2019-nCoV Literature Situation Report (Lit Rep)

May 7, 2020

The scientific literature on COVID-19 is rapidly evolving and these articles were selected for review based on their relevance to Washington State decision making around COVID-19 response efforts. Included in these Lit Reps are some manuscripts that have been made available online as pre-prints but have not yet undergone peer review. Please be aware of this when reviewing articles included in the Lit Reps.

Key Takeaways

- **The COPE Consortium has developed a COVID-19 Symptom Tracker mobile application. User self-report of symptoms through this app can be used to identify COVID-19 hotspots.**
- **A state-level study found that early implementation of stay-at-home orders markedly decreased the effective reproductive number (R_t) in the week after the 500th case occurred and slowed doubling times for both cases and deaths.**
- **There is a temporal pattern of increases in internet search terms related symptoms that matches the clinical course of COVID-19. Increases in searches for "fever" and "cough" are followed in 5-days by searches for "shortness of breath." COVID-19 cases and deaths increase 18-22 days after increases in searches for terms related to COVID-19 symptoms.**
- **A systematic review found the clinical features of COVID-19 in pregnant women were similar to those of the general population. There was no detection of SARS-CoV-2 RNA in samples of vaginal mucus, breast milk, or neonates throat swab.**
- **Antibody titers for IgG against SARS-CoV-2 spike glycoprotein and its receptor binding domain were not associated with the speed of recovery.**
- **A new agent-based stochastic model can generate predictions specific to place, time, and demographic subpopulation.**

Non-Pharmaceutical Interventions

- Collaborators from hospitals and research institutions across the country announce the COPE Consortium, a central component of which will be a COVID-19 Symptom Tracker mobile application, which will serve as a common data collection tool for epidemiological cohort studies gathering data on risk factors for COVID-19 susceptibility, clinical outcomes, and long-term physical, mental health, and financial sequelae. The COVID-19 Symptom Tracker app is intended to harmonize data and minimize participant burden.
- The general population is encouraged to self-report symptoms through the app, enabling identification of hotspots in need of expansion of testing or hospital capacity.

  Chan et al. (May 5, 2020). The COronovirus Pandemic Epidemiology (COPE) Consortium: A Call to Action. Cancer Epidemiology, Biomarkers & Prevention : A Publication of the American Association for Cancer Research, Cosponsored by the American Society of Preventive Oncology. Pre-print downloaded May 7 from https://doi.org/10.1158/1055-9965.EPI-20-0606

- A systematic literature review on the role of surgical and cloth face masks in preventing the spread of respiratory viruses in community or experimental setting shows that early initiation of facemask use can prevent the spread of respiratory viruses. This is particularly true for viruses which can be transmitted by presymptomatic or asymptotic individuals, but utility is limited by inconsistent adherence to mask use. Articles focusing on masks and N95 respirators in health care workers were excluded.

  Gupta et al. (May 6, 2020). The Use of Facemasks by the General Population to Prevent Transmission of Covid 19 Infection A Systematic Review. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.01.20087064

- Dreher et al. conducted a state-level analysis using regression models with primary outcomes defined as the average effective reproductive number (R_t) in the week after the state reached 500 cases and doubling time from 500 to 1000 cases.
- After controlling for population density, GDP, and health metrics, they found that having a stay-at-home order in place at the time of the 500th case was significantly associated with a lower average R_t the following week and had a very strong association with the probability of $R_t<1$.
- Doubling time for cases was significantly longer for states with an early stay at home order (HR=0.35), as was the doubling time for deaths for states with more time spent at home (HR=0.18).

  Dreher et al. (May 6, 2020). Impact of Policy Interventions and Social Distancing on SARS-CoV-2 Transmission in the United States. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.01.20088179

Transmission

- Using a machine learning approach, authors in three populous regions in Spain found a small inverse association between temperature and daily number of COVID-19 infections, and that this association persisted for lags of up to 6 days, corresponding to the mean incubation period for COVID-19. No evidence of association with humidity or wind speed was found.

  Abdollahi et al. (May 6, 2020). Effect of Temperature on the Transmission of COVID-19 A Machine Learning Case Study in Spain. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.01.20087759

Geographic Spread

- Analysis of global internet search patterns in 32 countries across six continents detected a robust temporal pattern of a progression of search terms related symptoms that matches the clinical course of COVID-19.
- Earliest-peaking search terms were combinations of “fever”, “cough”, “coronavirus symptoms”, and “coronavirus test.” There was an average lag of 5-days between increases in searches for “fever” and “cough” and the increase in searches for “shortness of breath”.
- Increases in reported COVID-19 cases and deaths followed increases in searches related to COVID-19 symptoms by 18.53 (95% CI 15.98, 21.08) and 22.16 days (95% CI 20.33, 23.99), respectively.

  Lu and Reis. (May 6, 2020). Internet Search Patterns Reveal Clinical Course of Disease Progression for COVID-19 and Predict Pandemic Spread in 32 Countries. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.01.20087858

Testing and Treatment

- Group testing of samples for the presence of SARS-CoV2 involves pooling samples from multiple individuals and testing individual samples only if the pool is positive. This strategy can greatly increase testing efficiency. This is especially critical during the use widespread screening and isolation as a part of primary control measures (i.e., absence of an effective therapeutic or vaccine).
- Using a mathematical model to simulate changing viral loads over the course of an epidemic and comparing different pooling strategies for community screening, the authors show group testing could accurately estimate overall prevalence and increase the identification of infected individuals.
- If group testing results in lower sensitivity it will increase the number of false negatives.

  Cleary et al. (May 6, 2020). Efficient Prevalence Estimation and Infected Sample Identification with Group Testing for SARS-CoV-2. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.01.20086801

Clinical Characteristics and Health Care Setting

- A systematic review that included 19 case series and case reports, corresponding to 266 women, found that the clinical characteristics of pregnant women with COVID-19 are similar to nonpregnant adults. Among mothers with nucleic acid testing in vaginal mucus and breast milk samples (n=28), all samples were negative, as were neonates who received testing via throat swab (n=113).

  Juan et al. (May 6, 2020). Effects of Coronavirus Disease 2019 (COVID-19) on Maternal Perinatal and Neonatal Outcomes a Systematic Review of 266 Pregnancies. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.02.20088484

- COVID-19 results in debility and neurological, pulmonary, neuromuscular, and cognitive complications that make rehabilitation an important component of recovery. These authors describe anticipated demands and strategies to meet the needs of this population, including early initiation of rehabilitation during hospitalization, provision of education on self-care after discharge, and models for outpatient rehabilitation.

  Lew et al. (May 4, 2020). The War on COVID-19 Pandemic. American Journal of Physical Medicine & Rehabilitation. https://doi.org/10.1097/PHM.0000000000001460

- Quantification of SARS-CoV-2 antibody responses from 20 hospitalized patient with confirmed SARS-CoV-2 infection found that the IgG titers against SARS-CoV-2 spike glycoprotein and its receptor binding domain (RBD) were not associated with their speed of recovery.
- One patient who recovered completely did not develop RBD antibodies. The authors note that COVID-19 immunity may involve cell-mediated (adaptive T-cell) as well as humoral (antibody) immunity.

  McAndrews et al. (May 6, 2020). Identification of IgG Antibody Response to SARS-CoV-2 Spike Protein and Its Receptor Binding Domain Does Not Predict Rapid Recovery from COVID-19. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.01.20087684

Modeling and Prediction

- Adler et al. address limitations of compartmental deterministic models, including their limited ability make predictions for specific locations, points in time, or demographic groups, and to capture chance ("stochastic") events, which is needed to estimate the probability of a second wave of transmission.

- The GERDA-1 model is a stochastic, geospatially-referenced and demography-specific agent-based model that can predict infection dynamics for specific subpopulations under a variety of scenarios (e.g., among health care workers with versus without adequate PPE access).

  Adler et al. (May 6, 2020). Geospatially Referenced Demographic Agent-Based Modeling of SARS-CoV-2-Infection (COVID-19) Dynamics and Mitigation Effects in a Real-World Community. Medrxiv. https://doi.org/10.1101/2020.05.03.20089235

Public Health Policy and Practice

- Researchers in Switzerland used a pre-existing representative survey of the population of Geneva to estimate SARS-CoV-2 seroprevalence. Each week, 1,300 participants not in quarantine or isolation were invited to participate, along with all members of the household 5 years or older. Over the first 3 weeks of the 12 week study, 1,335 participants were recruited (31% of those invited).
- Seroprevalence was estimated to be 3.1% (95% CI 0.2, 5.99) in week 1, 6.1% (95% CI 2.6, 9.33) in week 2, and 9.7% in week 3 (95% CI 6.1, 13.1). They found seroprevalence to be significantly higher in 5-19 year olds and 20-49 year olds compared to those >50 year olds.
- Despite increasing seroprevalence, these estimates show the population is far below the seroprevalence needed for herd immunity, assuming the presence of antibodies confers at least partial protection from infection.

  Stringhini et al. (May 6, 2020). Repeated Seroprevalence of Anti-SARS-CoV-2 IgG Antibodies in a Population-Based Sample from Geneva Switzerland. Pre-print downloaded May 7 from https://doi.org/10.1101/2020.05.02.20088898

Other Resources and Commentaries

- Privileges and Immunity Certification During the COVID-19 Pandemic – JAMA (May 6)
- Low Dose Lung Radiotherapy for COVID-19 Pneumonia. The Rationale for a Cost-Effective Anti-Inflammatory Treatment – Clinical and Translational Radiation Oncology (April 25)
- Interpreting Diagnostic Tests for SARS-CoV-2 – JAMA (May 6)
- Going Viral: How to Boost the Spread of Coronavirus Science on Social Media – Nature (May 5)
- Public Health Response to the Initiation and Spread of Pandemic COVID-19 in the United States , February 24 – April 21 , 2020 – MMWR (May 1)
- COVID-19 in Correctional and Detention Facilities — United States, February–April 2020 – MMWR (May 6)

Report prepared by the UW MetaCenter for Pandemic Preparedness and Global Health Security and the START Center in collaboration with and on behalf of WA DOH COVID-19 Incidence Management Team