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Respondent driven sampling is an effective method for engaging methamphetamine users in HIV prevention research in South Africa

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ABSTRACT

Background: South Africa, in the midst of the world's largest HIV epidemic, has a growing methamphetamine problem. Respondent driven sampling (RDS) is a useful tool for recruiting hard-to-reach populations in HIV prevention research, but its use with methamphetamine smokers in South Africa has not been described. This study examined the effectiveness of RDS as a method for engaging methamphetamine users in a Cape Town township into HIV behavioral research.
Methods: Standard RDS procedures were used to recruit active methamphetamine smokers from a racially diverse peri-urban township in Cape Town. Effectiveness of RDS was determined by examining social network characteristics (network size, homophily, and equilibrium) of recruited participants.
Results: Beginning with eight seeds, 345 methamphetamine users were enrolled over 6 months, with a coupon return rate of 67%. The sample included 197 men and 148 women who were racially diverse (73% Coloured, 27% Black African) and had a mean age of 28.8 years (SD = 7.2). Social networks were adequate (mean network size >5) and mainly comprised of close social ties. Equilibrium on race was reached after 11 waves of recruitment, and after ≤3 waves for all other variables of interest. There was little to moderate preference for either in- or out-group recruiting in all subgroups.
Conclusions: Results suggest that RDS is an effective method for engaging methamphetamine users into HIV prevention research in South Africa. Additionally, RDS may be a useful strategy for seeking high-risk methamphetamine users for HIV testing and linkage to HIV care in this and other low resource settings.

1. Introduction

South Africa is home to the largest HIV epidemic in the world, with an estimated 6.4 million residents living with HIV in 2012 (Shisana et al., 2014), and is experiencing an emerging epidemic of non-injection methamphetamine use. In the Western Cape Province, where the methamphetamine epidemic is concentrated, the proportion of admissions to drug treatment facilities for methamphetamine increased from 0.8% in 2002 to 52% in 2011 (Dada et al., 2012). Community-based surveys in Cape Town confirm the high prevalence of methamphetamine use, particularly in densely populated township communities. For example, in a sample of >3000 individuals recruited from alcohol serving venues in one township, 6.4% of participants reported methamphetamine use within the past 4 months, with rates three times higher among persons who were Coloured (a recognized group of mixed ethnicities) compared to Black African (Meade et al., 2012). It is feared that this increase in methamphetamine use may contribute to a new wave of HIV infections in the Western Cape (Parry et al., 2008).

Methamphetamine is mainly smoked in South Africa, so HIV risks associated with injection use remain low (Dada et al., 2012). However, as a stimulant, methamphetamine increases sexual desire and is associated with increased prevalence of risky sexual behavior and HIV infection (Carey et al., 2009; Freeman et al., 2011; Lorvick et al., 2012; Mimiaga et al., 2010; Rawson et al., 2008). Data from Cape Town confirms that methamphetamine smokers in this region are more likely to engage in risky sexual behaviors compared to non-smokers, and that methamphetamine is commonly used with sex to augment the sexual experience (Meade et al., 2012; Parry et al., 2011; Simbayi et al., 2006;

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Wechsberg et al., 2012). Given that methamphetamine smoking is most prevalent in Coloured communities, while HIV continues to disproportionately affect Black Africans, there is concern that a dual epidemic of methamphetamine and HIV may increase HIV incidence (Kapp, 2008). This has led to a call to prioritize strategies that promote engagement of methamphetamine smokers in research necessary for tracking the HIV epidemic and planning effective responses (Morris and Parry, 2006). Identifying and engaging methamphetamine smokers in targeted HIV research and prevention programs in South Africa remains difficult because methamphetamine-related stigma leads users to hide their addiction for fear of prosecution and rejection from family and friends (Myers et al., 2009; Watt et al., 2013).

Respondent driven sampling (RDS) has been used to engage members of hard-to-reach populations characterized by involvement in stigmatized and/or illegal behaviors (Heckathorn, 1997; Magnani et al., 2005). It is a variant of chain referral sampling that relies on peers to recruit diverse samples from the target population (Heckathorn, 1997; Salganik and Heckathorn, 2004). The primary advantage of RDS over other chain referral sampling strategies is that it employs statistical estimation methods to limit biases that may arise from peer-driven recruitment (Heckathorn, 1997). In theory, RDS can generate unbiased and accurate point-prevalence estimates for the population of interest (Heckathorn, 2002). While some recent evaluations of RDS have suggested that prevalence estimates can be biased with large design effects (Gile and Handcock, 2010; Goel and Salganik, 2010; Mouw and Verdery, 2012; Yamanis et al., 2013), others have concluded that RDS is an effective sampling method for HIV surveillance of hard-to-reach populations when appropriately designed and implemented (Johnston et al., 2008b; McCreesh et al., 2012; Platt et al., 2006; Robinson et al., 2006; Townsend et al., 2010, 2012). RDS has been successfully used in diverse settings internationally with numerous socially marginalized groups, including undocumented immigrants, sex workers, men who have sex with men (MSM), and illicit drug users (Johnston and Sabin, 2010; Malekinejad et al., 2008; Montealegre et al., 2013; Robinson et al., 2006; Wang et al., 2005).

RDS recruitment begins with purposive sampling of initial respondents ("seeds") from the target population. Once a seed completes the study assessment, he/she is compensated for participation ("primary incentive") and then asked to recruit a pre-determined number of peers (usually 2 to 3) using recruitment coupons. The seed is rewarded with a "secondary incentive" if their recruit is eligible and enrolls in the study. Enrolled participants then serve as recruiters and are offered the same primary and secondary incentives. This procedure creates an expanding system of chain referrals characterized by "waves" of recruitment until the target community is saturated or the desired sample size is reached (Heckathorn, 1997; Johnston, 2008).

In many parts of the world, hard-to-reach and socially marginalized groups play a central role in the rising incidence of HIV infections (Beyrer and Abdool Karim, 2013). RDS has been utilized extensively in HIV research among injection drug users (Burt et al., 2010; Lansky et al., 2012; Malekinejad et al., 2008). However, non-injection drug use is also driving the epidemic, contributing to HIV transmission via risky sexual behaviors, and strategies for HIV prevention among injectors do not translate well to non-injectors (Freeman et al., 2011; Shoptaw et al., 2013; Volkow et al., 2007). Therefore, linking non-injection drug users to HIV prevention efforts remains paramount, particularly in high prevalence settings (Degenhardt et al., 2010). By utilizing social networks and providing financial incentives for recruitment, RDS has the potential to successfully identify and engage methamphetamine smokers. This study describes the effectiveness of RDS as a method for engaging a cross-section of methamphetamine smokers into an HIV behavioral research study in a racially diverse township in South Africa. Additionally, it explores the effectiveness of RDS in reaching various sub-groups of methamphetamine smokers stratified by HIV risk profile (self-reported HIV status, HIV testing history, perceived HIV risk, and willingness to test) and substance use characteristics (frequency of methamphetamine smoking and concurrent other drug use).

2. Methods

Approval was obtained from the ethical review board at Duke University Health System and Stellenbosch University's Health Research Ethics Committee.

2.1. Setting and participants

This study was conducted during a 6 month period (May–October 2013) in Delft, a township located 15 miles outside the Cape Town city center. Delft was established in the early 1990s as a racially integrated township, with Black African and Coloured residents. The majority of its 150,000 residents are unemployed and living in poverty (Lehohla, 2012). The target population was adult methamphetamine smokers. Eligibility criteria were: ≥18 years of age, residence in Delft, and current methamphetamine use (verified by urine drug screen). Exclusion criteria were: acute intoxication, impaired mental status, and/or inability to provide informed consent. Except for seeds, participants were required to present a valid recruitment coupon. The study office was located inside the Delft South Public library and was open weekdays from 9am to 5pm. The field staff comprised of four fulltime staff (3 interviewers and 1 project manager).

2.2. Formative research

Formative research was used to adapt the RDS strategy for methamphetamine smokers living in a township community (Johnston et al., 2010). We assessed feasibility by evaluating characteristics of the social network (size, sociometric depth, and composition); acceptability of proposed incentives; and survey logistics such as study office location, hours of operation, and duration for the study visit. Four focus groups with members of the target population, stratified by race and gender, were conducted ($N = 31$, 7–8 per group). Participants were recruited using convenience sampling based on relationships established during prior research in Delft. Findings revealed that methamphetamine smokers: (1) are from all race, gender, and age groups; (2) often smoke methamphetamine daily; and (3) have well-established social networks with other methamphetamine smokers (i.e., they socialize and smoke together, with reported network sizes ranging from 2 to 60). We did not identify any group that existed in isolation or without existing "bridges" to other methamphetamine users. All participants reported that they would be willing to invite at least two peers from their social network. These results provided confidence that RDS procedures would be feasible to implement.

2.3. RDS procedures

Recruitment started with eight seeds stratified by race and gender that were identified by our field staff during the formative phase. After completing the study visit, each seed was given coupons to recruit two peers. The coupons listed the address, telephone number, and operating hours of the study office.

Recruited peers came to the study site with their coupons. Those who met preliminary eligibility provided written informed consent and completed a urine drug test. Only those who tested positive for methamphetamine were eligible to proceed. Participants completed an audio computer assisted structured interview (ACASI) on sexual risk behavior and mental health, a clinical interview on drug addiction, and additional face-to-face questions about their social network and relationship to their recruiter. The full study visit took approximately 2 h and each participant was given two coupons and instructed how to recruit new peers. All participants received the primary incentive of a grocery voucher worth ZAR 70 (~US$7), and had the potential to receive the secondary incentive of a ZAR 20 (~US$2) voucher for each of a maximum of two recruits. Each recruitment coupon had a unique serial number to track the relationships among participants. Participants received referral information for local support groups and treatment facilities for HIV and substance use. We aimed to enroll at least 160 methamphetamine smokers to address our primary goal of assessing the effectiveness of RDS, but allowed the recruitment process to proceed until study resources were exhausted.

To manage participant flow, seed enrollment was staggered throughout the study period and initiated one at a time. For seeds 1–7, we used systemized reduction of recruitment coupons (Johnston et al., 2008a): participants in waves 9–11 received only one coupon, and those in wave 12 received zero. Seed 8 was unique because he was initiated at the end of the study period when resources were limited. All participants recruited from seed 8 received only one coupon with no systemized reduction of coupons to ensure that characteristics of his recruits reached equilibrium distribution. The principal network theories underlying RDS are based upon a linear recruitment process, which is best achieved through the use of only one recruitment coupon (Heckathorn, 1997).