Implications of Mobility Patterns and HIV Risks for HIV Prevention Among Migrant Market Vendors in Kazakhstan

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Although the incidence of HIV cases annually is beginning to decline worldwide, recent data indicate that Central Asia now has one of the world's fastest-growing HIV epidemics.[1-3] Although the majority of HIV cases in Central Asia are attributed to injection drug use, a growing number are attributed to heterosexual transmission.[1-4] Migration may play a key role in heterosexual transmission of HIV and other sexually transmitted infections (STIs) in Central Asia, but little research on migration patterns and transmission of HIV and other STIs in Central Asia has taken place.[1-6]

The collapse of the Soviet Union in 1991 caused political, economic, and social changes in Central Asia, leading to an economic crisis, unemployment, poverty, and increased emigration, especially in Tajikistan, Kyrgyzstan, and Uzbekistan.[7] During the past decade, economic expansion in Kazakhstan and lack of employment opportunities in neighboring countries have made Kazakhstan a magnet for workers from other Central Asian nations.[7,8] From 1997 to 2006, the number of registered migrants entering Kazakhstan for temporary employment increased 16-fold, from about 70000 to about 1120000, ranking Kazakhstan ninth among the world's countries in terms of number of migrants received.[9] Income from migrants constitutes a major share of gross domestic product in most Central Asia countries. Recent data suggest that women represent a growing proportion of migrant workers who travel to Kazakhstan, primarily from Tajikistan, Kyrgyzstan, and Uzbekistan.[7,9] Internal migration from rural to urban areas within Kazakhstan has also increased.[7] Market vendors represent a substantial proportion of migrants in Kazakhstan.[7,9]

Evidence suggests that mobility increases vulnerability to HIV and STIs among migrant populations worldwide.[4-20] Studies have shown that migrant men were more likely to have multiple concurrent sexual partners and higher rates of HIV infection and STIs than were nonmigrant men.[10-12,20] Migrant men with circular travel patterns may bridge HIV-STI epidemics as they travel between high-endemic urban areas of immigration and low-endemic (often rural) areas of origin, have sex with casual partners or sex workers in cities, and then have sex with their spouses in their home villages.[20] Research on the impact of migration on transmission of HIV among migrant women is limited globally and absent in Central Asia. A recent study conducted in Africa showed that migrant women were more likely to report having multiple sexual partners, lower rates of condom use, and higher rates of HIV infection than were migrant men.[20]

Vulnerability to HIV risks among migrant workers in Central Asia may be magnified by a recent shift to more traditional gender roles. Since the collapse of the Soviet Union, the cultures of Central Asia countries—especially Tajikistan, Uzbekistan, and Kyrgyzstan—have shifted away from the secular values of communism to more traditional Muslim values.[21] Islam is the most widely practiced religion in Central Asia.[22] Migrant communities may reinforce conservative gender role behaviors for women as a way to preserve community heritage and Muslim traditions, but encouraging wives' submission to their husbands may lead to gender inequalities, which may influence women's ability to negotiate safe sex and affect their ability to make decisions about reproductive health.[23]

We examined the associations between mobility patterns and risk behaviors for HIV and STIs among a random sample of market stalls employing 422 male and female migrant workers in Almaty, Kazakhstan. First we described the demographics, mobility patterns, sexual risk behaviors, drug-use behaviors, and biomarkers of HIV, syphilis, and HCV among these migrant workers. We then examined the associations between mobility patterns and sexual HIV risks, adjusting for potentially confounding sociodemographics.

METHODS

Participants were recruited from Baraholka Market, one of the largest marketplaces in

Objectives. We examined the relationships between mobility characteristics and sexual risk behaviors among male and female migrant market vendors in Almaty, Kazakhstan.

Methods. Participants completed a structured interview covering sociodemographics, mobility characteristics, sexual behaviors, and biomarkers for HIV, HCV, and syphilis. We used multivariate analyses to examine associations between mobility patterns and HIV risks after adjusting for sociodemographics.

Results. Longer duration of a participant's last trip outside Almaty increased the odds of reporting multiple sexual partners. More frequent travel to visit family or friends was associated with multiple sexual partners and unprotected sex with steady partners. More frequent travel to buy goods in the past year was associated with multiple sexual partners. Men who traveled more often to buy goods were more likely to have purchased sex within the previous 90 days.

Conclusions. Relationships between mobility patterns and sexual risk behaviors underscore the need for HIV-prevention strategies targeting the specific transmission dynamics that migrant vendors are likely to present. (*Am J Public Health.* 2011;101:1075–1081. doi:10.2105/AJPH.2010.300085)

Central Asia, located 15 kilometers from the center of Almaty, Kazakhstan. Market stalls are numbered, and subsections are divided by types of goods sold. During the study period (July 2007 to October 2007), the market employed approximately 30 000 vendors. For this study, we targeted the largest 5 submarkets.

Before we started the research, we mapped all the stalls in these submarkets (5112 stalls) and selected a random sample of 435 stalls from this list. Recruiters approached workers employed in the selected stalls and screened them for eligibility. On average, 2 people were employed in each stall. We screened a total of 920 individuals employed in the 435 selected stalls; 805 agreed to complete the screening interview (87.5% participation rate) and 115 refused (12.5%). The 2 major reasons for refusal to participate in the research project were "lack of available time" and "no interest."

Eligibility Criteria and Study Enrollment

To be eligible, a participant had to be at least 18 years old, be employed as a worker or owner in a randomly selected stall, and have traveled 2 or more hours outside of Almaty within the previous year. Each participant also had to indicate that he or she was not a citizen of Kazakhstan (external migrant) or that he or she maintained a permanent residence 2 or more hours from Almaty (internal migrant). Participants also had to report having had vaginal or anal sex within the previous 90 days.

Of those screened, about half (n=422; 52.4%) were eligible (213 females and 209 males). To achieve equal representation among women and men, the following "adaptive biased coin" procedure[24,25] was employed: once a participant was screened as eligible, the probability of being invited to enroll was 100% for participants whose gender was less than 50% of the sample enrolled to date; for participants whose gender was overrepresented in the sample enrolled to date, the probability was reduced from 100% proportionate to the amount of overrepresentation.

Screening interviews took place in the stall, and survey interviews and biological testing took place in the research office located in the marketplace. Most interviews and biological testing took place within 2 weeks after screening.

Measures

We collected data in face-to-face interviews in the study's private research office in the marketplace. The instrument was developed in English, translated into Russian, and back-translated to English again. The instrument was piloted in Russian with 5 female and 5 male market vendors. On the basis of the vendors' feedback, we revised and approved the instrument's final version.

Sociodemographics. We recorded participants' age, ethnicity (Kazakh or non-Kazakh), education, marital status, and whether they currently lived with a primary partner in Almaty.

Employment and mobility characteristics. We asked participants how many times they had traveled in the previous year to buy goods, how many times they had traveled in the previous year to visit friends or family, how many days they had spent outside Almaty on their last trip, their employment status, how many years they had been employed at the market, their role at the market stall, and the type of goods sold at the stall. Measures of travel asked, "In the past year, have you traveled outside of Almaty to buy goods to sell at Barakholka Market?" and "In the past year, have you traveled outside of Almaty to visit friends or family?" If the participant answered yes to either question, we asked what the destination was, including travel to other regions of Kazakhstan or to other countries.

Sexual risk behaviors. We asked participants the number of times they had vaginal, oral, or anal sex with primary, casual, and commercial partners in the previous 90 days, and how many times they had used condoms during vaginal or anal sex during that time period. We measured consistent condom use during vaginal or anal sex as the number of times a condom was used during vaginal or anal sex divided by the total number of vaginal or anal sex acts in the previous 90 days (consistent condom use=1; if less than 1, then consistent condom use=0). We also asked about the total number of unprotected and protected vaginal or anal sex acts in the previous 90 days for each type of partner (primary, casual) and across all partners, and we asked them how many different types of sexual partners (primary, casual) they

had in the previous 90 days. We asked male participants whether they had purchased sex with money, drugs, or goods.

Self-reported STIs. We asked participants whether they had ever been diagnosed with chlamydia, gonorrhea, syphilis, trichomonas, genital or anal herpes, or genital or anal warts.

Biological testing for HIV, syphilis, and HCV. We screened participants for antibodies to HIV (HIV1.2.0, Murex antiHIV, Abbott Laboratories, Abbott Park, IL), HCV (Murex antiHCV, Abbott Laboratories, Abbott Park, IL), and syphilis (ICE Syphilis Murex, Abbott Laboratories, Abbott Park, IL) at the Almaty City AIDS Center laboratory. The Kazakhstan Ministry of Health's National AIDS Center guidelines on biological testing in epidemiological surveillance of HIV, HCV, and syphilis cites 99% sensitivity and 99% specificity for these tests for use with dry plasma.[26]

Alcohol dependency. We used the CAGE Screening Test to assess alcohol dependency.[27] CAGE scores equal to or greater than 2 denoted problems with alcohol.

Drug use. We assessed drug use by asking about use of heroin, marijuana or hashish, or any other illicit drug such as ecstasy at any time in the past and within the previous 90 days.

Overall health status. We asked participants, "How would you rate your health overall?" Responses were coded "fair/poor" or "good/excellent." Participants were asked if they currently had access to a primary care physician.

HIV-knowledge scale. This 12-item scale assessed knowledge about HIV transmission, AIDS, and condom use. Scores ranged from 0 to 12 correct responses. This instrument had been used in a previous study in Kazakhstan, yielding an α of 0.87.[28]

Statistical Analysis

We calculated descriptive statistics for these variables for the total sample and by gender. Most variables were fully observed or had a small proportion of missing responses (0.03%–3.1%). However, because the missing rate for the number of days spent outside of Almaty on the respondent's last trip was 11%, we performed multiple imputation with the MICE (Multiple Imputation by Chained Equations) module in Stata version 9.2 (StataCorp LP, College Station, TX) for Windows

(Microsoft Corporation, Redmond, WA).[24] Multiple imputation can reduce substantial bias caused by missing data.[25]

We conducted multivariate analyses to examine associations between mobility patterns and sexual risk behaviors. We used 3 independent variables for mobility: number of times traveled to purchase goods for the market stall, number of times traveled to visit friends or family, and number of days on last trip. Tests for skewedness and kurtosis determined that these mobility variables significantly departed from normal distribution. After transformation by natural logarithm, this was still the case. Therefore, final regression models relied on dichotomous predictors, indicating mobility above median versus mobility equal to or below median.

We used logistic regression for dichotomous dependent variables, including biological assay of syphilis, having more than 1 sexual partner, consistent condom use, and purchasing vaginal or oral sex within the previous 90 days. We used negative binomial regression for overdispersed count data, such as total number of unprotected sex acts by partner type and HIV knowledge score. All regression models were adjusted for age, ethnicity, education level, marital status, co-residence with partner in Almaty, and gender. We calculated odds ratios (ORs) for logistic regression, incidence rate ratios (IRRs) for negative binomial regression, and 95% confidence intervals (CIs) associated with both.

RESULTS

As seen in Table 1, participants' average age was about 28 years, and 59.5% had completed at least high school. Educational level was higher for women than it was for men. Most respondents were married (64.9%). More men than women reported being single (36.8% vs 14.7%). More than half of the participants reported living with primary partners in Almaty (56.8%). One fifth (21%) of the sample were ethnic Kazakh, and the remaining were largely Kyrgyz (27.1%) or from 1 of 2 smaller ethnic groups: the Karakalpaks (10.9%), who are mainly from Uzbekistan, and the Dunghas (10.7%) from Kyrgyzstan.

TABLE 1—Sociodemographic and Health Characteristics of Migrant Market Vendors: Almaty, Kazakhstan, 2007

	Women, No. (%) or Mean ±SD	Men, No. (%) or Mean ±SD	Total, No. (%) or Mean ±SD	P[a]
Participants	213 (50.5)	209 (49.5)	422 (100.0)	
Age, y	28.6 ±4.5	26.8 ±5.1	27.8 ±4.8	<.001
Education				
Secondary or less	18 (8.5)	36 (17.3)	54 (12.9)	.036
High school	132 (61.9)	119 (57.1)	251 (59.5)	
More than high school	63 (29.6)	53 (25.6)	117 (27.6)	
Marital status				
Married	148 (69.8)	126 (60.3)	274 (64.9)	.546
Single (never married)	31 (14.7)	77 (36.8)	108 (25.6)	
Divorced/separated/widowed	34 (15.6)	6 (2.9)	40 (9.5)	
Ethnicity				
Kazakh	54 (25.5)	35 (16.8)	89 (21.1)	.142
Kyrgyz	61 (28.8)	53 (25.3)	114 (27.1)	
Karakalpak	27 (12.7)	19 (9.1)	46 (10.9)	
Dungha	11 (5.2)	34 (16.3)	45 (10.7)	
Uzbek	18 (8.5)	9 (4.3)	27 (6.4)	
Tajik	0 (0.0)	23 (11.0)	23 (5.5)	
Uighur	15 (7.1)	6 (2.9)	21 (5.0)	
Other	26 (12.3)	30 (14.3)	56 (13.3)	
Co-resident with steady partner in Almaty				
Partner lives elsewhere	81 (38.1)	101 (48.3)	182 (43.2)	.035
Lives with partner	132 (61.2)	108 (51.7)	238 (56.8)	
Overall quality of health status (self-report)				
Poor to fair	106 (49.8)	88 (42.1)	194 (46.0)	.115
Good to excellent	107 (50.2)	121 (57.9)	228 (54.0)	
Alcohol dependence[b]				
No alcohol problem	145 (90.1)	188 (90.0)	333 (90.0)	.972
Has alcohol problem	16 (9.9)	21 (10.0)	37 (10.0)	
Drug use (ever)				
Heroin (injected or smoked)	0 (0.0)	0 (0.0)	0 (0.0)	>.99
Marijuana/hashish	7 (3.3)	29 (13.9)	36 (8.5)	<.001
Club drugs (e.g., ecstasy)	0 (0.0)	0 (0.0)	0 (0.0)	>.99

[a]By gender.
[b]As determined by CAGE Screening Test; scores equal to or greater than 2 denoted problems with alcohol.[27]

Employment and Mobility Characteristics

On average, participants had worked in Barakholka Market for 2.9 years (Table 2). Almost all worked full time (98.3%). The goods most commonly sold by participants were clothes, food, fabric, and shoes. Most participants reported having a residence outside of Kazakhstan (73.2%), and 44.8% had another residence in Kazakhstan 2 or more hours from Almaty. In addition, 24.9% of the sample had both a residence 2 or more hours away and a residence in another country (data not shown). Participants reported traveling to purchase goods to sell at the market an average of twice in the previous year (SD=3.17) and traveling to visit friends or family an average of 4.3 times (SD=4.10). Work-related travel was most frequently to Kyrgyzstan (64.7%), China (32.1%), and Turkey (12.2%), and travel to visit family or friends was usually to other regions of Kazakhstan (37.0%), Kyrgyzstan (34.6%), and Uzbekistan (22.7%). On average, participants spent almost 15 days away on their last trip

TABLE 2—Migration and Employment Characteristics of Migrant Market Vendors: Almaty, Kazakhstan, 2007

	Women	Men	Total	P^a
Has an out-of-country residence, no. (%)	148 (69.8)	160 (76.6)	308 (73.2)	.119
Has a residence ≥2 h away from Almaty, no. (%)	112 (59.3)	77 (40.7)	189 (44.8)	.001
Length of employment at market, y, mean (SD)	2.8 (1.8)	3.1 (2.4)	2.9 (2.1)	.097
Type of employment at market, no. (%)				
Part-time	1 (0.5)	6 (2.9)	7 (1.7)	.01
Full-time	211 (99.5)	201 (97.1)	412 (98.3)	
Responsibility at market stall, no. (%)				
Vendor	202 (94.8)	194 (92.8)	396 (93.8)	.391
Owner	26 (12.2)	34 (16.3)	60 (14.2)	.223
Times traveled to purchase goods to sell at market in previous y, median (mean; range)	0 (2.2; 0–50)	0 (1.9; 0–52)	0 (2.0; 0–52)	.246
Destination of travel to purchase goods in previous y, no. (%)				
Kyrgyzstan	65 (76.5)	36 (50.7)	101 (64.7)	.001
China	23 (27.1)	27 (38.0)	50 (32.1)	.146
Turkey	8 (9.4)	11 (15.5)	19 (12.2)	.25
Russia	5 (5.9)	1 (1.4)	6 (3.9)	.15
Uzbekistan	3 (3.5)	1 (1.4)	4 (2.6)	.407
India	0 (0.0)	3 (4.2)	3 (1.9)	.056
Iran	0 (0.0)	1 (1.4)	1 (0.6)	.458
Tajikistan	0 (0.0)	1 (1.4)	1 (0.6)	.275
Other regions of Kazakhstan	1 (1.2)	0 (0.0)	1 (0.6)	.362
Times traveled to visit friends or family in previous y, median (mean; range)	3 (4.7; 1–40)	2 (4.0; 1–50)	2(4.3; 1–50)	.005
Destination of travel to visit friends or family in previous y, no. (%)				
Other regions of Kazakhstan	82 (40.1)	68 (33.8)	150 (37.0)	.256
Kyrgyzstan	72 (34.4)	68 (34.8)	140 (34.6)	.511
Uzbekistan	56 (26.9)	38 (18.4)	94 (22.7)	.242
Tajikistan	4 (1.4)	23 (11.6)	27 (6.5)	.932
China	8 (3.8)	14 (6.8)	22 (5.3)	.699
Russia	10 (4.7)	3 (1.4)	13 (3.1)	.385
Turkey	1 (0.5)	3 (1.4)	4 (1.0)	.584
Days spent outside of Almaty on last trip, median (mean; range)	10 (14.6; 1–90)	10 (15.3; 1–90)	10 (14.9; 1–90)	.663

^{a}By gender.

outside of Almaty in the previous year (SD=13.15).

Substance Use, Health, and HIV Knowledge

Ten percent of the sample was classified as alcohol dependent on the basis of the CAGE score. No respondents reported ever using heroin, and none reported ever using "club drugs" such as ecstasy. Seven women and 29 men reported ever having smoked marijuana. Of the total sample, 46% described their health status as poor to fair. Only 5% had a primary care physician, with more women than men reporting this (7.1% vs 2.8%). In the previous year, 45% had needed to see a physician but did not. More women than men stated that they had needed to see a doctor in the previous year but did not do so (61.2% vs 28%). Participants' level of HIV/AIDS knowledge was low: the average score was 2.2 correct answers out of 12. Women had a lower level of knowledge than did men (Table 3).

Sexual Risk Behaviors

Table 3 presents frequencies of sexual risk behaviors. About 43% of the sample had more than 1 sexual partner within the previous 90 days, and 23.3% had ever used a condom during vaginal sex with their steady partners. Fewer women (20.3%) than men (66.3%) reported having had more than 1 partner within the previous 90 days. Overall, condom use was low with all partners: only 10.6% had consistently used condoms with their steady partner(s) within the previous 90 days. Almost 28% always used condoms with nonregular partners. Respondents reported an average of 38.5 unprotected vaginal sex acts with their steady sexual partner(s) in the previous 90 days and 9.7 unprotected sex acts with nonregular sexual partner(s). About 28% of the males reported having purchased vaginal or oral sex from a sex worker within the previous 90 days. Biological tests indicated that 5.7% of the sample tested positive for syphilis (n=24), including 6.6% of females and 4.8% of males. Only 1 male respondent (0.24%) tested positive for HIV, and 3 male participants (0.71%) tested positive for HCV. More than one quarter (27%) indicated that they had ever been diagnosed with an STI.

Mobility Characteristics and Sexual Risk Behaviors

Table 4 presents multivariate associations between mobility and HIV risks. Respondents whose number of days spent outside of Almaty during the previous trip was greater than that of the median had significantly increased odds of reporting multiple sexual partners (OR=3.16; CI=1.7, 5.71), but this association did not exist with any other HIV risk variable. Participants who traveled to purchase goods more often than the sample median were also significantly more likely to report multiple sexual partners (OR=2.27; CI=1.23, 4.20). Men who traveled to purchase goods more often than the sample median were more likely to have visited a sex worker in the previous 90 days (OR=2.42; CI=1.10, 5.31). Traveling more times than the

TABLE 3—Sexual Risk Behaviors, HIV, STIs, and HIV Knowledge Among Migrant Market Vendors: Almaty, Kazakhstan, 2007

	Women	Men	Total	P^a
Sexual risk behaviors, no. (%)				
Has more than 1 sex partner	43 (20.3)	138 (66.3)	181 (43.1)	<.001
Has ever used a condom during vaginal or anal sex with steady partner	37 (17.4)	59 (29.5)	96 (23.3)	<.001
Condom use with primary partner in previous 90 d, no. (%)				
Inconsistent condom use	200 (93.9)	177 (84.8)	377 (89.4)	.003
Always used a condom	13 (6.1)	32 (15.2)	45 (10.6)	
Condom use with other partners in previous 90 d, no. (%)				
Inconsistent condom use	32 (76.2)	87 (70.7)	119 (72.1)	.499
Always used a condom	10 (23.8)	36 (29.3)	46 (27.9)	
Unprotected vaginal sex acts with steady partner in previous 90 d, mean (SD)	40.5 (25.9)	36.5 (33.9)	38.5 (30.2)	.178
Unprotected vaginal sex acts with other partners in previous 90 d, mean (SD)	4.7 (7.2)	11.4 (22.2)	9.7 (19.8)	.056
Bought vaginal or oral sex in the previous 90 d,[a] no. (%)	. . .	59 (28.4)	59 (28.4)	. . .
HIV/AIDS and condom knowledge,[b] mean (SD)	1.9 (2.3)	2.6 (2.5)	2.2 (2.4)	.006
Antibody and STI results, no. (%)				
Syphilis	14 (6.6)	10 (4.8)	24 (5.7)	.429
HCV	3 (1.4)	0 (0.0)	3 (0.7)	.085
HIV	0 (0.0)	1 (0.5)	1 (0.2)	.928
Has ever been diagnosed with an STI,[c] no. (%)				
No	156 (73.2)	152 (73.1)	308 (73.2)	.97
Yes	57 (26.8)	56 (26.9)	113 (26.8)	

Note. STI = sexually transmitted infection.
[a]Men only.
[b]As determined by a 12-item scale assessing knowledge about HIV transmission, AIDS, and condom use. Scores ranged from 0 to 12 correct responses.
[c]As determined by self-report.

sample median to visit family or friends was positively associated with an increased likelihood of multiple sexual partners (OR=2.24; CI=1.28, 3.90) and a higher number of unprotected sex acts with steady partner(s) (IRR=1.06; CI=1.00, 1.12).

The accuracy rate on the HIV knowledge scale was 1.47 times higher for respondents who traveled more often to visit family or friends than it was for those who traveled less often (CI=1.16, 1.86). Gender was a significant predictor of higher HIV knowledge, having more than 1 sexual partner, and total number of unprotected sex acts with a steady partner. Males had significantly higher HIV knowledge than did females (IRR=1.35; CI=1.07, 1.70), but were significantly more likely to report multiple sexual partners (OR=15.72; CI=8.50, 29.06). However, males reported significantly fewer unprotected sex acts with steady partners than did females (IRR=0.94; CI=0.89, 0.99).

Travel to purchase goods displayed no association with HIV knowledge, consistent condom use with steady partner or other partners, or total number of unprotected sex acts with steady or other partners. Similarly, there was no association between travel to visit family or friends and consistent condom use or total number of unprotected sex acts. None of the 3 mobility variables was a statistically significant predictor of testing positive for syphilis. We did not examine HIV and HCV in the multivariate analysis because of low prevalence rates.

DISCUSSION

We tapped into an underresearched area: migration, mobility, and HIV risks among men and women recruited from the largest marketplace in Central Asia. The findings support other studies conducted with male and female migrant workers from Asia, Africa, and Central America[10–12,18,20,29] in showing that the majority of the sample were mobile, sexually active young adults and that a large number engaged in unprotected sex with both regular and casual partners. Two thirds of the men and one fifth of the women reported having had more than 1 sexual partner within the previous 90 days, and more than one fifth of the men reported having bought sex within the previous 90 days. Although sex trading by women exists in Kazakhstan, we did not ask female participants about trading sex. In 2004, it was estimated that there were 20 000 to 50 000 female sex workers in Kazakhstan,[5] but no data are available on how many of these are migrant workers.

The level of HIV knowledge was low among our participants, especially among women. More than two thirds of the participants did not have access to a primary care physician, even though almost half perceived their health quality as poor. More women than men stated that they had needed to see a physician in the past year but did not do so. Living and working conditions and health laws affecting migrants may lead to poor migrant health in Kazakhstan. According to Kazakhstani law, migrant workers have a right to receive free medical care only for acute diseases presenting a public health hazard (e.g., diphtheria, measles, rubella). The country's Law on Prevention of HIV indicates that all foreigners and stateless people residing in Kazakhstan have a right to free, anonymous, voluntary counseling and testing for HIV in Kazakhstani medical facilities; however, they are not eligible to receive HIV treatment or antiretroviral medication. Foreign nationals residing in Kazakhstan who test positive for HIV may be expelled if they require antiretroviral treatment, and those who avoid testing for HIV infection can be expelled as well. Thus, laws may restrict access to health care and deter migrants from seeking HIV and STI testing, prevention, and treatment.

The prevalence rate of syphilis was quite high (5.7%), but because status was assessed by an antibody test, it cannot be determined whether the cases were active or had resulted from a prior infection. Approximately one third

TABLE 4—Multivariate Analysis of Sexual HIV Risks Among Migrant Market Vendors: Almaty, Kazakhstan, 2007

				Models Predicting HIV Risk			
	HIV/AIDS and Condom Use Knowledge (n = 422), IRR (95% CI)	Biotest for Syphilis (n = 422), OR (95% CI)	More Than 1 Sexual Partner (n = 420), OR (95% CI)	Consistent Condom Use With Steady Partner in Previous 90 D (n = 422), OR (95% CI)	Consistent Condom Use With Other Partners in Previous 90 D (n = 165), OR (95% CI)	Total No. of Unprotected Sex Acts With Steady Partner in Previous 90 D (n = 402), IRR (95% CI)	Total No. of Unprotected Sex Acts With Other Partners in Previous 90 D (n = 167), IRR (95% CI)	Purchased Sex in Previous 90 D[b] (n = 208), OR (95% CI)
No. of times traveled to purchase goods for market in previous y[a]	1.11 (0.85, 1.45)	1.39 (0.52, 3.69)	2.27** (1.23, 4.20)	0.74 (0.31, 1.76)	1.00 (0.37, 2.71)	0.92 (0.61, 1.38)	2.42* (1.10, 5.31)
No. of times traveled to visit family or friends in previous y[a]	1.47*** (1.16, 1.86)	1.82 (0.73, 4.56)	2.23** (1.28, 3.90)	0.91 (0.42, 1.99)	2.17 (0.89, 5.32)	1.06* (1.00, 1.12)	1.94 (0.97, 3.89)
No. of d spent outside Almaty on last trip[a]	0.88 (0.68, 1.13)	0.94 (0.36, 2.49)	3.16*** (1.75, 5.71)	0.603 (0.28, 1.32)	0.79 (0.33, 1.90)	1.05 (0.96, 1.11)	1.42 (0.66, 3.01)

Note. CI = confidence interval; IRR = incidence rate ratio; OR = odds ratio. Models adjusted for gender, age, ethnicity, education, marital status, and co-residence with primary partner in Almaty.
[a]Dichotomized to 1 = above median number of times and 0 = below median number of times.
[b]Men only.
*P < .05; **P < .01; ***P < .001.

reported ever having been diagnosed with an STI. These prevalence rates may also indicate risky sexual activities and unprotected sex occurring among this migrant population. The low rate of HCV and absence of self-reported injection drug use suggest that these are not risk factors for HIV in this population.

Finally, although only 1 person tested positive for HIV, the relatively high rates of multiple sex partners, syphilis, and self-reported STIs—along with low rates of condom use and low levels of HIV knowledge—suggest the potential for heterosexual spread of HIV among this population if prevention efforts are not increased.

Consistent with other studies of migrant workers conducted in Central America, Asia, and Africa,[11,13,18,20,29,30] increased frequency and duration of travel within the past year were associated with sexual risk behaviors. Longer duration of last trip outside Almaty significantly increased odds of reporting multiple sexual partners. More frequent travel to visit family or friends was associated with having multiple sexual partners and engaging in unprotected sex with steady partners. More frequent travel to purchase goods in the past year was also associated with having multiple partners.

Men who traveled more frequently to purchase goods were more likely to have visited a sex worker within the previous 90 days. This finding suggests that traveling to buy goods may present additional opportunities to engage in commercial sex, especially if the traveler is isolated from the influence of family members. Some migrants may also be more likely to engage in riskier sexual encounters in Almaty, with exposure to more opportunities for sex and more permissive cultural norms, compared with fewer opportunities in their home villages, particularly in traditional rural areas of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan.[31] These factors may have played a significant role in fueling sexual risk behaviors among this population of migrants. Future research needs to address these factors to improve our understanding of the relationship between mobility patterns and HIV.

Our study has a few limitations. In the logistic regression, we adjusted for sociodemographics but failed to control for gender-role norms, ethnic differences between migrant groups, level of religiosity, polygamy, working

and living conditions, social network characteristics, and mixing between those in Almaty and those back in the country or region of origin. We also used a cross-sectional design, which limits our ability to draw conclusions about the causal relationships between mobility patterns and HIV risks. Despite these limitations, our study provides new knowledge about HIV and patterns of migration among an understudied population in Central Asia. Our findings on the presence of sexual risks associated with mobility underscore the need for action to prevent heterosexual transmission of HIV from becoming a greater part of Central Asia's HIV epidemic. ∎

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Contributors

N. El-Bassel, L. Gilbert, A. Terlikbayeva, and E. Wu designed the study. N. El-Bassel, L. Gilbert, and B. West particpated in data analysis and writing the article. P. Bearman, B. Zhussupov, I. Platais, and A. Brisson provided feedback on the work of the previously mentioned authors. All authors participated in approving drafts and the final version of the article.

Human Participant Protection

This study protocol was approved by the institutional review board of Columbia University and the ethics review board of Kazakhstan School of Public Health, Almaty, Kazakhstan.

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