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# Men who have sex with men population size estimation in Estonia

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Research report

Tallinn 2023

Eurasian Coalition on Male Health  
National Institute for Health Development

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# Introduction

Despite evidence of the importance and overall impact of prioritizing key populations in implementing effective and efficient HIV responses, many countries have limited current data or no data on key population size estimations (PSE) (1).

Men who have sex with men (MSM) are defined in Estonia as a vulnerable group in relation to HIV (2). Estimating the size of vulnerable groups, both at the national and local levels, is an important strategic resource for further decision-making on the response to the HIV epidemic (3).

The results of PSE can be used in several areas (3, 4):

- Assessment and forecasting of the HIV situation in the country for calculating the number of people living with HIV;
- To predict the spread of the HIV epidemic;
- To assess the burden and likely scale of the HIV epidemic if effective prevention measures are not taken;
- Effective planning, implementation and evaluation of prevention programs, development of HIV service organizations, in particular to assess the level of coverage of target groups with prevention interventions;
- To substantiate quantitative indicators of the development of preventive programs;
- To calculate the costs to ensure the planned level of coverage of target groups and the acquisition of the required number of means to prevent HIV infection and the production of the required amount of information and educational materials;
- To calculate the costs of purchasing test systems for diagnosing HIV infection and the costs associated with the treatment and care of patients, social support for HIV-infected people and their families;
- To plan the development of networks of community organizations and other HIV service structures;
- Assessing and planning treatment procurement, including scoping antiretroviral therapy needs;
- Justification of changes in the state policy on HIV, as well as anti-discrimination policy;
- Calculation of samples for conducting behavioral, epidemiological, and other studies among MSM.

MSM PSE studies have been conducted in almost all countries of the Eastern Europe and Central Asia (EECA) region (5), some examples are in the Table 1.

**Table 1.** Men who have sex with men population size estimations in Eastern Europe and Central Asian countries

Country	MSM PSE	Year	Method
Armenia (6)	12,461	2016	<ul style="list-style-type: none"> <li>• Multiplier methods</li> <li>• Wisdom of the crowds</li> <li>• Successive sampling PSE</li> </ul>
Yerevan	5,534		
Gyumri	415		
Vanadzor	282		
Belarus (7)	38,150 (6,320–70,000)	2015	<ul style="list-style-type: none"> <li>• Network scale-up</li> <li>• Service multiplier</li> <li>• Extrapolation of data</li> <li>• Triangulation of data</li> </ul>
Estonia (8)	9,195	2009	<ul style="list-style-type: none"> <li>• EMIS Data</li> </ul>
Georgia (9)	17,215 (11,700–27,600)	2014	<ul style="list-style-type: none"> <li>• Network scape-up</li> <li>• Multiple multipliers</li> <li>• Respondent driven sampling (RDS) based Handcock</li> <li>• Capture-recapture (Telefunken code)</li> <li>• Wisdom of crowds</li> </ul>
Batumi	450 (340–570)		
Tbilisi	5,100 (3,240–9,090)		
Other areas	11,700		
Kyrgyzstan (10)	22,000	2013	<ul style="list-style-type: none"> <li>• Capture-recapture</li> <li>• Multiplier</li> <li>• Method of nomination</li> <li>• Indirect multiplier</li> </ul>
Bishkek	1,151–6,960		
Osh	349–4,731		
Ukraine (11, 12)	152,267 (109,960–194,573)	2020	<ul style="list-style-type: none"> <li>• Network scale-up</li> <li>• Multiple multipliers</li> <li>• RDS based Handcock</li> <li>• Capture-recapture</li> </ul>

The Georgian data is derived from a PSE survey of MSM with statistical credibility, but with several possible limitations. This data was used by the government in the development of the concept note for the Global Fund HIV grant in 2014 (7). The NGO sector also used PSE data for planning their programs and for fundraising purposes.

A PSE of MSM was carried out in Kyrgyzstan in 2013. A PSE of the MSM population was included in the 2016 integrated bio-behavior survey (IBBS) (10). In 2012, the Kyrgyz government approved the «State program to stabilize the HIV epidemic for 2012–2016» in order to combat the HIV epidemic in the Kyrgyz Republic and to improve the effectiveness of ongoing HIV prevention activities (13).

In Belarus, a PSE of the MSM population was conducted in 2015 (7). The methodology of this study is based on an integrated approach using a triangulation of the data on the size of the target group obtained by different methods, data from sociological surveys of the target group and the general population, as well as of official statistics and statistics of NGOs. The PSE of MSM is superficially mentioned in the decision of the Council of Ministers of the Republic of Belarus No. 200 of March 14, 2016, on approval of the State Program «People's Health and Demographic Security of the Republic of Belarus for 2016–2020». However, no

concrete figures (such as ones indicating the amount of funding to be allocated to MSM) are provided.

Armenia conducted a PSE of the MSM population in 2016 and 2018 (6). Ukraine has been conducting population estimates regularly since 2004, covering all regional centers (including those in temporarily non-government-controlled areas), and the results form the basis of both national and local HIV programs (11, 12). In Armenia and Ukraine, estimates of the number of trans people have also been made (6, 11, 14).

According to previous estimates (2009), there are up to 9195 gay and bisexual men in Estonia (8). In 2016, another study was conducted in Estonia on the sexual behavior of the adult population of the country. In the study, 3% of respondents (men and women aged 18–79) said that they had had same-sex sexual contacts during their lifetime. At the same time, 1.5% of men and 1.0% of women said that they had same-sex sexual partners over the past 12 months (data not shown). The calculation shows that among men in the 18–79 age group, 7,050 men have had sex with men in the past 12 months. This figure does not include all men who are attracted to other men or who are gay, but only those who have had sex with men in the past 12 months. In total, 3.8% of men in Estonia are believed to be gay and other MSM (7).

The PSE in all countries were subject to several limitations that could lead to an underestimation of the true size of MSM populations (7). Generally, PSE studies cannot estimate the proportion of MSM who are truly hidden and/or MSM who do not acknowledge that they are MSM. In this sense, these estimates are likely an underestimation of the true MSM population size. In some countries, such as Georgia, the study was limited to MSM 18 years and older, and therefore does not include MSM younger than 18. PSE were carried out in only two urban areas in Georgia and Kyrgyzstan. Data for other urban areas is extrapolated from existing PSE data. Therefore, estimates at the country level may not be completely accurate. The quality of the estimate derived from the Multiplier method (website and mobile applications) is only as good as quality of data that was used to produce that estimate. The accuracy of Network Scale-up estimates is very dependent on the accuracy of responses received from the study participants, the quality of the data source for the real size of known population sizes, the transparency of MSM behaviors among the networks, and on the random mixing of MSM in the community. Some biases (such as transparency and popularity biases) were adjusted for, while some parameters were hard to measure and adjust.

The aim of the current study was to estimate the population size of men who have sex with men in Estonia in 2021.

# Methods

The WHO proposed a wide range of PSE methods (3), which can be used according to situation in a country. No gold standard exists. All methods have their strengths and limitations, and where possible, multiple estimates should be produced to derive a consensus estimate (4). Based on existing opportunities in Estonia, we have chosen the following methods:

**Multiplier method** is used if there is quantitative information from at least two independent sources and it is known that the measured groups intersect, and it is possible to estimate the volume of this intersection. The first source, for example, a list from the body that contacts representatives of the target group (statistical reporting, operational information, and other data bases), and the second is information received directly from representatives of the hidden group on their contact with this body (an affirmative answer to the questionnaire during the survey).

The accuracy of the estimate depends on the validity of the statistics, the adequacy of the sampling, and the reliability of the survey data. The multiplier method can be applied to any comparable data source related to the same population.

**Capture-recapture method** is very similar to the multiplier method; the main specificity is that the source of information is only «field» results (contacts with representatives of hidden groups). The procedure provides for two rounds – the issuance of unique objects to the target group and a second poll after a time, during which those who received a unique object in the first round are identified among the respondents. Thus, knowing the number of first-time respondents and the proportion of first-time respondents in the second coverage sample, one can calculate an estimate of the total size of the study group.

The following formulae (1–3) were used for calculating RSE in the multiplier and capture-recapture methods:

$$P = I \cdot \frac{N}{n} \quad (1)$$

where  $P$  is the estimated size of the group,  $I$  is the number of members of the estimated group according to an independent source,  $N$  is the survey sample,  $n$  is the number of respondents who indicated their belonging to an independent source

$$\text{Var}(P) = \frac{N \cdot I \cdot (N-n) \cdot (I-n)}{n^3} \quad (2)$$

$$95\% \text{ CI: } P \pm 1.96 \cdot \sqrt{\text{Var}(P)} \quad (3)$$

Additionally, we have used **the successive sampling method (SS)**, which is based on probability model as a function of the observed personal network sizes in the RDS sample, investigators' knowledge about the population size, and the unobserved network sizes. Estimate's validity depends on representativeness of the sample and reasonable prior information on the population size (4). As SS also depends on quality of data on individual network sizes of respondents, we have excluded from RDS database two respondents, whose answers were outliers.



## Data sources

The population size estimate was based mainly on the results of IBBS among MSM in Estonia (Harjumaa), conducted in Estonia's capital Tallinn in 2021, using respondent driven sampling (Table 2) (2). Information on the number of members/ clients was also obtained from various LGBT organizations and dating apps (direct contact).

Data of EMIS-2017 is contained in the report (15), all respondents from Harjumaa were taken into account. LGBT Ühing data was collected at our request on February 15, 2022. EHPV data (number of MSM clients from December 2020 till January 2022) received on request on February 9, 2022. Hornet LTD data is from 2017 and obtained 17.05.2017, in general for Estonia. Data about a number of active Grindr profiles in Tallinn was from our monitoring taken in April 2022. Data on the number of MSM profiles on dating sites (Bluesystem, Iha.ee) is as of February 2022, while it is not considered how many residents of Harjumaa are in an independent source and how many used in the last year. Data on the number of Estonian MSM who use Facebook (FB) for communication is taken as the number of profiles that are members of the «Kõik mehed on head» and «LGBT virtuaalne kogukond» groups — in both cases, the members of the groups were people not only from Harjumaa, and in the group «LGBT virtuaalne kogukond» in addition to men, homo- and bisexual women also communicate.

# Results

There is an almost two-hundred-fold spread of the obtained estimates (from 175 to 29,120) (Table 3), while the lowest estimate (i.e., 175) refers to the data of an organization that does not systematically record its clients. In addition, the minimum figure is less than the number of clients recorded as recipients of services in EHPV (i.e., 185). The highest value, 29,120, comes from Hornet LTD 2017 data, which unfortunately may differ significantly from 2021 data, which is not available to the research team. The estimate according to the Facebook group «LGBT virtuaalne kogukond» also cannot be considered reliable, since this number includes both men and women. In this regard, the values of 175,6466 and 29,120 should be excluded. Dating sites' (Bluesystem and Iha.ee) data and the Hornet mobile app's data do not allow to differ users from Harjumaa, but only give the total number of profiles from Estonia.

Calculations with RDS successive sampling based on 2021 RDS study (2; data not published) gave 5,371 (882–15,584) (as a prior median we have used 3,700 as expert estimation, based on extrapolation of 2009 Estonian EMIS data for Harjumaa (8)).

The consensus estimate ( $PSE_{Harjumaa} = 4,510$ , 95% CI: 2,858–6,483 or 2.0%, 95% CI: 1.3–2.9, Figure 1) based on the data in Table 3 was obtained using the Anchored Multiplier method. Anchored Multiplier calculator (16), created by researchers at the University of California at San Francisco led by Paul Wesson, uses a Bayesian model to combine empirical estimates. «Stronger» data (those with narrower confidence intervals) influence the final estimate more than «weaker» data (those with wider confidence intervals).

## Data extrapolation for all Estonia

Harjumaa is the most populated county in Estonia – according to the Estonian Statistics Department (<https://andmed.stat.ee/et/stat>) in 2021, as for 1.01.2022, the male population (18+ y.o.) of Harjumaa was 227,679 people, and the whole of Estonia – 500,261. Assuming about the even distribution of MSM throughout the country, we can do next generalization:

$$PSE_{Estonia} = PSE_{Harjumaa} \cdot \frac{500251}{227679}$$

As a result, the number of MSM in Estonia will be **9,909 (6,279–14,243)** men.

**Table 2.** Sources of information for population size estimation for men who have sex with men in Estonia

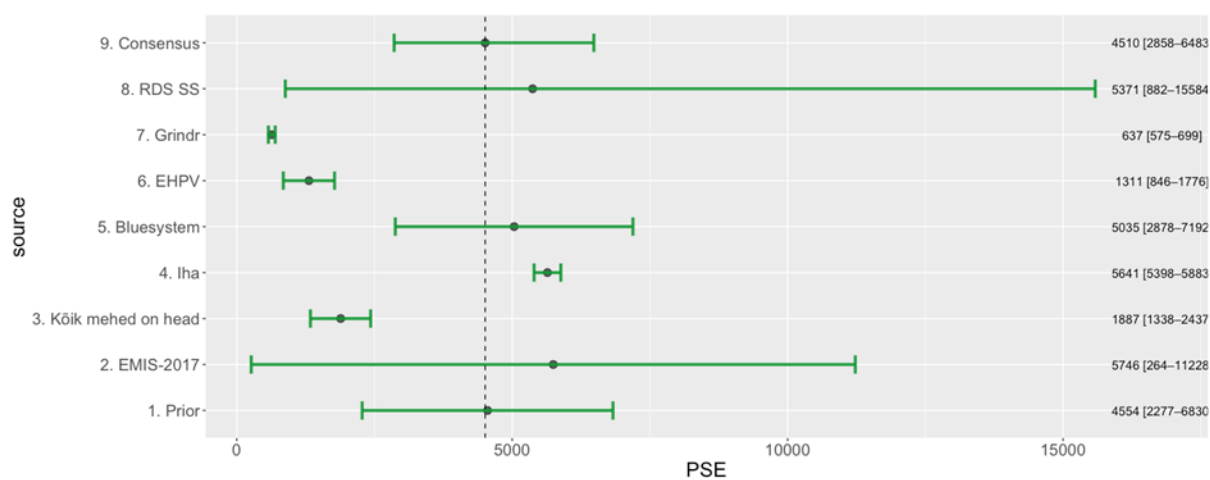
Source 1, question and answer	Source 2	Method for PSE
<b>Estonian MSM IBBS-2021:</b> «Did you participate in 2017 European MSM internet study EMIS?» – «Yes»	<b>EMIS-2017:</b> «Which country are you currently living in?» – «Estonia»	Capture-recapture
<b>Estonian MSM IBBS-2021:</b> «Are you a member of any of the following organizations?» – «Yes, LGBT Ühing»	<b>LGBT Ühing:</b> number of male clients	Multiplier
<b>Estonian MSM IBBS-2021:</b> «Are you a member of any of the following organizations?» – «Yes, EHPV»	<b>EHPV:</b> number of MSM clients	Multiplier
<b>Estonian MSM IBBS-2021:</b> «Which dating sites and apps have you used in the last 12 months in order to meet men in Estonia?» – «Facebook»	<b>FB groups «Kõik mehed on head» and «LGBT virtuaalne kogukond»:</b> number of members	Multiplier
<b>Estonian MSM IBBS-2021:</b> «Which dating sites and apps have you used in the last 12 months in order to meet men in Estonia?» – «Bluesystem»	<b>Date.bluesystem.world:</b> number of profiles from Estonia	Multiplier
<b>Estonian MSM IBBS-2021:</b> «Which dating sites and apps have you used in the last 12 months in order to meet men in Estonia?» – «lha.ee»	<b>lha.ee:</b> number of profiles of Estonian MSM	Multiplier
<b>Estonian MSM IBBS-2021:</b> «Which dating sites and apps have you used in the last 12 months in order to meet men in Estonia?» – «Hornet»	<b>Hornet data:</b> number of profiles	Multiplier
<b>Estonian MSM IBBS-2021:</b> «Which dating sites and apps have you used in the last 12 months in order to meet men in Estonia?» – «Grindr»	<b>Grindr data:</b> number of profiles	Multiplier
<b>Estonian MSM IBBS-2021:</b> the size of individual social network during the last month	–	RDS successive sampling

**Table 3.** Data from all possible sources and population size estimation's calculation for men who have sex with men in Estonia using multiplier and capture-recapture methods

Question in IBBS-2021	Sample of IBBS-2021	Answered «yes» in IBBS-2021	Independent source	How much in independent source	PSE in Harjumaa
	N	n		I	$P = I * (N / n)$
Participation in 2017 European MSM Internet study EMIS	163	4	EMIS-2017, Harjumaa	141	5,746
Using dating sites and apps in the last 12 months in order to meet men in Estonia (FB)	163	33	FB group «Kõik mehed on head»	382	1,887
Using dating sites and apps in the last 12 months in order to meet men in Estonia (FB)	163	33	FB group «LGBT virtuaalne kogukond»	1,309	6,466
Using dating sites and apps in the last 12 months in order to meet men in Estonia (Iha.ee)	163	43	Iha.ee	1,488	5,641
Using dating sites and apps in the last 12 months in order to meet men in Estonia (Bluesystem)	163	18	Bluesystem.world (Estonia)	556	5,035
Participation in organizations in the last 12 months (LGBT Ühing)	163	14	LGBT Ühing	15	175
Participation in organizations in the last 12 months (EHPV)	163	23	EHPV	185	1,311
Using dating sites and apps in the last 12 months in order to meet men in Estonia (Hornet)	163	57	Hornet (Estonia)	10,183	29,120
Using dating sites and apps in the last 12 months in order to meet men in Estonia (Grindr)	163	106	Grindr (Tallinn)	414	637

**Tabel 4.** Cleaned summary of population size estimates according to independent data sources, Estonia, 2022

Independent source	PSE	95% CI	% among men (18+ y.o) for 1.01.2022 (227,679)
EMIS-2017, Harjumaa	5,746	264–11,228	2.5 (0.1–4.9)
FB group «Kõik mehed on head»	1,887	1,338–2,437	0.8 (0.5–1.1)
Iha.ee	5,641	5,398–5,883	2.5 (2.3–2.6)
Bluesystem.world	5,035	2,878–7,192	2.2 (1.3–3.1)
EHPV	1,311	846–1,776	0.6 (0.4–0.8)
Grindr	637	575–699	0.3 (0.2–0.4)
RDS SS	5,371	882–15,584	2.3 (0.4–6.8)



**Figure 1.** Obtaining a consensus estimate of the number of MSM in Harjumaa using the Anchored Multiplier method (the value of 2% of the male population of Harjumaa was taken as an a priori estimate according to the UNAIDS recommendations (17))

## Discussion and conclusions

This is the second attempt in Estonia to estimate the population size of men who have sex with men. The first MSM PSE was conducted based on European MSM internet survey (EMIS 2009), and it concluded that the number of MSM in Estonia in 2010 was 9195 (8).

The current study is based mostly on the data from bio-behavioral study among MSM in capital city Tallinn and surrounding Harju County in 2021 (2), as well as data on the number of participants/clients of MSM oriented dating apps as well as LGBT and HIV services organizations.

The results of our study show that the number of MSM in capital city Tallinn and surrounding Harju country is **4,510, 95% CI: 2,858–6,483 or 2.0%, 95% CI: 1.3–2.9 of all men 18+ y.o.** Assuming about the even distribution of MSM throughout the country, the number of MSM in Estonia will be **9,909 (6,279–14,243)** men. These results are in the same range as the previous estimation.

Our study has several limitations. The bio-behavioral study implemented respondent-driven sampling (which is not an ideal random sampling), and all the data in this study were self-reported, thus this data source has many limitations of its own.

The members/clients of HIV and LGBT services organizations as well as gay dating apps may include mostly men who are more open about their sexuality, thus these samples may not represent all men who have sex with men in Estonia. This would mean that the actual number of men who have sex with men is larger.

The distribution of MSM throughout the country may not be even, as there may be tendency for the members of this vulnerable group to move to capital city where there is more anonymity as well as larger community of MSM. Thus, the actual number of MSM in all Estonia may be smaller.

Since the beginning of the war In Ukraine, many refugees have arrived to Estonia and the number of MSM may have changed. This change could be estimated only indirectly based on the change in general population size. It is recommendable to repeat the MSM IBBS and PSE as soon as possible. The PSE section in the next IBBS questionnaire need elaboration to collect all necessary data for PSE. Another gap is lack of IBBS and PSE on transgender and non-binary people in Estonia.

For better estimating the size of the MSM and LGBT populations in general, MSM/LGBT NGO should be supported with technical assistance to implement systems for unique clients' registration.

Despite all the limitations, the results of this study can contribute to many fields, including planning, implementation and evaluation of HIV prevention, treatment and care programs for men who have sex with men.

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