

NEXT GENERATION CB HAZARD PREDICTION AND CONSEQUENCE ASSESSMENT WITH MULTI-ECHELON DECISION SUPPORT APPLICATIONS

Epidemiological Model Selection

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Infectious disease modeling surged during the COVID-19 pandemic. Numerous epidemiological models were developed, implemented, and utilized to shape both research and public policy, including decisions related to resource needs, the implementation of non-pharmaceutical interventions, and prioritization of vaccine distribution. Researchers and policy-makers were saddled with selecting from models developed by individuals and institutions with diverse modeling objectives, whose methodology and data varied widely based on the model's scope, scale, and intended audience. Little guidance was available for selecting an appropriate epidemiological model for individual research or decision-making needs. In recognition of this need for guidance and with the understanding that the consequences of inaccurate modeling results could negatively impact both public health outcomes and public perception of modeling, we conducted a comprehensive review of epidemiological modeling tools to assist in model selection for future infectious disease outbreaks. Forty models and modeling platforms that have been or could be used to model an infectious disease or disease variant were identified and compared. Specifically, we focus on each model's strengths and weaknesses in terms of modeling flexibility and customizability (such as the ability to model novel agents and disease or transmission dynamics), the ability to implement pharmaceutical and non-pharmaceutical mitigations, visualization capabilities, and computer processing requirements to assist model users in selection of the most appropriate existing modeling tool for individual research and surveillance needs. The ideal use case for model selection begins with an understanding of a user's research questions, and the parameters that will need to be modeled. Once users make the determination of which assessment criteria are best suited to address their research questions, users may then compare the assessed models or score their own selection of available models to determine the tools that fulfill the criteria they have chosen. Groups seeking models that adapt quickly to changing data and novel diseases should prioritize models with flexibility; those looking for simple methods of communicating complex model results should prioritize visualization, while users hoping to investigate interventions and treatments in detail should prioritize mitigation.

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