

The Association between Remarriage and HIV Infection

Evidence from National HIV Surveys in Africa

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November 2009



Abstract

The literature shows that divorced, separated, and widowed individuals in Africa are at significantly increased risk for HIV. Using nationally representative data from 13 countries in Sub-Saharan Africa, this paper confirms that formerly married individuals are at significantly higher risk for HIV. The study goes further by examining individuals who have remarried. The results show that remarried individuals form a large portion

of the population—usually larger than the divorced, separated, or widowed—and that they also have higher than average HIV prevalence. This large number of high-risk remarried individuals is an important source of vulnerability and further infection that needs to be acknowledged and taken into account in prevention strategies.

This paper—a product of the Human Development and Public Services Team, Development Research Group—is part of a larger effort in the department to understand the determinants of the HIV/AIDS epidemic. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at ddewalque@worldbank.org.

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Keywords

Africa, Remarriage, HIV/AIDS, Widowed, Divorced, Marital Status

* We thank Adam Wagstaff for useful discussions and suggestions. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank, its Executive Directors, or the countries they represent. Working papers describe research in progress by the author and are published to elicit comments and to further debate.

Section 1: Introduction

One of Africa's most challenging problems is the HIV/AIDS epidemic ravaging the continent. There has been extensive research done on different aspects of the epidemic to try to understand the reasons it has spread so extensively and how to best target prevention efforts. A great deal of evidence from a variety of contexts shows that divorced, separated, and widowed individuals in Sub-Saharan Africa have an increased risk of being infected with HIV. Less has been written about what happens to these widows and divorced individuals (Caldwell 2007). If they have a high likelihood of being HIV positive and they are reinitiating sexual activity, it is important to consider their next steps after divorce or widowhood when trying to understand the way HIV may be spread.

Using nationally representative surveys across 13 African countries, this paper will investigate the proportion of those divorced, separated, and widowed that remarry and their risk of HIV infection. In order to better understand the magnitude of the problem, we compare the number of individuals and the degree of HIV prevalence of those remarried to formerly married individuals. Using multivariate regression analysis, we also analyze possible confounding factors to establish that the increased HIV prevalence of remarried individuals is truly associated to remarriage and not some other variable. We conclude that, in almost all of the countries examined, there are high rates of remarriage and these remarried individuals have significantly higher rates of HIV prevalence than the adult population in general and than other married individuals. We do not claim that the association between remarriage and HIV infection is causal as clearly the causality is more likely to run from HIV infection to divorce or widowhood and then remarriage. But we stress that remarried individuals constitute a large segment of the population that is highly vulnerable to HIV/AIDS but has not been clearly identified as such by existing prevention efforts.

Section 2: Literature Review

The increased risk of being HIV positive for widows and those divorced or separated is well documented in a number of studies. Naibutu et al. (1994) find an overall HIV prevalence rate of 8.2% in a rural population in Uganda but then a twofold increase of infection risk in divorced or separated individuals 25 or older compared with those currently married. In the same study area, 10.1% of the population was divorced or separated at the time of the survey in 1989/90. 15 years later, Lopman et al. (2009) show in a study in Zimbabwe that the prevalence of HIV among widowed men was 54% and widowed women was 63% compared to married men who had never been widowed at 19% and married women who had never been widowed at 28% . Many other studies have found that individuals who are divorced, separated or widowed have a higher risk of contracting HIV (Nunn et al. 1994, Quigley et al. 1997, Gregson et al. 2001; Gresenguet et al. 2002; Boerma et al. 2003; Porter et al. 2004; Bongaarts 2007; Mermin et al. 2008; Reniers 2008; Boileau et al. 2009).

The HIV prevalence rates among widowed and divorced individuals become even more alarming when we examine the pervasiveness of divorce and widowhood in Sub-Saharan Africa. In a rural area of Tanzania, 5% of men and 10% of women were divorced or separated at the time of a survey interview (Boerma et al. 2002). These numbers may not seem very high; however, among those married at the time of the interview, 44.8% of men and 33.9% of women had been divorced at least once. 11.1% of men and 5.6% of women had a least two broken marriages. Boileau et al. (2009) found similar results among rural women in Malawi; by the follow-up interview, 6.4% had gotten divorced or separated and 4.8% had been widowed in the previous three years. However, 34.4% of the women in the study had been divorced at least once during their married life and 9.8% had been widowed at least once. In another longitudinal survey, 32.5% of women and 28.6% men were divorced or separated and 7% of women and 4.3% of men were widowed (Reniers 2008). The findings in this study come from the Malawi

Diffusion and Ideational Change Project, which include data for approximately 1,500 ever-married women and their husbands who were interviewed four times over the course of eight years. Overall, the evidence indicates that not only is the HIV prevalence rate for widowed, divorced and separated individuals very high but also, in some cases, over a third of those married have been divorced or separated and between 5 and 10 percent of those married have been widowed.

A sizable proportion of those who have been divorced or widowed remarry. Because such a large percentage of those who are widowed or divorced are HIV positive and so many remarry, this creates a scenario whereby HIV potentially spreads within marriages. Munguti et al. (1997) report that of the men ever married in their survey, 137 out of 379 men (36%) had been widowed or divorced at least once. However, at the time of the survey, only 22 were currently widowed or divorced while 111 men had remarried at the time of the survey. For women, 176 out of 524 (33%) had been widowed or divorced at least once. At the time of the survey, 69 were currently divorced, widowed or separated while 125 had remarried. In a study focused on women in rural Malawi, where between 40 and 65% of marriages ended after 25 years, remarriage was almost universal with over 40% of women remarrying within two years, 75% of women remarrying within five years, and 90% remarrying after ten years (Reniers 2003). Also demonstrating that divorce is common in rural Malawi, Bracher et al. (2003) finds that after five years, between 14 and 26 percent of first marriages ended in divorce, depending on the region. These percentages increase over time; after 15 years, between 31 and 49 percent of these couples had gotten divorced. Another study showed that 34% of males of a sample in Tanzania and 28% of females had previous marriages that ended in divorce or widowhood. It is important to note that these individuals had a higher HIV prevalence rate than those who had not remarried (Quigley et al. 1997).

Some studies show that women are less likely to remarry than men, though most focus on widows rather than divorcees. One study in Uganda showed that 65.1% of widowers remarried compared to 27.3% of widows but that both widows and widowers whose spouse died of HIV were more likely to remarry than if the spouse had died of other diseases (Ntozi 1997). However, preliminary evidence from a more recent study in Tanzania indicates remarriage is significantly less likely for HIV positive women. It is also less likely for HIV positive men but the difference is not significant (Gregory et al. 2007). Another study gave evidence that more women than men were currently widowed or divorced, most notably among the oldest age group where 22% of women had not remarried but only 5% of men had not remarried (Munguti et al. 1997). One possible reason for fewer women remarrying is that cultural norms making remarriage likely for widows have been changing. 37.8% of respondents in a qualitative study in Uganda said that the tradition of widow inheritance by relatives of the deceased husband is no longer practiced due to fear of HIV (Mukiza-Gapere and Ntozi 1995).

In remarrying, these widowed and divorced who are more likely to be HIV positive also could infect their new spouse. Within marriage, intercourse is generally more frequent than outside it so there are more opportunities to infect the new spouse with HIV (Bracher et al. 2003; Clark 2004). One way to prevent these new spouses from becoming HIV positive is to use a condom. However, based on one nationally representative sample in Uganda, condom use within marriage is uncommon. This study showed that condom use increased when the subjects knew one partner was HIV positive, but most individuals in this study did not know that they were infected (Bunnell et al. 2008). Other studies support the finding that condom use within marriage is uncommon, even within discordant (when one spouse is HIV positive and the other is not) couples (Biraro et al. 2009; Allen et al. 2003).

Because of this possibility of spreading HIV to new spouses, it is all the more important to better understand this remarried segment of the population. Section 3 of this paper will explain

the data sets and methodology. Section 4 describes the results in detail. Section 5 is a discussion of the results and section 6 concludes.

Section 3: Methodology

The analysis is done using data from nationally representative and comparable surveys from 13 African countries: Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Malawi, Rwanda, Senegal, Tanzania, and Zimbabwe. Data from all the countries, except Côte d'Ivoire and Tanzania, are from the most recent Demographic Health Surveys (DHS), which include HIV testing for a sub-sample of the population and have similar questions (Burkina Faso 2003; Cameroon 2004; Ethiopia 2005; Ghana 2003; Guinea 2005; Kenya 2003; Lesotho 2004; Malawi 2004; Rwanda 2005; Senegal 2005 and Zimbabwe 2005/06). The data from Côte d'Ivoire and Tanzania (Côte d'Ivoire 2005 and Tanzania 2004) are from the HIV/AIDS Indicator Survey (AIS), which also includes HIV testing and socio-demographic variables (but these are more limited than in the standard DHS). For Ethiopia, the results are for females only because males were not asked the relevant questions about previous marriages in the DHS for Ethiopia. The data is weighted using the sample weights suggested by the data provider and the standard errors are clustered at the enumeration area level.

The samples of the surveys include women ages 15 to 49. There is more variation in the ages of the men; in Burkina Faso, Cameroon, Ghana, Guinea, Lesotho, Rwanda, and Senegal, men are ages 15-59, in Kenya, Malawi, and Zimbabwe, men are ages 15-54 and in Côte d'Ivoire and Tanzania, the men are ages 14-49. Table 1 compares the proportions of remarried and formerly married among all individuals and analyzes their HIV prevalence rates. The p-values from T-tests indicate the statistical significance of the difference between these prevalence rates. All individuals includes single, currently married (first marriage or remarried), and formerly married individuals. Single is defined as those who have never been married. Currently married

are those either legally married or those living with a partner with the intention of staying together in an informal union. Formerly married refers to individuals who are divorced, separated or widowed. Being divorced means that the individual is no longer legally or informally married to his/her spouse and being separated indicates that the partners are no longer living together and may become legally divorced. Widowhood is defined as having lost a spouse. The formerly married category is comprised of individuals who have not gotten remarried. Remarried individuals are those who had previously married at least one time and are currently married to a different spouse. Their earlier marriage(s) may have ended because of divorce, separation or widowhood.

Table 1 also includes an analysis among only currently married individuals. It compares the HIV prevalence among those currently married that have only been married once and among those currently married who have been married more than once (remarried).

Table 2 refines the analysis from Table 1 with results from bivariate and multivariate logistic regressions, displaying results as odds ratios. First, unadjusted odds ratios for HIV infection for remarried individuals compared to individuals, who have married only once are presented, followed by adjusted odds ratios. These multivariate regressions adjust for age, education, wealth, urban location, religion, ethnicity, and polygamy as potential confounding factors. In Côte d'Ivoire, Lesotho, Rwanda, Tanzania and Zimbabwe, no information about ethnicity was collected and in Lesotho, there was no information about polygamy. It was therefore not possible to adjust for these factors in these countries. The adjusted odds ratios for HIV infection for different marital status' are presented with single individuals serving as baseline.

Section 4: Results

Table 1a shows the percentage of formerly married individuals among all adults. In the majority of countries, the widowed, divorced and separated comprise between three and nine percent of the sample population. Only among females in Ethiopia, Kenya, Lesotho, Malawi, Rwanda, Tanzania and Zimbabwe do the formerly married make up more than 10 percent of the sample population and no country has higher than 16 percent formerly married individuals.

Compared to those formerly married, those remarried generally make up a larger percentage of the sample populations (table 1b). In nine of the 13 countries observed, remarried individuals comprise a higher percentage of the sample than those formerly married for both males and females. In Kenya, Rwanda and Zimbabwe, more males are remarried than formerly married, but the opposite holds for females, while in Lesotho, the remarried constitute a smaller fraction of the population than the formerly married. In the majority of the countries, those remarried make up more than 10 percent of the individuals in the sample population. For males and females in Cameroon, Ghana, and Malawi, males in Burkina Faso, and females in Ethiopia, remarried individuals comprise between 15 and 24.6 percent of the sample populations.

While this is already a large portion of the overall adult population, when we narrow the sample to only people who are currently married in table 1c, remarried people constitute an even larger fraction. Among those currently married, those remarried are more than 10 percent in all countries except for males and females from Lesotho and females from Kenya. Those remarried are more than 15 percent in all the remaining countries analyzed, with the additional exception of only females in Burkina Faso and Zimbabwe. Over 40 percent of males in the currently married population are remarried in Cameroon and Ghana, over 30 percent of males in Burkina Faso, Malawi and Tanzania, and over 20 percent of females in Cameroon, Ethiopia, Ghana, and Malawi and males in Côte d'Ivoire and Kenya are remarried. Except in Guinea and Senegal, the fraction of remarried individuals is higher among males. Based on these percentages, it is clear

that remarried individuals form a sizeable part of the married population in these 13 diverse African countries.

It has been established in previous research that the divorced, separated and widowed are at significantly greater risk for HIV than other marital statuses in many contexts in Africa. The analysis in Table 1d confirms this: HIV prevalence is significantly higher (at the 1 or 5 percent confidence level) for formerly married females in Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Rwanda, Tanzania and Zimbabwe and formerly married males in Cameroon, Côte d'Ivoire, Kenya, Lesotho, Rwanda, Tanzania, and Zimbabwe. Further, the differences are significant at the 10 percent level for females from Burkina Faso, Guinea, and Senegal. Only for males from Burkina Faso, Ghana, Malawi, and Senegal are the differences not statistically significant. Notice, however, that among males in Guinea, HIV prevalence is significantly lower for formerly married males than for those who are not formerly married, as the HIV prevalence among formerly married males is zero (N = 111). Overall, these findings demonstrate that, indeed, divorced, separated and widowed individuals are generally at significantly greater risk of being HIV infected overall than those who are not formerly married.

In addition, Table 1d shows that, similar to formerly married people, remarried individuals are at significantly greater risk for HIV infection than those who have not been remarried. An important difference, however, is that, generally, there are many more remarried individuals than formerly married individuals. HIV prevalence is significantly higher for remarried individuals (at the 1 and 5 percent confidence levels) for males and females from Ghana, Kenya, Malawi, Rwanda, Tanzania, and Zimbabwe and for females from Côte d'Ivoire, Ethiopia, Lesotho, and Senegal. Additionally, females from Cameroon and males from Côte d'Ivoire and Guinea have statistically significant differences at the 10 percent confidence level. Only females from Burkina Faso and Guinea and males from Burkina Faso, Cameroon, Lesotho, and Senegal do not have statistically significant differences. These results demonstrate that most

remarried individuals in the sample are at a statistically significant greater risk for HIV infection than those who have not remarried.

Table 1e analyzes the difference in HIV prevalence between remarried individuals and currently married individuals. This analysis shows that remarried individuals, especially females, are still generally at a significantly greater risk for HIV than the currently married population. Females from Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Rwanda, Senegal, Tanzania, and Zimbabwe and males from Ghana, Malawi, and Zimbabwe have significantly higher HIV prevalence at the 1 and 5 percent confidence levels. The differences are significant at the 10 percent confidence level for females from Burkina Faso, Guinea, and Lesotho and males from Kenya, Rwanda, and Tanzania. Only males from Burkina Faso, Cameroon, Côte d'Ivoire, Guinea, Lesotho, and Senegal are not at statistically significantly greater risk for HIV compared to all those currently married. It is important to note that, among the currently married, all remarried females have a statistically significant higher HIV prevalence.

Table 2 shows the results from bivariate and multivariate regression analyses. In order to compare the relative risk of being HIV positive, Table 2a displays the odds ratios for each marital group (married once, remarried and formerly married) after adjusting for age, education, wealth, urban location, religion, ethnicity, marital status and polygamy. Single individuals who have never been married are the baseline. Generally, those formerly married are at greatest risk for HIV compared to those who have never married. Formerly married individuals from almost all countries are at statistically significant greater risk for HIV, with the exception of only females from Burkina Faso and Côte d'Ivoire and males from Cameroon¹. Most other results indicate that formerly married individuals are significantly more at risk of being HIV positive to the 1 and 5 percent confidence levels with only formerly married males from Côte d'Ivoire,

¹ There is no odds ratio for formerly married males in Guinea as HIV prevalence among them is zero (N=111). In addition, for males in Senegal, the low HIV prevalence levels and the sample size do not allow for a meaningful estimation of the odds ratios in table 2a.

Ghana, and Rwanda and formerly married females from Ghana significant at the 10 percent confidence level.

Though in most countries being married once does not significantly increase one's risk of HIV, there are exceptions. Compared to singles, there is significantly increased risk for males who were married only once from Burkina Faso and Malawi to the 1 percent confidence level and males from Lesotho and females from Ethiopia to the 10 percent confidence level. However, being married once has a significantly protective effect for females from Burkina Faso and Côte d'Ivoire to the 1 or 5 percent confidence level.

Those who have remarried are generally at more risk than those who have married only once but at less risk for HIV than those formerly married, after adjusting for age, education, wealth, urban location, religion, ethnicity, marital status and polygamy. Even after controlling for the variables, the odds ratios are still statistically higher than one for those remarried for over half of the groups. Remarried groups that are significantly more likely to be HIV positive than single individuals at the 1 and 5 percent confidence level are males from Burkina Faso, Guinea, Lesotho, Malawi, Tanzania and Zimbabwe and females from Cameroon, Ethiopia, Kenya, Tanzania, and Zimbabwe. At the 10 percent confidence level, remarried males from Ghana and females from Guinea and Rwanda are at significantly higher risk for HIV.

The results from a regression analysis among only those who are currently married are reported in Table 2b and 2c. The unadjusted odds ratios from a bivariate regression analysis for remarried individuals (Table 2b) are shown and compared to the odds ratios from the multivariate regression adjusting for age, education, wealth, urban location, religion, ethnicity and polygamy (Table 2c). Overall, the adjusted odds ratios confirm the unadjusted odds ratio results. If the unadjusted odds ratio is significant, the adjusted odds ratio is also significant to the same or a greater confidence level in all but four cases. The confidence level went down from the unadjusted regression to the adjusted regression only for males in Côte d'Ivoire, Kenya, and

Tanzania and females in Lesotho and Senegal (though all results are still statistically significant). In contrast, the confidence level went up for females from Guinea in the adjusted odds ratio.

The results for these adjusted regressions indicate that remarried females are at a significantly higher risk for being HIV positive among the currently married. The results are significant to the 1 or 5 percent confidence levels for females from all the countries examined with the exception of the adjusted odds ratio for females from Lesotho, which was significant to the 10 percent confidence level. Males are generally not at as great risk, with only remarried males from Malawi, Rwanda, Tanzania and Zimbabwe at a statistically significant higher risk of being HIV positive.

Section 5: Discussion

Remarriage in Africa has not been examined in a systematic way within the currently published literature. In an effort to fill this gap, we use nationally representative surveys from 13 African countries to both determine the percentage of remarried individuals and analyze their HIV prevalence rate in relation to widowed, divorced, and separated individuals. The data sets come from the most recent standard Demographic Health Surveys, which include HIV testing for a sub-sample of the population, from Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Malawi, Rwanda, Senegal, and Zimbabwe. Data sets for Côte d'Ivoire and Tanzania are from the HIV/AIDS Indicator Survey, a lighter survey that focuses on HIV/AIDS, but provides the similar variables needed for this study.

It is important to note that both these data sets use nationally representative samples of the population. Previous studies in the literature have used non-representative samples either because they follow a specific cohort in a particular location (for example, Munguti et al. 1997; Boileau et al. 2009; Hosegood et al. 2009; Lopman et al. 2009) or they compare samples from

different environments (Gregson et al. 2001; Boerma et al. 2003). Some studies have used representative samples but these were limited to one country (Mermin et al. 2008; Reniers 2008; Ueyama and Yamauchi 2009). Bongaarts (2007) uses data from 33 nationally representative surveys, however, they examine the relationship of late marriage with risk for HIV, not remarriage specifically. To the best of our knowledge, this is the first study to use nationally representative data from so many different African countries to examine remarriage in the context of the HIV epidemic.

It has been established that divorced, separated, and widowed are at a significantly higher risk for being HIV positive than other marital groups (Naibutu et al. 1994, Nunn et al. 1994; Quigley et al. 1997; Gregson et al. 2001; Gresenguet et al. 2002; Boerma et al. 2003; Porter et al. 2004; Bongaarts 2007; Mermin et al. 2008; Reniers 2008; Boileau et al. 2009; Lopman et al. 2009). The results from this analysis confirm that divorced, separated, and widowed are at a significantly higher risk for being HIV positive than other groups.

This study also indicates that remarried individuals (who were, at some point, part of the divorced, separated, and widowed group) are also at a significantly higher risk for HIV infection. For over half the groups studied, the HIV prevalence for remarried individuals is significantly higher when compared to the adult population overall. Remarried females in particular are at a significantly higher risk for HIV among those currently married.

It is not clear from the available data why these remarried individuals have a higher HIV prevalence rate. They may have contracted HIV during their previous marriage, either from their spouse or outside their first marriage. This could have been a reason for divorce or separation or HIV/AIDS could have caused the death of their spouse. Or they may have become HIV positive after their first marriage ended and before – or after- they remarried, when they may have reinitiated sexual activity. Causality is difficult to establish, even in multivariate regressions.

In addition, this study underscores that remarried people form a – maybe surprisingly – large proportion of the general population and an even larger proportion of those who are currently married in the population. In most countries, there are many more remarried individuals than formerly married individuals. With a few exceptions, remarried individuals constitute over 15 percent and sometimes as high as 40 percent of all those currently married. It is important to recognize that there are large numbers of this high-risk group who are now in marriages where they might infect their spouse as well as potential extramarital partners with HIV.

Section 6: Conclusion

The results from this analysis provide important information about the number and HIV prevalence of remarried individuals in Africa. These analyses go beyond the previous literature because the data are from a large number of nationally representative surveys, enabling a far more complete picture of remarried individuals than has been described before.

The results first establish that remarried individuals generally have a significantly high risk of HIV, sometimes similar to or just lower than the HIV risk of formerly married individuals (widows, divorced, and separated individuals) that had been shown in previous literature. An important cause for concern comes from the second finding of this study, which is that remarried individuals form a large portion of the population, much higher than those formerly married. Those remarried constitute between 10 and 40 percent of the currently married population. The large number of remarried individuals combined with their high HIV prevalence is an important source of vulnerability and further infection that needs to be acknowledged. Based on the results in this study, it is important that prevention efforts be directed at this distinctly high-risk group of remarried individuals. Voluntary testing and counseling, possibly joint testing, paired with

promotion of condoms within marriages and remarriages could help stem the epidemic in an important way.

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Table 1: Percent formerly married and remarried among all and currently married and percent HIV positive with T-Tests from thirteen Demographic and Health Surveys and AIDS Indicator Surveys

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Burkina Faso 2003		Cameroon 2004		Côte d'Ivoire 2005		Ethiopia 2005	Ghana 2003		Guinea 2005		Kenya 2003	
	males	females	males	females	males	Females	females	males	females	males	Females	males	females
Table 1a: Percentage formerly married among all													
	0.0189	0.0404	0.0917	0.0846	0.0608	0.0895	0.105	0.0545	0.0908	0.0377	0.0452	0.0415	0.1066
	[0.0041]	[0.0045]	[0.0051]	[0.0046]	[0.0081]	[0.0078]	[0.0064]	[0.0042]	[0.0048]	[0.0048]	[0.0043]	[0.0044]	[0.0062]
N	3605	4422	5280	5391	3901	4541	6812	4274	5303	2930	3847	3578	4043
Table 1b: Percentage remarried among all													
	0.218	0.0922	0.2226	0.1615	0.1037	0.0958	0.1541	0.2302	0.1641	0.1069	0.1448	0.1183	0.0407
	[0.0097]	[0.0061]	[0.0095]	[0.0077]	[0.0095]	[0.0074]	[0.0094]	[0.0085]	[0.0064]	[0.0084]	[0.0069]	[0.0071]	[0.0044]
N	3605	4422	5280	5391	3901	4541	6812	4274	5303	2930	3847	3578	4043
Table 1c: Percentage remarried among currently married													
	0.3931	0.1214	0.4418	0.2362	0.2435	0.166	0.2399	0.4345	0.2621	0.1789	0.1833	0.2348	0.0676
	[0.0149]	[0.0075]	[0.0151]	[0.0099]	[0.0192]	[0.0116]	[0.0141]	[0.0127]	[0.0096]	[0.0136]	[0.0085]	[0.0125]	[0.0071]
N	1973	3366	2671	3696	1796	2788	4189	2323	3452	1760	3058	1855	2418
Table 1d: Percentage HIV positive among all and T-tests (P-value) for difference by marriage status													
Not form. married	0.0191	0.0166	0.0364	0.0553	0.0233	0.0557	0.0132	0.0154	0.0235	0.0114	0.0156	0.0435	0.0691
	[0.0032]	[0.0026]	[0.0031]	[0.0043]	[0.0037]	[0.0054]	[0.0023]	[0.0021]	[0.0023]	[0.0020]	[0.0025]	[0.0049]	[0.0057]
Formerly married	0.0412	0.0565	0.0672	0.1847	0.1099	0.1495	0.0643	0.0309	0.0628	0	0.0884	0.1111	0.2367
	[0.0251]	[0.0202]	[0.0119]	[0.0195]	[0.0405]	[0.0301]	[0.0146]	[0.0122]	[0.0126]	[0.0000]	[0.0422]	[0.0337]	[0.0273]
P-value	0.383	0.051*	0.012**	<0.001***	0.037**	0.003***	<0.001***	0.202	0.002***	<0.001***	0.086*	0.044**	<0.001***
N	3341	4189	5041	5154	3893	4535	5942	4265	5289	2925	3842	2917	3271
Not remarried	0.0183	0.0171	0.0363	0.0634	0.0258	0.057	0.0154	0.0117	0.022	0.0093	0.0175	0.0398	0.0834
	[0.0033]	[0.0028]	[0.0032]	[0.0045]	[0.0039]	[0.0058]	[0.0029]	[0.0021]	[0.0024]	[0.0019]	[0.0032]	[0.0048]	[0.0065]
Remarried	0.0239	0.0298	0.0491	0.0813	0.0529	0.1317	0.0359	0.0317	0.0528	0.0255	0.0272	0.0951	0.169
	[0.0078]	[0.0089]	[0.0075]	[0.0098]	[0.0154]	[0.0287]	[0.0089]	[0.0060]	[0.0079]	[0.0096]	[0.0076]	[0.0175]	[0.0403]
P-value	0.503	0.169	0.108	0.074*	0.082*	0.015**	0.025**	0.001***	<0.001***	0.099*	0.218	0.001***	0.036**
N	3341	4189	5041	5154	3893	4535	5942	4265	5289	2925	3842	2917	3271
Table 1e: Percentage HIV positive among currently married and T-test (P-value) for difference by marriage status													
Not remarried	0.031	0.0139	0.0479	0.0564	0.0309	0.0475	0.0093	0.0208	0.0206	0.0126	0.014	0.0608	0.0733
	[0.0068]	[0.0028]	[0.0064]	[0.0056]	[0.0065]	[0.0081]	[0.0027]	[0.0047]	[0.0030]	[0.0029]	[0.0028]	[0.0086]	[0.0073]
Remarried	0.0239	0.0298	0.0491	0.0813	0.0529	0.1317	0.0359	0.0317	0.0528	0.0255	0.0272	0.0951	0.169
	[0.0078]	[0.0089]	[0.0075]	[0.0098]	[0.0154]	[0.0287]	[0.0089]	[0.0060]	[0.0079]	[0.0096]	[0.0076]	[0.0175]	[0.0403]
P-value	0.492	0.084*	0.904	0.016**	0.147	0.006***	0.004***	<0.001***	<0.001***	0.203	0.096*	0.053*	0.019**
N	1838	3210	2540	3544	1795	2786	3716	2317	3445	1758	3053	1507	1984

Table 1 continued: Percent formerly married and remarried among all and currently married and percent HIV positive with T-Tests from thirteen Demographic and Health Surveys and AIDS Indicator Surveys

	(14) Lesotho 2004 males	(15) females	(16) Malawi 2004 males	(17) females	(18) Rwanda 2005 males	(19) females	(20) Senegal 2005 males	(21) females	(22) Tanzania 2004 males	(23) females	(24) Zimbabwe 2005/6 males	(25) females
Table 1a: Percentage formerly married among all												
	0.0672	0.1444	0.0301	0.1115	0.0253	0.1323	0.0357	0.0573	0.0574	0.1183	0.0486	0.1547
	[0.0065]	[0.0082]	[0.0041]	[0.0068]	[0.0024]	[0.0050]	[0.0043]	[0.0055]	[0.0044]	[0.0052]	[0.0037]	[0.0051]
N	2795	3538	2404	2864	4728	5663	3761	5062	5659	6863	5566	7503
Table 1b: Percentage remarried among all												
	0.0238	0.0138	0.2459	0.1725	0.0946	0.0731	0.0818	0.1244	0.1682	0.1238	0.0809	0.0794
	[0.0040]	[0.0026]	[0.0128]	[0.0091]	[0.0049]	[0.0039]	[0.0061]	[0.0057]	[0.0081]	[0.0065]	[0.0047]	[0.0041]
N	2795	3538	2404	2864	4728	5663	3761	5062	5659	6863	5566	7503
Table 1c: Percentage remarried among currently married												
	0.057	0.0259	0.3732	0.2327	0.1826	0.1519	0.1665	0.1928	0.3183	0.1935	0.1745	0.137
	[0.0096]	[0.0048]	[0.0169]	[0.0115]	[0.0090]	[0.0077]	[0.0112]	[0.0086]	[0.0131]	[0.0090]	[0.0097]	[0.0071]
N	1207	1871	1589	2097	2434	2710	1929	3479	3026	4396	2542	4334
Table 1d: Percentage HIV positive among all and T-tests (P-value) for difference by marriage status												
Not form. married	0.1793	0.2231	0.1003	0.1134	0.0204	0.0226	0.0039	0.0072	0.0573	0.0608	0.1329	0.1652
	[0.0107]	[0.0095]	[0.0087]	[0.0075]	[0.0023]	[0.0023]	[0.0013]	[0.0014]	[0.0048]	[0.0046]	[0.0065]	[0.0065]
Formerly married	0.3277	0.5087	0.165	0.2907	0.0825	0.1242	0.0206	0.0377	0.1504	0.1977	0.4346	0.4627
	[0.0462]	[0.0304]	[0.0532]	[0.0270]	[0.0246]	[0.0121]	[0.0145]	[0.0159]	[0.0268]	[0.0193]	[0.0361]	[0.0211]
P-value	0.002***	<0.001***	0.225	<0.001***	0.012**	<0.001***	0.251	0.056*	0.001***	<0.001***	<0.001***	<0.001***
N	2232	3020	2404	2864	4728	5663	3250	4466	4774	5969	5555	7494
Not remarried	0.1856	0.2617	0.0722	0.1166	0.0196	0.0342	0.0033	0.0074	0.0554	0.069	0.1295	0.1964
	[0.0109]	[0.0097]	[0.0080]	[0.0082]	[0.0024]	[0.0028]	[0.0012]	[0.0016]	[0.0050]	[0.0051]	[0.0066]	[0.0074]
Remarried	0.3261	0.4555	0.1945	0.2126	0.0452	0.0593	0.0169	0.019	0.0984	0.1336	0.3526	0.3826
	[0.0846]	[0.0986]	[0.0224]	[0.0200]	[0.0099]	[0.0112]	[0.0094]	[0.0052]	[0.0131]	[0.0173]	[0.0261]	[0.0245]
P-value	0.104	0.050**	<0.001***	<0.001***	0.012**	0.029**	0.151	0.033**	0.002***	<0.001***	<0.001***	<0.001***
N	2232	3020	2404	2864	4728	5663	3250	4466	4774	5969	5555	7494
Table 1e: Percentage HIV positive among currently married and T-test (P-value) for difference by marriage status												
Not remarried	0.2917	0.2638	0.1062	0.099	0.0267	0.0226	0.0059	0.0064	0.0689	0.0538	0.2009	0.1738
	[0.0202]	[0.0139]	[0.0127]	[0.0092]	[0.0038]	[0.0030]	[0.0026]	[0.0019]	[0.0078]	[0.0054]	[0.0140]	[0.0088]
Remarried	0.3261	0.4555	0.1945	0.2126	0.0452	0.0593	0.0169	0.019	0.0984	0.1336	0.3526	0.3826
	[0.0846]	[0.0986]	[0.0224]	[0.0200]	[0.0099]	[0.0112]	[0.0094]	[0.0052]	[0.0131]	[0.0173]	[0.0261]	[0.0245]
P-value	0.0697	0.055*	<0.001***	<0.001***	0.081*	0.001***	0.258	0.024**	0.052*	<0.001***	<0.001***	<0.001***
N	943	1610	1589	2097	2434	2710	1637	3095	2578	3874	2538	4329

Note: Standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Source: Demographic and Health Surveys (Burkina Faso 2003, Cameroon 2004, Ethiopia 2005, Ghana 2003, Guinea 2005, Kenya 2003, Lesotho 2004, Malawi 2004, Rwanda 2005, Senegal 2005 and Zimbabwe 2005/06) and AIDS Indicator Surveys (Côte d'Ivoire 2005 and Tanzania 2004)

Table 2: Odds ratio for being HIV positive for adults of different marital statuses from thirteen Demographic and Health Surveys and AIDS Indicator Surveys

Table 2a: Adjusted odds ratio for being HIV positive among all adults for different marital statuses - Adjusted for age, education, wealth, urban location, religion, ethnicity, marital status, and polygamy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Burkina Faso 2003		Cameroon 2004		Côte d'Ivoire 2005		Ethiopia 2005	Ghana 2003		Guinea 2005		Kenya 2003	
	males	females	males	females	males	females	females	males	females	males	females	males	females
	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +
Married once	4.61***	0.34**	0.83	1.11	0.76	0.28***	2.65*	1.9	0.75	2.68	1.31	1.17	0.91
	[1.59 - 13.40]	[0.12 - 0.95]	[0.48 - 1.42]	[0.64 - 1.92]	[0.30 - 1.91]	[0.16 - 0.50]	[0.93 - 7.53]	[0.52 - 6.98]	[0.30 - 1.84]	[0.58 - 12.35]	[0.30 - 5.65]	[0.58 - 2.34]	[0.53 - 1.55]
Remarried	5.11***	0.7	0.86	2.15**	1.31	0.9	16.19***	3.16*	1.8	4.72**	3.76*	1.61	2.51**
	[1.54 - 17.03]	[0.21 - 2.28]	[0.45 - 1.65]	[1.18 - 3.92]	[0.47 - 3.68]	[0.40 - 2.05]	[4.61 - 56.87]	[0.83 - 12.03]	[0.74 - 4.39]	[1.18 - 18.82]	[0.85 - 16.69]	[0.68 - 3.79]	[1.03 - 6.10]
Formerly	9.35**	0.97	1.32	4.68***	2.60*	1.04	12.39***	3.72*	2.49*	n.a.	7.53**	2.54**	4.44***
Married	[1.29 - 67.60]	[0.32 - 2.96]	[0.73 - 2.40]	[2.65 - 8.28]	[0.90 - 7.49]	[0.51 - 2.10]	[4.51 - 34.04]	[0.82 - 16.83]	[0.99 - 6.29]		[1.55 - 36.63]	[1.08 - 5.93]	[2.37 - 8.33]
Observations	2362	3555	4359	5115	2866	4429	5509	2822	4756	1424	3211	3004	3814

Table 2b: Unadjusted odds ratio for HIV prevalence among currently married adults for those remarried

Remarried	0.77	2.19**	1.03	1.48**	1.75*	3.04***	3.96***	1.54	2.65***	2.04	1.97**	1.62**	2.57***
	[0.35 - 1.68]	[1.07 - 4.46]	[0.68 - 1.55]	[1.10 - 1.99]	[0.92 - 3.35]	[1.61 - 5.76]	[1.84 - 8.48]	[0.86 - 2.76]	[1.73 - 4.06]	[0.83 - 5.03]	[1.01 - 3.84]	[1.05 - 2.52]	[1.41 - 4.68]
Observations	1973	3366	2670	3695	1795	2786	4189	2322	3447	1758	3053	1855	2417

Table 2c: Adjusted odds ratio for HIV prevalence among currently married adults for those remarried - Adjusted for age, education wealth, urban location, religion, ethnicity, and polygamy

Remarried	0.93	2.40**	1.19	1.98***	1.95	3.20***	8.34***	1.63	2.62***	1.64	3.09***	1.38	3.02***
	[0.41 - 2.14]	[1.12 - 5.11]	[0.71 - 2.00]	[1.37 - 2.86]	[0.87 - 4.38]	[1.62 - 6.33]	[3.36 - 20.69]	[0.85 - 3.12]	[1.66 - 4.12]	[0.63 - 4.27]	[1.34 - 7.14]	[0.72 - 2.63]	[1.48 - 6.17]
Observations	1278	2174	2060	3404	1513	2475	2869	1662	3092	821	2283	1547	2114

Table 2 continued: Odds ratio for being HIV positive for adults of different marital statuses from thirteen Demographic and Health Surveys and AIDS Indicator Surveys

Table 2a: Adjusted odds ratio for being HIV positive among all adults for different marital statuses - Adjusted for age, education, wealth, urban location, religion, ethnicity, marital status, and polygamy

	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
	Lesotho 2004		Malawi 2004		Rwanda 2005		Senegal 2005		Tanzania 2004		Zimbabwe 2005/6	
	males	females	Males	females	males	females	males [#]	females	males	females	males	females
	HIV +	HIV +	HIV +	HIV +	HIV +	HIV +						
Married once	1.42*	0.96	3.17***	0.81	0.71	0.77		0.72	1.49	0.82	1.5	0.87
	[0.95 - 2.12]	[0.67 - 1.35]	[1.39 - 7.24]	[0.38 - 1.72]	[0.32 - 1.57]	[0.42 - 1.41]		[0.13 - 4.04]	[0.85 - 2.61]	[0.51 - 1.32]	[0.84-1.89]	[0.67 - 1.13]
Remarried	2.58**	1.93	9.02***	1.74	1.44	1.95*		1.79	2.23**	2.46***	3.13***	2.32***
	[1.00 - 6.62]	[0.81 - 4.59]	[3.59 - 22.6]	[0.80 - 3.77]	[0.58 - 3.54]	[0.88 - 4.31]		[0.37 - 8.66]	[1.10 - 4.51]	[1.35 - 4.49]	[1.86-5.28]	[1.68 - 3.20]
Formerly married	2.38***	3.04***	5.30***	3.48***	2.51*	5.31***		4.71**	3.68***	4.11***	5.02***	3.90***
	[1.29 - 4.39]	[1.98 - 4.66]	[1.93 - 14.6]	[1.68 - 7.21]	[0.86 - 7.27]	[2.89 - 9.77]		[1.14 - 19.4]	[1.81 - 7.47]	[2.51 - 6.74]	[2.90-8.66]	[2.94 - 5.17]
Observations	2701	3467	2053	2772	3951	5266		3027	5577	6850	5555	7286

Table 2b: Unadjusted odds ratio for HIV prevalence among currently married adults for those remarried

Remarried	1.17	2.33**	2.03***	2.46***	1.73**	2.73***	2.91	3.01***	1.48**	2.71***	2.17***	2.95***
	[0.53 - 2.59]	[1.05 - 5.18]	[1.41 - 2.92]	[1.82 - 3.32]	[1.01 - 2.94]	[1.72 - 4.31]	[0.71 - 11.9]	[1.34 - 6.76]	[1.02 - 2.14]	[1.90 - 3.87]	[1.65 - 2.84]	[2.36 - 3.68]
Observations	1181	1838	1589	2097	2434	2710	1639	3100	3026	4394	2542	4334

Table 2c: Adjusted odds ratio for HIV prevalence among currently married adults for those remarried -Adjusted for age, education wealth, urban location, religion, ethnicity, and polygamy

Remarried	1.76	2.20*	2.96***	2.22***	2.12**	3.24***	3.82	2.50**	1.51*	3.50***	2.19***	2.95***
	[0.73 - 4.21]	[0.90 - 5.38]	[1.97 - 4.43]	[1.61 - 3.07]	[1.17 - 3.82]	[1.74 - 6.01]	[0.71 - 20.6]	[1.19 - 5.26]	[0.93 - 2.46]	[2.26 - 5.43]	[1.64-2.91]	[2.37 - 3.67]
Observations	1165	1831	1521	2062	2080	2588	297	1528	2942	4245	2517	4118

Note: 95% confidence intervals in brackets, * significant at 10%; ** significant at 5%; *** significant at 1%. N.a.: not applicable as HIV prevalence in that category is zero. # For males in Senegal, the low HIV prevalence levels and the sample size do not allow for a meaningful estimation of the odds ratios in table 2a. *Source:* Demographic and Health Surveys (Burkina Faso 2003, Cameroon 2004, Ethiopia 2005, Ghana 2003, Guinea 2005, Kenya 2003, Lesotho 2004, Malawi 2004, Rwanda 2005, Senegal 2005 and Zimbabwe 2005/06) and AIDS Indicator Surveys (Côte d'Ivoire 2005 and Tanzania 2004)