

LITERATURE REVIEW SARS-CoV 2 Impact on Health Systems

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Peer Reviewed by: Dr. Jason Rosenfeld, Updated on 10/3/2021



MASKS AND TRANSMISSION

MASK WEARING IN PUBLIC

- From Jan to May 2021, a ST. Louis University study found that close contacts with any unmasked showed greater adjusted chances of a positive test result than those with solely masked exposure. Each extra exposure was linked to a 40% increase in the likelihood of a positive test.
- Masks function as source control and personal protection to the mask wearer. Face masks were 79 percent effective in preventing transmission in households.
- Universal masking reduced high-risk exposures by 68 percent each patient-day, while universal testing further reduced those exposures by 77 percent.
- Analysis of data from 100 school districts and 14 charter schools in North Carolina schools, between March and June 2021, representing over 865,000 students and 160,000 staff, revealed that proper masking was the most effective mitigation strategy for preventing secondary transmission in schools when COVID-19 transmission was active and vaccination was unavailable.
- State government mandates for community use of face masks or covers across 15 US states has been associated with a decline in daily COVID-19 growth rates from 0.9 1-5 days after signing orders to 2.0 over 21 days after signing.
- The average jet distance traveled by a cough covered by a two-layer stitched mask made of quilting cotton was 2.5 in as compared to an uncovered cough which traveled approximately 8 ft. The droplets from a cough covered by a single-layer bandana style covering had an average jet distance of 3 ft 7 in.

EFFECTIVENESS OF STAY-AT-HOME ORDERS AND EFFECTS OF RE-OPENINGS

- According to an analysis of 1,020 out of 1,041 (98.0%) K-12 public noncharter schools in Maricopa and Pima counties in Arizona, the risks of a school-related COVID-19 outbreak were 3.7 times greater in schools with no mask requirement than in schools with an early mask requirement.
- From July 1–September 4, 2021, out of 3,142 U.S. counties surveyed, when compared to counties with school mask regulations, counties without school mask requirements had higher increases in pediatric COVID-19 case rates after the start of school.
- Data from four major cities in the US show that stricter stay-at-home measures corresponded to decreases in the average percent change in daily new cases. COVID outbreaks were reported in facilities that have re-opened (e.g., summer camps, nursing homes, and child care facilities) even when precautions were taken.
- At a Chicago institution, COVID-19 cases spiked as a result of unvaccinated travelers. Many introductions on campus were confirmed by sequencing, demonstrating that even a single importation can result in multiple instances.

Recommendation: Social distancing helped flatten the curve. As businesses begin to open up and people return to work and school, caution must continue to be taken. With adequate ventilation, social distancing, low % occupancy of a room, low exposure time, and mask requirements, the benefits of re-opening may outweigh the risk of spread. As childcare facilities and schools open, children should also wear masks. Although they tend to have milder symptoms, they can still transmit COVID-19. School re-openings have also been associated with increases in active cases; therefore, virtual schooling may be beneficial. The 18-24 age group may be playing a larger role in community spread, so safety precautions should be targeted to this age group.

TRANSMISSION FROM SURFACES

- Virus viability is greatest on surfaces that are cooler, have lower humidity, and are not exposed to sunlight. COVID-19 virus lifespan varies on different objects: plastic and stainless steel (72 hours), cardboard (24 hours), and copper (4 hours). Under ideal conditions, its persistence on smooth, non-porous surfaces lasts up to 28 days.
- No virus was detected after disinfection and sanitation of objects with a 0.1% hypochlorite solution. Other disinfecting chemicals (e.g. 75% ethanol, 10% bleach, advanced hand sanitizer) can also reduce its infectivity.

Recommendation: Be cautious when handling objects made of plastic, stainless steel, and cardboard, especially in higher risk settings such as the ICU, public computers, and door handles. Disinfecting techniques should be continued.

TRANSMISSION IN DROPLET VS AEROSOL FORM

- There is increasing evidence to support aerosol transmission (ranked 8/9 on plausibility of aerosol transmission)
 - In South Korea, transmission between apartment units was shown to be connected by a ventilation shaft.
 - Another study detected viral RNA in exhaust filters over 50 m away from patient care areas.
 - A model of New York City public schools showed an increased risk of transmission in areas with newer buildings where had better insulation and ventilation.
 - Another model showed droplets less than 60 μm can travel ~6-26 ft. Aerosols of COVID-19 were found to travel up to 13 ft.
- Some studies showed otherwise, disputing the spread mechanism by aerosols:
 - Measles which is spread by aerosols has a reproductive value of ~18 vs. COVID-19 ~ 2.5.
- Increasing ventilation and decreasing air-recirculation may reduce airborne transmission. Experimental studies showed better positioning for ventilation devices would decrease the likelihood of particles landing on surfaces due to ventilation. Laboratory modeling of exposure to COVID-19 virus on single-aisle and twin-aisle aircraft shows that when the middle seat was vacant, infection rate was reduced by 23% to 57%.

Recommendation: With increasing evidence supporting the aerosol transmission model, caution should be taken to optimize ventilation and reduce aerosolization, such as opening windows, avoiding large crowds and poorly ventilated areas, refraining from shouting/yelling around others, and installing/strategizing the location of ventilation devices.

**FOOD SECURITY**

- Food insecurity rates in the US have doubled from 18% to 35% since the pandemic. Previous observational studies suggest that living in food poverty increases the risk of developing childhood asthma, and that parents of children with Cystic Fibrosis are twice as likely to be living in food insecurity.

Recommendation: Clinicians should screen for food insecurity and connect patients with appropriate resources.

NONCOMMUNICABLE DISEASES & LIFE EXPECTANCY

- 75% of countries surveyed by the World Health Organization (WHO) reported considerable disruptions to noncommunicable disease services due to the pandemic. The CDC reported that by June 30th, 41% of US adults had delayed or avoided care due to the pandemic. Children may experience unhealthy weight gain, possibly attributed to food insecurity, or decreased physical activity because of social distancing measures.
- When compared to a prepandemic era, the rate of BMI growth in a cohort of 432,302 people aged 2–19 years nearly quadrupled during the pandemic. The most significant increases were seen in people who were pre-pandemic overweight or obese, as well as younger school-aged children.
- The average 2020 US life expectancy is estimated to decrease by 1.41 years. The Black-white life expectancy gap is estimated to increase by 50% (from 3.6 years to over 5 years), undoing 20 years of progress towards closing the gap. The previous Latino mortality average is expected to be reduced by over 70% (from >3-year survival advantage to <1-year).

Recommendation: Practitioners should educate patients with chronic diseases about telemedicine options in order to ensure adequate management.

MENTAL HEALTH

- Psychiatric symptoms such as depression, stress, and anxiety in the general population have increased since the pandemic. Young adults, essential workers, health care workers, LGBTQ+ individuals, unpaid caregivers of adults, families of children with special needs/disabilities, immigrants, and racial/ethnic minorities are experiencing these symptoms at higher rates. School closures reduced access to mental health care. Peripartum women also have increasingly experienced anxiety and depression.
 - Parents, unpaid caregivers of adults, and parents-caregivers (people in both roles) had significantly worse mental health with five times the odds of any adverse mental health symptoms among 10,444 U.S. adults surveyed.
 - Suspected suicide attempt ED visits increased 50.6 percent among females aged 12–17 years between February 21 and March 20, 2021, compared to the same period in 2019. Suspected suicide attempt ED visits increased 3.7 percent among boys aged 12–17 years.
 - 53.0 percent of the 26,174 state, tribal, local, and territorial public health employees questioned said they had experienced symptoms of at least one mental health problem in the previous two weeks.

Recommendation: Practitioners should screen for psychiatric symptoms, address patient concerns, and connect patients with mental health resources.

SUBSTANCE USE

- One study in the UK found that lockdown is a risk factor for increased alcohol consumption. The CDC reported that synthetic opioid overdose deaths increased by 38% between June 2019 and May 2020. Prior to the COVID-19 pandemic, opioid use related deaths were concentrated in areas east of the Mississippi; during the pandemic, fentanyl-related overdose death rates increased by 98% in western states.

Recommendation: Clinicians should alert patients to the risks of synthetic opioids and prescribe naloxone for individuals who have a history of substance use disorder and/or a history of a previous overdose. Clinicians should also instruct patients in the proper use of naloxone.

GENDER EQUALITY, DOMESTIC VIOLENCE, CHILD ABUSE & NEGLECT

- A study of working parents found that 36% of surveyed dual-earner couples adopted a strategy for childcare in which the wife worked and did all or most of the childcare, and that this group had the lowest measures of well-being and job performance.
- Domestic violence increased compared to pre-COVID-19 levels due to increased stress, especially in the LGBTQ+ population. Child abuse reporting in several states has decreased by up to 70% percent compared to pre-COVID-19 levels. In the US, 67% of substantiated reports come from victim-serving professionals like educators, so reduced reporting of child abuse and neglect may be related to school closures. Child ED visits related to abuse and neglect decreased by up to 53% compared to 2019, with a nadir in late March. In contrast, abuse related visits requiring hospitalization remained relatively stable.

Recommendations: As clinicians are some of the few remaining reporters, they should screen for signs of domestic violence, child abuse or neglect regardless of trends in cases reported in the community.

CHILDHOOD VACCINATIONS

- A WHO poll found that in 85% of 61 countries that responded, childhood immunization rates had decreased since January 2020. Immunization data from 10 U.S. jurisdictions indicated a substantial decrease in administered vaccine doses during March–September 2020 compared with the same period during 2018 and 2019, with Tdap administered being decreased by a median of over 60%, MMR over 20%, HPV over 60%, and DTaP over 15%.

Recommendations: Clinicians should continue outreach efforts for keeping pediatric patients up to date with routine vaccinations and educating parents on the importance of vaccination even during the pandemic. Making vaccine administration available with limited contact could ease parental concerns.

STIGMA & RACISM

- In one survey, a quarter of respondents felt that healthcare workers should have restrictions placed on their freedom of mobility to avoid infecting people with COVID-19. Nearly a third would avoid healthcare workers to avoid infection.
- In a survey of Chinese American families, nearly half of parents and youth reported being directly targeted by COVID-19 racial discrimination online. Parental and youth perceived racism and racial discrimination were associated with poorer mental health. In New Zealand, a survey of undergraduate pharmacy students, half of whom being Asians, found that 13% of respondents experienced direct racism, 35% reported indirect racism, and 37% admitted racism associated with COVID-19 affected their well-being. A Pew research Study found that Asians were more likely to report being the victim of racial slurs or jokes following the onset of the pandemic. Analysis of county-level segregation, racial disparities in socioeconomic outcomes, and incarceration rates was found to show that structural racism remains a driving force behind health disparities.

Recommendation: Clinicians should be sensitive to the unique challenges Asian American families may face due to racism during the COVID-19 pandemic and connect patients with appropriate mental health resources.

NEW STRAINS

- In a span of only 6 weeks beginning in April 2021, the alpha (B.1.1.7) variant of SARS-CoV-2 was displaced from a prevalence of 70% of positive cases to 42% of positive cases. The large majority of this displacement was due to the rise in prevalence of the B.1.617.2 (Delta) variant.
- Another variant of SARS-CoV-2, the P.1 (gamma) variant, is also contributing to the displacement of the Alpha variant.