What prevents Central Asian migrant workers from accessing HIV testing? Implications for increasing HIV testing uptake in Kazakhstan

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Abstract

Several barriers prevent key populations, such as migrant workers, from accessing HIV testing. Using data from a cross-sectional study among Central Asian migrant workers (n=623) in Kazakhstan, we examined factors associated with HIV testing. Overall, 48% of participants had ever received an HIV test. Having temporary registration (AOR 1.69; (95% CI [1.12–2.56]), having an employment contract (AOR 2.59; (95% CI [1.58–4.23]), being able to afford health care services (AOR 3.61; (95% CI [1.86–7.03]) having a medical check-up in the past 12 months (AOR 1.85; 95% CI [1.18–2.89]), and having a regular doctor (AOR 2.37; 95% CI [1.20–4.70]) were associated with having an HIV test. HIV testing uptake among migrants in Kazakhstan falls far short of UNAIDS 90-90-90 goals. Intervention strategies to increase HIV testing among this population may include initiatives that focus on improving outreach to undocumented migrants, making health care services more affordable, and linking migrants to health care.

Keywords

HIV testing; migrants; structural and individual barriers; Kazakhstan

INTRODUCTION

UNAIDS recently released a set of ambitious target goals for ending the AIDS epidemic: by 2020, 90% of all people living with HIV will know their HIV status, 90% of all people

diagnosed with HIV will receive sustained antiretroviral therapy (ART), and 90% of all people receiving ART will have viral suppression (1). The success of these goals hinges on the ability to drastically increase the number of people being tested for HIV, particularly among key affected populations with low HIV testing uptake, such as migrant workers. Globally, migrants have been identified as one of the most vulnerable groups for HIV infection (2). Studies indicate that migrants not only exhibit a higher risk for HIV acquisition than non-migrants, but may also facilitate the transmission of HIV to others (3–6). Linking HIV-positive migrants to HIV care requires them to first know their HIV status. Despite their classification as a vulnerable group for HIV, there is a paucity of data on HIV testing among migrant workers.

In particular, there is a dearth of research on migrants in Central Asia, a region that has one of the fastest growing HIV epidemics in the world (7). Five of the nine countries where HIV incidence increased 25% or more between 2001 and 2011 were in post-Soviet Central Asia (8, 9). Central Asia has high levels of migration flows, which may complicate controlling the HIV epidemic in the region. Tajikistan is the most remittance dependent country in the world (49% of its GDP comes from remittances) and the Kyrgyz Republic is the second most remittance dependent country (32% of its GDP comes from remittances) (10). Migrants from Tajikistan, Kyrgyzstan, and Uzbekistan migrate to the more prosperous nations of Kazakhstan and Russia in search of employment. Research has shown that Central Asian migrants are particularly vulnerable for HIV infection because they have significantly lower HIV-related knowledge than their East European counterparts and are less likely to practice safe sex behaviors (11).

Even though HIV testing is widely available across Kazakhstan, (12) Central Asian migrants may face multiple barriers at the structural, health care system and individual levels that impede their uptake of HIV testing. Although Central Asian migrants are technically required to have an HIV test in order to obtain a temporary or permanent resident card, (12) it is unclear the extent to which this regulation is actually enforced. Some migrants have been known to purchase false HIV test results in order to meet requirements (13). HIV positive individuals are barred from migration (and thus needed employment) in many countries, including Kazakhstan and Russia, and therefore migrants may purchase false results so that they can obtain employment abroad. Because of high levels of stigma against HIV, migrants who are not HIV positive may also prefer to purchase false test results than to risk being seen at the AIDS Center. Others may be worried that they are HIV positive, but don't want to know their status. Furthermore, many Central Asian migrants working in Kazakhstan are undocumented, and therefore illegal, which may limit their ability to access health care services. Many are also low-skilled workers who have limited incomes and work long hours and thus, may not have the financial resources or time to access health services, including HIV testing (14).

In order to achieve the UNAIDS 90-90-90 target goals, research is needed to identify the specific barriers and facilitators of HIV testing among Central Asian migrants. The purpose of this paper is to identify the determinants of HIV testing among Central Asian labor migrants in Kazakhstan. We hypothesize that economic factors, legal status, health care

access, and individual sexual risk behaviors are associated with HIV testing among migrant workers in Kazakhstan.

METHODS

Study design and population

This cross-sectional study was conducted among Central Asian migrant workers in three cities in Kazakhstan: Almaty, Astana, and Shymkent. Eligible participants had to be (1) at least 18 years of age; (2) not be a citizen or permanent resident of Kazakhstan or an oralman (Kazakh who was living outside of Kazakhstan at the time of the country's independence, and has since been repatriated back to Kazakhstan); (3) report a home or residency in Uzbekistan, Kyrgyzstan or Tajikistan; (4) have crossed the Kazakhstan border in the last 12 months; and (5) report coming to Kazakhstan for the purpose of earning money.

Recruitment and Data Collection

From August to November 2014, we used respondent driven sampling (RDS) to recruit participants (15, 16). The first participants, or "seeds," were selected based on the size of their social network, gender, work industry and home country to ensure the recruitment of a diverse and heterogeneous sample. The network of Red Crescent migration centers helped identify initial seeds. Each city had a pool of "seed" candidates. Almaty had 16 candidates, Shymkent had 8 candidates, and Astana had 9 candidates. Extra seeds were recruited if some seeds appeared inactive or if some ethnicities or work industries were under-represented.

After the seeds gave informed consent, they completed a structured computer-assisted survey containing measures on sociodemographics, legal status, sexual risk behaviors, and health care access. They were then given three recruitment coupons that enabled them to refer their peers to the study and were trained to recruit eligible participants. Each consecutive participant underwent the same procedures. The process continued until we recruited 200 participants in each city. Power analysis was conducted in R software using Cohen's recommended values (.02, .15, .35) and a significance level of .05 to determine that a starting sample size of 400 was necessary to have 80% power to detect effects as low as $f2 = .05$. A small incentive -- a telephone card worth 5 US dollars -- was given to all participants to compensate them for their time completing the interview. Participants were also given a $5 phone card for each eligible person they referred to the study. All participants completed informed consent. All protocols for the study were approved by XXX University institutional review boards.

Measures

The main outcome variable of having ever received an HIV test was dichotomized as a yes/no variable. Other variables included in this analysis were associated with HIV testing in the literature and consisted of demographic (age, gender, education, marital status, country of origin), economic (monthly income, sending remittances home, ability to afford medical services), legal (temporary registration, employment contract), sexual risk (sexually active in the past 6 months, multiple sex partners, sex with a commercial sex worker, condom use), and health care access factors (medical check-up in the last 12 months, health insurance,

regular doctor). For economic factors, participants were asked whether they were able to afford medical services in Kazakhstan, how much money they made a month in Kazakhstan, and whether they sent remittances home to their families. For legal factors, participants were asked if they had temporary registration in Kazakhstan and if they had a contract with their employer. For sexual risk factors, participants were asked whether they had had sex in the past 6 months, how many sex partners they had, and how many partners they had paid for sex. For health care utilization factors, participants were asked whether they had had a medical check-up in the last 12 months, whether they had health insurance in Kazakhstan, and whether they had a regular doctor. With the exception of age, all other independent variables were categorical. Measures used included the Living Standards Measurement Survey,(17) the Demographic Health Survey,(18) the World Health Survey,(19) and additional questions taken from previous studies conducted by the Global Health Research Center of Central Asia (GHRCCA).

Statistical Analysis

We used descriptive statistics to characterize the sample. To test our hypothesis and determine which factors were associated with HIV testing, we assessed associations between independent variables and HIV testing using bivariate logistic regression to calculate the unadjusted odds ratios (OR) and their 95% confidence intervals (CI). Data were weighted to account for the sampling design using RDSAT 7.1 (20). We examined the correlation between variables, but no variables were found to be highly correlated. Variables that showed significance at the 0.10 alpha level in the bivariate logistic regression models were included in the initial multivariate model. For selection of the final model, forward step-wise logistic regression was performed with significant variables from the bivariate analysis. Statistical significance in the multivariate analysis was determined using an alpha level of 0.05. After including only significant variables in the final model, we then assessed the change-in-estimates of the significant variables and goodness-of-fit of the model by adding non-significant terms back into the model. Our final multivariate model assessing determinants of HIV testing included fourteen independent variables (three sociodemographic, three economic, two legal, three sexual, and three health care access-related). All analyses were conducted using SPSS version 23 (Durham, NC).

RESULTS

Descriptive Statistics

Sociodemographic characteristics—Of 623 participants, the mean age was 31.02 years (SD 9.45). Over three-quarters of the participants were male (78%). The majority of participants were married (62.3%). Education levels were fairly low among the sample, with most participants possessing a high school education or less. Participants were migrants from Kyrgyzstan, Tajikistan, and Uzbekistan. Table 1 provides frequencies on the main characteristics of the sample (sociodemographic characteristics, economic characteristics, legal status, sexual risk behaviors, health care access).

HIV testing

Slightly less than half (48%) of participants had ever been tested for HIV. Only one of these reported an HIV-positive result (0.3%). Of those tested, 28.4% (n=85) were tested in the last 12 months, 52.2% (n=156) were tested one to three years ago, 15.7% (n=47) were tested more than three years ago, and 3.7% (n=11) could not remember when they had been tested.

Economic characteristics

Participants earned an average of $382 USD per month in Kazakhstan. Nearly half (47%) had sent remittances home. The majority of participants could not afford health care services in Kazakhstan.

Legal status

Less than half (45.5%) of all migrant workers in the sample had a valid temporary registration permit and less than a quarter (22%) had a contract with an employer.

Sexual risk behaviors

Less than half of participants reported they had been sexually active in the last six months (43.5%). Few participants reported multiple sex partners (6.3%) or having sex with a commercial sex worker in the last six months (5.3%). Condom use was also low. Of the total sample, only 14.5% reported using a condom during their last sex act with a regular partner, and only 46.4% reported using a condom during their last sex act with a casual partner.

Health care access

The sample as a whole reported low health care access. Just over a quarter had a medical check-up in the past 12 months. Only 2.4% reported having medical insurance in Kazakhstan and only 11.1% reported having a regular doctor they could see when they were sick. Migrant workers who had been tested for HIV were significantly more likely to have had a medical check-up in the past 12 months, have health insurance, and have a regular doctor.

Bivariate analysis

In the bivariate analysis (Table 2), having received an HIV test was significantly associated with the demographic variables of age (unadjusted odds ratio (OR) 0.98; 95% confidence interval (CI) [.97–1.00]; p 0.05), being female (OR 1.70; 95% CI [1.70–2.44]; p 0.01), and being a Kyrgyz migrant (OR 1.66; 95% CI [1.16–2.37]; p 0.01). Consistent with our hypothesis, *economic factors* (sending remittances home (OR 3.10; 95% CI [2.23–4.29]; p 0.01) and being able to afford medical services in Kazakhstan (OR 6.69; 95% CI [3.89–11.51]; p 0.01)), *legal factors* (having temporary registration in Kazakhstan (OR 2.73; 95% CI [1.95–3.82]; p 0.01) and a contract with an employer (OR 2.81; 95% CI [1.88–2.40]; p 0.01)), *health care access factors* (having a medical check-up in the last 12 months (OR 1.99; 95% CI [1.39–2.87]; p 0.01), having medical insurance in Kazakhstan (OR 4.48; 95% CI [1.25–16.03]; p 0.05), and having a regular doctor (OR 4.16; 95% CI [2.31–7.51]; p 0.01)), and *sexual risk factors* (having sex in the last 6 months (OR 4.54; 95% CI [3.23–6.29]; p 0.01) and having sex with a commercial sex worker (OR 5.94; 95% CI [2.59–

13.61]; p 0.01)) were significantly associated with HIV testing. Education and marital status were not significantly associated with HIV testing at the 0.10 level in the bivariate analysis and were thus excluded from the multivariate analysis.

Multivariate analysis

In the multivariate analysis (Table 3), we found that most demographic, economic, legal, health care access and sexual risk factors remained significant. For *demographic* factors, we found that age (adjusted odds ratio (AOR) 0.98; 95% CI [.96–1.00]; p 0.05) and being female (AOR 2.56; 95% CI [1.48–4.45]; p 0.01) were significantly associated with HIV testing. Both *legal* factors remained significant. Migrants who had temporary registration were 1.69 times (95% CI [1.12–2.56]; p 0.05) more likely to be tested for HIV and those who had an employment contract were 2.59 times (95% CI [1.58–4.23]; p 0.01) more likely to be tested. Two of the three *economic* factors were still significantly associated with HIV testing. Migrant workers who reported being able to afford health care services were 3.61 times (95% CI [1.86–7.03]; p 0.01) more likely to be tested for HIV. Those who sent remittances home were 2.04 times (95% CI [1.34–3.10]; p 0.01) more likely to be tested. Of the *health care access* factors, having a medical check-up in the past 12 months (AOR 1.85; 95% CI [1.18–2.89]; p 0.01) and having a regular doctor (AOR 2.37; 95% CI [1.20–4.70]; p 0.05) remained significantly associated with HIV testing. For *sexual risk* factors, migrants who reported being sexually active in the last 6 months (AOR 2.27; 95% CI [1.47–3.50]; p 0.01) or having sex with a sex worker (AOR 4.41; 95% CI [1.49–13.07]; p 0.01) were more likely to be tested for HIV than those who did not. Country of origin, monthly income, having multiple sex partners, and having medical insurance in Kazakhstan were not found to be significantly associated with HIV testing.

DISCUSSION

The findings show that less than half of Central Asian migrant workers in our sample had ever been tested for HIV. This number falls far short of the UNAIDS 90-90-90 target goals, and far more remains to be done if 90% of migrants living with HIV in Central Asia are to know their HIV status by 2020 (1). Migrant workers in Kazakhstan are currently given little attention in relation to HIV prevention and intervention. Few HIV prevention programs are available to migrant workers and there are no free HIV testing options for them. Low HIV testing rates in this sample indicate that there is a need for improved HIV testing strategies and options for migrant workers in Kazakhstan.

A systematic review on HIV testing among migrants in high-income countries revealed that migrants face several legal, economic, health care system, and individual barriers to HIV testing (21). Our results are consistent with these findings. After simultaneously placing all significant variables into the model, we found that HIV testing was significantly associated with age, being female, having temporary registration, having an employment contract, being able to afford health care services, sending remittances home, having a medical check-up in the past 12 months, having a regular doctor, being sexually active in the last 6 months, and having sex with a commercial sex worker. We found that income was not highly correlated with legal factors (having temporary registration or having an employment

contract), risk behaviors, or health care access. Income does not appear to be the sole barrier to HIV testing. Instead, results indicate that access to HIV testing for migrants is complex and is impeded by a number of different individual and structural level barriers.

Similar to findings in high-income countries, (21, 22) legal status is a significant barrier to HIV testing among migrants in Kazakhstan. Though many Central Asian migrants initially enter Kazakhstan legally, registration procedures and the process of obtaining work permits can be difficult to navigate for migrants (14). Although Kazakhstan has a visa-free regime with Kyrgyzstan, Tajikistan and Uzbekistan, registration is only valid from 30 to 90 days, and the process of obtaining approval for a longer stay in Kazakhstan can be cumbersome. Because of difficulties navigating the registration system, many migrants become "undocumented" after their temporary registration period elapses (14). Migrants to Kazakhstan are also required to have an HIV test in order to obtain a work permit or a temporary residence permit (12). Although we found that having a work permit or temporary residence permit was significantly associated with HIV testing, less than two-thirds of migrants in our study who had a temporary residence permit or work permit had ever been tested for HIV. This may be a result of regulations being inconsistently enforced or it may be that migrants paid for false HIV test results or found another way to bypass the system. It may also be possible that some migrants were actually tested for HIV, but did not know or remember that they had been tested. Our results indicated that illegal migrants were significantly less likely to be tested for HIV. Undocumented migrants may fear accessing health services, including HIV testing, for fear of being deported, even if they suspect they are HIV positive. Changes in legislation that ensure migrants will not be deported for testing HIV positive may increase testing uptake among migrant workers.

As found in studies among migrants in countries diverse as China, South Africa, and Canada (23–25), we found that migrants in Kazakhstan also face barriers related to access and affordability. Many migrants, particularly those who are undocumented, are not eligible to access health care services in government clinics and are forced to obtain health care at private clinics at higher costs (26, 27). However, because migrants often have low incomes and are unable to afford high health care costs, most are unable to access care at private clinics. As an alternative to private clinics, some migrants receive health care from the Red Crescent Society, NGOs, or friends with medical backgrounds; however, HIV testing is not available through many of these alternative sources of care. Paying for health care services can take up a sizeable portion of migrants' income, and they may not be willing to pay for health services they deem as unnecessary or not urgent, such as HIV testing (28). Indeed, our results indicated that Central Asian migrants who were able to afford health care services in Kazakhstan were over three and half times more likely to have been tested for HIV. Furthermore, participants who could afford to send remittances home were also more likely to have received an HIV test, indicating that sufficient financial resources are a significant determinant of HIV testing. Providing cheaper options for health care access, such as allowing undocumented migrants to access health care at government-run clinics or providing subsidized or free testing options, may increase HIV testing uptake among this population.

Another important factor for increasing HIV testing among migrants is access to and engagement in routine health care. The association we found between HIV testing and having a medical check-up in the last 12 months and having a regular doctor indicates that migrants who do not regularly seek health care may also miss opportunities to be offered an HIV test. Studies in other countries have also indicated a similar association between visiting a health care provider and receiving an HIV test (21, 29, 30). Although we cannot determine whether those who were tested for HIV received their test during a regular health visit, our results are consistent with findings from other regions and suggest that increasing the utilization of general health care services could help to improve HIV testing. Thus, encouraging migrants to obtain routine health care check-ups and decreasing obstacles to general health care access may also serve to increase HIV testing uptake among this population.

Sexual activity within the last six months and sex with a commercial sex worker were also found to be associated with receiving an HIV test. These findings are similar to research in Thailand which found that male migrants who had sex with a non-regular sex partner were more likely to receive HIV testing (31). Though it is not possible from the data we gathered to tell with whom participants have been sexually active, because many of the migrants in this sample had spouses who did not come with them to Kazakhstan, it is quite possible that they may be having sex with extra-marital partners while working in Kazakhstan. Central Asian migrant workers who have sex with extra-marital partners or commercial sex workers while in Kazakhstan may know they are at an increased risk of HIV infection and thus, may receive testing. Or, it may be possible that social connections to sex workers facilitate HIV testing. There are HIV testing outreach programs to sex workers in Kazakhstan, which may be successful in increasing HIV testing among sex workers and their partners. Further research is needed to determine the relationship between individual sexual risk behaviors, perception of HIV risk and HIV testing uptake among this population. Additionally, an increased promotion of HIV testing services is still sorely needed, as nearly a third of recently sexually active migrants had never been tested for HIV.

This study is subject to several limitations. First, participants were recruited using respondent-driven sampling, which can introduce sampling bias and limit the generalizability of study findings. For example, the Tajik migrants in our study had higher incomes than normal for migrants, so their risks likely differ from poorer Tajik migrants and migrants from other Central Asian countries. The majority of study participants were from Uzbekistan, and they may also have different risks than migrants from other Central Asian countries. The study may also have been subject to social desirability bias, as sexual risk behaviors may have been under-reported, while positive behaviors, such as accessing health care services or receiving HIV testing, may have been over-reported. Despite these limitations, this analysis makes an important contribution to the current literature by examining HIV testing and associated factors among migrants in an area of the world where HIV is rapidly increasing.

CONCLUSIONS

This study provides important insights for initiatives focusing on HIV testing among migrants in Central Asia. Many migrants in this study had not been tested for HIV, and a number of legal, economic, social, and structural barriers prevent migrants who may be infected with HIV from being tested and learning their status. Migrants' lack of knowledge about their HIV status and their ability to transmit to others could increase the spread of the HIV epidemic in both Kazakhstan and migrants' home countries. The HIV epidemic is complex, and the UNAIDS 90-90-90 target goals cannot be achieved without developing tailored strategies and approaches for key populations in diverse regions of the world. For Central Asian migrants in Kazakhstan, governmental policy changes that enable migrants to access government clinics, regardless of documentation status, and providing access to low-cost or no-cost HIV testing options would likely facilitate an increase in HIV testing among this population. Encouraging annual visits to a health care provider or having a regular physician may increase the uptake of HIV testing in clinical settings. For migrants who have a tenuous relationship with the healthcare system, the provision of alternate forms of testing, such as rapid point-of-care HIV tests, may be necessary. However, given the religious and socially conservative background of many migrants, structural changes alone will likely not be sufficient to increase HIV testing among all migrants who need it. Improving understanding and awareness of HIV and the importance of testing among migrant workers will likely also be necessary. Understanding and overcoming barriers to HIV testing and incorporating such knowledge into the development of future HIV testing initiatives is a necessary first-step in meeting the 90-90-90 goals.

Acknowledgments

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Table 1

Selected characteristics of Central Asian migrants tested for HIV and those not tested for HIV, 2014 (N=623)

	Overall (N=623)
Demographic Characteristics	
Age in years, *mean (SD)*	31.02 (9.45)
Gender, *n (%)*	
Female	137 (22%)
Male	486 (78%)
Country of Origin	
Kyrgyzstan	141 (22.6%)
Tajikistan	103 (16.5%)
Uzbekistan	379 (60.8%)
Education	
High school or less	529 (84.9%)
Higher education	94 (15.1%)
Marital Status	
Married	388 (62.3%)
Divorced/Widowed	19 (3.0%)
Single	216 (34.7%)
Economic Characteristics	
Monthly income in Kazakhstan, *mean (SD)*	$382.00 (155.47)
Send remittances home	293 (47.0%)
Can afford to pay for medical services in Kazakhstan	104 (16.7%)
Legal Status	
Have temporary registration in KZ	
Yes	284 (45.5%)
Yes, but it expired	48 (7.7%)
No	292 (46.8%)
Have a contract with an employer	137 (22%)
Sexual Risk Behaviors	
Had sex in the last 6 months	271 (43.5%)
Have multiple sex partners	39 (6.3%)
Have sex with a commercial sex worker in KZ	33 (5.3%)

	Overall (N=623)
Used a condom during last sex act with regular partner (n=241)	35 (14.5%)
Used a condom during last sex act with a casual partner (n=56)	26 (46.4%)
Used a condom during last sex act with a commercial sex worker (n=49)	40 (81.6%)
Used a condom every sex act in the past 6 months with a regular partner (n=238)	31 (13.0%)
Used a condom every sex act in the past 6 months with a casual partner (n=50)	21 (42.0%)
Used a condom every sex act in the past 6 months with a commercial sex worker (n=46)	36 (78.3%)
Health Care Access	
Had a medical check-up in the last 12 months	166 (26.6%)
Have medical insurance in KZ	15 (2.4%)
Have a regular doctor	69 (11.1%)

Table 2

Bivariate Analysis (Odds Ratios) for Economic, Legal, Sexual Risk, and Health Care Access Factors and HIV Testing, weighted data, (N=623)

		OR	95% CI	*P*
Demographic Factors				
Age		0.98	.97–1.00	*.038*
Gender	Male	1.00	Reference	
	Female	1.70	1.18–2.44	*.004*
Education	Higher Education	1.00	Reference	
	High School or less	1.29	.80–2.08	.297
Marital Status	Married	1.00	Reference	
	Divorced	1.35	.57–3.18	.494
	Single	0.89	.64–1.24	.476
Country of Origin	Uzbekistan	1.00	Reference	
	Kyrgyzstan	1.66	1.16–2.37	*.005*
	Tajikistan	1.42	.86–2.36	.172
Economic Factors				
How much money do you earn a month in Kazakhstan?		1.00	1.00–1.00	*.009*
Do you send remittances home?	No	1.00	Reference	
	Yes	3.10	2.23–4.29	*.000*
Can you afford to pay for medical services in Kazakhstan?	No	1.00	Reference	
	Yes	6.69	3.89–11.51	*.000*
Legal Factors				
Do you have temporary registration in Kazakhstan?	No	1.00	Reference	
	Yes	2.73	1.95–3.82	*.000*
	Expired	2.44	1.31–4.53	*.005*
Do you have a contract with an employer?	No	1.00	Reference	
	Yes	2.81	1.88–4.20	*.000*
Healthcare Access Factors				
Have you had a medical check-up in the last 12 months?	No	1.00	Reference	
	Yes	1.99	1.39–2.87	*.000*
Do you have medical insurance in Kazakhstan?	No	1.00	Reference	
	Yes	4.48	1.25–16.03	*.021*
Do you have a regular doctor you can see when you are sick?	No	1.00	Reference	

		OR	95% CI	*P*
	Yes	4.16	2.31–7.51	*.000*
Sexual Risk Factors				
Have you had sex in the last 6 months?	No	1.00	Reference	
	Yes	4.54	3.23–6.39	*.000*
Do you have multiple sex partners?	No	1.00	Reference	
	Yes	1.95	.99–3.83	.052
Have you had sex with a commercial sex worker in Kazakhstan?	No	1.00	Reference	
	Yes	5.94	2.59–13.61	*.000*

Table 3

Adjusted Odds Ratios for Economic, Legal, Sexual Risk, and Health Care Access Factors and HIV Testing among Central Asian migrant workers in Kazakhstan, weighted data, (n=623)[*]

Variable		AOR	95% CI	P-value
Demographic Factors				
Age		0.98	[.96–1.00]	*.014*
Gender	Male	1.00	Reference	
	Female	2.56	[1.48–4.45]	*.001*
Country of Origin	Uzbekistan	1.00	Reference	
	Kyrgyzstan	0.88	[.53–1.44]	.609
	Tajikistan	0.91	[.46–1.80]	.793
Economic Factors				
Monthly income		1.00	[1.00–1.00]	.173
Can afford health care services	No	1.00	Reference	
	Yes	3.61	[1.86–7.03]	*.000*
Sends remittances home	No	1.00	Reference	
	Yes	2.04	[1.34–3.10]	*.001*
Legal Factors				
Temporary Registration	No	1.00	Reference	
	Yes	1.69	[1.12–2.56]	*.013*
	Expired	1.55	[.75–3.19]	.236
Employment Contract	No	1.00	Reference	
	Yes	2.59	[1.58–4.23]	*.000*
Healthcare Access Factors				
Had a medical check-up in the past 12 months	No	1.00	Reference	
	Yes	1.85	[1.18–2.89]	*.007*
Has medical insurance in Kazakhstan	No	1.00	Reference	
	Yes	2.12	[.47–9.55]	.329
Has a regular doctor	No	1.00	Reference	
	Yes	2.37	[1.20–4.70]	*.013*
Sexual Risk Factors				
Sexually active in the last 6 months	No	1.00	Reference	
	Yes	2.27	[1.47–3.50]	*.000*
Multiple sex partners	No	1.00	Reference	

Variable		AOR	95% CI	P-value
	Yes	0.62	[0.24–1.64]	.335
Had sex with a sex worker	No	1.00	Reference	
	Yes	4.41	[1.49–13.07]	*.007*

*
Nagelkerke R Square = .378; Classification Table Overall Percentage = 73.0