Concurrence and selection of sexual partners as predictors of condom use among Mexican indigenous migrant workers

Concurrencia y selección de parejas sexuales como predictores del uso de condón en trabajadores migrantes indígenas mexicanos

Jose R. Caballero-Hoyos y Joel Monárrez-Espino

ABSTRACT

Objective To identify if the selection of mixed sexual partners and the existence of concurrent partners are predictors of condom use in indigenous migrant agricultural workers from Colima, Mexico.
Methods Analytical cross-sectional study using an egocentric sexual network approach. Community interviewers applied a structured questionnaire to 192 indigenous migrant workers in a sugarcane agro-industrial context. Data were analyzed with binary logistic regression; odds ratios (OR) and 95% confidence intervals (CI 95%) were estimated.
Results In the logistic regression model, adjusted odds (OR; 95% CI) of steady condom use were lower within partnerships of the same indigenous ethnicity compared to other partnerships (0.30; 0.17-0.53), partnerships that were concurrent to other partnerships (0.27; 0.15-0.50), and partnerships that used illegal drugs during sex to other partnerships (0.23; 0.11-0.49). Those variables were actually associated with increased risk of unprotected sex (occasionally or never using condoms), and therefore exposures were unprotected.
Conclusion Sexual partners of the same ethnicity, concurrent partnerships and partnerships that use illegal drugs favor the low frequency of constant condom use and, in turn, the vulnerability to STIs and HIV transmission in indigenous migrant agricultural workers.

Key Words: Condoms; indigenous population; sexual partners; transients and migrants; young adult *(source: MeSH, NLM)*.

RESUMEN

Objetivo Identificar si la selección de parejas sexuales mixtas y la existencia de parejas concurrentes son predictores del uso de condón en trabajadores agrícolas migrantes indígenas de Colima, México.
Métodos Estudio transversal analítico bajo un enfoque egocéntrico de redes de parejas sexuales. Entrevistadores comunitarios aplicaron un cuestionario estructurado a 192 trabajadores migrantes indígenas de un contexto agroindustrial cañero. Los datos se analizaron mediante regresión logística binaria; se calcularon razones de momios (RM) e intervalos de confianza (IC) de 95%.
Resultados En el modelo de regresión de predictores del uso constante de condón, las RM ajustadas (RM; IC 95%) fueron: menores en las parejas sexuales de la misma etnicidad que en las otras parejas (0.30; 0.17-0.53), menores en las parejas concurrentes que en las no concurrentes (0.27; 0.15-0.50); y menores en las parejas usuarias de drogas ilegales que en las no usuarias (0.23; 0.11-0.49). El sentido predictor de estas variables se asoció a un mayor riesgo de sexo no protegido (algunas veces o nunca usaron condón).
Conclusión Las parejas sexuales de la misma etnicidad, las parejas concurrentes y las parejas que usan drogas ilegales favorecen una baja frecuencia de uso constante del condón y con ello la vulnerabilidad a la transmisión de ITS y VIH en los trabajadores agrícolas migrantes indígenas.

JC: Sociologist. M. Sc. Communication. Ph. D. Medical Sociology. Affiliated to the Medical Research Unit in Clinical Epidemiology, Mexican Institute of Social Security, 2800 Colima, México. *jose.caballeroh@imss.gob.mx*
JM: MD. M. Sc. Gynecology and Obstetrics. Ph.D. International Health. Affiliated to the Department of Public Health Sciences, Karolinska Institutet, 17177 Stockholm, Sweden. Claustro Universitario de Chihuahua, Reserach Department. Chihuahua, Mexico.
joel.monarrez-espino@ki.se

Health conditions in migrant agricultural workers (MAW) in low-income settings are characterized by high levels of morbidity and mortality, being mental disorders, drug abuse, sexually transmitted infections (STI), and human immunodeficiency virus (HIV) infection common public health problems (1).

MAWs are vulnerable to STIs and HIV infection due to poor living conditions, labor exploitation, lack of social support, risky behaviors (e.g. multiple sexual partners, use of illegal drugs, and condomless sexual intercourse), and limited access to basic preventive services (2).

Sexual risk practices in MAWs leading to STI and HIV infection are associated with poverty and segregation, especially in Latin American indigenous populations with poor information about these diseases. Among these groups, the use of alcohol and drugs is also common; sexual violence and social stigma that lead to feelings of resistance, or beliefs that deter preventive measures such as the use of condoms, are also prevalent (3).

In Mexican indigenous MAWs, the spread of STIs and HIV is associated with a change of lifestyle after migrating to the United States or to domestic agro-industrial locations. While travelling, workers engage in unsafe sexual practices with infected partners in environments with limited access to health care (4,5).

Studies on STIs and HIV rates in Mexican indigenous MAW are still limited and tend to underreport cases. This is largely due to the marginalization and social exclusion conditions prevailing during their seasonal migratory experience (6). The 0.29% and 0.11% prevalence of STIs and HIV/AIDS, respectively, reported in 2014 among MAWs in the United States can be used as an approximation to illustrate the epidemiological impact, as nearly 90% were Hispanic migrants, mostly Mexicans, of which a third had indigenous origin (7). While there is no accurate information about the prevalence of these diseases among indigenous MAW in Mexico, exploratory data suggest that it could be higher than the national average, and that both epidemics may interact (8).

Network of sexual partners and the spread of infections
In the social network framework, sexual relationships are conceived as the physical interaction of two or more individuals within a sociocultural context that regulates its dynamic. If such relations are grouped, they constitute a network of sex partners that can spread infections. Thus, one infected person can pass on a disease to a susceptible sex partner disseminating the infection to an extent that depends on the number of partners of the infected individual, and the new partners of recently infected partners (9).

In the traditional sexual network analysis, the risk of STIs and HIV infection is constrained by people's position within the social structure. Therefore, local (egocentric) and global (sociometric) structures become determinants of the risk of infection (10). The two local structures needed to understand the transmission of STIs and HIV within the context of a network of sex partners include the mixed selection of partners and concurrent partners.

The mixed selection of partners implies two alternatives: 1) choosing sexual partners from close or assortative networks (e.g. partners of the same ethnicity), or 2) from external or disassortative networks (e.g. different ethnicity partners or non-indigenous partners). The rationale behind this model relates to the type of partner selection, which will impact the transmission of the infection based on condomless sexual intercourse. Consequently, if selection is assortative, it will lead to higher infection rates in a community, in contrast with disassortative selection, which will function as a bridge for the transmission of infections across communities exposed to different risk levels (11).

A classic finding regarding the transmission of STIs in assortative indigenous networks was documented in 1998 when analyzing the contact tracing system of 4 544 infected people and their sexual partners in Manitoba, Canada (12). It was found that indigenous networks were made of sex couples with a linear structure (i.e. frequent change of partners and a high number of couples) and ethnic assortativity, resulting in high rates of syphilis and gonorrhea within the same community, contrasting with non-indigenous people that conformed radial networks, fewer number of couples, and lower STI rates.

Concurrent partnerships imply having simultaneous partnerships leading to direct or indirect relations among partners connected to the same sexual network, increasing the risk of infection for the partners, but not for the index case; therefore, the presence of concurrence is expected to speed up the non-linear transmission of infections (13).

Sub-Saharan Africa is a drastic example of how the high prevalence of concurrent sexual partnerships has led to the largest regional epidemic of HIV/AIDS. Differences in levels of sexual partnership concurrence between various racial or ethnic groups could explain the HIV epidemic seen in the black South African population (14).

The combination of both factors (i.e. assortative selection of sex partners and concurrence) can further increase the prevalence of STIs and HIV, as is the case among young people in Afro-American communities of the United Sta-

tes, where a high proportion of assortative and concurrent sexual partnerships leads to a high prevalence of HIV (15).

Network of sex partners and condom use among MAWs

Studies on MAWs have reported various associations between the structure of sexual partnerships and the use of condom in the context of labor mobility:

a).MAWs increase their sexual activity, get involved with different types of partners, and have low frequency of condom use (16); however, condom use is higher with casual partners and sex workers than with primary partners (17).

b).MAWs have an increased interaction with sex partners exposed to higher risks of infections in social environments where drug abuse is frequent, as well as to STIs and HIV in locations with poor access to preventive services (18).

c).MAWs tend to form assortative sex partnerships where condom use is rare, especially if drug use is involved (19).

d).MAWs are less likely to form concurrent partnerships where unprotected sex predominates (20).

In the light of the existing literature, this study aimed at identifying if mixed sexual partner selection, based on ethnicity, and the concurrence of sex partners were independent predictors of condom use among indigenous migrant workers in an agro-industrial Mexican context. If such is the case, these workers and their sex partners could be more vulnerable to the transmission of STIs and HIV.

The use of condom is emphasized here, as it is the most important method to prevent the transmission of STIs and HIV (21), and the most accessible for indigenous populations, which are usual beneficiaries of preventive campaigns of the Mexican health sector.

METHODS

This was an analytical cross-sectional study that used an egocentric approach to sexual networks. In this approach, the index subject (individual A or ego) names his or her sex partners (individuals B, C, D or alters) and provides information of behaviors and attributes for each of them, thus characterizing subject A's personal or egocentric sex network (no data was collected from the partners themselves). In epidemiological terms, egocentric risk-prone networks are potential sources of infections. Thus, the effects of large-scale sex networks on individuals occur partially through their immediate sex partners (22).

Participants and setting

A total of 192 indigenous MAWs were interviewed. They were active workers during the sugarcane harvest of the year 2011 in the Cuauhtémoc municipality, State of Colima, in western Mexico, where they have been employed in the production of cane sugar since the 1960s (23). Workers come from marginalized areas of the southern states of Guerrero, Oaxaca and Chiapas, where the incidence of AIDS is higher than the national average (24).

Interviewees were selected from a census of indigenous MAWs and their families. They lived in one of the four laborer shelters situated in the localities of Cobano, Trapiche and Quesería. Residents comprised 941 individuals, including 480 male workers, of which 213 fulfilled the following inclusion criteria: being a sexually active Nahua or Amuzgo male aged 18-29 years, employed as MAW for at least three harvest years, who lived in a sugarcane boarding facility of the Cuauhtémoc municipality. This age range was chosen as most MAWs were young adult men, who started their sex life at age 13-14 on average. The 3-year criterion of migratory experience assumed cumulative sex practices of risk in various working environments. Exclusion criteria involved being unable to speak in Spanish during the interview due to lack of knowledge, or to alcohol or illicit drug consumption.

Workers were contacted in the shelters and asked to participate. From 213 eligible people, 192 interviews were conducted; 12 did not speak Spanish, five had used alcohol or illicit drugs, and four refused to participate, resulting in a refusal rate of 1.8%. No women were included due to the small number of working females (n=5), and because of the high social control of their male partners within the boarding premises.

Data collection

Data was collected between March and June 2011. Community health interviewers administered a structured questionnaire in Spanish with the assistance of a trained indigenous educator, who built rapport with interviewees and helped answering questions and concerns. The interviewers, who were well-known for their preventive work in the community, were trained in the administration of the egocentric network instrument. This helped achieving a positive response from MAWs when approaching sex topics. Interviews were conducted in private areas of the shelter, and lasted 25 minutes on average (range 18-29).

Participants were informed about the objectives, risks and benefits of the study. Participation was voluntary and written consent was obtained. All interviews were confidential and anonymous. Participants were given preventive information about sex counseling and reproductive health services. The study was approved by the Local Research Committee of the Mexican Institute of Social Security in the State of Colima (register number R-2010-601-2).

Questionnaire and variables

The validated and adapted version of the UNAIDS structured questionnaire (United Nations' tool for tracing sexual networks) was used (25). This instrument contains 40 items distributed into four sections: attributes of socio-demographic workers (age, ethnicity, marital status, education, occupation, religion and migration experience), anonymous listing of up to eight sexual partners within the last year prior to the interview, socio-demographic attributes of the sex partners (age, mix selection by ethnicity, sex, marital status, schooling, main occupation and type of partner), and characteristics of the sexual intercourse with partners (concurrence, frequency of condom use, alcohol and illegal drug use frequencies during sexual intercourse, and coital frequency).

Data management and analysis

Egocentric sexual network data can be analyzed using the subjects' attributes as well as sets of relationships. Data was organized using a matrix where rows corresponded to workers and columns to attributes of workers, partners and sexual relationships. The matrix was converted into a dyadic format where rows were transposed into columns, allowing analyses of combined attributes of workers (n=192) and sex partners (n=360). This format was used for relational analyses between attributes of the workers and those of their sex partners. The conversion was done using the software for the analyses of egocentric networks

E-NET v.0.024 (26); the resulting matrix was exported to SPSS v.20 for statistical analyses.

Pearson Chi² tests were used to identify differences in proportions between nominal data. Student t-tests and ANOVA were used for mean differences between groups in normally distributed variables, and Mann-Whitney and Kruskal-Wallis non-parametric tests for those not normally distributed. P values below 0.05 were considered statistically significant.

Factors associated with the steady use of condom were identified using binary logistic regression: unadjusted odds ratios (OR) and adjusted OR with 95% confidence intervals (95% CI) were computed.

Steady use of condom, dichotomously defined (27), was the dependent variable. Mixed selection of sex partners by ethnicity (28), presence of concurrent partnerships (13), frequency of drug use during sex, and number of partners were independent variables. Variables were included in the model based on marginal statistical significance seen in bivariate analyses (p<0.10). Operational definitions can be seen in Table 1.

Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test; a good model was indicated by a non-significant Chi² value (p>0.05). The magnitude of the variance inflation factor (VIF) was used to explore collinearity across independent variables; multicollinearity was defined when VIF values were above 3. Nagelkerke pseudo-R^2 was used to determine the proportion of the variability explained by the model.

Table 1. Operational definitions and coding of variables included in the binary logistic regression analysis

Variables	Definitions and questions	Codes
Dependent Steady use of condom[a]	Frequency of use in the previous year How often did you use a condom with your sex partner [number 1-8]?	0=Sometimes or never 1=Always
Independent Mixed sex partner selection ethnicity[b]	Indigenous or non-indigenous origin of sex partners What was the ethnic group of your sex partner [number 1-8]?	1=Same ethnicity (assortative) 2=Other ethnicity (disassortative) 0=Non-indigenous (disassortative)
Concurrence[c]	One or more simultaneous sex partners in the last year Did you have any additional sex partner during the time that you and [partner number 1-8] were having a sexual relationship?	0=Definitely no, unsure 1=Yes, definitely
Illicit drug use	Drug use during sexual intercourse in the preceding year How often did you use drugs with your sex partner [number 1-8]?	0=Never 1=Always or sometimes
Number of sex partners	Estimated no. of ego/alter sex partners in the last year	0=1 sex partner 1=≥ 2 sex partners

[a] Defined and coded based on (27); [b] Defined and coded based on (28); [c] Defined and coded based on (13)

RESULTS

Characteristics of indigenous migrant workers and their sex partners

A total of 80.2% of the respondents belonged to the Nahua ethnicity, and the remaining 19.8% were Amuzgo. Mean age was 23.7 years (range 16-29); 64.5% were

married or cohabiting (33.3% single, 2.1% divorced); 78.1% had primary school education or less (21.9% secondary school), and 65.6% were Catholics (13.5% non-Catholic Christians, 20.8% no religion). Within the last three years, 63.5% had migrant labor experience in Mexico, and 19.8% in agricultural fields from the United States.

Workers reported 360 sex partners (mean 2.3), from which 99.4% were women (mean age 22.5 years); 74.8% had primary education or less; 55.1% were married; 38.9% worked at home without salary; 64.5% were indigenous from the same ethnic group of the worker; 20.5% belonged to other groups, and 15.0% were non-indigenous.

Table 2 presents sociodemographic characteristics by ethnicity of sex partnerships. Nearly half of the partners were married when belonging to either the same (47.5%) or another (45.9%) ethnic group compared with 18.5% of non-indigenous partners. Education was similar for indigenous partners (comparisons were not possible for non-indigenous, as data was lacking in 59.3%). Most non-indigenous partners were sex workers (70.4%), compared with 2.6% and 13.5% of partners of similar and different ethnicity, respectively. Casual sex partners were more common with non-indigenous (77.8%) than with indigenous partners (same 27.6%, other ethnicity 43.2%). Mean partner's age was similar across groups, ranging from 21.9 in partners of the same ethnic group to 23.7 among those from another.

Table 2. Comparison of selected characteristics of sex partners in indigenous migrant workers by ethnicity

Variables	Sexual partners' ethnicity			P-value[a]
	Assortative	Disassortative		
	Same ethnicity n(%)	Other ethnicities n(%)	Non-indigenous n(%)	
Marital status				
Married/cohabiting	110 (47.4)	34 (45.9)	10 (18.5)	
Divorced/widowed	24 (10.3)	12 (16.2)	8 (14.8)	<0.001
Single	96 (41.4)	26 (35.1)	30 (55.6)	
Unknown	2 (0.9)	2 (2.8)	6 (11.1)	
Schooling				
None	34 (14.7)	4 (5.4)	2 (3.7)	
Primary	128 (55.2)	44 (59.5)	12 (22.2)	<0.001
Secondary or more	68 (29.2)	22 (29.7)	8 (14.8)	
Unknown	2 (0.9)	4 (5.4)	32 (59.3)	
Main occupation				
Salaried worker	30 (12.9)	10 (13.5)	6 (11.1)	
Day laborer	26 (11.2)	14 (18.9)	2 (3.7)	
Self-employed	24 (10.3)	8 (10.8)	4 (7.4)	
Sex worker	6 (2.6)	10 (13.5)	38 (70.4)	<0.001
Unemployed	120 (51.8)	18 (24.4)	2 (3.7)	
Student	24 (10.3)	14 (18.9)	0 (0.0)	
Other	2 (0.9)	0 (0.0)	2 (3.7)	
Type sex partner				
Main	168 (72.4)	42 (56.8)	12 (22.2)	<0.001
Casual	64 (27.6)	32 (43.2)	42 (77.8)	
Age in years, mean±SD.	22.0±6.2	23.6±6.1	23.0±5.3	0.095
Total	232	74	54	

[a] Pearson Chi^2 test was used for nominal data and ANOVA for continuous data

Sex behavior of indigenous MAWs by ethnicity of their sex partners

Table 3 shows that sexual concurrence (simultaneous existence of sexual partnerships) occurred almost exclusively among indigenous partners, with 20.7% belonging to the same ethnic group, 21.6% to a different ethnic group and 3.7% to the non-indigenous group. The proportion of steady use of condom was higher in non-indigenous partners (29.6%) than in indigenous partners (7.8% same and 13.5% different ethnicity). Alcohol and illicit drug use during sex tended to be higher in non-indigenous partners than among indigenous partners. The mean number of sex partners reported by the worker during the year prior to the interview was also higher in non-indigenous than among indigenous partners regardless of ethnicity (4.6% vs. 2.3%, p<0.001). Finally, the monthly median number of sexual relationships was higher among indigenous than in non-indigenous partners (p<0.005).

Factors associated with the steady use of condom

Table 4 shows the logistic regression model. Adjusted ORs (CI 95%) for steady condom use were lower within partnerships of same indigenous ethnicity (assortative) than in other partnerships (0.30; 0.17-0.53), in partnerships that were concurrent to other partnerships (0.27; 0.15-0.50), and in partnerships that used illegal drugs during sex to other partnerships (0.23; 0.11-0.49). Consequently, assortative partnerships, concurrent partnerships and illegal drug use were associated with increased risk (occasionally or never using condoms), and therefore exposures were unprotected. The unadjusted positive effect for the number of sex partners was lost in the ad-

Table 3. Sexual behavior of indigenous migrant workers by ethnicity of their sexual partners

Sexual behaviors	Sexual partners' ethnicity			P-value[a]
	Assortative	Disassortative		
	Same ethnicity n(%)	Other ethnicities n(%)	Non-indigenous n(%)	
Concurrent relationships				
Yes	48 (20.7)	16 (21.6)	2 (3.7)	<0.005
No	184 (79.3)	58 (78.4)	52 (96.3)	
Condom use frequency				
Always (steady)	18 (7.8)	10 (13.5)	16 (29.6)	<0.001
Sometimes	50 (21.5)	22 (29.7)	12 (22.2)	
Never	164 (70.7)	42 (56.8)	26 (48.2)	
Alcohol use during sex				
Always	12 (5.1)	8 (10.8)	8 (14.8)	<0.001
Sometimes	118 (50.9)	34 (45.9)	34 (63.0)	
Never	102 (44.0)	32 (43.3)	12 (22.2)	
Drug use during sex				
Always	6 (2.6)	2 (2.7)	2 (3.7)	
Sometimes	16 (6.9)	12(16.2)	18 (33.3)	<0.001
Never	210 (90.5)	60 (81.1)	34 (63.0)	
No. sex partners, mean±SD.	2.3±1.3	2.2+1.1	4.6±1.8	<0.001
No. sex relations, median (range)	4 (1-24)	3 (1-28)	1 (1-20)	<0.005
Total	232	74	54	

[a] Pearson Chi^2 tests were used for nominal data, and Kruskal-Wallis tests for continuous data

Table 4. Logistic regression models of factors associated with the steady use of condom during sexual intercourse by indigenous migrant workers with their partners

Variables	Condom use, n (%)		Odds ratio (95% confidence intervals)	
	Never-sometimes	Steady-always	Unadjusted	Adjusted[a]
Migrant workers' sexual partners' ethnicity				
Indigenous: same ethnicity (assortative)	214 (92.2)	18 (7.8)	0.20 (0.09-0.43)*	0.30 (0.17-0.53)*
Indigenous: other ethnicity (disassortative)	64 (86.5)	10 (13.5)	0.37 (0.15- 0.90)*	0.50 (0.19-1.34)
Non-indigenous (disassortative)	38 (70.4)	16 (29.6)	1	1
Have you ever engaged in a concurrent relationship?				
Yes	61 (91.0)	6 (9.0)	0.19 (0.05-0.82)*	0.27 (0.15-0.50)*
No	255 (87.0)	38 (13.0)	1	1
Drugs use during sexual relations				
Yes	62 (93.9)	4 (6.1)	0.41 (0.14-1.19)	0.23 (0.07-0.72)*
No	254 (86.4)	40 (13.6)	1	1
Number of sexual partners				
≥2	220 (84.6)	40 (15.4)	1.94 (1.21-3.11)*	0.55 (0.22-1.36)
1	96 (96.0)	4 (4.0)	1	1
Total	316	44		

Hosmer & Lemeshow goodness-of-fit test: Chi^2=8.8 (p=0.26); Nagelkerke R^2=0.19; variance inflation factor=1.21; [a]Adjusted for all variables in the table; * p<0.05.

justed analysis. The model fit well (p=0.26) and VIF was 1.21, indicating no collinearity. The final model explained 19% of the total variability.

DISCUSSION

The adjusted ORs for steady condom use were lower in sexual partnerships that were assortative and concurrent than in other partnerships and in those that used illegal drugs during sex.

Our findings support the proposed link between assortativeness and concurrence with the vulnerability to STIs and HIV infection mentioned in the sexual network theory. By hindering the constant use of condom, these variables contribute to a faster transmission and accumulation of infections in the indigenous community, speeding up the non-linear transmission of infections (11,20,29).

The use of illegal drugs also hindered the steady use of condom. This coincides with earlier studies on MAWs who migrated to agro-industrial environments where the use of drugs is prevalent (30), inciting workers to start using drugs or to increase their consumption.

The associations found can be interpreted as the expression of a sexual culture strongly influenced by a context of marginalization and extreme poverty, which in the case of Mexican indigenous MAWs, is characterized by very precarious working and living conditions with high rates of morbidity, mortality, violence, and drug abuse, as well as limited access to health and education (31). These conditions enable the development of networks of sexual

partnerships that incur in risky practices that lead to STIS and HIV vulnerability, as it has also been reported among migrant workers worldwide (2).

The lower proportion of steady use of condom with indigenous sex partners also coincides with the lower frequency seen among young indigenous groups from Latin America, stressing the higher vulnerability of indigenous people compared with the general population (32). This has also been reflected in a higher prevalence of infections in global indigenous populations (33).

Various limitations should be stressed: 1) the cross-sectional design used limited the assessment of partnership formation and the trends in condom use during sex practices, which can only be assessed using longitudinal designs; 2) the use of structured questionnaires for interviews could have led to bias and measurement errors when estimating the characteristics of sex practices, including the limit to eight sex partners to reduce inaccurate recall and participant fatigue; this was reduced by using a validated and pilot-tested instrument and by training the interviewers; 3) since the study was limited to young male workers, future efforts should be made to explore the perspective of minorities in this sector, namely women, older adults, and seniors, possibly using qualitative methodologies; 4) in the interviewed group, only two workers referred having male sex partners; this could be an underestimation of the true proportion of same sex relationships resulting from a response bias given the homophobic attitudes prevalent in the Mexican indigenous sexual culture, which can be associated with fear of discrimination and violence for having partners of the same sex (34), therefore, risk practices in men who have sex with other men need to be further investigated; 5) steady use of condom was dichotomously coded to obtain a robust indicator of consistent use; however, this measure should be further complemented with questions dealing with adequacy of use; 6) the variable "concurrence" focused on workers' reports on simultaneous sexual partnerships within the last year as an approximation to the risk of transmission in the partner, yet this measure could be improved using other two complementary measures: perceived concurrence among regular partners, and perceived concurrence based on temporal duration; and 7) findings cannot be generalized to other populations, as the study only dealt with asugarcane agro-industrial context and two ethnic groups, while the real population of migrant workers comprises many indigenous groups; thus, results can only be extrapolated to workers of similar ethnic, migration, social, and working characteristics.

In spite of the limitations, the study concludes that two egocentric sex network variables (assortative and concurrent partnerships) favor the low frequency of steady condom use, increasing the vulnerability of STIS and HIV transmission. The negative impact of illegal drug use, which appears to be growing among indigenous MAWS, needs to be considered.

In terms of preventive actions targeted to indigenous MAWS, these results could lead to the implementation of STIS and HIV risk reduction measures using complementary schemes through a structural approach aimed at improving socioeconomic and sanitary conditions in working places, including access to intercultural services of sexual, reproductive and mental health (35), and by developing culturally-contextualized preventive strategies for condom use in partners with assortative and concurrent sexual partnerships (15) ♦

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