

The Effect of Intimate Partner Violence on Receptive Syringe Sharing Among Young Female Injection Drug Users: An Analysis of Mediation Effects

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Abstract This study sought to explore the relationship between intimate partner violence (IPV) and receptive syringe sharing (RSS) among young female injection drug users (IDUs) and to examine mediating variables. Cross-sectional behavioral assessments were completed by 797 female IDUs in five U.S. cities who reported having at least one main sexual partner in the past three months. Linear regression was used to estimate direct and mediated effects. The product of coefficients method was used to statistically

evaluate mediation. Respondents were predominantly white (70%) and mean age was 23 years. Sixty percent reported RSS in the past three months and 33% reported IPV in the past year. The association between IPV and RSS was independently mediated by self-esteem and depression, but not by self-efficacy for safer drug injection. Findings suggest that interventions focused on improving victimized women's self-esteem and depression may help mitigate some of the negative health effects of IPV.

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Keywords Injection drug use · Syringe sharing · Women · Intimate partner violence · HIV · HCV · Mediation · Self-esteem · Depression · Self-efficacy

Introduction

The role of violence, in general, and violence perpetrated by intimate partners, more specifically, has been highlighted as one factor that may increase vulnerability to human immunodeficiency virus (HIV) and hepatitis C virus (HCV) infection among drug-using women (Bourgeois et al. 2004; Epele 2002; Gilbert et al. 2000; Kalichman et al. 1998). Being the victim of sexual or physical intimate partner violence (IPV) has been associated with sexual risk factors for HIV. In a cross-sectional analysis of women attending hospital-based health care clinics, current IPV was associated with greater likelihood of having multiple sex partners, increased risk of having a sexually transmitted infection (STI), less consistent condom use, and having a primary partner with known HIV risk (Wu et al. 2003). In a one-year longitudinal study of methadone maintenance treatment patients, El-Bassel et al. (2005) found that risk of IPV prospectively predicted self-reported STIs, greater likelihood of unprotected anal sex, and decreased likelihood of consistent condom use.

In cross-sectional analysis of data from a sample of impoverished women in Los Angeles, Tucker et al. (2004) found that sexually active women who experienced partner violence engaged in more frequent sex and reported less ability to refuse unwanted sex than their non-victimized counterparts. Importantly, longitudinal findings from this same study varied significantly from the cross-sectional results. In longitudinal analysis, partner violence predicted decreased likelihood of sexual activity among women living in shelters and decreased likelihood of unprotected sex among sexually active women (Tucker et al. 2004). These changes appear to be associated with changes in partner status (i.e., dropping a primary partner).

Despite recognition of the importance of the interplay between violence, substance use, and risk for HIV and HCV infection, few studies of victimization among female drug users have specifically focused on risk associated with injection drug use. In one study of injection drug users (IDUs) in Vancouver, Canada 68% of women had a lifetime history of sexual violence, which was significantly associated with syringe sharing (Braitstein et al. 2003). An earlier study in the same city showed that a history of lifetime sexual abuse was independently associated with syringe sharing among male and female IDUs (Strathdee et al. 1997), which has been reported in other settings (Lodico and DiClemente 1994). However, these studies focused on lifetime history of sexual violence, which included abuse that occurred both in childhood and adulthood. Therefore, the relationship between recent victimization by an intimate partner and injection-related risk behavior remains unclear. Furthermore, because a large number of studies to date have been conducted in health care or drug treatment settings with older women, existing data may not generalize to young female IDUs or those who may not currently be receiving drug treatment.

In the current analysis we hypothesized that being the victim of IPV would be associated with receptive syringe sharing in a sample of young female IDUs. While IPV may affect injection-related risk behavior, it is unlikely that this effect is direct. Mediation analysis can be used to understand the mechanisms through which independent variables affect dependent variables (Baron and Kenny 1986). In the case of IPV and injection risk behavior, mediation analysis can identify the mechanisms through which IPV may affect receptive syringe sharing. We further hypothesized that the effect of IPV would be mediated by intrapersonal variables that are both influenced by IPV and affect injection behavior. Miller (1999) has developed a theoretical model of the effects of sexual abuse on HIV risk that includes both sexual and drug-related HIV risk behaviors as outcomes, and posits that higher levels of drug use, self-destructive behavior, and psychopathology (including depression) are mediators in the causal pathway. However,

as is the case with previously cited investigations, this model defines lifetime history of sexual abuse as the independent variable and therefore our hypotheses remain untested.

Three potential mediators may partially explain the hypothesized association between IPV and syringe sharing: reduced self-efficacy for safer drug injection, depression, and lowered self-esteem. Reduced self-efficacy for safer drug injection has been found to be associated with unsafe injection (i.e., receptive syringe sharing; back loading; or sharing cookers, cotton or rinse water) in a variety of IDU populations (Deren et al. 2003; Gibson et al. 1993; Longshore et al. 1997; Tortu et al. 2003). Female IDUs' self-efficacy for safer drug injection may be inhibited by a violent and/or controlling partner, thereby influencing syringe sharing. Similarly, studies have identified depression as a correlate of both syringe sharing (Johnson et al. 2002; Mandell et al. 1999; Perdue et al. 2003; Stein et al. 2004; Strathdee et al. 1997) and IPV (Bonomi et al. 2006; Lehrer et al. 2006), suggesting its role as a mediator of the relationship between IPV and HIV risk. Finally, IPV has been associated with reductions in self-esteem (Zlotnick et al. 2006), perhaps due to the social isolation resulting from victimization (Miller 1999). Lack of self-esteem may ultimately reduce women's willingness or ability to engage in self-protective behaviors. Within the context of a multi-site study, we conducted an analysis to study the relationship between IPV and receptive syringe sharing, including mediation analyses to uncover the mechanism of an observed association. The findings could help better tailor risk reduction interventions for female IDUs, and could suggest factors that could be targeted to help mitigate the detrimental health effects of IPV.

Methods

Participants

Data for the current analysis were collected as part of the Collaborative Injection Drug Users Study III/Drug Users Intervention Trial (CIDUS III/DUIT), a randomized controlled trial of a behavioral intervention to reduce HIV and HCV infection among young IDUs. Study recruitment occurred in five cities: Baltimore, Chicago, Los Angeles, New York, and Seattle. Participants were recruited via a combination of street and agency outreach, targeted advertising, and respondent-driven recruitment methods. The sole eligibility criteria were age (15–30 years old), reported injection of any drug in the last six months, and expecting to stay in the area for one year. Individuals who were determined to be eligible following a brief screening questionnaire were invited to participate in the study and

provided informed consent. For individuals under 18 years old, parental consent was sought first. If obtaining parental consent would be risky for the minor, other adults who were not part of the study staff were available to advise the minor in making the decision about whether or not to participate. Minors were allowed to give their assent to participate without receiving parental consent because they were considered emancipated by the nature of their drug and sex involvement. Procedures for consenting/assenting minors differed slightly between study sites, but all consent procedures were approved by the Institutional Review Boards of the individual sites and of the Centers for Disease Control and Prevention. Between May, 2002 and January, 2004 a sample of 3,285 young IDUs was recruited and provided baseline information for the parent study. The sample included 2,280 (69.4%) men and 1,005 (30.6%) women. Of the women, 797 (79.3%) reported having at least one main sexual partner in the past three months and were retained for the current analysis.

Measures

At the baseline visit, eligible participants completed an interview administered via audio computer assisted self-interview (ACASI) followed by an HIV/HCV pretest counseling session and blood draw for HIV and HCV-antibody testing. Participants were also offered free hepatitis A and hepatitis B vaccine. The questionnaire assessed risk behaviors in the previous three months. The dependent variable for the current analysis was the proportion of injections in the past three months that was done with a syringe previously used by someone else (receptive syringe sharing). Responses were coded on a seven-point scale ranging from 0 to 100% of the time.

The independent variable in the current analysis, IPV, was assessed using eight items from the Conflict Tactics Scale (CTS; Straus 1979). Six of the items were taken from the eight-item violence subscale of the CTS. One of the remaining two (“Has your partner threatened to hit you or throw something at you?”) was taken from the verbal aggression scale, and the final item (“Has your partner physically forced you to have sex?”) was taken from the sexual coercion scale of the Revised CTS (Straus et al. 1996). We felt that it was important to assess, even minimally, these other two areas in addition to physical violence. Questionnaire length limited the total number of items that could be included, so two of the violence subscale items were dropped in order to include these other items. Unlike other variables in the current analysis, the CTS refers to behavior of respondent’s main sexual partner in the past 12 months. Responses to all eight items were summed and dichotomized into any vs. no violence.

Potential mediators were self-esteem, self-efficacy for safer drug injection, and depression. The Rosenberg Self-esteem Scale (Rosenberg 1965) included ten items such as, “I feel that I am a person of worth, at least on an equal basis with others,” rated on a four-point scale from “strongly agree” to “strongly disagree” (Cronbach $\alpha = 0.83$). Self-efficacy for safer drug injection was measured with six items developed by the investigators specifically for the parent study (e.g., “I can avoid sharing a needle even if I am dope sick or in withdrawal”), rated on a four-point scale from “strongly agree” to “strongly disagree” (Cronbach $\alpha = 0.90$). Depression was assessed with the Brief Symptom Inventory (BSI) depression subscale (Derogatis and Melisaratos 1983), which consists of seven items such as “In the past week, how much have you been bothered by feeling lonely?”, measured on a five-point scale ranging from “not at all” to “extremely” (Cronbach $\alpha = 0.90$).

Analysis

Because the CTS measure asks about IPV in reference to a specific main sexual partner, only women reporting a main sexual partner (of either sex) during the past three months were retained in the current analysis ($n = 797$). Though this inclusion criterion did not restrict the sample to only those with male partners, all subjects reported having a male partner (18% reported having both male and female main partners and none reported having only a female partner). Women were included in the analysis regardless of HIV and HCV serostatus. Univariate descriptive statistics were calculated for variables of interest. T-tests, Wilcoxon signed rank tests, and chi-square statistics were calculated to compare individuals who reported receptive syringe sharing in the past three months with those who reported no receptive syringe sharing.

Mediation analysis was conducted using the technique recommended by Baron and Kenny (1986) whereby linear regression coefficients are estimated for three paths: (1) path *a* accounts for the relationship between the independent variable and the mediator; (2) path *b* accounts for the relationship between the mediator and the dependent variable when controlling for the independent variable; and (3) path *c* accounts for the relationship between the independent variable and the dependent variable (i.e., the direct effect). When paths *a* and *b* are controlled, the coefficient for path *c* (indicated by c') should be reduced in both magnitude and significance level. In full mediation, this path is reduced to zero. If path c' is not reduced to zero, this suggests partial mediation. Partial mediation demonstrates that the mediator is important, though perhaps does not entirely explain the occurrence of the dependent variable

(Baron and Kenny 1986). MacKinnon et al. (2002) suggest that Baron and Kenny's (1986) reliance on (1) the statistical significance of the direct effect (path c), and (2) the reduction in magnitude and significance of that effect when controlled for the mediator, limit the power of that method to detect mediation effects. Therefore we also employed the "product of coefficients" method of statistically testing for mediation. In this method, the unstandardized coefficients for paths a and b are multiplied and divided by the standard error of ab , yielding a z -test statistic. We use Sobel's (1982) formula for the standard error of ab to formally test the mediation effects and set the significance level of the test at $\alpha = 0.05$. A significant result indicates that mediation exists.

Due to a high level of skewness in the variable for receptive syringe sharing, this variable was log-transformed for use in the linear regression models. Regression diagnostics showed that the log-transformation successfully normalized the distribution of the residuals, indicating that the transformation was appropriate. The log-transformed outcome variable was used in all regression analyses and results are reported on the log scale. Mean scores were calculated for each psychosocial scale (i.e., self-efficacy for safer drug injection, self-esteem, and depression). All linear regression equations were controlled for age, recruitment site, number of injections in the past three months, sex of main sex partner, and race/ethnicity.

Results

Respondents were, on average, 23 years old (range: 15–30 years) and predominantly white. Additional demographic characteristics of the sample are shown in Table 1. One third of respondents reported any IPV in the past year, and 60% of women reported using a previously used syringe at least once in the past three months. In bivariate analyses, IPV was marginally associated with receptive syringe sharing ($\chi^2 = 3.15$, $df = 1$, $p < 0.10$). Compared to those who reported no sharing, women who reported any receptive sharing were younger (22.6 vs. 23.6 years, $t = 3.44$, $df = 785$, $p < 0.01$), injected more (273 vs. 182 injections in the past three months, $z = -4.37$, $p < 0.01$), were more likely to be white (76 vs. 60%, $\chi^2 = 25.67$, $df = 3$, $p < 0.01$), and were more likely to be homeless (52 vs. 44%, $\chi^2 = 4.75$, $df = 1$, $p < 0.05$).

Mediation Analysis Results

In multiple linear regressions, IPV was marginally significantly associated with syringe sharing, after controlling for age, recruitment site, number of injections in the past three

months, sex of main sexual partner, and race/ethnicity (path c $\beta = 0.07$, $p = 0.05$). In the first mediation model (Fig. 1a), IPV was not significantly associated with self-efficacy for safer drug injection (path a $\beta = -0.04$, $p > 0.05$). Path b , the association between self-efficacy and receptive syringe sharing, controlling for IPV, was significant ($\beta = -0.42$, $p < 0.01$). After controlling for self-efficacy for safer drug injection, the coefficient for IPV lost significance and decreased in magnitude (path c' $\beta = 0.05$, $p > 0.05$). However, because path a in this model was not significant, self-efficacy for safer drug use did not meet established criteria for mediation ($z = 1.20$, $p > 0.05$).

In the second mediation model (Fig. 1b), IPV was significantly negatively associated with high self-esteem (path a $\beta = -0.16$, $p < 0.01$). After controlling for IPV, high self-esteem was significantly negatively associated with receptive syringe sharing (path b $\beta = -0.26$, $p < 0.01$). When controlled for self-esteem, the coefficient for IPV lost significance and decreased in magnitude (path c' $\beta = 0.04$, $p > 0.05$), indicating partial mediation by self-esteem ($z = 3.80$, $p < 0.01$).

In the final mediation model (Fig. 1c), IPV was significantly associated with depression (path a $\beta = 0.24$, $p < 0.01$). When IPV was controlled in the model, depression was significantly associated with receptive syringe sharing (path b $\beta = 0.15$, $p < 0.01$). After controlling for depression, the coefficient for IPV lost significance and decreased in magnitude (path c' $\beta = 0.04$, $p > 0.05$), again indicating partial mediation of the effects of IPV on syringe sharing by depression ($z = 3.44$, $p < 0.01$).

Discussion

Being the victim of IPV has been associated with a number of sexual HIV risk behaviors among drug using women (El-Bassel et al. 2004; El-Bassel et al. 2005; Gilbert et al. 2000; Wu et al. 2003). Our results support earlier suggestions that IPV is also associated with injection-related risk for blood-borne infections in the form of syringe sharing (Braitstein et al. 2003; Lodico and DiClemente 1994; Strathdee et al. 1997). While some investigations have found that women's syringe sharing is associated with feelings of support (Sherman et al. 2001) and closeness or trust between partners (MacRae and Aalto 2000), our findings suggest that another reason for syringe sharing may be the negative or controlling features of a relationship characterized by IPV. This association could have implications for syringe sharing with both the violent partner and others. Our findings extend those that have found women in violent relationships are less able to negotiate condom use (El-Bassel et al. 2005), to indicate that they may be less able to negotiate safer syringe use as well.

Table 1 Characteristics of study participants, by ever vs. never engaged in receptive syringe sharing ($N = 797$)

	Never shared syringes ($n = 316$)		Ever shared syringes ($n = 470$)		Test statistic
	n	%	n	%	
Mean age (SD)**		23.6 (3.8)		22.6 (3.7)	$t = 3.44, df = 785$
Median years of injection (q1–q3) ^a		4 (1.5–6)		3 (2–6)	$z = 0.96$
Median # of injections, past 3 months (q1–q3) ^{a,**}		182 (52–364)		273 (112–455)	$z = -4.37$
<i>Race**</i>					
White	190	60.3	354	76.3	
Latino	50	15.9	43	9.3	
African American	35	11.1	22	4.7	
Other	40	12.7	45	9.7	$\chi^2 = 25.67, df = 3$
Education (>High school or GED)	115	36.5	171	36.3	$\chi^2 = 0.003, df = 1$
<i>Type of sex partner in past 3 months</i>					
Steady only	173	56.2	224	49.7	
Steady and casual/trade	135	43.4	227	50.3	$\chi^2 = 3.10, df = 2$
<i>Sex of primary sex partner</i>					
Male	271	85.8	378	80.4	
Male and female	45	14.2	92	19.6	$\chi^2 = 3.74, df = 1$
Homeless in past 6 months (perceived)*	138	43.7	243	51.6	$\chi^2 = 4.75, df = 1$
Ever incarcerated	181	57.3	271	57.5	$\chi^2 = 0.01, df = 1$
Ever in drug treatment	185	58.5	304	64.8	$\chi^2 = 3.16, df = 1$
<i>Drug most injected in past 3 months</i>					
Heroin	239	80.5	359	77.2	
Stimulants (cocaine, crack, and amphetamines)	37	12.5	49	10.5	
Mixtures (speedballs and goofballs)	21	7.1	57	12.3	$\chi^2 = 5.60, df = 2$
<i>HIV positive</i>					
Self-report	2	0.7	5	1.2	$\chi^2 = 1.96, df = 2$
Lab-confirmed	3	1.0	8	1.8	$\chi^2 = 1.61, df = 3$
<i>HCV positive</i>					
Self-report	31	14.2	48	16.0	$\chi^2 = 0.90, df = 2$
Lab-confirmed	88	28.4	140	31.0	$\chi^2 = 0.59, df = 1$
Intimate Partner Violence (past 12 months) [†]	88	29.1	157	35.4	$\chi^2 = 3.15, df = 1$

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

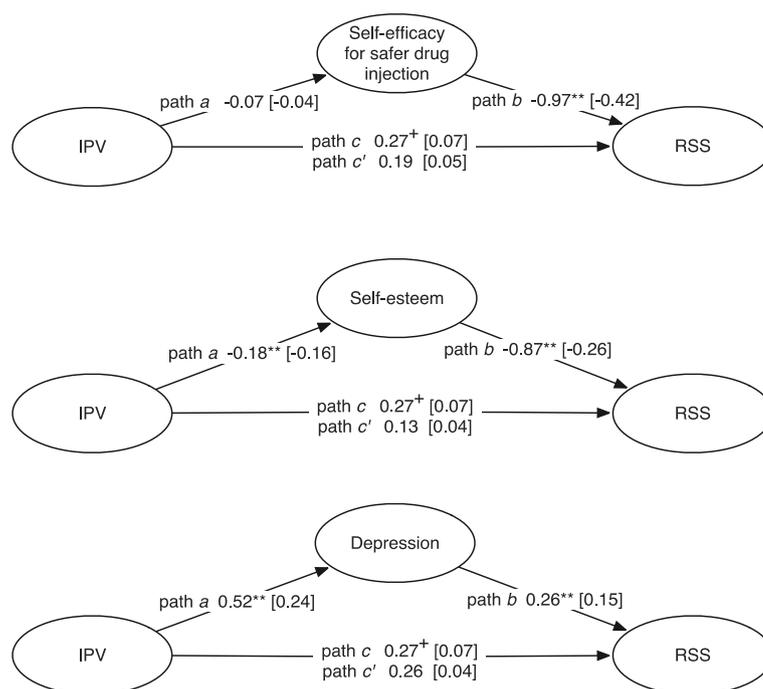
Note: Some frequencies do not sum to N due to missing values

^a q1–q3 indicates the first and third quartiles

Mediation analysis allows investigators to identify the mechanisms through which independent variables affect dependent variables (Baron and Kenny 1986). The direct effect of IPV on syringe sharing was marginally significant. This indicates that women who experienced IPV may be marginally more likely to share syringes than their counterparts in non-violent relationships, but the association must be confirmed in future studies to be certain it is real. Marginal or non-significant direct effects are still worthy of investigation with mediation analysis. Our findings suggest that the association between IPV and receptive syringe sharing can be at least partially explained by the role of depression and self-esteem as mediators.

Though our data were obtained from a single, cross-sectional wave of data collection, which limits our ability to draw conclusions regarding causality, the results suggest that IPV is associated with higher levels of depression and lower levels of self-esteem. Depression and low self-esteem, in turn, are associated with receptive syringe sharing. Evidence for mediation suggests not only that these factors are associated, but also that IPV may influence syringe sharing by increasing depression and decreasing women's self-esteem. High levels of depression and low levels of self-esteem resulting from exposure to relationship violence may make women less likely to engage in protective behaviors such as refusing to share syringes. Our findings support thinking about IPV as a

Fig. 1 (a–c) Mediation effects for self-efficacy, self-esteem, and depression on the relationship between intimate partner violence (IPV) and receptive syringe sharing (RSS). Unstandardized multiple regression coefficients determined by steps 1–3 of the mediation analysis are given outside the brackets. Standardized coefficients are given inside the brackets. $^+p < 0.10$; $*p < 0.05$; $**p < 0.01$. All models controlled for age, recruitment site, number of injections in the past three months, sex of main sex partner, and race/ethnicity



more distal causal factor responsible at least in part for the relationships between these factors; however, prospective analyses are needed to confirm this hypothesis.

Contrary to our hypothesis, self-efficacy for safer injection was not found to mediate the relationship between IPV and syringe sharing. Self-efficacy for safer injection is a specific measure of women's confidence that they can avoid engaging in risky injection behavior if they so desire. We anticipated that women who reported being the victim of violence would also report feeling less confident in their ability to inject safely. However, there was not a significant association between IPV and self-efficacy for safer injection. The significant negative association between self-efficacy for safer injection and syringe sharing indicates that if women feel they are able to avoid sharing syringes, they report lower syringe sharing behavior. Our findings suggest that that women's confidence in their ability to inject safely is not directly affected by their experiences with IPV. Future longitudinal studies are required to confirm the absence of an association between IPV and self-efficacy for safer injection.

While IPV was measured in reference to a specific sexual partner, we were limited by the fact that our measure of syringe sharing captured sharing with any partner. In the current sample, more than two-thirds of women stated that the person they shared with most was their sexual partner, which lends support to the notion that most of the syringe sharing captured by the dependent variable occurred within the context of sexual partnerships. Additionally, it is possible that the consequences of experiencing IPV in one's primary sexual relationship

extend beyond women's behavior with that individual to affect their interactions with other drug-using partners.

Our findings should be considered in light of some other limitations. Data for the current analysis were drawn solely from the cross-sectional baseline portion of the larger study in order to maintain representativeness of the sample and statistical power to make the required comparisons. Due to the cross-sectional nature of this analysis, assumptions about causality cannot be met. It is possible that young female IDUs who are depressed or who have low self-esteem are more likely to enter into violent relationships. Future prospective studies of the association between IPV, its implications for psychological outcomes (e.g., depression and self-esteem), and the influence of relationship-level factors on injection risk, are needed. Reports of syringe sharing and IPV may be underestimated due to social desirability. However, the use of ACASI should have minimized reporting biases (Des Jarlais et al. 1999). Finally, the young women in this sample were largely white, homeless, and not in drug treatment; therefore, results may not generalize to other groups of female IDUs.

Reducing unsafe injection practices among IDUs has been the target of numerous interventions designed to reduce the transmission of HIV and HCV (e.g., Avants et al. 2004; Garfein et al. 2006; National Institute on Drug Abuse 2000; Sterk et al. 2003; Strathdee et al. 2006). Our findings support the theory that receptive syringe sharing among young female IDUs is associated with both intra-personal characteristics and characteristics of the social environment, and that the influence of sexual partners plays an important role. Further, the social environment may

affect injection risk behavior by operating through intra-personal mechanisms such as depression and self-esteem.

Interventions designed to reduce blood-borne infections among young, female IDUs should address both intra- and interpersonal factors in order to create conditions under which women are empowered to safely engage in self-protective behaviors. Interventions that assist drug-using women in resisting and/or avoiding IPV, and interventions with women's partners that reduce the incidence of IPV are necessary. In the meantime, interventions focused on improving victimized women's self-esteem and depression may help mitigate the effect of IPV on the risk of acquiring HIV and other blood-borne infections.

Acknowledgments The DUIT Study Group includes the following people: Steffanie Strathdee, Elizabeth Golub, Marie Bailey-Kloch, Karen Yen-Hobelman (Baltimore); Lawrence Ouellet, Susan Bailey, Joyce Fitzgerald (Chicago); Sharon Hudson, Peter Kerndt, Karla Wagner (Los Angeles); Mary Latka, David Vlahov, Farzana Kapadia (New York); Holly Hagan, Hanne Thiede, Nadine Snyder, Jennifer V. Campbell (Seattle); Richard Garfein, David Purcell, Ian Williams, Paige Ingram, Andrea Swartzendruber (CDC). We also acknowledge the following people for their contributions to this research: Yvette Bowser, Peter O'Driscoll, Janet Reeves, Marcella Sapun (Baltimore); Angus Atkins-Trimmell, Mary Bonilla, David Cosey, Jaime Delgado, Julio Garcia, Michelle Giles, Erin Kubalanza, Michael Phillips, Edward Snulligan (Chicago); Marris Axelrod, Elizabeth Faber, Lawrence Fernandez Jr., Christian Geannette, Roberto Rojas (Los Angeles); Ebele Benjamin, Sebastian Bonner, Micaela Coady, Joanna Cruz, Sandra DelVecchio, Dirk Jackson, Gregory Malave, Joan Monserrate, Danielle Ompad, Clarisse Miller O'Shea, Yingfeng Wu, Manny Yonko (New York); Stanley Brown, Rong Lee, Susan Nelson, Jef St. De Lore, Carrie Shriver, Jeanette Frazier, Jean Pass, Paul Swenson (Seattle); Yuko Mizuno, Janet Moore, Ann O'Leary, Vincent Raimondi, Scott Santibanez, Roberto Valverde (CDC); Wendi Kuhnert, Himal Dhotre, Leigh Farrington (CDC Division of Viral Hepatitis); Suzette Bartley, Dollene Hemmerlein (CDC Serum Bank Branch); Jennifer Unger and Jean Richardson (USC Institute for Health Promotion and Disease Prevention Research). This study was funded in its entirety by a cooperative agreement from the Centers for Disease Control and Prevention: U64/CCU317662; U64/CCU517656; U64/CCU917655; U64/CCU217659; U64/CCU071615. Institutional Review Board # CDC-NCHSTP-2934.

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