COVID-19 Evidence Digest 2/10/21

Genomic Epidemiology Identifies Emergence and Rapid Transmission of SARS-CoV-2 B.1.1.7 in the United States (medRxiv – pre-print)

Bottom Line: This pre-print study performed genomic sequencing on SARS-CoV-2 samples collected from US testing sites during December 2020-January 2021, and found that the B.1.1.7 (UK) variant was likely already spreading in late November, was introduced to the US in multiple locations, and had an increased transmission rate of 35-45%.

Details: This study analyzed genomic sequencing performed on SARS-CoV-2 samples collected from US testing sites from December 2020 to January 2021 in order to examine prevalence and growth of the virus' B.1.1.7 (UK) variant in the US. Quantitative reverse transcription polymerase chain reaction (RT-qPCR) testing of the spike protein gene mutation (S gene target failure) reliably detected B.1.1.7; 212 B.1.1.7 variant genomes were sequenced. Findings indicate that while the proportion of B.1.1.7 variants found varied by state, B.1.1.7's doubling rate was a little over a week, accompanied by an increased transmission rate of 35-45%. Analyses also suggest that the variant was introduced into the US in multiple locations on both coasts and was likely already spreading in late November. Onward transmission enabled the variants' spread to at least 30 states as of January 2021.

Key Takeaways:

- Findings suggest that B.1.1.7 is on track to become a dominant SARS-CoV-2 variant in the US, like the UK and other countries, necessitating urgent measures, such as vaccination, mask wearing, and social distancing, to mitigate against associated morbidity and mortality.

SARS-CoV-2 B.1.1.7 Escape from mRNA Vaccine-Elicited Neutralizing Antibodies (medRxiv – pre-print)

Bottom Line: This pre-print study assessed immune responses to the wild type SARS-CoV-2 Spike protein and 8 mutations found in the B.1.1.7 variant's Spike protein following one dose of Pfizer-BioNTech's mRNA vaccine, and found decreased antibody neutralization against the variant.

Details: In this small pre-print study, antibody responses to the wild type SARS-CoV-2 Spike protein and 8 mutations found in the B.1.1.7 variant's Spike protein 3 weeks after one dose of Pfizer-BioNTech's mRNA vaccine were assessed in 24 participants (median age = 82). Neutralization with monoclonal antibodies was also assessed. Findings indicate that blood from participants who received one dose of vaccine had a broad range of neutralizing antibodies that were modestly reduced against the B.1.1.7 variant; in 15 individuals with neutralization activity, 10 showed evidence of reduced antibody efficacy against B.1.1.7. Reduced neutralization of B.1.1.7 was also found in monoclonal antibodies targeting the virus' N-terminal domain (NTD) and receptor binding motif (RBM). Adding the E484K mutation, first found in South Africa, to B.1.1.7 resulted in greater reduction of neutralizing activity by antibodies resulting from vaccination compared to the B.1.1.7 variant alone.

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Key Takeaways:

- Vaccine escape, or a variant evading neutralization by an immune response generated by a vaccine, appears likely, though in the near term, currently available vaccines should contribute to SARS-CoV-2 pandemic control.
- Future vaccines should be made to target mutated Spike protein sequences and use alternative viral antigens (substances that cause the immune system to produce antibodies against it).

Age Groups that Sustain Resurging COVID-19 Epidemics in the United States (Science)

Bottom Line: This study estimates that 20-49 year-olds in the US are the only age group sustaining resurgent SARS-CoV-2 transmission as of October 2020, due to changes in mobility and behavior among this group.

Details: This study sought to understand how various age groups are contributing to SARS-CoV-2 transmission resurgence. Age-specific mobility data and trends from over 10 million US individuals were linked to age-specific mortality due to COVID-19; data were gathered from publicly available sources in 42 US states, DC, and NYC since 3/15/20. Findings suggest that the recent SARS-CoV-2 resurgence (as of October 2020) has largely been driven by 20-49, and in particular, 35-49, year-olds, with an estimated 65/100 infections originating from 20-49 year-olds. After school reopening in October, 20-49 year-olds accounted for an estimated 72% of SARS-CoV-2 infections, compared to <5% and <10% from children 0-9 and 10-19 years of age, respectively. Among the 20-34 and 35-49 year-old age groups, the estimated reproduction numbers were 1.29 and 1.39, respectively, compared to ~1 for 10-19 and 50-64 year-olds; explanations for higher reproduction numbers among 20-49 year-olds include more contact with other adults >20 years of age, increasing mobility trends, and elevated transmission risk per venue visit over particular time periods compared to other age groups.

Key Takeaways:

- Major findings from this study include: transmission has been sustained primarily from 20-49 year olds; a majority of infections originate from 20-49 year olds; there have been no major shifts in age-specific transmission dynamics over time; and school reopening has not led to substantial increases in deaths due to COVID-19.
- Findings suggest the need for targeted interventions for 20-49 year-olds, including mass vaccination, in order to mitigate SARS-CoV-2 resurgence and prevent deaths due to COVID-19.

COVID-19 Vaccine Hesitancy in a Representative Working-Age Population in France: A Survey Experiment based on Vaccine Characteristics (Lancet Public Health)

Bottom Line: A model derived from a survey performed in France in July 2020 prior to the approval of currently-available COVID-19 vaccines predicted that 29.4% of working-age French people would outright refuse the COVID-19 vaccine. Individuals' level of vaccine hesitancy varied based on several characteristics, but of note, education about herd immunity and past experience with COVID-19 illness decreased vaccine hesitancy.

Details: This survey of 1942 adults age 18-64 in France conducted in July 2020 aimed to assess the effects of vaccine characteristics, information on herd immunity, and general practitioner recommendation on vaccine hesitancy. It divided the survey cohort into 3 groups who received different information about herd immunity and then again into 2 different groups who received different recommendations regarding the vaccine from their general practitioner. They were then presented with 8 different scenarios and asked for each if they would accept the vaccine or not. If respondents declined the vaccine in all scenarios, it was considered "vaccine refusal"; if respondents accepted the vaccine in some scenarios and declined in others, it was considered "vaccine hesitancy." A model was built from these results to estimate vaccine refusal and vaccine hesitancy across the working-age French population.

Key Takeaways:

- Increased COVID-19 vaccine hesitancy and refusal were strongly associated with: female gender, age with an inverted U-shaped relationship, lower educational level, poorer compliance with recommended vaccinations in the past, no report of a chronic condition, and lower perceived severity of COVID-19 if infected.
- Communicating the benefits of herd immunity was significantly associated with decreased vaccine hesitancy.
- Vaccine hesitancy decreased with higher vaccine efficacy and lower risk of serious side-effects. Vaccine hesitancy increased if vaccines were only accessible in mass vaccination centers rather than a GP practice or local pharmacy; it also increased if the vaccine was made in the US or China rather than the EU.