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Preventing HPV-Induced Cervical Cancer in Alberta, Canada: A Mathematical Modeling study

Human Papillomavirus (HPV) is a widespread sexually transmitted infection, responsible for nearly 99.7% of cervical cancer cases. Despite extensive public health efforts, controlling HPV transmission remains a challenge. This research applies a dynamic mathematical model to explore HPV infection and vaccination strategies in Alberta, Canada, aiming to identify the optimal vaccination program for both women and men to reduce infection prevalence.

A key challenge is the limited availability of reliable data for both sexes, particularly regarding prevalence. While female-specific data is abundant, male data is often overlooked in existing models, despite men playing a crucial role in HPV transmission. Addressing this gap could enhance the accuracy of models and lead to more effective public health interventions. Expanding data collection efforts to better represent males is essential for robust modelling.

The study will develop and calibrate an age- and sex-stratified mathematical model using Bayesian inference methods and MATLAB. This model will incorporate complex contact patterns and disease dynamics to simulate various vaccination scenarios and assess their long-term impacts on HPV transmission and health outcomes. The research will also estimate the potential reduction in cervical cancer cases resulting from the optimal vaccination strategy, providing quantitative evidence of its effectiveness.

Ultimately, this study aims to inform public health policy by identifying the most effective vaccination strategies for controlling HPV and preventing cervical cancer, while advocating for more comprehensive data collection to improve future modelling efforts.

Joint work with Tanjima Akhter and Michael Y Li from University of Alberta.