

UNC-Chapel Hill COVID-19 Research Output & Collaboration Analysis

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Prepared by:

[Nandita S. Mani](#), PhD

[Michelle Cawley](#), MLS

[Adam Dodd](#), MIS

[Fei Yu](#), PhD

[Barrie Hayes](#), MSLS



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Introduction

Research contributing to discoveries associated with COVID-19 has been growing on the UNC campus over the past year. To help increase visibility of this integral research and illustrate the extensive organizational collaborations that help move UNC research forward, a team from University Libraries – Health Sciences Library analyzed the COVID-19 research output of UNC Chapel Hill (UNC-CH) researchers. Between January 2020 and April 2021, a total of 782 UNC-CH researchers have authored 579 publications. This publication set was used to answer the following questions:

1. What is UNC-CH's research output related to COVID-19 and in which journals are UNC-CH researchers publishing?
2. Which individuals within the University have been involved in research efforts?
3. How are schools within UNC-CH collaborating on COVID-19 research efforts?
4. With which institutions, organizations, and countries are UNC-CH researchers collaborating?
5. What are the various areas of focus being investigated within the research domain?

Eighteen authors from UNC-CH had eight or more publications during the period analyzed and research output was dominated by authors affiliated with UNC School of Medicine and UNC Gillings School of Global Public Health. Articles were published in a variety of journals including leading journals in clinical care (e.g., JAMA, Lancet), Science (e.g., Nature, Science), and public health (e.g., American Journal of Public Health). UNC-CH researchers collaborated with authors from 81 other countries, and most often with co-authors based in the Canada, United Kingdom, China, and Australia.

Research topics in the publications analyzed included:

- Impact of COVID-19 pandemic on clinical care in terms of new recommendations, guidelines, practice changes, care accessibility, telemedicine, & healthcare workforce.
- Disease management, transmission, susceptibility, and associated international law and policy (e.g., travel and surveillance).
- Mental health, violence, stress, cancer, respiratory syndrome, IBD
- Virus origin, infection, control, and classification.
- Drug development, repurposing, and efficacy related to treating SARS-COV-2.

Methods

We searched Scopus and PubMed for literature relating to COVID-19 with one or more authors affiliated with UNC-CH to create the dataset for analysis. Scopus was searched from January 2020 to April 15, 2021. Our experience demonstrated that publications in PubMed will be indexed in Scopus; however, there may be a brief lag. Therefore, we searched PubMed for articles published over the previous 30 days (i.e., since March 15, 2021).

Our initial search strategy to identify literature on COVID-19 or the novel coronavirus for PubMed was based on the strategy for NIH's LitCovid database developed by the National Library of Medicine: <https://www.ncbi.nlm.nih.gov/research/coronavirus/faq>. We added terms to this strategy including MeSH terms and translated the search to run in Scopus (the search strategy is available at: <https://go.unc.edu/UNC-COVID19-Research>).

Search results for COVID-19 literature were limited to results with one or more authors affiliated with UNC-CH and included authors affiliated with schools or divisions including UNC School of Medicine, Gillings School of Global Public Health, UNC Medical Center, or other relevant UNC-CH affiliations (the search strategy is available at: <https://go.unc.edu/UNC-COVID19-Research>).

Search results were compiled into an EndNote library to remove duplicates. Errata, corrections, and corrigenda were removed and set aside in EndNote. Our team manually screened search results for relevance to COVID-19. We erred on the side of inclusion and as a result a few publications may be indirectly related to COVID-19. Analyses, including visualizations were developed using the unique, relevant studies from this search.

[Publications by Author and Unit](#)

Our analysis shows that those engaged in COVID-19 scholarship are primarily affiliated with UNC School of Medicine and Gillings School of Global Public Health (Table 1). Other affiliations reported by UNC-CH researchers who have COVID-19-related publications include UNC Health, other health affairs schools, and several institutes, centers, and initiatives. Publication types include journal articles (344), reviews (91), notes (63), letters (42), editorials (25), conference papers (6), short surveys (6), and book chapters (2).

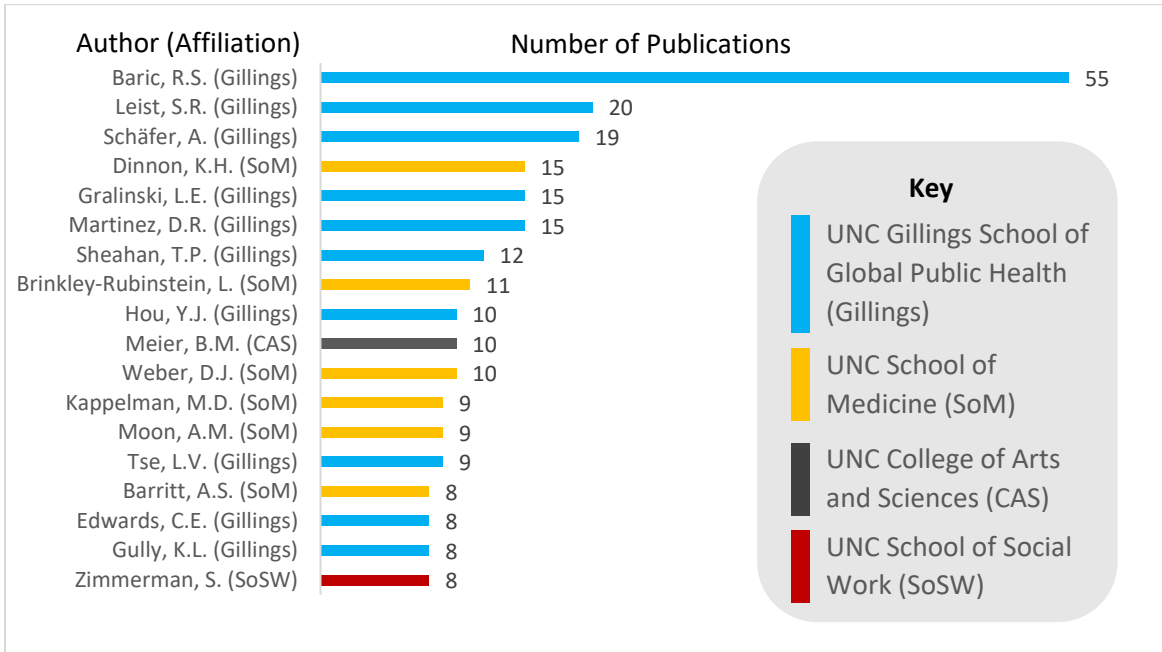
Table 1: Affiliations for UNC-CH researchers with one or more COVID-19-related publications. Publications may be counted for multiple units if researchers from different UNC-CH units were among the authors on a single publication.

UNC-CH Units with 200 or More COVID-19-Related Publications	
<ul style="list-style-type: none"> • UNC Gillings School of Global Public Health 	<ul style="list-style-type: none"> • UNC School of Medicine
UNC-CH Units with 11 to 50 COVID-19-Related Publications	
<ul style="list-style-type: none"> • Cecil G. Sheps Center for Health Services Research 	<ul style="list-style-type: none"> • UNC Eshelman School of Pharmacy
<ul style="list-style-type: none"> • Lineberger Comprehensive Cancer Center 	<ul style="list-style-type: none"> • UNC Health
<ul style="list-style-type: none"> • UNC College of Arts and Sciences* 	<ul style="list-style-type: none"> • UNC School of Social Work
UNC-CH Units with 10 or fewer COVID-19-Related Publications	
<ul style="list-style-type: none"> • Carolina Population Center 	<ul style="list-style-type: none"> • School of Library and Information Science (SILS)
<ul style="list-style-type: none"> • Institute for Global Health and Infectious Diseases (IGHID) 	<ul style="list-style-type: none"> • UNC / NCSU Joint Department of Biomedical Engineering
<ul style="list-style-type: none"> • Marsico Lung Institute 	<ul style="list-style-type: none"> • UNC Hussman School of Journalism and Media
<ul style="list-style-type: none"> • NC Translational and Clinical Sciences Institute (NC TraCS) 	<ul style="list-style-type: none"> • UNC Rapidly Emerging Antiviral Drug Discovery Initiative (READDI)
<ul style="list-style-type: none"> • Renaissance Computing Initiative at UNC (RENCI) 	<ul style="list-style-type: none"> • UNC School of Nursing

*UNC College of Arts and Sciences includes authors affiliated with UNC Department of Psychology and Neuroscience, UNC Department of Public Policy, and UNC Department of Computer Science among others.

Eighteen researchers affiliated with UNC-CH including faculty, staff, students, fellows, and post-docs published eight or more publications during the period analyzed. In total, these 18 UNC-CH researchers contributed to 125 publications related to COVID-19 from January 2020 to April 2021 (Figure 1). Dr. Ralph S. Baric from the Gillings School of Global Public Health leads the publication output of UNC-CH authors with 55 publications in the period analyzed.

Figure 1: Total COVID-19-related publications January 2020 to April 2021 for 18 authors with eight or more publications who reported an affiliation with UNC-CH.



Topic Analysis

We used the *k*-means algorithm to cluster title and abstract text in the full dataset of 579 publications to identify topics addressed by UNC-CH authors (Table 2). The *k*-means algorithm identifies a single cluster for each study and a set of keywords for each cluster that can be used to distinguish publications in each cluster. Bold formatting in Table 2 was added by authors to indicate unique topics for each cluster. We clustered using 2-grams meaning that keywords could be one or two words long. Additional stop words were added prior to clustering including: copyright, publication, abstract, ci, 95, delaying, middle, era, patient, patients, results, health, 2019, 19, shibboleth, use, using, human, pandemic, study.

Table 2: Topic analysis for all UNC-CH publications related to COVID-19 January 2020 to April 2021 (N=579). Studies assigned to clusters and keywords generated using *k*-means algorithm. Authors added bold formatting to indicate key topics for each cluster.

Cluster	# of Studies ¹	Keywords
1	43	opportunity, disorder, mental , care, available, new, telehealth , disorder available, challenges, social, crisis , people, challenge, response, bipolar disorder , bipolar, medical, stress , opioid disorder , opioid
2	55	disease, high, data, risk, care, coronavirus, public, income , including, factors, countries, low, novel, behavioral , review, related, available, income countries ² , high risk, level
3	109	cov, sars, sars cov, infection, vaccine , cov infection, respiratory, coronavirus, acute, syndrome, severe, available, acute respiratory, respiratory syndrome , virus, disease, severe acute, cells , coronavirus sars, syndrome coronavirus
4	46	impact, impact covid, practice, united states , united, states, pediatric , available, care, states available, coronavirus, risk, surgical , challenges, social , scientific, dental , coronavirus covid, clinical , treatment
5	12	IBD, registry, registry available, secure IBD, IBD covid, secure, IBD registry , therapy, international, available, fetal , value international, collaboration available, covid value, international registry , inflammatory bowel , bowel, outcomes, inflammatory, international collaboration
6	84	disease, coronavirus, coronavirus disease, respiratory, studies, clinical , disease covid, society , based, diseases, published, infectious, permissions, review, care, mortality , severe, research , syndrome
7	90	data , symptoms, social , care, reported, mental , adults, risk, response, associated, survey, participants, 2021, findings, life, outcomes , measures, methods, related, infection
8	13	international, international regulations , regulations, violate, violate international, law, restrictions, travel, available, travel restrictions , regulations covid, outbreak available, restrictions violate, law available, international law , regulations available , reimagining international, covid reimagining, solidarity wake, wake covid
9	10	center, admissions , admissions covid, increased, burn center , burn, center admissions, increased burn, respiratory diagnostic , diagnostic center, center available, covid available, covid respiratory, development implementation, implementation covid , available, therapy implications , tocilizumab associated, increased infection, car cell
10	117	available, covid available, care, prevention , time, research, learning , time covid, reply, public , prevention covid, student , cancer , violence , considered covid, ecmo , ecmo considered, venoarterial , venoarterial ecmo, disease

¹ See <https://go.unc.edu/UNC-COVID19-Research> to review study lists by cluster in MS Excel.

² Refers to studies evaluating topics related to COVID-19 in low, middle, and high income countries.

Collaboration Analyses

UNC-CH researchers are engaged in a high degree of collaboration both with U.S. institutions and international entities (Figure 2). Collaboration analyses indicate that UNC-CH researchers co-authored four or more publications with 93 other institutions in the United States. Of these 93 institutions, UNC-CH researchers collaborated with 34 entities on 10 or more publications; with Harvard University leading with 42 publications (Table 3a). UNC-CH partnered with researchers affiliated with 24 international institutions on four or more publications (Table 3b).

In total, of the 579 UNC-CH authored publications analyzed, UNC-CH researchers collaborated with more than 4000 external researchers in 81 other countries (Figure 3). International collaborations with UNC-CH authors primarily occurred with researchers in Canada (N=63), the United Kingdom (N=62), China (N=38), and Australia (N=35).

Figure 2: Organizational collaborations between UNC-CH researchers and U.S. or international institutions with five or more shared publications. All UNC-CH units (e.g., health affairs schools, UNC Health, institutes) are combined as single data point in blue.

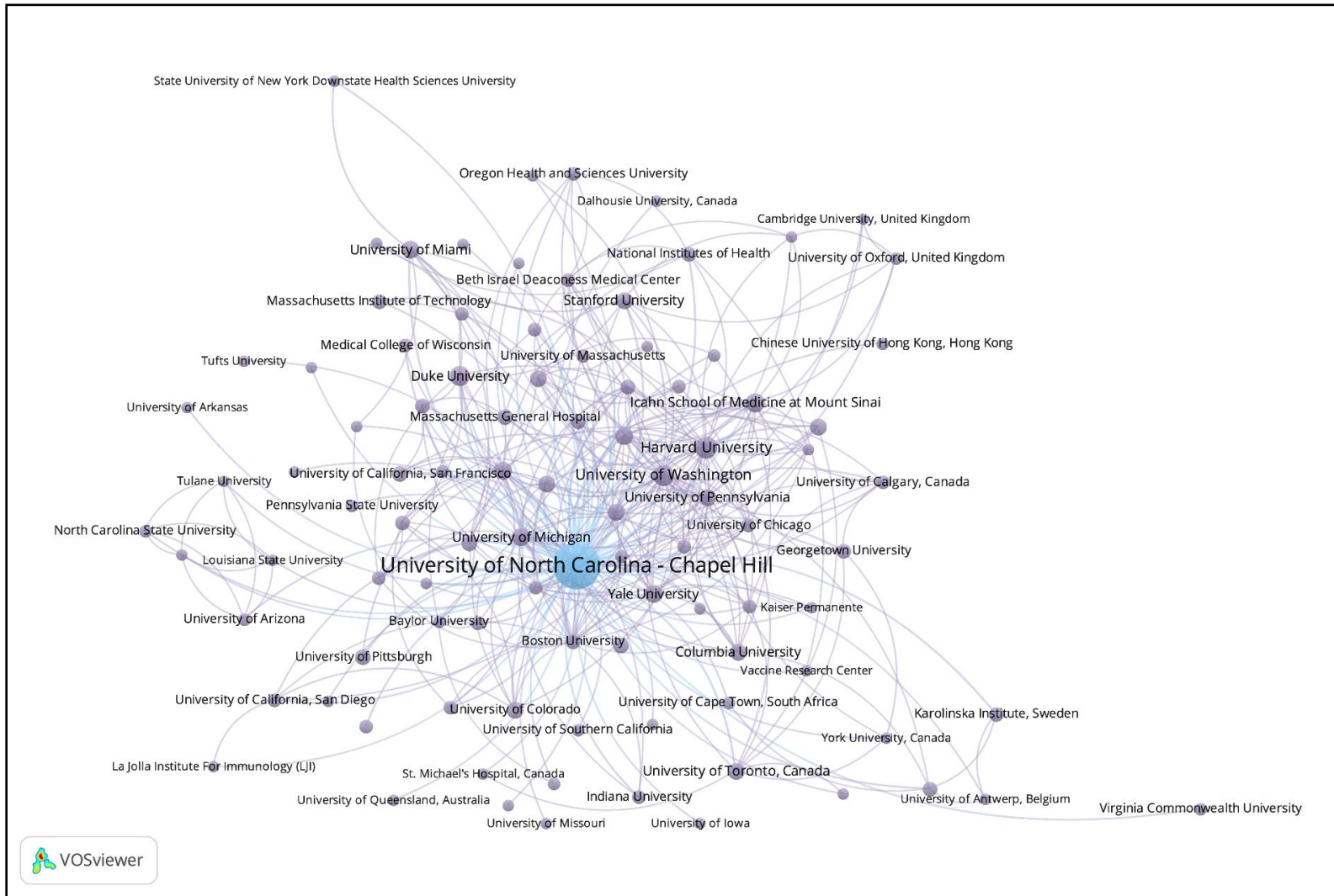
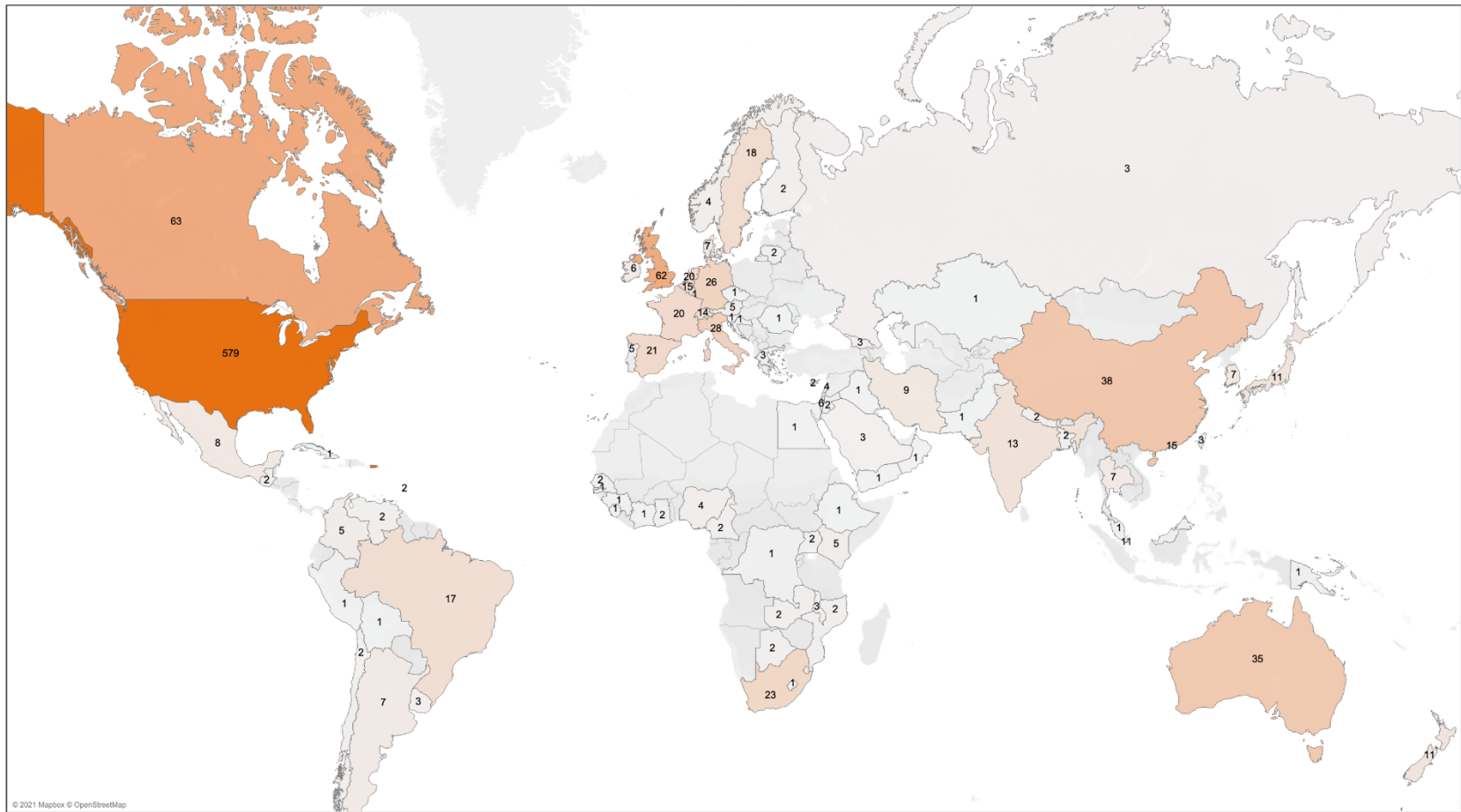


Table 3. Collaborations between UNC-CH authors and U.S. and global institutions on COVID-19-related publications; (a). institutions in the U.S. with 10 or more publication collaborations; (b). global institutions with 4 or more publication collaborations.

(a). Organization Name	Number of Publications	(b). Organization Name	Number of Publications
Harvard University	43	University of Toronto, Canada	18
University of Washington	37	Karolinska Institute, Sweden	12
Duke University	30	London School of Hygiene and Tropical Medicine, U.K.	11
Icahn School of Medicine At Mount Sinai	26	University College London, U.K.	10
University of Michigan	24	University of Calgary, Canada	9
Johns Hopkins University	23	Chinese University of Hong Kong, Hong Kong	8
Yale University	23	University of Oxford, U.K.	8
University of Maryland	22	University of Cape Town, South Africa	7
University of Miami	21	Cambridge University, U.K.	6
Emory University	20	York University, Canada	6
Stanford University	20	Dalhousie University, Canada	5
Vanderbilt University	20	St. Michael's Hospital, Canada	5
University of Pennsylvania	19	University of Antwerp, Belgium	5
Columbia University	18	University of British Columbia, Canada	5
Washington University, Saint Louis	18	University of Geneva, Switzerland	5
Brown University	17	University of Queensland, Australia	5
University of Colorado	17	Capital Medical University, China	4
University of California, San Francisco	16	Université de Paris, France	4
University of Pittsburgh	16	University of Barcelona, Spain	4
George Washington University	14	University of Brescia, Italy	4
Mayo Clinic	14	University of Bristol, U.K.	4
Georgetown University	13	University of Ghent, Belgium	4
Northwestern University	13	University of Leeds, U.K.	4
University of Wisconsin	13	University of Sydney, Australia	4
National Institutes of Health	12		
University of Minnesota	12		
University of Texas	12		
Boston University	11		
Massachusetts Institute of Technology	11		
Indiana University	10		
Medical College of Wisconsin	10		
University of California, Los Angeles	10		
University of California, San Diego	10		
University of Florida	10		

Figure 3: UNC-CH COVID-19 global research collaborations. UNC-CH authors collaborated with researchers from 82 countries including the United States. Numbers and color density indicate total publications co-authored by UNC-CH authors and researchers in each corresponding country.



Next Steps

When examining the extent to which UNC-CH has collaborated on a global scale, it is clear that the value we hold in being a strong global public research university remains strong. Through engaging in research focused on therapeutics, behavioral health, international regulations, respiratory diagnostics, vaccine development, mental health, and pediatrics, UNC researchers have made impactful contributions towards understanding, mitigating, and ultimately, combatting the COVID-19 pandemic at a time when academic partners and leaders were called to action.

In future iterations of this analysis, our team will focus on identifying efficiencies throughout our processes whereby we can seamlessly update UNC-based COVID-19 literature on a semi-annual basis. In addition, the team plans to provide search alerts for schools or research teams that are interested in keeping up to date with literature in their research domain. We also plan to investigate the creation of an interactive dashboard from which users can view and interact with real-time data.

Additional Information

The COVID-19 citation set and search strategies used for these analyses can be downloaded from the HSL web site via: <https://go.unc.edu/UNC-COVID19-Research>. The following files are available to download:

- Search strategies;
- RIS file containing all 579 publications; and
- Excel file containing all 579 publications including cluster indicated in Table 2.

Further, the UNC Health Sciences Library has developed and continues to maintain a COVID-19 LibGuide available at: <https://guides.lib.unc.edu/COVID19>.