Channel Islands
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CHANNEL ISLANDS

Graduate Mathematics Seminar

Evaluating the Probability of Outbreak and Spillover in Stochastic Epidemic Model

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Abstract: Newly emerging diseases such as Covid-19, SARS, MERS and re-emerging diseases such as measles and pertussis are major concerns to public health globally. Spillover from the zoonotic origin, amplification and spread of infection have been linked to 60% of emerging diseases. Additionally, wanning of vaccination or poor coverage of vaccination attribute to re-emerging diseases. In the first part, we evaluated the probability of disease outbreak applying Markov chain models and branching process approximation. The multigroup model is heterogenous based on individual's infectivity or susceptibility potential. Our results show that the probability of outbreak will be greater when infection initiated by individuals with higher infectivity potential. In the second part, we studied the effects of environmental and epidemiological factors on zoonotic spillover of infectious diseases. We investigated how the probability of spillover from animal to human is affected by seasonal variations such as rainfall, temperature, humidity using a time dependent stochastic framework. In the model, animal to animal and animal to human transmission rates are time-periodic due to environmental factors. Our studies find that the probability of the first spillover is also periodic and depends on animal-to-animal transmission, animal to human transmission and animal recovery rates. These results were compared with an influenza outbreak from domestic poultry to human.

When: Monday, April 19, 2021, 6:00 – 7:00 pm
Where: Zoom