

## 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

injection, placebo), scheduled visits (month 1, month 2 etc.), age, sex, prior migraine medication and country were explored as covariates. The final model was selected based on the Akaike information criterion (AIC) value using forward and backward selection. **Results:** In total, 3743 utility values from 970 patients were included in our analyses. The mean observed utility value was 0.83 for patients with 0 MMD and 0.51 for patients with 28 MMD. Fremanezumab decreased the number of MMD, thereby increasing a patient's quality-of-life. The variables MMD, baseline MMD, scheduled visits and country were included in the final model. The regression coefficient for MMD was -0.01 ( $p < 0.001$ ), demonstrating that, after adjusting for baseline MMD, schedule visits and country, utility decreased by 0.01 for every day increase in MMD. **Conclusions:** There was a strong correlation between the number of MMD and quality-of-life in patients with migraine. Estimates derived from the linear mixed-effects model can be used to inform health-state specific utilities in the Japanese cost-effectiveness model for fremanezumab in migraine prevention.

#### P11 DEVELOPMENT OF AN EQ-5D-5L VALUE SET FOR ITALY USING VIDEOCONFERENCING ADMINISTERED PERSONAL INTERVIEWS: REPORTING ON THE FEASIBILITY OF A NEW MODE OF ADMINISTRATION FOR VALUATION STUDIES

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**Objectives:** To derive an Italian value set for the EQ-5D-5L using videoconferencing interviews and to determine the feasibility of this mode of administration. **Methods:** Preferences were collected using the EQ-VT V2. Two valuation methods were employed, composite time trade-off (cTTO) and discrete choice experiment (DCE). The target sample size was 1,000 participants. Participants were recruited using a market research company with experience in quantitative and qualitative data collection. Videoconferencing administered interviews were conducted by 11 interviewers selected among PhD students, researchers, and other academic affiliates. A pilot of 199 interviews was employed to assess the technical, operational and protocol feasibility of videoconferencing interviews. Standard QC parameters were used to monitor interviewers' performance during the data collection. To inform the modelling choices, GLS, Tobit, Logit, Probit and Hybrid models were fitted to the data, with different error specifications. Models were compared in terms of monotonicity of coefficients, statistical significance, and theoretical considerations. **Results:** 1182 videoconferencing interviews were completed between October 2020 and February 2021, including 199 feasibility pilot interviews. Dropouts and technical problems occurred in less than 5% of the interviews, and all interviewers complied with the protocol as well as showing significant improvements in QC parameters. The results suggested videoconferencing was a feasible mode of administration. The final sample was representative of the Italian general population for age, gender, and education as recorded in 2019 by ISTAT. Among the models tested, the Hybrid Tobit heteroscedastic model without constant was selected for the derivation of the tariff. In the selected model, coefficients for all dimensions levels were statistically significant and monotonically decreasing. Values ranged from -0.571 for the PITS state to 1 for health state 11111. **Conclusions:** An Italian societal value set for the EQ-5D-5L was developed. This can be used for economic evaluations and decision making in Italy. Videoconferencing appeared feasible for valuation interviews.

#### P12 ARE GAINS IN HEALTH UTILITY ASSOCIATED WITH GAINS IN WORK PRODUCTIVITY AND ROLE FUNCTIONING IN CHRONIC DISEASES? A SYSTEMATIC LITERATURE REVIEW

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**Objectives:** Disease experience for people living with chronic diseases has changed dramatically with improvements in health utility. It remains unclear, however, the extent to which improvements in health utility leads to gains in work productivity and role functioning. This systematic literature review aimed to explore the relationship between health utility and work productivity or role functioning across chronic diseases. **Methods:** Diseases selected were chronic and severe (based on health utility weights in range 0.50 to 0.70). Records from a structured search conducted in MEDLINE, Embase and PsycINFO were reviewed against inclusion criteria and assessed for study quality/relevance. Articles published from 2000 - February 2021 and available in English were considered. Studies included a measure of health utility (e.g., EQ-5D) and productivity or role function (e.g., employment status, presenteeism and absenteeism). Study quality was assessed in terms of design, analysis approach, missing data and evidence of bias. **Results:** The search identified 876 records; 244 underwent full review, and 34 of the highest quality studies were extracted. Only 4 longitudinal studies were identified. Studies included different diseases including multiple sclerosis, rheumatoid arthritis, and stroke. Weighted mean health utilities of 0.79 were observed for employed (full/part time) people with a chronic disease, compared with 0.71 for part time employed, 0.61 for those unemployed/not in work, and 0.62 for those incapable of working. These associations

held in studies controlling for potential confounders (e.g., age, symptom severity etc). Values corresponded to approximately a 5% increase in employment per 0.1 unit increase in health utility value. **Conclusions:** There is limited longitudinal research among people with chronic diseases exploring how changes in health utility may lead to changes in work productivity and role functioning. However, the findings suggest that amongst people with a chronic and severe disease, better health states are expected to be associated with higher productivity.

### Emerging Opportunities for the Use of Real World Data in Comparative Effectiveness Research

#### P13 USE OF REAL-WORLD BIG DATA TO ASSESS THE EFFECTIVENESS ON OVERALL SURVIVAL AMONG CHEMOTHERAPY OR IMMUNOTHERAPY IN FIRST LINE METASTATIC NON-SMALL CELL LUNG CARCINOMA PATIENTS IN AN ITALIAN SETTING

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**Objectives:** The use of big data to assess the effectiveness of oncological treatments in clinical practice is gaining increasing interest. This analysis aimed to assess the overall survival of metastatic non-small cell lung (met-NSCLC) patients receiving chemotherapy (CT) or immunotherapy (I/O) as 1<sup>st</sup> line by using real-world data in a sample population in Italy. **Methods:** A retrospective observational analysis based on administrative data from a sample of Italian Local Health Units was conducted. Met-NSCLC patients starting a 1<sup>st</sup> line therapy with CT or I/O between 2017-2018 were identified. Stopping inclusion period up to 2018 enabled at least a two-years follow-up period for each included patient. Kaplan Meier overall survival analysis considered time (months) from therapy initiation to death. Multivariable analysis was performed to adjust for cofounders such as age, gender, metastasis, BRAF test prescription and pharmacological treatments. **Results:** A total of 3,126 (mean age $\pm$ SD 68.6 $\pm$ 9.8 years, 68.2% male) and 316 (mean age $\pm$ SD 68.6 $\pm$ 9.7 years, 74.4% male) patients initiated treatment with CT and I/O respectively. In both groups, the more frequent metastases detected were related to lymph nodes (42.1% CT, 24.1% I/O), bone (25.8% CT, 14.9% I/O) and brain (18.3% CT, 10.1% I/O). Median [95%CI] survival was 8.0 [7.4-8.6] and 14.6 [12.2-18.9] months for CT and I/O patients, respectively. Death was not reported in 31.2% of CT and in 44.3% of I/O cohorts. Multivariable analysis showed the risk of death to be significantly lower in patients treated with I/O compared to CT (HR [95%CI] 0.796 [0.681-0.930]). **Conclusions:** Results from our study showed among met-NSCL patients in 1<sup>st</sup>line a better overall survival of the I/O compared to CT patients and a reduced risk of death of I/O vs CT-treated patients. Our findings suggest real-world data could produce valuable insights into treatments and their outcomes in routine daily oncology practice, thus integrating the evidence from clinical trials.

#### P14 EXPLORING THE POTENTIAL FOR EHR-DERIVED REAL-WORLD DATA TO REDUCE UNCERTAINTY IN HTA DECISION-MAKING: A CASE STUDY OF LONG-TERM SURVIVAL OUTCOMES

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**Objectives:** Clinical trials are an important source of evidence for health technology appraisals (HTA). However, a key concern is uncertainty in survival due to immature data. This study investigates whether electronic health record (EHR)-derived data from the US may have the potential to reduce uncertainty in long-term outcomes, using NICE technology appraisal (TA) 531 as a case study. **Methods:** We selected patients with previously untreated, Stage IV NSCLC, with positive or unknown PDL1 status, who initiated first-line pembrolizumab monotherapy between October 2016 and December 2020 from the nationwide de-identified EHR-derived Flatiron Health database. We applied additional lab and ECOG eligibility criteria. Outcomes were overall survival from treatment start and treatment duration. Sensitivity analyses assessed a sub-group with known PDL1 status and a time horizon ending at NICE TA