS Foundation Trust                                  | UK       | 32   |
| Hung, Ivan Fan Ngai       | The University of Hong Kong Li Ka Shing Faculty of Medicine                 | China    | 32   |
| Vaishya, Raju             | Indraprastha Apollo Hospitals                                               | India    | 32   |
| Wang, Xinghuan            | Zhongnan Hospital of Wuhan University                                      | China    | 32   |
| Griffiths, Mark D.        | Nottingham Trent University                                                 | UK       | 32   |
| Signorelli, Carlo         | Università Vita-Salute San Raffaele                                        | Italy    | 32   |
| Tiwari, Ruchi             | College of Veterinary Science India                                         | India    | 32   |
| Jerome, Keith R.          | Fred Hutchinson Cancer Research Center                                      | USA      | 32   |
| Cowling, Benjamin J.      | The University of Hong Kong Li Ka Shing Faculty of Medicine                 | Hong Kong| 31   |
| Memish, Ziad A.           | Ministry of Health Saudi Arabia                                             | Saudi Arabia| 31 |
| Leo, Yee Sin              | Tan Tock Seng Hospital                                                      | Singapore| 31 |
| Eggo, Rosalind M.         | London School of Hygiene & Tropical Medicine                               | UK       | 31   |
| Grover, Sandeep           | Postgraduate Institute of Medical Education & Research, Chandigarh          | India    | 31   |
| Drosten, Christian        | Charité – Universitätsmedizin Berlin                                        | Germany  | 30   |
| Khunti, Kamlesh           | University of Leicester                                                     | UK       | 30   |
| Hu, Yu                    | Tongji Medical College                                                      | China    | 30   |
| Gholamrezanezhad, Ali     | Keck School of Medicine of USC                                              | USA      | 30   |
| Yang, Lin                 | Hong Kong Polytechnic University                                            | China    | 30   |
| Chiesa-Estomba, Carlos M. | Universitat de Barcelona                                                    | Spain    | 30   |
| Bhatnagar, Sushma         | Institute Rotary Cancer Hospital India                                      | India    | 30   |
Figure 1 Topics of prominence for COVID-19 authors and publications. The columns represent the progress of the spread at 3 different measuring points: by end of March, June and November. The first row represents the spread of authors of COVID-19 papers. The authors are assigned to their most dominant topic in their career. The data is filtered to include only topics with \( \geq 5 \) authors assigned. The second row shows similarly the topics of the top 2% authors by field (2019) according to a composite citations indicator.
Only topics with 2 or more authors are displayed. The third row displays the spread of COVID-19 publications across topics. The minimum threshold for a topic to be displayed is set to 5 COVID-19 publications.
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Supplementary Table 1. Number of authors and number of authors with at least 1 COVID-19-related publication. Data are limited to authors who have published anything that is Scopus-indexed in the first 11 months of 2020 and who have also authored in their entire career at least 5 Scopus-indexed papers that are classified as articles, reviews or conference papers, by the end of November 2020. Of a total of 2,759,916 such authors, 144,403 had at least one published and indexed COVID-19 paper. The Table shows data on 2,750,728 and 144,259 authors who can be classified in a subfield (the most common subfield for the papers that they have published in their career).

| SUBFIELD                                | FIELD                          | Number of authors | Authors with COVID-19 paper(s) | %    |
|-----------------------------------------|--------------------------------|-------------------|-------------------------------|------|
| Emergency & Critical Care Medicine      | Clinical Medicine              | 12620             | 3317                          | 26.3%|
| Anesthesiology                          | Clinical Medicine              | 11874             | 2712                          | 22.8%|
| Applied Ethics                          | Philosophy & Theology          | 1956              | 432                           | 22.1%|
| Virology                                | Biomedical Research            | 23307             | 4633                          | 19.9%|
| Allergy                                 | Clinical Medicine              | 5408              | 1023                          | 18.9%|
| Respiratory System                      | Clinical Medicine              | 20245             | 3740                          | 18.5%|
| Epidemiology                            | Public Health & Health Services| 2965              | 521                           | 17.6%|
| General & Internal Medicine             | Clinical Medicine              | 37069             | 6271                          | 16.9%|
| Surgery                                 | Clinical Medicine              | 30363             | 4898                          | 16.1%|
| Geriatrics                              | Clinical Medicine              | 3585              | 574                           | 16.0%|
| Otorhinolaryngology                     | Clinical Medicine              | 11754             | 1724                          | 14.7%|
| Cardiovascular System & Hematology      | Clinical Medicine              | 61073             | 8916                          | 14.6%|
| Public Health                           | Public Health & Health Services| 22942             | 3168                          | 13.8%|
| Medical Informatics                     | Information & Communication Technologies | 4642 | 636 | 13.7% |
| Microbiology                            | Biomedical Research            | 57643             | 7879                          | 13.7%|
| Urology & Nephrology                    | Clinical Medicine              | 23611             | 3224                          | 13.7%|
| Pediatrics                              | Clinical Medicine              | 18589             | 2525                          | 13.6%|
| Dermatology & Venereal Diseases         | Clinical Medicine              | 13924             | 1824                          | 13.1%|
| Gastroenterology & Hepatology           | Clinical Medicine              | 27848             | 3586                          | 12.9%|
| Field                                | Subfield                                      | Count 1 | Count 2 | Percent |
|--------------------------------------|-----------------------------------------------|---------|---------|---------|
| Arthritis & Rheumatology             | Clinical Medicine                             | 12853   | 1640    | 12.8%   |
| Gerontology                          | Public Health & Health Services               | 3497    | 438     | 12.5%   |
| General Clinical Medicine            | Clinical Medicine                             | 4063    | 508     | 12.5%   |
| Environmental & Occupational Health  | Clinical Medicine                             | 3277    | 406     | 12.4%   |
| Tropical Medicine                    | Clinical Medicine                             | 11433   | 1414    | 12.4%   |
| Psychiatry                           | Clinical Medicine                             | 23870   | 2936    | 12.3%   |
| Health Policy & Services             | Public Health & Health Services               | 6733    | 790     | 11.7%   |
| Nursing                              | Public Health & Health Services               | 13651   | 1472    | 10.8%   |
| Development Studies                  | Economics & Business                          | 1340    | 143     | 10.7%   |
| Immunology                           | Clinical Medicine                             | 44219   | 4712    | 10.7%   |
| Substance Abuse                      | Public Health & Health Services               | 5085    | 529     | 10.4%   |
| Clinical Psychology                  | Psychology & Cognitive Sciences               | 4564    | 474     | 10.4%   |
| Obstetrics & Reproductive Medicine   | Clinical Medicine                             | 23953   | 2421    | 10.1%   |
| Sport, Leisure & Tourism            | Economics & Business                          | 3294    | 327     | 9.9%    |
| Nuclear Medicine & Medical Imaging   | Clinical Medicine                             | 32747   | 3110    | 9.5%    |
| Demography                           | Social Sciences                               | 1055    | 97      | 9.2%    |
| Legal & Forensic Medicine           | Clinical Medicine                             | 3380    | 292     | 8.6%    |
| Endocrinology & Metabolism           | Clinical Medicine                             | 27361   | 2281    | 8.3%    |
| Social Work                          | Social Sciences                               | 2410    | 196     | 8.1%    |
| Social Psychology                    | Psychology & Cognitive Sciences               | 7615    | 616     | 8.1%    |
| Political Science & Public Administration |                                   | 7065    | 564     | 8.0%    |
| Oncology & Carcinogenesis           | Clinical Medicine                             | 109985  | 8562    | 7.8%    |
| Ophthalmology & Optometry           | Clinical Medicine                             | 19390   | 1507    | 7.8%    |
| Bioinformatics                       | Enabling & Strategic Technologies             | 8031    | 623     | 7.8%    |
| Law                                 | Social Sciences                               | 2238    | 168     | 7.5%    |
| Neurology & Neurosurgery            | Clinical Medicine                             | 101228  | 7355    | 7.3%    |
| Dentistry                           | Clinical Medicine                             | 20842   | 1491    | 7.2%    |
| Complementary & Alternative Medicine | Clinical Medicine                             | 4026    | 287     | 7.1%    |
| Agricultural Economics & Policy      | Economics & Business                          | 2223    | 158     | 7.1%    |
| Sociology                           | Social Sciences                               | 3182    | 213     | 6.7%    |
| Information & Library Sciences      | Social Sciences                               | 2620    | 175     | 6.7%    |
| Pathology                           | Clinical Medicine                             | 6089    | 405     | 6.7%    |
| Pharmacology & Pharmacy             | Clinical Medicine                             | 31268   | 2068    | 6.6%    |
| Industrial Relations                 | Economics & Business                          | 721     | 47      | 6.5%    |
| Orthopedics                         | Clinical Medicine                             | 24133   | 1565    | 6.5%    |
| Rehabilitation                      | Public Health & Health Services               | 8585    | 548     | 6.4%    |
| Communication & Media Studies        | Communication & Textual Studies               | 3676    | 230     | 6.3%    |

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| Field                                      | Scientific Field                      | Publications | Citations | Percentage |
|--------------------------------------------|----------------------------------------|--------------|-----------|------------|
| Family Studies                             | Social Sciences                        | 1074         | 66        | 6,1%       |
| Science Studies                            | Social Sciences                        | 1546         | 95        | 6,1%       |
| Nutrition & Dietetics                      | Biomedical Research                    | 14175        | 845       | 6,0%       |
| International Relations                    | Social Sciences                        | 2013         | 119       | 5,9%       |
| Criminology                                | Social Sciences                        | 3804         | 223       | 5,9%       |
| Economics                                  | Economics & Business                   | 15657        | 913       | 5,8%       |
| History of Science, Technology & Medicine  | Historical Studies                     | 556          | 32        | 5,8%       |
| Sport Sciences                             | Clinical Medicine                      | 11318        | 648       | 5,7%       |
| General Psychology & Cognitive Sciences    | Psychology & Cognitive Sciences        | 997          | 57        | 5,7%       |
| Urban & Regional Planning                  | Built Environment & Design             | 3948         | 222       | 5,6%       |
| Econometrics                               | Economics & Business                   | 560          | 31        | 5,5%       |
| Statistics & Probability                   | Mathematics & Statistics               | 9073         | 487       | 5,4%       |
| Toxicology                                 | Biomedical Research                    | 15751        | 808       | 5,1%       |
| Business & Management                      | Economics & Business                   | 16190        | 819       | 5,1%       |
| Geography                                  | Social Sciences                        | 5437         | 274       | 5,0%       |
| Medicinal & Biomolecular Chemistry         | Chemistry                              | 28199        | 1375      | 4,9%       |
| Developmental & Child Psychology           | Psychology & Cognitive Sciences        | 6970         | 339       | 4,9%       |
| Anatomy & Morphology                       | Biomedical Research                    | 1777         | 86        | 4,8%       |
| Gender Studies                             | Social Sciences                        | 615          | 29        | 4,7%       |
| Marketing                                  | Economics & Business                   | 4905         | 227       | 4,6%       |
| Information Systems                        | Information & Communication Technologies| 5481         | 246       | 4,5%       |
| Biophysics                                 | Biomedical Research                    | 5201         | 224       | 4,3%       |
| Anthropology                               | Historical Studies                     | 2561         | 107       | 4,2%       |
| Biochemistry & Molecular Biology           | Biomedical Research                    | 43945        | 1833      | 4,2%       |
| Social Sciences Methods                    | Social Sciences                        | 964          | 40        | 4,1%       |
| Psychoanalysis                             | Psychology & Cognitive Sciences        | 623          | 25        | 4,0%       |
| Strategic, Defence & Security Studies      | Enabling & Strategic Technologies      | 5691         | 222       | 3,9%       |
| Education                                  | Social Sciences                        | 22159        | 854       | 3,9%       |
| Developmental Biology                      | Biomedical Research                    | 46014        | 1713      | 3,7%       |
| Genetics & Heredity                        | Biomedical Research                    | 12863        | 475       | 3,7%       |
| Veterinary Sciences                        | Agriculture, Fisheries & Forestry      | 17316        | 607       | 3,5%       |
| Experimental Psychology                    | Psychology & Cognitive Sciences        | 11769        | 404       | 3,4%       |
| Physiology                                 | Biomedical Research                    | 6196         | 207       | 3,3%       |
| Cultural Studies                           | Social Sciences                        | 1402         | 46        | 3,3%       |
| Accounting                                 | Economics & Business                   | 1914         | 61        | 3,2%       |
| Finance                                    | Economics & Business                   | 4477         | 137       | 3,1%       |
| Field                                      | Subfield                                      | Publications | Citations | Impact Factor |
|-------------------------------------------|-----------------------------------------------|--------------|-----------|---------------|
| Human Factors                             | Psychology & Cognitive Sciences               | 4973         | 151       | 3.0%          |
| Logistics & Transportation                | Economics & Business                          | 8846         | 268       | 3.0%          |
| Religions & Theology                      | Philosophy & Theology                         | 1651         | 47        | 2.8%          |
| Fluids & Plasmas                          | Physics & Astronomy                           | 17674        | 500       | 2.8%          |
| Environmental Sciences                    | Earth & Environmental Sciences                | 33010        | 926       | 2.8%          |
| Artificial Intelligence & Image Processing | Information & Communication Technologies      | 92623        | 2490      | 2.7%          |
| Applied Mathematics                       | Mathematics & Statistics                      | 7231         | 191       | 2.6%          |
| Operations Research                       | Engineering                                   | 10099        | 263       | 2.6%          |
| Speech-Language Pathology & Audiology     | Public Health & Health Services               | 3497         | 91        | 2.6%          |
| Biomedical Engineering                    | Engineering                                   | 19096        | 496       | 2.6%          |
| Mycology & Parasitology                   | Biomedical Research                           | 8680         | 222       | 2.6%          |
| Meteorology & Atmospheric Sciences         | Earth & Environmental Sciences                | 26306        | 642       | 2.4%          |
| Evolutionary Biology                      | Biology                                       | 11772        | 269       | 2.3%          |
| Architecture                              | Built Environment & Design                    | 229          | 5         | 2.2%          |
| Economic Theory                           | Economics & Business                          | 733          | 16        | 2.2%          |
| History of Social Sciences                | Historical Studies                            | 598          | 13        | 2.2%          |
| Numerical & Computational Mathematics     | Mathematics & Statistics                      | 6317         | 132       | 2.1%          |
| Ecology                                   | Biology                                       | 25093        | 516       | 2.1%          |
| Drama & Theater                           | Visual & Performing Arts                      | 200          | 4         | 2.0%          |
| Analytical Chemistry                      | Chemistry                                     | 31961        | 634       | 2.0%          |
| Software Engineering                      | Information & Communication Technologies      | 6910         | 136       | 2.0%          |
| Behavioral Science & Comparative Psychology| Psychology & Cognitive Sciences               | 3838         | 74        | 1.9%          |
| Distributed Computing                     | Information & Communication Technologies      | 3012         | 56        | 1.9%          |
| Biotechnology                             | Enabling & Strategic Technologies             | 18585        | 341       | 1.8%          |
| Mathematical Physics                      | Physics & Astronomy                           | 2017         | 37        | 1.8%          |
| Languages & Linguistics                   | Communication & Textual Studies               | 4400         | 75        | 1.7%          |
| Geological & Geomatics Engineering        | Engineering                                   | 19978        | 332       | 1.7%          |
| Microscopy                                | Biomedical Research                           | 807          | 13        | 1.6%          |
| Chemical Physics                          | Physics & Astronomy                           | 27566        | 437       | 1.6%          |
| Philosophy                                | Philosophy & Theology                         | 2807         | 42        | 1.5%          |
| History                                   | Historical Studies                            | 2137         | 31        | 1.5%          |
| Field                                               | Subfield                                      | Code | Count | Rate |
|-----------------------------------------------------|-----------------------------------------------|------|-------|------|
| Networking & Telecommunications                     | Information & Communication Technologies     | 56227| 813   | 1.4% |
| Environmental Engineering                           | Engineering                                  | 17124| 247   | 1.4% |
| Organic Chemistry                                   | Chemistry                                     | 40706| 555   | 1.4% |
| Building & Construction                             | Built Environment & Design                    | 11876| 157   | 1.3% |
| General Chemistry                                   | Chemistry                                     | 11963| 158   | 1.3% |
| Food Science                                         | Agriculture, Fisheries & Forestry             | 22825| 300   | 1.3% |
| Design Practice & Management                        | Built Environment & Design                    | 2852 | 34    | 1.2% |
| Computation Theory & Mathematics                    | Information & Communication Technologies     | 7676 | 90    | 1.2% |
| Folklore                                             | Visual & Performing Arts                      | 86   | 1     | 1.2% |
| Acoustics                                            | Physics & Astronomy                           | 9055 | 97    | 1.1% |
| Industrial Engineering & Automation                 | Engineering                                  | 34144| 340   | 1.0% |
| Dairy & Animal Science                              | Agriculture, Fisheries & Forestry             | 19125| 187   | 1.0% |
| Nanoscience & Nanotechnology                        | Enabling & Strategic Technologies             | 41310| 401   | 1.0% |
| Literary Studies                                     | Communication & Textual Studies               | 2061 | 20    | 1.0% |
| Chemical Engineering                                | Engineering                                  | 20051| 185   | 0.9% |
| Classics                                             | Historical Studies                            | 462  | 4     | 0.9% |
| Plant Biology & Botany                              | Biology                                      | 50847| 426   | 0.8% |
| Computer Hardware & Architecture                    | Information & Communication Technologies     | 5051 | 41    | 0.8% |
| Inorganic & Nuclear Chemistry                        | Chemistry                                     | 19345| 156   | 0.8% |
| Energy                                               | Enabling & Strategic Technologies             | 69935| 562   | 0.8% |
| Fisheries                                            | Agriculture, Fisheries & Forestry             | 12513| 94    | 0.8% |
| Art Practice, History & Theory                       | Visual & Performing Arts                     | 267  | 2     | 0.7% |
| Music                                                | Visual & Performing Arts                     | 404  | 3     | 0.7% |
| Marine Biology & Hydrobiology                        | Biology                                      | 17028| 125   | 0.7% |
| Entomology                                           | Biology                                      | 9946 | 70    | 0.7% |
| Polymers                                             | Chemistry                                     | 27068| 190   | 0.7% |
| Ornithology                                          | Biology                                      | 2161 | 15    | 0.7% |
| General Physics                                      | Physics & Astronomy                           | 22850| 142   | 0.6% |
| Agronomy & Agriculture                              | Agriculture, Fisheries & Forestry             | 24841| 150   | 0.6% |
| Zoology                                              | Biology                                      | 6379 | 38    | 0.6% |
| Field                          | Subfield                          | Code | Entries | Citation | Percentage |
|-------------------------------|-----------------------------------|------|---------|----------|------------|
| Forestry                      | Agriculture, Fisheries & Forestry | 9365 | 54      | 0.6%     |
| Nuclear & Particle Physics    | Physics & Astronomy               | 49810| 277     | 0.6%     |
| Mechanical Engineering & Transports | Engineering               | 36046| 190     | 0.5%     |
| Horticulture                  | Agriculture, Fisheries & Forestry | 1768 | 9       | 0.5%     |
| General Mathematics           | Mathematics & Statistics          | 24846| 126     | 0.5%     |
| Geochemistry & Geophysics     | Earth & Environmental Sciences    | 30332| 146     | 0.5%     |
| Archaeology                   | Historical Studies                | 4501 | 20      | 0.4%     |
| Optics                        | Physics & Astronomy               | 21071| 90      | 0.4%     |
| Electrical & Electronic Engineer | Engineering              | 26785| 112     | 0.4%     |
| Optoelectronics & Photonics   | Enabling & Strategic Technologies | 25577| 99      | 0.4%     |
| Mining & Metallurgy           | Engineering                       | 7837 | 30      | 0.4%     |
| Applied Physics               | Physics & Astronomy               | 74683| 277     | 0.4%     |
| Physical Chemistry            | Chemistry                         | 11784| 43      | 0.4%     |
| Aerospace & Aeronautics       | Engineering                       | 11841| 43      | 0.4%     |
| Materials                     | Enabling & Strategic Technologies | 71353| 256     | 0.4%     |
| Astronomy & Astrophysics      | Physics & Astronomy               | 21905| 69      | 0.3%     |
| Civil Engineering             | Engineering                       | 16967| 51      | 0.3%     |
| Oceanography                  | Earth & Environmental Sciences    | 5420 | 16      | 0.3%     |
| Geology                       | Earth & Environmental Sciences    | 4455 | 11      | 0.2%     |
| Paleontology                  | Earth & Environmental Sciences    | 8916 | 20      | 0.2%     |
| Automobile Design & Engineering | Engineering              | 391  | 0       | 0.0%     |
Supplementary Table 2. Number of influential authors and number of them who had at least 1 COVID-19-related publication. The construct is similar to Supplementary Table 1, but is limited to those authors who are the top 2% of their subfield for their career-long work based on a composite citation indicator.

| SUBFIELD                                    | FIELD                      | Number of authors | Authors with COVID-19 paper(s) | %    |
|---------------------------------------------|----------------------------|-------------------|-------------------------------|------|
| Emergency & Critical Care Medicine          | Clinical Medicine          | 516               | 300                           | 58.1%|
| Allergy                                     | Clinical Medicine          | 271               | 136                           | 50.2%|
| Virology                                    | Biomedical Research        | 1030              | 494                           | 48.0%|
| Respiratory System                          | Clinical Medicine          | 939               | 428                           | 45.6%|
| Geriatrics                                  | Clinical Medicine          | 168               | 76                            | 45.2%|
| Applied Ethics                              | Philosophy & Theology      | 87                | 39                            | 44.8%|
| General & Internal Medicine                 | Clinical Medicine          | 1853              | 744                           | 40.2%|
| Cardiovascular System & Hematology          | Clinical Medicine          | 2729              | 1062                          | 38.9%|
| Epidemiology                                | Public Health & Health Services | 160             | 60                            | 37.5%|
| Gerontology                                 | Public Health & Health Services | 151             | 54                            | 35.8%|
| Tropical Medicine                           | Clinical Medicine          | 483               | 170                           | 35.2%|
| Medical Informatics                         | Information & Communication Technologies | 219          | 77                            | 35.2%|
| Surgery                                     | Clinical Medicine          | 1394              | 489                           | 35.1%|
| Otorhinolaryngology                         | Clinical Medicine          | 533               | 184                           | 34.5%|
| Gastroenterology & Hepatology               | Clinical Medicine          | 1370              | 466                           | 34.0%|
| Anesthesiology                              | Clinical Medicine          | 608               | 196                           | 32.2%|
| Public Health                               | Public Health & Health Services | 870             | 280                           | 32.2%|
| General Clinical Medicine                   | Clinical Medicine          | 231               | 74                            | 32.0%|
| Dermatology & Venereal Diseases             | Clinical Medicine          | 727               | 224                           | 30.8%|
| Arthritis & Rheumatology                    | Clinical Medicine          | 533               | 164                           | 30.8%|
| Sport, Leisure & Tourism                    | Economics & Business       | 111               | 34                            | 30.6%|
| Psychiatry                                  | Clinical Medicine          | 1010              | 305                           | 30.2%|
| Urology & Nephrology                        | Clinical Medicine          | 1137              | 340                           | 29.9%|
| Immunology                                  | Clinical Medicine          | 1959              | 576                           | 29.4%|
| Agricultural Economics & Policy             | Economics & Business       | 82                | 24                            | 29.3%|
| Clinical Psychology                         | Psychology & Cognitive Sciences | 207             | 60                            | 29.0%|
| Pediatrics                                  | Clinical Medicine          | 852               | 240                           | 28.2%|
| Development Studies                         | Economics & Business       | 51                | 14                            | 27.5%|
| Environmental & Occupational Health         | Clinical Medicine          | 197               | 54                            | 27.4%|
| Field                                           | Area                          | Total  | Courses | Percentage |
|------------------------------------------------|-------------------------------|--------|---------|------------|
| History of Science, Technology & Medicine      | Historical Studies           | 22     | 6       | 27.3%      |
| Health Policy & Services                       | Public Health & Health Services | 292    | 79      | 27.1%      |
| Obstetrics & Reproductive Medicine             | Clinical Medicine            | 1137   | 301     | 26.5%      |
| Endocrinology & Metabolism                     | Clinical Medicine            | 1209   | 310     | 25.6%      |
| Nursing                                         | Public Health & Health Services | 585    | 149     | 25.5%      |
| Microbiology                                    | Biomedical Research          | 2326   | 592     | 25.5%      |
| Industrial Relations                            | Economics & Business         | 29     | 7       | 24.1%      |
| Complementary & Alternative Medicine           | Clinical Medicine            | 146    | 34      | 23.3%      |
| Oncology & Carcinogenesis                      | Clinical Medicine            | 4144   | 947     | 22.9%      |
| Nuclear Medicine & Medical Imaging             | Clinical Medicine            | 1469   | 311     | 21.2%      |
| Substance Abuse                                 | Public Health & Health Services | 223    | 46      | 20.6%      |
| Legal & Forensic Medicine                      | Clinical Medicine            | 158    | 31      | 19.6%      |
| General Psychology & Cognitive Sciences        | Psychology & Cognitive Sciences | 41     | 8       | 19.5%      |
| Bioinformatics                                  | Enabling & Strategic Technologies | 328    | 63      | 19.2%      |
| Social Psychology                               | Psychology & Cognitive Sciences | 278    | 53      | 19.1%      |
| Ophthalmology & Optometry                       | Clinical Medicine            | 906    | 166     | 18.3%      |
| Sport Sciences                                  | Clinical Medicine            | 402    | 71      | 17.7%      |
| Pharmacology & Pharmacy                         | Clinical Medicine            | 1564   | 276     | 17.6%      |
| Pathology                                       | Clinical Medicine            | 336    | 59      | 17.6%      |
| Rehabilitation                                  | Public Health & Health Services | 359    | 63      | 17.5%      |
| Neurology & Neurosurgery                        | Clinical Medicine            | 4010   | 686     | 17.1%      |
| Political Science & Public Administration       | Social Sciences              | 243    | 41      | 16.9%      |
| Family Studies                                  | Social Sciences              | 43     | 7       | 16.3%      |
| Anatomy & Morphology                            | Biomedical Research          | 81     | 13      | 16.0%      |
| Orthopedics                                     | Clinical Medicine            | 976    | 154     | 15.8%      |
| Dentistry                                       | Clinical Medicine            | 856    | 135     | 15.8%      |
| Geography                                       | Social Sciences              | 214    | 33      | 15.4%      |
| Urban & Regional Planning                       | Built Environment & Design   | 144    | 22      | 15.3%      |
| Nutrition & Dietetics                           | Biomedical Research          | 590    | 90      | 15.3%      |
| Economics                                       | Economics & Business         | 515    | 76      | 14.8%      |
| Medicinal & Biomolecular Chemistry              | Chemistry                    | 1330   | 196     | 14.7%      |
| Information Systems                             | Information & Communication Technologies | 272    | 39      | 14.3%      |
| Developmental & Child Psychology                | Psychology & Cognitive Sciences | 267    | 37      | 13.9%      |
| Sociology                                       | Social Sciences              | 103    | 14      | 13.6%      |
| Toxicology                                      | Biomedical Research          | 752    | 102     | 13.6%      |
| Econometrics                                    | Economics & Business         | 15     | 2       | 13.3%      |
| Strategic, Defence & Security Studies           | Enabling & Strategic Technologies | 270    | 35      | 13.0%      |
| Criminology                                     | Social Sciences              | 165    | 21      | 12.7%      |
| Subject Area                                      | Division                                      | Publications | Citations | Contribution |
|------------------------------------------------|-----------------------------------------------|--------------|-----------|--------------|
| Business & Management                           | Economics & Business                          | 581          | 72        | 12.4%        |
| Communication & Media Studies                   | Communication & Textual Studies               | 146          | 18        | 12.3%        |
| Accounting                                      | Economics & Business                          | 68           | 8         | 11.8%        |
| Marketing                                       | Economics & Business                          | 181          | 21        | 11.6%        |
| Anthropology                                    | Historical Studies                            | 95           | 11        | 11.6%        |
| Statistics & Probability                       | Mathematics & Statistics                      | 279          | 32        | 11.5%        |
| Law                                             | Social Sciences                               | 88           | 10        | 11.4%        |
| Social Work                                     | Social Sciences                               | 97           | 11        | 11.3%        |
| Psychoanalysis                                  | Psychology & Cognitive Sciences               | 36           | 4         | 11.1%        |
| Developmental Biology                           | Biomedical Research                           | 1884         | 205       | 10.9%        |
| Veterinary Sciences                             | Agriculture, Fisheries & Forestry             | 730          | 79        | 10.8%        |
| Genetics & Heredity                             | Biomedical Research                           | 550          | 59        | 10.7%        |
| Demography                                      | Social Sciences                               | 39           | 4         | 10.3%        |
| Logistics & Transportation                      | Economics & Business                          | 373          | 38        | 10.2%        |
| Biochemistry & Molecular Biology                | Biomedical Research                           | 2097         | 213       | 10.2%        |
| Fluids & Plasmas                                | Physics & Astronomy                           | 723          | 72        | 10.0%        |
| Environmental Sciences                          | Earth & Environmental Sciences                | 1235         | 122       | 9.9%         |
| Cultural Studies                                | Social Sciences                               | 61           | 6         | 9.8%         |
| Science Studies                                 | Social Sciences                               | 62           | 6         | 9.7%         |
| Human Factors                                   | Psychology & Cognitive Sciences               | 209          | 20        | 9.6%         |
| International Relations                         | Social Sciences                               | 84           | 8         | 9.5%         |
| Distributed Computing                           | Information & Communication & Technologies    | 160          | 15        | 9.4%         |
| Religions & Theology                            | Philosophy & Theology                         | 78           | 7         | 9.0%         |
| Literary Studies                                | Communication & Textual Studies               | 90           | 8         | 8.9%         |
| Biophysics                                      | Biomedical Research                           | 277          | 24        | 8.7%         |
| Meteorology & Atmospheric Sciences              | Earth & Environmental Sciences                | 961          | 83        | 8.6%         |
| Information & Library Sciences                  | Social Sciences                               | 139          | 12        | 8.6%         |
| Artificial Intelligence & Image Processing      | Information & Communication & Technologies    | 3830         | 322       | 8.4%         |
| Applied Mathematics                             | Mathematics & Statistics                      | 284          | 23        | 8.1%         |
| Education                                       | Social Sciences                               | 867          | 69        | 8.0%         |
| Evolutionary Biology                            | Biology                                       | 415          | 32        | 7.7%         |
| Finance                                         | Economics & Business                          | 132          | 10        | 7.6%         |
| Ecology                                         | Biology                                       | 864          | 64        | 7.4%         |
| Mycology & Parasitology                         | Biomedical Research                           | 348          | 25        | 7.2%         |
| Software Engineering                            | Information & Communication & Technologies    | 365          | 26        | 7.1%         |
| Mathematical Physics                            | Physics & Astronomy                           | 74           | 5         | 6.8%         |
| Experimental Psychology                        | Psychology & Cognitive Sciences               | 387          | 26        | 6.7%         |
| Biomedical Engineering                          | Engineering                                   | 876          | 58        | 6.6%         |
| History                                         | Historical Studies                            | 79           | 5         | 6.3%         |
| Operations Research                             | Engineering                                   | 388          | 24        | 6.2%         |
| Analytical Chemistry                            | Chemistry                                     | 1565         | 95        | 6.1%         |
| Field                                      | Subfield                     | Total | Top 10 | %  |
|--------------------------------------------|------------------------------|-------|--------|----|
| Physiology                                 | Biomedical Research         | 307   | 18     | 5.9%|
| Philosophy                                 | Philosophy & Theology       | 90    | 5      | 5.6%|
| Numerical & Computational Mathematics      | Mathematics & Statistics    | 234   | 13     | 5.6%|
| Building & Construction                     | Built Environment & Design  | 478   | 26     | 5.4%|
| Biotechnology                              | Enabling & Strategic Technologies | 853 | 45     | 5.3%|
| Classics                                   | Historical Studies          | 19    | 1      | 5.3%|
| Social Sciences Methods                     | Social Sciences             | 39    | 2      | 5.1%|
| Networking & Telecommunications            | Information & Communication Technologies | 2823 | 142    | 5.0%|
| Nanoscience & Nanotechnology               | Enabling & Strategic Technologies | 1464 | 67     | 4.6%|
| Economic Theory                            | Economics & Business        | 23    | 1      | 4.3%|
| Geological & Geomatics Engineering         | Engineering                 | 772   | 32     | 4.1%|
| Languages & Linguistics                     | Communication & Textual Studies | 171 | 7      | 4.1%|
| Computer Hardware & Architecture           | Information & Communication Technologies | 304 | 12     | 3.9%|
| Industrial Engineering & Automation        | Engineering                 | 1577  | 62     | 3.9%|
| History of Social Sciences                  | Historical Studies          | 26    | 1      | 3.8%|
| Environmental Engineering                   | Engineering                 | 744   | 27     | 3.6%|
| Organic Chemistry                          | Chemistry                   | 1968  | 69     | 3.5%|
| Chemical Physics                           | Physics & Astronomy         | 1233  | 41     | 3.3%|
| Agronomy & Agriculture                      | Agriculture, Fisheries & Forestry | 938 | 31     | 3.3%|
| Energy                                     | Enabling & Strategic Technologies | 3286 | 105    | 3.2%|
| Food Science                               | Agriculture, Fisheries & Forestry | 846 | 27     | 3.2%|
| Dairy & Animal Science                      | Agriculture, Fisheries & Forestry | 756 | 23     | 3.0%|
| Fisheries                                  | Agriculture, Fisheries & Forestry | 440 | 13     | 3.0%|
| Design Practice & Management               | Built Environment & Design  | 138   | 4      | 2.9%|
| Polymers                                   | Chemistry                   | 1375  | 39     | 2.8%|
| Acoustics                                  | Physics & Astronomy         | 462   | 13     | 2.8%|
| Behavioral Science & Comparative Psychology | Psychology & Cognitive Sciences | 155 | 4      | 2.6%|
| Forestry                                   | Agriculture, Fisheries & Forestry | 396 | 10     | 2.5%|
| Chemical Engineering                       | Engineering                 | 993   | 25     | 2.5%|
| Entomology                                 | Biology                     | 403   | 10     | 2.5%|
| Plant Biology & Botany                      | Biology                     | 1916  | 45     | 2.3%|
| Computation Theory & Mathematics           | Information & Communication Technologies | 262 | 6      | 2.3%|
| Marine Biology & Hydrobiology              | Biology                     | 617   | 14     | 2.3%|
| General Chemistry                          | Chemistry                   | 707   | 15     | 2.1%|
| Speech-Language Pathology & Audiology       | Public Health & Health Services | 150 | 3      | 2.0%|
| Microscopy                                 | Biomedical Research         | 52    | 1      | 1.9%|
| Mechanical Engineering & Transports        | Engineering                 | 1591  | 29     | 1.8%|
| Field                        | Department                           | Code | Count | Ratio |
|------------------------------|--------------------------------------|------|-------|-------|
| Inorganic & Nuclear Chemistry| Chemistry                            | 971  | 16    | 1.6%  |
| General Mathematics          | Mathematics & Statistics             | 800  | 12    | 1.5%  |
| General Physics              | Physics & Astronomy                  | 1031 | 15    | 1.5%  |
| Civil Engineering            | Engineering                          | 744  | 10    | 1.3%  |
| Astronomy & Astrophysics     | Physics & Astronomy                  | 781  | 10    | 1.3%  |
| Physical Chemistry           | Chemistry                            | 558  | 7     | 1.3%  |
| Mining & Metallurgy          | Engineering                          | 400  | 5     | 1.3%  |
| Electrical & Electronic Engineering| Engineering                      | 1484 | 18    | 1.2%  |
| Archaeology                  | Historical Studies                   | 170  | 2     | 1.2%  |
| Applied Physics              | Physics & Astronomy                  | 3814 | 44    | 1.2%  |
| Nuclear & Particle Physics   | Physics & Astronomy                  | 1924 | 22    | 1.1%  |
| Optics                       | Physics & Astronomy                  | 980  | 11    | 1.1%  |
| Aerospace & Aeronautics      | Engineering                          | 652  | 7     | 1.1%  |
| Geochemistry & Geophysics    | Earth & Environmental Sciences       | 1142 | 9     | 0.8%  |
| Optoelectronics & Photonics  | Enabling & Strategic Technologies    | 1544 | 12    | 0.8%  |
| Materials                    | Enabling & Strategic Technologies    | 3059 | 21    | 0.7%  |
| Paleontology                 | Earth & Environmental Sciences       | 314  | 2     | 0.6%  |
| Zoology                      | Biology                              | 211  | 1     | 0.5%  |
| Folklore                     | Visual & Performing Arts             | 2    | 0     | 0.0%  |
| Horticulture                 | Agriculture, Fisheries & Forestry    | 63   | 0     | 0.0%  |
| Geology                      | Earth & Environmental Sciences       | 183  | 0     | 0.0%  |
| Ornithology                  | Biology                              | 91   | 0     | 0.0%  |
| Art Practice, History & Theory| Visual & Performing Arts             | 8    | 0     | 0.0%  |
| Gender Studies               | Social Sciences                      | 23   | 0     | 0.0%  |
| Automobile Design & Engineering| Engineering                         | 24   | 0     | 0.0%  |
| Architecture                 | Built Environment & Design           | 14   | 0     | 0.0%  |
| Music                        | Visual & Performing Arts             | 25   | 0     | 0.0%  |
| Oceanography                 | Earth & Environmental Sciences       | 215  | 0     | 0.0%  |
| Drama & Theater              | Visual & Performing Arts             | 6    | 0     | 0.0%  |
Supplementary Table 3. Scientists with highest composite citation indicator based on their COVID-19 publications indexed in Scopus as of December 1, 2020 (in order of ranking per the composite indicator).

| AUTHOR            | INSTITUTION                                      | COUNTRY | MOST COMMON SUBFIELD                   | SECOND MOST COMMON SUBFIELD                  |
|-------------------|--------------------------------------------------|---------|----------------------------------------|----------------------------------------------|
| Lu, Hongzhou      | Fudan University                                 | chn     | Microbiology                           | Oncology & Carcinogenesis                     |
| Henry, Brandon M. | Cincinnati Children's Hospital Medical Center    | usa     | Anatomy & Morphology                   | Surgery                                      |
| Tang, Ning        | Tongji Medical College                           | chn     | Cardiovascular System & Hematology     | General Clinical Medicine                     |
| Thachil, J.       | Manchester Royal Infirmary                       | gbr     | Cardiovascular System & Hematology     | Immunology                                   |
| Lippi, Giuseppe   | Università degli Studi di Verona                | ita     | General Clinical Medicine              | Cardiovascular System & Hematology           |
| Elfishy, Abdo A.  | Cairo University                                 | egy     | Virology                               | Biophysics                                   |
| Guan, Wei Jie     | Guangzhou Medical University                    | chn     | Respiratory System                     | Oncology & Carcinogenesis                     |
| Cao, Bin          | China-Japan Friendship Hospital                 | chn     | Microbiology                           | Respiratory System                           |
| Li, Taisheng      | Peking Union Medical College Hospital            | chn     | Virology                               | Oncology & Carcinogenesis                     |
| Chan, Jasper Fuk Woo | The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases | hkg     | Microbiology                           | Virology                                     |
| Lipsitch, Marc    | Harvard T.H. Chan School of Public Health       | usa     | Microbiology                           | Epidemiology                                 |
| Yancy, Clyde W.   | Northwestern University Feinberg School of Medicine | usa     | Cardiovascular System & Hematology     | General & Internal Medicine                   |
| Perlman, Stanley  | University of Iowa                               | usa     | Virology                               | Immunology                                   |
| Rodriguez-Morales, Alfonso J. | Universidad Tecnológica de Pereira | col     | Microbiology                           | Tropical Medicine                            |
| Huang, Chaolin    | Jinyintan Hospital                               | chn     | General & Internal Medicine            | Immunology                                   |
| Schwartz, David   | Medical College of Georgia                       | usa     | Respiratory System                     | Immunology                                   |
| Cook, Tim M.      | Royal United Hospitals Bath NHS                  | gbr     | Anesthesiology                         | General & Internal Medicine                   |
| Rosenbaum, Lisa   | Brigham and Women's Hospital                    | usa     | General & Internal Medicine            | Public Health                                |
| Heymann, David    | London School of Hygiene & Tropical Medicine    | gbr     | Tropical Medicine                      | General & Internal Medicine                   |
| Recalcati, Sebastiano | Azienda Ospedaliera Ospedale Di Lecco          | ita     | Dermatology & Venereal Diseases        | Immunology                                   |
| To, Kelvin Kai Wang | The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases | hkg     | Microbiology                           | Virology                                     |
| Baig, Abdul Mannan | The Aga Khan University                         | pak     | Neurology & Neurosurgery               | Microbiology                                 |
| D’Antiga, Lorenzo | Papa Giovanni XXIII Hospital                    | ita     | Gastroenterology & Hepatology          | Surgery                                      |
| Kanne, Jeffrey P. | University of Wisconsin School of Medicine and Public Health | usa     | Nuclear Medicine & Medical Imaging     | Respiratory System                           |
| Mehra, Mandeep R. | Brigham and Women's Hospital                    | usa     | Cardiovascular System & Hematology     | Surgery                                      |
| Ivanov, Dmitry    | Hochschule für Wirtschaft und Recht Berlin      | deu     | Operations Research                    | Industrial Engineering & Automation           |
| Singhal, Tanu     | Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute | ind     | Pediatrics                            | Microbiology                                 |
| Name             | Institution                                                      | Country | Position                                                                 |
|------------------|-------------------------------------------------------------------|---------|--------------------------------------------------------------------------|
| Ludvigsson, J. F. | Karolinska Institutet                                              | swe     | Gastroenterology & Hepatology                                            |
| Al-Tawfiq, Jaffar A. | Johns Hopkins Aramco Healthcare                                    | sau     | Microbiology & Tropical Medicine                                         |
| Wu, Joseph T.    | The University of Hong Kong Li Ka Shing Faculty of Medicine       | chin    | General & Internal Medicine                                              |
| Banerjee, Debajnan | National Institute of Mental Health and Neuro Sciences             | ind     | Psychiatry & Artificial Intelligence & Image Processing                  |
| Gautret, Philippe | Aix Marseille Université                                            | fra     | Microbiology & Tropical Medicine                                         |
| Gostin, Lawrence O. | Georgetown Law                                                   | usa     | Applied Ethics & General & Internal Medicine                             |
| Raoult, Didier    | Aix Marseille Université                                            | fra     | Microbiology & Tropical Medicine                                         |
| Liang, Wenhua     | Guangzhou Medical University                                      | chin    | Oncology & Carcinogenesis & Surgery                                      |
| Cowling, Benjamin J. | The University of Hong Kong Li Ka Shing Faculty of Medicine     | hkg     | Microbiology & General & Internal Medicine                               |
| Wilder-Smith, Annelies | London School of Hygiene & Tropical Medicine                   | gbr     | Tropical Medicine & Microbiology                                         |
| Rajkumar, Ravi Philip | Jawaharlal Institute of Postgraduate Medical Education and Research | ind     | Psychiatry & Pharmacology & Pharmacy                                      |
| Koh, David        | Universiti Brunei Darussalam                                       | brn     | Environmental & Occupational Health & Respiratory System & General & Internal Medicine |
| Wang, Chen        | Chinese Academy of Medical Sciences & Peking Union Medical College | chin    | Endocrinology & Metabolism & Nutrition & Dietetics                       |
| Misra, Anoop      | Diabetes Foundation (India), New Delhi                             | ind     | Virology, General & Internal Medicine & Immunology                       |
| Krammer, Florian  | Icahn School of Medicine at Mount Sinai                           | usa     | Microbiology & Gastroenterology & Epidemiology                           |
| Livingston, Edward H. | University of California, Los Angeles                          | usa     | Surgery, Respiratory System & Oncology & Carcinogenesis                  |
| Zhong, Nan Shan   | Guangzhou Medical University                                      | chin    | Virology, Immunology & Cardiac Medicine                                  |
| Munster, Vincent  | NIAID Rocky Mountain Laboratories                                 | usa     | Microbiology & Neurology & Neurosurgery                                 |
| Grasselli, Giacomo | Università degli Studi di Milano                                  | ita     | Emergency & Critical Care Medicine & Toxicology                          |
| Tobias, Aurelio   | CSIC - Instituto de Diagnostico Ambiental y Estudios del Agua (IDAEA) | esp     | General & Internal Medicine & Epidemiology                              |
| Zhou, Fei         | China-Japan Friendship Hospital                                    | chin    | Respiratory System & Microbiology                                       |
| Corman, Victor Max | Charité – Universitätsmedizin Berlin                             | deu     | Microbiology & Virology                                                  |
| Zhou, Peng        | Wuhan Institute of Virology Chinese Academy of Sciences          | chin    | Microbiology & Virology & Immunology                                     |
| Phan, Tung        | University of Pittsburgh Medical Center                           | usa     | Microbiology & General & Internal Medicine                               |
| Greenhalgh, Trisha | University of Oxford Medical Sciences Division                   | gbr     | Medical Informatics & Health Policy & Services                           |
| Colson, Philippe  | Aix Marseille Université                                            | fra     | Microbiology & Virology                                                  |
| Hoffmann, Markus  | Deutsches Primatzenrum                                            | deu     | Microbiology & General & Internal Medicine                               |
| Kalil, Andre C.   | University of Nebraska Medical Center                             | usa     | Microbiology & Surgery                                                   |
| Young, Barnaby Edward | Tan Tock Seng Hospital                                           | sgp     | Microbiology & General & Internal Medicine                               |
| Levi, Marcel      | University College London Hospitals NHS Foundation Trust          | gbr     | Cardiovascular System & Hematology & General & Internal Medicine         |
| Gurwitz, David    | Tel Aviv University, Sackler Faculty of Medicine                  | isr     | Pharmacology & Neurology & Neurosurgery                                 |
| Pal, Rimesh       | Postgraduate Institute of Medical Education & Research, Chandigarh | ind     | Endocrinology & Metabolism & General & Internal Medicine                |
| Liu, Yingxia      | Second Affiliated Hospital of Southern University of Science and Technology | chin    | Virology & General & Internal Medicine                                   |
| Zhu, Na           | Chinese Center for Disease Control and Prevention                 | chin    | Virology & General & Internal Medicine                                   |
| Kim, Jin Yong     | Incheon Medical Center                                             | kor     | General & Internal Medicine & Epidemiology                               |
| Name                  | Institution                                    | Country | Field                                      | Subfield                               |
|-----------------------|-------------------------------------------------|---------|--------------------------------------------|----------------------------------------|
| Xiang, Yu Tao         | Universidade de Macau                           | chn     | Psychiatry                                 | Nursing                                |
| Lai, Chih Cheng       | Veterans General Hospital-Kaohsiung Taiwan       | twn     | Microbiology                               | General & Internal Medicine            |
| van Doremalen, Neeltje| NIAID Rocky Mountain Laboratories               | usa     | Virology                                   | Microbiology                           |
| Phelan, Alexandra L.  | Georgetown Law                                  | usa     | General & Internal Medicine               | Applied Ethics                         |
| Shi, Yuan             | Ministry of Education China                     | chn     | Pediatrics                                 | Nutrition                              |
| Wang, Fu Sheng        | General Hospital of People's Liberation Army    | chn     | Gastroenterology & Hepatology             | Immunology                             |
| Yuen, K. Y.           | The University of Hong Kong Li Ka Shing Faculty | hkg     | Microbiology                               | Virology                               |
| Lee, Sherman A.       | Christopher Newport University                  | usa     | Social Psychology                          | Clinical Psychology                    |
| Zhao, Shi             | Chinese University of Hong Kong                | hkg     | Microbiology                               | Tropical Medicine                      |
| Xiong, Yong           | Wuhan University                                | chn     | Microbiology                               | Virology                               |
| Cheng, Vincent Chi    | Queen Mary Hospital Hong Kong                   | hkg     | Microbiology                               | Epidemiology                           |
| Plebani, Mario        | Azienda Ospedaliera Di Padova                   | ita     | General Clinical Medicine                 | Gastroenterology & Hepatology          |
| Ioannidis, John P.A.  | Stanford University School of Medicine          | usa     | General & Internal Medicine               | Epidemiology                           |
| Buonsenso, Danilo     | Fondazione Policlinico Universitario Agostino   | ita     | Pediatrics                                 | Nuclear Medicine & Medical Imaging     |
|                      | Gemelli IRCCS Università Cattolica del Sacro Cu |         |                                           |                                        |
| Lu, Roujian           | Chinese Center for Disease Control and Prevention| chn     | Virology                                   | Microbiology                           |
| Qiao, Jie             | Peking University                               | chn     | Obstetrics & Reproductive Medicine        | Oncology & Carcinogenesis              |
| Hui, David S.C.       | Chinese University of Hong Kong                 | hkg     | Respiratory System                        | Microbiology                           |
| Wang, Wenling         | Chinese Center for Disease Control and Prevention| chn     | Virology                                   | Microbiology                           |
| Du, Ronghui           | Wuhan Pulmonary Hospital                         | chn     | Respiratory System                        | Immunology                             |
| Gautam, S.            | Karunya Institute of Technology and Sciences     | ind     | Environmental Sciences                    | Ecology                                |
| Tandon, Rajiv         | Western Michigan University Homer Stryker M.D.  | usa     | Psychiatry                                 | Neurology & Neurosurgery               |
|                      | School of Medicine                              |         |                                           |                                        |
| Bourouiba, L.         | Massachusetts Institute of Technology           | usa     | Fluids & Plasmas                           | Evolutionary Biology                   |
| Singh, Awadhesh Kumar | G.D Hospital & Diabetes Institute                | ind     | Endocrinology & Metabolism                | Pharmacology & Pharmacy                |
| Xu, Zhe               | General Hospital of People's Liberation Army    | chn     | Immunology                                 | Complementary & Alternative Medicine   |
| Lu, Xiaoxia           | Tongji Medical College                           | chn     | Pediatrics                                 | Allergy                                |
| Kucharski, Adam J.    | London School of Hygiene & Tropical Medicine    | gbr     | Microbiology                               | Developmental Biology                  |
| Mckee, Martin         | London School of Hygiene & Tropical Medicine    | gbr     | Public Health                              | General & Internal Medicine            |
| Mukhtar, Sonia        | University of Management and Technology Lahore  | pak     | Gender Studies                             | Sociology                              |
| Liu, Lei              | Second Affiliated Hospital of Southern University| chn     | Microbiology                               | Gastroenterology & Hepatology          |
| Graham, Barney S.     | National Institute of Allergy and Infectious    | usa     | General Science & Technology              | Immunology                             |
|                      | Diseases (NIAID)                                |         |                                           |                                        |
| Lee, Vernon           | Ministry of Health, Government of Singapore     | sgp     | Microbiology                               | Virology                               |
| Coulhard, P.          | Barts and The London School of Medicine and Dentistry| gbr | Dentistry                                 | General & Internal Medicine            |
| Atangana, Abdon       | University of the Free State                    | zaf     | Applied Mathematics                        | Mathematical Physics                   |
| Wrapp, Daniel         | The University of Texas at Austin               | usa     | General Science & Technology              | Virology                               |
Angus, Derek C. University of Pittsburgh usa Emergency & Critical Care Medicine Respiratory System
Wang, Dawei Zhongnan Hospital of Wuhan University chn Emergency & Critical Care Medicine Developmental Biology
Chung, Michael Icahn School of Medicine at Mount Sinai usa Nuclear Medicine & Medical Imaging Oncology & Carcinogenesis
Huynh, Toan Luu Duc University of Economics Ho Chi Minh City vnm Economics Finance
Zhang, Chao General Hospital of People's Liberation Army chn Immunology Microbiology
Greenberg, Neil King's College London gbr Psychiatry Environmental & Occupational Health Immunology
Mehta, Puja University College London gbr Arthritis & Rheumatology Oncology & Carcinogenesis
Lechien, Jerome R. Universitat de Barcelona esp Otorhinolaryngology Oncology & Carcinogenesis
Ogen, Yaron Martin-Universität Halle-Wittenberg deu Agronomy & Agriculture Geological & Geomatics Engineering
Shi, Heshui Tongji Medical College chn Nuclear Medicine & Medical Imaging Oncology & Carcinogenesis
Hopkins, Claire Guy's and St Thomas' NHS Foundation Trust gbr Virology Microbiology
de Wit, E. NIAID Rocky Mountain Laboratories usa Virology Microbiology
Ho, Cyrus S.H. National University Hospital, Singapore sgp Toxicology Psychiatry
Vankadari, Naveen Monash University aus Biochemistry & Molecular Biology Microbiology
Iwasaki, Akiko Howard Hughes Medical Institute usa Immunology Developmental Biology
Spinelli, Antonino Humanitas Research Hospital ita Surgery Gastroenterology & Hepatology Virology
Geldsetzer, Pascal Stanford University usa General & Internal Medicine Bioinformatics
Connors, Jean Marie Harvard Medical School usa Cardiovascular System & Hematology Immunology
Mizumoto, K. Georgia State University usa Microbiology Bioinformatics
| Name                  | Institution/University                                      | Country | Specialization                                                                 |
|-----------------------|-------------------------------------------------------------|---------|--------------------------------------------------------------------------------|
| Hellewell, Joel       | London School of Hygiene & Tropical Medicine                | gbr     | General & Internal Medicine, Developmental Biology                             |
| Guarner, Jeannette    | Emory University                                             | usa     | Cardiovascular System & Hematology                                             |
| Hsueh, Po Ren         | National Taiwan University Hospital                          | twn     | Microbiology, General & Internal Medicine                                       |
| Vaduganathan, Muthiah | Harvard Medical School                                       | usa     | Cardiovascular System & Hematology                                             |
| Dhma, Kuldeep         | Indian Veterinary Research Institute                        | ind     | Veterinary Sciences, Medicinal & Biomolecular Chemistry                        |
| Khan, Suliman         | Zhengzhou University                                         | chn     | Microbiology, Plant Biology & Botany                                            |
| Leung, Kathy          | The University of Hong Kong Li Ka Shing Faculty of Medicine  | hkg     | Microbiology, General & Internal Medicine                                       |
| Wu, Yuntao            | George Mason University - Science and Technology Campus     | usa     | Virology, Biochemistry & Molecular Biology                                     |
| Kraemer, Moritz U.G.  | University of Oxford                                         | gbr     | Tropical Medicine, Microbiology                                                 |
| Becker, Richard C.    | University of Cincinnati College of Medicine                | usa     | Cardiovascular System & Hematology                                             |
| Zangrillo, Alberto    | IRCCS San Raffaele Scientific Institute                     | ita     | Anesthesiology, Emergency & Critical Care Medicine                             |
| Khunti, Kamlesh       | University of Leicester                                      | gbr     | Endocrinology & Metabolism, Virology                                            |
| Wang, Manli           | Wuhan Institute of Virology Chinese Academy of Sciences     | chn     | Virology, Nanoscience & Nanotechnology                                          |
| Kruse, Robert L.      | BCM Center for Cell and Gene Therapy                        | usa     | Developmental Biology                                                          |
| Lescure, F. X.        | Hôpital Bichat-Claude-Bernard AP-HP                         | fra     | Microbiology, General & Internal Medicine                                       |
| Stahel, Philip F.     | Rocky Vista University                                       | usa     | Orthopedics, Neurology & Neurosurgery                                           |
| Wu, Zunyou            | National Center for AIDS/STD Control and Prevention          | chn     | Public Health, Virology                                                        |
| Jiang, Shibo          | Fudan University                                             | chn     | Virology, Microbiology                                                          |
| Yao, Hao              | Harvard T.H. Chan School of Public Health                   | usa     | Psychiatry, Neurology & Neurosurgery                                            |
| Leung, Char           | Deakin University                                            | aus     | Virology, Finance                                                              |
| Zhang, Wei            | Wuhan Institute of Virology Chinese Academy of Sciences     | chn     | Virology, General Science & Technology                                          |
| Holshue, Michelle     | Centers for Disease Control and Prevention                  | chn     | General & Internal Medicine, General Science & Technology, Pathology           |
| Brufsky, Adam         | UPMC Hillman Cancer Center                                   | usa     | Oncology & Carcinogenesis, Microbiology                                         |
| Chowell, Gerardo      | Georgia State University                                     | usa     | Bioinformatics                                                                 |
| Chen, Yu              | Wuhan University                                             | chn     | Virology, Developmental Biology                                                 |
| Gates, Bill           | Bill and Melinda Gates Foundation                            | usa     | Business & Management, Networking & Telecommunications, Biophysics             |
| Walls, Alexandra C.   | University of Washington, Seattle                            | usa     | Developmental Biology, Virology, Gastroenterology & Hepatology, Microbiology   |
| Chen, Jieliang        | Fudan University                                             | chn     | Virology                                                                        |
| Baud, David           | Centre Hospitalier Universitaire Vaudois                     | che     | Obstetrics & Hepatology, Microbiology                                          |
| Ronco, Claudio        | Ospedale San Bortolo                                        | ita     | Urology & Nephrology, Cardiovascular System & Hematology                       |
| Ceriello, Antonio     | IRCCS Multimedica                                            | ita     | Endocrinology & Metabolism, Cardiovascular System & Hematology                 |
| Bernheim, Adam        | Icahn School of Medicine at Mount Sinai                     | usa     | Nuclear Medicine & Medical Imaging, Neurology & Neurosurgery                    |
| Patel, Zara M.        | Stanford University School of Medicine                      | usa     | Virology, Microbiology                                                          |
| Benvenuto, Domenico   | Università Campus Bio-Medico di Roma                         | ita     | Virology, Nanoscience & Nanotechnology                                          |
| Bai, Yan              | Zhengzhou University                                         | chn     | Virology, Nuclear Medicine & Medical Imaging                                    |
| Name                        | Institution and Country             | Field of Study                           | Specializations               |
|-----------------------------|-------------------------------------|------------------------------------------|-------------------------------|
| Alhazzani, Waleed           | McMaster University, Canada         | General & Internal Medicine              | General & Internal Medicine  |
| Lauer, Stephen A.           | Johns Hopkins Bloomberg School of   | Statistics & Probability                 | General & Internal Medicine  |
| Gupta, Ritesh               | Fortis CDOC Hospital, India         | Endocrinology & Metabolism               | General Clinical Medicine     |
| Jernigan, Daniel B.         | Centers for Disease Control and Prevention, USA | Microbiology | General & Internal Medicine  |
| Ren, Lili                   | Institute of Pathogen Biology, China | Microbiology | Virology                      |
| Wölfl, Roman                | Institut für Mikrobiologie der      | Microbiology | Virology                      |
| Tang, Y. W.                 | Weill Cornell Medicine, USA         | Microbiology | Virology                      |
| Curigliano, Giuseppe        | Università degli Studi di Milano, Italy | Oncology & Pharmacology & Pharmacy | Immunology                    |
| Klok, F. A.                 | Leiden University Medical Center, Netherlands | Cardiovascular System & Hematology | Immunology                    |
| Jiang, Shibo                | Fudan University, China             | Microbiology | Developmental Biology         |
| Asmundson, Gordon J.G.      | University of Regina, Canada        | Clinical Psychology | Psychiatry                  |
| Conti, P.                   | University of G. d’Annunzio Chieti and Pescara, Italy | Immunology | Biochemistry & Molecular Biology | General & Internal Medicine |
| Zhou, Wenhao                | Children’s Hospital of Fudan University, China | Genetics & Heredity | Pediatrics                  |
| Brooks, S. K.               | King’s College London, UK           | Psychiatry | General & Internal Medicine  |
| Galea, Sandro               | Boston University, USA              | Public Health | Psychiatry                  |
| Fauci, Anthony S.           | National Institute of Allergy and Infectious Diseases (NIAID), USA | Immunology | General & Internal Medicine  |
| Rubin, G. James             | King’s College London, UK           | Psychiatry | Public Health                |
| Mason, Robert J.            | National Jewish Health, USA         | Respiratory System | Biochemistry & Molecular Biology | Oncology & Carcinogenesis |
| Kim, Hyungjin               | Seoul National University College of Medicine, Korea | Nuclear Medicine & Medical Imaging | Oncology & Carcinogenesis |
| Del Rio, Carlos             | Emory University School of Medicine, USA | Public Health | Microbiology                 |
| Zhang, Jin jin              | Zhongnan Hospital of Wuhan University, China | Allergy | None                         |
| Lagunas-Rangel, Francisco Alejandro | Centro de Investigacion y de Estudios Avanzados, Mexico | Gerontology | Oncology & Carcinogenesis |
| Bonilla-Aldana, D. Katterine | Universidad Tecnológica de Pereira, Colombia | Microbiology | Tropical Medicine            |
| Leung, Gabriel M.           | The University of Hong Kong Li Ka Shing Faculty of Medicine, Hong Kong, China | Epidemiology | General & Internal Medicine  |
| Cecconi, Maurizio           | Humanitas Research Hospital, Italy   | Emergency & Critical Care Medicine | Anesthesiology                |
| Ling, Yun                   | Fudan University, China             | Immunology | Microbiology                 |
| Paniz-Mondoifi, Alberto E.  | Icahn School of Medicine at Mount Sinai, USA | Microbiology | Dermatology & Venereal Diseases |
| Vaishya, Raju               | Indraprastha Apollo Hospitals, India | Orthopedics | General & Internal Medicine  |
| Xia, Shuai                  | Fudan University, China             | Virology | Medicinal & Biomolecular Chemistry |
| Liu, Jia                    | Wuhan Institute of Virology Chinese Academy of Sciences, China | Medicinal & Biomolecular Chemistry | Pharmacology & Pharmacy |
| Chu, Hin                    | The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases | Virology | Microbiology                |
| Murthy, Srinivas            | The University of British Columbia, Canada | General & Internal Medicine | Emergency & Critical Care Medicine |
| Ong, Sean Wei Xiang         | Tan Tock Seng Hospital, Singapore | Microbiology | Epidemiology                |
| Sanchis-Gomar, Fabian       | University of Valencia, Spain       | Cardiovascular System | General Clinical Medicine |
Lake, Mary A. University of Cambridge gbr General Clinical Medicine General & Internal Medicine
Stebbing, Justin Charing Cross Hospital gbr Oncology & Carcinogenesis Immunology
Shen, Kun Ling Beijing Children's Hospital, Capital Medical University chn Pediatrics Microbiology
Shang, Jian College of Veterinary Medicine usa Virology General Science & Technology
Nishiura, Hiroshi Graduate School of Medicine jpn Microbiology Bioinformatics
Goodell, John W. University of Akron usa Finance Business & Management
Casadevall, Arturo Johns Hopkins Bloomberg School of Public Health usa Microbiology Immunology
Bansal, Manish Medanta - The Medicity ind Cardiovascular System & Hematology General & Internal Medicine
Li, Hui China-Japan Friendship Hospital chn Microbiology Respiratory System
Robson, B. The Dirac Foundation gbr Biochemistry & Molecular Biology Biomedical Engineering
Arabi, Yaseen M. King Saud bin Abdulaziz University for Health Sciences sau Emergency & Critical Care Medicine General & Internal Medicine
Cai, Hua David Geffen School of Medicine at UCLA usa Cardiovascular System & Hematology Biochemistry & Molecular Biology
Guo, Li Institute of Pathogen Biology, Chinese Academy of Medical Sciences & Peking Union Medical College chn Virology Microbiology
Brodin, Petter Karolinska Institutet swe Immunology Developmental Biology
Verity, Robert Imperial College London gbr Microbiology General & Internal Medicine
Rose, Suzanne University of Pennsylvania Perelman School of Medicine usa General & Internal Medicine None
Peng, Zhiyong Zhongnan Hospital of Wuhan University chn Emergency & Critical Care Medicine Urology & Nephrology General & Internal Medicine
Ko, Wen Chien National Cheng Kung University twn Microbiology General & Internal Medicine
Fernandez-Nieto, Diego Hospital Ramon y Cajal esp Dermatology & Venereal Diseases General & Internal Medicine
McInnes, Iain B. University of Glasgow gbr Arthritis & Rheumatology Immunology
Wan, Yushun College of Veterinary Medicine usa Virology Biochemistry & Molecular Biology
MacIntyre, Chandini Raina Kirby Institute aus Virology Microbiology
Jin, Running Tongji Medical College chn Oncology & Carcinogenesis Pediatrics
Mao, Ling Tongji Medical College chn Neurology & Neurosurgery Biochemistry & Molecular Biology
Neurath, Markus F. Friedrich-Alexander-Universität Erlangen-Nürnberg deu Gastroenterology & Hepatology Immunology
Tetro, Jason A. University of Guelph can Epidemiology Microbiology
Poon, Liona Chiu Yee Chinese University of Hong Kong chn Obstetrics & Reproductive Medicine Endocrinology & Metabolism Oncology & Carcinogenesis
Wang, Fan Zhongnan Hospital of Wuhan University chn Gastroenterology & Hepatology Applied Ethics
Emanuel, Ezekiel J. University of Pennsylvania Perelman School of Medicine usa Emergency & Critical Care Medicine General & Internal Medicine
Namendys-Silva, Silvio A. Instituto Nacional de Cancerologia, Mexico mex Virology Biochemistry & Molecular Biology
Martinez, Miguel Angel Hospital Universitari Germans Trias i Pujol esp Respiratory System
| Name                  | Institution                                      | Country | Specialties                                              |
|-----------------------|--------------------------------------------------|---------|----------------------------------------------------------|
| Li, Qun               | Chinese Center for Disease Control and Prevention | chn     | Microbiology, Toxicology                                 |
| McGonagle, Dennis     | University of Leeds, School of Medicine           | gbr     | Arthritis & Rheumatology, Immunology                     |
| Vaira, Luigi Angelo   | Azienda Ospedaliero Universitaria                | ita     | Dentistry, Otorhinolaryngology                           |
| Bhopal, R. S.         | Edinburgh Medical School                          | gbr     | Public Health, General & Internal Medicine               |
| Asadi-Pooya, Ali A.   | Shiraz University of Medical Sciences             | irn     | Neurology & Neurosurgery, General & Internal Medicine    |
| Leung, Gabriel M.     | The University of Hong Kong Li Ka Shing          | chn     | General & Internal Medicine, Immunology                  |
| Shi, Shaobo           | Renmin Hospital of Wuhan University               | chn     | Cardiovascular System & Hematology, General & Internal Medicine |
| Wang, Cuiyan          | Huaibei Coal Industry Teachers College            | chn     | Toxicology, Psychiatry                                  |
| Favalli, Ennio Giulio | ASST Gaetano Pini-CTO                             | ita     | Arthritis & Rheumatology, Microbiology, Immunology       |
| Ye, Guangming         | Zhongnan Hospital of Wuhan University             | chn     | General & Internal Medicine, Microbiology, Virology      |
| Cortegiani, Andrea    | Università degli Studi di Palermo                | ita     | Emergency & Critical Care Medicine, Microbiology, Virology |
| Chu, Daniel K.W.      | The University of Hong Kong Li Ka Shing Faculty   | hkg     | General & Internal Medicine, Microbiology, Virology      |
| Xu, Kaijin            | The State Key Laboratory for Diagnosis and Treatment of Infectious Diseases | chn     | Microbiology, Virology                                  |
| Cao, Wei              | Peking Union Medical College Hospital             | chn     | Microbiology, Virology                                  |
| He, Jianxing          | Guangzhou Medical University                     | chn     | Oncology & Carcinogenesis, Geriatrics, Respiratory System |
| Ouslander, Joseph G.  | Charles E. Schmidt College of Medicine            | usa     | General & Internal Medicine, Immunology                  |
| Sun, Ziyong           | Tongji Medical College                            | chn     | Microbiology, Immunology                                 |
| Shoenfeld, Yehuda     | Chaim Sheba Medical Center Israel                 | isr     | Immunology, Arthritis & Rheumatology                     |
| Netea, Mihai G.       | Radboud University Nijmegen Medical Centre        | nld     | Immunology, Microbiology                                |
| Xiao, Shu Yuan        | The University of Chicago Medicine                | usa     | Pathology, Gastroenterology & Hepatology, Immunology     |
| Qin, Chuan            | Tongji Medical College                            | chn     | Neurology & Neurosurgery, Geriatrics, Gerontology        |
| Onder, Graziano       | Istituto Superiore Di Sanita                      | ita     | Physiology                                               |
| Fan, Bingwen Eugene   | Tan Tock Seng Hospital                            | sgp     | Cardiovascular System & Hematology, Virology             |
| Shen, Chenguang       | Second Affiliated Hospital of Southern University | chn     | Virology, Nanoscience & Nanotechnology, Toxicology       |
| Rocklöv, Joacim       | Umeå Universitet                                 | swe     | Tropical Medicine, Virology                             |
| Liu, Weiyong          | Tongji Medical College                            | chn     | Microbiology, Virology                                  |
| Zhao, Jianping        | Tongji Medical College                            | chn     | General & Internal Medicine, Respiratory System          |
| Wu, Fan               | Fudan University                                  | chn     | General Science & Technology, Virology                   |
| Coccia, Mario         | Consiglio Nazionale delle Ricerche               | ita     | Business & Management, Science Studies                   |
| Vaninov, Natalie      | Icahn School of Medicine at Mount Sinai          | usa     | Immunology                                               |
| Dong, Ensheng         | Johns Hopkins University                          | usa     | Microbiology                                              |
| Tobin, Martin J.      | Loyola University of Chicago                      | usa     | Respiratory System, Emergency & Critical Care Medicine   |
| Bontempi, Elza        | Università degli Studi di Brescia                | ita     | Applied Physics                                           |
| Han, Huan             | Renmin Hospital of Wuhan University               | chn     | General Clinical Medicine, Microbiology                 |
| Chen, Huijun          | Zhongnan Hospital of Wuhan University             | chn     | Oncology & Carcinogenesis, General & Internal Medicine   |
| Name            | Institution                                      | Country | Field                                      | Subfield                |
|-----------------|--------------------------------------------------|---------|--------------------------------------------|-------------------------|
| Sah, Ranjit     | Tribhuvan University Teaching Hospital           | npl     | Microbiology                               | Tropical Medicine       |
| Li, Lanjuan     | Zhejiang University                              | chn     | Microbiology                               | Gastroenterology & Hepatology |
| Rothan, Hussin A. | Georgia State University                     | usa     | Virology                                   | Analytical Chemistry    |
| Richardson, Peter J. | BenevolentAI Limited              | gbr     | Developmental Biology                      | None                    |
| Hu, Yu          | Tongji Medical College                           | chn     | Oncology & Carcinogenesis                 | Immunology              |
| Lurie, Nicole   | Coalition for Epidemic Preparedness Innovations | nor     | General & Internal Medicine               | Health Policy & Services|
| Wu, Peng        | The University of Hong Kong Li Ka                | hkg     | Microbiology                               | General & Internal Medicine|
| Galanakis, Charis M. | King Saud University                  | sau     | Food Science                               | Biotechnology           |

Not listed are 26 authors who are journalists writing news stories or editors writing editorials for very prestigious journals (The Lancet, Mahase E, Day M, Iacobucci G, Kupferschmidt K, Burki T, Horton R, Ledford H, Cohen J (split in two author ID records), Rimmer A, Thornston J, Dyer O, Cyranoski D, Zarocostas J, Kirby T, Tamne J, Wise, J, Callaway E, Godlee F, Abbasi J, Eurosurveillance Editorial Team, Torjesen I, The Lancet Oncology, Stower H, Adam D)