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Factors associated with incident HIV infection versus prevalent infection among youth in Rakai, Uganda

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Abstract Factors associated with prevalent and incident HIV infection were compared among sexually experienced Ugandans aged 15–24. Most factors were similar. However, in women, older age and current marriage were associated with prevalent, but not incident, infection. It is important to recognize the limitations of prevalence analyses for identifying at-risk youth.

1. Introduction

Youth (15–24 years) represent 39% of all new HIV infections [1], and nearly 80% of the 5 million youth living with HIV reside in Sub-Saharan Africa (SSA) [2].

Most studies examining the factors associated with HIV infection in SSA youth have been cross-sectional with prevalent, not incident, infection as an outcome [3]. Prevalent infections in youth are likely to be relatively recent because of the recent initiation of sex, and therefore, factors associated with prevalent infection may approximate those of incident HIV. However, without a formal comparison, this remains an untested hypothesis. Epidemiologic principles [4] and available comparisons [5] suggest they might differ.

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This study investigated whether similar factors were associated with incident [6] and prevalent HIV infection among youth in the Rakai District of Uganda.

2. Materials and methods

This study used a prospective longitudinal study design. The study population was sexually experienced youth participating in the on-going Rakai Community Cohort Study (RCCS) between March 1999 and April 2008. The RCCS is an open cohort of residents aged 15—49 years from 50 communities in the Rakai district of southwestern Uganda. Communities are surveyed approximately annually [7].

Between March 1999 and April 2008 there were 7 RCCS survey rounds and 15,173 participants 15—24 years of age who ever had sex and were tested for HIV. These participants are eligible for the analysis of prevalent infection. Incident analyses were restricted to initially HIV-negative youth who were followed up at one or more study visits with no more than 1 survey round missing (n = 6741). HIV status was determined by two separate ELISA tests and confirmed by HIV-1 western blot [7].

Institutional review board (IRB) approvals were obtained from the Uganda Virus Research Institute's Science and Ethics Committee, Uganda National Council for Science and Technology, and IRBs at Columbia and Johns Hopkins universities and Western IRB in the United States.

2.1. Analyses

A recently published incident analysis which estimated incident rate ratios (IRR) [6] was compared with analyses in which the outcome was prevalent HIV. Prevalence rate ratios (PRR) were estimated using modified Poisson regression [8] with generalized estimating equations (GEE) and robust standard errors to account for repeated observations per person. To address concerns that results could be biased toward participants with multiple observations, additional analyses were performed in a subsample wherein one observation was chosen at random per individual. The results (not shown) were similar to those presented in this paper.

This study presents unadjusted and multivariate analyses. For multivariate models, variable selection was conducted by first performing backward selection in domain-specific models (domains: demographic, sexual behaviors, alcohol use and sexually transmitted infection [STI] symptoms) and then backward selection in models containing statistically significant factors from the domain-specific models [6].

For all factors, incident HIV and prevalence analyses were qualitatively compared by measures of association, magnitude, statistical significance and inclusion in the multivariate model. Additional analyses were conducted to explore differences observed between the prevalent and incident analyses with respect to age and marital status.

3. Results

Among the 15,173 sexually experienced youth, there were 27,228 observations eligible for the analysis of prevalent HIV infection and 12,111 for the incidence analysis. Most observations eligible for the prevalence, but not the incidence, analysis were baseline observations (87.0%). HIV prevalence at baseline was 2.5% in young men and 9.9% in young women.

In the unadjusted analyses, most factors associated with incident infection were similar to prevalent infection (Table 1). Among young men, incident and prevalent HIV were positively associated with older age, marital status, not being enrolled in school, alcohol consumption, number of sexual partners, sexual concurrency and STI symptoms. Never having attended school was associated with prevalent (PRR: 2.46; confidence interval (CI): 1.40—4.32), but not incident, infection (IRR: 0.63; CI: 0.09—4.45).

Among young women, both incident and prevalent HIV infection were positively associated with residence in a trading village, former marriage, not being enrolled in school, number of partners, concurrency and STI symptoms (Table 1). Older age was positively associated with prevalent (PRR: 1.79; CI: 1.62—1.98), but not incident, infection (IRR: 0.92; CI: 0.64—1.33). Current marriage was negatively associated with incident (IRR: 0.55; CI: 0.37—0.81), but not prevalent, infection (PRR: 1.12; CI: 0.96—1.29).

The strength of association was generally greater in the incident analyses for sexual behaviors and STI symptoms (Table 1). For some factors, including condom use and alcohol consumption in young women, the measures of association were similar between the unadjusted incident and prevalent analyses, but statistical significance was constrained by sample size. More factors were selected for the multivariate model in the prevalence than incidence analyses, including older age, condom use and additional STI symptoms