

## Decision Modeling and Simulation

### P5 REAL-WORLD VALIDATION OF THE IMPLEMENTATION OF HEALTHCARE CAPACITY OPTIMIZATION MEASURES GUIDED BY THE SIMPLI TOOL: AN OPHTHALMOLOGY PROOF OF CONCEPT IN PORTUGAL



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**Objectives:** Hospital services in ophthalmology face significant capacity constraints in Portugal. In 2020, SimPLI – Simulating Capacity Performance Leading to Impact was introduced to assist services in simulating the impact of measures to decrease the backlog of outpatient consultations and procedures. The aim of this work is to introduce the validation of the simulator outputs with the real-world production in a reference ophthalmology center in Portugal. **Methods:** A spreadsheet-based simulator was developed for testing measures to accelerate the realization of delayed external consultations and outpatient surgeries. The baseline backlog is represented by the number of delayed procedures. The time to eliminate this backlog was calculated and compared with the output for scenarios where one or more measures were implemented. The number of consultations and procedures simulated at 2020 year-end (YE) was compared with real hospital production data for model validation. **Results:** The implementation of 15-minute telemedicine consultations for follow-up appointments and the reduction in 10 minutes in the time of face-to-face consultations was predicted to increase the number of 1<sup>st</sup> consultations by 68% and the number of follow-up consultations by 77% in comparison with a scenario without any optimization measures. The time to solve outstanding consultations would be reduced by 7 months. In real practice in the same service, the application of the aforementioned measures was successful, with an additional 58% of 1<sup>st</sup> consultations and 85% follow-up appointments until 2020 year-end. In outpatient surgeries, the application of measures for capacity optimization reduced by 22% the number of patient lost to private hospitals, with considerable resulting savings. **Conclusions:** SimPLI is invaluable for planning the investment in efficient actions towards optimization of hospital capacity. The proof of concept demonstrates that the proposed measures were validated in real practice with improved provision of care in ophthalmology, eventually resulting in improved patient outcomes.

### P6 PROJECTING COVID-19 HOSPITALIZATIONS AND DEATHS UNDER SCENARIOS OF VACCINATION IN JEFFERSON COUNTY, KENTUCKY



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**Objectives:** This report investigated the simulated effect of several vaccination scenarios on COVID hospitalizations and deaths in Jefferson County, Kentucky. **Study Design:** Eight scenarios were considered. First, it was assumed that the status quo scenario (~30,000 doses of Pfizer and Moderna vaccines distributed and administered every week) would continue without Johnson & Johnson's vaccine. Then, three scenarios of the addition of Johnson & Johnson's vaccine (10,000, 15,000, and 20,000 weekly) were considered. Next, an expansion over the status quo scenario (~40,000 doses of Pfizer per week) was considered with and without Johnson & Johnson's vaccine scenarios. **Methods:** An epidemic dynamics model (namely, a Susceptible-Exposed-Infectious-Recovered (SEIR) model) is adopted and estimated in this study. In the model, transmission through different phases of the COVID-19 epidemic (susceptible, exposed, infectious, hospitalized, vaccinated, recovered, and dead) is regulated with transmission and clinical dynamics parameters. Key transmission parameters are the population, basic and effective reproduction factors, lengths of incubation periods, pre-infectiousness, infectiousness with and without symptoms, and vaccines' efficacy rates and coverage. Key clinical dynamics parameters are hospitalization rate among the symptomatic, time from onset of severe symptoms to hospitalization, length of hospital stay, fatality rate among the hospitalized, recovery time among the hospitalized, the time from hospitalization to death. **Results:** More intense vaccination than the status quo is expected to decrease hospitalizations and deaths in the next three months. However, the magnitude of the decrease in deaths is small, < 3 dozen. Importantly, it is expected that the COVID-19 infection continues to spread. Therefore, social distancing and other COVID-19 protection measures (for example, mask-wearing) must continue – should they be relaxed, a “during vaccination surge” will occur and should be expected in the late April-early May period. **Conclusions:** Implications for Policy or Practice are Social distancing and other COVID-19 protection measures (for example, mask-wearing) must continue.

### P7 EVALUATING IMPACT OF UNIVERSAL VARICELLA VACCINATION STRATEGIES ON CLINICAL BURDEN OF VARICELLA AND HERPES ZOSTERIN ENGLAND AND WALES



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**Objectives:** England and Wales have not implemented universal varicella vaccination (UVV) primarily due to its hypothesized impact on herpes zoster (HZ) incidence. Our study evaluated long-term clinical impact of UVV and exogenous boosting on varicella and HZ in England and Wales. **Methods:** An age-structured, deterministic, dynamic transmission model using a dynamic population was adapted to England and Wales to assess varicella cases, associated hospitalizations and HZ cases. Ten (one- and two-doses, with/ without catch-up) vaccination strategies at short (12m/18m) and medium (18m/40m) dose intervals with and without catchup for 2 doses at 14 and 15 years of age were compared to no vaccination over a 50-year time horizon. Four varicella vaccines were considered with monovalent and quadrivalent formulations [Varivax®, ProQuad® (V/MMRV-MSD) Varilrix® and Priorix-Tetra®(V/MMRV-GSK)]. Vaccination coverage was assumed to be 91% for first doses and 89% for 2<sup>nd</sup> doses and 87% for catch-up. The model accounted for the impact of exogenous boosting on HZ cases. **Results:** All vaccine strategies substantially reduced the clinical burden of varicella over no vaccination: with 82-97% reduction in total varicella cases and 78%-86% reduction in the number of hospitalizations. One-dose strategies without catchup resulted in the smallest reduction in cases, hospitalizations, while the greatest reduction was seen with the 2-dose short-interval (12m and 18m) strategy. Incidence of HZ is estimated to be reduced by 7-11%. Strategies with V/MMRV-MSD vaccines were more effective in averting all four outcomes than with V/MMRV-GSK vaccines with similar intervals. **Conclusions:** Our model estimated that all one and two-dose UVV strategies significantly reduced the clinical burden of varicella including reduction in varicella related incidence, and hospitalization as well as reduction in HZ incidence compared to no vaccination in England and Wales. Policymakers should consider including UVV in their childhood immunization program to reduce disease burden.

### P8 NEW ONSET CARDIOVASCULAR DISEASE IN AUSTRALIA BY SOCIOECONOMIC GROUPS: A MODELLING STUDY



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**Objectives:** To project incident cardiovascular disease (CVD) and related health economic outcomes in Australia by socioeconomic status between 2020 and 2029. **Methods:** A dynamic population model was built to project the annual incidence new-onset CVD by quintile of socioeconomic disadvantage in Australians aged 40-90 years between 2020 and 2029 using the Pooled Cohort Equation (PCE). The model projected years of life lived, quality adjusted life years (QALYs), direct healthcare medical costs, and productivity losses due to new-onset CVD. All outcomes were discounted by 5% annually. **Results:** Cardiovascular risk profiling using the PCE showed that 20% of the most disadvantaged quintile were considered at high risk of CVD, compared to 12% in the least disadvantaged quintile. From 2020 to 2029, the model projected 211,901 incident cardiovascular events would occur in the most disadvantaged quintile compared to 184,846 in the least disadvantaged. Acute healthcare costs in the most socioeconomically disadvantaged group were AU\$ 206 million higher than in the least disadvantaged group, while the difference in societal costs was AU\$ 820 million. Scenario analyses estimated that a 17% risk reduction in CVD would be needed in disadvantage quintiles 1-4 to achieve the same outcomes as the least disadvantaged quintile (quintile 5). **Conclusions:** The number of CV events and associated costs highlight the urgent need to implement scalable primary prevention interventions targeted at disadvantaged groups. This model provides a platform to assess which interventions are likely to yield more benefits in each socioeconomic group at the population level.

## Development and Measurement of Health Utilities

### P10 EVALUATING THE CORRELATION BETWEEN MONTHLY MIGRAINE DAYS AND QUALITY-OF-LIFE: UTILITY ANALYSES TO INFORM A JAPANESE COST-EFFECTIVENESS MODEL FOR FREMANEZUMAB IN MIGRAINE



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**Objectives:** A cost-effectiveness model (CEM) for fremanezumab in migraine prevention from a Japanese public healthcare payer perspective has been developed. To inform health state specific utilities, we analyzed the correlation between the number of monthly migraine days (MMD) and a patient's quality-of-life using data from Japanese-Korean trials. **Methods:** The health states in the CEM are defined by the number of MMD, ranging from 0 to 28. Data from three Japanese-Korean clinical trials (406-102-00001, 406-102-00002, 406-102-00003) was analyzed. MSQoL (migraine specific quality of life) values measured in the trials were mapped to EQ-5D-3L utility values using a previously published mapping algorithm. To account for the repeated nature of the data, linear mixed effects models were fitted to the EQ-5D-3L values. MMD, MMD at baseline, treatment arm (monthly injection, quarterly