HIV and Related Risk Behaviors Among Female Sex Workers in Iran: Bias-Adjusted Estimates from the 2010 National Bio-Behavoral Survey

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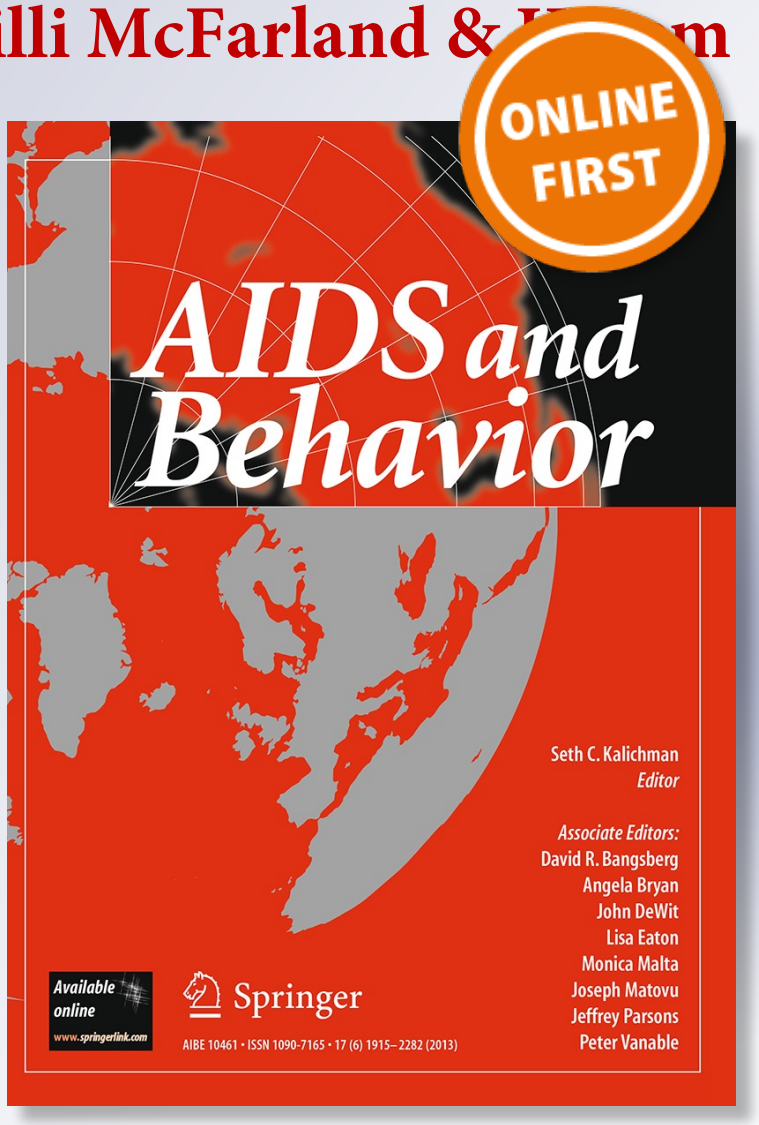
AIDS and Behavior

ISSN 1090-7165

AIDS Behav
DOI 10.1007/s10461-013-0548-3



Springer

AIDS Behav
DOI 10.1007/s10461-013-0548-3

ORIGINAL PAPER

HIV and Related Risk Behaviors Among Female Sex Workers in Iran: Bias-Adjusted Estimates from the 2010 National Bio-Behavoral Survey

Ali Mirzazadeh · Saharnaz Nedjat · Soodabeh Navadeh · AliAkbar Haghdoost · Mohammad-Ali Mansournia · Willi McFarland · Kazem Mohammad

Abstract In a national, facility-based survey of female sex workers in 14 cities of Iran ($N = 872$), HIV prevalence was measured at 4.5 % (95 % CI, 2.4–8.3) overall and at 11.2 % (95 % CI, 3.4–18.9) for FSW with a history of injection drug use. Using methods to correct for biases in reporting sensitive information, the estimate of unprotected sex in last act was 35.8 %, ever injecting drugs was 37.6 %, sexually transmitted disease symptoms was 82.1 %, and not testing for HIV in the last year was 64.0 %. The amount of bias correction ranged from <1 to >30 %, in parallel with the level of stigma associated with each behavior. Considering the current upward trajectory of HIV infection in the Middle East and North Africa region, as well as the ongoing high level of risky behaviors and considerable underreporting of many such behaviors in surveys, bias corrections may be needed, especially in the context of Iran, to obtain more accurate information to guide prevention and care responses to stop the growing HIV epidemic in this vulnerable group of women.

Keywords Female sex workers · Behaviors · HIV · Iran · Bias · Middle East

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Introduction

Unlike in most other regions of the world, the HIV epidemic in countries of the Middle East and North Africa (MENA) appears to be rising. Although there are very limited epidemiological data for the HIV epidemic in this region, UNAIDS global estimates projected that the number of people newly infected in MENA has increased by more than 35 %, from 27,000 (22,000–34,000) in 2001 to 37,000 (29,000–46,000) in 2011 [1]. The HIV epidemic in MENA is concentrated mostly within vulnerable populations, particularly injection drug users (IDU), men who have sex with men (MSM), and female sex workers (FSW) [2]. The epidemic is characterized by low coverage of preventive programs, large numbers of affected people who do not know their HIV status, high levels of stigma and discrimination associated with HIV infection and related risk behaviors, and very low coverage of antiretroviral therapy overall (8 %) and for the prevention of mother-to-child transmission (less than 5 %) [1, 3].

While true for FSW in most parts of the world, many countries in the MENA region have especially stringent

Published online: 16 July 2013

laws and discriminatory policies that hinder an effective HIV response. In Iran, people who engage in sex work and sex outside of marriage face potentially severe penalties. This context not only affects the prevention response but also makes it extremely difficult to fill gaps in knowledge about the size of the affected population, the frequency of risky behaviors, and access to HIV testing and preventive and care services [2]. Existing social and religious norms, taboos, and laws against extramarital sex make the collection of behavioral data particularly challenging and the reporting highly prone to social-desirability response bias. For example, the rate of underreporting of sensitive behaviors by FSW in Iran has been estimated to vary from 6.7 % for history of HIV testing to 36.1 % for history of sexually transmitted disease (STD) symptoms [4].

Recently, methods for correcting biases in surveys of stigmatized behaviors have been explored through Bayesian and probabilistic sensitivity analysis [5, 6] using data collected from FSW in Iran. The present study applies these corrections to a national survey of FSW in Iran in 2010, with the aim of producing the most accurate possible estimates of risk.

Methods

Data originated in a 2010 national survey of 872 FSW (response rate 96.4 %). Findings of this survey, analyzed conventionally and according to protocol without correction for bias, are reported elsewhere [7]. The present report applies and shows the bias-adjusted figures. Participants were recruited between April and July by facility-based sampling plus outreach to FSW aged 18 years and older at 21 sites in 14 cities. The facilities were a combination of non-governmental organizations (NGO) and public STD clinics serving vulnerable women, including FSW. With advice from a local health department surveillance team, we chose facilities (maximum two per city) for the study according to the capacity of staff to consent, enroll, and counsel participants; the resources of the facility to implement the survey; and the number of FSW registered and receiving services. At each facility, using convenience sampling, 30–45 eligible FSW were recruited among those seeking routine services. FSW were approached by a trained recruiter who verified eligibility criteria (age $\geq$ 18 years; selling sex for money, drugs, or goods in the last 12 months; and a history of doing sex work for at least 6 months) and explained the objectives and potential risks and benefits of participating in the study. Through a face-to-face interview using a standardized questionnaire, we measured demographic characteristics and risk behaviors, including number of sex partners (both commercial and non-commercial) during the week preceding the interview; number of sexual contacts per week; condom use at last contact with a commercial sex partner; ever doing sex work in association with a venue (e.g. private home, abandoned building or shelter), used for either finding clients or having sex; history of illicit drug use; HIV testing during the 12 months preceding the interview; and history of genital ulcer or discharge in the year before the interview. From women who consented additionally for HIV testing ($N = 817$), we collected five dried blood spots (DBS). Women with two positive DBS results by Enzyme-linked Immunosorbent Assay (ELISA—4th generation, Genescreen, Biorad) were considered to be HIV-positive. The study was anonymous, and participants could receive their HIV test results, post-test counseling, and referrals from the local testing and counseling center by providing the study identification code. We did not collect names or any other personal identifying information during recruitment, informed consent, interview, or HIV testing. The unique code that we provided to participants was used to link survey responses to their test results. The study protocol and procedures were reviewed and approved by the Research Review Board at Kerman University of Medical Sciences.

As previously detailed [4, 6], our analysis adjusted for measurement bias by using extra information (bias parameters) from a validation study of 63 FSW. In brief, the validation study was an independent survey conducted in Tehran and Kerman, where participants underwent both a quantitative, structured, face-to-face interview as well as a qualitative, in-depth interview with cognitive testing (which we considered the gold-standard for corrections) [4]. Recruitment sites for the validation study were among those used for sampling in the current national FSW survey, with the same eligibility criteria. Demographic characteristics of the recruited FSW in the validation study were reported elsewhere [4] and are comparable to what we observed in the national FSW survey reported here. In the present study, we adjusted for underreporting of stigmatized behaviors by applying a Bayesian bias correction method for categorical behaviors and Monte Carlo simulation for numerical behaviors [5, 6, 8, 9]. In brief, for categorical behaviors (e.g. non-condom use in last sex act) we acquired bias parameters (Se = sensitivity; Sp = specificity) from the previous validation study and applied the formula below to correct for imperfect self-reporting of risky behaviors:

$$\widehat{\mathrm{TP}} = \left(\widehat{\mathrm{AP}} + \widehat{\mathrm{Sp}} - 1\right) / \left(\widehat{\mathrm{Se}} + \widehat{\mathrm{Sp}} - 1\right)$$

Se is defined as the conditional probability, P (classified as FSW reports having the risky behavior | truly has the risky behavior); and Sp as the conditional probability, P (classified as FSW reports not having the risky behavior | truly does not have the risky behavior). If there is no bias in reporting—i.e. Se and Sp are both equal to one—the true prevalence (TP) of

risky behavior would be equal to apparent prevalence (AP). Because we did not have a gold-standard method for measuring the truth, and because we included only the 872 FSW in the national survey and the 63 FSW in the validation study, we acknowledge the likelihood of bias and statistical uncertainty in these estimates. To account for the uncertainty of both systematic and random errors, we labeled our parameters as estimates—e.g. $\widehat{\text{AP}}$ instead of AP—and applied a simulation process, considering the priors for TP, Se, and Sp as uniform distributions, and programmed the model in WinBUGS V.1.4.3 (MRC Biostatistics Unit, Cambridge, UK). The program repeated the calculation for 50,000 iterations to capture the uncertainty around all the parameters, considering the prior distributions. We summarized the results of the last 10,000 iterations.

For numerical behaviors (e.g. number of sex acts in the last 7 days), we acquired the mean difference (D) between the risk behaviors reported in the face-to-face interviews and the in-depth interviews and applied the following equation to correct for bias:

$$\widehat{\text{TM}} = \widehat{\text{AM}} + \widehat{\text{D}}$$

As described above for categorical variables, we ran this model in WinBUGS V.1.4.3 (MRC Biostatistics Unit, Cambridge, UK) for 50,000 iterations. At each iteration, one number was collected from the dependent distributions of $\widehat{\text{AM}}$ and $\widehat{\text{D}}$ (acquired from the validation study) and then used to solve the equation for $\widehat{\text{TM}}$. We then summarize the findings of the last 10,000 iterations.

Apparent estimates of HIV risk behaviors are reported as point estimates with conventional 95 % confidence intervals (CI). Adjusted estimates are also presented as point estimates, but with 95 % Bayesian creditable intervals (BCI) for categorical behaviors and 95 % simulation intervals (SI) for numerical behaviors.

Results

The 872 FSW who provided demographic and risk behavior information had an average age of 31.6 years (with a median of 30 years and interquartile range of 12 years). Most (81.5 %) reported having been married, with 35.9 % in a current marital union. Overall, 14.7 % were illiterate, and 4.3 % had a university degree (Table 1).

Differences in crude versus bias-adjusted prevalence of risk behaviors differed by a range of from <1 % (e.g. not testing for HIV in the last 12 months) to >30 % (e.g. ever associated with a venue to sell sex). Adjusted prevalence of non-condom use in the last commercial sex act was 35.8 % (95 % BCI, 22.9–48.5), history of genital ulcer or discharge in the last 12 months was 82.1 % (95 % BCI, 65.3–98.0), not testing for HIV in the last 12 months was 64.1 % (95 % BCI, 51.6–78.4), not receiving HIV test results was 36.8 % (95 % BCI, 14.0–82.0), history of ever using illicit drugs was 69.6 % (95 % BCI, 22.9–87.5), history of ever injecting drugs was 37.6 % (95 % BCI, 16.8–83.3), and previous or current association with a venue to sell sex (e.g. private home or abandoned building or shelter) was 68.0 % (95 % BCI, 44.9–95.7).

FSW in the survey started selling sex at an average adjusted age of 24.9 years (95 % SI, 23.3–26.4). Mean number of sexual contacts with both commercial and non-commercial partners in the last 7 days was 3.8 (95 % SI, 2.8–4.8); on average, condoms were used in 2.9 (95 % SI, 2.2–3.6) of those contacts. Adjusted number of clients for the 7 days preceding the interview was 2.3 (95 % SI, 1.6–3.0). FSW sold sex for a mean of 3.7 days (95 % SI, 3.1–4.3) in the week preceding the interview.

Among the 817 FSW who provided a specimen, overall HIV prevalence was 4.5 % (95 % CI, 2.4–8.3), with a prevalence of 3.1 % (95 % CI, 0.87–5.38) among those who never injected drugs and 11.2 % (95 % CI, 3.4–18.9) among those who had ever injected drugs.

Discussion

Although it is well known worldwide that FSW are highly vulnerable to HIV, most countries in the MENA region still struggle with obtaining valid estimates of prevalence of infection, levels of risk behaviors, and reach of prevention programs [2, 10]. As a consequence, the region lags in scaling up preventive measures for this marginalized group. We document that FSW in Iran have a prevalence of HIV nearing 5 %, the conventional cutoff for a concentrated epidemic, with prevalence of almost 11 % among FSW who have a history of injection drug use. This prevalence is considerably higher than the regional estimate for MENA of 1.7 % (95 % CI, 0.9–2.6), reported in a comprehensive review by Baral et al. [10]. In addition, several indicators suggest a high level of ongoing risk, in that the majority of study participants reported symptoms of STD, one-third did not use a condom during their last commercial sex act, one-third have ever used injection drugs, and two-thirds had not tested for HIV in the previous year.

Our estimates are higher than previous surveys of FSW in Iran, suggesting a recent increase in HIV incidence for this population. Among 177 FSW recruited by respondent-driven sampling (RDS) in Kerman in 2009–2010, no HIV-positive cases were detected, and levels of unprotected sex were lower [11]. A previous survey of 196 women arrested in Tehran in 2002 found no HIV infections among either those arrested for selling sex or those arrested for drug-related charges [12]. Of note, however, high levels of

Table 1 Crude and bias-adjusted estimates of key risk and preventive behavioral indicators, FSW participating in a national behavioral survey ($N = 872$), Iran, 2010

Categorical variables	Crude prevalence (95 % CI[a])	Adjusted prevalence (95 % BCI[b])
Ever married	81.5 (71.5–88.6)	87.7 (77.7–97.9)
Currently married	35.9 (25.7–47.5)	32.3 (22.9–41.4)
Education level		
Illiterate	14.7 (8.3–24.6)	14.7 (8.3–24.6)
Able to read and write	8.0 (3.9–15.5)	8.0 (3.9–15.5)
Some or completed primary education	22.0 (16.6–28.6)	22.0 (16.6–28.6)
Some or completed middle education	26.6 (22.5–31.2)	31.1 (29.4–39.1)
Some or completed secondary education	24.4 (16.6–34.4)	19.9 (9.7–26.5)
Some or completed university	4.3 (1.9–8.8)	4.3 (1.9–8.8)
Non-condom use last commercial sex act	36.7 (28.0–46.8)	35.8 (22.9–48.5)
History of genital ulcer or discharge, last 12 months	52.9 (39.3–66.1)	82.1 (65.3–98.0)
Not tested for HIV, last 12 months	64.1 (51.9–74.7)	64.0 (51.6–78.4)
Not receiving the result of the last HIV test	21.0 (9.7–39.8)	36.8 (14.0–82.0)
Ever used illicit drugs	71.6 (59.7–81.1)	69.6 (22.9–87.5)
Ever injected drug	14.6 (10.0–20.8)	37.6 (16.8–83.3)
Ever associated with a venue to sell sex	35.5 (25.8–46.6)	68.0 (44.9–95.7)
Numerical variables	**Crude mean (95 % CI)**	**Adjusted mean (95 % SI[c])**
Age	31.7 (29.7–33.5)	31.6 (29.6–33.7)
Age at first sex act for money, drugs or shelter	24.8 (23.0–26.6)	24.9 (23.3–26.4)
Number of commercial and non-commercial sexual contacts, last 7 days	2.3 (1.5–3.1)	3.8 (2.8–4.8)
Number of times condoms used in commercial and non-commercial sex, last 7 days	2.6 (1.8–3.3)	2.9 (2.2–3.6)
Number of clients, last 7 days	1.5 (0.9–2.1)	2.3 (1.6–3.0)
Number of days in last week doing commercial sex	2.9 (2.3–3.4)	3.7 (3.1–4.3)

[a] Confidence interval

[b] Bayesian credible interval

[c] Simulation interval

non-condom use have been reported in many of the countries in the MENA region, with Egypt and Somalia having the highest rates (above 70 %) [13]. In a qualitative study of sexually active women in Iran [14], the most important barriers to condom use were low self-esteem and low self-efficacy due to lack of risk perception. This was especially true within the legal-but-gray area of temporary marriages (known as "sighe′"), which may serve as a cover for sex work. In the scope of relatively more overt commercial sex, as with our study population, these barriers could play a significant role and should be addressed by specific programs.

We note that adjustments to account for biases in reporting behaviors found corrections that were small; however, there are several exceptions. The largest discrepancy was between the reported and corrected levels of being associated with a venue where sex is sold. While 69 % of FSW are estimated to be associated with such venues, only 35 % acknowledged it. This large difference may be explained by the law enforcement context in Iran. Police conduct sweeps of sex venues when they are alerted; therefore, we expect women to be very reluctant to report being associated with such venues, for their protection as well as their associates'. Other notable differences were in the underreporting of STD symptoms, not obtaining one's HIV test results, and the number of sexual and client contacts in the last week.

Differences between these adjusted and crude point estimates are likely driven by relatively high levels of stigma that lead to underreporting (e.g. STD symptoms, number of clients) or social-desirability response bias that leads to over reporting (e.g. obtaining HIV test results). We believe our adjusted estimates with the wider Bayesian or simulated intervals provide a more credible estimate of the truth, as they take into account both random error and the amount of underreporting or over reporting observed in the validation study [4].

Because sex work is illegal in Iran with potentially severe penalties, further compounded by the illegality of sex outside of marriage, we emphasize the extreme difficulty in

conducting true probability-based studies of FSW and other populations where sexual transmission of HIV predominates. To provide a national picture of the HIV epidemic among FSW, we recruited our study population from 21 public health facilities around the country. Nonetheless, we note that the demographic characteristics (age, education and marital status) of our recruited samples are comparable to findings from the recent community-based survey done by RDS among FSW in Kerman [11]. However, with respect to history of using drugs, our estimate after correcting for underreporting bias is 69.6 % (of whom 20.5 % injected drugs), while in the Kerman RDS, history of drug injection was reported by 18 % of study subjects. In another study of 144 non-injecting FSW recruited by snowball sampling over a 7 months period in 2009, study subjects were more likely than ours to report being in a marital union and having higher education [13]. Of note, nearly 20 % of this sample had sexual contact with IDU during the month before the interview [15].

The most recent data synthesis and modeling of the HIV epidemic in Iran indicates an upward trend in new infections among both FSW and MSM and a relative shift from IDU, suggesting more sexually transmitted HIV [16]. These projections are corroborated by the most recent CDC-Iran case-reporting data [17], which show a rising trend in newly diagnosed HIV cases among females overall and among FSW when recorded specifically. Our findings indicate that FSW in Iran are underserved by prevention efforts and may be in the midst of a rising rate of HIV acquisition and subsequent transmission to male clients and, indirectly, their wives and children. To stop the growing HIV epidemic among these groups, health authorities need to create a legal, social, and religious space to expand health services for FSW, much in the same way that harm-reduction programs proliferated successfully for IDU in Iran [18, 19]. Given the illegality and religious stigma associated with sex work and extramarital sex, we acknowledge that such services will be fraught with challenges greater than those experienced by the IDU programs. Nonetheless, we are hopeful that concerns for the health and welfare of the nation will prevail in time to prevent further spread of infection among FSW and their sexual networks.

Lastly, the method that we have applied to quantify the bias in reporting risky behaviors, and the bias analysis done for adjusting the estimates, should be considered as an integral part of behavioral surveillance activities, particularly in settings or countries experiencing high levels of stigma and discrimination around HIV and its related risk behaviors.

Acknowledgments The authors would like to give special thanks to the staff of the recruiting facilities for their assistance in implementing the survey. We recognize and are grateful to the Iranian HIV/AIDS National Office in the Center for Disease Control, Ministry of Health, for their technical assistance and financial support. This work (as a PhD thesis for AM) was supported jointly by HIV Research Trust (grant no. HIVRT11-052), Tehran University of Medical Sciences (grant no. 240/1626) and Regional Knowledge Hub for HIV/AIDS Surveillance WHO collaborating center based at Kerman University of Medical Sciences (grant no 90/122). Authors also received technical assistance, editorial input, and partial support through the University of California San Francisco from the following grants from the U.S. National Institutes of Health (NIH): Fogarty International Center (FIC) D43TW005799, National Institute for Mental Health (NIMH) P30 MH062246, R25MH064712, and the FIC AIDS International Training and Research Program (AITRP), D43TW000003. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH, NIMH or FIC.

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