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Knowledge, Normative Beliefs and Attitudes Related to Recent HIV Infection among People who Inject Drugs in Athens, Greece

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Abstract

Background—Despite great improvements in prevention over the last years, much has to be done to reduce new human immunodeficiency virus (HIV) infections. Substantial evidence shows that the six-month period of recent HIV infection contributes disproportionately to HIV transmission.

Objective—This study aims to investigate knowledge, normative beliefs, and attitudes of people who inject drugs (PWID) regarding recent HIV infection.

Method—People who inject drugs in Athens, Greece were recruited in the fifth round of a respondent-driven sampling program (ARISTOTLE). The participants were tested for HIV and answered a structured questionnaire, which also included items on knowledge, normative beliefs, and attitudes regarding recent infection to address needs of the social network-based Transmission Reduction Intervention Project. The multivariable analyses included logistic regression models, which produced odds ratios (OR) and 95% confidence intervals (CI).

Results—In total, 1,407 people (mean age: 36.3 ± 7.9 years old; males: 81.9%) took part in the fifth round of ARISTOTLE. Of these, 61.5% knew that HIV-infected people who are not on treatment are more likely to transmit HIV during the first six months of their infection and 58.4% reported that people in their network would react positively towards a recently HIV-infected person. People who inject drugs who were knowledgeable of recent HIV infection were more likely to disagree with statements such as that one should avoid all contact with a person recently infected by HIV (adjusted OR: 1.510, 95% CI: 1.090, 2.091) or more likely to agree with statements such as that an HIV+ person is much less likely to transmit HIV when h/she is on combination antiretroviral treatment (adjusted OR: 2.083, 95% CI: 1.231, 3.523).

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CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Conclusion—A considerable proportion of PWID in Athens, Greece, were aware of the high HIV transmission risk of recent HIV infection, although improvement is needed for some population segments. People who inject drugs who were knowledgeable of the role of recent HIV infection were more likely to have normative beliefs and attitudes that favor behaviors that could help rather than harm or stigmatize people who have recently been infected with HIV. Interventions that are based on the role of recent HIV infection in HIV transmission could be important to HIV prevention.

Keywords

recent infection; PWID; HIV transmission; knowledge; beliefs; attitudes

1. INTRODUCTION

Despite great achievements in HIV prevention, 1.8 million new HIV infections and 1 million AIDS-related deaths occurred in 2016 [1]. Nearly 36.7 million people were living with HIV and only half of them were on antiretroviral therapy (ART) in June 2016 [1,2].

An effective and safe vaccine that could potentially end the HIV epidemic is not available yet [3,4]. Condoms, which are an essential prevention tool, have been shown to substantially reduce HIV transmission but by less than 100% when used consistently by HIV serodiscordant heterosexual couples [5]. New prevention strategies including male circumcision and ART for prevention or as pre-exposure prophylaxis (PrEP) in HIV-negative individuals are very promising [6–10]. It is obvious, however, that no single type of intervention can contain the HIV epidemic. There are calls both for new prevention methods and for the implementation of multicomponent programs [11,12].

Studies have shown that the probability that acutely and recently HIV-infected people (i.e. those who acquired HIV in the past six months) will infect others is higher than that of longer-term infected persons [13–16]. Elevated viral load levels during the period of acute/early infection [17,18], lack of effective immune responses, and heightened rates of risky behaviors [19,20] seem to explain the greater HIV transmission rates during this stage [21]. Phylogenetic studies have shown that the recent phase of HIV infection may account for up to half of onward transmissions [14,22].

Historically, men who have had sex with men (MSM) have accounted for the majority of new HIV infections in Greece [23]. However, while Greece was facing a serious economic downturn [24,25], an outbreak of HIV among people who inject drugs (PWID) occurred in 2011 and resulted in more than 1,000 new HIV infections in the following three years [26–31]. The responses to the outbreak included increased HIV testing, scale-up of needle and syringe programs (NSP), improved access to opioid substitution therapy (OST), and novel interventions: specifically, a multi-wave, respondent-driven sampling (RDS) program (ARISTOTLE) [31]; and social network-based contact tracing efforts (Transmission Reduction Intervention Project-TRIP) [32,33].

If more people had correct information on recent HIV infection and its disproportionate contribution to HIV transmission and maintained a positive attitude toward those who have

recently contracted HIV, they would perhaps be more likely to seek testing, to encourage others to get tested at the time they recognize symptoms as indicative of recent infection, to enter care earlier, and/or to help other people with recent infection receive care quickly. Early HIV detection and treatment and potential behavioral change after an HIV diagnosis could prevent a substantial proportion of HIV transmissions—something that becomes more important in times of outbreaks and high HIV incidence. Despite the critical role of recent infection in onward HIV transmission, there still is a gap in the literature regarding research, both quantitative and qualitative, on people's knowledge, beliefs, and attitudes toward recent HIV infection, with only a couple of previous studies focusing on acute/early infection [34–37]. The aim of this work was to measure knowledge on recent HIV infection and normative beliefs and attitudes towards persons with recent HIV infection among a sample of PWID, during a period of high HIV incidence among PWID.

2. MATERIALS AND METHOD

2.1. Description of TRIP and ARISTOTLE

TRIP and ARISTOLE have been described in detail elsewhere [31–33,38,39]. In short, TRIP was a network-based contact tracing intervention that was conducted in Athens, Greece between June 2013 and July 2015. TRIP was focused on recently HIV-infected individuals [33], based on the assumption that recruiting and testing network members of a recently infected person is likely to identify more people who are recently infected or highly infectious and who are thus more likely to infect others [32]. The participants, who were mostly PWID, completed the TRIP questionnaire and were tested for HIV and recent infection if they were HIV positive. They were also provided with standard counseling and were actively linked to care if they had been diagnosed with HIV infection [32].

ARISTOTLE was an RDS intervention in an effort to recruit PWID in Athens during the outbreak and halt HIV transmission among them [31,38,39]. The program consisted of five sampling rounds between mid-2012 and the end of 2013 that recruited approximately 1,400 PWID per round. Each round lasted 10–12 weeks with between-rounds intervals of 1–4 weeks. People were eligible to participate in ARISTOTLE if they had injected drugs without a prescription in the past 12 months, were 18 years of age, and lived in Athens. They were not allowed to participate twice in the same round. Recruitment began with a limited number of persons (seeds) who received incentives for their participation and for recruiting others. All participants completed a questionnaire [40] and were tested for HIV. HIV tests, both in TRIP and in ARISTOTLE, were performed with a microparticle enzyme anti-HIV-1/2 immunoassay; and HIV infections were confirmed by Western blot. After the interview, ARISTOTLE participants received three coupons to recruit others, a monetary incentive, low dead-space syringes, condoms, and leaflets with information on HIV. PWID diagnosed with HIV were referred to infectious disease units for medical care and ART, and to drug treatments centers for OST.

2.2. Present analysis

The present analysis includes data from the fifth round (19 September 2013–16 December 2013) of ARISTOTLE, as this was the first round in which ARISTOTLE's questionnaire

included items from the TRIP questionnaire regarding participants' knowledge of recent infection; their normative beliefs about reactions of people in their networks to persons with recent infection; and their own attitudes towards recently infected individuals. The questionnaire items (Q) and the response options (R) are given below:

Q1: If someone gets infected with HIV and then has unsafe sex or shares syringes with someone, h/she is more likely to transmit the virus to his/her partner:

R1: (a) during the first six months after h/she gets infected; (b) more than a year after h/she gets infected; (c) h/she is equally likely to infect his/her partner at any time during the first five years after h/she gets infected; (d) don't know/don't answer.

Q2: How would most people in your social circle react if a friend had recently gotten infected with HIV?

R2: (a) they would become closer with him/her; (b) their friendship would not change; (c) they would stop seeing the friend as frequently; (d) don't know/don't answer.

Q3: If you learn someone else in the neighborhood or among your friends/acquaintances is in the highly infectious early month or months of HIV infection, how can you best protect yourself and others? A) avoid all contact with that person; B) avoid sex and drugs with that person; C) make sure the neighbors/friends/acquaintances stay calm; D) physically remove that person from the neighborhood or from friends/acquaintances; E) help that person get medical care; F) help the person avoid engaging in risk behaviors like unsafe sex or unsafe drug injection; G) help the person deal with his/her anxiety and fear; H) tell neighbors/friends/acquaintances that the person will be highly infectious for less than half a year, and they should help the person get through it safely; and I) tell the person that an HIV+ person who takes combination drug treatment is less likely to transmit HIV to his/her partners.

R3: Participants were asked to indicate for each of the above statements whether they: (a) strongly disagree; (b) somewhat disagree; (c) neither disagree nor agree; (d) somewhat agree; e) strongly agree.

2.3. Statistical methods:

Descriptive statistics included mean/median values and standard deviation/interquartile range for continuous variables and frequencies/percentages for categorical variables. Univariable analyses were done using chi-squared tests and t-tests, while multivariable methods included logistic regression models. Q1 and Q2 were treated as binary variables. The responses to Q1 were categorized into correct and incorrect/don't know/don't answer (R1a vs. R1b,c,&d). The responses to Q2 were grouped into positive/neutral reaction and negative reaction/don't know/don't answer (R2a&b vs. R2c&d). The response options for Q3 were collapsed into three categories: disagree, neither disagree nor agree, agree (R3a&b, R3c, & R3d&f) but were grouped into two outcomes for logistic regression analyses. A p-value less than 0.05 indicates statistical significance. All statistical analyses were conducted in Stata v. 14 (Stata Corp., USA).

3. RESULTS:

3.1. Characteristics of PWID who participated in the fifth round of ARISTOTE

As shown in Table 1, 1,407 PWID (mean age: 36.3 ± 7.9 years old; males: 81.9%) participated in the fifth round of ARISTOTE. Most of the participants were of Greek ethnicity (1,233, 87.6%), while the rest (12.4%) originated mainly from Afghanistan, Iran, the Middle East, Europe, and Africa. Approximately one third of the participants (489, 34.8%) reported that they were currently homeless or had been homeless in the past 12 months. In terms of education, more than half of the participants (801, 57.2%) had primary or middle/secondary school education. The HIV prevalence (unadjusted for the RDS design) was 14.6% (Table 2), and was significantly ($p < 0.001$) higher among the homeless (23.6%) than among those with stable accommodation (10.8%).

3.2. Responses to questions

3.2.1. Questionnaire item 1-Knowledge: Nearly two thirds of the participants (865, 61.5%) correctly stated that the likelihood of HIV transmission is higher during the first six months of HIV infection (Table 3). The responses did not differ by gender or by education level. Knowledge was significantly better ($p < 0.05$) among PWID with stable accommodation (63.5%) than among homeless PWID (57.8%), among PWID of Greek origin (65.1%) than among non-Greeks (46%), and among participants with HIV infection (72.3%) than among those without HIV (59.6%) (Table 3).

3.2.2. Questionnaire item 2-Normative beliefs: In total, 821 PWID (58.4%) believed that most people in their networks would become closer with a friend with recent HIV infection or that their friendship with that person would not change. Similar beliefs were recorded among men and women ($p = 0.151$), and among Greeks and non-Greeks ($p = 0.939$). Significantly ($p < 0.001$) fewer participants with only primary school education (46.5%), compared to those with higher educational levels (>60%), believed that people in their networks would react to a friend with recent HIV infection in a positive/neutral manner. Finally, a significantly ($p < 0.05$) higher proportion of participants with stable accommodation (60.3%) than of homeless (54.7%), and a higher proportion of HIV positives (65%) than of people without HIV infection (57.2%) believed that a positive/neutral reaction to a recently HIV-infected friend is the most likely behavior in their networks (Table 3).

3.2.3. Questionnaire item 3-Attitudes: Table 4 presents the frequencies of participants' responses to the individual items of Q3 based on their HIV status. A large majority of PWID (87.4%) disagreed with the statement that they would avoid any contact with a recently infected person in his/her first month/s of HIV infection. The proportion of the HIV positives who disagreed was significantly higher (94.1%, $p = 0.003$) than that of the HIV negatives (86.2%). Around 90% of the participants also disagreed with physically removing a recently HIV-infected person from the neighborhood. Very high proportions of the participants (>80%), and even higher ($p < 0.05$) proportions of those diagnosed with HIV, compared to those without HIV infection, agreed that a person with recent HIV infection should get appropriate medical care and assistance so as to cope with his/her anxiety and fear, and avoid engagement in risky practice. They also agreed that the neighbors, friends, or

acquaintances should be reassured and stay calm, and also be told that the recently infected person will be much less likely to transmit HIV when h/she begins ART. Around 80% of the participants said that they agree with the statement that is best to avoid sex or drug use with a recently HIV-infected person. There was, however, a substantial difference ($p < 0.001$) between participants with (53.7%) and without (86.5%) HIV.

Gender, country of origin, and accommodation status did not significantly affect the responses to Q3. In general, however, participants with primary school education were a bit less likely to have positive attitudes specially when asked about avoiding all contact with a recently infected person (disagreement: primary education 81% vs >87% in higher than primary education groups), making sure that everyone in the neighborhood stays calm (agreement: primary education 73% vs 84% in higher than primary education groups), helping a recently infected person get medical care (agreement: primary education 88% vs >93% in higher than primary education), avoiding engagement in risky behaviors (agreement: primary education 83% vs >91% in higher than primary education groups), or coping with his/her anxiety and fear (agreement: primary education 87% vs 94% in higher than primary education groups).

3.2.4. Association between knowledge, normative beliefs and attitudes—

Knowledge was related to both normative beliefs and attitudes (Table 5). Participants who knew that people with recent HIV infection were more likely to transmit the virus in the first six months of their infection were 3.5 times (95% CI for the adjusted estimate: 2.737, 4.357) more likely than those who failed to give a correct answer to believe that people in their network would become closer with a person with recent infection or that their relationship with the recently infected individual would not change. In terms of attitudes, PWID who were knowledgeable of recent HIV infection were between 50% and 100% more likely to disagree with statements such as that one should avoid all contact or sex and drug use with a person with recent HIV infection (adjusted OR: 1.510, 95% CI: 1.090, 2.091; adjusted OR: 2.513, 95% CI: 1.473, 4.287, respectively) or that recent infected persons should be removed from the neighborhood (adjusted OR: 1.968, 95% CI: 1.356, 2.857). They were twice as likely to agree with the statement that an HIV+ person is less likely to transmit HIV when h/she is on combination ART (adjusted OR: 2.083, 95% CI: 1.231, 3.523), but were 37% less likely to agree with the need to help people with recent infection get through this phase safely (adjusted OR: 0.630, 95% CI: 0.468, 0.847). HIV status and education levels remained significantly associated with normative beliefs and attitudes in multivariable models.

4. DISCUSSION:

This analysis measured knowledge, normative beliefs, and attitudes related to recent HIV infection of people who inject drugs in Athens, Greece. Knowledge means correct information and understanding, and helps increase the likelihood of behavioral change [41]. Previous research has shown that acutely HIV-infected people who were knowledgeable about the symptoms of early infection adopted safer sexual behaviors, even before receiving a clinical diagnosis, and were frequently motivated by concerns about infecting others [36,37]. The proportion of ARISTOTLE participants who had accurate information on

recent HIV infection is considered satisfactory. This could be partly attributed to the fact that most of the subjects had also been recruited in previous rounds of ARISTOTLE and had thus probably been exposed to prevention messages. The proportion is considered good because 1) the particular question on recent infection refers to a detailed specific component of HIV transmission dynamics; 2) the literature suggests that the level of knowledge about the importance of acute/early infection in onward HIV transmission [37,42] and about other aspects of HIV transmission is disappointingly low [43]; and 3) PWID are more likely to be excluded from HIV education and prevention services.

More effort is needed to adequately educate people with lower educational levels and migrant populations who have shown worse performance on knowledge questions both in this and in previous studies [43]. HIV-infected PWID scored better on the knowledge question about recent infection. Different responses between those with and without HIV infection have been observed for other concepts as well such as for Treatment as Prevention or for the meaning of undetectable viral load [44,45]. As this might reflect the contact of HIV-infected people with clinical settings and consequently their access to accurate information provided by health care staff, it may also represent an opportunity for dissemination of information on recent infection in other settings as well, including drug treatment centers and outreach projects.

It is very encouraging that most participants believed they would behave in a manner that would help rather than stigmatize or harm people with recent HIV infection. This is important and to some degree was confirmed later in TRIP, which was effective at identifying recently HIV-infected persons without causing harm [32,46–48]. Attitudes and normative beliefs, along with information about HIV, are key constructs in many theories that try to explain or change behavior, such as the Health Belief model, the Theory of Reasoned Action/Planned Behavior, the Transtheoretical Model of Change, or the Social Cognitive Theory [49–53].

This analysis has some limitations. First, knowledge and normative beliefs were measured by one question each and not by well-validated scales. However, this was the first attempt to capture these constructs about recent HIV infection, and sufficed for our basic need to know what people knew or believed about recent infection in preparation for launching TRIP, our social network-based contact tracing intervention. Second, recent infection has not been extensively discussed in HIV education programs, and people's exposure to this concept has been limited. This might have caused difficulties in the participants' understanding of the questions. Third, questions of this kind, especially those on attitudes, are likely to be affected by social desirability bias.

5. ETHICAL STATEMENT:

Each participant of ARISTOTLE and TRIP gave informed consent. The study was approved by the Institutional Review Boards of the National and Kapodistrian University of Athens, Medical School (Athens, Greece), of the Hellenic Scientific Society for the study of AIDS and Sexually Transmitted Diseases (Athens, Greece), and of the National Development and Research Institutes (New York City, US) in accordance with the ethical standards of the

committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2008.

CONCLUSION

There is considerable evidence that people with HIV are more infectious in the first six months of their infection. This is important information about which to teach people (especially high-risk groups). Therefore, new preventive interventions with promising results such as TRIP [32] are designed and implemented based on this information, with promising results. Knowledge can often promote behavioral change and good decision-making. PWID in Athens, Greece were quite knowledgeable, on average, of the role of recent HIV infection in HIV transmission, although efforts are needed to improve knowledge rates, especially among migrants and people with lower education levels. Normative beliefs and attitudes were deemed positive overall for the TRIP sample, as participants were more likely to report that they would respond to recently infected people with help and solidarity, rather than stigma and hostility. This was especially true among those who were aware of the increased risk of HIV transmission during the period of recent HIV infection. Although further research is needed to confirm these findings in other geographical or epidemiological settings, it seems that interventions to improve knowledge of the importance of recent HIV infection in HIV transmission could be useful.

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Table 1

Sociodemographic characteristics of participants in the fifth round of ARISTOTLE (19 September 2013–16 December 2013).

Sociodemographic Characteristics		Gender		Total
		Male	Female	
Total (N, (%))		1,153 (81.9)	254 (18.0)	1,407
Age (Mean± SD)		36.5 ± 7.8	35.6 ± 8.1	36.3 ± 7.9
Country of origin (N, (%))	Greece	1,003 (87.0)	230 (90.5)	1,233
	Other origin ^a	150 (13.0)	24 (9.4)	174
Homeless in past 12 months (N, (%))	No	762 (66.1)	155 (61.0)	917
	Yes (not currently)	135 (11.7)	45 (17.7)	180
	Yes (currently)	255 (22.1)	54 (21.3)	309
Education, highest level (N, (%))	Primary school	324 (28.2)	46 (18.1)	370
	Middle/secondary school	356 (31.0)	75 (29.5)	431
	High school	329 (28.7)	81 (31.9)	410
	University or equivalent	138 (12.0)	52 (20.5)	190

^a Afghanistan/Iran, Middle East, Europe (other), Africa, Other

Table 2

HIV prevalence by gender, accommodation status, and country of origin.

Sociodemographic Characteristics		HIV		TOTAL	P-value
		(+)	(-)		
Total (N, (%))		206 (14.6)	1,201 (85.4)	1,407	
Gender	Male	166 (14.4)	987 (85.6)	1,153	0.581
	Female	40 (15.7)	214 (84.2)	254	
Homeless (past 12 months) (N, (%))	No	99 (10.8)	818 (89.2)	917	<0.001
	Yes (not currently)	34 (18.9)	146 (81.1)	180	
	Yes	73 (23.6)	236 (76.4)	309	
Country of origin (N, (%))	Greece	178 (14.4)	1,055 (85.6)	1,233	0.563
	Other origin ^a	28 (16.1)	146 (83.9)	174	

^a Afghanistan/Iran, Middle East, Europe (other), Africa, Other

Table 3

Responses of participants in the fifth round of ARISTOTLE to questionnaire items 1 (Q1) and 2 (Q2) by gender, accommodation status, country of origin, education level, and HIV status.

		Q1 ^a		P-value	Q2 ^d		P-value
		Correct ^b	Incorrect ^c /don't know/don't answer		Belief that there would be positive reaction in the network ^e	Belief that there would be negative reaction in the network ^f /don't know/don't answer	
Gender	Male	709 (61.5)	444 (38.5)	0.982	683 (59.2)	470 (40.8)	0.151
	Female	156 (61.4)	98 (38.6)		138 (54.3)	116 (45.7)	
	Total	865 (61.5)	542 (38.5)		821 (58.4)	586 (41.6)	
Homeless (past 12 months) (N, (%))	No	582 (63.5)	335 (36.5)	0.036	553 (60.3)	364 (39.7)	0.042
	Yes (currently and not)	283 (57.8)	207 (42.2)		268 (54.7)	222 (45.3%)	
	Total	865 (61.5)	542 (38.5)		821 (58.4)	586 (41.6)	
Country of origin (N, (%))	Greece	761 (65.1)	407 (34.8)	<0.001	719 (58.3)	514 (41.7)	0.939
	Other	74 (46.0)	87 (54.0)		102 (58.6)	72 (41.4)	
	Total	835 (62.8)	494 (37.2)		821 (58.4)	586 (41.6)	
Education, highest level (N, (%))	Primary school	209 (56.5)	161 (43.5)	0.108	172 (46.5)	198 (53.5)	<0.001
	Middle/secondary school	263 (64.2)	147 (35.8)		262 (60.8)	169 (39.21)	
	High school	268 (62.2)	163 (37.8)		264 (64.4)	146 (35.6)	
	University or equivalent	123 (64.7)	67 (35.3)		121 (63.7)	69 (36.3)	
	Total	863 (61.5)	542 (38.5)		819 (58.5)	582 (41.5)	
HIV status (No. (%))	(+)	149 (72.3)	57 (27.7)	<0.001	134 (65.0)	72 (35.0)	0.035
	(-)	716 (59.6)	485 (40.4)		687 (57.2)	514 (42.8)	
	Total	865 (61.5)	542 (38.5)		821 (58.4)	586 (41.6)	

^aQuestionnaire item 1: If someone gets infected with HIV and then has unsafe sex or shares syringes with someone, h/she is more likely to transmit the virus to his/her partner:

^bDuring the first 6 months after h/she gets infected

^cMore than a year after h/she gets infected; h/she is equally likely to infect his/her partner at any time during the first five years after h/she get infected

^dQuestionnaire item 2: How would most people in your social circle react if a friend had recently gotten infected with HIV?

^eThey would become closer with him/her; their friendship would not change

^fThey would stop seeing the friend as frequently

Table 4

Participants' responses to questionnaire item 3 (Q3) by HIV status

Q3 ^a	Attitude	HIV status			
		(+)	(-)	TOTAL	P-value
A	avoid all contact with that person				
	strongly disagree / somewhat disagree	192 (94.1%)	1,028 (86.2%)	1,220 (87.4%)	0.003
	neither agree nor disagree	6 (2.9%)	42 (3.5%)	48 (3.4%)	
	somewhat agree/ strongly agree	6 (2.9%)	122 (10.2%)	128 (9.2%)	
B	avoid sex and drugs with that person				
	strongly disagree / somewhat disagree	74 (36.1%)	43 (3.6%)	117 (8.4%)	<0.001
	neither agree nor disagree	21 (10.2%)	118 (9.9%)	139 (10.0%)	
	somewhat agree/ strongly agree	110 (53.7%)	1,030 (86.5%)	1,140 (81.7%)	
C	make sure the neighbors/friend/acquaintances stay calm				
	strongly disagree / somewhat disagree	10 (5.0%)	87 (7.5%)	97 (7.1%)	0.001
	neither agree nor disagree	10 (5.0%)	153 (13.2%)	163 (12.0%)	
	somewhat agree/ strongly agree	181 (90.0%)	917 (79.3%)	1,098 (80.9%)	
D	physically remove that person from the neighborhood or from friends/acquaintances				
	strongly disagree / somewhat disagree	192 (93.2%)	1,070 (90.1%)	1,262 (90.6%)	0.373
	neither agree nor disagree	6 (2.9%)	54 (4.6%)	60 (4.3%)	
	somewhat agree/ strongly agree	8 (3.9%)	63 (5.3%)	71 (5.1%)	
E	help that person get medical care				
	strongly disagree / somewhat disagree	1 (0.5%)	49 (4.2%)	50 (3.6%)	0.018
	neither agree nor disagree	6 (3.0%)	57 (4.8%)	63 (4.5%)	
	somewhat agree/ strongly agree	193 (96.5%)	1,084 (91.1%)	1,277 (91.8%)	
F	help the person avoid engaging in risk behaviors like unsafe sex or unsafe drug Injection				
	strongly disagree / somewhat disagree	4 (2.0%)	57 (4.8%)	61 (4.4%)	0.001
	neither agree nor disagree	4 (2.0%)	92 (7.8%)	96 (6.9%)	
	somewhat agree/ strongly agree	196 (96.8%)	1,035 (87.4%)	1,231 (88.7%)	
G	help the person deal with his/her anxiety and fear				
	strongly disagree / somewhat disagree	3 (1.5%)	56 (4.7%)	59 (4.2%)	0.022
	neither agree nor disagree	4 (2.0%)	53 (4.5%)	57 (4.1%)	
	somewhat agree/ strongly agree	197 (96.6%)	1,077 (90.8%)	1,274 (91.6%)	

Q3 ^a	Attitude	HIV status			
		(+)	(-)	TOTAL	P-value
H	tell neighbors/friends/acquaintances that the person will be highly infectious for less than half a year, and they should help the person get through it safely				
	strongly disagree / somewhat disagree	16 (7.9%)	98 (8.3%)	114 (8.5%)	0.249
	neither agree nor disagree	15 (7.4%)	132 (11.2%)	147 (10.6%)	
	somewhat agree/ strongly agree	172 (84.7%)	949 (80.5%)	1,121 (81.1%)	
I	tell the person that a HIV+ person who takes combination drug treatment is less likely to transmit HIV to his/her partners				
	strongly disagree / somewhat disagree	1 (0.5%)	13 (1.1%)	14 (1.0%)	0.027
	neither agree nor disagree	1 (0.5%)	47 (4.1%)	48 (3.5%)	
	somewhat agree/ strongly agree	201 (99.1%)	1,097 (94.8%)	1,298 (95.4%)	

^a Questionnaire item 3: If you learn someone else in the neighborhood or among your friends/acquaintances is in the highly infectious early month or months of HIV infection, how can you best protect yourself and others?

Table 5

Odds ratios (OR) and 95% Confidence Intervals (CI) for participants' responses to questionnaire items (Q) 2 and 3 in association with (A) their knowledge of recent HIV infection and (B) their knowledge of recent HIV infection adjusted for their gender, age, HIV status, accommodation status, country of origin, and education level.

A	Knowledge-Q1^a						
	Correct^b vs Incorrect^c/ don't know/ don't answer						
Q2^d	Normative beliefs						
	OR (95% CI)						
	Positive reaction ^e vs Negative reaction ^f /don't know/don't answer						
	3.512 (2.804, 4.399)						
Q3^g	Attitude						
A	avoid all contact with that person ^h						
	1.690 (1.230, 2.322)						
B	avoid sex and drugs with that person ^h						
	3.052 (1.878, 4.958)						
C	make sure the neighbors/friends/acquaintances stay calm ⁱ						
	1.066 (0.807, 1.407)						
D	physically remove that person from the neighborhood or from friends/acquaintances ^h						
	2.120 (1.475, 3.048)						
E	help that person get medical care ⁱ						
	1.430 (0.971, 2.105)						
F	help the person avoid engaging in risk behaviors like unsafe sex or unsafe drug injection ⁱ						
	1.022 (0.727, 1.437)						
G	help the person deal with his/her anxiety and fear ⁱ						
	1.586 (1.083, 2.322)						
H	tell neighbors/friends/acquaintances that the person will be highly infectious for less than half a year, and they should help the person get through it safely ⁱ						
	0.638 (0.477, 0.854)						
I	tell the person that a HIV+ person who takes combination drug treatment is less likely to transmit HIV to his/her partners ⁱ						
	2.344 (1.398, 3.930)						
B							
	Knowledge-Q1	Gender	Age	HIV status	Homeless (past 12 months)	Country of origin	Education, highest level completed
Q2	3.454 (2.737, 4.357)	0.750 (0.559, 1.005)	1.000 (0.985, 1.014)	1.311 (0.942, 1.824)	0.838 (0.656, 1.071)	1.390 (0.973, 1.987)	1.297 (1.156, 1.455)
Q3-A	1.510 (1.090, 2.091)	1.102 (0.708, 1.718)	0.990 (0.970, 1.010)	2.405 (1.300, 4.449)	1.208 (0.845, 1.726)	0.656 (0.412, 1.042)	1.247 (1.057, 1.471)
Q3-B	2.513 (1.473, 4.287)	0.625 (0.339, 1.152)	0.974 (0.946, 1.004)	15.200 (9.757, 23.680)	0.765 (0.479, 1.222)	1.270 (0.648, 2.486)	1.128 (0.907, 1.403)
Q3-C	0.937 (0.703, 1.248)	0.727 (0.514, 1.028)	0.997 (0.980, 1.015)	2.631 (1.607, 4.309)	0.836 (0.622, 1.123)	0.806 (0.533, 1.220)	1.305 (1.123, 1.505)
Q3-D	1.968 (1.356, 2.857)	1.281 (0.755, 2.171)	0.991 (0.969, 1.014)	1.416 (0.784, 2.555)	1.012 (0.679, 1.508)	0.993 (0.568, 1.737)	1.436 (1.181, 1.746)

A					Knowledge-Q1 ^a		
Q3-E	1.319 (0.888, 1.960)	1.582 (0.866, 2.890)	0.993 (0.969, 1.017)	2.667 (1.222, 5.946)	0.975 (0.638, 1.488)	1.268 (0.660, 2.435)	1.393 (1.133, 1.711)
Q3-F	0.902 (0.636, 1.280)	0.993 (0.630, 1.566)	0.990 (0.970, 1.012)	3.922 (1.878, 8.191)	0.862 (0.600, 1.237)	0.968 (0.571, 1.641)	1.412 (1.182, 1.687)
Q3-G	1.401 (0.947, 2.074)	1.352 (0.765, 2.391)	1.003 (0.979, 1.028)	2.927 (1.283, 6.453)	0.930 (0.613, 1.410)	0.970 (0.540, 1.742)	1.431 (1.164, 1.758)
Q3-H	0.630 (0.468, 0.847)	1.030 (0.717, 1.479)	0.998 (0.981, 1.016)	1.423 (0.936, 2.163)	1.157 (0.855, 1.564)	1.310 (0.816, 2.102)	1.158 (1.007, 1.331)
Q3-I	2.083 (1.231, 3.523)	1.330 (0.616, 2.868)	1.004 (0.972, 1.038)	5.359 (1.286, 22.339)	0.928 (0.532, 1.618)	0.990 (0.454, 2.145)	1.482 (1.120, 1.961)

^aQuestionnaire item 1: If someone gets infected with HIV and then has unsafe sex or shares syringes with someone, h/she is more likely to transmit the virus to his/her partner:

^bDuring the first 6 months after h/she gets infected

^cMore than a year after h/she gets infected; h/she is equally likely to infect his/her partner at any time during the first five years after h/she get infected

^dQuestionnaire item 2: How would most people in your social circle react if a friend had recently gotten infected with HIV?

^eThey would become closer with him/her; their friendship would not change

^fThey would stop seeing the friend as frequently

^gQuestionnaire item 3: If you learn someone else in the neighborhood or among your friends/acquaintances is in the highly infectious early month or months of HIV infection, how can you best protect yourself and others?

^hstrongly disagree / somewhat disagree *vs* neither agree nor disagree / somewhat agree / strongly agree

ⁱsomewhat agree / strongly agree *vs* strongly disagree / somewhat disagree / neither agree nor disagree