

# **Modeling of HIV/AIDS Epidemic in Taiwan: Current Trends and Future Projection**

## **Abstract**

### Background

HIV/AIDS prevalence in Taiwan has remained low since first reported case in 1984. However, an outbreak of HIV-1 CRF07\_BC infections among intravenous drug users (IDU) led to an explosion of reported cases during 2004-2006, resulting in drastic changes in its epidemiology.

### Methods

We make use of government HIV surveillance data to infer the number of undetected persons living with HIV/AIDS (PLWHA), by utilizing a discrete-time compartmental model for disease transmission to estimate epidemiological parameters (i.e., infection rate, reporting rate, onset rate, mortality rate) for three different time periods during 2001-2011, in order to understand the recent trends of the epidemic and to provide future projections based on these model parameter estimates.

### Results

Estimates for model parameters from pre-IDU outbreak period (2001-2003) to the outbreak period (2004-2006), then to the post-outbreak period (2007-2011) were obtained to compare the changes in epidemiology of the epidemic before and after the 2004-2006 HIV/IDU outbreak. Moreover, we make use of the 2007-2011 estimates to project the numbers of both reported and unreported PLWHA in Taiwan from 2012 to 2015, by assuming that the parameters remain unchanged during the near future. We also compute the reproduction number,  $R$ , for each time period in order to compare transmission of HIV infections potential before, during, and after the IDU/HIV outbreak.

### Conclusions

Reproduction number was also significantly higher during 2004-2006, reflecting the ongoing spread among IDUs during that time, while the substantial drop in reproduction number after 2007 could be an encouraging sign of successful HIV/AIDS control and prevention in Taiwan. However, comparison of the 2012-2013

model projections, with the 2012-2013 real data indicates a substantial underestimate of newly reported HIV/AIDS cases, which requires further investigation, since only short-term projections are expected to be more reliable.