Assessing progress with HIV incidence in national cohorts

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In *The Lancet HIV*, Jessica Justman and colleagues[1] provide HIV incidence rates for Swaziland from a national 6 month follow-up study, making an important contribution to understanding the dynamics of the HIV epidemic in this small southern African country with a population of 1·25 million people. 145 HIV seroconversions were observed in a cohort of 11 232 HIV-negative individuals during 6086 person-years of observation, leading to an HIV incidence rate of 2·4 per 100 person-years.

At the national-level, reliable estimates of both prevalence and incidence are required to appreciate the changing dynamics of HIV infection. Although data for HIV prevalence are common and routinely available, accurate data for incidence are scarce. Very few prospectively measured HIV incidence rates are available, beyond HIV prevention trials, at the district, national, or regional level. Instead, mathematical models or laboratory assays for recent infection are most often used to calculate HIV incidence on the basis of data or samples from one or more seroprevalence surveys.

Although useful, estimates from mathematical models should be interpreted with care as their results can vary substantially depending on both the structure of the model and assumptions involved. Several laboratory techniques, including the assay for p24 antigen in the absence of antibodies, the BED-CEIA assay (a capture enzyme immunoassay with gp41 peptides from HIV subtypes B, E, and D), and more recently, nucleic acid amplification in the absence of antibodies, can identify those recently infected to estimate HIV incidence. Even though the accuracy of tests has improved over the past decade, the variability in each test[2] makes extrapolation dependent on what constitutes recent for each assay. Swaziland's closest neighbours have national HIV incidence estimates as determined with BED-CEIA assays (South Africa[3] and Botswana[4]) or mathematical models (Zimbabwe[5] and Mozambique[6]); none have cohort-based national HIV incidence measures. So, are national-based cohort studies to measure HIV incidence required?

Given that the UN has adopted the goal of ending AIDS as a global health threat by 2030,[7] accurate estimates of HIV incidence over time will be needed to assess progress towards the attainment of this goal. To assess changes in HIV incidence, individual measures will need to be reliable, with narrow confidence intervals. Such measures of HIV incidence are going to become a key marker for assessing country-level HIV epidemic trends. Accurate measurements of incidence are also needed to measure the effectiveness of prevention interventions, either singly or in combination. Although cohort-based HIV incidence is routinely measured in randomised controlled trials assessing HIV prevention modalities, it is rarely used to assess the effect of national prevention programmes.

The main reason for the dearth of national, cohort-based HIV incidence measurements is that large cohorts need to be followed for long periods to get reliable estimates, making measurement of HIV incidence time consuming, expensive, and logistically and ethically difficult.[8] A further limitation of cohort studies is that their provision of safer sex interventions such as HIV counselling, condom promotion, sexually transmitted infection treatment and other HIV prevention interventions might change the HIV risk behaviour of participants. Individuals might also modify their risk taking behaviour in response to their awareness of being observed, the so-called Hawthorne effect.[9] As a result, there are concerns that measuring HIV incidence through identifying seroconversions during long-term follow-up might not produce accurate estimates of the HIV incidence.

Despite these limitations, the measurement of HIV seroconversions during follow-up is the gold standard for HIV incidence. Without cohort-based estimates,

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country-level progress toward the UN 2030 goal will be difficult to assess. As HIV incidence usually declines in small decrements, extrapolations from mathematical models or laboratory assays might not identify these changes because of the inherent variability in their estimates. Although multilevel sampling strategies are well established to provide reasonably representative samples, large studies will be required for cohort-based approaches to detect small changes in HIV incidence over time. In Swaziland, which is smaller than many cities, it was practically feasible to establish a national cohort to assess a national male circumcision intervention.[1] This might be a much more complex task in larger countries.

Swaziland is the first country in southern Africa to have a national cohort-based HIV incidence rate, serving as an example to encourage others to follow suit. Accurate measurement of HIV incidence is taking on a new level of importance for measuring the effect of population-level interventions and monitoring progress on the path to HIV epidemic control.

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I declare no competing interests

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