Published in final edited form as:
J Acquir Immune Defic Syndr. 2009 October ; 52(2): 280. doi:10.1097/QAI.0b013e3181ab6eab.

Late disease stage at presentation to an HIV clinic in the era of free antiretroviral therapy in sub-Saharan Africa

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Abstract

Background—Access to free antiretroviral therapy (ART) in sub-Saharan Africa has been steadily increasing, and the success of large-scale ART programs depends on early initiation of HIV care. However, little is known about the stage at which those infected with HIV present for treatment in sub-Saharan Africa.

Methods—We conducted a cross-sectional analysis of initial visits to the Immune Suppression Syndrome Clinic of the Mbarara University Teaching Hospital, including patients who had their initial visit between February 2007 and February 2008 (N=2311).

Results—Median age was 33 years (range 16–81). 64% were female. Over one-third (40%) were categorized as late presenters, that is World Health Organization disease stage 3 or 4. Male gender, age 46 to 60 (versus younger), lower education level, being unemployed, living in a household with others, being unmarried, and lack of spousal HIV status disclosure were independently associated with late presentation, while being pregnant, having young children, and consuming alcohol in the prior year were associated with early presentation.

Conclusions—Targeted public health interventions to facilitate earlier entry into HIV care are needed, as well as additional study to determine whether late presentation is due to delays in testing versus delays in accessing care.

Keywords

Antiretroviral therapy; access; sub-Saharan Africa; late presentation

Introduction

Sub-Saharan Africa remains the most affected region in the global AIDS epidemic, with an estimated 22.5 million people living with HIV in 2007. Increasing numbers of patients are

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receiving free HIV antiretroviral therapy (ART) in this region, with 1.7 million treated under the President's Emergency Plan for AIDS Relief.[1] Approximately 39% of HIV positives in Uganda who meet eligibility criteria for HIV antiretroviral therapy (ART), based on either CD4 count ≤ 200 cells/mL or clinical diagnosis of World Health Organization (WHO) stage 3 or 4,2 are currently receiving ART.3

The health status of patients at the time of ART initiation plays a crucial role in the success of treatment. Patients with advanced HIV disease at the time of ART initiation are less likely to respond to treatment, more likely to place financial strain on health services, and have a higher mortality rate compared to those who initiate earlier.[4–12] In addition, late presentation poses a higher cumulative risk of HIV transmission to others, considering that earlier presentation and HIV-suppressing treatment might otherwise reduce viral load and risk of transmission.[12–16]

A large proportion of HIV-infected individuals in the developed world, roughly 15–43%, present at clinics for care with advanced or severe disease (WHO stage 3 or 4, CDC Category B or C, or CD4 ≤200 cells/ml).5,7,17–26 Characteristics associated with late presentation in the developed world include older age, male sex, risk behavior (including injection drug and alcohol use), lower income, as well as low degree of education.[27–35] However, little is known in low income countries, particularly those in sub-Saharan Africa, about the proportion or characteristics of HIV-infected individuals who present late for care at clinics. One study of 31 patients in Haiti reported that 65% presented with a CD4 count less than 350 cells/ml.36 Several studies from sub-Saharan Africa have shown that a large number of patients have low CD4 cell counts at ART initiation;[37–40] however it is not possible to determine how much of this is attributable to the sickest patients being prioritized for treatment. We are unaware of any other published studies that have examined HIV stage at presentation for care in low income countries.

Quantifying the proportion of HIV-positive patients who present at clinics at WHO HIV disease stage 3 or 4 and identifying correlates of late presentation in sub-Saharan Africa may assist health professionals in allocating resources to different types of HIV care services, and in designing interventions to overcome barriers to early HIV care. We therefore conducted an analysis of medical records from patients' initial visit to the HIV clinic of a large referral hospital in southwestern Uganda to estimate the proportion of patients presenting at WHO stage 3 or 4, and to identify demographic, psychosocial, and behavioral correlates of late presentation. We also examined whether correlates of late presentation vary by sex.

Methods

Subjects

Our sample included all patients who attended the Mbarara University Teaching Hospital (MUTH) Immune Suppression Syndrome (ISS) clinic for the first time between February 1st, 2007 and February 29th, 2008 and were accessing HIV care for the first time. The MUTH is the regional referral hospital for a population of 1.2 million in southwestern Uganda. As of February 29th, 2008 the ISS Clinic had 6,381 active HIV-positive patients, 3,939 of whom were receiving ART.

Data collection

Data for this study was the patient information that is routinely collected at initial clinic visit on a standard form that was adapted from the Open Medical Record System, an electronic medical records system framework developed by Moi University and Indiana University for use in developing countries. The ISS initial visit form includes socio-demographic, behavioral

and clinical information, including physical examination findings, medication history, symptoms, WHO stage, and HIV treatment plan. The socio-demographic and behavioral data are collected by counselors while the clinical data are collected by physicians. The data from this form is entered into the OpenMRS data management system (www.openmrs.org). Quality control checks are performed on 5% of entered records, through which electronic records are compared variable by variable with the original source document; entry errors occur in less than 1% of the data.

Measurements

Outcome variable—We used WHO stage at initial clinic visit as the outcome variable for these analyses. The WHO HIV staging system41 applies clinical conditions to measure disease progression and is widely used in resource limited settings including sub-Saharan Africa, where laboratory values of disease stage (i.e. CD4+ T cell counts and plasma HIV RNA levels) are not always readily available. This staging system has been shown to reliably predict survival time and subsequent disease progression.42–46 We categorized WHO stage dichotomously, as not severe (stages 1 and 2) or severe (stages 3 and 4), and clinic presentation as early or late, respectively.

Independent variables—Independent variables included socio-demographic information recorded on the ISS initial visit form such as gender, pregnancy, age, tribe, religion, socioeconomic status (i.e. education level, occupation, monthly income, in-house running water), household composition (i.e. number of children and adults), and marital status. We also examined variables directly related to HIV care, such as the time required to travel to the ISS clinic, the number of HIV-infected household members, the number of those receiving HIV care, and among the married patients, whether they had disclosed their HIV status to their spouse, whether the spouse was HIV-infected, and whether the spouse was identified as the primary treatment supporter. We assessed alcohol use in the prior year using the Alcohol Use Disorders Identification Test-C (AUDIT-C),[47] a shortened and validated version of the WHO-developed AUDIT.48

Statistical Analysis

We calculated summary statistics to describe the general socio-demographic, medical, and behavioral features of the population. Where more than 2.5% of the data were missing for any independent variable, we created a separate category for the missing values. We used chi-square tests of association for nominal variables and chi-square trend tests for ordinal variables to compare patients missing WHO stage to those with WHO stage data. We similarly conducted unadjusted analyses, and performed multivariable logistic regression to identify independent correlates of late presentation. Given our large sample size and the exploratory nature of the study, we included all variables in the model, except the number of HIV-infected household members and the number of household members in HIV care, because these variables were collinear with the total number of household members.

We also conducted multivariable analyses stratified by sex because we hypothesized that the psychosocial correlates of late presentation might differ by sex. Several variables were relevant to only the married participants, so we conducted additional analyses among the married participants only. In those analyses, we were unable to include whether the participants' spouses were identified as their HIV treatment supporters in the model due to collinearity with whether the participants had disclosed their HIV status to their spouses.

Ethical considerations

The study was approved by the ISS Clinic data sharing committee and the Institutional Review Boards of Mbarara University of Science and Technology and the University of California, San Francisco.

Results

Of the 2,584 unique patients who presented to the ISS Clinic between February 1st, 2007 and February 29th, 2008, we excluded 58 who had received prior HIV care elsewhere. For 216 patient records, no WHO stage or specific clinical condition was checked on the ISS initial visit form to indicate WHO stage. We compared patients who had WHO stage information (n=2,311) with those who had none (n=216) and found the two groups to be similar ($p > 0.05$) in all analyzed characteristics: gender, age, tribe, religion, level of education, occupation, income, household water source, alcohol use, time required to travel to ISS clinic, number of children under 5 years, number of household members, number of HIV positive household members and number receiving HIV care, marital status, treatment supporter, HIV status of spouse, as well as disclosure of HIV status to spouse.

We therefore analyzed the records with WHO stage of 2,311 unique patients. The median age was 33 years (range 16–81) (Table 1). The sample was 64% female, including 4% who were pregnant. Fifty-five percent of the total sample reported being married. Twenty-two percent (22%) reported having had some secondary school education, and 7% reported at least some college education. The majority (80%) reported a monthly income that is the equivalent of US $60 or less and 38% were farmers. Over one-third (40%) presented at the ISS Clinic late, that is at a severe WHO disease stage (35% stage 3 and 5% stage 4), while 60% were presented early (23% stage 1 and 37% stage 2).

Bivariate results

Demographic factors—Several factors demographic factors were associated with late presentation on bivariate analyses, including male gender (50% of males presented late versus 36% of non-pregnant females), non-pregnancy (36% of non-pregnant women presented late versus 15% of pregnant women), and older age (52%, 41%, and 35% of those 46–50, 31–45, and 16–25 years old respectively presented late).

Socioeconomic factors—Socioeconomic factors associated with late presentation were lesser education (42% of those with no secondary education presented late versus 33% of those with some secondary education or more), non-business occupation (43% of those unemployed, 42% of farmers and 40% of those with other occupations versus 33% of those with business employment presented late), no household water source (42% of those without piped water presented late versus 37% of those with piped water), and more time required to travel to the ISS clinic (44%, 41%, and 35% of those traveling >2 hours, 30–60 minutes, and less than 30 minutes to clinic respectively presented late).

Household and family related factors—Household-related factors that were associated with late presentation included no children under age 5 in the household (46% of those with no children under age 5 presented late versus 36% of those with 1 or more), no other HIV-infected household members (62% of those with no HIV-infected household members presented late versus 39% of those with 1 or more), and unmarried status (43% of those who were widowed, 49% of those who were separated/divorced versus 35% of those who were married presented late). Among married patients (n=1,218), factors associated with late presentation in bivariate analyses included proposed non-spousal HIV treatment supporter (45% of those who listed someone other than the patient's spouse versus 33% of those who

listed their spouse presented late), and HIV non-disclosure to spouse (43% of those who disclosed to another person who was not their spouse presented late versus 34% of those who disclosed to their spouse).

Behavioral factors—Alcohol consumption in the past year was associated with HIV stage at presentation, with more non-drinkers presenting late (42%, 36%, and 32% of those who reported no alcohol use, moderate alcohol use, and heavy alcohol use respectively presented late).

Multivariate results

We also conducted multivariate analyses (Table 2) using all of the variables studied except the number of HIV-infected household members and the number of household members in HIV care, due to collinearity with the total number of household members. We found that male gender, older age, local tribal identity (Munyankole), having no secondary school education, being unemployed, having no children under age 5, not reporting living alone, and being unmarried or missing marital status were independently associated with presenting late at WHO stage 3 or 4, while being pregnant and reporting some alcohol use in the past year were independently associated with presenting early at WHO stage 1 or 2.

In multivariate analyses stratified by sex (Table 2), we found that among women, older age, having no children under age 5 and being unmarried remained independently associated with late presentation, and being pregnant and reporting hazardous alcohol use in the past year remained independently associated with early presentation. Among men, local tribal identity (Munyankole), having no secondary education, having no children less than 5 years, and missing marital status remained independently associated with late presentation, while moderate or hazardous alcohol use in the past year remained independently associated with early presentation. Having no piped tap water at home was independently associated with late presentation among women, whereas it was associated with early presentation among men.

When we conducted analyses among the married participants only (Table 3), we included all variables used in the multivariate analyses listed above, as well as HIV status of spouse and HIV disclosure to spouse. We found that compared to patients who disclosed their HIV status to their spouses, patients who did not disclose to their spouses were significantly more likely to present late, after controlling for all other variables. Other multivariate odds ratios among married patients were similar to those for the whole sample.

Discussion

In an era when HAART is not only free but also widely available in Uganda, we found that 40% of new patients in a large HIV clinic had late-stage HIV disease at their initial clinic visit. This figure may represent a lower bound for late-stage presentation, because the HIV stage was based on observable clinical signs and may have missed asymptomatic patients with advanced immunological disease. In a study in rural Uganda, 19% of those classified as at stage 1 or 2 HIV disease actually had CD4 counts of below 200 cells/mL.[49] In addition, low detection of opportunistic infections, a plausible scenario in a busy clinical setting, may also have caused us to under-estimate the proportion presenting with late-stage disease. We found that 50% of the men presented with severe disease compared to 36% of the non-pregnant women and 15% of the pregnant women. This suggests that current programs to routinely offer HIV testing and treatment for the prevention of mother-to-child transmission (PMTC) in antenatal clinics in Mbarara are successfully linking most HIV-infected women with HIV care. Prior HIV testing and counseling in PMTC might also explain the lower rate of late presentation in non-pregnant women compared to men. However, other gender-related factors may be at play, as outpatient health service utilization in Uganda is generally higher among women as compared to men.

[50] Gender and pregnancy differences in stage at presentation have also been observed in Haiti, Canada, and several countries in Europe.[21,26,51–53]

Older age was also associated with late-stage presentation, which may be explained in part by the unavailability of HIV treatment in years past. Older people, on average, may have become infected longer ago and may have been more likely to suspend their clinic attendance for lack of treatment options. Another explanation for this finding could be that older people, like other low- risk groups, have a low self-perceived HIV risk, and therefore HIV test later than younger people, though this has not been shown in Africa.[10,15,54–56] Other studies conducted in the United States,[57] Europe,[58–63] Australia[64] and Venezuela[65] have shown similar associations of age with stage of HIV disease at presentation. Older age has been shown to compound the negative impact of late presentation on treatment outcomes both in Africa[66] and in the western world.[67,68]

Several socioeconomic factors were associated with late presentation to the ISS clinic. We found that patients with some secondary education had significantly lower odds of presenting with late-stage disease, compared to those with none; this has also been noted in the United States as well as in Venezuela[65,69,70] Similarly, those who were employed were less likely to present late than those who were unemployed. Travel time to clinic was associated with late presentation on bivariate analysis, but not on multivariate analyses that controlled for other indicators of economic status and family responsibilities. These findings suggest that there may be structural barriers to seeking care in a rural setting where the travel to the only public hospital may require a substantial investment of time and money.

Several variables related to household and marriage were associated with HIV stage at presentation. Being married was associated with earlier presentation as compared with being single, separated or widowed, particularly among the women. Patients who had any children less than 5 years old in their household were also less likely to present late. Patients with young children, like pregnant women, may have more contact with the healthcare system and thus initiate HIV care earlier in the course of their disease. Among the married people, those who did not disclose their HIV status to their spouses were more likely to present late compared to those who disclosed, particularly among men. This suggests that the desire to hide one's HIV-positive status from a spouse may inhibit HIV care-seeking. Studies have shown that the rates of sero-status disclosure among sexual partners in Africa are low [71,72] and our findings suggest that this may discourage participation in HIV treatment programs.

Surprisingly, patients who reported hazardous or moderate alcohol use in the previous year had lower odds of presenting late compared to those who abstained from alcohol for at least one year. There may be several explanations for this, including that those who are the most ill, i.e. those who are presenting with severe disease, are unlikely to feel healthy enough to consume alcohol. Another explanation could be that alcohol users have a heightened risk perception, a phenomenon similar to that observed among injecting drug users and men who have sex with men in the United States.[73] A last possibility is that there is a high mortality rate among HIV-positives who consume alcohol, which caused the absence of many would-be late presenters from our sample of alcohol users. Further research is needed to determine the effect of alcohol on access to and receipt of HIV care and treatment.

The biggest limitations of this study are its cross-sectional design and selection bias. Because we did not follow HIV-positives prospectively from time of diagnosis and instead drew our sample from a snapshot of clinic attendees, our analyses of delayed presentation do not represent the proportion or characteristics of HIV-positives in the catchment area who never attended clinic. In addition, secular trends in the AIDS epidemic could also cause a variety of apparent associations. Lastly, under-diagnosis of late presentation may have caused bias to the

null. However, these data serve as a preliminary examination of the amount of late presentation and factors associated with late presentation in the African setting where it is difficult to conduct large longitudinal studies.

The data we used came solely from information routinely collected during clinical encounters and as a result were lacking several potentially important variables. In particular, the ISS initial visit form did not include any questions regarding perceived or experienced HIV stigma, which has been shown to discourage HIV testing and counseling in sub-Saharan Africa.[74,75] Nor did we capture patients' HIV care attitudes and beliefs, for example, perceived eligibility requirements for ART. Because we did not know the date of first positive HIV test, we were unable to determine whether late clinic presentation was attributable to a delay in HIV testing or in accessing treatment upon diagnosis. Therefore, we are limited in our ability to recommend appropriate interventions to hasten the initiation of HIV care.

The level of missing data was higher than in typical analytic studies. However, we felt that it was important to disseminate the findings if the missing data were unlikely to cause significant bias. We created separate categories for missing data and found that these categories were not associated with the outcome, except in two instances concerning household composition; it appears that the data were likely missing at random.

Despite these limitations, our study includes a large number of HIV-positive patients in a developing country, providing a preliminary investigation into demographic, psychosocial, and behavioral correlates of late clinic presentation in this context. The associations we observed may provide a framework upon which to build a conceptual model of late presentation.

The large percentage of patients with late-stage HIV disease at their initial clinic visit suggests that barriers to HIV care are considerable in Uganda. Delays in HIV care have serious public health implications because opportunities to prevent further transmission through effective treatment with antiretroviral drugs are lost, and because initiating treatment for HIV disease at an advanced stage leads to worse treatment outcomes than treatment started earlier. This study reveals a need to develop interventions that facilitate earlier entry into HIV care.

This study also suggests that low CD4 count at ART initiation, as observed in several studies in sub-Saharan Africa, may be due to the high frequency of late-stage presentation among new HIV-positive patients, rather than to selective treatment of patients with late-stage disease. Late presentation poses a significant threat to the success of large scale ART. More research is needed to determine whether late presentation is due to delayed HIV diagnosis or a delay after diagnosis. Our findings suggest that in southwestern Uganda potential interventions, whether designed to promote HIV testing or early entry into care, should target men, un-married and older women, and those of lower socioeconomic status. In addition, we speculate that HIV testing programs may help accelerate initiation of HIV care by encouraging HIV sero-status disclosure to partners upon positive diagnosis.

Acknowledgments

Funding: This work was supported by the US National Institutes of Health grants R25 MH064712, P30 MH062246, U01 AI069911, P30 AI027763, and R01 MH054907, the Starr Foundation AIDS International Scholarship Fund, the International AIDS Society HIV Research Trust, the East Africa International Epidemiologic Databases to Evaluate AIDS (IeDEA) Consortium, the Antiretroviral Treatment in Lower Income Countries (ARTLINC) Collaboration, and Mark and Lisa Schwartz. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Table 1

Demographic and behavioral characteristics and bivariate associations with late HIV disease stage (i.e. WHO stages 3 and 4) at initial clinic visit at the ISS Clinic in Mbarara, Uganda, February 2007–March 2008

Characteristics	Total N=2,311	(Col%)	Late Stage n=928	(Row%)	Odds Ratio	(95% CI)	P-value
WHO stage at presentation							
Stage 1	**525**	(23)					
Stage 2	**858**	(37)					
Stage 3	**811**	(35)					
Stage 4	**117**	(5)					
Gender							
Female (Not pregnant)	**1387**	(60)	505	(36)	1		
Female (Pregnant)	**100**	(4)	15	(15)	0.31ψ	(0.18 – 0.54)	< 0.01
Male	**824**	(36)	408	(50)	1.71ψ	(1.44 – 2.04)	< 0.01
Age							
16–30 years	**869**	(38)	302	(35)	1		
31–45 years	**1127**	(49)	463	(41)	1.31ψ	(1.09 – 1.57)	< 0.01
46–60 years	**250**	(11)	131	(52)	2.07ψ	(1.55 – 2.75)	< 0.01
> 60 years	**40**	(2)	18	(45)	1.53	(0.81 – 2.91)	0.18
Tribe							
Other	**684**	(30)	255	(37)	1		
Munyankole	**1519**	(66)	630	(41)	1.19	(0.99 – 1.44)	0.06
Missing	**108**	(5)	43	(40)	1.11	(0.73 – 1.69)	0.61
Religion							
Catholic	**571**	(25)	237	(42)	1		
Protestant	**1084**	(47)	429	(40)	0.92	(0.75 – 1.13)	0.45
Muslim	**218**	(9)	88	(40)	0.95	(0.69 – 1.31)	0.77
Other	**133**	(6)	55	(41)	0.99	(0.67 – 1.46)	0.97
Missing	**305**	(13)	119	(39)	0.90	(0.68 – 1.20)	0.48
Education							
Some Secondary School	**556**	(24)	182	(33)	1		
No Secondary School	**1665**	(72)	706	(42)	1.51ψ	(1.24 – 1.85)	< 0.01

Characteristics	Total N=2,311	(Col%)	Late Stage n=928	(Row%)	Odds Ratio	(95% CI)	P-value
Missing	**90**	(4)	40	(44)	1.64*	(1.05 – 2.58)	0.03
Occupation							
Business	**425**	(18)	142	(33)	1		
Unemployed	**276**	(12)	119	(43)	1.51ψ	(1.11 – 2.06)	< 0.01
Agriculture	**802**	(35)	339	(42)	1.46ψ	(1.14 – 1.87)	< 0.01
Other (Student, Government, Army)	**597**	(26)	242	(40)	1.36*	(1.05 – 1.76)	0.02
Missing	**211**	(9)	86	(41)	1.37	(0.98 – 1.93)	0.07
Monthly Income (Ugandan shillings)							
≥ 100,000 (≥ $60 USD)	**361**	(16)	138	(38)	1		
< 100,000 (< $60 USD)	**1457**	(63)	585	(40)	1.08	(0.86 – 1.37)	0.50
Missing	**493**	(21)	205	(42)	1.15	(0.87 – 1.52)	0.32
Piped Water in the Household							
Yes	**766**	(33)	281	(37)	1		
No	**1153**	(50)	484	(42)	1.25*	(1.03 – 1.51)	0.02
Missing	**392**	(17)	163	(42)	1.23	(0.96 – 1.58)	0.09
Travel time to clinic							
<30 minutes	**365**	(16)	127	(35)	1		
30 – 60 minutes	**648**	(28)	268	(41)	1.32*	(1.01 – 1.72)	0.04
1 – 2 hours	**538**	(23)	216	(40)	1.26	(0.95 – 1.66)	0.10
>2 hours	**480**	(21)	212	(44)	1.48ψ	(1.12– 1.96)	< 0.01
Missing	**280**	(12)	105	(38)	1.12	(0.81 – 1.55)	0.48
Number children < 5 yrs in house							
1 or more	**961**	(42)	344	(36)	1		
0	**249**	(11)	114	(46)	1.51ψ	(1.14 – 2.01)	< 0.01
Missing	**1101**	(48)	470	(43)	1.34ψ	(1.12 – 1.60)	< 0.01
Number of people in household							
1 (respondent)	**137**	(6)	56	(41)	1		
2–4	**983**	(43)	378	(38)	0.90	(0.63 – 1.30)	0.59
5–16	**1141**	(49)	468	(41)	1.01	(0.70 – 1.44)	0.97
Missing	**50**	(2)	26	(52)	1.57	(0.82 – 3.00)	0.18

Characteristics	Total N=2,311	(Col%)	Late Stage n=928	(Row%)	Odds Ratio	(95% CI)	P-value
Number HIV+s in household (among those not living alone, N=2,124)							
1 or more	**1676**	(79)	651	(39)	1		
0	**21**	(1)	13	(62)	2.56*	(1.05 – 6.21)	0.03
Missing	**427**	(20)	182	(43)	1.17	(0.94 – 1.45)	0.15
Alcohol use in the last year							
None	**1392**	(60)	582	(42)	1		
Moderate	**123**	(5)	39	(32)	0.65*	(0.44 – 0.96)	0.03
Heavy (Audit C Test Positive)	**360**	(16)	130	(36)	0.79*	(0.61 – 1.00)	0.05
Missing	**436**	(19)	177	(41)	0.95	(0.76 – 1.18)	0.65
Number HIV+s in household receiving HIV care (among those with ≥1 HIV+ household member N=1,676)							
1 or more	**953**	(57)	381	(40)	1		
0	**58**	(3)	17	(29)	0.62	(0.35 – 1.11)	0.11
Missing data	**665**	(40)	253	(40)	0.92	(0.75 – 1.13)	0.43
Marital Status							
Married	**1218**	(53)	431	(35)	1		
Single	**192**	(8)	77	(40)	1.22	(0.90 – 1.67)	0.21
Separated/Divorced	**414**	(18)	203	(49)	1.76ψ	(1.40 – 2.20)	< 0.01
Widowed	**391**	(17)	170	(43)	1.40ψ	(1.11 – 1.77)	< 0.01
Missing	**96**	(4)	47	(49)	1.75ψ	(1.15 – 2.66)	< 0.01

Characteristics: Married Persons Only	Total N=1,218	(Col%)	Late Stage n=431	(Row%)	Odds Ratio	(95% CI)	P-value
Proposed treatment supporter							
Spouse	**820**	(67)	280	(33)	1		
Other	**195**	(16)	450	(45)	1.64ψ	(1.35 – 1.98)	< 0.01
Missing	**203**	(17)	198	(44)	1.58ψ	(1.25 – 1.99)	< 0.01
HIV status of spouse							
Positive	**515**	(42)	184	(36)	1		
Negative/Unknown	**584**	(48)	211	(36)	1.02	(0.79 – 1.30)	0.89

Characteristics: Married Persons Only	Total N=1,218	(Col%)	Late Stage n=431	(Row%)	Odds Ratio	(95% CI)	P-value
Missing	**119**	(10)	36	(30)	0.76	(0.49 – 1.16)	0.20
HIV disclosure to spouse							
Told spouse	**678**	(56)	231	(34)	1		
Told other person, not spouse	**246**	(246)	105	(43)	1.44*	(1.07 – 1.94)	0.02
Missing	**294**	(24)	95	(32)	0.91	(0.68 – 1.21)	0.51

*P-value < 0.05

ψP-value < 0.01

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Table 2

Adjusted odds ratios and 95% confidence intervals for late HIV disease stage (i.e. WHO stages 3 and 4) at clinic presentation for all new patients and stratified by patient gender, Mbarara, Uganda, February 2007–March 2008

Correlates	All (N=2,311)		Women (n=1,487)		Men (n=824)	
	OR_{Adj}	95% CI	OR_{Adj}	95% CI	OR_{Adj}	95% CI
Gender and pregnancy						
Male (vs. non-pregnant female)	2.23$^{\psi}$	(1.80 – 2.76)	-------	----------	-------	----------
Pregnant female (vs. non–pregnant female)	0.42$^{\psi}$	(0.24 – 0.75)	0.45$^{\psi}$	(0.25 – 0.80)	-------	----------
Age						
31–45years (vs. 16–30 years)	1.13	(0.91 – 1.39)	1.05	(0.81 – 1.35)	1.24	(0.81 – 1.90)
46–60years (vs. 16–30 years)	1.55$^{\psi}$	(1.13 – 2.14)	1.79$^{\psi}$	(1.16 – 2.77)	1.49	(0.86 – 2.60)
Older than 60 (vs. 16–30 years)	0.84	(0.43 – 1.66)	0.91	(0.30 – 2.80)	0.90	(0.36 – 2.27)
Tribe						
Munyankole (vs. other)	1.23*	(1.00 – 1.51)	1.15	(0.89 – 1.49)	1.54*	(1.07 – 2.22)
Missing (vs. other)	1.03	(0.66 – 1.61)	1.20	(0.69 – 2.07)	0.80	(0.36 – 1.77)
Religion						
Protestant (vs. Catholic)	0.87	(0.70 – 1.09)	0.93	(0.70 – 1.23)	0.77	(0.53 – 1.12)
Muslim (vs. Catholic)	0.96	(0.67 – 1.35)	1.08	(0.70 – 1.66)	0.75	(0.40 – 1.39)
Other (vs. Catholic)	0.87	(0.58 – 1.31)	0.77	(0.46 – 1.31)	1.08	(0.54 – 2.17)
Missing (vs. Catholic)	0.87	(0.64 – 1.18)	1.03	(0.70 – 1.52)	0.67	(0.40 – 1.13)
Education						
No secondary school (vs. some secondary)	1.48$^{\psi}$	(1.17 – 1.86)	1.28	(0.93 – 1.76)	1.79$^{\psi}$	(1.27– 2.54)
Missing (vs. some secondary)	1.46	(0.90 – 2.37)	1.53	(0.82 – 2.86)	1.39	(0.63– 3.07)
Occupation						
Unemployed (vs. business)	1.44*	(1.02 – 2.03)	1.29	(0.85 – 1.96)	1.92	(0.97 – 3.80)
Agriculture (vs. business)	1.25	(0.95 – 1.65)	1.19	(0.83 – 1.69)	1.43	(0.90 – 2.26)
Other (vs. business)	1.21	(0.92 – 1.60)	1.03	(0.71 – 1.51)	1.48	(0.97 – 2.26)
Missing (vs. business)	1.32	(0.92 – 1.91)	1.52	(0.96 – 2.43)	1.03	(0.56 – 1.89)
Monthly income						
≤ 100,000 UGX [$60] (vs. >100,000 UGX)	0.99	(0.75 – 1.31)	0.78	(0.51 – 1.20)	1.20	(0.82 – 1.76)
Missing (vs. >100,000 UGX)	1.12	(0.81 – 1.56)	0.90	(0.56 – 1.44)	1.22	(0.74 – 2.02)

Correlates	All (N=2,311)		Women (n=1,487)		Men (n=824)	
	OR_{Adj}	95% CI	OR_{Adj}	95% CI	OR_{Adj}	95% CI
Piped tap water in home						
No piped tap water (vs. piped tap water)	1.09	(0.88 – 1.36)	1.43*	(1.09 – 1.88)	0.68*	(0.47 – 0.97)
Missing (vs. piped tap water)	1.16	(0.88 – 1.52)	1.24	(0.87 – 1.77)	1.03	(0.67 – 1.60)
Travel time to clinic						
30–60 minutes (vs. < 30 minutes)	1.18	(0.88 – 1.57)	1.18	(0.80 – 1.72)	1.17	(0.73 – 1.88)
1–2 hours (vs. < 30 minutes)	1.09	(0.80 – 1.48)	1.19	(0.79 – 1.77)	0.94	(0.57 – 1.54)
> 2hours (vs. < 30 minutes)	1.27	(0.93 – 1.75)	1.23	(0.82 – 1.85)	1.29	(0.76 – 2.18)
Missing (vs. < 30 minutes)	1.05	(0.74 – 1.48)	1.07	(0.69 – 1.66)	0.94	(0.51 – 1.54)
Number of children < 5 years in household						
None (vs. ≥ 1)	1.83ψ	(1.21 – 2.78)	1.80*	(1.06 – 3.05)	2.10*	(1.02 – 4.33)
Missing (vs. ≥ 1)	1.19	(0.97 – 1.44)	1.26	(0.98 – 1.63)	1.16	(0.82 – 1.62)
Number of people in household						
2–4 (vs. 1)	1.80*	(1.04 – 3.10)	1.66	(0.81 – 3.37)	2.10	(0.84 – 5.22)
5–16 (vs. 1)	1.90*	(1.09 – 3.28)	1.86	(0.92 – 3.80)	2.03	(0.81 – 5.09)
Missing (vs. 1)	2.48*	(1.11 – 5.54)	2.88	(0.96 – 8.62)	2.14	(0.61 – 7.49)
Marital status						
Single (vs. married)	1.43*	(1.00 – 2.03)	1.70*	(1.07 – 2.69)	1.20	(0.66 – 2.17)
Separated/divorced (vs. married)	1.94ψ	(1.51 – 2.49)	2.39ψ	(1.77 – 3.23)	1.34	(0.83 – 2.14)
Widowed (vs. married)	1.47ψ	(1.13 – 1.91)	1.56ψ	(1.15 – 2.14)	1.23	(0.69 – 2.17)
Missing (vs. married)	1.81ψ	(1.16 – 2.83)	1.33	(0.73 – 2.44)	3.18ψ	(1.47 – 6.85)
Alcohol use in the last year						
Heavy– Audit C test positive (vs. none)	0.60ψ	(0.46 – 0.78)	0.55ψ	(0.37 – 0.80)	0.57ψ	(0.38 – 0.84)
Moderate (vs. none)	0.49ψ	(0.33 – 0.78)	0.56	(0.29 – 1.07)	0.47ψ	(0.27 – 0.84)
Missing (vs. none)	0.80	(0.64 – 1.02)	0.84	(0.61 – 1.14)	0.80	(0.55 – 1.18)

*P-value < 0.05

ψP-value < 0.01

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Table 3

Adjusted odds ratios and 95% confidence intervals for late HIV disease stage (i.e. WHO stages 3 and 4) at clinic presentation for all married patients and stratified by patient gender, Mbarara, Uganda, February 2007-March 2008

Correlates Among Married Patients	All Married (N=1,205)		Married Women (n=669)		Married Men (n=536)	
	OR_{Adj}	95% CI	OR_{Adj}	95% CI	OR_{Adj}	95% CI
Gender and pregnancy						
Male (vs. non-pregnant female)	2.39ψ	(1.77 – 3.24)	-------	----------	-------	----------
Pregnant female (vs. non-pregnant female)	0.37ψ	(0.18 – 0.77)	0.37ψ	(0.18 – 0.80)	-------	----------
Age						
31–45 years (vs. 16–30 years)	1.28	(0.94 – 1.76)	1.34	(0.90 – 2.02)	1.21	(0.68 – 2.14)
46–60years (vs. 16–30 years)	1.40	(0.85 – 2.30)	1.06	(0.40 – 2.79)	1.76	(0.86 – 3.58)
Older than 60 (vs. 16–30 years)	0.66	(0.22 – 1.97)	-------	----------	0.67	(0.19 – 2.35)
Tribe						
Munyankole (vs. other)	1.21	(0.90 – 1.62)	1.16	(0.77 – 1.74)	1.38	(0.86 – 2.20)
Missing (vs. other)	0.90	(0.59 – 1.39)	1.14	(0.43 – 3.03)	0.47	(0.17 – 1.31)
Religion						
Protestant (vs. Catholic)	0.99	(0.72 – 1.37)	1.39	(0.86 – 2.24)	0.75	(0.47 – 1.20)
Muslim (vs. Catholic)	0.86	(0.52 – 1.42)	1.02	(0.51 – 2.12)	0.78	(0.36 – 1.68)
Other (vs. Catholic)	1.57	(0.89 – 2.79)	1.68	(0.75 – 3.80)	1.68	(0.67 – 4.20)
Missing (vs. Catholic)	0.90	(0.59 – 1.39)	1.38	(0.74 – 2.59)	0.62	(0.33 – 1.18)
Education						
No secondary school (vs. some secondary)	1.36	(0.99 – 1.86)	1.30	(0.79 – 2.14)	1.45	(0.95 – 2.24)
Missing (vs. some secondary)	1.59	(0.81 – 3.13)	2.18	(0.83 – 5.66)	1.13	(0.41 – 3.13)
Occupation						
Unemployed (vs. business)	1.39	(0.83 – 2.33)	1.16	(0.56 – 2.39)	2.42	(0.97 – 6.06)
Agriculture (vs. business)	1.24	(0.84 – 1.83)	1.44	(0.81 – 2.57)	1.09	(0.62 – 1.90)
Other (vs. business)	1.43	(0.98 – 2.09)	1.53	(0.83 – 2.83)	1.34	(0.80 – 2.23)
Missing (vs. business)	1.26	(0.75 – 2.13)	1.95	(0.95 – 4.03)	0.78	(0.35 – 1.75)
Monthly income						
≤ 100,000 UGX [$60] (vs. >100,000 UGX)	1.17	(0.82 – 1.67)	0.82	(0.45 – 1.49)	1.28	(0.80 – 2.05)

Correlates Among Married Patients	All Married (N=1,205)		Married Women (n=669)		Married Men (n=536)	
	OR_{Adj}	95% CI	OR_{Adj}	95% CI	OR_{Adj}	95% CI
Missing (vs. >100,000 UGX)	1.30	(0.84 – 2.02)	0.78	(0.39 – 1.56)	1.65	(0.87 – 3.14)
Piped tap water in home						
No piped tap water (vs. piped tap water)	0.97	(0.71 – 1.32)	1.44	(0.92 – 2.24)	0.63*	(0.40 – 0.99)
Missing (vs. piped tap water)	1.08	(0.74 – 1.59)	1.01	(0.56 – 1.83)	1.07	(0.61 – 1.86)
Travel time to clinic						
30–60 minutes (vs. < 30 minutes)	1.18	(0.78 – 1.78)	1.07	(0.59 – 1.93)	1.40	(0.76 – 2.57)
1–2hours (vs. < 30 minutes)	1.08	(0.70 – 1.66)	1.04	(0.55 – 1.93)	1.15	(0.61 – 2.17)
> 2hours (vs. < 30 minutes)	1.55	(0.98 – 2.43)	1.40	(0.73 – 2.67)	1.74	(0.88 – 3.44)
Missing (vs. < 30 minutes)	0.97	(0.58 – 1.62)	0.99	(0.49 – 1.98)	0.84	(0.38 – 1.85)
Number of children < 5 years in household						
None (vs. ≥ 1)	1.53	(0.85 – 2.77)	1.32	(0.55 – 3.17)	1.50	(0.62 – 3.63)
Missing (vs. ≥ 1)	1.12	(0.85 – 1.48)	1.17	(0.79 – 1.73)	1.11	(0.74 – 1.68)
Number of people in household						
2–4 (vs. 1)	1.52	(0.42 – 5.49)	0.77	(0.14 – 4.26)	3.34	(0.43 – 26.06)
5–16 (vs. 1)	1.53	(0.43 – 5.52)	0.91	(0.17 – 5.03)	2.96	(0.38 – 22.90)
Missing (vs. 1)	1.82	(0.39 – 8.48)	0.65	(0.06 – 6.80)	4.54	(0.44 – 46.32)
HIV status of spouse						
Negative/Unknown (vs. positive)	0.92	(0.69 – 1.23)	1.12	(0.73 – 1.71)	0.92	(0.69 – 1.23)
Missing (vs. positive)	0.75	(0.47 – 1.20)	0.99	(0.51 – 1.94)	0.83	(0.54 – 1.28)
HIV disclosure to spouse						
Told other person (vs. told spouse)	1.50*	(1.06 – 2.12)	1.32	(0.82 – 2.14)	1.73*	(1.06 – 2.12)
Missing (vs. told spouse)	0.99	(0.71 – 1.38)	0.83	(0.51 – 1.34)	1.25	(0.77 – 2.04)
Alcohol use in the last year						
Heavy- Audit C test positive (vs. none)	0.65*	(0.44 – 0.95)	0.72	(0.35 – 1.46)	0.58*	(0.35 – 0.95)
Moderate (vs. none)	0.46*	(0.25 – 0.84)	0.22*	(0.05 – 1.00)	0.59	(0.29 – 1.22)
Missing (vs. none)	0.81	(0.58 – 1.15)	1.00	(0.61 – 1.65)	0.72	(0.44 – 1.17)

*P-value < 0.05

$^{\psi}$P-value < 0.01