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Behaviors Associated With a Risk of HIV Transmission From HIV-Positive Street Youth to Non–Street Youth in Ukraine

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Abstract

Background—Little is known about the extent to which HIV-infected street youth (living part or full time on the streets) exhibit behaviors associated with HIV transmission in their interactions with youth not living on the streets (“non–street youth”). We aimed to determine prevalences and predictors of such “bridging behaviors”: inconsistent condom use and needle sharing between HIV-positive street youth and non–street youth.

Methods—A total of 171 street youth in 3 Ukrainian cites were identified as HIV infected after testing of eligible participants aged 15 to 24 years after random selection of venues. Using data from these youth, we calculated prevalence estimates of bridging behaviors and assessed predictors using logistic regression.

Results—Overall, two-thirds of HIV-infected street youth exhibited bridging behaviors; subgroups with high prevalences of bridging included females (78.3%) and those involved in transactional sex (84.2%). In multivariable analysis, *inconsistent condom use* with non–street youth was associated with being female (adjusted prevalence ratio [aPR], 1.2; 95% confidence interval [CI], 1.1–1.4), working (aPR, 1.2; 95% CI, 1.03–1.4), multiple partners (aPR, 1.4; 95% CI, 1.2–1.6), and “never” (aPR, 1.4; 95% CI, 1.1–1.6) or “sometimes” (aPR, 1.3; 95% CI, 1.02–1.8) versus “always” sleeping on the street. *Needle sharing* with non–street youth was associated with being male (aPR, 1.4; 95% CI, 1.02–2.0), orphaned (aPR, 2.3; 95% CI, 1.8–3.0), and 2 years or less living on the streets (aPR, 1.8; 95% CI, 1.5–2.1).

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Conclusions—Bridging behaviors between HIV-infected street youth and non–street youth are common. Addressing the comprehensive needs of street and other at-risk youth is a critical prevention strategy.

In Eastern Europe, street youth—young people living part or full time on the street—have recently been shown to have high HIV seroprevalences, ranging from 18% to 37%.[1,2] These are some of the most vulnerable and marginalized populations who often have limited access to HIV prevention, testing, and care. Importantly, little is known about the potential for spread of HIV from street youth networks into the general population through high risk "bridging" behaviors with youth who do not live part or full time on the street (non–street youth).

The HIV prevalence in Ukraine is among the highest in Europe at 0.8%.[3,4] Street youth are particularly vulnerable to HIV infection because they often engage in risk behaviors, they lack knowledge and skills to access services,[5] and are vulnerable to sexual exploitation.[6] In many parts of the world, they may not have legal authority to access HIV testing and care without parental consent.[7,8]

HIV-infected persons who belong to a high-risk network, such as street youth, and who have unprotected sex or share needles with people who do not share these risk characteristics, such as non–street youth, pose a risk for bridging HIV infection from high-prevalence populations into the general population.[9] The impact of such bridging behaviors was demonstrated in a report in St Petersburg, which found that among those recently infected with HIV who did not belong to any high-risk group, one-third reported engagement in sex with an injection drug user (IDU) and two-thirds never used condoms with these partners.[10] The street youth population possesses a heterogeneous social profile, with some spending all their time on the streets, whereas others still spend most nights at a residence[1,2] which could allow for more contact with non–street youth. Previously, data from a systematic assessment of street youth in 3 Ukrainian cities demonstrated an 18% HIV seroprevalence among sampled street youth in 3 cities.[2] We used data from this study to determine the prevalence of bridging behaviors in this population which increase exposure to HIV in the non–street youth population: inconsistent condom use with non–street youth and needle sharing for injection drug use with non–street youth. Furthermore, we examined whether prevalence of bridging varied by sex, age, and other social determinants of health, in particular with regard to length of time on the street and homeless status, as well as sexual or substance abuse risk factors.

METHODS

Data for this analysis were collected as part of a rapid assessment of HIV seroprevalence among Ukrainian street youth. Methods have been described.[2,11] Briefly, in May to December 2008, a systematic community-based multicity assessment was carried out in 3 cities—Odesa, Kyiv, and Donetsk. The target population was street and out-of-school youth aged 15 to 24 years. A sampling frame of public venues frequented by street youth was developed in collaboration with local nongovernmental organizations serving street youth. Sites were selected randomly using an adaptation of time-location sampling.[11] Mobile teams

consisting of outreach workers, social workers, and nurses visited selected sites and approached all potentially eligible youth present at the time. Youth aged 15 to 17 years (legal minors) were eligible if they were found at a street venue without parents and had at least one of the following characteristics: living part or full time on the street, being out of family care, self-identifying as street youth, or attending school irregularly or not at all. Older youth aged 18 to 24 years were eligible if they were living part or full time on the street or self-identified as street youth. Of note, these criteria allowed youth who slept most nights in their residence but spent much of their day on the street to be defined as "living" part time on the street. Youth were excluded who had previously participated, were unable to provide informed consent, or were suspected to pose a threat to self or to staff. An interviewer-administered survey, HIV counseling, and rapid HIV testing of whole blood from finger stick using Determine rapid HIV-1/2 test (Abbott Laboratories, Abbott Park, IL) were implemented with consenting eligible youth. (Study staff approached 961 eligible youth, of whom 929%–97% consented).

The current analysis was restricted to the 171 youth (of the 929 tested) who tested positive for HIV: 83 (26.7%) of 311 in Odesa, 58 (18.7%) of 311 in Kyiv, and 30 (9.8%) of 307 in Donetsk.[2] In this population, we estimated prevalences of 2 types of bridging behaviors which increase exposure to HIV in the non–street youth population: inconsistent condom use with non–street youth and needle sharing for injection drug use with non–street youth. Sex without a condom and needle sharing are 2 significant routes of HIV transmission.[12] Field staff had observed street youth engaging in these risk behaviors with non–street youth, and specific questions were included in the survey accordingly.

We estimated the prevalence of *inconsistent condom use with non–street youth* using the question: "Over the last year, how often did you use condoms with the following partners: other young people who do not hang out on streets (such as those living in nearby flats)." Response options included "Never," "seldom," "often," "always," and "not applicable." HIV-infected street youth who answered "never," "seldom," or "often" were defined as using condoms inconsistently with non–street youth. The reference group consisted of the remaining HIV-infected youth (who always used condoms with non–street youth, were not sexually active with non–street youth, or were not sexually active at all).

Needle sharing with non–street youth was defined as having injected drugs in the past month and reported having shared needles with non–street youth in the past month or previously. The reference group consisted of the remaining HIV-infected youth (who had shared needles with non–street youth at some point but who had not injected drugs in the past month, who only ever shared needles with other street youth, who did not share needles at all, or who had never injected drugs).

We used logistic regression to examine crude associations between sex and age as well as other demographic, social, sexual, and substance abuse risk factors with bridging behaviors (inconsistent condom use with non–street youth and/or needle sharing with non–street youth). Social risk factors examined included length of time on the streets, frequency of sleeping on the streets, school attendance, work for pay, orphan status (either or both parents dead), legal registration in the city (for which having an official address is required), and

exposure to childhood violence (emotional, sexual, or physical). Sexual and substance abuse risk factors examined include alcohol use, number of sex partners during the last year, and whether youth had ever exchanged sex for goods. “Heavy alcohol use” was defined as having been drunk 6 or more times during the previous month. “Sex partner” was defined as a partner of the opposite sex or a male same sex partner. We present the results of bivariate models as crude prevalence ratios (PRs) and their 95% confidence intervals (95% CIs). Because the absolute prevalences of bridging in different groups were of particular interest for their potential to inform prevention, we also present prevalence differences (PDs) and 95% CI.

In multivariable modeling, we created 1 model having inconsistent condom use with non–street youth as the outcome and a second model having needle sharing with non–street youth as the outcome. Risk factors with a statistically significant association ($P < 0.05$) with either outcome in bivariate analysis were included in respective multivariable models. We used SAS-callable SUDAAN (Research Triangle Institute, Research Triangle Park, NC) to account for intracluster homogeneity within sites, stratification (cities), and sampling weights which were calculated taking into account proportions of sites sampled in each city and the response fraction at each site. We also performed subgroup analyses restricting logistic models to youth who were sexually active (for the inconsistent condom use outcome, n = 158) and youth who had ever injected drugs (for the needle sharing outcome, n = 131). We additionally performed subgroup analysis restricted to only those youth who had shared needles in the past month with non–street youth.

Ethical Considerations

The protocol was reviewed by the Centers for Disease Control and Prevention and the Ukrainian Ministry of Family, Youth, and Sports. It was found to be exempt from institutional review board evaluation because of its focus on public health practice.

RESULTS

Following citywide mapping, 91 locations frequented by street youth were identified and 74 of those randomly sampled. Of the 961 eligible youth approached, 929 (97%) consented. Of these, 171 were found to be HIV infected. Among HIV-infected youth, 75.9% were male, 85.2% were older (18–24 years), and most (83.6%) had spent more than 2 years on the street (Table 1).

More than 80% of youth spent some or all nights on the street. More than three-quarters of females and half of males had experienced emotional, physical, or sexual violence in childhood. More than half of youth had had 2 or more sexual partners during the previous year. Around three-quarters of youth had a lifetime history of injection drug use which was the strongest risk factor for HIV infection in a previous analysis.[2] More than 70% of youth were aware that condoms can prevent HIV transmission, and more than 90% knew that HIV can be transmitted by sharing needles. Only 16.6% of current injectors reported using a needle-syringe exchange program, many citing that they did not know about such programs or that they were not convenient. The most common drugs used during the past month include opiates (29%), marijuana (29%), pervitine (23%), inhalants (23%), ephedrine (19%),

and barbiturates (18%). Current use of most drugs was more common among older youth (except for inhalants and ephedrine) and among males (except for barbiturates).

Our evaluation of bridging behaviors found that more than half of all HIV-infected youth used condoms inconsistently with non–street youth and almost a third shared needles with non–street youth (Table 2).

Two-thirds of all youth engaged in either or both bridging behaviors, and this proportion was particularly large among females, (78.3%), youth who had exchanged sex for goods (84.2%), and youth with multiple partners (77.0%).

Looking only at the prevalence of inconsistent condom use with non–street youth, the proportion exhibiting this bridging behavior exceeded 60% for females, older youth, youth who worked for pay, youth who never or only sometimes slept on the streets, and those who had multiple partners or a history of exchanging sex for goods. The prevalence of the other bridging behavior examined—needle sharing with non–street youth—was greater than or equal to 40% among orphans, youth who had spent 2 years or less on the street, or youth who got drunk more than 6 times in the past month.

In crude analysis (Table 3), we found statistically significant associations between several risk factors and inconsistent condom use with non–street youth, including female sex (PR, 1.3; PD, 16%), older age (PR, 1.8; PD, 27.1%), working for pay (PR, 1.4; PD, 20.3%), and never (PR, 1.6; PD, 24.6%) or only sometimes (PR, 1.5; PD, 21.7%) compared with “always” sleeping on the streets, exposure to childhood violence (PR, 1.2; PD, 8.6%), exchange of sex for goods (PR, 1.4; PD, 21.3%), and multiple partners (PR, 1.5; PD, 21.8%). In multivariable analysis, associations with most risk factors remained significant with adjusted PRs generally greater than 1.2 and greater than 10% adjusted PDs in the prevalence of inconsistent condom use with non–street youth compared with their referent categories.

Our analysis also identified risk factors for needle sharing with non–street youth. In crude analyses (Table 4), statistically significant associations were observed for males (PR, 1.7; PD, 15.3%), older age (PR, 1.8; PD, 15.8%), being orphaned (PR, 1.9; PD, 18.9%), being out of school (PR, 2.9; PD, 22.6%), having spent 2 years or less on the street (PR, 1.3; PD, 10.1%), being registered in the city (PR, 1.4; PD, 11.0%), and “always” (PR, 2.2; PD, 19.2%) or “sometimes” (PR, 2.2; PD, 19.3%) compared with “never” sleeping on the streets. Behavioral factors, including heavy alcohol use (PR, 2.0; PD, 26.4%) and having multiple partners (PR, 1.5; PD, 11.8%), were also associated with higher rates of needle sharing with non–street youth. In multivariable analysis, associations for all risk factors except age and sex exchange remained significant. Of these, all had adjusted PRs greater than 1.3 and a greater than 9% adjusted differences in the prevalence of needle sharing with non–street youth compared with their referent categories. Small sample sizes in some cells precluded examinations of effect modification by sex or age.

In subgroup analyses which restricted the multivariable model for the outcome “inconsistent condom use with non–street youth” to those who reported being sexually active (n = 158), the association for all risk factors remained similar, with the exception of age, which did not

remain statistically significant due to small numbers of younger sexually active participants (results not shown). Likewise, when restricting the multivariable model for the outcome needle sharing with non–street youth to only those who had ever injected (n = 131), most risk factors remained similar. Of note, among only IDUs, youth aged 18 to 24 years were statistically significantly less likely to share needles with non–street youth than those aged 15 to 17 years (results not shown). Finally, in the analysis where the outcome "needle sharing with non–street youth" included only those who had shared needles with non–street youth in the past month, the majority of risk factors in the multivariable model remained similar, although not all retained statistical significance.

DISCUSSION

This report found that among HIV-infected street youth, nearly 8 of 10 girls and more than 6 of 10 boys engaged in bridging behaviors by using condoms inconsistently and/or sharing needles with non–street youth.

Our examination of the individual bridging behaviors found that girls and young women were more likely to use condoms inconsistently with non–street youth, whereas males were more likely to share needles. Youth with more opportunity to maintain social connections with non–street living youth, through, for example, spending some nights at home, had higher prevalences of bridging. Orphan status and sexual and substance abuse behaviors were also correlated with bridging, as was a history of exposure to violence.

Many factors that make young women vulnerable to HIV infection, such as lack of power to negotiate safe sex, sex trade, being victims of forced sex, or a lack of access to HIV testing and care,[13] are likely relevant when considering why females in our sample were at higher risk for bridging, as it relates to inconsistent condom use. Female street youth are more likely than male street youth to engage in unprotected sex[1,14,15] and to be more likely to have people "from home" as part of their "emotional network,"[16] which could be additional explanatory factors. Understanding risk patterns by age is also key to targeting interventions. In our sample, it seems that the higher likelihood of needle sharing with non–street youth seen among older street youth was largely driven by this group being more likely to be IDUs —in our analysis restricted to IDUs only, we observed that youth aged 15 to 17 years were more likely to share needles with non–street youth. This finding may be explained by younger youth being more likely to still have connections with friends or family members who are not on the street. Alternatively, youth in this younger age group may have fewer financial opportunities to buy their own drugs and paraphernalia and so potentially engage in cost-sharing with non–street youth.

Street youth have previously been shown to maintain social connections with people outside their street youth network,[16,17] although the number of such connections with people "from home" decreases over time.[14,18] In our sample, characteristics relating to the extent to which street youth mixed with non–street youth were linked to bridging. Youth working for pay and not always sleeping on the streets were more likely to use condoms inconsistently with non–street youth; these groups likely had more opportunity for social and sexual mixing with non–street youth. Similarly, social mixing factors may have influenced the prevalence

of needle sharing with non–street youth. For example, those who had spent 2 years or less on the street, as well as registered youth, may still have had social links with youth not living on the street. Other social determinants were also important: as previously reported for this population, orphans were more likely to inject drugs[19] and the current analysis shows that for HIV-infected youth, orphanhood was also a risk factor for needle sharing with non–street youth. HIV risk behaviors are known to be linked to adverse childhood experiences such as exposure to violence,[20] which was also seen in our sample.

With regard to behavioral risk factors, youth with multiple partners are more likely to share needles[15] and youth who inject drugs are more likely to share needles with people with whom they had sex.[21] In our sample, youth with multiple partners were more likely to both use condoms inconsistently *and* share needles with non–street youth. This association is worrisome because multiple partnerships are associated with an increased risk of HIV infection.[22–24] Preventing needle sharing, including understanding barriers to use of needle-syringe exchange programs is especially critical, given the very high transmission risk.[25] At the time of the study, no such programs specifically targeted most at risk adolescents, and adult services were not always youth friendly. Although there has been increased support for peer-driven needle exchange programs, such programs have not targeted adolescents.

We considered limitations that may have influenced our findings. All behaviors are self-reported and thus subject to social desirability bias. It is also possible that some youth who had shared needles in the past no longer did so, although they were active injectors, in which case our associations might be biased toward the null. Finally, since the spring of 2014, the security situation in Eastern Ukraine, where Donetsk is located, has deteriorated substantially because of armed conflict, which has made the situation with youth out of family care more acute. Many schools have closed[26] and large numbers of persons are internally displaced, including children[27,28] who are often not integrated in the education system in host communities.[26] Conflict may also increase the vulnerability to HIV/AIDS through behavior change, transactional sex, reduction in services, and an increased risk for substance abuse.[29–31] In the region affected by the conflict, many HIV programs, substance abuse programs, and programs that care for marginalized children have been disrupted.[32–34] Together, these consequences of the conflict suggest that attention to youth out of family care and HIV risk behaviors may be needed more than ever before.

With regard to bridging behaviors specifically, it is not clear what the impact of the conflict will be. However, most youth in our sample (81%) did not live in the areas directly affected by the conflict, and we believe that our findings are still relevant in Kyiv and Odesa. Some internally displaced children from the East have relocated to those cities,[28] but although the total number of street youth in those cities may increase as a result, there is not an apparent reason to suggest that those youth who are bridging would stop doing so. We also believe that this article provides an important preconflict, baseline documentation against which future studies can be compared to. Furthermore, our findings are intended to highlight that bridging is important to consider for programs working with street youth in other large cities, in Ukraine and elsewhere, and thus should be considered in future research on youth living outside family care.

Addressing HIV risks associated with bridging, as well as preventing further spread of HIV within the street youth network, requires working both with HIV-positive and HIV-negative street youth, as well as youth who do not spend much or any time on the street. Their varied needs should be addressed in a comprehensive manner by using a combination prevention framework,[35] ensuring that services are youth-friendly and gender sensitive.[36] Biomedical and behavioral approaches such as diagnosis of and treatment for those who are HIV positive, promotion of condom use, and needle-exchange programs should be combined with structural interventions. These include ways to help street youth leave the street and at-risk youth to stay in family care through broad socioeconomic support to families, including violence prevention and substance abuse services for both youth and parents, and vocational training. Failing that, foster care may be preferable to institutionalized care in terms of keeping youth off the streets (M. S. Kornilova et al., submitted for publication). Addressing gender-specific considerations such as violence, transactional sex, sexual violence, and reproductive health needs is also important. There is evidence that a comprehensive prevention approach works for street youth: in St Petersburg, Russia, HIV prevalence dropped by 73% between 2006 and 2012 (M. S. Kornilova et al., submitted for publication).

Structural factors also refer to the broader sociopolitical context, and in Ukraine, the ongoing conflict could prove to be a driver of HIV risk. Rebuilding or improving social and HIV services in areas directly affected by the conflict will be extremely challenging and should receive particular consideration.[37] In other areas, growing needs brought on by the internally displaced population challenge may require extra resources (H. Skipalska, personal communication).

In conclusion, the extremely high prevalence of bridging behaviors found among HIV-infected street-living youth is alarming. Not only was a large proportion of street living youth in these 3 Ukrainian cities HIV infected (18%),[2] but two thirds of these youth provided a bridge between their high prevalence network and non–street-living youth, with transmission of HIV into the general population a likely consequence. Our findings suggest that future research on youth outside family care will be strengthened by inclusion of data describing their social and sexual networks. This report provides evidence that addressing the needs of HIV-infected street youth is critical not only to keep them AIDS-free but also to halt the spread of the HIV epidemic.

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TABLE 1

Characteristics of 171 HIV-Positive Street Youth

	n	%	95% CI
Demographic characteristics			
Sex			
Male	130	75.9	71.9–80.0
Female	41	24.1	20.0–28.1
Age, y			
18–24	143	85.2	83.7–86.8
15–17	28	14.8	13.2–16.3
Social risk factors			
≥2 y on streets	141	83.6	81.6–85.6
Sleeping on the streets			
Always *	86	49.1	44.7–53.4
Sometimes	54	34.1	29.8–38.4
Never	31	16.8	14.5–19.1
Orphan	109	60.8	56.6–65.1
In school	14	8.0	6.0–10.0
Work for pay	72	41.4	37.1–45.6
City			
Kyiv	58	41.1	33.1–49.2
Odessa	83	39.6	34.1–45.1
Donetsk	30	19.3	15.6–23.0
Registered in city	91	57.4	53.8–60.9
Ever lived in institution (orphanage or internat) *	48	27.4	25.1–29.6
Experienced violence(physical, sexual, or emotional)	97	56.5	50.7–62.3
Females	32	76.7	71.5–82.0
Males	65	50.0	43.6–56.4
Sexual			
Ever had sex †	158	94.2	92.9–95.5
≥2 sex partners past year †	102	59.5	56.6–62.5
Did not use condoms at last sexual intercourse †	96	60.6	57.7–63.5
Ever exchanged sex for goods	15	8.7	6.6–10.7
Know condoms as a way to prevent HIV	121	71.2	68.4–74.1
Substance use			
Injection drug use			
Lifetime	131	77.2	73.4–81.1
Current (past month)	82	48.6	44.4–52.8
Injected 3+ y	76	48.9	43.0–54.8
Know HIV transmitted by needle sharing	154	90.2	88.8–91.6
If current injector: using needle-syringe exchange program	12	16.6	11.8–21.5

	n	%	95% CI
Alcohol use			
Drunk 6+ d last month	36	23.8	19.8–27.7
Previously diagnosed as having HIV	25	15.3	12.2–18.4

Numbers (n) are unweighted, and percentages are weighted.

*Youth who “always” sleep on the streets comprise youth who either do not have a residence or who have a residence but have not spent the night there for more than 3 months.

†Total n decreased due to missing data (ever had sex, n = 2; condoms at last sex, n = 13).

TABLE 2

Prevalence Among HIV-Positive Street Youth of Inconsistent Condom Use With Non–Street Youth and Needle Sharing With Non–Street Youth by Sex, Age, and Other Covariates (n = 171)

	Inconsistent Condom Use With Non–Street Youth Past Year*		Needle Sharing With Non–Street Youth†		Either Inconsistent Condom Use Past Year or Needle Sharing With Non–Street Youth or Both	
	%	95% CI	%	95% CI	%	95% CI
Total	56.2	52.8–59.6	32.6	27.8–37.4	66.8	63.0–70.6
Sex						
Female	68.3	60.5–76.1	21.0	11.7–30.3	78.3	73.6–83.0
Male	52.3	48.6–56.0	36.3	31.1–41.5	63.2	58.7–67.7
Age, y						
18–24	60.1	55.8–64.4	34.9	29.6–40.2	72.3	68.3–76.4
15–17	33.0	26.5–39.5	19.1	12.7–25.5	35.2	28.9–41.5
Time on streets, y						
≤2	55.1	50.0–60.1	41.0	35.3–46.7	68.2	63.1–73.2
>2	56.4	52.5–60.4	31.0	25.9–36.0	66.6	62.2–71.0
Sleep on streets						
Always	44.6	38.5–50.6	35.8	29.7–41.9	60.1	53.4–66.7
Sometimes	66.2	59.6–70.9	35.9	26.6–45.2	74.0	67.3–80.8
Never	69.1	63.4–74.9	16.6	11.0–22.2	71.9	66.2–77.7
Orphan						
Yes	54.8	51.4–58.3	40.0	34.5–45.6	67.6	64.1–71.0
No	58.3	51.3–65.3	21.1	14.2–28.0	65.7	59.3–72.1
In School						
Yes	47.4	36.0–58.8	11.8	9.3–14.4	47.4	36.0–58.8
No	57.0	53.4–60.6	34.4	29.4–39.4	68.5	64.6–72.5
Work for pay						
Yes	68.0	63.8–72.2	29.4	24.6–34.3	75.6	71.4–79.8
No	47.7	41.9–53.6	34.8	28.8–40.9	60.7	54.8–66.5
City						
Kyiv	51.8	45.3–58.2	45.2	37.1–53.3	70.8	62.9–78.8

	Inconsistent Condom Use With Non–Street Youth Past Year*		Needle Sharing With Non–Street Youth†		Either Inconsistent Condom Use Past Year or Needle Sharing With Non–Street Youth or Both	
	%	95% CI	%	95% CI	%	95% CI
Odesa‡	54.2	—	23.9	—	61.3	—
Donetsk	69.6	60.6–78.7	23.6	15.4–31.8	69.6	60.6–78.7
Registered						
Yes	58.1	53.9–62.4	37.3	31.3–43.2	71.0	66.1–75.8
No	53.5	49.9–57.2	26.3	22.5–30.1	61.3	58.0–64.6
Childhood violence						
Yes	59.9	55.9–63.9	28.0	23.2–32.8	69.1	64.4–73.9
No	51.3	46.7–55.9	38.6	31.6–45.5	63.9	59.5–68.2
Sex partners last year						
≥2	64.9	59.8–70.0	37.4	31.9–42.9	77.0	73.7–80.3
<2	43.1	37.5–48.7	25.6	20.1–31.1	51.9	45.3–58.6
Sex exchange						
Ever	75.7	60.2–91.1	22.3	12.6–32.0	84.2	75.6–92.8
Never	54.3	50.2–58.4	33.6	28.9–38.3	65.2	61.0–69.4
Know condoms protect against HIV						
Yes	55.0	51.1–59.0	—	—	—	—
No	59.1	53.9-64.3	—	—	—	—
Ever IDU						
Never	62.7	55.7-69.7	—	—	—	—
Ever	54.3	50.4–58.2	—	—	—	—
Know HIV can be transmitted by needle sharing						
Yes	—	—	32.4	27.5–37.3	—	—
No	—	—	34.3	25.8–42.7	—	—
Alcohol						
Drunk 6+ days last month	56.7	49.2–64.2	52.7	42.1–63.4	74.9	66.7–83.0
Drunk fewer than 6 d	56.0	52.7–59.4	26.3	23.1–29.6	64.3	60.4–68.3
Previously diagnosed with HIV						
Yes	60.3	46.8–73.9	24.6	14.6–34.7	69.8	56.1–83.5
No	55.4	51.9–59.0	34.0	28.1–39.9	66.3	61.8–70.8

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Results are weighted.

*Total n reduced by 2 due to missing data on sexual behavior.

†Youth who have injected drugs in the past month and reported sharing needles with non–street youth in the past month or previously.

‡In Odesa, all locations were sampled.

TABLE 3

Crude PRs, Crude PDs, Adjusted PRs (aPRs), and Adjusted PDs (aPDs) Describing, Among HIV-Positive Street Youth, the Association Between Each Risk Factor and Inconsistent Condom Use With Non–Street Youth* (n = 169)

	Crude				Adjusted			
	PR	**95% CI**	**PD, %**	**95% CI**	**aPR**	**95% CI**	**aPD, %**	**95% CI**
Sex (female vs. male)	1.3	1.2–1.5	16.0	8.1 to 24.0	1.2	1.1–1.4	13.2	4.2 to 22.2
Age (18–24 y vs. 15–17 y)	1.8	1.4–2.3	27.1	18.2 to 36.0	1.4	1.1–1.7	15.5	5.5 to 25.5
Length of time on streets (≤2 y vs. >2 y)	0.98	0.9–1.1	−1.4	−7.8 to 5.1	—	—	—	—
Sleeping on the street								
Never	1.6	1.4–1.8	24.6	17.4 to 31.8	1.4	1.1–1.6	16.8	8.2 to 25.4
Sometimes	1.5	1.2–1.8	21.7	11.1 to 32.3	1.3	1.02–1.8	16.4	1.4 to 31.4
Always	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Orphan (yes vs. no)	0.9	0.8–1.1	−3.5	−11.4 to 4.5	—	—	—	—
In school (no vs. yes)	1.2	0.9–1.5	9.6	−2.4 to 21.6	—	—	—	—
Work for pay (yes vs. no)	1.4	1.2–1.7	20.3	12.1 to 28.5	1.2	1.03–1.4	9.4	11.6 to 3.9
City					—	—	—	—
Kyiv	0.95	0.8–1.1	−2.5	−8.9 to 3.9				
Odesa	Reference	Reference	Reference	Reference				
Donetsk	1.3	1.1–1.5	15.4	6.4 to 24.4				
Registered as living in city (yes vs. no)	1.1	1.01–1.2	4.6	0.3 to 9.0	0.96	0.8–1.1	−2.4	−10.0 to 5.2
Childhood violence (yes vs. no)	1.2	1.1–1.3	8.6	3.7 to 13.6	1.1	1.1–1.2	6.2	2.8 to 9.6
Sex partners past year (≥2 vs. <2)	1.5	1.3–1.8	21.8	13.5 to 30.1	1.4	1.2–1.6	17.2	9.8 to 24.6
Know condoms protect against HIV (yes vs. no/Don't know)	0.9	0.8–1.04	4.1	−10.2 to 2.1	—	—	—	—
Exchanged sex for goods (ever vs. never)	1.4	1.1–1.8	21.3	3.8 to 38.9	1.04	0.7–1.5	2.0	−19.0 to 23.0
Ever IDU (ever vs. never)	1.2	1.01–1.3	8.4	0.2 to 16.6	1.04	0.9–1.2	2.1	−4.5 to 8.7
Drunk 6+ times last week (yes vs. no)	1.01	0.9–1.2	−0.7	−7.0 to 8.3	—	—	—	—

*The reference group consists of youth who always used condoms with non–street youth, youth who were not sexually active outside the street youth network, and youth who were not sexually active at all. Results are weighted. Two observations out of the total sample of 171 were excluded due to missing data on sexual behavior.

N = 169.

TABLE 4

Crude PRs, Crude PDs, Adjusted PRs (aPRs), and Adjusted PDs (aPDs) Describing the Association, Among HIV-Positive Street Youth, Between Each Risk Factor and Needle Sharing With Non–Street Youth* (n = 171)

	Crude				Adjusted			
	PR	**95% CI**	**PD (%)**	**95% CI**	**aPR**	**95% CI**	**aPD**	**95% CI**
Sex (male vs. female)	1.7	1.1–2.7	15.3	5.5 to 25.0	1.4	1.02–2.0	10.2	2.2 to 18.2
Age (18–24 y vs. 15–17 y)	1.8	1.3–2.6	15.8	7.9 to 23.7	1.3	0.9–1.9	7.4	−2.6 to 17.4
Length of time on streets (≤2 y vs. >2 y)	1.3	1.1–1.6	10.1	4.2 to 15.9	1.8	1.5–2.1	22.4	15.4 to 29.4
Sleeping on the street†								
Never	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Sometimes	2.2	1.6–3.0	19.3	10.7 to 27.9	2.0	1.4–2.9	18.9	11.3 to 26.5
Always	2.2	1.5–3.2	19.2	11.0 to 27.4	1.9	1.3–2.7	15.8	8.8 to 22.8
Orphan (yes vs. no)	1.9	1.4–2.6	18.9	12.1 to 25.8	2.3	1.8–3.0	24.5	17.5 to 31.5
In school (no vs. yes)	2.9	2.2–3.8	22.6	17.0 to 28.1	1.4	1.1–1.9	9.5	1.9 to 17.1
Work for pay (yes vs. no)	0.8	0.7–1.02	−5.4	−11.6 to 0.76	—	—	—	—
City								
Kyiv	1.9	1.6–2.23	21.3	13.1 to 29.5	1.8	1.5–2.3	19.6	11.0 to 28.2
Odesa	Reference	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Donetsk	0.99	0.7–1.4	−0.04	−8.2 to 8.1	1.1	0.8–1.5	1.8	−7.4 to 11.0
Registered as living in city (yes vs. no)	1.4	1.2–1.6	11.0	5.9 to 16.0	1.3	1.1–1.6	8.9	3.3 to 14.5
Childhood violence‡ (yes vs. no)	0.7	0.6–0.9	−10.6	−17.9 to −3.2	—	—	—	—
Sex partners past year (≥2 vs. <2)	1.5	1.2–1.8	11.8	6.0 to 17.6	1.6	1.3–2.00	14.6	8.6 to 20.6
Exchanged sex for goods (ever vs. never)	0.7	0.5–0.97	−11.3	−19.3 to −3.2	0.7	0.6–0.9	−9.2	−13.4 to −5.0
Drunk 6+ times last week (yes vs. no)	2.0	1.7–2.4	26.4	17.1 to 35.7	1.3	1.1–1.7	10.0	0.0 to 20.0
Know HIV transmitted by needle sharing (yes vs. no/don't know)	0.95	0.8–1.2	−1.8	−9.8 to 6.1	—	—	—	—

*Youth who have injected drugs in the past month and reported sharing needles with non–street youth in the past month or previously. The reference group consisted of the rest of the HIV-infected youth which included youth who had shared needles with non–street youth at some point but who had not injected drugs in the past month, youth who only ever shared needles with other street youth, youth who did not share needles at all, and youth who had never injected drugs. Results are weighted.

†Due to differences in prevalence of the 2 bridging behaviors in the 3 different categories of the variable, a different reference category was chosen here compared with Table 3.

‡Childhood violence was not included in final model for needle sharing because it was only borderline significant in the bivariate analysis and including it made the estimate for sex (a main exposure of interest) unstable.