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A network-based HIV prevention intervention for Tajik migrant workers who inject drugs

Judith A. Levy¹, Mary Ellen Mackesy-Amiti¹, Makhbatsho Bakhromov², Jonbek Jonbekov², Carl A. Latkin³

¹University of Illinois at Chicago, School of Public Health, Chicago, Illinois, USA

²PRISMA Research Center, Dushanbe, Tajikistan

³John Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA

Abstract

We developed and pilot-tested the Migrants' Approached Self-Learning Intervention in HIV/AIDS for Tajiks (MASLIHAT). We recruited 30 Tajik labor migrants who inject drug in Moscow as peer educators (PEs) to attend the 5-session intervention, then share what they learned with their peers. Each PE recruited two drug-injecting network members for interviewing about their drug and sexual behavior at baseline, 6 weeks, 3 months, and 6 months post-intervention. GEE and mixed effects regression tested time and participant type effects on each outcome. HIV knowledge and risk perception increased among both PEs and network peers, while use of shared syringes, condomless sex, sex with a sex worker, and alcohol use decreased significantly for both groups at 6 weeks and 3 months with a sustained effect through 6 months. The MASLIHAT intervention proved successful in disseminating HIV prevention information and reducing HIV risk behavior over 6 months among both PEs and network members.

Resumen

Desarrollamos y realizamos una prueba piloto de la Intervención de autoaprendizaje con enfoque de migrantes en el VIH / SIDA para tayikos (MASLIHAT). Reclutamos a 30 trabajadores

Correspondence to: Mary E. Mackesy-Amiti, University of Illinois at Chicago, School of Public Health MC 932, 1603 W. Taylor St., Chicago, Illinois 60612. Tel. +1 312-355-4892. mmamiti@uic.edu.

Author contributions

JL, CL and MB contributed to the study conception and design. Material preparation and data collection were performed by MB and JJ. MM conducted the data analysis. The first draft of the manuscript was written by JL and MM and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Conflicts of interest / competing interests

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethics approval

The study protocol was approved the Institutional Review Boards of the University of Illinois at Chicago, the PRISMA Research Center, and the Russian Autonomous NGO Scientific and Educational Center "Most v budushee".

Consent to participate

Informed consent was obtained from all individual participants included in the study.

migrantes tayikos que se inyectan drogas en Moscú como educadores de pares (EP) para asistir a la intervención de 5 sesiones y luego compartir lo que aprendieron con sus pares. Cada EP reclutó a dos miembros de la red de usuarios de drogas inyectables para entrevistarlos sobre su comportamiento sexual y con las drogas al inicio, 6 semanas, 3 meses y 6 meses después de la intervención. El GEE y la regresión de efectos mixtos probaron el tiempo y los efectos del tipo de participante en cada resultado. El conocimiento del VIH y la percepción del riesgo aumentaron tanto entre los EP como entre los compañeros de la red, mientras que el uso de jeringas compartidas, el sexo sin condón, el sexo con una trabajadora sexual y el consumo de alcohol disminuyeron significativamente para ambos grupos a las 6 semanas y 3 meses con un efecto sostenido durante 6 meses. La intervención MASLIHAT tuvo éxito en la difusión de información sobre la prevención del VIH y en la reducción de las conductas de riesgo del VIH durante 6 meses entre los EP y los miembros de la red.

Keywords

HIV prevention; injection drug use; peer networks; migrant workers; Tajik migrants

Introduction

Labor migration is a major contributor to fueling the global AIDS epidemic and also the movement of HIV across country borders and populations.^{1–3} Migrants who inject drugs while in a host country are at especially high risk due to behaviors that are exacerbated by social marginalization and lack of access to health care and preventive services.⁴ Tajikistan, a small country in Central Asia with a high unemployment rate and growing drug epidemic, exports more than a million Tajiks annually, many of whom inject drugs, to work outside of their own country.^{5,6} Russia, with one of the world's highest drug-related HIV rates, is a major destination.

Our research among Tajik male migrants who inject drugs in Moscow showed alarmingly high normative and behavioral risk for HIV due to risky drug use, needle sharing, alcohol consumption at behavioral disinhibiting levels, and unsafe sex with casual and paid sex partners.⁷ Yet, little exists in the way of HIV prevention programming for migrants who inject drugs in Russia⁴ or even prevention models for migrants worldwide.⁸ A grave need exists for a targeted culturally and contextually congruent HIV preventive intervention for drug users.⁹

This research developed and pilot tested the Migrants' Approached Self-Learning Intervention in HIV/AIDS for Tajiks (MASLIHAT) intervention model for reducing risky drug, alcohol, and sexual behavior among male Tajik migrants who inject drugs while living in Moscow. MASLIHAT was developed as a socio-cultural adaption of the Self-Help in Eliminating Life-Threatening Diseases (SHIELD) model, which is designated by the CDC as a best practice, evidenced-based HIV behavioral intervention for use in the U.S.¹⁰ Like SHIELD, MASLIHAT is guided by social network theory,¹¹ according to which, as one or two influential members of a social network change, others do so as well. A key to promoting safer behavior lies in embedding members within networks as a

catalyst to change. We also draw on Yang's Theory of Migration,¹² which posits that successfully changing risk behavior requires modifying the psycho-social conditions and life circumstance that help to generate it.

By transforming their own HIV norms and behavior, and encouraging others at risk to do so too, migrant peer educators can initiate positive changes at the individual and social network levels in both their host and also their home country when they return.

Methods

Intervention Development.

MASLIHAT is a small-group, interactive intervention that relies on peer networks to reduce drug, alcohol, and sexual risk behaviors among temporary migrant workers who inject drugs. Migrants in the host country who inject drugs or previously injected drugs are trained as peer educators (PEs) to promote positive HIV risk-reduction norms and behavioral change through role modeling and sharing what they learned during MASLIHAT training sessions with their at-risk network members, especially other Tajiks who inject drugs. The intervention includes 5 HIV knowledge and skill-building sessions that involve goal setting, role playing, demonstrations, homework, and group discussions. These sessions teach participants techniques for personal risk reduction and the communication and outreach skills needed to encourage others at HIV risk to adopt them as well. As migrants often confront special challenges based on social marginalization and economic disadvantage as a population within the host country,^{13–20} MASLIHAT sessions also address lifestyle, health, and safety issues.

The 5 sessions are: 1) Introduction to MASLIHAT; general risks and safety for Tajik migrant workers; living a healthy lifestyle, resources & organizations serving Tajik migrants; 2) HIV 101; peer communication skills; 3) HIV/STI risk/prevention thorough hazardous alcohol consumption/unsafe sex; 4) HIV risk/prevention related to drug use; 5) Maintaining a healthier lifestyle; graduation. Homework and case studies in each session help to script peer educator messages.

The steps of intervention development included: 1) solicit input from community leaders, 2) pre-test the intervention with a small group of participants and conduct focus groups to collect feedback, 3) conduct supervised practice for facilitators, and 4) develop and pre-test the assessment instrument in preparation for pilot testing. A community advisory board (CAB) reviewed a working draft of the MASLIHAT manual and provided important insights that were useful in identifying and recruiting effective peer educators and modifying session content. Eight men who injected drugs or previously injected drugs were recruited through the Tajik Union in Moscow were invited to participate in a pre-test of all 5 MASLIHAT sessions (2 hours each) followed by a one-hour focus group critique. Focus group discussions addressed key topics such as attendees' comfort with the content of the intervention, cultural appropriateness for use with Tajik migrants, perceived feasibility of its homework assignments, usefulness of the session content for reducing HIV risk, and suggested modifications. Finally, five Tajik migrants were invited to assist in developing and pre-testing the questionnaire. In addition to new questions relevant to adapting the

MASLIHAT model for a new population, key items were drawn from those successfully used in a prior Moscow/Tajik study and in testing the original SHIELD model in the U.S.

Pilot test and evaluation procedures.

Procedures for the pilot test included: 1) recruit PEs and network members, 2) conduct baseline interviews, 3) conduct MASLIHAT sessions with 4 cohorts of PEs, and 4) conduct follow-up interviews at 6 weeks, 3 months, and 6 months following the final intervention session.

Recruitment.—The Tajik Union and other diaspora organizational staff referred male Tajik migrants who appeared to meet the study’s eligibility criteria for peer educators to PRISMA for screening. Consistent with the SHIELD Model²¹ and social cognitive theory of peer influence,^{22,23} we asked them to recommend individuals who were respected and influential within local drug-using communities and whose advice would be taken seriously by their peers. To be eligible as a peer educator, prospective participants needed to be: a male Tajik migrant age 18 or older, a current or former PWID, willing to give informed consent, intending to reside in Moscow for the next six months to participate in the intervention and follow-up data collection, and be willing to recruit two Tajik migrant men who inject drugs to participate as network members for interviewing. Network members had to meet the same criteria as peer educators but also: 1) have injected drugs at least once in the last 30 days, and 2) be someone whom the PE sees at least once a week. To screen for the latter, upon presenting for possible enrollment, network members were queried as to how they knew the peer leader who nominated them and the frequency with which they interacted. Such weekly or greater contact among Tajik migrants is a common element of living and working in diaspora within the social and physical boundaries of a tight-knit ethnic community. Also, drug injection among Tajik migrants regularly occurs within small, close groups of exclusively Tajik network members typically eligible for study enrollment²⁴ and for whom the intervention was especially targeted. Peer educators could refer network members after their own enrollment but before beginning the MASLIHAT sessions so that all three were interviewed at baseline before PE training and outreach activities began. Both peer leaders and network members were screened prior to enrollment for injection drug use by inspecting their arms and/or other body parts for injection marks. If no marks were present, they were questioned about the injection process using a screening form designed to elicit and confirm detailed knowledge about how drugs are injected. Both PEs and network participants received the customary compensation in Moscow of \$20.00 for their time and transportation costs for being interviewed at baseline, post-intervention, and follow-up.

MASLIHAT.—We conducted 4 cycles of the MASLIHAT 5-session trainings sequentially with 7 to 10 PEs per cycle (30 total). The PEs, in turn, were asked to share what they learned with others in their social networks including the two network members who were enrolled in the study. Because migrant workers are often stopped by police for document check at certain subway stops, group facilitators accompanied PEs to and from those stations to the PRISMA office for the group sessions.

Interviews.—Both PEs and network members were interviewed at baseline and at 6 weeks, 3 months, and 6 months post-intervention. Baseline interviews were conducted at the PRISMA office in Moscow. Due to fear of being detained by police, follow-up interviews often were conducted at a location of the participant’s choice close to their home and far from the PRISMA office. When a participant was too “high” to participate, the interview was rescheduled for another day. The 6-month follow-up interviews that were scheduled to be held at the beginning of July 2018 were delayed until mid-July to avoid overlap with the World Soccer Championship that was held in Moscow. This was a high security period that placed migrants at high risk for detention and possible deportation.

Measures.

The baseline questionnaire collected information on sociodemographic characteristics, migration characteristics and community involvement, substance use prior to migration and in the past 6 months in Moscow, sexual risk behavior, the Moscow network of Tajik migrant males who inject drugs, injection risk behavior, and HIV-related knowledge and attitudes. The measures used in this study are described below.

HIV knowledge—HIV knowledge was assessed with a measure comprised of 13 items (Cronbach alpha = 0.91). Eight items assessed knowledge of HIV transmission and non-transmission routes with response options being “safe,” “unsafe,” or “not sure.” Five additional true-false items assessed HIV-related knowledge such as, “You can look at a person and tell if they are infected with HIV,” and “There is a cure for HIV.” The measure was scored by summing the number of correct responses with responses of “not sure” counted as incorrect. Participants also were asked to rate their likelihood of being infected with HIV as “not at all likely,” “somewhat likely,” or “very likely.”

Alcohol use—Alcohol use measures included frequency of alcohol use in the past month and heavy drinking. Participants were asked, “About how many times in the past month have you used alcohol including beer, wine, or vodka?” Heavy drinking was assessed with the question, “How often do you have 6 or more drinks on one occasion?” with responses on a 5-point scale from “never” to “daily or nearly daily.” No participants endorsed greater than monthly heavy drinking, therefore responses were dichotomized as less than monthly vs. at least monthly.

Sexual risk behavior—Sexual risk behavior outcomes included having sex with a sex worker in the past month and having sex without a condom. Condom use with a regular sexual partner in Moscow and with sex workers was assessed separately on a 4-point scale: “never,” “sometimes,” “often,” or “always.” These items were combined to create a binary measure of any condomless sex.

Injection risk behavior—Injection risk behavior measures included using a shared syringe in the past month and cleaning syringes with bleach or water. Syringe sharing was assessed with the question, “When was the last time that you used a needle to shoot drugs after someone else used it first?” with options: never, more than 4 weeks ago, in the last 4 weeks, within the last week, yesterday, or today. Responses were dichotomized to

create a binary measure of having used a shared syringe within the past month. Participants were asked about syringe cleaning practices with the question, “When you have used a needle after someone else, how often did you clean the syringe with [bleach, alcohol, water only, soap and water, or nothing]?” with options ranging on a 6-point scale from “never” to “always.” Participants reported never using alcohol; soap was never used at baseline and rarely at follow-up. We combined responses to create a measure of frequency of cleaning with bleach or water with three levels: never or rarely, sometimes, or always.

Process measures and MASLIHAT participant feedback.—Process measures used after each MASLIHAT session assessed if the session and its content were presented engagingly and as intended. Participants completed a brief written report and checklist of answers to questions asking them to rate the facilitators’ delivery of the intervention sessions. They indicated their perceptions of the acceptability and relevance of session topics/activities, likelihood of being able to deliver the information as suggested, and perceptions of whether Tajik network peers whom they know would benefit from and use the session information. Discussions of homework during the session included participants reporting if they had used or shared what they learned the previous week with their peers. Also, each facilitator wrote an overall description of the group session, any problems or challenges encountered in delivering the intervention, and accomplishments of the group (if any).

Analysis

We estimated a mixed effects regression model with random subject and recruiter intercepts to test changes in HIV knowledge from baseline to 6-week follow-up. For dichotomous risk behavior outcomes assessed over the 6-month follow-up period, we estimated population-averaged Poisson regression models with a robust (sandwich) error variance using GEE to obtain risk ratios.^{25–27} We also estimated mixed effects logistic regression models with random subject and recruiter intercepts for comparison of effect sizes and to compute predicted probabilities. For the count outcome of alcohol use in the past month, we estimated a Poisson mixed effects regression.

In the mixed models if recruitment group clustering was not significant, the recruiter effect was dropped, and a 2-level model was estimated. We included a participant type by time interaction term to assess if the intervention had differential impact on PEs compared to network members. If the p-value for the interaction effect was > 0.05 , the interaction effect was dropped from the model. We also tested the contribution of HIV knowledge to changes in condom use and syringe sharing by including a time by knowledge score interaction in the regressions. Knowledge scores were mean-centered at each time point.

Results

Participation and retention.

Thirty Tajik male migrants who injected drugs were recruited to participate in the MASLIHAT intervention, and each PE recruited two male drug-using network members. All PEs and network members completed the baseline interview (N=90). Nearly all PEs

completed the entire sequence of five MASLIHAT sessions; three participants missed one session, and two participants were removed from a session due to intoxication. Table 1 shows demographic characteristics and risk behaviors of PEs and network members at baseline. No PEs were lost to follow-up. Of the 60 network members, three left Moscow before completing study participation. Each reported behavioral change at last measurement: One reported decreased sex and injection use at 6 weeks, but no change in alcohol use. The second decreased injection risk and alcohol use at 6 weeks but had no sex risk at baseline. The third reported no sex or injection risk at baseline but decreased alcohol use at 3 months.

HIV knowledge and beliefs.

The average HIV transmission knowledge score was 7.59 (SE 0.36) at baseline (58% correct) and increased significantly to 12.43 (SE 0.09) at 6-week follow-up ($B=4.84$, 95% CI 4.15–5.54). In mixed effects regression models, knowledge scores of network members were not significantly different from those of PEs. Both PEs and network members showed increases in perceptions of their own risk for HIV at six weeks that persisted through the six-month follow-up (see Table 2).

Behavioral Outcomes.

Model results for behavioral outcomes including high-risk alcohol use, sexual risk behavior, and injection risk behavior are presented in Table 3, and predicted values are shown in Table 4. Recruitment group clustering was non-significant, therefore the recruiter random intercept was dropped and a 2-level model was estimated. For all outcomes, the interaction term for the participant type by time effect was non-significant and was therefore dropped from the model. The main effect of participant type was also non-significant in all models, indicating no difference in baseline behaviors.

Alcohol.—Outcomes for alcohol use included number of times used alcohol in the past month and also heavy drinking (6 or more drinks on one occasion). Both measures of alcohol use showed significant reductions in both 6-week and 3-month follow-up interviews. At the 6-month follow-up, heavy drinking remained low and the number of times used alcohol in the past month continued to decline.

Sexual risk.—Outcomes for sexual behavior included having sex with a sex worker in the past month and having sex without a condom. Both PEs and network members were less likely to report sex with a sex worker on follow-up, with a significant decline at each follow-up time point. Sex without a condom also decreased for both groups at 6 weeks and at 3 months, and the effect was sustained through 6 months. Since only one person reported unprotected sex at the 6-month follow-up, additional analyses were restricted to the 6-week and 3-month follow-ups. Paradoxically, greater HIV knowledge was associated with a greater likelihood of condomless sex (baseline OR = 1.92, 95% CI 1.20–3.08). The interaction of knowledge score with time was not significant.

Injection risk.—Outcomes for injection risk included using a shared syringe in the past month and also cleaning syringes with bleach or water. Use of shared syringes decreased significantly for both groups at 6 weeks and at 3 months, and the effect was sustained

through 6 months. At the 3-month follow-up, only 2% (2/88) of participants reported using a shared syringe within the past 4 weeks. At the 6-month follow-up, none of the participants reported using a shared syringe in the past 4 weeks. Syringe cleaning increased substantially on follow-up in both groups with 83% always cleaning their syringes with water at 6 weeks and increasing only slightly to 87% at 3 months (Table 5). Cleaning with bleach was less prevalent with 49% reporting cleaning with bleach often or sometimes at the 3-month and 6-month follow-ups. HIV knowledge had a significant negative effect on syringe sharing (baseline OR = 0.82, 95% CI 0.71–0.95), and the interaction with time was not significant.

Qualitative feedback on feasibility and acceptability.

Peer educator evaluation of facilitator performance and intervention content.

—Facilitators received high appraisal by PEs because of their non-judgmental, open, friendly, and supportive attitude. PEs reported a high level of satisfaction with the sessions delivered by facilitators and felt that the content was culturally relevant for Tajik migrants who inject drugs. They reported that they found the information delivered in the session to be very useful and that they actively shared the information with their network members. For example, we received the following comments:

“Even my brothers do not talk to me like these guys here, gentle and with understanding, as if they were my own real brothers.”

“Usually, people avoid you when they know that you are drug user. Here to the contrary, they attract you, invite you, and try to help you to be safe. This is what we need.”

“It is not a lesson as we used to have at school, boring and uninteresting. It is like a talk in a circle of friends, it is interesting and useful.”

“It is more like a game, kind of educational game which is interesting and helpful.”

“Some Tajik people say that condom is not culturally proper for us, but I think they would change their mind after they know what HIV is and the number of HIV infected in Tajikistan. I changed my mind now, and I think condom is relevant to all cultures.”

“Everything that helps people to stay healthy and to stay alive is culturally proper for everybody. These sessions are saving our lives; therefore, they should be part of our culture.”

“We didn’t know for many years that we could use even water to clean our syringe and needle and to protect ourselves from HIV.”

“Some of us knew before that sharing needle is risky, but these sessions really gave us a “push” in order to act and to find new syringes and needles and stop sharing them.”

“I think many of Tajik guys could be saved if we had these sessions some years before. They are really helpful and an only way to save our youngsters.”

Two criticisms of the MASLIHAT curricula were offered. Discussion of female condoms was seen as culturally inappropriate as Tajik norms place men in charge of contraception. Using a demonstration model to show putting on a condom properly was judged as culturally offensive. Verbal explanation was considered sufficient.

Facilitator evaluations.—Session facilitators reported that they started using the information from sessions in their own life. For example:

“As it was said in the sessions, if a leader is not following the recommendations for reducing risk himself, then he won’t be able to convince others that it is useful. Therefore, I strictly use every lesson I learned here.”

“Our lives depend on each other. If I won’t protect myself and if I won’t teach my friends how to be safe, then one day we would regret this. That’s why I stopped sharing needles and my buddies also followed me.”

“It was a little unusual during the first week to clean my needle before injecting, but then everything seemed normal. Now all of us clean our needle though we try not to share needles anymore.”

“My girlfriend was happy when I offered myself to use a condom. She first didn’t believe it.”

Discussion

The MASLIHAT intervention was well accepted by male Tajik migrant workers in Moscow who inject drugs and the pilot study showed promising effects on reducing HIV risk behavior among both peer educators and network members. HIV knowledge, condom use, and syringe cleaning increased among both participants and their network peers accompanied by a decrease in high-risk alcohol use and syringe sharing. Bleach, however, was used by only about half of those respondents who had shared a syringe in the previous 3 months, and those who did use it inconsistently. Behavior change occurred equally among peer educator participants and their network members indicating rapid diffusion.

MASLIHAT meets the vital need globally for a successful HIV intervention for male temporary labor migrants who use drugs in their host country. The intervention fits well with the prevention needs of Tajik men who inject drugs living in diaspora. It is delivered by migrants to migrants and not dependent on support from a host national health care system that denies them access to services. Using current and former PWID to recruit and teach other PWID can reach migrant drug-using populations that are hidden or hard-to-reach. Taking a peer network approach addresses risk reduction at both the individual and network levels and requires little resource investment to implement. By transforming cultural norms and practices, positive changes tend to be self-sustaining through habituation, shared agreement, and possibly as an outcome of socializing new and existing members. Such changes also tend to be reinforced and can increase over time as members become comfortable in adopting them. To date, only a few interventions for labor migrants have been developed or tested despite their considerable vulnerability to HIV. Yet, the need for such interventions is pressing.²⁸ This research helps to fill that gap.

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Availability of data

The datasets generated and analyzed during the current study are available in the Open Science Framework repository through permission from the authors.

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Table 1:

Demographic characteristics and baseline risk behavior of peer educators and network members enrolled in the MASLIHAT pilot study

	Peer educator (n=30)			Network member (n=60)		
	<i>Range</i>	<i>Mean</i>	<i>SD</i>	<i>Range</i>	<i>Mean</i>	<i>SD</i>
Age	24 – 45	32.5	6.4	19 – 43	31.3	6.0
Age first injected	20 – 38	26.8	5.1	17 – 40	26.5	5.2
		<i>n</i>	<i>%</i>		<i>n</i>	<i>%</i>
Education						
Secondary or less		18	60.0	39	65.0	
College or technical college		8	26.7	12	20.0	
University but no degree		1	3.3	1	1.7	
University degree		3	10.0	8	13.3	
Marital Status						
Not married		12	40.0	24	40.0	
Married		5	16.7	17	28.3	
Divorced		13	43.3	19	31.7	
How long in Russia						
One year or less		10	33.3	24	40.0	
> 1 to 2 years		8	26.7	13	21.7	
3 or more years		12	40.0	23	38.3	
Employment						
Construction		13	43.3	22	36.7	
Loading in bazaar		8	26.7	14	23.3	
Selling/food service		5	16.7	6	10.0	
Other		4	13.3	18	30.0	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Frequency of alcohol use past month		2.3	0.60	2.2	0.58	
		<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	
Any heavy drinking		12	40.0	21	35.0	
Any sex work partner		18	60.0	33	55.0	
Sex without condom		12	40.0	18	30.0	
Injected with used syringe in past 4 weeks		14	46.7	33	55.0	

Table 2.

Beliefs about personal HIV risk among peer educators and network members enrolled in pilot testing the MASLIHAT model (n=90)

	Baseline		6 weeks		3 months		6 months	
	n	%	n	%	n	%	n	%
How likely to get HIV								
Not at all	37	41.1	5	5.6	2	2.3	2	2.3
Somewhat	46	51.1	62	68.9	63	71.6	62	71.3
Very	7	7.8	23	25.6	23	26.1	23	26.4
How likely at least one person you inject drugs with has HIV								
Not at all	45	50.0	1	1.1	0	0.0	0	0.0
Somewhat	39	43.3	61	67.8	62	70.5	61	70.1
Very	6	6.7	28	31.1	26	29.5	26	29.9
How likely you have shared syringes with someone who has HIV								
Not at all	46	51.1	26	28.9	20	22.7	20	23.0
Somewhat	37	41.1	42	46.7	47	53.4	46	52.9
Very	7	7.8	22	24.4	21	23.9	21	24.1
How much you worry about HIV								
Not at all	54	60.0	1	1.1	0	0.0	0	0.0
Somewhat	36	40.0	32	35.6	31	35.2	31	35.6
A lot	0	0.0	57	63.3	57	64.8	56	64.4

Table 3.

Time and participant type effects in follow-up to MASLIHAT intervention: Mixed effects and population-averaged (GEE) regression models (n=90)

	Contrasts ^c			
	IRR	95% Conf. Int.	chi2	p-value
Past month alcohol use (# times) ^a				
6 weeks	0.70	(0.632 – 0.784)	41.15	< 0.001
3 months	0.58	(0.493 – 0.687)	11.39	0.0007
6 months	0.39	(0.297 – 0.508)	19.4	< 0.001
Network member vs. PE	1.01	(0.826 – 1.225)		
Any Heavy drinking ^b	RR	95% Conf. Int.		
6 weeks	0.64	(0.422 – 0.959)	4.67	0.0308
3 months	0.42	(0.247 – 0.729)	7.27	0.007
6 months	0.44	(0.257 – 0.742)	1.02	0.313
Network member vs. PE	1.04	(0.635 – 1.692)		
Any sex work partner ^b				
6 weeks	0.69	(0.541 – 0.871)	9.62	0.0019
3 months	0.40	(0.275 – 0.572)	13.48	0.0002
6 months	0.20	(0.111 – 0.355)	9.04	0.0026
Network member vs. PE	1.09	(0.737 – 1.611)		
Sex without condom ^b				
6 weeks	0.40	(0.251 – 0.637)	14.94	0.0001
3 months	0.10	(0.035 – 0.299)	7.39	0.0066
6 months	0.03	(0.005 – 0.231)	1.84	0.1751
Network member vs. PE	0.85	(0.447 – 1.612)		
Injected with used syringe ^{b,d}				
6 weeks	0.47	(0.313 – 0.700)	13.7	0.0002
3 months	0.04	(0.011 – 0.181)	12.26	0.0005
Network member vs. PE	1.21	(0.789 – 1.849)		

^a mixed effects Poisson regression

^b GEE Poisson regression with robust variance estimator

^c reverse adjacent contrasts for time effects

^d 6-month data omitted: 0% injected with used syringe at 6 months

PE: peer educator

Table 4.

Predicted values of outcomes from mixed effects regression models (n=90)

	Peer Educator			Network member				
	BL	6 wks	3 mos	6 mos	BL	6 wks	3 mos	6 mos
Alcohol use								
Past month alcohol use (# times) ^a	4.99	3.51	2.90	1.94	5.02	3.53	2.92	1.95
Heavy drinking (6 or more drinks) ^b	0.35	0.22	0.14	0.15	0.38	0.24	0.16	0.16
Sexual risk								
Had sex with sex worker ^c	0.51	0.34	0.18	0.08	0.60	0.43	0.25	0.12
Had sex without condom ^c	0.41	0.18	0.05	0.01	0.30	0.11	0.02	0.01
Injection risk								
Injected with used syringe past 4 weeks ^c	0.47	0.21	0.02	-	0.55	0.26	0.03	-

^a2-level Poisson model with random subject intercepts

^b3-level logistic model with random subject and recruiter intercepts

^c2-level logistic model with random subject intercepts

Table 5.

Prevalence of syringe cleaning among participants injecting with a used syringe

	Baseline		6 weeks		3 months		6 months	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Cleaned syringe (by any means)								
Never/rarely	26	35.1	0	0.0	0	0.0	0	0.0
Sometimes	48	64.9	12	16.7	9	12.9	9	13.0
Always	0	0.0	60	83.3	61	87.1	60	87.0

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