INTERNATIONAL MIGRATION REVIEW

Male Migration, Women Left Behind, and Sexually Transmitted Diseases in Armenia

Arusyak Sevoyan
Victor Agadjanian
Arizona State University

The effect of male circular labor migration on risks of sexually transmitted diseases (STDs) among women left behind has not been well studied. Our study examines this effect using data from a survey of 1,240 married women in rural Armenia, where international male labor migration has traditionally been very common. A multivariate comparison of women married to migrants and women married to non-migrants finds that the former, ceteris paribus, reported more STD symptoms, on average, and were more likely to report diagnosed STDs than the latter. However, in the case of STD symptoms, this effect is moderated by household income, as the predicted number of STD symptoms reported by migrants' wives increases as income rises. The findings illustrate the complex tradeoffs that migration entails for left-behind women and are interpreted in the context of the literature on gender, migration, and STDs.

BACKGROUND

The connections between migration and the spread of sexually transmitted diseases (STDs) have long attracted the attention of scholars and policymakers. Migrant populations are often reported to have higher prevalence of STD/HIV than non-migrant populations (De Schryver and Meheus, 1990; Mabey and Mayaud, 1997; Yang, 2004; He *et al.*, 2005). Research on the association between migration and HIV/AIDS, one of the most often studied STDs, has long looked at migration as a link between high and low HIV prevalence regions, tracking the transmission of HIV infection from areas of migrant labor concentration to migrant labor reserve areas (Hunt, 1989; Quinn, 1994). However, studies have also suggested that geographic connectivity alone cannot explain the spread of HIV epidemic. Particularly, Decosas *et al.* (1995) suggested that the spread of the

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HIV was fueled mostly by certain types of migration, such as seasonal labor migration, female migration (often leading to transactional sex), and rural-to-urban migration.

A large body of literature has focused on migrants' STD/HIV risks. Some studies have found that migrants are more likely to engage in high-risk behavior, such as commercial sex, multiple partnerships or IV drug use than are non-migrants (Anarfi, 1993; Brockerhoff and Biddlecom, 1999; Lagarde *et al.*, 2003; Li *et al.*, 2004; Yang, 2004; Coffee *et al.*, 2005; He *et al.*, 2005; Liu *et al.*, 2005; Mtika, 2007; Yang, Derlega, and Luo, 2007; Agadjanian and Avogo, 2008; Yang and Xia, 2008). Such elevated risks stem from the changes associated with migration – splitting of established sexual partnerships, relaxed social control, removal of many social taboos, as well as social isolation and marginalization of migrants in host communities (Matteelli and Signorini, 2000; Yang, Derlega, and Luo, 2007). Moreover, evidence from China suggests that migrants are more likely to engage in risky sexual behaviors when they become better off and their life becomes more stable in destination areas (Liu *et al.*, 2005). He *et al.* (2005) also found higher prevalence of STDs among migrants with higher income and higher status and attributed this to greater opportunities for extramarital and commercial sex among more successful migrants.

A few dissenting studies have argued that migrants are, in fact, less likely to engage in risky behavior than non-migrants (*e.g.*, Collinson *et al.*, 2006; Mundandi *et al.*, 2006; Yang and Xia, 2008). Thus Collinson *et al.* (2006) have found that migrants, compared to non-migrants, have heightened perceptions of HIV risks, which makes them more careful in their sexual behavior. Yang and Xia (2008) observed that the higher level of risky sexual behavior among temporary migrants as a whole appears to be mainly attributable to female migrants' elevated proclivity toward risky sexual behavior. Male temporary migrants in their study actually scored lower on the risky sexual behavior index than did male non-migrants.

More recently, the focus in research on migration and STD/HIV has been expanded from migrants to their partners left behind. The nature of left-behind partners' vulnerabilities and the mechanisms through which STDs/HIV spread among the partners of migrants are debatable. Thus Kishamawe *et al.* (2006) found that in couples, men and women who were resident (not mobile) and had a long-term mobile partner both reported more sexual risk behavior and also showed higher HIV prevalence than people with resident or short-term mobile partners. However, another study in South Africa showed no significant association between

women's HIV status and their partners' migration (Lurie *et al.*, 2002). That study found that the risks of women left behind were related to the number of their partners rather than to their partners' migration status. A further analysis of the same data revealed that both migrant men and non-migrant women were more likely to get infected outside of marriage, irrespective of husband's migration status (Lurie *et al.*, 2003). Moreover, the authors found that in one-third of discordant couples, non-migrant females were the ones to carry the virus. Likewise, Coffee, Lurie, and Garnett (2007) modeled the impact of migration on the HIV epidemic in South Africa to come to a conclusion that migration increases prevalence of HIV by increased high-risk sexual behavior among both migrants and their non-migrant partners.

These findings add an interesting nuance to the emerging debate on the association between STD/HIV risks and the gendered division of power and resources, as well as the issues of sexual negotiation between migrant men and their partners left behind. Women in general are biologically more susceptible to STDs/HIV, and their excessive vulnerability is often amplified by the social-cultural environments in which they live. In the settings where women are stigmatized for seeking or discussing information about sexual risks, women lack knowledge about prevention and treatment of STDs/HIV (Gupta, 2000). Women's STD/HIV risks are often increased due to an unequal gender division of labor and power. Studies have found that women often are not able to negotiate safe sex practices or to refuse having sexual intercourse with high STD/HIV-risk partners because they depend on them economically and socially or are physically abused by them (Gupta, 2000; Weiss, Whelan, and Gupta, 2000; Wingood and DiClemente, 2000). The gendered division of labor and power can be even stronger among couples with a migrant male partner. Hughes, Hoyo, and Puoane (2006) found that women married to migrants in South Africa had higher risks of STDs as a result of reduced power for sexual negotiation, especially in cases of long separation. In their study, women who saw their husbands less frequently were less likely to communicate with them about STDs, HIV/AIDS, and contraception. Although these studies show that women with migrant husbands have increased risks of STDs/HIV, more research is needed to understand the mechanisms through which men's migration affects the spread of STDs among their non-migrant partners.

Overall, research on migration and STD/HIV has come to a relative consensus that risky sexual behavior triggered or facilitated by migration

is the key factor in the spread of STDs/HIV. However, this consensus is based mostly on research in high HIV prevalence southern African settings. The rapid spread of the HIV/AIDS epidemic in southern Africa is believed to be largely explained by high rates of concurrent partnerships compared to other settings (Morris and Kretzschmar, 1995, 1997; Epstein, 2007). Differing patterns of sexual partnerships and of gender inequalities, therefore, can help explain the levels of severity of the HIV/AIDS epidemic (Halperin and Epstein, 2007). These cultural and social dynamics exacerbate the vulnerabilities created by large numbers of young people, rapid urbanization, increasing mobility, and lack of STD prevention programs, diagnostic facilities, and effective treatment (Piot and Tezzo, 1990; Mabey, 1996). However, relatively little is known about how these factors play out in the spread of STDs and HIV in transitional countries that once constituted the Soviet Union. These countries have high rates of STDs (Kelly and Amirkhanian, 2003) and growing prevalence of HIV (Buckley, 2009). Some of these countries, especially those located in Central Asia and the Caucasus, have also experienced mass labor out-migration in the last two decades (Heleniak, 2008). Given the role of migration in the spread of HIV in other parts of the world and that migration from these countries is directed primarily to Russia and Ukraine, two countries with rapidly growing HIV prevalence, research on the connections between migration and STD/HIV risks in post-Soviet Eurasia is of utmost importance.

This study looks at the association between male labor migration and STDs among rural women in Armenia. It adds to research on risks of STDs among women left behind and more broadly, contributes to our understanding of how migration shapes socioeconomic and health vulnerabilities in developing and transitional settings. The study poses two main questions: (1) Is male labor migration associated with increased STD risks among women left behind in rural Armenia?; and (2) How does household income affect the relationship between husbands' migration and the STD risks of their left-behind wives?

Though the literature is inconclusive, most studies, as shown in the review above, tend to conclude that labor migration is associated with elevated risks of STDs among migrants and, by extension, increase the risks of STDs among migrants' wives relative to women whose husbands do not migrate. Hence, we hypothesize that women married to migrants have significantly higher STD risks than women married to non-migrants, net of other factors. Several studies reviewed above also suggest that STD risks

among migrants are positively associated with their socioeconomic status. Again, because migrants' risks are assumed to translate into their non-migrating partners' risks, we hypothesize that STD risks among women increase with rising incomes in migrants' households. Conversely, we do not expect to find a similar effect of household income on women's STD risks in non-migrant households.

THE SETTING

Migration from Armenia

Armenia, a nation of some three million residents and a Gross National Income per capita estimated at $2,640 (World Bank, 2008), gained independence after the dissolution of the USSR in 1991. The collapse of the Soviet rule and the war with neighboring Azerbaijan in the early 1990s led to a severe socioeconomic crisis that affected, among other things, the scope and patterns of international migration. Seasonal labor migration to Russia and other parts of the Soviet Union, popularly known as *khopan*, was common in Armenia even before its independence, but the hardships of the early 1990s largely replaced it with massive permanent emigration (Poghosyan, 2003; Yeganyan and Shahnazaryan, 2004). It is estimated that since the dissolution of the USSR about 15 percent of the Armenian population permanently left the country (Heleniak, 2008). However, since the mid-1990s, as the economic situation in the country stabilized and then started to improve, permanent emigration began to subside while temporary labor migration began to rise again. The net migration rate[1] rose from −10.4 in 2000 (of which −9.9 was to CIS[2] countries) to −6.4 in 2007 (−4.7 to CIS countries) (National Statistical Service of the Republic of Armenia [NSS RA], 2005; NSS RA, 2008). Today, two main international migration patterns can be distinguished: permanent emigration from Yerevan, Armenia's capital city and by far the largest city, to Europe and the United States, and seasonal labor migration from rural areas to Russia and, to a lesser extent, other countries of the Soviet Union (Gevorkyan, Mashuryan, and Gevorkyan, 2006). According to Heleniak (2008), there is a well developed seasonal

[1]Net migration rate is the difference between in-migrants and out-migrants of an area in a year per 1,000 inhabitants. A positive value indicates more people coming to an area than leaving it, while a negative value means more people leaving than coming.

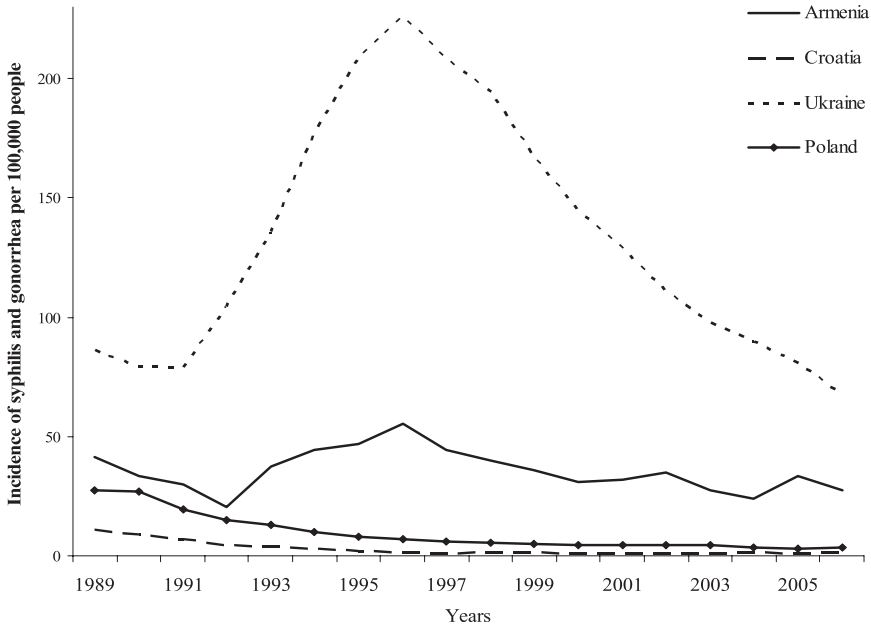
[2]The Commonwealth of Independent States (CIS) is a regional organization that includes most of the former Soviet Republics.

pattern of migration mostly to Russia, whereby people leave from January to August for seasonal work in construction and agriculture and return between the months of September and December.

Sexually Transmitted Diseases in Armenia

Although HIV levels in Armenia still remain relatively low, Buckley (2005) reports that HIV incidence there and in the neighboring countries has been rising rapidly in the last few years. It has also been observed that increasingly more new HIV cases in the country are attributed to heterosexual transmission, expanding beyond core risk groups such as commercial sex workers and intravenous drug users (Buckley, 2008). Prevalence and incidence of sexually transmitted diseases other than HIV/AIDS in Armenia has been among the highest in Eastern Europe and Eurasia. Figure I presents trends in incidence of syphilis and gonorrhea in Armenia

Figure I. **Incidence of Sexually Transmitted Diseases in Selected Countries for the Years Between 1989 and 2006 (Newly Registered Cases of Syphilis and Gonorrhea per 100,000 people).**



Source: TransMONEE, Innocenti Research Centre (2008), UNICEF

between 1989 and 2006. For comparison purposes, Figure I also depicts trends in incidence of these STDs in selected East European countries. As shown in the figure, incidence of STDs in Armenia is lower than in Ukraine but higher than in Poland and Croatia (where incidence rates are similar to those in Western Europe). Notably, the incidence rates of the two diseases in Armenia increased greatly in the early years of independence, likely due to the socioeconomic collapse and resulting crisis in the healthcare system. Though the STD incidence rates have decreased gradually since then and are now close to the rates in pre-independence years (about 30 cases per 100,000 residents), they are high by the European standards.

There is a dearth of scholarly literature on gender relations, sexual culture, and marital partnerships in the country to help understanding the risks of STDs/HIV among Armenian men and women. A general picture can be drawn based on limited statistics. According to the 2005 Armenia Demographic and Health Survey (DHS), knowledge of HIV prevention methods among men and women age 15–49 was 79.9 and 68.4 percent respectively. About 72 percent of women mentioned condom use as an HIV prevention method they knew; however, only 8 percent reported currently using condoms. The DHS also showed that multiple partnerships are not common among women. The share of women who reported more than one partner in the twelve months preceding the survey was 0.1 percent, and this number mostly accounts for women's partnerships in the capital city. In contrast, men reported much higher numbers of multiple partnerships. Thus more than 12 percent of men reported having two and more partners in the past 12 months and only 76 percent reported condom use at last high-risk intercourse (with a non-marital partner). The average number of lifetime partners among men was 5.6, compared to only one partner among women on average (it is, of course, possible that women underreported their partnerships while men overreported theirs). Despite a considerably higher number of partners among men, women reported having had more of STDs and STD symptoms than did men (NSS RA, Ministry of Health [Armenia], and ORC Macro, 2006). The DHS also found that about 35 percent of women with diagnosed STDs or STD symptoms did not seek treatment, echoing the literature that stresses limited health care resources for testing and treating STDs, especially in rural areas (Buckley, 2005; Papoyan, Arakelyan, and Bakshinyan, 2005).

Gegharkunik *marz* (province), where the data used in this study were collected, is one of the poorest provinces of Armenia. Gegharkunik's

soil and climatic conditions, unfavorable for agriculture, and shortage of non-agricultural employment have long pushed its men to look for jobs elsewhere, primarily in Russia. As a result, the province has one of the highest rates of labor migration in the country (Yeganyan and Shahnazaryan, 2004). Gegharkunik is also believed to have among the highest STD/HIV incidence and prevalence levels in Armenia (Papoyan, Arakelyan, and Bakshinyan, 2005; NSS RA, Ministry of Health [Armenia], and ORC Macro, 2006). According to the DHS, Gegharkunik had by far the highest share of women with STD or STD symptoms – 19.8 percent (compared to 14.0 percent in the second-highest prevalence province). In addition, the share of men reporting multiple partnerships and high-risk intercourse in the twelve months preceding the survey was also among the highest in Gegharkunik, whereas no woman there reported having had more than one partner during the same period (NSS RA, Ministry of Health [Armenia], and ORC Macro, 2006).

DATA AND METHODS

Data

The data for this study come from a survey "Labor Migration and STD/HIV Risks" conducted in the summer of 2007, at the height of the migration season, in rural areas of Gegharkunik province. A three-stage sampling procedure was used to select a sample of 1,240 married women aged 18–45 years. At the first stage, 31 villages were selected with a probability proportional to village population size. The second stage included identification of eligible households in the village. At this stage, village administrative journals that contain information about each household's composition were used to identify households with at least one married woman aged 18–45. For each of those households, the migration status of the woman's husband – labor migrant or not – was established with the help of village administrators. Based on the husband's migration status, the households were assigned to two lists. Each of the lists was used as a separate sampling frame for the last stage of sample selection. At that stage, twenty households from each list were randomly selected using a random numbers algorithm. If a household included more than one married woman with required characteristics (age and husband's migration status), the woman with the closest birthday was interviewed.

This sampling procedure was designed to assure a balanced representation of women from migrant and non-migrant households. However, several smaller villages did not have enough eligible or available women with migrant husbands; in such cases, women from the non-migrant household list were added to the village sample to assure that the sample size in each village was the same. As a result, the number of non-migrant households exceeded the number of migrant households in the survey. We should stress that the sampling procedure used in the survey was not meant to produce a province or village-level representative sample of women married to migrants and non-migrants but rather was chosen to afford sound comparisons between the two types of rural women.

The survey instrument included questions on household structure and individual socio-demographic characteristics; marriage and husband's characteristics including husband's migration history; health and reproductive history, detailed history of STDs; social capital and community; household economic characteristics and living conditions; and gender attitudes.

Methods

To assess the exposure to STD risks among the survey respondents we use two outcomes based on respondents' reports. The first outcome is whether or not a woman reported having been diagnosed in the three years preceding the survey with at least one of the following STDs: gonorrhea, trichomoniasis, chlamydia, syphilis, and HIV/AIDS. If the woman had been diagnosed with at least one of these diseases, the variable is coded 1, otherwise it is coded 0. The second outcome is the number of STD symptoms in twelve months preceding the survey reported by respondents. To construct this variable we use a syndromatic approach, *i.e.*, an approach that relies on symptoms reported by individuals rather than on the results of STD tests. This approach was first introduced by the World Health Organization in 1991, as a more cost-effective method for identifying and treating STDs in developing countries (WHO, 1991). Despite the continuing debate around this approach, it has been shown to be an effective method for STD identification and treatment in resource-limited settings. The main symptoms used in this approach include: pain during urination, ulcers or sores in the genital area, itching in or around the vagina, vaginal odor or smell, vaginal bleeding, and abnormal discharge from the vagina. However, the algorithm based on vaginal discharge has

been shown to be a poor predictor of STDs (Bosu, 1999; Pettifor *et al.*, 1999). Thus, our second outcome is the number of the STD symptoms listed above, excluding abnormal vaginal discharge, that women reported having in the twelve months preceding the survey.

The two outcomes therefore approximate STD risks differently both in terms of definition and in terms of time period. Although the first outcome is a more accurate measure of STDs as it refers to diagnosed diseases, it may underrepresent incidence of STDs. To be diagnosed with a disease women need professional health care intervention. Due to limited health care facilities in the region, lack of knowledge about STDs and stigma associated with them, women may be unable or unwilling to go to a health facility to get tested for STDs. In contrast, the syndromatic approach may more fully capture the cases of untested STDs but, at the same time, may overestimate the incidence of STDs as some of the reported symptoms may be STD-unrelated. We acknowledge these issues as limitations of our study.

The different specification of the two outcomes also calls for different estimating approaches. Thus to model the reported diagnosed STDs, a dichotomous outcome, logistic regression is used. The second outcome is a count variable and it is modeled using negative binomial regression.[3] To account for village clustering and to protect against deflated standard errors that might bias the hypothesis testing, we fit random intercept models, which allow the intercept to vary randomly by village. These models are fitted using the GLIMMIX procedure for binary and negative binomial distributions in SAS (Schabenberger, 2009).

The main predictor in both types of models is the husband's migration status. Because having been diagnosed with an STD refers to the previous three years, husband's migration status for this outcome is measured as a cumulative number of years spent in migration during those three years. The possible value range is therefore from 0 to 3. For the next outcome – the number of STD symptoms in the twelve months preceding the survey – the husband's migration status is operationalized in two alternative ways: (1) whether or not the husband was a migrant at the time of the survey, and (2) whether or not the husband was a migrant in 2006, i.e., the year before the survey year (the model with the latter specification

[3]Negative binomial regression is preferred over Poisson regression due to the overdispersion of the outcome variable.

of the husband's migration status excludes women married in the year of the survey). Models with both specifications are tested.

The second predictor of interest is household income. To smooth and normalize its distribution household income is logged. The log-transformation of income results in a continuous variable with values ranging between 2 and 9. In addition to modeling main effects of the husband's migration status and household income, to test our second hypothesis we look at the effect of the interaction between the two predictors on the outcomes of interest.

The models include several individual-, household-, and community-level characteristics as control variables. The individual characteristics are woman's age in years, age squared (to control for a possible non-linear effect of age), woman's education (coded 1 if vocational or higher education and 0 if secondary or less), age difference between the spouses, and husband's education (coded 1 if vocational or higher education and 0 if secondary or less). The models also control for past abortions. Abortion can be associated with STD symptoms in a variety of ways: it can follow a pregnancy resulting from unprotected intercourse with an infected permanent or casual partner or lead to an infection if done outside a proper medical setting. Post-abortion complications can also be confounded with STD symptoms. The variable is coded 1 if the woman ever had an abortion, and 0 if otherwise.

At the household level, the models control for the total number of household residents. At the village level, as proxies for women's social relationships, and their informal access to health related information, the models include the number of relatives in the village (coded 1 if a woman has more than 30 relatives in the village, and 0 if 30 or fewer) and the frequency of visits with non-kin residing in the village (coded 1 if a woman has more than seven visits, and 0 if seven or fewer). Finally, both sets of models control for the size of village population (the number of households in the village in hundreds). We acknowledge as a limitation that the control variables included in the models were measured at the time of the survey and therefore might have changed values since the women's exposure to STD risks. However, because the outcome variables refer to a relatively recent past, we believe that the resulting biases should not be large.

The distribution of the variables used in the multivariate statistical tests by husband's migration status at the time of the survey is presented in Table 1 (the distribution of the variables by the other independent

TABLE 1
Distribution of Independent, Control, and Dependent Variables by Husband's Current Migration Status

	Husband is currently		
	Migrant	Non-migrant	Total
Woman's age (mean)	30.7	30.6	30.7
Woman's education (%)**			
Secondary or less	72.1	64.7	67.5
Vocational or higher	27.9	35.3	32.5
Husband–wife age difference (mean)	6.1	5.8	5.9
Husband's education (%)*			
Secondary or less	75.2	65.4	69.1
Vocational or higher	24.8	34.6	30.9
Had at least one abortion (%)	61.3	58.3	59.5
Number of household members (mean)	5.1	4.9	5.0
Household monthly income, Armenian drams[a] (mean)*	93,800	80,500	85,600
Number of relatives in the village (%)**			
Fewer than 30 relatives	46.1	55.9	52.1
30 or more relatives	53.9	44.1	47.9
Number of visits with non-kin in past week (%)			
Fewer than 7 visits	60.5	61.4	61.1
7 visits or more	39.5	38.6	38.9
Had at least one STD in past 3 years (%)**	11.2	4.6	7.1
Number of STD symptoms in past 12 months (mean)*	1.03	0.88	0.94
Percent in sample	38.5	61.5	100

Notes: Significance level of migrants' wives versus non-migrants' wives differences: **$p \leq 0.01$, *$p \leq 0.05$, t-test for means, chi-square test for percentages.
[a]The exchange rate of dram at the time of interview was $1 = 350 dram.

variable, the number of years the husband was in migration in the three years preceding the survey, closely follows the one presented in Table 1 and therefore is not shown). As the table shows, 39 percent of the surveyed women were married to current migrants. The difference in household monthly income was substantial: women married to migrants reported a much higher income, on average, than did women married to non-migrants. Women married to migrants and married to non-migrants were similar on some of the individual-level characteristics, such as average age and average age difference between the husband and the wife. The levels of women's and their husbands' education significantly differed between the two groups of women: the percent of women and men with higher education was larger among non-migrant than among migrant households. The abortion experience did not differ between the two groups. At the household level, the differences between women with migrant and non-migrant husbands were also modest. The average number of household members was about five for both categories of women.

Visits of non-relatives were also similar for migrants and non-migrants' wives: about 61 percent had less than seven non-kin visits in the past week. However, the percent of women having large kin networks in the village was significantly higher among those married to migrants than among those married to non-migrants.

RESULTS

The bottom part of Table 1 presents the distribution of the main outcomes by husband's current migration status. The percent of women who reported having been diagnosed with at least one STD in the past three years among women married to migrants was almost 2.5 times that of women married to non-migrants. The average number of reported STD symptoms was also significantly higher among women married to migrants than among women married to non-migrants.

Table 2 shows the results of logistic regression and negative binomial regression models of diagnosed STDs and reported STD symptoms, respectively, on husband's migration status. For both models, Table 2 presents exponentiated regression coefficients. For the STD diagnosis model, the presented results are odds ratios and should be interpreted as increase or decrease in the odds of having been diagnosed with an STD associated with a unit increase in the continuous independent variable in question or, for categorical variables, with being in a given category relative to the reference category. The results for the negative binomial regression of the number of reported STD symptoms presented in Table 2 are incidence rate ratios, which indicate changes in the predicted number of reported symptoms associated with a unit increase (being in a category relative to the reference category) of the corresponding predictors. In both models, a value above unity signifies a positive effect, whereas a value below unity means a negative effect.

The results of both models provide support for our first hypothesis. Model 1 for each outcome is the baseline model, with the husband's migration status as the only predictor. The results for Model A.1 (STD diagnosis) indicate that each additional year of the husband's migration in the three years preceding the survey increases the odds of a woman having been diagnosed with at least one STD in the same time period by 96 percent ($p \leq 0.01$). In the case of the number of STD symptoms (baseline model in B.1), being married to a current migrant increases the predicted number of reported symptoms by about 16 percent ($p \leq 0.05$). The

TABLE 2
Logistic Regression of Diagnosed STDs (Odds Ratios) and Negative Binomial Regression of the Number of STD Symptoms (Incidence Rate Ratios)

	A. Has been diagnosed with an STD in 3 years (odds ratios)		B. Number of reported STD symptoms in 12 months (incidence rate ratios)		
Predictors	Model 1	Model 2	Model 1	Model 2	Model 3
Husband's current migration status					
Husband is not a migrant (Ref.)	N/A	N/A	1	1	1
Husband is a migrant	N/A	N/A	1.163*	1.154*	0.280**
Cumulative years of husband's migration in last 3 years	1.964**	1.832**	N/A	N/A	N/A
Household Income (Logged)		1.453*		0.964	0.868**
Migrant*Household Income					1.314**
Woman's age		0.983		1.054	1.056
Woman's age squared		1.001		0.999	0.999
Woman's education					
Secondary or less (Ref.)		1		1	1
Vocational or higher		0.813		0.854*	0.855*
Husband–wife age difference		0.973		1.007	1.007
Husband's education					
Secondary or less (Ref.)		1		1	1
Vocational or higher		0.857		0.986	0.991
Abortion experience					
Never had an abortion (Ref.)		1		1	1
Had at least one abortion		1.971+		1.382**	1.382**
Number of household members		1.104		0.997	0.998
Number of relatives in the village					
30 or fewer relatives (Ref.)		1		1	1
More than 30 relatives		2.385**		1.153*	1.152*
Number of non-kin visits in a week					
Seven or fewer visits (Ref.)		1		1	1
More than seven visits		2.038*		1.031	1.023
Village population size (in hundreds)		0.845*		0.974*	0.974*
Model χ^2	557	782	1,322	1,304	1,296
Number of cases	1,238	1,237	1,238	1,237	1,237

Note: Significance level **p ≤ 0.01; *p ≤ 0.05; +p ≤ 0.1.

results are essentially the same when we use the husband's migration status a year earlier as the predictor (not shown). After we add the control variables (Model 2 for each outcome), the magnitude of the effects of the husband's migration status slightly decreases but the effects remain statistically significant: net of other factors, the number of years the husband spent in migration in the past three years has a significant positive association with the likelihood of having been diagnosed with an STD during the same period (Model A.2) and being married to a current migrant significantly increases the predicted number of reported STD symptoms in the past twelve months (Model B.2).

Unlike the effects of husband's migration status, the effects of household income differ in the two models. Household income is positively and significantly associated with the odds of having been diagnosed with an STD: each unit increase in the log of household income increases the odds of having had a diagnosed STD by about 45 percent, net of other factors. In comparison, the effect of household income on the number of reported STD symptoms is negative and is not statistically significant.

To test our hypothesis about the difference in the effect of household income on STD risks between migrants' wives and non-migrants' wives, we add interaction between husband's migration status and household income to both the diagnosed STDs and STD symptoms models. The interaction term in the diagnosed STD model has no significant effect (not shown). However, when we add the interaction term to the model predicting the number of STD symptoms (Model B.3 of Table 2), an instructive pattern emerges. The main effect of husband's migration status on the predicted number of symptoms is now negative: being married to a migrant decreases the predicted number of STD symptoms by about 72 percent. The main effect of income (which now represents the income effect for wives of non-migrants) is negative and highly statistically significant. The effect of the interaction term is positive and also statistically significant: each unit increase in migrant household's logged income increases the predicted number of STD symptoms by 31 percent, net of the main effect of income and other factors.

The results of Model B.3 suggest that at the lower end of the income range, the predicted number of STD symptoms is higher among women with non-migrant husbands than among women with migrant husbands. However, the higher the income in migrants' households, the greater the predicted number of STD symptoms for women in those households. In contrast, as income rises in non-migrant households, the predicted number of STD symptoms appears to decline.

The effects of other variables included in the models should also be mentioned. Education had a negative effect in the STD symptoms model (its effect was even stronger in magnitude but not statistically significant in the diagnosed STD model). Education may be associated with better awareness of sexual risks and greater ability to negotiate safer sex, which may decrease STD risks. As anticipated, having had an abortion, an indicator of unprotected sexual intercourse or a possible cause for the STD-like symptoms, exerted a significant positive effect on the predicted number of symptoms; its effect was in the same direction but only

marginally significant for the diagnosed STD outcome. Larger kin and non-kin social networks showed positive associations with the likelihood of having had and STD diagnosis; in the STD symptoms model, only the size of kin networks had a significant effect. As we suggested earlier, interactions through social networks may be associated with increased awareness of own health status and knowledge about testing services which in turn may affect the two outcomes of interest. Admittedly, the mechanisms of these associations require a separate investigation with a different type of data, as do the pathways through which the village population size may influence the individual-level STD outcomes.

CONCLUSION

Our study makes a contribution to the scant literature on STD/HIV risks among women with migrant partners. Our findings agree with those studies that suggest that women with migrant partners have higher risks of STD/HIV than those with non-migrant partners (*e.g.*, Hughes, Hoyo, and Puoane, 2006; Kishamawe *et al.*, 2006). Indeed, studies that have not detected such a relationship and instead have found that women's STD/HIV risks were associated with multiple partnerships regardless of their partners' migration status were done mainly in sub-Saharan settings (*e.g.*, Lurie *et al.*, 2002, 2003), where women's extramarital partnerships are much more common than in settings like Armenia. Although, the direction of transmission of STDs between the husband and the wife is not possible to capture through our data, we are inclined to believe that women's increased risks of STDs are more likely to be a result of risky behavior of their migrant partners rather than of their own extramarital sexual ties.

Our study also offers an interesting addition to the literature by suggesting that the association between male migration and left-behind women's STD risks may be moderated by income. The causal link between migration and income is hard to ascertain with cross-sectional data. On the one hand, higher income may facilitate migration, but on the other hand, migration increases household income. However, regardless of the direction of this association, our study shows that income has different effects on STD risks of women with migrant and non-migrant husbands. In fact, when income is low, and consequently migrants' access to commercial and other transactional sex is limited, husband's migration may be a protective factor against STDs, perhaps partly as a result of decreased sexual contact between spouses. However, as migration-derived

income rises, husbands' migration is likely to increase the STD risks of their left-behind wives. As previous research has shown, migrants with higher income are more likely to engage in high HIV-risk behavior than migrants with lower income (He *et al.*, 2005; Liu *et al.*, 2005). Higher income affords migrants more opportunities for high-risk behavior in places of migration destination (in contrast to non-migrants, who are under stronger social control in their communities), and therefore leads to higher infection rates among them and, consequently, among their non-migrant wives.

Increase in risks of women married to economically successful migrants, may also be related to the effect of migrants' income on gender relations. Research on gender inequalities and risks shows that women often fail to negotiate sexual practices due to economic dependency on their partners (Gupta, 2000; Weiss, Whelan, and Gupta, 2000; Wingood and DiClemente, 2000). Thus, higher income and greater material comfort derived from migration may result in decreased power for sexual negotiation among migrants' women. Therefore, on the one hand, higher income of migrants may translate into larger remittances and better socio-economic conditions for their left-behind households, but on the other hand, it may also result in higher risks of STDs for migrants and for their non-migrant wives. This tradeoff between material comfort and sexual health risks adds another nuance to the complex picture of the effects of men's migration on their left-behind wives painted in previous studies (*e.g.*, Salgado de Snyder, 1993; Aysa and Massey, 2004; Menjívar and Agadjanian, 2007).

The model predicting STD diagnoses, while detecting strong positive effects of husband's migration and of household income, did not point to any significant interaction between the two predictors. It is possible that the difference between the results of the two models is due to the time frame – current year vs. last three years – used for the operationalization of both the main predictor, husband's migration status, and the outcomes. The difference may also have resulted from the different nature of the two outcomes. Thus it is possible that migrants' wives are more likely to report an STD diagnosis because they have greater awareness of risks and therefore are more likely to get tested for STDs. Similarly, the significant positive effect of household income on an STD diagnosis may reflect not just (and even not so much) the risk of contracting an STD but rather access to STD testing, as women with higher income are more likely to afford being tested for STDs than those with lower income. This

association between income and access to STD testing services is probably independent of the type of husband's occupation; hence no interaction between husband's migration and household income could be detected. These issues require an investigation that would go beyond the limits of our data. For now, the inconsistency between the results of the two models calls for caution in their interpretation.

Despite this inconsistency, however, the results of our study do suggest that seasonal male labor migration increases STD risks of women left behind. While further research is needed to fully examine the connections between male migration and STD/HIV risks of non-migrating partners and other household members in Armenia and similar post-Soviet settings, the findings of our study illustrate the importance of these connections for policy. Given the persistently high levels of international labor migration in the region, high STD rates, and rapidly rising HIV levels, prevention programs should target both migrants and their non-migrant partners. Yet, to be effective these programs should also heed the complex transformations that migration introduces into the household economy and gender relations in origin areas.

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