Published in final edited form as:

AIDS Behav. 2011 October ; 15(7): 1561–1569. doi:10.1007/s10461-011-9970-6.

High-Risk Behaviors Associated with Injection Drug Use Among Recently HIV-Infected Men Who Have Sex with Men in San Diego, CA

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Abstract

The contribution of injection drug use to HIV risk among men who have sex with men (MSM) is understudied. MSM infected with HIV within the prior 12 months completed a questionnaire assessing sociodemographic, sexual, drug use, and social factors. Analyses were performed to identify factors associated with lifetime history of injection drug use. Among 212 participants, the mean age was 33.8 years, 72% were White, 89% had attended college, and 9.4% reported ever injecting drugs. In multivariable logistic regression analysis, ever trading sex and using methamphetamine during sex with at least one of their last three partners were associated with injection drug use. Adjusting for these variables, in separate models, ever perpetrating violence against others (Adjusted Odds Ratio [AOR] = 3.16), having physically abusive sexual partners (AOR = 3.08), or physically abusing sexual partners (AOR = 10.17) were significantly ($P < 0.05$)

associated with injection drug use. These findings suggest that violence is more common among MSM who inject drugs, which should be considered in HIV prevention efforts.

Keywords

MSM; Injection drug use; Violence; HIV-risk; Sexual behavior

Introduction

Despite extensive HIV research, prevention efforts, and treatment advancements, a disproportionately high burden of HIV among men who have sex with men (MSM) persists in the United States (U.S.) [1]. MSM remain the leading risk group for HIV infection, accounting for approximately 48% of persons living with HIV and more than half of all new HIV infections [1].

Early in the HIV epidemic, risk factors other than exposure to HIV-tainted blood were overlooked among injection drug users (IDUs). Because the primary route of HIV transmission among IDUs has traditionally been through injection, there has been relatively little research investigating the role of social and sexual risk behavior on HIV transmission among IDUs [2]. Additionally, while MSM constitute a large risk group for HIV, their risk is not uniform. MSM-IDUs represent 7% of persons living with HIV and 4% of new infections in the U.S. in 2007 [3]. MSM who inject illicit drugs may be at increased risk for HIV acquisition and transmission through both risky sexual behaviors and sharing needles or other injection equipment [1].

While few studies have examined the confluence of MSM and IDU risk behaviors, some information can be gleaned from studies that have focused on MSM or IDUs individually. For example, two studies focusing on IDUs found that having sex with men was a risk factor for incident HIV infection among male IDUs [4, 5]. Selling sex has been associated with injection drug use among MSM [6, 7] and MSM-IDUs were more likely than heterosexual male IDUs to have sold sex [8]. In addition, unprotected anal intercourse (UAI) was found to be more common among MSM-IDUs compared to MSM non-IDUs [9].

Methamphetamine has been identified as a drug of choice among some MSM-IDUs and MSM-IDUs may use more non-injection drugs compared to non-IDUs [9]. By investigating individual risk factors among MSM-IDUs, these studies provide the foundation for additional research to directly examine behaviors together, allowing for a more comprehensive understanding of the risk profile of MSM-IDUs.

Most information about risk behaviors among MSM-IDUs comes from studies examining risk factors for HIV infection among IDUs [4, 5] or studies that compared MSM-IDUs with other male IDUs [8] and with other subgroups of MSM (i.e., sex hustling MSM and non-gay identified MSM) [6]. Only a few have compared MSM-IDUs directly to MSM non-IDUs [9, 10]. These studies, however, did not control for the time since HIV infection. During acute and early HIV infection patients experience high viral loads, resulting in increased infectiousness and a potential for onward transmission if individuals continue to engage in risky behaviors [11–13]. This analysis of baseline data from a cohort study of acute and

early HIV infection was conducted to identify whether sociodemographics, sexual practices, drug use behaviors, and violence among recently HIV-infected MSM differed between those with and without a history of injection drug use.

Methods

Study Population

Between May 2002 and November 2008, patients with suspected acute (0–30 days) or early (1–12 months) HIV-infection were recruited in San Diego, California to gain knowledge about behavioral and biological factors associated with acute and early HIV infection. Details about participant recruitment have been published previously [14, 15]. In brief, individuals were included if they were at least 18 years old, were able and willing to provide written informed consent, and had documented acute or early HIV infection, or “recent” infection, as determined by one of the following: (1) HIV seroconversion within the previous 12 months (negative HIV enzyme immunoassay [EIA] followed by positive EIA); (2) presence of HIV RNA in plasma, but a negative EIA; or (3) results on a Western blot or detuned EIA that are consistent with early infection. Of the 236 individuals with documented recent HIV infection who enrolled in the study and completed a behavioral questionnaire, 231 were male, and 222 reported having sex with men in the last 12 months. Ten individuals lacked complete questionnaire data on variables of interest and were excluded leaving 212 MSM with recent HIV infection for this analysis. The protocol for this study was approved by the Institutional Review Board (IRB) at the University of California, San Diego and the current analysis was approved by the IRB at San Diego State University. All participants provided informed consent prior to participation.

Patient Recruitment and Data Collection

Individuals with suspected recent HIV infection were recruited from local hospitals, physicians’ offices, HIV counseling and testing sites, organizations that cater to MSM, friends, partners, and other study participants. Patients were informed about screening for the study by clinicians and counselors in the medical care setting, through study brochures, or word of mouth. Biological samples were collected when participants attended their first eligibility screening/baseline visit to measure viral load and CD4 count and determine if they were recently HIV-infected. All participants completed a 60-min computer assisted self-interview (CASI) questionnaire and were offered sexually transmitted infection (STI) screening and pre- and post- HIV test counseling, as well as reimbursement for time and travel to participate in the study.

Measures

Interviews were completed, on average, 4 weeks (median = 2 weeks) after HIV screening/baseline; thus, all participants knew their HIV status at the time of the interview. Participants who reported ever injecting illicit drugs were classified as IDUs and were compared to those who reported never injecting drugs (non-IDUs) for this analysis. Detailed information was also collected on sociodemographic factors, sexual behaviors, and substance use (lifetime and past 12 months). Three questions were asked related to violence

or abuse. These variables included ever using violence against another person, ever having a sexual partner who was physically abusive, and ever physically abusing a sexual partner.

Biological measures collected within 4 weeks and closest to the interview date were analyzed including viral load (copies/ml), CD4 count (cells/ μ l), and presence of an STI. Prevalence of any individual STI throughout the study was low, therefore syphilis, gonorrhea, and chlamydia were collapsed into a single variable (any/none); 3 (1.4%) participants lacked STI data. Time since HIV infection was included in the analysis; this variable was calculated as the time between the interview and the estimated date of infection (EDI), which was based on HIV serologic and virologic data as described previously [14].

Statistical Analysis

Variables were analyzed using means or medians for continuous measures, and counts and percentages for categorical measures. The dependent variable for this analysis was ‘self-reported lifetime history of injection drug use’ (Yes/No). Associations between independent variables and injection history were examined using chi-square or Fisher’s exact tests for categorical variables, and *t*-tests or Wilcoxon rank-sum tests for continuous variables depending upon whether or not the data were normally distributed. Log transformation was also applied for non-normally distributed continuous variables. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) assessing the bivariate and multivariable associations of selected factors with injection drug use status.

Significant ($P < 0.10$) variables from bivariate association analyses were considered for inclusion in multivariable analysis. Since the variables “ever used violence against another person”, “ever had a sexual partner who was physically abusive”, and “ever physically abused a sexual partner” were highly correlated ($P < 0.0001$), separate multivariable regression models for each variable were constructed. Forward selection was used and the final multivariable models contained variables significant at $P < 0.05$. Adjusted odds ratios (AORs) and 95% CIs were obtained. All analyses were conducted in SAS version 9.1 for Windows (SAS Institute Inc., Cary, NC).

Results

Of the 212 recently HIV-infected MSM, mean age was 33.8 years (range = 19–64); 72% were White, 19% were Hispanic, 3.3% were African American, and 5% were other/mixed race; most (89%) had attended at least some college; and 29% were unemployed (Table 1).

Overall, 20 (9.4%) participants were classified as IDUs. IDUs reported having sex at least once with a partner they believed to be HIV-positive more frequently than non-IDUs (100% versus 65%, respectively, $P = 0.001$) and reported ever having sex with more than one person at a time more frequently than non-IDUs (100% versus 84%, respectively, $P = 0.050$) (Table 1).

In bivariate analyses (Table 2), IDUs were more likely to be unemployed (OR = 4.16, 95% CI: 1.55–11.20) and report ever having sex to receive money or goods (OR = 5.40, 95% CI: 2.07–14.09) compared to non-IDUs. IDUs were marginally more likely to report ever having

UAI with at least one of their last three sex partners (OR = 5.82, 95% CI: 0.76–44.65). IDUs were more likely to report injection and/or non-injection methamphetamine use during sex with at least one of the last three sex partners compared to non-IDUs (OR = 6.81, 95% CI: 2.48–18.69). Additionally, over the last 12 months, 86% of IDUs and 56% of non-IDUs reported ever using methamphetamine; however, this information was only available for 45% ($n = 95$) of the sample (data not shown). IDUs were more likely to report ever using violence against another person (OR = 3.60, 95% CI: 1.31–9.88), ever having a sexual partner who was physically abusive (OR = 3.32, 95% CI: 1.28–8.57), and ever having physically abused a sexual partner (OR = 5.49, 95% CI: 1.68–17.87) compared to non-IDUs. No other factors examined were statistically significant.

In multivariable analyses (Table 3), ever having sex to receive money or goods and using methamphetamine during sex with at least one of their last three sex partners remained significantly associated with having a history of injection drug use after controlling for the other variables in the model. In separate models that included each of the three violence variables alone while adjusting for trading sex and methamphetamine use, ever using violence against another person (AOR = 3.16, 95% CI: 1.05–9.51), ever having a sexual partner who was physically abusive (AOR = 3.08, 95% CI: 1.08–8.77), or ever physically abusing a sexual partner (AOR = 10.17, 95% CI: 2.37–43.74) remained associated with having a history of injection drug use.

Discussion

Among recently HIV-infected MSM in San Diego, 9.4% reported a history of injection drug use indicating two potential routes of HIV exposure and transmission. This proportion was slightly lower than previous studies [7, 9]; however, important significant associations with injection drug use were observed. In addition to trading sex for money or goods and using methamphetamine with at least one of the last three sex partners, both behaviors known to be associated with increased likelihood of HIV and other STIs, injection drug use was found to be associated with an increasing likelihood of involvement in violence. While our data cannot determine whether violence preceded or was a consequence of injection drug use, a history of violence among recently HIV-infected MSM who have injected drugs suggests that this group may require targeted social services, in addition to medical care, for their HIV infection.

All measures of violence were significantly associated with having a history of injection drug use in this study. Intimate partner violence (IPV) victimization has been associated with risky sexual behaviors including unprotected sex, multiple sex partners, trading sex for money, and substance use among women [16]. Prior research suggests that victimization by partners is at least as prevalent among MSM as it is among heterosexual women, and more prevalent than it is among heterosexual men [17]. Not surprisingly, MSM who are victims of IPV share similar risk profiles as women who are victims of IPV: lower income, unemployment, family history of violence, childhood sexual abuse, depression, and heavy substance use [17]. Consistent with previous research among MSM [18–21] and IDUs [22], IPV may be an important factor associated with high-risk sexual behavior including UAI and consequently HIV infection. We found a high prevalence of both physical abuse

perpetration (25%) and victimization (45%) between sex partners among MSM-IDUs. This was slightly lower than studies of IDUs which found approximately 41% of HIV-positive males reported perpetrating IPV against a main female partner [22] and 70% of males in a prospective study reported experiencing any physical violence by anyone at least once [23]. Our findings suggest that MSM who inject drugs may be at a previously unrecognized risk of abusing or being victimized by a sex partner. IPV should be incorporated into intervention strategies for MSM-IDUs as well as studies examining transmission of HIV.

We found that methamphetamine use during sex was significantly more prevalent among MSM who injected drugs than non-injecting MSM. This is consistent with previous research that identified methamphetamine as a drug of choice among MSM-IDUs [24] and found that nearly 60% of MSM-IDUs used methamphetamine [25]; non-injection use has also been reported to be more common among MSM-IDUs than non-IDUs [9]. Furthermore, a higher proportion of MSM-IDUs than non-MSM IDUs reported ever injecting methamphetamine and ever using non-injection methamphetamine in previous studies [26]. Methamphetamine use has been associated with sharing injection equipment when the drug is injected [1], increased risk of HIV infection when used before sex [11, 27–30], and use during sex has been associated with UAI and multiple sex partners among MSM [27, 31–33]. The high prevalence of methamphetamine use during sex observed among recently HIV-infected MSM and the increased odds of methamphetamine use among IDUs in this study was consistent with other studies.

As in prior studies, we found that injection drug use was associated with trading sex for money or goods among MSM [6, 7]. Involvement in the drug/sex economy has been identified as a main context for unprotected sexual encounters among HIV-positive IDUs [34]. Trading sex has been found to be highly associated with HIV status and UAI among IDUs [35, 36]. While the prevalence of trading sex among IDUs in other studies ranged from 1.8% to 30% [8, 35, 36], IDUs in our cohort had an even higher prevalence of trading sex (50%), which was over three times greater than among the non-IDUs (16%). Based on these findings, recently HIV-infected MSM who have a history of injection may have multiple factors contributing to their risk of HIV infection, which complicates efforts to quantify the risk from any one factor.

Incarceration history was found to be associated with injection drug use in bivariate analysis, and when incarceration was added to the three models in Table 3, we found that statistical significance was lost for the associations between injection drug use and perpetrating any violence on another person and being physically abused (data not shown). However, physically abusing sexual partners remained significant after controlling for incarceration. The relationship between violence and incarceration could not be explained using the psychosocial measures available in this study; therefore, future studies specifically targeting these factors are needed. Since we were primarily interested in identifying modifiable or explanatory factors that differed between IDUs and non-IDUs and could be addressed by HIV prevention interventions, incarceration was not included in the final multivariable models.

Certain limitations should be considered in the interpretation of these results. Given the cross-sectional design of this analysis, the temporal relationship between injection drug use, risk behaviors and recent HIV-infection cannot be determined; thus, the relationships observed should not be interpreted as causal. Comparing lifetime history to current practices (e.g., methamphetamine use in the past 3 months) could have led to spurious findings if current practices differed from lifetime practices disproportionately between IDUs and non-IDUs but we found no evidence to suggest that was the case. In fact, 70% of the participants who reported ever injecting drugs also reported injecting drugs in the last 12 months. Although several variables were significant in the bivariate analysis, the absolute number of MSM who reported ever injecting drugs in our sample ($n = 20$) limited our ability to control for more than three factors simultaneously in multivariable analyses. While having more than one covariate for every 10 events in the dependent variable could limit power to detect significance, the low power in our study actually increases our confidence in the associations that were found to be significant. Additionally, since the magnitude and direction of the odds ratios in our final models were similar to the univariate odds ratios, this further increases our confidence in these significant associations. This was a secondary analysis; therefore, the questionnaire was not designed to ascertain the types of drugs injected or the method of drug administration. As a result, we could not determine whether IDUs were more likely to use methamphetamine regardless of route of administration or whether the association between methamphetamine and injection drug use was due to injection being the primary route of methamphetamine administration. There was also limited information regarding recent male-to-male sexual activity so we could not determine whether it was injection drug use or sexual behavior that more likely accounted for HIV infection. Some behaviors may have been underreported due to socially desirable responding since behavioral assessments were conducted shortly after participants learned of their HIV infection. However, the use of computer assisted self interviewing technology should have minimized this type of biased responding [37, 38]. Finally, as this was a predominately White cohort of MSM in an urban Southern California city, the results may not be generalizable to other MSM communities.

To our knowledge, this is the first study to report on differences in HIV risk behaviors, drug use and partner violence between recently infected MSM with and without a history injection drug use. The findings of this study suggest that recently HIV-infected MSM-IDUs may be more likely to transmit HIV than non-IDUs due to their self-reported high-risk behaviors. Furthermore, their uneven power relationships due to experience with violence and impaired judgment from substance abuse suggests the need for HIV prevention interventions that address these factors as they may moderate the effectiveness of interventions broadly targeting MSM. The greater likelihood of having a history of violence with partners and history of selling sex suggests that MSM who inject drugs are more prone to have social circumstances that make adopting safer behaviors more difficult. Interventions directed at MSM who inject drugs should continue to focus on abstaining from drug use during sexual activity and should also address the barriers to reducing HIV risk that MSM-IDUs face such as participation in sex trade, physical abuse, and addiction that may affect an individual's ability or willingness to adopt safer behaviors.

Acknowledgments

The authors would like to acknowledge and thank Tari Gilbert, Paula Potter, Joanne Santangelo, and the University of California, San Diego Antiviral Research Center staff for their support in data collection. Most of all we would like to thank our participants for volunteering for this study. This work was supported by UCSD Center for AIDS Research (AI36214), AI43638, AI074621 from the National Institutes of Health, and RN07-SD-702 from the California HIV Research Program (CHRP).

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Table 1

Characteristics of recently HIV-infected men who have sex with men (MSM) by history of injection drug use (IDU) in San Diego, CA ($n = 212$)

	Total <i>n</i> (%)	IDU (<i>n</i> = 20) <i>n</i> (%)	Non-IDU (<i>n</i> = 192) <i>n</i> (%)	<i>P</i> -value ^a
Sociodemographics				
Age, years				0.7274
Mean (SD)	33.8 (9.57)	34.5 (8.83)	33.7 (9.66)	
Race/ethnicity				0.7318
African American	7 (3.3)	0 (0.0)	7 (3.6)	
Hispanic	40 (18.9)	2 (10.0)	38 (19.8)	
Other	13 (6.1)	1 (5.0)	12 (6.3)	
White	152 (71.7)	17 (85.0)	135 (70.3)	
Educational attainment				0.1625
1–12 grade	24 (11.3)	3 (15.0)	21 (10.9)	
Attended/completed college	144 (67.9)	16 (80.0)	128 (66.7)	
Post-graduate education	44 (20.8)	1 (5.0)	43 (22.4)	
Employment status				0.0076
Unemployed	61 (28.8)	12 (60.0)	49 (25.5)	
Part-time	25 (11.8)	1 (5.0)	24 (12.5)	
Full-time	126 (59.4)	7 (35.0)	119 (62.0)	
Sexual behaviors				
Unprotected anal intercourse with 1 of the last 3 sex partners				0.0832
Yes	166 (78.3)	19 (95.0)	147 (76.6)	
Ever had sex with more than 1 person at a time				0.0501
Yes	181 (85.4)	20 (100.0)	161 (83.8)	
Ever gave someone money or goods for sex				0.2089
Yes	33 (15.6)	5 (25.0)	28 (14.6)	
Ever received money or goods for sex				0.0002
Yes	40 (18.9)	10 (50.0)	30 (15.6)	
Lifetime frequency of sexual encounters with known HIV(+) partners ($n = 206$)				0.0012
1 time	140 (68.0)	20 (100)	120 (64.5)	
0 times	66 (32.0)	0 (0)	66 (35.5)	
No. of male sex partners in the last 12 month ^c				0.7697
>20 partners	102 (48.1)	9 (45.0)	93 (48.4)	
0–20 partners	110 (51.9)	11 (55.0)	99 (51.6)	
Ever used the Internet to find sex partners				0.5649
Yes	169 (79.7)	15 (75.5)	154 (80.2)	
Drug use				
Used methamphetamine during sex with 1 of the last 3 sex partners				<0.0001
Yes	63 (29.7)	14 (70.0)	49 (25.5)	

	Total <i>n</i> (%)	IDU (<i>n</i> = 20) <i>n</i> (%)	Non-IDU (<i>n</i> = 192) <i>n</i> (%)	<i>P</i> -value ^a
Used poppers during sex with 1 of the last 3 sex partners				0.8415
Yes	57 (26.9)	5 (25.0)	52 (27.1)	
Violence				
Ever used violence against another person				0.0090
Yes	32 (15.1)	7 (35.0)	25 (13.0)	
Ever had a sexual partner who was physically abusive				0.0197
Yes	47 (22.2)	9 (45.0)	38 (19.8)	
Ever physically abused sexual partner				0.0100
Yes	16 (7.6)	5 (25.0)	11 (5.7)	
Ever been incarcerated in lifetime				<0.0001
Yes	35 (16.5)	11 (55.0)	24 (12.5)	
Biological data				
Viral load, copies/ml				
Median (IQR)	45,000 (11,100–174,000) 44,800 (11,700–111,000)	45,200 (10,500–179,667)	0.9401 ^b	
Natural log mean (SD)	10.4 (2.24)	10.5 (1.63)	10.4 (2.29)	0.8006
CD4 count, cells/μl				
Mean (SD)	581.5 (223.1)	544.8 (216.5)	585.1 (223.9)	0.4536
Time since HIV infection, months				
Median (IQR)	3.0 (2.70–4.83)	3.9 (2.96–5.10)	2.99 (2.70–4.83)	0.1024 ^b
Natural log Mean (SD)	1.1 (0.61)	1.3 (0.52)	1.1 (0.62)	0.3022
Currently infected with syphilis, gonorrhea or chlamydia (<i>n</i> = 209)				0.1749
Yes	31 (14.8)	4 (21.1)	27 (14.2)	

^a*P*-values are based on chi-square test or Fisher's exact test for nominal variables and *t*-tests for continuous variables unless otherwise specified. Fisher's exact method was used to calculate *P*-values when the expected cell value was <5 observations

^b*P*-value obtained using Wilcoxon ranked sum test

^cOnly 2 IDU and 5 non-IDUs reported having no male sex partners in the past 12 months

Table 2

Bivariate associations between lifetime history of injection drug use and selected variables among recently HIV-infected men who have sex with men (MSM) in San Diego, CA from simple logistic regression ($n = 212$)

	Odds ratio	95% Confidence interval	Wald Chi-square <i>P</i> -value
Sociodemographics			
Age, years (per year)	1.01	0.96–1.06	0.7260
Race/Ethnicity (ref: White)			0.5038
African American	Undefined		
Hispanic	0.42	0.09–1.89	
Other	0.66	0.08–5.41	
Educational attainment (ref: Post grad education)			0.2570
1–12 grade	6.14	0.60–62.66	
Attended/completed college	5.38	0.69–41.73	
Employment status (ref: Full-time)			0.0097
Unemployed	4.16	1.55–11.20	
Part-time	0.71	0.08–6.03	
Sexual behaviors			
Unprotected anal intercourse with 1 of last 3 sex partners (ref: No)	5.82	0.76–44.65	0.0905
Ever gave someone money or goods for sex (ref: No)	1.95	0.66–5.80	0.2283
Ever received money or goods for sex (ref: No)	5.40	2.07–14.09	0.0006
>20 male sex partners in the last 12 month (ref: 20)	0.87	0.35–2.20	0.7698
Ever used the Internet to find sex partners (ref: No)	0.74	0.25–2.16	0.5823
Drug use			
Used methamphetamine during sex with 1 of last 3 sex partners (ref: No)	6.81	2.48–18.69	0.0002
Used poppers during sex with 1 of last 3 sex partners (ref: No)	0.90	0.31–2.59	0.8416
Violence			
Ever used violence against another person (ref: No)	3.60	1.31–9.88	0.0130
Ever had a physically abusive sexual partner (ref: No)	3.32	1.28–8.57	0.0134
Ever physically abused sexual partner (ref: No)	5.49	1.68–17.87	0.0047
Ever been incarcerated in lifetime (ref: No)	8.56	3.21–22.78	<0.0001

Table 3

Multivariable logistic regression analysis of factors associated with lifetime history of injection drug use among recently HIV-infected men who have sex with men (MSM) in San Diego, CA (*n* = 212)

	Model 1				Model 2				Model 3			
	Adjusted ^a odds ratio	95% Confidence interval	P-value		Adjusted ^a odds ratio	95% Confidence interval	P-value		Adjusted ^a odds ratio	95% Confidence interval	P-value	
Sexual behaviors and drug use												
Ever had sex to receive money or goods (ref: No)	3.67	1.32–10.18	0.0125		3.42	1.22–9.65	0.0199		3.59	1.27–10.14	0.0160	
Used methamphetamine during sex with 1 of the last 3 sex partners (ref: No)	5.58	1.95–15.99	0.0014		5.67	1.96–16.38	0.0014		8.41	2.54–27.87	0.0005	
Violence												
Ever used violence against another person (ref: No)	3.16	1.05–9.51	0.0412									
Ever had a sexual partner who was physically abusive (ref: No)					3.08	1.08–8.77	0.0348					
Ever physically abused sexual partner (ref: No)									10.17	2.37–43.74	0.0018	

^aOdds ratios are adjusted for all other variables in the model