**How HIV prevalence, number of sexual partners and marital status are related in rural Uganda.**

Ivan Kasamba (2), Dermot Maher (2), Sam Biraro (2), Heiner Grosskurth (1,2), Jim Todd (1).

1. LSHTM, Keppel Street, London, WC1E 7HT
2. MRC/UVRI Uganda Research Unit on AIDS, Entebbe, Uganda.

## Abstract

Marriage is not well defined in rural Uganda, with high rates of separation and widowhood. We took three rounds from annual surveys of a rural population based cohort, defining 5 year age groups by sex. We describe the marital status of the population and compare HIV cases and reported number of sexual partners by marital status and age.The proportion widowed or separated was similar across rounds. Widowhood increased with age for females. There were an increasing number of HIV cases found among the mono or polygamous married participants across rounds. Participants reported to be monogamously married reported 2 or more number of sexual partners compared to other marital status. There seems to be a strong relationship between HIV prevalence, sexual partners and marital status. Misclassification of marital status occurred in early rounds. This masked the association between HIV and marriage.

## Introduction

In many African countries there is a high rate of marital separation and widowhood, [1] which has been associated with higher rates of HIV [2]. However, the causal direction of this association may be complex to disentangle. Marital separation may be incited by suspicion of unfaithfulness while widowhood may have been caused by death of partner due to AIDS in which case an HIV-positive widower may be produced [5]. Alternatively, those who are separated or widowed may subsequently become infected in a later sexual relationship. Many have, therefore, assumed that those widowed and separated engage in risky sexual behavior, but there are few data to corroborate these assumptions.

Marriage is sometimes considered to be protective against sexually transmitted diseases especially if it is monogamous and coincides with initiation of sexual activity [7]. Previous findings have suggested that men mostly acquire HIV infection from premarital and extramarital relations while, for married women, the behaviour of their partners is the strongest determinant of infection [8]. In such cases marriage is a potentially risky form of partnership since sex occurs more frequently and condom use may be low [6].

This presentation shows the distribution of HIV by marital status by age and sex across 10 years from a longitudinal cohort in rural Uganda. In addition, we show the reported number of sexual partners by marital status, and use logistic regression to show how HIV infection varies by marital status and the number of sexual partners.

## Methods

### Data sources

Data on number of sexual partners in the last year and marital status were taken from a prospective general population cohort (GPC) study in the rural south-western Uganda. This cohort was started in 1989 as an open cohort and annual rounds of data collection have been maintained [3,4]. Three rounds of the annual surveys in 1997 (Round 8), 2002 (Round 13) and 2007 (Round 18) were considered for this analysis.

After obtaining informed consent, survey staff administered risk factor questionnaires to individuals in private, after which blood was taken for HIV-1 serological tests. HIV prevalence was based on the results from these blood samples collected at the same time.

Self-reported information on marital status was obtained at each round. While there are varying definitions of marriage across and within countries in sub-saharan Africa, the GPC relies on respondents self-reports of their status as married, regardless of whether or not they are formally married. Thus, both formal and informal marriages were included. Marital status was defined by the question “Have you ever been married?” in R8, but an additional question “Have you ever had someone you called husband or wife?” was also used in R13 and R18.

### Data analysis

Separate analysis was done for each sex. For these analyses, all study participants aged 15 years and above were used. These were grouped into 5-year age groups and the age groups were used to describe the marital status of respondents in the different survey

rounds. The trends in the reported number of partners in the last year were compared across rounds for all respondents classified by sex, and marital status. We compared the distribution of HIV prevalent cases and the reported number of partners in the past 12 months by marital status and age group.

To show how HIV infection varies by marital status and the number of sexual partners, we used logistic regression analysis in which we examined the odds of being a prevalent case using marital status and number of partners in the last year as predictor variables adjusted for age. We also assessed changes in these odds over time.

## Results

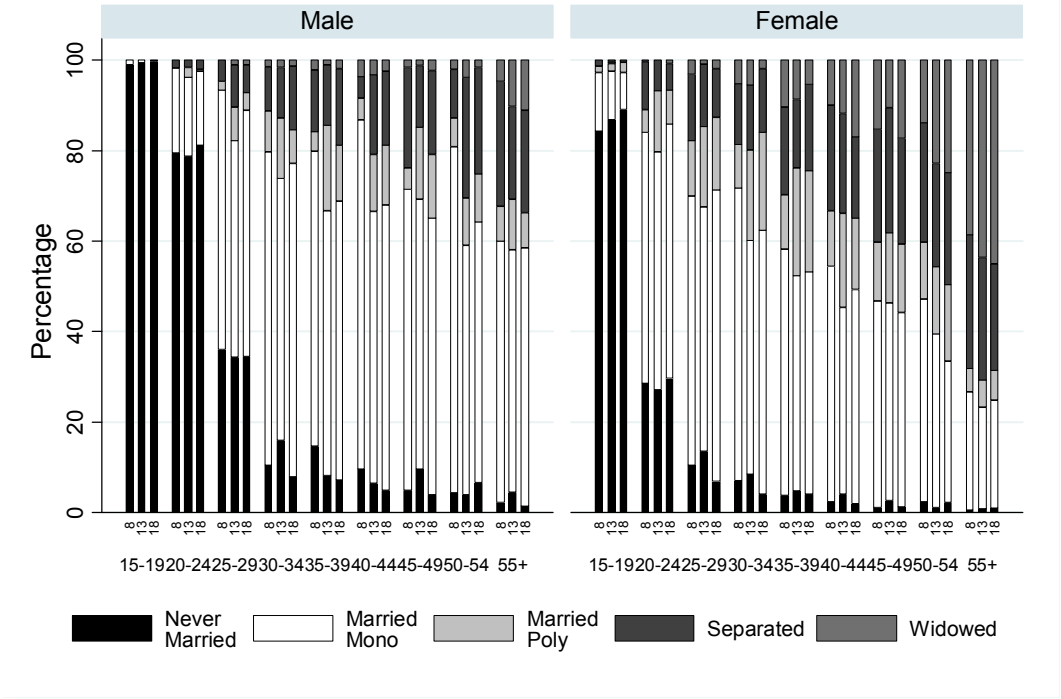
A total of 1395 males and 1534 females aged 15 years or more where seen in R8, 2669 and 3407 in R13, 2369 and 3231 in R18.

*Marital status*
We compared the marital status of respondents across the three rounds (Fig 1). Marital comparison varied across demographic subgroups of sex and age. In all rounds, there was a noticeable decrease across age in the proportion of males and females who report being single.

In males less than 40 years, there was a slight decline in the proportion of people reporting to be polygamously married between R13 and R18. A similar proportion of polygamous marriages were seen among females across all three rounds, but a lower proportion of men were seen in polygamous marriages in R8, and this may have been due to the absence of the additional question on informal marriages in that round.

Almost one out of every ten females was widow; higher four times than the male widowers. Reported widowhood increased sharply with increasing age among females than males well as similar proportions of separation were seen in both sexes with increasing age.

Figure 1. Proportion in each marital status by age, round and sex.



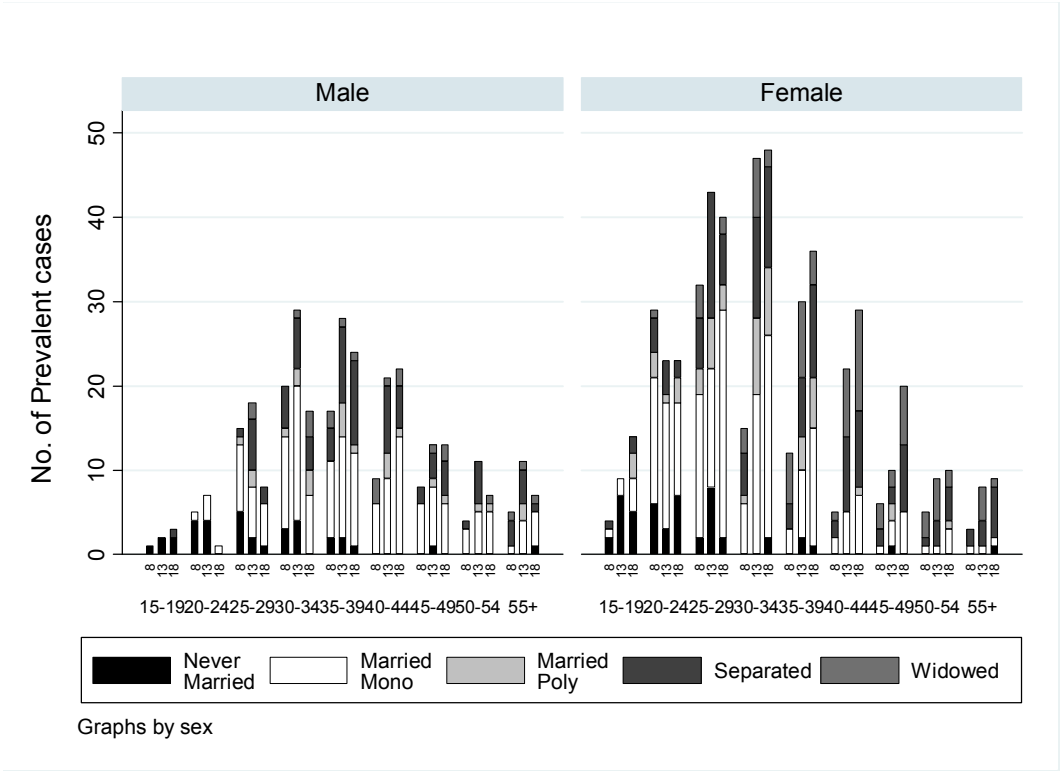

*HIV prevalence by marital status*

The majority of infections are among the females in all rounds (Fig 2). Also, there is a general steady increase across rounds in the number of people with HIV in this area especially among women. Across rounds, there are an increasing number of infections among monogamous or polygamous marriages for both males and females.

In males above 25 years, most infections are among the married people while it varies for females. In females between 20-39 years, most infections are among married. In females above 40 years, most infections were almost three times higher among the divorced and separated than the married.

In R8, the age-group with most infections is 25-39 in males and 20-29 in females while in R18, most infections are among 35-45 in males and 25-39 in females.

Figure 2. Numbers of HIV positive cases by marital status and 5 year age groups for each sex separately.

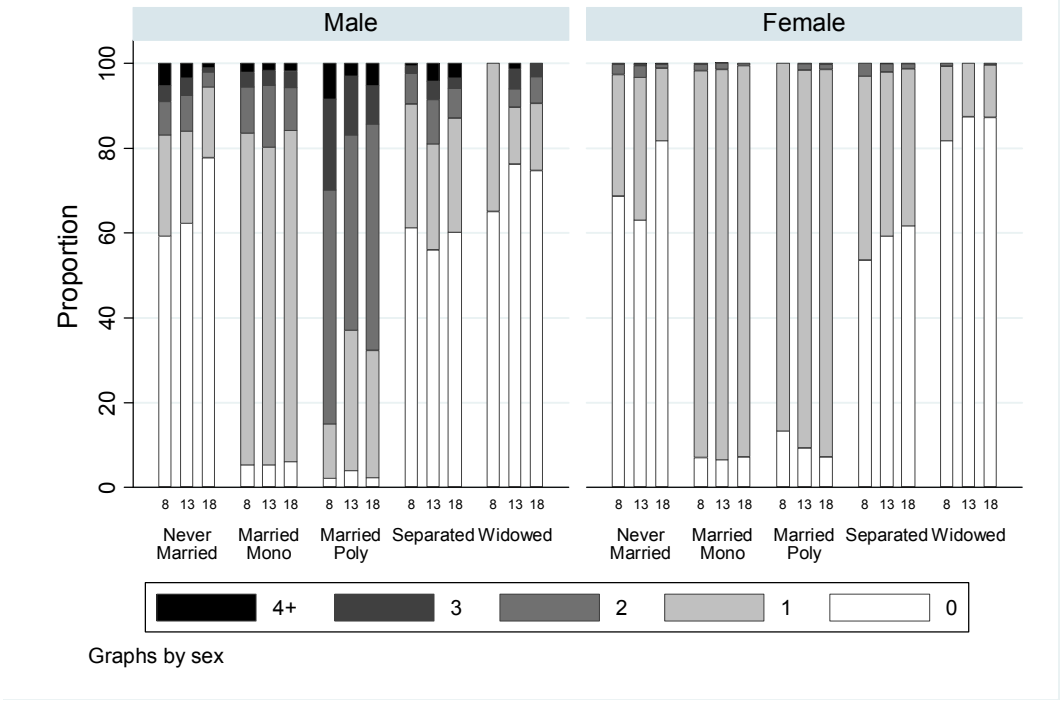



*Number of sexual partners*

There is a decline in the proportion of respondents reporting 2 or more sexual partners in the last year across the rounds (Fig 3). In all rounds, a bigger proportion of married males is reporting 2 or more partners than in other marital status. In females, a very tiny proportion has 2 or more partners with slight declines across the rounds.

The proportion of single, separated or widowed respondents reporting no partners in the last year for both males and females is increasing across rounds. However, a larger proportion of separated respondents having 2 or more partners than widowed or single respondents in both R13 and R18. In R8, more single men reported having 2 or more partners than separated respondents, which may be due to misclassification or marital status in men in R8.

Figure 3. Number of partners in the last year by marital status across 5-year Time points




*Model of HIV prevalence*

We modeled the prevalence of HIV in this population looking at the effects of marital status and number of partners. We assessed changes in these effects over time (R8, R13 and R18). The model was adjusted for the number of partners in the last year and age of respondent.

Overall, the risk of HIV is almost 5 times higher among widowers than monogamously married respondents, and is similar among men and women. However, the risk in separated respondents is twice that in monogamously married respondents. In all rounds, after adjusting for age and the number of partners in the last year, polygamous respondents have a non-significant reduced risk of HIV compared to those who are married.

For unmarried men the risk of HIV changes across the rounds, in R8 the OR is close to 1, but in R18, after adjusting for age and number of partners, the OR shows that unmarried men have a significantly lower risk of HIV than married men. There is no consistent change in the risk of HIV in unmarried women, compared to married women, across the three rounds.

## Discussion

The prevalence of widowhood and separation is high in this population, as has been observed previously [1]. The increase with age in the proportion of females who are widowed indicates that the male partner (usually the older partner) is more likely to die. In addition the female widow less likely to remarry than the male widower. In this population there has been little change in the marriage patterns over the 10 years observed (1997-2007).

The definition of marriage is not easy in this population where marriage is a process, rather than a discrete event. In earlier rounds almost 20% of men and almost 30% of women over the age of 30 years, reported never having married, but many of these were living in informal marriages, or were separated or widowed. Wrong responses like this will bias any estimates of the effect of marriage on HIV prevalence.

HIV prevalence is different among marital status, sex and ages. However, across these 10 years, HIV infection has moved into older age groups, and now has higher prevalence among the married people. Also a higher proportion of married people report more than 2 sexual partners in the last year compared to the other categories. Over the 10 years, we observe a reduction in the number of sexual partners among the never married men and women, but little or no reduction in the number of partners reported by those who are married, widowed or separated.

The chances of HIV are more than 5 times higher, in all rounds, among the widowed than the monogamously married respondents. This may be because their partners died of AIDS. Comparing the three rounds of data, the odds ratio for HIV infection comparing women with different marital status to those in monogamous marriages has not change much. The risk of HIV infection in never married men has changed considerably over the 10 years. In 1997 the odds ratio was at parity with the married men, but by 2007 the odds ratio showed a significantly reduced risk of HIV in never married men compared to married men. This may be due to improved HIV awareness in youth, but may also reflect improved measurement of marital status.

## References


1. Nabaitu J, Bachengana C, Seeley J. Marital instability in a rural population in South-West Uganda: Implications for the spread of HIV infection. Africa 1994:64; 242-251.
2. Boerma, J. T., Urassa, M., Nnko, S., Ng'weshemi, J., Isingo, R., Zaba, B., et al. Sociodemographic context of the AIDS epidemic in a rural area of Tanzania with a focus on people's mobility and marriage. *Sexually Transmitted Infections,* 2002:78(Suppl. 1), S97-S105.
3. Seeley J, Wagner U, Mulemwa J, Kengeya-Kayondo J, Mulder D. The development of a community-based HIV/AIDS counselling service in a rural area in Uganda. *AIDS Care* 1991;**3**(2)**:**207-217.
4. Mulder DW, Nunn AJ, Wagner H-U, Kamali A, Kengeya-Kayondo JF. HIV-1 incidence and HIV-1-associated mortality in a rural Ugandan population cohort. *AIDS* 1994;**8:**87-92.
5. Porter L, Hao L, Bishai et al. HIV status and union dissolution in sub-Saharan Africa: the case of Rakai, Uganda. *Demography* 2004;41:465-82.
6. Biraro S, Shafer LA, Kleinschmidt I, et al. Is sexual risk taking behaviour changing in rural south-west Uganda? Behaviour trends in a rural population cohort 1993-2006. *Sex Transm Infect* 2009; 85(Suppl I):i3-i11
7. Hallet TB, Gregson S, Lewis JJC, et al. Behaviour change in generalized HIV epidemics: impact of reducing cross-generational sex and delaying age at sexual debut. *Sex Transm Infect* 2007; 83:i50-4.
8. Glynn JR, Carael M, Buve A, et al. HIV risk in relation to marriage in areas with high prevalence of HIV infection. *J AIDS* 2003;33:526-35

**Table 1: Logistic model for prevalence of HIV by sex and Round**

| | Males | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|
| | | HIV +ve | OR (95%CI) | | | HIV +ve | OR (95%CI) | |
| ***Over all*** | Number | No. (%) | Adjusted for Age | Adj.(Partners,age) | Number | No. (%) | Adjusted for Age | Adj.(Partners,age) |
| Married Mono | 2,408 | 160 (6.6) | 1 | 1 | 3,136 | 211(6.7) | 1 | 1 |
| Married Poly | 385 | 24 (6.2) | 0.90 (0.57-1.41) | 0.82 (0.51-1.33) | 919 | 54 (5.9) | 0.87 (0.64-1.20) | 0.86 (0.63-1.17) |
| Separated | 636 | 84 (13.2) | 2.69 (2.01-3.62) | 2.63 (1.88-3.67) | 1,138 | 141(12.4) | 2.85 (2.25-3.62) | 2.88 (2.23-3.72) |
| Widowed | 150 | 23 (15.3) | 5.45 (3.20-9.27) | 5.27 (3.01-9.23) | 913 | 86 (9.4) | 4.75 (3.47-6.51) | 4.95 (3.52-6.98) |
| Never Married | 2,854 | 35 (1.2) | 0.58 (0.37-0.92) | 0.57 (0.35-0.92) | 2,066 | 49 (2.4) | 0.67 (0.45-0.98) | 0.66 (0.44-1.00) |
| ***Round 8 (1996/7)*** | | | | | | | | |
| Married Mono | 561 | 45 (8.0) | 1 | 1 | 641 | 47 (7.3) | 1 | 1 |
| Married Poly | 47 | 2 (4.3) | 0.51 (0.12-2.18) | 0.44 (0.10-1.94) | 113 | 7 (6.2) | 0.82 (0.36-1.88) | 0.85 (0.37-1.95) |
| Separated | 124 | 16 (12.9) | 2.38 (1.26-4.49) | 2.02 (1.05-3.90) | 228 | 26 (11.4) | 2.02 (1.20-3.38) | 1.78 (1.06-3.01) |
| Widowed | 20 | 6 (30.0) | 7.51 (2.46-22.93) | 6.58 (2.14-20.29) | 137 | 21 (15.3) | 4.59 (2.54-8.28) | 3.92 (2.14-7.17) |
| Never Married | 643 | 15 (2.3) | 1.13 (0.60-2.15) | 0.99 (0.52-1.89) | 415 | 10 (2.4) | 0.77 (0.38-1.58) | 0.67 (0.32-1.38) |
| ***Round 13 (2001/2)*** | | | | | | | | |
| Married Mono | 947 | 62 (6.5) | 1 | 1 | 1,235 | 68 (5.5) | 1 | 1 |
| Married Poly | 203 | 15 (7.4) | 1.02 (0.56-1.85) | 0.95 (0.52-1.75) | 425 | 22 (5.2) | 0.88 (0.53-1.45) | 0.85 (0.51-1.40) |
| Separated | 257 | 41 (16.0) | 3.15 (2.03-4.89) | 2.79 (1.75-4.43) | 479 | 55 (11.5) | 3.01 (2.05-4.42) | 2.71 (1.82-4.03) |
| Widowed | 67 | 7 (10.4) | 3.08 (1.28-7.37) | 2.66 (1.09-6.48) | 387 | 35 (9.0) | 4.90 (3.06-7.84) | 4.41 (2.71-7.16) |
| Never Married | 1,195 | 15 (1.3) | 0.69 (0.37-1.25) | 0.62 (0.33-1.14) | 881 | 21 (2.4) | 0.98 (0.58-1.65) | 0.84 (0.49-1.44) |
| ***Round 18 (2006/7)*** | | | | | | | | |
| Married Mono | 900 | 53 (5.9) | 1 | 1 | 1,260 | 96 (7.6) | 1 | 1 |
| Married Poly | 135 | 7 (5.2) | 0.82 (0.36-1.87) | 0.76 (0.33-1.75) | 381 | 25 (6.6) | 0.84 (0.53-1.33) | 0.81 (0.51-1.29) |
| Separated | 255 | 27 (10.6) | 2.13 (1.29-3.50) | 1.78 (1.05-3.01) | 431 | 60 (13.9) | 2.58 (1.81-3.68) | 2.23 (1.54-3.24) |
| Widowed | 63 | 10 (15.9) | 6.33 (2.85-14.07) | 5.20 (2.30-11.76) | 389 | 30 (7.7) | 2.54 (1.60-4.05) | 2.13 (1.31-3.46) |
| Never Married | 1,016 | 5 (0.5) | 0.39 (0.15-1.01) | 0.32 (0.12-0.84) | 770 | 18 (2.3) | 0.80 (0.46-1.39) | 0.69 (0.39-1.21) |