

## Estimating the Visibility Rate of Alcohol Consumption: A Case Study in Shiraz, Iran

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### Original Article

#### Abstract

**Background:** Network Scale Up (NSU) is applied in many settings to estimate the size of hidden populations. The visibility of alcohol consumption - as a hidden behavior - in Iran has not been yet set. Our aim is to estimate the visibility factor (VF) of alcohol consumption in Iran which is an Islamic country in the Middle East.

**Methods:** Ninety persons who had a history of alcohol consumption were recruited. Relationships in network were aligned in three main subgroups: immediate family, extended family, and non-family. According to the game of contact methodology, participants answered questions about total and aware number of persons they know in each relationship category. VF was calculated by dividing total number of people aware about the respondent's alcohol consumption by total number of respondent's social network. The 95% confidence intervals (CIs) were computed through bootstrapping.

**Findings:** The mean and standard deviation (SD) of participants' age was  $32.9 \pm 10.2$ , the sex ratio was 3. Overall VF (95% CI) was 40% (33% to 47%). VF was estimated at 44% and 23% among men and women's network, respectively. The immediate family was the highest informed group, followed by non-family and extended family members.

**Conclusion:** The visibility of alcohol consumption in Iran was not high. This is due to religious and legal prohibitions around it.

**Keywords:** Alcohol drinking; Visibility; Size estimation; Iran

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## Introduction

Total alcohol per capita (APC) consumption in the world's population over 15 years of age rose from 5.5 litres in 2005 to 6.4 litres in 2010 and remained at the level of 6.4 litres in 2016.<sup>1</sup>

In the year 2016, the total APC for Iran was 1.9 litre and 0.1 litre among men and women, respectively. The total APC for both genders was 1.0 that was only based on unrecorded APC. The prevalence of alcohol use disorders (AUDs) for both genders was 1.0 (men = 1.8, women = 0.1), while it was 0.8 for World Health Organization (WHO) Eastern Mediterranean Region.<sup>1</sup> Jalilian et al. reported that 10.1% of the male university students in Isfahan and Kermanshah, Iran, had a history of alcohol drinking during three months prior to the study.<sup>2</sup> This gap between reports could be due to under-reporting bias of measuring such a sensitive issue.<sup>3,4</sup>

In 2016, 46% of countries in the WHO region reported having written national alcohol policies which is a key indicator of reducing alcohol-related harm in a country and 6% had a total ban on alcohol.<sup>1,5</sup> Iran is amongst the countries with the total ban, where producing, selling, and drinking alcohol is a crime which increases the unrecorded data on alcohol consumption and more health-related problems.<sup>1,6</sup>

Rehm et al. study showed that unrecorded alcohol use is about 30 percent of all global alcohol consumed.<sup>4</sup> Previous studies showed the enormous global burden of disease caused by the alcohol consumption.<sup>1</sup> Numerous health conditions ranging from liver diseases, road injuries, and violence to cancers, cardiovascular diseases (CVDs), and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) are linked to harmful alcohol use.<sup>7-12</sup> Furthermore, alcohol consumption is one of the key reasons of mortality and disabilities.<sup>2,13</sup>

To estimate the size of the hidden populations, several methods including indirect sample estimation methods, enumeration methods, capture-recapture techniques, multiplier methods, and synthetic estimation have been used.<sup>14</sup> These methods were not feasible for reliable estimations and failed to identify the high-risk individuals.<sup>14,15</sup>

Among different size estimation methods, Network Scale Up (NSU) technique is an appropriate method which needs no direct contact

with high-risk individuals.<sup>14,16,17</sup> In NSU, a representative sample of the general population is asked to count the number of the target population in their active social network.<sup>18</sup> It has been shown that this method is less prone to prestige bias, as respondents do not reply on behalf of themselves. They simply count the number of people they know who are engaged in the risky behavior.

Therefore, to be able to implement NSU studies, two extra sources of information are required: average network size of the population and visibility of the behavior. Respondents are not necessarily aware of sensitive characteristics of people who form their network. Therefore, NSU estimates are crude and just show the tip of the iceberg. Therefore, NSU estimates should be adjusted to take into account the visibility issue.

So far, only one study in Brazil has estimated the visibility of alcohol consumption. However, visibility highly depends on cultural and religious beliefs. In most Islamic countries, alcohol consumption is against social norms and there might be some punishments for sellers and users. Therefore, Brazilian figure might not be optimum for Islamic societies. Hence, we aimed to estimate the visibility rate in Iran which is an Islamic country in the Middle East.<sup>19</sup>

## Methods

This cross-sectional study was conducted in Shiraz City (IR.SUMS.REC.1398.862), the capital of Fars Province, which is located in south of Iran. Iran is located in the Middle East with total population of 79926270 in 2016, of which 4851274 live in Fars Province.<sup>18</sup> Eligible participants were residents of Shiraz during the past 5 years regardless of gender and age. Ninety persons who lived in Shiraz and had a history of alcohol consumption were included in this study. People who came to five drugstores and intended to buy white alcohol (ethanol) without reasonable justification of non-edible use of it or asked for advices on alcohol consumption and its interaction with their medications were questioned. These five pharmacies were located in different urban areas.

After questioning and ensuring of alcohol consumption by the training individual, the objectives of the study were explained and the questionnaire was completed for him. If he also knew someone else, he would introduce him/her

to us. The questioners completed a two-hour course on how to complete the questionnaire correctly. In order to clarify the questions, a questionnaire was completed at the training session.

The interview checklist had two sections. In the first section, after describing an overview of the study and its objectives, a table was designed. In this table, the participant's active social network relationships were listed in the rows.

Participants were asked about each of relative's awareness of their alcohol consumption as follows: "How many people of each relationship do you have?" and "How many of them are informed about your alcohol consumption?". Participants were explained about the standard definition of an active social network members in the NSU method, which is "people whom you know and who know you by name, with whom you can interact, if needed, and with whom you have had contact over the last two years personally, or by telephone or e-mail".<sup>18,20</sup>

In order to help remembering and increasing the accuracy of responses,<sup>3</sup> a comprehensive list of all possible relationships in active social network was aligned in two main subgroups: family and non-family. Family subgroup included two categories: immediate family (first-degree relatives) and extended family (second- and third-degree relatives). Immediate family means children, siblings, and parents; extended family means aunts, uncles, cousins, grandparents, nieces, nephews, etc. The non-family subgroup included friends, neighbors, and colleagues.

The second section of questions collected the demographic characteristics information.

The alcohol consumption visibility was estimated through formula (1):

Formula 1:

$$\text{The alcohol consumption visibility} = \frac{\text{The total number of adults who were informed about respondent's alcohol consumption}}{\text{The total number of adults in respondent's social network}}$$

The 95% confidence intervals (CIs) were computed through bootstrapping 1000 independent samples with replacement. The visibility and 95% CI based on different demographic characteristics were computed as well. The Stata software (version 11.2, Stata Corporation, College Station, TX, USA) and Microsoft Excel (version 2007) were used for analyzing the data.

## Results

In this study, 90 alcohol users were recruited. The mean and standard deviation (SD) of their age was  $32.9 \pm 10.2$ . More than three-fourth (76.7%) of respondents were men and 23.3% were women. Regarding the marital status, 40.0% of respondents were single, 58.9% were married, and 1.1% was divorced.

The social network size of men and women in this study was in average 80 and 62 individuals, respectively. Of the social network, in average, 10% were immediate family, 45% were extended family, and 45% were non-family members. The sex ratio of the participants' active social network of men was 56% male to 44% female; the corresponding figure for women was 41% male to 59% female.

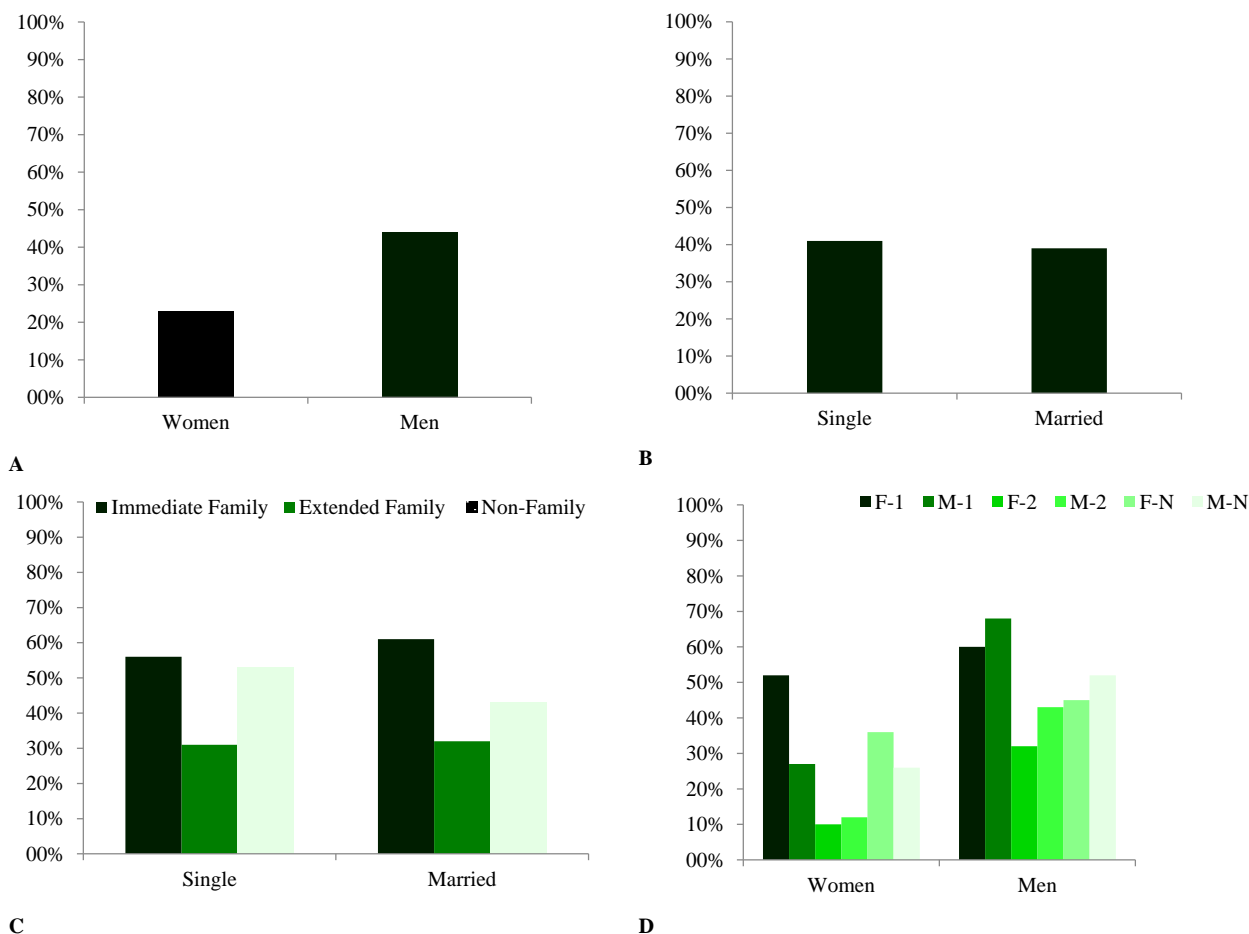
The visibility (95% CI) of alcohol consumption was 40% (33% to 47%) in total. This visibility among male networks was two times higher than that of females. Visibility rate was estimated at 44% (36% to 52%) and 23% (15% to 30%) among men and women's network, respectively (Figure 1, A). The visibility was not much different between single [41% (29% to 52%)] and married [39% (30% to 49%)] respondents (Figure 1, B).

The extended family was the lowest informed about the alcohol consumption. Moreover, alcohol consumption was more visible to immediate family than to non-family members. In married participants, immediate family were much more informed (61%) about alcohol consumption than non-family members (43%); but in single participants, immediate family information (56%) was about equal to non-family (53%) (Figure 1, C).

Among men's network, the three most informed groups were grade-1 males, grade-1 females, and non-family males. Interestingly, among women networks, the corresponding rank was grade-1 females, non-family females, and grade-1 males (Figure 1, D). This means that in women, non-family members of their network (both males and females) are more informed than their grade-1 male members (fathers and brothers) about their alcohol consumption.

## Discussion

Our study estimated the visibility rate of alcohol consumption at about 40% in total. This means that in the case of estimation of proportion of alcohol users through NSU methodology, its results should be multiplied by a factor of 2.5.



**Figure 1.** Alcohol consumption visibility in the city of Shiraz, Iran, in 2018  
 A. Comparison of visibility factor (VF) between women and men members of network; B. Comparison of VF between single and married members of network; C. Comparison of VF between tree type of family; D. Comparison of VF between tree network categories, stratified by gender; F-1: Grade-1 females; M-1: Grade-1 males; F-2: Grade-2 females; M-2: Grade-2 males; F-N: Non-family females; M-N: Non-family males

Our findings add to the body of literature that emphasizes the necessity of adjustment of NSU results.

We only found three manuscripts which addressed the visibility of alcohol use. In Brazil study, following game of contact methodology, 294 severe drug users were approached adopting a respondent-driven sampling method.<sup>19</sup> Individuals who had injected drugs at least once in the last 6 months and/or had used illicit drugs on at least 25 days during the last 6 months were considered as heavy drug users. The overall visibility factor (VF) was estimated at 76.0%.

In two other manuscripts, an innovative method was applied in which ratio of estimates derived from two methods was calculated as a proxy for VF. In 2016, Kazemzadeh et al. compared results of crosswise (CW) method with

NSU.<sup>21</sup> In CW method, a sensitive question is matched with a non-sensitive one. A total of 563 university students have been recruited through random sampling and were asked to choose the option “A” if the answers to both sensitive and non-sensitive questions were the same, and to choose “B” if the answers were different. Authors assumed that the ratio of the prevalence obtained using NSU method to the prevalence estimated through the CW method was a surrogate measure of VF. That is because in CW method respondents provide replies on behalf of themselves, while in NSU on behalf of their network. They reported VF at 48.0%.

In another study, Sheikhzadeh et al. compared the NSU method results with the proxy respondent method (PRM) in 420 university students.<sup>21</sup> The PRM is a modified version of the

NSU method but in this method, no information about individuals' social network size is needed. In this method, respondents are asked for example: "Do you have a close friend with a specific name and does he/she have the risky behavior of interest?". Authors assumed that results of PRM were less prone to visibility and assumed that the ratio of estimates made through NSU to those from PRM could be a surrogate for the VF. The VF for male and female students was estimated as 48% and 19%, respectively. In line with this finding, in our study, the alcohol consumption among male participants' network was about two times more visible than female's one. This partially might be justified by the fact that stigma around sensitive issues for women are much higher than men.<sup>22</sup>

Another finding was that extended family members were less informed than non-family members. This is in line with other studies indicating that people keep fewer secrets from their friends and non-family relations.<sup>23</sup> First-degree family members were the most informed category. This generates this hypothesis that alcohol users prefer to drink alcohol with either their first-degree relatives or non-family alters.

### Conclusion

One of the weaknesses of our study was that we were not able to get a representative sample of alcohol users. We only approached those who asked drugstore staff for white alcohol (methanol) or asked for advices on alcohol consumption and its

interaction with their medications. However, this is a limitation in all game of contact studies. On the other hand, our study had several strengths. It was the first study in an Islamic country where alcohol use is prohibited. The focus of other studies conducted in Iran was on students. As students are at younger age and are more educated, their VF cannot be generalizable to the whole general population. Our study was the first which provided an estimate of VF that can more or less be generalized to the general population. Moreover, with respect to other game of contact studies, we approached a relatively high sample size.

One important limitation of game of contact methodology is that it approaches members of high-risk group and asks them some questions to estimate VF. On the other hand, NSU estimates are derived by approaching members of general population. These two pieces of information are combined to adjust NSU estimates for visibility bias. There is room to develop new methodologies that derive both pieces from one source.

### Conflict of Interests

The Authors have no conflict of interest.

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### Authors' Contribution

The contributions of all authors is equal.

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## برآورد میزان شفافیت مصرف الکل: یک مطالعه مروری در شیراز

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### مقاله پژوهشی

### چکیده

**مقدمه:** برای تخمین اندازه جمعیت‌های پنهان در بسیاری از بسترها، از مقیاس شبکه استفاده می‌شود. شفافیت استفاده از الکل به عنوان یک رفتار پنهان در ایران هنوز مشخص نشده است. هدف از انجام پژوهش حاضر، تخمین ضریب شفافیت مصرف الکل در ایران به عنوان یک کشور اسلامی در خاورمیانه بود.

**روش‌ها:** ۹۰ نفر با سابقه مصرف الکل وارد مطالعه شدند. روابط شبکه‌ای در سه زیرگروه اصلی «خانواده، فامیل و آشنایان غیر فامیل» بررسی شد. با توجه به روش تماس با افراد پرخطر، شرکت‌کنندگان به سؤالات مربوط به تعداد کل افرادی که در هر گروه می‌شناسند، پاسخ دادند. عامل شفافیت با تقسیم تعداد کل افراد مطلع از مصرف مشروبات بر تعداد کل افراد موجود در شبکه فرد و با احتساب فاصله اطمینان ۹۵ درصد از روش‌های خودگردان‌ساز محاسبه گردید.

**یافته‌ها:** میانگین سنی شرکت‌کنندگان  $10/2 \pm 32/9$  سال و نسبت جنسی ۳ بود. به طور کلی، میزان شفافیت ۴۰ درصد (۳۳ تا ۴۷ درصد) به دست آمد. این مقدار برای شبکه مردان و زنان به ترتیب ۴۴ و ۲۳ درصد تخمین زده شد. خانواده بارزترین گروه مطلعان بود و پس از آن، به ترتیب آشنایان غیر فامیل و فامیل قرار داشت.

**نتیجه‌گیری:** شفافیت مصرف الکل در ایران بالا نبود که به جهت بازدارنده‌های قانونی و مذهبی پیرامون مصرف الکل می‌باشد.

**واژگان کلیدی:** مصرف الکل، شفافیت، تخمین اندازه، ایران

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