JHAD
Health and Development Journal
https://jhad.kmu.ac.ir
10.34172/jhad.1200
JHAD. 2025;14:1200

Letter to Editor

Population Size Estimation of Hidden Groups: Things We Have Learned from Iran's Experiences

Ali Akbar Haghdoost[1], Hamid Sharifi[2,3], Mohammad Reza Baneshi[4*]

[1]Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran
[2]HIV/STI Surveillance Research Center, and WHO Collaborating Center for HIV Surveillance, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran
[3]Institute for Global Health Sciences, University of California, San Francisco, San Francisco, CA, USA
[4]Center for Longitudinal and Life Course Research, School of Public Health, The University of Queensland, Herston, Queensland, Australia

***Corresponding Author:** Mohammad Reza Baneshi, Email: m.baneshi@uq.edu.au

Citation: Haghdoost AA, Sharifi H, Baneshi MR. Population size estimation of hidden groups: things we have learned from Iran›s experiences. Health Dev J. 2025;14:1200. doi:10.34172/jhad.1200

Received: August 17, 2025, **Revised:** September 3, 2025, **Accepted:** September 3, 2025, **ePublished:** October 28, 2025

Introduction

Estimating the size of hidden populations presents a unique methodological challenge. These populations, including but not limited to people who inject drugs, sex workers, or participate in same-sex sexual activity, are often underrepresented in routine data due to criminalisation and stigma (1-3). The core difficulty lies in trying to measure something that people actively avoid revealing.

Traditional size estimation methods, where individuals are asked directly about sensitive behaviours (e.g., "Have you ever injected drugs?"), tend to produce underestimates. This is largely because respondents may fear judgment, legal consequences, or breaches of confidentiality (4, 5). In highly conservative or legally restrictive settings, even anonymous surveys may not be perceived as safe. As a result, new methods have been developed to estimate the size of hidden populations while reducing the impact of stigma and social desirability bias (2, 6-8). At its core, PSE for hidden groups involves a trade-off: producing figures that are plausible enough to guide action, while designing studies that encourage participation and truthful reporting of hidden or sensitive characteristics.

Iran's experience

Over the past decade, researchers in Iran have implemented one of the most extensive programs for estimating the hidden population size in the region. This effort has covered a range of key populations and behaviours, from drug injection (9-13), alcohol use (10, 12, 14, 15), and sex work (12, 13, 16) to abortion (17, 18) and suicide attempts (19). Recognising that there is no one-size-fits-all solution, researchers employed a combination of PSE methods and triangulation approaches (to combine estimates from multiple PSE methods) to provide an informed estimate for many hidden groups.

Beyond methods: policy and capacity building

The impact of this body of work extends beyond academia. PSE efforts in Iran have not only generated valuable data but also contributed to building institutional infrastructure for ongoing public health surveillance. The findings have been used to inform national HIV and harm reduction programs, guide resource allocation, and shape policy debates at various levels.

In addition, engagement with policymakers was embedded in the research process. For most national studies, the research teams held several consultative meetings with key stakeholders from the Iranian Ministry of Health and Medical Education. These discussions were used to review and adapt study protocols, agree on appropriate estimation methods, and co-develop survey instruments that aligned with policy needs. This collaborative approach helped build trust in the data and increased the likelihood that the results would inform real-world decisions.

Capacity building was a central feature of this work: several students were trained to conduct alternative PSE methods, and numerous theses and methodological guidelines were developed, creating a foundation for

© 2025 The Author(s); Published by Kerman University of Medical Sciences. This is an open-access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

sustained expertise.

Conclusion

Estimating hidden populations is about recognising people who are often unseen and making sure they are counted where it matters most: in planning, policy, and care. Successful implementation of PSE methods depends not only on technical design but on strong coordination and cross-sector collaboration. Equally important is support from policymakers. Finally, size estimates only make a difference when they are used to shape health services and ensure that marginalised groups are not overlooked. For that to happen, researchers and decision-makers must work hand in hand.

Authors' Contribution

Conceptualization: Mohammad Reza Baneshi.
Writing–original draft: Mohammad Reza Baneshi.
Writing–review & editing: Mohammad Reza Baneshi, Ali Akbar Haghdoost, Hamid Sharifi.

Competing Interests

The authors declared no conflict of interest.

Funding

None.

References

1. Bernard HR, Hallett T, Iovita A, Johnsen EC, Lyerla R, McCarty C, et al. Counting hard-to-count populations: the network scale-up method for public health. Sex Transm Infect. 2010;86(Suppl 2):ii11-5. doi: 10.1136/sti.2010.044446.
2. Xu C, Jing F, Lu Y, Ni Y, Tucker J, Wu D, et al. Summarizing methods for estimating population size for key populations: a global scoping review for human immunodeficiency virus research. AIDS Res Ther. 2022;19(1):9. doi: 10.1186/s12981-022-00434-7.
3. Johnston LG, McLaughlin KR, El Rhilani H, Latifi A, Toufik A, Bennani A, et al. Estimating the size of hidden populations using respondent-driven sampling data: case examples from Morocco. Epidemiology. 2015;26(6):846-52. doi: 10.1097/ede.0000000000000362.
4. Ewemooje OS, Adebola FB, Amahia GN. Alternative estimator in dichotomous randomized response technique. Commun Math Stat. 2019;7(4):383-400. doi: 10.1007/s40304-018-0145-x.
5. Zhao Y. Estimating the size of an injecting drug user population. World J AIDS. 2011;1(3):88-93.
6. Abdul-Quader AS, Baughman AL, Hladik W. Estimating the size of key populations: current status and future possibilities. Curr Opin HIV AIDS. 2014;9(2):107-14. doi: 10.1097/coh.0000000000000041.
7. Crawford FW, Wu J, Heimer R. Hidden population size estimation from respondent-driven sampling: a network approach. J Am Stat Assoc. 2018;113(522):755-66. doi: 10.1080/01621459.2017.1285775.
8. Feehan DM, Salganik MJ. Generalizing the network scale-up method: a new estimator for the size of hidden populations. Sociol Methodol. 2016;46(1):153-86. doi: 10.1177/0081175016665425.
9. Nikfarjam A, Shokoohi M, Shahesmaeili A, Haghdoost AA, Baneshi MR, Haji-Maghsoudi S, et al. National population size estimation of illicit drug users through the network scale-up method in 2013 in Iran. Int J Drug Policy. 2016;31:147-52. doi: 10.1016/j.drugpo.2016.01.013.
10. Rastegari A, Baneshi MR, Hajebi A, Noroozi A, Karamouzian M, Shokoohi M, et al. Population size estimation of people who use illicit drugs and alcohol in Iran (2015-2016). Int J Health Policy Manag. 2023;12:6578. doi: 10.34172/ijhpm.2022.6578.
11. Shokoohi M, Baneshi MR, Haghdoost AA. Size estimation of groups at high risk of HIV/AIDS using network scale up in Kerman, Iran. Int J Prev Med. 2012;3(7):471-6.
12. Sheikhzadeh K, Baneshi MR, Afshari M, Haghdoost AA. Comparing direct, network scale-up, and proxy respondent methods in estimating risky behaviors among collegians. J Subst Use. 2016;21(1):9-13. doi: 10.3109/14659891.2014.942401.
13. Jafari-Khounigh A, Haghdoost AA, Salari Lak S, Zeinalzadeh AH, Yousefi-Farkhad R, Mohammadzadeh M, et al. Size estimation of most-at-risk groups of HIV/AIDS using network scale-up in Tabriz, Iran. J Clin Res Gov. 2014;3(1):21-6. doi: 10.13183/jcrg.v3i1.80.
14. Nikfarjam A, Hajimaghsoudi S, Rastegari A, Haghdoost AA, Nasehi AA, Memaryan N, et al. The frequency of alcohol use in Iranian urban population: the results of a national network scale up survey. Int J Health Policy Manag. 2017;6(2):97-102. doi: 10.15171/ijhpm.2016.103.
15. Kazemzadeh Y, Shokoohi M, Baneshi MR, Haghdoost AA. The frequency of high-risk behaviors among Iranian college students using indirect methods: network scale-up and crosswise model. Int J High Risk Behav Addict. 2016;5(3):e25130. doi: 10.5812/ijhrba.25130.
16. Sharifi H, Karamouzian M, Baneshi MR, Shokoohi M, Haghdoost AA, McFarland W, et al. Population size estimation of female sex workers in Iran: synthesis of methods and results. PLoS One. 2017;12(8):e0182755. doi: 10.1371/journal.pone.0182755.
17. Rastegari A, Baneshi MR, Haji-Maghsoudi S, Nakhaee N, Eslami M, Malekafzali H, et al. Estimating the annual incidence of abortions in Iran applying a network scale-up approach. Iran Red Crescent Med J. 2014;16(10):e15765. doi: 10.5812/ircmj.15765.
18. Zamanian M, Zolala F, Haghdoost AA, Baneshi MR. Estimating the annual abortion rate in Kerman, Iran: comparison of direct, network scale-up, and single sample count methods. Int J Fertil Steril. 2019;13(3):209-14. doi: 10.22074/ijfs.2019.5721.
19. Moradinazar M, Najafi F, Baneshi MR, Haghdoost AA. Size estimation of under-reported suicides and suicide attempts using network scale up method. Bull Emerg Trauma. 2019;7(2):99-104. doi: 10.29252/beat-070202.