

TRINETX

# COVID-19

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2019-nCoV (COVID-19) Real-World Data Report  
USA

Issue 5

Run on August 25, 2020



**TriNetX**



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## OVERVIEW

TriNetX is the global health research network that connects the world of drug discovery and development from pharmaceutical company to study site, and investigator to patient by sharing real-world data to make clinical and observational research easier and more efficient. This report summarizes critical information about the characteristics, treatments, and outcomes of COVID-19 patients identified in our network and will be updated on an ongoing basis.

## NETWORK CHARACTERISTICS

This report includes data from the TriNetX Dataworks – USA network, representing electronic medical record (EMR) data from 37 healthcare organizations (HCOs) across the United States, representing over 58 million patients. The Dataworks – USA network provides the ability to download datasets.

## COHORT SUMMARY

Potential COVID-19 patients were identified using on a combination of ICD-10 diagnostic terms and confirmatory laboratory results occurring on or after January 1, 2020 (See Appendix A). TriNetX identified **141,675 potential COVID-19 patients** as of August 25, 2020. From this cohort of all potential COVID-19 patients, we identified a sub-cohort of 22,403 severe patients who were hospitalized within one month on or after the first instance of COVID-19 in their EMR.

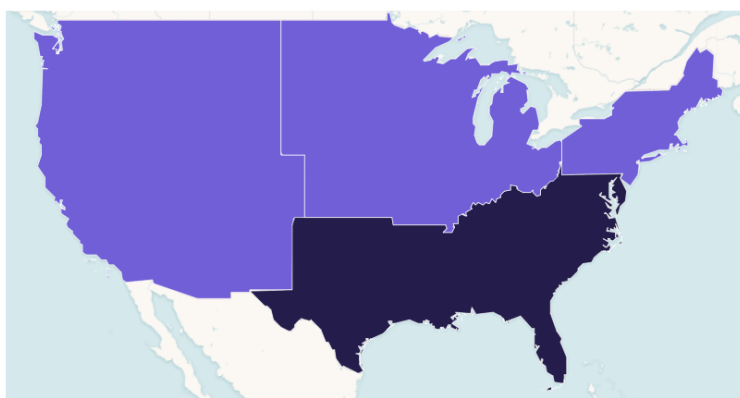
## CLINICAL FINDINGS

### COVID-19 Patient Density Map

US Regions	Patients	Percent
Northeast	23,757	17%
Midwest	17,065	12%
South	76,719	54%
West	24,129	17%

Other Regions	Patients	Percent
Unknown	10	<1%

Patient location is determined by location of HCO headquarters



## PATIENT CHARACTERISTICS

### Demographics and Prior/Coexisting Conditions of COVID-19 Patients

Demographics	All COVID-19 Patients		Severe COVID-19 Patients	
	n=141,675		n=22,403	
Age, years (mean ± SD)	47 ± 19		58 ± 19	
10 - 19 (n, %)	8,158	5.8	424	1.9
20 - 29 (n, %)	24,636	17.4	1,512	6.7
30 - 39 (n, %)	25,071	17.7	2,276	10.2
40 - 49 (n, %)	22,816	16.1	2,779	12.4
50 - 59 (n, %)	23,215	16.4	4,109	18.3
60 - 69 (n, %)	18,355	13.0	4,587	20.5
70 - 79 (n, %)	11,221	7.9	3,798	17.0
≥80 (n, %)	8,203	5.8	2,894	12.9
Male Sex (n, %)	62,966	44.4	11,062	49.4
Female Sex (n, %)	77,770	54.9	11,250	50.2
Unknown Sex (n, %)	939	0.7	91	0.4
<b>Prior or Coexisting Condition<sup>1</sup></b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Respiratory diseases	55,494	39.2	10,971	49.0
Asthma	11,084	7.8	1,918	8.6
COPD	4,771	3.4	1,968	8.8
Seasonal allergies	5,918	4.2	725	3.2
Cardiovascular diseases	43,936	31.0	11,576	51.7
Hypertension	33,131	23.4	8,918	39.8
Congestive heart failure	6,463	4.6	2,998	13.4
Myocardial infarction	2,535	1.8	1,292	5.8
Angina pectoris	2,139	1.5	812	3.6
Diabetes	16,805	11.9	5,370	24.0
Cancer	8,691	6.1	2,724	12.2
Kidney disease	7,720	5.4	3,414	15.2
HIV	739	0.5	175	0.8

<sup>1</sup> Data as of August 25, 2020. Diagnoses captured any time to one day before first instance of COVID-19 in EMR

## Clinical Characteristics During COVID-19 Episode

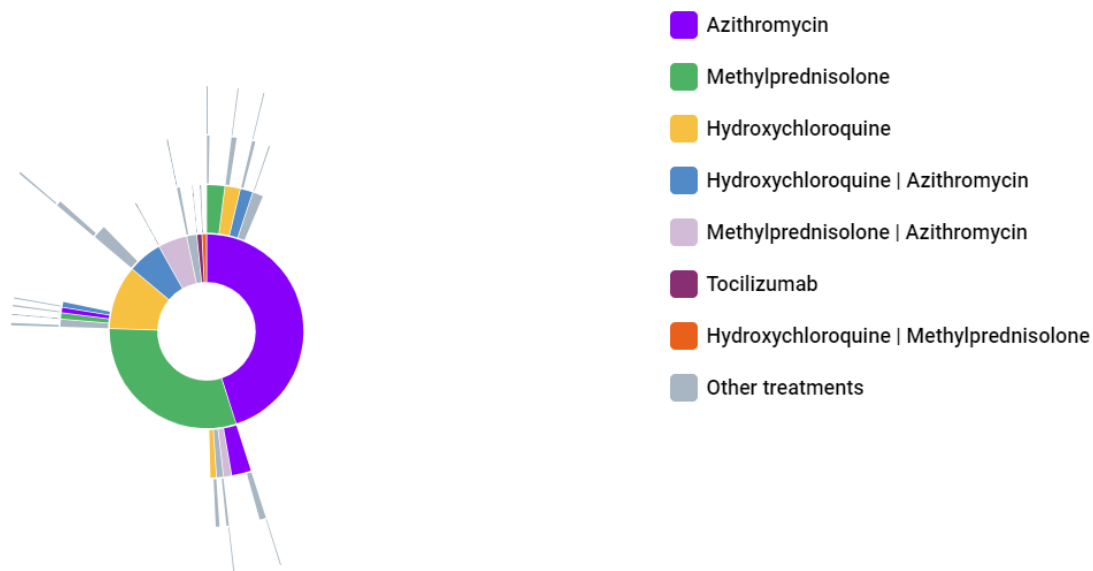
	All COVID-19 Patients		Severe COVID-19 Patients	
	n=141,675		n=22,403	
Diagnosis <sup>2</sup>	n	%	n	%
Cough	26,772	18.9	4,200	18.7
Fever	19,477	13.7	5,708	25.5
Shortness of breath	18,408	13.0	7,166	32.0
Pneumonia	17,593	12.4	10,881	48.6
Pain in throat and chest	8,295	5.9	2,768	12.4
Acute lower respiratory infections	8,061	5.7	2,130	9.5
Renal failure	6,046	4.3	4,492	20.1
Diarrhea	4,860	3.4	3,753	16.8
Hypotension	2,846	2.0	2,299	10.3
Acute respiratory distress syndrome (ARDS)	1,945	1.4	104	0.5
Loss of taste or smell	1,583	1.1	377	1.7
Bronchitis	409	0.3	308	1.4
Hepatic failure	6,046	4.3	4,492	20.1
Clinical Setting <sup>2</sup>	n	%	n	%
Emergency	39,156	27.6	13,854	61.8
Inpatient	23,404	16.5	22,403	100.0
Medication <sup>3</sup>	n	%	n	%
Antibiotics	30,788	21.7	12,770	57.0
Glucocorticoids	18,920	13.4	9,877	44.1
Antimalarials	4,638	3.3	2,883	12.9
Antivirals	825	0.6	422	1.9
Interleukin Inhibitors	30,788	21.7	12,770	57.0

<sup>2</sup> Diagnoses and clinical setting captured in EMR one week before to one month after first instance of COVID-19 in EMR.

<sup>3</sup> Medications captured in EMR one day before to one month after first instance of COVID-19 in EMR.

## Treatment Pathway of COVID-19 Patients

The sunburst diagram shows the top ten individual or combination therapies used to treat potential COVID-19 patients. Here a line of therapy is defined as any treatments taken within 1 day. Treatment pathways were analyzed from the first instance of COVID-19 in EMR until August 25, 2020.



121,518 patients or 86% of the cohort don't have a pathway

## MAJOR OUTCOMES

	All COVID-19 Patients	Severe COVID-19 Patients
	n=141,675	n=22,403
Laboratory Data <sup>4</sup>	Mean ± SD	Mean ± SD
Complete Blood Count		
Hemoglobin, g/dL	12.2 ± 2.3	11.4 ± 2.3
Hematocrit, %	33.9 ± 12.5	34.0 ± 9.3
RBC, 10 <sup>6</sup> cells/μL	4.2 ± 0.8	4.0 ± 0.8
Platelet Count, 10 <sup>3</sup> cells/μL	261.1 ± 115.4	271.7 ± 130.4
WBC, 10 <sup>3</sup> cells/μL	8.0 ± 5.8	8.9 ± 6.4
Eosinophils, %	1.6 ± 2.7	1.7 ± 3.0
Metabolic		
Creatinine, mg/dL	1.2 ± 1.7	1.3 ± 1.7
Hepatic		

ALT, U/L	54.79 ± 234.6	66.5 ± 293.2		
AST, U/L	67.2 ± 541.2	86.1 ± 687.4		
Alk Phos, U/L	92.4 ± 69.0	99.7 ± 85.0		
Total bilirubin, mg/dL	0.6 ± 1.1	0.7 ± 1.4		
<b>Inflammatory</b>				
C Reactive Protein, mg/L	57.5 ± 75.9	62.6 ± 79.9		
IL-6, pg/mL	204.5 ± 875.8	176.3 ± 512.9		
<b>Cardiac</b>				
Ejection Fraction, %	55.3 ± 13.9	55.0 ± 14.2		
QTc prolongation, ms	419.1 ± 108.3	421.7 ± 111.6		
<b>Renal</b>				
Creatinine clearance, mL/min	71.7 ± 51.3	82.3 ± 46.4		
<b>Care and Management<sup>4</sup></b>				
Hospitalization (n, %)	45,206	31.9	22,302	99.5
Mean time to discharge, days	6		6	
Chest radiology (e.g., x-ray, CT, MRI) (n, %)	23,543	16.6	9,559	42.7
Abnormal finding on imaging of lung <sup>5</sup>	5,501	23.4	3,774	39.5
Mechanical ventilation (including ECMO) (n, %)	3,364	2.4	2,745	12.3
Follow-up time at least 14 days (n, %)	49,825	35.2	11,627	51.9
Follow-up time at least 21 days (n, %)	41,381	29.2	9,775	43.6
Follow-up time at least 28 days (n, %)	35,542	25.1	8,342	37.2
<b>Mortality<sup>6</sup></b>			<b>n</b>	<b>%</b>
All-cause mortality	3,284	2.3	2,336	10.4

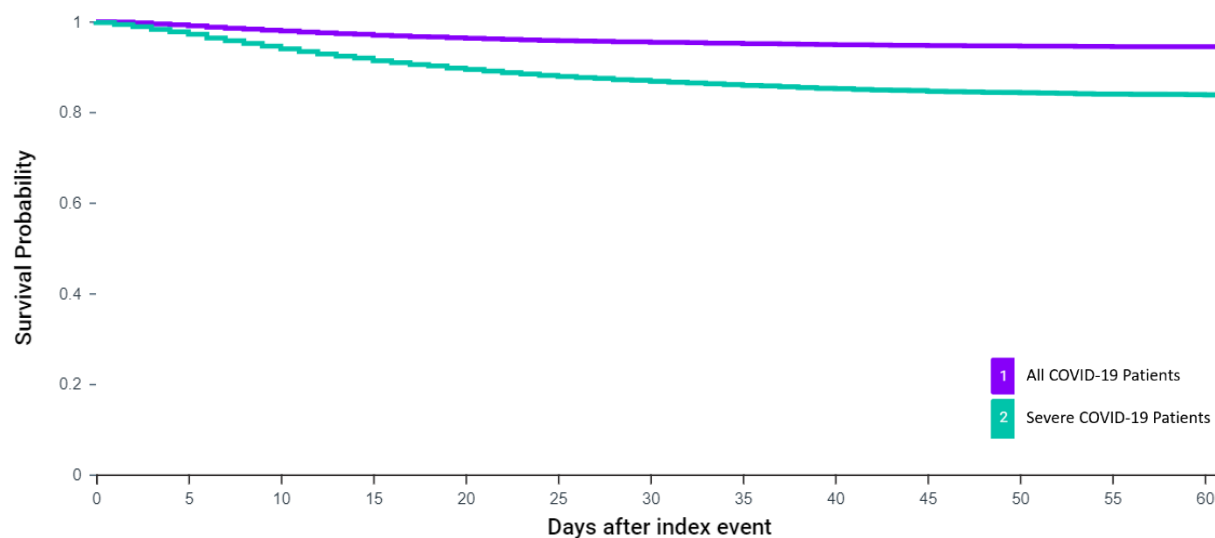
<sup>4</sup> Laboratory and care and management variables captured in EMR on same day to one month after first instance of COVID-19 in EMR. Laboratory data are of patients' most recent laboratory results in this time window. Not all patients have laboratory data.

<sup>5</sup> Abnormal finding on imaging of lung is an ICD-10 term (R91). Percentages are calculated among patients with chest radiology performed.

<sup>6</sup> All-cause mortality captured in EMR on same day to two months after first instance of COVID-19 in EMR.

## Kaplan-Meier Survival Curve for All-Cause Mortality

The Kaplan-Meier curve shows the survival probability among all COVID-19 patients and severe COVID-19 patients. All-cause mortality was analyzed from the first instance of COVID-19 up to 2 months after, through August 25, 2020.



## CLINICAL SPOTLIGHT

Each issue of the 2019-nCoV (COVID-19) Real-World Data Report spotlights real-world insights generated in the TriNetX platform or datasets.

In a US-based analysis of patients  $\leq 17$  years old, we examined the risk of inflammation in pediatric COVID-19 patients with and without fever on the Dataworks – USA network. Our findings show that the risk of inflammation is over four times higher in pediatric patients with fever than those without (Table 1). This analysis may provide real world evidence of Multisystem Inflammatory Syndrome in Children (MIS-C), a complication associated with COVID-19 which often requires hospitalization and may present as persistent fever, fatigue, and elevated inflammatory markers (<https://www.cdc.gov/mis-c/hcp/>). We also found that each month, the percentage of new pediatric COVID-19 cases rises compared to all new COVID-19 cases, which corresponds with increased testing among the pediatric population (Fig. 1).

	N	% with inflammation marker (lab result or symptom)
With fever	1,182	27.7%
Without fever	5,884	6.0%

Table 1. Risk of inflammation within 1 month following diagnosis in pediatric COVID-19 patients with and without fever 1 week before up to 1 week after their COVID-19 diagnosis from April through July 2020\*

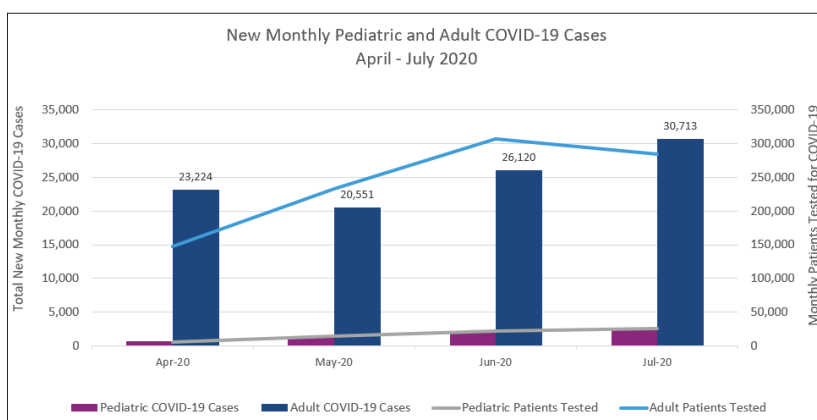


Figure 1. New monthly cases of COVID-19 in pediatric and adult patients in the Dataworks – USA network from April through July 2020\*  
\* Data as of 8/27/2020. Due to data refresh rates, data for July 2020 may not yet be complete.



# APPENDIX

## Appendix A: COVID-19 query in TriNetX

**Network**    Datanworks - UISA

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**Population**    ≥ 10 years, Any sex

MUST Have

Search Term... 🔍 📄

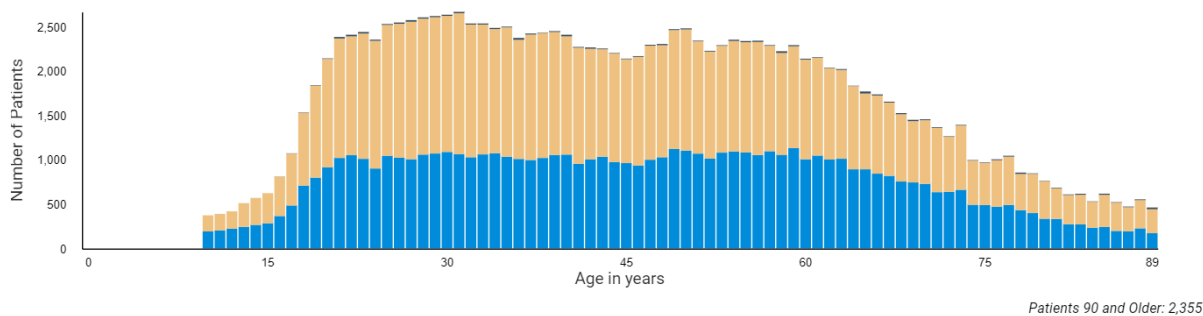
CANNOT Have

Search Term... 🔍 📄

Event 1A: The terms in this event occurred on or after Jan 01, 2020 ✎
+ Add Related Event ✕

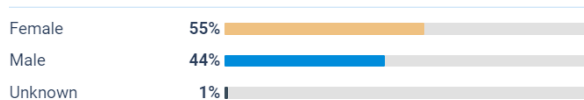
<div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">B34.2    Coronavirus infection, unspecified</span> <span style="float: right;">24,923</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em;">B97.29    Other coronavirus as the cause of diseases classified elsewhere</span> <span style="float: right;">37,645</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">J12.81    Pneumonia due to SARS-associated coronavirus</span> <span style="float: right;">424</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">U07.1    COVID-19</span> <span style="float: right;">10,414</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em;">94309-2    SARS coronavirus 2 RNA [Presence] in Unspecified specimen by NAA with probe detection</span> <span style="float: right;">8,384</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; Positive, Ever</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94500-6    SARS coronavirus 2 RNA [Presence] in Respiratory specimen by NAA with probe detection</span> <span style="float: right;">54,421</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; Positive, Ever</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94533-7    SARS coronavirus 2 N gene [Presence] in Respiratory specimen by NAA with probe detection</span> <span style="float: right;">4,596</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; Positive, Ever</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94534-5    SARS coronavirus 2 RdRp gene [Presence] in Respiratory specimen by NAA with probe detection</span> <span style="float: right;">1,233</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; Positive, Ever</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94559-2    SARS coronavirus 2 ORF1ab region [Presence] in Respiratory specimen by NAA with probe detection</span> <span style="float: right;">209</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; Positive, Ever</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94507-1    SARS coronavirus 2 IgG Ab [Presence] in Serum or Plasma by Rapid immunoassay</span> <span style="float: right;">10</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; Positive, Ever</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94505-5    SARS coronavirus 2 IgG Ab [Units/volume] in Serum or Plasma by Immunoassay</span> <span style="float: right;">34</span> </div> <div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; ≥ 0.1 units, ever</span> </div> <div style="padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">OR</span> <span style="font-size: 0.7em;">94506-3    SARS coronavirus 2 IgM Ab [Units/volume] in Serum or Plasma by Immunoassay</span> <span style="float: right;">17</span> </div> <div style="padding: 2px 5px;"> <span style="font-size: 0.7em; color: #0070c0;">&gt; ≥ 0.1 units, ever</span> </div>	<div style="border-bottom: 1px solid #ccc; padding: 2px 5px;"> <span style="font-size: 0.7em;">079.89    Other specified viral infection</span> <span style="float: right;">18,393</span> </div>
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## Appendix B: Distribution of age and sex



Total Patients	Minimum Age	Maximum Age	Mean Age	Standard Deviation
141,675	10	90	47	19

### Sex



## APPENDIX C: COVID-19 Publications Using TriNetX Data

- Harrison S, Fazio-Eynullayeva E, Lane D, et al. (2020.) Co-morbidities Associated with Mortality in 31,461 Adults with COVID-19 in the United States: A Federated Electronic Medical Record Analysis. Accepted to PLOS Medicine.
- Singh S, Khan A, Chowdhry M, et al. (2020). Risk of Severe COVID-19 in Patients with Inflammatory Bowel Disease in United States. A Multicenter Research Network Study. Published in Gastroenterology. DOI: <https://doi.org/10.1053/j.gastro.2020.06.003>
- Hadi Y, Naqvi S, Kupec J, et al. (2020). Characteristics and outcomes of COVID-19 in patients with HIV, AIDS. Volume Publish Ahead of Print - Issue - doi: 10.1097/QAD.0000000000002666.
- Singh S, Chowdhry M, Chatterjee A, et al. (2020). Gender-Based Disparities in COVID-19 Patient Outcomes: A Propensity-matched Analysis medRxiv preprint. <https://doi.org/10.1101/2020.04.24.20079046>
- Griffith DM, Sharma G, Holliday CS, et al. (2020). Men and COVID-19: A Biopsychosocial Approach to Understanding Sex Differences in Mortality and Recommendations for Practice and Policy Interventions. Prev Chronic Dis. doi:10.5888/pcd17.200247
- Khan A, Chatterjee A, Singh S (2020). Comorbidities and Disparities in Outcomes of COVID-19 Among African American and White Patients. medRxiv 2020.05.10.20090167; doi: <https://doi.org/10.1101/2020.05.10.20090167>
- Shailendra Singh, Mohammad Bilal, Ahmad Khan, Monica Chowdhry, Sergio A. Sánchez-Luna, Gursimran S. Kochhar, Diogo Turiani Hourneaux de Moura, Christopher C. Thompson.

- Singh S, Bilal M, Khan A, et al. (2020). Outcomes of COVID-19 in Patients with Obesity in United States: A Large Research Network Study. *Lancet* pre-print.
- Onteddu SR, Nalleballe K, Sharma R., et al. (2020). Underutilization of Healthcare for strokes during the COVID-19 outbreak. *International Journal of Stroke*, 1747493020934362.
- Annie F, Bates MC, Nanjundappa A, et al. (2020). Prevalence and outcomes of acute ischemic stroke among patients ≤ 50 years of age with laboratory confirmed COVID-19 infection. *American Journal of Cardiology*. , doi: <https://doi.org/10.1016/j.amjcard.2020.06.010>
- Singh S, Khan A, Chowdhry M, et al. (2020). Outcomes of hydroxychloroquine treatment among hospitalized COVID-19 patients in the United States - real-world evidence from a federated electronic medical record network. medRxiv.
- Ranabothu S, Onteddu S, Nalleball K, et al. (2020). Spectrum of COVID-19 in Children. *Acta Paediatrica* <https://doi.org/10.1111/apa.15412>
- Nalleballe K, Reddy Onteddu S, et al. (2020) Spectrum of neuropsychiatric manifestations in COVID-19 [published online ahead of print, 2020 Jun 17]. *Brain Behav Immun*. S0889-1591(20)31008-4. <https://doi:10.1016/j.bbi.2020.06.020>
- London JW, Fazio-Eynullayeva E, Palchuk MB, Sankey P, McNair C. (2020). Effects of the COVID-19 pandemic on cancer-related patient encounters. *JCO Clinical Cancer Informatics*, 4, 657-665.
- Singer ME, Kaelber DC, Antonelli MJ (2020). Hydroxychloroquin ineffective for COVID-19 prophylaxis in lupus and rheumatoid arthritis. *Annals of the Rheumatic Diseases*. <https://ard.bmj.com/content/annrhumdis/early/2020/08/05/annrhumdis-2020-218500.full.pdf>
- Singh S, Khan A. (2020) Clinical characteristics and outcomes of COVID-19 among patients with pre-existing liver disease in United States: a multi-center research network study, *Gastroenterology*, doi: <https://doi.org/10.1053/j.gastro.2020.04.064>.
- Turk MA, Landes SD, Formica MK, & Goss KD (2020). Intellectual and developmental disability and COVID-19 case-fatality trends: TriNetX analysis. *Disability and health journal*, 100942. Advance online publication. <https://doi.org/10.1016/j.dhjo.2020.100942>
- Alkhoul M, Nanjundappa A, Annie F, et al. (2020) Sex differences in COVID-19 case fatality rate: insights from a multinational registry. *Mayo Clin Proc*. 2020;95(x):xx-xx. doi: <https://doi.org/10.1016/j.mayocp.2020.05.014>.