HIV Infection, Marital Dissolution, and Migration in Malawi

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Abstract

Research on the relationship between migration and HIV infection in sub-Saharan Africa often shows that migrants are at higher risk of HIV infection because they are more likely to engage in risk behavior than non-migrants, and tend to move to areas of higher HIV prevalence. Instead of focusing on ways in which migration is an individual risk factor of HIV infection, I examine the possibility that HIV infection leads to migration. Using a longitudinal dataset of rural residents and migrants from Malawi, I find that migrants originating from rural areas are indeed more likely than non-migrants to be HIV positive and to have engaged in HIV risk behavior. However, HIV positive individuals are also more likely migrate than HIV negative individuals. The explanation for this phenomenon appears to be marital instability, which occurs more frequently among HIV positive individuals and leads to migration after marital dissolution.

1. Introduction

It has long been established that population mobility plays an important role in the spread of HIV/AIDS throughout sub-Saharan Africa. Starting in the 1950s, urban centers in sub-Saharan African experienced rapid population growth (Preston 1979), which was due, in large part, to increasing rural-urban migration (Oucho and Gould 1993). Urban centers in sub-Saharan Africa become hubs for the rapid spread of HIV/AIDS early in the epidemic (Kreiss et al 1986, Mann et al 1986), and migration then linked high HIV prevalence cities with rural areas of relatively low HIV prevalence, as well as major transport routes along the way (Barongo et al 1992, Orubuloye et al 1993).

Empirical evidence indicates that, throughout sub-Saharan Africa, migrants are indeed more at risk of HIV infection than non-migrants. HIV prevalence was higher among individuals with a history of migration in South Africa (Lurie et al 2003), Senegal (Pison et al 1993), and Uganda (Nunn et al 1995). Migrants were more likely to have engaged in HIV risk behavior (e.g. higher number of sexual partners, less frequent condom use) in Ghana (Anarfi 1993), Kenya (Brokerhoff and Biddlecom 1999), and Malawi (Chirwa 1997a). Short-term mobility was a risk factor for HIV infection among migrants in Senegal and Guinea-Bissau (Legarde et al 2003). The above represents a non-exhaustive list of research which consistently shows that migrants are more likely to have engaged in HIV risk behavior and/or be HIV positive than non-migrants.

Several reasons are offered for why migrants are more at risk of HIV infection. Research often focuses on HIV risk for migrants to urban locations, where HIV prevalence is higher than rural areas throughout sub-Saharan Africa (Dyson 2003). With higher HIV prevalence, urban residents are exposed to greater risk of HIV infection than rural residents, even if the number of sexual partners does not differ between rural and urban residents. However, some suggest that the number of sexual partners increases after migration to an urban area. By moving from a rural home, individuals are liberated from the constraints imposed in social rules and regulations surrounding sexual conduct in their rural areas of origin, and are thus able to engage more freely in sexual activity (Anarfi 1993, Grmek 1990, Setel 1999). The link between urban migration and HIV risk has become less clear of late, as Coffee et al (2005) show that rural-urban migration is no longer associated with increased risk of HIV infection in some areas of sub-Saharan Africa, and Coast (2006) indicates that some migrants are aware of the higher HIV prevalence in urban areas and change their behavior in response to the increased risk.

Another common explanation for increased HIV risk among migrants is due to the separation from spouses as a result of labor migration. The seasonal availability of labor throughout much of sub-Saharan Africa, such as mines in South Africa (Chirwa 1997a, Lurie 1997) or factory work in Zimbabwe (Bassett et al 1992), leads to temporary migration, where migrant workers will live at their place of work while the spouse stays behind. Separated from a spouse, migrants are more likely to engage in sexual activity with more risky individuals, and have more overall sexual partners than permanent rural residents (Anarfi 1993, Chirwa 1997a, Lurie 1997, Wolffers et al 2002). As a result of the increased risk activity, labor migrants are not only more likely to be HIV infected, but

serve as conduits of HIV to rural areas by infecting their non-migrating spouses or sexual partners (Kishamawe et al 2006, Lurie et al 1997). In addition, these migrants face risk of HIV infection not only through sexual activity while separated from a spouse, but also from the spouse, who may have become HIV infected through infidelity while permanently residing at the migrant's home (Lurie et al 2003).

As seen above, a theme that has dominated the existing research on HIV infection and migration is summarized by the frequently-made statement "migration is an independent risk factor for HIV infection." However, longitudinal data on migration is very rare, so migration research is often limited to only cross-sectional analyses that compare the characteristics and behaviors of migrants with non-migrants. While this paper does not seek to contradict the fact that migration can lead to increased risk of HIV infection, I suggest an additional possibility to explain why migrants are more likely to be HIV positive. In this paper I use longitudinal data on migration in Malawi to compare HIV risk between migrants and permanent rural residents. Next, if migrants are more at risk of HIV infection, I re-examine the relationship between migration and HIV infection: does migration cause HIV infection, or are HIV positive respondents more likely to migrate? Finally, if there is evidence that HIV positive individuals are indeed more likely to migrate, what are the social factors that influence this phenomenon?

I find that Malawian migrants are indeed more likely to engage in risk behavior than permanent rural residents and are significantly more likely to be infected with HIV. However, this increased risk does not appear to result from the act of migration itself: I instead find that individuals who are HIV positive are more likely to migrate. Marital instability appears to explain this phenomenon: HIV positive individuals are more likely to experience marital dissolution (divorce or widowhood), which then causes these individuals to migrate after divorce or widowhood, or to marry a new spouse after the end of a previous marriage.

In the following sections, I first describe the design of the migration study and the project of which it is a part, the Malawi Diffusion and Ideational Change Project. I next describe the nature of migration for rural Malawians, including background characteristics of migrants and reasons for migration. In the analysis, I first look at associations between HIV risk and migration, and proceed to identify why migrants are more likely to be HIV positive. Finally, I discuss the implications of this study for HIV/AIDS research in sub-Saharan Africa.

2. Background: Internal Migration in Malawi

Malawi is among countries with the highest HIV prevalence, with an estimated national prevalence of 11.8% of adults aged 15-49 infected (MDHS, 2004). As with many AIDS-affected countries in sub-Saharan Africa, there are large differences in HIV prevalence between urban centers and rural areas. For the 14% of Malawi residents living in urban areas in 2004, HIV prevalence was approximately 17%, compared with 11% in rural areas (MDHS 2004). Regardless of residence, heterosexual transmission is the primary

mode of HIV infection throughout sub-Saharan Africa, with men most likely to be infected by pre-marital and extramarital partners, and women most likely to be infected by their husbands (de Zousa, Sweat and Denison 1996; Heise and Elias 1995; King et al 1993; McKenna et al. 1997).

Research on internal migration in sub-Saharan African countries often focuses on urbanization. However, compared with neighboring countries, Malawi is an anomaly in terms of urban growth from the post-colonial period starting in the 1960s. While increases in rural-urban migration contributed to rapid urbanization in the 1960s and 70s for most sub-Saharan African countries (Preston 1979), Malawian migrants instead traveled in large numbers to work in mines or agricultural estates in South Africa, Zambia, or Zimbabwe (Kalipeni 1992, Kydd and Christiansen 1982). Beginning in the 1970s, efforts to expand the agricultural sector within Malawi led to the repatriation of many international migrants (Kydd and Christiansen 1982, Christiansen and Kydd 1983). The crash of a plane carrying Malawian migrants from South Africa in 1974 also induced the President of Malawi, Dr. Hastings Kamuzu Banda, to limit the recruiting of Malawian laborers by representatives of other countries (Chirwa 1996). As a result of these policies, agricultural estates for tobacco, coffee and tea grew in rural areas of Malawi throughout the 1970s and 80s (Kalipeni 1992, Englund 2002). International migration decreased further in the late 1980s, after restrictions were enacted in South Africa limiting the ability of Malawian laborers to find work in mines (Chirwa 1997a, Chirwa 1997b). With the decline in international migration, the majority of internal migrants relocated to other rural areas for work on agricultural estates, and rural-urban migration grew modestly in Malawi in the 1970s and 80s (Englund 2002). While urban growth increased after the new government was elected in 1994, rural-rural migration for *ganyu*, or piece-work, continued to be a dominant phenomenon in Malawi (Englund 2002).

Economic reasons are not the only reason for large-scale internal migration in Malawi. As described in Reniers (2003) and Mtika and Doctor (2002), internal migration is also closely tied to marital patterns in Malawi. The dominant ethnic group in the northern region of Malawi, the Tumbuka, practices a tradition of patrilocal residence after marriage, while ethnic groups in the southern region are characterized by a matrilocal tradition. Residents of the central region do not strictly adhere to either matrilocal or patrilocal residence after marriage. In addition, marital breakup, whether due to separation, divorce or widowhood, also leads to migration by either husband or wife depending on the marital residential pattern of the region (Reniers 2003). Given the relatively weak marital bonds for several ethnic groups in Malawi (Phiri 1983), marital dissolution is a frequent occurrence in Malawi (Reniers 2003, Reniers 2005) and can therefore be expected to contribute to internal migration in Malawi.

3. Data

The data for the analysis come from the Malawi Diffusion and Ideational Change Project (MDICP), a panel survey that examines the role of social networks in changing attitudes and behavior regarding family size, family planning, and HIV/AIDS in rural Malawi.

The first round of the MDICP (MDICP-1) was carried out in 1998, at which time MDICP interviewed 1541 ever-married women of childbearing age and 1065 husbands of the currently married women in three districts of Malawi: Balaka in Southern region, Mchinji in the Central and Rumphi in the North. In 2001 and 2004, the second and third rounds of the survey (MDICP-2 and MDICP-3) re-interviewed the same respondents along with new spouses for respondents who remarried between the two survey waves (more detailed information about fieldwork and sampling procedures can be found at http://www.malawi.pop.upenn.edu/; see also Watkins et al. 2003 and Anglewicz et al. 2007). MDICP-3 also added a sample of approximately 1,000 adolescents between the ages of 15-25, and collected biomarkers for HIV/AIDS and sexually transmitted infections for all respondents who agreed to be tested (testing protocol is described in Bignami-Van Assche et al. 2004). In 2006, MDICP returned for a fourth wave of data collection to re-interviewed all MDICP respondents and their spouses and test for HIV.

During 2006 fieldwork, MDICP also collected information for respondents who were interviewed in at least one previous MDICP wave but had since migrated to a location outside of villages in the MDICP sample. The overall 2006 MDICP sample consisted of 4,528 respondents, of whom a total of 807 individuals (17.8%) had permanently relocated by 2006. For these migrating respondents, MDICP administered a "migration autopsy" questionnaire to family members or neighbors of the migrant. This questionnaire included detailed information on the city, town, village and neighborhood where the migrant moved, along with other relevant information for contacting migrants, such as the names of other members of the migrant's new household, and phone numbers if available.

In the spring of 2007, the MDICP used contact and moving information in the migration autopsies to attempt to trace these 807 migrants and administer the 2006 MDICP survey questionnaire and an HIV test. The data collected in this migration study offers a unique opportunity to examine the relationship between HIV infection and migration in sub-Saharan Africa, for several reasons. For instance, the migration study data include both rural-urban and rural-rural migration, which I compare to test the claim that urban migrants are at particular risk of HIV infection. Also, despite being the most common type of internal migration (among rural-rural, rural-urban, urban-rural and urban-urban) (Oucho and Gould 1993), rural-rural migration is studied less frequently than migration involving an urban destination or origin. In addition, the MDICP migration study combines data from before and after moving, which can be used to examine both factors that influence mobility in the future, as well as characteristics of migrants after moving. Finally, instead of relying only on reported behavioral risk factors of HIV infection, these data also include actual HIV status for the migrants and spouses. Using data from MDICP waves 1-4, migration autopsies, and the 2007 MDICP migrations study, I next provide information on the characteristics of all MDICP migrants, as well as those interviewed and tested by the migration study team in 2007.

4. MDICP Migration Study Background

To compare characteristics of migrants and reasons for migration with the literature, and because detailed data on internal migration is seldom available for countries in sub-Saharan African, the following section describes characteristics of migrants from rural Malawi. First, I describe MDICP sample characteristics and the extent of migration among rural residents of MDICP sample villages. Next, I provide background characteristics of rural migrants in Malawi. I provide tabulations of migration by gender, age, and region of origin. Then I describe migrants by destination for migrants and describe the extent of international migration for MDICP respondents, and divide internal migrants into rural-urban and rural-rural migration. Once we know who is migrating and to where they migrate, I display reasons for why MDICP respondents relocate. Finally, I make a transition to the relationship between migration and HIV infection by displaying differences between migrants and permanent rural residents in HIV prevalence.

The background information for migrants comes from two sources: the 2006 MDICP logging database, and migration autopsies collected during 2006 MDICP fieldwork. The logging database recorded outcomes of visits by MDICP survey interviewers to the homes of respondents during 2006 MDICP fieldwork. Survey team visit outcomes, shown in Table 1, represent the outcome of the final visit to a respondent's home. Table 1 displays 2006 fieldwork survey team outcomes for all MDICP respondents interviewed at least once in a previous survey wave. Overall, the survey team interviewed approximately 70% of all previously-interviewed respondents. Migration was the second most frequent outcome for the family listing team; approximately 18% of the 2006 MDICP sample moved to another location[1].

[1] This resembles the percentage of MDICP migrants between waves 1 and 2. According to Bignami et al (2003), 16 and 19% of MDICP 1 men and women moved by MDICP wave 2 in 2001.

Table 1: MDICP 2006 Survey Outcomes

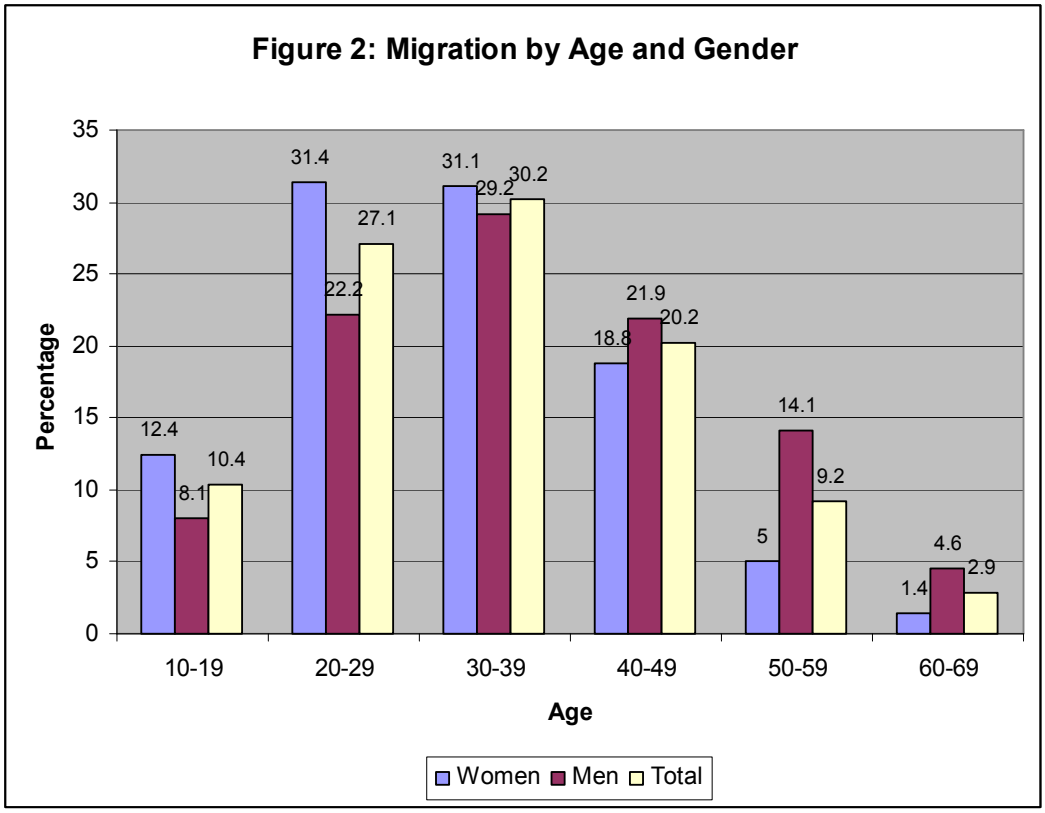
	Freq	Percent
Completed survey	3,180	70.2%
Refused	55	1.2
Hospitalized	8	0.2
Dead	132	2.9
Not Found or unknown	178	3.9
Temp Absent	27	0.6
Moved	**807**	**17.8**
Other	141	3.1
Total	4,528	

Of the 807 MDICP respondents who migrated by 2006, over 50% were last interviewed in MDICP-3, in 2004. As shown in Table 2, the smallest percentage of MDICP migrants comes from MDICP-1, in 1998. Table 2 also shows overall migration by gender: female MDICP migrants (437) compose a larger percentage of migrants at 54%- which is approximately the same as the percentage of women in the overall MDICP 2006 sample.

Table 2: MDICP migrants by last year interviewed and gender

Year last interviewed	Female	Male	Total
1998	90	67	157
	20.6%	18.1%	19.5%
2001	131	99	230
	30.0	27.8	28.5
2004	216	204	420
	49.4	55.1	52.0
Total	437	370	807

MDICP migrants are most frequently between 30 and 39 years old, although there are differences in age of migration by gender. As seen in Figure 2, female migrants are typically younger than male migrants, which reflects differences in reasons for migration by men and women: women often migrate due to marriage and typically marry at younger ages than men (Reniers 2003). The likelihood of migrating appears to decline after 39 years old for both sexes; only about 3% of MDICP migrants are 60 or older.



Differences in regional patterns of migration for men and women are apparent in Table 4. Women from the Northern region are the more likely to move than women from Balaka or Mchinji, while men from the Southern region compose the largest percentage of MDICP male migrants. Again, differences by region of origin and gender reflect the influence of marriage customs on migration patterns in Malawi. MDICP respondents in the northern region typically practice a patrilocal marital tradition, while individuals from the Southern region are primarily matrilocal (Mtika and Doctor 2002, Reniers 2003). The central region is divided between these two traditions, supported by the fact that it is neither the most or least frequent MDICP site of origin for men and women.

Table 4: Migration by MDICP region of origin and gender

Region	Female	Male	Total
Mchinji	150	115	265
	34.3%	31.1%	32.8%
Balaka	123	165	288
	28.2	44.6	35.7
Rumphi	164	90	254
	37.5	24.3	31.5
Total	437	370	807

Of the 807 MDICP respondents who moved prior to 2006, 89 (11%) moved to a location outside of Malawi. Table 5 below displays the destination for international MDICP migrants by their region of origin. Given the proximity of MDICP's fieldwork site in the Central region (Mchinji) to Zambia, it is not surprising that the largest percentage of international migrants moved to Zambia, and that the largest percentage of migrants by region is individuals originating from Mchinji. International migrants from Balaka are most likely to travel to South Africa, which likely reflects the proximity of Balaka to the major highway that travels through Malawi to South Africa, and the well-established pattern of labor migration from Malawi to South Africa (Chirwa 1997a). Mozambique is relatively close to both Balaka and Mchinji and represents the second most frequent destination for international MDICP migrants.

Table 5: International destination for MDICP migrants by region of origin

	Region of origin							
	Mchinji		Balaka		Rumphi		Total	
International destination	Freq	%	Freq	%	Freq	%	Freq	%
Great Britain	0	0.0	0	0.0	1	0.2	1	0.0
Mozambique	19	30.6	6	27.3	0	0.0	25	28.1
South Africa	0	0.0	14	63.6	2	40.0	16	18.0
Zambia	43	69.4	2	9.1	2	40.0	47	52.8
Total	62		22		5		89	

Although most residents of sub-Saharan Africa still live in rural areas, urban centers continue to grow (Dyson 2003). Of the 718 MDICP respondents who moved within Malawi, 160 (22%) moved to an urban area[2]. Table 6 displays frequencies for rural-urban MDICP migrants. The most frequent urban destination for migration among MDICP respondents is Lilongwe, the centrally-located nation's capital, and is followed by Mzuzu, the largest city in the Northern region and Blantyre. A larger percentage of male migrants move to an urban area than female MDICP respondents (23% for men and 17% women).

[2] I define urban migration as a move to one of the regional capitals of Malawi (Mzuzu for the Northern region, Lilongwe for the Central, Blantyre for the Southern region), or to the capital of one of Malawi's 22 districts.

Table 6: Urban destination for MDICP migrants

Urban location	Freq.	Percent
Blantyre*	29	18.1
Dedza	3	1.9
Karonga	2	1.3
Kasungu	4	2.5
Lilongwe**	50	31.3
Mangochi	3	1.9
Mchinji	10	6.3
Mzuzu*	36	22.5
Nkhata-Bay	1	0.6
Ntcheu	2	1.3
Rumphi	16	10.0
Salima	1	0.6
Zomba	3	1.9
Total	160	100.0

Notes: *regional capital, **national capital

Moving for work and to find new land for farming are common reasons for migration among MDICP respondents. According to Table 7, overall, 25% of MDICP migrants relocated for work and 14% for farming-related reasons. As expected, internal migration is also closely tied to marital patterns in Malawi. As shown in Table 7, marriage-related reasons compose the largest category of MDICP migrants- approximately 30% of MDICP migrants moved due to divorce, widowhood or new marriage.

Differences by gender are apparent in Table 7, where approximately 25% of men move for marriage-related reasons, compared with approximately 41% of women. In contrast, MDICP male migrants more often move due to work reasons, which make up approximately 36% of male migrants compared with only 17% of women.

The "other reason" category groups together all reason for migration that didn't fit into the above categories and didn't make up more than 2% of the reasons for migration for men or women. Some of these reasons include moving to visit a relative, following parents or relatives to a new location, in need of a change of scenery, and imprisonment.

Table 7: Reasons for migration by MDICP respondents, by gender

	Female Migrants		Male Migrants		All Migrants	
	Freq.	%	Freq.	%	Freq.	%
1. To look for work / offered job	67	16.7%	115	36.4%	182	25.4%
2. Attending school	18	4.5	19	6.0	37	5.2
3. Divorce or separation	51	12.7	19	6.0	70	9.8
4. Widowed	33	8.2	7	2.2	40	5.6
5. New marriage	81	20.1	28	8.9	109	15.2
6. Illness	17	4.2	11	3.5	28	3.9
7. Taking care of sick relative	16	4.0	20	6.3	36	5.0
8. New land for farming	51	12.7	47	14.9	98	13.6
9. Conflict with others in village	27	6.7	13	4.1	40	5.6
10. Other reason	41	10.2	37	11.7	78	10.9
Total	402		316		718	

Next, I present summary statistics for MDICP migrants who were successfully traced and interviewed by the 2007 MDICP migration study team. The sample for this study was the 718 MDICP respondents who migrated within Malawi and had previously been interviewed at least once in a prior MDICP wave, and all new spouses for migrating respondents. Outcomes for attempts to trace each MDICP migrant are displayed below in Table 8, and divided by outcomes for the original sample of migrants (718), and including their new spouses. Not including new spouses, the MDICP migration study traced approximately 60% of migrants, and interviewed approximately 56% of these migrants (with the remaining 4% dead, hospitalized or refusing to be interviewed). Including new spouses for migrants, the interview percentage was approximately 63% and 66% were successfully traced.

Of respondents who were not traced by the migration team, approximately 28% were not found at the location described in their migration autopsy. This occurred for several reasons. First, there was often not sufficient detail provided in the migration autopsy to find the respondent, only a general location. Also, the friend or family member provided incorrect directions or locations for MDICP migrants. Migrant occasionally changed their name after migration and were not known by the name in MDICP respondent lists, a phenomenon that has been found for permanent rural residents as well (Watkins et al 2006).

Table 8: Outcomes for tracing MDICP migrants

Outcome	Original sample		Including new spouses	
	Freq.	Percent	Freq.	Percent
Not found at location	200	27.9	200	23.5
Completed interview	401	55.9	534	62.6
Refused	15	2.1	17	2.0
Hospitalized	3	0.4	3	0.3
Dead	13	1.8	13	1.5
Unknown in village	25	3.5	25	2.9
Temporarily absent	9	1.2	9	1.1
Moved again	34	4.7	34	4.0
Other	4	0.6	4	0.5
Didn't look for	14	1.9	14	1.6
Total	718	100.0	853	100.0

One of the goals of the migration study was to interview and test MDICP migrants to compare HIV infection among migrants and permanent rural residents. Of the 534 respondents interviewed in the migration study, 486 consented for HIV testing (a 91% acceptance rate, similar to HIV testing acceptance for the overall MDICP study in 2004, as described in Thornton et al 2005). Table 9 below displays highly significant differences in HIV prevalence between MDICP migrants and permanent rural residents (according to 2006 MDICP HIV prevalence estimates). Overall, approximately 14% of the 486 MDICP migrants tested were found HIV positive, significantly greater than the 5.3% of HIV positive permanent rural residents. Similar difference are found by gender and region: across region of origin and gender, only male migrants originating from the Northern region and Central region were not significantly more likely to be HIV positive than their counterparts in 2006 MDICP study.

Since there are highly significant differences in HIV status between migrants and permanent rural residents, in the next section I address these differences by investigating the following questions: are MDICP migrants more likely than permanent rural residents to engage in HIV risk activity? Since some of the respondents in the migration study were tested for HIV prior to migration, in 2004, are individuals who were found HIV positive in 2004 more likely to more than HIV negative individuals? If so, what factors explain why there are differences in migration patterns between HIV positive and negative individuals?

Table 9: Difference in HIV status between migrants and permanent MDICP residents, by gender and region

	2006 MDICP Non-migrants	2007 Migration Migrants
Overall HIV status	5.33%	14.01%**
Gender		
Men	3.50%	9.33%**
Women	6.73%	17.29%**
Region		
Balaka	6.51%	19.82%**
Mchinji	4.81%	12.38%**
Rumphi	4.62%	10.81%**
Gender and Region		
Women		
Balaka	8.90%	24.07%**
Mchinji	6.25%	16.39%**
Rumphi	4.85%	14.14%**
Men		
Balaka	3.17%	15.79%**
Mchinji	3.08%	6.82%
Rumphi	4.21%	4.08%

Note: Differences between MDICP migrants and permanent rural residents is significant at * p<0.05 ** p<0.01

5. Methods and Results

5.1 Are Migrants at Greater Risk of HIV Infection?

Research has shown that migrants in sub-Saharan Africa are typically at greater risk of HIV infection than non-migrants. In many sub-Saharan African countries, migrants have more sexual partners, are more likely to not use condoms (e.g. Brokerhoff and Biddlecom 1999, Anarfi 1993), and are more likely to be HIV positive than non-migrants in South Africa (Lurie et al 2003), Senegal (Pison et al 1993), and Uganda (Nunn 1995).

In this section I compare HIV risk for migrants and non-migrants in rural Malawi to see if MDICP migrants are also at higher risk of HIV infection. To do so, I focus on five measures of HIV risk: marital infidelity, spousal infidelity, worry of HIV infection, number of lifetime sexual partners, and actual HIV status. I merge results for the 2007 MDICP migration survey with the most recent MDICP data for permanent rural residents (from 2006). Then, I run regressions with each of these five HIV risk measures as the dependent variable and correlates of HIV risk as independent variables.

There are two primary variables of interest in these regressions, both related to migration from a MDICP fieldwork village. First, I include a binary indicator to represent any respondent who migrated from the MDICP sample to another rural or urban area of the

country and was interviewed by the migration study team in 2007. Next, I include an indicator for rural-urban migrants (shown in Table 6 above). If migrants are at greater risk of HIV infection primarily due to rural-urban migration, one would expect that the indicator for rural-urban migration to be significant in these regressions.

Results from these regressions in Tables 10-14 clearly show that both male and female MDICP migrants are at higher risk of HIV infection than permanent rural residents. For example, Table 11 shows that male MDICP migrants are approximately 2.4 times more likely to report that their wife or current partner has been unfaithful. Female migrants are more than two times more likely to report infidelity to a spouse or current partner than are permanent rural female residents (Table 10). In Table 12, female migrants also report a significantly higher number of lifetime sexual partners than non-migrants. In addition to greater frequency of risk behavior, migrant men and women also perceive higher risk of HIV infection: ordered logistic regression results in Table 13 show that both male and female MDICP migrants are significantly more likely to be worried about HIV infection than are permanent rural residents. MDICP migrants are also significantly more likely to be HIV positive than permanent rural residents. Finally, the increased risk behavior and HVI risk perception is indeed associated with greater likelihood of HIV infection for MDICP migrants. Table 14 reveals that female migrants are approximately two times more likely to be HIV positive than permanent female residents, and male migrants are more than three times more likely to be HIV positive than their permanent male counterparts.

According to the results in Tables 10-14, migration to an urban destination does not explain the difference in HIV risk between migrants and permanent rural residents. Of all five HIV risk measures for both men and women, only one shows a significant difference for rural-urban migrants: men who migrate to an urban area are more likely to report marital infidelity than non-migrants. Although DHS data shows a higher HIV prevalence in urban areas of Malawi than rural areas (MDHS 2004), migrants from villages in the MDICP sample to urban areas in Malawi are not significantly more likely to be HIV positive than permanent rural residents.

These results clearly demonstrate that MDICP migrants are at significantly greater risk of HIV infection than permanent rural residents. However, this difference is not explained by urban migration: greater likelihood of HIV risk behavior is found for only one measure of risk for male rural-urban migrants in Tables 10-14. While it is apparent that migrants are at higher risk of HIV infection, it is not possible to discern from these regressions whether MDICP migrants became HIV infected as a result of migration, or if migration can be the result of HIV infection prior to moving. I use longitudinal MDICP data to address this question in the following section.

Table 10: Logistic regression results for differences in reporting marital infidelity between migrants and non-migrants, by gender for MDICP 2006-2007 data

	Unfaithful to Spouse			
	Women		Men	
	Odds	S.E.	Odds	S.E.
Age	1.02	0.01	0.97**	0.01
Household amenities				
Iron	0.92	0.33	0.93	0.21
Bicycle	0.58**	0.16	1.20	0.20
Radio	0.75	0.22	1.19	0.23
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	1.17	0.38	0.41***	0.08
Rumphi	0.99	0.35	0.64**	0.13
Level of education				
No education (ref)	---	---	---	---
Primary school	1.35	0.47	1.04	0.22
Secondary school	3.10**	1.48	1.20	0.35
Marital characteristics				
Polygamous	1.54	0.46	15.49***	2.80
Marital duration	0.52	0.29	1.61	0.77
Currently married (ref)	---	---	---	---
Divorced or separated	0.20	0.21	1.32	0.99
Widowed	0.98	0.02	1.01	0.01
Number of children	1.03	0.05	1.04*	0.02
MDICP migrant	**2.20*** **	**0.66**	**0.82**	**0.21**
Rural-urban migrant	**1.26**	**0.68**	**2.70****	**1.28**
N=	1814		1172	
Pseudo R2	0.067		0.228	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Logistic regression results for differences in spousal infidelity between migrants and non-migrants, by gender for MDICP 2006-2007 data

	Spouse Unfaithful			
	Women		Men	
	Odds	S.E.	Odds	S.E.
Age	1.01	0.01	1.02	0.02
Household amenities				
Iron	1.09	0.17	0.89	0.31
Bicycle	1.14	0.14	1.47	0.40
Radio	1.09	0.15	0.59*	0.17
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	0.89	0.12	1.22	0.35
Rumphi	0.55***	0.09	1.12	0.37
Level of education				
No education (ref)	---	---	---	---
Primary school	1.15	0.16	2.03*	0.80
Secondary school	0.98	0.26	1.49	0.79
Marital characteristics				
Polygamous	4.45***	0.60	2.13***	0.57
Marital duration	0.99	0.01	0.98	0.02
Currently married (ref)	---	---	---	---
Divorced or separated	3.77***	0.73	8.89***	4.29
Widowed	1.29	0.33	---	---
Number of children	1.04*	0.02	0.98	0.04
MDICP migrant	**0.79**	**0.13**	**2.37*** **	**0.77**
Rural-urban migrant	**0.84**	**0.33**	**1.27**	**0.78**
N=	1811		1179	
Pseudo R2	0.097		0.073	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

Table 12: Ordinary least squares regression results for differences in number of lifetime sexual partners between migrants and non-migrants, by gender for MDICP 2006-2007 data

	Number of Sexual Partners			
	Women		Men	
	Coef	S.E.	Coef	S.E.
Age	0.01**	0.01	-0.02	0.02
Household amenities				
Iron sheet roof	0.08	0.14	0.21	0.42
Bicycle	-0.04	0.11	0.29	0.33
Radio	0.03	0.12	-0.46	0.38
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	-0.33**	0.12	-0.52	0.36
Rumphi	-0.77***	0.14	-1.88***	0.41
Level of education				
No education (ref)	---	---	---	---
Primary	0.00	0.13	0.35	0.43
Secondary	0.48**	0.21	0.13	0.58
Marital characteristics				
Polygamous	0.27	0.13	2.30	0.40
Number of children	-0.01	0.02	-0.03	0.05
Marital duration	0.01	0.01	0.05**	0.02
Currently married (ref)	---	---	---	---
Divorced	0.49**	0.19	0.61	1.16
Widowed	-0.35	0.24	1.41	1.80
Never married	-0.99***	0.23	-1.08**	0.47
MDICP migrant	**0.87*** **	**0.14**	**0.54**	**0.53**
Rural-urban migrant	**-0.20**	**0.31**	**0.85**	**1.01**
Constant	1.69***	0.22	4.63	0.84
N=	1943		1474	
R2	0.078		0.074	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

Table 13: Ordered logistic regression results for differences in HIV risk perception between migrants and non-migrants, by gender for MDICP 2006-2007 data

	Worry of HIV Infection			
	Women		Men	
	Odds	S.E.	Odds	S.E.
Age	0.99**	0.01	0.98**	0.01
Household amenities				
Iron sheet roof	1.02	0.13	0.79	0.13
Bicycle	1.00	0.10	1.05	0.12
Radio	1.10	0.12	0.99	0.13
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	0.71***	0.08	0.66***	0.09
Rumphi	0.69***	0.08	0.60***	0.09
Level of education				
No education (ref)	---	---	---	---
Primary	1.04	0.12	1.11	0.17
Secondary	1.24	0.23	0.83	0.18
Marital characteristics				
Polygamous	2.03***	0.24	1.36**	0.20
Number of children	1.04**	0.02	1.00	0.02
Marital duration	---	---	---	---
Currently married (ref)	1.25	0.21	1.38	0.52
Divorced	0.64**	0.14	5.06	3.27
Widowed	0.53***	0.11	0.92**	0.16
Never married	1.00	0.01	1.01	0.01
MDICP migrant	**2.27*** **	**0.29**	**2.13*** **	**0.39**
Rural-urban migrant	**1.09**	**0.30**	**1.64**	**0.55**
Received HIV test result	0.74***	0.07	0.70***	0.08
N=	1937		1467	
Pseudo R2	0.044		0.036	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

Table 14: Logistic regression results for differences in HIV infection between migrants and non-migrants, by gender for MDICP 2006-2007 data

	HIV Infection			
	Women		Men	
	Odds	S.E.	Odds	S.E.
Age	1.00	0.01	1.00	0.02
Household amenities				
Iron sheet roof	1.48	0.40	1.78	0.70
Bicycle	1.13	0.26	0.69	0.22
Radio	1.20	0.29	1.06	0.40
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	0.62*	0.15	1.08	0.40
Rumphi	0.40***	0.11	0.87	0.35
Level of education				
No schooling	---	---	---	---
Primary	1.31	0.33	3.03**	1.68
Secondary	1.57	0.66	2.39	1.68
Marital characteristics				
Currently Married (ref)	---	---	---	---
Divorced	4.03***	1.18	0.63	0.70
Widowed	7.68***	2.54	6.12	5.33
Never married	#	#	#	#
Polygamous	1.65**	0.40	0.53	0.23
Number of children	0.89**	0.05	0.91	0.06
Duration of marriage	0.99	0.01	1.02	0.02
Spouse unfaithful	1.32	0.29	1.09	0.58
Respondent unfaithful	2.07*	0.81	2.12**	0.73
MDICP migrant	**1.87*** **	**0.46**	**3.19*** **	**1.21**
Rural-urban migrant	**1.67**	**0.77**	**1.10**	**0.77**
N=	1529		942	
Pseudo R2	0.122		0.076	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%
dropped out due to multicollinearity

5.2 Does HIV Status Influence Migration?

As described above, research on migration and HIV infection often suggests that individuals become HIV infected because of migration. For various reasons, migrants are more likely to practice risk behavior after migration, or are at risk due to greater HIV prevalence in their destination. In this section I examine an alternative possibility: that HIV status is associated with a greater likelihood to migrate. To do so, I use the two most recent waves of MDICP data, 2004 and 2006. As shown in Table 2, of 420 MDICP respondents were interviewed in 2004 but migrated by 2006. Of these respondents who migrated between 2004 and 2006, approximately 85% were tested for HIV in 2004. Using survey information and HIV testing data from 2004, I run regressions for men and women to identify 2004 characteristics that predict migration after 2004 MDICP.

The characteristics used in these regressions to predict migration are informed by reasons for migration displayed in Table 7. To examine the effect of various sets of factors that influence migration, I run a series of nested logistic regression models in this section. The dependent variable in these models is a binary indicator for migration between 2004 and 2006. In this set of regressions, Model 1 includes only background characteristics: age, household economic status, region of residence and level of education. Model 2 adds two health-related measures: HIV status from 2004 MDICP testing, and self-rated health. Model 3 includes two other variables that, according to Table 7, can be expected to influence the likelihood of migration. First, since a relatively large percentage of MDICP respondents move due to farming purposes, I include an indicator of whether the respondent owns land in the village. Next, since migration may be a reoccurring event where migrants leave a rural home for work and return periodically (Chirwa 1997a, Lurie et al 2003), I include a variable for individuals who have lived outside of their 2004 village of residence for 6 months or more since the age of 15. If HIV infection is caused by migration, one would expect that the effect of previous migration would be significant. Finally, because cultural traditions regarding marriage in Malawi influence migration (Mtika and Doctor 2002, Reniers 2003), Model 4 includes a set of variables that indicate if the respondent was currently married, never-married, divorced or separated, or widowed in the 2004 MDICP survey.

The influence of background characteristics on migration is consistent across the four models. As shown in Table 15, there is a non-linear effect of age on migration for women, where women at the youngest ages are less likely to migrate, but the likelihood increases with age. This could be due to marital patterns in Malawi. Once old enough for marriage, women move from their parents' home and then become less likely to move again after marriage. For men, the likelihood of migration decreases with age. There is a strong and highly significant effect of education on migration for women. Across models 1-4, women with a primary school education are 15-20 times more likely to migrate and women with secondary school are 20-30 times more likely to migrate than women with no education. The strong effect of education on migration possibilities reflects the fact that women often attend primary and secondary school outside of their village of origin in Malawi (Poulin 2006). Also, women with education are more likely to find work outside of the village, and are perhaps more likely to find a spouse outside of the village as well. Men with more education are also more likely to migrate, but these results are not significant at the 10% level.

There are also strong regional effects of migration, which comply with regional marital patterns for migration. Since marriage is one of the most common reasons for migration among rural Malawians, and Balaka has the highest rate of marital disruption in the three MDICP fieldwork sites (Reniers 2003), it is perhaps not surprising that both men and women from Balaka are significantly more likely to move than are respondents from Mchinji. However, marriage alone does not explain differences in migration across regions. Since the northern region of Malawi follows a patrilocal tradition, it is somewhat surprising that men from the north are more likely to migrate than male respondents from Mchinji.

Table 15: Logistic regression results for 2004 MDICP survey characteristics predicting migration between MDICP 2004 and 2006, women

	Model 1		Model 2		Model 3		Model 4	
	Odds	**SE**	**Odds**	**SE**	**Odds**	**SE**	**Odds**	**SE**
Age	0.89***	0.02	0.89***	0.03	0.90***	0.03	1.00	0.01
Age^2	1.00***	0.00	1.00***	0.00	1.00**	0.00	---	---
Education								
No education (ref)	---	---	---	---	---	---	---	---
Primary	20.91***	10.86	18.04***	9.54	17.84***	9.42	15.37***	8.09
Secondary	30.99***	17.33	27.61***	16.06	26.60***	15.51	21.19***	12.54
Household amenities								
Iron sheet roof	0.89	0.24	0.74	0.22	0.74	0.22	0.72	0.24
Bicycle	1.29	0.21	1.35	0.25	1.37*	0.26	1.36	0.27
Radio	1.27	0.22	0.94	0.19	0.95	0.19	1.12	0.25
Region of residence								
Mchinji (ref)	---	---	---	---	---	---	---	---
Balaka	1.23	0.22	1.61**	0.35	1.63**	0.35	1.59**	0.36
Rumphi	0.72*	0.14	0.85	0.19	0.80	0.19	0.74	0.19
Health status								
Excellent (ref)	---	---	---	---	---	---	---	---
Very good			0.91	0.22	0.90	0.22	0.92	0.23
Good			1.01	0.20	1.01	0.20	0.90	0.19
Fair			0.75	0.22	0.75	0.22	0.69	0.22
Poor			0.64	0.71	0.63	0.70	0.65	0.72
HIV positive			1.88**	0.56	1.92**	0.57	1.85**	0.57
Owns land					0.82	0.16	0.86	0.18
Previously lived outside the village					1.12	0.28	1.10	0.29
Marital characteristics								
Number of children							0.97	0.05
Currently married (ref)							---	---
Never married							2.61***	0.70
Divorced or separated							2.12**	0.81
Widowed							2.19*	1.04
N=	2006		1506[†]		1506		1506	
Pseudo R^2	0.122		0.124		0.125		0.144	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

[†] Difference in sample size between Model 1 and Model 2 is due to respondents not tested for HIV or not found by the 2004 MDICP testing team.

Table 16: Logistic regression results for 2004 MDICP survey characteristics predicting migration between MDICP 2004 and 2006, men

	Model 1		Model 2		Model 3		Model 4	
	Odds	**SE**	**Odds**	**SE**	**Odds**	**SE**	**Odds**	**SE**
Age	0.97***	0.01	0.97***	0.01	0.98***	0.01	1.01	0.01
Education								
No education (ref)	---	---	---	---	---	---	---	---
Primary	1.77*	0.58	1.77	0.65	1.82	0.68	1.61	0.61
Secondary	1.77	0.69	1.63	0.70	1.68	0.73	1.33	0.60
Household amenities								
Iron sheet roof	1.77**	0.42	1.57*	0.41	1.44	0.38	1.41	0.39
Bicycle	0.95	0.19	0.87	0.19	0.91	0.20	0.91	0.20
Radio	0.83	0.17	0.54***	0.12	0.62**	0.14	0.60**	0.14
Region of residence								
Mchinji (ref)	---	---	---	---	---	---	---	---
Balaka	3.71***	0.89	3.66***	1.01	3.80***	1.07	3.42***	0.99
Rumphi	1.55*	0.41	1.83**	0.54	1.87**	0.56	1.85**	0.58
Health status								
Excellent (ref)	---	---	---	---	---	---	---	---
Very good			0.78	0.21	0.77	0.21	0.72	0.21
Good			0.62*	0.15	0.64*	0.16	0.60**	0.16
Fair			0.99	0.33	1.00	0.33	0.96	0.33
Poor			1.29	1.04	1.30	1.06	1.32	1.09
HIV positive			3.78***	1.45	3.96***	1.53	3.36***	1.39
Owns land					0.47***	0.10	0.49***	0.11
Previously lived outside the village					1.75**	0.45	1.69**	0.44
Marital characteristics								
Number of children							0.86***	0.05
Currently married (ref)							---	---
Never married							1.12	0.36
Divorced or separated							#	
Widowed							#	
N=	1493		1142[†]		1142		1080[‡]	
Pseudo R^2	0.078		0.093		0.110		0.124	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

dropped out due to multicollinearity

[†] Difference in sample size between Model 1 and Model 2 is due to respondents not tested for HIV or not found by the 2004 MDICP testing team.

[‡] Difference in sample size between Model 3 and Model 4 is due to divorced or separated, or widowed respondents who dropped out of the regression.

Both male and female MDICP respondents who were found HIV positive in 2004 are significantly more likely to migrate after the 2004 MDICP survey. This result is particularly strong for men, where Models 2-4 reveal that HIV positive men are three times more likely to migrate after 2004 than are HIV negative men. Similarly, women who are HIV positive are approximately 90% more likely to migrate while controlling for other correlates of migration in Models 2-4.

Ownership of land and prior history of migration are important factors that tie men to their MDICP village of origin. As shown in the results for Model 3-4 in Table 16, men who own land are significantly less likely to migrate after 2004. A history of migration also increases the likelihood of future migration: men who lived elsewhere for 6 months or more since age 15 were significantly more likely to migrate again after 2004. This indicates that land ownership perhaps ties male respondents to their village, or that men who intend to migrate are less likely to invest in land.

While land ownership or migration history is not significantly associated with migration for women, marital status is an important predictor. Women who are never-married, divorced, or widowed in 2004 are all more than two times more likely to migrate than women who are currently married in 2004. Since marriage is a primary reason for migration among MDICP women (as shown in Tables 7), it is reasonable to assume that women who are not currently married often move because they become married, either for the first time or following a the end of a previous marriage. These results are not significant for MDICP men.

Overall, these regressions show a portrait of typical characteristics of migrants for men and women in rural Malawi. Women who migrate are never-married or have undergone marital disruption, are better-educated and more likely to come from the Southern region of Malawi. Male migrants are younger, less likely to come from the Central region, and less tied to their MDICP village of origin. Most importantly, HIV positive men and women are significantly more likely to migrate than HIV negative individuals.

While the above results provides strong evidence that HIV status influences migration among MDICP respondents, this result does not invalidate previous research that shows that migrants are more likely to become HIV positive. These two research findings are not mutually-exclusive: because individuals may have previously infected by HIV from time spent in an urban area prior to migration, migrants may still become infected through migration. However, this section provides evidence for a different causal direction than research on HIV infection and migration typically suggests and a phenomenon that warrants further investigation.

It is important to note that the logistic regressions cannot establish a causal relationship between HIV status and migration. Although HIV positive respondents are more likely to migrate, there could be unmeasured confounders that influence both HIV status and migration in the models for this section. For example, by definition individuals who move from their village of origin are less risk-averse than permanent rural residents. This risk-aversion could also lead to a greater likelihood of engaging in behavior that puts one at risk of contracting HIV. Fixed effects regression models control for such unobserved characteristics. However, because fixed effects regression utilizes only respondents who change migration status or HIV status over time, and very few MDICP respondents have an observed change in HIV status between 2004 and 2006, I cannot run fixed effects regression to estimate the effect of HIV status on migration. Similarly, a suitable instrumental variable that could affect HIV status but not migration was not apparent in

the data. Nonetheless, the strong association between HIV status and migration is sufficient to question the assumption implicit in much migration work: that HIV infection typically occurs as a result of migration. In the next section, I focus on reasons for migration among MDICP migrants to identify the primary reason why migrants are disproportionately HIV positive.

5.3 Why are migrants more likely to be HIV positive?

Here, I investigate reasons why migrants are more likely to be HIV positive than permanent residents of villages in the MDICP sample. I begin by examining reasons for migration provided by MDICP migrants to see if HIV prevalence is higher for any particular reason for migration.

To see if HIV prevalence is significantly higher among migrants who move for a particular reason, I run multinomial logistic regressions where the dependent variable is the reason for migration (shown in Table 17, below), and independent variables are background characteristics for migrants (age, education, household amenities, and region of origin) and HIV status. Because there are numerous reasons for migration and many of the reasons make up only a small percentage of the overall motivation for migration, I group the categories of moving into the three largest percentages. The first category is work-related reasons for moving, which includes looking for work and having been offered a job in a new location (categories 1 and 2 in Table 17). Work-related migration makes up a total of approximately 28% of reasons for migration stated by 2007 MDICP migration study respondents. Categories 3-5 make up one marriage-related group, which accounts for approximately 35% of migrants. The final category (which serves as the reference category in these multinomial logistic regressions) combines the remaining reasons for migration, none of which individually compose more than 20% of the reasons for migration.

Table 17: Reasons for migration among respondents interviewed in the 2007 MDICP migration study

	Female Migrants		Male Migrants		All MDICP Migrants	
	Freq.	%	Freq.	%	Freq.	%
1. To look for work / offered job	47	20.4%	65	38.2%	112	27.9%
2. Attending school	8	3.5	9	5.3	17	4.2
3. Divorce or separation	36	15.6	9	5.3	45	11.2
4. Widowed	20	8.7	3	1.8	23	5.7
5. New marriage	58	25.1	16	9.4	74	18.5
6. Illness	7	3.0	1	0.6	8	2.0
7. Taking care of sick relative	9	3.9	13	7.7	22	5.5
8. New land for farming	27	11.7	35	20.6	62	15.4
9. Conflict with others in village	1	0.4	5	2.9	6	1.6
10. Other reasons	18	7.8	14	8.2	32	8.0
Total	231		170		401	

Results for these multinomial regressions (in Tables 18 and 19) show that male and female MDICP respondents who move for marriage-related reasons are significantly more likely to be HIV positive than individuals who migrate for other reasons. For example, women who move because due to separation, divorce, widowhood, or to marry a new husband were more than 11 times more likely to be HIV positive than women who migrated for another reason. Similarly, men who moved because of a marital change were more than 10 times more likely to be HIV positive than men who moved for other reasons. In contrast, men and women who moved for work-related reasons were not significantly more likely to be HIV positive than respondents who moved for other reasons.

As a result, it appears that marital change is the primary reason why migrants from rural areas of Malawi are more likely to be HIV positive than permanent rural residents. This result fits logically within the literature on HIV infection, marriage and migration, where previous research has shown that HIV infection is associated with greater likelihood of marital dissolution in Uganda (Porter et al 2004), and that marriage and marital dissolution are common reasons for internal migration in sub-Saharan African countries (Boerma et al 2006, Reniers 2003). However, the link between HIV status, marital change and migration has not been previously established and appears to explain why rural MDICP migrants are significantly more likely to be HIV positive than permanent rural residents of Malawi.

Table 18: Multinomial logistic regression results for factors influencing migration for work-related or marriage-related reasons, MDICP 2006 data for women

	Work-related migration versus other reason for migration		Marriage-related migration versus other reason for migration	
	Odds	**S.E.**	**Odds**	**S.E.**
Age	0.95	0.03	1.00	0.02
Household amenities				
Iron sheet roof	8.41**	0.54	1.55	0.47
Bicycle	1.65	0.47	0.80	0.37
Radio	1.01	0.53	0.88	0.38
Region of residence				
Mchinji (ref)		---		---
Balaka	1.61	0.65	0.74	0.43
Rumphi	5.00*	0.69	1.85	0.48
Education				
No schooling (ref)		---		---
Primary	0.96	0.64	1.45	0.44
Secondary	0.93	0.85	0.77	0.65
Polygamous marriage	1.24	0.50	1.95	0.39
Number of children	1.35*	0.13	0.93	0.10
HIV positive	5.87	0.91	11.59**	0.77
Pseudo R2 =		0.169		
N=		222		

Notes: * significant at 5%; ** significant at 1%
17 cases where the respondent refused an HIV test are dropped from this regression. Regression results are the same when HIV status is recoded as a categorical variable with 0=HIV negative, 1=HIV positive and 2=refused test.

Table 19: Multinomial logistic regression results for factors influencing migration for work-related or marriage-related reasons, MDICP 2006 data for men

	Work-related migration versus other reason for migration		Marriage-related migration versus other reason for migration	
	Odds	**S.E.**	**Odds**	**S.E.**
Age	1.00	0.02	1.01	0.03
Household amenities				
Iron sheet roof	2.66*	0.47	0.24	0.95
Bicycle	0.81	0.43	0.61	0.62
Radio	1.52	0.50	0.17**	0.65
Region of residence				
Mchinji (ref)		---		---
Balaka	0.71	0.53	0.21*	0.72
Rumphi	2.53	0.56	0.09*	0.99
Education				
No schooling (ref)		---	---	---
Primary	0.87	0.66	2.09	0.86
Secondary	0.92	0.88	9.87*	1.16
Polygamous marriage	0.62	0.60	1.44	0.79
Number of children	1.01	0.08	1.27*	0.11
HIV positive	1.90	0.75	10.38**	0.79
Pseudo R2 =		0.197		
N=		148		

Notes: * significant at 5%; ** significant at 1%
19 cases where the respondent refused an HIV test are dropped from this regression. Regression results are the same when HIV status is recoded as a categorical variable with 0=HIV negative, 1=HIV positive and 2=refused test.

To verify the relationship between migration, HIV infection and marital change that is suggested in the results above, I run two additional sets of regressions. First, if marriage is a primary reason for migration, and marriages involving HIV positive individuals are more fragile than marriage with sero-concordant HIV negative spouses, one would expect that (1) migrants are more likely to have experienced a divorce in the past, and that (2) migrants average more marriages than permanent rural residents. To test these possibilities, I run regressions similar to the above, using 2006-07 MDICP data for migrants and permanent rural residents. First, I run ordinary least squared regressions where the dependent variable is the overall number of marriages for men and women. Next, I run logistic regressions where the dependent variable is a binary indicator of whether the respondent has experienced a divorce in the past. Independent variables include background characteristics (age, region of residence, household amenities, level of education), and correlates of marriage and divorce (number of living children, spousal infidelity, respondent's infidelity). Of primary interest in these regressions is the indicator for whether the respondent is a MDICP migrant, and HIV status.

Results for these regressions, displayed in Tables 20 and 21, confirm that migrants have had significantly more marriages and are significantly more likely to have experienced a divorce in the past than permanent rural residents. For example, as shown in Table 20,

MDICP migrants have had an average of 0.14 and 0.22 (for women and men, respectively) more marriages than permanent rural residents. Similarly, Table 21 shows that male MDICP migrants are two times more likely to have previously experienced a divorce than non-migrants, and female migrants are 45% more likely to have experienced a divorce. Also, as expected, HIV positive men and women also have had a significantly greater number of marriages and are significantly more likely to have experienced divorce. These regressions verify that there is indeedn a strong relationship between marital dissolution, migration and HIV status.

Table 20: Ordinary least squares regression results for differences in lifetime number of marriages between migrants and non-migrants, by gender for MDICP 2006-2007 data

	Number of marriages			
	Women		Men	
	Coef.	S.E.	Coef.	S.E.
Age	0.02***	0.00	0.01***	0.00
Household amenities				
Iron sheet roof	-0.13***	0.05	-0.06	0.09
Bicycle	-0.06*	0.04	0.03	0.07
Radio	-0.02	0.04	-0.02	0.08
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	-0.22***	0.04	-0.21***	0.08
Rumphi	-0.30***	0.05	-0.28***	0.09
Education				
No schooling (ref)	---	---	---	---
Primary	-0.04	0.04	0.01	0.09
Secondary	-0.17**	0.08	-0.11	0.12
Marital characteristics				
Currently married (ref)	---	---	---	---
Divorced	0.17**	0.07	0.07	0.22
Widowed	-0.34***	0.08	0.08	0.30
Polygamous marriage	0.04	0.04	1.09***	0.09
Number of children	-0.01	0.01	0.02**	0.01
Spouse unfaithful	-0.02	0.04	0.02	0.13
Unfaithful to spouse	-0.03	0.08	-0.05	0.08
HIV positive	0.27***	0.06	0.52***	0.14
MDICP migrant	**0.14*** **	**0.05**	**0.22****	**0.10**
Constant	1.06***	0.07	0.98***	0.15
R^2 =	0.166		0.286	
N=	1530		943	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

Table 21: Logistic regression results for differences in likelihood of ever being divorced between migrants and non-migrants, by gender for MDICP 2006-2007 data

	Ever divorced			
	Women		Men	
	Odds	S.E.	Odds	S.E.
Age	1.12***	0.03	1.11***	0.04
Age2	0.99***	0.00	0.99**	0.00
Household amenities				
Iron sheet roof	0.99	0.17	0.90	0.20
Bicycle	0.57***	0.07	0.85	0.14
Radio	0.80	0.11	0.88	0.16
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	0.53***	0.08	0.67**	0.12
Rumphi	0.40***	0.07	0.31***	0.07
Education				
No Schooling (ref)	---	---	---	---
Primary	0.91	0.13	1.20	0.24
Secondary	0.58	0.16	0.94	0.29
Marital characteristics				
Polygamous marriage	1.22	0.18	2.87***	0.59
Number of children	0.87***	0.03	0.97	0.02
Spouse unfaithful	1.21	0.16	1.28	0.38
Unfaithful to spouse	0.76	0.22	0.91	0.17
HIV positive	2.43***	0.51	3.36***	1.07
MDICP migrant	**1.45****	**0.22**	**2.10*****	**0.47**
Pseudo R^2 =	0.104		0.113	
N=	1530		943	

Notes: * Significant at 10%; ** significant at 5%; *** significant at 1%

To further solidify the relationship between migration, HIV status and marital change, I use MDICP data from 2004 to see if HIV status in 2004 predicts divorce. To do so, I run logistic regressions where the dependent variable is an indicator for experiencing a divorce between 2004 and 2006 (from 2006 MDICP and 2007 MDICP migration study data), and the independent variables of interest are (1) an variable representing migration between 2004 and 2006, and (2) HIV status in 2004. In addition to background characteristics, other independent variables of interest are factors that influence divorce, including marital infidelity, infidelity of a spouse, whether the spouse usually stays in the same village as the respondent (asked only for women), self-rated health status, and number of living children.

The results in Table 22 again support the expected relationship between HIV status, marital change and migration. Men who migrate between 2004 and 2006 are 2.4 times more likely to experience divorce between 2004 and 2006 than are permanent male rural residents. In addition, men who are HIV positive in 2004 are more than three times more likely to experience a divorce by 2006/07 than men who are HIV negative. While female migrants are also more likely to divorce between MDICP waves, the difference with non-

migrants is only marginally significant. However, HIV positive women are more than four times more likely to experience a divorce by 2006 than are HIV negative female respondents.

Table 22: Logistic regression results for 2004 MDICP survey characteristics predicting divorce between MDICP 2004 and 2006 by gender

	Divorce between 2004 and 2006			
	Women		Men	
	Odds	S.E.	Odds	S.E.
Age	1.01	0.01	1.02	0.02
Education				
No schooling (ref)	---	---	---	---
Primary	1.32	0.42	1.14	0.55
Secondary	0.92	0.57	0.46	0.32
Household amenities				
Iron sheet roof	0.81	0.36	1.13	0.53
Bicycle	0.56**	0.15	0.64	0.22
Radio	1.07	0.28	0.96	0.34
Region of residence				
Balaka (ref)	---	---	---	---
Mchinji	0.56*	0.17	0.94	0.35
Rumphi	0.41**	0.14	0.61	0.26
Polygamous marriage	1.51	0.39	2.47*	1.26
Unfaithful to spouse	2.47**	1.01	1.02	0.41
Spouse unfaithful	0.88	0.23	0.66	0.37
Self-rated health status				
Excellent (ref)	---	---	---	---
Very good	1.17	0.38	1.19	0.47
Good	1.22	0.36	0.62	0.26
Fair	0.77	0.33	1.08	0.52
Poor (dropped out)				
Spouse stays outside village	2.47***	0.73	---	---
HIV status	4.28***	1.25	3.31**	1.68
Number of children	0.91*	0.05	0.84**	0.06
Migrant between 2004 and 2006	**1.77***	**0.54**	**2.35****	**0.88**
R2 =	0.114		0.088	
N=	1461		1078	

Notes: * significant at 5%; ** significant at 1%

Because approximately 33% of MDCIP migrants were not traced (including new spouses of migrants), there is a potential selection bias in these data. For example, if migrants that are more difficult to find are also more likely to be HIV negative, the regressions estimated in this section may overestimate the difference in HIV status between migrants and permanent rural residents. If certain reasons for moving are more strongly associated with HIV infection than others (as indicated in Tables 18 and 19), and there are significant differences in reasons for moving between migrants traced and those not found by the MDICP migration study, then the results in Tables 11-15 overstate the

difference between migrants and non-migrants. To investigate the possibility of this selection bias, I compare the means of reasons for moving (from migration autopsies) between migrants interviewed and those not traced in the migration study. Results from T-tests, shown in Table 23, indicate that there are few significant differences between migrants and non-migrants. Of the 10 categories of reasons for moving, only four are significantly different between migrants found and not found. Although migrants traced were more likely to move for a new marriage than migrants not found, the other marriage-related reasons for moving are not significantly different between migrants found and not found. Also, respondents who moved due to illness were less likely to be interviewed, which, since research indicates that some individuals return to their home to be cared for by their family while in the final stages of AIDS infection (Clark et al 2007), may represent an underestimation of HIV infection among all MDICP migrants. The largest difference in reason for moving between migrants found and not found is the 'other' category, which may reflect the fact that the friend or family member being interviewed for the migration autopsy didn't have as much accurate information on the migrant, resulting in a more vague reason for moving and less specific information on the migrants new residence.

Table 23: T-tests for differences in means in reasons for moving between migrants interviewed by MDICP migration study and migrants not interviewed

	Not interviewed		Interviewed		Difference	
Reason for migration	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**T-test**
1. To look for work / offered job	0.221	(0.415)	0.279	(0.449)	-0.058	-1.790
2. Attending school	0.063	(0.244)	0.042	(0.201)	0.021	1.245
3. Divorce or separation	0.079	(0.270)	0.112	(0.316)	-0.033	-1.496
4. Widowed	0.054	(0.226)	0.057	(0.233)	-0.003	-0.216
5. New marriage	0.110	(0.314)	0.185	(0.388)	-0.075**	-2.759
6. Illness	0.063	(0.244)	0.020	(0.140)	0.043**	2.979
7. Taking care of sick relative	0.044	(0.206)	0.055	(0.228)	-0.011	-0.652
8. New land for farming	0.113	(0.318)	0.154	(0.362)	-0.041	-1.592
9. Conflict with others in village	0.108	(0.310)	0.016	(0.122)	0.092**	5.457
10. Other reasons	0.145	(0.353)	0.080	(0.271)	0.065**	2.804
Total	1.000		1.000			

Notes: * significant at 5%; ** significant at 1%

Finally, I further investigate the implications of not-interviewed migrants by estimating changes to HIV prevalence based on assumptions of the HIV status of these untraced migrants. Table 24 shows HIV prevalence for MDICP migrants and MDICP permanent residents, by gender. As shown in the first row in Table 24, HIV prevalence for MDICP women increases from 6.73% (only the MDICP 2006 permanent female residents) to 7.97% when the 2007 MDICP migrants are added (at 17.29% HIV prevalence). Similarly, HIV prevalence increases for men from 3.51% to 4.16% when male migrants are included. The next two rows show HIV prevalence estimates if (1) all untraced

migrants are HIV positive, and (2) if all untraced migrants are HIV negative. For example, if all untraced MDICP migrants were HIV positive, overall HIV prevalence in MDICP would increase substantially: from 6.3% to approximately 17.5%. The change in overall HIV prevalence would be much smaller if all unfound MDICP migrants were HIV negative- from 6.3% to 5.5%.

Previous research on HIV infection, migration and marriage has hinted that HIV infection may be associated with migration and marital dissolution. For example, research has shown that men often become infected with HIV through extramarital partners, while the husband is the primary source of HIV infection for women (de Zousa, Sweat and Denison 1996; Heise and Elias 1995; King et al 1993; McKenna et al. 1997). In addition, an increased incidence of divorce has been shown for individuals who fear HIV infection as a result of suspected spousal infidelity (Reniers 2005, Smith and Watkins 2005). Also, a positive relationship between likelihood of marital dissolution and HIV infection has also previously been established (Porter et al 2004), and that migration often occurs after marital dissolution for several countries in sub-Saharan Africa (Boerma 2002, Reniers 2003). However, previous research has not put all these pieces together to show that HIV infection is associated with greater marital instability, which often leads to migration. As a result of the above, it is clear that the relationship between HIV risk and migration is more complex than how it is often portrayed.

Table 24: HIV prevalence among MDICP migrants and permanent residents depending on assumptions of HIV status for migrants not traced

	HIV Prevalence- Women			HIV Prevalence- Men			Total- Both Genders
	Migration 2007	MDICP 2006	Total Women	Migration 2007	MDICP 2006	Total Men	
HIV prevalence	17.29%	6.73%	7.97%	9.33%	3.51%	4.16%	6.25%
If untraced migrants 100% HIV positive	55.97%	6.73%	17.86%	56.96%	3.51%	17.29%	17.49%
If untraced migrants 0% HIV positive	9.20%	6.73%	7.04%	4.43%	3.51%	3.55%	5.50%

6. Discussion/Conclusion

This article examines the complex relationship between HIV infection, marital dissolution and migration among rural residents of Malawi. Using longitudinal data that includes HIV biomarkers and survey information for individuals before and after migration, it is clear that, as suggested in previous research, migrants are more at risk of HIV infection than permanent residents of rural Malawi. However, among rural Malawians, it appears that HIV infection is associated with increased marital dissolution, which subsequently leads to greater likelihood of migration- either for marriage to a new spouse or to return home after a previous marriage has ended.

Research on the relationship between migration and HIV infection often focuses only on individuals migrating for work-related reasons and reasons why these labor migrants are more at risk of HIV infection (e.g. Anarfi 1993, Bassett et al 1992, Chirwa 1997a, Lurie 1997, Wolffers et al 2002). While not understating the importance of labor migrants in the spread of HIV, it is also important to acknowledge other reasons for migration in sub-Saharan Africa, and that these reasons for migration may also be associated with greater HIV risk: as shown above, only 25% of rural MDICP migrants moved for work-related reasons, and these migrants were not significantly more likely to be HIV infected than migrants moving for other reasons.

As stated above, this research is not without limitations in the empirical analyses. The relationship between reasons for migration and HIV status could be affected by the presence of unobserved characteristics that could lead to bias in the parameter estimates in Tables 18 and 19- for example, if less risk-averse individuals were more likely to migrate and average more marriages. Empirical techniques that correct for such biases, such as fixed-effects or instrumental variables, however, are not readily available in this data.

Nonetheless, the body of evidence provided in the analyses in this paper should, at the very least, lead to a re-examination of the relationship between HIV infection and migration in sub-Saharan African countries. Similarly, intervention programs that focus on curbing the risk behavior of migrants may be addressing only part of the overall HIV risk for migrants, and awareness should also be raised in rural communities that new residents could be more at risk of HIV infection than permanent residents.

7. Acknowledgements

The Malawi Diffusion and Ideational Change Project has been funded by the National Institute of Child Health and Human Development (NICHD), grants R01-HD37276, R01-HD044228-01, R01-HD050142, R01-HD/MH-41713-0. The MDICP has also been funded by the Rockfeller Foundation, grant RF-99009 #199. The MDICP Migration Study was funded by a grant from PARC, grant number X.

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