Natural Language Processing in

COVID-19 Research

Sunna Jo

Overview

1. Objective
2. Data & Process
3. Results & Discussion
4. Considerations & Future Work

73,153

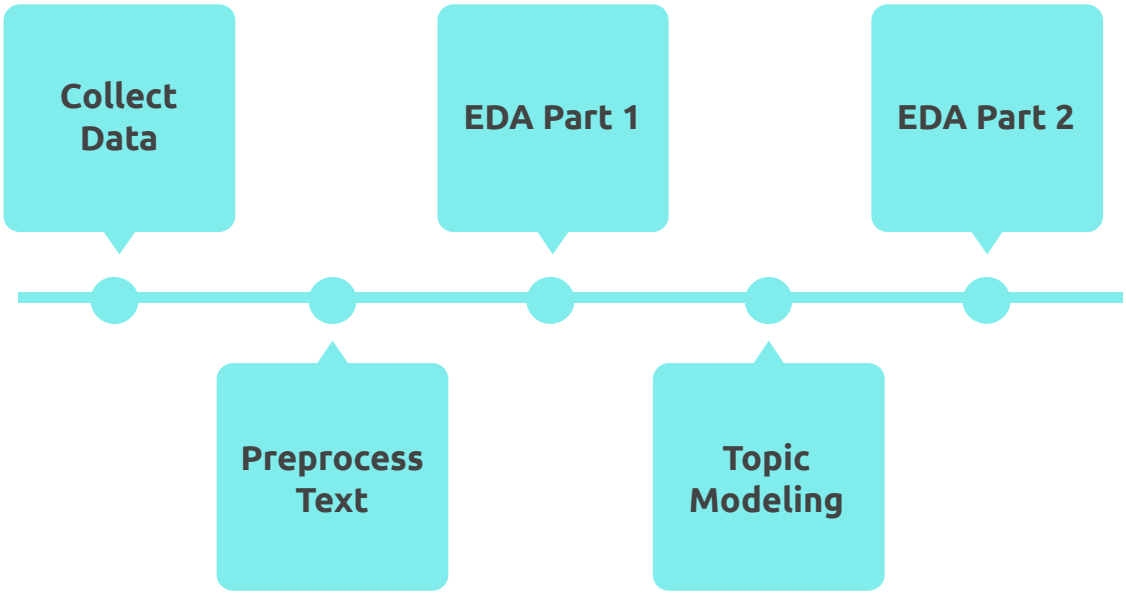
citations related to *COVID-19* in **2020**

73,153

citations related to *COVID-19* in **2020**

What can we glean?

Process/Workflow



DATA

> Eur Rev Med Pharmacol Sci. 2020 Jul;24(14):7804-7815. doi: 10.26355/eurrev_202007_22285.

Clinical outcomes of 201 neonates born to mothers with COVID-19: a systematic review

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Affiliations – collapse

Affiliation

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PMID: 32744708 DOI: 10.26355/eurrev_202007_22285

Abstract

~~**Objective:**~~ To evaluate the clinical manifestations and outcomes of neonates born to women who had ~~Coronavirus Disease 2019 (COVID-19)~~ during pregnancy.

~~**Materials and methods:**~~ A systematic literature search was conducted on PubMed and Embase till April 15, 2020, by combining the terms ~~(COVID-19, Severe Acute Respiratory Syndrome Coronavirus 2, SARS-CoV-2, Novel Coronavirus, 2019-nCov, Wuhan pneumonia)~~ and (pregnancy, pregnant women, mother, fetus, neonate, newborn, infant).

Results: We included 16 case series and 12 case reports describing a total of 223 pregnant women and 201 infants. Four newborns born to mothers affected by COVID-19 were reported to have laboratory-confirmed Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection within 48 hours after birth. However, Reverse Transcription-Polymerase Chain Reaction tests of the breast milk, placenta, amniotic fluids, and cord blood and maternal vaginal secretions were all negative for SARS-CoV-2 in the reported cases. Fetal death was reported in two cases, and 48 of 185 newborns (25.9%) were born prematurely. Infants born small for gestational age and low birth weight (< 2,500 g) accounted for 8.3% and 15.6% of reported cases, respectively. Birth asphyxia and respiratory distress syndrome were observed in 1.8% and 6.4% of neonates, respectively. There was one neonatal death due to intractable gastric bleeding among the SARS-CoV-2-negative infants.

Conclusions: Current evidence suggests that COVID-19 during pregnancy rarely affects fetal and neonatal mortality, but can be associated with adverse neonatal morbidities. Vertical transmission has not been observed in the majority of the reported cases. The infants born to mothers with COVID-19 are carefully monitored for accompanying complication, and quarantine of infected mothers is warranted.

PubMed

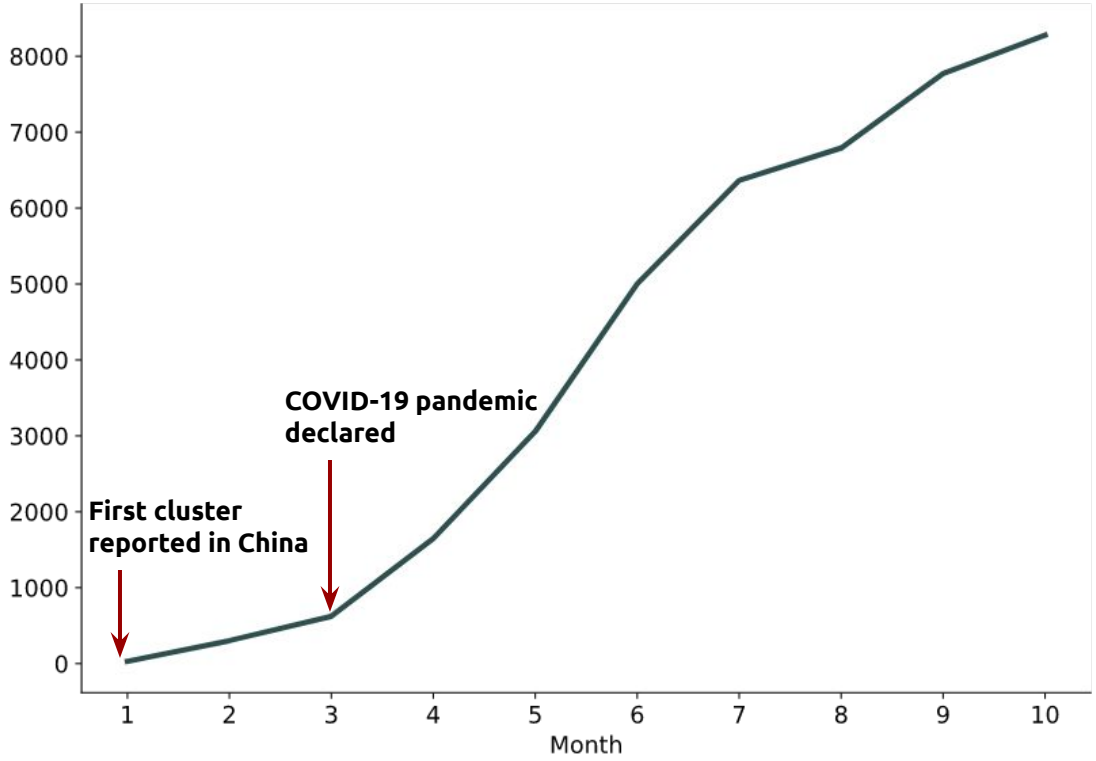
January 1 - November 5, 2020

42,977 abstracts

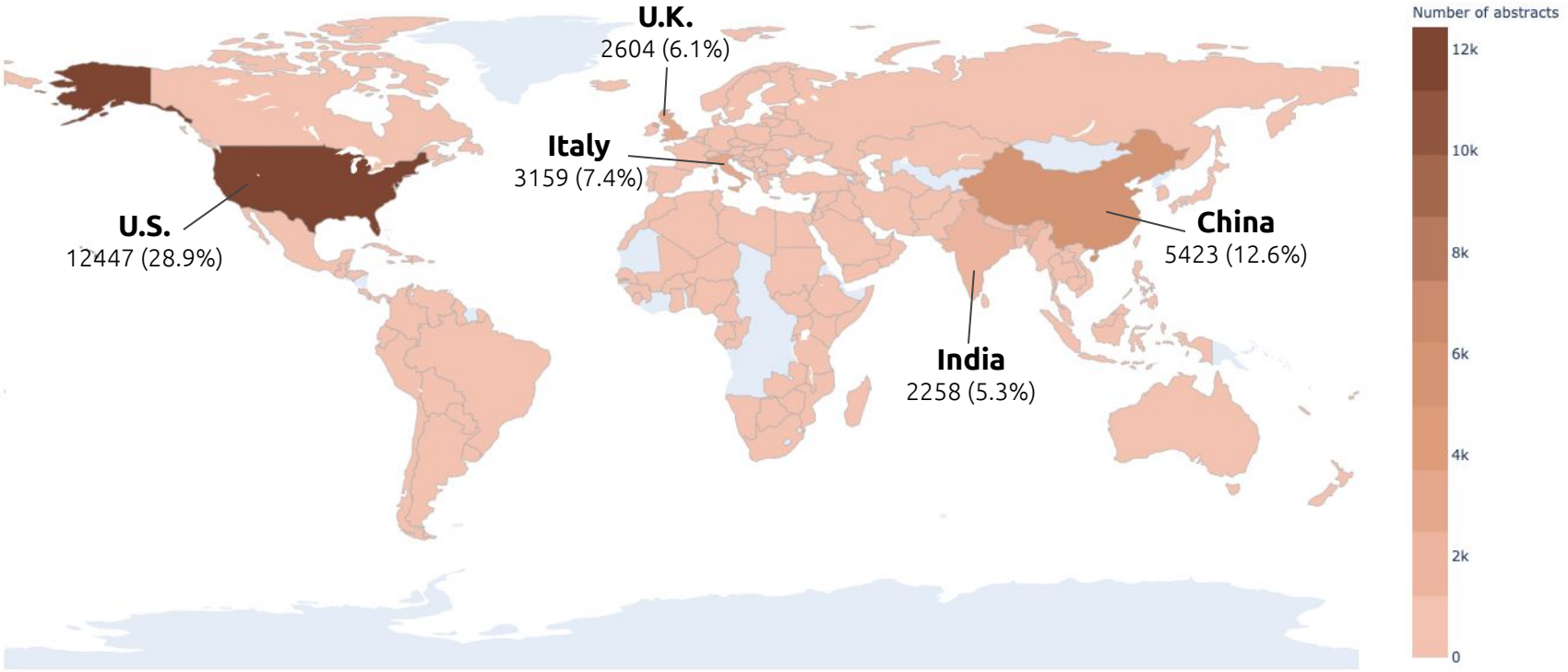
2,209,210 terms

NLTK

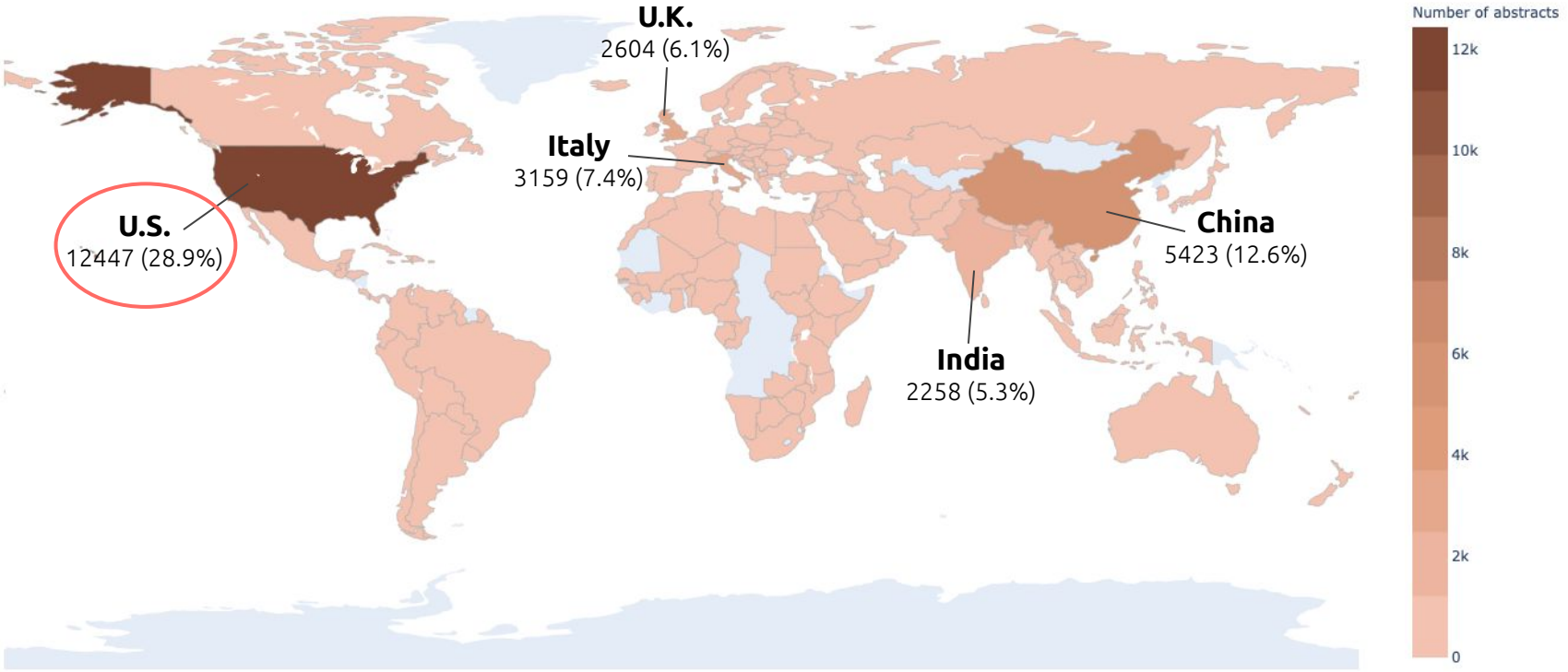
Number of Abstracts Over Time



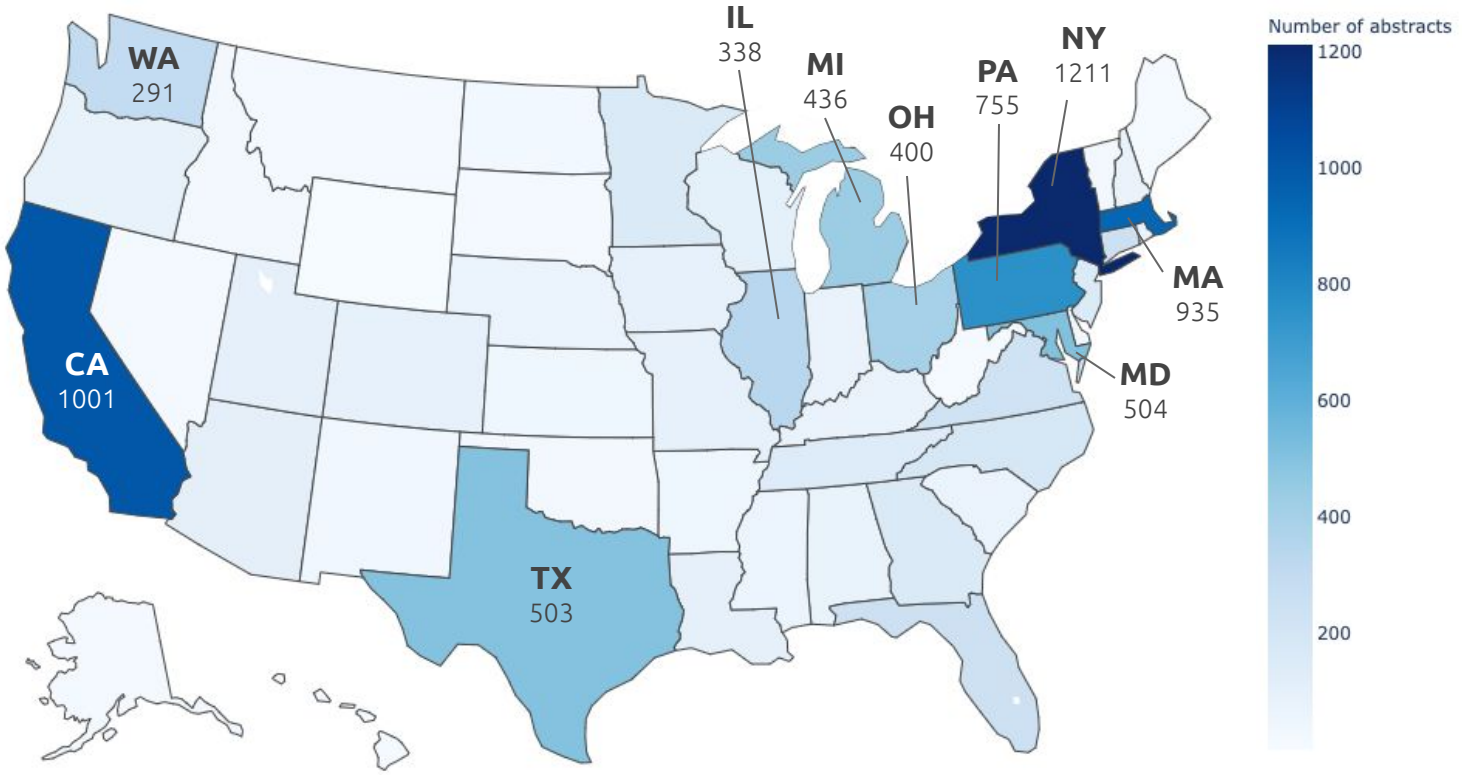
Number of Abstracts by Country



Number of Abstracts by Country



Number of Abstracts by State



TOPIC MODELING

Model

TFIDF Vectorizer

Count Vectorizer

Bag-of-Words

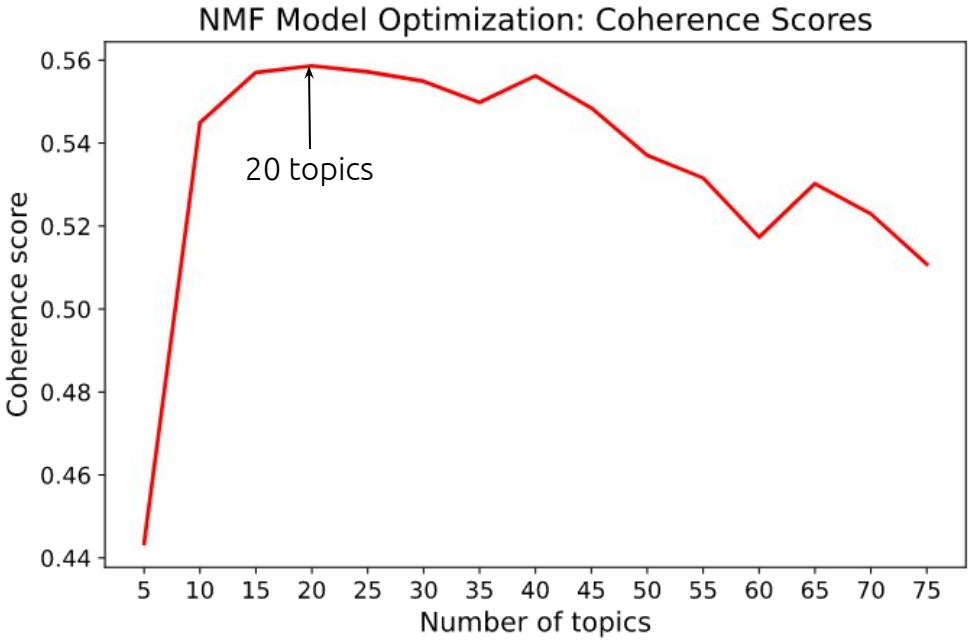
Non-Negative Matrix Factorization

Latent Semantic Analysis

Latent Dirichlet Allocation

Corex

Model: Evaluation



Topics

Resources & Technology	Predictions/Forecasting	Global Impact	Deaths	HCW & PPE
“challenge” “information” “access” “support”	“model” “accuracy” “trend” “population”	“country” “economy” “policy” “capacity”	“estimate” “comorbidities” “failure” “toll”	“mask” “nurse” “protection” “exposure”

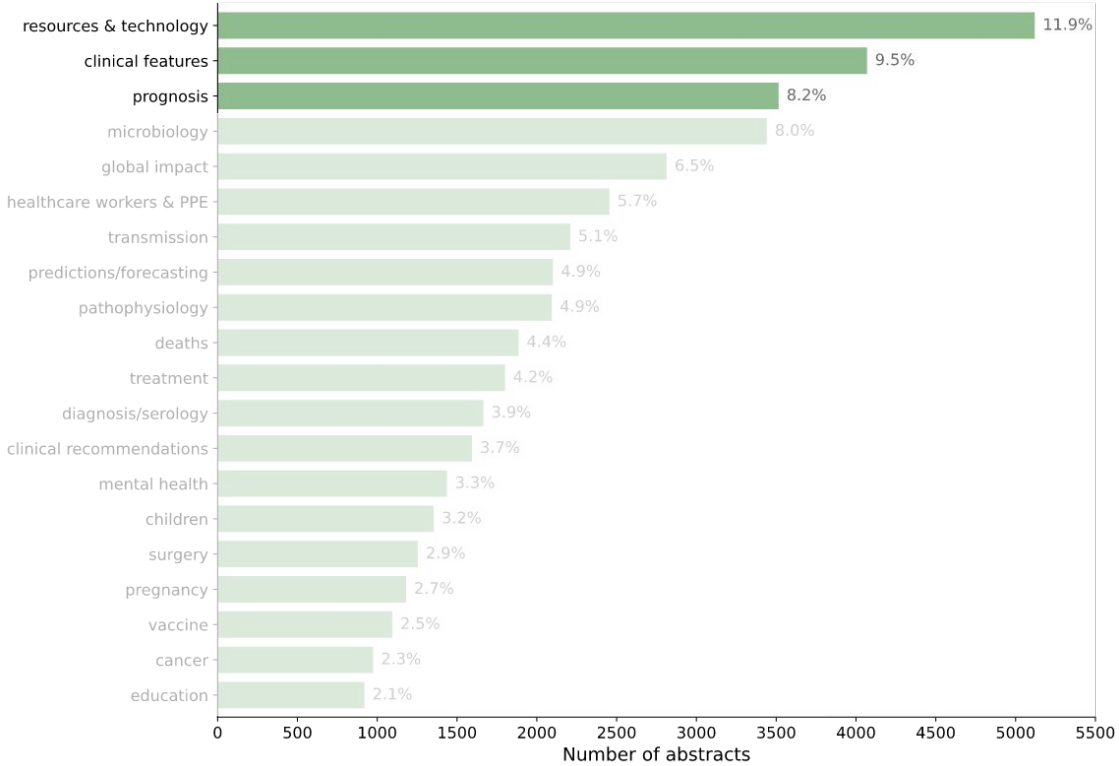
Clinical Recommendations	Clinical Features	Transmission	Pathophysiology	Prognosis
“management” “guideline" “emergency” “prevention”	“pneumonia” “kidney” “severity” “computed_tomography”	“contact” “spread” “droplet” “isolation”	“cytokine” “inflammation” “mechanism” “lung”	“mortality” “hospitalization” “outcome” “hypertension”

Diagnosis/Serology	Cancer	Surgery	Pregnancy	Children
“antibody” “specificity” “titer” “laboratory”	“tumor” “chemotherapy” “delay” “stage”	“volume” “safety” “reduction” “trauma”	“labor” “delivery” “birth” “cesarean_section”	“family” “school” “mis_c” “fever”

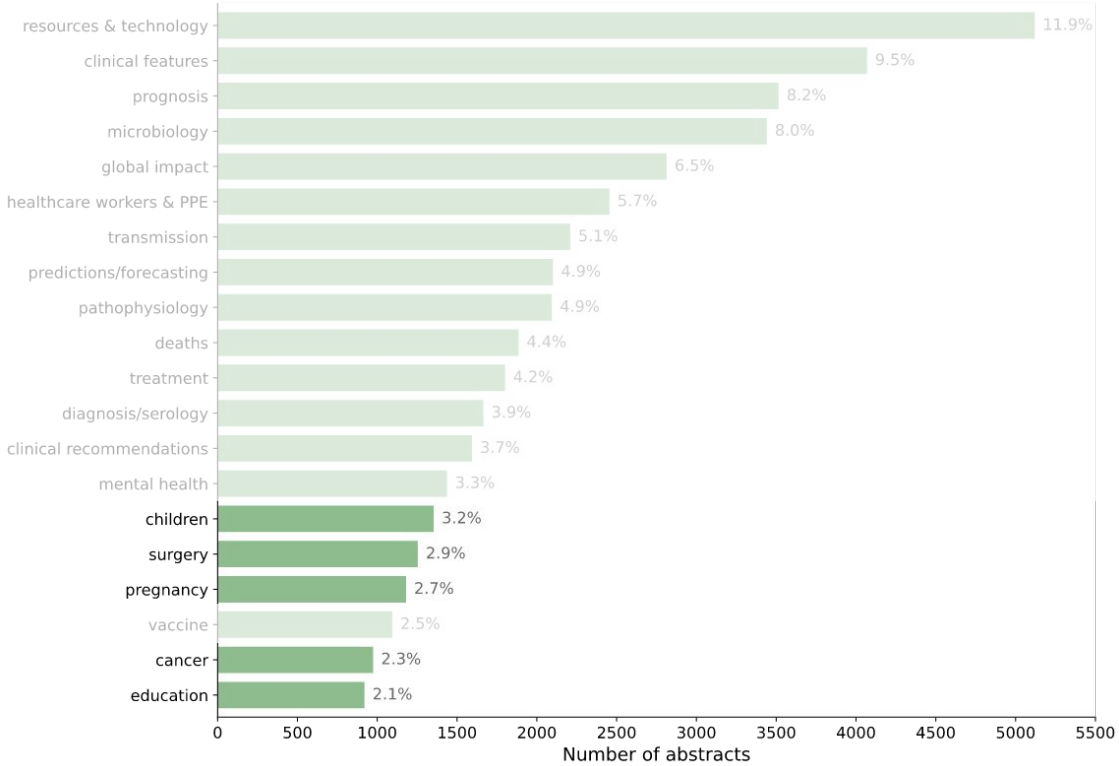
Education	Mental Health	Microbiology	Treatment	Vaccine
“student” “university” “online” “learning”	“anxiety” “depression” “stress” “fear”	“inhibitor” “interaction” “receptor” “host”	“trial” “efficacy” “hydroxychloroquine” “remdesivir”	“development” “protection” “epitope” “candidate”

INSIGHTS

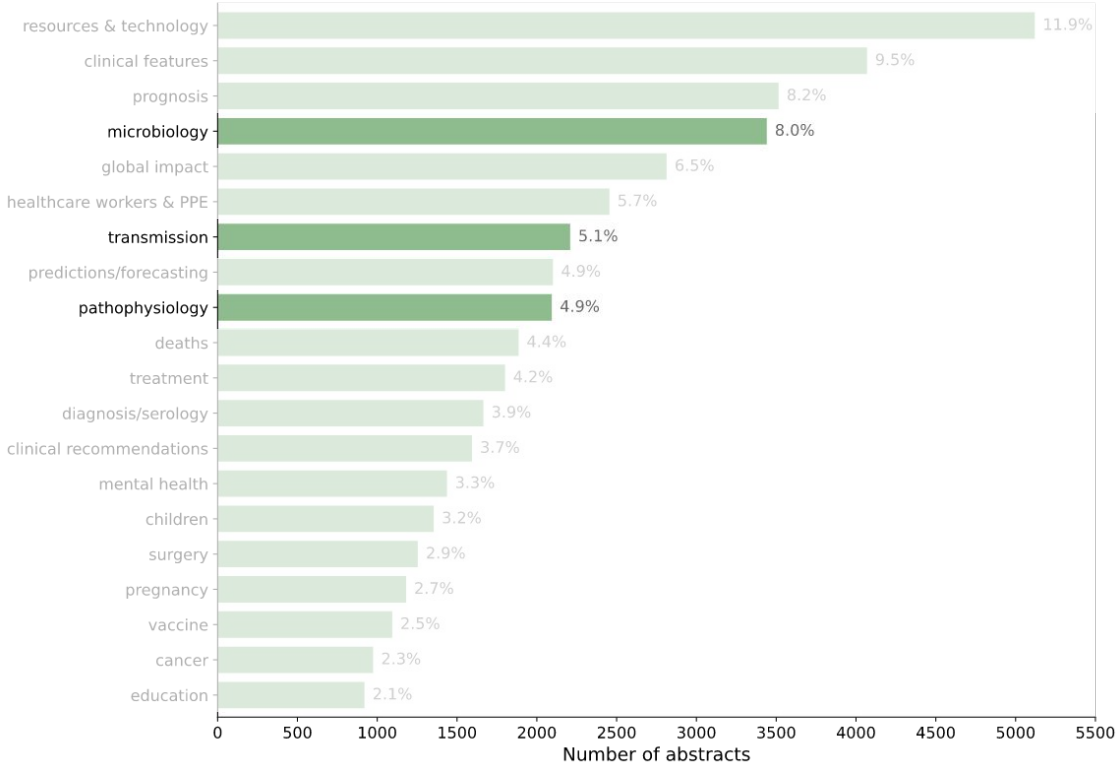
Topics: Number of Abstracts



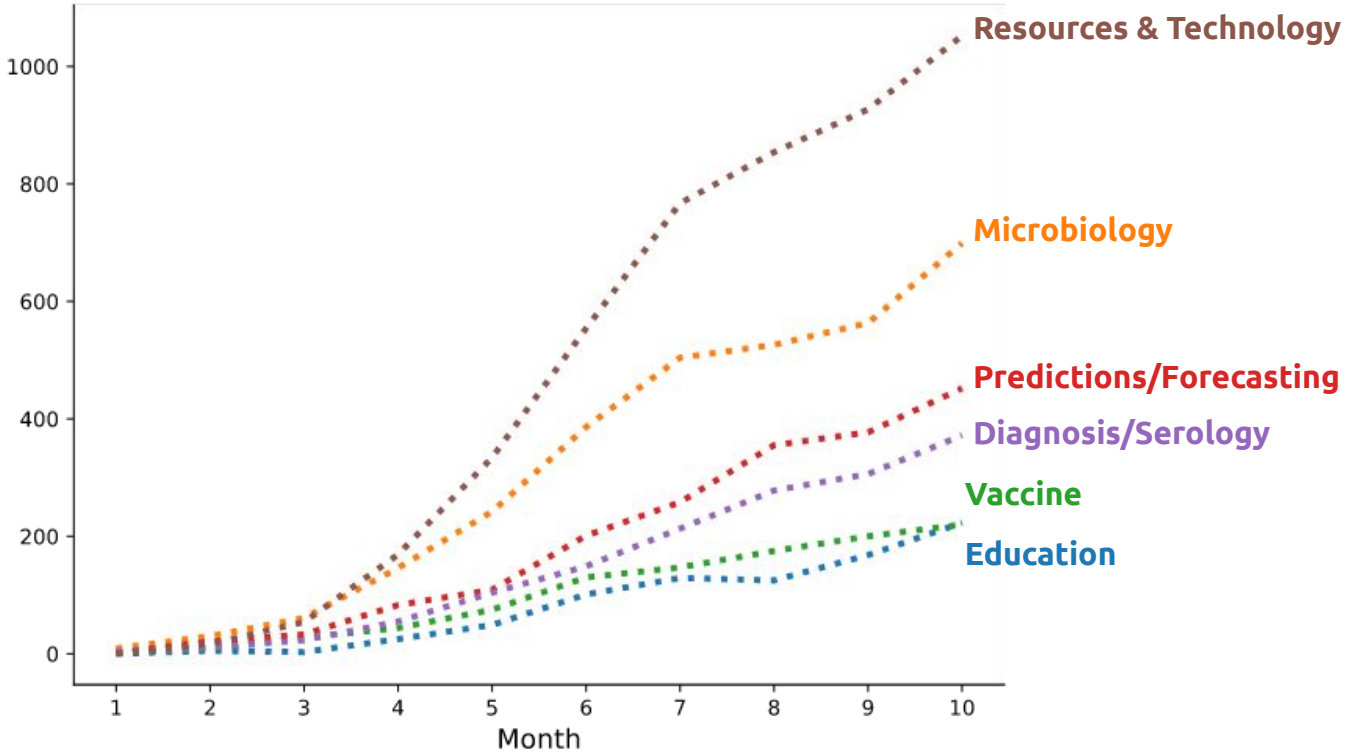
Topics: Number of Abstracts



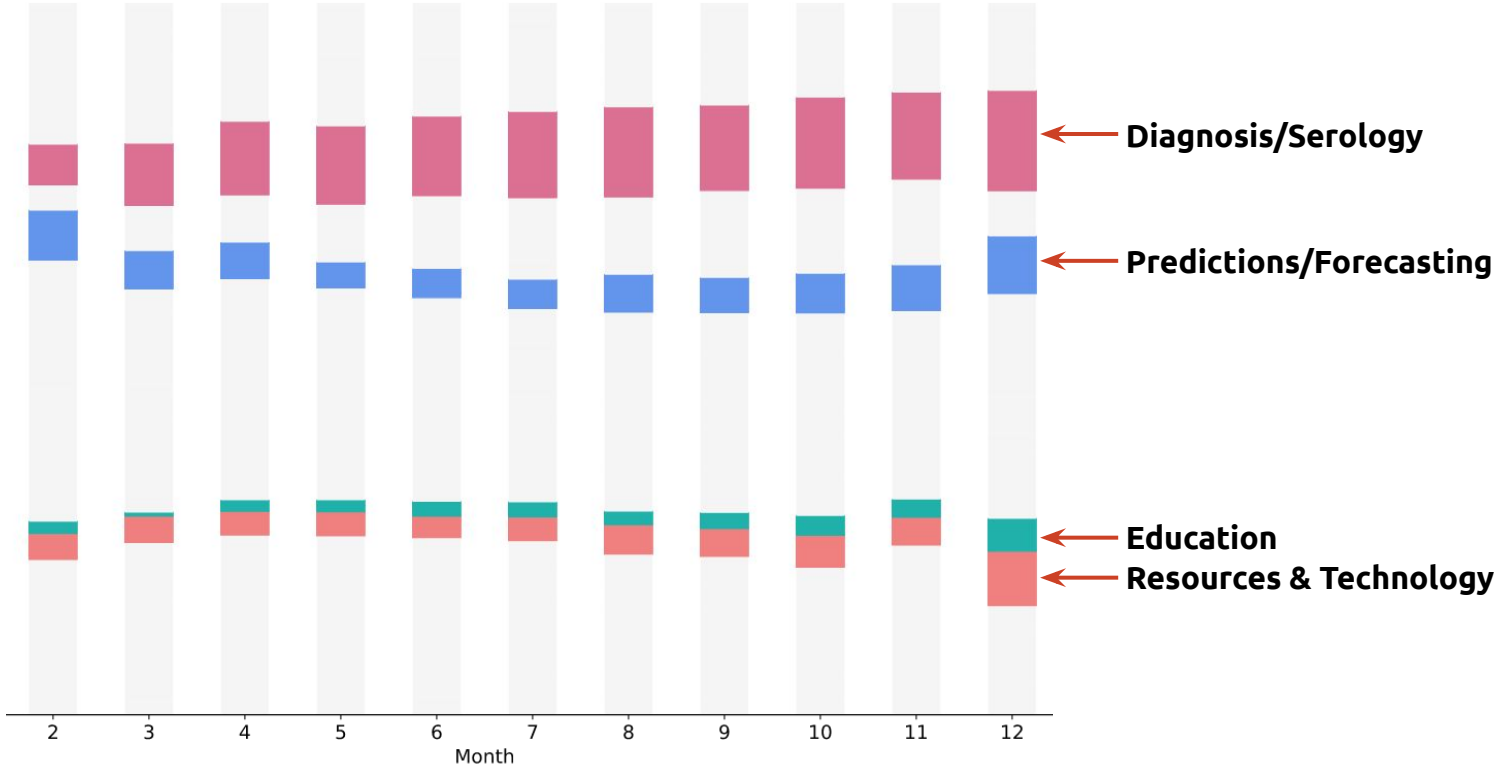
Topics: Number of Abstracts



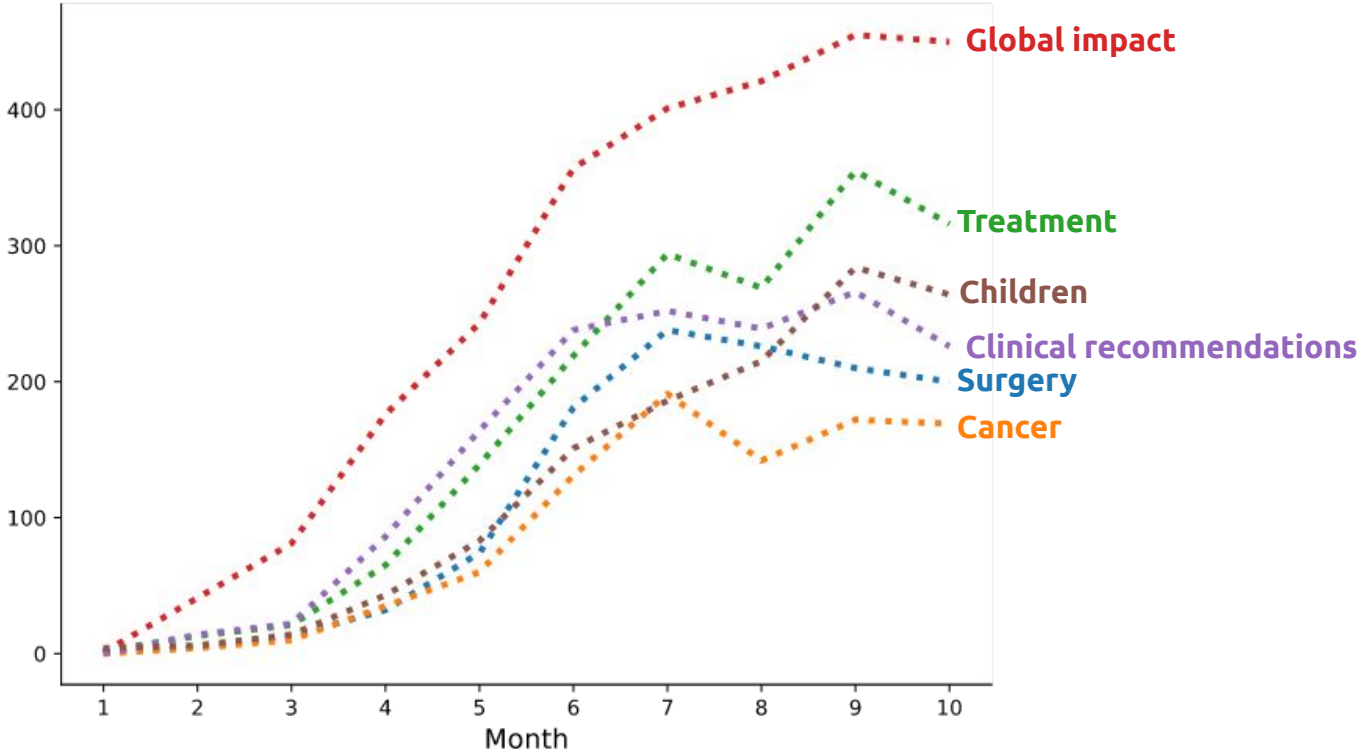
Topics: Trends



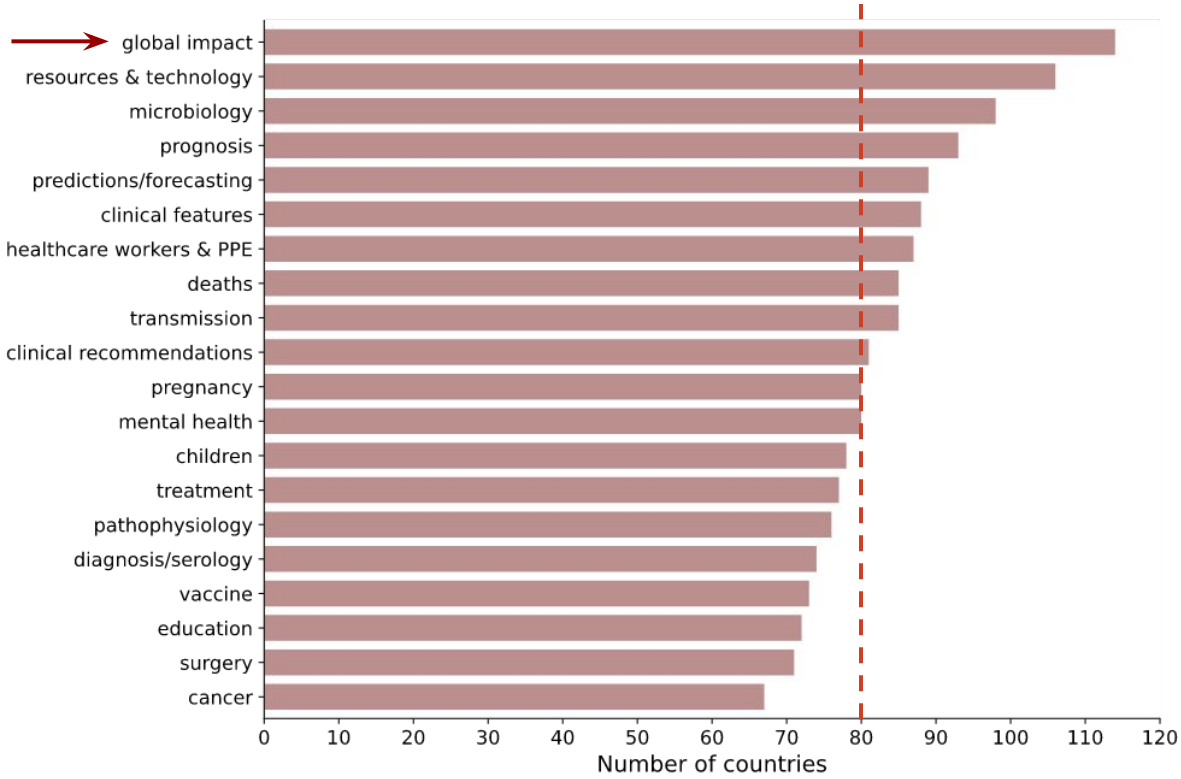
Topics: Trends



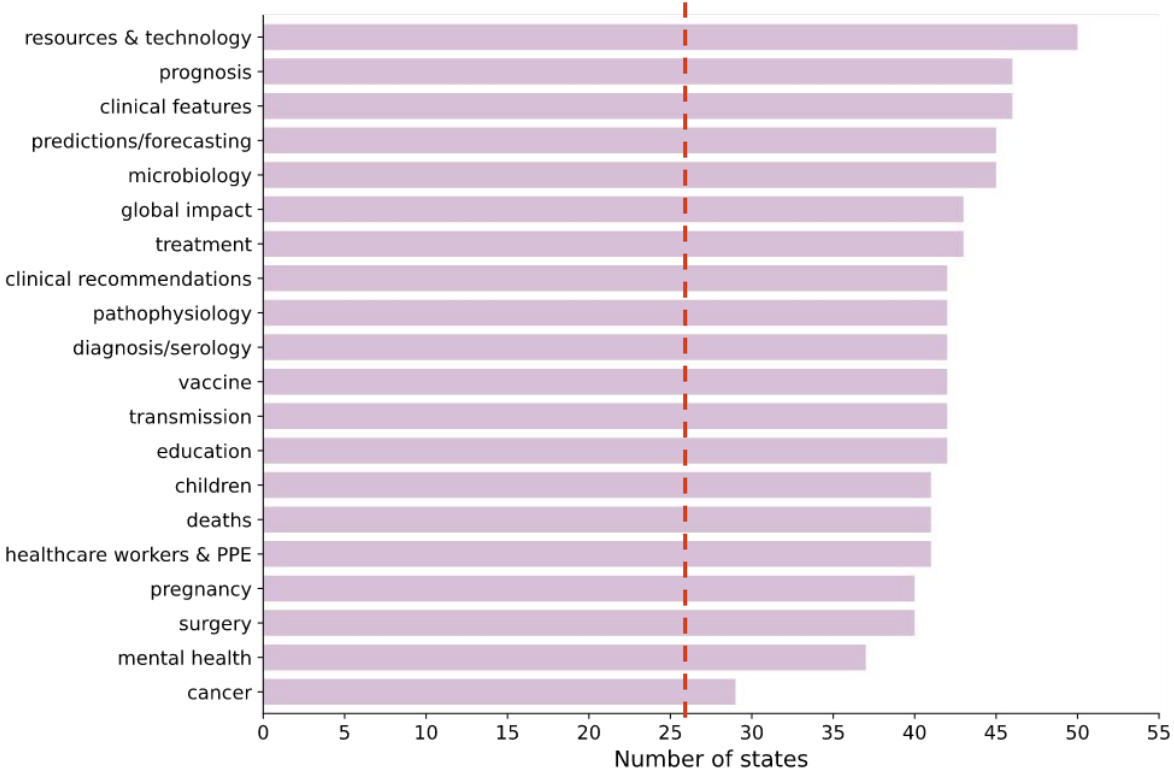
Topics: Trends



Topics: Number of Countries



Topics: Number of U.S. States



Recommender System

Abstract of interest:

Children were less frequently infected with SARS-CoV-2 than adults during 2020 COVID-19 pandemic in Warsaw, Poland

Recommender System

Abstract of interest:

Children were less frequently infected with SARS-CoV-2 than adults during 2020 COVID-19 pandemic in Warsaw, Poland

PubMed similar articles:

Rapid, point-of-care antigen and molecular-based tests for diagnosis of SARS-CoV-2 infection.

Antibody tests for identification of current and past infection with SARS-CoV-2.

Screening of healthcare workers for SARS-CoV-2 highlights the role of asymptomatic carriage in COVID-19 transmission.

Recommender System

Abstract of interest:

Children were less frequently infected with SARS-CoV-2 than adults during 2020 COVID-19 pandemic in Warsaw, Poland

Recommended:

A comparative-descriptive analysis of clinical characteristics in 2019-coronavirus-infected children and adults

Neurological Complications of SARS-CoV-2 Infection in Children: A Systematic Review and Meta-Analysis

Clinical characteristics of COVID-19 in children: Are they similar to those of SARS?

PubMed similar articles:

Rapid, point-of-care antigen and molecular-based tests for diagnosis of SARS-CoV-2 infection.

Antibody tests for identification of current and past infection with SARS-CoV-2.

Screening of healthcare workers for SARS-CoV-2 highlights the role of asymptomatic carriage in COVID-19 transmission.

Future Work

Other clustering methods

Study type

Further clustering/ topic modeling

Topics
Months
Geographical areas

Compare with metadata

Analyze in conjunction with timeline

Recommender system

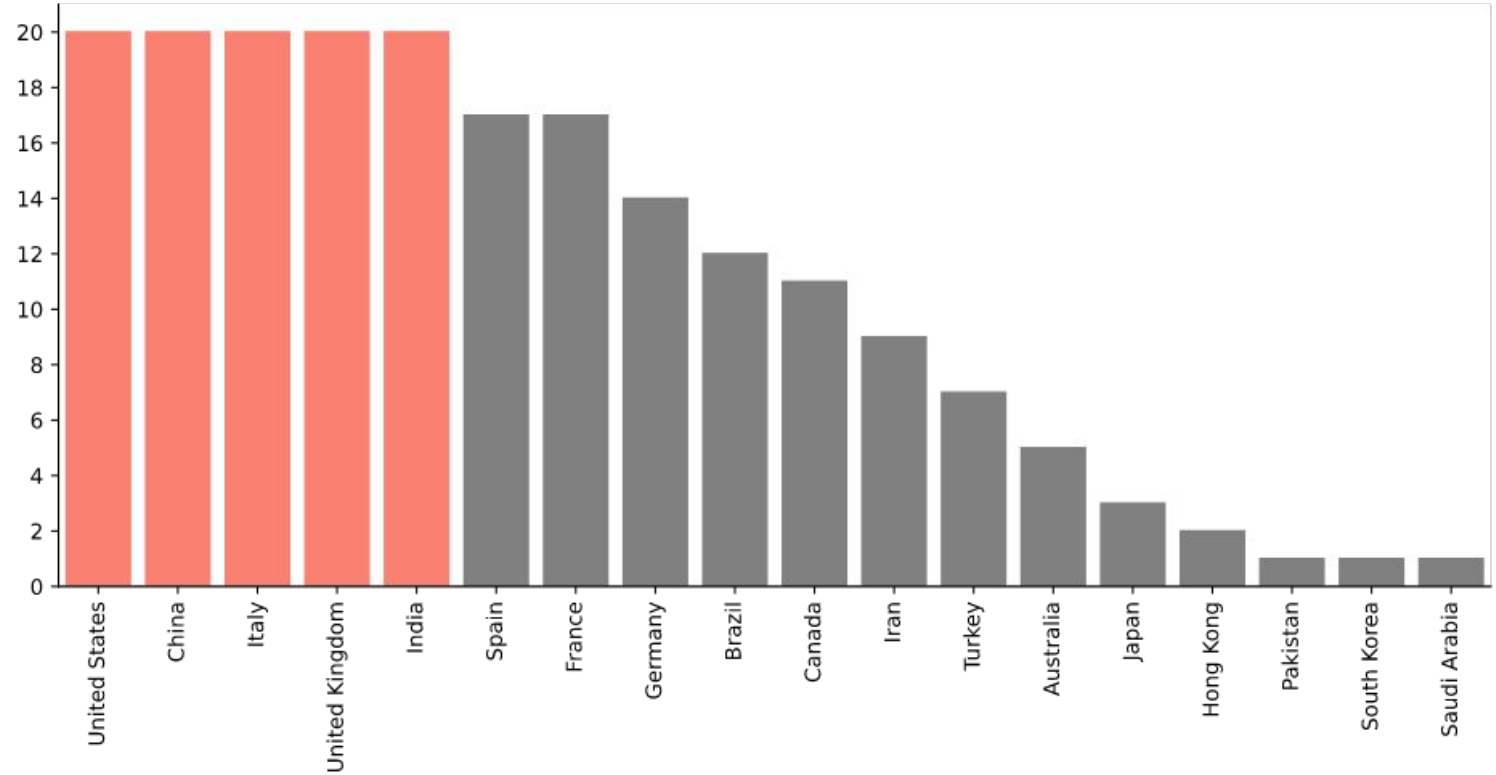
Application

Questions?

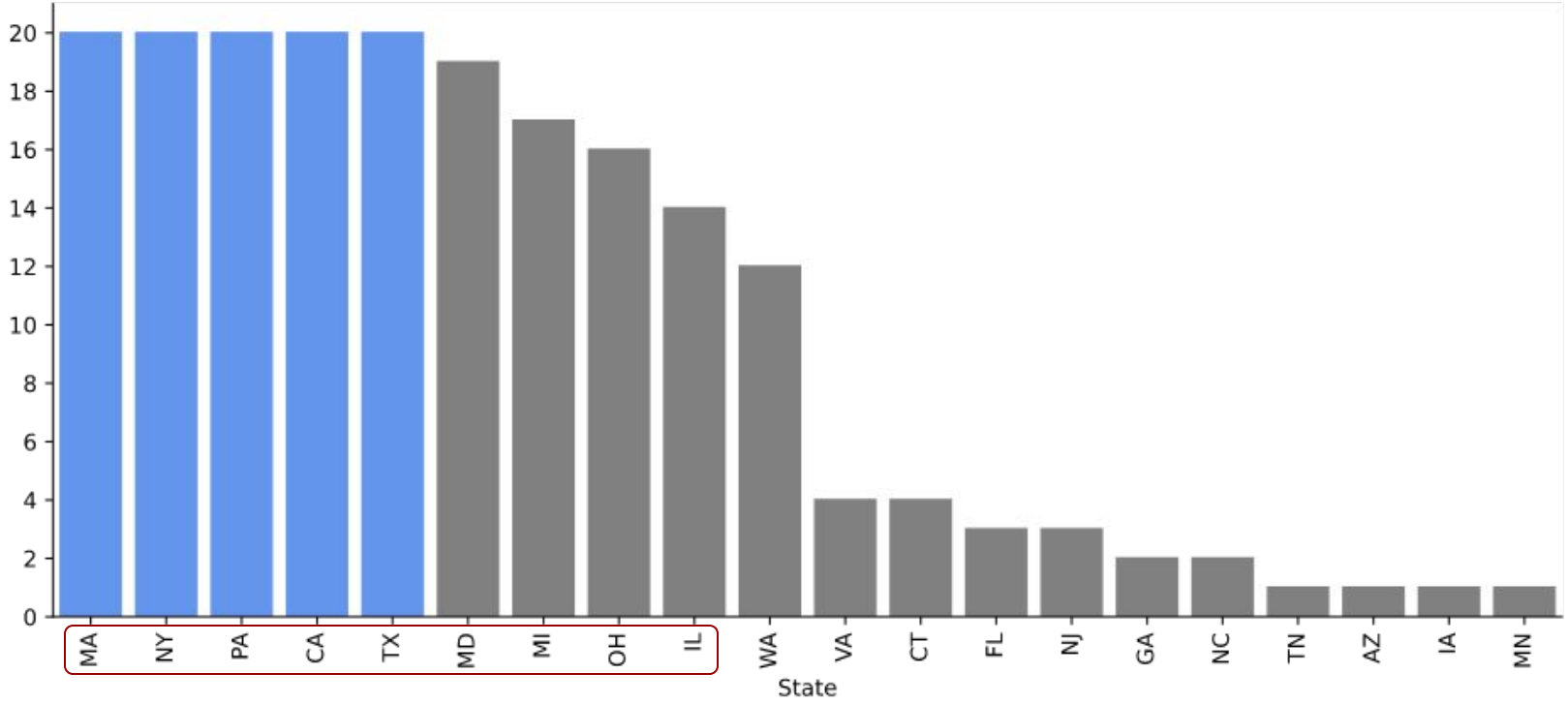
Thank you!

Appendix

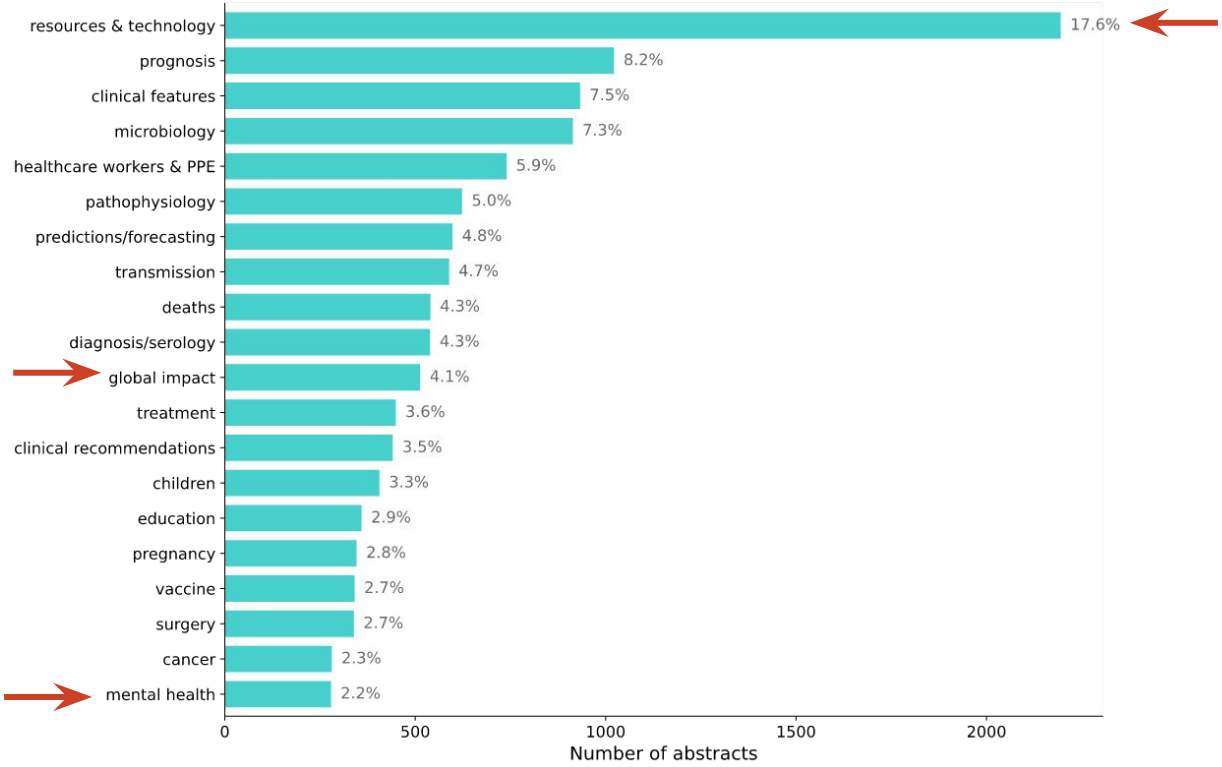
Number of Topics by Country



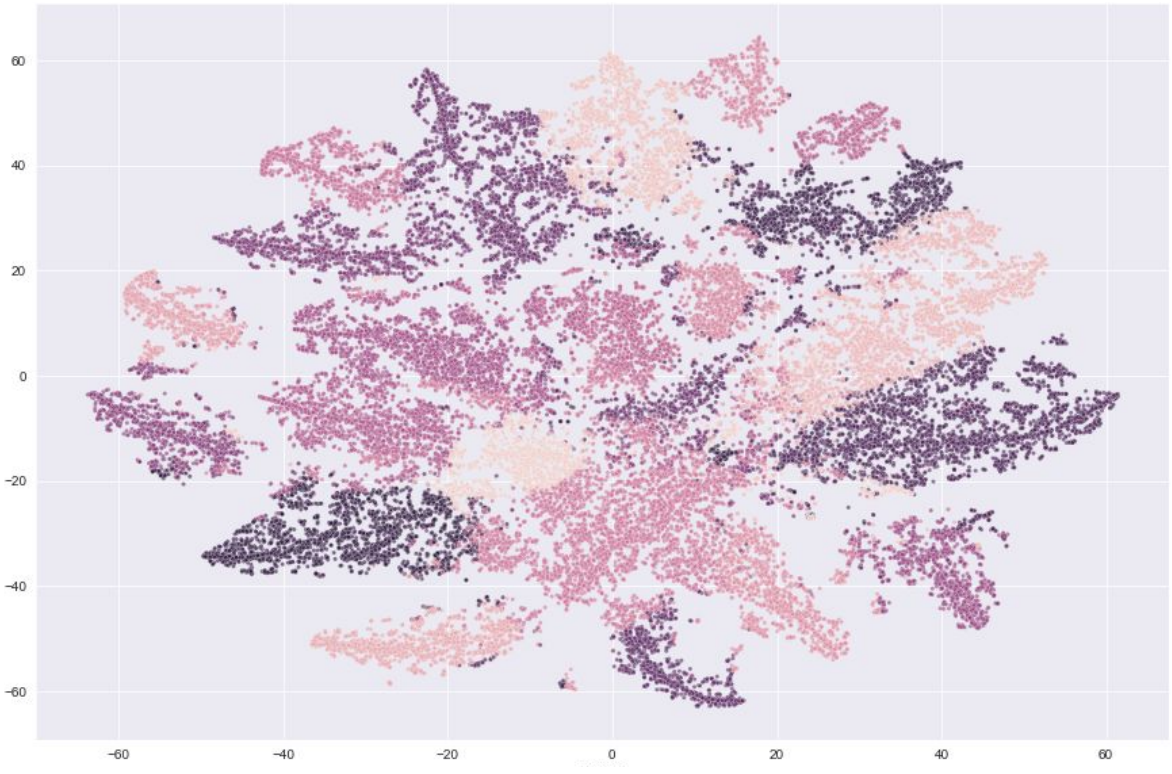
Number of Topics by U.S. State



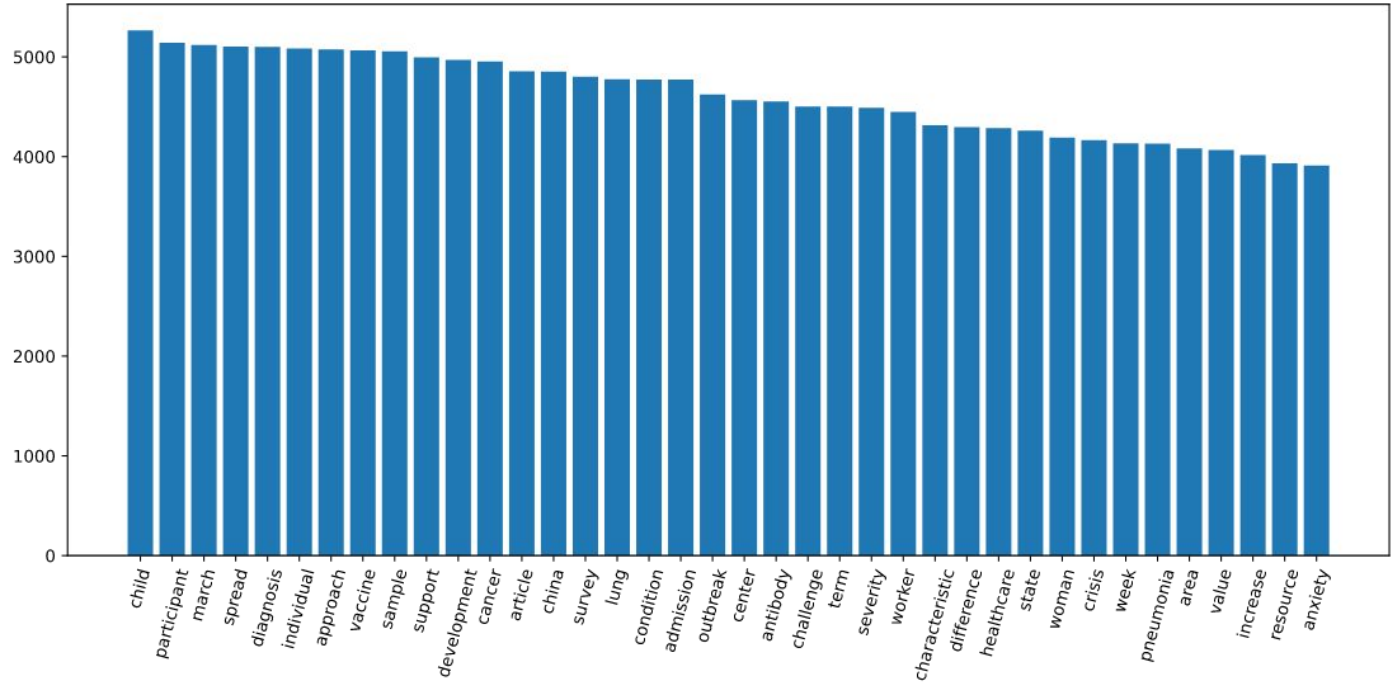
Distribution of Topics for U.S.



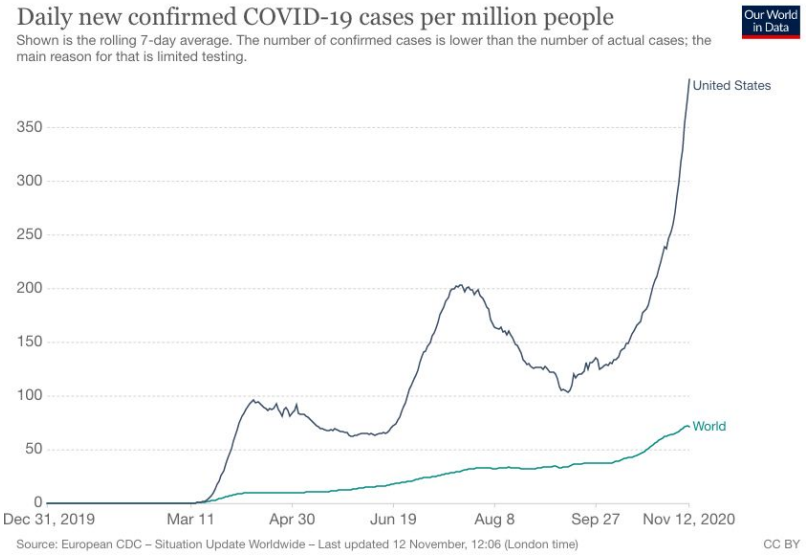
Model: t-SNE

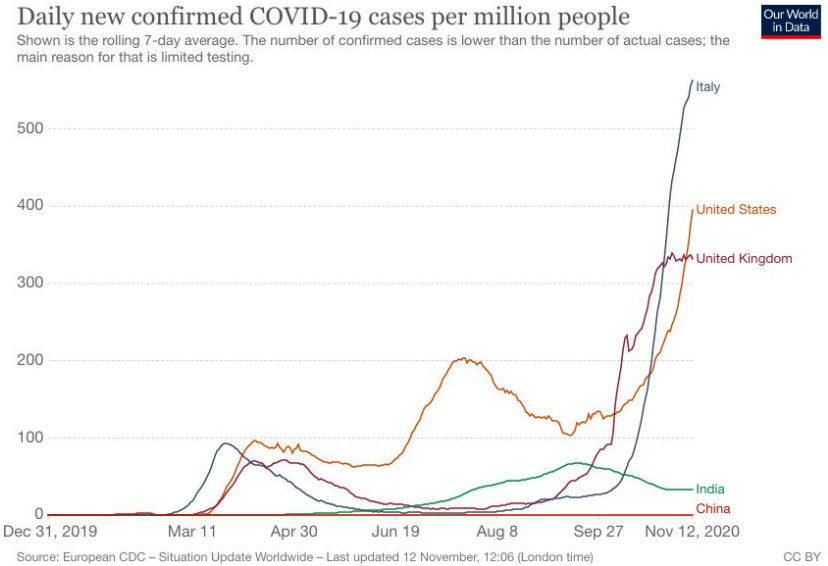


Term Counts

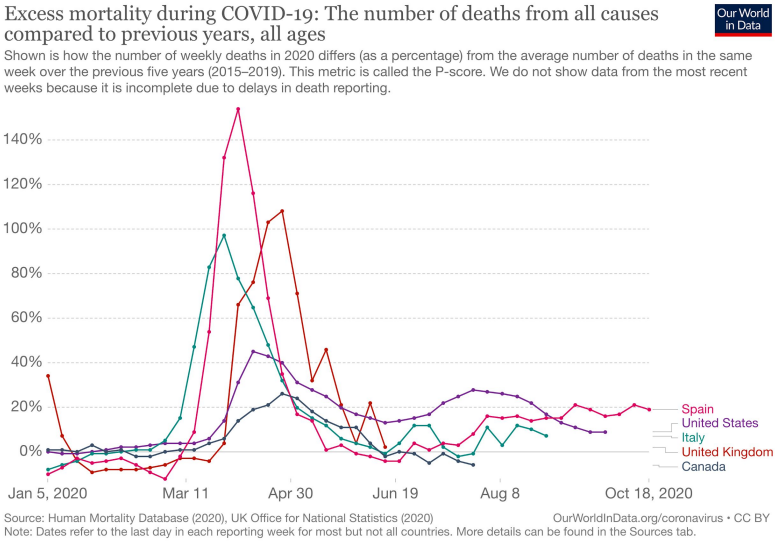

5000
4000
3000
2000
1000
0
child
participant
march
spread
diagnosis
individual
approach
vaccine
sample
support
development
cancer
article
china
survey
lung
condition
admission
outbreak
center
antibody
challenge
term
severity
worker
characteristic
difference
healthcare
state
woman
crisis
week
pneumonia
area
value
increase
resource
anxiety

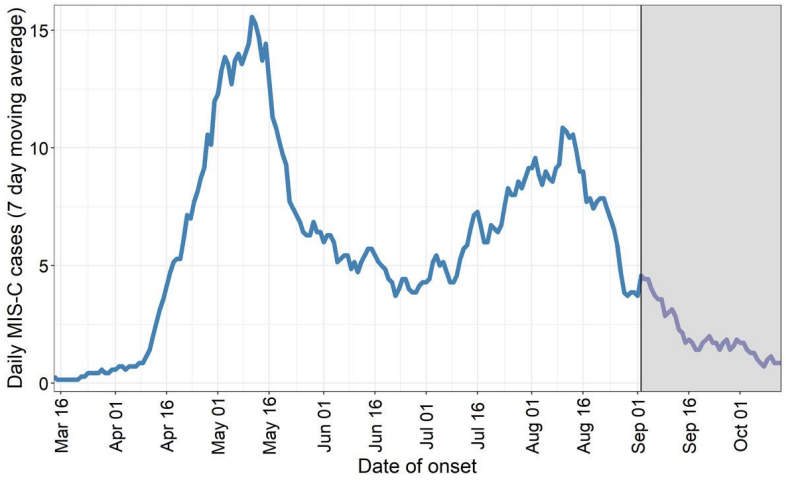
Metadata


Daily new confirmed COVID-19 cases per million people
Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.
Our World in Data
United States
World
350
300
250
200
150
100
50
0
Dec 31, 2019
Mar 11
Apr 30
Jun 19
Aug 8
Sep 27
Nov 12, 2020
Source: European CDC – Situation Update Worldwide – Last updated 12 November, 12:06 (London time)
CC BY

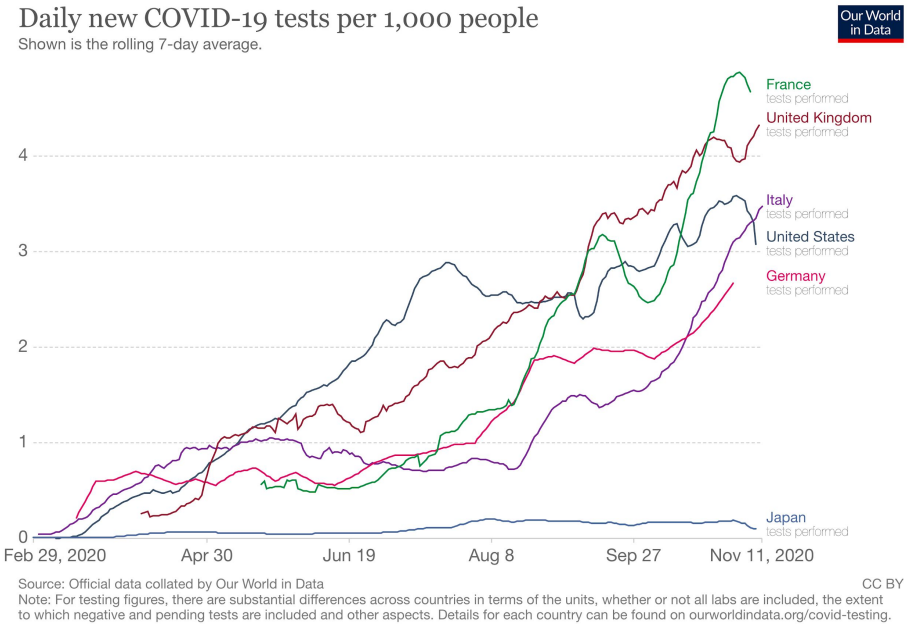

Daily new confirmed COVID-19 cases per million people
Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.
Our World in Data
Italy
United States
United Kingdom
India
China
500
400
300
200
100
0
Dec 31, 2019
Mar 11
Apr 30
Jun 19
Aug 8
Sep 27
Nov 12, 2020
Source: European CDC – Situation Update Worldwide – Last updated 12 November, 12:06 (London time)
CC BY

Metadata

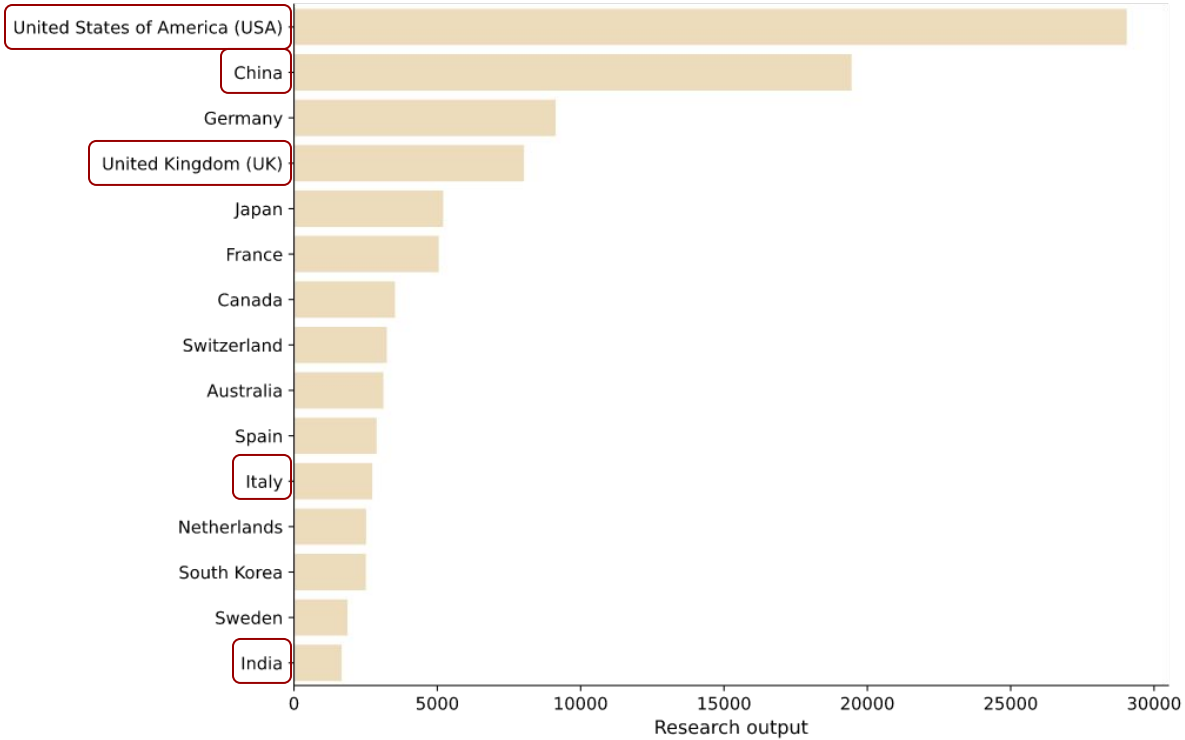

Excess mortality during COVID-19: The number of deaths from all causes compared to previous years, all ages
Our World in Data
Shown is how the number of weekly deaths in 2020 differs (as a percentage) from the average number of deaths in the same week over the previous five years (2015–2019). This metric is called the P-score. We do not show data from the most recent weeks because it is incomplete due to delays in death reporting.
140%
120%
100%
80%
60%
40%
20%
0%
Jan 5, 2020
Mar 11
Apr 30
Jun 19
Aug 8
Oct 18, 2020
Spain
United States
Italy
United Kingdom
Canada
Source: Human Mortality Database (2020), UK Office for National Statistics (2020)
OurWorldInData.org/coronavirus • CC BY
Note: Dates refer to the last day in each reporting week for most but not all countries. More details can be found in the Sources tab.


Daily MIS-C cases (7 day moving average)
15
10
5
0
Mar 16
Apr 01
Apr 16
May 01
May 16
Jun 01
Jun 16
Jul 01
Jul 16
Aug 01
Aug 16
Sep 01
Sep 16
Oct 01
Date of onset

Metadata


Daily new COVID-19 tests per 1,000 people
Shown is the rolling 7-day average.
Our World in Data
France
tests performed
United Kingdom
tests performed
Italy
tests performed
United States
tests performed
Germany
tests performed
Japan
tests performed
4
3
2
1
0
Feb 29, 2020
Apr 30
Jun 19
Aug 8
Sep 27
Nov 11, 2020
Source: Official data collated by Our World in Data
CC BY
Note: For testing figures, there are substantial differences across countries in terms of the units, whether or not all labs are included, the extent to which negative and pending tests are included and other aspects. Details for each country can be found on ourworldindata.org/covid-testing.

Metadata: Nature Index 2019



Source: nature.com

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(https://fonts.google.com/specimen/Ubuntu)

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