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Hepatitis C serosorting among people who inject drugs in rural Puerto Rico

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ABSTRACT

Due to the high cost of treatment, preventative measures to limit Hepatitis C (HCV) transmission among people who inject drugs (PWID) are encouraged by many public health officials. A key one of these is serosorting, where PWID select risk partners based on concordant HCV status. Research on the general U.S. population by Smith et al. (2013) found that knowledge of one's own HCV status facilitated serosorting behaviors among PWID, such that respondents with knowledge of their own status were more likely to ask potential partners about their status prior to sharing risk. Our objective was to see if this held true in rural Puerto Rico. We replicate this study using a sample of PWID in rural Puerto Rico to draw comparisons. We used respondent driven sampling to survey 315 participants, and have a final analytic sample of 154. The survey was heavily modeled after the National HIV Behavioral Survey, which was the dataset used by the previous researchers. We found that among PWID in rural Puerto Rico, unlike in the general population, knowledge of one's own HCV status had no significant effect on the selection of one's most recent injection partner, based on his/her HCV status. We conclude that PWID in rural Puerto Rico differ from the general U.S. population when it comes to serosorting behaviors, and that these differences should be taken into account in future outreaches and intervention strategies.

1. Introduction

Recent research on a national CDC data base of people who inject drugs (PWID) Smith et al. (2013) found that participants who knew their own Hepatic C (HCV) status were more likely to ask potential injection partners about their HCV status before sharing injection equipment than participants who didn't know their own HCV status. The goal of this inquiry is to find partners who are of concordant HCV status and share only with them, so uninfected PWID do not contract Hepatitis C. This is a process known as "serosorting," (Smith et al., 2013). While these national-level findings are significant, we seek to replicate one of the models in this study using data collected in rural Puerto Rico, in order to draw comparisons between rural Puerto Rican PWID and the general U.S. population of PWID in regards to their serosorting behaviors.

It is well known that the behavior and norms of PWID vary from community to community, and this is no different with serosorting. A 2007 study comparing PWID in five U.S. cities found that perceived peer norms condoning needle sharing were the biggest factor associated with serosorting and needle sharing behaviors (Golub et al., 2007). Such peer norms have been shown to apply to ethnic sub-populations within larger PWID communities. Puerto Rican PWID living in the U.S. are more likely to share needles with one another (Deren et al., 2001) and twice as likely to take part in indirect equipment sharing (Andía et al., 2008) as non-Puerto Rican PWID in these same areas. Additional research found that Puerto Rican PWID who recently immigrated to New York City reported more risky injection behavior than those who were not new immigrants (Deren et al., 2003). These differences have immediate consequences: one study comparing New York PWID who identified as Puerto Rican to PWID who lived in Puerto Rico found that the latter had over four times the annual mortality rate of their New York counterparts (Colon et al., 2006). In part, this is due to radical disparities in availability of care. Here we argue that underlying these disparities are large differences in behavior and disposition to risk.

Hepatitis C is a public health issue with the potential for serious consequences if left unattended. First discovered in 1989 (Choo et al., 1989), recent reports suggest that 2.7 million Americans are chronically HCV+ (Denniston et al., 2014), and worldwide between 130 and 170 million people, or 2 to 3% of the population, is infected with HCV (Averhoff et al., 2012). Of these, approximately 500,000 die each year as a result of HCV infection related diseases (Lozano et al., 2012). HCV is a blood borne virus, putting PWID at a particularly high risk of infection. Current research suggests that approximately one third of PWID under age 30 are infected with HCV, and prevalence among older and former PWID ranges from 70 to 90% (U.S. Centers of Disease Control and Prevention, 2015a). In recent years, deaths as a result of HCV have outpaced those from the human immunodeficiency virus (HIV) in the

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U.S. (Ly et al., 2012). Among PWID in particular, incidence and prevalence rates of HCV infection (Hahn et al., 2002; Roy et al., 2007) have far surpassed those of HIV (Mehta et al., 2006).

One reason for this is that the HCV virus is highly robust in comparison to HIV, capable of surviving for days without a host, particularly in some types of syringes (Paintsil et al., 2010) and injection works like cookers and cotton (Abadie et al., 2016). Additionally, a March 2014 CDC report states that 80% of PWID with HIV are co-infected with HCV as well (U.S. Centers of Disease Control and Prevention, 2015b), indicating that in many situations, potential HCV infections confront individuals with reduced immune function.

Current common HCV treatment typically involves taking prophylactic medications, which have been found effective in 43 to 80% of patients, depending on the genotype of the infection (Manns et al., 2001). When these treatments do work, though, they come with problematic side effects (Alvarez et al., 2006). Additionally, a new HCV treatment drug, Sofosbuvir, has recently come on to the market. Though it has potential to treat HCV more effectively than current methods, it's high cost must be weighed against these benefits (Berden et al., 2014).

Because HCV is spread in much the same way as HIV, interventions to curb HCV transmissions are often patterned after HIV interventions. A common one is the "testing as intervention" method. Here, PWID are tested for the Hepatitis C virus and/or HIV and encouraged to serosort when selecting injection partners. However, the majority of serosorting research has been done on sexual partner selection, not injection partner selection (Cox et al., 2004; Fendrich et al., 2010; Zablotska et al., 2009). In regards to sexual transmission, there is indeed reason to believe that serosorting reduces the risk of HIV infection (Philip et al., 2010), and the practice is recommended for sexual risk by the CDC (Serosorting|HIV Risk Reduction Tool|CDC, 2016).

Concerning infection through co-injection, one study focusing specifically on HIV found that approximately 40% of PWID regularly serosorted (Mizuno et al., 2011). Earlier research on HCV serosorting among PWID found a similar proportion (Burt et al., 2009). Despite the similar percentage of serosorting, Hepatitis C is not considered a serious threat in some PWID communities, at least in comparison to HIV. One recent study found that 86% of Seattle PWID and 90% of those in Denver who knew they had an HCV infection failed to get treatment, despite outreach programs available in the community (Al-Tayyib et al., 2015). Other research suggests that many PWID see infection as an unavoidable consequence of injecting (Rhodes et al., 2004).

2. Methods

Interviews with 315 participants were completed between April 19th, 2015 and June 15, 2015 in rural areas approximately 30–40 miles from San Juan, Puerto Rico, drawing participants from several surrounding towns. We worked with El Punto en la Montaña, a syringe exchange program operating in these areas, to facilitation data collection. All information was collected in private research offices or a similar, confidential interview space. Eligible participants were alert, 18 years of age or older, and reported injecting drugs within the last 30 days. Visual inspections for injection signs, as well as questionnaires about drug injection knowledge, were used to confirm this. Upon completing the questionnaire, participants were compensated with $25. Recruitment into the sample was managed using respondent driven sampling (RDS) whereby participants who completed the survey were given three referral coupons they could pass out to other qualified individuals who had not previously participated in the project. For every referral that then completed the survey, the referee could earn an additional $10. This method of recruitment is often preferred for stigmatized populations (Heckathorn, 2002). The study received IRB approval through the University of Nebraska-Lincoln (IRB# 20131113844FB) and the University Of Puerto Rico School Of Medicine (IRB# A8480115). Additional details about the sampling procedure can be found in previous work using the data (Abadie et al., 2016).

The questionnaire itself was interviewer-administered and based on the CDC NHBS IDU Round 3 Questionnaire version 13. The instrument asked questions about injection behavior, prior HCV and HIV status and testing, and several other topics related to drug use and HIV/HCV risk. In addition to recording the participants' self-reported HCV and HIV status prior to participating in the study, the project provided rapid testing for both HIV and HCV - INSTI Rapid HIV antibody tests (Biolytical Laboratories) and OraQuick HCV Rapid antibody tests (OraSure Technologies). Participants were compensated an additional $5 for each test completed. Participants who tested positive for HCV or HIV were offered referral and transportation to a primary care doctor for confirmatory testing and link-to-care.

The current analysis replicates Model 2 from Smith et al., which examined if participants could have attempted to serosort on their last injection partner, or simply if they had knowledge of their last injection partner's HCV status (Smith et al., 2013). It does not examine how participants used this information: only if they sought it. The exact phrasing of this question is as follows: "*The last time you injected with this person* [last injection partner]*, did you know if they had been tested for Hepatitis C?*" The factors for asking your potential partner about their HCV status before co-injecting discussed by Smith et al. include 1) self-reported HCV status, 2) gender, 3) birth year (age), 4) education (high school graduate vs. not), 5) ever homeless, 6) employment status, 7) income, and 8) age at first injection. Multivariate logistic regressions were performed and adjusted odds ratios, where all variables are placed in the model at once to control for one another, were calculated to assess how each variable was associated with whether respondents had knowledge of their last injection partner's HCV status. Models 1 and 3 from the Smith et al. study are not replicated here due to our substantially smaller sample size.

Our model mirrored the Smith et al. model, but with four distinguishable differences. First, race/ethnicity was included in the Smith et al. model, but this information was impractical for our rural Puerto Rican sample as all but a very small number of participants in the study identified as Puerto Rican. Second, Smith et al. measured homelessness by whether participants had ever been homeless. Our participants were asked only about homelessness during the 12 months prior to the interview. Third, due to differences in average income between Puerto Rico and the U.S. mainland, an annual income of $5000 was used as the threshold point between high-income and low-income, as opposed to the $15,000 marker used by Smith and colleagues. A threshold of $5000 was chosen to allow income percentiles to remain roughly proportional. U.S. Census data shows that the median 2012 income for the U.S. was $51,915 (U.S. Census Bureau, 2015a) and $19,518 for Puerto Rico (U.S. Census Bureau, 2015b). Keeping the same ratio, $15,000 on the mainland is comparable to $5638 on the island. Because our data on income was collected at the ordinal level, using a tipping point of $5000 is the best available option.

Finally, as our sample was substantially smaller, only one participant in the final sample was over the age of 65, this individual was binned down into the next younger age category and the highest age category was not used. Though data was collected from 315 participants, skip patterns in the questionnaire resulted in only 162 respondents on our dependent variable – if they had knowledge of their last injection partner's HCV status. Respondents who reported either a) never injecting with a partner, or b) injecting with multiple partners or in a shooting gallery on last injection were skipped on this question. List wise deletion for missing data across independent and control variables resulted in a loss of 8 additional cases, giving us a final sample-size of 154. *t*-Tests revealed significant differences between our analytic sample and our excluded sample in four areas: respondents in the analytic sample were more likely to be HCV positive ($p = 0.0446$), less likely to make $5000 a year or more ($p = 0.0184$), less likely to be unemployed ($p = 0.0175$) vs. employed, and more likely to have some other employment status (0.0269) than be employed, such as being a student or retired.