TRINETX

COVID-19

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

Issue 6
Run on September 17, 2020

TriNetX

CONTENTS

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 **150,042 potential COVID-19 patients** as of September 17, 2020. From this cohort of all potential COVID-19 patients, we identified a sub-cohort of 25,802 severe patients who were hospitalized within one month on or after the first instance of COVID-19 in their EMR.

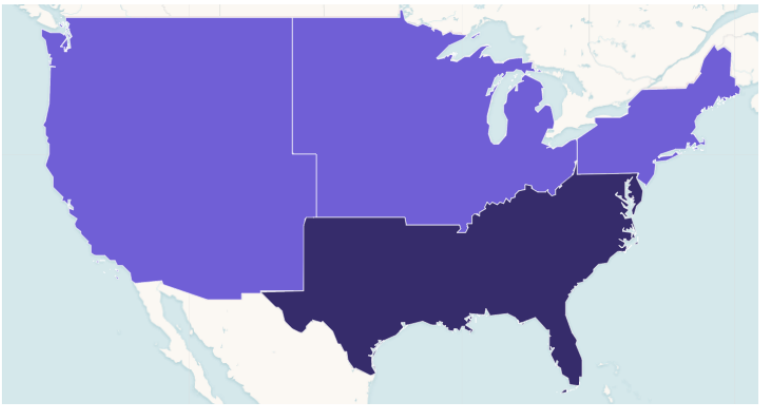
CLINICAL FINDINGS

COVID-19 Patient Density Map

US Regions	Patients	Percent
Northeast	26,854	18%
Midwest	22,258	15%
South	74,260	49%
West	26,663	18%

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

	All COVID-19 Patients		Severe COVID-19 Patients	
Demographics	**n=150,042**		**n=25,802**	
Age, years (mean ± SD)	46 ± 20		58 ± 19	
10 - 19 (n, %)	9,816	6.5	531	2.1
20 – 29 (n, %)	26,854	17.9	1,787	6.9
30 – 39 (n, %)	25,619	17.1	2,615	10.1
40 – 49 (n, %)	23,484	15.7	3,238	12.5
50 – 59 (n, %)	24,202	16.1	4,714	18.3
60 – 69 (n, %)	19,269	12.8	5,275	20.4
70 – 79 (n, %)	11,999	8.0	4,349	16.9
≥80 (n, %)	8,799	5.9	3,293	12.8
Male Sex (n, %)	67,320	44.9	12,682	49.2
Female Sex (n, %)	81,748	54.5	13,030	50.5
Unknown Sex (n, %)	974	0.6	90	0.3
Prior or Coexisting Condition[1]	**n**	**%**	**n**	**%**
Respiratory diseases	60,046	40.0	12,359	47.9
Asthma	12,268	8.2	2,248	8.7
COPD	5,279	3.5	2,225	8.6
Seasonal allergies	6,478	4.3	866	3.4
Cardiovascular diseases	46,979	31.3	13,212	51.2
Hypertension	35,145	23.4	10,167	39.4
Congestive heart failure	7,080	4.7	3,382	13.1
Myocardial infarction	2,817	1.9	1,451	5.6
Angina pectoris	2,384	1.6	951	3.7
Diabetes	18,228	12.1	6,119	23.7
Cancer	9,622	6.4	3,128	12.1
Kidney disease	8,386	5.6	3,878	15.0
HIV	824	0.5	199	0.8

1 Data as of September 17, 2020. Diagnoses captured any time to one day before first instance of COVID-19 in EMR

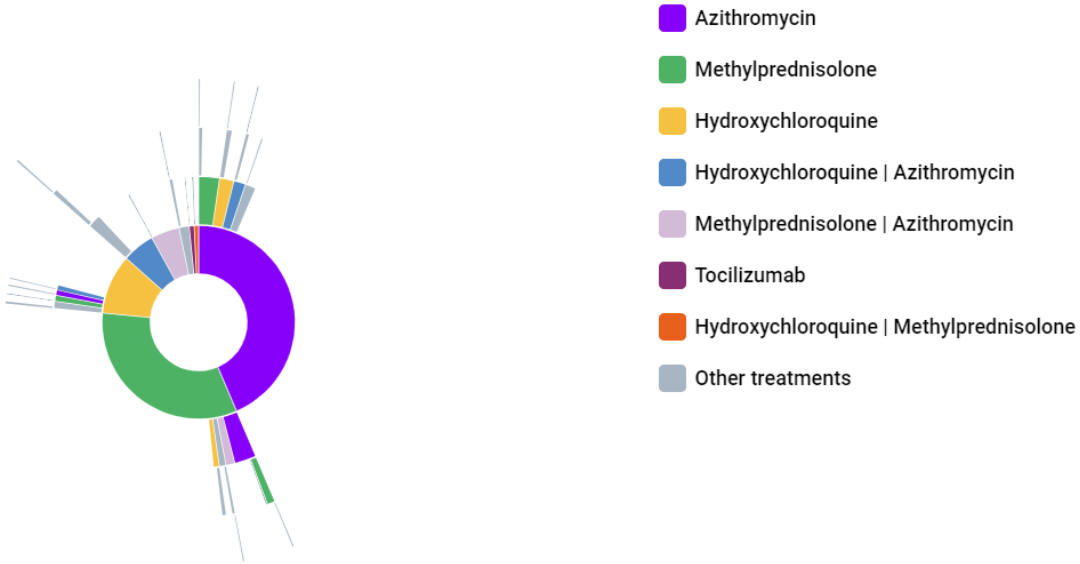
Clinical Characteristics During COVID-19 Episode

	All COVID-19 Patients		Severe COVID-19 Patients	
	n=150,042		n=25,802	
Diagnosis[2]	**n**	**%**	**n**	**%**
Cough	27,280	18.2	4,780	18.5
Fever	20,836	13.9	6,347	24.6
Shortness of breath	20,408	13.6	8,271	32.1
Pneumonia	19,561	13.0	12,432	48.2
Acute lower respiratory infections	10,330	6.9	2,559	9.9
Pain in throat and chest	9,745	6.5	3,370	13.1
Renal failure	6,733	4.5	5,124	19.9
Diarrhea	5,762	3.8	2,160	8.4
Hypotension	5,323	3.5	4,185	16.2
Acute respiratory distress syndrome (ARDS)	3,128	2.1	2,580	10.0
Loss of taste or smell	2,036	1.4	137	0.5
Bronchitis	1,694	1.1	436	1.7
Hepatic failure	487	0.3	379	1.5
Clinical Setting[2]	**n**	**%**	**n**	**%**
Emergency	42,431	28.3	16,148	62.6
Inpatient	26,943	18.0	25,802	100.0
Medication[3]	**n**	**%**	**n**	**%**
Antibiotics	33,151	22.1	14,649	56.8
Glucocorticoids	21,379	14.2	11,735	45.5
Antimalarials	4,738	3.2	2,957	11.5
Antivirals	2,519	1.7	1,155	4.5
Interleukin Inhibitors	858	0.6	450	1.7

2 Diagnoses and clinical setting captured in EMR one week before to one month after first instance of COVID-19 in EMR.
3 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 September 17, 2020.



128,107 patients or 85% of the cohort don't have a pathway

MAJOR OUTCOMES

	All COVID-19 Patients	Severe COVID-19 Patients
	n=150,042	n=25,802
Laboratory Data[4]	**Mean ± SD**	**Mean ± SD**
Complete Blood Count		
Hemoglobin, g/dL	12.2 ± 2.4	11.4 ± 2.3
Hematocrit, %	34.9 ± 11.1	34.1 ± 8.9
RBC, 10^6 cells/µL	4.2 ± 0.8	4.0 ± 0.8
Platelet Count, 10^3 cells/µL	260.6 ± 115.5	270.3 ± 129.5
WBC, 10^3 cells/µL	8.0 ± 5.8	9.0 ± 6.4
Eosinophils, %	1.6 ± 2.8	1.7 ± 3.1
Metabolic		
Creatinine, mg/dL	1.2 ± 1.7	1.3 ± 1.7
Hepatic		

ALT, U/L	55.2 ± 232.3		65.8 ± 285.9	
AST, U/L	67.2 ± 531.3		84.7 ± 669.8	
Alk Phos, U/L	92.9 ± 72.1		99.4 ± 85.2	
Total bilirubin, mg/dL	0.6 ± 1.2		0.7 ± 1.5	
Inflammatory				
C Reactive Protein, mg/L	56.6 ± 74.9		61.3 ± 78.4	
IL-6, pg/mL	191.3 ± 840.2		165.5 ± 502.5	
Cardiac				
Ejection Fraction, %	55.4 ±14.0		55.0 ± 14.2	
QTc prolongation, ms	415.2 ± 114.9		420.8 ± 113.0	
Renal				
Creatinine clearance, mL/min	71.1 ± 50.6		80.1 ± 46.6	
Care and Management[4]				
Hospitalization (n, %)	49,389	33.0	225,658	99.4
Mean time to discharge, days	6		6	
Chest radiology (e.g., x-ray, CT, MRI) (n, %)	26,089	17.4	11,110	43.1
Abnormal finding on imaging of lung[5]	6,280	24.1	4,251	38.3
Mechanical ventilation (including ECMO) (n, %)	3,748	2.5	3,137	12.2
Follow-up time at least 14 days (n, %)	58,624	39.1	14,230	55.2
Follow-up time at least 21 days (n, %)	50,317	33.5	12,177	47.2
Follow-up time at least 28 days (n, %)	44,291	29.5	10,593	41.1
Mortality[6]	**n**	**%**	**n**	**%**
All-cause mortality	3,543	2.4	2,589	10.0

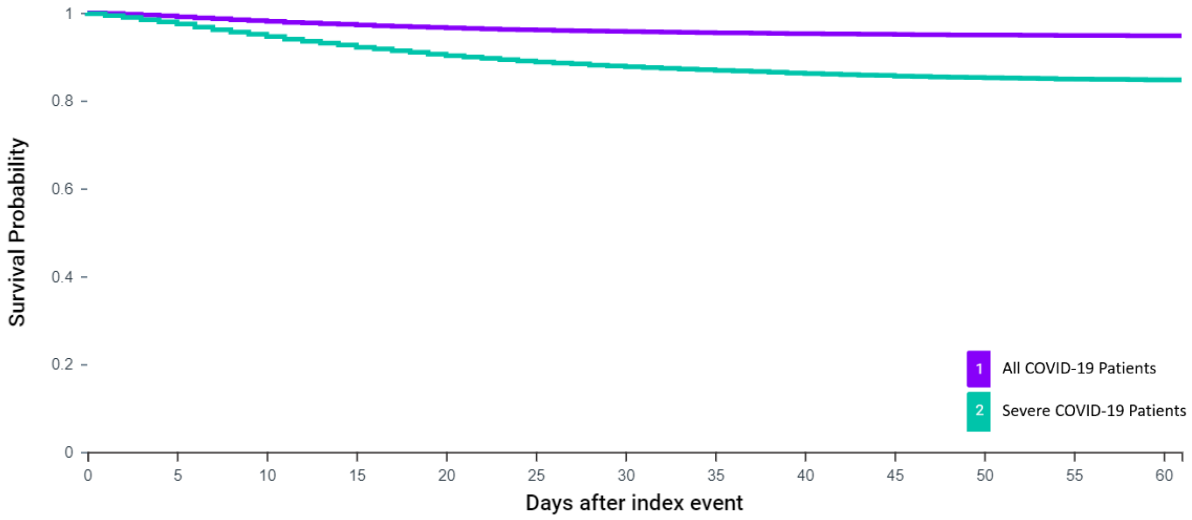
4 Laboratory and care and management variables captured in EMR on same day to one month after first instance of COVID-19 in EMR. Laboratory data are of patients' most recent laboratory results in this time window. Not all patients have laboratory data.

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

6 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 September 17, 2020.



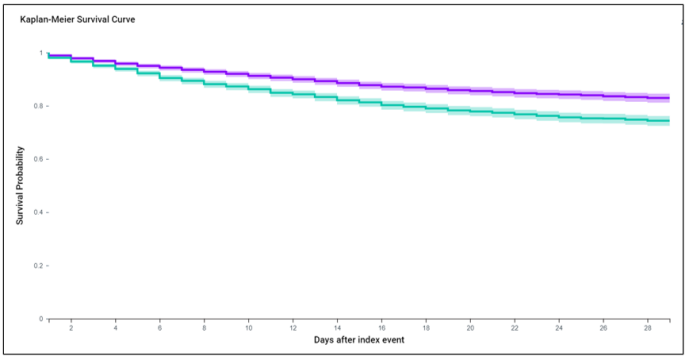
CLINICAL SPOTLIGHT

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

In June, the UK RECOVERY clinical trial tested several potential treatments for COVID-19 and published that hospitalized and ventilated patients treated with dexamethasone had lower 28-day mortality rates compared to those receiving usual care alone. A replication of this trial using the TriNetX Dataworks – USA network found consistent results, suggesting that patients ventilated and treated with dexamethasone in the 1 week before up to 2 weeks after their COVID-19 diagnosis have lower risk of mortality than those not treated with dexamethasone. We also expanded the analysis to the whole class of glucocorticoids and found consistent results. This analysis can be easily expanded to explore mortality rates in other therapies being tested in the treatment of COVID-19 using TriNetX's suite of Advanced Analytics.

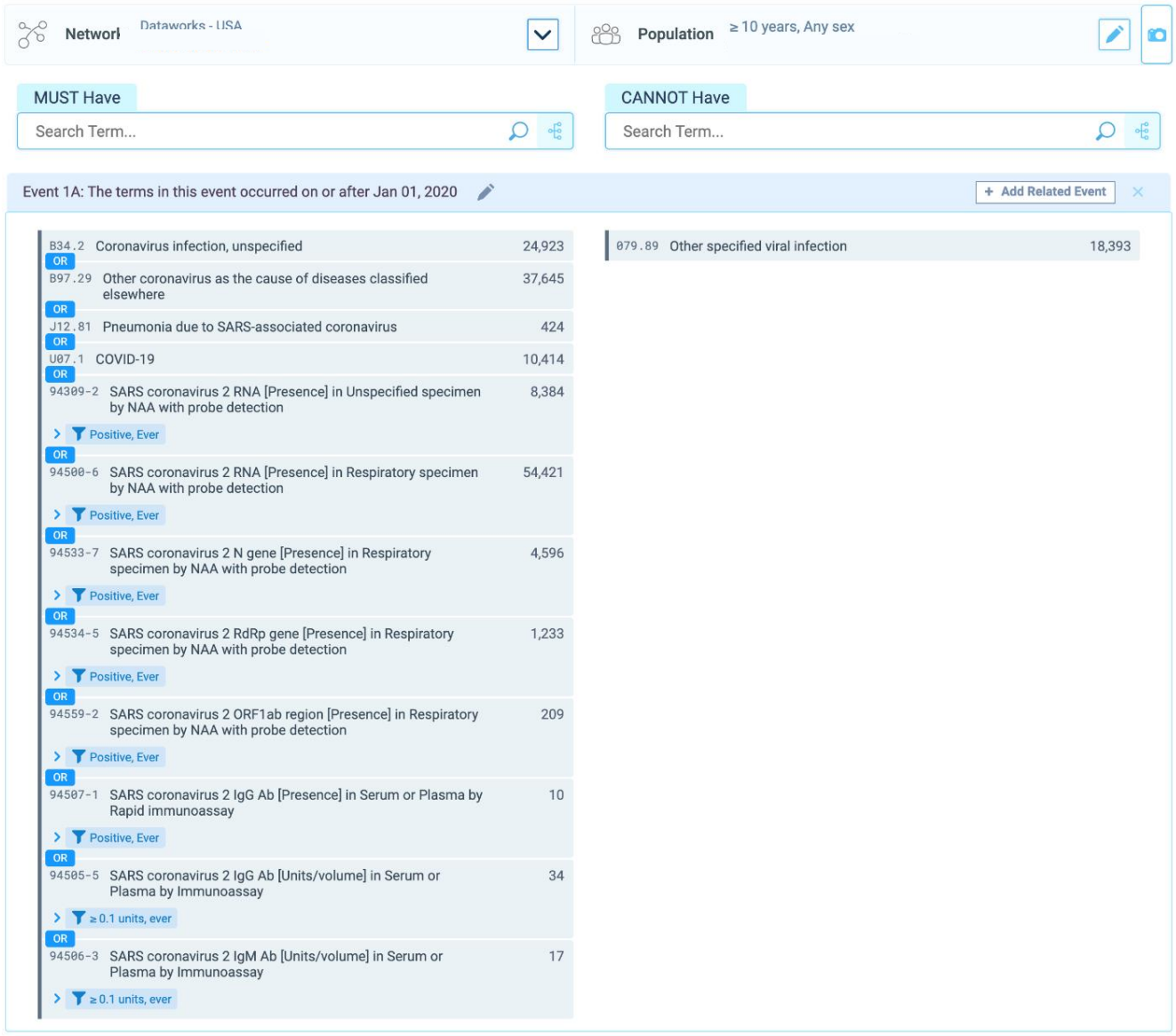
	Cohort	Patients in Cohort	Patients with Outcome	Risk
		Cohort Statistics		
1	treatment dexa dataworks Septe...	2,827	346	12.239%
2	control dex dataworks Septembe...	2,827	577	20.41%

Risk Difference				Risk Ratio		Odds Ratio	
Risk Difference	95 % CI	z	p	Risk Ratio	95 % CI	Odds Ratio	95 % CI
-8.171%	(-10.086%,-6.256%)	-8.312	< 0.0001	0.6	(0.53,0.678)	0.544	(0.47,0.629)

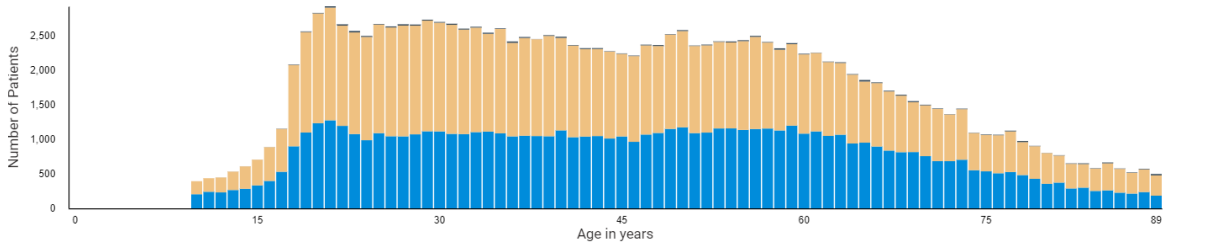


APPENDIX

Appendix A: COVID-19 query in TriNetX



Appendix B: Distribution of age and sex



Total Patients	Minimum Age	Maximum Age	Mean Age	Standard Deviation
150,042	10	90	46	20

Sex

Female	54%
Male	45%
Unknown	1%

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/annrheumdis/early/2020/08/05/annrheumdis-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
- Alkhouli 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.