# Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

**Supplementary Table 1.** Summary of studies (n=86)

| Author, date | Date of publicat-ion | Date of data collection | Source | Study design | Cou-n-try | Setting | Samp-le size | Outcome measures | Objective | VOC | Main Findings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **INCLUDED STUDIES FROM JULY 14 TO AUGUST 25, 2021 (N=32)** | | | | | | | | | | | |
| **Adenaiye 2021**[1] | 13-Aug-21 | May 2020 to Apr 2021 | medRxiv [preprint] | Observ-ational | 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. |
| **Amirth-alingam 2021**[2] | 28-Jul-21 | Jan – May 2021 | medRxiv [preprint] | Observ-ational | 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**[3] | 13-Aug-21 | Dec 28th 2020 to May 19th 2021 | medRxiv [preprint] | Modell-ing | CAD | Community | N/A | Impact of lifting NPIs on dates of cases, hospitalizati ons, 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**[4] | 21-Jul-21 | NR | Physics of Fluids | Labor-atory | IND | Community | NR | Leakage of droplets from various masks and mask combinatio ns | Determine optimal masking strategies | Alpha, Beta & Gamm a | Double masking is effective in improving mask fitment and protection. The most effective combination was cotton mask with N95 mask. |
| **Bablani 2021**[5] | 21-Aug-21 | NR | medRxiv [preprint] | Modell-ing | AUS | Community | N/A | Determine number of cases, hospitaliz-tions and deaths 100 | 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 |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | days after Aug 1 | | preventing COVID-19 hospitalizations and deaths. |
| **Cazelles 2021[6]** | 03-Aug-21 | June 2020 to March 25th 2021 | BMC Infect-ious Diseases | Modell-ing | IRL | Community | N/A | Observed daily infections, hospital and ICU admissions, daily deaths, and hospital discharges and cases | Examine the dynamics of COVID-19 in Ireland using public data | Alpha | Sharp decline of cases seems to be the result of mitigation measures, when in the presence of the Alpha variant. |
| **Chang 2021[7]** | 10-Aug-21 | June to July 2021 | Research Square [preprint] | Modell-ing | 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[8]** | 21-Aug-21 | Mar 8th – Jun 7th 2021 | medRxiv [preprint] | Modell-ing | 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[9]** | 25-Aug-21 | Feb 2021 | medRxiv [preprint] | Modell-ing | 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 | 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. |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | moderate restrictions remain |
| **Dick 2021**[10] | 24-Aug-21 | Data up to Jun 27th, 2021, projections to Mar 2022 | medRxiv [preprint] | Modell-ing | CAD | Community | N/A | Distribution of immunity in the Canadian population, by age, from infection and from vaccination. | Estimate the distribution of immunity to COVID-19 in the Canadian population, and determine the risk of resurgence in Fall 2021-Winter 2022. | 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 resurgence of virus because of the relaxation of NPIs and the reopening of schools. |
| **Enright 2021**[11] | 04-Aug-21 | Sep 2020 to Dec 2020 | Royal Society Open Science | Modell-ing | 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**[12] | 07-Sep-21 | NR | medRxiv [preprint] | Modell-ing | 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**[13] | 07-Aug-21 | N/A | medRxiv [preprint] | Modell-ing | 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**[14] | 16-Jul-21 | Feb to Mar 2021 | medRxiv [preprint] | Observ-ational | 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. |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Head 2021[15] | 23-Aug-21 | Feb to Apr 2021 | medRxiv [preprint] | Modell-ing | USA | Schools | N/A | Individual based transmission model to simulate Delta variant transmission, to examine school reopening policies | Characterize the risks to students and teachers in schools under various scenarios (varying NPIs and vaccination coverage) | 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 additional measures such as cohorts and testing, they should consider doing so. |
| Hillus 2021[16] | 13-Aug-21 | Dec 27, 2020 - June 14, 2021 | The Lancet Respiratory Medicine | Observ-ational | 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[17] | 14-Aug-21 | Blood samples submitted 0-4 weeks before | medRxiv [preprint] | Observ-ational | USA | Community (particularly solid organ | 31 SOTRs | Pre and post-third dose | Investigate the efficacy of third-dose | Delta | A third dose of the vaccine showed an increase of antibody levels as well as |

| | | third dose and 2 weeks after | | | | transplant recipients [SOTRs]) | | samples of recipients were compared for immunogenicity | vaccinations in organ transplant recipients | | neutralizing abilities against VOCs in some organ transplant recipients. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Koslow 2021**[18] | 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**[19] | 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 |
| **Layton 2021**[20] | 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**[21] | 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**[22] | 19-May-21 | Daily vaccination supply estimates cover each | medRxiv [preprint] | Modelling | ITA | Community | N/A | Fraction of individuals recovered (and immune) | To simulate the effect of a vaccine rollout assuming that governments will be capable to maintain | 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 |

| | | quarter of 2021 and first half of 2022 | | | | | | from SARS-CoV-2 infection; age-specific vaccination 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 | an approximately constant incidence by adjusting physical distancing restrictions as immunity accumulates. | | 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 number of conditions are simultaneously met. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Paassen 2021**[23] | 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. |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panovska-Griffiths 2021**[24] | 22/Jul/21 | Model was calibrated until January 25, 2021, to simulate the impact of a full national lockdown with schools closed until April 19, 2021 | medRxiv [preprint] | Modelling | UK | Community | N/A | Cumulative diagnoses, cumulative deaths and cumulative hospital admissions under various partial and full lockdown scenarios, accompanied by social distancing and ongoing Test, Trace and Isolate intervention | To use mathematical modelling to simulate the impact of a full national lockdown (FNL) in England from January 4, 2021 compared to partial national lockdowns (PNL) in which some elements of in-person schooling remained open | 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 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**[25] | 21-Jul-21 | Dec 7, 2020 - Mar 12, 2021 | Cell [preprint] | Observ-ational | UK | Community | 503 partici pants | Effectiveness of the BNT162b2 vaccine against PCR-confirmed infection (asymptoma tic and symptomati c) was estimated in SIREN participants by comparing time to infection in vaccinated and unvaccinate | 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 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | d participants | | | |
| **Plan 2021**[26] | 5-Aug-21 | From beginning of pandemic until June 27, 2021 | medRxiv [preprint] | Modelling | VNM | Community | N/A | Total number of confirmed cases; rate of transmission (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 | To examine the temporal aspects of the lockdown in Ho Chi Minh City and predict the progress of the outbreak in terms of the total number of confirmed cases | 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 lockdown - there could be half as many cases had the inevitable lockdown started a week earlier. |
| **Si 2021**[27] | 21-Jul-21 | Mar 1 - 21, 2021 | Frontiers in Public Health - Health Economics | Observ-ational | CHN | Community | 4,540 partici pants | Participants' health-protective measures, that is, wearing masks, handwashin g, and keeping physical distance | To analyze the impact of vaccination against COVID-19 on participants' attitudes toward protective countermeasures | Alpha, Beta, Gamm a, 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 |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | factors affecting their vaccination choice. However, cultural roots and accessibility to health-protection products do not significantly influence participants' vaccination intention. |
| **Sonabend 2021**[28] | 18-Aug-21 | Datasets used were "up to 8 March 2021" and "8 March to 31 July" 2021. Projections made for June 2021 - June 2022. | medRxiv [preprint] | Modelling | UK | Community | N/A | Lifting of NPIs on deaths, hospital admissions and bed occupancy, serological data and PCR testing data | To assess each step of UK's roadmap out of lockdown in relation to Delta, and potential epidemic magnitude | Alpha, Delta | The phased lifting of NPIs in England, coordinated with vaccine roll-out, has been largely successful at keeping 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**[29] | 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. |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tran Kiem 2021**[30] | 14-Jul-21 | September 1, 2021, to April 1, 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 term, using France as a case study | 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 performance of the campaign in a context of scarce resources. |
| **Vie 2021**[31] | 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**[32] | 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 (≥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=33)** | | | | | | | | | | | |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Adamoski 2021[33] | 21-Jun-21 | Oct 10th 2020 to May 24th 2021 | medRxiv [preprint] | Observational | BRA | University | 7249 people; 12558 tests | Positive sample Genotype | Provide safer work environment for employees of the Federal University of Paraná in Brazil | Gamma | Analysis of saliva presents a cheap, easy to collect, & feasible asymptomatic screening strategy. |
| Adeyinka 2021[34] | 05-Jul-21 | Jan 3rd to Feb 6th 2020 & Jan 1st to Jun 15th 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[35] | 21-Jun-21 | July 15th 2020 to Feb 15th 2021 | medRxiv [preprint] | Surveillance | PYF | Community | 59,490 individual self-collected samples | Number of positive SARS-CoV-2 cases | Reduce the importation of SARS COV-2 into French Polynesia through travel | Alpha | Self-collection & pooling proved to be a low resource-intensive approach to testing, while still effectively detecting VOC |
| Bauer 2021[36] | 25-Aug-21 | May 2021 to Fall of 2021 | ArXiv [preprint] | Modelling | Europe | Community | N/A | Rate at which NPIs can be lifted in relation to vaccine campaigns | To study how the planned vaccine rollout in the EU along with cumulative post-infection immunity allows for lifting restrictions; In particular, we study how precisely the number of contacts can be increased without rendering disease spread uncontrolled over the year 2021 | All (but the model is based on Alpha) | Recommendation is to keep case numbers as low as possible to facilitate test-traceand-isolate programs, reduce mortality and morbidity, and offer better preparedness against emerging variants, potentially escaping immune responses. Keeping moderate preventive measures in place (such as improved hygiene, use of face masks, and moderate contact reduction) is highly recommended will further facilitate control. |
| Berec 2021[37] | 05-Jul-21 | Aug 31st 2020 to Jun 30th 2021 | medRxiv [preprint] | Modelling | CZE | Community | N/A | COVID-19 related deaths | Determine whether delaying the 2nd vaccine dose from 21 to 42 days is advantageous | Alpha | A 2nd dose at 21 days is advantageous when vaccine supply is sufficient & epidemic is mild, while a 2nd dose at 42 days is advantageous when vaccine supply is insufficient & epidemic is severe |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Betti 2021**[38] | 03-Jun-21 | Dec 12th 2020 to May 7th 2021 | Vaccines | Modell-ing | 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**[39] | 10-Aug-21 | N/A | medRxiv [preprint] | Modell-ing | 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. |
| **Borch-ering 2021**[40] | 14-May-21 | Mar 27th 2021 | CDC MMWR | Modell-ing | USA | Community | n/a | Weekly reported cases, hospitalizations & deaths | 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 would lead to increases in severe COVID-19 outcomes, even with enhanced vaccination coverage. |
| **Bowie 2021**[41] | 10-Jun-21 | Jun 1st 2021 | medRxiv [preprint] | Modell-ing | 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 | Delta | An improved FTTIS system could help prevent a 3rd wave caused by VOC |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | immunization levels & a circulating VOC | | |
| **Braun 2021**[42] | 15-Jun-21 | Jan to Mar 2021 | International Journal of Clinical Pharmacology & Therapeutics | Modell-ing | 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**[43] | 15-Jun-21 | Nov 1st 2020 to Jan 20th 2021 | SSRN The Lancet [preprint] | Observ-ational | UK | Community | 41,341 type 1 groups comprising 160,600 backward events available for analysis | SGTF prev-alence (proxy for Alpha) | Estimate COVID-19 transmission risk, including Alpha, across comm-unity 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**[44] | 22-May-21 | 3 data-sets: Jun 12th to Nov 13th 2020; Nov 14th 2020 to Mar 24th 2021; & Mar 2020 to May 12th 2021 | medRxiv [preprint] | Modell-ing | UK | Community | N/A | Reproduction number, daily infections & daily deaths | Estimate reproduction numbers & transmission rate of Alpha to assess the UK's re-opening plan in relation to vaccine rollout | Alpha | Number of daily cases are predicted to increase as NPIs are lifted in May & Jun 2021. A further significant increase in cases is predicted with a reduced uptake of vaccination by eligible individuals. |
| **Domenico 2021**[45] | 16-May-21 | Mar 2020 to Apr 2021 | medRxiv [preprint] | Modell-ing | FRA | Community | N/A | Number of cases of SARS-CoV-2 | Compare various intervention scenarios to examine adherence to & | 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 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | sustainability of epidemic control | | | similar results as high intensity lockdowns. Short & strict lockdowns perform better than longer moderate lockdowns due to waning adherence of lockdown measures. |
| **Dimeglio 2021**[46] | 12-May-21 | Feb 5th to 12th 2021 & Mar 5th to 12th 2021 | Viruses | Modell-ing | 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**[47] | 01-Jul-21 | NA | SSRN The Lancet [preprint] | Modell-ing | 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, Gam-ma & Delta | Modell-ing 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**[48] | 07-Jul-21 | N/A | medRxiv [preprint] | Modell-ing | 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 |
| **Lane 2021**[49] | 09-Jul-21 | Jan 25th 2020 to Jan 31st 2021 | Lancet Public Health | Observati onal | 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**[50] | 27-Jun-21 | Mar 1st 2020 to May 31st 2021 & Dec 13th 2020 to May 31st 2021 | medRxiv [preprint] | Modell-ing | USA | Community | N/A | Number of wildtype & Alpha cases | Estimate the transmission dynamics of wildtype & VOC SARS-CoV-2 in | Alpha | Current vaccines are effective against the alpha variant, & 70% coverage would be sufficient protection, to allow for social activities to resume |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | relation to vaccine coverage in the US | | |
| Loenen-bach 2021[51] | 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[52] | 09-Jun-21 | Apr 2nd 2021 | Research Square [preprint] | Observational | USA | Community | Alpha & Beta | Prev-alence & origin of VOC in Hawai'i | Demonstrate a method to defining COVID-19 variants' lineages | Alpha, Beta, Gam-ma | 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[53] | 13-Jul-21 | Jan 22nd, 2020 to Mar 6th, 2021 | medRxiv [preprint] | Modell-ing | USA | Community | N/A | Vaccine effective-ness | 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[54] | 08-Jul-21 | Dec 12th 2020 to Jun 28th 2021 | medRxiv [preprint] | Modell-ing | USA | Community | N/A | Case data in areas with different vaccination progress | Quantify impact of vaccination on cases | Alpha, Gam-ma & 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 |
| Neu-berger 2021[55] | 03-Jul-21 | Aug 31st 2020 to May 31st 2021 & Ongoing | medRxiv [preprint] | Observational | DEU | Childcare centres | 8,500 ECEC managers | Reported infections | Define risk determinants & underst& difference in risk between children & adults | Alpha | Centers with children with lower socioeconomic status have a higher risk of infection, strict contact restrictions have shown to prevent infection |
| Nielson 2021[56] | 06-Jul-21 | NR | medRxiv [preprint] | Modell-ing | 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[57] | 14-Jun-21 | NR | medRxiv [preprint] | Modell-ing | 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 |

# Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Quinonez 2021**[58] | 17-May-21 | Dec 2019 to Apr 2021 | Viruses | Modell-ing | NA | Community | N/A | Estimates of VOC infection | Forecast the variant behaviour due to selective pressure | Alpha, Beta, Gam-ma & 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**[59] | 02-Jun-21 | Mar 12th to Apr 11th 2021 & Mar 22nd to April 21st 2021 | Research Square [preprint] | Modell-ing | IMN & ISR | Community | N/A | Viral transmissio n | 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**[60] | 30-June-21 | March & April 2021 | medRxiv [preprint] | Modell-ing | 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 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. | 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. |
| **Sanz-Leon 2021**[61] | 08-Jul-21 | Mar to May 2020 & Feb to Mar 2021 | medRxiv [preprint] | Modell-ing | AUS | Community | N/A | Estimated transmissio | Assess the risk of continued transmission with the | Alpha | A small group of people infected with variants with increased transmissibility |

# Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| Study | Date | Study period | Source | Study type | Country | Setting | | Outcome | Objective | Variants | Findings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | n of COVID-19 | presence more transmissible variants | | could result in larger & longer community transmission outbreaks |
| Turner 2021[62] | Jun-2021 | Jan 2020 to May 2021 | CESifo Working Papers | Modelling | OECD 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[63] | 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[64] | 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[65] | 07-Jul-21 | Jan 25th 2020 to Mar 12th 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 REVIEW[66] (N=21)** | | | | | | | | | | | |
| Ahn 2021[67] | 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**[68] | 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**[69] | 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 and the control measures) will shape its dynamics for the coming months | 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 may not be sufficient to compensate for the increased transmissibility of Alpha. |
| **Buchan 2021**[70] | 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 |
| **Chudasama 2021**[71] | 10-May-21 | Oct 1 to Dec 15, 2020 | Journal of Infection | Observational | UK | Community | 57,382 | Household outbreak | A comparative analysis of household | Alpha | Analysis of national data has shown that Alpha cases were almost twice as |

# Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | clustering to provide a rapid assessment of transmissibility of this variant against other sequenced cases | | 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**[72] | 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 |
| **Giordano 2021**[73] | 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**[74] | 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 | 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. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 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 | | |
| **Kim 2021**[75] | 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**[76] | 26-Apr-21 | N/A | medRxiv [preprint] | Modelling | DEU | Community | N/A | Effectiveness of lockdowns, measured by number of new cases | To provide viable strategies of careful opening of facilities in low-incidence regions without being affected by neighboring regions of substantially higher incidence. | 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. |
| **Linka 2021**[77] | 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 | 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 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | overall disease dynamics | | test-trace-isolate strategies will be critical in successfully managing these local outbreak dynamics |
| **Meister 2021**[78] | 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 |
| **Munitz 2021**[79] | 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**[80] | 20-Mar-21 | Santé publique France data from Jan 8 to | medRxiv [preprint] | Modelling | FRA | Community | N/A | # of individuals recovered, # of in hospital | To model the expected dynamics of COVID-19 with variant strains applying protective | 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 |

| | | 27, 2021, and Feb 18, 2021 | | | | | | deaths, ICU resource use | measures and several vaccine strategies | | (i.e., public health measures) would limit the number of deaths and avoid ICU resource saturation |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Piantham 2021**[81] | 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**[82] | 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. |
| **Scherbina 2021**[83] | 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**[84] | 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. |
| **Victora 2021**[85] | 30-Apr-21 | Weeks 1-14, 2021 | medRxiv [preprint] | Observational | BRA | Community | 370,000 regist | Mortality rate ratios over two- | To evaluate the real-life effectiveness of the vaccination | Gamma | Rapid scale up of vaccination among elderly Brazilians in early 2021 was associated with a decline in relative |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ered deaths in Brazil | weekly periods in between Jan 3rd, 2021 and Apr 22nd, 2021 for individuals aged 80+ and 90+ years | campaign among the elderly in Brazil | | mortality compared to younger individuals |
| **Wells 2021**[86] | 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 measures would be needed to mitigate its impact. |
| **Zimerman 2021**[87] | 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. |

AUS: Australia; Brazil: BRA; CAD: Canada; CDC: centres for disease control & prevention; 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;

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

NPI: non-pharmaceutical intervention; PRT: Portugal; PYF: French Polynesia; 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[70] | MedRxiv | PP | -2 | 6 (67) | Medium |
| Chudasama, 2021[71] | Journal of Infection | PR | N/A | 8 (89) | High |
| Cross-sectional Studies Appraised with NOS Tool[b] | | | | | |
| Victora, 2021[85] | MedRxiv | PP | -2 | 6 (60) | Medium |
| Cohort Studies Appraised with JBI Tool[d] | | | | | |
| Amirthalingam, 2021[2] f | MedRxiv | PP | -2 | 9 (81.8) | High |
| Karaba, 2021[17] | MedRxiv | PP | -2 | 7 (63.6) | Medium |
| Hillus, 2021[16] | The Lancet: Respiratory Medicine | PR | N/A | 11 (100) | High |
| Payne, 2021[25] | SSRN | PP | -2 | 9 (81.2) | High |
| Cross-sectional Studies Appraised with JBI Tool[c] | | | | | |
| Adenaiye, 2021[1] | MedRxiv | PP | -2 | 3 (37.5) | Medium |
| Neuberger, 2021[55] | MedRxiv | PP | -2 | 3 (37.5) | Medium |
| Si, 2021[27] | Frontiers in Public Health | PR | N/A | 5 (62.5) | Medium |
| Prevalence Studies Appraised with JBI Tool[a] | | | | | |
| Gorji, 2021[14] | MedRxiv | PP | -2 | 6 (66.6) | High |
| Lane, 2021[49] | Lancet Public Health | PR | N/A | 9 (100) | High |

## Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

| Loenenbach, 2021[51] | Eurosurveillance | PR | N/A | 9 (100) | High |
|---|---|---|---|---|---|
| Case Series Studies Appraised with JBI Tool[c] | | | | | |
| Ademoski, 2021[33] | MedRxiv | PP | -2 | 2 (25) | Low |
| Maison, 2021[52] | Research Square | PP | -2 | 2 (25) | Low |

[a]Total scores calculated out of 9; [b]Total score calculated out of 10; [c]Total score calculated out of 8; [d]Total score calculated out of 11

## 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 |

# Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

## 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 |
| 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} |

**Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021**

| 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 |
| 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 |

# Public Health Implications of SARS-CoV-2 VOC, updated September 10, 2021

engl& variant
english variant
britain variant
british variant
kent variant
south africa variant
brazil variant
variant of concern *(phrase search)*
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

References

1.      Adenaiye OO, Lai J, de Mesquita PJB, Hong F, Youssefi S, German J, et al. Infectious SARS-CoV-2 in Exhaled Aerosols and Efficacy of Masks During Early Mild Infection [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.13.21261989

2.      Amirthalingam G, Bernal JL, Andrews NJ, Whitaker H, Gower C, Stowe J, et al. Higher serological responses and increased vaccine effectiveness demonstrate the value of extended vaccine schedules in combatting COVID-19 in England [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Jul [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.07.26.21261140

3.      Aruffo E, Yuan P, Tan Y, Gatov E, Moyles I, Bélair J, et al. Mathematical modeling of vaccination rollout and NPIs lifting on COVID-19 transmission with VOC: a case study in Toronto, Canada [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.11.21261932

4.      Arumuru V, Samantaray SS, Pasa J. Double masking protection vs. comfort—A quantitative assessment. Phys Fluids. 2021 Jul;33(7):077120.

5.      Bablani L, Wilson T, Andrabi H, Sundararajan V, Ait Oukarim D, Abraham P, et al. Can a vaccine-led approach end the NSW outbreak in 100 days, or at least substantially reduce morbidity and mortality? [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.18.21262252

6.      Cazelles B, Nguyen-Van-Yen B, Champagne C, Comiskey C. Dynamics of the COVID-19 epidemic in Ireland under mitigation. BMC Infect Dis. 2021 Dec;21(1):735.

7.      Chang S, Cliff O, Zachreson C, Prokopenko M. Nowcasting transmission and suppression of the Delta variant of SARS-CoV-2 in Australia [Internet]. In Review; 2021 Aug [cited 2021 Sep 2]. Available from: https://www.researchsquare.com/article/rs-757351/v1

8.      Colosi E, Bassignana G, Contreras DA, Poirier C, Cauchemez S, Yazdanpanah Y, et al. Self-testing and vaccination against COVID-19 to minimize school closure [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.15.21261243

9.      Contreras S, Dehning J, Mohr SB, Bauer S, Spitzner FP, Priesemann V. Low case numbers enable long-term stable pandemic control without lockdowns [Internet]. Public and Global Health; 2020 Dec [cited 2021 Sep 3]. Available from: http://medrxiv.org/lookup/doi/10.1101/2020.12.10.20247023

10.     Dick DW, Childs L, Feng Z, Li J, Röst G, Buckeridge DL, et al. Fall 2021 Resurgence and COVID-19 Seroprevalence in Canada Modelling waning and boosting COVID-19 immunity in Canada A Canadian Immunization Research Network Study [Internet]. Public and Global Health; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.17.21262188

11.     Enright J, Hill EM, Stage HB, Bolton KJ, Nixon EJ, Fairbanks EL, et al. SARS-CoV-2 infection in UK university students: lessons from September–December 2020 and modelling insights for future student return. R Soc Open Sci. 2021 Aug;8(8):210310.

12.     España G, Cucunubá ZM, Cuervo-Rojas J, Díaz H, González-Mayorga M, Ramírez JD. The potential impact of delta variant of SARS-CoV-2 in the context of limited vaccination coverage and increasing social mixing in Bogotá, Colombia [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 3]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.06.21261734

13.     Giardina J, Bilinski A, Fitzpatrick MC, Kendall EA, Linas BP, Salomon J, et al. When do elementary students need masks in school? Model-estimated risk of in-school SARS-CoV-2 transmission and related infections among household members before and after student vaccination [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.04.21261576

14.     Gorji H, Lunati I, Rudolf F, Vidondo B, Hardt W-D, Jenny P, et al. Results from Canton Grisons of Switzerland Suggest Repetitive Testing Reduces SARS-CoV-2 Incidence (February-March 2021) [Internet]. Epidemiology; 2021 Jul [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.07.13.21259739

15.     Head JR, Andrejko KL, Remais JV. Model-based assessment of SARS-CoV-2 Delta variant transmission dynamics within partially vaccinated K-12 school populations [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.20.21262389

16.     Hillus D, Schwarz T, Tober-Lau P, Vanshylla K, Hastor H, Thibeault C, et al. Safety, reactogenicity, and immunogenicity of homologous and heterologous prime-boost immunisation with ChAdOx1 nCoV-19 and BNT162b2: a prospective cohort study. Lancet Respir Med. 2021 Aug;S221326002100357X.

17.     Karaba AH, Zhu X, Liang T, Wang KH, Rittenhouse AG, Akinde O, et al. A Third Dose of SARS-CoV-2 Vaccine Increases Neutralizing Antibodies Against Variants of Concern in Solid Organ Transplant Recipients [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.11.21261914

18.     Koslow W, Kühn MJ, Binder S, Klitz M, Abele D, Basermann A, et al. Appropriate relaxation of non-pharmaceutical interventions minimizes the risk of a resurgence in SARS-CoV-2 infections in spite of the Delta variant [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Jul [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.07.09.21260257

19.     Krueger T, Gogolewski K, Bodych M, Gambin A, Giordano G, Cuschieri S, et al. Assessing the risk of COVID-19 epidemic resurgence in relation to the Delta variant and to vaccination passes [Internet]. Epidemiology; 2021 May [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.05.07.21256847

20.     Layton A, Sadria M. Understanding the Dynamics of SARS-CoV-2 Variants of Concern in Ontario, Canada: A Case Study [Internet]. In Review; 2021 Aug [cited 2021 Sep 2]. Available from: https://www.researchsquare.com/article/rs-788073/v1

21.     Liu H, Zhang J, Cai J, Deng X, Peng C, Chen X, et al. Herd immunity induced by COVID-19 vaccination programs to suppress epidemics caused by SARS-CoV-2 wild type and variants in China [Internet]. Epidemiology; 2021 Jul [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.07.23.21261013

22.     Marziano V, Guzzetta G, Mammone A, Riccardo F, Poletti P, Trentini F, et al. Conditions for a return to normal under COVID-19 mitigation measures and vaccinations [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Mar [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.03.19.21253893

23.     Paaßen A, Anderle L, John K, Wilbrand S. Workplace risk management for SARS-CoV-2: a three-step early in-tervention strategy for effective containment of infection chains with special regards to virus variants with increased infectivity [Internet]. Occupational and Environmental Health; 2021 Jul [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.07.21.21260756

24.     Panovska-Griffiths J, Stuart RM, Kerr CC, Rosenfield K, Mistry D, Waites W, et al. Modelling the impact of reopening schools in the UK in early 2021 in the presence of the alpha variant and with roll-out of vaccination against SARS-CoV-2 [Internet]. Epidemiology; 2021 Feb [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.02.07.21251287

25.     Payne RP, Longet S, Austin JA, Skelly D, Dejnirattisai W, Adele S, et al. Sustained T Cell Immunity, Protection and Boosting Using Extended Dosing Intervals of BNT162b2 mRNA Vaccine. SSRN Electron J [Internet]. 2021 [cited 2021 Sep 10]; Available from: https://www.ssrn.com/abstract=3891065

26.     Plan ELCVM, Thi HL, Le DM, Phan H. Temporal considerations in the 2021 COVID-19 lockdown of Ho Chi Minh City [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.04.21261332

27.	Si R, Yao Y, Zhang X, Lu Q, Aziz N. Investigating the Links Between Vaccination Against COVID-19 and Public Attitudes Toward Protective Countermeasures: Implications for Public Health. Front Public Health. 2021 Jul 21;9:702699.

28.	Sonabend R, Whittles LK, Imai N, Perez-Guzman PN, Knock ES, Rawson T, et al. Non-pharmaceutical interventions, vaccination and the Delta variant: epidemiological insights from modelling England's COVID-19 roadmap out of lockdown [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.17.21262164

29.	Susswein Z, Valdano E, Brett T, Rohani P, Colizza V, Bansal S. Ignoring spatial heterogeneity in drivers of SARS-CoV-2 transmission in the US will impede sustained elimination [Internet]. Epidemiology; 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.09.21261807

30.	Tran Kiem C, Massonnaud CR, Levy-Bruhl D, Poletto C, Colizza V, Bosetti P, et al. A modelling study investigating short and medium-term challenges for COVID-19 vaccination: From prioritisation to the relaxation of measures. EClinicalMedicine. 2021 Aug;38:101001.

31.	Vie A. Emergence of more contagious COVID-19 variants from the coevolution of viruses and policy interventions. ArXiv210314366 Phys Q-Bio [Internet]. 2021 Mar 26 [cited 2021 Sep 2]; Available from: http://arxiv.org/abs/2103.14366

32.	Zhang Y, Johnson K, Lich KH, Ivy J, Keskinocak P, Mayorga M, et al. COVID-19 Projections for K12 Schools in Fall 2021: Significant Transmission without Interventions [Internet]. Infectious Diseases (except HIV/AIDS); 2021 Aug [cited 2021 Sep 2]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.08.10.21261726

33.	Adamoski D, Oliveira JC de, Bonatto AC, Wassem R, Nogueira MB, Raboni SM, et al. Large-scale screening of asymptomatic for SARS-CoV-2 variants of concern and rapid P.1 takeover, Curitiba, Brazil. medRxiv. 2021 Jun 21;2021.06.18.21258649.

34.	Adeyinka DA, Camillo CA, Marks W, Muhajarine N. Implications of COVID-19 vaccination and public health countermeasures on SARS-CoV-2 variants of concern in Canada: evidence from a spatial hierarchical cluster analysis. medRxiv. 2021 Jul 5;2021.06.28.21259629.

35.	Aubry M, Teiti I, Teissier A, Richard V, Mariteragi-Helle T, Chung K, et al. Self-collection and pooling of samples as resources-saving strategies for RT-PCR-based SARS-CoV-2 surveillance, the example of travelers in French Polynesia. medRxiv. 2021 Jun 21;2021.06.17.21254195.

36.	Bauer S, Contreras S, Dehning J, Linden M, Iftekhar E, Mohr SB, et al. Relaxing restrictions at the pace of vaccination increases freedom and guards against further COVID-19 waves. 2021 Jul. Report No.: arXiv:2103.06228v4.

37.	Berec L, Levínský R, Weiner J, Šmíd M, Neruda R, Vidnerová P, et al. Importance of epidemic severity and vaccine mode of action and availability for delaying the second vaccine dose. medRxiv. 2021 Jul 5;2021.06.30.21259752.

38.	Betti M, Bragazzi N, Heffernan J, Kong J, Raad A. Could a New COVID-19 Mutant Strain Undermine Vaccination Efforts? A Mathematical Modelling Approach for Estimating the Spread of B.1.1.7 Using Ontario, Canada, as a Case Study. Vaccines. 2021 Jun;9(6):592.

39.	Bilinski A, Ciaranello A, Fitzpatrick MC, Giardina J, Shah M, Salomon JA, et al. SARS-CoV-2 testing strategies to contain school-associated transmission: model-based analysis of impact and cost of diagnostic testing, screening, and surveillance. 2021 Aug.

40.	Borchering RK. Modeling of Future COVID-19 Cases, Hospitalizations, and Deaths, by Vaccination Rates and Nonpharmaceutical Intervention Scenarios — United States, April–September 2021. MMWR Morb Mortal Wkly Rep [Internet]. 2021 [cited 2021 Jul 27];70. Available from: https://www.cdc.gov/mmwr/volumes/70/wr/mm7019e3.htm

41.	Bowie C. Modelling the effect of an improved trace and isolate system in the wake of a highly transmissible Covid-19 variant with potential vaccine escape. medRxiv. 2021 Jun 10;2021.06.07.21258451.

42.	Braun P, Braun J, Woodcock BG. COVID-19: Effect-modelling of vaccination in Germany with regard to the mutant strain B.1.1.7 and occupancy of ICU facilities. Int J Clin Pharmacol Ther. 2021 Jul 1;59(07):487–95.

43.	Chen C, Packer S, Turner C, Anderson C, Hughes G, Edeghere O, et al. Using Genomic Concordance to Estimate COVID-19 Transmission Risk Across Different Community Settings in England 2020/21. Prepr Lancet [Internet]. 2021 Jun 15 [cited 2021 Jul 27]; Available from: https://papers.ssrn.com/abstract=3867682

44.	Conn H, Taylor R, Willis MJ, Wright A, Bramfitt V. Mechanistic model calibration and the dynamics of the COVID-19 epidemic in the UK (the past, the present and the future). medRxiv. 2021 May 22;2021.05.18.21257384.

45.	Domenico LD, Sabbatini CE, Boëlle P-Y, Poletto C, Crépey P, Paireau J, et al. Adherence and sustainability of interventions informing optimal control against COVID-19 pandemic. medRxiv. 2021 May 16;2021.05.13.21257088.

46.	Dimeglio C, Milhes M, Loubes J-M, Ranger N, Mansuy J-M, Trémeaux P, et al. Influence of SARS-CoV-2 Variant B.1.1.7, Vaccination, and Public Health Measures on the Spread of SARS-CoV-2. Viruses. 2021 May;13(5):898.

47.	Du Z, Wang L, Bai Y, Wang X, Pandey A, Chinazzi M, et al. Cost Effective Proactive Testing Strategies During COVID-19 Mass Vaccination: A Modelling Study. Prepr Lancet [Internet]. 2021 Jul 1 [cited 2021 Jul 27]; Available from: https://papers.ssrn.com/abstract=3878074

48.	Jayasundara P, Peariasamy KM, Law KB, Rahim KNKA, Lee SW, Ghazali IMM, et al. Sustaining effective COVID-19 control in Malaysia through large-scale vaccination. medRxiv. 2021 Jul 7;2021.07.05.21259999.

49.	Lane CR, Sherry NL, Porter AF, Duchene S, Horan K, Andersson P, et al. Genomics-informed responses in the elimination of COVID-19 in Victoria, Australia: an observational, genomic epidemiological study. Lancet Public Health [Internet]. 2021 Jul 9 [cited 2021 Jul 27];0(0). Available from: https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(21)00133-X/abstract

50.      Li R, Li Y, Zou Z, Liu Y, Li X, Zhuang G, et al. Projecting the impact of SARS-CoV-2 variants on the COVID-19 epidemic and social restoration in the United States: a mathematical modelling study. medRxiv. 2021 Jun 27;2021.06.24.21259370.

51.      Loenenbach A, Markus I, Lehfeld A-S, Heiden M an der, Haas W, Kiegele M, et al. SARS-CoV-2 variant B.1.1.7 susceptibility and infectiousness of children and adults deduced from investigations of childcare centre outbreaks, Germany, 2021. Eurosurveillance. 2021 May 27;26(21):2100433.

52.      Maison DP, Cleveland SB, Nerurkar VR. Genomic Analysis of SARS-CoV-2 Variants of Concern Circulating in Hawai'i to Facilitate Public-Health Policies [Internet]. Research Square. 2021 [cited 2021 Jul 27]. Available from: https://www.researchsquare.com/article/rs-378702/v2

53.      Mancuso M, Eikenberry SE, Gumel AB. Will Vaccine-derived Protective Immunity Curtail COVID-19 Variants in the US? medRxiv. 2021 Jul 13;2021.06.30.21259782.

54.      Moghadas SM, Sah P, Fitzpatrick MC, Shoukat A, Pandey A, Vilches TN, et al. COVID-19 deaths and hospitalizations averted by rapid vaccination rollout in the United States. medRxiv. 2021 Jul 8;2021.07.07.21260156.

55.      Neuberger F, Grgic M, Diefenbacher S, Spensberger F, Lehfeld A-S, Buchholz U, et al. COVID-19 infections in day care centres in Germany: Social and organisational determinants of infections in children and staff in the second and third wave of the pandemic. medRxiv. 2021 Jul 3;2021.06.07.21257958.

56.      Nielsen J. Recruiting Test Participants for Usability Studies [Internet]. Nielsen Norman Group. 2003 [cited 2020 Apr 28]. Available from: https://www.nngroup.com/articles/recruiting-test-participants-for-usability-studies/

57.      Quilty BJ, Russell TW, Clifford S, Flasche S, Pickering S, Neil SJ, et al. Quarantine and testing strategies to reduce transmission risk from imported SARS-CoV-2 infections: a global modelling study [Internet]. Epidemiology; 2021 Jun [cited 2021 Jul 29]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.06.11.21258735

58.      Quinonez E, Vahed M, Hashemi Shahraki A, Mirsaeidi M. Structural Analysis of the Novel Variants of SARS-CoV-2 and Forecasting in North America. Viruses. 2021 May;13(5):930.

59.      Sachak-Patwa R, Byrne H, Dyson L, Thompson R. The risk of SARS-CoV-2 outbreaks in low prevalence settings following the removal of travel restrictions [Internet]. Research Square. 2021 [cited 2021 Jul 27]. Available from: https://www.researchsquare.com/article/rs-547702/v1

60.      Salvatore M, Bhattacharyya R, Purkayastha S, Zimmermann L, Ray D, Hazra A, et al. Resurgence of SARS-CoV-2 in India: Potential role of the B.1.617.2 (Delta) variant and delayed interventions. 2021 Jun. Report No.: 10.1101/2021.06.23.21259405.

61.      Sanz-Leon P, Stevenson NJ, Stuart RM, Abeysuriya RG, Pang JC, Lambert SB, et al. Susceptibility of zero community transmission regimes to new variants of SARS-CoV-2: a modelling study of Queensland. medRxiv. 2021 Jul 8;2021.06.08.21258599.

62.     Turner D, Égert B, Guillemette Y, Botev J. The tortoise and the hare: The race between vaccine rollout and new COVID variants. 2021 Jun 11 [cited 2021 Jul 27]; Available from: https://www.oecd-ilibrary.org/economics/the-tortoise-and-the-hare-the-race-between-vaccine-rollout-and-new-covid-variants_4098409d-en

63.     Van Egeren D, Stoddard M, Novodhodko A, Rogers M, Joseph-McCarthy D, Zetter B, et al. The specter of Manaus: the risks of a rapid return to pre-pandemic conditions after COVID-19 vaccine rollout. 2021 May.

64.     Yang HM, Junior LPL, Castro FFM, Yang AC. Quarantine, relaxation and mutation explaining the CoViD-19 epidemic in São Paulo State (Brazil). medRxiv. 2021 Apr 15;2021.04.12.21255325.

65.     Zou Z, Fairley CK, Shen M, Scott N, Xu X, Li Z, et al. Critical timing for triggering public health interventions to prevent COVID-19 resurgence: a mathematical modelling study. medRxiv. 2021 Jul 7;2021.07.06.21260055.

66.     Curran J, Boulos L, Somerville M, Dol J, Johnson C, Crowther D, et al. Public Health Implications of SARS-CoV-2 VOC. SPOR Evidence Alliance; COVID-END; CoVaRR-NET; 2021 Jul. Report No.: Deliverable 1.

67.     Ahn H-S, Silberholz J, Song X, Wu X. Optimal COVID-19 Containment Strategies: Evidence Across Multiple Mathematical Models [Internet]. Rochester, NY: Social Science Research Network; 2021 Apr [cited 2021 May 26]. Report No.: ID 3834668. Available from: https://papers.ssrn.com/abstract=3834668

68.     Borges V, Sousa C, Menezes L, Gonçalves AM, Picão M, Almeida JP, et al. Tracking SARS-CoV-2 lineage B.1.1.7 dissemination: insights from nationwide spike gene target failure (SGTF) and spike gene late detection (SGTL) data, Portugal, week 49 2020 to week 3 2021. Euro Surveill Bull Eur Sur Mal Transm Eur Commun Dis Bull. 2021 Mar;26(10).

69.     Bosetti P, Kiem CT, Andronico A, Paireau J, Bruhl DL, Lina B, et al. A race between SARS-CoV-2 variants and vaccination: The case of the B.1.1.7 variant in France [Internet]. 2021 [cited 2021 May 26]. Available from: https://hal-pasteur.archives-ouvertes.fr/pasteur-03149525

70.     Buchan SA, Tibebu S, Daneman N, Whelan M, Vanniyasingam T, Murti M, et al. Increased household secondary attacks rates with Variant of Concern SARS-CoV-2 index cases. medRxiv. 2021 Apr 5;2021.03.31.21254502.

71.     Chudasama DY, Flannagan J, Collin SM, Charlett A, Twohig KA, Lamagni T, et al. Household clustering of SARS-CoV-2 variant of concern B.1.1.7 (VOC-202012–01) in England. J Infect [Internet]. 2021 Apr 29 [cited 2021 May 26];0(0). Available from: https://www.journalofinfection.com/article/S0163-4453(21)00216-4/abstract

72.     Di Domenico L, Sabbatini CE, Pullano G, Levy-Bruhl D, Colizza V. Impact of January 2021 curfew measures on SARS-CoV-2 B.1.1.7 circulation in France. Eurosurveillance [Internet]. 2021 Apr;26(15). Available from: https://doi.org/10.2807/1560-7917.ES.2021.26.15.2100272

73.     Giordano G, Colaneri M, Di Filippo A, Blanchini F, Bolzern P, De Nicolao G, et al. Modeling vaccination rollouts, SARS-CoV-2 variants and the requirement for non-pharmaceutical interventions in Italy. Nat Med. 2021 Apr 16;1–6.

74.     Gurbaxani BM, Hill AN, Paul P, Prasad PV, Slayton RB. Evaluation of Different Types of Face Masks to Limit the Spread of SARS-CoV-2 – A Modeling Study. medRxiv. 2021 Apr 27;2021.04.21.21255889.

75.     Kim D, Keskinocak P, Pekgün P, Yildirim I. The Balancing Role of Distribution Speed against Varying Efficacy Levels of COVID-19 Vaccines under Variants. medRxiv. 2021 Apr 13;2021.04.09.21255217.

76.     Kühn MJ, Abele D, Binder S, Rack K, Klitz M, Kleinert J, et al. Regional opening strategies with commuter testing and containment of new SARS-CoV-2 variants. medRxiv. 2021 Apr 26;2021.04.23.21255995.

77.     Linka K, Peirlinck M, Schäfer A, Tikenogullari OZ, Goriely A, Kuhl E. Effects of B.1.1.7 and B.1.351 on COVID-19 dynamics. A campus reopening study. medRxiv. 2021 Apr 27;2021.04.22.21255954.

78.     Meister T, Fortmann J, Todt D, Heinen N, Ludwig A, Brüggemann Y, et al. Comparable environmental stability and disinfection profiles of the currently circulating SARS-CoV-2 variants of concern B.1.1.7 and B.1.351. 2021.

79.     Munitz A, Yechezkel M, Dickstein Y, Yamin D, Gerlic M. BNT162b2 vaccination effectively prevents the rapid rise of SARS-CoV-2 variant B.1.1.7 in high-risk populations in Israel. Cell Rep Med. 2021 May 18;2(5):100264.

80.     Pageaud S, Ponthus N, Gauchon R, Pothier C, Rigotti C, Eyraud-Loisel A, et al. Adapting French COVID-19 vaccination campaign duration to variant dissemination. medRxiv. 2021 Mar 20;2021.03.17.21253739.

81.     Piantham C, Ito K. Estimating the increased transmissibility of the B.1.1.7 strain over previously circulating strains in England using frequencies of GISAID sequences and the distribution of serial intervals. medRxiv. 2021 Mar 30;2021.03.17.21253775.

82.     Sah P, Vilches TN, Moghadas SM, Fitzpatrick MC, Singer BH, Hotez PJ, et al. Accelerated vaccine rollout is imperative to mitigate highly transmissible COVID-19 variants. EClinicalMedicine [Internet]. 2021 May 1 [cited 2021 May 26];35. Available from: https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(21)00145-0/abstract

83.     Scherbina A. Would the United States Benefit from a COVID Lockdown? Reassessing the Situation. SSRN [Internet]. 2021 Feb 20 [cited 2021 Apr 26]; Available from: https://papers.ssrn.com/abstract=3789690

84.     Tokuda Y, Kuniya T. Japan's Covid mitigation strategy and its epidemic prediction. medRxiv. 2021 May 7;2021.05.06.21256476.

85.     Victora C, Castro MC, Gurzenda S, Barros AJD. Estimating the early impact of immunization against COVID-19 on deaths among elderly people in Brazil: analyses of secondary data on vaccine coverage and mortality. medRxiv. 2021 Apr 30;2021.04.27.21256187.

86.      Wells CR, Townsend JP, Pandey A, Fitzpatrick MC, Crystal WS, Moghadas SM, et al. Quarantine and testing strategies for safe pandemic travel [Internet]. Epidemiology; 2021 Apr [cited 2021 May 26]. Available from: http://medrxiv.org/lookup/doi/10.1101/2021.04.25.21256082

87.      Zimerman RA, Cadegiani FA, Pereira E Costa RA, Goren A, Campello de Souza B. Stay-At-Home Orders Are Associated With Emergence of Novel SARS-CoV-2 Variants. Cureus. 2021 Mar 11;13(3):e13819.