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How well do trends in HIV prevalence in young people reflect HIV incidence? Results from 10 years of HIV serosurveillance in San Francisco

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Trends in HIV prevalence among young populations (15–24 years) are held to approximate trends in HIV incidence. Using the Serological Testing Algorithm for Recent HIV Seroconversion (STARHS) to estimate HIV incidence, we were able to demonstrate that this assumption was true for young patients at San Francisco's public sexually transmitted infection clinic from 1989 to 1998. However, the trend in prevalence among young people did not mirror trends in incidence in the overall population.

The recent UNAIDS update on the global HIV/AIDS epidemic reports the good news of potential declines in HIV prevalence in three sub-Saharan African countries: Kenya, Uganda, and Zimbabwe [1]. In Zimbabwe, the decline in HIV prevalence among pregnant young women (aged 15–24 years) is provided as evidence that the rate of new HIV infections (incidence) in the overall population could also be slowing.

Two widely held assumptions underpin the interpretation of these data. One assumption is that trends in HIV prevalence among the youngest age group (i.e. those under 24 years) will reflect trends in HIV incidence in that age group. This assumption is based upon the reasoning that the onset of sexual risk behavior is recent among younger individuals. The second assumption is that the trends in HIV prevalence in younger populations, when used to estimate HIV incidence, will predict the incidence rates in the population as a whole. Although widely held, these assumptions have rarely been validated with empirical data.

Data on temporal trends in HIV incidence are difficult to obtain. Throughout the world, the epidemic is tracked through serial cross-sectional HIV prevalence surveys called 'sentinel surveillance', usually among women in antenatal clinics or patients of sexually transmitted diseases (STD) clinics. Although it is acknowledged that these data may not reflect the absolute levels of HIV prevalence in the population as a whole [2], it is widely believed that they reflect temporal trends in the epidemic. However, trends in HIV prevalence (i.e. the proportion of individuals living with HIV, including old and new infection) do not always reflect trends in HIV incidence (i.e. the rate of new infection) [3,4].

In San Francisco, we have the opportunity to compare 10 years of HIV prevalence and HIV incidence data in a sentinel surveillance site at the municipal STD clinic. The data permit an examination of the temporal trends in HIV prevalence and incidence for the youngest age group (i.e. under 24 years) in the context of a mature epidemic. Details of this surveillance activity have been reported in elsewhere [3]. In brief, serial cross-sectional surveys were conducted by retaining the left-over sera collected from a consecutive sample of individuals screened for syphilis at the city's only public STD clinic from 1989 to 1998. HIV testing is carried out after the permanent removal of all identifying information. HIV incidence was estimated using the Serological Testing Algorithm for Recent HIV Seroconversion (STARHS) [5]. Trends in HIV prevalence and incidence were assessed using logistic regression models.

Between 1989 and 1998, a total of 34 866 serum samples were collected, and 3314 were HIV positive. STARHS testing was performed on 97% of the stored HIV-positive samples (3225 total samples). The percentage of the population during these 10 years who were 24 years old or younger peaked at 33.3% in 1991, and fell to a low of 22.8% in 1996.

Trends in HIV prevalence and incidence in the 24 years and younger age group are presented in Figure 1. There was a significant decline in HIV prevalence among STD clinic attendees aged less than 24 years from 1989 to 1998 [odds ratio (OR) per year 0.84; 95% confidence interval (CI) 0.80, 0.89]. In parallel, HIV incidence significantly declined over the same period (OR per year 0.88; 95% CI 0.77, 1.0) for this age group. In contrast, the temporal trend in HIV prevalence among clinic attendees of all ages did not mirror the trend in HIV incidence among all ages. Whereas HIV prevalence declined significantly (OR per year 0.92; 95% CI 0.91, 0.94), HIV incidence remained stable (OR per year 1.0; 95% CI 0.98, 1.1). Of note is the fact that the trend of HIV prevalence among attendees under 24 years of age did not mirror or predict the trend in HIV incidence for all ages.

Limitations to interpreting our data include the inability to distinguish patients receiving antiretroviral therapy that may falsely appear to have a new infection by STARHS testing when they have been infected for a longer period of time [5]. Although this may have led to overestimating

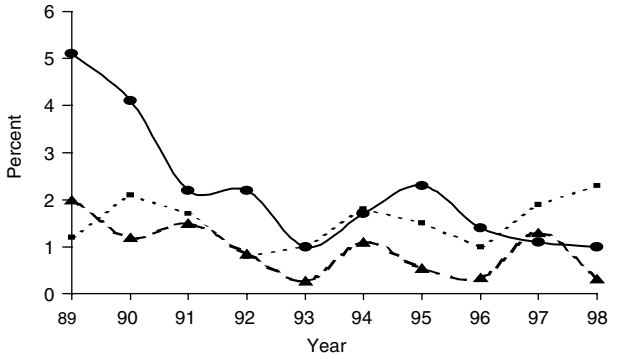

Fig. 1. Temporal trends in HIV prevalence and HIV incidence among sexually transmitted infection clinic attendees, San Francisco, 1989–1998. —●— HIV prevalence, 24 years of age. Significant decreasing trend, odds ratio (OR) per year 0.84 [95% confidence interval (CI) 0.80, 0.89]. - - ▲ - - HIV incidence, 24 years of age. Significant decreasing trent, OR per year 0.88 (95% CI 0.77, 1.0). - - ■ - - HIV incidence, all ages. No significant trend, OR per year 1.0 (95% CI 0.98, 1.0).

incidence in the later years of the study, the effect was not likely to be large. Another limitation is that individuals with known HIV infection may have chosen to get care elsewhere over the years, impacting the trend in declining prevalence. Finally, there were low numbers of recent infections, particularly when stratified by age and year, which reduced the precision of our estimates.

Our study supports the assumption that trends in HIV prevalence in the youngest age group mirror trends in HIV incidence in that age group. We recognize that most of the HIV-positive individuals in San Francisco are men who have sex with men, and that limits how generalizable these data are to the situation in the developing world. That being said, these findings compare with those reported by Wawer *et al.* [4] on cohort data from Rakai, Uganda, in which they noted a downward trend in both the prevalence and incidence of HIV among individuals aged 15–24 years, but the trend in incidence was not statistically significant. However, our data do not support the assumption that the trends in HIV prevalence in the youngest age group can be used to project trends in the HIV epidemic in the whole population. In our sample, HIV prevalence among young STD patients declined, whereas HIV incidence overall remained level. It is possible that HIV incidence may shift to older populations over time, particularly in mature epidemics.

Relying on trends in HIV prevalence in the youngest age groups as a marker for the epidemic as a whole may miss changes in the age structure of the epidemic over time. Whereas it is good news that Zimbabwe may see a slowing of new infection in young persons, it is unclear whether this should lead us to conclude that HIV incidence is also slowing in the older population. The continued development of simple, valid, and reliable serological methods to estimate incidence using cross-sectional data are essential tools with which to monitor the HIV epidemic worldwide.

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Received: 21 February 2006; revised: 2 March 2006; accepted: 9 March 2006.

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Out-of-pocket costs of HAART limit HIV treatment responses in Botswana's private sector

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A large number of HIV-infected patients in sub-Saharan Africa pay out-of-pocket for HAART. This analysis from Botswana indicates that higher median out-of-pocket regimen costs to patients for the initial 30 days of HAART are associated with failure to achieve a viral load< 400 copies/ml [US$32; interquartile range (IQR), 20–84 compared with US$22; (IQR, 17–36), $P = 0.001$]. HAART costs should be minimized as scale-up efforts in sub-Saharan Africa progress.

HAART is available at clinics in Africa where patients pay for care [1–6], but patients treated at free clinics have higher response rates compared with patients treated at sites that charge [7,8]. Studies documenting this have not controlled for potential confounding, and individual patient charges were not measured.