# HIV incidence estimates are key to understanding the changing HIV epidemic in South Africa

The study by Rehle et al.[1] in this issue of the *SAMJ* makes an important contribution to understanding the dynamics of the HIV epidemic in South Africa. While the high prevalence of HIV confirms that HIV continues to be hyper-endemic in South Africa, their estimates of HIV incidence highlight the extraordinarily high levels of ongoing HIV transmission in South Africa. A deep concern is the unrelenting epidemic in youth, with particularly high incidence rates in young women. In their study, Rehle et al. utilise the IgG-Capture BED enzyme immunoassay (BED-CEIA) to detect recent HIV seroconversion for the purpose of calculating HIV incidence rates. This technology[2] has been applied to several cross-sectional surveys to estimate incidence, including an injecting drug user population from Bangkok.[3] Since this method is still being validated for different conditions, such as viral clade, the absolute estimates of incidence should be regarded as tentative, but the subgroup comparisons in the study remain highly informative.

In order to understand the dynamics of HIV infection and epidemic trends, more data are needed on the current burden of disease, the rate of new HIV infections and mortality rates.[4] At a time when prevalence trends in pregnant South African women suggest that incident cases of HIV infection are being masked by rising mortality, it is of particular importance to monitor changes in the number of new infections in South Africa.

Reliable estimates of both prevalence and incidence are required to appreciate the changing dynamics of HIV infection in South Africa. While data on HIV prevalence on sentinel populations such as pregnant women are widely available in South Africa, data on HIV incidence remain limited. Incidence is substantially more difficult to measure directly because large cohorts need to be followed for long periods to determine the number of seroconversions. This is time-consuming and expensive as well as logistically and ethically difficult.[4] Incidence estimates from longitudinally collected information such as the data from sex workers in KwaZulu-Natal[5,6] are rare and generally provide information on small sub-groups within the population. Hence, measures of HIV incidence obtained indirectly from HIV prevalence studies using statistical and mathematical models utilising cross-sectional age-prevalence data can provide useful information. Some of the early estimates of HIV incidence in South Africa used simple statistical models to assess the feasibility of conducting vaccine trials.[7] Subsequently, more sophisticated, dynamic and demographic models were developed to obtain age-specific incidence from age-prevalence data.[8] While useful, these estimates from statistical models should be interpreted with care as they depend both on the structure of the model and assumptions involved.

Several laboratory techniques have also been developed to estimate HIV incidence. These include the assay for p24 antigen in the absence of antibodies, the sensitive/less sensitive ELISA to determine antibody levels, the BED-CEIA, and more recently, nucleic acid amplification in the absence of antibodies. These approaches allow for the extrapolation of incidence by identifying those who were recently infected. The extrapolation is critically dependent on what is meant by 'recent' for each assay; knowing this duration of positivity following onset of infection accurately enables the estimation of incidence.

In applying the BED-CEIA, Rehle et al. provide valuable information on recent HIV infection and national HIV incidence estimates for South Africa. As mortality increases in a mature epidemic, HIV prevalence trends can be deceptive[6] by under-estimating the growth of the epidemic. In contradistinction, as the rollout of AIDS treatment impacts on AIDS survival, HIV prevalence may over-estimate the growth of the epidemic. As a result, reliable estimates of HIV incidence are needed to establish the impact of prevention interventions, understand HIV epidemic dynamics and interpret temporal trends in different populations and sub-groups. South Africa needs many more studies that provide such useful estimates of HIV incidence if we are to truly understand the nature of this relentless epidemic.

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