2017

Population Size Estimation of People who Inject Drugs in Georgia 2016

STUDY REPORT

Prepared by:

Bemoni Public Union (BPU)

Curatio International Foundation (CIF)

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AIDS Center	Infectious Diseases, AIDS & Clinical Immunology Research Center
BPU	Bemoni Public Union
IBBS	Integrated Bio-Behavioral Surveillance
CI	Confidence interval
CIF	Curatio International Foundation
EMCDDA	European Monitoring Center for Drugs and Drug Addiction
GEL	Georgian Lari (exchange rate of 2.49GEL = 1USD at the time of this report)
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHRN	Georgian Harm Reduction Network
GoG	Government of Georgia
HCT	HIV Counseling and Testing
HIV	Human Immunodeficiency Virus
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
IEC	Information, Education, Communication
MoIA	Ministry of Internal Affairs of Georgia
MoLHSA	Ministry of Labor, Health and Social Affairs of Georgia
NCDCPH	National Center for Disease Control and Public Health
NSU	Network Scale-Up
NGO	Non-Government Organization
OST	Opioid Substitution Treatment
PSE	Population Size Estimation
PWID	People Who Inject Drugs
RDS	Respondent Driven Sampling
RDSCM	Respondent Driven Sampling Coupon Management
RDSAT	Respondent Driven Sampling Analysis Tool
SPSS	Statistical Package for the Social Sciences

CONSENSUS ESTIMATE 2016

Estimated number of PWID in Georgia equals 52,500 (50,000 – 56,000)

National prevalence estimates for the injection drug use equals

2,24% (2,13% - 2,39%) per 18-64 years old population, and

1,41% (1,34% - 1,51%) per general population

EXECUTIVE SUMMARY

In order to design comprehensive, effective and adaptive HIV prevention and control programs, public health practitioners must understand their local epidemic in terms of the predominate modes of HIV transmission, populations that are most at risk of acquiring HIV and within which new infections are occurring, and the size of these populations. Although HIV prevalence is low in Georgia, based on the latest statistical data, new HIV infections continue to be predominantly attributed to the risk exposure via heterosexual contact followed by acquisition through injection drug use.

It is difficult to overestimate the importance of obtaining accurate information on the prevalence of illicit drug use. Such information is valuable both in terms of monitoring the impact of drug misuse at both national and local levels as well as in assessing the effectiveness of prevention efforts. It is not possible to give an accurate, definite, answer to the question of how many drug users are present in a community. Therefore, we must establish an 'estimate' that will provide us with an approximate picture of drug use. The usefulness of prevalence estimates is dependent on the appropriateness of the method employed and the reliability of the data sources used. Many experts now believe that no one method will give us a true picture and several methods should be combined to get the best picture possible. The present study used multiple population size estimation methods applicable for People Who Inject Drugs (PWID).

The present study was implemented within the GFATM-funded project "Generate evidence base on progress in behaviour change among MARPs and effectiveness of preventive interventions" by Curatio International Foundation (CIF) and Bemoni Public Union (BPU). This program aims at conducting IBBS studies among PWID in 7 main urban areas of Georgia, using Respondent Driven Sampling (RDS) method and the PSE questionnaire was incorporated into the main IBBS instrument.

This study was to estimate the size of PWID population in Georgia in 2016 using different estimation methods and triangulating the findings to provide the most plausible estimates. For the purpose of this study, we regarded any person who has used any psychoactive drug through injections (into muscles or veins) in a non-medical context. We applied Network Scale-Up (NSU) and Multiplier-Benchmark methods to estimate number of PWID in Georgia.

Calculation of the PWID population size nationwide revealed these figures:

Estimation Methods	2016	2014
	Estimated N of PWID	**Estimated N of PWID**
Estimation method N 1, using Network Scale-up (NSU) method	**36,500**	43,800
THE FIRST SCENARIO – Calculation of national prevalence and estimated numbers according to the mean indicators of 7 cities		
Estimation method N 2, using multiplier benchmark method with demographic indicator (population density)	**62 300**	52,903
Estimation method N 3, using multiplier benchmark method with prevalence rate coefficients	**58 900**	52,494
THE SECOND SCENARIO – Calculation of national prevalence and estimated number according to the median indicators of 7 cities		
Estimation method N 2, using multiplier benchmark method with demographic indicator (population density)	**53 000**	33 390
Estimation method N 3, using multiplier benchmark method with prevalence rate coefficients	**50 000**	34 937
National estimates *		
Based on mean indicators of multiplier benchmark with demographic indicator & prevalence rate coefficients.	**52,500**	**49,700**
Prevalence % (18-64)	2.24	2.02
Based on median indicators of multiplier benchmark with demographic indicator & prevalence rate coefficients	**46,500**	**37,400**
Prevalence % (18-64)	1.98	1.5

Findings from all estimation methods were discussed at the consensus meeting and the final consensus estimates were endorsed by the participants. It was decided that the mean of estimates calculated by all presented methods should be regarded as the estimated size of the PWID population in Georgia in 2016. According to the final consensus estimate, the Estimated number of IDUs in Georgia equals 52,500 (50,000 – 56,000); National prevalence estimates for the injection drug use equals 2,24% (2,13% - 2,39%) per 18-64 years old population and 1,41% (1,34% - 1,51%) per general population.

2016 estimates derived from both mean and median indicators, are higher than estimated sizes of PWID in Georgia, calculated in earlier PSE exercises. This indicates that in recent years there has been a persistent tendency in increasing the number of problem drug users in Georgia.

1. INTRODUCTION

In order to design comprehensive, effective and adaptive HIV prevention and control programs, public health practitioners must understand their local epidemic in terms of the predominate modes of HIV transmission, populations that are most at risk of acquiring HIV and within which new infections are occurring, and the size of these populations. Although HIV prevalence is low in Georgia, based on the latest statistical data, new HIV infections continue to be predominantly attributed to the risk exposure via heterosexual contact followed by acquisition through injection drug use.

It is difficult to overestimate the importance of obtaining accurate information on the prevalence of illicit drug use. Such information is valuable both in terms of monitoring the impact of drug misuse at both national and local levels as well as in assessing the effectiveness of prevention efforts. It is not possible to give an accurate, definite, answer to the question of how many drug users are present in a community. Therefore, we must establish an 'estimate' that will provide us with an approximate picture of drug use. The usefulness of prevalence estimates is dependent on the appropriateness of the method employed and the reliability of the data sources used. Many experts now believe that no one method will give us a true picture and several methods should be combined to get the best picture possible. The present study used multiple population size estimation methods applicable for People Who Inject Drugs (PWID).

If it deems possible, it is always expedient to address the issue of estimation of the size of key populations within the framework of larger studies, aimed to achieve some other goals (e.g. behaviour monitoring of most at-risk groups) – you can just add a set of relevant size estimation questions to the questionnaire. This will save you a lot of money and effort. For example, in order to estimate the size of PWID population in a certain city using different estimation methods it would be enough to add relevant questions to the Integrated Bio-Behavior Surveillance (IBBS) surveys questionnaire.

The present study was implemented within the GFATM-funded project "Generate evidence base on progress in behaviour change among MARPs and effectiveness of preventive interventions" by Curatio International Foundation (CIF) and Bemoni Public Union (BPU). This program aims at conducting IBBS studies among PWID in 7 main urban areas of Georgia, using Respondent Driven Sampling (RDS) method and the PSE questionnaire was incorporated into the main IBBS instrument.

2. METHODOLOGY

2.1 Objective of the Study

This study was to estimate the size of PWID population in Georgia in 2016 using different estimation methods and triangulating the findings to provide the most plausible estimates.

2.2 Defining the Target Population

For the purpose of this study, we regarded any person who has used any psychoactive drug through injections (into muscles or veins) in a non-medical context.

Inclusion criteria - to be eligible, each participant must meet the following criteria:

1. Aged 18 years or older
2. Lives in the participating city/district or neighbouring village
3. Has not previously completed an interview under the current study
4. Able to complete the interview in Georgian
5. Arrives at the study site with a valid study recruitment coupon
6. Provides informed consent
7. Currently injects drugs (this was identified by reported drug injection in the month prior the survey)
8. Has either:

⇒ Physical evidence of recent injection (fresh track marks, scabs, or abscesses), OR

⇒ Knowledge of drug prices, preparation, injection, and etc.

2.3 Methods

A variety of methods are available for estimating the prevalence of heavier or more problematic patterns of illegal drug use. These include: population-based surveys (although, these are often unreliable for rarer, stigmatized and hidden patterns of drug use); case-finding studies; capture-recapture estimates; multiplier techniques; nomination techniques; synthetic estimates, based on social or demographic variables assumed to correlate with drug prevalence; and a variety of more sophisticated statistical modeling approaches.

We applied Network Scale-Up (NSU) and Multiplier-Benchmark methods to estimate number of PWID in Georgia.

Method 1: Network Scale-up

The general concept behind network scale-up method is that an individual's social network is representative of the whole population (Bernard et Al., 2010; Sulaberdize et al., 2016) That is, one person's group of friends reflects the characteristics of the community as a whole. By asking the respondent questions about the stigmatized behavior (e.g. injecting

drugs) in their acquaintances (anybody in their network), rather than the respondent themselves, it is expected that we collect more honest responses and so would have an accurate population size estimation (Feehan et al., 2016). For example, if in a household survey of 400 participants, on average everyone has 200 persons in their network and on average the survey participants know 2 persons who inject drugs, then the overall estimated prevalence of dug injection is 2/200=%1.

Household surveys and data collection

- **Kutaisi household survey**: Using a two-stage cluster random sampling, we recruited 500 adults (18 to 49 years old) in a household survey to estimate the average network size and the size of PWID population in Kutaisi in 2017. The National Statistics Office census data from 2014 year was used as a sampling frame. Kutaisi is divided into 319 census areas. Census areas were selected as primary sampling units (PSU) and households as the second. 100 PSUs were selected from the list by a system random method. Number of households in each PSU was defined as five. Within each PSU the random walk method was used to select the households. Within each selected household one adult person (aged 18-49 years) was selected for interview (based on last birthday). We defined PWID as any person who injected drug for none-medical purposes in the past 12 months before the survey. Then, we divided participants in two groups by random. One group were asked to report the number of people they knew by name or face and had contacts (in-person or by phone, email, message) during past two years and the other group were asked to report the number of people they had meal with during the past two years (Freehan, 2016). To collect the data, in a face-to-face interview with the survey participants, we asked and recorded the number of PWID they knew or had meal with during the last two years. We also asked them to report number of PWID by different subgroups including male, female, under 18 years, 18 to 30 years, and older than 18 years.
- **Tbilisi household survey**: Using cluster two-stage stratified random sampling, in a household survey in 2014, we recruited 1,015 adults (18 to 49 years old) in Tbilisi to estimate the network size and the size of PWID population. The National Statistics Department election list for 2010 was used as a sampling frame. Tbilisi was divided by municipalities (strata) and election areas. The election areas were selected as primary sampling units (PSU) and households as the secondary sampling units (SSU). Within each municipality number of PSUs were selected based on the probability proportion to size. PSU were randomly selected from the list. Within each PSU, the random walk method was used to select five households. Within each selected household, one person aged 18-49 years was selected by random for interview. If there were no response at the household after 3 visits (on different days and different times) the next household on the right was selected. We defined PWID as any person who injected drug for none-medical purposes in the past 12 months before the survey. Participants were asked to report the number of people they knew by name or face and had contacts (in-person or by phone, email, message) during past two years. To collect the data, in a face-to-face interview with the survey participants, we asked and recorded the number of PWID they knew during the

last two years. We also asked them to report number of PWID by different subgroups including male, female, under 18 years, 18 to 30 years, and older than 18 years.

Analysis

Average Network Size Estimation

To estimate the average social network size in Kutaisi, we applied the known-size population approach (Restegari et al., 2013) an adapted game of contacts (McCormic et al., 2010; Salganic et al., 2011). We asked and recorded the number of people from the 21 groups with "known size" population whom they knew or had meal with during the last two years (Table 1). For average network size calculation for Tbilisi residents, we used the same 21 groups with the corresponding known size for 2014.

Table 1– List and population size of twenty-one "known size" populations in Georgia

Question	Known Size	Sex Category	Same-sex Population Size in Georgia	Total Population in Georgia	% of the same-sex category	% of total population
First name of "**Mamuka**" in **2016**?	22,293	male	1,779,500	3,720,400	1.3%	0.6%
First name of "**Luka**" in **2016**?	32,739	male	1,779,500	3,720,400	1.8%	0.9%
First name of "**Zurab**, or **Zura**, or **Zuka** or **Zuriko**" in 2016?	32,944	male	1,779,500	3,720,400	1.9%	0.9%
First name of "**Vazha**" in **2016**?	13,504	male	1,779,500	3,720,400	0.8%	0.4%
First name of "**Sophiko**, or **Sophio** or **Sopho**" in **2016**?	31,372	female	1,940,900	3,720,400	1.6%	0.8%
First name of "**Manana**" in **2016**?	34,698	female	1,940,900	3,720,400	1.8%	0.9%
First name of "**Shorena**" in **2016**?	15,671	female	1,940,900	3,720,400	0.8%	0.4%
First name of "**Nino**, or **Niniko**, or **Nina**" in **2016**?	124,108	female	1,940,900	3,720,400	6.4%	3.3%
First name of "**Maya**" in **2016**?	47,859	female	1,940,900	3,720,400	2.5%	1.3%
First name of "**Davit**, or **Dato**, or **Datuna**, or **Datiko**" in **2016**?	72,304	male	1,779,500	3,720,400	4.1%	1.9%
Married in **2016**	25,101	both	3,720,400	3,720,400	0.7%	0.7%
Teachers in **2016-17**	65,445	both	3,720,400	3,720,400	1.8%	1.8%
Male teachers in **2016-17**	9,107	male	1,779,500	3,720,400	0.5%	0.2%
Deaths in **2016**	50,711	both	3,720,400	3,720,400	1.4%	1.4%
Male deaths in **2016**	26,098	male	1,779,500	3,720,400	1.5%	0.7%
Deaths due to cancer in **2016**	6,819	both	3,720,400	3,720,400	0.2%	0.2%
Male deaths due to cancer in **2016**	3,844	male	1,779,500	3,720,400	0.2%	0.1%
Injured or deaths in road accidents in **2016**	8,561	both	3,720,400	3,720,400	0.2%	0.2%
Male injured or deaths in road accidents in **2016**	5,255	male	1,779,500	3,720,400	0.3%	0.1%
Students in higher education institutions in **2016-17**	140,261	both	3,720,400	3,720,400	3.8%	3.8%
Male students in higher education institutions in **2016-17**	68,668	both	3,720,400	3,720,400	1.8%	1.8%

In both household surveys, to account for the implausible outliers, for anybody who has reported more than 30 persons in each of the 21 groups, their responses were capped at 30.

We used 21 known size populations (j=21), to back calculate the average social network size for residents of Kutaisi and Tbilisi. Calculations were made using the following steps (Sulaberidze et al., 2016; Wang et al., 2015)

Calculate the network size for every participant (i) using all eligible populations with known size (j):

$$c_i = \frac{\sum_{ij} m_{ij}}{\sum_j e_j} t$$

1. Make the average of C_i and use the average ($\hat{c}$) to back calculate the size of every populations:

$$e_j = \frac{\sum_{ij} m_{ij}}{\sum_i \hat{c}} t$$

2. Devide the estimated size (e) by the real size (E) of each 21 populations with known size to measure the bias factor:

$$Bias\ factor_i = \frac{E_i}{e_i}$$

3. If any of the bias factors are more than 2.0 or less than 0.5, drop the population with the most deviance. Go to step 1, and repeat the process.
4. Stop when all bias factors are within the range of 0.5 to 2.0 and report the average social network size.

PWID Population Size Estimation

In Kutaisi household survey, since the two groups (asking about the number people they knew or had meal) had reported comparable number of people in their social and meal networks, we did not analysis the results by the study groups.

In both household surveys, to account for the implausible outliers, for anybody who has reported more than 30 PWID in their network, their response was capped at 30. We also excluded data for participants who have not reported the number of PWID by sex (male and female) or age (under 18, 18-30, >30) groups or their total PWID number was different from the summation of subgroups by ± 2 number for two sex groups and by ± 3 number for three age groups.

After removing outliers and discordant data (as explained above), using the maximum likelihood estimator proposed by (Killworth et al., 2006), we estimated the population size of PWID by

$$\text{PSE}_{\text{(Network Scale-Up)}} = e = \frac{\sum_i m_i}{\sum_i \hat{c}} t$$

- The average social network size of participant i = c_i
- Number of PWID who were known to or had meal with the participant i = m_i

- The total (and male, female, under 18, 18+) population of Kutaisi (or Tbilisi) in 2016 = t

To account for the uncertainty in number of PWID that have been reported by the survey participants, we used Bootstrap resampling with 1000 replications to calculate the point and 95%CI for 'm'. We used the point and 95%CI for 'm' to calculate the point and 95%CI for the PWID population size using the above formula.

Adjusting the PWID population size for two biases

In order to adjust the estimates for two known biases, information transparency bias (PWID may not openly talk to others about their injection behavior) (Maghsoudi et al., 2014). and popularity ratio (in comparison to others, PWID may have smaller network sizes and therefore are less likely to be counted in social or meal networks) (Maghsoudi et al., 2014), 280 PWID in Kutaisi and 370 PWID in Tbilisi who provided verbal informed consent and agreed to participate, were recruited by an RDS method. RDS participants were asked to report the number of persons in each of the 21 known size populations listed in the Table 1. They also were asked about how many of them knew that the participant injected drugs.

In both RDS surveys, to account for the implausible outliers, for anybody who has reported more than 30 persons in each of the 21 groups, their responses were capped at 30. Then, we calculated the two correction factors:

- Information transparency bias = Total number of people in the 21 groups that they knew the participants injecting drugs divided by the total number of people in the 21 groups reported by the participates. In Kutaisi, 0.52 or 53% of people in the 21 groups knew that the participants injected drug. So, the correction factor (called visibility factor) for Kutaisi is 1/0.52 = 1.92. We used bootstrap resampling to calculate the 95% simulation interval (SI) for this corrections factor for Kutaisi. The lower and upper 95% SI are 1.81 and 2.04. Using the same methods, we calculated the correction factor (visibility factor) for Tbilisi as 1/0.45=2.24 (95% SI: 2.11, 2.39).
- Popularity ratio = Average number of people in the 21 groups that reported by the RDS survey participants divided by the average number of people in the 21 groups that reported by the household survey participants. In Kutaisi, on average RDS participants knew 4.88 (95%SI 4.32, 5.45) persons from the 21 known size groups, while household participants on average knew 1.46 (95%SI: 1.32, 1.63) persons from the 21 known size groups. So, the popularity ratio in Kutaisi is estimated as 3.33 (95%SI: 2.28, 3.38) which transformed to a popularity correction factor of 1/3.33 = 0.29 (95%SI: 0.28, 0.36). With the same approach, In Tbilisi, on average RDS participants knew 4.63 (95%SI: 4.16, 5.11) persons from the 21 known size groups, while household participants on average knew 3.10 (95%SI: 2.87, 3.33) persons from the 21 known size groups. So, the popularity ratio in Tbilisi is estimated as 1.49 (95%SI 1.45, 1.53) which transformed to a popularity correction factor of 1/1.49 = 0.67 (95%SI: 0.65, 0.69). After presenting the popularity ratios to the technical advisory group, and reviewing the literature on popularity ratio of PWID (which was on average 0.70), the group technical advisory group suggested to use

0.70+(1.0-0.70)/2 = 0.85 as the popularity ratio, and 1/0.85=1.18 as the popularity correction factor for population size estimation for both Kutaisi and Tbilisi.

Method 2: Multiplier-benchmark Method with Synthetic Estimation

Of all the methods of indirect estimation the multiplier-benchmark approach is probably the easiest to implement and probably the one with the longest history of use in the field of drug epidemiology. There is a flexibility in how it is applied that makes it useful in many circumstances. In the standard application, it uses information about the known size of an identifiable subsection of the target population of drug users, and generalizes from that subsection to give an estimate of the complete target population by applying a multiplying factor.

In multiplier-benchmark studies, the research makes use of pre-existing data for some behaviour or event that is common in the target population of problem drug-taking, for example, police arrest data for drug use or possession, accident and emergency ward data and, more directly, drug treatment data and data on drug-related deaths. Such pre-existing information, which can be simply an anonymous count of the key behaviour over a fixed time period, is called **the benchmark information**. Along with that national data set is required an estimate of the proportion of the target population who have experienced the event, that is, who have been arrested, who have died etc.; the inverse of that proportion is called **the multiplier**. Estimating the associated multiplier requires, usually, a small, separate sub-study using **nomination technique** and again, usually, anonymous records are sufficient.

The following stages of prevalence estimation method for each of the selected 7 cities had been used in this study.

1. PWID Data collection (gaining the benchmark data - B) - all available data on injection drug use in Georgia were reviewed. PWID data are recorded under the current system for the year 2016 (details see below in chapter "Benchmark Data Collection"). ***2. Estimation of the value of multiplier (M) -*** the proportion of the target population in the benchmarks is obtained from research studies using nomination techniques (study using the Respondent Driven Sampling (RDS) methodology based on appropriate eligibility criteria and accurate sample size calculations was conducted). The survey collected the data among PWID using nomination method/ questionnaire developed by SCAD epidemiology experts. ***3. The derivation of multiplier -*** this stage involves two steps: a) Estimation of the **percentage (P)** of PWID recorded from Stage 2. Separate estimates for different benchmarks were made in each city. b) **Multiplier (M)** is estimated for each benchmark by the inverse of percentages (Pisani, 2002). The formula **M = 100/P;** ***4. Estimate the number of drug injectors -*** numbers of PWID estimates for each benchmark are obtained by multiplying the recorded number of PWID (collected from the available data source) by an appropriate multiplier (The formula **E = BxM**). ***5. Calculation of a prevalence of drug injection for each city -*** it was based on data on population distribution (State Department of Statistics of the Ministry of Economic Development of Georgia). The Census data gave the population for urban areas. The population between 18 and 65 was used as the denominator for the

prevalence based estimate. The appropriate estimates of injecting drug use were then applied to the adult population. An upper and lower limit is provided by statistical means.

Development of the nomination questionnaire

Nomination questionnaire was developed in 2008 during the first round of size estimation exercise and was slightly changed during subsequent rounds of the survey.

Benchmark Data Collection

The benchmark data for this study were collected from the following accessible data sources:

1. **NCDCPH database for abstinence oriented treatment facilities (addiction clinics) -** This database obtains anonymous data on individuals who are in contact with a range of drug services. The number of centers involved in treatment of drug addicts in 2016 was 10 (eight of those were located in Tbilisi, 1 – in Batumi, and 1 – in Imereti).
2. **NCDCPH database for HIV testing with PWID identifier -** Since 2010, NCDC maintains the epidemiology register for HIV testing developed by the CIF under the Global Fund Project entitled "Establishment of Evidence-based Basis for HIV/AIDS National Program by Strengthening Surveillance System". The project was carried out from February 2008 to December 2010. The aim of the project was to reform the national HIV/AIDS surveillance system, and it encompassed three basic components, each of them embracing a series of activities. The NCDCPH has been identified as the key national agency responsible for coordinating HIV/AIDS surveillance.
3. **Center for Mental Health and Prevention of Addiction Opioid Substitution Program database of attending PWID -** In December 2005, the first Methadone substitution therapy programme was launched in the country. In 2016, Georgia had three types of opioid substitution treatment: GFATM Opiate Substitution Therapy (OST) Program, the State Substitution Program and substitution programs operating by private institutions. Two different types of OST are available: Methadone substitution and Suboxone® (combination of Buprenorphine and Naloxone) substitution. In 2016, 14 Opioid substitution Centers operated throughout Georgia: in Tbilisi, Gori, Kutaisi, Zestaponi, Zugdidi, Ozurgeti, Poti, Batumi, Kobuleti and Telavi.
4. **Ministry of Internal Affairs database of PWID -** The data on Injection drug users come into contact with the police throughout the country is available by special request from the Ministry of Internal Affairs (MoIA). Under the Article 45[1] of the Administrative Code of Georgia, purchase and possession of drugs in minor

[1] Article 45 of the Administrative Code of Georgia - "Illegal production, purchase, storage, use without doctor's prescription of small amounts of psycho-active substances under control in Georgia for individual use"

quantities or use of drugs without medical prescription is punishable with fine, or administrative detention. The Article 273 [2] of the Criminal Code of Georgia stipulates that drug use is only qualified as a criminal offence if a person previously subjected to administrative punishment for drug use continues to use drugs without medical prescription during one year following the penalty. Information relating to the use of injection drugs is available from the Department of Information and Analysis of the MoIA. According to the Article 45 of the Code of Administrative Offences, in case of considerable doubt that a person is under the influence of drugs and/or psychotropic substances, or has used drugs, the police officer is authorized to demand that the person in question undergo an examination. A clinical laboratory and/or laboratory test determining the fact of drug use and/or drug and/or psychotropic intoxication is carried out based on the official referral from an authorized police officer. The, MoIA specifically, the Department of Information and Analysis records all cases where the fact of drug use without appropriate medical purposes has been established.

5. **The databases on PWID receiving HIV Counselling and Testing (HCT)** of Georgian Harm Reduction Network (GHRN) available in all selected cities - GHRN runs fourteen harm reduction service sites in eleven cities across Georgia. GHRN is a key actor to deliver low threshold harm reduction services to PWIDs. The services accessible in service sites include but are not limited to needle/syringe, safe injection devices, safe sex devices and information material distribution. GHRN service sites offer medical counselling and other supplementary services. The Network reaches out to approximately 9,500-11,000 PWIDs per month and plays a crucial role in HIV prevention among them.

Benchmark Data

As a drug user may be in contact with more than one agency, and therefore be included in the data from more than one source, sufficient information is needed on each individual to identify multiple occurrences. Matching records between data sources can be complex, and within the area of record linkage, it is recognized that problems exist even when several different fields of data on each individual has been collected.

1. Health-related Indicators

⇒ PWID in abstinence oriented treatment in 2016

Source of information: The National Center for Disease Control and Public Health (NCDC), Center for Mental Health and Prevention of Addiction

[2] Article 273 of the Criminal Code of Georgia – "Illegal production, purchase, storage of narcotic drugs, their analogs or precursors for personal use and/or illegal use without doctor's prescription"

Table 2 Detoxification treatment benchmark data

City	Treatment Type	# of Treated PWID
Tbilisi	**Inpatient**	**768**
	Outpatient	**1419**
Batumi	**Inpatient**	**27**
	Outpatient	**35**
Imereti*	**Inpatient**	**13**
Grand total		**2262**

Explanation: Double counting cannot be excluded, as many drug users will come into contact with a variety of treatment facilities. Utilizing unique personal identifiers to prevent double counting is impossible in Georgia.

* LTD B. Naneishvili Mental Health National Center

⇒ Drug users in Opioid substitution treatment in 2016

Source of information: Methadone Substitution Programme database of the Center for Mental Health and Prevention of Addiction

Table 3 Opioid substitution treatment benchmark data

City	Treatment Facility	# of PWID
Tbilisi	Global Fund OST Center	737
	State Methadone program	1875
	State Suboxone program	131
	Total	**2743**
Batumi	Global Fund OST Center	246
Telavi	State program	177
Gori	Global Fund OST Center	111
Kutaisi	State program	626
Zugdidi	State program	413
Ozurgeti	State program	225
Poti	State program	203
Kobuleti	State program	658
Zestaponi	State program	138
	Grand Total	**5540**

⇒ Drug users using needle exchange and other low-threshold programs in 2016

Source of information: Monitoring systems of low threshold agencies - computer based database for monitoring of the program operation

Table 4 # of PWID in the needle/syringe programs plus one additional harm reduction service in 2014

City	# of PWID outreached
Tbilisi	10284
Gori	1821
Telavi	1940
Zugdidi	2392
Batumi	2060
Kutaisi	2164
Rustavi	2668
Samtredia	615
Poti	740
Ozurgeti	1200
Grand Total	**23769**

Explanation: The main services offered to PWID under the harm reduction programs in Georgia are HCT, hepatitis B, C counselling and testing, TB counselling and needle/syringe programs. The different agencies maintained different databases. The table above represents the aggregated data.

⇒ Drug users tested on HIV in 2016

Source of information: HIV/AIDS register run by the NCDC and the database of the GHRN.

Table 5 HIV testing benchmark data

City	# of PWID tested on HIV
Tbilisi	11,931
Gori	1869
Telavi	2097
Zugdidi	2396
Batumi	2105
Kutaisi	2841
Rustavi	2740
Samtredia	768
Poti	785
Ozurgeti	932
Grand Total	**28521**

Explanation: The cases are identified through routine surveillance data reported by HIV diagnostic labs operating throughout the country.

⇒ Drug users tested on HCV in 2016

Source of information: The GHRN register

Table 6 HCV testing benchmark data

City	# of PWID tested on HCV
Tbilisi	8143
Gori	1890
Telavi	1700
Zugdidi	2335
Batumi	2001
Kutaisi	2730
Rustavi	2609
Samtredia	727
Poti	771
Ozurgeti	881
Grand Total	**26477**

Explanation: The cases are identified through routine data reported by the the GHRN.

Crime-related Indicators

⇒ Injection drug users registered by the police tested positively for presence of illegal drugs in 2016

Source of information: Ministry of Internal Affairs

Table 7 Benchmark data on PWID came into contact with the police

City	Total # of registered drug users, based on the positive test results	of those, # of registered PWID, based on the positive test results
Tbilisi	2399	1776
Gori	322	135
Telavi	214	44
Zugdidi	1028	307
Batumi	1039	704
Kutaisi	2004	369
Rustavi	352	102
Kobuleti	101	89
Ozurgeti	196	71
Sachkhere	105	8
Gurjaani (Chalaubani)	286	71
Mtskheta	146	54
Ambrolauri	48	7
Senaki	356	44
Akhaltsikhe	63	9
Borjomi	75	37
Grand Total	**8734**	**3827**

Explanation: Taking into consideration that Georgian drug legislation does not distinguish between being detained in connection with the use of drugs and being convicted for purchase or possession of drugs, we use only police records regarding the persons tested positively for presence of illegal drugs.

Extrapolation from Local to National Prevalence estimates

Local estimates using multiplier-benchmark methods give important information on extent of drug problem. However, they are employed in studies of drug use on a smaller, geographically local scale. Nonetheless, there is still very often a need for overall national estimates to be made, and one way of doing that is to extrapolate from local prevalence studies to an overall picture. Extrapolation methods are not a specific method of prevalence estimation in themselves, but when some prevalence information is known they are used to extend that information into areas - usually, other geographic regions—where the prevalence information is not known. The extrapolation methods are based on statistical regression techniques. The method described below comes under various headings: usually, "synthetic estimation", or "multi-indicator" method, or sometimes under the more technical name of "regression on principal components".

The ***Multivariate Indicator Method (MIM)*** (EMCDDA, 2004) is a special case of synthetic estimation. Generally, synthetic estimation methods are methods which transfer information about a variable of interest, e.g. drug use prevalence, from a population in which it can be observed (calibration population/anchor point) to a target population in which it cannot be observed. From anchor points, a functional relationship between some variables and the variable of interest is derived which is extended to the target population. Applied to the field of drugs, the prevalence of problem drug use in a country may be estimated by relating a set of drug use indicators, which are available in all regions of a country, to prevalence estimates in a few regions (calibration population). The indicators may be directly (e.g. mortality, morbidity, and arrest) or indirectly related to drug use (e.g. population density, unemployment rate, housing density). Typically, analyses are based on prevalence rates and indicator rates per 100,000 inhabitants.

With regard to the MIM, two main variants of the method are common. One way is to estimate the relationship between drug use indicators and prevalence estimates in the anchor points via (linear) regression and to apply the regression coefficients to the drug use indicators in the target population. This yields prevalence estimates for the non-anchor points. Summing up all regional prevalence estimates yields the national prevalence estimate. Smit and colleagues (2003) used this method to estimate local and national problem drug use prevalence in the Netherlands, employing population density and housing density as indicators.

The key assumption of the method is that the relationship between **prevalence (dependent variable) and the predictors (independent variables)** in the calibration sample is transferable to all other areas. It is also assumed that a single factor underlies the

drug-related indicators and that principal components analysis can be used to extract the main factor that explains the largest amount of variance in the indicators.

The application of the multivariate indicator method requires a breakdown of national states by regions and data on problem/injection drug use (indicators), which must be available for each of the regions and refer to the same time period. Two separate national estimations were produced:

Estimation N 1. It is recommended to use drug-related indicators as predictors in this regression model, i.e. drug related offences, drug-related deaths, clients in treatment, HIV cases related to injection drug use, imprisoned drug users (EMCDDA, 1999). Unfortunately, however, ***these statistics are not available in Georgia for the whole country.*** Due to a lack of available drug-related indicators the Dutch research group used an alternative model with social indicators such as housing density and population density (Smit et al., 2003). Similarly, taking in consideration that none of the drug-related indicators could be obtained for all urban areas in Georgia, national PWID prevalence was calculated using only one ***demographic indicator such as population density*** (the Census data). Unfortunately the data on housing density was not available in the Country.

Estimation N 2. The second method used ***the drug injection prevalence rate coefficient*** for each city in order to estimate the number of injection drug users nationwide (modified from the method suggested by E. Pizani) (Pisani, 2006). It was based on input from people working in the area of drug addiction. Addiction experts ranked all 64 cities and municipalities in Georgia by prevalence rates with corresponding coefficients. Five categories of prevalence rate coefficients had been chosen and each city was assigned to one of the following categories:

Table 8 Prevalence Rate coefficients by cities

Prevalence Rate	Very High	High	Medium	Low	Very Low
Coefficient	**8**	**5**	**2**	**1,0**	**0,5**

Description of the Multivariative Indicator Method Applied

Five indicators, denoted by A, B, C, D and E had been used for MIM. Additionally to the indicators, the population size F of the age group 18-64 in each city (totally 64 cities) as well as independently obtained prevalence estimates G for 7 cities (the so-called anchor points) are needed.

The different indicators highlight different aspects of the drug problem. No indicator is supposed to measure prevalence. The indicators are, however, indicative of whether problem drug use increases or decreases (Person et al., 1977). By applying principal component analysis a common factor is extracted which is assumed to be proportional to prevalence of problem drug use. As a principal component analysis underlies the assumption of a linear relationship between observable variables and the principal components there should be a linear relationship between indicators of problem drug use and the unknown prevalence.

Obviously, the validity of prevalence estimation can be improved by increasing the number of anchor points. Then, more drug use indicators (proxy variables) can be used in the linear regression model. One of the problems is, however, the choice of appropriate drug use indicators (proxy variables). If the number of drug use indicators equals or exceeds the number of anchor points linear regression is not possible. As drug use indicators are more easily available than reliable regional prevalence estimates it is often necessary to reduce the number of drug use indicators. Up to now, different methods of reducing the number of indicators have emerged: Mariani (1999) as well as Person, Retka and Woodward (1977, 1978) applied a principal component analysis (PCA) (EMCDDA, 2002).

The steps below summarize the process used to derive the national estimate for the percentage of injection drug users in Georgia using the Multiple Indicator Method.

Step 1. Data indicating the prevalence of injection drug use must be collected for a defined time period for each city. The following variables were used as indicators:

A - Number of PWID registered by Police for drug consumption

B - Number of PWID tested on HIV

C - Number of clients in treatment

D - Number of clients of the low threshold services

E - Population density (for the estimation N 1) and prevalence rate coefficients (for the estimation N 2).

Step 2. In addition, the population size F for urban areas had been obtained from data on population distribution (the State Department of Statistics of the Ministry of Economic Development of Georgia).

Step 3. For seven selected cities reliable independent estimates G (resulting from the multiplayer - benchmark study) are necessary. These cities are called „anchor points".

Step 4. For each of the variables A to E, G and for each region the figure per 100,000 inhabitants has to be calculated.

$A_F = A*100{,}000/F$

$G_F = G*100{,}000/F$

Step 5. Principal components analysis requires standardised values for A_F to G_F (subtracting the mean and dividing by the standard deviate).

Step 6. Principal components analysis of A_F to E_F with the extraction of the first factor, whose coefficients are saved. No rotational solution is needed, as any rotation only serves as an improvement for the fit of a set of indicators, and is therefore here redundant as only one indicator will be extracted.

Step 7. A linear regression (dependent variable: G_F, independent variable: coefficients of the first factor) results in estimated prevalence rates per 100,000 inhabitants. Finally, these have to be transformed to prevalence estimates for the cities (multiplying with F and

dividing by 100,000). Summation of the urban area prevalence estimates yields the national prevalence estimate.

In order to derive national estimates original data was entered into the SPSS version 13.0 data files, than ***SPSS-Syntax of the variant "PCA per 100,000"*** reflecting the above mentioned steps had been created based on instructions provided in the EMCDDA Scientific Report.[3] The regression analysis was done by this SPSS syntax to make predictions of the estimated level of the drug abuse prevalence rates. Two separate estimations (by demographic indicator and by prevalence rate coefficients) were made.

3. RESULTS

3.1 Network Scale-Up estimates

Average Social Network Size

We found all 21 populations were eligible to calculate the average network size. We estimated the average network size for adult (18-49y) people living in Kutaisi and Tbilisi in 2016 is 138 and 303 persons, respectively. Applying the proportion of men, women and in the three age groups living in Kutaisi and Tbilisi, the average network size in each city, we calculated number of men, women and in three age groups in social networks of people living in Kutaisi and Tbilisi in 2016 (Table 9). We summed up the number of people aged 18-30 and >30 to calculate the number of adults in network of people living in Kutaisi (i.e. 25+82=107 persons) and Tbilisi (i.e. 54+180=234) in 2016.

Table 9– Average social network size of people living in Kutaisi in 2017

Year 2016	Male	Female	<18y	18-30y	>30y	Total
Tbilisi	145	158	69	54	180	303
Kutaisi	66	72	31	25	82	138

PWID Population Size by NSU

After adjusting for information transparency and popularity ratio biases, we estimate the prevalence of PWID in Tbilisi as 1.11% (95%SI: 0.84 to 1.41) (

Table 10). It corresponds to 12,300 (95%SI: 9,340 to 15,700) persons. In Kutaisi, the PWID prevalence estimated as 0.75% (95%SI: 0.55 to 0.96) which corresponds to 1,110 (95%SI: 820 to 1,420) persons. Assuming that PWID prevalence in the 5 other major cities in Georgia (Gori, Telavi, Zugdidi, Batumi, and Rustavi) is the same as PWID prevalence in Tbilisi (i.e. 1.11%) and in the rest of Georgia is the same as prevalence in Kutaisi (i.e. 0.75%), we estimated a total of 37,780 (1.02%, 95%SI 0.76 to 1.30%) PWID living in Georgia in 2016.

[3] Prevalence of problem drug use at the national level, EMCDDA, 2002

The prevalence PWID among adults (18+) in Georgia in 2016 is 1.27% (or 36,513 persons) and among adolescents (under 18) is 0.15% (or 1,267 persons).

Table 10 - Population Size estimation of People who Inject Drugs in Georgia by Age Groups and in different locations in 2016 Using Network Scale-up Method

	Population Size in 2016	PWID PSE	PWID PSE 95%SI		PWID Prevalence	PWID Prevalence 95%SI	
Overall							
Tbilisi	1,113,000	12,300	9,340	15,700	1.11%	0.84%	1.41%
Gori	126,100	1,394	1,058	1,779	1.11%	0.84%	1.41%
Telavi	58,300	644	489	822	1.11%	0.84%	1.41%
Zugdidi	105,200	1,163	883	1,484	1.11%	0.84%	1.41%
Batumi	154,600	1,709	1,297	2,181	1.11%	0.84%	1.41%
Kutaisi	147,900	1,110	820	1,420	0.75%	0.55%	0.96%
Rustavi	126,000	1,392	1,057	1,777	1.11%	0.84%	1.41%
All 7 cities	1,831,100	19,711	14,945	25,163	1.08%	0.82%	1.37%
Rest of Georgia	1,889,295	14,179	10,475	18,139	0.75%	0.55%	0.96%
Georgia	**3,720,395**	**37,780**	**28,374**	**48,201**	**1.02%**	**0.76%**	**1.30%**
Adults (18+)							
Tbilisi	860,974	12,100	9,300	15,200	1.41%	1.08%	1.77%
Gori	97,546	1,371	1,054	1,722	1.41%	1.08%	1.77%
Telavi	45,099	634	487	796	1.41%	1.08%	1.77%
Zugdidi	81,379	1,144	879	1,437	1.41%	1.08%	1.77%
Batumi	119,593	1,681	1,292	2,111	1.41%	1.08%	1.77%
Kutaisi	114,410	1,040	790	1,310	0.91%	0.69%	1.15%
Rustavi	97,469	1,370	1,053	1,721	1.41%	1.08%	1.77%
All 7 cities	1,416,469	19,339	14,854	24,297	1.37%	1.05%	1.72%
Rest of Georgia	1,461,487	13,285	10,092	16,734	0.91%	0.69%	1.15%
Georgia	**2,877,956**	**36,513**	**27,900**	**45,930**	**1.27%**	**0.97%**	**1.60%**
Under 18y							
Tbilisi	252,026	200	40	500	0.08%	0.02%	0.20%
Gori	28,554	23	5	57	0.08%	0.02%	0.20%
Telavi	13,201	10	2	26	0.08%	0.02%	0.20%
Zugdidi	23,821	19	4	47	0.08%	0.02%	0.20%
Batumi	35,007	28	6	69	0.08%	0.02%	0.20%
Kutaisi	33,490	70	30	110	0.21%	0.09%	0.33%
Rustavi	28,531	23	5	57	0.08%	0.02%	0.20%

	Population Size in 2016	PWID PSE	PWID PSE 95%SI		PWID Prevalence	PWID Prevalence 95%SI	
All 7 cities	414,631	372	90	866	0.09%	0.02%	0.21%
Rest of Georgia	427,808	894	383	1,405	0.21%	0.09%	0.33%
Georgia	**842,439**	**1,267**	**474**	**2,271**	**0.15%**	**0.06%**	**0.27%**

3.2 Multiplier-benchmark estimates

Calculation of the estimated size of the PWID population in the surveyed cities revealed these figures (mean and median estimates):

Table 11 Estimates of the number of PWID in 7 cities in 2016

	Mean Estimates			Median Estimates		
City	**Estimated size**	**95% CI**		**Estimated size**	**95% CI**	
Tbilisi	**38463**	32466	46552	**29440**	24152	37122
Gori	**2706**	2997	3610	**3012**	2848	3200
Telavi	**5930**	5381	7428	**4139**	3795	4543
Zugdidi	**5892**	4765	6338	**6266**	5734	6892
Batumi	**5294**	4520	6241	**3637**	3264	409
Kutaisi	**7061**	6863	9619	**5907**	5459	6431
Rustavi	**10443**	9235	12548	**10452**	9222	11983

Multipliers were derived from the RDS survey of 2016 PWID recruited across 7 cities. Totally, 6484 PWID had been nominated by survey participants. Participants' responses to the questionnaire were used to produce a final series of PWID size estimates, including 95% confidence intervals.

The following section provides specific estimates for each selected city. Different number of separate multiplier estimates was made to calculate the quantity of problem drug users in different cities.

The population size estimate for PWID was the mean of 6 multiplier estimations in Tbilisi and Batumi, 5 - in Gori, Zugdidi, Telavi and Kutaisi, 4 – in Rustavi. This study suggests using the statistical lower and upper limits (at 95% confidence interval) to reflect the minimum and maximum ranges.

Tables below (Table 12 -

Table 19) and the Figure 1 set out the multiplier estimates of PWID in 7 cities across the country derived from different sources, together with the mean and median of the estimates in 2016.

Table 12 Estimates of the number of PWID in Tbilisi in 2016

Tbilisi	**Benchmark**	**Multiplier**	**95% CI**		**Estimated size**	**95% CI**	
Police data	1776	5.86	5.08	6.84	10412	9029	12156

Tbilisi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
HIV testing data	11,931	4.07	3.64	4.60	48601	43370	54931
Treatment data	2187	18.16	13.97	24.45	39725	30545	53472
Methadone substitution data	2743	4.71	4.16	5.40	12933	11415	14803
Needle/syringe data	10284	9.72	8.0	11.98	99953	82669	123062
HCV testing data	8143	2.35	2.18	2.55	19156	17760	20773
				Mean	**38463**	**32466**	**46552**
				Median	**29440**	**24152**	**37122**

Table 13 Estimates of the number of PWID in Gori in 2016

Gori	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Police data	135	7.32	6.11	8.94	988	824	1206
HIV testing data	1869	2.45	2.24	2.89	4571	4189	5024
Methadone substitution data	111	6.18	5.24	7.41	686	582	822
Needle/syringe data	1821	2.35	2.16	2.57	4275	3928	4682
HCV testing data	1890	1.59	1.51	1.69	3012	2848	3200
				Mean	**2706**	**2474**	**2987**
				Median	**3012**	**2848**	**3200**

Table 14 Estimates of the number of PWID in Telavi in 2016

Telavi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Police data	44	5.5	6.49	9.61	242	285	423
HIV testing data	2097	4.69	4.08	5.45	9834	8563	11428
Methadone substitution data	177	7.92	5.46	7.76	1383	967	1373
Needle/syringe data	1940	7.24	6.06	8.83	14053	11750	17123
HCV testing data	1700	2.43	2.23	2.67	4139	3795	4543
		Mean			**5930**	**5093**	**7016**
		Median			**4139**	**3795**	**4543**

Table 15 Estimates of the number of PWID in Zugdidi in 2016

Zugdidi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Police data	307	5.03	4.39	5.83	1544	1347	1791
HIV testing data	2396	3.93	3.49	4.45	9405	8369	10668

Zugdidi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Methadone substitution data	413	6.54	5.58	7.79	2702	2303	3217
Needle/syringe data	2392	3.99	3.54	4.53	9539	8479	10833
HCV testing data	2335	2.68	2.46	2.95	6266	5734	6892
				Mean	**5892**	**5247**	**6680**
				Median	**6266**	**5734**	**6892**

Table 16 Estimates of the number of PWID in Batumi in 2016

Batumi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Police data	704	4.72	4.07	5.54	3322	2866	3902
HIV testing data	2105	3.50	3.1	4.0	7372	6531	8410
Treatment data	62	24.63	17.24	37.74	1527	1069	2340
Methadone substitution data	246	4.99	4.28	5.89	1227	1054	1450
Needle/syringe data	2060	6.97	5.79	8.56	14365	11935	17637
HCV testing data	2001	1.97	1.83	2.14	3952	3663	4289
				Mean	**5294**	**4520**	**6338**
				Median	**3637**	**3264**	**409**

Table 17 Estimates of the number of PWID in Kutaisi in 2016

Kutaisi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Police data	369	5.22	4.50	6.15	1927	1659	2268
HIV testing data	1256	5.63	4.81	6.68	7066	6044	8385
Methadone substitution data	626	7.27	6.06	8.87	4549	3796	5555
Needle/syringe data	2164	7.33	6.11	8.96	15857	13219	19391
HCV testing data	2730	2.16	2.0	2.36	5907	5459	6431
				Mean	**7061**	**6036**	**8406**
				Median	**5907**	**5459**	**6431**

Table 18 Estimates of the number of PWID in Rustavi in 2016

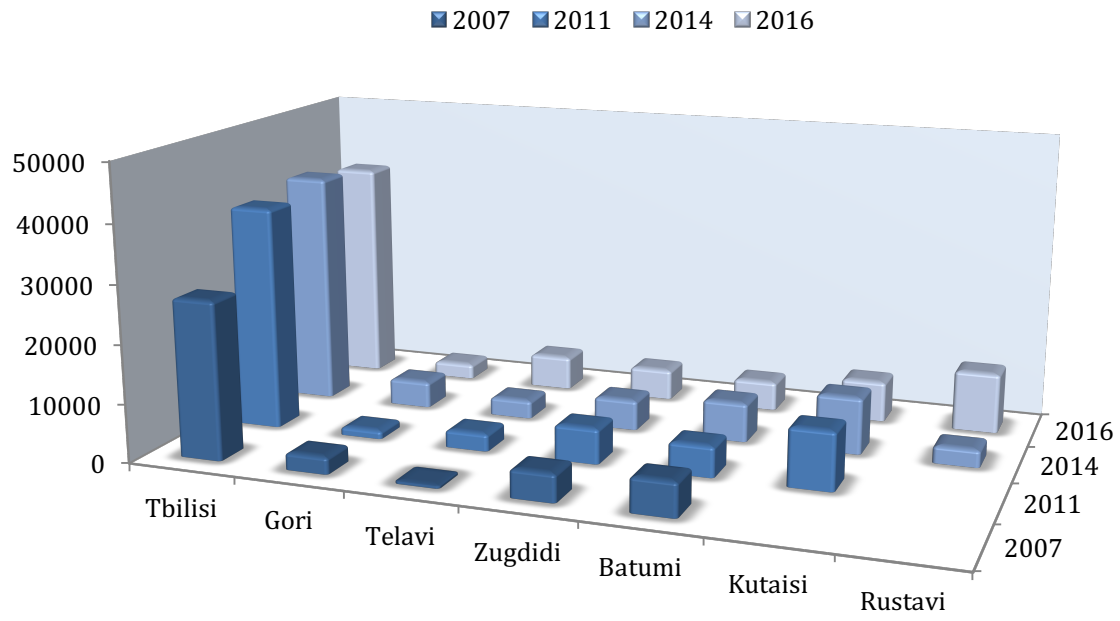
Rustavi	Benchmark	Multiplier	95% CI		Estimated size	95% CI	
Police data	102	4.50	3.95	5.19	459	403	530
HIV testing data	2740	7.45	6.24	9.05	20410	17104	24796
Needle/syringe data	2668	5.17	4.48	6.04	13792	11959	16111
HCV testing data	2609	2.73	2.49	3.01	7113	6485	7856

Mean	**10443**	**8988**	**12323**
Median	**10452**	**9222**	**11983**

Table 19 Estimates of the number of PWID according to cities and indicators

Indicator / City	Estimated size						
	Tbilisi	**Gori**	**Telavi**	**Zugdidi**	**Batumi**	**Kutaisi**	**Rustavi**
Police data	10412	988	242	1544	3322	1927	459
HIV testing data	48601	4571	9834	9405	7372	7066	20410
Treatment data	39725				1527		
Methadone substitution data	12933	686	1383	2702	1227	4549	
Needle/syringe data	99953	4275	14053	9539	14365	15857	13792
HCV testing data	19156	3012	4139	6266	3952	5907	7113
Mean	**38463**	**2706**	**5930**	**5892**	**5294**	**7061**	**10443**
Median	**29440**	**3012**	**4139**	**6266**	**3637**	**5907**	**10452**

Figure 1. Estimates of the number of PWID by cities in 2007, 2011, 2014 and 2016



Estimation of the prevalence of injection drug use

Prevalence estimates for the injection drug use were produced for 7 cities of Georgia. National Statistics Office of Georgia provided the population data between 18 and 64 for urban areas across the country (the data is based on the results of the Population Census 2014). The appropriate estimations of injecting drug use shown in the tables above were then applied to that population. The statistical lower and upper limits (at 95% confidence interval) were used to reflect the minimum and maximum ranges. Calculation of the PWID

prevalence estimation (%) in the surveyed cities revealed these figures (mean and median estimates):

Table 20 PWID prevalence estimates in 7 cities in 2016

City	Mean Estimates			Median Estimates		
	PWID prevalence *(%)*	95% CI		PWID prevalence *(%)*	95% CI	
Tbilisi	***5.24***	4.42	6.34	***4.01***	3.29	5.06
Gori	**3.25**	2.97	3.59	***3.62***	3.42	3.85
Telavi	**15.68**	13.47	18.55	***10.94***	10.03	12.01
Zugdidi	**8.49**	7.56	9.62	***9.03***	8.26	9.93
Batumi	**5.19**	4.43	6.21	***3.57***	3.2	4.01
Kutaisi	**7.23**	5.18	8.61	***6.05***	5.59	6.59
Rustavi	**12.56**	10.81	14.82	***12.56***	10.81	14.82

Tables (Table 21 -

Table 27) below present the PWID prevalence estimation (%) in 7 cities across the country derived from different sources, together with the mean and median of the estimates.

Table 21 Estimated Prevalence Rates in Tbilisi in 2016

Tbilisi				Adult population (18-64)	734580	
	Estimated size	95% CI		Prevalence of PWID (%)	95% CI	
Police data	10412	9029	12156	1.42	1.23	1.66
HIV testing data	48601	43370	54931	6.62	5.90	7.48
Treatment data	39725	30545	53472	5.41	4.16	7.28
Methadone substitution data	12933	11415	14803	1.76	1.55	2.02
Needle/syringe program data	99953	82669	123062	13.61	11.25	16.77
HCV testing data	19156	17760	20773	2.61	2.42	2.83
Mean	**38463**	**32466**	**46552**	***5.24***	***4.42***	***6.341***
Median	**29440**	**24152**	**37122**	***4.01***	***3.29***	***5.06***

Table 22 Estimated Prevalence Rates in Gori in 2016

Gori				Adult population (18-64)	83226	
	Estimated size	95% CI		Prevalence of PWID (%)	95% CI	
Police data	988	824	1206	1.19	0.99	1.45
HIV testing data	4571	4189	5024	5.49	5.03	6.04
Methadone substitution data	686	582	822	0.82	0.70	0.99
Needle/syringe Programs data	4275	3928	4682	5.14	4.72	5.63

HCV testing data	3012	2848	3200	3.62	3.42	3.85
Mean	**2706**	**2474**	**2987**	***3.25***	***2.97***	***3.59***
Median	**3012**	**2848**	**3200**	***3.62***	***3.42***	***3.85***

Table 23 Estimated Prevalence Rates in Telavi in 2016

Telavi				**Adult population (18-64)**		**37818**
	Estimated size	**95% CI**		**Prevalence of PWID (%)**	**95% CI**	
Police data	242	285	423	0.64	0.55	0,76
HIV testing data	9834	8563	11428	26.0	22.64	30.22
Methadone substitution data	1383	967	1373	3.66	3.04	4.50
Low Threshold Programs data	14053	11750	17123	37.16	31.07	45.28
HCV testing data	4139	3795	4543	10.94	10.03	12.01
Mean	**5930**	**5093**	**7016**	***15.68***	***13.47***	***18.55***
Median	**4139**	**3795**	**4543**	***10.94***	***10.03***	***12.01***

Table 24 Estimated Prevalence Rates in Zugdidi in 2016

Zugdidi				**Adult population (18-64)**		**69432**
	Estimated size	**95% CI**		**Prevalence of PWID (%)**	**95% CI**	
Police data	1544	1347	1791	2.22	1.94	2.58
HIV testing data	9405	8369	10668	13.55	12.05	15.36
Methadone substitution data	2702	2303	3217	3.89	3.32	4.63
Needle/syringe Programs data	9539	8479	10833	13.74	12.21	15.60
HCV testing data	6266	5734	6892	9.03	8.26	9.93
Mean	**5892**	**5247**	**6680**	***8.49***	***7.56***	***9.62***
Median	**6266**	**5734**	**6892**	***9.03***	***8.26***	***9.93***

Table 25 Estimated Prevalence Rates in Batumi in 2016

Batumi				**Adult population (18-64)**		**102036**
	Estimated size	**95% CI**		**Prevalence of PWID (%)**	**95% CI**	
Police data	3322	2866	3902	3.26	2.81	3.82
HIV testing data	7372	6531	8410	7.23	6.40	8.24
Treatment data	1527	1069	2340	1.50	1.05	2.29
Methadone substitution data	1227	1054	1450	1.20	1.03	1.42
Needle/syringe Programs data	14365	11935	17637	14.08	11.70	17.29
HCV testing data	3952	3663	4289	3.87	3.59	4.2
Mean	**5294**	**4520**	**6338**	***5.19***	***4.43***	***6.21***
Median	**3637**	**3264**	**409**	***3.57***	***3.2***	***4.01***

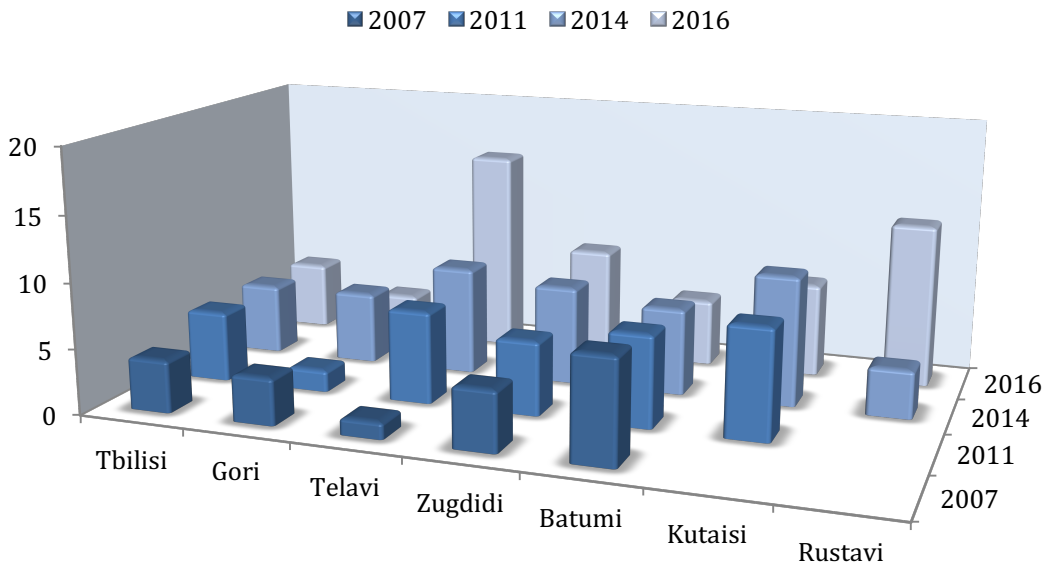
Table 26 Estimated Prevalence Rates in Kutaisi in 2016

Kutaisi				Adult population (18-64)		97614
	Estimated size	95% CI		Prevalence of PWID (%)	95% CI	
Police data	1927	1659	2268	1.97	1.70	2.32
HIV testing data	7066	6044	8385	7.24	6.19	8.59
Methadone substitution data	4549	3796	5555	4.66	3.89	5.69
Needle/syringe Programs data	15857	13219	19391	16.24	13.54	19.86
HCV testing data	5907	5459	6431	6.05	5.59	6.59
Mean	**7061**	**6036**	**8406**	***7.23***	***5.18***	***8.61***
Median	**5907**	**5459**	**6431**	***6.05***	***5.59***	***6.59***

Table 27 Estimated Prevalence Rates in Rustavi in 2016

Rustavi				Adult population (18-64)		83160
	Estimated size	95% CI		Prevalence of PWID (%)	95% CI	
Police data	1586	1391	1828	0.55	0.48	0.64
HIV testing data	20410	17104	24796	24.54	20.57	29.82
Needle/syringe Programs data	13792	11959	16111	16.58	14.38	19.37
HCV testing data	7113	6485	7856	8.55	7.8	9.45
Mean	**10725**	**9235**	**12548**	***12.56***	***10.81***	***14.82***
Median	**10452**	**9222**	**11983**	***12.56***	***10.81***	***14.82***

Figure 2. Prevalence Estimates of PWID by cities in 2007, 2011, 2014 and 2016



Results of the national prevalence estimation

The application of the multivariate indicator method requires a breakdown by regions and data on problem/injection drug use (indicators), which must be available for each of the regions and refer to the same time period. The national PWID prevalence estimates in the present study were derived from the estimates of the urban areas. Since injection drugs are more available in cities and drug injection is not common in rural areas (locally cultivated pot is particularly widely spread in villages), actually there is a little number of PWID in rural areas as well. Consequently, not considering this population may have resulted in an under-estimate. However, assuming that injection drug users are mainly concentrated in the urban parts of Georgia we are willing to ignore this downward bias.

National prevalence estimates for the injection drug use were produced for 64 cities and municipalities of Georgia. National Statistics Office of Georgia provided the population data between 18 and 64 for all urban areas across the country (the data is based on the results of the Population Census 2014 and natural and migration balance for the last year).

THE FIRST SCENARIO

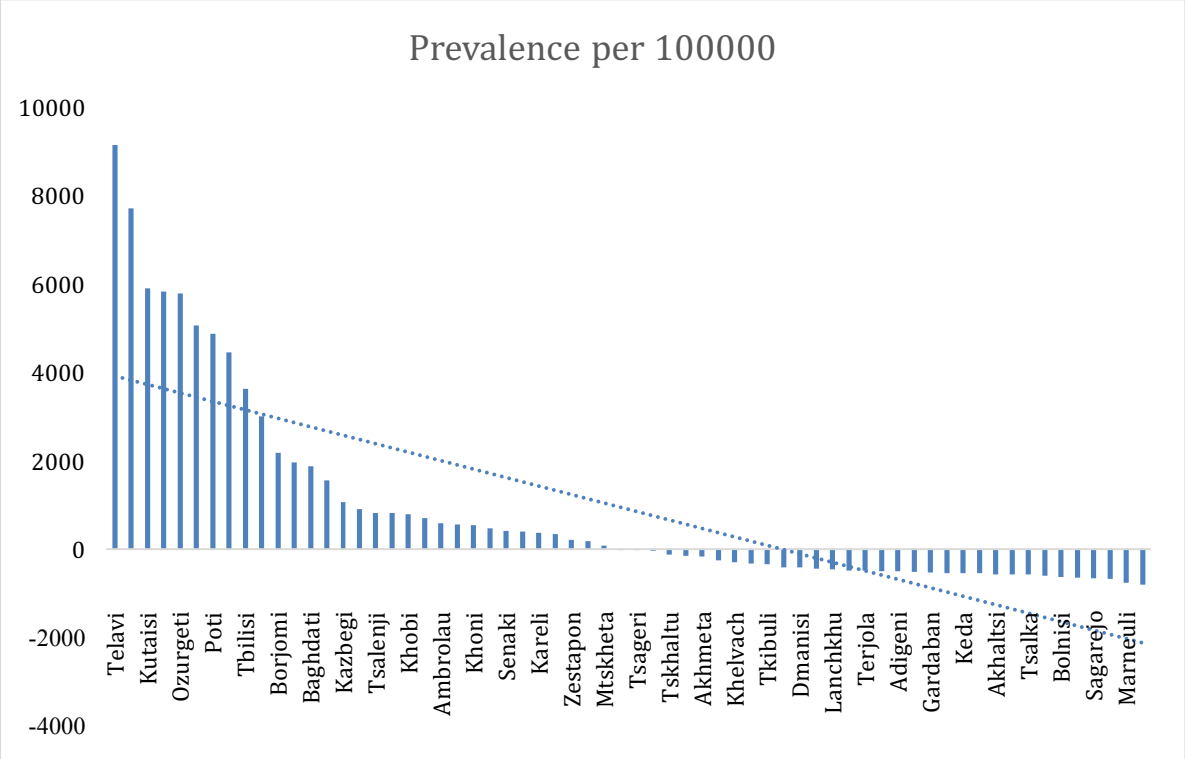
Calculation of national prevalence and estimated numbers according to the mean indicators of 7 cities (2016)

The first scenario presented below uses exactly the same methodology that was applied during the previous rounds of the size estimation exercise conducted in 2008, 2012 and 2014.

Calculation of the PWID prevalence estimation nationwide using mean estimates resulted in the following figures:

1. estimation method N 1, using demographic indicator (population density) – **2,54%** (estimated number of PWID – **62,253**)
2. estimation method N 2, using prevalence rate coefficients **- 2, 40%** (Number of PWID – **58,923**).

Figure 3 Regression line indicating relationship between factor scores and population standardized anchor point estimates (by Prevalence Rate Coefficient in 2016)



THE SECOND SCENARIO

Calculation of national prevalence and estimated numbers according to the median indicators of 7 cities (2016)

Some of the population size and prevalence rate estimations calculated by the multiplier-benchmark method within the cities significantly differ (extremely high or low estimates compared to the others) that result in skewed mean estimations for the cities (see Table 21-Table 27).

To control these outliers the researchers decided to examine an alternative version - Calculate national prevalence and estimated size ***using median*** instead of mean estimations in all 7 cities.

In this regard, we have received the following figures:

1. estimation method N 1, using demographic indicator (population density) – **2,17%** (estimated number of PWID equals **53143**)
2. estimation method N 2, using prevalence rate coefficients **- 2,03%** (Number of PWID – **49817**)

Table 29 below present the national PWID prevalence estimation (%) produced by 2 different indicators:

Table 28 National Estimation by Population Density in 2016

Cities	Population 18-64	Density of the Population per 1 sq.km	Prevalence per 100 000	Prevalence %	Estimated Number
Tbilisi	734580	2198,79	3163.23	3.16	23236
Batumi	102036	1857,10	5783.99	5.78	5902
Keda	11154	37,08	-334.14	-0.33	-37
Kobuleti	49635	105,15	3509.92	3.51	1742
Shuakhevi	9966	25,59	-381.93	-0.38	-38
Khelvachauri	34122	143,63	136.15	0.14	46
Khulo	15510	32,85	-416.21	-0.42	-65
Lanchkhuti	34716	59,06	-159.86	-0.16	-33
Ozurgeti	20790	73,66	4370.67	4.37	1517
Chokhatauri	12474	23,03	-27.19	-0.03	-3
Kutaisi	97614	2180,72	6512.36	6.51	6357
Baghdati	14190	26,47	1469.57	1.47	209
Vani	16170	44,01	435.54	0.44	70
Zestaponi	37950	136,01	485.17	0.49	184
Terjola	23364	99,62	-52.37	-0.05	-12
Samtredia	32010	133,38	1740.68	1.74	557
Sachkhere	24948	49,15	-226.75	-0.23	-57
Tkibuli	13596	43,52	-128.22	-0.13	-17
Tskhaltubo	37356	81,25	121.89	0.12	46
Chiatura	26268	73,86	-211.91	-0.21	-56
Kharagauli	12804	21,31	-383.25	-0.38	-49
Khoni	15444	55,01	603.74	0.60	93
Akhmeta	37818	14,25	-96.84	-0.10	-20
Gurjaani	20922	64,23	493.12	0.49	175
Dedoplistskaro	35574	8,38	-472.78	-0.47	-66
Telavi	13926	35,77	5738.25	5.74	2170
Lagodekhi	27588	46,82	-313.40	-0.31	-86

Cities	Population 18-64	Density of the Population per 1 sq.km	Prevalence per 100 000	Prevalence %	Estimated Number
Sagarejo	34452	33,31	-487.80	-0.49	-168
Sighnaghi	19536	23,94	-402.03	-0.40	-79
Kvareli	19668	29,83	-159.87	-0.16	-31
Dusheti	36762	8,61	-440.86	-0.44	-74
Tianeti	16750	10,45	-411.14	-0.41	-25
Mtskheta	6138	80,48	225.60	0.23	83
Kazbegi	2508	3,51	-349.77	-0.35	-9
Ambrolauri	7900	8,02	213.12	0.21	15
Lentekhi	2904	3,26	-292.38	-0.29	-8
Oni	3960	4,51	-405.25	-0.41	-16
Tsageri	6732	13,78	-237.36	-0.24	-16
Poti	69432	630,17	5093.93	5.09	1395
Abasha	27390	69,27	1449.94	1.45	211
Zugdidi	14586	93,22	5441.85	5.44	3778
Martvili	21978	38,00	-200.42	-0.20	-44
Mestia	6204	3,06	-398.07	-0.40	-25
Senaki	26070	76,15	592.43	0.59	154
Chkhorotskhu	14652	36,02	523.73	0.52	77
Tsalenjikha	17226	40,45	748.86	0.75	129
Khobi	20064	45,19	747.81	0.75	150
Adigeni	25608	20,59	-416.75	-0.42	-45
Aspindza	10890	12,57	-426.53	-0.43	-29
Akhalqalaqi	6864	36,49	-488.05	-0.49	-146
Akhaltsikhe	29832	21,04	-351.68	-0.35	-90
Borjomi	16566	21,21	1758.53	1.76	291
Ninotsminda	16170	18,09	-500.61	-0.50	-81
Rustavi	83160	2064,41	4768.89	4.77	3966
Bolnisi	35508	66,65	-284.47	-0.28	-101
Gardabani	54318	67,54	-224.88	-0.22	-122
Dmanisi	12606	15,97	-356.29	-0.36	-45
Tetri Tskaro	13860	17,99	135.84	0.14	19

Cities	Population 18-64	Density of the Population per 1 sq.km	Prevalence per 100 000	Prevalence %	Estimated Number
Marneuli	69498	111,49	-410.33	-0.41	-285
Tsalka	12474	17,94	-465.33	-0.47	-58
Gori	83226	58,03	2373.29	2.37	1975
Kaspi	28842	54,50	702.09	0.70	203
Kareli	27268	60,08	463.27	0.46	126
Khashuri	34782	89,89	867.77	0.87	302

Table 29 National Estimation by Prevalence Rate Coefficient in 2016

Cities	Population 18-64	Rank	Prevalence Coefficient	Prevalence per 100 000	Prevalence %	Estimated Number
Tbilisi	734580	H	5	3064.85	3.06	22514
Batumi	102036	H	5	4833.28	4.83	4932
Keda	11154	VL	0,5	-433.53	-0.43	-48
Kobuleti	49635	H	5	4270.78	4.27	2120
Shuakhevi	9966	VL	0,5	-381.51	-0.38	-38
Khelvachauri	34122	VL	0,5	-226.06	-0.23	-77
Khulo	15510	VL	0,5	-522.10	-0.52	-81
Lanchkhuti	34716	VL	0,5	-364.38	-0.36	-76
Ozurgeti	20790	M	2	4872.29	4.87	1691
Chokhatauri	12474	VL	0,5	-10.78	-0.01	-1
Kutaisi	97614	H	5	4965.32	4.97	4847
Baghdati	14190	VL	0,5	1593.84	1.59	226
Vani	16170	VL	0,5	353.34	0.35	57
Zestaponi	37950	VL	0,5	197.01	0.20	75
Terjola	23364	VL	0,5	-385.06	-0.39	-90
Samtredia	32010	L	1	1669.81	1.67	535
Sachkhere	24948	VL	0,5	-406.75	-0.41	-101
Tkibuli	13596	VL	0,5	-260.07	-0.26	-35
Tskhaltubo	37356	VL	0,5	-83.13	-0.08	-31
Chiatura	26268	VL	0,5	-458.45	-0.46	-120
Kharagauli	12804	VL	0,5	-395.02	-0.40	-51

Cities	Population 18-64	Rank	Prevalence Coefficient	Prevalence per 100 000	Prevalence %	Estimated Number
Khoni	15444	VL	0,5	479.85	0.48	74
Akhmeta	37818	VL	0,5	-117.23	-0.12	-25
Gurjaani	20922	L	1	410.27	0.41	146
Dedoplistskaro	35574	VL	0,5	-429.87	-0.43	-60
Telavi	13926	VH	8	7702.65	7.70	2913
Lagodekhi	27588	L	1	-342.89	-0.34	-95
Sagarejo	34452	L	1	-530.42	-0.53	-183
Sighnaghi	19536	VL	0,5	-484.46	-0.48	-95
Kvareli	19668	VL	0,5	-243.86	-0.24	-48
Dusheti	36762	VL	0,5	-434.88	-0.43	-73
Tianeti	16750	VL	0,5	-97.22	-0.10	-6
Mtskheta	6138	L	1	93.32	0.09	34
Kazbegi	2508	VL	0,5	917.20	0.92	23
Ambrolauri	7900	VL	0,5	514.37	0.51	37
Lentekhi	2904	VL	0,5	790.63	0.79	23
Oni	3960	VL	0,5	306.30	0.31	1
Tsageri	6732	VL	0,5	8.92	0.01	1
Poti	69432	M	2	4117.21	4.12	1128
Abasha	27390	VL	0,5	1325.99	1.33	193
Zugdidi	14586	VH	8	6492.36	6.49	4508
Martvili	21978	VL	0,5	-326.96	-0.33	-72
Mestia	6204	VL	0,5	10.61	0.01	1
Senaki	26070	VL	0,5	366.39	0.37	96
Chkhorotskhu	14652	VL	0,5	497.25	0.50	73
Tsalenjikha	17226	VL	0,5	713.93	0.71	123
Khobi	20064	VL	0,5	688.63	0.69	138
Adigeni	25608	VL	0,5	-396.92	-0.40	-43
Aspindza	10890	VL	0,5	-192.16	-0.19	-13
Akhalqalaqi	6864	VL	0,5	-647.85	-0.65	-193
Akhaltsikhe	29832	VL	0,5	-453.74	-0.45	-116
Borjomi	16566	VL	0,5	1853.12	1.85	307
Ninotsminda	16170	VL	0,5	-542.25	-0.54	-88

Cities	Population 18-64	Rank	Prevalence Coefficient	Prevalence per 100 000	Prevalence %	Estimated Number
Rustavi	83160	H	8	3754.77	3.75	3122
Bolnisi	35508	VL	0,5	-499.33	-0.50	-177
Gardabani	54318	VL	0,5	-419.42	-0.42	-228
Dmanisi	12606	VL	0,5	-327.61	-0.33	-41
Tetri Tskaro	13860	VL	0,5	182.54	0.18	25
Marneuli	69498	L	1	-612.59	-0.61	-426
Tsalka	12474	VL	0,5	-458.35	-0.46	-57
Gori	83226	M	2	2546.95	2.55	2120
Kaspi	28842	VL	0,5	608.92	0.61	176
Kareli	27268	VL	0,5	328.45	0.33	90
Khashuri	34782	1	1	710.26	0.71	247

4. DATA TRIANGULATION AND THE FINAL CONSENSUS ESTIMATE

As described earlier researchers made a decision to calculate PWID estimated number and national prevalence using median instead of mean indicators in all 7 cities, that would allow for controlling for biases caused by outliers in the multiplier estimates.

In order to trace the trend in the number of PWID in comparison with the previous years and ensure methodological consistency it was decided to re-calculate national prevalence and estimated numbers of the earlier rounds of size estimation survey (2012 and 2014) according to the median indicators of major cities where local estimates (anchor points) had been estimated. The details are provided in the Table 30 below:

Table 30 - Population size estimation of people who inject drugs (PWID) in Georgia 2012, 2014, 2016, recalculated according to the median indicators of major cities, prevalence among 18-64 population

Estimation Methods	2016		2014		2012	
	Estimated N	Prevalence %	Estimated N	Prevalence %	Estimated N	Prevalence %
Estimation method N 1, using Network Scale-up (NSU) method	36,500	1.56%	43.800	1.86	N/A	N/A
Estimation method N 2, using multiplier benchmark method with demographic indicator (population density)	53,143	2.17	33,390	1.36	22,424	0.82
Estimation method N 3, using multiplier benchmark method with prevalence rate coefficients	49,817	2.03	34,937	1.4	23,458	0.86
Mean estimates	**46,500**	**1.98**	**37,400**	**1.5**	**23,000**	**0.84**

Median indicator based estimates resulted in the reduction of the overall estimated number of problem drug users in Georgia across the years. Point estimate for 2016 is 6,000 less compared to the point estimate derived from the mean based indicator calculations (46,500 vs. 52,500).

Importantly 2016 estimates derived from both mean and median indicators, are higher than estimated sizes of PWID in Georgia, calculated in earlier PSE exercises. This indicates that in recent years there has been a persistent tendency in increasing the number of problem drug users in Georgia.

Triangulation in public health is an approach to synthesising multiple, diverse sources of data at the level of interpretation (Rutherford et a., 2010). Local knowledge and expert opinion are particularly important in the triangulation process.

Consensus-building meetings have been practiced in Georgia since the first round of the PSE exercise to discuss study results, enrich it with expert opinion and reach a consensus on the population size estimates. Building consensus on the key population size is particularly important because there is no "gold standard" for the size estimation. Additionally, this study uses various size estimation methods, resulting in wide-ranging estimates. Reaching consensus does not equate to complete unanimity, but it is desirable that the participants support the final best estimate and the range.

The ***consensus-building meeting*** was held in Tbilisi on October 20, 2017. Professionals and service providers active in the addiction and HIV/AIDS fields attended the meeting.

The following options were presented to the consensus meeting participants:

Table 31 - Population size estimation of people who inject drugs (PWID) in Georgia in 2016 using network scale-up (NSU) and multiplier-benchmark methods (mean and median)

Estimation Methods	2016	2014
	Estimated N of PWID	**Estimated N of PWID**
Estimation method N 1, using Network Scale-up (NSU) method	**36,500**	43,800
THE FIRST SCENARIO – Calculation of national prevalence and estimated numbers according to the <u>mean</u> indicators of 7 cities		
Estimation method N 2, using multiplier benchmark method with demographic indicator (population density)	**62 300**	52,903
Estimation method N 3, using multiplier benchmark method with prevalence rate coefficients	**58 900**	52,494
THE SECOND SCENARIO – Calculation of national prevalence and estimated number according to the median indicators of 7 cities		

Estimation Methods	2016	2014
	Estimated N of PWID	**Estimated N of PWID**
Estimation method N 2, using multiplier benchmark method with demographic indicator (population density)	**53 000**	33 390
Estimation method N 3, using multiplier benchmark method with prevalence rate coefficients	**50 000**	34 937
National estimates *		
Based on mean indicators of multiplier benchmark with demographic indicator & prevalence rate coefficients.	**52,500**	**49,700**
Prevalence % (18-64)	2.24	2.02
Based on median indicators of multiplier benchmark with demographic indicator & prevalence rate coefficients	**46,500**	**37,400**
Prevalence % (18-64)	1.98	1.5

* The national estimate represents mean of all three PSE method estimates: NSU, multiplier benchmark with demographic indicator and multiplier benchmark with prevalence rate coefficients.

Findings from all estimation methods were discussed. The meeting participants expressed their experiential sense that number of problem drug users has increased in Georgia during last couple of years, that was in accordance with the trends captured by the current study as well as recalculated estimates. There was some disagreement on use of mean or median indicator based estimates. Proponents of the median based estimates argued that mean indicators based estimates are skewed and lead to overestimation of the real number of PWID in the country.

Determining the final consensus estimate

After a lengthy discussion, majority of the consensus meeting participants approved the approach described in the first scenario for calculating National PWID population size estimates in Georgia and the mean of estimates calculated by all three methods (network scale-up and Calculation of national prevalence and estimated number according to the mean indicators of 7 cities by population density and prevalence rate coefficients) should be regarded as the estimated size of the PWID population in Georgia in 2016.

The estimates given below were endorsed by the consensus meeting:

CONSENSUS ESTIMATE 2016

Estimated number of PWID in Georgia equals 52,500 (50,000 – 56,000)

National prevalence estimates for the injection drug use equals

2,24% (2,13% - 2,39%) per 18-64 years old population, and

1,41% (1,34% - 1,51%) per general population

5. LIMITATION OF THE STUDY

No matter what method is used, all data are potentially biased for a variety of reasons. Limitations that are commonly associated with NSU are connected to the assumptions on which this method relies on. They include the following:

- Respondents may do not know the behaviour of their acquaintances', because members of hidden population (people who inject drugs) may not talk to others about their behaviours, that is information transparency bias. In order to adjust this bias additional exercise was held along with the Bio-BBS study (PWIDs recruited by RDS were interviewed with the specific questions, which were incorporated into the main IBBS questionnaire).
- Members of hidden population may have not an equal chance of knowing someone in their network and predominantly, may have less chance to be counted in someone else's social networks, because they might have smaller network size compare to the general population. That yields to the popularity ratio, which also was adjusted for this current study using experts' opinion and estimates attained from the literature review.
- Current NSU study has applied the social network size information derived from the two urban areas, one of which uses Tbilisi 2014 HH survey data. The HH survey asked about the marginal number of PWID by sex (male and Female) and age groups (under 18, 18-30, >30). To be able to estimate the PWID population size in both sex and age groups (e.g. male 18-30), such questions need to be added to the household questionnaire. Therefore proportion of population in each subgroup of sex and age was applied to estimate the sex-age specific social network sizes. In addition no rural area social network size information is available in Georgia therefore extrapolated estimations are based on number of assumptions. The study used corrected popularity ratio (0.85 - as a mean of 1.00 and the estimate based on the literature review) that was discussed with and agreed by the expert consensus meeting.

The multiplier methods is relatively straightforward to use, but will depend on good institutional record-keeping. The greatest difficulty in using multiplier methods correctly is finding data from institutions and populations that correspond with one another. To use institutional and survey data together to estimate the size of a population, the members of the population all have to have a chance of being included in both the survey and in the institutional data (for example because they have access to that service).

Sources of information used for estimations may limit the generalizability of the final estimates. Here are some examples of how this happens: (1) Drug treatment programs typically attract chronic, long term PWID at the conclusion of their drug using careers, under-representing newer drug users. (2) Jails and criminal justice settings will have fewer newer PWID under-representing long-term users and those not involved in criminal activities to support their drug use. (3) Methadone treatment programs will only yield

information about opioid users, private programs will only include PWID that can afford to be in treatment.

The prevalence estimation obtained in this study should be treated with caution as there are several critical factors that should be taken into account:

- Reliability of low threshold program multiplier estimates is weak: Multiplier estimates for the low threshold programs across the cities are much higher than multiplier estimates for other benchmark sources such as police data, methadone substitution and treatment data. On the other hand, the introduction of the State Program of the Hepatitis C elimination dramatically increased the demand for HCV testing among PWID. As a result the number of beneficiaries applied to the harm reduction services has significantly increased. Worth to mention that harm reduction service data is based on beneficiary's unique number constructed based on beneficiary's response, therefore mismatches and duplications could not be ruled out. Moreover, these services are most available and accessible for PWID in several cities of Georgia.
- Number of benchmark data that varies across cities: ideally multiple benchmark data sources (and hence a variety of multipliers) should be used in a prevalence estimation exercise. Unfortunately different numbers of benchmarks are available in different cities of Georgia.
- Reporting bias as the data are self-reported; underreporting or over-reporting of behaviours is possible yet difficult to ascertain.
- The applicability of the Multiple Indicator Method for the extrapolation from local to national prevalence estimates as proposed by the EMCDDA was of limited use in the Georgian context because of a lack of drug-related indicators throughout the country.

6. CONCLUSION AND RECOMMENDATIONS

Population size estimation methods are a useful set of tools for public health researchers to monitor and quantify disease in a population. Despite the breadth of options available, the degree to which different population size estimation methods produce estimates that are in agreement with each other, is unknown. Differences in estimates calculated from different population size estimation methods applied to the same population compromise the reliability of any one method to produce estimates from which public health policy is based.

Currently, there is no evidence for a single best method to estimate the size of a hidden population. Reliable estimates of the sizes of hidden populations are needed in order to responsibly invest in programs targeting key populations and allocating limited public health resources to curb the HIV epidemic. At a minimum, multiple different PSE methods should be implemented within the same study, so as to communicate the degree of agreement (or disagreement) between different methods for estimating the size of the same population, thereby providing a more transparent indication of the certainty of the final size estimate. Moreover, multiple estimates based on different assumptions should reduce the risk of selecting a size estimate based on a single severely biased method. We should use both network scale-up and multiplier-benchmark methods.

Some key issues must be kept in mind in using multiplier methods successfully for PWID population size estimation. Firstly, a clear and consistent definition of PWID in different surveys should be used. Even when referring to the broadest possible target group, the „drug users“, any definition should include: a time period, an age group, frequency of use, and a definition of substances. Secondly, the catchment area for the selected data sources should be ideally the same as that covered in the survey from which multipliers are derived.

As in the previous cases, these estimates should not be considered as accurate and reliable. On the other hand, the multiplier method used in this study has its advantages. Firstly, the result suggests that combining this method with the HIV/AIDS behavioural surveillance to produce population size estimations is feasible and cost effective – in this way the necessary parameters for the estimation can be simply obtained. Secondly, combining this method with the IBBS, estimates can be obtained regularly (under the framework of the National Surveillance System) and trends in the size of PWID with time can be observed. Furthermore, this method can be generalized to the other cities, and thus estimates can be obtained for broader geographical areas.

Possible limitations to the study could have affected the results. The small numbers of women participating in the surveillance may indicate a strong desire to remain hidden, their limited numbers, or a reflection of poor recruiting. Because few women have been arrested or attended treatment facilities, there are only some data regarding injection drug use amongst women in Georgia. Reporting bias: as in any interview-based surveys, it is possible that respondents may not have accurately answered some of the sensitive questions, or may have had difficulties in recalling information.

The validity of this method depends on the ability of selected services to maintain accurate records concerning unique clients of the target population seen by the service during a specified timeframe, Each indicator selected to calculate the PWID estimates has biases; each indicator that we considered in this study is based on a different way of "encountering" an PWID. HIV counseling and testing and drug abuse treatment are usually based on voluntary interaction with health agencies. Data on treatment demand and HIV testing and counseling events depend on the desires of potential clients and on the availability of capacity at the service agency, they can happen multiple times a year for some persons and much less often for others. Drug abuse treatment and HIV counseling and testing services may be funded more or less adequately, and this can change over time. Biases may also exist in these data due to the different histories of HIV counseling and testing by PWID in different cities. For example, the counseling and testing data could include repeat testers; this will reduce the accuracy of the estimates.

The estimates derived from low-threshold services (such as needle/syringe programs) or HIV testing are most doubtful, and might result in overestimation due to significantly higher multiplier estimates than derived from other sources, or, in contrary, estimates based on police data are inadequately low. It should be mentioned that multiplier-benchmark approach risks confusing the reliability of the estimates with the validity of the estimates. Estimates can be highly consistent with each other, and therefore reliable (i.e., produce similar results), and yet all of them may systematically under- or over- estimate the true population size, thus producing invalid estimates. This presents a dilemma in choosing which result is correct in the absence of a gold standard and it is rather difficult to make decision which estimates should be excluded from the calculation. Therefore in the data triangulation and synthesis process it is highly important to involve field experts to arrive at best answer to the question that is important for the policy and program decision-making.

The PSE finding presented in this report were examined, re-examined and approved by the national group of stakeholders through the consensus building process.

The report clearly highlights many urban areas where despite substantial presence of PWID, no targeted interventions are in place. The data must be used for prioritizing resource allocation and planning for extension of prevention services in these urban areas in order to achieve universal access targets. These findings should form an integral part of the future geographic prioritization scheme and the target settings. For cities with substantial prevalence rate that have not been included in this survey, it is recommended that such studies be undertaken to validate the assumptions made for extrapolation to calculate national prevalence estimation.

The presented methods to derive national prevalence estimates are cost-effective, as they do not require new data collection (with exception of household survey for estimation of social network size), unless separate studies are needed to estimate new anchor points for synthetic estimation. Evidently, increasing the number of anchor points makes the regression more stable. Local estimation methods should be used and further developed to produce regional anchor points for the multivariative indicator method.

To achieve accurate estimates with the NSU method countrywide it is desirable to conduct household surveys in general population in other urban and rural areas, as the social network size may significantly differ by location.

The use of PWID population size estimates should be incorporated in the planning and evaluation of substance abuse, HIV and HCV prevention, treatment and care programs. Practical guidelines on the application of this information should be developed to ensure consistent usage to strengthen program planning and evaluation standards at the regional and national levels.

Appendixes

1. Network scale-up method survey questionnaire

N.1 Number of people you know with specific name

Now, I want you to recall and write down the number of people with specific name that you know. These people should be

General description of the "person you know"

- [People that you know them by sight and name, and who also know you by sight and name]
  AND
- [People that you had some contact with either in-person, over the phone or internet(e.g.: e-mail, Skype, chat through social networks) in the last 2 years]
  AND
- [People of all ages who lives in Georgia].

Description of the "person you know with whom you shared meal"

- [People that you know them by sight and name, and who also know you by sight and name]
  AND
- [People that you had shared a meal or drink with in the last 2 years, including family members, friends, coworkers, or neighbors, as well as meals or drinks taken at any location, such as at home, at work, or in a restaurant]
  AND
- [People of all ages who lives in Georgia].

Example: Suppose we are asking you to recall the number of people you know with the "first name of Elena" in last 2 years? Take your time and try to recall the overall number of people you know, having "Elena" as a first name. Let's say you recall/count 11 people with the first name of Elena. Perfect! First, you should exclude famous people that you know about, but who do not know about you. So, you should not consider Elena Satine, as she doesn't know about you! ☺. Then, exclude those who are not living in Georgia. Here, as all Elena that you know are living here in Georgia, you should not exclude anyone. And last, of those 10 people with the fist name of Elena, exclude anyone (let's say 3) whom you did not contact with over the last 24months either in-person, phone or internet. So, the number of people you may write down is 7 (11 – 1 – 3 = 7).

Important notes:

We know it is not an easy task. Please do your best to recall as much as you can.

If at the end, you could not recall anyone from the mentioned group, write 0.

Description	Answer	How many of those already know that you inject drugs?
How many people do you know with the "first name of Mamuka" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Luka" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Zurab, Zura, Zuka, Zuriko" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Vazha" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Sophiko, Sophio, Sopho" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Manana" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Shorena" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Nino, Niniko, Nina" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Maya" ?	_____ person(s)	_____ person(s)
How many people do you know with the "first name of Davit, Dato, Datuna, Datiko"?	_____ person(s)	_____ person(s)

N.2 Number of people you know by groups

Now I will ask you the number of people you know. Again, I am asking about

General description of the "person you know"

- [People that you know them by sight and name, and who also know you by sight and name]
  AND
- [People that you had some contact with either in-person, over the phone or internet(e.g.: e-mail, Skype, chat through social networks) in the last 2 years]
  AND
- [People of all ages who lives in Georgia].

Description of the "person you know with whom you shared meal"

- [People that you know them by sight and name, and who also know you by sight and name]
  AND
- [People that you had shared a meal or drink with in the last 2 years, including family members, friends, coworkers, or neighbors, as well as meals or drinks taken at any location, such as at home, at work, or in a restaurant]
  AND
- [People of all ages who lives in Georgia].

	Overall	How many of those already know that you inject drugs?	Only male	How many of those already know that you inject drugs?
How many people do you know, who were married in2016 year?	_____ persons	_____ persons	_____ male	_____ male
How many teachers do you know?	_____ persons	_____ persons	_____ male	_____ male
How many people do you know, who died in 2016 year?	_____ persons	_____ persons	_____ male	_____ male
How many people do you know, who died due to cancer in 2016 year?	_____ persons	_____ persons	_____ male	_____ male
How many people do you know, who were injured or died in road accidents in 2016?	_____ persons	_____ persons	_____ male	_____ male
How many higher educational students do you know?	_____ persons	_____ persons	_____ male	_____ male

2. Nomination method questionnaire

Questionnaire Identification Number: ☐

Coupon Number: ☐

1. What is the number of your **close friends** with whom you have been using drugs in the last year (or whom you know for sure they are or were using drugs, including those who passed away and those who ceased to use drugs meanwhile)?

In total _____ female among those _____

2. Are you sure? Could you please think about this number for me for a while? Sounds to me (too high or low /too quick/ too round). Maybe you could name them by their first names (even unreal, imaginary) to obtain more specific number?

Names:

I.	VI.
II.	VII.
III.	VII.
IV.	IX.
V.	X.

Final number: _____

3. Was (name) ____ tested by police for presence of illegal drugs in 2016?

   1. Yes
   2. No
   88. Don't know
   99. No response

4. Was (name) ____ tested for HIV in 2016?

   1. Yes
   2. No
   88. Don't know
   99. No response

5. Was (name) ____ in abstinence-oriented treatment in 2016?

   1. Yes ***(Go to Q. 8)***
   2. No
   88. Don't know } ***Continue***
   99. No response

6. Was (name) ____ considering entering the abstinence oriented treatment in 2016, but did not do so?

1. Yes ***(Continue)***
2. No ***(Go to Q.8)***
88. Don't know **(Continue)**
99. No response ***(Continue)***

7. Why s/he did not?
   1. Changed his mind
   2. Because of high cost
   3. Entered the substitution treatment
   4. Any other reason
   88. Don't know
   99. No response

8. Was (name) ____ in substitution with methadone treatment in 2016?
   1. Yes
   2. No
   88. Don't know
   99. No response

9. Did (name) ____ receive free prevention services in 2016?

   9.1 Was (name) ____ in the needle exchange program (when used needles are changed by new ones) in 2016?

   1. Yes
   2. No
   88. Don't know
   99. No response

   9.2 Was (name) ____ in the other low-threshold programs (e.g. voluntary counseling and testing on Hepatitis B, C and HIV, counselling offered by physicians and psychologists) in 2016?
   1. Yes
   2. No
   88. Don't know
   99. No response

10. Was (name) ____ deceased due to a fatal drug overdose in 2016?
   1. Yes
   2. No
   88. Don't know
   99. No response

Questions 3-10 will be asked for every nominated drug user.

Thank you indeed!

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