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# **Estimating the Size of Populations with High Risk for HIV Using the Network Scale-up Method**

## **Analytical Report**

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## **Abbreviations**

HIV – human immunodeficiency virus

FSW – female sex workers

PLWH – people living with HIV

NGO – non-governmental organization

CSW – commercial sex workers

IDU – injection drug users

AIDS – acquired immune deficiency syndrome

MSM – men who have sex with men

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## MAIN FINDINGS

The “Estimating the Size of Populations with High Risk for HIV Using the Network Scale-up Method” research was conducted by Kiev International Institute of Sociology from December 2, 2008 to February 12, 2009 (using a sample representative for the population of Ukraine aged 14 and older overall and each of its 24 oblasts, the AR of Crimea, the cities of Kyiv and Sevastopol, we conducted face-to-face interviews with 10,866 respondents).

The following objectives were set for this research project:

- to collect data concerning the number of people representing populations at risk (IDU, CSW, MSM) and bridge groups (IDUs’ sexual partners, FSWs’ commercial partners and MSMs’ female sexual partners) on the national scale and on the level of main administrative units of Ukraine (oblasts);
- to estimate the size of populations at risk (IDU, CSW, MSM) and bridge groups on the national scale and on the level of oblasts;
- to estimate the size of populations at risk (IDU, CSW, MSM) in the age groups of 10-14 and 15-18 years.

Chosen as the basic research method was the scale-up method assuming that the probability of presence of the researched group representatives in social networks is proportional to this group size in the general population; thus, to estimate the size of one group or another, the researcher needs to estimate the average size of social networks in the studied population. Analysis has proved the model of 13 “known” groups (whose size is known to researchers) used in the study to provide rather accurate estimates for these group sizes: the average relation of the group size estimates and statistical data is 0.98.

Using the survey questionnaire examined by members of the scale-up method study group involving the method authors and most active developers, KIIS research workers made the following estimates for populations at risk and bridge groups on the national scale:

	Group size estimates	Confidential interval (95%)
Those who used injection drugs over the past 12 months giving themselves injections	103,000	85,000 – 112,000
<i>Under the age of 15</i>	7,700	4,800 – 9,700
<i>Aged 15-17</i>	17,000	14,000 – 20,000
Females who provided paid sexual services over the past 12 months	34,000	27,000 – 39,000
<i>Under the age of 15</i>	1,600	940 – 2,200
<i>Aged 15-17</i>	7,800	5,200 – 10,000
Males who provided paid sexual services over the past 12 months	2,400	1,800 – 3,400
<i>Under the age of 15</i>	443	0 – 1,200
<i>Aged 15-17</i>	292	107 – 512
MSM	7,200	5,300 – 9,100
<i>Under the age of 15</i>	258	0 – 540
<i>Aged 15-17</i>	198	43 – 314
PLWH	45,000	37,000 – 54,000
Sexual partners of IDUs	19,000	16,000 – 23,000
FSW clients	77,000	67,000 – 87,000
Female sexual partners of MSMs	1,455	–

It is worth noting that these estimates may have been influenced to some extent by such factors as information transmission effects, insincerity of respondent’s answers and barrier effects, which could have a negative effect on the quality of these estimates. To improve the results, we

made data correction. Reasoning from the detected tendency of respondents reporting fewer acquaintances in a group if they feel it has lower social respect, we based our correction of respondents' estimates on the assumption that the least biased estimates of numbers of acquaintances in populations at risk were given by respondents assessing social respect to the group as neutral (by those giving "medium" appraisal). After we calculated weighting factors for correction of the estimates, we obtained the following results:

	<b>Group size estimates</b>	<b>Confidential interval (95%)</b>
Those who used injection drugs over the past 12 months giving themselves injections	358,000	285,000 – 389,000
<i>Under the age of 15</i>	28,000	17,000 – 34,000
<i>Aged 15-17</i>	59,000	49,000 – 69,000
Females who provided paid sexual services over the past 12 months	81,000	65,000 – 93,000
<i>Under the age of 15</i>	3,800	2 200 – 5,300
<i>Aged 15-17</i>	17,000	12,000 – 24,000
Males who provided paid sexual services over the past 12 months	3,700	2,800 – 5,200
<i>Under the age of 15</i>	700	0 – 800
<i>Aged 15-17</i>	500	200 – 800
MSM	14,000	10,000 – 17,000
<i>Under the age of 15</i>	500	0 – 1000
<i>Aged 15-17</i>	400	80 – 600
Sexual partners of IDUs	32,000	27,000 – 39,000
FSW clients	285,000	248,000 – 322,000
Female sexual partners of MSMs	2,700	–

Taking into account the drawbacks of the methodology revealed in the project, the research team has made some suggestions to improve it. In particular, it is necessary to use some techniques to eliminate effects deteriorating the quality of estimates. One of them can be using the size of networks of optimal (not maximal) social distance in calculations, which is considering the factor of relation power in a network to estimate its size. Besides, it could be a good methodological solution to use the method of "anonymous (or thought of) acquaintance" in future studies. This method can reduce the negative effect of stigmatization and respondents' unwillingness to admit their belonging to the groups whose sizes are being estimated; after findings of many studies are accumulated, it can also minimize the factor of low group penetration (very small proportion of the researched groups in the population).

## 1. Introduction

Ukraine is one of the Eastern European countries with the greatest scale of HIV/AIDS epidemic. According to the latest official data [1], the scale of HIV/AIDS epidemic in Ukraine continues to grow despite the complex steps taken to stop the epidemic in the country. Since the first HIV-case was documented in Ukraine in 1987, over 144,728 HIV cases have been documented among residents of Ukraine as for late February of 2009. So far the HIV epidemic in Ukraine has been concentrated in populations at highest risk like injection drug users (IDU), commercial sex workers (CSW), and men who have sex with men (MSM).

To improve the effectiveness of response Ukraine gives to the HIV/AIDS epidemic on its concentration stage, it is important to obtain accurate information regarding the numbers of people currently belonging to the populations with the highest risk for HIV both on the national and local levels. This is essential as estimation of these group sizes answers the key question asking “How significant is the problem of HIV prevention in populations at risk?” and become the starting point in planning the scope and directions for prevention measures. To increase prevention effectiveness, it is also important to consider the size of bridge groups that spread infection from most at risk populations to the general public that are IDUs’ sexual partners and people using CSWs’ services.

Populations with higher risk for HIV, as well as bridge groups, are hidden in the society because of stigmatization of their behavioral practices, so official statistics offers no real numbers to estimate their size. At the same time, these groups are not numerous (their size may be smaller than 1% of the population), which makes attempts to reach them in representative studies of the general population ineffective as it requires too large samples. Besides, researching such ‘sensitive’ issues as HIV risk behavior in such studies calls for the use of special techniques to increase sincerity of respondents’ answers, which is not a widespread practice in research conducted in Ukraine yet. So, studying populations with high risk for HIV and bridge groups to estimate their size requires rather special research techniques.

The world experience of addressing the HIV epidemic has given rise to a number of approaches and methods of estimating the size of populations at risk<sup>1</sup> [2]. However, applicability of the existing methods - like multiplier method, ‘capture-recapture’ method, enumeration method, nomination method - is mostly limited to estimating the size of certain populations on small local territories because of their considerable resource-intensiveness (which is much more significant than in polling the general public), caused, in particular, by the need for representative samples in the researched populations (and the existing approaches limit their representativeness to separate settlements - towns or cities). To raise it to the national level, it is necessary to conduct such studies in a great number of settlements (60 or more), which is not financially realistic. If we use fewer number of sample units (settlements) and extrapolate the obtained results to the rest of the territory, we are going to deal with inestimable errors.

This report presents the findings of the first Ukrainian research estimating the size of populations with high risk for HIV and bridge groups conducted with the use of the network scale-up method. This method has spread over the past years in the USA, where it was used in a number

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<sup>1</sup> Taking into account the international experience and work of Ukrainian experts in social research, the first study on estimating the size of populations with high risk for HIV was realized in Ukraine in 2005. The main results of this study were published in the report “Estimating the size of populations with high risk for HIV in Ukraine” by the ICF “International Alliance on HIV/AIDS” in 2006.

of studies estimating the size of hard-to-reach populations including such at-risk population as heroine users. In contrast to the abovementioned ‘traditional’ methods of estimating the size of populations, this method requires much fewer financial, manpower and time resources, which makes it possible to estimate size of several populations at a time and is equally efficient for estimations on both national and local levels.

## 2. The scale-up method

### 2.1. The general idea

Contrary to other risk-group-number-estimation methods requiring representative samples of surveyed groups, a network scale-up method (the scale-up) is based on questionnaire survey of a statistically representative sample of the general population, thus facilitating data acquisition.

The idea of the method consists in finding representatives of target groups (in this particular case populations with high risk for HIV/AIDS) among people known to respondents – or, in other words, among their social networks. It is difficult to obtain adequate estimates for the stigmatized groups by answers to direct questions to respondents due to a “sensitive” nature of such questions. Instead, especially when the anonymity is guaranteed, it is much easier for respondents to answer questions, for example: “How many injecting drug users (IDUs) are there among your acquaintances?” However, even such data will be most probably underestimated because even in this form the question remains “sensitive”. [4].

It should be noted that unlike other definitions of social networks specified in the relevant literature [3] (e.g., “support network”, “network of intimates”), the definition used in the scale-up method distinguishes the so-called “active network” (those who were kept in touch with during last two years) from a “broad network” of respondents’ acquaintances (all whom the respondent new some time) [4]. In the established version, definition of acquaintances used in this method sounds like this: “*People whom you know and who know you, in appearance or by name, with whom you can interact, if needed, and with whom you have contacted over last two years personally or by telephone, or e-mail*”.

Along with surveyed groups, which size is to be calculated based on the survey results, the survey questionnaire according to the scale-up method must include about 20-30 groups (but not less than 6 groups), which size is known to the official statistics. Respondents are asked whether among their acquaintances there are representatives of a number of populations – for example, men named Pavlo, women who delivered a child in 2008, etc. Based on respondents’ answers about these “known” groups, the method allows to estimate, first, the number of acquaintances that the respondents have ( $e$ ) (social network size, *a maximum likelihood estimate* is determined):

$$c_i = t \cdot \frac{\sum_{j=1}^L m_{ij}}{\sum_{j=1}^L e_j}$$

where  $t$  – number of the general population among which we find the number of unknown groups (for example, among the Ukrainian population or among population of individual Ukrainian oblasts);

$m$  – number of each respondent’s acquaintances  $i$  in a certain “known” group  $j$  (possess the values from 1 to L).

Then, based on estimated number of acquaintances, the method makes it possible to obtain estimates for surveyed at-risk populations, which size is unknown ( $e$ ).

$$e = t \cdot \frac{\sum_{j=1}^L m_{ij}}{\sum_{i=1}^N c_i}$$

Also, estimates of group number can be obtained from analysis of sample average numbers of acquaintances in groups and sample-average size of social network (our experience of the method application shows that results according to these two estimation methods are very close). The basic assumption forming the grounds for this method consists in that the more the size of a certain population category (group), the more often its representatives will come across among the acquaintances of respondents' who covered by the survey. That is, fraction ( $p$ ) of each population category number ( $e$ ) among the general population ( $t$ ) ( $p = e/t$ ) with a certain probability may be applied to each individual social network ( $c$ ), or social networks of people reflect distribution of these categories in society [5]. Such assumption is characterized by formula:

$$\frac{m}{c} = \frac{e}{t}$$

where  $m$  – number of people of a certain category in the respondent's social network ( $c$ ).

The method also relies on such three assumptions [6]:

- All respondents have a sufficient level of knowledge about their acquaintances (lack of information “transmission errors”). The scale-up method provides that the respondents are kept sufficiently informed of their acquaintances' characteristics asked in the course of survey – for example, whether their acquaintances are ill with diabetes.
- All people have equal chances to know somebody from surveyed population categories ( $e$ ) – lack of “barrier effects”. For example, we assume that each resident of Ukraine has an equal chance of knowing people with diabetes. And these chances increase in proportion to increase in categories' sizes. It is clear that this assumption is true only as a certain tendency; there are populations for which this assumption will not be true, for example, a chance of having among their acquaintances the Crimean tartars are well over with residents of the Autonomous Republic of Crimea than with residents of other Ukrainian oblasts.
- Respondents are able in short time allocated for the interview give sufficiently accurate calculations (or estimates) of the number of their acquaintances that belong to a certain category (doctors, men above 70, etc.). Poor recall and inaccurate estimates given by respondents may distort accuracy of data obtained by this method.

We can add to this list the fourth assumption common to all methods operating with “sensitive” behavior aspects:

- Sincerity of the respondents' answers. The validity of this assumption raises certain doubts when we ask the respondents “sensitive questions”. It is here that the “social desirability” effect of answers works, especially when it comes to the stigmatized groups.

The principal advantage of this method is its mathematical and statistical validity that makes possible with the aid of network size formulas to predict the number of target groups and, provided lack of systematic deviations from formulated assumptions which serve the basis for the method, estimates of group sizes can be made with very high accuracy. Also, accuracy of number estimates is verified by means of group size estimates for which there is a reliable number statistics. Accordingly, on condition that there is a successful prediction of the number of statistically known groups, there are grounds to consider that the number of target groups is also predicted accurately. The method is also convenient in use as it does not require reaching the very representatives of target groups which number is estimated.

## ***2.2. History of method and review of conducted surveys***

The network scale-up method was first proposed by H. Russel Bernard, Peter D. Killworth, Eugene C. Johnsen and Scott Robinson in 1986 to estimate the number of hardly accessible groups, in particular, people who had died in the earthquake in Mexico City [7]. In subsequent years, in a number of surveys conducted in the United States this method was applied to estimation of the number of such groups as HIV-positive people, heroin users, women who had fallen victims to rape, and street people [8].

In 1993-1994 the method was used to estimate the number of HIV-positive people in Florida (USA) [4]. A representative sample of 1524 Florida residents was interviewed by telephone. To estimate the size of the social network, 25 population categories were used, which number is known to official statistics of the United States: selected categories included people having various illnesses (both stigmatizing and neutral); going in for different kinds of sports; other visible types of activities, for example, aircraft piloting. Respondents were also asked whether they knew someone named according to the list of 14 names used in the survey. Based on the survey results, an average social network size of Florida residents was 108, and the number of HIV-positive people was estimated at 1.6 mn. The estimate of HIV-positive people went over estimates obtained by other methods (it should be noted that estimates obtained by other methods are not accurate also as they have a number of systematic errors). Among a variety of factors that could lead to overestimates (attributing to HIV-positive people those who are not the HIV-positive due to insufficient knowledge of acquaintances and groundless conclusions based on possible symptoms – transmission effect; acquaintances duplication – due to close nature of social networks of HIV-positive people and their higher chances to know other HIV-positive people) the authors of the survey designate as a main factor limitation of the sample survey that included only Florida residents, while this limitation was not applied to respondents' acquaintances (a question about acquaintances was generally formulated as “whom you know and who know you, in appearance or by name, with whom you can interact, if needed, and with whom you have contacted over last two years personally or by telephone or e-mail”).

Another survey using the scale-up method was conducted in 1994 to estimate the number of HIV-positive people, street people and women who had fallen victims to rape in the United States [8]. The survey was conducted on the national representative sample of 1554 respondents who were asked by phone. The size of the respondents' individual social networks was estimated using data about acquaintances in 29 categories, among them women who delivered a child over the last 12 months; women who adopted a child over the last 12 months; widowers or widows; people with kidney dialysis; post-office employees; commercial pilots; members of certain organizations; people with diabetes; those who opened their businesses over the last 12 months; those who have a twin sister of a twin brother; official arms dealers; ill with AIDS; men in prison; people who were killed over the last 12 months; those who committed suicide over the last 12 months; people killed in traffic accidents over the last 12 months; and 6 feminine and 6

masculine names. Based on the survey results, the unbiased estimate of maximum likelihood for the number of people known to each respondent (size of an individual social network) was obtained. The average social network size of respondents in the survey is 286. Based on obtained estimates the size of populations with unknown number was calculated – estimate values and 95% confidence interval were 800,000 +/- 43,000 for HIV-positive people, 526,000 +/- 35,000 for street people, and 194,000 +/- 21,000 for women who had been fallen victims to rape over the last 12 months. The estimated number of HIV-positive people is very closely agreed with medical estimates, the estimated number of street people lies within the range of other estimates published at time of survey, and the estimate by authors of the number of women who have fallen victims to rape lies in the middle of the interval established by other published estimates.

In 1997-1999 the scale-up method was used to estimate the number of heroin users on a part of sample of the national drug and alcohol uses prevention survey in the United States [9]. The survey design using the scale-up method provided for telephone survey of 5892 respondents at the age of 16-44 years in 14 regions. Estimates of the number of heroin users were calculated separately for each region. The sample size in the regions varied from 197 to 1029 respondents. Questions about acquaintances in the following 6 population categories were included in the survey to estimate the respondents' individual social networks: 1) theft victims, 2) robbery victims, 3) assault victims, 4) carnapers victims, 5) alcohol addicts; and 6) marihuana users. It should be noted that the “control” size of “known” groups with which the scale-up method estimates of these groups sizes were compared, was obtained from the very survey based on direct questions to respondents belonging to a particular group. The average correlation of estimated and control values for these 6 groups gives 0.943. The estimated number of heroin users looks adequate for cities for which there are comparable data obtained by other estimation methods. The average respondents' social network size is 55 people. Authors of the survey note that such a small size of the social network ( $c$ ) may result from that the very groups on which basis the estimate of  $c$  was conducted, are rather specific, and data for them may themselves, as in the case of heroin users, suffer from poor information transmission and a barrier effect. It should be noted that if it is assumed that estimate  $c$  in this survey may be underestimated, then, the number of heroin users should be considered overestimated.

Therefore, the social network scale-up method shows promising results in the context of estimating the number of vulnerable populations, including HIV/AIDS risk groups.

### ***2.3. Organization of a survey using the scale-up method***

Always, whenever possible, it is reasonable that the problem to estimate the size of populations at risk or bridge groups is solved within the framework of surveys which are organized to reach other purposes (for example, within the framework of monitoring behavior of populations at risk), simply by adding a block of size estimation questions to the survey questionnaire – this will save considerable financial resources. For example, to estimate the number of IDUs in a certain city by the “multiplier method”, it may be enough to add only one question to the monitoring survey provided that its sample is representative for this city.

However, not all number estimation methods allow this. The scale-up method requires a small questionnaire (which scope is, in fact, defined by the number of population categories selected

for the analysis) that enables easily integrate it in surveys conducted for other purposes – for example, this can be a block of questions in an omnibus survey<sup>2</sup>.

What are the requirements for the survey design using the scale-up method? These requirements can be combined into two groups:

- requirements for the sample;
- requirements for the survey questionnaire.

Data collection for the scale-up method may be carried out in different ways – both by personal interview and by telephone or postal inquiry. While selecting data collection methods, allowance should be made for survey geography in view of such an objective factor as the level of installation of telephone services for households as well as the “response rate” that can be given by a specific data collection method.

#### *Sample requirements*

Sample requirements are given by the designation of general population it should represent and a desirable range of confidence interval to estimate the number. General population to be represented by the survey sample is determined by assignments on estimation of the number of surveyed groups. Among what population we want to estimate the number of risk groups? For example, if researchers require the figure at the country level in general, the sample should be representative at the general national level. If estimates are required at the level of individual regions, the survey sample should be also representative for the right regions.

#### *Structure of the survey questionnaire:*

A survey questionnaire should contain such blocks:

- questions to estimate the number of acquaintances the respondent has in the surveyed groups which number we want to estimate;
- questions to estimate sizes of respondents’ individual social networks – questions about the number of people whom the respondent knows in populations, their number is known to official statistics;
- social and demographic data about the respondent.

Therefore, the questionnaire scope is determined by actual populations which size estimate is to be obtained and the number of populations to estimate the size of social networks ( $c$ ). Articles published with regard to this method recommend that 20-30 “known” groups are used to make size estimates as the larger number of groups used in the analysis gives less standard deviation from the average size of the social network [9], or if the number of groups is less than 20, estimates of the surveyed groups are biased. However, it has been proved that even 6-7 groups give unbiased estimates [4]. In one of the most recent works on the “scale-up” method [11] the authors showed that the larger total fraction of “known” groups among the total population gives less standard deviation of the social network estimate, at that the largest fall down of the standard deviation occurs in gradual increase in the fraction up to 0.2, and upon reaching this value the standard deviation no longer decreases significantly as a fraction of “known” groups increases. This conclusion is true particularly for 6, 12, and 18 groups.

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<sup>2</sup> The Omnibus is a regular multi-purpose population survey conducted by sociological centers on simultaneous request of multiple clients with various tasks based on co-financing (everybody pays only for its questions in the questionnaire).

*Definition of acquaintances*

Questions about the respondent's acquaintances which belong to a specific group require a clear definition of whom we mean as "acquaintances" in the survey. This definition should precede any questions about acquaintances and, therefore, it should be communicated to the respondent in the interviewer's opening remarks at the start of the interview. An established definition of acquaintances used for the "scale-up" method was already mentioned in general terms in subsection 2.1 hereof. In each specific study the "geography" of this general definition should be specified proceeding from the survey assignments, namely: if the survey design provides for to estimate the number of groups at the national level, then definition of acquaintances should refer to those respondent's acquaintances who live in Ukraine; if estimates are required for specific regions – for instance, oblasts, then the definition should designate people living in a certain oblast.

*Selection of "known" groups*

Selection of "known" groups from accessible sources requires that a number of principles are observed. First, these categories should be determined by characteristics apparent to respondents – thinking of their acquaintances during the interview, the respondents, based on these characteristics, should be able to determine easily whether they belong to a specific category. For example, delivery of a child by woman is a noticeable event for her acquaintances, of which they will know soon. Instead, according to the American survey, such characteristics as blood group of acquaintances or their membership in a political party or a trade union are almost unknown to respondents [12]. Names of acquaintances are a good example of characteristics that are easy for the respondent to identify. Second, groups should be selected on a heterogeneity basis. Inclusion of only one-type groups – for example, only ethnic groups or categories of people having specific illnesses may lead to barrier errors [10]. Third, groups should vary by their sizes. Inclusion of only large sized groups (for example, "men at the age of 20 to 30 years" or "women over 70 years") may bring in many errors due to that it is more difficult for respondents to estimate the number of their acquaintances in large categories<sup>3</sup>. Using only small sized groups is also a bad approach leading to errors in estimates due to that there may be in the sample a very small number of people having such acquaintances. Authors of the "scale-up" works recommend that groups are selected which number ranges from 0.1% to 4% among the general population [10]. It is reasonable to add to the number of "known" groups that of close to the surveyed ones – by number, geographic location and stigmatization level. While selecting groups, it is essential to estimate, at least qualitatively, to what extent large errors of transmission and a barrier can be connected with the specific group.

Selection of population categories with known number for the survey purposes is limited by accessible official statistical data. Unfortunately, many groups that may be of interest to a researcher may not be covered by statistical recording. The best thing is that selected groups are regularly monitored by state statistical authorities – this offers the opportunity to conduct repeated surveys based on similar methodology to keep track of changes in the number of surveyed groups in the course of time.

*Determination of populations with high risk for HIV for respondents*

Special attention should be given to determination of populations with high risk for HIV for respondents. Established characteristics of these groups specified in professional literature are not always suitable for respondents. Designations "injecting drug users", "female sex workers",

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<sup>3</sup> As it is evidenced by results of focus groups conducted by American researchers [6], as well as results of cognitive interviews conducted by KIIS within the framework of the Ukrainian research instrumentation pretest, while answering questions about the number of their acquaintances in small sized populations the respondents estimate the number of their acquaintances, whereas when questions relate to large sized groups they give the estimated number which in their opinion is most close to the real number of their acquaintances in these groups.

“people living with HIV”, “men who have sex with men” are not known to respondents. It is clear that researchers have to “speak respondents’ language”. But in case of stigmatized groups, the population has been used to practice offensive language – “narcotic users”, “homosexuals”, “prostitutes” or incorrect designation “ill with AIDS”. Use of such names in the questionnaire will only raise sensitivity of questions and insincerity of respondent’s answers to them, or in terms of “ill with AIDS” will give hard to interpret results (one part of respondents may correctly understand hereunder people who had fallen ill with AIDS, while other part may understand this designation as that of covering all people with HIV). That is why it is important that not merely designations understandable to respondents are used, but also neutrality of designations is kept constant.

### 3. Description of survey implemented in Ukraine

The survey “Estimation of the number of populations with high risk for HIV” was conducted by Kyiv International Institute of Sociology” in the period from December 2 to February 12, 2009. Fieldworks (respondents’ survey) continued from December 23, 2008 to February 1, 2009. The survey was held in the form of face-to-face interview in respondents’ households.

The survey pursued the following objectives:

- Collect data on the number of people in populations at risk (IDUs, CSWs, MSM) and representatives of bridge groups (IDU sexual partners, CSWs commercial partners and MSM sexual partners (women) at the country/ main territorial and administrative units level.
- Estimate the size of at-risk populations (IDUs, CSWs, MSM) and bridge groups at the national and oblast levels.
- Estimate the size of at-risk populations (IDUs, CSWs, MSM) in age categories 10-14 years and 15-18 years.

It should be noted that applicability of the “scale-up” method to estimate populations with high risk for HIV and bridge groups has not been widely confirmed and still requires additional surveys. The method has not been earlier applied to estimate the number of FSWs, MSM and bridge groups. At the stage of survey planning we placed in question the possibility of adequate estimate for such closed group as MSM as well as for groups “IDUs sexual partners” and “MSM sexual partners (women)”. In our opinion, people may know that their acquaintances use injecting drugs or have sex with men, or buy women’s sexual services, but it is less probable that they know about their acquaintances such details as the number of sexual partners and their sex.

In view of the abovementioned difficulties we selected an indirect method to obtain a minimum estimated number of “MSM sexual partners (women)” – a question about MSM acquaintances also having sex with women. Due to considerable closedness of the group, sexual behavior of men who have sex with men may be less known to acquaintances from their environment (those who themselves are non-MSM), hence, the estimate according to this method for the number of MSM may be less reliable than for other surveyed groups. Nevertheless, in cases when the respondent himself belongs to the MSM group he will have many such acquaintances, and for that reason we should obtain a minimum estimated number for this group. It is also probable that data about IDUs may include data about users of other drugs – it may be rather difficult for respondents to differentiate between their acquaintances using injecting drugs or that of using them by other means, especially if these are people whom they know not well enough.

#### *Survey sample*

The sample used for the survey is representative for the population aged 14 and older both for Ukraine as a whole and for each of 24 oblasts, the Autonomous Republic of Crimea, cities of

Kyiv and Sevastopol. The survey sample includes 478 settlements (PSUs) (194 cities, 103 urban settlements and 181 villages). The sample size is 10866 interviews. For each administrative and territorial unit (24 Ukraine's oblasts, Autonomous Republic of Crime and cities of Kyiv and Sevastopol) a separate representative sample was built with population of 400 interviews.

The minimum age of populations at risk representatives which number had to be determined in this survey was assigned by the survey sponsoring agency and constituted 10 years. The lower age limit for the sampled population was fixed at 14 years due to several reasons. First, for ethical reasons, questions about populations with high risk for HIV may have a negative effect on children at the age 14 or earlier. Second, for children aged 10-13 it would be more difficult to understand the substance of questions in the questionnaire than for other respondents, thus leading to large number of answers "it's hard to tell" or "don't know". Third, in children's surveys we use a form of informed consent to be read by parents before they agree that their child is participated in the survey. Sensitive nature of questions, particularly, questions about people providing sexual services or people using drugs, may result in parents' refusal from holding and interview with their child.

#### *Survey Questionnaire features*

Definition of acquaintances used in this survey is formulated as follows: for the purposes of this survey "acquaintances mean people aged 10 and above whom you know personally and who know you by name or in appearance, and with whom you can interact personally, by telephone or in other way, and have contacted over the last two years". This definition has an advantage in that it covers a large share of people whom the respondent knows and, thus, facilitates raising the probability of that among his acquaintances occur representatives of target groups of the survey – in this particular case – representatives of populations with high risk for HIV. Yet, at the same time a wide range of acquaintances also includes those people with whom respondents keep not very close contacts, and, hence, know little about them.

Asking about the number of various populations' representatives (which number is known – the so-called "control groups", and those which number is to be determined) among respondents' acquaintances, we put 2 questions for each group. Guided by the survey assignment – to determine the number of populations at risk (IDUs, CSWs, MSM) and bridge groups at the national and oblast levels – we asked respondents about general number of acquaintances in a certain category living in Ukraine and, particularly, about the number of those living outside the oblast limits (for cities of Kyiv and Sevastopol – outside these cities' limits). This was done to estimate at the stage of regional data analysis the number of acquaintances living within the oblast limits.

Along with questions about the number of the respondents' acquaintances in certain populations, it has been suggested that the respondents should estimate the level of respect showed by the Ukrainian society to these groups. These data were used to estimate the level of understatement by respondents the number of their acquaintances in populations with low respect showed by the society, i.e. populations with high risk for HIV and bridge groups.

The survey questionnaire has undergone expert review of Christopher McCarty and H. Russel Bernard – members of the scale-up research group, including its authors and researchers who are most actively engaged in its development.

The average duration of interview in the survey was 22 minutes.

#### *"Statistically known" populations*

The list of "known" populations used in the survey included 22 groups:

- Men aged 20-30
- Men aged 15-17
- Men above 70
- Women aged 20-30
- Women aged 15-17
- Women above 70
- Children (boys and girls) aged 10-13
- Moldavians
- Romanians
- Poles
- Jews
- Romany
- 1<sup>st</sup> group invalids<sup>4</sup>
- Doctors of any specialty
- People who died in 2007
- Men named Pavlo
- Men who served sentences in places of imprisonment in 2007
- Men who officially divorced in 2007
- Women who gave birth to a child in 2007
- Doctors and Candidates of Science who received a scientific degree in Ukraine over the last 15 years
- Nurse women, nurse men, aid-men and aid-women
- Militiamen

On page 33 hereof there is the list of sources of statistical data about number of the groups at the national and oblast levels.

Certain groups were restricted by data for 2007 (dead; women who delivered a child; men who officially divorced; men who served sentences in places of imprisonment) due to lack of statistical data about their number in 2008. Questions for these groups also covered year 2007.

Statistics of ethnic groups was also obtained from the All-Ukrainian census of population due to lack of more recent data in official institutions engaged in their collection and estimation. It should be noted that the number of ethnic national groups includes people at the age of less than 10 years, but it turned out to be impossible to obtain a profile by age in the statistical data about these groups. However, we assume that this brings little biases in estimated data that can be neglected.

The group “Doctors and Candidates of Science who received a scientific degree in Ukraine over the last 15 years” was initially thought as “Doctors and Candidates of Science”, but lack of official statistics about total number of people with such scientific degree in Ukraine made us to used a modified definition of this group.

The number of group “militiamen” is set forth by the specific Law of Ukraine as last amended in 18.05.2004; we assume that the number of this group has not changed since than.

The total share of “known” groups among the general population is 0.47.

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<sup>4</sup> 1<sup>st</sup> group invalids – people with sharply expressed restriction of vital functions resulted from illnesses, injuries, birth defects that lead to social disadaptation due to impossibility to learn, communicate, orientation, control own behavior, movement, self-service, participation in labor activity, if the above abnormalities necessitate permanent nursing care and assistance. The respondents were given a relevant explanation.

*Analysis of collected data*

Data collected in the course of interview have passed through “external” and “internal” quality control. The external control included checking compliance of obtained data with statistical data by key social and demographic characteristics – age, sex, type of locality. The internal control provided for control of 15% interviewers’ work through revisiting respondents’ households (subject to checking was the fact of interviewing, compliance with sampling methodology, duration of held interviews, certain questionnaire’s questions were readdressed to respondents), as well as “logic” control of input data to diagnose possible errors of interviewers during recording respondents’ answers, and data input errors. At the stage of analysis an outliers control was conducted – from distribution of respondents’ answers to the questionnaire’s questions about the number of acquaintances in a specific category about 5% extreme values were withdrawn (4-6% of maximum values).

## 4. Survey results

This section discusses the estimated size of populations at risk and bridge groups obtained from the survey, and the estimated size of the respondents’ social networks as compared to other methods to evaluate the adequacy of results obtained from the scale-up model.

### 4.1. National estimates

To estimate the required number of groups using the scale-up method, one ought to have an estimate of the average social network size ( $c$ ) in the surveyed population (in our survey, this is the population aged above 14 in Ukraine as a whole and certain oblasts and cities).

#### 4.1.1. Social network size estimates

22 groups were included in the survey questionnaire aiming to estimate the respondents’ social network size. We began the analysis with inclusion of all groups. The average maximum likelihood estimate for the respondents’ social network size is 202 people, mean square deviation is 128. The minimum network size gives 0 (a respondent knows no one), maximum - 856. Trimmed mean (5%) gives 193. In further analysis we used a trimmed mean estimate. Based on the estimate of social networks sizes we can estimate the number of “known” groups. Table 1 illustrates estimated numbers for “known” groups obtained from the scale-up model as compared to the size of these groups according to the official statistics

*Table 1*

<b>Group</b>	<b>Estimated number</b>	<b>Statistics</b>	<b>Estimate/ statistics</b>
Men aged 20-30	4651463	4 088 438	1,14
Men aged 15-17	2096100	935 153	2,24
Men above 70	1258531	1 328 606	0,95
Women aged 20-30	3857891	3 966 956	0,97
Women aged 15-17	1803648	889 443	2,03
Women above 70	1649871	2 993 846	0,55
Children (boys and girls) aged 10-13	1534735	1 869 098	0,82
Moldavians	122216	258 619	0,47
Romanians	75999	150 989	0,50
Poles	284714	144 130	1,98
Jews	427085	104 186	4,10

Group	Estimated number	Statistics	Estimate/ statistics
Romany	236681	47 587	4,97
1 <sup>st</sup> group invalids	247251	278 195	0,89
Doctors of any specialty	1161290	222 884	5,21
People who died in 2007	463337	762 877	0,61
Men named Pavlo	332437	323 863	1,03
Men who served sentences in places of imprisonment in 2007	111936	108 511	1,03
Men who officially divorced in 2007	113544	178 364	0,64
Women who gave birth to a child in 2007	288706	472 657	0,61
Doctors and Candidates of Science who received a scientific degree in Ukraine over the last 15 years	141725	69 471	2,04
Nurse women, nurse men, aid-men and aid-women	736444	487 148	1,51
Militiamen	523048	273 200	1,91
			<b>1,65</b>

Accuracy of the number of known groups' prediction is one of the criteria of the scale-up model operation. Obtained estimates highly correlate with statistical data – Pearson's correlation coefficient  $r = 0.912$ . However, accuracy of estimated number for individual groups fluctuates significantly. The average ratio of estimates and statistical data is 1.65. This means that on the average we overestimate the group number by 65%<sup>5</sup>. The number of 6 groups – “men aged 20-30”, “men above 70”, “women aged 20-30”, 1<sup>st</sup> group invalids”, “men named Pavlo”, and “men who served sentences in places of imprisonment in 2007” – we predict with to high precision. A part of groups we overestimate considerably – most doctors (more than 5 times), Romany (4.97 times), Jews (4.10), men aged 15-17 (2.24), women aged 15-17 (2.03), Doctors and Candidates of Science who received a scientific degree in Ukraine over the last 15 years (2.04). While other groups – Moldavians (0.47), Rumanians (0.50), women above 70 (0.55) – are underestimated twice as much. Why do data for these groups differ from statistical indicators so much?

Overestimation of the number of doctors can be explained supposing that respondents could include in the number of their acquaintances known doctors with whom they have only formal doctor-patient relationship. If this is true, this group should be excluded from further analysis, as in that case no basic assumption that forms the basis for this method comes true, namely about probability of group representatives presence in the social networks in proportion to its number among the general population. Indeed, definition of acquaintances which is used in the scale-up method in general does not exclude doctors with which respondents could interact during a two-year period due to medical reasons. Based on the interview results, absolute majority of respondents – 89% - explained that they knew at least 1 doctor. Also, overestimated 1.51 times are “nurse women, nurse men, aid-men and aid-women” due to similar reasons as well.

The same explanation may be applied to the estimated number of militiamen which exceeds statistical data 1.91 times. 72% of respondents reported that they knew at least one militiaman. It

<sup>5</sup> Data obtained by American researches show accuracy level similar to that of ours for predicted number of “known” groups: in 1994 survey [8] predicted number and statistical data for 29 “known” groups correlate at the level of 0.79 (Pearson's coefficient  $r$ ), at that strongly underestimated are two groups – people who have a twin brother or a twin-sister, and people ill with diabetes (in exclusion of these two outliers from the analysis  $r = 0.94$ ).

is conceivable that men may have more acquaintances among militiamen because they have to do with law and order bodies more often. As it was showed by the survey data, men, in fact, knew militiamen more often (as reported by 77% of men), than women (68%). The average number of familiar militiamen among male respondents differed from that of among women slightly, though significantly in terms of statistics (at the level of 0.01) – 3 against 2, respectively.

Certainly, statistical data that we have for the ethnic groups could lose their actuality since 2001, however, it is unlikely to assume that the number of the Romany or the Jewish people has increased over 2001-2009 period. On the contrary, at least for the Jewish people it is assumed that there is an opposite tendency because out-migration of Jews in these years continued (though at a lesser rate than before). The basis for designating a person as a Jew in the course of census when it occurs according to oral information provided by person himself, and in other situation when it goes about the respondent's acquaintances in an interview is, probably, different. Jews may be a group which representatives are not easily identified among one's acquaintances, unless they are close acquaintances, or unless such people openly communicate in its social network about its ethnic background. If people have no precise information, they can draw conclusions about "Jewish roots" of their acquaintances based on such uncertain characteristics as the surname or appearance. Our definition of acquaintances is wide enough and may include respondents' acquaintances, for ethnic background of which they have no reliable data.

More importantly, it is characteristic of most population to show a certain level of anti-Semitism<sup>6</sup>, they qualify as Jews those who "stained" by Jewish origin, considering Jews persons from mixed families, who are Jews by half or by quarter (for example, those whose father is a Ukrainian, and mother is Jewess), while in the course of census they identified themselves with other ethnic groups, rather than with Jews. This has resulted in that the number of Jews in out interview is overestimated considerably.

Similar explanation may also be true for overestimated number of the Romany.

Groups of "men aged 15-17" and "women aged 1-17" can have indistinct age limits in respondents' perception. Thus, it may be difficult for adults and older people to estimate exactly the age of known youth, which exact age they do not know or do not remember. And though it is possible to estimate age of acquaintances based on other characteristics – whether they study at school or in the institute, if at school, in what form – estimates may be diluted due to adjacent to group limits' values – aged 13-14 and aged 18-19 acquaintances. At the same time, one can see that the group number "children aged 10-13" is underestimated at 18%. In view of the youngsters' acceleration that can be observed recently in Ukraine, it is assumed that a part of children could be attributed by respondents to a senior group aged 15-17. In determination of the age interval of these groups we strived for simplification of assignments for the respondents and tried to determine the groups so that they are not large<sup>7</sup>, as cognitive interview held within the framework of the survey instrumentation pretest showed that it was difficult for respondents to estimate the number of acquaintances in large groups<sup>8</sup>.

In a similar way, category "Doctors and Candidates of Science who received a scientific degree in Ukraine over the last 15 years» could be overestimated due to that the respondents could attribute to it their acquaintances who received a degree at other time. We have provided for this difficulty at the planning stage, but unfortunately, as far as we know from numerous attempts to

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6 See. V.Paniotto. Dynamics of Xenophobia and Anti-Semitism in Ukraine (1994-2007) – Sociology: Theory, Methods, Marketing. 2008, No.1, pp. 197-214

<sup>7</sup> Share of these groups among population is 0.05 and 0.04, respectively.

<sup>8</sup> In this respect, also, see [6].

obtain such data, there is no cumulative register of researchers of all generations in Ukraine. And their number is too small to estimate it reliably in the course of regular sociological surveys.

Perhaps, the reason of underestimation of such ethnic groups as Moldavians and Romanians is to be sought in the barrier effect. As can be seen from data of All-Ukrainian census (2001), majority of Moldavians (74%) live in two oblasts of Ukraine – Odesa Oblast (48%) and Chernivtsi Oblast (26%), and 97% Romanians are concentrated in Chernivtsi Oblast (76%) and Zakarpattia Oblast (21%). Therefore, residents of these Oblasts have considerably more chances to know Moldavians and Romanians than the rest Ukraine’s population, thus, bringing biases in both estimates of respondents’ social networks sizes and numbers of these groups. In case of very large inhomogeneous settlement of a certain group, it is required to ensure “oversampling” in regions of compact settlement of this group. Having analyzed regional distribution of these ethnic groups at the planning stage, we included these groups in the survey to see what happens with estimated number of groups under the barrier effect, but we had not the possibility to change the survey design considerably.

It is more difficult to explain what is the reason of underestimation of women aged above 70. The authors of the method mentioned in their works [8] a tendency to overestimate small groups by the scale-up model and underestimate large ones. However, it is not traced with our data.

We excluded from the analysis 9 above mentioned groups for which we could not obtain adequate estimated numbers, and which biases in estimated numbers are explained by inaccuracy of measurement (doctors, other medical personnel, militiamen, Jews, Romany, Candidates and Doctors of Science, Poles), or a barrier effect (Moldavians, Romanian, Poles). A share of 13 groups reserved in the analysis among the general population is 0.43. The estimates size of the social network based on data about 13 known groups gives the average estimate 175. Under such number of groups the model predicts exactly their number – an average ratio of estimated number of these groups and statistical data is 0.98. Estimates and statistical data correlate at the level  $r = 0.948$ .

The second group in Table 2 joins “children aged 10-13” (underestimated earlier) and men and women aged 15-17 who were overestimated 2 times. Such joint group is still overestimated by 50%, though a reduced bias of estimates may say for influence of acceleration and biased respondents’ estimates for the youngest group towards older youngsters.

*Table 2*

<b>Group</b>	<b>Estimated number</b>	<b>Statistics</b>	<b>Estimate/ statistics</b>
Men aged 20-30	5129899	4 088 438	1.25
Young people aged 10-17	5531278	3 693 694	1.50
Men above 70	1387980	1 328 606	1.04
Women aged 20-30	4254703	3 966 956	1.07
Women above 70	1819572	2 993 846	0.61
1 <sup>st</sup> group invalids	272683	278 195	0.98
People died in 2007	510995	762 877	0.67
Men named Pavlo	366631	323 863	1.13
Imprisoned men (2007)	123449	108 511	1.14
Divorced men (2007)	125223	178 364	0.70
Women who delivered a child in 2007	318401	472 657	0.67
			<b>0.98</b>

To what extent the estimated sizes of respondents’ social networks are adequate? It is hard to determine without comparison with data of other surveys. In their surveys American authors of the method consistently obtain the average estimate of the social network several times which gives 290 persons [6]. But these are results obtained in other cultural environment where value

of maintaining social relations may have other meaning. As data of World Value Survey (1999) showed (<http://www.worldvaluessurvey.org/>), friends and acquaintances are very important in their lives for 64% of Americans compared to only 39% of Ukrainians, rather important for 32% of Americans and 48% of Ukrainians.

In 2005 by order of the ICF “International HIV/AIDS Alliance” KIIS estimated the number of populations with high risk for HIV at the national level using the “anonymous (or thought of) acquaintances” method<sup>9</sup>. Within the framework of the survey, it was estimated the general number of acquaintances which Ukrainian residents have. To this end, a representative national sample – 1000 respondents aged 18 and – were asked how many family members and other relatives, friends and close acquaintances, co-workers, acquaintances with which they study, neighbors and other familiar person they have. Therefore, the respondents were asked to estimate the number of different categories of their acquaintances (in the social network analysis such procedure is called a “network generator”). Based on obtained estimates, the arithmetic mean value of the number of relatives, friends, etc. was calculated, and then the average total number of respondents’ acquaintances was derived (see Table 3). As it is seen from the table, the survey data show that the average estimate of Ukraine’s adults’ individual network is about 55 persons.

*Table 3*

<b>Categories of acquaintances</b>	<b>Average number</b>
Family members and other relatives	14
Friends and close acquaintances	11
Coworkers	7
Acquaintances with which they study	2
Neighbors	9
Other acquaintances	12
<b>Total number of acquaintances</b>	<b>55</b>

This network size is three times less than the estimate we obtained using the scale-up method in 2008. It is clear that over three years that have passed since 2005 social networks of Ukraine’s population could not be subject to such a sweeping change. Can these estimates be compared to define which one is the most adequate? In our opinion, these two estimates designate different social networks. The scale-up method operates with a broad idea of the “active social network” that applies to respondents’ acquaintances with whom they have been interacting over the last 2 years, while circles of acquaintances in the 2005 generator, where it was not suggested that respondents should determine specifically their acquaintances, may be limited by stronger ties. As it was illustrated by Brewer<sup>10</sup>, recollection by respondents of their acquaintances is determined by the extent to which respondents have strong ties with them – close acquaintances are recollected by respondents best of all. This may also be true for acquaintances that were reported by respondents in 2005 survey. However, perhaps, in 2005 we underestimated the size of social networks due to characteristics of the used generator (a small number of rather wide groups was used).

<sup>9</sup> This method lies in that the respondents are asked to prepare a list of their 10-20 acquaintances that they know well. The interviewer guarantees that he will not ask who these people are, and that the list will remain with the respondent. This creates anonymity and makes it possible to tell about oneself or one’s inner circle sincerely. In the course of the interview the respondents are asked questions whether among their acquaintances on the list (the second part of the interview also refines data about the rest of acquaintances who were not entered on the list) there are different social categories: both populations for which there are statistical data (control groups to estimate the model operation) and populations with high risk for HIV, etc. Estimates of the size of unknown groups are obtained from both data about the inner circle of respondents’ acquaintances (people on the list) and for all social network on the whole.

<sup>10</sup> The work is cited in [3].

To validate data of this year survey, KIIS has interviewed a sample of resident adults at 200 respondents (a quoted two-step sample for the audience of TV program “Freedom on Inter”<sup>11</sup>). The day before an interview, the respondents were asked to make a list of all their acquaintances that are covered by the scale-up method (“active network”). It is quite natural that it takes time, but time for this task was not limited by interviewers. Respondents were assisted by the “network generator”. Then respondents classified their acquaintances on the list by categories (similar to those we used in 2005 survey). As a result of this experiment we obtained data for the social network size that are close to the scale-up data (see Table 4).

Table 4

Categories of acquaintances	Average number
Family members	5
Other relatives	16
Friends and good acquaintances	23
Co-workers and/ or acquaintances with which they study	29
Neighbors	12
People with whom they spend free time	11
Other acquaintances	51
<b>Total number of acquaintances</b>	<b>157</b>

#### 4.1.2. Estimating the number of at-risk populations and bridge groups

Table 5 below shows results of estimating populations at risk and bridge group at the national level.

Table 5

	Estimated number	Confidence interval of estimation (95%) <sup>12</sup>
People using injecting drugs over the last 12 months– making shots	103 000	85 000 – 112 000
<i>Under 15</i>	7 700	4 800 – 9 700
<i>Aged 15-17</i>	17 000	14 000 – 20 000

<sup>11</sup> Compared to Ukraine’s population, the audience selected for participation in the program “Freedom on Inter”, on the average, has higher level of education and demonstrates higher level of interest in the country political life: people who agree to come to the telecast have more pronounced views and convictions than the public at large, and show higher level of political activity. Therefore, their views are the “core” of public opinion – thus, imposing certain restrictions, but also giving certain advantages.

<sup>12</sup> Calculated for the fixed estimates of social networks’ sizes “c”.

Women (girls) providing sexual services for payment over the last 12 months	34 000	27 000 – 39 000
<i>Under 15</i>	1 600	940 – 2 200
<i>Aged 15-17</i>	7 800	5 200 – 10 000
Men (boys) providing sexual services for payment over the last 12 months	2 400	1 800 – 3 400
<i>Under 15</i>	443	0 - 1200
<i>Aged 15-17</i>	292	107 - 512
MSM	7 200	5 300 – 9 100
<i>Under 15</i>	258	0 - 540
<i>Aged 15-17</i>	198	43 - 314
People living with HIV	45 000	37 000 – 54 000
IDUs sexual partners	19 000	16 000 – 23 000
FSW clients	77 000	67 000 – 87 000
MCM sexual partners (women)	1 455*	-

\* The estimate was obtained by the maximum likelihood estimation.

To what extent are our national estimates of the number of the specified groups correct? It is difficult to answer this question without other adequate estimates available for comparison. Table 6 shows results of estimated number of IDUs, FSW and MSM groups obtained from other methods.

Table 6

Group	Range of estimates
IDUs	230 - 360 thousand persons
FSW	40 - 63 thousand persons
MSM	95 - 213 thousand persons

It should be noted that accuracy of these estimates leaves in doubt too. Thus, the lower estimate of IDUs number (230,000) was obtained based on program monitoring data as implemented for this group in specific regions (these are not general data for Ukraine). The upper estimate – 360 thousand persons – is the result of extrapolation of results obtained by the “multiplier method” in the survey covering only 16 Ukrainian cities (oblast centers), where small samples in individual cities brought in considerable errors in estimates that are ignored here.

The estimate for FSWs was obtained in even more complicated way using more steps for obtaining estimates with errors introduced at each step and ignored in the aggregate estimate results.

The number of MSM showed in Table 6 is the result of calculations based on behavioral survey data among the Ukrainian youth (2004 survey) that were obtained through direct questions about

experience of homosexual relations in the course of respondents' lifetimes. Estimated percentage of those who had such experience during lifetime, included both who answered 'yes' to the relevant questionnaire question and those who refused to answer. However, the assumption that those who wish to conceive the relevant experience refuse to answer raises doubts as it can be assumed in a similar way that these are refusals of those who consider questions offensive for themselves due to considerable stigmatization of this experience in Ukraine<sup>13</sup>. At the same time, statistical data for IDUs as of January 1, 2009 (number of persons registered with the Ministry of Internal Affairs in terms of drug uses) give 174 110 persons<sup>14</sup>. And though there are no statistical data for FSWs and IDUs<sup>15</sup>, experts working with these groups in the area of HIV/AIDS agree that their number by the scale up method is underestimated.

If this is the case, what are the reasons of at-risk populations' underestimation?

We see three basic reasons:

- information transmission effects;
- insincere respondents' answers;
- barrier effects.

The barrier effect may lie in that the stigmatized at-risk populations – such as IDUs, FSWs and MSM are unequally localized inside Ukraine. Thus, for example, many FSWs migrate in the Autonomous Republic of Crimea in summer that becomes the largest health resort in the country. But this phenomenon must not be treated as the barrier effect in the survey as the respondents consider for their acquaintances a period of 2 years, while this migration has a seasonal nature. Rather, the barrier effect for FSWs may lie in that their part (those who provide services “at home”) may live “at their place of work” and have no opportunity for maintaining social relations, except for working ones – with other FSWs, “procurers” and clients. This may mean that one can learn about this part of FSWs only according to information provided by their clients or neighbors who were brought into in the sample survey, though it is impossible to tell promptly whether the number of these CSWs in Ukraine is large.

Another problem is a possible failure to reach those who know CSWs most probably – their clients. Perhaps, we do not reach in the survey long-distance truck drivers who are clients of the so-called “en-route” or “street” FSWs. These people can spend most of their time in transit on business and, hence, it is difficult to cover them by interviews in households. Even if this is the case, this is only a part of FSWs clients, whose number, still, can not be estimated in this survey.

A barrier effect action may be also assumed for a part of IDUs that may be a closed group that interact mainly with other drug users (it goes about joint residence and drug uses). Most probable that this group will be known to its representatives, their relatives and neighbors. It is probable, that city dwellers know more about drug users than rural people<sup>16</sup>. But our sample is representative for city and rural areas, and this barrier effect action must not occur.

It can be assumed for MSM a barrier effect action regarding its youngest part living in the street (street people) and providing services to men to earn a living. Perhaps, this MSM subgroup is characterized by more intensive networking inside the group than with the ambient society. But

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<sup>13</sup> According to KIIS data, a tolerance level in relation to men with homosexual orientation over recent 15 years has changed insignificantly – a share of population has somewhat changed in part of those who disagree to one extent or another that the society has to treat homosexuals as all other people (from 34.9% to 28.5%). At that, a share of advocates for equal treatment (33.7% and 33.3%) has not changed and a share of those who gives an interim evaluation “agreed and disagreed” has increased – from 8.9% to 16.3%.

<sup>14</sup> It should be mentioned that these figures include data about all drug users, not only IDUs.

<sup>15</sup> Data about client coverage by prevention programs for FSWs (SyRex data base) give 13606 for FSWs.

<sup>16</sup> According to our data, people of urban areas know 2.5 times more about IDUs than that of rural areas.

this group should not be large size, thus these effects may explain only an insignificant part of underestimated number of MSM in this survey.

Anyway, we can only assume action of certain barrier effects in this survey, but cannot evaluate their impact.

It seems that more powerful impact for these at-risk populations may have information transmission effects in social networks groups and insincere answers of respondents. Populations at risk are mostly stigmatized in Ukraine (see, for example, [13]), thus their representatives may conceal their behavior from acquaintances, while acquaintances (here, respondents of the survey) may not wish to confide that they know such people.

Also, one can concede that period restriction – 12 months – could make it more difficult for respondents to answer whether their acquaintances belong to the relevant groups or not. For “known” groups that were also restricted by a relevant period (except for men who served sentences and rather who are prisoners for longer period, than 12 months, and hence, it is easier for them to estimate the relevant status of their acquaintances), we obtained estimates of the number lesser than the official statistics by 30%. But we cannot say what part of our underestimation is explained by this factor.

Underestimation of HIV-positive people in Ukraine may be explained primarily by that in view of diagnosis “sensitivity” of HIV-infection for a person and social fear and stigmatization in relation to HIV-positive people [14], information about HIV-status of acquaintances is distributed poorly in social networks. As per results of an American survey [12], HIV-positive people have on the average lesser social networks and consider a number of factors before to report their status to other people. A Ukrainian survey [14] also revealed problems of PLWH social exclusion made itself evident in the fact that social relations are wrecked and go down, thus deteriorating integration of PLWH in the society. Also, inadequacy of the estimate for “people living with HIV” may be connected with misunderstanding by part of respondents the definition of this group – who is meant<sup>17</sup>. This is, particularly, evidenced by a considerable number of answers “it’s hard to tell”, “don’t know” to this question – 31%, while for other at-risk populations it constitutes below 1%. In further surveys it is relevant to use formulation “people who became infected with HIV or AIDS patients”.

In this survey, we attempted to estimate two errors – the insincere respondents’ answers error and the information transmission error about at-risk populations in the social networks due to “invisibility” of groups. Results of the transmission error survey are presented in Annex 3 hereof (we excluded them from basic results of the survey in view of unreliability of obtained data).

#### ***4.2. Adjusting data to account for level of social respect for groups***

Questions on whether respondents know someone from a stigmatized “at-risk group” are “sensitive” questions especially if they are put before respondent during face-to-face interviews when respondent communicates directly with the interviewer. It is common knowledge that to “sensitive questions” respondents tend to give “socially desirable” responses. Are respondents being frank in this study when answering questions about acquaintances they have in at-risk populations? We analyzed this subject based on additional data collected within this study.

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<sup>17</sup> Estimation of this group number was not planned in this survey initially. The group was added to the questionnaire before the fieldworks upon request of the Customer of the survey, already after the instrumentation pretest.

One of dimensions of social stigma is the level of social respect for this group. In this study we asked all respondents to estimate the level of social respect attributed to groups in question. Questionnaire included questions to help respondents estimate what level of respect these populations have in Ukraine, including most at risk populations: “What level of respect do following groups have in Ukraine...”. The following range was used: 1 – very low level of respect, 2 – low, 3 – medium, 4 – high, 5 – very high.

We calculated the number of acquaintances in at-risk populations and bridge populations estimated by the respondents depending on level of respect attributed to the group. Analysis demonstrates that for all groups in question following tendency holds true: the lower is level of respect for a particular group, the lesser number of acquaintances is reported within that group. This tendency does not hold true only in those instances when number of respondents who indicated high and very high level of respect is less than 60 respondents, in this case data becomes statistically unreliable, theoretical error for sample is above 15% (see Table 7-8<sup>18</sup>).

Table 7. IDU, CSW, MSM – average estimate of acquaintances in risk populations in relation to level of respect

Level of respect	IDU		CSW		MSM	
	Average number of acquaintances	n – sample size*	Average number of acquaintances	n – sample size*	Average number of acquaintances	n – sample size*
Very low	0,382	7094	0,107	5673	0,022	7857
Low	0,380	2606	0,129	3208	0,059	1733
Average	1,486	461	0,351	919	0,059	405
High	0,055	58	0,414	142	0,122	47
Very high	0,000	11	0,260	29	0,216	25
<b>Total within sample</b>	<b>0,429</b>	<b>10229</b>	<b>0,141</b>	<b>9971</b>	<b>0,0305</b>	<b>10068</b>

\* Option “Difficult to say, do not know” was not included in analysis

Table 8. Male CSW, sexual partners of IDUs, CSW clients – average estimate of acquaintances in risk populations in relation to level of respect

Level of respect	Male CSW		Sexual partners of IDUs		Clients of CSW	
	Average number of acquaintances	n – sample size*	Average number of acquaintances	n – sample size*	Average number of acquaintances	n – sample size*
Very low	0,008	6802	0,078	6490	0,129	5786
Low	0,010	2539	0,084	2543	0,212	2271
Average	0,016	510	0,139	574	1,234	1172
High	0,170	81	0,141	73	3,221	118
Very high	0,000	24	0,061	25	2,899	30
<b>Total within sample</b>	<b>0,010</b>	<b>9956</b>	<b>0,08329659</b>	<b>9705</b>	<b>0,3353</b>	<b>9378</b>

We believe that level of respect may serve as indirect means of evaluating respondents’ sincerity in listing acquaintances in at-risk populations.

<sup>18</sup> For female sexual partners of MSM we failed to acquire reliable data because a very low number of respondents indicated that they have such acquaintances. For HIV positive people there is no relation between number of acquaintances and level of respect.

Adjustments are based on assumption that less biased are those responses given by respondents who estimated level of respect attributed to the group as medium, i.e. provided a neutral response.

To adjust respondents' estimates for each risk population an equation had been developed:

$$W_i = M_i/M_3,$$

where  $W_i$  - weight for each group depending on level of respect ("i" ranges from 1 to 5, i.e. those are clusters of respondents who attribute "very low", "low", "high", "average" or "very high" level of respect to a group in question),

$M_i$  – average number of acquaintances in a particular at-risk population in i-group of respondents depending on level of respect,

$M_3$  – average number of acquaintances in a cluster of respondents who gave a "medium" estimate of level of respect.

The weights were applied to average estimates in respective populations.

Adjusted statistics are as follows:

Table 9

Group	Size estimation	Confidential interval (95%)
Individuals who in the last 12 months used injection drugs	358 000	285 000 – 389 000
<i>Under 15 years of age</i>	28 000	17 000 – 34 000
<i>15-17 years of age</i>	59 000	49 000 – 69 000
Women (girls) who in the last 12 months provided sexual services for reward	81 000	65 000 – 93 000
<i>Under 15 years of age</i>	3 800	2 200 – 5 300
<i>15-17 years of age</i>	17 000	12 000 - 24 000
Men (boys) who in the last 12 months provided sexual services for reward	3 700	2 800 – 5 200
<i>Under 15 years of age</i>	700	0 – 800
<i>15-17 years of age</i>	500	200 - 800
MSM	14 000	10 000 – 17 000
<i>Under 15 years of age</i>	500	0 - 1000
<i>15-17 years of age</i>	400	80 - 600
Sexual partners of IDUs	32 000	27 000 – 39 000
CSW clients	285 000	248 000 – 322 000
Female sexual partners of MSM	2 700	-

According to our data IDUs ages between 10 and 15 make up 8% of all IDUs, 24% of IDUs are minors. For CSWs similar tendency holds true – according to our data 26% of CSWs are minors.

As one may judge from Table 9, following adjustments to account for insincere responses size estimates for sexual partners of IDUs and female sexual partners of MSM remain low. We have already mentioned in this report that those groups have low visibility in Ukrainian society. Respondents may be aware only of stable sexual partners of IDUs and female sexual partners of

MSM (who are married or living together). Data collected in the framework of recent quantity monitoring survey of IDU behavior in 2008 carried out in sixteen regions of Ukraine using RDS<sup>19</sup> suggests that 86% respondents had sexual contacts within the reporting period (last three months) [15]; out of which 76% (65% of all IDUs) had sexual contact with a steady sexual partners; 37% of IDUs had casual sexual partners; 5% had sex with commercial sexual partners and 4% themselves provided sexual services for a reward. Although, based on this data it is difficult to estimate how many unaccounted for sexual partners there are as we cannot extend data from sixteen regions to the whole country (this extrapolation<sup>20</sup> would be inaccurate leading to error which is difficult to estimate), one may state that the estimate number of sexual partners of IDUs have to be higher.

### **4.3. Regional estimates**

When using network scale up model to arrive at regional estimates for groups in question regional data is needed: data from the regions is needed – data on number of acquaintances in different regions in “known” groups (to estimate social network size) as well as in groups in question. To estimate size of social network of respondents’ statistical data on “known” groups is required<sup>21</sup>.

In this survey respondents were asked about their acquaintances who reside in Ukraine then we ask additional questions on how many acquaintances live outside the region (in case of Sebastopol and Kyiv outside these cities) to estimate the number of acquaintances within regions /cities. We assumed that most acquaintances of our respondents live in the region so it would be easier for them to estimate number of acquaintances outside the region and not otherwise.

Sample size for each region is about 400 respondents, this is the reason why at regional level we have a greater sample size error in estimating small groups like risk groups and bridge populations compared to national level. Size estimates for groups at regional level are presented in Appendix 1 of this report.

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<sup>19</sup> Respondent driven sample. For more details see [15].

<sup>20</sup> For example, regional data on single IDUs vary between cities from 7% до 80%.

<sup>21</sup> In regional analysis for some regions to estimate size of social networks category “men who were incarcerated in 2007” was not used as there were no such individuals in the region reported in the statistics.

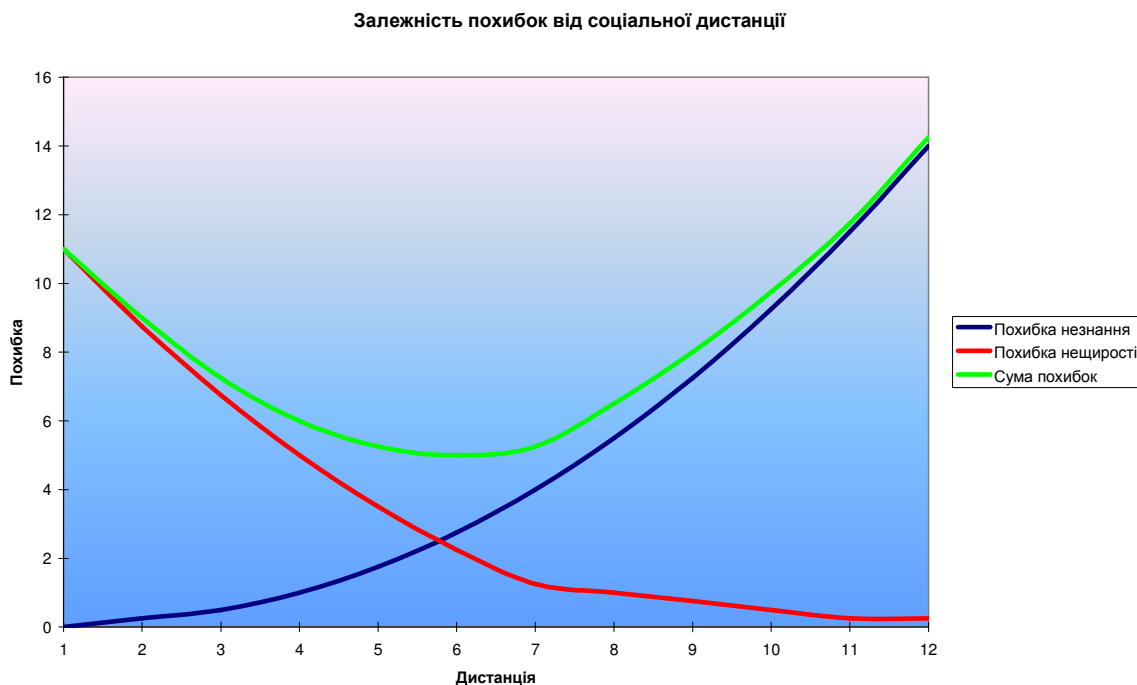
## 5. Results and recommendations

Survey results demonstrate that network scale up methodology needs to be further improved when using it in estimating size of at-risk populations.

First, to achieve higher level of sincerity special techniques have to be employed (repeated interviewing of respondents, secret ballot methodology, etc.).

We believe that one of the study's weaknesses in respect to using network scale up method is the following: the method aims to determine the maximum size of an "active network" i.e. those acquaintances respondent keeps in contact with during the last two years (see Chapter 2.1) but this network also includes weaker relations – acquaintances respondent does not know that well. When using concept of a circle<sup>22</sup> and concept of distance to the respondent "active network" are all those individuals respondent "saw" during two years – from close relations to "beyond the horizon". One has to account for the transmission effect and effect of insincerity resulting from stigmatization of the group or in other words respondents either are not aware or do not want to admit that they keep contact with someone from a marginalized group. The following trends may be defined. The weaker are the connections, the greater is the distance between respondent and his/hers acquaintance, the more probable is the "unawareness error" and less probable is "error of unwillingness to include into the network" (stigmatization effect). For example, it is much easier to admit that you know some drug user but it is much more difficult to say that he is your close friend. Also vice versa, the stronger are the connections, the closer is the distance to the respondent, "Unawareness error" is less probable in this case, however respondents are less likely to admit that they know this individual from a marginalized group.

Please see Diagram 1 for more detail.



<sup>22</sup> Anatoliy Pipich, Oksana Pipich. Social circles in the framework of social mediation (theoretical and methodological aspect). // "Sociology: theory, methods, marketing", 2008, N4. P.148-165

Total error is minimal not with great distances and not with little distances, but somewhere in between. It means that when using the network scale up method it is better to determine size of social network *not for maximum* social distance (not till “beyond the horizon”) but rather to determine the network size for *optimal* social distance.

Therefore, we believe that network scale up method should be employed in surveys that also measure social distance (power of connections), establishing network size when using different power connections and making quality forecasts for a wide range of known groups (especially known groups of low status).

2) Another way to improve size estimates for risk populations is to use the “anonymous (or thought or) acquaintance” methodology and accumulate data from several surveys. Please let us explain.

When we analyzed why it is not possible to estimate size of risk populations within usual population surveys the first difficulty had to do with stigmatization of these groups and respondent’s unwillingness to admit that they belong to those groups; and the second was that groups in question are hard to reach populations, they are relatively small compared to the rest of the population.

First difficulty may be solved by employing the “anonymous acquaintance” technique. Respondents are asked to select one of their acquaintances they know very well and the interviewer asks questions on the acquaintance’s lifestyle. Interviewer assures the respondent that s/he wouldn’t try to find out who that person is and how intimate their relationship is. Interview becomes anonymous and helps respondent open up about themselves and their close circle of friends. Special study demonstrates that respondents often talk about themselves or close relations. Therefore “unawareness error” in this case is practically eliminated and insincerity error is eliminated by a promise of anonymity and the fact that interviewer does not know how close respondent and his/hers acquaintance are.

The second difficulty is that non-specialized national surveys engage 2000 respondents, where fraction of risk populations is less than quarter percent – that is five people (even in large scale surveys with ten thousand respondents that is 25 persons), this is far from enough to ensure study’s reliability. One way out of this difficulty is to *accumulate* data from several studies in the course of a year. For example Kyiv International Sociology Institute conducts 60-70 representative surveys per year and if we could include in, say, 50 surveys several questions relating to an anonymous acquaintance who belongs to a risk population we could receive reliable data from 100 thousand respondents (even data on anonymous acquaintances would have error of 7 to 10%). Other sociology centers also conduct surveys. The cost of estimating size of one at-risk group in 50 surveys will be around 12-15 thousand USD.

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## APPENDIX 1. Regional estimates of at-risk populations and bridge groups

IDU	Corrected to account for level of social respect towards IDU		
	Size estimate	95% interval, lower bound	95% interval, upper bound
AR Crimea	33100	17700	48400
Kyiv city	29200	11600	46800
Kyivska	15200	7800	22600
Vinnnytska	10500	4600	16300
Volynska	5600	1400	10000
Dnipropetrovska	54900	30100	79800
Donetska	18000	5800	29900
Zhytomyrska	7100	3700	10600
Zakarpatska	600	0	1500
Zaporizka	38900	25800	51900
Ivano-Frankivska	3900	600	7200
Kirovogradska	11800	2600	20900
Luhanska	23000	7100	38900
Lvivska	13600	5900	21300
Mykolayivska	9100	3800	14500
Odeska	8100	2500	13600
Poltavska	10600	3500	17800
Rivnenska	2800	900	4600
Sumska	6000	2400	9600
Ternopil'ska	3100	1300	4900
Kharkivska	16600	5100	28100
Khersonska	9400	4700	14200
Khmelnitska	11900	6800	17700
Cherkaska	7400	2400	12300
Chernivetska	1400	300	2700
Chernihivska	12000	6200	17900
Sevastopol city	8100	3500	12700

FSW	Corrected to account for level of social respect towards FSW		
	Size estimate	95% interval, lower bound	95% interval, upper bound
AR Crimea	9100	3700	14600
Kyiv city	2000	100	4100
Kyivska	2100	700	3600
Vinnyska	4000	500	7800
Volynska	500	0	1200
Dnipropetrovska	4700	1400	8600
Donetska	9500	1700	18500
Zhytomyrska	2500	200	4800
Zakarpatska	1500	400	2600
Zaporizka	13600	7900	19200
Ivano-Frankivska	1100	300	2100
Kirovogradska	2300	900	3600
Luhanska	9200	3200	15000
Lvivska	3200	1700	4800
Mykolayivska	1400	400	2300
Odeska	2200	0	4900
Poltavska	2600	600	5000
Rivnenska	600	200	1000
Sumska	1800	500	3300
Ternopil'ska	300	0	600
Kharkivska	5900	2600	9400
Khersonska	4000	0	11200
Khmelnitska	2000	1000	3100
Cherkaska	2900	0	5800
Chernivetska	1000	200	1900
Chernihivska	500	0	1500
Sevastopol city	500	200	800

MSM	Corrected to account for level of social respect towards MSM		
	Size estimate	95% interval, lower bound	95% interval, upper bound
AR Crimea	3000	1400	4000
Kyiv city	200	0	7500
Kyivska	200	0	400
Vinnytska	300	0	800
Volynska	0	0	0
Dnipropetrovska	1100	0	2600
Donetska	500	0	1300
Zhytomyrska	300	0	800
Zakarpatska	200	0	500
Zaporizka	900	70	1800
Ivano-Frankivska	200	0	400
Kirovogradska	400	0	900
Luhanska	400	0	800
Lvivska	1800	0	4000
Mykolayivska	100	0	200
Odeska	200	0	400
Poltavska	500	0	700
Rivnenska	300	0	900
Sumska	40	0	100
Ternopil'ska	300	0	700
Kharkiv'ska	1900	100	3000
Kherson'ska	300	0	700
Khmelnitska	0	0	0
Cherkaska	400	100	800
Chernivetska	100	0	400
Chernihiv'ska	100	0	300
Sevastopol city	400	0	700

Sexual partners of IDU	Corrected to account for level of social respect towards sexual partners of IDU		
	Size estimate	95% interval, lower bound	95% interval, upper bound
AR Crimea	6000	2100	10000
Kyiv city	1500	100	2800
Kyivska	1200	100	2200
Vinnitska	3100	900	5300
Volynska	600	0	1200
Dnipropetrovska	7000	3900	10000
Donetska	2200	100	4300
Zhytomyrska	300	0	500
Zakarpatska	100	0	200
Zaporizka	400	0	900
Ivano-Frankivska	300	0	600
Kirovogradska	1500	500	2500
Luhanska	1600	0	3200
Lvivska	1700	700	2800
Mykolayivska	1000	400	1700
Odeska	1900	600	3300
Poltavska	1200	100	2300
Rivnenska	400	21	700
Sumska	200	0	500
Ternopil'ska	700	37	1300
Kharkiv'ska	900	0	2200
Kherson'ska	400	0	800
Khmelnitska	700	100	1300
Cherkaska	1100	0	2400
Chernivetska	300	28	600
Chernihiv'ska	900	0	2700
Sevastopol city	600	0	1700

Clients of FSW	Corrected to account for level of social respect towards clients of FSW		
	Size estimate	95% interval, lower bound	95% interval, upper bound
AR Crimea	12000	7000	17100
Kyiv city	21500	5900	37100
Kyivska	5100	1700	8400
Vinnyska	36300	23900	48700
Volynska	0	0	0
Dnipropetrovska	13400	7400	19400
Donetska	15500	6000	25000
Zhytomyrska	2400	700	4100
Zakarpatska	1600	300	2800
Zaporizka	28100	7200	49100
Ivano-Frankivska	4300	500	8200
Kirovogradska	1600	0	3500
Luhanska	43100	19100	67100
Lvivska	5000	1600	8400
Mykolayivska	8500	4300	12800
Odeska	16200	4900	27400
Poltavska	1400	0	3600
Rivnenska	3400	1300	5500
Sumska	1000	100	1900
Ternopilska	3100	1100	5200
Kharkivska	25800	15200	36400
Khersonska	1200	0	2900
Khmelnitska	12800	7300	18200
Cherkaska	1100	0	2600
Chernivetska	5200	2400	8000
Chernihivska	400	0	900
Sevastopol city	4300	800	7700

<b>Bisexuals</b>	<b>Corrected to account for level of social respect towards the group</b>		
	Size estimate	95% interval, lower bound	95% interval, upper bound
AR Crimea	3100	1600	4700
Kyiv city	0	0	0
Kyivska	0	0	0
Vinnnytska	200	0	500
Volynska	0	0	0
Dnipropetrovska	200	0	600
Donetska	400	0	1200
Zhytomyrska	0	0	0
Zakarpatska	0	0	0
Zaporizka	300	0	800
Ivano-Frankivska	100	0	300
Kirovogradska	100	0	300
Luhanska	0	0	0
Lvivska	1300	0	3100
Mykolayivska	0	0	0
Odeska	200	0	500
Poltavska	200	0	700
Rivnenska	100	0	200
Sumska	0	0	0
Ternopilska	300	0	800
Kharkivska	0	0	0
Khersonska	600	0	1400
Khmelnitska	0	0	0
Cherkaska	0	0	0
Chernivetska	100	0	200
Chernihivska	0	0	0
Sevastopol city	100	0	300

## APPENDIX 2. The Survey Questionnaire

The wealth of the person lies in the diversity of his or her social connections. There are people who have few acquaintances and there are people having wider range of acquaintances. We study how broad networks of acquaintances residents of Ukraine have, what life experience they have, whether they imagine how other people live.

I would like to ask you about all your acquaintances **who live in Ukraine and are aged 10 years and above**. As ‘acquaintances’ in this interview we will mean people you know in person and they know you by sight or by name and you can contact them in person, by phone or else, **and you had contact with the person in the past 2 years**. They could be your family members and other relatives, your friends and chaps, neighbors, colleagues or people with whom you study, perhaps people you despise or hate etc.

I will not ask you who you are talking about. It is important for me to know only the number of people we are talking about. All your answers will be fully anonymous.

ASK THE QUESTIONS OF THIS SECTION SEQUENTIALLY. YOU SHOULD ASK 2 QUESTIONS

**1. How many NAME EVERY CATEGORY FROM THE TABLE do you know?**

(FOR EXAMPLE: **How many men aged 20 to 30 do you know?**) WRITE DOWN THE NUMBER OF ACQUAINTANCES MENTIONED INTO THE TABLE IN COLUMN 1.

“Altogether in Ukraine”

**2. How many of them live outside your oblast?**

FOR INTERVIEWS IN KIEV OR IN CRIMEA YOU SHOULD ASK: **How many of them live outside Kiev (Crimea)?** WRITE DOWN THE NUMBER OF ACQUAINTANCES MENTIONED IN COLUMN 2. “Outside Oblast”. PASS CARD 1 TO THE RESPONDENT.

№	Group name	1. Altogether in Ukraine	2. Outside oblast
1.	How many men aged 20 to 30 years do you know?		
2.	How many men aged 15 to 17 years?		
3.	How about men over 70 years old? How many of them do you know?		
4.	How many women aged 20 to 30 years do you know?		
5.	How many women aged 15 to 17 years?		
6.	How about women over 70 years old? How many of them do you know?		
7.	How many children (girls and boys) aged 10-13 years do you know?		
8.	How many Moldavians who live in Ukraine do you know?		
9.	How many Romanians who live in Ukraine?		
10.	How many Poles?		
11.	How many Jews?		
12.	Gypsies?		
13.	How many people with disability of the 1 <sup>st</sup> category (the most evident limits of vital activity) do you know? SEE INSTRUCTION FOR A DEFINITION!		
14.	How many doctors of any specialty?		
15.	How many people deceased in 2007 are there among your acquaintances?		
16.	How many men named Pavel?		
17.	How many who were in prison in 2007?		
18.	How many men who officially divorced in 2007?		
19.	Do you know people that used drugs by injection for the last 12 months? How many of them? IF “0” GO TO QUESTION 24	 0 → №24	
20.	How many of them are under 15?		
21.	How many of them are aged 15-18?		

PRELIMINARY DRAFT. NOT FOR DISTRIBUTION

№	Group name	1. Altogether in Ukraine	2. Outside oblast
22.	How many of these (NAME NUMBER FROM Q. 19) are men?		
23.	How many of these (NAME NUMBER FROM Q. 19) are women?		
24.	Do you know people who are sexual partners of people who used drugs by injections during last 12 months? How many of them?		
25.	Do you know women who gave birth to a child in 2007? How many of them?		
26.	Do you know women (girls) aged 10 and above that provided sex services for money for the last 12 months? How many of them? IF "0" GO TO QUESTION 29	 0 → №29	
27.	How many of them are under 15?		
28.	How many of them are aged 15-18?		
29.	Do you know men (boys) aged 10 and above that provided sex services for money for the last 12 months? How many of them? IF "0" GO TO QUESTION 32	 0 → №32	
30.	How many of them are under 15 years old?		
31.	How many of them are aged 15-18?		
32.	Tell me please, among people you know, are there any philosophy doctors or doctors of sciences who gained their academic degree in Ukraine during the last 15 years? If there are, how many of them?		
33.	Do you know <u>women</u> who used sexual services provided by men for money? How many of them?		
34.	How about <u>men</u> who used sexual services provided by women for money? How many of them?		
35.	How many nurses who work in their specialty do you know?		
36.	Do you know men (boys) aged 10 and above who have sex with men for the last 12 months? How many of them? IF "0" GO TO QUESTION 40	 0 → №40	
37.	How many of them are under 15?		
38.	How many of them are aged 15-18?		
39.	Are there men among these (NAME NUMBER FROM Q. 36) who also have sex with women? If there are, how many of them?		
40.	How many militia men do you know?		
41.	Do you know people who live with HIV/AIDS? If yes, how many of them?		
42.	How many people who went for earnings abroad in 2008 do you know?		
43.	How many people who have a possibility to use Internet at home do you know?		

44. Now look at this card, please. I will name representatives of certain groups and you will say using the card what level of respect these groups enjoy with the social surroundings : PASS CARD  
44 TO THE RESPONDENT

		Very low	Low	Average	High	Very high	DK/NA
44.1.	Moldavians	1	2	3	4	5	8
44.2.	Romanians	1	2	3	4	5	8
44.3.	Poles	1	2	3	4	5	8
44.4.	Jews	1	2	3	4	5	8
44.5.	Gypsies	1	2	3	4	5	8
44.6.	Men aged 20 to 30 years	1	2	3	4	5	8

## PRELIMINARY DRAFT. NOT FOR DISTRIBUTION

		Very low	Low	Average	High	Very high	DK/NA
44.7.	Men aged 15 to 17 years	1	2	3	4	5	8
44.8.	Men over 70 years old	1	2	3	4	5	8
44.9.	Women aged 20 to 30 years	1	2	3	4	5	8
44.10.	Women aged 15 to 17 years	1	2	3	4	5	8
44.11.	Women over 70 years old	1	2	3	4	5	8
44.12.	Children (girls and boys) aged 10-13	1	2	3	4	5	8
44.13.	People with disability of the 1 <sup>st</sup> category (the most evident limits of vital activity)	1	2	3	4	5	8
44.14.	Men named Pavel	1	2	3	4	5	8
44.15.	Men who officially divorced in 2007	1	2	3	4	5	8
44.16.	Women who gave birth to a child in 2007	1	2	3	4	5	8
44.17.	Men who were in prison in 2007	1	2	3	4	5	8
44.18.	People who use drugs by injections	1	2	3	4	5	8
44.19.	Doctors	1	2	3	4	5	8
44.20.	Women who provide sexual services for money	1	2	3	4	5	8
44.21.	Men who provide sexual services for money	1	2	3	4	5	8
44.22.	Philosophy doctors or doctors of sciences who gained their academic degree in Ukraine during the last 15 years	1	2	3	4	5	8
44.23.	Men who have sex with men	1	2	3	4	5	8
44.24.	Men who use sex services provided by women for money	1	2	3	4	5	8
44.25.	Women who use sex services provided by men for money	1	2	3	4	5	8
44.26.	Nurses	1	2	3	4	5	8
44.27.	Sexual partners of people who use drugs by injections	1	2	3	4	5	8
44.28.	Men who have sex with men and women	1	2	3	4	5	8
44.29.	Militia men	1	2	3	4	5	8
44.30.	People who live with HIV/AIDS						
44.31.	People who went for earnings abroad in 2008	1	2	3	4	5	8
44.32.	People who have a possibility to use Internet at home	1	2	3	4	5	8

**SECTION D. SOCIO-DEMOGRAPHIC QUESTIONS**

**D1.** Indicate sex of the respondent: male...1 female...2

**D2.** How old are you? \_\_\_\_\_ (full years)

**D3. What highest level of education have you completed? CARD D3.**

Basic (less than 7 grades)	1	Vocational secondary (technical school etc.)	6
Incomplete secondary (less than 10 grades)	2	Incomplete higher (3 years and more)	7
RU, FZU, PTU after 7-8 grades	3	Complete secondary	8
Complete secondary (10-11 grades)	4	Candidate of sciences, doctor of sciences	9
SPTU, PTU after 10-11 grades	5	DK/NA	97

**D4. What is your nationality?**

Ukrainian		Pole	
Russian		Tatar, Crimean Tatar	
Moldavian	3	Gypsy	8
Jewish	4	Other	9
Romanian	5	DK/NA	10

**D5. D5. What is your current employment situation? If you work, what is your profession? Profession/Occupation \_\_\_\_\_**

WRITE DOWN RESPONDENT'S FULL ANSWER! CODE HIS/HER PROFESSION USING CODES 1-5 IN THE TABLE BELOW. IF RESPONDENT IS UNEMPLOYED CODE HIS OCCUPATION USING CODES 6-10.

Employed		Unemployed	
Doctor (of any specialty)	1	Housekeeper	6
Nurse	2	Pensioner (retired)	7
Military men	3	Student	8
Militia men	4	Looking for a job	9
Other profession	5	Other	10

DK/NA....11

### **APPENDIX 3. Estimating “social visibility” of populations with high risk of HIV (IDU, CSW, MSM) – results of a qualitative survey**

When using network scale up method to estimate size of at-risk groups, “transmission effect” may occur as a result of social invisibility or illusiveness of these groups. Women providing sexual services for reward, men having sex with men and injecting drug users as a result of stigmatization and fear of discrimination may keep their practices hidden even from their family members. These individuals may be among our close relations and acquaintances we just wouldn’t be aware of that.

“Transmission effect” does not overlap with the insincerity error which we analyzed and corrected in this study based on level of social respect to risk groups and bridge populations. If a person is disrespected because s/he belongs to a particular group it means that acquaintances know that s/he belongs to a particular group and vice versa if acquaintances do not know that a person belong to a particular group they cannot show respect or disrespect. Therefore, correct estimation of network size is equal to what we got as a result of network scale up method plus those individuals who were not included because of disrespect and those who were not included because of unawareness (transmission effect). Total correction of these two effects is product of two correction coefficients i.e. correction for visibility has to be applied to data corrected for the respect bias.

Estimation of “transmission effect” requires a representative study among at-risk groups. Design of such study would foresee:

- 1) surveying representative samples of at-risk groups on sites (different regions or Ukraine wide) with aim to listing all of their acquaintances (network scale up model defines acquaintance as an individual one kept in contact with within the last two years – “active social network”);
- 2) surveying members of social network of respondents – overall or selective in order to find out whether they know among other that their acquaintances (respondents in the first phase of the survey) belong to at-risk group.

Based on this data correction coefficient is derived to eliminate transmission effect – for example, if study results demonstrate that only half of social network of women who provide sexual services for payment are aware of this fact it means that network scale up data is underestimated two fold and correction coefficient will be 2.

It is difficult to conduct a study such as this one – it requires substantial resources and careful selection of research tools; there may be a leak in confidential information about respondents. In the framework of this study we attempted to estimate possible values of transmission effect within rapid quality survey of at-risk populations. We also searched for relevant data in available studies of at-risk populations conducted in Ukraine. This is a quality study, as it does not yield reliable results. Moreover validity of the study may also be called into question, because we did not have an opportunity to question members of respondents’ social networks.

From March 7 to March 9 interviews with most at-risk populations were organized, namely injecting drug users, female sex workers and men having sex with men. 28 IDUs, 21 CSW and 108 MSM were interviewed in Kyiv, Donetsk, Odesa and Lviv. NGO social workers working with vulnerable groups recruited respondents. NGO clients were invited to participate in the interview. Apart from regional quotas respondents must have engaged in risky behavior in the past 12 months (sex for payment in case of CSW, injection drug use in case of IDUs and sex with men in case of MSM). Taking into account that CSWs and IDUs often intermix, an

additional selection criterion was introduced for CSWs – abstinence from drugs in the last 12 months.

Data collection tools included a combination of personal interviews and phone interviews and questionnaires filled out by respondents. Interviews were conducted by the Kyiv International Sociology Institute (IDUs and CSW) and social workers of the ICF “International HIV/AIDS Alliance Ukraine” partner organizations. Standardized questionnaire was used during interviews. Respondents were not limited in time to make up a full list of their acquaintances who fit criteria developed for representative survey based on a network scale up model. Number of persons on the list was documented during the interview. Then respondent was asked how many people on the list know about his/hers risky behavior. We also asked respondent to introduce sub categories (relations, friends, acquaintances, colleagues, neighbors and so on) and indicate how many people in these sub categories know that the respondent uses injection drugs/provides sexual services for payment/practices sex with men.

Social networks of NGO clients who acted as respondents in this survey include social workers of these NGOs and other IDUs, CSWs or MSM who probably know that the client belongs to a risk group and this may influence our estimates, to avoid that we asked respondents not to include those people into the acquaintances list (at the end of questionnaire questions on number of such acquaintances were put to respondents).

Please see Table D3.1 for results on how many people in social networks of individuals from at-risk populations know that they engage in risky behavior:

*Table D3.1*

<b>Group</b>	<b>Surveyed</b>	<b>% of people on the list who are aware of risky behaviour</b>	<b>% of people who are not aware</b>	<b>Correction coefficient</b>
IDU	28	57%	43%	1.75
CSW	21	34%	66%	2.94
MSM	108	24%	76%	4.17

As we have mentioned earlier this data is unreliable because sample are too small and non-representative, however results seem to support out hypothesis that IDUs are the most visible group, and MSM are least visible.

Apart from that we believe that statistics on those who are aware are underestimated because statistics do not account for dissemination of information among the network of respondents.

Using relevant data within other studies conducted among Ukrainian at-risk populations allowed to receive more reliable data on MSM (see Table D3.2 – D3.4). However validity of these data when used to calculate transmission effect may also be called into question.

Table D3.2. Survey of MSM in Ukraine: Internet site qguys.ru, 2009

Who knows that you are gay (bi)?	Number	% of surveyed MSM
I am open about it	1300	10%
It is obvious	251	2%
Close friends	6478	50%
Relations	1424	11%
Co-workers	478	4%
No one but me	4399	34%
<b>TOTAL</b>	<b>12829</b>	<b>112%</b>

Experts who work within the MSM community in Ukraine say that this web site is very popular among the target group; however a more active part of gay community registers there. Data analysis demonstrates that option “no one but me” was selected by 5% of those who selected other options. Moreover, as data presented by “Our World” (see Table D3.3) shows, this variant probably means “no one but a close circle of other MSM”, because when this option was introduced only 4% of MSM remain invisible.

Table D3.3. MSM Survey: “Our World”, 2005[16] (mail survey among registered users; snowball sampling)

Visibility of MSM	Numbers	% of surveyed MSM
Openly gay to everybody	85	10%
Openly gay to a wide circle of friends	153	18%
Openly gay to relations and close friends	230	27%
Openly gay to a narrow circle of other MSM	348	41%
Remain closed to everybody	34	4%
<b>TOTAL</b>	<b>850</b>	<b>100%</b>

Table D3.4. MSM Survey: “Center for social expertise of the Sociology Institute of the National Academy of Sciences of Ukraine”, 2004 (800 respondents in seven regional centres, snowball sampling)

Signs of internal discrimination	% of those who agree with the statement
I try my best to conceal the fact that I have sexual contact with men, for fear of being discovered	57%
I believe I have more opportunities and interests than men who do not have sex with men	45%
I try to socialize with the likes of me (that is men who have sex with men)	31%
Sometimes I think that I am not capable of forming relations with other people unless they are men who practice sex with men	15%
I believe I have less opportunities to realize my life potential than men who do not have sexual contacts	6%

Please see Table D3.5 for generalized data we used to adjust estimates on group size of MSM for transmission effect and correction coefficients.

Table D3.5

	Aware	Somewhat aware	Not aware	Not aware (+50% out of somewhat aware)
Quality estimate	24	0	76	76
qguys.ru	16	55	29	57
Our World	28	68	4	38
Centre for Social Expertise	43	0	57	57

If we assume that 57% are not aware (43% know) correction coefficient for MSM would be **K=100/43=2.3**.

Therefore correction coefficient for MSM which was presented in a rapid quality survey of at-risk populations was adjusted with data from other studies. In this case other coefficients have to be adjusted to keep in line with the correction coefficient (see Table D3.6).

Table D3.6

Group	Correction coefficient	Adjusting correction coefficient
IDU	1.7	1.5
CSW	2.9	2.0
MSM	4.2	2.3

Applying these correction techniques to adjust network scale up data, previously adjusted for respondents' insincerity, produces the following estimates of at-risk populations:

Table D3.7

	Size estimation	Confidential interval (95%)
Individuals who in the last 12 months used injection drugs	537 000	428 000 – 584 000
Women (girls) who in the last 12 months provided sexual services for reward	162 000	130 000 – 186 000
Men who in the last 12 months practiced sex with men	32 000	23 000 – 39 000