Using Respondent Driven Sampling to Estimate Lifetime Prevalence of Informal Sector Abortion among Women of Reproductive Age in Soweto, South Africa

Caitlin Gerdts, Ruvani Jayaweera, Isabel Munoz, Relebohile Motana, Tshego Bessenaar, Paul Wesson

Background

In contexts where abortion is legally restricted or other barriers hinder abortion access, abortion commonly occurs outside of the formal health sector (for the purposes of this paper we will refer to all such abortions as *informal sector* abortions). In such contexts, unsafe abortion persists as a completely preventable cause of maternal mortality and morbidity, but increasing access to mifepristone and misoprostol—drugs that can be used to safely terminate an unwanted pregnancy— and reliable information about medication abortion protocols, can enable those who cannot access formal sector abortions services to safely self-manage abortions on their own. Given the changing landscape of informal sector abortion, the World Health Organization (WHO) has recently modified the classification of abortion safety—noting that among abortions not strictly adhering to WHO guidelines, some may be more dangerous (classified as "least safe") while others may be safer (classified as 'less safe').[1] However, existing data on the prevalence and outcomes of informal sector abortion are fraught with bias. Indirect methods for estimating the prevalence of induced abortions rely on assumptions and extrapolations that are often difficult to test, and direct survey techniques suffer from widespread underreporting. Due to abortion stigma and fear of legal consequences, women seeking informal sector abortion may be reluctant to seek care in the event of complications, and/or to reliably report their abortion experiences to researchers. These challenges in data collection likely lead to underestimates of abortion prevalence, as well as biased data on the characteristics and outcomes of abortion in such contexts. There is, therefore, a pressing need for new and innovative research methods to assess the prevalence, incidence, and characteristics of abortions that occur outside of formal health care settings.

Respondent Driven Sampling (RDS) is a sampling methodology that has been successfully used to estimate unbiased prevalence of sensitive and illegal behaviors among hidden populations such as injection drug users, sex workers, and men who have sex with men,[2-8] but has never before been employed for generating prevalence estimates for abortion. RDS relies upon social networks to identify populations engaging in stigmatized, illicit, or otherwise hidden behaviors; this approach may offer a previously untested alternative to measuring informal sector abortions. RDS attempts to leverage a small non-random sample of initial participants (known as *seeds*) within social networks engaging in hidden or stigmatized behaviors to recruit others within the same social networks (i.e. the target population). Each individual seed is given a set number of coupons with which they can recruit their social network peers. Once a participant with a valid coupon presents to the study site, she is provided with the same number of coupons with which to enroll other members of the social network, thus resulting in a lengthy chain of participants representing the target population.[4,5,9]

In order to generate unbiased prevalence estimates for the outcomes, behaviors, or characteristics of interest in the target population, RDS samples are adjusted for potential selection bias in analyses by

weighting participants with more contacts in the target population inversely proportional to the number of contacts in the network itself.[4,5,10] Like any statistical methodology, RDS has its limitations—specifically that accuracy of estimates can be influenced by recruitment dynamics and the distribution of the behavior of interest within the social network[10] —however, recent research suggests that rigorous formative research to identify appropriate initial seeds can improve the accuracy of estimates.[2] Testing the feasibility of using RDS to effectively recruit participants and measure informal sector abortion among a population where such abortions are common could result in the development of a new tool for producing less-biased estimates of prevalence, safety, efficacy, and experiences with informal sector and/or unsafe abortion in a variety of contexts.

Here we present preliminary midline results from an RDS study conducted in Soweto, South Africa. In 1996, South Africa passed legislation allowing legal termination of pregnancy on request up to 13 weeks gestation, and for socioeconomic or medical reasons from 13-20 weeks.[11] Despite the legalization of abortion, barriers to access remain.[11-14] A shortage of trained and willing providers and a lack of dedicated facilities in which to perform abortions have resulted in waiting lists that delay abortions by weeks.[11,15] Informal sector abortions are widely known to occur, but the prevalence, safety, and efficacy of informal sector abortion, women's experiences with informal sector abortion, and its impact on women's health in South Africa is unknown.

Methods

Study Design and Sample

In April 2018, we launched a RDS study in Soweto, South Africa. Nine "seeds" were identified and completed an interview-administered questionnaire on their experience with abortion in or outside of clinic settings. Seeds were instructed to recruit up to three eligible participants (women of reproductive age living in Soweto) from their social network; recruits present to study sites, complete the questionnaire, and are instructed to recruit up to three participants from their social network. Based on available data about the prevalence of informal sector abortion in the general population in South Africa, as well as RDS recruitment rates per seed in other stigmatized populations in the country,[16,17] we calculated the need to recruit a sample size of 900 women into our study. Recruitment will continue until the study proportions for selected characteristics and the proportion of women reporting an informal sector abortion reach equilibrium, or the point of recruitment at which the demographic composition of the study sample does not change drastically with each successive wave of recruitment. All participants will complete a follow-up questionnaire about their experiences recruiting; participants who reported an abortion will complete an additional follow-up questionnaire about their abortion experience. Our primary outcome of interest is lifetime prevalence of informal sector abortion, defined as any abortion that takes place outside of a formal health care setting. Data collection will close after the sample size has been reached, or 12 months after recruitment began. Ethical approval was granted for this study by the Human Sciences Research Council, Research Ethics Committee in Johannesburg South Africa (Protocol Number: REC 10/18/11/15, FWA Organisation No. 0000 6347).

Statistical Analysis

Data management will be conducted in R[18] and Stata.[19] The estimated proportion of the population that has ever had an informal sector abortion will be calculated using the RDS-2 estimator[20] in R, calculated as the number of respondents who report ever having had an informal sector abortion, weighted by the inverse of their network degree size. Network degree is assessed as the number of women of reproductive age who live in Soweto that the respondent has seen in the past week.

Results

Data collection is currently ongoing and will continue through November 2018. We present preliminary analyses of our primary outcome below, which will be updated once data collection is completed.

Between April and August 2018, a total of 439 women, including seeds, participated in the study. Two of the nine seeds have yet to recruit any participants; among the remaining seven seeds, the minimum wave length is one and the maximum wave length is 15. The majority (83%) of participants in the study are from one seed. Recruitment chains can be seen in Figure 1.

In weighted estimates, 15.3% of participants in the current RDS sample reported ever terminating a pregnancy (lifetime prevalence of abortion); 4.6% reported ever terminating a pregnancy in the informal sector. Figure 2 displays the change in the weighted lifetime prevalence of abortion over the study period (as sample size increases); the proportion appears to be converging on a stable estimate. Additional analyses to assess convergence towards stable estimates for selected socio-demographic characteristics are ongoing.

Once data collection is complete, we will test the assumptions underlying unbiased estimation using RDS, namely: 1) accuracy of reporting network degree, 2) approximation of random sampling with replacement, 3) reciprocity of network ties, and 4) sample convergence to equilibrium. We will compare the socio-demographic characteristics of our sample with census data to assess sample representativeness.

Additional analyses that will be conducted in the final sample include estimating 1-year incidence of informal sector abortion, as well as characteristics of informal sector abortion among participants (method type, provider, and additional care seeking).

Discussion

RDS is an exciting new tool that may have broad-reaching implications for abortion research globally. To our knowledge, this is the first study to utilize RDS to measure abortion experiences among women of reproductive age. Preliminary results suggest that RDS as a method is a feasible method of recruitment among this population; ongoing analyses will assess the feasibility of this method for producing unbiased estimates of abortion prevalence and incidence.
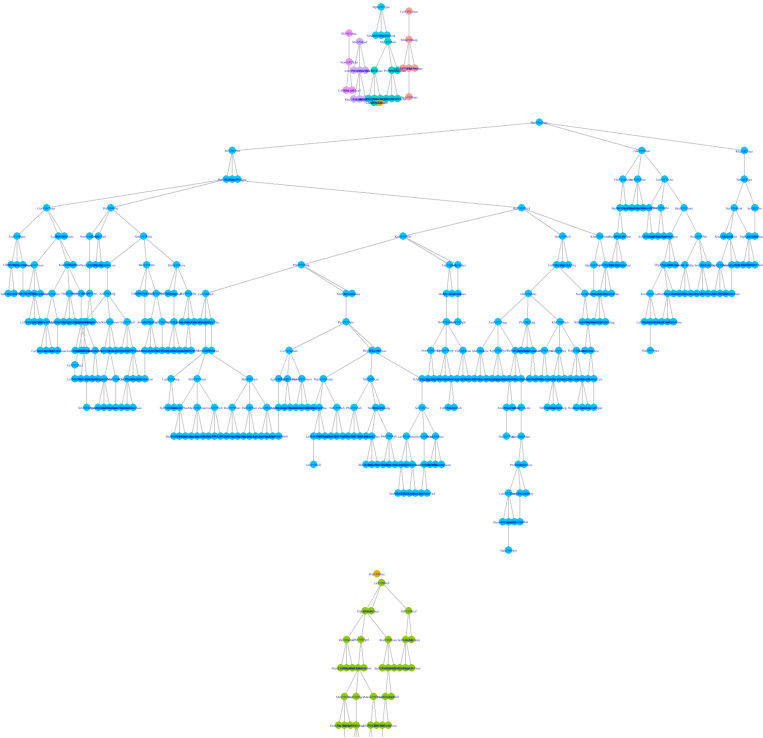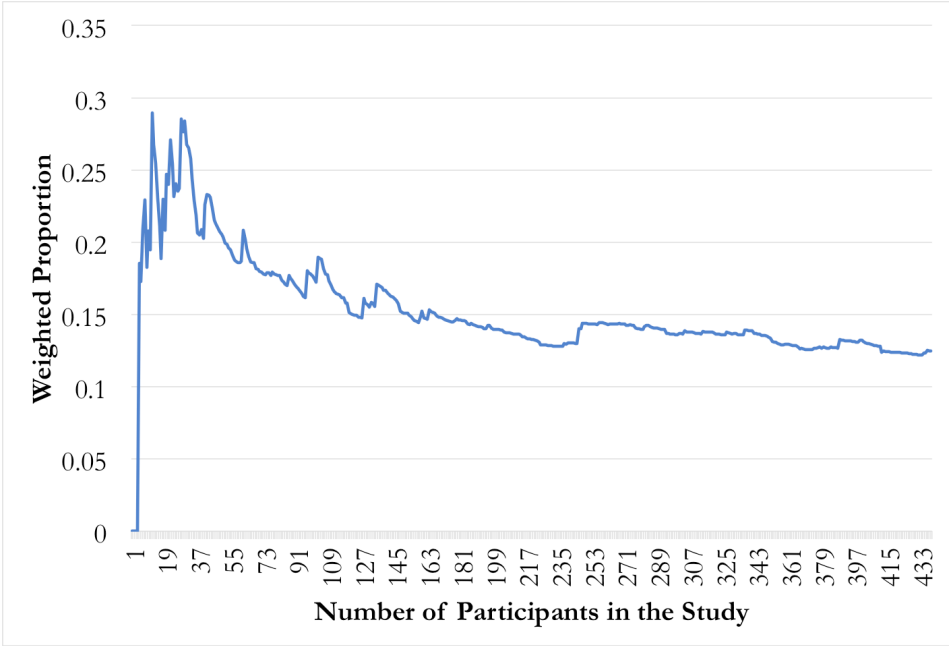
Figure 1. Recruitment chains.

Figure 2. Weighted lifetime prevalence of abortion over study period (April – August 2018)

References

1. Ganatra B, Gerdts C, Rossier C, et al. Global, regional, and subregional classification of abortions by safety, 2010–14: estimates from a Bayesian hierarchical model. *The Lancet*. 2017;390(10110):2372-2381.
2. Wang J, Carlson RG, Falck RS, Siegal HA, Rahman A, Li L. Respondent-driven sampling to recruit MDMA users: a methodological assessment. *Drug and alcohol dependence*. 2005;78(2):147-157.
3. Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. *Social problems*. 1997:174-199.
4. Heckathorn DD. Respondent-driven sampling II: deriving valid population estimates from chain-referral samples of hidden populations. *Soc. Probl*. 2002;49(1):11-34.
5. Salganik MJ, Heckathorn DD. Sampling and estimation in hidden populations using respondent-driven sampling. *Sociological methodology*. 2004;34(1):193-240.
6. Decker MR, Marshall BD, Emerson M, et al. Respondent-Driven Sampling for an Adolescent Health Study in Vulnerable Urban Settings: A Multi-Country Study. *Journal of Adolescent Health*. 2014;55(6):S6-S12.
7. Reisner SL, Mimiaga MJ, Johnson CV, et al. What makes a respondent-driven sampling "seed" productive? Example of finding at-risk Massachusetts men who have sex with men. *J. Urban Health*. 2010;87(3):467-479.
8. Ludlam AH, Saxton PJ, Dickson NP, Adams J. Respondent-driven sampling among gay and bisexual men: experiences from a New Zealand pilot study. *BMC research notes*. 2015;8(1):549.
9. Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. *Soc. Probl*. 1997;44(2):174-199.
10. Goel S, Salganik MJ. Assessing respondent-driven sampling. *Proceedings of the National Academy of Sciences*. 2010;107(15):6743-6747.
11. Jewkes RK, Gumede T, Westaway MS, Dickson K, Brown H, Rees H. Why are women still aborting outside designated facilities in metropolitan South Africa? *BJOG: An International Journal of Obstetrics & Gynaecology*. 2005;112(9):1236-1242.
12. Harries JC, D; Strebel, A; Colvin, C. Conscientious objection and its impact on abortion service provision in South Africa: a qualitative study. *Reproductive Health*. 2014;11(16).
13. Constant DG, D; Lince, N; Harries, J. Self-induction of abortion among women accessing second-trimester aboriton services in the public sector, Western Cape Province, South Africa: An exploratory study. *South African Medical Journal*. 2014;104(4):302-305.
14. Harries JG, C; Momberg, M; Foster, DG. An exploratory study of what happens to women who are denied abortions in Cape Town, South Africa. *Reproductive Health*. 2015;In Pres.
15. Harries J, Orner P, Gabriel M, Mitchell E. Delays in seeking an abortion until the second trimester: a qualitative study in South Africa. *Reprod Health*. 2007;4(7).
16. Lane T, Raymond HF, Dladla S, et al. High HIV prevalence among men who have sex with men in Soweto, South Africa: results from the Soweto Men's Study. *AIDS and Behavior*. 2011;15(3):626-634.
17. Townsend L, Jewkes R, Mathews C, et al. HIV risk behaviours and their relationship to intimate partner violence (IPV) among men who have multiple female sexual partners in Cape Town, South Africa. *AIDS and Behavior*. 2011;15(1):132-141.
18. Team RC. R: A language and environment for statistical computing. 2013.
19. LP SC. *Stata Statistical Software Release 15*. Stata Press Publication; 2017.
20. Salganik MJ. Variance estimation, design effects, and sample size calculations for respondent-driven sampling. *J. Urban Health*. 2006;83(1):98.