

An Analysis of Respondent Driven Sampling with Injection Drug Users (IDU) in Albania and the Russian Federation

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ABSTRACT *Injection drug users in Tirana, Albania and St. Petersburg, Russia were recruited into a study assessing HIV-related behaviors and HIV serostatus using Respondent Driven Sampling (RDS), a peer-driven recruitment sampling strategy that results in a probability sample. (Salganik M, Heckathorn DD. Sampling and estimation in hidden populations using respondent-driven sampling. Sociol Method. 2004;34:193–239). This paper presents a comparison of RDS implementation, findings on network and recruitment characteristics, and lessons learned. Initiated with 13 to 15 seeds, approximately 200 IDUs were recruited within 8 weeks. Information resulting from RDS indicates that social network patterns from the two studies differ greatly. Female IDUs in Tirana had smaller network sizes than male IDUs, unlike in St. Petersburg where female IDUs had larger network sizes than male IDUs. Recruitment patterns in each country also differed by demographic categories. Recruitment analyses indicate that IDUs form socially distinct groups by sex in Tirana, whereas there was a greater degree of gender mixing patterns in St. Petersburg. RDS proved to be an effective means of surveying these hard-to-reach populations.*

KEYWORDS *Albania, Injection drug users, Respondent driven sampling.*

INTRODUCTION

Accessing hard-to-reach populations for HIV prevention and research activities has historically been challenging. Certain high-risk populations are fundamental in the proliferation of HIV, particularly in the early stages of a country's epidemic. Owing to the stigmatized and often criminalized behaviors of injection drug users, for example, these populations avoid open contact with the rest of civil society. Respondent Driven Sampling (RDS) offers a solution to that dilemma, allowing researchers to access hard-to-reach populations through their social networks.^{2,3} A social network person includes other persons with whom he/she has a social relationship and who tend to engage in the same behaviors as the index person. This paper presents approaches used to implement RDS in Tirana, Albania and St. Petersburg, Russia and lessons learned in these two cities.

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MATERIALS AND METHODS

The studies in St. Petersburg and Tirana utilized RDS to recruit IDUs into an HIV-related behavioral survey. While the methodology behind RDS has been described elsewhere,³ in brief it is a referral-based system whereby participants refer a limited number of friends or acquaintances (who are also members of the target group) to participate. Study participants receive an incentive both for participating and successfully recruiting others. Data are analyzed using the recruiting linkages and yield a probability sample of the population in the target area.

For inclusion in either study, participants had to be at least 15 years old and report having injected drugs recreationally in the past 6 months. Data collection for both surveys included face-to-face interviews and encompassed a 7–8 week period at three sites in each city. In Tirana, data collection took place in offices of two non-governmental organizations (NGOs), conducting outreach to IDU and in one treatment hospital. Data collection in St. Petersburg was conducted in three sites in various parts of the city. One was a fixed site in the center of the city. The other two sites were located just outside the city center and open on weekend afternoons, operating from mobile vans at stable locations. One site was selected due to its proximity to an illegal drug market.

The data collection team at each site and shift consisted of two interviewers and one person serving as coupon manager, supervised by a study coordinator. The coupon manager recorded data for each participant on a form that included each individual's self-reported network size, the coupon number brought to the interview, and the coupon numbers each was given for distribution. The Tirana sites also had a physician, laboratory technician and counselor as data collection included biological samples for HIV and other STIs.

Questionnaire topics included sociodemographic indicators, sexual and drug injection risk behaviors, knowledge of HIV and STIs, and previous HIV testing. Survey duration in Tirana was approximately 1.5 hour for both the behavioral and biological portions of the study, while in St. Petersburg data collection lasted approximately 45 minute. In accordance with RDS methodology, the initial participants of the study, known as "seeds",⁴ were members of the target IDU population in their respective cities, and were selected to begin recruiting their peers into the study. In Tirana, 15 seeds launched the study, while in Russia recruitment was initiated with 11 seeds; 2 seeds were added later to generate more recruiting. The seeds selected in both cities were referred from local NGOs conducting outreach with the IDU population, as well as personal IDU contacts of study staff. Each participant in St. Petersburg received three coupons with an eight-week expiration date to recruit their peers while two coupons per participant were used in Tirana (no expiration dates). In St. Petersburg, three coupons continued to be distributed until approximately 200 participants were attained, after which participants were warned that the study would be ending within a few days. In Tirana, coupons were distributed until the desired sample size of 200 was reached; however, participants were warned from the beginning that once this was reached, no more coupons would be honored.

In Tirana, participants received cash incentives of 10 euros for participating and an additional 5 euros for each successful recruit. In St. Petersburg, use of monetary incentives was discouraged by all local stakeholders; therefore, participants were given a gift package consisting of a box of chocolates and personal hygiene products for completing the survey, and a box of chocolates or a can of coffee for each

successful recruit. The gifts were equivalent to U.S. \$10 for participating and U.S. \$5 for recruiting.

Two hundred ten IDUs (not including seeds) were surveyed between July and August 2005 in Tirana, and 200 IDUs (not including seeds) were surveyed in St. Petersburg during the same time period.

Biometric measures were taken in Tirana to discourage study members from participating in multiple sites. Measurements consisting of wrist circumference multiplied by forearm length were taken and recorded. Participants were told that this was a unique measurement that could be used to determine if they attempted to return or access other data collection sites. Project staff also rotated between sites to decrease the likelihood of participants visiting multiple sites. In St. Petersburg, biometric measurements were not taken since local researchers thought it would induce suspicion among IDUs and consequently discourage participation. Recognition of potential duplicate participants depended upon study staff, who were outreach workers familiar with the target population and operated out of the same site for the entire 8 weeks of data collection.

The data were analyzed using RDS Analysis Tool version 5.4 (RDSAT). RDS population estimates and confidence intervals as calculated by RDSAT are reported. The homophily index describes the extent of in-group ties. A homophily index of $H = 1.0$ reflects perfect homophily, indicating that ties are formed with other members of the same group. In contrast, $H = -1.0$ reflects perfect heterophily, indicating that ties are formed completely outside of the group.³ Both studies were approved by the FHI Protection of Human Subjects Committee and the Tirana study was also approved by the Medical Ethical Committee of Albania.

In both cities, information about whether anyone refused to accept coupons was elicited from those who returned to collect their compensation for successful recruiting. Approximately 20% (Tirana) and 5% (St. Petersburg) of those approached to participate refused to accept the coupon from participants. Of a total of 450 coupons distributed in Tirana, 210 were returned. In St. Petersburg, 200 out of a total of 629 coupons distributed were returned. Furthermore, in Tirana, only two potential participants were found to be ineligible for participation and once consent had been given, no participants withdrew from the process. This information is not yet available for St. Petersburg.

RESULTS

Demographic Characteristics

Table 1 describes the characteristics of the study samples in Tirana and St. Petersburg. The sample in Tirana consists predominately of male IDUs, with only 14 female IDUs recruited for the survey. This contrasts substantially from the sample in St. Petersburg, where more females were represented compared to Tirana, with 36% being female and 64% being male.

In Tirana, the majority had completed at least middle school (eight classes), with a third of the sample completing middle school and a third completing high school (12 classes). Only 7% in Tirana had completed university. In St. Petersburg, the majority (84%) had completed either secondary or vocational education, and 16% had completed university. In Tirana, the sample was comprised of young IDUs with 38% between 15 and 22 years of age and 74% below 27 years of age. The St.

TABLE 1. Demographic information

	Albania	Russia
Sex		
Males	91% (86, 96)	64% (55, 73)
Females	9% (4, 14)	36% (27, 45)
Education completed		
Did not attend school	9% (5, 16)	0%
Primary	17% (11, 26)	0%
Secondary/vocational	67% (58, 76)	84% (77, 92)
University	7% (3, 8)	16% (8, 23)
Age		
15–22 years	38% (33, 48)	11% (7, 15)
23–27 years	36% (27, 41)	38% (29, 47)
28 years or more	26% (19, 32)	51% (42, 62)
Current co-habitation situation		
Married living with spouse	12% (6, 18)	9% (4, 15)
Married living with other sex partner	0%	4% (2, 9)
Married not living with any partner	3% (1, 6)	4% (1, 7)
Not married, living with sex partner	20% (14, 26)	33% (25, 42)
Not married, not living with sex partner	65% (58, 72)	49% (39, 60)

The numbers in parentheses represent the 95% confidence intervals as calculated by RDS.

Petersburg study included an older IDU population, with over half of participants 28 years of age or older and only 11% between 15 and 22 years of age. In St. Petersburg, males were slightly older than females; a much higher proportion of males were 28 years of age or older (66 *vs* 26% of females; data not shown).

The majorities of the samples are unmarried (85% in Tirana and 82% in St. Petersburg). In Tirana, the majority also did not live with a sex partner (65%), while another 20% were unmarried but living with a sexual partner. A higher proportion of IDUs in Russia reported being unmarried but living with a sex partner (33%).

Network Sizes

As a part of RDS methodology, respondents were asked about the size of their personal networks. Specifically, participants were asked how many people they know personally who used injecting drugs (i.e., “you know who they are, they know who you are, you have seen them in the last six months”).

In Tirana, male IDUs reported a larger average personal network size than female IDUs. In contrast, in St. Petersburg, females had a larger average personal network size than males (20 *vs* 17, respectively).

The pattern of network size by age is again very different between IDUs in Tirana and St. Petersburg. In Tirana, network size increases with age (from 16 among the youngest age group to 21 in the oldest age group), whereas in St. Petersburg, network size decreases with age (from 25 in the youngest age group to 15 in the oldest age group). The same trend and differences between the two cities is observed with regard to education, which is likely due to the collinearity between age and education.

Similarly, in Tirana, there was a trend of increasing network size with increasing duration of injection drug use. However, in St. Petersburg, the network

TABLE 2. History of injection drug use

Duration of injection drug use	Albania	Russia
<1 year	21% (11, 24)	6% (3, 9)
1–5 years	72% (69, 83)	43% (31, 51)
>5 years	6% (3, 11)	52% (43, 63)

size was larger for recent initiates and long-term injectors compared to those who injected for 1–5 years (Table 2).

Recruiting

Table 3 represents the recruitment patterns of IDUs in Tirana and St. Petersburg with respect to sex, age and length of injection. RDS provides the opportunity to learn about the degree to which people tend to affiliate with others sharing their same characteristics. In Tirana, the gender affiliation patterns demonstrate a strong heterophily in women, whereby women recruited only men ($H = -1.00$), while men recruited women 7% of the time ($H = 0.16$; this is probably due to the small number of women in the Tirana sample, with only 14 women participating). From a possible 28 coupons given to these women, 16 coupons were returned (57%). In contrast, the gender affiliation patterns of IDUs in St. Petersburg reflects neither strong homophily nor heterophily. Both males and females recruited males about the same percentage of times (63 and 57%, respectively). The heterophily index in males was -0.02 and homophily index was 0.12 for females.

The affiliation patterns of age recruiting relations in IDUs in Tirana reflects neither homophily nor heterophily. The homophily indices were 0.02 for the younger (15–22 years), 0.05 for the medium age (23–27 years) categories, and 0.09 for the older age group (≥ 28 years). As can be seen, both youngest and the oldest age categories recruited the medium age group approximately one-third of the time. Further, both the youngest and the medium age groups equally recruited the oldest age group (approximately 23–29% of the time). Lastly, the medium and the oldest age groups recruited the youngest group with equal vigor at about one-third of the time.

Among IDUs in St. Petersburg, the affiliation patterns of age relations reflect neither homophily nor heterophily. The homophily indices were -0.03 for both the younger (15–22 years) and the medium age (23–27 years) categories, and -0.15 for the older age group (≥ 28 years).

In Tirana, as with the relations by age, the affiliation patterns of relations based on duration of injection drug use reflects neither homophily nor heterophily. The homophily indices were 0.09 for new injectors (i.e., <1 year of injection experience), -0.10 for the mid-term users (1–5 years), and 0.09 for the longer-term injectors (>5 years). New users were recruited the least by the mid- and longer-term injectors (8 and 4%, respectively), and both the new and longer term injectors recruited mid-term injectors (64 and 65%, respectively).

In St. Petersburg, however, the affiliation patterns of relationships by duration of injection drug use differed between new injectors and longer-term injectors. The group of new injectors was completely heterophilous ($H = -1.0$), reflecting a lack of in-group ties. However, both mid-term and longer-term injectors exhibited neither heterophily nor homophily ($H = -0.07$ and $H = 0.05$, respectively).

TABLE 3. Recruitment patterns by age, sex, and duration of drug injection in Tirana and St. Petersburg

Recruiters	Recruits					
	Tirana			St. Petersburg		
	Youngest (15–22 years)	Middle (23–27 years)	Oldest (≥ 28 years)	Youngest (15–22 years)	Middle (23–27 years)	Oldest (≥ 28 years)
Age						
Youngest (15–22 years)	42%	35%	23%	10%	54%	36%
Middle (23–27 years)	33%	38%	29%	19%	36%	45%
Oldest (≥ 28 years)	29%	39%	32%	12%	44%	44%
Sex						
Male	93%	Female		Male	Female	
Female	100%	7%		63%	37%	
Duration of drug injection						
New (<1 year)				New (<1 year)		
Mid-term (1–5 years)	20%	Mid-term (1–5 years)	Long-term (>5 years)	57%	Mid-term (1–5 years)	Long-term (≥ 5 years)
Long-term (>5 years)	8%	64%	16%	0%	43%	57%
	4%	57%	35%	7%	40%	54%
		65%	32%	6%	40%	54%

DISCUSSION

These two studies are among the first to report on the level of sexual and drug injection risk behaviors and knowledge about HIV prevention in a probability sample of IDUs in Tirana and St. Petersburg using RDS. The use of a systematic peer recruitment method afforded the possibility of capturing a wider range of IDUs than studies recruiting with outreach workers or from specific venues, such as STI clinics or needle exchange programs. Additionally, these two studies shed light on the social context by identifying social network relations among the IDUs.

The recruitment analysis suggests that IDUs in Tirana form socially distinct groups by sex. Female IDUs do not seem to interact with each other; no female IDU referred another woman. This suggests that intravenous drug use amongst females may be a highly stigmatized activity, or it may reflect their initiation into drug use by men.

In contrast, IDUs in St. Petersburg do not form socially distinct groups with regard to sex. The lack of strong ties within sex groups may be a reflection of injection behaviors in that they often inject in group settings which are likely to be of mixed sex and share needles with members of the opposite sex.

In Tirana, the lack of strong ties both within and between age groups most likely indicates that younger IDUs are probably **not** being initiated into injection drug use by injectors who are older in age. However, in St. Petersburg, there were no intra-group ties among younger females or among newer IDUs. All new IDUs appeared to be recruited only by long- and mid-term IDUs, and all younger female IDUs were primarily recruited by older male and female IDUs. This suggests that new IDUs, particularly female IDUs, have been initiated into injection drug use by older IDUs. The high prevalence of HIV and STIs⁵⁻⁷ in the IDU population in Russia places these new injectors at extremely high risk for HIV acquisition. The differences in average network sizes of male and female IDUs between Tirana and St. Petersburg may have implications for prevention programs. The larger network size of male IDUs compared to female IDUs in Tirana is not surprising given that the IDU population in Albania appears to be predominately male and clandestine for women. Therefore, it is apparently rare for female IDUs to know other female IDUs. In contrast, in St. Petersburg, female IDUs on average had a larger network size compared to male IDUs, which may be a reflection of the overlap of this population and the sex worker population. A sizable proportion are engaged in sex work so they likely know other sex workers from working in the same areas.

The younger age of IDUs in the Albanian sample indicates a potential for longer term drug use, allowing for greater transmission. Additionally, continued migration between borders with neighboring countries where prevalence amongst high-risk groups is higher (i.e., to Greece, Italy or Eastern European countries) may create a transmission-migration effect.⁸

The male-to-female ratio of almost 2:1 in St. Petersburg is consistent with the decreasing trend in the male-to-female ratio of IDUs previously reported, from 7:1 in 1991 to 5:1 in 2001.⁹ However, it is also possible that previous studies may have underestimated the proportion of female IDUs. RDS may reach female IDUs better than other sampling methodologies. This could be evidence that RDS can capture a more diverse and possibly a more representative sample of IDUs in St. Petersburg.

The Tirana sample is proportionately younger than the St. Petersburg sample, perhaps describing an epidemic that is newer or reflecting the population structure in Albania where 40% is under 25 years of age.¹⁰ Records indicate an increase in

substance abuse treatment since 2000 and the first HIV case was detected in Albania in 1993—lending credence to the possibility of a younger epidemic.¹¹

The co-habitation situation in Tirana differs from that in St. Petersburg, with a far greater proportion in St. Petersburg unmarried but living with a sex partner. It is possible that the more conservative nature of Albanian society and a holdover from the Albanian communist regime policies are reflected in this indicator.¹² The finding in St. Petersburg that all new injectors were recruited only by long- and mid-term injectors is of concern. These social relations combined with the high prevalence of HIV in the IDU population in Russia place these new injectors at extremely high risk for HIV acquisition. This scenario is likely exacerbated by their large average network size (approximately 18).

The research conducted in Albania with IDUs is of vital importance. For the first time, policy makers and those involved with drug treatment and prevention of HIV and STIs have information to better plan and target interventions.

The pace of recruitment in both countries (approximately 8 weeks) seems to be fairly efficient. Differing numbers of coupons (two in Tirana and three in St. Petersburg) did not seem to affect overall recruitment with both studies reaching the desired sample size in approximately the same amount of time. In St. Petersburg, slow recruitment particularly at the fixed site at the city center was boosted by the addition of two seeds at week 6; participation of only 50 IDUs at week 6 increased to 200 by the eighth week. Over 200 IDUs were reached by the study in 7–8 weeks with 13–15 seeds in each city.

The body of literature regarding the use of RDS amongst hard-to-reach populations in developing countries is still in its nascence. Little is known about the effect of incentives on populations in developing countries or if random recruiting of peers (a fundamental assumption underlying the RDS methodology) is valid in countries where a large proportion of the population is poor. A greater body of research employing these methods in developing countries is needed.

Lessons learned from RDS methodology

Data collection during the summer was ideal in St. Petersburg given that some sites were mobile vans and participants had to wait outside. The season was also beneficial in Tirana, with data collection taking place before summer vacation. Given the large size of both cities, having three study sites in different parts of each city facilitated recruitment. Evening and Saturday hours were important to ensure that workers could participate. In St. Petersburg, upon recommendation from local NGOs, letters of support obtained from city police officials helped ensure that IDUs would not be harassed at the study sites. In Tirana, biometrics were useful in creating a disincentive to participate multiple times. Involving NGO staff to recruit seeds and conduct data collection in the NGO offices enabled participants to feel comfortable about the process.

Limitations

Possible limitations to the study could have affected the results. In Tirana, the small numbers of women participating in the surveillance may indicate a strong desire to remain hidden, their limited numbers, or a reflection of poor recruiting. Because few women have been arrested or attended treatment facilities, there are no data regarding intravenous drug use amongst women in Tirana, or anywhere in Albania.¹¹ In both cities, it is possible that RDS may have selectively attracted those IDUs

desiring the incentives, which may have biased our sample. Formative research was conducted to assess if the amount would be coercive, so this is unlikely.

The major limitation of RDS is that it cannot control for non-response bias. Barriers to participation due to unknown characteristics of certain sub-groups or to factors beyond the control of the project could occur and are not measurable. Both studies attempted to determine the rate of non-response by asking participants returning to claim recruiting incentives about the number of attempts made before their coupons were accepted and the demographic characteristics of those who refused. They were also asked characteristics of those accepting the coupons. It is hoped that forthcoming analysis can assess if there is a difference between those who refuse, those who accept but do not show up, and those who accept and participate.

The coupon return rate in St. Petersburg was considerably lower than that of Tirana most likely due to the greater number of coupons given out by each participant in St. Petersburg (three coupons) than in Tirana (two coupons).

CONCLUSION

Because IDU participants were recruited through RDS, it is likely that the study sampled from a wide range of IDUs thereby increasing the sample representativeness in these two cities. Our study methodology likely drew a more diverse sample of IDUs compared to traditional recruitment by outreach workers or through needle exchange programs.

The studies in Tirana and St. Petersburg greatly enhance our understanding of IDUs and their network characteristics. They also provide evidence for the effectiveness of using RDS in recruiting hard-to-reach populations in environments where stigmatization and criminalization against their behaviors are commonplace.

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