EXECUTIVE SUMMARY FOR MSS 229R
Quantification of population viral load and its temporal changes in subpopulation transmission networks for projecting the HIV epidemic in Hong Kong

Aim and objectives. With the aim of assessing the HIV transmission potentials in Hong Kong, the study carries the objectives of: (a) quantifying population viral loads and assessing their temporal changes; (b) characterizing transmission networks in MSM subpopulations; (c) modelling and making projections on HIV epidemiology at population and subpopulation levels; and (d) developing analysis on the impacts of public health interventions on the epidemiologic patterns.

Project design. Retrospective cohort study using anonymous clinical data from patients attending HIV specialist services in Hong Kong, following institutional approval.

Target population. People living with HIV/AIDS

Main achievements. Data from over 3000 patients were accessed and analysed, the diagnoses of whom were made between 1985 and 2012. In studying viral loads at population level, ICVL (in-care viral load), MVL (monitored viral load), CVL (community viral load) were measured in accordance with CDC's definitions. Seroconversion time and the undiagnosed interval of each patient were then derived from available data. Full community viral load (fCVL) was a newly designed marker estimated by back-calculating the time of seroconversion and then quantifying the overall viral load during the undiagnosed period. The difference between fCVL and CVL reflected the viral load contributed by undiagnosed individuals or those not in care. Overall, there was little difference between MVL and ICVL, implying minimal missing viral load records after 1998. However, the gap between CVL and ICVL (reflecting the viral load contributed by patients not in care) widened with time. In the development of compartmental modelling, 4 scenarios were constructed to examine the potential impacts of interventions on sexual transmission of HIV through the year 2020: (a) treatment coverage expansion; (b) testing coverage enhancement; (c) test-and-treat (mixed intervention); and (d) improved treatment retention. The results suggested that test-and-treat strategy with high retention rate would be most effective for controlling the MSM and heterosexual epidemic. However, increasing the HIV testing rate would be more feasible and impactful for the heterosexual, as a result of the early detection of HIV which would otherwise become late diagnoses.

Conclusions. With the collaboration of all HIV services in the territory, it was possible to measure population viral load for improving epidemiologic surveillance. The results have contributed to enhancing the evidence-based description of Hong Kong's HIV epidemiology, and the modelling of virus transmission in the coming years. The finding provided scientific evidence for the need to promote early diagnosis both for improving clinical outcome and for creating epidemic curves that could reflect the situation closest to reality

PUBLICATIONS.

- Wong NS, Wong KH, Wong PKH, Lee SS. Incorporation of estimated community viral load before HIV diagnosis for enhancing epidemiologic investigations – a comparison between men who have sex with men and heterosexual men in Hong Kong. *Asia Pac J Public Health* 2015;27(7) 756–764.

- Wong NS, Wong KH, Lee MP, Tsang OTY, Chan DPC, Lee SS. Estimation of the undiagnosed intervals of HIV-infected individuals by a modified back-calculation method for reconstructing the epidemic curves. *PLoS ONE* 2016;11(7): e0159021.