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The rapid, massive growth of COVID-19 authors in the scientific literature

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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ABSTRACT (198 words)

We examined the extent to which the scientific workforce in different fields was engaged in publishing COVID-19-related papers. According to Scopus (data cut, August 1, 2021), 210,183 COVID-19-related publications included 720,801 unique authors, of which 360,005 authors had published at least 5 full papers in their career and 23,520 authors were at the top 2% of their scientific subfield based on a career-long composite citation indicator. The growth of COVID-19 authors was far more rapid and massive compared with cohorts of authors historically publishing on H1N1, Zika, Ebola, HIV/AIDS and tuberculosis. All 174 scientific subfields had some specialists who had published on COVID-19. In 109 of the 174 subfields of science, at least one in ten active, influential (top-2% composite citation indicator) authors in the subfield had authored something on COVID-19. 52 hyper-prolific authors had already at least 60 (and up to 227) COVID-19 publications each. Among the 300 authors with the highest composite citation indicator for their COVID-19 publications, most common countries were USA (n=67), China (n=52), UK (n=32), and Italy (n=18). The rapid and massive involvement of the scientific workforce in COVID-19-related work is unprecedented and creates opportunities and challenges. There is evidence for hyper-prolific productivity.

Keywords: COVID-19, bibliometrics, citations, productivity, authorship

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The acute crisis of COVID-19 has challenged the scientific community to generate timely evidence about the new coronavirus and its pandemic. Interest on COVID-19 has spread rapidly and widely across the scientific literature and among researchers. Such an "all hands on deck" response of the scientific workforce during a crisis may have been beneficial in generating ideas and evidence expeditiously. However, many authors publishing on COVID-19 may have lacked proper background expertise. The explosive focus on COVID-19 may have caused some inappropriate "covidization" of research[2,3] and the resulting research, conducted in such haste, may suffer from low validity.[4,5]

Here, we aim to understand which scientific areas and which types of scientists have been most mobilized by the pandemic. The growth of the COVID-19 author cohort is contrasted against what happened in the mobilization of the scientific workforce for 5 other major infectious diseases. We also probe whether there is evidence of hyper-prolific productivity with some scientists rapidly publishing large numbers of papers. Concurrently, we evaluate scientists who have had the highest citation impact for their COVID-19-related work. Finally, we discuss the implications of this rapid "covidization" of the research enterprise.

METHODS

We used a copy of the Scopus database[6] extracted on August 1, 2021. 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

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Elsevier International Center for the Study of Research (ICSR) Lab infrastructure to publications indexed (loaded) in Scopus in 2020 or 2021 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 either not available or 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 considered both publications in peer-reviewed venues and preprints. To avoid double counting of the same item (e.g., a work published both in a peer-reviewed journal and as a preprint, or in two preprint servers), we identified and filtered out duplicates by matching against author names and titles. Our search-based approach applies methods used for unstructured reference linking[7] and ranks documents based on similarity of fields. We used a combination of author names and titles, as many commonly used fields in reference linking, such as journal title, do not apply. The process first identifies multiple potential duplicate matches based on these fields, and then validates the best match based on the overlap between words in the title and author names. After identifying top candidate matches for de-duplication, the process applies a validation step based on the overlap between words in the title and author names. We excluded all preprints that link to either a non-preprint item, such as journal articles, or another preprint with an earlier date. The result of this step is exclusion of 10,703 preprints.

We further focused on the 3,862,276 authors who have at least one Scopus-indexed publication since 2020 and who have also authored in their entire career at least 5 Scopus-

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indexed papers classified as articles, reviews or conference papers. This allows exclusion of authors with limited recent 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.[8,9]

Influential scientists

We also examined 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 August 1, 2021, using the code as provided with the supplemental data recently published for the most cited authors across science.[10-12] 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[10,11] and accordingly 170,832 scientists can be classified as being in the top 2% of their main subfield discipline based on the citations that their work received through 2020. Of those, 125,869 were active and had published at least 1 paper also in 2020 or early 2021.

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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 graphical mapping of scientific fields that has been previously developed[13] 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.[14] Each of the 27 categories is assigned a unique 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.[15] 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.

Comparison against other infectious diseases

We performed Scopus searches for terms reflecting 4 other infectious diseases that have manifested as epidemics in modern history (H1N1, AIDS, Ebola, Zika) and

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tuberculosis, an epidemic that is ongoing since ancient times and that has probably resulted in the largest cumulative number of deaths over history compared with any other infectious pathogen. One should cautiously interpret comparisons between different infectious diseases considering also for the explosive, pandemic nature of COVID-19 and the relative impact of these various disease entities. We used the search terms TITLE-ABS-KEY("swine flu" OR *h1n1*), TITLE-ABS-KEY(*ebola*), TITLE-ABS-KEY(*zika*), and TITLE-ABS(*tuberculosis*). AIDS requires a more thorough search strategy as keywords and title searches will yield many false positives for the target disease. We collected papers based on the Fingerprint engine concepts[29] "Human Immunodeficiency Virus 1", "HIV Infection", "AIDS/HIV", "HIV-1", "HIV Prevention", "HIV Testing", "Human Immunodeficiency Virus 1 Reverse Transcriptase". These concepts are based on a unified controlled thesaurus which among other things, addresses the disambiguation of homonyms such as “hearing aids.”

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 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. Hyper-prolific publishing reflects a complex phenomenon and may be generated by true productivity and excellence, but also by misconduct (e.g., gift and honorary authorship), and publication of trivialities or “salami-slicing” where one body of work is cut into multiple “least publishable units.” We make no

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effort to probe the key drivers in each hyper-prolific author. This is not feasible for the broad scope and number of papers considered in our study, plus misconduct is extremely difficult to prove. Nevertheless, we dissected among hyper-prolific authors whether they published also very large numbers of full papers (articles, reviews, conference proceeding papers) or mostly editorializing and other items that are not full papers.

Citation impact was assessed with the previously proposed citation indicator[10-12] 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 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.[11,12] 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 are descriptive and exploratory.

RESULTS

COVID-19 papers and authors

As of August 1, 2021, Scopus classified 210,863 papers as relevant to COVID-19, which accounts for 3.7% of the 5,728,015 papers across all science published and indexed in Scopus in the period January 1, 2020 until August 1, 2021. The 210,863 published items were classified by Scopus as articles (114,625, 54%), letters (23,029, 11%), reviews

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(20,641, 10%), preprints from ArXiv, SSRN, BioRxiv, ChemRxiv, and medRxiv that could not be matched to other publications (17,953, 9%), notes (12,125, 6%), editorials (10,419, 5%), conference papers (2,578, 3%), and other items (4,813, 2%).

The 210,863 COVID-19 papers include 720,801 unique authors (with different Scopus IDs), amounting to over 7% of the 9,736,088 author IDs who have published at least 1 paper of any type and on any topic in 2020 or early 2021. The most common countries of these 720,801 authors were USA (n=143,917), China (n=72,385), UK (n=50,392), Italy (n=45,304), India (n=34,211) and Spain (n=29,954) accounting for a total of 376,163 authors (52%). China had more authors involved in COVID-19 papers until May 2020, after which the USA surpassed China.

Among the 3,862,276 authors who have published anything that is Scopus-indexed in 2020 or early 2021 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 July 2021, 360,005 of these authors (9.3%), had at least one published and indexed COVID-19 paper.

Scientific fields and subfields

Among the 3,862,276 authors, researchers from Public Health and Clinical Medicine (based on their career-long Science Metrix main field) published on COVID-19 at the highest rate: 20.6% (15,886/77,292) of Public Health authors and 17.7% (208,147/1,178,036) of Clinical Medicine authors published COVID-19 research by the end of July 2021. However, publishing COVID-19 research were seen across all 21 major fields. The lowest percentage was seen in the field of Physics & Astronomy (1.7%), from which even 5,364 authors had COVID-19 publications. At the subfield discipline level, the

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highest COVID-19 publication rate of authors was seen (Table 1) in Emergency and Critical Care Medicine (37.00%). However, such rates were higher than 10% (i.e., at least one in ten authors in that field had published on COVID-19) in 75 subfield disciplines and higher than 5% (i.e., at least one in twenty authors) in 107 subfield disciplines. All 174 subfields had one or more authors publishing on COVID-19. Supplementary Table 1 gives detailed data for COVID-19 publication rates of authors across all subfield disciplines.

28% 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 the epidemiology of COVID-19 in healthcare personnel. Even experts specializing in their past work on 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 have published COVID-19 research (Supplementary Table 2). Among the 125,869 influential scientists active in publishing in 2020 or early 2021, 23,520 (18.7%) had COVID-19 publications in 2020 or early 2021. The publication rate was the highest in the fields of Public Health (39.7%) and Clinical Medicine (34.4%). Among subfield disciplines, the highest publication rate of such active, influential authors was seen (Table 2) in, Emergency & Critical Care Medicine (64.4%), Applied Ethics (60.2%) and Allergy (59.0%). However, publication rates were higher than 10% (i.e., at least one in ten authors in that field had authored something on COVID-19) in

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109 of 174 subfield disciplines across science and higher than 5% (i.e., at least one in twenty authors) in 134 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.

Comparison with other infectious diseases

As shown in Figure 2, the massive growth of authors publishing on COVID-19 has been far more rapid and prominent than the growth of the publishing scientific workforce retrieved with the searches for terms reflecting 5 other infectious diseases. None of the other 5 infectious diseases managed to attract more than one-tenth the number of new authors in a single year (maximum: HIV/AIDS, 17,968 new authors publishing in 2016 who had not published HIV/AIDS items before) compared with the number of authors recruited by COVID-19 (245,222 authors in 2020) (Figure 2A). Moreover, none of the other 5 infectious diseases reached such a large number of active authors publishing in any single year (maxima of 54,409 active authors on HIV/AIDS in 2016, 28,274 active authors on tuberculosis in 2016, 13,983 active authors on H1N1 in 2011, 10,182 active authors on Zika in 2017, 6,855 active authors on Ebola in 2016).

Productivity for COVID-19 publications

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A total of 9,809 author IDs in Scopus had 10 or more Scopus-indexed published COVID items. Setting thresholds of at least 15, 20, 25, 30,40, 50 and 60 items, the numbers amounted to 3,661, 1,674, 932, 539, 220, 113 and 54 separate author IDs, respectively. Figure 3 shows the distribution of COVID publication frequency of authors and Table 2 the 53 authors with 60 or more COVID-19 published items indexed in Scopus (one author had two separate Scopus author ID files which we merged). Of these 53 extremely prolific authors, 5 were BMJ news journalists (including the author with the highest number of published items, Elisabeth Mahase, n=227 published items), two were editors of the New England Journal of Medicine, and one was a journalist at Option/Bio. Among the remaining 45 scientists, the most common countries were USA (n=7), UK (n=6) Italy (n=6) and India (n=5). When limited to full papers (articles, reviews, conference proceeding papers), there were 7 authors who had published 60 or more such full papers and 50 authors had published 40 or more.

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, 30 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 USA (n=67), China (n=52), UK (n=32), Italy (n=18), Hong-Kong (n=14) and India (n=12). Of the 270 scientists excluding journalists/editors, Microbiology was one of their top 2 publishing Science Metrix subfields for 99, followed by General & Internal Medicine (n=60), Virology (n=56) and Immunology (n=34).

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DISCUSSION

More than 700,000 scientists (and counting) have published work related to COVID-19. The most influential scientists across science were even more commonly engaged with COVID-19 research. More than one in six active, influential scientists quickly added or adjusted their publishing portfolio to include COVID-19. More than half of the active, influential scientists in several scientific subfields were involved urgently in COVID-19 work, and every single scientific subfield had some scientists publishing on COVID-19.

The rapid and extensive spread of COVID-19 interests across the map of science was unique compared with other major epidemic infectious diseases. A comparison against 5 other major epidemic infectious diseases showed that none of them came anywhere close to the explosive nature of the involvement of the scientific workforce in COVID-19-related work. This applied even to HIV/AIDS and tuberculosis that have had a far greater cumulative mortality toll. HIV/AIDS has killed over 35 million people and tuberculosis has killed over 1 billion people to-date.[16,17]

Our data even underestimate the explosive growth of COVID-19-related work, since some papers are published but not yet indexed. Some of this deficit is captured by preprints (a popular method of disseminating information in the COVID-19 era),[18-20] but the COVID-19 literature is substantially larger than what is indexed in Scopus. The COVID-19 Global Literature on Coronavirus Disease database maintained by the World Health Organization included 318,173 published items as of July 31, 2021 (including 23,673 preprints) (https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-

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ncov/). It is possible that authors publishing on COVID-19 may be approaching (or have exceeded) a million as of this writing.

Many authors had published an astonishingly large number of COVID-19 items, and 53 had published 60 or more in such short 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 locations, as well as prevalent co-authorship practices in these countries. Some of the unethical and questionable practices surrounding authorship may cluster in specific countries and specific research environments that overtly game and manipulate authorship, through practices such as gift or honorary authorship. Importantly, meritorious productivity versus sloppiness is difficult to disentangle without examining each case in depth. A large share of the hyper-prolific authors capitalized mostly on copious publishing of editorializing items rather than full papers (articles, reviews or conference proceeding papers).

We also addressed the citation impact of authors for their COVID-19 work. The top ranks included many journalists and editors who published numerous news stories and editorials in their highly visible 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 in both academic journals and the popular press may be prominent during the pandemic.[21-24] It is unknown whether non-peer-reviewed news stories and in-house editorials in major journals help safeguard against the “infodemic” or

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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 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. The quality of the published work was not assessed in our analysis, given the broad scope and huge diversity of the included papers. Nevertheless, many surveys of the quality of COVID-19 publications already exist.[25-38] Although existing surveys of the quality of COVID-19 research do not cover all subfields of investigation and quality is often difficult to measure precisely, the consistent finding of high prevalence of low quality studies across very different types of study designs suggests that a large portion (perhaps even the large majority) of the immense and rapidly growing COVID-19 literature may be of low quality. Moreover, massive productivity has been described in the pre-COVID era, as affecting researchers across many fields[39] and may be a particular 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, fostering interdisciplinarity. There are situations

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where experts in seemingly extremely remote fields (e.g., music or second-language acquisition) may indeed be relevant to contribute to the COVID-19 literature. For example, experts almost in any field may be fully justified to publish on how COVID-19 impacted their work. However, we have anecdotally noted that many published contributions represent situations of epistemic trespassing, where scientists try to address COVID-19 health and medical questions, although they come from unrelated fields and probably lack fundamental subject-matter expertise. In particular, scientists who work with data of any sort, may feel entitled that they can handle, analyze, and interpret COVID-19-related data. We do not wish to single out specific scientists, since this may be a very common problem. Furthermore, the exact magnitude of this problem is difficult to fathom, because it is impossible to know details on whether specific scientists may have additional training/expertise on disciplines beyond what they have published on in their careers. However, in the absence of relevant subject-matter expertise among the authors' teams, the generated research products may be fundamentally flawed.[40] Such fundamentally flawed research may then even pass peer-review, since the same people populate also the ranks of peer-reviewers. Flaws go beyond retractions, which account for <0.1% of published COVID-19 work.[41,42]

Furthermore, there has been a rapid mobilization of funding into COVID-19 research, with some areas, e.g., vaccine development, earmarked for urgent work. According to one analysis, until the end of June 2021, $21.7 trillion have been committed to various activities related to the COVID-19 response (https://www.devex.com/news/interactive-who-s-funding-the-covid-19-response-and-what-are-the-priorities-96833). While the vast majority of these funds are not directly

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related to research, some of this funding may eventually also support research products and publications. Direct research activities amount to $14 billion, plus there are $173 billion committed to vaccines and treatments and $237 billion committed to health systems. This funding may have worked as an additional attractor of scientists to this rapidly expanding field.

Certain limitations should be discussed. First, current Scopus data have high precision and recall (98.1% and 94.4%, respectively),[6] 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 are not yet indexed in Scopus, fields with slower publication and indexing may be relatively under-represented in the analyses. Fifth, we used simple terms that are highly specific for the comparative evaluation of other infectious diseases and some relevant papers and authors working on them may have been missed. However, the difference of these other diseases against the explosive nature of COVID-19 authorships is so stark that it would still be very prominent even if some additional authors working on these diseases could be identified. Sixth, given our study design, we cannot tell whether scientists who shift their attention to COVID-19 are

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abandoning their prior work, or just working additionally on COVID-19. The pandemic has had direct effects on some types of research, e.g., some investigations were suspended during lockdowns. One would need to have a far longer perspective to examine the long-term impact of potential "covidization" of research upon other scientific disciplines.

The vast number of COVID-19 papers have posed an extra strain to the already stretched availability of peer-reviewers in journals. Moreover, an unknown percentage of these papers represent work that required research ethics review, adding another layer of reviewing burden. 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.[2,3] Will scientists continue to flock from different disciplines into COVID-19 research? What consequences might this have for other areas of important investigation, and 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 and publishing scientists.

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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	17,450	6,457	37.00%	523	337	64.44%
Anesthesiology	18,365	6,235	33.95%	669	264	39.46%
Virology	31,279	10,069	32.19%	1,004	562	55.98%
Epidemiology	3,830	1,176	30.70%	143	57	39.86%
Applied Ethics	2,696	819	30.38%	86	51	59.30%
Respiratory System	27,030	7,744	28.65%	930	471	50.65%
General & Internal Medicine	54,981	15,639	28.44%	2,593	1,323	51.02%
Allergy	7,147	1,978	27.68%	254	149	58.66%
Medical Informatics	6,807	1,854	27.24%	221	113	51.13%
Public Health	31,577	8,220	26.03%	939	434	46.22%
Geriatrics	5,129	1,301	25.37%	172	89	51.74%
Microbiology	80,988	18,518	22.87%	2,447	854	34.90%
Surgery	43,798	9,825	22.43%	1,522	597	39.22%
Cardiovascular System & Hematology	84,330	18,264	21.66%	2,989	1,288	43.09%
Tropical Medicine	15,754	3,298	20.93%	480	210	43.75%

*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.

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Table 2. Extremely prolific authors with at least 60 COVID-19 publications indexed in Scopus by August 1, 2021 (not including 8 editors/journalists)

AUTHOR	INSTITUTION	COUNTRY	COVID-19 ITEMS	COVID-19 ITEMS (non pre-prints)	COVID-19 ITEMS Article / Review / Conf P
Wiwanitkit, Viroj	Dr. D.Y. Patil Vidyapeeth Deemed University, Pune	India	217	217	9
Lippi, Giuseppe	Università degli Studi di Verona	Italy	145	139	74
Rodriguez-Morales, Alfonso J.	Fundación Universitaria Autónoma de las Américas	Colombia	139	139	75
Dhama, Kuldeep	Indian Veterinary Research Institute	India	118	118	99
Baden, Lindsey R.	Brigham and Women's Hospital	United States	93	88	14
Henry, Brandon Michael	Cincinnati Children's Hospital Medical Center	United States	92	87	40
Krammer, Florian	Icahn School of Medicine at Mount Sinai	United States	90	66	52
Rezaei, Nima	Research Center for Immunodeficiencies	Iran	87	85	56
Raoult, Didier	Aix Marseille Université	France	83	82	47
Baric, Ralph S.	The University of North Carolina at Chapel Hill	United States	82	61	58
Yuen, Kwok Yung	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	80	80	69
Hasan, Syed Shahzad	University of Huddersfield	United Kingdom	80	80	26
To, Kelvin Kai Wang	The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases	China	79	75	66
Kow, Chia Siang	International Medical University	Malaysia	77	77	23
Corman, Victor M.	Charité – Universitätsmedizin Berlin	Germany	77	58	50
Khunti, Kamlesh	College of Life Sciences	United Kingdom	77	75	44
Bragazzi, Nicola Luigi	York University	Canada	76	68	60
McKee, Martin	London School of Hygiene & Tropical Medicine	United Kingdom	76	72	29
Lechien, Jerome R.	Université de Mons	Belgium	76	74	50
Buonsenso, Danilo	Università Cattolica del Sacro Cuore, Campus di Roma	Italy	74	71	48
Lu, Hongzhou	Fudan University	China	73	68	60
Greninger, Alexander L.	Fred Hutchinson Cancer Research Center	United States	71	59	49
Memish, Ziad A.	Alfaisal University	Saudi Arabia	69	68	41
Eggo, Rosalind M.	London School of Hygiene & Tropical Medicine	United Kingdom	69	55	49
Hung, Ivan	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	68	66	57
Griffiths, Mark D.	Nottingham Trent University	United	67	66	45

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		Kingdom			
Koopmans, Marion P.G.	Erasmus MC	Netherlands	66	51	41
Chan, Jasper Fuk Woo	The University of Hong Kong Li Ka Shing Faculty of Medicine	China	65	61	58
Tiwari, Ruchi	College of Veterinary Science India	India	65	65	55
Fabbrocini, Gabriella	Università degli Studi di Napoli Federico II	Italy	63	63	20
Cowling, Benjamin J.	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	63	52	40
Saussez, Sven	Université de Mons	Belgium	63	61	39
Ohmagari, Norio	National Center for Global Health and Medicine	Japan	62	59	46
Joob, Beuy	Private Academic Practice	Thailand	62	62	3
Finsterer, Josef	Messerli Institute	Austria	62	62	9
Young, Barnaby Edward	Tan Tock Seng Hospital	Singapore	62	56	47
Bruno, Raffaele	Università degli Studi di Pavia	Italy	62	57	40
Jerome, Keith R.	Fred Hutchinson Cancer Research Center	United States	62	50	41
Harky, Amer	Liverpool Heart and Chest Hospital	United Kingdom	61	61	40
Netea, Mihai G.	Radboud University Nijmegen Medical Centre	Netherlands	61	46	38
Zangrillo, A.	IRCCS San Raffaele Scientific Institute	Italy	61	61	41
Plebani, Mario	Azienda Ospedale Università Padova	Italy	60	54	33
Alter, Galit	Massachusetts Institute of Technology	United States	60	42	37
Vaishya, Raju	Indraprastha Apollo Hospitals	India	60	60	37
Lye, David Chien Boon	Tan Tock Seng Hospital	Singapore	60	55	48

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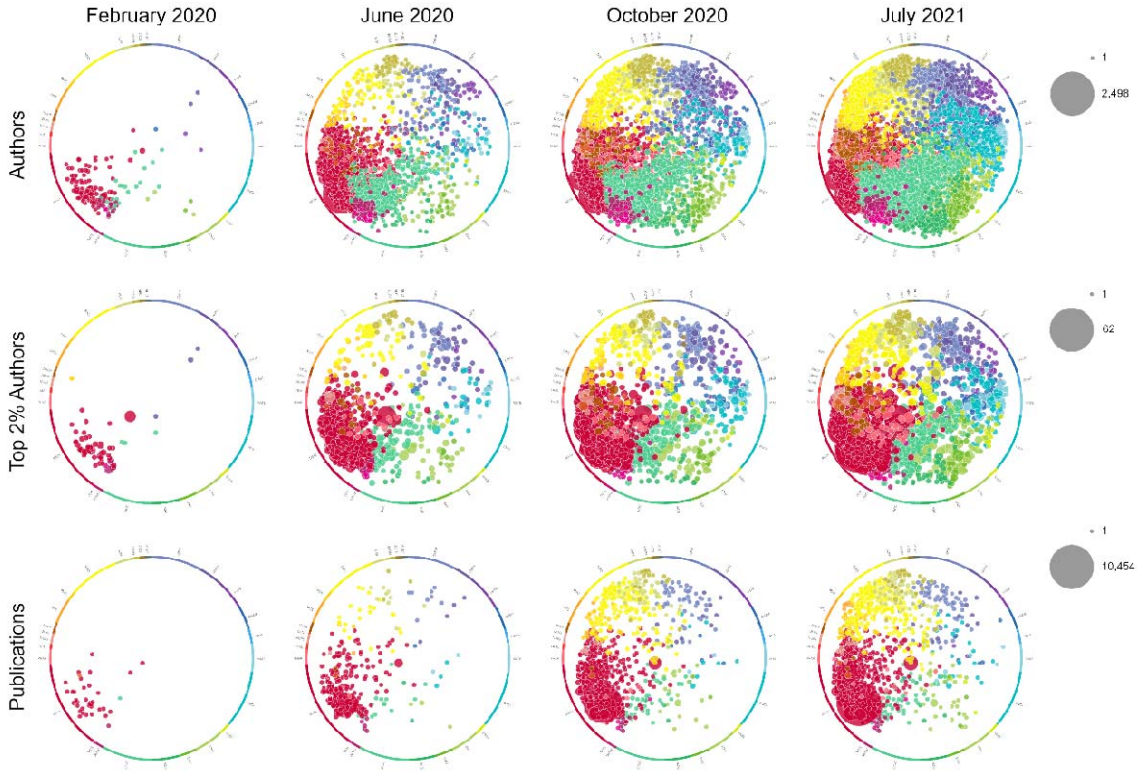

Figure 1 Topics of prominence for COVID-19 authors and publications. The columns represent the progress of the spread at 3 different measuring points: by end of February 2020, end of June 2020, end of October 2020 and end of July 2021. The first row represents the spread of authors of COVID-19 papers. The authors are assigned to their most dominant topic in their career. The data is filtered to include only topics with >=5 authors assigned. The second row shows similarly the topics of the top 2% authors by field 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. Of note, the author panels show more dispersed distributions than the publication topic panels, suggesting that several authors are moving out of their main career topics to publish on COVID-19.

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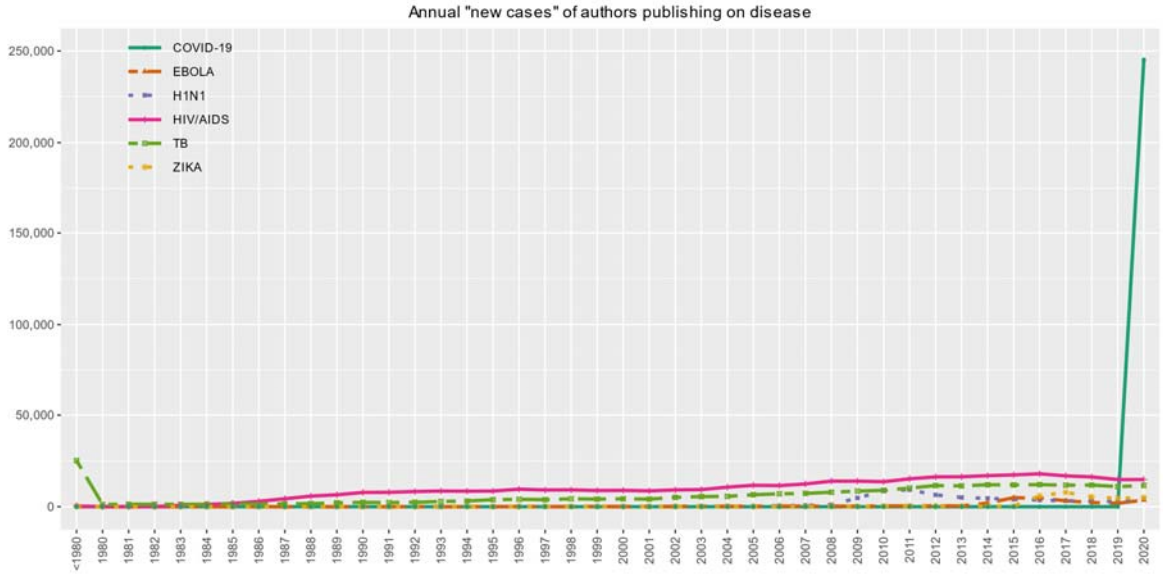
Panel A



Panel B

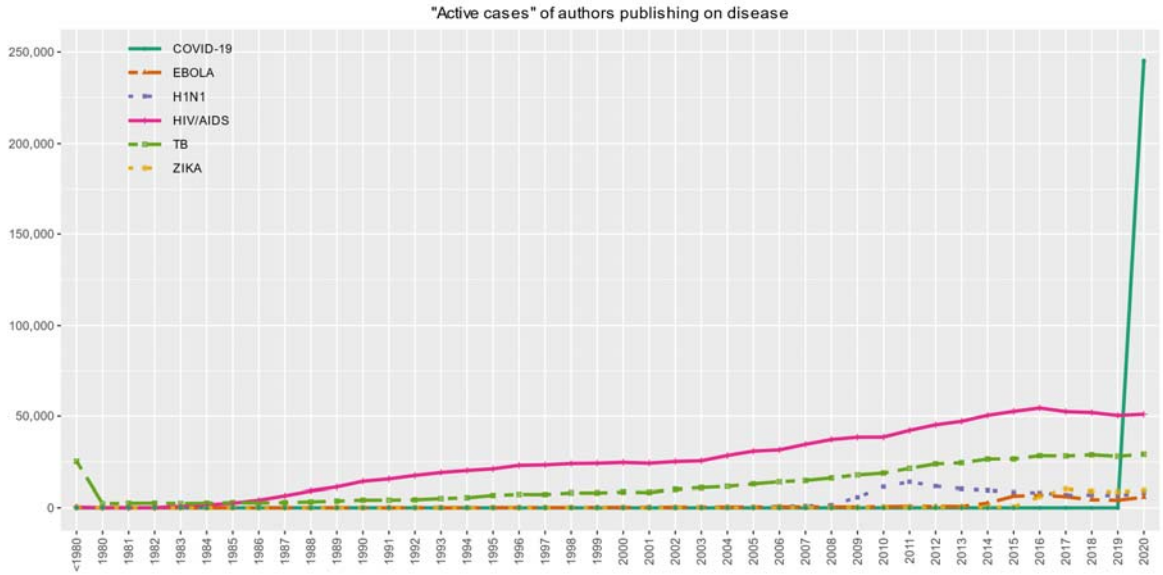


Figure 2. Authors publishing on different infectious diseases and COVID-19 every year among the approximately 8 million authors who have published at least 5 full papers by 2020. Panel A. New author “cases” per year (authors who publish for the first time on the respective topic, without having any previous publications on this same topic in previous years). Panel B. All active author “cases” per year (all authors who publish on the respective topic in each year, regardless of whether they have also published on the same topic in previous years or not).

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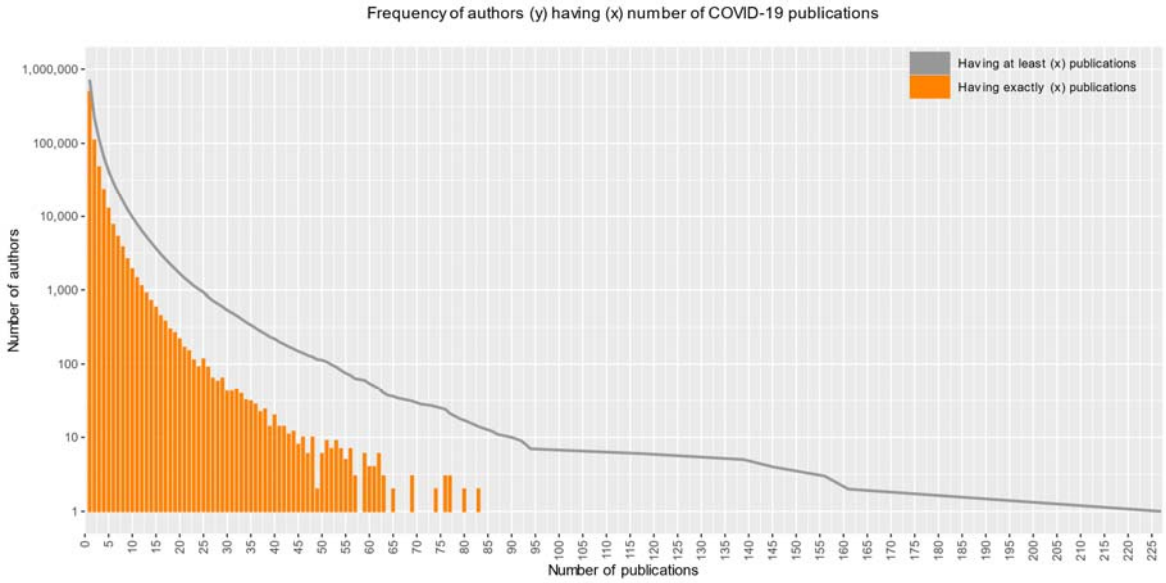

Figure 3. Frequency of authors according to the number of COVID-19 publications among the authors in Scopus with 5 or more publications in total on any topic.

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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 January 1, 2020 to August 1, 2021 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 July 2021. Of a total of 2,989,810 such authors, 211,894 had at least one published and indexed COVID-19 paper. The Table shows data on 2,987,454 and 211,685 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)	%
Clinical Medicine	Emergency & Critical Care Medicine	17450	6457	37.0%
Clinical Medicine	Anesthesiology	18365	6235	34.0%
Biomedical Research	Virology	31279	10069	32.2%
Public Health & Health Services	Epidemiology	3830	1176	30.7%
Philosophy & Theology	Applied Ethics	2696	819	30.4%
Clinical Medicine	Respiratory System	27030	7744	28.6%
Clinical Medicine	General & Internal Medicine	54981	15639	28.4%
Clinical Medicine	Allergy	7147	1978	27.7%
Information & Communication Technologies	Medical Informatics	6807	1854	27.2%
Public Health & Health Services	Public Health	31577	8220	26.0%
Clinical Medicine	Geriatrics	5129	1301	25.4%
Biomedical Research	Microbiology	80988	18518	22.9%
Clinical Medicine	Surgery	43798	9825	22.4%
Clinical Medicine	Environmental & Occupational Health	4607	1028	22.3%
Clinical Medicine	Psychiatry	32338	7073	21.9%
Public Health & Health Services	Health Policy & Services	9442	2055	21.8%
Clinical Medicine	Cardiovascular System & Hematology	84330	18264	21.7%
Clinical Medicine	Pediatrics	25686	5533	21.5%
Clinical Medicine	Arthritis & Rheumatology	17528	3766	21.5%
Clinical Medicine	General Clinical Medicine	5734	1224	21.3%
Economics & Business	Sport, Leisure & Tourism	4656	983	21.1%
Clinical Medicine	Tropical Medicine	15754	3298	20.9%
Public Health & Health Services	Gerontology	4879	1021	20.9%
Public Health & Health Services	Substance Abuse	6762	1392	20.6%
Public Health & Health Services	Nursing	19314	3899	20.2%

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Clinical Medicine	Urology & Nephrology	32902	6460	19.6%
Clinical Medicine	Otorhinolaryngology	16486	3179	19.3%
Clinical Medicine	Immunology	60939	11541	18.9%
Clinical Medicine	Gastroenterology & Hepatology	38200	7231	18.9%
Social Sciences	Demography	1536	285	18.6%
Enabling & Strategic Technologies	Bioinformatics	10688	1960	18.3%
Clinical Medicine	Dermatology & Venereal Diseases	19581	3551	18.1%
Psychology & Cognitive Sciences	Clinical Psychology	6288	1130	18.0%
Psychology & Cognitive Sciences	Social Psychology	10349	1797	17.4%
Economics & Business	Development Studies	2071	348	16.8%
Social Sciences	Social Work	3559	598	16.8%
Clinical Medicine	Obstetrics & Reproductive Medicine	33013	5197	15.7%
Economics & Business	Economics	23629	3712	15.7%
Social Sciences	Political Science & Public Administration	10721	1564	14.6%
Social Sciences	Information & Library Sciences	4355	622	14.3%
Clinical Medicine	Nuclear Medicine & Medical Imaging	44468	6295	14.2%
Clinical Medicine	Endocrinology & Metabolism	36724	5163	14.1%
Social Sciences	Law	4554	631	13.9%
Communication & Textual Studies	Communication & Media Studies	5888	815	13.8%
Economics & Business	Agricultural Economics & Policy	3001	415	13.8%
Clinical Medicine	Legal & Forensic Medicine	5364	740	13.8%
Social Sciences	Family Studies	1456	196	13.5%
Public Health & Health Services	Rehabilitation	12265	1576	12.8%
Economics & Business	Industrial Relations	1048	130	12.4%
Clinical Medicine	Complementary & Alternative Medicine	6006	744	12.4%
Mathematics & Statistics	Statistics & Probability	11867	1468	12.4%
Clinical Medicine	Neurology & Neurosurgery	139702	17148	12.3%
Clinical Medicine	Oncology & Carcinogenesis	157097	18969	12.1%
Clinical Medicine	Ophthalmology & Optometry	27337	3297	12.1%
Clinical Medicine	Pharmacology & Pharmacy	48853	5885	12.0%
Economics & Business	Business & Management	25629	3081	12.0%
Clinical Medicine	Sport Sciences	15621	1870	12.0%
Clinical Medicine	Pathology	8201	981	12.0%
Psychology & Cognitive Sciences	Developmental & Child Psychology	9494	1131	11.9%
Economics & Business	Finance	6730	801	11.9%
Biomedical Research	Nutrition & Dietetics	20195	2358	11.7%
Social Sciences	Sociology	4802	555	11.6%
Clinical Medicine	Dentistry	30160	3474	11.5%
Biomedical Research	Toxicology	22084	2498	11.3%
Social Sciences	Criminology	5429	611	11.3%
Psychology & Cognitive Sciences	General Psychology & Cognitive Sciences	1409	158	11.2%
Built Environment & Design	Urban & Regional Planning	5627	618	11.0%
Economics & Business	Econometrics	757	82	10.8%
Social Sciences	Science Studies	2135	227	10.6%
Biomedical Research	Biophysics	6854	714	10.4%
Information & Communication Technologies	Information Systems	7648	789	10.3%

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Social Sciences	Gender Studies	1060	109	10.3%
Clinical Medicine	Orthopedics	34468	3508	10.2%
Social Sciences	International Relations	3396	342	10.1%
Social Sciences	Education	34723	3476	10.0%
Economics & Business	Marketing	6675	657	9.8%
Biomedical Research	Developmental Biology	70598	6807	9.6%
Social Sciences	Geography	7930	747	9.4%
Psychology & Cognitive Sciences	Human Factors	6657	581	8.7%
Biomedical Research	Biochemistry & Molecular Biology	60891	5305	8.7%
Social Sciences	Social Sciences Methods	1237	107	8.6%
Biomedical Research	Genetics & Heredity	17049	1455	8.5%
Chemistry	Medicinal & Biomolecular Chemistry	38993	3317	8.5%
Psychology & Cognitive Sciences	Psychoanalysis	917	77	8.4%
Psychology & Cognitive Sciences	Experimental Psychology	15882	1309	8.2%
Economics & Business	Logistics & Transportation	12194	978	8.0%
Biomedical Research	Anatomy & Morphology	2479	194	7.8%
Economics & Business	Accounting	3027	234	7.7%
Engineering	Operations Research	13389	1030	7.7%
Historical Studies	History of Science, Technology & Medicine	904	67	7.4%
Enabling & Strategic Technologies	Strategic, Defence & Security Studies	8405	585	7.0%
Information & Communication Technologies	Artificial Intelligence & Image Processing	142567	9845	6.9%
Biomedical Research	Physiology	7784	528	6.8%
Agriculture, Fisheries & Forestry	Veterinary Sciences	23531	1524	6.5%
Historical Studies	Anthropology	3897	252	6.5%
Earth & Environmental Sciences	Meteorology & Atmospheric Sciences	35410	2248	6.3%
Philosophy & Theology	Religions & Theology	3158	198	6.3%
Earth & Environmental Sciences	Environmental Sciences	47276	2753	5.8%
Social Sciences	Cultural Studies	2536	146	5.8%
Mathematics & Statistics	Applied Mathematics	9353	530	5.7%
Engineering	Biomedical Engineering	25948	1457	5.6%
Economics & Business	Economic Theory	985	55	5.6%
Historical Studies	History of Social Sciences	920	50	5.4%
Public Health & Health Services	Speech-Language Pathology & Audiology	4797	252	5.3%
Visual & Performing Arts	Drama & Theater	425	22	5.2%
Physics & Astronomy	Fluids & Plasmas	22311	1135	5.1%
Biomedical Research	Mycology & Parasitology	11507	582	5.1%
Psychology & Cognitive Sciences	Behavioral Science & Comparative Psychology	5137	254	4.9%
Chemistry	Analytical Chemistry	42847	2074	4.8%
Visual & Performing Arts	Folklore	191	9	4.7%
Enabling & Strategic Technologies	Biotechnology	24957	1111	4.5%
Information & Communication Technologies	Software Engineering	8525	375	4.4%
Information & Communication Technologies	Distributed Computing	3886	167	4.3%

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Built Environment & Design	Architecture	471	20	4.2%
Biology	Evolutionary Biology	15692	664	4.2%
Built Environment & Design	Building & Construction	16833	703	4.2%
Biology	Ecology	34062	1415	4.2%
Physics & Astronomy	Mathematical Physics	2607	107	4.1%
Information & Communication Technologies	Computation Theory & Mathematics	10330	398	3.9%
Communication & Textual Studies	Languages & Linguistics	8025	301	3.8%
Physics & Astronomy	Chemical Physics	36046	1347	3.7%
Information & Communication Technologies	Networking & Telecommunications	79790	2943	3.7%
Mathematics & Statistics	Numerical & Computational Mathematics	7748	283	3.7%
Built Environment & Design	Design Practice & Management	3770	130	3.4%
Engineering	Geological & Geomatics Engineering	28983	990	3.4%
Philosophy & Theology	Philosophy	5071	162	3.2%
Engineering	Environmental Engineering	22962	721	3.1%
Chemistry	Organic Chemistry	56522	1724	3.1%
Agriculture, Fisheries & Forestry	Food Science	32581	966	3.0%
Visual & Performing Arts	Music	877	25	2.9%
Engineering	Industrial Engineering & Automation	45450	1249	2.7%
Chemistry	General Chemistry	15466	419	2.7%
Enabling & Strategic Technologies	Nanoscience & Nanotechnology	60423	1559	2.6%
Biomedical Research	Microscopy	1061	26	2.5%
Historical Studies	History	4672	112	2.4%
Communication & Textual Studies	Literary Studies	5129	114	2.2%
Visual & Performing Arts	Art Practice, History & Theory	630	14	2.2%
Agriculture, Fisheries & Forestry	Fisheries	17676	371	2.1%
Agriculture, Fisheries & Forestry	Dairy & Animal Science	28047	582	2.1%
Physics & Astronomy	Acoustics	12355	256	2.1%
Engineering	Chemical Engineering	27625	561	2.0%
Biology	Plant Biology & Botany	72793	1445	2.0%
Enabling & Strategic Technologies	Energy	99364	1939	2.0%
Information & Communication Technologies	Computer Hardware & Architecture	6762	131	1.9%
Biology	Marine Biology & Hydrobiology	22647	431	1.9%
Chemistry	Inorganic & Nuclear Chemistry	24930	452	1.8%
Biology	Ornithology	3069	52	1.7%
Chemistry	Polymers	36114	610	1.7%
Physics & Astronomy	Nuclear & Particle Physics	64338	1060	1.6%
Physics & Astronomy	General Physics	28868	425	1.5%
Agriculture, Fisheries & Forestry	Forestry	13055	190	1.5%
Biology	Zoology	8839	126	1.4%
Engineering	Mechanical Engineering & Transports	49806	703	1.4%
Mathematics & Statistics	General Mathematics	33053	445	1.3%
Biology	Entomology	13927	179	1.3%
Agriculture, Fisheries & Forestry	Agronomy & Agriculture	33649	429	1.3%
Engineering	Electrical & Electronic Engineering	40279	510	1.3%
Enabling & Strategic Technologies	Optoelectronics & Photonics	33331	412	1.2%
Historical Studies	Archaeology	7423	90	1.2%

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Physics & Astronomy	Optics	31997	385	1.2%
Earth & Environmental Sciences	Oceanography	7323	88	1.2%
Enabling & Strategic Technologies	Materials	113262	1110	1.0%
Engineering	Aerospace & Aeronautics	17493	163	0.9%
Engineering	Mining & Metallurgy	10209	95	0.9%
Physics & Astronomy	Astronomy & Astrophysics	27036	251	0.9%
Physics & Astronomy	Applied Physics	96801	893	0.9%
Earth & Environmental Sciences	Geochemistry & Geophysics	41248	367	0.9%
Engineering	Civil Engineering	23294	203	0.9%
Chemistry	Physical Chemistry	15280	126	0.8%
Agriculture, Fisheries & Forestry	Horticulture	2327	19	0.8%
Historical Studies	Classics	989	8	0.8%
Earth & Environmental Sciences	Paleontology	11219	63	0.6%
Earth & Environmental Sciences	Geology	6440	23	0.4%
Engineering	Automobile Design & Engineering	543	1	0.2%

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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)	%
Clinical Medicine	Emergency & Critical Care Medicine	523	337	64.4%
Philosophy & Theology	Applied Ethics	83	50	60.2%
Clinical Medicine	Allergy	256	151	59.0%
Biomedical Research	Virology	992	549	55.3%
Clinical Medicine	Geriatrics	169	87	51.5%
Information & Communication Technologies	Medical Informatics	214	108	50.5%
Clinical Medicine	Respiratory System	933	469	50.3%
Clinical Medicine	General & Internal Medicine	2554	1277	50.0%
Clinical Medicine	General Clinical Medicine	214	103	48.1%
Economics & Business	Sport, Leisure & Tourism	118	55	46.6%
Public Health & Health Services	Public Health	924	416	45.0%
Public Health & Health Services	Health Policy & Services	313	138	44.1%
Clinical Medicine	Arthritis & Rheumatology	522	230	44.1%
Clinical Medicine	Cardiovascular System & Hematology	2974	1304	43.8%
Public Health & Health Services	Gerontology	157	66	42.0%
Clinical Medicine	Tropical Medicine	471	197	41.8%
Clinical Medicine	Gastroenterology & Hepatology	1380	554	40.1%
Public Health & Health Services	Epidemiology	150	60	40.0%
Clinical Medicine	Surgery	1499	579	38.6%
Clinical Medicine	Immunology	2019	771	38.2%
Clinical Medicine	Psychiatry	1100	416	37.8%
Clinical Medicine	Dermatology & Venereal Diseases	678	255	37.6%
Clinical Medicine	Anesthesiology	660	248	37.6%
Enabling & Strategic Technologies	Bioinformatics	337	124	36.8%
Clinical Medicine	Pediatrics	865	311	36.0%
Clinical Medicine	Environmental & Occupational Health	212	76	35.8%
Public Health & Health Services	Substance Abuse	221	77	34.8%
Biomedical Research	Microbiology	2430	827	34.0%
Economics & Business	Agricultural Economics & Policy	99	33	33.3%

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Psychology & Cognitive Sciences	Clinical Psychology	249	83	33.3%
Economics & Business	Development Studies	64	21	32.8%
Clinical Medicine	Urology & Nephrology	1147	366	31.9%
Public Health & Health Services	Nursing	1135	357	31.5%
Clinical Medicine	Complementary & Alternative Medicine	156	47	30.1%
Psychology & Cognitive Sciences	Social Psychology	298	88	29.5%
Clinical Medicine	Otorhinolaryngology	522	153	29.3%
Clinical Medicine	Obstetrics & Reproductive Medicine	1186	345	29.1%
Clinical Medicine	Endocrinology & Metabolism	1254	364	29.0%
Public Health & Health Services	Rehabilitation	357	98	27.5%
Mathematics & Statistics	Statistics & Probability	297	80	26.9%
Communication & Textual Studies	Communication & Media Studies	164	44	26.8%
Clinical Medicine	Oncology & Carcinogenesis	4188	1118	26.7%
Clinical Medicine	Nuclear Medicine & Medical Imaging	1453	372	25.6%
Social Sciences	Social Work	105	26	24.8%
Clinical Medicine	Pathology	303	74	24.4%
Social Sciences	Political Science & Public Administration	286	69	24.1%
Clinical Medicine	Sport Sciences	424	101	23.8%
Social Sciences	Geography	257	60	23.3%
Social Sciences	Science Studies	60	14	23.3%
Clinical Medicine	Pharmacology & Pharmacy	1570	363	23.1%
Economics & Business	Economics	623	144	23.1%
Clinical Medicine	Ophthalmology & Optometry	928	211	22.7%
Social Sciences	Family Studies	44	10	22.7%
Chemistry	Medicinal & Biomolecular Chemistry	1255	283	22.5%
Social Sciences	Information & Library Sciences	142	32	22.5%
Biomedical Research	Nutrition & Dietetics	616	138	22.4%
Clinical Medicine	Legal & Forensic Medicine	180	40	22.2%
Information & Communication Technologies	Information Systems	296	64	21.6%
Social Sciences	Sociology	136	29	21.3%
Clinical Medicine	Neurology & Neurosurgery	4332	923	21.3%
Psychology & Cognitive Sciences	Human Factors	226	48	21.2%
Economics & Business	Industrial Relations	33	7	21.2%
Economics & Business	Business & Management	714	150	21.0%
Psychology & Cognitive Sciences	Developmental & Child Psychology	312	64	20.5%
Clinical Medicine	Dentistry	857	172	20.1%
Economics & Business	Logistics & Transportation	384	77	20.1%
Social Sciences	Demography	40	8	20.0%
Enabling & Strategic Technologies	Strategic, Defence & Security	264	52	19.7%

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	Studies			
Built Environment & Design	Urban & Regional Planning	155	30	19.4%
Biomedical Research	Genetics & Heredity	539	102	18.9%
Biomedical Research	Toxicology	719	134	18.6%
Historical Studies	History of Science, Technology & Medicine	27	5	18.5%
Biomedical Research	Developmental Biology	2051	379	18.5%
Clinical Medicine	Orthopedics	894	165	18.5%
Economics & Business	Marketing	198	36	18.2%
Social Sciences	Cultural Studies	68	12	17.6%
Psychology & Cognitive Sciences	General Psychology & Cognitive Sciences	47	8	17.0%
Biomedical Research	Biophysics	263	44	16.7%
Psychology & Cognitive Sciences	Psychoanalysis	30	5	16.7%
Social Sciences	Law	128	21	16.4%
Agriculture, Fisheries & Forestry	Veterinary Sciences	702	115	16.4%
Economics & Business	Economic Theory	19	3	15.8%
Biomedical Research	Biochemistry & Molecular Biology	2381	372	15.6%
Earth & Environmental Sciences	Environmental Sciences	1267	194	15.3%
Engineering	Operations Research	400	61	15.3%
Social Sciences	Criminology	172	26	15.1%
Economics & Business	Accounting	80	12	15.0%
Biomedical Research	Physiology	315	47	14.9%
Information & Communication Technologies	Distributed Computing	149	22	14.8%
Physics & Astronomy	Fluids & Plasmas	778	113	14.5%
Earth & Environmental Sciences	Meteorology & Atmospheric Sciences	1048	150	14.3%
Information & Communication Technologies	Artificial Intelligence & Image Processing	4233	599	14.2%
Biomedical Research	Mycology & Parasitology	327	46	14.1%
Chemistry	Analytical Chemistry	1500	198	13.2%
Biology	Evolutionary Biology	444	57	12.8%
Economics & Business	Finance	175	22	12.6%
Mathematics & Statistics	Applied Mathematics	275	34	12.4%
Social Sciences	Education	1007	121	12.0%
Biomedical Research	Anatomy & Morphology	75	9	12.0%
Engineering	Biomedical Engineering	972	116	11.9%
Enabling & Strategic Technologies	Biotechnology	784	89	11.4%
Psychology & Cognitive Sciences	Experimental Psychology	439	49	11.2%
Economics & Business	Econometrics	18	2	11.1%
Historical Studies	Anthropology	117	13	11.1%
Social Sciences	International Relations	102	11	10.8%
Built Environment & Design	Building & Construction	484	52	10.7%
Social Sciences	Gender Studies	28	3	10.7%

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Biology	Ecology	922	96	10.4%
Information & Communication Technologies	Software Engineering	338	35	10.4%
Enabling & Strategic Technologies	Nanoscience & Nanotechnology	1720	170	9.9%
Information & Communication Technologies	Networking & Telecommunications	2748	269	9.8%
Philosophy & Theology	Religions & Theology	98	9	9.2%
Visual & Performing Arts	Drama & Theater	11	1	9.1%
Public Health & Health Services	Speech-Language Pathology & Audiology	150	13	8.7%
Engineering	Industrial Engineering & Automation	1562	134	8.6%
Philosophy & Theology	Philosophy	133	11	8.3%
Communication & Textual Studies	Languages & Linguistics	220	18	8.2%
Agriculture, Fisheries & Forestry	Food Science	846	63	7.4%
Physics & Astronomy	Chemical Physics	1286	94	7.3%
Agriculture, Fisheries & Forestry	Fisheries	443	32	7.2%
Historical Studies	Archaeology	198	14	7.1%
Historical Studies	History	101	7	6.9%
Engineering	Environmental Engineering	751	52	6.9%
Engineering	Geological & Geomatics Engineering	815	56	6.9%
Chemistry	Organic Chemistry	2037	133	6.5%
Built Environment & Design	Architecture	16	1	6.3%
Physics & Astronomy	Mathematical Physics	83	5	6.0%
Information & Communication Technologies	Computer Hardware & Architecture	288	17	5.9%
Mathematics & Statistics	Numerical & Computational Mathematics	223	13	5.8%
Communication & Textual Studies	Literary Studies	160	9	5.6%
Enabling & Strategic Technologies	Energy	3438	193	5.6%
Engineering	Chemical Engineering	941	51	5.4%
Built Environment & Design	Design Practice & Management	139	7	5.0%
Biology	Entomology	417	21	5.0%
Biology	Marine Biology & Hydrobiology	621	30	4.8%
Chemistry	Polymers	1371	63	4.6%
Biology	Ornithology	90	4	4.4%
Biology	Plant Biology & Botany	1951	80	4.1%
Agriculture, Fisheries & Forestry	Agronomy & Agriculture	835	34	4.1%
Agriculture, Fisheries & Forestry	Dairy & Animal Science	699	28	4.0%
Engineering	Mechanical Engineering & Transports	1512	59	3.9%
Physics & Astronomy	Optics	1080	38	3.5%
Engineering	Electrical & Electronic Engineering	1554	53	3.4%
Physics & Astronomy	Acoustics	417	14	3.4%
Chemistry	General Chemistry	479	16	3.3%

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Information & Communication Technologies	Computation Theory & Mathematics	275	9	3.3%
Chemistry	Inorganic & Nuclear Chemistry	940	30	3.2%
Mathematics & Statistics	General Mathematics	862	27	3.1%
Social Sciences	Social Sciences Methods	32	1	3.1%
Physics & Astronomy	General Physics	1020	31	3.0%
Visual & Performing Arts	Music	33	1	3.0%
Engineering	Civil Engineering	708	19	2.7%
Physics & Astronomy	Astronomy & Astrophysics	822	22	2.7%
Agriculture, Fisheries & Forestry	Forestry	403	10	2.5%
Enabling & Strategic Technologies	Optoelectronics & Photonics	1289	31	2.4%
Physics & Astronomy	Applied Physics	3718	85	2.3%
Biomedical Research	Microscopy	45	1	2.2%
Enabling & Strategic Technologies	Materials	3855	77	2.0%
Biology	Zoology	207	4	1.9%
Chemistry	Physical Chemistry	505	9	1.8%
Psychology & Cognitive Sciences	Behavioral Science & Comparative Psychology	169	3	1.8%
Physics & Astronomy	Nuclear & Particle Physics	2112	35	1.7%
Engineering	Mining & Metallurgy	370	6	1.6%
Earth & Environmental Sciences	Paleontology	317	5	1.6%
Earth & Environmental Sciences	Geochemistry & Geophysics	1206	19	1.6%
Engineering	Aerospace & Aeronautics	650	10	1.5%
Earth & Environmental Sciences	Oceanography	201	3	1.5%
Earth & Environmental Sciences	Geology	203	1	0.5%
Visual & Performing Arts	Art Practice, History & Theory	12	0	0.0%
Engineering	Automobile Design & Engineering	27	0	0.0%
Historical Studies	Classics	27	0	0.0%
Visual & Performing Arts	Folklore	3	0	0.0%
Historical Studies	History of Social Sciences	25	0	0.0%
Agriculture, Fisheries & Forestry	Horticulture	64	0	0.0%

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Supplementary Table 3. Scientists with highest composite citation indicator based on their COVID-19 publications indexed in Scopus as of August 1, 2021 (in order of ranking per the composite indicator).

AUTHOR	INSTITUTION	COUNTRY	MOST COMMON SUBFIELD	SECOND MOST COMMON SUBFIELD
Lu, Hongzhou	Fudan University	China	Microbiology	Oncology & Carcinogenesis
Henry, Brandon Michael	Cincinnati Children's Hospital Medical Center	United States	Surgery	Cardiovascular System & Hematology
Thachil, Jecko	The University of Manchester	United Kingdom	Cardiovascular System & Hematology	Immunology
Lippi, Giuseppe	Università degli Studi di Verona	Italy	General Clinical Medicine	Cardiovascular System & Hematology
Krammer, Florian	Icahn School of Medicine at Mount Sinai	United States	Virology	Immunology
Tang, Ning	Tongji Medical College	China	Cardiovascular System & Hematology	General Clinical Medicine
Elfiky, Abdo A.	Cairo University	Egypt	Virology	Biophysics
Lipsitch, Marc	Harvard T.H. Chan School of Public Health	United States	Microbiology	Epidemiology
Perlman, Stanley	University of Iowa	United States	Virology	Immunology
Ludvigsson, Jonas F.	Karolinska Institutet	Sweden	Gastroenterology & Hepatology	General & Internal Medicine
Graham, Barney S.	National Institute of Allergy and Infectious Diseases (NIAID)	United States	Immunology	Virology
Yancy, Clyde	Northwestern University Feinberg School of Medicine	United States	Cardiovascular System & Hematology	General & Internal Medicine
Ivanov, Dmitry	Hochschule für Wirtschaft und Recht Berlin	Germany	Operations Research	Industrial Engineering & Automation
Guan, Wei Jie	Guangzhou Medical University	China	Respiratory System	Oncology & Carcinogenesis
Jiang, Shibo	Fudan University	China	Microbiology	Developmental Biology
Chan, Jasper Fuk Woo	The University of Hong Kong Li Ka Shing Faculty of Medicine	China	Microbiology	Virology
Baig, Abdul Mannan	The Aga Khan University	Pakistan	Neurology & Neurosurgery	Microbiology
Cao, Bin	China-Japan Friendship Hospital	China	Microbiology	Respiratory System
Schwartz, David A.	Medical College of Georgia	United States	Pathology	Microbiology
Rajkumar, Ravi Philip	Jawaharlal Institute of Postgraduate Medical Education and Research	India	Psychiatry	Pharmacology & Pharmacy
Rodriguez-Morales, Alfonso J.	Fundación Universitaria Autónoma de las Américas	Colombia	Microbiology	Tropical Medicine
Cook, T. M.	Royal United Hospitals Bath NHS Foundation Trust	United Kingdom	Anesthesiology	General & Internal Medicine
Banerjee, Debanjan	National Institute of Mental Health and Neuro Sciences	India	Psychiatry	Experimental Psychology
Iwasaki, A.	Yale School of Medicine	United States	Immunology	Developmental Biology
Lee, Sherman A.	Christopher Newport University	United States	Social Psychology	Clinical Psychology
Baric, Ralph S.	The University of North Carolina at Chapel Hill	United States	Virology	Microbiology
Rezaei, Nima	Research Center for Immunodeficiencies	Iran	Immunology	Allergy
Heymann, David	London School of Hygiene & Tropical Medicine	United Kingdom	Tropical Medicine	Microbiology

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To, Kelvin Kai Wang	The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases	China	Microbiology	Virology
Greenhalgh, Trisha	University of Oxford Medical Sciences Division	United Kingdom	General & Internal Medicine	Public Health
Huang, Chaolin	Wuhan Jinyintan Hospital	China	Immunology	General & Internal Medicine
Gostin, Lawrence O.	Georgetown Law	United States	Applied Ethics	General & Internal Medicine
Ioannidis, John P.A.	Stanford University School of Medicine	United States	General & Internal Medicine	Epidemiology
Kanne, Jeffrey P.	University of Wisconsin School of Medicine and Public Health	United States	Nuclear Medicine & Medical Imaging	Respiratory System
Levi, Marcel	University College London Hospitals NHS Foundation Trust	United Kingdom	Cardiovascular System & Hematology	General & Internal Medicine
Greenberg, Neil	King's College London	United Kingdom	Psychiatry	Environmental & Occupational Health
McKee, Martin	London School of Hygiene & Tropical Medicine	United Kingdom	General & Internal Medicine	Public Health
Wilder-Smith, Annelies	London School of Hygiene & Tropical Medicine	United Kingdom	Tropical Medicine	Microbiology
Koopmans, Marion P.G.	Erasmus MC	Netherlands	Microbiology	Virology
Coccia, M.	Consiglio Nazionale delle Ricerche	Italy	Business & Management	Science Studies
D'Antiga, Lorenzo	Papa Giovanni XXIII Hospital	Italy	Gastroenterology & Hepatology	Surgery
Zhou, Peng	Wuhan Institute of Virology Chinese Academy of Sciences	China	Virology	Microbiology
Al-Tawfiq, Jaffar A.	Johns Hopkins Aramco Healthcare	Saudi Arabia	Microbiology	Tropical Medicine
Singhal, Tanu	Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute	India	Pediatrics	Microbiology
Recalcati, Sebastiano	Azienda Ospedaliera Ospedale Di Lecco	Italy	Dermatology & Venereal Diseases	Immunology
Cowling, Benjamin J.	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Microbiology	General & Internal Medicine
Wu, Joseph T.	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Microbiology	General & Internal Medicine
Kalil, Andre C.	University of Nebraska Medical Center	United States	Microbiology	Surgery
Grasselli, Giacomo	Università degli Studi di Milano	Italy	Emergency & Critical Care Medicine	Anesthesiology
Li, Taisheng	Peking Union Medical College Hospital	China	Virology	Oncology & Carcinogenesis
Fauci, Anthony S.	National Institute of Allergy and Infectious Diseases (NIAID)	United States	Immunology	General & Internal Medicine
Gurwitz, David	Tel Aviv University, Sackler Faculty of Medicine	Israel	Pharmacology & Pharmacy	Biochemistry & Molecular Biology
Mehra, Mandeep R.	Brigham and Women's Hospital	United States	Cardiovascular System & Hematology	Surgery
Zhao, Shi	Chinese University of Hong Kong	Hong Kong	Microbiology	Tropical Medicine
Corman, Victor M.	Charité – Universitätsmedizin Berlin	Germany	Microbiology	Virology
Young, Barnaby Edward	Tan Tock Seng Hospital	Singapore	Microbiology	General & Internal Medicine
Tobias, Aurelio	CSIC - Instituto de Diagnostico Ambiental y Estudios del Agua (IDAEA)	Spain	Toxicology	Environmental Sciences
Atangana, A.	University of the Free State	South Africa	Applied Mathematics	Mathematical Physics
Plebani, Mario	Azienda Ospedale Università Padova	Italy	General Clinical Medicine	Cardiovascular System & Hematology
Pal, Rimesh	Postgraduate Institute of Medical Education & Research, Chandigarh	India	Endocrinology & Metabolism	General & Internal Medicine
Hoffmann, Markus	Deutsches Primatenzentrum	Germany	Virology	Developmental Biology

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Buonsenso, Danilo	Università Cattolica del Sacro Cuore, Campus di Roma	Italy	Pediatrics	Nuclear Medicine & Medical Imaging
Gautret, Philippe	Aix Marseille Université	France	Microbiology	Tropical Medicine
Leung, Gabriel M.	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Epidemiology	General & Internal Medicine
Singh, Awadhesh Kumar	G.D Hospital & Diabetes Institute	India	Endocrinology & Metabolism	Pharmacology & Pharmacy
Taylor, Steven	The University of British Columbia	Canada	Clinical Psychology	Psychiatry
Zhou, Fei	China-Japan Friendship Hospital	China	Respiratory System	Microbiology
Misra, Anoop	Diabetes Foundation (India), New Delhi	India	Endocrinology & Metabolism	Nutrition & Dietetics
Koh, David	Universiti Brunei Darussalam	Brunei Darussalam	Environmental & Occupational Health	General & Internal Medicine
Bourouiba, Lydia	Massachusetts Institute of Technology	United States	Fluids & Plasmas	Evolutionary Biology
Becker, Richard C.	University of Cincinnati College of Medicine	United States	Cardiovascular System & Hematology	General & Internal Medicine
Angus, Derek C.	University of Pittsburgh School of Medicine	United States	General & Internal Medicine	Emergency & Critical Care Medicine
Liang, Wenhua	Guangzhou Medical University	China	Oncology & Carcinogenesis	Surgery
Phelan, Alexandra L.	Georgetown University	United States	General & Internal Medicine	Applied Ethics
Hung, Ivan	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Microbiology	Gastroenterology & Hepatology
Munster, Vincent J.	NIAID Rocky Mountain Laboratories	United States	Virology	Microbiology
Lai, Chih Cheng	Veterans General Hospital-Kaohsiung Taiwan	Taiwan	Microbiology	Arthritis & Rheumatology
Klompas, Michael	Brigham and Women's Hospital	United States	Epidemiology	Microbiology
Tandon, Rajiv	Western Michigan University Homer Stryker M.D. School of Medicine	United States	Psychiatry	Neurology & Neurosurgery
Wiwanitkit, Viroj	Dr. D.Y. Patil Vidyapeeth Deemed University, Pune	India	Tropical Medicine	General & Internal Medicine
Sher, Leo	Icahn School of Medicine at Mount Sinai	United States	Psychiatry	Public Health
Goodell, John W.	University of Akron	United States	Finance	Business & Management
Lechien, Jerome R.	Université de Mons	Belgium	Otorhinolaryngology	Speech-Language Pathology & Audiology
Wang, Chen	Chinese Academy of Medical Sciences & Peking Union Medical College	China	Respiratory System	General & Internal Medicine
Kucharski, Adam J.	London School of Hygiene & Tropical Medicine	United Kingdom	Microbiology	General & Internal Medicine
Xiang, Yu Tao	University of Macau	China	Psychiatry	Nursing
Guarner, Jeannette	Emory University School of Medicine	United States	Pathology	Microbiology
Ho, Cyrus S.H.	Yong Loo Lin School of Medicine	Singapore	Toxicology	Psychiatry
Huynh, Toan Luu Duc	WHU - Otto Beisheim School of Management	Germany	Economics	Finance
Larson, Heidi J.	London School of Hygiene & Tropical Medicine	United Kingdom	Virology	Public Health
Brodin, Petter	Karolinska Institutet	Sweden	Immunology	Developmental Biology
Raoult, Didier	Aix Marseille Université	France	Microbiology	Tropical Medicine
Curigliano, Giuseppe	Università degli Studi di Milano	Italy	Oncology & Carcinogenesis	Pharmacology & Pharmacy
Galea, Sandro	School of Public Health	United States	Public Health	Psychiatry

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Ratten, Vanessa	La Trobe Business School	Australia	Business & Management	Marketing
Zhong, Nan shan	Guangzhou Medical University	China	Respiratory System	Oncology & Carcinogenesis
Mukhtar, Sonia	University of Management and Technology Lahore	Pakistan	Gender Studies	Sociology
Colson, Philippe	Aix Marseille Université	France	Microbiology	Virology
Nkengasong, John N.	Africa Centres for Disease Control and Prevention	Ethiopia	Virology	Microbiology
Dhama, Kuldeep	Indian Veterinary Research Institute	India	Dairy & Animal Science	Veterinary Sciences
Liu, Yingxia	Second Affiliated Hospital of Southern University of Science and Technology	China	Virology	Microbiology
Yuen, Kwok Yung	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Microbiology	Virology
Naveen, Vankadari	Faculty of Medicine, Nursing and Health Sciences	Australia	Biochemistry & Molecular Biology	Physical Chemistry
Cheng, V. C.C.	Queen Mary Hospital Hong Kong	Hong Kong	Microbiology	Epidemiology
Khunti, Kamlesh	College of Life Sciences	United Kingdom	Endocrinology & Metabolism	General & Internal Medicine
Wu, Zun You	Chinese Center for Disease Control and Prevention	China	Public Health	Virology
Hui, David S.C.	Chinese University of Hong Kong	Hong Kong	Respiratory System	Microbiology
Liu, Jia	Tongji Medical College	China	Virology	Immunology
Gautam, Sneha	Karunya Institute of Technology and Sciences	India	Environmental Sciences	Ecology
Rubin, G. James	King's College London	United Kingdom	Psychiatry	Public Health
Vaishya, Raju	Indraprastha Apollo Hospitals	India	Orthopedics	General & Internal Medicine
Kraemer, Moritz U.G.	University of Oxford	United Kingdom	Tropical Medicine	Microbiology
Tang, Julian W.	University of Leicester	United Kingdom	Microbiology	Virology
Xiong, Yong	Zhongnan Hospital of Wuhan University	China	Microbiology	Virology
Tobin, Martin J.	Loyola University of Chicago	United States	Respiratory System	Emergency & Critical Care Medicine
Phan, Tung	University of Pittsburgh Medical Center	United States	Virology	Microbiology
Wang, Yeming	China-Japan Friendship Hospital	China	Microbiology	General & Internal Medicine
Bikdeli, Behnood	Cardiovascular Research Foundation	United States	Cardiovascular System & Hematology	General & Internal Medicine
Mamun, Md Abdullah Al	Centre for Health Innovation, Networking, Training, Action and Research - Bangladesh	Bangladesh	Psychiatry	Nursing
Connors, Jean M.	Harvard Medical School	United States	Cardiovascular System & Hematology	Immunology
Volkow, Nora D.	National Institute on Alcohol Abuse and Alcoholism (NIAAA)	United States	Neurology & Neurosurgery	Psychiatry
Liu, Lei	Second Affiliated Hospital of Southern University of Science and Technology	China	Microbiology	Immunology
Wichmann, Dominic	Universitätsklinikum Hamburg-Eppendorf	Germany	Emergency & Critical Care Medicine	Microbiology
Wang, Xinghuan	Zhongnan Hospital of Wuhan University	China	Oncology & Carcinogenesis	Biochemistry & Molecular Biology
Asmundson, Gordon J.G.	University of Regina	Canada	Clinical Psychology	Psychiatry
Baden, Lindsey R.	Brigham and Women's Hospital	United States	Microbiology	General & Internal Medicine
Hotez, Peter J.	Baylor College of Medicine	United States	Tropical Medicine	Mycology & Parasitology
van Vugt, Michèle	Universiteit van Amsterdam	Netherlands	Tropical Medicine	Microbiology

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Walls, Alexandra C.	University of Washington	United States	Developmental Biology	Biophysics
Wrapp, Daniel	The University of Texas at Austin	United States	Virology	Developmental Biology
Galanakis, Charis M.	Galanakis Laboratories	Greece	Food Science	Biotechnology
Brufsky, Adam	UPMC Hillman Cancer Center	United States	Oncology & Carcinogenesis	Pathology
Shi, Yuan	Children's Hospital of Chongqing Medical University	China	Pediatrics	Neurology & Neurosurgery
Poland, Gregory A.	Mayo Clinic	United States	Virology	Immunology
van Doremalen, Neeltje	NIAID Rocky Mountain Laboratories	United States	Virology	Microbiology
Du, Ronghui	Wuhan First Hospital	China	Respiratory System	Immunology
Hopkins, Claire	Guy's and St Thomas' NHS Foundation Trust	United Kingdom	Otorhinolaryngology	General & Internal Medicine
Bragazzi, Nicola Luigi	York University	Canada	General & Internal Medicine	Toxicology
Wang, Fusheng	General Hospital of People's Liberation Army	China	Gastroenterology & Hepatology	Immunology
Mizumoto, Kenji	Graduate School of Advanced Integrated Studies in Human Survivability	Japan	Microbiology	Bioinformatics
Kim, Jin Yong	Incheon Medical Center	South Korea	General & Internal Medicine	Microbiology
Zhang, Wei	Beijing Ditan Hospital Capital Medical University	China	Virology	Microbiology
Ren, Lili	Institute of Pathogen Biology, Chinese Academy of Medical Sciences & Peking Union Medical College	China	Microbiology	Virology
Xu, Zhe	General Hospital of People's Liberation Army	China	Microbiology	Oncology & Carcinogenesis
Wang, Dawei	Zhongnan Hospital of Wuhan University	China	Emergency & Critical Care Medicine	General & Internal Medicine
Carr, Anitra C.	University of Otago, Christchurch	New Zealand	Nutrition & Dietetics	Biochemistry & Molecular Biology
Iacobellis, Gianluca	University of Miami Leonard M. Miller School of Medicine	United States	Endocrinology & Metabolism	Cardiovascular System & Hematology
Sohrabi, Catrin	The Royal London Hospital	United Kingdom	Surgery	General & Internal Medicine
Chung, Michael	Icahn School of Medicine at Mount Sinai	United States	Nuclear Medicine & Medical Imaging	Respiratory System
Zhu, Na	Chinese Center for Disease Control and Prevention	China	Virology	Microbiology
Leung, Kathy	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Microbiology	General & Internal Medicine
Lu, Roujian	Chinese Center for Disease Control and Prevention	China	Virology	Microbiology
Shi, Heshui	Tongji Medical College	China	Nuclear Medicine & Medical Imaging	Oncology & Carcinogenesis
Horby, Peter W.	Nuffield Department of Medicine	United Kingdom	Microbiology	General & Internal Medicine
Wang, Wenling	Chinese Center for Disease Control and Prevention	China	Virology	Microbiology
Ashraf, Badar Nadeem	Jiangxi University of Finance and EcoNomics	China	Finance	Economics
Varga, Zsuzsanna	UniversitatsSpital Zurich	Switzerland	Oncology & Carcinogenesis	Pathology
Lu, Xiaoxia	Tongji Medical College	China	Pediatrics	Neurology & Neurosurgery
Stebbing, Justin	Imperial College London	United Kingdom	Oncology & Carcinogenesis	Immunology
Asadi-Pooya, Ali A.	Shiraz University of Medical Sciences	United	Neurology &	General & Internal Medicine

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		States	Neurosurgery	
Mehta, Puja	University College London Hospitals NHS Foundation Trust	United Kingdom	Arthritis & Rheumatology	Immunology
Qiao, Jie	Peking University Third Hospital	China	Obstetrics & Reproductive Medicine	Oncology & Carcinogenesis
Lee, Vernon J.M.	Ministry of Health, Government of Singapore	Singapore	Microbiology	Virology
Hellewell, Joel	London School of Hygiene & Tropical Medicine	United Kingdom	General & Internal Medicine	Microbiology
Casadevall, Arturo	Johns Hopkins Bloomberg School of Public Health	United States	Microbiology	Immunology
Amanat, Fatima	Icahn School of Medicine at Mount Sinai	United States	Microbiology	Immunology
Morawska, L.	Queensland University of Technology	Australia	Environmental Sciences	Meteorology & Atmospheric Sciences
Petersen, Eskild	Aarhus Universitet	Denmark	Microbiology	Tropical Medicine
de Wit, Emmie	NIAID Rocky Mountain Laboratories	United States	Virology	Microbiology
del Rio, Carlos	Emory University	United States	Virology	Public Health
Poon, Leo L.M.	The University of Hong Kong Li Ka Shing Faculty of Medicine	Hong Kong	Virology	Microbiology
Helms, Julie	Les Hôpitaux Universitaires de Strasbourg	France	Emergency & Critical Care Medicine	Neurology & Neurosurgery
Coulthard, P.	?Queen Mary University London	United Kingdom	Dentistry	General & Internal Medicine
Griffiths, Mark D.	Nottingham Trent University	United Kingdom	Substance Abuse	Psychiatry
Brooks, Samantha K.	King's College London	United Kingdom	Psychiatry	General & Internal Medicine
Bhopal, Raj S.	Edinburgh Medical School	United Kingdom	Public Health	General & Internal Medicine
Zangrillo, A.	IRCCS San Raffaele Scientific Institute	Italy	Anesthesiology	Emergency & Critical Care Medicine
Sette, Alessandro	La Jolla Institute for Immunology	United States	Immunology	Virology
Lescure, François Xavier	Hôpital Bichat-Claude-Bernard AP-HP	France	Microbiology	General & Internal Medicine
Gössling, Stefan	Linnaeus University, Kalmar	Sweden	Sport, Leisure & Tourism	Logistics & Transportation
Chowell, Gerardo	Georgia State University	United States	Microbiology	Bioinformatics
Zhang, Sheng	Shanghai Jiao Tong University School of Medicine	China	Oncology & Carcinogenesis	Microbiology
Yang, Xiaobo	Tongji Medical College	China	Emergency & Critical Care Medicine	Immunology
Pranata, Raymond	Universitas Pelita Harapan	Indonesia	Cardiovascular System & Hematology	Endocrinology & Metabolism
Chen, Nanshan	Wuhan Jinyintan Hospital	China	General & Internal Medicine	Oncology & Carcinogenesis
Peiris, Malik	HKU-Pasteur Research Pole	Hong Kong	Microbiology	Virology
Leung, Char	Deakin University	Australia	Virology	Finance
Ali, Nurshad	Shahjalal University of Science and Technology	Bangladesh	Toxicology	Microbiology
Topol, Eric	Scripps Translational Science Institute	United States	Cardiovascular System & Hematology	General & Internal Medicine
Chen, Yu	Wuhan University	China	Virology	Developmental Biology
Zumla, Alimuddin	University College London	United Kingdom	Microbiology	General & Internal Medicine
Iba, Toshiaki	Juntendo University Graduate School of Medicine	Japan	Cardiovascular System & Hematology	Emergency & Critical Care Medicine

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Levin, Michael	Imperial College London	United Kingdom	Pediatrics	Microbiology
Edmunds, W. John	London School of Hygiene & Tropical Medicine	United Kingdom	Virology	Microbiology
Zhang, Chao	General Hospital of People's Liberation Army	China	Immunology	Microbiology
Conti, Pio	University of G. d'Annunzio Chieti and Pescara	Italy	Immunology	Biochemistry & Molecular Biology
Ogen, Yaron	Tel Aviv University	Israel	Agronomy & Agriculture	Geological & Geomatics Engineering
Wölfel, Roman	Institut für Mikrobiologie der Bundeswehr	Germany	Microbiology	Virology
Yao, Hao	Harvard T.H. Chan School of Public Health	United States	Health Policy & Services	Psychiatry
Neurath, Markus F.	Universitätsklinikum Erlangen	Germany	Gastroenterology & Hepatology	Immunology
Davies, Nicholas G.	London School of Hygiene & Tropical Medicine	United Kingdom	General & Internal Medicine	Microbiology
Cao, Xuetao	Nankai University	China	Immunology	Oncology & Carcinogenesis
Hobbs, Jill E.	University of Saskatchewan	Canada	Agricultural Economics & Policy	Business & Management
Geldsetzer, Pascal	Universität Heidelberg	Germany	General & Internal Medicine	Virology
Guo, Li	Institute of Pathogen Biology, Chinese Academy of Medical Sciences & Peking Union Medical College	China	Virology	Microbiology
Higgins-Desbiolles, Freya	University of South Australia	Australia	Sport, Leisure & Tourism	International Relations
Emanuel, Ezekiel J.	University of Pennsylvania Perelman School of Medicine	United States	General & Internal Medicine	Applied Ethics
Bontempi, Elza	Università degli Studi di Brescia	Italy	Applied Physics	Materials
Ceriello, Antonio	IRCCS Multimedica	Italy	Endocrinology & Metabolism	Cardiovascular System & Hematology
Lam, Tommy T.Y.	The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases	Hong Kong	Virology	Microbiology
Mauvais-Jarvis, Franck	Tulane University School of Medicine	United States	Endocrinology & Metabolism	Developmental Biology
Grech, Victor	Mater Dei Hospital	Malta	Pediatrics	General & Internal Medicine
Paniz-Mondolfi, Alberto E.	Icahn School of Medicine at Mount Sinai	United States	Microbiology	Virology
Bauchner, Howard	Journal of American Medical Association		Pediatrics	General & Internal Medicine
Sanchis-Gomar, Fabian	Universitat de València	Spain	Cardiovascular System & Hematology	General Clinical Medicine
Wang, Cuiyan	Huaibei Coal Industry Teachers College	China	Toxicology	Psychiatry
Netea, Mihai G.	Radboud University Nijmegen Medical Centre	Netherlands	Immunology	Microbiology
Klok, Frederikus A.	Leiden University Medical Center – LUMC	Netherlands	Cardiovascular System & Hematology	General & Internal Medicine
Khan, Suliman	Zhengzhou University	China	Microbiology	Plant Biology & Botany
Montemurro, Nicola	Università di Pisa	Italy	Neurology & Neurosurgery	Dentistry
Ronco, Claudio	Ospedale San Bortolo	Italy	Urology & Nephrology	Emergency & Critical Care Medicine
Drosten, Christian	Charité – Universitätsmedizin Berlin	Germany	Microbiology	Virology
Ling, Yun	Fudan University	China	Microbiology	Immunology
Meo, Sultan Ayoub	King Saud University Medical College	Saudi Arabia	General & Internal Medicine	Gastroenterology & Hepatology
Wang, Manli	Wuhan Institute of Virology Chinese	China	Virology	Nanoscience &

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	Academy of Sciences			Nanotechnology
Arabi, Yaseen	King Saud bin Abdulaziz University for Health Sciences	Saudi Arabia	Emergency & Critical Care Medicine	General & Internal Medicine
Zhou, Wenhao	Children's Hospital of Fudan University	China	Pediatrics	Neurology & Neurosurgery
Vabret, Nicolas	Icahn School of Medicine at Mount Sinai	United States	Immunology	Virology
Murthy, Srinivas	The University of British Columbia	Canada	General & Internal Medicine	Emergency & Critical Care Medicine
Joob, Beuy	Private Academic Practice	Thailand	Tropical Medicine	Oncology & Carcinogenesis
Buckee, Caroline O.	Harvard T.H. Chan School of Public Health	United States	Microbiology	Developmental Biology
Bansal, Manish	Medanta Hospital	India	Cardiovascular System & Hematology	General & Internal Medicine
Prem, Kiesha	London School of Hygiene & Tropical Medicine	United Kingdom	General & Internal Medicine	Microbiology
Mason, Robert J.	National Jewish Health	United States	Respiratory System	Biochemistry & Molecular Biology
Binnicker, Matthew J.	Mayo Clinic	United States	Microbiology	Immunology
MacIntyre, C. Raina	The Kirby Institute	Australia	Microbiology	Virology
Baud, David	Centre Hospitalier Universitaire Vaudois	Switzerland	Obstetrics & Reproductive Medicine	Microbiology
Rasmussen, Sonja A.	University of Florida College of Medicine	United States	Genetics & Heredity	Obstetrics & Reproductive Medicine
Santosh, Kc	University of South Dakota	United States	Artificial Intelligence & Image Processing	Medical Informatics
Fan, Bingwen Eugene	Tan Tock Seng Hospital	Singapore	Cardiovascular System & Hematology	Immunology
Bloch, Evan M.	Johns Hopkins School of Medicine	United States	Cardiovascular System & Hematology	Microbiology
Xia, Shuai	Fudan University	China	Virology	Medicinal & Biomolecular Chemistry
Kampf, Günter	Universitätsmedizin Greifswald	Germany	Epidemiology	Microbiology
Spinelli, A.	Humanitas Research Hospital	Italy	Surgery	Gastroenterology & Hepatology
Bernheim, Adam	Icahn School of Medicine at Mount Sinai	United States	Nuclear Medicine & Medical Imaging	Microbiology
Li, Hui	China-Japan Friendship Hospital	China	Microbiology	Respiratory System
Petrosillo, Nicola	IRCCS Istituto Nazionale Malattie Infettive Lazzaro Spallanzani	Italy	Microbiology	General & Internal Medicine
Park, Matthew D.	Icahn School of Medicine at Mount Sinai	United States	Immunology	Oncology & Carcinogenesis
Chen, Jieliang	Fudan University	China	Virology	Gastroenterology & Hepatology
Armitage, Richard	University of Nottingham	United Kingdom	Pediatrics	Public Health
Khosravi, Mohsen	Zahedan University of Medical Sciences	Iran	Psychiatry	Neurology & Neurosurgery
Tang, Yi Wei	Danaher Diagnostic Platform	China	Microbiology	Virology
Jarvis, Christopher I.	London School of Hygiene & Tropical Medicine	United Kingdom	General & Internal Medicine	Microbiology
Ng, Siew C.	Chinese University of Hong Kong	Hong Kong	Gastroenterology & Hepatology	Oncology & Carcinogenesis
Vaira, Luigi A.	Azienda Ospedaliero Universitaria Sassari	Italy	Otorhinolaryngology	Dentistry
Onder, Graziano	Istituto Superiore Di Sanita	Italy	Geriatrics	Gerontology
Beigel, John H.	National Institute of Allergy and Infectious Diseases (NIAID)	United States	Microbiology	Virology
Bonilla-Aldana, D. Katterine	Fundación Universitaria Autónoma de las Américas	Colombia	Microbiology	Tropical Medicine

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Memish, Ziad A.	Alfaisal University	Saudi Arabia	General & Internal Medicine	Microbiology
Harky, Amer	Liverpool Heart and Chest Hospital	United Kingdom	Cardiovascular System & Hematology	Respiratory System
Merad, Miriam	Icahn School of Medicine at Mount Sinai	United States	Immunology	Oncology & Carcinogenesis
Viner, R. M.	UCL Great Ormond Street Institute of Child Health	United Kingdom	Pediatrics	General & Internal Medicine
Amirian, E. Susan	Rice University	United States	Oncology & Carcinogenesis	Epidemiology
Hsueh, Po Ren	National Taiwan University Hospital	Taiwan	Microbiology	General & Internal Medicine
Chu, Hin	The University of Hong Kong, State Key Laboratory of Emerging Infectious Diseases	Hong Kong	Virology	Microbiology
Goyal, Parag	Weill Cornell Medicine	United States	Cardiovascular System & Hematology	General & Internal Medicine
Kim, Hyungjin	Seoul National University College of Medicine	South Korea	Nuclear Medicine & Medical Imaging	Oncology & Carcinogenesis
Martinez, Miguel Angel	Hospital Universitari Germans Trias i Pujol	Spain	Virology	Biochemistry & Molecular Biology
Javaid, Mohd	Jamia Millia Islamia	India	Operations Research	Materials
Grifoni, Alba	La Jolla Institute for Immunology	United States	Immunology	Virology

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