MODELLING HEPATITIS C VIRUS TRANSMISSION IN A HIGH-RISK INCARCERATED POPULATION

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Background: Hepatitis C virus (HCV) transmission is largely attributed to injecting drug use (IDU). Highlighting the close relationship between IDU and crime, most people who inject drugs (PWID) have been incarcerated. In Australia, 70%~ of prisoners are PWID. Our previous studies show ongoing HCV transmission in the New South Wales (NSW) prisons with an incidence rate of 14.1% and no evidence of protection from existing prevention programs. Moreover, we have reported molecular epidemiological evidence of HCV transmission in this setting. Here, an individual-based mathematical model (IBM) is developed to further describe HCV transmission dynamics and trends in a high-risk prison setting.

Methods: The IBM has been adapted from an existing HIV transmission model. It is structured into injecting risk groups and prison locations. Prisoners are represented as individual agents, while prison and HCV-related events are implemented as functions. An event is simulated for every individual at one time. Prevention programs namely opioid substitution therapy (OST) and direct-acting antivirals (DAA) delivery are also implemented.

Risk behaviours, prevention programs, and incidence calibration data were obtained from the HITS-p cohort (n=500). Prison movements and incarceration duration data were obtained from the NSW Department of Corrective Services. Other relevant information including age and gender was collected from literature and prison surveys.

Results: The model is calibrated to replicate the prison population (9217~), HCV incidence, and prevalence in NSW prisons in the past 5 years. Forward simulations show a steady incidence rate of approximately 10% per year. Various scenarios of scale-up of OST and DAA delivery are being modelled.

Conclusion: The first HCV transmission IBM in the prison setting has been developed and validated with actual prison data. This informs future estimates of HCV infection and disease burden in such setting. Currently, analysis on prevention strategy impact is being performed. Cost-effectiveness analyses are also underway.