Mathematical Biology Seminar

Monday, September 11, 2023

3 pm MDT - 457 CAB (in person)

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Meeting ID: 984 9769 5684
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Comparing the spread, mortality, and response to vaccination of past and future SARS-CoV-2 variants

Over the course of the COVID-19 pandemic, several distinct strains of SARS-CoV-2 have emerged. This includes the original form of the virus as well as, among others, the Delta and Omicron variants. Each of these strains has its own unique properties: the Omicron variant in particular was widely reported as being more infectious but causing less severe disease than the strains previously in circulation. In fact, based on applying an inverse method to calculate infection and mortality rates, we found that Omicron's properties were more akin to seasonal influenza than to other SARS-CoV-2 variants. Even though Omicron's genetic differences to other strains allowed it to evade previously developed vaccines to a certain extent, this was mitigated by the application of a booster dose. Hence, we found that the administration of booster doses prevented about 40 million cases in the United States, and 1 million in Canada, during Omicron's initial outbreak wave. This implies that vaccination will play a key role in controlling future SARS-CoV-2 variants that may emerge now that COVID-19 is in an endemic stage. Indeed, we found that high perceived risk from receiving a vaccine can raise the probability of a new variant emerging by a factor of four for intermediate viral mutation rates. We also found that the caseload from a newly emergent SARS-CoV-2 strain depended less on fear of that strain than fear of the variant that was dominant at the time the new strain appeared. Furthermore, we found that the combination of rapid vaccination and non-pharmaceutical interventions during an outbreak wave can best prevent new variants from emerging during said wave, due to interaction effects between those two strategies.