YIJUN LOU, The Hong Kong Polytechnic University

Getting jab or regular test: observations from an impulsive epidemic COVID-19 model

Several safe and effective vaccines are available to prevent people from getting seriously ill or dying from the coronavirus disease 2019 (COVID-19) and widespread vaccination is believed to be a critical tool to fight the disease. However, individuals with vaccine hesitancy or other medical conditions may choose not to vaccinate, and regular compulsory testing is required in some sectors for such unvaccinated individuals. It is interesting to find that different sectors pose various testing frequencies, for example on a weekly or biweekly basis, and it becomes an important scientific problem to determine the test frequency and identify underlying factors. This talk is going to present a population based model to accommodate different personal decision choices (getting vaccination or regular tests), vaccine efficacies and uncertainties in the epidemic transmission. The model, in the form of impulsive differential equations, uses time instant to represent the reporting date for the test result of an unvaccinated individual. By employing some well-acceptable indices to measure the transmission risk, including the basic reproduction number, the peaking time and the final size, an optimal test frequency is shown to be very sensitive to parameters involved in the transmission process, including vaccine efficacy, disease transmission rate, the test accuracy, and the existing vaccination coverage. The testing frequency should be appropriately designed with the consideration of all these factors, as well as the control objectives measured by epidemiological quantities of great concern.