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# Advantages and challenges of using census and multiplier methods to estimate the number of female sex workers in a Chinese city

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## Abstract

Using census and multiplier methods to estimate the size of the population of female sex workers (FSWs) in a small city in western China, this study compared the advantages and challenges of the two methods. It was estimated that there were about 1,500 FSWs within the urban area using the census method, which was significantly lower than that estimated by the multiplier method (2,500). Each method has advantages and limitations, and could be applied to different situations. The census method is less time and resource consuming in smaller regions and has a tendency to underestimate, and therefore, the result can be viewed as a low limit. It is useful in a local setting, for example, when estimations are needed for planning HIV/AIDS prevention programmes in a single city. Using existing information or resources, multiplier method could be used to produce estimates for a large geographic area or at a national level.

## Introduction

Female sex workers (FSWs) play an important role in the rise of the AIDS epidemic in China. Sentinel surveillance data indicate that HIV prevalence among FSWs has risen from 0.02% in 1996 to nearly 1% in 2006. In the areas with high HIV epidemic such as Yunan and Xinjiang Province, the prevalence has reached to 4% to 6%, while the prevalence of HIV in general population averages 0.05% in China in 2005 (Beyrer et al., 2000; Lu et al., 2004).

The sex trade in China has been burgeoning since early 1980s (Gill et al., 2002). Understanding the size of the FSW population is very important to effectively plan, manage and evaluate HIV/AIDS prevention and intervention programmes (Ghys et al., 2001). However, in China, most current surveillance efforts in this population have narrowly focused on HIV prevalence and risk behaviours (Yang et al., 2005; Yang et al., 2005). Little attention has been paid to the size of this population.

Capture-recapture method has been widely used by health professionals to estimate the size of sub-populations. The basic requirements of the method (two closed and independent sources of information, homogeneous within each source, and individuals can be correctly matched between sources), however, are rarely possible to be satisfied in the HIV/AIDS field. Reluctance to self-report risk behaviours in a household setting causes another popular estimation method – the household survey – to have a serious tendency to underestimate (Walker et al., 2004). In this study, we used two methods – a multiplier and a census method – to estimate the size of the FSW population in the urban area of a Chinese city. This allowed us to explore the advantages and challenges of these two methods.

## Methods

The study was carried out in a small city with an urban population of 0.16 million in Guizhou Province in western China.

### Census method

Census method, in essence, is to count every individual FSW within the study area (UNAIDS/WHO, 2003). Four trained members of staff from the local Center for Disease Control and Prevention visited every entertainment establishment and counted the individuals of FSWs. They also asked managers or so-called 'pimps' how many sex workers going out with clients or not working for health reasons. Given the difficulty in counting street-based sex workers, this study only provided estimates based on the repeated observation of venues where street-based sex workers tend to gather.

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*Multiplier method*

The multiplier method in this study was based on two epidemiologic surveys. One was among female STD attendees at selected STD clinics. All 16 registered STD clinics (four government-run and twelve privately run) were involved. Ninety-two female patients were interviewed by doctors after informed consent to obtain the proportion of FSWs among female STD attendees *(p1)*. Those who had exchanged sex for money in the previous three months were defined as sex workers. The number of female STD attendees over three months (*m*) was determined from the medical records of the clinics excluding those who came for sex counselling or were less than 14 years old.

Another survey was conducted among the community FSW population based on a two-stage cluster sampling design among entertainment establishments (UNAIDS/WHO, 2003). The women were interviewed anonymously at their working places. A list of the selected STD clinics was highlighted on the questionnaire by including the names and addresses of the clinics and names of doctors. FSWs were asked that whether they have visited the selected STD clinics in the past three months to obtain the proportion *p2*.

The size of the FSW population was derived by the formula $N = m \times p1/p2$ where N is the size of the FSW population to be estimated, m is the number of female STD attendees in selected STD clinics over three months, p1 is the proportion of FSWs among female STD attendees in the selected STD clinics, and p2 is the proportion in a cross-sectional survey of FSWs who reported attending the selected STD clinics in the past three months (Archibald et al., 2001; UNAIDS/WHO, 2003).

**Results**

*Census method*

A total of 1,521 individual FSWs were identified in the urban area of the study city, of which 42.4% were found in Karaoke centres, and 25.7% in Hair salons. 6.6% were street-based sex workers. The rest were counted in massage centres and night clubs.

*Multiplier method*

A total of 842 females visited the selected STD clinics over the three-month period. Of the 92 female STD attendees that were interviewed, 45 (48.9%) reported having had commercial sex in the previous three months. According to the survey among FSWs in community, 16.2% (47/327) of them had sought a medical consultation in the selected STD clinics. Therefore, the size of the FSW population in the urban area of the study city would be 2,500 ($842 \times 48.9\%/16.2\%$) with a 95% Confidence Interval of (2,000–3,400) (rounded to the nearest 100).

**Discussion**

Compared to the multiplier method, the census method is straightforward and more suitable to be used in a local setting. If FSWs can be easily identified and their working places can be well defined, the census method is less time and resource consuming and more likely to yield accurate estimation than the multiplier method (UNAIDS/WHO, 2003). However, the census method is not suitable for large areas. A well-defined frame of entertainment establishments in a large city is rarely possible to obtain and nor is it feasible to arrange a large number of health professional staff for field investigation. Therefore the census method could only produce estimates in a small area and is probably suitable for the evaluation of HIV/AIDS prevention and intervention programmes in a local setting. In addition, when commercial sex is clandestine and FSWs are hard to reach, the census method probably is not appropriate. Furthermore, this method also requires completing the census survey in a short period of time in order to reduce double counting because of the mobility of FSWs between entertainment establishments.

Multiplier methods are time and material consuming. Specific surveys are needed to obtain the relevant parameters. Multiplier methods also require the catchment area of selected STD clinics is the same as the survey among female sex worker population, which is difficult to evaluate. However, multiplier methods can be used based on existing data sources, such as the HIV/AIDS behavioural surveillance system. Relevant questions could be inserted into the behavioural/sentinel surveillance among FSWs and STD attendees to obtain necessary information for the calculation (UNAIDS/WHO, 2003). Therefore, multiplier methods can produce estimation in a broader area or nationally. This characteristic makes multiplier methods more suitable for raising the awareness of the government, performing a national estimate of HIV infection and lobbying for resources.

The estimation obtained from the multiplier method in this study was significant higher than that by using the census method. However, because there is no gold standard method available to verify the results, it is difficult to determine which is closer to the truth. The directions of potential bias in the two methods can only be speculated upon. The census method has an obvious tendency to underestimate because it is almost impossible to

enumerate every individual entertainment establishment within the city and each individual FSW. In addition, managers of the establishments may be reluctant to let people other than clients know that there are many sex workers under their control, and may tend to underreport the true figures of FSWs. Furthermore, it is difficult to estimate the number of street-based sex workers. Most of them are farmers, older than women working in entertainment establishments and engage in commercial sex not as frequently as the 'direct' sex workers. Therefore, the census method is to count individuals that actually exist, the result should be viewed as the lower limit of the FSW population size. In the case of the multiplier method, although all STD clinics in the urban areas were involved in this study, sex workers working and living outside the city or in remote suburbs may also come to see doctors within the urban area. This might account for the fact that the method achieved a higher estimate than the census method.

## Conclusion

Each of the two methods has its own advantages and challenges, and suits different situations. It is crucial to understand the objective of the estimation and what existing data are available before conducting estimates (UNAIDS/WHO, 2003). If the estimation is for an HIV/AIDS prevention or intervention programme in a local setting, the census method is a better choice. If the objective is to produce estimation at a national level, such as using the number of FSWs to estimate the number of people living with HIV/AIDS (Walker et al., 2004), the census method is not feasible and the multiplier method is more useful.

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