HIV/AIDS, knowledge of sero-status, and sexual and reproductive experiences and intentions of adolescents in Uganda

Francis Obare, Population Council, Nairobi

Harriet Birungi, Population Council, Nairobi

Abstract

This paper compares the sexual and reproductive experiences and intentions of adolescents aged 15-19 years who are perinatally infected with HIV and know their sero-status to those of adolescents who do not know their sero-status using data from Uganda. Analysis involves a simple comparison of means and proportions as well as estimation of random-effects logit and Cox proportional hazards models. The findings show that both groups of adolescents do not significantly differ in terms of sexual debut and whether they intend to have children in future. However, adolescents who are HIV positive and know their status are significantly more likely to use a modern method of contraception, use condoms, and to want to have children later in life. Nonetheless, the level of condom use among these adolescents is still limited (less than half of those sexually active) and inconsistent (less than half of those in relationships reported always using condoms).

Introduction

In a high HIV prevalence setting such as sub-Saharan Africa (SSA) and where heterosexual contact is the predominant mode of HIV infection, the chances of acquiring the virus can be very high in certain circumstances such as cases of acts of unprotected sex with many partners and other pre-existing sexually transmitted infections (STIs). But how would HIV/AIDS affect sexual activity? Would the knowledge of one's HIV status lead to more careful or to further high-risk sexual behaviour? The evidence here is mixed. On the one hand, there are studies that found positive changes in sexual behaviours of HIV-positive individuals and sero-discordant couples after they received voluntary counselling and testing (VCT) for HIV (Voluntary HIV-1 Counseling and Testing Efficacy Study Group 2000; Allen et al. 2003; Marks et al. 2005). On the other hand, there are studies that have documented high-risk sexual behaviours among HIV-positive individuals, who are aware of their sero-status, especially with partners who are also HIV-positive (Kalichman 2000; Rice et al. 2006; Bell et al. 2007; Golden et al. 2007; Johnson and Buzducea 2007). Other studies among those who are HIV-negative have also found higher likelihood of engaging in high-risk sexual behaviours after than before VCT (Matovu et al. 2007).

Most of the above studies focus on adults and married couples. It is, however, not clear whether and how the knowledge of one's HIV status would affect the sexual behaviour of adolescents, that is, those aged 10-19 years according to the World Health Organization's (WHO) definition (WHO 2002). The interest in this topic and age group is guided by a number of factors that suggest potentially conflicting scenarios. First, as evidence from the Demographic and Health Surveys (DHS) indicates, ages 10-19 years are a critical stage when many young people in SSA explore their sexuality. Thus, we should expect that regardless of the knowledge

of their HIV status, all adolescents are inclined to explore their sexuality. Second, emerging evidence indicates that many service providers and counsellors working with adolescents living with HIV emphasize refraining from or postponement of sexual initiation for this segment of the population (Birungi et al. 2009a). We should therefore expect more careful sexual behaviour among these adolescents, especially with respect to abstinence, compared to their counterparts who do not have regular contacts with the HIV/AIDS treatment, care and support programmes. Third, HIV/AIDS programmes in many countries in the region are organized around paediatric and adult care. This implies that the sexual and reproductive health (SRH) needs of those who are transitioning to adolescence and early adulthood (that is, those aged 10-19 years), but who do not fit under the paediatric or adult care clinics, are inadequately addressed by the existing programmes. In this respect, we should expect no difference in the sexual behaviour of adolescents who know their HIV status and those who do not.

In this paper, we compare the sexual and reproductive experiences and intentions of adolescents perinatally infected with HIV who knew their sero-status to those of adolescents in the general population who reported that they had never been tested for HIV or that they had been tested but they did not obtain their test results. Using data from Uganda, we specifically explore whether there were significant differences between the two groups of adolescents in terms of having: 1) had sex, 2) used a method to prevent HIV infection, re-infection, and/or pregnancy, 3) ever been pregnant, 4) living children, and 5) the intention of getting children in future. Uganda presents an interesting case study because it was once characterized by high HIV prevalence but has been touted as a showcase in HIV prevention efforts, though this is itself subject to debate (see, for instance, Allen 2006).

Data sources

The data for this study come from two sources. Information on adolescents aged 15-19 years who were HIV positive and knew their sero-status (hereafter referred to as "those who knew their HIV status") comes from the Population Council Study (PCS) that was conducted in 2007. The Uganda Demographic and Health Survey (UDHS) that was conducted in 2006, on the other hand, provides the data on the adolescents (of similar age groups) who did not know their HIV status.

Population Council Study (PCS)

The Population Council study was conducted in four districts in Uganda, namely, Kampala, Wakiso, Masaka, and Jinja. Its overall aims were to better understand the notions of sexuality among HIV-positive adolescents aged 10-19 years, identify gaps in sexual and reproductive health (SRH) information and services for this group, and identify and develop interventions that integrate SRH issues into HIV/AIDS treatment, care, and support programs for the adolescents (Birungi et al. 2008). Sexuality in this context was broadly defined to encompass not only sexual experiences and practices but also desires, beliefs, values, anxieties and fears surrounding such experiences/practices. The project involved quantitative interviews with a sample of 732 HIV-positive adolescents aged 15-19 years who were aware of their HIV sero-status, seven focus group discussions with another 48, and in-depth interviews and ethnographic case stories with another 12, four of whom participated in the survey. The study participants were identified and recruited through the existing HIV/AIDS treatment, care, and support programs/centres in the four districts. Nine of these centres/facilities were in Kampala, six in Jinja, three in Masaka, and two in Wakiso district.

The study obtained ethical clearance from the Internal Review Board of The AIDS Support Organization (TASO)- Uganda, the Uganda National Council of Science and Technology (UNCST), and the Population Council Ethical Research Review Committee. The management of the centres/facilities granted the research team access to the client registers. The data clerks/officers at the centres/facilities assisted with identifying clients aged 15-19 years and from these, the counsellors identified those clients who were presumed to be (i.e., those who have been living with HIV since infancy) or recorded as perinatally infected with HIV and who knew their sero-status. For respondents aged 15-17 years who had parents/guardians, informed consent to participate in the study was sought at two levels: from their parents/guardians and then from the adolescents themselves. Respondents aged 15-17 years without parents/guardians and those aged 18-19 years provided individual consent only. It is worth noting here that the Ugandan constitution considers individuals aged 18 years and above as adults who can grant consent to participate in a research study. In addition, the Uganda National Council of Science and Technology allows those aged below 18 years and who do not have parents/guardians to grant such consent provided that they are thoroughly informed about the risks involved.

The study also involved in-depth interviews with four purposively selected counsellors, one from each of the four districts, to obtain some insights on provider perspectives regarding SRH counselling and services for HIV-positive adolescents. In addition, a stakeholder analysis was also undertaken using unstructured interview questions administered to 23 key informants from governmental institutions, private organizations, non-governmental organizations, health development partners and technical assistance agencies in Uganda. The interviews focused on the availability of national and institutional policy guidelines on adolescent SRH, the content of training on counselling and services, how broad SRH concerns of HIV-positive adolescents are

handled within existing services, and whether existing programs have the capacity to handle SRH concerns of HIV-positive adolescents.

This paper relies on the quantitative interviews with the HIV-positive adolescents. A total of 740 HIV-positive adolescents were identified for the interviews but two refused to participate while six participated but did not complete the interviews. The reasons for not completing the interviews included the inability of the respondent to continue because of feebleness resulting from breakdown as well as doubts about the respondent's peri-natal infection status. A structured questionnaire was used to collect information ranging from basic socio-demographic characteristics to access to information and support services for the HIV-positive adolescents, sexual behaviour and desires, knowledge and use of preventive methods for HIV re-infection and pregnancy, pregnancy and childbearing experiences and intentions, and issues of self-esteem, worries, sexual and physical violence. In this paper, we focus on sexual behaviour, use of preventive methods, and pregnancy and childbearing experiences and intentions. The questionnaires were translated into two major local languages (*Luganda* and *Lusoga*) and administered by trained interviewers. The location of the interview depended on the respondent's preference taking into account the need for privacy and confidentiality.

Uganda Demographic and Health Survey (UDHS)

The UDHS comprised a nationally-representative probability-based sample of men and women of reproductive age. The sample was identified in two stages. The first stage involved a selection of 321 clusters from a list of clusters sampled in the 2005-2006 Uganda National Household Survey (UNHS), 17 clusters from the 2002 Census for Karamoja District, and 30 internally displaced persons camps from a list of camps compiled by the United Nations Office for the

Coordination of Human Affairs (UBOS and ORC Macro 2007). In the second stage, a sample of 9,864 households was selected from these primary sampling units; interviews were conducted in 98 per cent of these households (UBOS and ORC Macro 2007). All women aged 15-49 years who were either permanent residents or visitors present in the selected households on the night before the survey were eligible for interviews. A total of 9,006 women were eligible and interviews were conducted with 95 per cent of them (UBOS and ORC Macro 2007). In addition, in one-third of all the selected households, all men aged 15-54 years were eligible to be interviewed if they were either permanent residents or visitors present in the household on the night before the survey. From a total of 2,760 eligible men, 91 per cent were interviewed (UBOS and ORC Macro 2007).

Information was collected on basic socio-demographic characteristics, sexual activity, fertility experiences and intentions, awareness and use of family planning methods, maternal and child health, mortality, as well as on awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections. Similar to the PCS, we focus on sexual activity, fertility experiences and intentions, and the use of methods to prevent pregnancy and HIV infection among male and female respondents aged 15-19 years. Unlike the PCS, however, the UDHS sample for this analysis excludes those adolescents who reported that they had taken an HIV test before and that they obtained their test results i.e. those who knew their HIV sero-status. Out of 8,531 women aged 15-49 years who were interviewed, 1,948 (23 per cent) were aged 15-19 years and 274 (14 per cent) of these reported having been tested and obtaining the test results. A total of 2503 men aged 15-54 years were interviewed, 582 (23 per cent) were aged 15-19 years, and 43 (7 per cent) of these reported that they had been tested for HIV and that they obtained their test results.

Methods of analysis

We use three approaches to examine whether the sexual and reproductive experiences and intentions of the adolescents differ by knowledge of HIV status. The first approach is a simple comparison of means and proportions together with the relevant significance tests, that is, the *student's t-test* for means and significance tests of proportions. We compare the two groups of adolescents in terms of the basic socio-demographic characteristics (*age, sex*, and *current marital status*), sexual activity and contraceptive use (the proportion that had ever had sex, and among those who had, the mean age at first sex, the proportion that used a method to prevent HIV infection, re-infection, and/or pregnancy at first sex, the proportion that had ever used a contraceptive method, and the proportion currently using condoms), and pregnancy and childbearing experiences and intentions (the proportion that had ever been pregnant, the proportion with at least one living child, the proportion that intends to have children in future and how soon, and the mean number of desired children).

The second approach aims at modelling the time to first sex or censoring by knowledge of HIV status controlling for respondents' age and sex. We estimate a Cox proportional hazards model of the form:

$$h(t \mid x_j) = h_0(t)\exp(x_j\beta) \qquad [1]$$

where $h(t \mid x_j)$ is the hazard of having had first sex at time t for the j^{th} individual with a given set of measured characteristics x_j, $h_0(t)$ is the baseline hazard, and β are the regression coefficients. The advantage of the Cox model is that it makes no assumptions about the functional form of the baseline hazard or the shape of the hazard over time (Cleves et al. 2004). Such assumptions, if wrong, could lead to misleading estimates of β. This, however, results in loss in efficiency since

knowing the functional form of the baseline hazard could lead to better estimates of β (Cleves et al. 2004). The model assumes that the covariates multiplicatively shift the baseline hazard such that an individual's hazard is a constant multiple of every other individual's hazard.

The third analysis approach involves estimating random-effects logit models predicting the probability of *using a preventive method at first sex, ever use of a method of contraception, current use of a modern method of contraception, current use of condoms, ever having been pregnant, intention to have children in future,* and the *intended timing of future child birth*. Models for pregnancy experiences and childbearing intentions are estimated for female respondents only since the UDHS did not ask male respondents similar questions in a manner that would be comparable to those of the PCS. The model specification is as follows:

$$\log it(\pi_{ij}) = \beta X_{ij} + \mu_{ij} \qquad [2]$$

where π_{ij} is the probability of a given outcome for individual i in district j; X_{ij} is the vector of covariates including *knowledge of HIV status*; β is the associated vector of parameter estimates; and μ_{ij} is the disturbance term due to unmeasured characteristics that also affect a given outcome for individual i in district j.

The random-effects approach is necessitated by the fact that the two sources of data have only a few characteristics that are comparable and which can be used as controls in a multivariate analysis framework. These include respondent's *age* (in single years), *sex, current marital status* (whether the individual was married or living together with someone at the time of the survey), and *current living arrangements* (whether the individual was living with at least one biological parent at the time of the survey). Models that do not account for unmeasured characteristics may therefore result in inconsistent estimates of β. The model takes account of unmeasured characteristics at the district level. This is because though the district is larger than a sample

cluster, it was the only level of aggregation that was common to both datasets. The model's major drawback is its assumption that the unmeasured characteristics are uncorrelated with the measured variables, an assumption which, if violated, still leads to inconsistent estimates of β (Petersen 2004).

Results

Comparisons of means and proportions

The results of the comparison of the two groups of adolescents in terms of the various characteristics are presented in Table 1. Whereas there is no significant difference in the mean ages of the two groups, this masks the significant differences in the distribution across ages. In addition, a significantly higher proportion of respondents who did not know their HIV status were married or living together at the time of the survey compared to their counterparts who were HIV positive and knew their status.

<Table 1 about here>

With respect to sexual activity and contraceptive use, there is no significant difference between the two groups of adolescents in terms of the proportion of respondents that had ever had sex. It is, however, interesting to note that a significantly higher proportion of those who were HIV positive and knew their HIV status report using a preventive method at first sex, ever use of a contraceptive method, current use of a modern method of contraception, and current condom use compared to those who did not know their status. The higher proportions of adolescents who were HIV positive and knew their HIV status reporting using preventive methods might, perhaps, suggest more careful sexual behaviour on their part.

The results of the comparisons further show that among female respondents who had ever had sex, a significantly higher proportion of those who did not know their HIV status report having been pregnant compared to those who were HIV positive and knew their status (Table 1). Among female respondents who had ever been pregnant, the proportion reporting having at least one living child is lower among those who were HIV positive and knew their status than among those who did not know their HIV status. Although this is consistent with the differential mortality of children by mothers' HIV status-- children of HIV-positive mothers are likely to experience high mortality if the virus was passed on to them-- the difference is not statistically significant.

The results also show that a significantly higher proportion of female respondents who did not know their HIV status intend to have children in future compared to their counterparts who were HIV positive and knew their status. Moreover, the average number of children that female respondents intend to have is significantly higher among those who did not know their HIV status than among those who were HIV positive and knew their status. These results might be consistent with the notion that HIV/AIDS could result in low fertility among HIV-positive women not only through reduced physical capacity to conceive and give birth but also through reduced intention to have children. The assumption here is that such women would live to realize their fertility intentions. However, fertility intentions may change with time while the ability to realize them can also be affected by the socio-economic and cultural environment that could affect the women's ability to make decisions concerning their fertility.

Multivariate analysis

The results of the Cox model predicting the hazard to first sex or censoring confirm the results of the above comparisons that show no significant difference in the proportions that had ever had sex by knowledge of HIV status, although those who were HIV positive and knew their status had a lower hazard of having had sex or being censored by the time of the survey (hazard ratio: 0.92; 95% CI: 0.80 – 1.07). In contrast, whereas the comparisons show significant differences by knowledge of HIV status with respect to ever use of a preventive method at first sex, ever use of contraception, pregnancy experience, and whether an individual intended to have children in future, these differences cease to be significant once the individual characteristics are controlled for (Tables 2). Nonetheless, adolescents who were HIV positive and knew their HIV status are significantly more likely to report using a modern method of contraception, current condom use, and the intention to have children later in life compared to their counterparts who did not know their status after controlling for the individual characteristics.

<Table 2 about here>

Another interesting finding from the multivariate analyses (not shown) is that living with at least one biological parent is significantly associated with a lower likelihood of having had sex compared to living with other persons (β=-0.40; p<0.01). This is consistent with previous studies, for instance by Ngom et al. (2003) which found reduced odds of having poor adverse reproductive health outcomes among teenage girls in Nairobi slums if they lived with their biological father. In addition, being married or living together with someone is significantly associated with a lower likelihood of ever use of a contraceptive method, current use of a modern method of contraception, and current use of condoms (Table 2). This is consistent with evidence

of disapproval of condom use within marital and other stable unions in other parts of sub-Saharan Africa (Bauni and Jarabi 2003; Chimbiri 2007).

Discussion

One of the major findings of this paper is that there was no significant difference in the likelihood of having had sex by knowledge of HIV status among adolescents aged 15-19 years in Uganda. This is consistent with the hypothesis that these are critical ages when most young people in SSA explore their sexuality. Indeed, qualitative interviews with the adolescents perinatally infected with HIV and who knew their sero-status showed a general feeling among them that having sex is unavoidable (Birungi et al. 2009b). The second major finding is that though adolescents perinatally infected with HIV and who knew their sero-status were just as likely to have had sex as other adolescents, they were significantly more likely to report using a modern method of contraception or condoms compared to their counterparts who did not know their status. Whereas this seems encouraging, the results show that condom use among adolescents who were HIV positive and knew their sero-status is still limited (less than half of those sexually active). In addition, both quantitative and qualitative evidence showed that these adolescents did not consistently use condoms (Birungi et al. 2009a). For instance, among those who were currently in a relationship, less than half reported always using condoms. This suggests that young people living with HIV may be at risk of spreading the virus to their uninfected (discordant) partners if they engage in unprotected sex.

We further find that after controlling for the background characteristics, the two groups of adolescents (female respondents who were HIV positive and knew and those who did not know their HIV status) did not significantly differ in terms of whether they intended to have

children in future. For adolescents living with HIV and who knew their sero-status, this is not surprising given the availability of prevention of mother-to-child transmission (PMTCT) of HIV and antiretroviral treatment (ART) services. Furthermore, the fact that they were identified through the existing HIV/AIDS treatment, care and support centres implies that they are well-informed about HIV/AIDS and are exposed to ART services that would greatly postpone their own mortality as well as prevent the transmission from the mother to the infant. However, the intention to have children in future has implications for HIV transmission in discordant relationships. Despite the lack of significant difference in the intention to have children in future by knowledge of HIV status, those who were HIV positive and knew their sero-status were significantly more likely to intend to have children later compared to those who did not know their status. In addition, the descriptive results show that compared to adolescents who did not know their HIV status, those who were HIV-positive and knew, on average, intended to have fewer children. This suggests that in the long-term, HIV/AIDS might lead to lower fertility among this group compared to their counterparts in the general population since by the time they are ready to have children, their capacity to conceive might already be impaired by the virus.

These findings might be affected by the study's limitations. To begin with, differences between the two groups of adolescents in terms of sexual and reproductive experiences and intentions could also be affected by differences in the time of the survey. However, since the two surveys were conducted roughly one year apart, it is unlikely that the short duration could witness huge changes in the indicators of interest. Second, the multivariate analyses do not control for education, which could be a major factor influencing the sexual and reproductive behaviour of the adolescents, mainly because of data limitations. The PCS only collected information on whether the respondent was in or out of school while the UDHS collected

information on the education level with no indication of whether an individual was in or out of school. Third, the reporting of sexual behaviour has been found to be problematic with male respondents over-reporting and female respondents under-reporting on their experiences (Eggleston et al. 2000; Buvé et al. 2001; Fenton et al. 2001; Mensch et al. 2003; Curtis and Sutherland 2004). However, as long as the reporting error by sex was in the same direction in both surveys, this is not likely to greatly affect the comparison of the two groups. It could, however, pose serious limitations to the study if, for instance, adolescents who were HIV positive and knew their status tended to under-report while those who did not know their status tended to over-report on their experiences. Finally, the study does not differentiate whether first sex was consensual (both partners willing) or otherwise. Whereas the PCS collected information on the circumstances of first sex, the UDHS did not. Thus, for comparability purposes, the study focused on all those who had ever had sex regardless of whether it was consensual or not.

Acknowledgements

The Population Council project was co-funded by the Ford Foundation and the United States Agency for International Development (USAID). It was implemented by The AIDS Support Organization (TASO)-Uganda and the Population Council. The successful completion of the project was also made possible by the support from the HIV/AIDS treatment centres and the research assistants. The 2006 Uganda Demographic and Health Survey (UDHS) was conducted by the Uganda Bureau of Statistics (UBOS) with technical assistance from Macro International Inc. The survey was funded by the USAID/Uganda Mission, the United Kingdom Department for International Development (DFID), the President's Emergency Plan for AIDS Relief (PEPFAR), the Government of Uganda, the Health Partnership Fund, the United Nations Children's Fund (UNICEF), the United Nations Population Fund (UNFPA), and the Government of Japan. The opinions expressed in the paper are, however, the authors' and do not necessarily reflect the views of the implementing or donor agencies.

References

Allen, Susan, Jareen Meinzen-Derra, Michele Kautzmana, Isaac Zulud, Stanley Traske, Ulgen Fidelia, Rosemary Musondag, Francis Kasolod, Feng Gaoe, and Alan Haworthh. 2003. "Sexual behavior of HIV discordant couples after HIV counseling and testing." *AIDS* 17:733-740.

Allen, Tim. 2006. "AIDS and evidence: Interrogating some Ugandan myths." *Journal of Biosocial Science* 38:7-28.

Bauni, Evasius K. and Ben Obonyo Jarabi. 2003. "The Low Acceptability and Use of Condoms within Marriage: Evidence from Nakuru District, Kenya." *African Population Studies* 18(1):51-65.

Bell, D.C., J.S. Atkinson, V. Mosier, M. Riley, and V.L. Brown. 2007. "The HIV transmission gradient: Relationship patterns of protection." *AIDS and Behavior* 11(6):789-811.

Birungi, Harriet, John F. Mugisha, Francis Obare, and Juliana Nyombi. 2009a. "Sexual behaviour and desires among adolescents perinatally infected with HIV in Uganda: Implications for programming." *Journal of Adolescent Health* 44(2): 184-187.

Birungi, Harriet, Francis Obare, John Frank Mugisha, Humphres Evelia, and Juliana Nyombi. 2009b. "Sexual expressions, experiences and preventive service needs of young people perinatally infected with HIV in Uganda." *AIDS Care* 21(6):725-731.

Birungi, Harriet, John Frank Mugisha, Juliana Nyombi, Francis Obare, Humphres Evelia, and Hannington Nyinkavu. 2008. "Sexual and reproductive health needs of adolescents perinatally infected with HIV in Uganda." *FRONTIERS Final Report*. Washington, DC: Population Council.

Buvé, A., E. Lagarde, M. Caraël, N. Rutenberg, et al. 2001. "Interpreting sexual behaviour data:

Validity issues in the multicentre study on factors determining the differential spread of HIV in four African cities." *AIDS* 15(suppl 4): S117-S126.

Chimbiri, Agnes M. 2007. "The condom as an 'intruder' in marriage: Evidence from rural Malawi." *Social Science & Medicine* 64: 1102-1115.

Cleves, Mario A., William W. Gould, and Roberto G. Gutierrez. 2004. *An introduction to survival analysis using Stata®*, Revised edition. College Station, Texas: Stata Corporation.

Curtis, S.L. and E.G. Sutherland. 2004. "Measuring sexual behaviour in the era of HIV/AIDS: The experience of Demographic and Health Surveys and similar enquiries." *Sexually Transmitted Infections* 80(suppl ii): ii22-ii27.

Eggleston, Elizabeth, Joan Leitch, and Jean Jackson. 2000. "Consistency of self-reports of sexual activity among young adolescents in Jamaica." *International Family Planning Perspectives* 26(2): 79-83.

Fenton, Kevin A., Anne M. Johnson, Sally McManus, and Bob Erens. 2001. "Measuring sexual behaviour: Methodological challenges in survey research." *Sexually Transmitted Infections* 77:84-92.

Golden, M.R., R.W. Wood, S.E. Buskin, M. Fleming, and R.D. Harrington. 2007. "Ongoing risk behavior among persons with HIV in medical care." *AIDS and Behavior* 11(5):726-735.

Johnson, B.T., and D. Buzducea. 2007. "HIV-positive Romanian adolescents: Acquisition routes, risk behaviors, and psychological correlates." *AIDS and Behavior* 11(5):716-725.

Kalichman, S.C. 2000. "HIV transmission risk behaviors of men and women living with HIV-AIDS: Prevalence, predictors, and emerging clinical interventions." *Clinical Psychology: Science and Practice* 7(1): 32–47.

Marks, G., N. Crepaz, J.W. Senterfitt, and R.S. Janssen. 2005. "Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: Implications for HIV prevention programs." *Journal of Acquired Immune Deficiency Syndrome* 39:446–453.

Matovu, J.K.B., R.H. Gray, N. Kiwanuka, F. Wabwire-Mangen, F. Nalugoda, D. Serwadda, N.K. Sewankambo, and M.J. Wawer. 2007. "Repeat voluntary HIV counseling and testing (VCT), sexual risk behavior and HIV incidence in Rakai, Uganda." *AIDS and Behavior* 11: 71-78.

Mensch, Barbara S., Paul C. Hewett, and Annabel S. Erulkar. 2003. "The reporting of sensitive behavior by adolescents: A methodological experiment in Kenya." *Demography* 40(2): 247-268.

Ngom, Pierre, Monica A. Magadi, and Tom Owuor. 2003. "Parental presence and adolescent reproductive health among the Nairobi poor." *Journal of Adolescent Health* 33(5):369-377.

Petersen, Trond. 2004. "Analyzing Panel Data: Fixed- and Random-Effects Models." In Melissa A. Hardy and Alana Bryman (eds.). *Handbook of Data Analysis*. London: Sage Publications Ltd.

Rice, E., P. Batterham, and M.J. Rotheram-Borus. 2006. "Unprotected sex among youth living with HIV before and after the advent of highly active antiretroviral therapy." *Perspectives on Sexual and Reproductive Health* 38(3):162–167.

Uganda Bureau of Statistics (UBOS) [Uganda] and Macro International Inc. 2007. *Uganda Demographic and Health Survey 2006*. Calverton, Maryland, USA, UBOS and Macro International Inc.

Voluntary HIV-1 Counseling and Testing Efficacy Study Group. 2000. “Efficacy of voluntary HIV-1 counseling and testing in individuals and couples in Kenya, Tanzania, and Trinidad: A randomized trial.” *Lancet* 356:103–112.

World Health Organization [WHO]. 2002. “Sexual and reproductive health of adolescents.” In *Progress in Reproductive Health Research*, No. 58. UNDP/UNFPA/ WHO/ World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP).

Table 1: Comparison of respondents according to HIV status and knowledge by various characteristics, PCS 2007 and UDHS 2006

Characteristics	Percent/mean Knows HIV status (PCS)	 Does not know HIV status (UDHS)
All respondents	(*N* = 732)	(*N* = 2,213)
Mean age (years)	16.7	16.7^{ns}
Age in single years (%)		
15	33.5	26.6**
16	16.1	22.6**
17	9.3	18.8**
18	23.9	17.3**
19	17.1	14.7^{ns}
Percent female	64.1	75.7**
Percent married/living together	2.1	12.5**
Male respondents	1.5	1.9^{ns}
Female respondents	2.4	16.0**
Percent ever had sex	33.1	36.0^{ns}
Respondents who had ever had sex	(*N* = 242)	(*N* = 795)
Mean age at first sex	14.5	15.1**
Used a preventive method/condom at first sex (%)	36.4	27.9*
Ever used a contraceptive method (%)	49.6	40.8*
Currently using a modern method (%)	42.6	33.2**
Currently using a condom (%)	47.1	11.1**
Female respondents who had ever had sex	(*N* = 144)	(*N* = 606)
Currently using pill or injectables (%)	12.5	0.7**
Ever been pregnant (%)	41.0	55.6**
Female respondents who have ever been pregnant	(*N* = 60)	(*N* = 341)
Has at least one living child (%)	66.7	70.1^{ns}
All female respondents	(*N* = 469)	(*N* = 1,674)
Intends to have children in future (%)	79.7	84.1*
Female respondents without living children	(*N* = 429)	(*N* = 1,435)
Intend to have children later (%)	67.6	35.3**
Mean number of wanted children	2.8	4.2**

Notes: PCS- Population Council Study (respondents who were HIV positive and knew their HIV status); UDHS- Uganda Demographic and Health Survey (respondents who did not know their HIV status); Differences between PCS and UDHS means/proportions are significant at: $^{*}p<0.05$; $^{**}p<0.01$; ns- not statistically significant.

Table 2: Coefficient estimates from the random-effects logit models predicting various sexual and reproductive outcomes, PCS 2007 and UDHS 2006

	All sexually active respondents				Sexually active female respondents	All female respondents	Female respondents with no living children
Covariates	Used a preventive method at first sex	Ever used a method of contraception	Currently using a modern method of contraception	Currently using condoms	Have ever been pregnant	Intention to have children in future	Want to have children later in life
Age (single years)	0.07	0.34**	0.33**	0.26**	0.59**	0.08	0.07
	(0.06)	(0.06)	(0.09)	(0.08)	(0.08)	(0.04)	(0.04)
Sex (Female = 1)	0.09	-0.28	-0.49**	-0.95**	n/a	n/a	n/a
	(0.17)	(0.16)	(0.38)	(0.21)			
Current marital status	n/a	-0.55**	-0.72**	-0.82**	2.12**	1.26**	0.93**
(married/living together = 1)		(0.19)	(0.28)	(0.31)	(0.24)	(0.28)	(0.19)
Current living arrangement	n/a	-0.03	0.04	0.17	-0.20	0.29*	0.01
(lives with at least one		(0.16)	(0.24)	0.21)	(0.22)	(0.01)	(0.12)
biological parent = 1)							
Knows HIV status (HIV	0.53	0.15	1.98**	2.60**	-0.37	-0.41	2.48**
positive and knows status = 1)	(0.40)	(0.37)	(0.43)	(0.39)	(0.28)	(0.64)	(0.48)
N	1,036	1,030	929	976	747	2,133	1,744

Notes: Sexually active respondents refer to those who had ever had sex; PCS- Population Council Study (respondents who were HIV positive and knew their HIV status); UDHS- Uganda Demographic and Health Survey (respondents who did not know their HIV status); n/a- not applicable because the covariates might be consequences of the outcome variable (column 2) or the model is estimated for female respondents only (columns 6 and 7); Estimates are based on equation [2]; Standard errors are in parentheses; *p<0.05; **p<0.01.

Sources: Authors' calculations from the PCS and UDHS data.