

# Longitudinal Associations Between Types of Childhood Trauma and Suicidal Behavior Among Substance Users: A Cohort Study

Brandon D. L. Marshall, PhD, Sandro Galea, MD, DrPH, Evan Wood, MD, PhD, and Thomas Kerr, PhD

The global burden of suicide is considerable and is the tenth leading cause of death worldwide, with annual mortality estimated at 14.5 deaths per 100 000.<sup>1</sup> Suicide is a major and preventable public health problem among young people aged 15 to 24 years in Canada (second leading cause of death<sup>2</sup>) and the United States (third leading cause of death<sup>3</sup>). Each year, approximately 1 million adults in the United States attempt suicide, resulting in 35 000 deaths and more than 320 000 emergency department visits.<sup>4</sup> The societal, financial, and public health burdens associated with suicide are therefore substantial.

The epidemiology of suicide is multifactorial and complex.<sup>1</sup> The *2012 National Strategy for Suicide Prevention* identifies several groups at particularly high risk of suicide in the United States, including individuals with a past history of suicidal behavior, members of the armed forces and veterans, American Indians/Alaska Natives, men in midlife, and individuals in justice and child welfare settings.<sup>5</sup> Of public health concern in Canada, suicide rates among Aboriginal Peoples are 2 to 3 times that observed in the nonaboriginal population.<sup>6,7</sup> A large body of literature has also demonstrated high rates of suicidal behavior among lesbian, gay, bisexual, and transgender populations.<sup>8-10</sup>

People who use illicit drugs are particularly vulnerable to suicidal ideation and behavior, and suicide is a leading cause of death in drug-using populations.<sup>11,12</sup> Furthermore, the relationship between substance abuse and increased suicide risk has been well established.<sup>13,14</sup> A growing body of research has examined various correlates of suicide attempts among drug users. In treatment-seeking samples of drug and alcohol abusers, major depressive disorder and other psychiatric conditions (e.g., borderline personality disorder, anxiety, agoraphobia) have been associated with a history of suicide attempts.<sup>15-20</sup>

**Objectives.** We examined the longitudinal associations between different types and severities of childhood trauma and suicide attempts among illicit drug users.

**Methods.** Data came from 2 prospective cohort studies of illicit drug users in Vancouver, Canada, in 2005 to 2010. We used recurrent event proportional means models to estimate adjusted and weighted associations between types and severities of childhood maltreatment and suicide attempts.

**Results.** Of 1634 participants, 411 (25.2%) reported a history of suicidal behavior at baseline. Over 5 years, 80 (4.9%) participants reported 97 suicide attempts, a rate of 2.6 per 100 person-years. Severe to extreme levels of sexual abuse (adjusted hazard ratio [AHR] = 2.5; 95% confidence interval [CI] = 1.4, 4.4), physical abuse (AHR = 2.0; 95% CI = 1.1, 3.8), and emotional abuse (AHR = 3.5; 95% CI = 1.4, 8.7) predicted suicide attempts. Severe forms of physical and emotional neglect were not significantly associated with an increased risk of suicidal behavior.

**Conclusions.** Severe sexual, physical, and emotional childhood abuse confer substantial risk of repeated suicidal behavior in adulthood. Illicit drug users require intensive secondary suicide prevention efforts, particularly among those with a history of childhood trauma. (*Am J Public Health.* 2013;103:e69–e75. doi: 10.2105/AJPH.2013.301257)

Furthermore, markers of social disadvantage and marginalization, such as unemployment and homelessness, are associated with a heightened risk of suicide and are common among drug users.<sup>11</sup> Specific typologies of drug use have also been linked to a greater likelihood of attempting suicide, including longer durations of substance use,<sup>18,21</sup> polysubstance use,<sup>20,22</sup> and injection methamphetamine use.<sup>23</sup>

In recent years, childhood maltreatment has emerged as a consistent correlate of suicidal ideation and behavior among drug users.<sup>19,24,25</sup> These studies provide preliminary evidence that childhood abuse and neglect are important determinants of suicide in drug-using populations. However, it is unclear whether certain types of childhood maltreatment are more strongly associated with suicidal behavior than others. The majority of studies to date have examined suicide and early traumatic experiences among clinical samples, which may be subject to selection bias if being in treatment is a common effect of both

exposure (i.e., childhood maltreatment) and other, unmeasured factors that may cause suicidal behavior (e.g., genetic or familial susceptibility to psychiatric disorders such as depression). To our knowledge no studies have prospectively examined suicidal behavior in a community-recruited cohort of drug users. Drug-using cohorts are particularly well suited to examining the relationship between childhood maltreatment and recurrent suicidal behavior because of their high rates of suicide. We used recurrent event survival models to determine the longitudinal associations between exposure to different types and severities of childhood trauma and suicide attempts, measured prospectively in a cohort of drug users in Vancouver, British Columbia.

## METHODS

The objectives, design, and methods of the Vancouver Injection Drug Users Study (enrolling HIV-negative persons) and the AIDS Care

Cohort to Evaluate Exposure to Survival Services (enrolling HIV-positive drug users) are described in detail elsewhere.<sup>26,27</sup> Briefly, since May 1996, 2707 drug users have been recruited into the studies. The instruments and all other follow-up procedures for each study are identical to allow for combined analyses. Recruitment proceeds by word of mouth, street-based outreach, and referrals from local social services. Participants are eligible to participate if they are aged at least 14 years, reside in the greater Vancouver region, and report injection drug use within the past 6 months. Commencing in 2005, an additional wave of recruitment was conducted, with similar criteria. However, eligibility for the AIDS Care Cohort to Evaluate Exposure to Survival Services study was expanded to include persons reporting heavy noninjection drug use in the past 6 months (e.g., crack cocaine, methamphetamine).

Measures ascertaining exposure to childhood trauma were added in late 2005; therefore, we restricted our analyses to the 1804 individuals who were enrolled and had completed at least 1 follow-up visit between December 1, 2005, and December 1, 2010. We further excluded 12 (0.7%) individuals who were missing sociodemographic data and 158 (8.8%) who refused to provide information regarding childhood traumatic experiences. The final analytic sample was 1634.

Every 6 months, participants attend study visits and complete an interviewer-administered questionnaire. Nurses also assess participants for various health conditions and obtain blood specimens for HIV and hepatitis C serology. Participants receive Can\$20 for each visit.

### Measures

The studies collected information on a wide array of participant characteristics, such as sociodemographic information, drug use patterns, health service utilization, HIV risk behaviors, and health conditions, including suicidal ideation and behavior. Our primary outcome was response to the question, “In the last 6 months, have you attempted suicide?” Participants who responded affirmatively were counseled by on-site nurses and referred to additional services, if appropriate. At their first visit during the study period, participants were

also asked if they had ever attempted suicide in their lifetime.

The primary exposure of interest was childhood trauma, as measured by responses to the Childhood Trauma Questionnaire (CTQ).<sup>28</sup> All participants completed this instrument at their first study visit. The CTQ is a 25-item validated instrument used to assess, retrospectively, 3 forms of abuse (sexual, physical, and emotional) and 2 forms of neglect (physical and emotional) occurring in childhood. The CTQ provides a separate score for 5 subscales, each with 5 items, that correspond to each type of abuse or neglect. On a 5-point Likert scale from 1 (never true) to 5 (very often true), participants respond to statements such as “When I was growing up I had to wear dirty clothes” (physical neglect) and “Someone tried to make me do sexual things” (sexual abuse). Each subscale produces scores ranging from 5 to 25. We used recommended and a priori cutoff scores to translate each subscale score into 1 of 4 levels of childhood trauma: none or minimal (5–8), low to moderate (9–12), moderate to severe (13–15), and severe to extreme (> 15).<sup>28</sup> The reliability and validity of the CTQ has been demonstrated,<sup>28–30</sup> and the instrument has been used successfully in several studies of illicit drug users.<sup>31,32</sup>

To examine the extent to which childhood maltreatment predicts adult suicidal behavior outside of pathways involving established suicide risk factors, we included in all models individual characteristics known to increase the risk of attempting suicide. Variables considered as confounders were year of birth (age in years); gender (female vs male); sexual orientation (lesbian, gay, bisexual, or transgender vs heterosexual); aboriginal ancestry (Inuit, Métis, or First Nations vs other); HIV status, determined by serological testing (positive vs negative); and lifetime history of suicidal behavior at baseline (any attempts vs none). We also included the following as time-updated covariates in all hazards models (all, yes vs no): active injection drug use in the past 6 months, homelessness in the past 6 months, physical or sexual victimization in the past 6 months, recent nonfatal overdose experience, and current enrollment in a drug or alcohol treatment program. Finally, in light of the established relationship between depressive symptomology and suicidal behavior, we included as

a time-updated covariate self-reported depression, measured at each follow-up with the previously validated Center for Epidemiologic Studies Depression Scale and defined by an established cutoff ( $\geq 22$ ) indicating high levels of depressive symptoms.<sup>33</sup>

### Statistical Analyses

As a first step, we computed mean scores and Cronbach  $\alpha$  for each CTQ subscale. We used the Pearson  $\chi^2$  test and the Wilcoxon test to compare sociodemographic characteristics and CTQ responses among those who reported attempting suicide during follow-up with those who did not.

Second, we used Kaplan–Meier methods<sup>34</sup> to determine the cumulative incidence of attempting suicide during follow-up among study participants, stratified by CTQ severity category for each type of trauma. The study questionnaires assessed suicidal behavior occurring in the past 6 months, so we estimated the date of suicide attempt as occurring 3 months prior to the interview date. In time to first event analyses, we right-censored all participants who reported suicidal behavior as of the date of their first suicide attempt reported during follow-up. We right-censored persons who never reported a suicide attempt as of their last visit. We used the person–time method to calculate the cumulative incidence of suicidal behavior over the study period. We used the log-rank test to compare the survival distributions of the 4 CTQ severity categories. We used Cox proportional hazards regression to determine the crude and adjusted associations between each type of childhood trauma and time to first report of attempting suicide during follow-up.

Third, because some participants reported more than 1 suicide attempt during the study period, we constructed 5 recurrent event survival models to examine the relationship between the outcome of interest and exposure to each type of childhood trauma. These models incorporated information on all suicide attempts recorded over the entire study period and improved precision of the estimates of interest, because of more suicide events in each analysis. We used a proportional rates–means model described by Lin et al.<sup>35</sup> to account for correlation among the length of individuals’ repeated time at risk for a suicide attempt. In

**TABLE 1—Sociodemographic Characteristics of Participants Who Did and Did Not Attempt Suicide: Vancouver Injection Drug Users Study and AIDS Care Cohort to Evaluate Exposure to Survival Services, Vancouver, British Columbia, 2005–2010**

Characteristic	Attempted Suicide (n = 80), Median (IQR) or No. (%)	Did Not Attempt Suicide (n = 1554), Median (IQR) or No. (%)	P
Age, <sup>a</sup> y	41 (33–47)	43 (36–48)	.111
Gender			<.001
Female	41 (51.3)	484 (31.2)	
Male	39 (48.7)	1070 (68.8)	
Aboriginal ancestry <sup>b</sup>			.016
Yes	36 (45.0)	498 (32.0)	
No	44 (55.0)	1056 (68.0)	
Sexual orientation			.474
LGBT	12 (15.0)	191 (12.3)	
Heterosexual	68 (85.0)	1363 (87.7)	
HIV status			.749
Positive	30 (37.5)	611 (39.3)	
Negative	50 (62.5)	944 (60.7)	
History of suicidal behavior at baseline			<.001
Yes	55 (68.7)	356 (22.9)	
No	24 (31.3)	1137 (77.1)	
Baseline depression score <sup>c</sup>	35 (26–45)	24 (14–33)	<.001

Note. IQR = interquartile range; LGBT = lesbian, gay, bisexual, or transgender. Columns do not add to 100% because of missing or unavailable data.

<sup>a</sup>At first interview during follow-up.

<sup>b</sup>Self-identified First Nation, Inuit, or Métis.

<sup>c</sup>Score on Center for Epidemiologic Studies Depression scale  $\geq 22$  indicated major depressive symptomatology.

these models, we specified a counting process framework to define time to repeated events, such that individuals were considered to be at risk from time zero to the first event, from the first event to the second event, and so forth. As in the case of Cox proportional hazards regression, the model assumed proportional means.<sup>36</sup> We assessed this assumption for each variable of interest by visual inspection of the Schoenfeld residuals plots<sup>37</sup> and by examining time-by-covariate interactions.<sup>38</sup>

We first computed hazard ratios representing the bivariable associations between severity of childhood traumatic experiences and repeated suicide attempts. We then constructed multivariable models that incorporated all variables hypothesized a priori as confounders. To account for possible informative censoring, we constructed a final set of models with stabilized inverse probability of censoring weights (IPCW).<sup>39</sup> In IPCW analyses, the sample is reweighted such that the contribution of participants who drop out is effectively

inflated. If model specification is correct, IPCW thus permits the estimation of effect estimates that would have been observed if all participants had stayed in the study. We modeled the probability of remaining uncensored, conditional on the study exposure and other covariates associated with the outcome, with pooled logistic regression, as described elsewhere.<sup>40,41</sup> We conducted all statistical analyses with SAS version 9.3 (SAS Institute Inc, Cary, NC). We reported 2-sided *P* values.

## RESULTS

The 1634 participants eligible for analysis attended 6217 study visits (median = 4; interquartile range [IQR] = 1–6). The median age at first study visit was 42 years (IQR = 36–48; range = 19–71); 1109 (67.9%) were male, 534 (32.7%) were of aboriginal ancestry, and 203 (12.4%) self-identified as lesbian, gay, bisexual, or transgender. At their first study visit, 411 (25.2%) participants reported

a lifetime history of suicidal behavior. Over the study period, 195 (11.9%) were lost to follow-up; dropouts were younger than retained respondents ( $P < .001$ ) and more likely to have reported a history of suicidal behavior at their first study visit (35.3% vs 24.9%;  $P = .002$ ). Persons lost to follow-up also reported higher scores on each CTQ subscale ( $P < .05$ ). We accounted for these differences in the IPCW analysis.

Over the 5-year study period, 65 participants reported 1 suicide attempt, 13 reported 2 attempts, and 2 reported 3 attempts, for a total of 97 events among 80 participants. The resulting incidence density was 2.6 per 100 person-years (95% confidence interval [CI] = 2.1, 3.2). As shown in Table 1, persons who reported attempting suicide during follow-up were more likely than those who did not to be female (51.3% vs 31.2%;  $P < .001$ ); be of Aboriginal ancestry (45.0% vs 32.0%;  $P = .016$ ); score higher on the depression scale, indicating a greater prevalence of depressive symptomatology at baseline (median score = 35 vs 24;  $P < .001$ ); and report a history of attempting suicide at baseline (68.7% vs 22.9%;  $P < .001$ ).

We observed a high prevalence of childhood traumatic experiences among study participants. The mean scores on the CTQ subscales were sexual abuse, 10 (SD = 7); physical abuse, 11 (SD = 6); emotional abuse, 13 (SD = 6); physical neglect, 10 (SD = 5); and emotional neglect, 13 (SD = 6). As shown in Table 2, the proportion of participants reporting severe to extreme levels of maltreatment ranged from 15.4% (physical neglect) to 34.2% (emotional neglect). Notably, one quarter of participants reported severe to extreme forms of sexual and physical abuse. For each subscale, Cronbach  $\alpha$  was greater than 0.75, indicating very good internal consistency. As shown in Table 2, for every CTQ subscale, we observed a significant association between the severity of childhood trauma and suicidal behavior during follow-up (all,  $P < .01$ ).

We observed statistically significant relationships between trauma severity and increased cumulative incidence of suicidal behavior for all types of abuse and neglect (all log-rank *P* values  $< .01$ ; Figures A–E, available as a supplement to the online version of this article at <http://www.ajph.org>). The cumulative

**TABLE 2—Associations of Childhood Trauma With Suicide Attempts Reported During Follow-Up: Vancouver Injection Drug Users Study and AIDS Care Cohort to Evaluate Exposure to Survival Services, Vancouver, British Columbia, 2005–2010**

Type of Maltreatment <sup>a</sup>	Total (n = 1634), No. (%)	Attempted Suicide (n = 80), No. (%)	Did Not Attempt Suicide (n = 1554), No. (%)	<i>P</i> <sup>b</sup>
<b>Sexual abuse</b>				
None or minimal	960 (60.2)	25 (32.0)	935 (61.7)	<.001
Low to moderate	127 (8.0)	4 (5.1)	123 (8.1)	
Moderate to severe	135 (8.5)	6 (7.7)	129 (8.5)	
Severe to extreme	372 (23.3)	43 (55.1)	329 (21.7)	
<b>Physical abuse</b>				
None or minimal	720 (44.9)	24 (31.2)	696 (45.6)	.004
Low to moderate	301 (18.7)	10 (13.0)	291 (19.0)	
Moderate to severe	182 (11.3)	12 (15.6)	170 (11.1)	
Severe to extreme	402 (25.1)	31 (40.2)	371 (24.3)	
<b>Emotional abuse</b>				
None or minimal	497 (31.3)	8 (10.2)	489 (32.4)	<.001
Low to moderate	323 (20.4)	14 (18.0)	309 (20.5)	
Moderate to severe	248 (15.6)	15 (19.2)	233 (15.5)	
Severe to extreme	518 (32.7)	41 (52.6)	477 (31.6)	
<b>Physical neglect</b>				
None or minimal	652 (40.7)	23 (35.9)	629 (41.3)	<.001
Low to moderate	429 (26.8)	16 (20.5)	413 (27.2)	
Moderate to severe	273 (17.1)	11 (14.1)	262 (17.2)	
Severe to extreme	246 (15.4)	28 (29.5)	218 (14.3)	
<b>Emotional neglect</b>				
None or minimal	416 (26.2)	13 (16.7)	403 (26.7)	.007
Low to moderate	328 (20.6)	10 (12.8)	318 (21.1)	
Moderate to severe	301 (19.0)	15 (19.2)	286 (18.9)	
Severe to extreme	543 (34.2)	40 (51.3)	503 (33.3)	

Note. Not all columns add to 1634 because of missing values.

<sup>a</sup>Derived from responses to the Childhood Trauma Questionnaire.<sup>30</sup>

<sup>b</sup>Two-sided, from the  $\chi^2$  test with 3 *df*.

incidence of attempting suicide was particularly elevated among persons with severe to extreme levels of childhood traumatic experiences.

Table 3 depicts the crude, adjusted, and adjusted with IPCW recurrent event models for each type of childhood trauma. Plots of Schoenfeld residuals and inclusion of product terms between variables of interest and log time did not suggest evidence of nonproportionality in any of the 5 models. In adjusted and weighted proportional means models, severe to extreme sexual (adjusted hazard ratio [AHR] = 2.46; 95% CI = 1.37, 4.42), physical (AHR = 2.00; 95% CI = 1.06, 3.78), and emotional (AHR = 3.52; 95% CI = 1.42, 8.71) abuse were all significantly associated with an

increased risk of suicidal behavior. By contrast, severe to extreme childhood physical (AHR = 1.43; 95% CI = 0.71, 2.91) and emotional (AHR = 1.37; 95% CI = 0.70, 2.69) neglect did not predict suicide attempts during follow-up. The adjusted HRs corresponding to the low to moderate and moderate to severe categories for all types of childhood maltreatment were not significant.

In a subanalysis entering all considered covariates and each type of abuse into 1 model, severe to extreme childhood sexual abuse remained positively associated with suicidal behavior (AHR = 2.77; 95% CI = 1.46, 5.23), but severe to extreme physical (AHR = 0.73; 95% CI = 0.35, 1.51) and emotional (AHR =

2.10; 95% CI = 0.75, 5.90) abuse lost statistical significance. The results of the standard Cox proportional hazards regression were similar to those obtained in the recurrent event models (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>).

## DISCUSSION

In this prospective cohort study of more than 1600 illicit drug users, a lifetime history of suicidal behavior was highly prevalent; furthermore, suicide attempts were common over the 5-year study period. We observed an increased hazard of suicidal behavior among persons who reported experiencing severe to extreme levels of childhood physical, emotional, and sexual abuse in weighted and adjusted recurrent event analyses.

To our knowledge, ours is the first study to examine prospectively the relationship between suicidal behavior and exposure to childhood trauma among a community-recruited cohort of drug users. The observed lifetime prevalence of attempting suicide (25%) in our cohort was consistent with other samples of injection and noninjection drug users, which have reported prevalence estimates between 17% and 45%.<sup>11,42–44</sup> Suicidal behavior was significantly more common than in studies of the general population; for example, our observed incidence of attempting suicide was at least 5 times the rate in representative samples of adult populations in the Netherlands,<sup>45</sup> Australia,<sup>46</sup> and the United States.<sup>47</sup>

Our finding that emotional abuse was strongly associated with an increased hazard of suicide attempts supports a small but growing body of cross-sectional studies suggesting that this type of maltreatment is, in addition to sexual and physical abuse, an important risk factor for suicidal behavior.<sup>48,49</sup> For example, a study of low-income African American women demonstrated that persons who experienced any type of childhood abuse—physical, sexual, or emotional—were significantly more likely than women with no history of abuse to report suicidal behavior.<sup>50</sup> The strong associations between emotional abuse and suicidal behavior observed in our study and others merit further investigation but nonetheless



**TABLE 3—Crude and Adjusted Hazard Ratios for Attempting Suicide During Follow-Up From 5 Recurrent Event Models for Types of Childhood Trauma: Vancouver Injection Drug Users Study and AIDS Care Cohort to Evaluate Exposure to Survival Services, Vancouver, British Columbia, 2005–2010**

Type of Maltreatment <sup>a</sup>	Participants, No.	Suicide Attempts, No.	Crude HR (95% CI)	AHR <sup>b</sup> (95% CI)	AHR With IPCW <sup>b,c</sup> (95% CI)
<b>Sexual abuse</b>					
None to minimal	960	30	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Low to moderate	127	4	1.20 (0.41, 3.49)	0.92 (0.29, 2.93)	0.85 (0.28, 2.56)
Moderate to severe	135	7	1.65 (0.66, 4.18)	1.05 (0.31, 3.58)	0.52 (0.13, 2.13)
Severe to extreme	372	54	5.05 (3.00, 8.52)	2.81 (1.54, 5.14)	2.46 (1.37, 4.42)
<b>Physical abuse</b>					
None to minimal	720	29	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Low to moderate	301	11	1.05 (0.49, 2.25)	0.81 (0.34, 1.94)	1.16 (0.45, 2.96)
Moderate to severe	182	13	1.86 (0.91, 3.82)	1.10 (0.44, 2.75)	1.11 (0.37, 3.39)
Severe to extreme	402	41	2.79 (1.59, 4.89)	1.57 (0.83, 2.99)	2.00 (1.06, 3.78)
<b>Emotional abuse</b>					
None to minimal	497	8	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Low to moderate	323	20	3.45 (1.42, 8.38)	2.32 (0.88, 6.14)	2.43 (0.94, 6.29)
Moderate to severe	248	16	3.85 (1.63, 9.08)	2.01 (0.77, 5.24)	1.41 (0.50, 3.95)
Severe to extreme	518	51	6.53 (3.02, 14.12)	2.85 (1.20, 6.76)	3.52 (1.42, 8.71)
<b>Physical neglect</b>					
None to minimal	652	26	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Low to moderate	429	21	1.22 (0.62, 2.41)	0.79 (0.37, 1.70)	1.02 (0.45, 2.30)
Moderate to severe	273	13	1.09 (0.52, 2.29)	0.57 (0.22, 1.49)	0.57 (0.22, 1.50)
Severe to extreme	246	34	3.72 (2.09, 6.61)	1.60 (0.81, 3.18)	1.43 (0.71, 2.91)
<b>Emotional neglect</b>					
None to minimal	416	16	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Low to moderate	328	12	1.09 (0.46, 2.58)	0.92 (0.39, 2.15)	0.92 (0.38, 2.19)
Moderate to severe	301	19	1.83 (0.83, 4.02)	1.17 (0.50, 2.72)	1.22 (0.49, 3.04)
Severe to extreme	543	48	2.59 (1.35, 4.95)	1.48 (0.76, 2.88)	1.37 (0.70, 2.69)

Note. AHR = adjusted hazard ratio; CI = confidence interval; IPCW = inverse probability of censoring weights.

<sup>a</sup>Derived from responses to the Childhood Trauma Questionnaire.<sup>30</sup>

<sup>b</sup>All models adjusted for age, gender, aboriginal ancestry, sexual orientation, HIV status, lifetime history of suicidal behavior at baseline, depression, active injection drug use, homelessness, victimization, recent overdose experience, and current enrollment in drug or alcohol treatment.

<sup>c</sup>Five sets of censoring weights were constructed from pooled logistic models with the following covariates: age, gender, aboriginal ancestry, lifetime history of suicidal behavior at baseline, depression, victimization, recent overdose experience, and each type of childhood trauma (for each of 5 models).

suggest that emotional maltreatment should be addressed in therapeutic and clinical contexts.

The etiologic mechanisms through which childhood trauma heightens vulnerability to suicidal behavior have been the focus of clinical, epidemiological, and genetic studies. Evidence shows that early exposure to stress and trauma adversely affects brain development, which in turn results in an increased risk of psychopathological symptoms.<sup>51</sup> Many mediating factors have also been identified, for example, alcoholism,<sup>52</sup> depression,<sup>53,54</sup>

aggression,<sup>55</sup> posttraumatic stress disorder,<sup>53</sup> and impulsivity.<sup>56</sup> We were unable to identify mediational mechanisms because of limited power; however, it is likely that some of these pathways explain the relationships we observed.

Clinicians and community health professionals working with illicit drug users should be aware that persons with a history of severe traumatic childhood experiences are at high risk for suicidal behavior. Therefore identifying and treating persons with severe childhood trauma may have a significant impact on this

public health problem. In addition, clinicians who identify suicide attempts should routinely assess patients for childhood abuse to address these problems and reduce the risk of recurrent suicidal behavior.<sup>57</sup> Finally, the integration of suicide prevention interventions within programs frequently accessed by drug users, such as community health clinics and needle exchange programs,<sup>58</sup> requires increased attention, consideration, and evaluation.

### Limitations

Although we were able to account for several important risk factors associated with suicidal behavior, there exists the possibility of unmeasured confounding. Specifically, we were unable to examine early childhood environmental and familial factors that have been shown to frequently co-occur with childhood abuse and neglect.<sup>49,59</sup> We were also unable to account for recently identified genetic factors that have been shown to moderate the relationship between childhood traumatic experiences and adulthood psychopathologies.<sup>60,61</sup> The lengthy period between exposure to childhood trauma and participants' responses likely led to some under- or misreporting of some traumatic experiences as a result of response biases. We attempted to reduce the degree of exposure misclassification by relying on a previously validated instrument that showed a high level of internal consistency among study participants.

It is also likely that some suicide attempts were either not reported because of recall error or were considered unintentional overdoses by study participants. Whenever possible, nurses and trained interviewers attempted to distinguish suicide events from overdose experiences, and they assured participants of confidentiality throughout the interviewing process to minimize underreporting of suicidality. We excluded 158 participants who refused to provide information regarding childhood traumatic experiences, which may have introduced selection bias. Only a small proportion of respondents did not complete the CTQ, so we expect that the magnitude of this bias, if present, was small. Finally, in light of the non-random sampling procedures, the results may not be generalizable to drug users in other urban areas.

## Conclusions

Our study adds to a growing body of research suggesting that severe childhood maltreatment confers significant detrimental impacts, including an elevated risk of suicidal behavior in adulthood. Additional research is required to elucidate the etiological mechanisms and mediational pathways that explain these relationships. Continued development and evaluation of effective interventions to prevent suicide in high-risk populations of drug users are required. ■

## About the Authors

At the time of writing, Brandon D. L. Marshall and Sandro Galea were with the Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY. Brandon D. L. Marshall was also with and Evan Wood and Thomas Kerr are with the Urban Health Research Initiative, British Columbia Centre for Excellence in HIV/AIDS, Vancouver. Evan Wood and Thomas Kerr are also with the Department of Medicine, University of British Columbia, Vancouver.

Correspondence should be sent to Brandon D. L. Marshall, PhD, Dept of Epidemiology, Brown University, Box G-S-121-2, 121 South Main St, Providence, RI 02912 (e-mail: brandon\_marshall@brown.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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## Contributors

E. Wood and T. Kerr originated the Vancouver Injection Drug Users Study and the AIDS Care Cohort to Evaluate Exposure to Survival Services study and contributed to their development and procurement of funding. B. D. L. Marshall conducted the literature review, designed and conducted the analysis, and directed its implementation, with input from S. Galea and T. Kerr. B. D. L. Marshall wrote the article, and all authors critically revised it, provided important intellectual content, and approved the final version.

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## Human Participant Protection

The Vancouver Injection Drug Users Study and AIDS Care Cohort to Evaluate Exposure to Survival Services

study were approved by the University of British Columbia and Providence Health Care Research Institute research ethics boards. All participants provided informed consent.

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