Modelling space and time patterns of HIV interventions on HIV burden in a high priority district in South Africa

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Abstract

Background: Ekurhuleni Metropolitan Municipality (EMM) collects monthly data from primary healthcare facilities on the HIV programmes to inform its HIV response. To study patterns of HIV burden and uptake of HIV services at a population level, the application of small area analysis offered a powerful epidemiological approach while investigating on a geographical scale, the risk, and confounding factors of certain health outcomes. This PhD thesis was aimed at highlighting and understanding the heterogeneity of HIV prevalence and selected HIV outcomes at a ward-level between 2012 and 2016.

Materials and Methods: A mixed-methods approach using the HIV result chain logical framework was applied to several sources of data. Firstly, data from a National HIV Survey, the South African National Census analysed using Bayesian techniques in WINBUGS to provide an epidemiological profile of the risk factors for HIV prevalence, sub-optimal condom use and non-ART use. Secondly, a model of time and space using R-INLA applied to routinely collected HIV program data (clinical and laboratory) assessed the predictors of viral load suppression (VLS) [<1000 copies/mL (WHO) and <400 copies/mL (SA)]. Forecasting of VLS (five years post-2016) was conducted using ARIMA models. Lastly, a thematic analysis using the social cognitive theory framework on in-depth interviews with patients and healthcare staff was conducted to understand factors influencing uptake of selected HIV services in different geographical settings.

Results and findings: There were several clusters of high HIV infection, sub-optimal condom, non-ART use and VLS in EMM driven by different risk factors discussed in this PhD thesis. The proportion of VLS increased from 2012-2015 and decreased in 2016, and heterogeneity was observed at ward-level. As the female population and ART initiation rates increased at ward-level, VLS increased. However, this observed relationship was strong in some areas and weak in others. Lastly negative sequalae including stigma from healthcare workers and communities prevented optimum uptake of HIV services, particularly in women. Social support, availability of services and differentiated care encourage utilisation of HIV services.

Conclusions: Findings highlighted the heterogenous nature of health events in EMM and are likely to inform targeted interventions to improve HIV programmes at ward-level towards achieving the 95-95-95 targets.