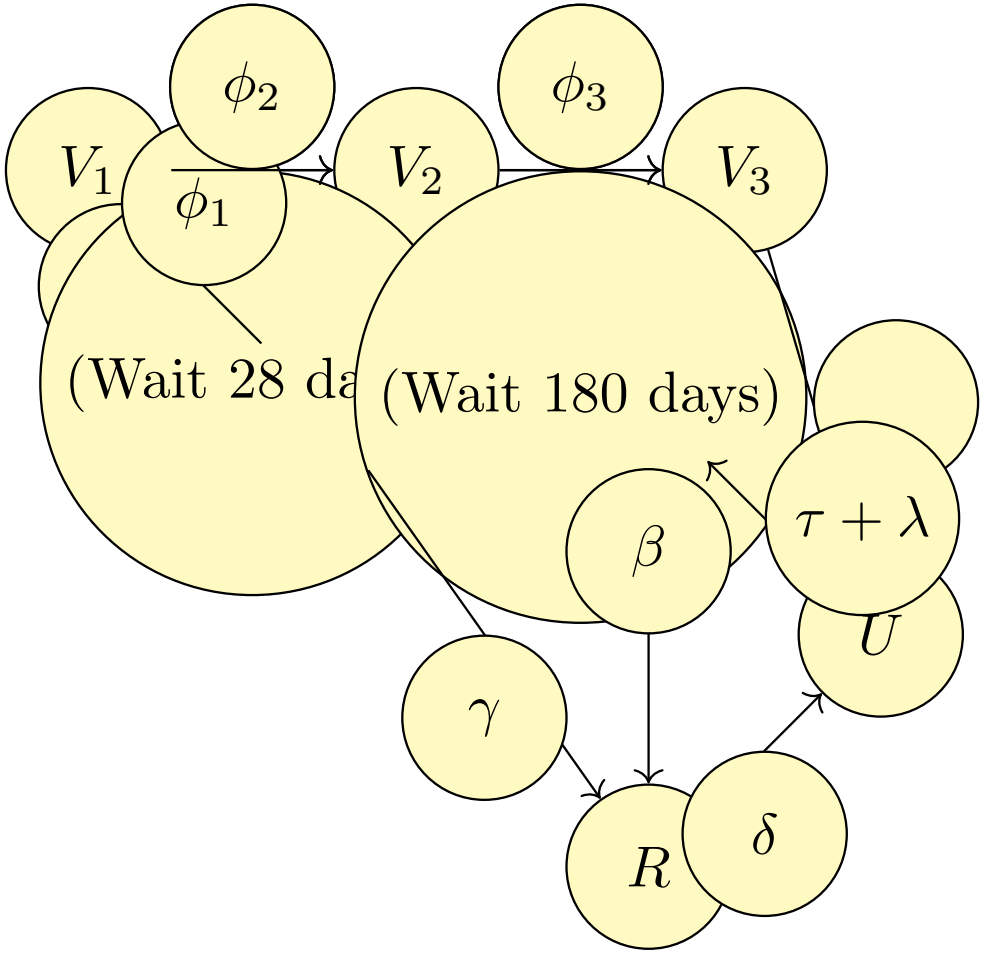

figureThe SIRV Compartmental Model for COVID-19 disease dynamics (similar to the one in Abou-Ismail et al [**?**]), consisting Susceptible (S), Exposed (E), Quarantined (U), Recovered (R), and Vaccinated (V) compartments. Three doses of vaccination are assumed, the second and the third being administered 28 and 208 days after the first. The transmission rate is β, recovery rate is δ, the rate of becoming susceptible after disease is γ, the vaccination rates are α_i for i^{th} vaccination, calculated as a proportion of people who took the previous vaccine, and the rate of vaccination immunity wearing off from i^{th} vaccination is ϕ_i.