Migrant workers in Kazakhstan: gender differences in HIV knowledge and sexual risk behaviors

Baurzhan Zhussupov

University at Albany, State University of New York, baurzhan.zhussupov@gmail.com

The University at Albany community has made this article openly available. Please share how this access benefits you.

Follow this and additional works at: https://scholarsarchive.library.albany.edu/legacy-etd

Part of the Epidemiology Commons

Recommended Citation
https://scholarsarchive.library.albany.edu/legacy-etd/812

This Master's Thesis is brought to you for free and open access by the The Graduate School at Scholars Archive. It has been accepted for inclusion in Legacy Theses & Dissertations (2009 - 2024) by an authorized administrator of Scholars Archive. Please see Terms of Use. For more information, please contact scholarsarchive@albany.edu.
Migrant Workers in Kazakhstan:

Gender Differences in HIV Knowledge

and Sexual Risk Behaviors

by

Baurzhan Zhussupov

A Thesis
Submitted to the University at Albany, State University of New York
in Partial Fulfillment of
the Requirements for the Degree of
Master of Science

School of Public Health
Department of Epidemiology and Biostatistics
2012
ABSTRACT

Background: The effect of labor migration on HIV risk is well documented. Many studies show that domestic and international labor migration increases sexual risk behavior. However, little is known about the role of gender on HIV risk among labor migrants. This study examines and compares sexual risk behaviors among male and female migrant market vendors in Almaty, Kazakhstan.

Methods: From the Barakhokla Market in Almaty, Kazakhstan, 422 market Vendors (209 males and 213 females) were randomly recruited to participate in the study. Self-reported data on demographics and HIV knowledge such as condom use, sexual risk behavior, safe sex communication, and mobility characteristics were collected through standardized face-to-face interviews. Dry blood spot was used as specimen for syphilis testing. To determine the gender effect on HIV-related knowledge and risk factors, propensity score stratification was used to estimate adjusted prevalence and rate ratios by gender, while controlling for demographic and mobility characteristics.

Results: Compared to male migrant workers, females had lower HIV knowledge and were less likely to have multiple sexual partners. There was no evidence of a gender difference for prevalence of syphilis, condom use with unsteady partners, and safer sex communication between couples. Associations between migrant patterns and engagement in multiple sexual partnerships were stronger among women than men.

Conclusions: Efforts should be made to mitigate the gender differential in HIV knowledge among migrants, especially women. Such efforts may prove challenging because they need to be implemented in both home and host countries. Outreach will likely also be affected by interactions between gender and migrant patterns and HIV risk.
ACKNOWLEDGMENTS

I offer my sincerest gratitude to my supervisor, Dr. Louise-Anne McNutt. I appreciate her mentorship, helpful advices, constant encouragement, and invaluable support. I would like to thank my co-advisor, Dr. Nabila El-Bassel. I am grateful for her inspiration, guidance, support and thoughtful feedback. This thesis would not have been possible without data provided by Columbia University's Global Health Research Center of Central Asia. The financial support provided by the New York State International Training and Research Program for the two years of my studies is acknowledged and appreciated. I thank my family and friends for their support.
# Table of Contents

1 Background ................................................................................................................................... 1  
  1.1 General information about the Republic of Kazakhstan ........................................................ 1  
  1.2 HIV Epidemic in Kazakhstan ................................................................................................. 3  
  1.3 Sexually Transmitted Infections in Kazakhstan ..................................................................... 4  
  1.4 The System of HIV/AIDS Surveillance, Prevention and Treatment in Kazakhstan .............. 5  
  1.5 Migration in Kazakhstan ........................................................................................................ 6  
  1.6 Migration, gender and HIV epidemic..................................................................................... 7  
  1.7 Current status of HIV epidemic among migrants in Central Asia......................................... 9  
2 Journal article ............................................................................................................................. 11  
3 Epidemiologic considerations ..................................................................................................... 23  
  3.1 Selection ............................................................................................................................... 23  
     3.1.1 Selection of study participants ...................................................................................... 23  
     3.1.2 Missing data .................................................................................................................. 23  
     3.1.3 Representativeness of the sample .................................................................................. 24  
     3.1.4 Assessment of selection bias ......................................................................................... 25  
  3.2 Information bias ....................................................................................................................... 25  
     3.2.1 Potential misclassification of the study outcomes ......................................................... 25  
     3.2.2 Potential misclassification of the study exposure and other covariates ......................... 27  
  3.3 Confounding ......................................................................................................................... 27  
Bibliography ................................................................................................................................... 28
Table of Tables

TABLE I. Baseline characteristics of the study sample.................................................................35

TABLE II. Gender effect on outcome variables (crude and propensity score model).................36

TABLE III. Association between having more than one sexual partner in the past 90 days with migration and job characteristics, stratified by gender.................................................................37
Table of Figures

FIGURE 1. Map of Central Asia .................................................................38

FIGURE 2. Number of newly-registered HIV cases by year (Kazakhstan, 2000-2011) .............39

FIGURE 3. Cumulative number of registered HIV cases by year (Kazakhstan, 2000-2011) ..........39

FIGURE 4. Percentage of persons acquiring HIV through heterosexual transmission and by sharing of contaminated drug equipment among newly-registered HIV cases (Kazakhstan, 2006-2011) .................................................................40
1 Background

1.1 General information about the Republic of Kazakhstan

Kazakhstan is located in Central Asia, deep in the Eurasian heartland, and is bordered by Russia on the north, China on the east, Kyrgyzstan, Uzbekistan and Turkmenistan on the south, and the Caspian Sea on the west (Figure 1). In terms of territory, Kazakhstan is the ninth largest country in the world, with an area of 2.7 million square kilometers. The Republic stretches 3,000 kilometers and three time zones from east to west, from the piedmont of the Altai Mountains to the lower reaches of the Volga River. The north-south stretch is 2000 kilometers, from the Western Siberian lowlands to the Kyzyl Kum desert and the Tian Shan mountain system, of which the rugged symmetry of Khan Tengri is notable as the world’s northernmost 7000 m peak. Its remoteness from oceans and great territory influence its climactic conditions. The country’s climate is decidedly continental. One-quarter of the territory of Kazakhstan is made up of steppe, 44% is desert and 14% is semi-desert. After attaining sovereignty in 1991, the Republic of Kazakhstan became a democratic and unitary state [1].

Kazakhstan is comprised of 14 administrative areas (oblasts) and two national cities – Astana, the nation’s capital (since December 10, 1997) and Almaty – which is divided into districts. The State language is Kazakh, although in government agencies and the offices of local government, Russian has official status and is used alongside Kazakh. The primary religions in Kazakhstan are Sunni Islam and Orthodox Christianity. The population of Kazakhstan is approximately 16.7 million. Around 55% of the population lives in towns and cities. The largest cities are Almaty (with a population of 1.5 million) and Astana (752,000). Kazakhstan is a multi-ethnic state: 64% of the
population is Kazakh, 22% is Russian and the remaining 14% comprise more than 100 other ethnic groups. Kazakhstan has one of the world's lowest population densities, at 6 people per square kilometer [2].

Average life expectancy in Kazakhstan was trending downward until 1997. By the end of 1997 life expectancy was 64 years (58.5 for men and 69.9 for women). Beginning in 1997 stabilization of life expectancy could be seen (in 2010 it reached 68.4 years, 63.5 for men and 73.3 for women). This indicator puts Kazakhstan in the lowest ranking of life expectancy among countries of the Commonwealth of Independent States (CIS) [3]. Increases in mortality in Kazakhstan are attributable to high the mortality rate among the male population – mortality is 4.9 times greater for men than women due to trauma, poisoning and accidents, 3.9 times higher for respiratory diseases and 1.4 times higher for diseases of the circulatory system. In 80% of cases, these figures apply to men of working age [4].

The economic potential of Kazakhstan is great because the country has tremendous natural resource reserves, including oil, gas, coal, and metals, among others. In 2010, per capita gross national income (GNI) converted to international dollars using purchasing power parity rates was 10,770. Kazakhstan has a much higher GNI than other Central Asian countries including Kyrgyzstan (2,070), Tajikistan (2,140), and Uzbekistan (3,110) [5].
1.2 HIV Epidemic in Kazakhstan

Through 1995 in Kazakhstan and Central Asia overall, cases of HIV occurred only sporadically. The first outbreak of HIV in Kazakhstan and in Central Asia, which started during the second half of 1996, was registered in the city of Temirtau, Karaganda Oblast, where there was a sharp increase in the number of HIV infected during a 12 month period – from 30 in 1996 to 399 in 1997. Approximately 90% of these cases were among injecting drug users (IDUs) [6]. Since then, the HIV epidemic has been concentrated among IDUs. Starting in 2000, incident cases emerged with greater frequency in other regions of the country (Figure 2), specifically in the oblasts of Southern-Kazakhstan, Pavlodar, Western and Eastern Kazakhstan, as well as the city of Almaty [7].

Data about the prevalence of HIV in the Republic was provided through a system of routine testing and screening for HIV. By January 1, 2012 there were 17,763 registered cases of HIV infection (Figure 3) (86.8 per 100,000) including 12,444 (70.1%) males, 5,319 (27.6%) females, and 369 (2.1%) children under age 14. The estimated number of people living with HIV was 20,500. The geographic distribution of registered HIV cases was uneven. The highest prevalences of HIV cases were registered in Almaty city (3569 cases, 214.7/100,000), in Pavlodar (1763 cases, 180.5/100,000) and Karaganda (3224, 153/100,000) regions [7].

In 2011, for the first time since HIV registration started, the majority of HIV transmissions among newly-registered HIV cases occurred during heterosexual contacts rather than injecting drug use (51% vs 44%) (Figure 4). Now the heterosexual mode of
transmission accounts for 71% of HIV infections among females and 24% of HIV infections among males. This is direct contrast to the relative proportions of IDU which dominates among men (72%) and accounts for only 25% of HIV infections among females [7].

1.3 Sexually Transmitted Infections in Kazakhstan

Sexually transmitted infection (STI) prevalence is a good proxy for the types of sexual behavior which increase the risk of HIV infection. In Kazakhstan, four STIs are subject to mandatory registration: syphilis, gonorrhea, chlamydia and bacterial vaginosis. The majority of syphilis cases are diagnosed as a result of routine screening of the population conducted when any health care is provided to an adult. In recent years there has been a sharp increase in the number of registered cases of syphilis. While in 1991 the incidence of syphilis was 2.1 per 100,000 population, by 1997 it had increased over 100-fold to 268.9 per 100,000 population [8]. Beginning in 1998 the prevalence began to fall. In 2009, the syphilis incidence reached 39.7 per 100,000 [7].

It should be noted that official statistics often reflect only a part of the real STI picture. For example, in Kazakhstan the number of newly registered cases of syphilis (6309) in 2009 was comparable with the number of gonorrhea cases in the same time period (7461). In the USA in 2010 the rate of syphilis (4.5 cases per 100,000 population) was 50 times less than the rate of gonorrhea (100.8 cases per 100,000 population) [9]. The situation is exacerbated by the fact that the system of managing and treating STI patients has been and remains repressive. All procedures tied to these diseases fall under
the purview of the dermato-venereological service (DVS). The practice of compulsory treatment of STI remains in place. Because STI patients must reveal their contacts, there is a definite stigma associated with the DVS, prompting widespread self-treatment. However, one might argue that such conservatism is counterproductive given that only 20–40% of STI cases are treated by the service [10]. Despite the obvious ineffectiveness of the system in treating STIs, the dermato-venereologists tend to be very reluctant to relinquish their grip on STI care, arguing that general practice doctors are not capable of treating STIs.

1.4 The System of HIV/AIDS Surveillance, Prevention and Treatment in Kazakhstan

In Kazakhstan, as in other countries of the CIS, the system of public health comprises a complex network of specialized state facilities with a particular focus – such as centers for the prevention and treatment of AIDS. It includes the Republic AIDS Center, the central state agency established to coordinate the work of centers that exist in every oblast and in some municipalities. According to the 1994 Law on Preventing and Fighting against AIDS, all HIV/AIDS services must be free to the patient, including prevention, diagnostic, treatment and long-term care. As of January 1, 2011, antiretroviral therapy was provided for 1830 patients with HIV infection [7]. To scale up response to the HIV epidemic, Kazakhstan has received grants from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). A significant portion of the funds provided by the Kazakh Government and GFATM are aligned with efforts to combat the HIV epidemic via prevention measures among the most at-risk populations – injecting drug users, sex
workers, prisoners, and men having sex with men. There are 97 non-government organizations working in HIV/AIDS-related areas; 39 of them received government grants in 2011 [7].

### 1.5 Migration in Kazakhstan

Between 1991 and 2001 the population in Kazakhstan demonstrated declined by 1.3 million. This negative population dynamic resulted from a process of active migration: during this period 2.3 million people left the boundaries of the republic. Since 2003 the trend has reversed, and Kazakhstan has once again become a country with a positive balance of migration [11]. Difficult economic conditions in Kyrgyzstan, Tajikistan and Uzbekistan have precipitated migration to Russia and Kazakhstan. The latter may be favored among some of these migrants for several reasons – Kazakhstan is geographically and culturally closer to migrant home countries than Russia, and it is also economically attractive [12].

Estimates vary regarding how many migrants from other Central Asian Republics work in Kazakhstan – 140 thousand to 1 million from Uzbekistan, roughly 120 thousand from Kyrgyzstan, and 36-50 thousand from Tajikistan [11]. Trade-related internal and external movements are a special type of migration, and were the predominant cause of labor migration in CIS countries in 1990s [11]. Although the specific employment opportunities have changed – more migrants work in construction, agriculture and services – trade-related migration still affects many external and internal migrants. Four regions, including the two biggest cities, Almaty and Astana, and the oil-rich Atyrau and
agricultural Southern Kazakhstan, receive the majority of migrants from Central Asia [12]. While most of the labor migrants in Kazakhstan are men, women represent almost half of the labor migrants from Kyrgyzstan and between 10% and 40% of labor migrants from Tajikistan and Uzbekistan [13].

Only a minority of the migrants has proper legal status. In 2011, the Ministry of Labor and Social Protection gave 44,650 work permits for foreigners (Degree #451. Ministry of labor and social protection. Issued December 30, 2010). The remaining migrants live in Kazakhstan without legal permission, increasing their vulnerability to human trafficking, exploitation by abusive employers, and physical violence from mafia and the police. Furthermore, illegal migrants do not have an access to medical services including HIV diagnostic and antiretroviral treatment [12].

1.6 Migration, gender and HIV epidemic

Approximately 90 million people are estimated to be international labor migrants [14]. While migration itself is not an HIV risk factor, migrants are typically caught in circumstances which increase their vulnerability to HIV infection. The risk of HIV infection among labor migrants, both domestic [15] and foreign [16] increases because of various social, economic and political factors [17] [18]. Many migrants are separated from families. The living conditions of migrant workers are often difficult. They have limited access to HIV prevention information and services because of language and legal barriers, and often have much lower levels of education compared to citizens of host countries. Migrants from Central Asia also tend to have low HIV/AIDS knowledge.
Although substance use is not prevalent, a significant proportion engages in risky sexual behavior [19, 20]. In general, the HIV epidemic is affected by migration based on the epidemic's stage and migrant features [21].

The Joint United Nations Programme on HIV/AIDS (UNAIDS), International Labour Organization (ILO) and International Organization for Migration (IOM) developed the policy ‘HIV and International Labour Migration’ [22]. UNAIDS, ILO and IOM jointly recommended multiple actions for governments, workers’ organizations, businesses, civil society and international partners that aim to ensure access to HIV/AIDS prevention programs for migrant and mobile workers and to reduce their vulnerability to HIV/AIDS. The main recommended action is to ‘ensure … that international labour migrants and their families have the same access as nationals to HIV prevention, treatment, care and support programs which are sensitive to gender and culture, and in a language or medium the migrant worker can understand’ [22]. In the policy, special focus was made on female migrant workers. Traditional societies, from which most migrants come, have differing views on acceptable sexual behaviors according to gender. Women are expected to abstain from sexual contacts outside marriage. In contrast, promiscuous behavior among men is generally tolerated or even expected. Obviously, the woman remains at risk for HIV despite a monogamous relationship if the male engages in risky sexual behaviors. Finally, migrant females may be more vulnerable to HIV infection despite their increased likelihood of monogamy due to the risks associated with sexual exploitation and abuse [23].
1.7 Current status of HIV epidemic among migrants in Central Asia

In Kazakhstan, no data is available on the HIV prevalence among migrants. According to the country’s HIV case surveillance, 118 HIV cases were identified among foreigners in 2011 (in 2010 – 115 cases) [7]. This figure accounted for 6% of all HIV cases registered in this time period. In Tajikistan, more than 9% of all registered HIV cases were among labor migrants returning from other countries [24]. This rate appears to be higher than neighboring countries, but there is no data as of yet to confirm this disparity as the denominators are different (proportion of all HIV cases vs proportion of migrants who are HIV-positive). As such, we do not know if migrants are serving as a substantial pool for infection given their inherently transient status and the propensity among men to engage in risky sexual behaviors.

Surveillance systems attempt to add granularity to the HIV/AIDS picture. HIV Sentinel Surveillance Systems in Tajikistan and Uzbekistan include migrants as one of the sentinel groups tracked. In 2009 in Uzbekistan, among 1596 migrants who participated in the HIV sentinel surveillance, 15 (0.9%) were HIV-positive. The prevalences of hepatitis C and syphilis were 4.6% and 2.3%, respectively. [25]. HIV sentinel surveillance conducted among migrants in 2008 in Tajikistan found that 0.5% of participants were HIV positive, 1.7% were positive for hepatitis C, and 1.7% for syphilis. Having HIV was significantly associated with having comorbid hepatitis C, but not syphilis [26]. Injecting drug use wasn’t prevalent among migrants from both Tajikistan and Uzbekistan, with fewer than 1% of migrants from these two countries reporting injecting drug use in the past. However, the continued importance of injecting drug users
in fueling the HIV epidemic is highlighted by following: in 2009, 18% of injecting drug users were HIV-positive in Tajikistan [27], and 11% in Uzbekistan [28].
2 Journal article

Migrant Workers in Kazakhstan: Gender Differences in HIV knowledge and sexual risk behaviors

Introduction

Kazakhstan is one of only seven countries to experience an increase in HIV incidence of more than 25% during 2001-2009 [29]. Injecting drug use is the main driver of the HIV epidemic in Eastern Europe and the Central Asian region [30]. In addition to injecting drug users, the HIV epidemic in Kazakhstan is concentrated among their sexual partners and sex workers who often use drugs by injection, and spread the virus to other population groups including youth and migrants [31,32]. Although migrants in the region are not considered the population at greatest risk for contracting HIV, their populous and highly mobile nature makes them not only substantial contributors to the spread of infection, but also very difficult to reach with educational messages regarding prevention. About 7% of the HIV cases registered in Kazakhstan in 2009 were migrants from abroad [33]. In Tajikistan, more than 9% of all registered HIV cases were among labor migrants returning from other countries [24].

In Central Asia, Kyrgyzstan, Tajikistan, and Uzbekistan represent possible source countries with estimated numbers of international migrants as follows: 223, 284, and 1,176 thousands, respectively. Kazakhstan receives migrants from throughout Central Asia and is the 15th largest migrant-receiving country in the world, and second only to Russia for hosting migrants from other Central Asian countries [34]. The risk of HIV infection among both domestic [15] and foreign [16] labor migrants increases due to
various social, economic, and political factors [17, 21]. Many migrants are separated from their families and often live under difficult conditions. They have limited access to HIV prevention information and services because of language and legal barriers, and often have much lower levels of education compared to citizens of host countries. Migrants from Central Asia also tend to have low HIV knowledge. Although substance use is not prevalent, a significant proportion engages in risky sexual behavior [19, 20]. In general, the HIV epidemic is affected by migration based on the epidemic's stage and migrant features [21].

Trade-related internal and external movements are a special type of migration. Trading is one of the main activities of migrants after construction, agriculture, and services. Both sexes are involved in commercial migration in contrast with construction work in which migration among males predominates [13]. While majority of labor migrants in Kazakhstan are men, almost half of the labor migrants from Kyrgyzstan and between 10% and 40% of labor migrants from Tajikistan and Uzbekistan are female [13].

As in the general population, migrant males are more likely to engage in risky sexual behavior compared to migrant females [35]. Traditional societies, from which most migrants originate, have differing views on acceptable sexual behaviors according to gender. Women are expected to abstain from sexual contact outside of marriage. In contrast, promiscuous behavior among men is generally tolerated or even expected. Obviously, the woman remains at risk for HIV despite a monogamous relationship if the male engages in risky sexual behaviors. Finally, migrant females may be more vulnerable
to HIV infection despite their increased likelihood of monogamy due to the risks associated with sexual exploitation and abuse [23].

In a previous publication from this study, we found that migrant vendors in Kazakhstan showed associations between mobility characteristics and sexual risk behaviors [36]. In the current paper, we examine the impact of gender differences on sexual risk behaviors, HIV knowledge and safer sex communication between couples. Such knowledge will inform targeted health risk education strategies among this difficult-to-reach population in an effort to curb the increasing incidence of HIV. Propensity score analysis (PSA) was utilized to control for imbalances between gender groups, i.e., to mitigate gender-selection bias. PSA is considered more robust and more precise than logistic regression widely used for covariate adjustment [37]. We hypothesize that HIV-related knowledge and risk factors are affected by gender.

Methods

Sample

The study recruitment and eligibility criteria were previously described [36]. A total of 422 market vendors—209 males and 213 females—from the Barakholka Market in Almaty, Kazakhstan were randomly recruited for the study. Data were collected through standardized face-to-face interviews. Internal or external migrants aged 18 years and older, who engaged in vaginal or anal sex in the past 90 days, and had traveled two or more hours outside of Almaty in the past year, were employed as a worker or owner in a randomly selected stall at the Barakholka Market. The institutional review boards of
Columbia University and the Ethics Review Board of the Ministry of Health of Kazakhstan approved protocols of the study.

**Measurement**

*Socio-demographics*

Socio-demographic variables included gender, age, level of education completed, country of citizenship, type of residency, and living together with spouse or girlfriend/boyfriend.

*HIV Knowledge*

HIV knowledge was measured by a scale with values varying from 0 to 12. Respondents answered on 12 questions about HIV prevention, transmission and treatment. HIV knowledge score was calculated as a number of correct responses given to these questions.

*Safer Sex Communication*

We included safer sex communication between couples as an outcome variable because of its importance to women in gaining control of their sexual lives [38]. For the assessment of safer sex communication, seven questions about communication with a steady partner about condom use, sex alternatives, and HIV and sexually transmitted infection prevention and testing were used. Possible scores ranged from 0 to 7 with positive responses indicating the number of correct responses. The score had a Cronbach’s alpha of .83 indicating good internal validity.
**Mobility**

Mobility was characterized by number of times traveled in past year to buy goods to sell at the Barakhola Market, number of times traveled to visit friends or family in the past year, number of years employed at the market, and primary job responsibility at market stall (owner or vendor).

**Biotest for syphilis**

Capillary whole blood, blotted on to a filter paper, was used as specimen for testing for syphilis. Serologic testing for syphilis was performed by the reference laboratory at the Republican AIDS Center in Almaty. A standard immune-capture enzyme immunoassay (ICE Syphilis, Abbott Murex Diagnostics) was used.

**Statistical Analyses**

We used prevalence ratios to investigate the gender effect on binary outcome variables (having multiple partners, consistent condom use with an unsteady partner, and a positive syphilis test), and rate ratios for HIV knowledge and condom use and safer sex communication. We computed prevalence ratios to address the second question about the effect of gender on associations between the mobility patterns of migrant workers and risky sexual behaviors. Statistical analyses were conducted in R version 2.14.2.
We used stratification on the propensity score as a method of propensity score adjustment. The propensity model included the variables that were considered to be possibly associated with gender or with outcomes. Nine socio-demographic and migration variables were used in logistic regression model to calculate propensity scores as predicted probabilities to be in the female group. The 20%, 40%, 60%, and 80% quintiles of the estimated rates or ratios were defined. Based on these quintiles, participants were stratified into five equal-size groups. Five groups were selected to achieve substantial gender group overlap in all groups. Moreover, creating five groups removes at least 90% of the selection bias in observed covariates that are used to calculate propensity score [39].

Proportions of missing responses in covariates didn’t exceed 1.5%. We used multiple imputations (MICE package, R) to estimate the values of missing data. For the evaluation of balance diagnostic, we used Cohen’s h effect size for two proportions. The model-adjusted value of the outcome variable in female and male groups was calculated as mean of the stratum-specific values. The standard error for each parameter was estimated by bootstrap simulations.

A sensitivity analysis was performed to estimate how the gender effect on outcome variables changes with associations of an unobserved covariate with gender and outcome; that is, to assess the potential for missed confounders [40]. We defined the values of these associations that eliminate the gender effect on outcomes completely.
Results

Balance diagnostics

The 20th, 40th, 60th and 80th percentiles of the propensity score were 0.338, 0.435, 0.517, and 0.715, respectively. The proportion of females within each stratum ranged from 12.2% to 80.2%. Thus, our model fit the crucial requirements of having overlap in the propensity score between female and male respondents in all groups. The baseline characteristics of female and male market vendors are described in Table I. Five of the nine variables had standardized differences that exceeded 0.20, meaning presence of systematic differences in baseline characteristics between female and male respondents. The standardized differences ranged from 0.00 to 0.59 with a mean of 0.18. After propensity score adjustment, standardized differences reduced to a mean of 0.07 with a range of 0.01 to 0.19. The balance diagnostics demonstrated that female and male participants had similar distributions of measured baseline covariates.

Estimated gender effects

Our hypothesis is that five outcome variables characterizing HIV risk factors, HIV and condom use knowledge, biotest for syphilis, multiple sexual partners in the past 90 days, consistent condom use with unsteady partner or partners in the past 90 days, and couple safer sex communication, are affected by gender. The effects of gender on outcome variables, unadjusted and adjusted by PSA are shown in Table II. Women were less likely than men to have more than one partner in the past 90 days: 20.3% of the
women compared to 66.0% of the men (prevalence ratio [PR]=0.31, 95% confidence interval [CI]= 0.23–0.41). In the adjusted propensity score model, the gender difference remained statistically significant with the same magnitude (PR=0.31, CI=0.20-0.45). There was no significant difference in consistent condom use with an unsteady partner in the past 90 days between females and males in either the unadjusted rate (PR=0.81, CI=0.44-1.49) or the propensity score model (PR=0.77, CI=0.29-1.41). One reason might be the relatively small number of participants reporting unsteady partners (43 females and 138 males).

No statistically significant difference among gender in the prevalence of syphilis: 6.6% of females and 4.4% of males tested positive for syphilis (PR=1.37, CI=0.62-3.02). The difference remained insignificant after propensity score adjustment (PR=1.03, CI=0.28-2.65).

Female migrants demonstrated lower HIV and condom use knowledge, compared with male migrants both in the sample (Rate Ratio [RR] = 0.75, CI=0.63-0.91) and the propensity score model (RR=0.77, CI=0.61-0.95). Similarly, the mean score for safer sex communication between couples was lower among female respondents than among male respondents (RR=0.59, CI=0.42-0.84), but statistical significance eroded after propensity score adjustment (RR=0.77, CI=0.51-1.10).

A sensitivity analysis was performed for two statistically significant gender effects on having multiple sexual partners and HIV and condom use knowledge. A gender effect on having multiple sexual partners would be eliminated if an unobserved covariate with 50% prevalence among males had an exceptionally strong association with
gender (odds ratio [OR]=55) and with having multiple partners (OR=74). To eliminate the gender effect on HIV and condom use knowledge, an unobserved covariate with 50% prevalence among males would need to have a strong association with gender (OR=4.5) and with HIV and condom use knowledge (RR=2.2).

Gender as an effect modifier

Gender modifies mobility patterns as well as job characteristics with respect to sexual risk behaviors, particularly having multiple sexual partners (Table III). Two mobility patterns—traveling in the past year to purchase goods to sell at the market and travelling out of Almaty to visit family and friends in the past year—were significantly associated with having multiple sexual partners among women but not among men.

Discussion

The study demonstrated that migrant market vendors exhibit a higher prevalence of having multiple partners compared to the general population. Further, migrant men were more than three times as likely to have multiple partners as migrant females. In 2007, Kazakhstan reported that 25% of men and 5% women aged 15-49 had sexual intercourse with more than one partner in the last 12 months (UNGASS indicator 16) [41].
While multiple sexual partnerships contribute significantly to the HIV epidemic when the HIV prevalence among the general population becomes high [42], this study showed the high potential for HIV transmission among migrant males as well as females. Presence of sexual risk in both sexes was confirmed by syphilis, the prevalence of which is high in both male and female migrant populations.

In contrast to men, women tended to have multiple sexual partnerships in association with migration characteristics, such as travelling outside Almaty to purchase goods or to visit family or friends. Thus, “double migration”—migration to Almaty and travelling from/to Almaty—predominantly affects the sexual risk behaviors of women. This phenomenon should be accounted in development and implementation of HIV prevention measures.

Female migrant vendors had less HIV knowledge than male migrant vendors. This counters well established literature on the influence of gender on HIV knowledge. In general, gender doesn’t affect HIV knowledge as much as education or age, and when there is a gender difference, men typically demonstrate a better understanding. For instance, of the 85 countries providing data to UNAIDS in 2005-2007 about the percentage of young women and men aged 15-24 who both correctly identify ways of preventing the sexual transmission of HIV, and who reject major misconceptions about HIV transmission (UNGASS indicator #13), 22 countries reported better HIV knowledge among males than females (differential exceeding 5%), and 12 countries reported the reverse [41]. The gender difference in HIV knowledge found in our data may be explained by factors originating in home countries before migration. In traditional
societies, from which most of the migrants came, discussing sexuality is taboo, particularly for girls and women. For example, migrants’ wives in Tajikistan said that sexual activity, HIV/AIDS, condoms, and HIV testing were not subjects of communication with their husbands [43]. As a result, traditional societal values supported and promoted in families lead to lack of willingness to openly discuss sexuality, creating barriers to HIV knowledge, and increasing the vulnerability of migrant women.

Estimated gender effects are subject to several limitations. First, the study was observational and there could be confounders that were not accounted in the study. However, sensitivity analysis showed that existence of such a powerful covariate that could eliminate gender effect on having multiple partners and HIV knowledge is unlikely. Second, data are cross-sectional and we cannot identify the time when syphilis occurred. Thus, values of potential confounders used in our analysis could be differing from ones at that time. Third, the study was conducted in one city, Almaty, which reduces generalizability of the results. Finally, we may expect having measurement bias because of social desirability. Participants could avoid socially undesirable answers, e.g., reporting drug use or having multiple partners. Interviewers were trained and the questionnaire was tested to reduce the latter bias.

Despite the limitations, the findings have important research and prevention implications for migrant workers in Central Asia and in particular for females. Although male migrants workers are typically the main focus for prevention efforts for obvious reasons (greater likelihood of risky sexual behaviors, number of partners, IDU, mobility),
female migrants are rarely included in research and prevention services. The findings from this research underscore the need to increase HIV prevention for women in both home and host countries. Moreover, empowering women to access services for HIV must be included in the countries strategic public health efforts.
3 Epidemiologic considerations

3.1 Selection

3.1.1 Selection of study participants

Study participants were recruited in 2007 from the Barakholka Market, located in an outlying district of the city of Almaty, Kazakhstan. This huge, busy marketplace consolidates 30,000 vendors serving 40 different markets. From the 5,112 numbered stalls in which market vendors work, 450 stalls employing 920 individuals were randomly selected for recruitment. Of the 920 recruited vendor employees, 805 agreed to complete the screening interview (87.5% participation rate) to assess eligibility according to the following criteria:

(1) S/he is between 18 and 35 years old; (2) S/he reports having vaginal or anal sex in the past 90 days; (3) S/he is employed at a stall in the Barakholka Market; (4) S/he traveled outside of Kazakhstan in the past year. Upon meeting these eligibility criteria, the recruiter entered basic descriptive information into a database then used an “Adaptive Biased Coin” procedure to balance the gender of subjects recruited from the selected stalls. Thus, of the 805 screened, just over half (N=422) were eligible and enrolled (213 female and 209 males).

3.1.2 Missing data

The proportion of missing responses in covariates was less than 1.5%. We used multiple imputations (MICE package, R) to estimate the values of missing data. Multiple
imputation is considered as the best method to handle missing data under the assumption that the missing data mechanism follows a missing at random (MAR) model [44]. By using logistic regression models for binary variables and polynomial logistic regression models for categorical variables, missing values were imputed five times. A single point estimate was calculated by averaging the values of the parameter estimates across the five ‘complete’ datasets. We have no evidence to indicate the missing data mechanism is missing not at random (MNAR), for which the appropriate model to handle missing data is not yet known [45]. However, proportions of missing data are not big enough to significantly change the effect sizes computed in this study.

3.1.3 Representativeness of the sample

Because we have no data describing characteristics of the entire study population (all 40,000 vendors), it is not possible to directly compare characteristics of our sample with the corresponding characteristics of population from which they were drawn. Moreover, the study was conducted in one city, Almaty, reducing generalizability of the results to all migrant vendors in Kazakhstan. However, drawing a random sample from such a large pool should yield a sufficiently representative sample from which we may safely infer trends and proportions.
3.1.4 Assessment of selection bias

The refusal rate was 12.5% in both genders. We assessed the role of selection bias on the gender effect for two outcomes – having multiple sexual partners and HIV/AIDS knowledge – that are significantly affected by gender. To do that we made several assumptions about values of the outcomes in respondents who refused to participate. The first extreme assumption is that all men who refused to participate didn’t have more than one partner, but all women did. In this scenario prevalence of having multiple partners would be 27.8% among females and 53.6% among males. Thus, even in this extreme test, any bias in selection cannot eliminate the gender effect on having multiple partners. For HIV/AIDS knowledge we assume the women who didn’t participate in the study gave twice as many correct answers as men (4 and 2 respectively). In this scenario, the mean number of correct answers given by males would be 3.3 and by females 2.8. The propensity score model presented the mean score 3.5 among men and 2.7 among women. Again, selection bias would not significantly change the magnitude of the gender effect.

3.2 Information bias

3.2.1 Potential misclassification of the study outcomes

Five outcome variables were studied. Presence of syphilis was classified by specimen testing and four were collected by face-to-face interview. Generally speaking, non-differential misclassification produces a bias toward the null. Any misclassification in serologic testing for syphilis would be very slight because the standard immune-capture enzyme immunoassay (ICE Syphilis, Abbott Murex Diagnostics) used has high
sensitivity (100%) and specificity (99.8%). Of the four other outcome variables measured by interview, two might be vulnerable to measurement bias because of social desirability. Participants could avoid socially undesirable answers, e.g. reporting of having multiple partners and non-use of condoms with unsteady partners. The first variable is expected to have differential misclassification by gender. In behavior surveys, men typically report higher numbers of sexual partners than women [46]. As a result, differential misclassification by gender with respect to multiple sexual partners can occur. On the other hand, two conditions present in our study can reduce the influence of the misclassification on study results. First, when the magnitude of the difference between the two groups is large, it is less likely to influence covariant estimates in the propensity score model (when the gap is narrower, the influence of differential misclassification is more profound). In our study, 60.3% of males and 18.8% of females reported having multiple partners, thus somewhat insulating our results from the effects of differential misclassification by gender. Second, our outcome is binary – having one sexual partner in the past 90 days compared to two or more. This binary outcome is less affected by bias than the number of partners, which is a continuous (quantitative) variable. Finally, reported condom use is subject to non-differential misclassification because both males and females are inclined to overestimate it [47]. Therefore, its measurement bias is directed towards the null.
3.2.2 Potential misclassification of the study exposure and other covariates

It is very unlikely that gender may be subject to misclassification. Migration and demographic characteristics used for the propensity score calculation were unlikely to be intentionally misclassified by respondents because they didn’t have sensitive data people would hide.

3.3 Confounding

A sensitivity analysis helps identify the potential for missed confounders by estimating how the gender effect on outcome variables changes in conjunction with associations of an unobserved covariate [40]. To carry out the sensitivity analysis, we artificially assigned the values of associations to eliminate the gender effect on outcomes completely. The sensitivity analysis was performed for two statistically significant gender effects on 1) having multiple sexual partners and 2) HIV/AIDS and condom use knowledge. A gender effect on having multiple sexual partners would be eliminated if an unobserved covariate with 50% prevalence among males had an exceptionally strong association with gender (OR=55) and with having multiple partners (OR=74). To eliminate the gender effect on HIV/AIDS and condom use knowledge, an unobserved covariate with 50% prevalence among males would need to have a strong association with gender (OR=4.5) and with HIV/AIDS and condom use knowledge (RR=2.2). The sensitivity analysis showed that existence of such a powerful covariate is unlikely (one which could eliminate the gender effect on having multiple partners and HIV/AIDS knowledge).
Bibliography


15. May Sudhinaraset et al. Migration and Unprotected Sex in Shanghai, China: Correlates of Condom Use and Contraceptive Consistency Across Migrant and Nonmigrant Youth. Journal of Adolescent Health 2012, 50:S68-S74


Tables

TABLE I. Baseline characteristics of the study sample.

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted data</th>
<th></th>
<th>Propensity score model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F (N=213)</td>
<td>M (N=209)</td>
<td>Effect size*</td>
<td>F (N=213)</td>
</tr>
<tr>
<td>N=422</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 21 yrs</td>
<td>40 (9.5%)</td>
<td>5.6 (12)</td>
<td>13.4 (28)</td>
<td>0.27 (8.6%)</td>
</tr>
<tr>
<td>21 – 25</td>
<td>95 (22.5%)</td>
<td>16.9 (36)</td>
<td>28.2 (59)</td>
<td>0.27 (23.9%)</td>
</tr>
<tr>
<td>26 – 30</td>
<td>145 (34.4%)</td>
<td>39.9 (85)</td>
<td>28.7 (60)</td>
<td>0.24 (38.5%)</td>
</tr>
<tr>
<td>31+</td>
<td>142 (33.6%)</td>
<td>37.6 (80)</td>
<td>29.7 (62)</td>
<td>0.17 (29.0)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary or less</td>
<td>53 (12.9%)</td>
<td>8.6 (18)</td>
<td>17.4 (35)</td>
<td>0.27 (15.9%)</td>
</tr>
<tr>
<td>High School</td>
<td>244 (59.5%)</td>
<td>61.7 (129)</td>
<td>57.2 (115)</td>
<td>0.09 (54.3%)</td>
</tr>
<tr>
<td>More than high school</td>
<td>113 (27.6%)</td>
<td>29.7 (62)</td>
<td>25.4 (51)</td>
<td>0.10 (27.9)</td>
</tr>
<tr>
<td><strong>Country of citizenship</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>153 (36.3%)</td>
<td>38.2 (81)</td>
<td>34.4 (72)</td>
<td>0.08 (40.0%)</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>120 (28.5%)</td>
<td>30.7 (65)</td>
<td>26.3 (55)</td>
<td>0.10 (28.7%)</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>97 (23.0%)</td>
<td>27.8 (59)</td>
<td>18.2 (38)</td>
<td>0.23 (22.0)</td>
</tr>
<tr>
<td>Other</td>
<td>51 (12.1%)</td>
<td>3.3 (7)</td>
<td>21.1 (44)</td>
<td>0.59 (8.8)</td>
</tr>
<tr>
<td><strong>Type of residence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own apartment</td>
<td>26 (6.2%)</td>
<td>5.2 (11)</td>
<td>7.2 (15)</td>
<td>0.08 (7.9)</td>
</tr>
<tr>
<td>Family home/apartment</td>
<td>32 (7.7%)</td>
<td>6.2 (13)</td>
<td>9.2 (19)</td>
<td>0.11 (6.5)</td>
</tr>
<tr>
<td>Partner’s home/apartment</td>
<td>12 (2.9%)</td>
<td>2.9 (6)</td>
<td>2.9 (6)</td>
<td>0.00 (5.0)</td>
</tr>
<tr>
<td>Someone else’s home/apartment</td>
<td>316 (75.8%)</td>
<td>72.9 (153)</td>
<td>78.7 (163)</td>
<td>0.14 (72.0)</td>
</tr>
<tr>
<td>Other</td>
<td>31 (7.4%)</td>
<td>12.9 (27)</td>
<td>1.9 (4)</td>
<td>0.46 (7.6)</td>
</tr>
<tr>
<td>Spouse or girlfriend/boyfriend lives with participant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>238 (56.7%)</td>
<td>61.6 (130)</td>
<td>51.7 (108)</td>
<td>0.20 (53.0)</td>
</tr>
<tr>
<td>No</td>
<td>182 (43.3%)</td>
<td>38.4 (81)</td>
<td>48.3 (101)</td>
<td>- (47.0)</td>
</tr>
<tr>
<td>Owner is primary responsibility at stall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>37 (8.8%)</td>
<td>6.6 (14)</td>
<td>11.1 (23)</td>
<td>0.16 (10.3)</td>
</tr>
<tr>
<td>No</td>
<td>383 (91.2%)</td>
<td>93.4 (199)</td>
<td>88.9 (184)</td>
<td>- (89.7)</td>
</tr>
<tr>
<td>Travel in past year to purchase goods to sell at market</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>153 (36.4%)</td>
<td>39.2 (83)</td>
<td>33.7 (70)</td>
<td>0.11 (42.0)</td>
</tr>
<tr>
<td>No</td>
<td>267 (63.6%)</td>
<td>60.8 (129)</td>
<td>66.3 (138)</td>
<td>- (58.0)</td>
</tr>
<tr>
<td>Travel out of Almaty to visit family/friends in past year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3+ times</td>
<td>200 (48.1%)</td>
<td>55.0 (116)</td>
<td>41.0 (84)</td>
<td>0.28 (54.4)</td>
</tr>
<tr>
<td>&lt;3 times</td>
<td>216 (51.9%)</td>
<td>45.0 (95)</td>
<td>59.0 (121)</td>
<td>- (45.6)</td>
</tr>
<tr>
<td>Length of time in job at market</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 1 yr</td>
<td>33 (7.8%)</td>
<td>6.6 (14)</td>
<td>9.1 (19)</td>
<td>0.09 (5.8)</td>
</tr>
<tr>
<td>1-3 yrs</td>
<td>183 (43.5%)</td>
<td>45.5 (97)</td>
<td>41.3 (86)</td>
<td>0.08 (42.2)</td>
</tr>
<tr>
<td>&gt;3 years</td>
<td>205 (48.7%)</td>
<td>47.9 (102)</td>
<td>49.5 (103)</td>
<td>0.03 (52.1)</td>
</tr>
</tbody>
</table>

*standardized difference of proportions.
TABLE II. Gender effect on outcome variables (crude and propensity score model).

<table>
<thead>
<tr>
<th></th>
<th>Female (N=213)</th>
<th>Male (N=209)</th>
<th>Prevalence/Rate ratio (95% CI)</th>
<th>Propensity score model</th>
<th>Prevalence/Rate ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than one sexual partner (%)</td>
<td>20.3</td>
<td>66.0</td>
<td>0.31 (0.23-0.41)</td>
<td>19.6</td>
<td>62.5</td>
</tr>
<tr>
<td>Consistent condom use with unsteady partner in past 90 days (%)</td>
<td>23.8</td>
<td>29.3</td>
<td>0.81 (0.44-1.49)</td>
<td>18.9</td>
<td>25.0</td>
</tr>
<tr>
<td>Biotest for Syphilis (%)</td>
<td>6.6</td>
<td>4.8</td>
<td>1.37 (0.62-3.02)</td>
<td>4.9</td>
<td>4.7</td>
</tr>
<tr>
<td>HIV and condom use knowledge (score mean)</td>
<td>2.5</td>
<td>3.3</td>
<td>0.75 (0.63-0.91)</td>
<td>2.7</td>
<td>3.5</td>
</tr>
<tr>
<td>Couple safer sex communication (score mean)</td>
<td>0.8</td>
<td>1.5</td>
<td>0.59 (0.42-0.84)</td>
<td>1.0</td>
<td>1.3</td>
</tr>
</tbody>
</table>
TABLE III. Association between having more than one sexual partner in the past 90 days with migration and job characteristics, stratified by gender.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th></th>
<th>Male</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;1 partner % (n)</td>
<td>1 partner % (n)</td>
<td><strong>Risk Ratio (RR) (95%CI)</strong></td>
<td>&gt;1 partner % (n)</td>
</tr>
<tr>
<td><strong>Owner is primary responsibility at stall</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28.6 (4)</td>
<td>71.4 (10)</td>
<td>1.45 (0.60-3.49)</td>
<td>65.2 (15)</td>
</tr>
<tr>
<td>No</td>
<td>19.7 (39)</td>
<td>80.3 (159)</td>
<td>1.0</td>
<td>66.3 (122)</td>
</tr>
<tr>
<td><strong>Travel in the past year to purchase goods to sell at the market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32.5 (27)</td>
<td>67.5 (56)</td>
<td>2.60 (1.50-4.53)</td>
<td>67.1 (47)</td>
</tr>
<tr>
<td>No</td>
<td>12.5 (16)</td>
<td>87.5 (112)</td>
<td>1.0</td>
<td>65.9 (91)</td>
</tr>
<tr>
<td><strong>Travel out of Almaty to visit family/friends in the past year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 +</td>
<td>30.2 (35)</td>
<td>69.8 (81)</td>
<td>3.55 (1.73-7.27)</td>
<td>67.9 (57)</td>
</tr>
<tr>
<td>&lt; 3</td>
<td>8.5 (8)</td>
<td>91.5 (86)</td>
<td>1.0</td>
<td>65.3 (79)</td>
</tr>
<tr>
<td><strong>Number of years working at market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 1 yr</td>
<td>7.1 (1)</td>
<td>92.9 (13)</td>
<td>1.0</td>
<td>57.9 (11)</td>
</tr>
<tr>
<td>1 – 3 yrs</td>
<td>19.6 (19)</td>
<td>80.4 (78)</td>
<td>2.74 (0.40-18.92)</td>
<td>72.1 (62)</td>
</tr>
<tr>
<td>&gt; 3 yrs</td>
<td>22.8 (23)</td>
<td>77.2 (78)</td>
<td>3.19 (0.47-21.80)</td>
<td>63.1 (65)</td>
</tr>
</tbody>
</table>
Figures

FIGURE 1. Map of Central Asia
FIGURE 2. Number of newly-registered HIV cases by year (Kazakhstan, 2000-2011).

FIGURE 3. Cumulative number of registered HIV cases by year (Kazakhstan, 2000-2011).
FIGURE 4. Percentage of persons acquiring HIV through heterosexual transmission and by sharing of contaminated drug equipment among newly-registered HIV cases (Kazakhstan, 2006-2011).