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The Past, Present and the Future of Mathematical Modeling Supporting Public Health

Mathematical modeling has been critical in supporting public health initiatives, providing valuable insights into disease dynamics, intervention strategies, and resource allocation. This talk explores the past, present, and future of mathematical modeling in supporting public health, highlighting its transformative impact on addressing complex health challenges in different eras.

In the past, mathematical modeling laid the foundations for understanding basic disease transmission dynamics. For example, R0 provides insights into the potential for disease transmission and helps inform public health interventions; the SIR (Susceptible-Infectious-Recovered) model, allowed researchers to simulate and predict the spread of infectious diseases, aiding in the formulation of effective public health interventions.

In the present era, math modeling has become an indispensable tool in public health research and practice. Advancements in computational power, data availability, and demands for supporting public health policies, practices, and surveillance led to more sophisticated models, incorporating real-world data and parameters. Collaborative efforts with multidisciplinary have opened up many possibilities to advance the state-of-the-art modeling supporting public health.

Looking toward the future, math modeling holds immense promise in transforming public health practices. Advanced modeling techniques provide a more nuanced understanding of disease dynamics, biological mechanisms, and social interactions. Integration of evolving real-time data sources such as genomics, serological, sentinel, and citizen science surveillance enhances modeling. Lastly, to fully leverage the potential of math modeling, interdisciplinary collaborations, and stakeholder engagement are crucial. By involving public health experts, policymakers, scientists, and communities in the modeling process, models can be co-developed to address public health challenges.