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2019-nCoV Literature Situation Report (Lit Rep)
May 1, 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

- **Detection of SARS-CoV-2 RNA in the blood is strongly associated with severe disease (ICU hospitalization 32% v. 14%; mechanical ventilation 21% v. 4%) and increased mortality among COVID-19 patients (14% v. 0%) compared to patients without detectable RNA.**
- **Modeling indicates that broad screening strategies to detect COVID-19 infection that include both symptomatic and asymptomatic individuals could decrease case-fatality ratios in France (1 life saved per 1000 additional screening tests).**
- **A population-based study found that US counties with more diverse demographics, higher population, education, income levels, and lower disability rates are under higher risks of COVID-19 infection. Counties with higher disability and poverty rates have higher mortality rates. These health inequities might be due to the workforce of essential services, poverty, and access to care.**
- **SARS-CoV-2 RNA has been detected in septic tanks of Wuchang Fangcang Hospital and stool of COVID-19 patients. Although there is no evidence of fecal-oral transmission, virus may embed in fecal particles that resist disinfection via sodium hypochlorite.**
- **An estimated 3% of employees at meat/poultry processing facilities have contracted COVID-19 (4,913 cases, 20 deaths). The percentage of workers with COVID-19 per facility ranges from 0.6% to 18.2%.**

Non-Pharmaceutical Interventions

- This review discusses the importance of understanding the transmission dynamics of COVID-19 (e.g., using the basic reproduction number (R_0) to estimate the overall number of people likely to be infected). Although there is considerable uncertainty, model-based predictions of changes in transmission over time can provide insights into the epidemiological situation, support policy makers to develop a resilience strategy for the period until effective pharmaceutical interventions are available, and identify whether outbreak control measures are having a measurable effect.
  Hens, Vranck, and Molenberghs. (May 1, 2020). The COVID-19 Epidemic, Its Mortality, and the Role of Non-Pharmaceutical Interventions. European Heart Journal: Acute Cardiovascular Care. https://doi.org/10.1177/2048872620924922

Transmission

- Zhang et al. identified SARS-CoV-2 viral RNA in septic tanks of Wuchang Fangcang Hospital after disinfection with sodium hypochlorite (bleach). They posit that the virus may embed in fecal particles that resist disinfection. The liquid waste showed no evidence of SARS-CoV-2 RNA when

overdosed with sodium hypochlorite but this resulted in high a level of disinfection by-product residuals, possessing significant ecological risks. It is unknown whether the presence of SARS-CoV-2 RNA alone poses any risk as a source of infection.

> *Zhang et al. (Apr 30, 2020). Potential spreading risks and disinfection challenges of medical wastewater by the presence of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) viral RNA in septic tanks of Fangcang hospital. Pre-print downloaded May 1 from* https://doi.org/10.1101/2020.04.28.20083832

- Eder et al. review current evidence of gastrointestinal (GI) involvement in patients with SARS-CoV-2 infection. Approximately 10% of COVID-19 cases experience GI symptoms that precede respiratory symptoms and fever, and 50% of all cases report GI symptoms. Although there is growing evidence that GI manifestations are an important clinical characteristic, the mechanisms remain unclear.
- Although there is evidence of detection of RNA in stool (including after tests from oral or nasopharyngeal swabs are negative), there is currently no evidence of fecal-oral transmission.
- There is some evidence that patients with diarrhea have more severe symptoms of pneumonia.
- Pathogenesis may be explained by the expression of angiotensin converting enzyme 2 (ACE2) proteins along the respiratory and gastrointestinal tracts. SARS-CoV-2 has a high affinity to ACE2 proteins, which serve as an entry receptor for SARS-CoV-2.

> *Eder et al. (May 1, 2020). Addressing multiple gastroenterological aspects of COVID-19. Polish Archives of Internal Medicine.* https://doi.org/10.20452/pamw.15332

Testing and Treatment

- Serological tests, which measure antibody responses against pathogens, are useful for retroactively determining the total number of cumulative SARS-CoV-2 infections that have occurred within a population (i.e. seroprevalence). Bouman et al. propose a likelihood-based method for estimating population-level seroprevalence that may overcome the deficits of serological tests for SARS-CoV-2 with low sensitivity. They use simulations to explore the performance of their method, compared to traditional threshold-based measures that dichotomized serological antibody measurements as "positive" or "negative" using a cutoff value.

> *Bouman et al. (April 30, 2020). Estimating Seroprevalence with Imperfect Serological Tests: A Cutoff-Free Approach. Pre-print downloaded May 1 from* https://doi.org/10.1101/2020.04.29.068999

Clinical Characteristics and Health Care Setting

- Kass et al. suggest that in populations with high prevalence of obesity, COVID-19 will affect younger populations more than previously reported. Among 265 patients admitted to ICU at 6 university hospitals across the U.S., there was a significant inverse correlation between age and BMI, such that younger individuals admitted to hospital were more likely to be obese. This is particularly relevant in the US because the prevalence of obesity is ~40% (compared to 6% in China and 20% in Italy).

> *Kass et al. (Apr 30, 2020). Obesity could shift severe COVID-19 disease to younger ages. Lancet.* https://doi.org/10.1016/S0140-6736(20)31024-2

- Recent case reports suggest that people co-infected with SARS-CoV-2 and other respiratory viruses (such as influenza virus and seasonal coronaviruses) may have higher morbidity and mortality. However, Nowak et al. found that co-infection was uncommon. In a retrospective review of laboratory results from 8 inpatient and associated outpatient facilities in the greater New York City metropolitan area, they found that 3% (36/1,204) of SARS-CoV-2 positive patients were concurrently

infected with non-SARS-CoV-2 respiratory pathogens, compared to 13% (111/845) of patients who tested negative for SARS-CoV-2.

> *Nowak et al. (Apr 30, 2020). Co-infection in SARS-CoV-2 infected Patients: Where Are Influenza Virus and Rhinovirus/Enterovirus? Journal of Medical Virology.*
> https://doi.org/10.1002/jmv.25953

- Baud et al. present a single case report of a second trimester miscarriage in a pregnant woman with COVID-19. The authors found evidence that the miscarriage was related to placental infection with SARS-CoV-2. Findings from a placental histological examination and fetal autopsy found that the placental submembrane and cotyledon both tested positive for SARS-CoV-2, while amniotic fluid, maternal blood, and fetal samples were all SARS-CoV-2 negative.

> *Baud et al. (April 30, 2020). Second-Trimester Miscarriage in a Pregnant Woman With SARS-CoV-2 Infection. JAMA.* https://doi.org/10.1001/jama.2020.7233

- Detection of SARS-CoV-2 RNA in the blood is associated with poor clinical outcomes and increased mortality among COVID-19 patients. In this study, SARS-CoV-2 RNA was detected in 33% (28/85) of patients, the majority of whom were hospitalized (22/28). Detection of RNA occurred more frequently in individuals who required an ICU transfer (32% v 14%; p=0.05), mechanical ventilation (21% v 4%, p-value = 0.01) and 30-day all-cause mortality (14 % v 0%, p-value = 0.01). Levels of viral RNA in the nasopharynx were not associated with detected SARS-CoV-2 RNA.

> *Hogan et al. (May 1, 2020). High Frequency of SARS-CoV-2 RNAemia and Association with Severe Disease. Pre-print downloaded May 1 from* https://doi.org/10.1101/2020.04.26.20080101

- Cardiovascular disease (CVD) is a risk factor for severe COVID-19 disease and mortality. Additionally, evidence of myocardial injury (defined as elevation of high-sensitivity cardiac troponin (hs-cTn)) is common in COVID-19 patients and portends a worse prognosis. Increased levels of hs-cTn correlate with disease severity and mortality in COVID-19 patients, even after controlling for comorbidities. The pattern of rise of cTn levels is prognostic as fatal cases experience a higher level of Tn elevation which continue to rise until death, while cTn levels for survivors remain unchanged. This finding may support monitoring of cTn levels every few days in hospitalized patients.

> *Kang et al. (May 1, 2020). Cardiovascular Manifestations and Treatment Considerations in Covid-19. Heart.* https://doi.org/10.1136/heartjnl-2020-317056

- Pietrobelli et al. examined whether youth who are classified as obese display unfavorable trends in lifestyle behavior when removed from structured school activities and confined at home during the COVID-19 pandemic. They found significantly increased intake of potato chips, red meat, and sugary drinks. Time spent in sports activities decreased by 2.30 hours/week. Sleep time and screen time increased by 0.65 and 4.85 hours/day, respectively.
- These effects of lockdowns may have a lasting impact on a child's or adolescent's adult obesity level.

> *Pietrobelli et al. (May 1, 2020). Effects of COVID-19 Lockdown on Lifestyle Behaviors in Children with Obesity Living in Verona, Italy: A Longitudinal Study. Obesity.*
> https://doi.org/10.1002/oby.22861

Modeling and Prediction

- This study uses a disease transmission model to compare deaths and critical care admissions in scenarios where social distancing measures are preferentially relaxed for members of the US population who are seropositive for SARS-CoV-2. Such strategies would rely on serological tests correctly identifying individuals who are protected against infection. Implementing a strategy of

serological testing and shielding could reduce population risk while offsetting the severe social and economic costs of sustained shutdowns.

> *Kraay et al. (May 1, 2020). Modeling Serological Testing to Inform Relaxation of Social Distancing for COVID-19 Control. Pre-print downloaded May 1 from https://doi.org/10.1101/2020.04.24.20078576*

- Terriau et al. report that a strategy of widespread screening for COVID-19 infection using RT-PCR and focusing on asymptomatic as well as symptomatic individuals could significantly decrease case-fatality ratios in France. They estimate 1 life would be saved for each additional 1000 screening tests of COVID-19 infection. The authors say their analysis supports implementation of mass screening strategies and can be used by decision-makers to implement measures to limit the disease spread.

> *Terriau et al. (May 1, 2020). Impact of virus testing on COVID-19 case fatality rate: estimate using a fixed-effects model. Pre-print downloaded May 1 from https://doi.org/10.1101/2020.04.26.20080531*

Public Health Policy and Practice

- This population-based cross-sectional study explores racial and economic inequality associated with the infection and mortality due to COVID-19 in the US. Counties with more diverse demographics, higher population, education, income levels, and lower disability rates have higher rates of COVID-19 infection. Counties with higher disability and poverty rates have higher mortality rates. African Americans experience a higher burden of COVID-19 compared to other racial/ethnic groups.
- The observed inequality might be due to the distribution of the workforce of essential services, poverty, and access to care. Counties in more urban areas are may be better equipped for providing care. The lower rate of infection, but higher death rate in counties with higher poverty and disability could be due to lower levels of mobility, but a higher rate of comorbidities and health care access.

> *Abedi et al. (May 1, 2020). Racial, Economic and Health Inequality and COVID-1 Infection in the United States. Pre-print downloaded May 1 from https://doi.org/10.1101/2020.04.26.20079756*

- The CDC reported that among 115 meat or poultry processing facilities in 19 states, there were a total of 4,913 cases (3% of workers) and 20 COVID-19–related deaths (as of April 27). The percentage of workers with COVID-19 at each facility ranged from 0.6% to 18.2%.
- The report recommends improvements in COVID-19 prevention and control that addressed industry-specific barriers.

> *Dyal et al. (May 1, 2020). COVID-19 Among Workers in Meat and Poultry Processing Facilities — 19 States, April 2020. MMWR. https://doi.org/10.15585/mmwr.mm6918e3*

Other Resources and Commentaries

- Prisons are "in no way equipped" to deal with COVID-19 – Lancet (May 1)

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