Respondent driven sampling: An effective methodology to estimate vulnerability to HIV transmission in Sex Workers of Santos, Brasil

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SUMMARY
Some population groups of difficult access, as the sex workers (SW), present high vulnerability to HIV infection. The methodology Respondent Driven Sampling (RDS) begins with the identification of the first participants, named "seeds", that initiate the selection of others participants. RDS assumes that social nets are long enough for guarantee a representative final sample of the group to be studied. The RDS methodology applied in 175 sex workers of Santos, Brazil, showed that they did not communicate, forming two different nets, nightclubs workers and streets/hotels workers. Their vulnerability to the HIV was similar to the estimated at the beginning of epidemics in 1986. Despite of the similarity of exposition, the poorest women present a higher prevalence to the HIV. The change in the standard of drugs suggests revision of prevention actions that should be continuous and organized from the nets. The RDS constitutes an important strategy for access the TS.

INTRODUCTION

The HIV/AIDS epidemic had posed to scientists and researches many and constant challenges in all levels. Some population groups still present high vulnerability for the infection. Users of drugs, men who make sex with men and sex workers belong to groups of difficult access and the prevention programs directed to them frequently have difficulties to be implanted and evaluated, due to the special needs these persons present of not be identified from fear of discrimination.

The concern in having access to these groups in valid statistical samples made a group of scientists to develop a type of sampling based on nets of contacts. This methodology called Respondent Driven Sampling (RDS) elaborated by Douglas Heckathorn, starts with the identification, for the researchers, of the first participants of the study, called “seeds”, that have the function of initiating the election of other members. The recruitment expands in waves, where Wave 1 is formed by the participants indicated for the seeds, Wave 2 for the

participants indicated for the components of Wave 1, and thus each recruitment is a link of the chain. Each participant is recruited through coupons identified by numbers.

This process continues until the sample reaches the projected size. With exception of the seeds all the participants are recruited by persons of the group, meaning that they are effectively participating of a social net. This system guarantees the participation of people not reached for another type of methodology.

The RDS is based on the principle that the social nets are long enough to reach a sufficient number of waves or cycles of recruitment that guarantee a final sample with characteristics and representative behaviors of the group to be studied. The point where the sample presents stability is called “balance”.

The context of HIV vulnerability in the city of Santos constitutes a big challenge to prevention activities. The fact to shelter the biggest port of Latin America with intense movement of trucks, ships of load and passengers, produces a concentration of commerce of the sex, beyond intense circulation of sex workers between the main cities of the state of São Paulo. Santos was considered the Capital of the AIDS with the highest AIDS prevalence rate in the period 1989-1993.

Diverse studies to estimate HIV prevalence in sex workers of the city and the context where the infection occurred were developed (Table 1). All of them found similar situations of HIV prevalence and a vulnerability context that involved intense sex commerce activity and constant use of drugs between sex workers.

In 2001 a census verified that sex comerce in Santos was concentrated in historical center area next to the port, in the streets, hotels, nightclubs, and in agencies distributed in places next to the beach. In recent years a change in this profile can be observed, the reduction of sex workers in the streets and the concentration in two nightclubs of the center. The sex workers who act in the city are still a group that needs special attention of public health in assistance and prevention. The RDS appears as a chance of a new approach with this segment.

The present work had the purpose of studying the net of social interaction of sex workers in the city of Santos, their vulnerability conditions and HIV prevalence infection and evaluating RDS applicability for monitoring HIV.

METHODOLOGY

Population and recruitment

This was a cross descriptive study that engaged 175 women older than 18 years, who practice sex commercial activities in the city of Santos, in the period of November of 2005 to

April of 2006. It was driven in three unities of Santos municipal health services, near to the zone of prostitution.

The questionnaire used was based on studies and previous experiences, and it asked about social and demographic characteristics, knowledge on the HIV; history of testing for HIV, knowledge of the sorologic status, historical of STI; sexual initiation; number and types of sexual partners; use of condom; sexual commerce, use of drugs and alcohol and access to health services. The questionnaire was applied by experienced multidisciplinar team in interviews and advising.

The methodology used was the RDS - Respondent Driven Sampling, which is able to produce probabilistic samples of social nets or chains of recruitment in which the people interviewed besides being a part of the sample are responsible for the recruitment of the other participants. The probability of any individual to be included in the sample is not known.

The first 10 seeds recruited by the team distributed three encoded coupons to his eligible couples. The net size was determined by the question: "How many sex workers do you know personally, knows the name, and they also know you? ", and their connections were controlled by this sequence of codes.

After the sex workers were recruited, they answered a questionnaire and were submitted to the tests for detection of HIV (Determine™ HIV 1/2/Laboratories Abbott and the Rapid Check HIV 1*2/NDI) and Hepatitis B. In case of disagreement between the two, the test Uni-Gold™ HIV/Trinity Biotech was used for decision, according to algorithm approved by the National Program of STI and AIDS.

When this stage ended, in the same place, the result of the HIV test and the advising were provided. The nets were formed from the arrival of news participants with valid coupons. This process took place until the sample was complete.

All the instruments predicted in the methodology, identified only by codes (coupons, control of incentives and physical signs to reduce the chance of duplicity of participation), favoured the field control.

Statistical analysis

The sample size of 148 women was calculated with the Program EPINFO 6.0 considering: a universe of approximately 600 Sex Workers, according to the census developed in 2001 and a frequency of use of condom with clients of 85 %, with the possibility of a error of 5 % in an confidence interval of 95 %.

Because of the difficulties in accessing the population of sex workers, a loss of around 10% and an effect of sampling up to 25 % were estimated, giving a total sample size of 200 participants. The project interviewed and tested 175 sex workers.

All the questionnaires were revised "in-locus" before being processed (Statistical Package for the Social Sciences, version 10.0/SPSS Inc., Chicago, Illinois, USES). The statistical analysis was done using the Respondent Driven Sampling (RDS) Analysis Tool (RDSAT), version 5.4/Cornell University, Ithaca, New York, USES.

RESULTS

Using the RDS technique 175 women were recruited from 10 seeds in 5 different waves with the following social and demographic characteristics and HIV vulnerability factors and serology.

Most of the sex workers (67,5%) was aged between 18 and 29 years, minimum of 18 and maximum of 62 years. More than a half (53%) were white and 42,8% were black. 42,2% of the women had attained seven years of education. The sex workers concentrated in the least favored social classes (C and D/E), corresponding to 89,8% of the sample (Table 2).

Regarding the place of work, it was observed that between the women who worked in nightclubs, 11,3% were of the classes A/B, 45,0% of the class C and 43,7% of the classes C/D/E, whereas those who worked in streets/hotels 3,3% were of the Classes A/B, 21,9% of C and 74,8% of the classes D/E (Table 3).

Regarding the sex workers main vulnerability factors, 50% of them had initiated the sexual life between 12 and 15 years, and the activity of sex commerce for approximately 21,7% of the women occurred before the 18 years old. The time in prostitution disclosed that half of the women had initiated this activity in the last three years. The use of condoms with clients also was not consistent for 27% of them. Of the 175 participants of the study, 123 (70.2%) had made use of illicit drugs, however any user of injectable drugs was found.

The entrance in sex commerce activities occurred in the adolescence (up to 18 years), for approximately 36,2% of the participants. The practice of anal sex with clients was reported by 21,1% of the interviewed women. The non use of condom with clients was reported by 18% of the sex workers.

Table 3 illustrates the main differences between the women who work in nightclubs and in streets/hotels, the first ones present greater percentage of white women, more years of study and better social and economic level.

The main factors of HIV vulnerability were to work in the streets, to have few years of schooling, precarious dwelling, early age of beginning sexual life and commerce of sex, to be non-white persons and to use drugs, specially crack. Despite of the similar exposition, the poorest women presented a higher prevalence to the HIV.

All the 175 participants agreed to complete the test anti HIV. Ten women were identified (5.7%) with reagent result, 4 of them (2.9%) already knew to be HIV positive.

Table 4 presents the HIV prevalence related with some vulnerability factors.

Among drugs users the HIV prevalence was 4,9% and 2,7% among not users. Of the 10 HIV positive identified women, nine (90%) related use or experimentation of drugs.

For the women who declare to use condoms in all sexual relations with clients, the HIV prevalence was 3,9%, for the others the measure attained 0,9%.

The prevalence of HIV positive was higher among women of non-white races (5,3%), for the white the prevalence was 1,5%. 42.8% of the seropositive women were not white.

For sex workers who practice anal sex the HIV prevalence was 11,2%, dropping to 1% among those who had not adopted this practice.

The main factors of vulnerability to HIV, with their different prevalence found in the sample were: drug use, inconsistent use of condoms with clients, practice of anal sex and race.

Figure 1 illustrates the nets obtained by the application of RDS methodology, showing that the 175 accessed sex workers did not communicate, despite of the proximity of the places where they work, constituting two distinct nets, workers of nightclubs and workers of streets/hotels.

The same figure shows the occurrence of the infection by the HIV between the sex workers; the infection does not occur equally in the net, it concentrates in the workers that develop activities in the streets and hotels. The seropositive women concentrate in the poorest places of the city frequented by clients of minor acquisitive power. Those women were the most vulnerable for HIV infection.

DISCUSSION

The conclusions of this study were that Santos sex workers present vulnerability to the HIV similar at the observed at the epidemic initiation in 1986, 5.8%. The seroprevalence of HIV remains high among sex workers, reminding the studies carried out in the 1990s when the HIV prevalence ranged from 5% to 8% and the city was considered as the "Capital of AIDS." The data show that sex workers continue to have significant risk for HIV infection, and this may be due to the disruption observed in prevention programs targeting this group.

The epidemic affecting the female sex workers in Santos follows the national trends involving the less privileged social classes, with poor study and black.

The previous studies found 3% of injecting drug use, in this study there is a change in the pattern of use, use of drugs by injection was not found. This behavior is similar to the one observed in other cities in Brazil where injecting drug use has decreased systematically. Despite this change, the drug use remains an important factor of vulnerability to HIV

confirming the studies that show increase in consumption and experimentation of drugs and alcohol in this population.

A limitation of the RDSAT tool of analysis in this study was the inability to identify significant risk factors, described in the literature in studies of SW, due to the large confidence intervals generated by the RDSAT. This phenomenon was due to high level of homofilia, more than 30%, found on the place of work.

The research had three innovative aspects that can serve as a basis for future studies: the sampling technique directed for the people interviewed (RDS), the use of the RDSAT software for analysis, and the use of the fast test for HIV serology.

The sampling technique was efficient to achieve the number of participants in a short space of time reducing the costs of the project and was able to access different profiles of sex workers. The use of RDSAT was also effective for understanding the female sex workers networks formation and to visualize the most vulnerable areas.

The accomplishment of fast test in field was one of the positive points of this study. For most participants the main incentive for participation was the possibility of receiving a diagnosis of HIV in few minutes. The perception that their working practices could mean risks for HIV infection was a fact proved to be assimilated by the interviewees, expressed by the great number of women who had already performed the test and by the fact of none of them had refused to collect the blood sample.

The effectiveness of counseling in situations of rapid test is the proximity between the pre and post-test that occurs almost in parallel helping the perception of vulnerability.

The study reinforces the importance of taking advantages of the sex workers high rate of access to health services, established by the significant number of women who underwent gynecological appointments in the last year, for promotion of condom use, treatment of sexually transmitted diseases and counseling.

It is critical that effective preventive actions in the field were wide and continuous, taking into account the cultural and social characteristics of the group in focus. The results of the study and the mapping of the networks must be advisers of the places where preventive actions should be developed.

This study concluded that it is necessary to review the harm reduction strategies to be applied in this specific population for the use of non-injectable drugs, such as crack and cocaine, and to develop programs for prevent the use of alcohol.

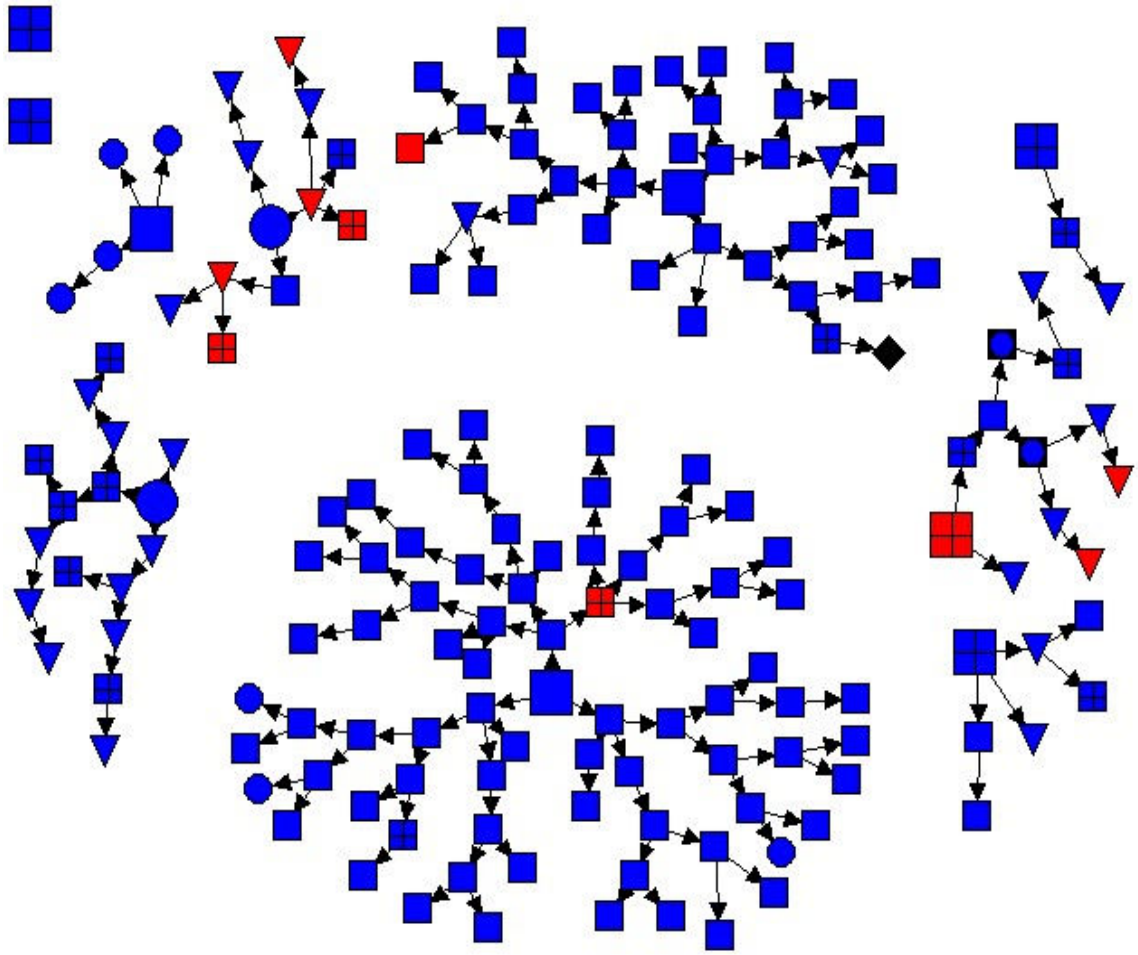
The similarity of the sex workers information obtained in this study with some others previously performed suggest the effectiveness of using the RDS methodology as a strategy that proved to be feasible and easily adapted to public health activities.

The RDS constitutes an important strategy for accessing sex workers.

Table 1 - HIV prevalence in studies with Sex Workers in Santos

Studies	Year	Number	Sampling	Prevalence HIV (%)	Use of drugs (%)		
					Injectable	Crack	Cocaine
Granato, C	1991	954	Convenience	4,7	-	-	-
Szwarcwald,C	1997	697	“Snow Ball”	8,0	3,2	6,6	13,5
Silva, N	1998	1047	Census	7,0	3,4	16,2	44,5
RDS	2006	175	RDS	5,7	0	17	45,6

Figure 1. HIV prevalence in Sex Workers by local of work – Respondent Driven Sampling - Santos, 2006



HOTEL STREET

AGENCY BAR

NIGHTCLUB

HIV - HIV +

Table 2. Sex Workers social and demographic characteristics (N=175). Santos, 2006.

Characteristics	N	%
Age		
18 a 24	67	38,4
25 a 29	51	29,1
30 a 39	41	23,4
40 or more	16	9,1
Race		
White	93	53,3
Black	75	42,8
Indian	2	1,1
Other	5	2,8
Conjugal Situation		
Single	144	82,3
Married	8	4,5
Divorced	16	9,2
Widow	7	4,0
Education		
1 to 7 years	74	42,3
8 or more	101	57,7
Social Class		
A/B	18	10,2
C	73	41,7
D/E	84	48,1
Local of work		
Nightclub	115	65,7
Other	60	34,3

Table 3 – Sex Workers vulnerability factors to HIV according to Local of work (N=175). Santos, 2006

Vulnerability Factors	Nightclubs (N=115)			Streets/Hotels (N=60)		
	Prevalence (%)	Confidence Interval Lower	Upper	Prevalence (%)	Confidence Interval Lower	Upper
Drugs Use						
Yes	72,0	53,4	84,1	45,2	28,4	66,7
Not	28,0	16	46,7	54,8	33,5	71,2
Condom Use						
Yes	70,5	57,8	82,5	74,2	55,9	92
Not	29,5	17,5	42,2	25,8	8	44,1
Social Class						
A/B	11,3	3,1	18,6	3,3	1	6,4
C	45	34,3	65,8	21,9	10,8	4,3
D/E	43,7	25,8	55,4	74,8	52,3	87,0
Race						
White	58,3	46,5	72,9	67,2	46,9	82,5
Not white	41,7	27,1	53,5	32,8	17,5	53,2
Education						
1 to 7 years	24,4	15,1	35,9	52,8	28,7	76,7
8 or more	75,6	64,2	84,9	47,2	23,3	71,3
Time of Sex work						
Up to 1 year	29,4	15,1	42,1	36,3	11,2	54,2
1 to 3	33,1	20,7	50,7	19,2	4,2	39,7
3 to 5	11,4	5,7	16,8	5,8	2,2	16,2
5 to 10	12,8	6,2	19,9	6,6	3,0	13,1
10 or more	13,3	5,8	21,4	32,1	14,3	54,6
Age at first intercourse						
Up to 11 years	2,7	0,6	5,9	0,9	0,1	2,9
12 to 15	40,4	27,5	53,2	74,8	54,6	83,9
16 to 18	46,4	27,4	59,2	21,1	11,5	37,1
19 to 21	1,5	0,8	3,0	2,0	0,4	5,8
22 or more	9,0	0,4	26,8	1,1	1,0	5,8
Age at first commercial intercourse						
Up to 18 years	30,5	18,9	43,8	66,3	40,6	79,4
19 to 21	35,1	21,1	47,5	5,8	3,0	11,5
22 or more	34,4	22,3	48,7	27,9	14,7	51,9

Table 4. Sex Workers HIV prevalence according to Vulnerability factors (N=175). Santos, 2006

	Prevalence (%)	Confidence Interval	
		Lower	Upper
Use of drugs			
Yes	4,9	1,3	11,1
Not	2,7	0,5	6,0
Use of condom			
Not	3,9	0,6	8,6
Yes	0,9	0,3	2,5
Anal sex practice			
Yes	11,2	1,5	23,4
Not	1,0	0,1	2,2
Race			
White	1,5	0,3	2,8
Not White	5,3	0,3	12,4

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