



## Research paper

# Factors associated with syphilis seroreactivity among polydrug users in Northeast Brazil: A cross-sectional study using Respondent Driven Sampling



Cremildo João Baptista<sup>a,\*</sup>, Ines Dourado<sup>b</sup>, Sandra Brignol<sup>c</sup>, Tarcísio de Matos Andrade<sup>d</sup>, Francisco Inácio Bastos<sup>e</sup>

<sup>a</sup> Departamento de ciência e tecnologia (Decit), Ministério da Saúde, Brazil

<sup>b</sup> Instituto de Saúde Coletiva (ISC), Universidade Federal da Bahia, Brazil

<sup>c</sup> Instituto de Saúde Coletiva (ISC), Universidade Federal Fluminense, Brazil

<sup>d</sup> Faculdade de Medicina da Bahia (Fameb), Universidade Federal da Bahia, Brazil

<sup>e</sup> Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (ICICT), Fiocruz, Brazil

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## ABSTRACT

**Background:** The burden of sexually transmitted infections (STIs), such as syphilis, is higher in low-income countries, with serious consequences and profound impact on sexual and reproductive health and human immunodeficiency virus (HIV) spread. Syphilis prevalence tend to be higher among people who misuse drugs than in the general population.

**Objective:** To assess syphilis and associated factors among polydrug users (PDU) in the city of Salvador, Northeast Brazil.

**Methods:** A cross-sectional study was conducted in 10 Brazilian cities between September and November 2009 using Respondent Driven Sampling (RDS). Participants answered an Audio Computer-Assisted Self Interview (ACASI) and were rapid tested for HIV and syphilis. We performed multivariable regression models for correlates of syphilis on Stata 10.0. Estimates were weighted by the inverse size of the individual social network size and homophily.

**Results:** Mean age was 29.3 years (range: 18–62), 74.0% were males, and 89.8% were non-white. Syphilis prevalence was 16.6%. Females (adjwOR:2.14; 95%CI:1.09–4.20), individuals over 29 years old (adjwOR:4.44; 95%CI:2.41–8.19), those who exchanged sex for money or drugs (adjwOR:3.51; 95% CI:1.84–6.71), “No/low” self-perceived risk of HIV infection (adjwOR:5.13; 95%CI:1.36–19.37), and having nine or less years of education (adjwOR:2.92; 95%CI:1.08–7.88) were associated with syphilis.

**Conclusion:** One of the most pressing needs for syphilis prevention/control is the availability of rapid point-of-care diagnostic tests and treatment. Interventions should be tailored to PDU needs and their multiple burdens as shown in the present study, that may contribute to future studies aiming to better understand the relationships between drug use and syphilis.

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## Introduction

Drug users remain a key population for the prevention of sexually transmitted infections (STIs) (Chemi, Abdullah, Singh, Fadzli, & Isa, 2014; Shockman, Buescher, & Stone, 2014; Zoni, González, & Sjögren, 2013). People who use illicit drugs frequently

engage in high levels of risky sexual behaviours in diverse settings and contexts (Liao et al., 2013; Todd et al., 2010), increasing their risk of acquiring and transmitting STIs.

High prevalence of syphilis infection has been reported among drug users (Wang et al., 2013). In addition, syphilis infection among them consist of several risk determinants, such as individual, structural and contextual factors. Such factors include stigma and discrimination, violence (De Carvalho and Seibel, 2009; Cruz et al., 2014), less than optimal access to education (Liao et al., 2013; Todd et al., 2011), race/ethnicity in its relationship with racism and marginalization, and incarceration (Rossi et al., 2008). Different sexual risk behaviours, e.g. inconsistent condom use (Liao et al.,

\* Corresponding author at: Departamento de Ciência e Tecnologia, Decit, Secretaria de Ciência, Tecnologia e Insumos Estratégicos, Ministério da Saúde, Unidade IX, SCN Quadra 02 Projeção C, Brasília DF 70712-902, Brazil.

E-mail address: [cjbpatista.moz@gmail.com](mailto:cjbpatista.moz@gmail.com) (C.J. Baptista).

2013), sex work (Platt et al., 2007), multiple sexual partners, and exchange sex for money and/or presents (Guimaraes et al., 2014; Wu et al., 2010) were determinants of STIs acquisition and transmission.

In Brazil, a national survey conducted in 2012 in 27 Brazilian state capitals and Brazil's capital district (*Brasília*) estimated at 2.3% the use of illicit drugs, other than cannabis (Brazil, 2014). Regarding syphilis, data from 2005 estimated at 9.0% the prevalence of syphilis among illicit drug users (Bastos, Bertoni, & Hacker, 2008). And further study confirmed that the prevalence of syphilis and other STIs among Brazilian illicit drug users is higher than that in the general population (Malta et al., 2010). Syphilis prevalence was estimated at 0.53% among male conscripts in 2007 (Ribeiro, Rezende, Pinto, Pereira, & Miranda, 2012). However, population-based data on drug users' profiles and particularly on the relationships between drug use and STIs is scarce in Brazil especially in poor Regions of Brazil. Therefore, the purpose of this study is to report the prevalence of syphilis and its associated factors among people who use different psychoactive substances/polydrug users (PDU) in the city of Salvador, Northeast Brazil.

## Methods

### Study design and data collection

A cross-sectional Multicenter Study using Respondent-Driven Sampling (RDS) was conducted between September and November 2009 in 10 Brazilian cities among PDU (Belo Horizonte, Brasília, Campo Grande, Curitiba, Itajaí, Manaus, Santos, Salvador, Recife, and Rio de Janeiro). This analysis focus on data collected in the city of Salvador, Brazil's third largest – and one of its lowest-income – cities. Participants were 18 years or older, resident in Salvador, who reported injecting substances such as cocaine, crack, amphetamine, heroin or hallucinogens at least once or reported using any of them by other routes (i.e. other than injecting) for at least 25 times in the 6 months preceding the interview. These criteria were defined after Pan American Health Organization's (PAHO's) CODAR (“Consumidores de Drogas con Alto Riesgo” or “High Risk Drug Users”, in English) manual and related materials (PAHO, 2004).

RDS is a chain-link sampling method that begins with a convenience sample of members of the target population called ‘seeds’. Seeds recruit a pre-specified number of recruits who in turn recruit a pre-specified number of new participants (Heckathorn, 1997). In this study, four purposefully selected “seeds” diverse in age, gender, drug use type, and socioeconomic characteristics started the recruitment process. Each participant was allowed to invite three recruits using specific barcoded coupons linked to the recruiter's coupon. A public health centre served as the assessment centre where, after consenting, eligible participants responded to a validated questionnaire using an Audio Computer-Assisted Self Interview (ACASI), that included questions concerning socio-demographic factors, drug use and sexual behaviour, their social context and networks, access to healthcare, access to/use of condoms, prior HIV testing, history of violence and discrimination, and knowledge of STIs. After completing research procedures, they received a primary incentive of R\$(Brazilian Real) 40.00 (~US\$20.00 in 2009) and a secondary incentive of R \$40.00 for each of their recruitees who completed the survey. The study protocol was approved by the Ethical Committee of the Sergio Arouca National School of Public Health (CEP/ENSP n°. 90/2008). All participants signed a free and informed consent form and received pretest and post-test counselling. We referred to specialized care those who tested positive for one or more than one of the rapid tests.

### Outcome and exposure measures

For this analysis, the outcome of interest is “syphilis” (positive or negative). Blood specimens were drawn for voluntary syphilis rapid-testing, as standardised by the Brazilian Ministry of Health (Brazil, 2005). Syphilis was screened using the rapid plasma reaction (RPR) *Bioline Syphilis*<sup>TM</sup> kit, using finger prick blood. Those respondents who tested positive for RPR in this study were cross-compared to those who tested negative. The explanatory variables of the syphilis were analysed according to the three levels of vulnerability as described by Ayres (after J. Mann's [1947–1998] original contribution): individual, social and programmatic (Ayres, 1996). The individual level considered age (taking mean as the cut point), gender, condom use at first sexual intercourse, self-perceived risk of HIV infection, condom use with stable and casual partners, number of sexual partners, frequency of condom use, and engaging in sex in exchange for money or drugs in the 12 months preceding the interview. The social level included race/skin colour, marital status, years of education, income, to have ever been forced to have sex, to have ever forced someone to have sex, and to have suffered discrimination because of the use of drugs. Programmatic vulnerability level comprised free access to condoms, to have received counselling on preventing STIs and educational materials in the last 12 months.

### Data analysis

Among the 434 PDUs who reached the study site, eight (1.8%) were ineligible. There were two undetermined results for syphilis, which were excluded from subsequent analyses. Logistic regression analyses were fitted to the valid data. Estimates were weighted using the inverse of the social network size (degree) and homophily that were calculated with the help of The RDS Analysis Tool (RDSAT 7.1; available at [www.respondentdrivensampling.org](http://www.respondentdrivensampling.org)) (Salganik & Heckathorn, 2004). The social network size was self-reported by the participants by answering the following question: “Of those drug users you know by name and have met in the last month, how many of them would you invite to participate in this study?”. Individuals weights which takes into account the probability of selection that depends on the individual's social network size, and the homophily degree (Heckathorn, 1997), were exported to a Stata 10.0 database in order to run the analyses using the weighted estimates.

Pearson's Chi-square test was used to compare proportions with significance level set at 0.05. Findings are presented as odds ratios (OR) and respective 95% confidence intervals (95%CI). Intermediate models for each of the three groups of explanatory variables were fitted separately, inserting variables with *p* value less than 0.20 from the univariate analyses. The final regression model fitted the explanatory variables from each of the three intermediate models with *p*-values < 0.10. The magnitude of the independent association between explanatory variables and syphilis was assessed calculating the weighted odds ratio (adjwOR) at significance level of 0.05. A Pearson's Chi-squared test for categorical data assessed the fitness of the final logistic regression model.

## Results

### Characteristics of participants

Unweighted prevalence of syphilis were 24.6% (95%CI: 16.5–32.6) and 13.6% (95%CI: 9.8–17.5), whereas weighted prevalences were 20.0% (95%CI: 12.5–27.5) and 14.6% (95%CI: 10.6–18.5) for females and males, respectively. Selected characteristics of the final sample (*n* = 424) are presented in Table 1. Mean

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