

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

Supplementary Table 1. Summary of studies (n=126)

| Author, date | Date of publication | Date of data collection | Source | Study design | Country | Setting | Sample size | Outcome measures | Objective | VOC | Main Findings |
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| INCLUDED STUDIES FROM AUGUST 25 TO OCTOBER 4, 2021 (N=42) | | | | | | | | | | | |
| Abu-Raddad 2021¹ | 28-May-21 | Feb 1 st to Mar 31 st 2021 | Journal of Travel Medicine | Case control | QAT | Community | 333,764 | Vaccine effectiveness | Document Pfizer-BioNtech vaccine protection on weekly basis after first dose | Alpha, Beta | 75% protection reached after 15-21 days since initial dose. Protection increased most rapidly against hospitalization and death, and slowest against B.1.351 infection. |
| Adamoski 2021² | 17-Sept-21 | Oct 10 th 2020 to May 24 th 2021 | Emerging Infectious Diseases | Cross Sectional | BRA | University | 7,249 | Positive test sample, genotype | Implement large screening campaign to provide safer environment for individuals on-site of university | Gamma | Analyzing saliva samples provides a cheap and easy asymptomatic screening strategy. |
| Antonini 2021³ | 17-Aug-21 | Sep 1 st 2020 to May 1 st 2021 | Vaccines | Modelling | ITA | Community | N/A | Disease severity, hospitalizations, ICU admissions, deaths | Explore the dynamics of COVID-19 with different vaccination paces and a policy of gradual reopening | Alpha, Gamma | The control of COVID-19 can be accomplished by a multi-strategy approach combining highly effective vaccines, social distancing, and isolation of positive cases. |
| Avila 2021⁴ | 26-Sep-21 | Dec 20 th 2020 to Aug 17 th 2021 | medRxiv [preprint] | Modelling | USA | Community | N/A | Infections, asymptomatic vs. symptomatic infections, deaths, vaccination rates | Model virus spread in unvaccinated and vaccinated subpopulations with parameters associated with delta variant, two-dose vaccination, and the variant's partial vaccine resistance | Delta | Combination of strengthening vaccine induced immunity, and preventative behaviour measures will decrease the rise of variants. |
| Bauer 2021⁵ | 02-Sep-21 | May 2021 to Fall 2021 | PLOS Computational Biology | Modelling | EUR | Community | N/A | Rate of NPI relaxation | Study how planned vaccine rollout in EU allows for restriction relaxation. | Alpha, Beta, Gamma, Delta | Keeping moderate preventative measures such as improved hygiene, use of face masks and moderate contact reduction is recommend to control virus spread. |
| Chen 2021⁶ | 27-Sep-21 | N/A | medRxiv [preprint] | Modelling | CHN | Community | N/A | Infections, symptomatic COVID-19, | Evaluate long-term dynamics of neutralizing antibody | Delta | Timely boosting with vaccines can provide protection against Delta variant. Better performance |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | severe COVID-19 | and predict time-varying efficacy against Delta variant by vaccine, age group and clinical severity | | associated with mRNA vaccines rather than protein and inactivated vaccines. |
| Cipriano 2021⁷ | 05-Sep-21 | Aug to Dec 2021 | medRxiv [preprint] | Modelling | CAD | Community | N/A | Infections, hospitalizations, time to reinstate public health measures, vaccine coverage, level of contact reduction | Project number of COVID-19 cases and demand for hospital resources for Fall 2021. Evaluate if current levels of vaccine coverage and contact reduction could mitigate 4 th wave, or if public health measures should be reinstated | Alpha, Delta | High vaccination coverage and mask wearing in public will not be sufficient to prevent a resurgence of COVID-19 in Fall 2021. Immediate moderate public health measures can prevent the need for more intense measures to be implemented later. |
| Cowley 2021⁸ | 08-Sep-21 | Nov 2020 to Apr 2021 | Nature Microbiology | Bayesian time-scaled phylogenetic analysis | BGD | Community | 152 | Infections, COVID-19 lineages, population mobility | Track the spread of COVID-19 lineages and identify outbreak dynamics. | Alpha, Beta | Repeated international importations until late March were followed by a period of sustained community transmission. Stay-at-home orders can exacerbate transmission. |
| Cuesta-Lazaro 2021⁹ | 23-Sep-21 | July 10th, 2021, to Feb 1st, 2022 (simulations) | medRxiv [preprint] | Modelling | UK | Schools | N/A | Infections, deaths | Simulate the spread of COVID-19 infections after reopening of schools and compare the influence of three different vaccination campaigns, as well as the impact of continuing NPIs in schools. | Delta | The primary result from the comparison of vaccine scenarios is that vaccinating 80% of 12–17 year olds prior to July 2021 would have had a major effect on the epidemic progression — significantly more than just vaccinating those 16 and older or adults alone. |
| De-Leon 2021¹⁰ | 20-Sep-21 | July 2020 to June 2021 | medRxiv [preprint] | Modelling | ISR | Community | N/A | Confirmed cases, severe hospitalizations, vaccine effectiveness | Examine the extent of the impact of the Delta variant on morbidity and whether it can solely explain the outbreak, or if waning vaccine | Delta | Both Delta infectiousness and waning vaccine effectiveness could have been able to push Israel below the herd immunity threshold (HIT) independently; thus, to mitigate the outbreak, effective NPIs are required. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | effectiveness also played a role. | | |
| Doyle 2021 ¹¹ | 03-Sep-21 | March 15 to May 3, 2021 | Morbidity and Mortality Weekly Report (MMWR) | Case series | USA | Schools | 158 | Infections | Evaluate the role of travel and social connections, as well as the potential impact of SARS-CoV-2 variants, on transmission among a cluster of students with COVID-19 at an urban university. | Alpha | Student travel by unvaccinated students during a university break and subsequent on-campus gatherings drove introduction and transmission of several lineages. |
| Eyre 2021 ¹² | 01-Oct-21 | January 1 to July 31, 2021 | medRxiv [preprint] | Retrospective cohort | UK | Community | 146,243 | Infections, SARS-CoV-2 lineages, transmission, index case and contact vaccination | Investigate associations between transmission and index case and contact vaccination, and how these vary with Alpha and Delta variants and time since second vaccination. | Alpha, Delta | Vaccination reduces transmission of Delta, but by less than the Alpha variant. The impact of vaccination decreased over time. Factors other than PCR Ct values at diagnosis are important in understanding vaccine-associated transmission reductions. Booster vaccinations may help control transmission together with preventing infections. |
| Fiori 2021 ¹³ | 21-Sep-21 | January to June 2021 | medRxiv [preprint] | Time series analysis/modeling | ARG, BRA, CHL, PRY, URY | Community | N/A | Infections (incidence data), viral transmissions (reproduction rate), deaths, vaccinations, population mobility | Investigate the impact of national vaccination programs and natural infection on viral transmission in select South American countries. | Gamma | Populations from the South American Southern cone probably achieved the conditional herd immunity threshold to contain the spread of regional SARS-CoV-2 variants. |
| Gollier 2021 ¹⁴ | 09-Jun-21 | Not reported | Journal of Benefit-Cost Analysis | Modelling | FRA | Community | N/A | Infections, ICU admissions, deaths, rate of vaccination, economic/GDP loss | To measure the welfare benefit for France of the optimal vaccination campaign (of prioritizing older people, together with people with comorbidities), by combining its wealth | Alpha | Three-quarters of the welfare benefit of the vaccine can be achieved with a speed of 100,000 full vaccination per day. A 1-week delay in the vaccination campaign raises the death toll by approximately 2,500 and reduces wealth by 8 billion euros. Prioritizing the allocation of vaccines to the most vulnerable people saves 70,000 |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | and health impacts; and to measure the welfare cost of the misallocation of the vaccine. | | seniors, but it also increases the death toll of younger people by 14,000. If the production country vaccinates its entire population before exporting to another, the global death toll would be increased by 20%. |
| Hagan 2021¹⁵ | 24-Sep-21 | July 12 th to Aug 14 th , 2021 | Morbidity and Mortality Weekly Report (MMWR) | Case study | USA | Prison | 172 | Positive COVID cases | Describe an outbreak involving the Delta variant in a highly vaccinated incarcerated population | Delta | Widespread vaccination among incarcerated persons and staff members in coordination with other prevention strategies remain critical to limiting SARS-CoV-2 transmission and COVID-19–related illness and death in congregate settings, including correctional and detention facilities. |
| Kost 2021¹⁶ | 22-Sep-21 | Not reported | Archives of Pathology & Laboratory medicine | Modelling | USA | Community | N/A | Tiered sensitivity/specificity | Use original mathematics and visual logistics for interpreting COVID-19 rapid antigen test performance patterns, gauge the influence of prevalence, and evaluate repeated testing | Delta | Performance of self- and home-antigen tests with Food and Drug Administration Emergency Use Authorization peaks in low prevalence. Fall-off in performance appears with increasing prevalence because suboptimal sensitivity creates false negatives. |
| Lam-Hine 2021¹⁷ | 03-Sep-21 | May 23 rd to June 12 th , 2021 | Morbidity and Mortality Weekly Report (MMWR) | Case study | USA | School | 26 | Positive COVID cases | To describe the case of an outbreak in an elementary school. | Delta | Due to the delta variant's high transmissibility, masking is highly recommended in schools. Other NPIs are also very important in protecting the vulnerable school children, as they are ineligible for vaccination. |
| Lasser 2021¹⁸ | 29-Sep-21 | Not reported | medRxiv [preprint] | Modelling | AUT | School | 616 clusters; 3,498 cases | Effectiveness of mitigation measure to reducing cluster size | Quantify how many transmissions can be expected for different scenarios/school types, in a way that is appropriate to derive evidence-based policies for keeping schools open at a controllable infection transmission risk. | Delta | Different types of schools require different combinations of preventive measures. The ideal mix of mitigation measures needs to be more stringent in secondary schools than in primary schools, and needs to preferentially focus on teachers as sources of infection. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Levine-Tiefenbrun 2021 ¹⁹ | 01-Sep-21 | June 28 th to Aug 24 th , 2021 | medRxiv [preprint] | Retrospective cohort | ISR | Community | 11,889 | Positive COVID cases | Analyze viral loads in over 11,000 infections during the current wave of the Delta variant to compare viral load amongst various vaccination statuses. | Delta | The vaccine is initially effective in reducing infectiousness of breakthrough infections even with the Delta variant, and that while this protectiveness effect declines with time it can be restored, at least temporarily, with a booster vaccine. |
| Li 2021 ²⁰ | 31-Aug-21 | June 1 st , 2020 to Feb 13 th , 2021 | The Lancet | Modelling | UK | Community | N/A | Data on community mobility; reproduction number (R) of SARS-CoV-2 across UK local authorities | Determine association between community mobility and COVID-19 transmission. | Alpha | Increased visits to retail and recreation places, workplaces, and transit stations in cities are important drivers of increased SARS-CoV-2 transmission; the increasing trend in the effects of these drivers in the first 6 weeks of 2021 was possibly associated with the emerging alpha (B.1.1.7) variant. |
| MacIntyre 2021 ²¹ | 16-Sep-21 | March 1 st , 2020 to June 29 th , 2021 | Vaccine | Modelling | USA | Community | N/A | Number of cases, number of deaths, mask usage and efficacy | Estimate the impact of community face mask use, at varying levels of mask uptake and mask effectiveness during the roll out of vaccination in NYC | Delta | The epidemic curve is suppressed by 50% with mask wearing but surges when mask usage drops below 30%. NPIs are needed during vaccine rollout, and the ongoing need is contingent upon waning of vaccine immunity, VOCs and use of boosters. |
| Majeed 2021 ²² | 20-Sep-2021 | Not reported | Mathematical Biosciences | Modelling | CAD | Community | N/A | Infections, impact of variability in COVID-19 and whole genome testing capacity on spread | Examine the impact of NPIs, including test capacity and contact tracing and quarantine strength, on the VOC-induced epidemic wave. | Alpha, Beta, Gamma, Delta | A combination of large COVID-19 clinical test capacity, a short delay in both the clinical test and WGS test and the subsequent contact-tracing and quarantine, and moderate level of additional strain-specific quarantine is a feasible and optimal approach to prevent or mitigate a VOC-driven outbreak. |
| Mathiot 2021 ²³ | 01-Sep-21 | December 2019 to July 2021 | medRxiv [preprint] | Modelling | FRA, DEU, ITA | Community | N/A | Virus spread of initial strain, Alpha variant, and Delta variant | Examine density and intensity of social relationships to further understanding of epidemic propagation | Alpha, Delta | Variant spread is determined by escape from vaccine protection/or COVID infected non-vaccinated, and no continuity of vaccine strategy such as third doses to extend immunity. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | via the respiratory tract. | | |
| McBryde 2021 ²⁴ | 03-Sep-21 | Not reported | The Medical Journal of Australia | Modelling | AUS | Community | N/A | Number of infections, hospitalizations, deaths; number of years of life lost | Analyse outcomes of COVID-19 vaccination by type of vaccine, age, eligibility, vaccination strategy and coverage | Delta | Vaccinating vulnerable population first is important when overall vaccine coverage is low; vaccinating more socially active groups becomes more important as R(eff) declines and vaccination coverage increases. Based on an R(eff) of 5, herd immunity only likely to occur if 85% of population aged 5+ are vaccinated. |
| McPeck 2021 ²⁵ | 20-Sep-21 | Not reported | medRxiv [preprint] | Modelling | USA | Schools | N/A | Total number in infectious and recovered classes, representing total disease burden | To test the effects of vaccination and masking in a scenario containing a quantity of agents representing double occupancy of the 20 dorm rooms on the map (40 agents). | Delta | Universal masking with N95 masks and 100% vaccination of susceptible people resulted in significantly lower prevalence after 3 weeks compared to all other scenarios, but still led to a substantial number of infections. Increased vaccination levels from 52% to 100% by itself did not result in a significant difference in prevalence due to symptomatic and asymptomatic breakthrough infections. These results suggest that universal masking is the best way forward. |
| Mele 2021 ²⁶ | 15-Sep-21 | Not reported | medRxiv [preprint] | Modelling | USA | Schools | N/A | Infections, hospitalizations, deaths, reinfections | To project the impact of school-masking on the community, which can inform policy decisions, and support healthcare system planning. | Delta | The implementation of masking policies in school settings can reduce additional infections post-school opening by 23-36% for fully-open schools, with an additional 11-13% reduction for hybrid schooling, depending on mask quality and fit. Masking policies and hybrid schooling can also reduce peak hospitalization need by 71% and result in the fewest additional deaths post-school opening. |
| Milne 2021 ²⁷ | 02-09-21 | Not reported | Preprints with The Lancet [preprint] | Modelling | AUS | Community | N/A | Infections, hospitalizations, deaths | To model a range of COVID-19 vaccination strategies to determine their effectiveness in | Delta | High vaccine efficacy and extremely high vaccination coverage (90%) was shown to be required to mitigate highly transmissible variants such as Delta without activation of strong |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | preventing local epidemics of the B1.617.2 Delta variant. | | lockdown measures, in contrast to the Alpha variant. Greater than 70% vaccine coverage in those 12+ years, together with a vaccine boosting regimen, would be sufficient to halt a Delta outbreak if coupled with early, moderate lockdown measures. |
| Patalon 2021 ²⁸ | 31-08-21 | Jan to Aug 21 st , 2021 | medRxiv [preprint] | A test-negative design and a matched case-control design | ISR | Community | 153,753 | Positive Covid-19 PCR (test negative analysis) | To evaluate initial short-term marginal effectiveness of the third dose of the BNT162b2 vaccine against the Delta variant compared to a two-dose regimen. | Delta | We found that 7-13 days after the booster shot there is a 48-68% reduction in the odds of testing positive for SARS-CoV-2 infection and that 14-20 days after the booster the marginal effectiveness increases to 70-84%. |
| Pettit 2021 ²⁹ | 21-09-21 | N/A | medRxiv [preprint] | Scenario-based modelling | USA | Workplace | Modeling | Community acquired infections (CAI), number of workplace-acquired infections (WAI), number of acquired infections (TAI, of CAI + WAI) | To test the rates of WAI and CAI based on applied isolation strategies, community infection rates (CIR), scales of testing, NPIs, variant predominance and testing strategies, vaccination coverages, and vaccination efficacies | Delta | The study identified different thresholds at which NPI can be changed - for example, when the CIR is 5 new confirmed cases per 100,000 or fewer, and at 50% of the workforce is vaccinated with a 95% efficacious vaccine, then testing daily with an antigen-based or PCR-based test in only unvaccinated workers will result in less than one infection through 4,800 person weeks. |
| Reingruber 2021 ³⁰ | 21-02-21 | Jan 20 to Feb 21, 2021 | medRxiv [preprint] | Modelling | FRA | Community/hospital modeling | 586 patients' clinical data | Number of new infected per age group | To develop a data-driven modelling framework with the aim to provide reliable near-future predictions under constantly evolving social and pandemic conditions | Delta | Reproduction numbers and herd immunity levels are not universal but depend on the underlying social dynamics, and in the presence of the delta variant should be above 90%. Finally, we conclude that vaccination of the young generation should be pursued before all social restrictions are relieved. |
| Rose 2021 ³¹ | 02-02-21 | Not reported | medRxiv [preprint] | Laboratory | DEU | Laboratory | N/A | Immunoglobulin G and neutralizing capacities | To compare immunoglobulin G response after heterologous | Alpha, Delta | The heterologous SARS-CoV-2 vaccination leads to a strong antibody response with anti-SARS-CoV-2 IgG and VNA titres at a level comparable |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | against VOC after vector vaccine followed by mRNA boost compared to double immunization with mRNA | immunization with that elicited by homologous vaccination schedules; to assess various methods to investigate the development of VNA against two prevalent VOCs | | to that of a homologous BNT162b2 vaccination scheme. The observed reduction in the VNA titre against VOC B.1.617.2 is remarkable and may be attributed to a partial immune escape of the Delta variant. |
| Sarkar 2021 ³² | 21-09-21 | March 2020–February 2021 and March 2021–first week of April 2021 | Pathogens Journal | Epidemiological | IND | Community | N/A | Descriptive, analytical comparison of two waves | To comprehensively analyze the key factors responsible for the sharp rising of confirmed COVID-19 cases in India in the second wave of infection as compared to the first wave. | Delta | Lineage analysis in India showed the emergence of new SARS-CoV-2 variants, i.e., B.1.617.1 and B.1.617.2, during April–May 2021, which might be one of the key reasons for the sudden upsurge of confirmed cases/day. Furthermore, the emergence of the new variants contributed to the shift in infection spread by the G clade of SARS-CoV-2 from 46% in period II to 82.34% by the end of May 2021. |
| Šmíd 2021 ³³ | 29-09-21 | June 4, 2020 to Apr 7, 2021 | medRxiv [preprint] | Modelling | CZE | Schools | 4,235 + modelling | In-cohort growth rates of infection | To assess impact of school opening with various mitigation measures (masks, rotations, mass testing) on growth rate of new cases in child cohorts | Alpha | The estimates of in-cohort growth rates were significantly higher for normally opened schools compared to closed schools. For secondary education, mitigation measures reduce school-related growth 2-6 times. |
| Tauzin 2021 ³⁴ | 21-09-21 | Not reported | medRxiv [preprint] | Laboratory | Not reported | Laboratory | 43 (22 SARS-CoV-2 naïve, 21 previously infected) | Presence of SARS-CoV-2-specific antibodies (Abs) (IgG, IgM, IgA) recognizing the receptor-binding domain | To characterize vaccine-elicited humoral responses in a cohort of SARS-CoV-2 naïve and previously infected individuals that received the two doses with an extended interval of sixteen weeks | Alpha, Beta, Gamma, Delta | Despite initial concerns, the long interval between doses did not result in poor immune responses. Delayed second vaccine boost in naïve individuals significantly enhances several immune responses and tightens the network of linear correlations among those. Previously infected individuals who received one dose had better responses 19 weeks after their dose. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Truelove 2021 ³⁵ | 02-09-21 | 9 different models using data available through July 3, 2021 | medRxiv [preprint] | Modelling | USA | Community | N/A | Weekly reported cases, hospitalizations, and deaths | To project weekly reported cases, hospitalizations, and deaths, both nationally and by jurisdiction (50 states and the District of Columbia), for four different epidemiological scenarios | Delta | Increased vaccination uptake is critical to limiting transmission and disease, particularly in states with lower current vaccination coverage. Higher vaccination can potentially avert 1.5 million cases and 21,000 deaths and improve the ability to safely resume social, educational and business activities. Continued or renewed NPIs can limit transmission, particularly as schools and businesses reopen. |
| Urbanowicz 2021 ³⁶ | 01-09-21 | Beginning in January 2021, up to 14 and 21 days after participants had received second dose | Science Translational Medicine | Cohort study | UK | Community (cohort of healthcare workers [HCWs]) | 45 HCWs | Presence of spike-reactive or virus-neutralizing antibodies against lineage A and B.1.351 virus | To evaluate antibody reactivity and neutralization potency in serum samples collected from individuals who received the BNT162b2 SARS-CoV-2 vaccine with or without a prior history of infection | Beta, Gamma | Regardless of prior infection status, vaccination elicited antibodies that bound to SARS-CoV-2 spike proteins, including spike proteins from variants of concern. However, prior infection further enhanced anti-spike protein antibody responses against variants. |
| Signals 2021 ³⁷ | 30-Aug-21 | Aug - Dec 2021 | medRxiv [preprint] | Modelling | FRA | Community | N/A | Number of cases, severe infections, ICU hospitalizations | To estimate if barrier gestures (i.e., public health measures) can be relaxed without causing a resurgence of severe infections | Alpha, Beta, Gamma, Delta | Maintaining application of barrier gestures appears essential to avoid a resurgence of severe infections that would exceed health care capacities, while surmounting vaccine hesitancy represents the key to consider their relaxation. |
| Wang 2021 ³⁸ | 05-09-21 | N/A | medRxiv [preprint] | Laboratory | CHN | Community | 66 | Level of humoral immune response | To evaluate the nature of humoral immune response elicited by a booster dose of CoronaVac and to compare humoral immune responses elicited against circulating SARS-CoV-2 variants | Alpha, Beta, Gamma, Delta | A third-dose booster of inactivated vaccine can elicit an expeditious, robust and long-lasting recall humoral response which continues to evolve with ongoing accumulation of somatic mutations, emergence of new clones and increasing affinities of antibodies to antigens, conferring enhanced neutralizing potency and breadth. |
| Woodhouse 2021 ³⁹ | 02-09-21 | Used data from fall 2020 to model | medRxiv [preprint] | Modelling | UK | Schools | N/A | Infection prevalence and | To compare the effects of different mitigation strategies | Delta | Testing-based surveillance of infections in the classroom population with isolation of positive cases is a |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | outcomes for fall 2021 | | | | | | incidence rate | on infection transmission rates within schools | | more effective mitigation measure than bubble quarantine both for reducing transmission in schools and for avoiding pupil absence. Maintaining reduced contact rate has a major beneficial impact for managing Covid-19 in school settings. |
| Wu 2021 ⁴⁰ | 27-09-21 | Not reported | medRxiv [preprint] | Modelling | CAD | Community | N/A | Attack ratio | To estimate the attack ratio of COVID-19 among children (0-11 years) when a large proportion of eligible population is vaccinated (age 12+) and other NPIs are in place | Delta | With the increased transmissibility of the Delta variant, a reduction from 12.73 to 10 contacts per day within the vaccine-eligible population in Ontario is necessary to avoid an outbreak sustained by the vaccine-eligible population due to lower vaccine coverage or vaccine efficiency against infection. |
| Yinon 2021 ⁴¹ | 31-08-21 | July 30 to August 22, 2021 | medRxiv [preprint] | Cohort study | ISR | Community | No booster = 4, 018, 929 person days; booster = 3,351, 598 person days | Infection (confirmed, i.e., PCR positivity), severe illness | To estimate the reduction in relative risk for confirmed infection and severe COVID-19 provided by the booster dose. | Delta | The booster dose of the BNT162b2 (Pfizer) vaccine is highly effective in reducing the risk of both confirmed infection and severe illness. |
| Yorsaeng 2021 ⁴² | 21-09-21 | June and July 2021 | medRxiv [preprint] | Cohort study | THA | Community | 549 | Immunological (humoral) response to vaccination, and neutralizing activity against the wild type and all VOC | To characterize the increase in immune response and neutralizing antibody induced by heterologous vaccination with AZD1222 in HCWs who were previously fully vaccinated with CoronaVac. | Alpha, Beta, Delta | A three-dose heterologous regimen, two initial CoronaVac followed with a third AZD1222 vaccine, indicated a strong immunological response. Sera samples from booster dose vaccine recipients elicited higher neutralizing activity against the wild type and all variants of concern than those in the recipients of the two-dose CoronaVac and AZD1222 vaccines. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

| INCLUDED STUDIES FROM JULY 14 TO AUGUST 25, 2021 (N=32) | | | | | | | | | | | |
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| Adenaiye 2021 ⁴³ | 13-Aug-21 | May 2020 to Apr 2021 | medRxiv [preprint] | Observational | USA | Community | 61 | Amount of RNA exhaled in alpha variant infection; face mask efficacy | Examine impact alpha variant has on aerosol shedding and the efficacy of face masks as a source of control | Alpha | Face masks provided significant protection against infectious aerosols, indicating importance of community wide masking in the prevention of virus transmission. |
| Amirthalingam 2021 ⁴⁴ | 28-Jul-21 | Jan to May 2021 | medRxiv [preprint] | Observational | UK | Primary care networks | 750 | Antibody responses | Compare serological response to vaccination with different intervals in between doses | Alpha & Delta | Prioritizing the first dose of vaccine was supported, as the evidence suggested that there was higher protection on extended vaccination schedules. |
| Aruffo 2021 ⁴⁵ | 13-Aug-21 | Dec 28 th 2020 to May 19 th 2021 | medRxiv [preprint] | Modelling | CAD | Community | N/A | Impact of lifting NPIs on dates of cases, hospitalizations, and deaths | Determine the optimal strategy to lifting NPIs | Alpha | Efforts should be directed towards individuals ages 20-59. NPIs should be considered when reopening, as a complete reopening lacking NPIs would result in substantial spread of the virus, regardless of vaccination coverage. |
| Arumuru 2021 ⁴⁶ | 21-Jul-21 | NR | Physics of Fluids | Laboratory | IND | Community | NR | Leakage of droplets from various masks and mask combinations | Determine optimal masking strategies | Alpha, Beta & Gamma | Double masking is effective in improving mask fitment and protection. The most effective combination was cotton mask with N95 mask. |
| Bablani 2021 ⁴⁷ | 21-Aug-21 | NR | medRxiv [preprint] | Modelling | AUS | Community | N/A | Determine number of cases, hospitalizations and deaths 100 days after Aug 1 | Estimate length of time for cases to reach less than five per day, under various lockdown strategies | Delta | Accelerating vaccine rollout is important to making the population more resilient to outbreaks. Until vaccination coverage is at an effective level, the strength of lockdowns, public health and social measures which will have the largest impact on preventing COVID-19 hospitalizations and deaths. |
| Cazelles 2021 ⁴⁸ | 03-Aug-21 | June 2020 to March 25 th 2021 | BMC Infect- | Modelling | IRL | Community | N/A | Observed daily infections, | Examine the dynamics of COVID- | Alpha | Sharp decline of cases seems to be the result of mitigation measures, when in the presence of the Alpha variant. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | ious Diseases | | | | | hospital and ICU admissions, daily deaths, and hospital discharges and cases | 19 in Ireland using public data | | |
| Chang 2021 ⁴⁹ | 10-Aug-21 | June to July 2021 | Research Square [preprint] | Modelling | AUS | Community | N/A | Agent based modelled tested the adequacy of outbreak control measures | Calibrate R0 of the Delta variant, and using the model, NPIs are investigated for feasibility in virus control. Outbreak suppression conditions are quantified. | Delta | Current social distancing requirements are not adequate for control. With 80% compliance, and month will be needed to control case numbers. |
| Colosi 2021 ⁵⁰ | 21-Aug-21 | Mar 8 th – Jun 7 th 2021 | medRxiv [preprint] | Modelling | FRA | Schools | 683 schools | Empirical contact data: examination of screening protocols was used to perform a cost-benefit analysis for varying scenarios | Model transmission of COVID-19 in schools | Delta | COVID-19 will still pose a risk to the safe opening of schools. Vaccination coverage of adolescents should be increased, and regular testing should be prioritized. |
| Contreras 2020 ⁵¹ | 25-Aug-21 | Feb 2021 | medRxiv [preprint] | Modelling | EU | Community | N/A | Effectiveness of NPIs, spreading dynamics | Model a stable equilibrium at low case numbers, where test-trace-and-isolate policies compensate for local spreading events and only moderate restrictions remain | Alpha | A lockdown and regain control over the spread of COVID-19, vaccination helps mitigate VOCs. In the future, immunization, large scale testing and international coordination will further facilitate virus control. |
| Dick 2021 ⁵² | 24-Aug-21 | Data up to Jun 27 th , 2021, projections to Mar 2022 | medRxiv [preprint] | Modelling | CAD | Community | N/A | Distribution of immunity in the Canadian | Estimate the distribution of immunity to COVID-19 in the Canadian | Delta | Model predicts 60-80% of population will have some immunity to COVID-19 by the end of the vaccination campaign. Population is vulnerable to |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | population, by age, from infection and from vaccination. | population, and determine the risk of resurgence in Fall 2021-Winter 2022. | | resurgence of virus because of the relaxation of NPIs and the reopening of schools. |
| Enright 2021 ⁵³ | 04-Aug-21 | Sep 2020 to Dec 2020 | Royal Society Open Science | Modelling | UK | Universities | N/A | Contributing factors to within-institution spread | Summarize the understanding of COVID-19 patterns from Fall 2020 and explore strategies for the safe return of students in the future | Alpha | Residences with higher populations posed a greater risk of higher transmission. The proposal of staggering the return of students was not successful in reducing transmission. Adherence to testing and self-isolation is modelled to be much more effective in reducing transmission. |
| España 2021 ⁵⁴ | 07-Sep-21 | NR | medRxiv [preprint] | Modelling | COL | Community | N/A | Time-varying trends of cases and deaths; population based seroprevalence data | Explore the impact of circulating VOCs | Alpha, Beta & Gamma | COVID-19 in the city could be explained by higher mobility and higher number of social contacts. A preferred strategy to mitigation is maintaining moderate levels of social mixing, combined with a rapid increase in vaccination rates. |
| Giardina 2021 ⁵⁵ | 07-Aug-21 | N/A | medRxiv [preprint] | Modelling | USA | Schools | N/A | Agent-based dynamic transmission model | Evaluate the probability of in-school transmission and the increase of infections | Alpha & Delta | The risk of transmission between students and their households remains high. Mitigation measures and student vaccinations can reduce these risks significantly. |
| Gorji 2021 ⁵⁶ | 16-Jul-21 | Feb to Mar 2021 | medRxiv [preprint] | Observational | CHE | Community | 27514 employees | Mass testing campaign relying on voluntary repetitive testing | Provide empirical evidence that repetitive mass testing can be effective in preventing the spread of COVID-19 | Alpha & Beta | Applying a mass testing strategy can prevent the spread of COVID-19. Program should consider and try to control for the population outside of the program. |
| Head 2021 ⁵⁷ | 23-Aug-21 | Feb to Apr 2021 | medRxiv [preprint] | Modelling | USA | Schools | N/A | Individual based transmission model to simulate Delta | Characterize the risks to students and teachers in schools under various scenarios (varying | Delta | Vaccination of adult community members can protect unvaccinated elementary school students. Schools can have low risks with high community vaccination levels and universal masking. If schools support |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | variant transmission, to examine school reopening policies | NPIs and vaccination coverage) | | additional measures such as cohorts and testing, they should consider doing so. |
| Hillus 2021 ⁵⁸ | 13-Aug-21 | Dec 27, 2020 - June 14, 2021 | The Lancet Respiratory Medicine | Observational | DEU | Community (population: healthcare workers) | 380 participants | Reactogenicity (by use of electronic questionnaires); immunogenicity (by the presence of SARS-CoV-2-specific antibodies, an RBD-ACE2 binding inhibition assay, a pseudovirus neutralisation assay and anti-S1-IgG avidity); T-cell reactivity (by IFN- γ release assay) | To assess the reactogenicity and immunogenicity of heterologous immunizations with homologous ChAdOx1 nCov-19 or heterologous ChAdOx1 nCov-19-BNT162b2 vaccination with a 10-12-week vaccine interval or homologous BNT162b2 vaccination with a 3-week vaccine interval | Alpha & Beta | The heterologous ChAdOx1 nCov-19-BNT162b2 immunization with 10-12-week interval, recommended in Germany, is well tolerated and improves immunogenicity compared with homologous ChAdOx1 nCov-19 vaccination with 10-12-week interval and BNT162b2 vaccination with 3-week interval. Heterologous prime-boost immunization strategies for COVID-19 might be generally applicable. |
| Karaba 2021 ⁵⁹ | 14-Aug-21 | Blood samples submitted 0-4 weeks before third dose and 2 weeks after | medRxiv [preprint] | Observational | USA | Community (particularly solid organ transplant recipients [SOTRs]) | 31 SOTRs | Pre and post-third dose samples of recipients were compared for | Investigate the efficacy of third-dose vaccinations in organ transplant recipients | Delta | A third dose of the vaccine showed an increase of antibody levels as well as neutralizing abilities against VOCs in some organ transplant recipients. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | immunogenicity | | | |
| Koslow 2021 ⁶⁰ | 14-Jul-21 | June to August 2021 (90-day period beginning June 6, 2021) | medRxiv [preprint] | Modelling | DEU | Community | N/A | Effects of non-pharmaceutical interventions in Germany, age-dependent factors and commuting activities between regions; vaccination process; timing of return to pre-pandemic contacts and suspension of mask wearing and testing | To analyze different strategies for removing the restrictions of non pharmaceutical interventions that were in effect during the SARS-CoV-2 pandemic, while accounting for the new Delta variant and the ongoing vaccination process | Alpha & Delta | At the current rate of vaccination, there is still a great risk of another wave of infections if NPIs are lifted too early. The severity of these infections will be significantly reduced compared to previous waves due to the prioritization of the older population during the vaccination process. In all scenarios, rising infection numbers will hit school children the hardest. A key role will be played by the duration of immunity conferred by the licensed vaccines. |
| Krueger 2021 ⁶¹ | 18-Jul-21 | Not reported | medRxiv [preprint] | Modelling | FRA, UK | Community | N/A | Vaccine effectiveness, re-vaccination rate, waning immunity | To illustrate vaccination dynamics and possible different restrictions for VP holders in relation to the Alpha & Delta variants | Alpha & Delta | Risk of virus resurgence is higher with the introduction of vaccine passports and exempting holders from wearing masks and testing. Resurgence (particularly Delta-driven) can be mediated with high restrictions for the general population and small-moderate restrictions for holders. Public health measures flexibility is favored in a model where there is high vaccine effectiveness, low number of never-vaccinated, high re-vaccination rate, slowly waning immunity, and proportional social mixing |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Layton 2021 ⁶² | 12-Aug-21 | January 1, 2020, to December 31, 2021 (projections) | Research Square [preprint] | Modelling | CAD | Community | N/A | Dynamics and interactions of 3 SARS-CoV-2 strains, including (i) asymptomatic and symptomatic infections, (ii) two-dose vaccinations with variable dosing intervals, (iii) effects of NPI | To develop and apply a much expanded Susceptible-Infection-Recovered-type model to better understand to what extent the competition and interaction of VOC impact the spread of SARS-CoV-2 | Alpha & Delta | In addition to infectivity, the extent of the NPI, and vaccination rate, factors that determine how fast COVID-19 spreads include: the prevalence of asymptomatic infections; enhanced infectivity of asymptomatic patients; fraction of the population who are vaccinated; types of vaccines distributed; and contextual differences between countries/regions. Both simultaneous and rapid deployment of pharmaceutical and NPI are needed to combat a dangerous VOC. |
| Liu 2021 ⁶³ | 23-Jul-21 | Vaccination capacity data up to May 23, 2021 | medRxiv [preprint] | Modelling | CHN | Community | N/A | Herd immunity under three scenarios | To evaluate the feasibility of reaching herd immunity against SARS-CoV-2 through vaccination, considering heterogeneity in population age, age-specific patterns, vaccine efficacy and virus plus variants characteristics | Alpha, Beta, Gamma, Delta | Reaching herd immunity is challenging; authorizing vaccines for children is essential; highly efficacious vaccines in particular against the variants is necessary; despite all, vaccination is paramount to pandemic control. |
| Marziano 2021 ⁶⁴ | 19-May-21 | Daily vaccination supply estimates cover each quarter of 2021 and first half of 2022 | medRxiv [preprint] | Modelling | ITA | Community | N/A | Fraction of individuals recovered (and immune) from SARS-CoV-2 infection; age-specific vaccination | To simulate the effect of a vaccine rollout assuming that governments will be capable to maintain an approximately constant incidence by adjusting physical distancing restrictions | Alpha | The combination of vaccine roll-out and effective mitigation strategies is expected to prevent a large proportion of deaths while at the same time allowing a progressive lifting of physical distancing restrictions. A complete return to a pre-pandemic lifestyle can be expected between 9 and 15 months since the start of vaccination, only if a |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | rates over time; COVID-19-related deaths; alternative prioritization orders for vaccination; vaccine coverage; duration of vaccine protection; incidence level of reported cases; vaccine efficacy | as immunity accumulates. | | number of conditions are simultaneously met. |
| Paassen 2021 ⁶⁵ | 22/Jul/21 | Not reported | medRxiv [preprint] | Modelling | DEU | Community (Workplace) | N/A | Testing strategies, isolation and quarantine management; these are combined to develop a novel risk strategy | To develop and present epidemiologic modelling that calculates infection risks and the expected success of the measures across virus generations and that allows for a differentiated risk analysis for contact persons based on the day-dependent infectivity | Alpha | Public health measures implemented in workplaces can be effective, particularly combined measures (isolation, quarantine, symptom monitoring, testing) compared to single measures. It is imperative to implement measures early. |
| Panovska-Griffiths 2021 ⁶⁶ | 22/Jul/21 | Model was calibrated until January 25, 2021, to simulate the impact of a full national | medRxiv [preprint] | Modelling | UK | Community | N/A | Cumulative diagnoses, cumulative deaths and cumulative hospital admissions | To use mathematical modelling to simulate the impact of a full national lockdown (FNL) in England from January 4, 2021 compared to partial | Alpha | The strict social distancing measures, i.e. national lockdown, imposed from January 2021 with schools closed was likely to have been successful in suppressing the wave of COVID-19 cases that emerged towards the end of 2020. Continued epidemic control |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | lockdown with schools closed until April 19, 2021 | | | | | | under various partial and full lockdown scenarios, accompanied by social distancing and ongoing Test, Trace and Isolate intervention | national lockdowns (PNL) in which some elements of in-person schooling remained open | | was achievable even with cautious reopening of schools from March 8, 2021 whilst continuing the vaccination efforts initiated from December 2020. It is important to effectively roll out a mass vaccination strategy during lockdowns. |
| Payne 2021 ⁶⁷ | 21-Jul-21 | Dec 7, 2020 - Mar 12, 2021 | Cell [preprint] | Observational | UK | Community | 503 participants | Effectiveness of the BNT162b2 vaccine against PCR-confirmed infection (asymptomatic and symptomatic) was estimated in SIREN participants by comparing time to infection in vaccinated and unvaccinated participants | To describe the dynamics of T cell and Ab responses after the first dose of BNT162b2 mRNA vaccine over an extended dosing interval, and to compare the magnitude of Ab and T cell responses 4 weeks after dose 2 between short and long vaccination regimens | Alpha | Extension of the dosing interval is an effective, immunogenic protocol (even against Alpha) and antiviral T cell responses are a potential mechanism of protection |
| Plan 2021 ⁶⁸ | 5-Aug-21 | From beginning of pandemic until June 27, 2021 | medRxiv [preprint] | Modelling | VN M | Community | N/A | Total number of confirmed cases; rate of transmission | To examine the temporal aspects of the lockdown in Ho Chi Minh City and predict the progress of the outbreak in | Delta | An earlier lockdown is always advised as this avoids the exponential increase in the number of cases. Moreover, a lockdown duration of at least 3 weeks is ideal as there are noticeable improvements compared to a 15-day |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | n (as a function of the mobility of people) and infection; effects of containment measures such as lockdown severity and temporal aspects of lockdown and isolation and testing strategies | terms of the total number of confirmed cases | | lockdown - there could be half as many cases had the inevitable lockdown started a week earlier. |
| Si 2021 ⁶⁹ | 21-Jul-21 | Mar 1 - 21, 2021 | Frontiers in Public Health - Health Economics | Observational | CHN | Community | 4,540 participants | Participants' health-protective measures, that is, wearing masks, handwashing, and keeping physical distance | To analyze the impact of vaccination against COVID-19 on participants' attitudes toward protective countermeasures | Alpha, Beta, Gamma, Delta | Vaccination lessened participants' frequency of hand washing by 1.75 times and their compliance frequency intensity of observing physical distancing by 1.24 times. However, the rate of mask-wearing did not reduce significantly. A reduction in the frequency of hand washing and observing physical distance could cause a resurgence of COVID-19. Participants' gender, age, education level, individual health risk perception, public health risk perception, social responsibility, peer effect, and government supervision are the main factors affecting their vaccination choice. However, cultural roots and accessibility to health-protection products do not significantly influence participants' vaccination intention. |
| Sonabend 2021 ⁷⁰ | 18-Aug-21 | Datasets used were "up to 8 March 2021" | medRxiv [preprint] | Modelling | UK | Community | N/A | Lifting of NPIs on deaths, | To assess each step of UK's roadmap out of lockdown in relation | Alpha, Delta | The phased lifting of NPIs in England, coordinated with vaccine roll-out, has been largely successful at keeping |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | and "8 March to 31 July" 2021. Projections made for June 2021 - June 2022. | | | | | | hospital admissions and bed occupancy, serological data and PCR testing data | to Delta, and potential epidemic magnitude | | hospitalisation and deaths at low levels since March 2021. However, the high transmissibility of Delta, imperfect VE, and future increases in contact rates are likely to lead to a substantial wave of transmission in the autumn, albeit of highly uncertain magnitude. Finally, vaccination alone in the absence of NPIs may not be sufficient to control Delta even with high vaccination coverage. |
| Susswein 2021 ⁷¹ | 10-Aug-21 | Not reported | medRxiv [preprint] | Modelling | USA | Community | N/A | Transmission dynamics and spatial mobility data | To demonstrate the roles of within-community contact versus between-community mobility in transmission risk, the role of natural versus vaccine-induced immunity in structuring the susceptibility landscape, the variable impact of potential variant mutations on disease dynamics, and the influence of altering each of these mechanisms in the effectiveness of public health intervention | Alpha, Delta | Regional mobility networks drive patterns of COVID-19 transmission throughout the United States. The COVID-19 pandemic in the US is characterized by a geographically localized mosaic of transmission along an urban-rural gradient, with many outbreaks sustained by between-county transmission. There is a dynamic tension between the spatial scale of public health interventions and population susceptibility as pre-pandemic contact is resumed. Due to spatial connectivity, certain regions are rendered particularly at risk from invasion by variants of concern. |
| Tran Kiem 2021 ⁷² | 14-Jul-21 | September 1 st , 2021, to April 1 st , 2022 | EclinicalMedicine | Modelling | FRA | Community | N/A | Risk of severe disease by age and comorbidity and transmission dynamics | To understand how vaccine characteristics, levels of vaccine coverage and heterogeneities in individual risks may affect the impact of vaccination in the short and medium | Alpha | Prioritizing at-risk individuals reduces morbi-mortality the most if vaccines only reduce severity, but is of less importance if vaccines also substantially reduce infectivity or susceptibility. Age is the most important factor to consider for prioritization; additionally accounting for comorbidities increases the |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | term, using France as a case study | | performance of the campaign in a context of scarce resources. |
| Vie 2021 ⁷³ | 26-Mar-21 | Not reported | arXiv [preprint] | Modelling | Globally | Community | N/A | Emergence of more contagious variants using genetic algorithms (GAs); policy measures aiming at minimizing infection rates in the population; how they competitively evolve | To examine the phenomenon of coevolution with COVID-19 variants and evaluate the impact of policy interventions over the evolution of the viruses | Alpha | Under coevolution, virus adaptation towards more infectious variants is considerably faster than when the virus evolves against a static policy. More contagious strains become dominant much faster in the virus population under coevolution. Seeing more infectious virus variants becoming dominant may signify that the policy measures are effective. Seeing more infectious virus variants becoming dominant may signify that the policy measures are effective. |
| Zhang 2021 ⁷⁴ | 3-Sep-21 | Not reported | medRxiv [preprint] | Modelling | USA | Schools (K - 12) | N/A | Number of infections | To estimate the number of new infections during one semester among a student population under different assumptions about mask usage, routine testing, and levels of incoming protection. | Delta | Without interventions in place (testing & masking), the vast majority of susceptible students ($\geq 75\%$) will become infected through the semester. Universal masking can reduce student infections by 26-78% (dependent upon incoming protection), and biweekly testing along with masking reduces infections by another 50%. |
| INCLUDED STUDIES FROM MAY 11 TO JULY 14, 2021 (N=31) | | | | | | | | | | | |
| Adeyinka 2021 ⁷⁵ | 05-Jul-21 | Jan 3 rd to Feb 6 th 2020 & Jan 1 st to Jun 15 th 2021 | medRxiv [preprint] | Modelling | CAD | Community | NR | Prevalence of VOC, vaccination data & public health measures | Examine clustering patterns of COVID-19 public health efforts & cluster differences in prevalence of VOC in Canada | Alpha, Beta, Gamma & Delta | Public health measures varied greatly across provinces, indicating the importance for increasing the number of fully vaccinated individuals |
| Aubrey 2021 ⁷⁶ | 21-Jun-21 | July 15 th 2020 to Feb 15 th 2021 | medRxiv [preprint] | Surveillance | PYF | Community | 59,490 individual | Number of positive SARS-CoV-2 cases | Reduce the importation of SARS COV-2 into French | Alpha | Self-collection & pooling proved to be a low resource-intensive approach to testing, while still effectively detecting VOC |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | self-collected samples | | Polynesia through travel | | |
| Berec 2021 ⁷⁷ | 05-Jul-21 | Aug 31 st 2020 to Jun 30 th 2021 | medRxiv [preprint] | Modelling | CZE | Community | N/A | COVID-19 related deaths | Determine whether delaying the 2 nd vaccine dose from 21 to 42 days is advantageous | Alpha | A 2 nd dose at 21 days is advantageous when vaccine supply is sufficient & epidemic is mild, while a 2 nd dose at 42 days is advantageous when vaccine supply is insufficient & epidemic is severe |
| Betti 2021 ⁷⁸ | 03-Jun-21 | Dec 12 th 2020 to May 7 th 2021 | Vaccines | Modelling | CAD | Community | N/A | Number of positive SARS-CoV-2 cases | Predict when new variants overtake the wildtype during an outbreak | Alpha | Due to current underreporting of COVID-19 cases, it is estimated that a VOC wouldn't become dominant until March/April 2021. Therefore, NPIs should be maintained in ON along with vaccination to prevent further outbreaks. |
| Bilinski 2021 ⁷⁹ | 10-Aug-21 | N/A | medRxiv [preprint] | Modelling | USA | Schools | N/A | 30-day cumulative incidence of SARS-CoV-2 infection; proportion of cases detected; proportion of planned and unplanned days out of school; cost of testing programs and childcare costs | Identify the costs and benefits of testing strategies to reduce the infection risks of full-time in-person K-8 education at different levels of community incidence | Delta | "Test to stay" policies and/or screening tests can facilitate consistent in-person school attendance with low transmission risk across a range of community incidence. Surveillance may be a useful reduced-cost option for detecting outbreaks and identifying school environments that may benefit from increased mitigation. |
| Borchering 2021 ⁸⁰ | 14-May-21 | Mar 27 th 2021 | CDC MMWR | Modelling | USA | Community | n/a | Weekly reported cases, hospitalizations | Provide COVID-19 projections in the US over 6 months | Alpha | High vaccination coverage & moderate NPI adherence would allow hospitalizations & deaths to remain low, with a projected decline in cases by July 2021. Lower NPI adherence |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | ons & deaths | | | would lead to increases in severe COVID-19 outcomes, even with enhanced vaccination coverage. |
| Bowie 2021 ⁸¹ | 10-Jun-21 | Jun 1 st 2021 | medRxiv [preprint] | Modelling | UK | Community | n/a | Incidence, death rate & reproductive ratio | Determine whether an effective find, test, trace, isolate & support (FTTIS) system would be helpful in the UK with low case numbers, moderate immunization levels & a circulating VOC | Delta | An improved FTTIS system could help prevent a 3 rd wave caused by VOC |
| Braun 2021 ⁸² | 15-Jun-21 | Jan to Mar 2021 | International Journal of Clinical Pharmacology & Therapeutics | Modelling | DEU | Community | N/A | Daily number of newly infectious persons, total number of infected persons & occupancy of ICU | Model the epidemiological effect of vaccination in relation to the presence of Alpha in Germany | Alpha | Daily number of new infections, total number of infections & ICU occupancy is directly related to the speed of vaccine rollout amongst the population |
| Chen 2021 ⁸³ | 15-Jun-21 | Nov 1 st 2020 to Jan 20 th 2021 | SSRN The Lancet [preprint] | Observational | UK | Community | 41,341 type 1 groups comprising 160,600 backward events available for analysis | SGTF prevalence (proxy for Alpha) | Estimate COVID-19 transmission risk, including Alpha, across community settings in Engl& | Alpha | Highest risk of transmission associated with personal services (e.g. hairdressers), visiting friends/relatives & daycare/educational settings. Transmission risk depends on environmental factors with higher risk in certain settings likely associated with single source transmission or indoor environments. |
| Conn 2021 ⁸⁴ | 22-May-21 | 3 data-sets: Jun 12 th to | medRxiv [preprint] | Modelling | UK | Community | N/A | Reproduction number, | Estimate reproduction | Alpha | Number of daily cases are predicted to increase as NPIs are lifted in May & |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | Nov 13 th 2020; Nov 14 th 2020 to Mar 24 th 2021; & Mar 2020 to May 12 th 2021 | | | | | | daily infections & daily deaths | numbers & transmission rate of Alpha to assess the UK's re-opening plan in relation to vaccine rollout | | Jun 2021. A further significant increase in cases is predicted with a reduced uptake of vaccination by eligible individuals. |
| Domenico 2021 ⁸⁵ | 16-May-21 | Mar 2020 to Apr 2021 | medRxiv [preprint] | Modelling | FRA | Community | N/A | Number of cases of SARS-CoV-2 | Compare various intervention scenarios to examine adherence to & sustainability of epidemic control | Alpha | An estimated increase in cases predicted for May & Jun 2021 as NPIs are lifted. Moderate NPIs should be in place for extended time to achieve similar results as high intensity lockdowns. Short & strict lockdowns perform better than longer moderate lockdowns due to waning adherence of lockdown measures. |
| Dimeglio 2021 ⁴⁸ | 12-May-21 | Feb 5 th to 12 th 2021 & Mar 5 th to 12 th 2021 | Viruses | Modelling | FRA | Community | N/A | Number of new daily SARS-CoV-2 cases | Estimate transmission dynamics of SARS-CoV-2 in Toulouse, France in the presence of VOC & in relation to public health measures, including vaccination rollout . | Alpha | Alpha became dominant in Feb 2021, which indicates its capacity to adapt to new hosts. Its transmission dynamics suggest that the public health measures are effective against Alpha in contrast to some reports |
| Du 2021 ⁸⁷ | 01-Jul-21 | NA | SSRN The Lancet [preprint] | Modelling | USA | Community | N/A | Testing strategies & number of positive SARS-CoV-2 cases | Assess the economic impact of proactive testing strategies versus different transmission scenarios of SARS-CoV-2 | Alpha, Beta, Gamma & Delta | Modelling suggests daily testing is needed for confirmed cases when population immunity is low & weekly testing when immunity is high. As transmission rate increases in the population, testing becomes more economical. |
| Jaya-sundara 2021 ⁸⁸ | 07-Jul-21 | N/A | medRxiv [preprint] | Modelling | MYS | Community | N/A | Number of SARS-CoV-2 cases | Predict the impact of vaccine rollout on controlling the spread of SARS-CoV-2 in relation to various public health response scenarios in Malaysia | Alpha, Beta & Delta | Under current vaccination rollout, lifting all NPIs would lead to a surge in cases. VOC are estimated to be responsible for the current resurgence in case numbers & therefore, rapid vaccine rollout is necessary to mitigate the spread of SARS-CoV-2, along with continuation of NPIs |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Lane 2021 ⁸⁹ | 09-Jul-21 | Jan 25 th 2020 to Jan 31 st 2021 | Lancet Public Health | Observational | AUS | Community | 20 451 cases of COVID-19 | Genomic analyses & associated case clusters | Explore the role of genomic epidemiology in mitigating COVID-19 outbreaks in Australia | Alpha | Swift & comprehensive quarantine & public health measures are effective at mitigating COVID-19 outbreaks, even with high viral growth rates. Real-time genomic analysis surveillance is a useful public health tool |
| Li 2021 ⁹⁰ | 27-Jun-21 | Mar 1 st 2020 to May 31 st 2021 & Dec 13 th 2020 to May 31 st 2021 | medRxiv [preprint] | Modelling | USA | Community | N/A | Number of wildtype & Alpha cases | Estimate the transmission dynamics of wildtype & VOC SARS-CoV-2 in relation to vaccine coverage in the US | Alpha | Current vaccines are effective against the alpha variant, & 70% coverage would be sufficient protection, to allow for social activities to resume |
| Loenenbach 2021 ⁹¹ | 2027-05-21 | Jan to Feb 2021 | Euro-surveillance | Observational | DEU | Childcare centres | 3 outbreaks | Secondary attack rate | Investigate childcare center outbreaks & assess secondary attack rate within centers & associated households | Alpha | Evidence supports a higher transmissibility rate of alpha variant, & there are indications that it affects children at a higher rate. This highlights the need for NPIs |
| Maison 2021 ⁹² | 09-Jun-21 | Apr 2 nd 2021 | Research Square [preprint] | Observational | USA | Community | Alpha & Beta | Prevalence & origin of VOC in Hawai'i | Demonstrate a method to defining COVID-19 variants' lineages | Alpha, Beta, Gamma | Quarantine prevented VOC from entering Hawai'i. There would be benefit from a collective quarantine across various states rather than individual state quarantines |
| Mancuso 2021 ⁹³ | 13-Jul-21 | Jan 22 nd , 2020 to Mar 6 th , 2021 | medRxiv [preprint] | Modelling | USA | Community | N/A | Vaccine effectiveness | Assess the impact of vaccination & vaccine-induced cross-protection against COVID-19 & the alpha variant | Alpha | Wide-scale vaccination & vaccine-induced cross protection is imperative to slowing the spread of COVID-19 |
| Moghadas 2021 ⁹⁴ | 08-Jul-21 | Dec 12 th 2020 to Jun 28 th 2021 | medRxiv [preprint] | Modelling | USA | Community | N/A | Case data in areas with different vaccination progress | Quantify impact of vaccination on cases | Alpha, Gamma & Delta | Vaccination program is highly effective in preventing COVID-19 cases. The speed of vaccination can have a very large impact on outbreak prevention, & increasing vaccination rates in areas which are underserved should be a priority |
| Neuberger 2021 ⁹⁵ | 03-Jul-21 | Aug 31 st 2020 to May 31 st 2021 & Ongoing | medRxiv [preprint] | Observational | DEU | Childcare centres | 8,500 ECEC managers | Reported infections | Define risk determinants & understand difference | Alpha | Centers with children with lower socioeconomic status have a higher risk of infection, strict contact |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | in risk between children & adults | | restrictions have shown to prevent infection |
| Nielson 2021 ⁹⁶ | 06-Jul-21 | NR | medRxiv [preprint] | Modelling | N/A | Community | N/A | Overdispersion & mean infectiousness of variants | Determine how overdispersion will affect the variant | Alpha | Overdispersion is evolutionarily unstable, & variants could become dominant |
| Quilty 2021 ⁹⁷ | 14-Jun-21 | NR | medRxiv [preprint] | Modelling | Global | Community | N/A | Proportion of infected travelers | Assess the effectiveness of quarantine & testing strategies for travelers | Alpha | Quarantine & strategic testing are effective methods in preventing transmission due to traveling |
| Quinonez 2021 ⁹⁸ | 17-May-21 | Dec 2019 to Apr 2021 | Viruses | Modelling | NA | Community | N/A | Estimates of VOC infection | Forecast the variant behaviour due to selective pressure | Alpha, Beta, Gamma & Delta | B.1.351, B.1.617, & P.1 variants have shown to escape vaccine induced immunity, indicating the potential need for a third dose of vaccination |
| Sachak-Patwa 2021 ⁹⁹ | 02-Jun-21 | Mar 12 th to Apr 11 th 2021 & Mar 22 nd to April 21 st 2021 | Research Square [preprint] | Modelling | IMN & ISR | Community | N/A | Viral transmission | Assess the risk of virus outbreak upon the removal of NPIs & travel restrictions | Alpha | Upon lifting travel restrictions, surveillance of incoming passengers will be crucial to preventing outbreaks |
| Salvatore 2021 ¹⁰⁰ | 30-June-21 | March & April 2021 | medRxiv [preprint] | Modelling | IND | Community | N/A | Number of deaths and case counts | To compare the second and first waves, nationally and across states and union territories, in terms of public health metric. Then, to investigate the extent to which the emergence and altered epidemiological properties of the SARS-CoV-2 Delta variant might have driven the surge in the observed case and death counts in the 2nd wave in India. Finally, to estimate the number of deaths | Delta | Using an extended SIR model accounting for reinfections and waning immunity, we produce evidence in support of how early public interventions in March 2021 would have helped to control transmission in the country. We argue that enhanced genomic surveillance along with constant assessment of risk associated with increased transmission is critical for pandemic responsiveness. [...] To summarize, had action taken place at any time in March, it is plausible that more than 90% of observed cases and deaths between March 1-May 15 could potentially be avoided under both strong and moderate intervention scenarios. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | that could have been averted through an early nationwide intervention (like a lockdown) at various time points in March and April 2021 during the onset of the second wave. | | |
| Sanz-Leon 2021 ¹⁰¹ | 08-Jul-21 | Mar to May 2020 & Feb to Mar 2021 | medRxiv [preprint] | Modelling | AUS | Community | N/A | Estimated transmission of COVID-19 | Assess the risk of continued transmission with the presence more transmissible variants | Alpha | A small group of people infected with variants with increased transmissibility could result in larger & longer community transmission outbreaks |
| Turner 2021 ¹⁰² | Jun-2021 | Jan 2020 to May 2021 | CESifo Working Papers | Modelling | OEC D countries | Community | N/A | Reproduction number | Analyze the impact of a set of policies, & the importance of vaccination in relation to variants | Alpha, Beta, Gamma, Delta | Increased vaccination rates would provide economic relief due to fewer containment policies & lower infection rates |
| Van Egeren 2021 ¹⁰³ | 18-May-21 | N/A | medRxiv [preprint] | Modelling | USA | Community | N/A | Estimated transmission rates of VOC in presence of vaccines | To model the impact of vaccine-evading variants on the course of the COVID-19 pandemic in the presence of vaccines | Alpha, Beta, Gamma | Variants that are already present within the population may be capable of quickly defeating the vaccines as a public health intervention, a fatal flaw in strategies that emphasize rapid reopening before achieving control of SARS-CoV-2 |
| Yang 2021 ¹⁰⁴ | 25-Jun-21 | Mar 2020 to May 2021 | medRxiv [preprint] | Modelling | IND | Community | N/A | Number of infections, reported cases, & reported deaths | Understand the epidemiological characteristics & impact of the Delta variant | Delta | Case decline was most likely due to NPIs & weather conditions which negatively impacted SARS-CoV-2 transmission, rather than high population immunity |
| Zou 2021 ¹⁰⁵ | 07-Jul-21 | Jan 25 th 2020 to Mar 12 th 2021 | medRxiv [preprint] | Modelling | AUS | Community | N/A | Effective reproduction number | Create a model to inform decision makers on suitable timing for public health measure implementation | Alpha, Delta | The number of cases which were reported on the day of public health measure implementation predicted the size of case outbreaks |
| INCLUDED STUDIES FROM EARLIER RAPID REVIEW¹⁰⁶ (N=21) | | | | | | | | | | | |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Ahn 2021 ¹⁰⁷ | 05-May-21 | N/A | SSRN The Lancet [preprint] | Modelling | USA | Community | Not reported | Policies | To propose a multi-model optimization (MMO) framework that identifies policies that perform well across structurally distinct models, and we apply this to design 12-month COVID-19 containment strategies | Alpha | Considering the heterogeneity across states, we have determined the MMO policies for all 50 US states over a one-year period and estimated the associated outcomes. Under our optimal policy, we show that some states can be on the trajectory to the halfway normal or minimal response policies for most 2021, while we recommend a few states to spend a significant portion of the year in more restrictive interventions. We also find that the prevalence of highly infectious variants (e.g., Alpha) can significantly increase the 12-month cost, which strongly supports the case for aggressive work to contain variants. |
| Borges 2021 ¹⁰⁸ | 11-Mar-21 | Dec 2020 to Feb 5, 2021 | Eurosurveillance | Modelling | PRT | Community | 3367 positive SGTF tests (proxy for Alpha) from Portuguese National Institute of Health | SGTF & SGTL test | To investigate the proportion of SGTF cases to gain insight on Alpha frequency and spread in Portugal | Alpha | After implementing public health measures, a decelerating trend was observed in proportion of SGTF/SGTL remaining below 50% in week 7 of 2021 |
| Bosetti 2021 ¹⁰⁹ | 23-Feb-21 | N/A | HAL Archives | Modelling | FRA | Community | N/A | Hospitalization | To develop mathematical models and explore scenarios that help understand how the interplay of the key drivers of the pandemic (the variants, the vaccines | Alpha | The current curfew and conditions appear sufficient to control the spread of the historical virus but not that of Alpha. With vaccination targeting those at higher risk of hospitalization, the burden on hospitals could quickly be alleviated. However, our assessment suggests that this effect |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | and the control measures) will shape its dynamics for the coming months | | may not be sufficient to compensate for the increased transmissibility of Alpha. |
| Buchan 2021 ¹¹⁰ | 05-Apr-21 | Feb 7-27, 2021 | medRxiv [preprint] | Observational | CAD | Community | 5617 index cases and 3397 secondary cases | Household secondary attack rate 1-14 days after index case | To compare household secondary attack rates in those with VOC versus non-VOC index cases in Ontario | Alpha | Secondary attack rate 1.31 higher in VOC vs non-VOC in same household, further accentuated in asymptomatic (RR=1.91) and pre-symptomatic (RR=3.41) cases. Findings suggest need for aggressive public health measures physical distancing, masking, testing and contact tracing |
| Chudasma 2021 ¹¹¹ | 10-May-21 | Oct 1 to Dec 15, 2020 | Journal of Infection | Observational | UK | Community | 57,382 | Household outbreak | A comparative analysis of household clustering to provide a rapid assessment of transmissibility of this variant against other sequenced cases | Alpha | Analysis of national data has shown that Alpha cases were almost twice as likely to give rise to household clusters compared with wild type cases. Household exposures are high risk with passive surveillance demonstrating high attack rates, providing an important indicator of transmissibility as household exposures are unlikely to differ between cases infected with different variants and their contacts. |
| Domenico 2021 ¹¹² | 14-Apr-21 | Jan 7-8, 2021 | medRxiv [preprint] | Modelling | FRA | Community | N/A | Estimated # cases of historical strain and VOC based on various social distancing measures using data from a large-scale genome sequencing initiative conducted in France | To assess the impact of implemented measures on two COVID strains (i.e., Alpha and wild type) through modeling | Alpha | Social distancing implemented in Jan 2021 would bring down the R of historical strain, however VOC would continue to increase. School holidays also slowed down dynamics. Accelerating vaccinations will help but won't be sufficient to stop the spread of the VOC, even with optimistic vaccination rates |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Giordano 2021 ¹¹³ | 16-Apr-21 | February 24, 2020, through March 26, 2021 | Nature Medicine | Modelling | ITA | Community | N/A | Health care costs, death | To compare different vaccines campaign scenarios, varying SARS-CoV-2 profiles and NPI restriction | Alpha, Beta | Findings strongly advocate for NPI to remain in place during vaccine roll out until sufficient population immunity is reached. Pre-emptive NPI actions (close then open at low case #s) could drastically reduce hospitalizations and deaths |
| Gurbaxani 2021 ¹¹⁴ | 27-Apr-21 | N/A | medRxiv [preprint] | Modelling | USA | Community | N/A | Effectiveness of mask wearing | To extend the model of Worby and Chang to use age-stratified social contact patterns for the general U.S. population, and we analyzed the model both employing the measured face mask efficacy parameters for a variety of specific types of masks and for efficacy estimates that can act as benchmarks for evaluating these products | Alpha | Showed the potential for substantial reduction in SARS-CoV-2 transmission, even with moderately effective masks, when they are worn consistently correctly (over the chin and covering nose and mouth) and/or per manufacturers' specifications by a large portion of the population. |
| Kim 2021 ¹¹⁵ | 13-Apr-21 | Dec 14, 2020, to Mar 2, 2021 | medRxiv [preprint] | Modelling | USA | Community | N/A | Evaluate the impact of each vaccine type using infection attack rate (IAR) as the main health outcome | To evaluate the trade-offs between speed of distribution vs. efficacy of multiple vaccines when variants emerge | Alpha, Beta | The speed of the vaccine distribution is a key factor to achieve low IAR levels, even though the vaccine may have high efficacy both before and after the variants emerge. |
| Kühn 2021 ¹¹⁶ | 26-Apr-21 | N/A | medRxiv [preprint] | Modelling | DEU | Community | N/A | Effectiveness of lockdowns, measured by number | To provide viable strategies of careful opening of facilities in low-incidence regions without being affected by | Alpha | In order to keep the spread of the virus under control, strict regional lockdowns with minimum delay and commuter testing of at least twice a week are advisable. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | of new cases | neighboring regions of substantially higher incidence. | | |
| Linka 2021 ¹¹⁷ | 27-Apr-21 | N/A | medRxiv [preprint] | Modelling | USA | University campus | N/A | Effective reproduction number | To perform a retrospective study to evaluate the risks that would have been associated with the reopening of Stanford University in the spring, summer, and fall of 2020, and winter of 2021; and to explore the possible effect of variants on the overall disease dynamics | Alpha, Beta | With no additional countermeasures, during the most affected quarter, the fall of 2020, there would have been 203 cases under baseline reproduction, compared to 4727 and 4256 cases for the Alpha and Beta variants. The results suggest that population mixing presents an increased risk for local outbreaks, especially with new and more infectious variants emerging across the globe. Tight outbreak control through mandatory quarantine and test-trace-isolate strategies will be critical in successfully managing these local outbreak dynamics |
| Meister 2021 ¹¹⁸ | 16-May-21 | N/A | Journal of Infectious Diseases | Laboratory | DEU | Community | N/A | Viral stability over 48hr (for testing different surfaces); viral infectivity (for testing effect of soap/ethanol); reduction of viral titers by end point dilution to calculate TCID50 values (to test susceptibility to heat) | To compare the surface stability of 3 SARS-CoV-2 strains, the preexisting variant (wild type) and the currently emerging Alpha and Beta variants on different surfaces and their sensitivity to heat, soap and ethanol | Alpha, Beta | The currently circulating VOC did not exhibit enhanced surface stability or differences in disinfection profiles indicating that current hygiene measures are sufficient and appropriate...Overall, our data support the application of currently recommended hygiene concepts to minimize the risk of Alpha and Beta transmission |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Munitz 2021 ¹¹⁹ | 18-May-21 | Dec 6, 2020, to Feb 10, 2021 | Cell Reports Medicine | Modelling | ISR | Community; Nursing homes | N/A | SGTF data, reproduction number (Rt) & cycle threshold | To explore the transmission dynamics of the variant B.1.1.7 and to estimate the success of the above operations to mitigate the risk in the general population and in the elderly | Alpha | Israel's national vaccine program which initially targeted the elderly (60+ years) resulted in containment of Alpha in that population. By Jan 14th, 2021 when 50% of the 60+ were 2 weeks beyond their first dose of Pfizer vaccine, a striking decline was observed in the incidence of Alpha in the 60+ age group compared with 0-19 or 20-59 years of age ($r=0.075$, $p=0.74$; $r=-0.005$, $p=0.98$, respectively) |
| Pageaud 2021 ¹²⁰ | 20-Mar-21 | Santé publique France data from Jan 8 to 27, 2021, and Feb 18, 2021 | medRxiv [preprint] | Modelling | FRA | Community | N/A | # of individuals recovered, # of in hospital deaths, ICU resource use | To model the expected dynamics of COVID-19 with variant strains applying protective measures and several vaccine strategies | Alpha, Beta, Gamma | While rapid vaccination of the whole population within 6 months provides the best outcome, a one-year vaccination campaign with extended non-pharmaceutical interventions (i.e., public health measures) would limit the number of deaths and avoid ICU resource saturation |
| Piantham 2021 ¹²¹ | 30-Mar-21 | Sep 1, 2020 to Feb 19, 2021 | medRxiv [preprint] | Modelling | UK | Community | 71692 Alpha strains and 65850 non-Alpha strains | Time from illness onset in a primary case to illness onset in secondary case (using serial interval distribution) | To propose a method to estimate selective advantage of mutant strain over previous strains | Alpha | Alpha has an estimated reproduction advantage of 33.7% over non-VOC, suggesting control measures need to be strengthened by 33.7% |
| Sah 2021 ¹²² | 07-Apr-21 | N/A | Eclinical Medicine | Modelling | USA | Community | N/A | Transmission probability; Hospitalization (non-ICU and ICU) | To evaluate the impact of accelerated vaccine distribution on curbing the disease burden of novel SARS-CoV-2 variants | Alpha | The current pace of vaccine rollout is insufficient to prevent the exacerbation of the pandemic that will be attributable to the novel, more contagious SARS-CoV-2 variants. Accelerating the vaccination rate should be a public health priority for averting the expected surge in COVID-19 hospitalizations and deaths that would be associated with widespread dissemination of the SGTF variants. |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| Scherbina 2021 ¹²³ | 20-Feb-21 | N/A | SSRN The Lancet [preprint] | Modelling | USA | Community | N/A | Estimated future monetary cost of the pandemic | To estimate the benefits of a lockdown in the US similar to those imposed in Europe | Alpha | Modeling suggests strict lockdown could reduce R by 76%, or R0: 0.933. A less restrictive lockdown would lead to R0:1.66. Optimal lockdown time of 6-7 weeks is needed to achieve high-dQALY outcomes, or 4-5 weeks to meet low-dQALY outcomes |
| Tokuda 2021 ¹²⁴ | 07-May-21 | Jan 14 to Apr 20, 2021 | medRxiv [preprint] | Modelling | JPN | Community | N/A | Number of new infections per day | To construct the COVID-19 epidemic curve to examine effect of vaccination schedules and need for restrictions (lockdown) | Alpha | If the vaccination pace could not be quadrupled from the current pace, Japan could not achieve Zero Covid status, which is reflected by a low COVID-19 death rate and less economic damage. |
| Victoria 2021 ¹²⁵ | 30-Apr-21 | Weeks 1-14, 2021 | medRxiv [preprint] | Observational | BRA | Community | 370,000 registered deaths in Brazil | Mortality rate ratios over two-weekly periods in between Jan 3rd, 2021 and Apr 22nd, 2021 for individuals aged 80+ and 90+ years | To evaluate the real-life effectiveness of the vaccination campaign among the elderly in Brazil | Gamma | Rapid scale up of vaccination among elderly Brazilians in early 2021 was associated with a decline in relative mortality compared to younger individuals |
| Wells 2021 ¹²⁶ | 07-May-21 | N/A | medRxiv [preprint] | Modelling | USA | Community | N/A | Length of quarantine for origin-destination pairs of European countries | Use modeling travel between pairs of European countries to identify travel quarantine and testing strategies that will not increase infections in the destination country compared to a strategy of complete border closure | Alpha, Beta | Quarantines for European destinations that are specific to travel origin can be informed by country-specific prevalence, daily incidence, vaccine coverage, age-demographics, and travel flow. For Alpha, in countries with similar prevalence, quarantine and testing strategies are similar for wild-type transmission. In contrast there is much greater variance between countries in prevalence of Beta VOC. Consequently, more extreme quarantine and testing |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| | | | | | | | | | | | measures would be needed to mitigate its impact. |
| Zimmerman 2021 ¹²⁷ | 11-Mar-21 | Jun 1, 2020 to Jan 10, 2021 | Cureus | Modelling | BRA | Community | 773 genomic sequence samples | Social isolation index (SII), which is based on percentage of individuals who stayed within 450m of their home | To assess whether social isolation into small families or groups is associated with the emergence of new variants | Gamma | In the state of Amazonas, where household sizes are large, there was a positive correlation between SII and the prevalence of Gamma when SII was above 40%. Authors hypothesize that forced prolonged cohabitation may boost viral mutation and increased infectivity. |

ARG: Argentina; AUS: Australia; AUT: Austria; Brazil: BRA; CAD: Canada; CDC: centres for disease control & prevention; CHL: Chile; CHN: China; CZE: Czech Republic; DEU: Germany; FRA: France; IND: India; ISR: Israel; IMN: Isle of Man; ITA: Italy; JPN: Japan; MMWR: morbidity & mortality weekly report; MYS: Malaysia; NA: North America; N/A: Not available; NPI: non-pharmaceutical intervention; PRT: Portugal; PRY: Paraguay; PYF: French Polynesia; THA: Thailand; URY: Uruguay; USA: United States of America; UK: United Kingdom; VNM: Vietnam; VOC: variant/s of concern

Supplementary Table 2. Critical appraisal results of included studies

| Author, Year | Source | Preprint or Peer Review | Adjusted score for PP | Total Score (%) | Overall Quality |
|--|----------------------|-------------------------|-----------------------|-----------------|-----------------|
| Cohort Studies Appraised with NOS Tool ^a | | | | | |
| Buchan, 2021 ¹¹⁰ | MedRxiv | PP | -2 | 6 (67) | Medium |
| Chudasama, 2021 ¹¹¹ | Journal of Infection | PR | N/A | 8 (89) | High |
| Cross-sectional Studies Appraised with NOS Tool ^b | | | | | |
| Victoria, 2021 ¹²⁵ | MedRxiv | PP | -2 | 6 (60) | Medium |
| Cohort Studies Appraised with JBI Tool ^d | | | | | |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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|--|----------------------------------|-----|-----|----------|--------|
| Amirthalingam, 2021 ^{44 f} | MedRxiv | PP | -2 | 9 (81.8) | High |
| Eyre, 2021 ¹² | MedRxiv | PP | -2 | 7 (63.6) | Medium |
| Hillus, 2021 ⁵⁸ | The Lancet: Respiratory Medicine | PR | N/A | 11 (100) | High |
| Karaba, 2021 ⁵⁹ | MedRxiv | PP | -2 | 7 (63.6) | Medium |
| Levine-Tiefenbrun, 2021 ¹⁹ | MedRxiv | PP | -2 | 6 (54.5) | Medium |
| Payne, 2021 ⁶⁷ | SSRN | PP | -2 | 9 (81.2) | High |
| Urbanowicz, 2021 ³⁶ | Science Translational Medicine | PR | N/A | 8 (72.7) | High |
| Yinon, 2021 ⁴¹ | MedRxiv | PP | -2 | 8 (72.7) | High |
| Yorsaeng 2021 ⁴² | MedRxiv | PP | -2 | 4 (36.4) | Medium |
| Cross-sectional Studies Appraised with JBI Tool ^c | | | | | |
| Adenaiye, 2021 ⁴³ | MedRxiv | PP | -2 | 3 (37.5) | Medium |
| Neuberger, 2021 ⁹⁵ | MedRxiv | PP | -2 | 3 (37.5) | Medium |
| Si, 2021 ⁶⁹ | Frontiers in Public Health | PR | N/A | 5 (62.5) | Medium |
| Prevalence Studies Appraised with JBI Tool ^a | | | | | |
| Gorji, 2021 ⁵⁶ | MedRxiv | PP | -2 | 6 (66.6) | High |
| Lane, 2021 ⁸⁹ | Lancet Public Health | PR | N/A | 9 (100) | High |
| Loenenbach, 2021 ⁹¹ | Eurosurveillance | PR | N/A | 9 (100) | High |
| Case Series Studies Appraised with JBI Tool ^c | | | | | |
| Ademoski, 2021 ¹²⁸ | MedRxiv | PP | -2 | 2 (25) | Low |
| Doyle 2021 ¹¹ | MMWR | PR* | -1 | 4 (44.4) | Medium |
| Hagan 2021 ¹⁵ | MMWR | PR* | -1 | 6 (66.6) | High |
| Lam-Hine 2021 ¹⁷ | MMWR | PR* | -1 | 4 (44.4) | Medium |
| Maison, 2021 ⁹² | Research Square | PP | -2 | 2 (25) | Low |
| Case Control Studies Appraised with JBI Tool ^b | | | | | |
| Abu-Raddad, 2021 ¹ | Journal of Travel Medicine | PR | N/A | 8 (80) | High |
| Patalon, 2021 ²⁸ | MedRxiv | PP | -2 | 6 (60) | Medium |

^aTotal scores calculated out of 9; ^bTotal score calculated out of 10; ^cTotal score calculated out of 8; ^dTotal score calculated out of 11; *sources are not peer reviewed journal articles but have undergone some level of peer review

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

Search Strategies

All searches last executed on August 25, 2021.

MEDLINE (Ovid MEDLINE All)

COVID-19 search filter: CADTH <https://covid.cadth.ca/literature-searching-tools/cadth-covid-19-search-strings/>

| | |
|----|---|
| 1 | (coronavirus/ or betacoronavirus/ or coronavirus infections/) & (disease outbreaks/ or epidemics/ or p&emics/) |
| 2 | (ncov* or 2019ncov or 19ncov or covid19* or covid or sars-cov-2 or sarscov-2 or sarscov2 or severe acute respiratory syndrome coronavirus 2 or severe acute respiratory syndrome corona virus 2).ti,ab,kf,nm,ot,ox,rx,px. |
| 3 | ((new or novel or "19" or "2019" or wuhan or hubei or china or chinese) adj3 (coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV)).ti,ab,kf,ot. |
| 4 | ((coronavirus* or corona virus* or betacoronavirus*) adj3 (p&emic* or epidemic* or outbreak* or crisis)).ti,ab,kf,ot. |
| 5 | ((wuhan or hubei) adj5 pneumonia).ti,ab,kf,ot. |
| 6 | or/1-5 [CADTH COVID-19 filter, no date limit] |
| 7 | ((uk or united kingdom or engl& or english or britain or british or kent) adj3 (variant* or voc or vui)) or "b117" or "20i 501yv1" or "variant of concern 202012 01" or "voc 202012 01" or "variant under investigation in december 2020" or "variant under investigation 202012 01" or "vui 202012 01").ti,ab,kw,kf. |
| 8 | ((south africa* or sa) adj3 (variant* or voc or vui)) or "b1351" or "501v2" or "501yv2" or "20h 501yv2" or "20c 501yv2").ti,ab,kw,kf. |
| 9 | ((brazil* adj3 (variant* or voc or vui)) or "p1" or "b11281" or ((mutation* or spike*) adj3 (k417t or e484k or n501y))).ti,ab,kw,kf. |
| 10 | ((mutation* or spike*) adj3 d614g).ti,ab,kw,kf. |
| 11 | ((india* adj3 (variant* or voc or vui)) or "b1617*" or "g 452v3" or "voc 21apr" or "vui 21apr" or double mutation or double mutant or double variant or triple mutation or triple mutant or triple variant or ((mutation* or spike*) adj3 (e484q or l452r or p681r))).ti,ab,kw,kf. |
| 12 | ((alpha or beta or Gam-ma or delta) adj3 variant*).ti,ab,kw,kf. |
| 13 | or/7-12 |
| 14 | 6 & 13 |

Embase (Elsevier Embase.com)

COVID-19 search filter: CADTH adapted to Embase.com format; line 1 exploded

| | |
|---|--|
| 1 | 'SARS-related coronavirus'/exp |
| 2 | ('coronavirinae'/de OR 'betacoronavirus'/de OR 'coronavirus infection'/de) & ('epidemic'/de OR 'p&emic'/de) |
| 3 | (ncov* OR 2019ncov OR 19ncov OR covid19* OR covid OR 'sars-cov-2' OR 'sarscov-2' OR 'sars-cov2' OR sarscov2 OR 'severe acute respiratory syndrome coronavirus 2' OR 'severe acute respiratory syndrome corona virus 2'):ti,ab,kw,de,tt,oa,ok |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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| 4 | ((new OR novel OR '19' OR '2019' OR wuhan OR hubei OR china OR chinese) NEAR/3 (coronavirus* OR 'corona virus*' OR betacoronavirus* OR cov OR hcov)):ti,ab,kw,de,tt,oa,ok |
| 5 | ((coronavirus* OR 'corona virus*' OR betacoronavirus*) NEAR/3 (p&emic* OR epidemic* OR outbreak* OR crisis)):ti,ab,kw,tt,oa,ok |
| 6 | ((wuhan OR hubei) NEAR/5 pneumonia):ti,ab,kw,tt,oa,ok |
| 7 | #1 OR #2 OR #3 OR #4 OR #5 OR #6 |
| 8 | ((uk OR 'united kingdom' OR engl& OR english OR britain OR british OR kent) NEAR/3 (variant* OR voc OR vui)) OR 'b.1.1.7' OR b117 OR '20i 501y.v1' OR 'variant of concern 202012 01' OR 'voc 202012 01' OR 'variant under investigation in december 2020' OR 'variant under investigation 202012 01' OR 'vui 202012 01'):ti,ab,kw |
| 9 | ((('south africa*' OR sa) NEAR/3 (variant* OR voc OR vui)) OR 'b.1.351' OR b1351 OR '501.v2' OR '501y.v2' OR '20h 501y.v2' OR '20c 501y.v2'):ti,ab,kw |
| 10 | ((brazil* NEAR/3 (variant* OR voc OR vui)) OR 'p.1' OR p1 OR 'b.1.1.28.1' OR b11281 OR ((mutation* OR spike*) NEAR/3 (k417t OR e484k OR n501y))):ti,ab,kw |
| 11 | ((mutation* OR spike*) NEAR/3 d614g):ti,ab,kw |
| 12 | ((india* NEAR/3 (variant* OR voc OR vui)) OR 'b.1.617*' OR b1617* OR 'g 452.v3' OR 'voc 21apr' OR 'vui 21apr' OR 'double mutation' OR 'double mutant' OR 'double variant' OR 'triple mutation' OR 'triple mutant' OR 'triple variant' OR ((mutation* OR spike*) NEAR/3 (e484q OR l452r OR p681r))):ti,ab,kw |
| 13 | ((alpha OR beta OR Gam-ma OR delta) NEAR/3 variant*):ti,ab,kw |
| 14 | #8 OR #9 OR #10 OR #11 OR #12 OR #13 |
| 15 | #7 & #14 |

Cochrane Database of Systematic Reviews & Cochrane CENTRAL (Cochrane Library, Wiley)

| | |
|----|---|
| 1 | MeSH descriptor: [Coronavirus] this term only |
| 2 | MeSH descriptor: [Betacoronavirus] this term only |
| 3 | MeSH descriptor: [Coronavirus Infections] this term only |
| 4 | {or #1-#3} |
| 5 | MeSH descriptor: [Disease Outbreaks] this term only |
| 6 | MeSH descriptor: [Epidemics] this term only |
| 7 | MeSH descriptor: [P&emics] this term only |
| 8 | {or #5-#7} |
| 9 | #4 & #8 |
| 10 | (ncov* or 2019ncov or 19ncov or covid19* or covid or "sars-cov-2" or "sarscov-2" or sarscov2 or "severe acute respiratory syndrome coronavirus 2" or "severe acute respiratory syndrome corona virus 2"):ti,ab,kw |

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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|----|---|
| 11 | ((new or novel or "19" or "2019" or wuhan or hubei or china or chinese) near/3 (coronavirus* or "corona virus*" or betacoronavirus* or cov or hcov)):ti,ab,kw |
| 12 | ((coronavirus* or "corona virus*" or betacoronavirus*) near/3 (p&emic* or epidemic* or outbreak* or crisis)):ti,ab,kw |
| 13 | ((wuhan or hubei) near/5 pneumonia):ti,ab,kw |
| 14 | {or #9-#13} |
| 15 | (variant* or voc or vui or mutation* or spike):ti,ab |
| 16 | #14 & #15 |

Epistemonikos Living Overview of the Evidence (LOVE) for COVID-19

Basic search of the following terms within the LOVE:

variant* OR voc OR vui OR "B.1.1.7" OR "20I/501Y.V1" OR "202012/01" OR "B.1.351" OR "501.V2" OR "501Y.V2" OR "20H/501Y.V2" OR "20C/501Y.V2" OR "P.1" OR "B.1.1.28.1" OR "K417T" OR "E484K" OR "N501Y" OR "D614G" OR "B.1.617" OR "B.1.617.1" OR "B.1.617.2" OR "B.1.617.3" OR "G/452.V3" OR "VOC-21APR" OR "VUI-21APR" OR "double mutation" OR "double mutant" OR "triple mutation" OR "triple mutant" OR "E484Q" OR "L452R" OR "P681R"

medRxiv / bioRxiv

medRxiv & bioRxiv simultaneous search; Date limit changed for each search update (this update: May 11 - July 14, 2021); Title & Abstract search; All words (unless otherwise specified); 50 per page; Best Match; export first 50 results only

Searches:

| |
|---|
| alpha variant beta variant Gam-ma variant delta variant uk variant united kingdom variant engl& variant english variant britain variant british variant kent variant south africa variant brazil variant variant of concern (<i>phrase search</i>) |
|---|

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

variants of concern (*phrase search*)

B.1.1.7
20I/501Y.V1
202012/01
B.1.351
501.V2
501Y.V2
20H/501Y.V2
20C/501Y.V2
P.1
B.1.1.28.1
K417T
E484K
N501Y
D614G
india variant
B.1.617
B.1.617.1
B.1.617.2
B.1.617.3
G/452.V3
VOC-21APR
VUI-21APR
E484Q
L452R
P681R

Public Health Implications of SARS-CoV-2 VOC, updated October 22, 2021

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