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## The Effects of Childhood Maltreatment on Violent Injuries and Premature Death During Young Adulthood Among Urban High-Risk Men

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### Abstract

**Objective**—To assess childhood maltreatment as a risk factor for violent injuries and premature death in young adulthood and whether these associations are mediated by adolescent heavy drinking, hard drug use, hard drug selling, and violent offending.

**Design**—A prospective longitudinal study of boys followed from childhood into young adulthood.

**Setting**—Pittsburgh, Pennsylvania

**Participants**—A total 1,009 men of the Pittsburgh Youth Study

**Main Outcome Measures**—Premature deaths between ages 18 and 38 from the Social Security Death Index and self-reports of violent injuries inflicted by gunshot or knife between ages 18 and 28.

**Results**—Young men who experienced childhood maltreatment, compared to their counterparts who did not experience it, had a greater risk of violent injuries (relative risk [RR], 1.61; 95% confidence interval [CI], 1.01–2.35) and death (hazard ratio, [HR], 2.85; 95% CI, 1.37–5.93) during young adulthood. Adolescent violent offending and hard drug selling explained the association between childhood maltreatment and violent injuries, and violent offending partially accounted for the association between childhood maltreatment and premature death. Although adolescent violent offending predicted both outcomes, maltreated boys still had an increased risk of premature death (HR, 2.54; 95% CI, 1.21–5.34) after accounting for their adolescent violence.

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**Author Contributions:** Dr. White had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Study concept and design:* Lee, White

*Acquisition of data:* White

*Analysis and interpretation of data:* Lee, White

*Drafting of the manuscript:* Lee, White

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*Statistical analysis:* Lee

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*Study supervision:* White

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**Conclusions**—Childhood maltreatment significantly predicts premature death and violent injuries during young adulthood. These associations are partially explained by adolescent involvement in violence and drug dealing. Targeted interventions for maltreated boys to reduce their involvement in adolescent deviant behaviors may help decrease their risks for later serious injuries and premature death.

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Childhood maltreatment is a significant public health concern in the U.S. Data from the National Child Abuse and Neglect Data System (NCANDS) indicated that 9.3 children per 1,000 were victims of childhood maltreatment in 2009<sup>1</sup> and data from the 2005–2006 National Incidence Study (NIS-4) indicated rates of 39.5 children per 1000.<sup>2</sup>

Individuals maltreated in childhood, compared to non-maltreated individuals, are at higher risk for morbidity<sup>3–8</sup> and mortality<sup>9–12</sup> over the life span. Nevertheless, research focusing on the effects of childhood maltreatment on injuries and mortality has been largely limited to studies in early developmental periods<sup>5,10</sup> or later adulthood.<sup>3,11</sup> Most studies that examined later outcomes have relied on retrospective self-reports of childhood maltreatment.<sup>3,11</sup> No studies have clearly identified the potential mechanisms that might account for premature death and nonfatal injuries beyond early childhood. This study attempts to fill these gaps.

Findings from longitudinal studies of maltreated youth in adolescence and adulthood have been inconsistent with regard to whether these individuals are at higher risk for premature death. One study followed youth through age 18 and found that abused, compared to non-abused, children had an elevated risk of death.<sup>10</sup> Similarly, another found that adverse childhood experiences, including childhood abuse, were associated with an elevated risk of premature death in midlife.<sup>11</sup> In contrast, another study did not find that mortality rates differed between maltreated individuals and matched controls in young adulthood, after controlling for several demographic and family characteristics.<sup>12</sup> These inconsistencies may be due to differences in measures, observation periods, age cohorts, geographic area, and/or analytic methods.

Because death rates of young adults are over twice those of adolescents,<sup>13</sup> the mortality gap between maltreated and non-maltreated individuals might further increase in young adulthood. Accordingly, it is imperative to investigate the association between childhood maltreatment and premature death through young adulthood. Moreover, death might not be the only severe ramification of childhood maltreatment in adolescence and young adulthood; adolescents are likely to engage in risk behaviors,<sup>14</sup> which might lead to injuries that are not fatal but disabling. To date, no studies have concurrently investigated the association of childhood maltreatment with both violent injuries and premature death.

Attention should be paid to the mechanisms by which childhood maltreatment increases the risk of death and violent injuries. A problem behavior perspective<sup>15</sup> has the potential to explain this association. For example, involvement in deviant behaviors may increase the risk of non-fatal and fatal consequences. Specifically, adolescent substance use,<sup>16, 17</sup> drug selling,<sup>18</sup> and violence<sup>19–20</sup> are well-known precursors of the risk for mortality, as well as for violent injuries among adolescents and young adults. Considering that these behaviors are highly prevalent among individuals with childhood maltreatment histories,<sup>21–29</sup> these behaviors may be direct mechanisms linking childhood maltreatment to premature death and violent injuries in young adulthood.

This study focuses on adolescent risk behaviors because of the importance of early risk behaviors on developmental trajectories of deviant behaviors<sup>24, 29</sup> and the need to maintain the temporal order between mediators and outcomes. This study will contribute to the literature by examining whether childhood maltreatment increases the risk of violent injuries and/or premature death during young adulthood through adolescent heavy drinking, hard

drug use, hard drug selling, and violent offending after controlling for other childhood adversities and sociodemographic characteristics.

## METHODS

### STUDY DESIGN AND STUDY POPULATION

Subjects were boys from the Pittsburgh Youth Study (PYS), a prospective longitudinal study of youth development.<sup>30</sup> The PYS began in 1987 and initially consisted of three cohorts (N=1,517) who had been randomly selected from the first, fourth, and seventh grades of Pittsburgh public schools (referred to as the youngest, middle, and oldest cohorts, respectively). After an initial screening, the top 30% who screened at highest risk for antisocial behavior were included in the sample for follow-up, together with 30% randomly selected from the remainder. Over half of the sample was Black, and the rest were almost all White. More than 90% lived with their natural mother at the time of their screening. Although about one-third received public assistance, the boys were fairly evenly distributed across socioeconomic status (SES) levels.<sup>30</sup> The current study was limited to the youngest (N=503; age range at baseline: 5–9) and oldest (N=506; age range at baseline: 11–16) cohorts because the middle cohort was surveyed only from 1987 to 1991. Data were collected at approximate ages 7–20, 25, and 28 for the youngest cohort and approximate ages 13–25 and 34 for the oldest. The study was approved by the University of Pittsburgh (PA) Institutional Review Board.

### DEFINITIONS OF VARIABLES

Boys were identified *as maltreated* if any type of maltreatment (i.e., physical or sexual abuse, physical neglect, emotional maltreatment, or moral/legal/educational maltreatment) was substantiated, and they were first referred to Children and Youth Services (CYS) by age 13. Age 13 was chosen as the cutoff because a history of childhood maltreatment was fully documented for both cohorts through age 13. Those who were first referred to CYC between ages 14 and 17 (n=20 out of 298 referrals, 7%) were excluded to assure temporal order between childhood maltreatment and the mediators (ages 14–17). In addition, those who were referred to CYC but were unsubstantiated cases (n=76 out of 298 referrals, 26%) were excluded from the study because prior findings have been inconsistent about whether they more closely resemble substantiated cases<sup>31</sup> or non-maltreated cases<sup>32</sup> in terms of their risk behaviors. Also, referral to CYC could be biased by race and poverty.<sup>33–35</sup> The final sample consisted of 913 men (202 maltreated and 711 non-maltreated).

*Violent injuries* was defined if the man reported any gunshot or knife wound from ages 18 through 28 (average age 25 at their last report). Death data came from mortality records obtained from a search of the Social Security Death Index (SSDI) through July 27, 2010 when the youngest cohort was ages 27–32 (average age 29) and the oldest cohort was ages 34–38 (average age 35). *Premature death* was any death that occurred between ages 18 and 38.

The mediators were measured at ages 14 to 17, which was an intermediate period between childhood maltreatment and the outcomes. Because the frequency of engaging in the risk behaviors was low, all the mediators were coded as dichotomous variables. *Heavy drinking* was defined if boys reported typically drinking six or more drinks (of beer, wine or liquor) per occasion. *Hard drug use* was defined if boys reported using any illegal drug except marijuana (i.e., hallucinogens, cocaine, crack, heroin, phencyclidine, tranquilizers, barbiturates, codeine, amphetamines, and other prescription medications for nonmedical reasons). *Hard drug selling* was defined if boys reported selling any hard drugs (e.g., heroin, cocaine, or LSD). Violent offending was assessed using official conviction records (country,

state, and/or federal) or self-or caretaker-report of the youth committing robbery, attacking to hurt or kill, homicide, manslaughter, rape or forced sex, simple assault, or gang fighting. *Violence* was defined as any violent offense between age 14 and age 17.

To disentangle the impact of childhood maltreatment from other adverse childhood experiences, four domains of household dysfunction were measured. Approximately at ages 8 and 15 for the youngest and oldest cohorts, respectively, the primary caretaker (usually the mother) was asked about female and male caretaker problems. *Caretaker's alcohol/drug problems* was defined if any caretaker sought help for a substance use problem. *Caretaker's mental illness* was defined if a caretaker had ever sought help for any mental health problem (i.e., depression, anxiety, mental retardation, or schizophrenia). *Caretaker's incarceration* was defined if any caretaker had ever been incarcerated. *Not living with two biological parents* was defined if the primary caretaker was ever widowed, never married, or ever divorced/separated, or there was no female caretaker up to age 17 for the participant. The *household dysfunction score* was the sum of these four domains, ranging from 0 to 4, which is similar to a measure used in previous research.<sup>11</sup> Because cohort differences in patterns of alcohol use and violence have been found in this sample,<sup>36–37</sup> *cohort* (oldest vs. youngest) was controlled in the analyses. *Parental socioeconomic status* (SES), based on the Hollingshead's index of social status<sup>38</sup> at the first follow-up assessment, was also controlled. *Race/ethnicity* was controlled with Blacks compared to Whites and other/mixed race/ethnicities. *Age* at the initial screening was included to account for within-cohort differences in age and age differences in outcomes.

## STATISTICAL ANALYSIS

All analyses were conducted with the STATA system, version 11.0.<sup>39</sup> Chi-square analyses and *t*-tests were conducted to compare characteristics between maltreated and non-maltreated young men. Bivariate correlations are reported for all the variables included in the multivariate analyses. A generalized linear model with a log link and binomial error distribution was used to examine the effects of childhood maltreatment experiences on violent injuries through the hypothesized mediators. The Kaplan-Meier method and the log-rank test were conducted to assess the relative risk of death between the maltreated and non-maltreated groups.<sup>40</sup> Cox proportional hazard method for survival analysis was used to estimate the hazard of death for non-maltreated and maltreated young men through the proposed mediators.<sup>40</sup> Two respondents who died prior to age 17 were eliminated due to a temporal order issue. Relative risk ratios (RRs) for serious injuries, hazard ratios (HRs) for premature death, and 95% confidence intervals (CIs) are reported.

For both outcomes, individual mediators were first added separately, and all significant mediators ( $P < .05$ ) from the single mediator models were tested simultaneously in a multiple mediator model.<sup>41–42</sup> Missing data ranged from 4.3 % to 6.5%. All missing data except for the dependent variables were imputed under the missing-at-random assumption.<sup>43</sup>

## RESULTS

### CHARACTERISTICS OF MALTREATED YOUNG MEN

Table 1 presents results from bivariate analyses comparing characteristics of maltreated (22.1%) and non-maltreated (77.9%) young men. Maltreated, compared to non-maltreated, young men were slightly younger at screening (9.2 vs 9.8 years;  $P < .05$ ) and were more likely to be Black (25.6% vs 18.1%;  $P < .01$ ) and to be in the youngest cohort (26.0% vs 18.2%;  $P < .01$ ). Maltreated young men were also significantly more likely to grow up in a lower SES household (29.4 vs 37.6;  $P < .001$ ), with a caretaker who was in an unstable marriage (87.6% vs 65.0%;  $P < .001$ ), and with a caretaker(s) who were more likely to have

alcohol/drug (18.3% vs 8.9 %;  $P<.001$ ) and mental health (28.7% vs 17.9%;  $P<.01$ ) problems and higher rates of incarceration (10.9% vs 2.1%;  $P<.001$ ). Maltreated, compared to non-maltreated, young men reported significantly higher rates of hard drug selling (29.7% vs 17.6%;  $P<.001$ ) and violent offending (51.0% vs 30.7%;  $P<.001$ ) during adolescence. There was no significant difference in heavy drinking or hard drug use between the two groups. During young adulthood, maltreated, compared to non-maltreated, young men had a greater risk of violent injuries (18.8% vs 11.1%;  $P<.01$ ) and mortality (7.4% vs 2.5%;  $P<.01$ ).

Table 2 shows the correlations among all the variables included in the multivariate analyses. All the problem behaviors were significantly related to each other but multicollinearity was not a problem in multivariate model.

### **DIRECT AND MEDIATED EFFECTS OF CHILDHOOD MALTREATMENT ON VIOLENT INJURIES**

Table 3 shows that, after adjusting for covariates, maltreated, compared to non-maltreated, young men were more likely to be injured (RR, 1.61; 95% CI, 1.10–2.35). The effect of childhood maltreatment was slightly reduced by individually adding heavy drinking, hard drug selling, and violent offending to the model (panels 2, 4, and 5). After adding these three significant mediators to the same model (panel 6), the effect of childhood maltreatment was no longer significant (RR, 1.32; 95% CI, 0.93–1.89). Hard drug selling (RR, 1.89; 95% CI, 1.30–2.75) and violent offending (RR, 2.27; 95% CI, 1.51–3.40) significantly predicted violent injuries.

### **DIRECT AND MEDIATED EFFECTS OF CHILDHOOD MALTREATMENT ON PREMATURE DEATH**

There were a total of 35 deaths during the 913 person-year observation period, yielding a mortality rate of 3,834 per 100,000 person years (7,426 for maltreated and 2,813 for non-maltreated). The major cause of death was homicide (n=26), followed by an accident (n=3), unknown (n=3), natural (n=2), and suicide (n=1). Survival curves between non-maltreated and maltreated young men based on the Kaplan-Meier estimator are shown in Figure 1. Compared to non-maltreated young men, maltreated young men had a significantly diminished survival time through young adulthood (log-rank=9.72,  $P=.002$ ).

Table 4 shows that, after controlling for the covariates, death rates were higher for maltreated than non-maltreated young men (HR, 2.85; 95% CI, 1.37–5.93). The risk of childhood maltreatment on premature death was reduced by adolescent violent offending, although the effect of childhood maltreatment on premature death remained significant (HR, 2.54; 95% CI, 1.21–5.34), indicating only a partial mediation effect. Adolescent heavy drinking, hard drug use, and hard drug selling were not significant mediators.

### **COMMENT**

This study sought to extend our understanding of the association between childhood maltreatment and premature death and violent injuries. The results indicated that young men who experienced childhood maltreatment and were referred by age 13, compared to their counterparts who did not experience it, had a greater risk of violent injuries and death during young adulthood, as well as greater risks of engaging in risk behaviors during adolescence. Hard drug selling and violent offending during adolescence (ages 14–17) were underlying mechanisms linking childhood maltreatment to violent injuries. Adolescent violence, in particular, remained a strong and significant predictor for both violent injuries and death



after accounting for sociodemographic and familial factors, as well as childhood maltreatment.

The findings are consistent with a problem behavior perspective<sup>15</sup> and prior research, which has shown that childhood maltreatment plays a major role in the development of deviant behaviors,<sup>21–29</sup> and that these behaviors appear to increase the risk of violent injuries and mortality.<sup>16–20</sup> However, previous studies have not formally tested this potential mediation effect.

Researchers have suggested that childhood maltreatment might be only one type of childhood adversity that contributes to the development of negative health outcomes. That is, the adverse association between childhood maltreatment and health outcomes might be accounted for by the potentially confounding effects of other childhood adversities, such as parental substance use and poverty,<sup>44–45</sup> which may ultimately increase the likelihood of a false positive relationship. Except for one study,<sup>12</sup> prior studies focusing on childhood maltreatment and mortality could not fully disentangle confounding associations. This study intended to clarify this issue. After adjusting for demographic characteristics and household dysfunction scores, the risk of death was almost twice as high and risk of violent injuries was approximately 60% higher for maltreated than non-maltreated young men. The fact that these findings are different from White and Widom,<sup>12</sup> who found no significant effects of childhood maltreatment on premature death, may be due to several differences between the two studies. There may be a period effect because the youths in this study grew up in an inner city in the 1980s and 1990s when American society experienced a dramatic increase in rates of violence and homicide during the crack-cocaine epidemic.<sup>18, 46</sup> The fact that 74% of cases who died were homicide victims might, in part, explain the period effect. White and Widom's sample was born during an earlier time period (before 1971) and also included both men and women. Further, racial and geographic area differences between the two samples might account for the differences in findings.

We focused on deviant behaviors only during adolescence as mediators due to the issue of temporal order. Yet, persistent risky behaviors throughout adulthood might lead to fatal or near fatal consequences. Future research should examine adulthood risk behaviors as potential mediators. In addition, there might be other mechanisms linking childhood maltreatment to violent injuries and premature death, such as social support,<sup>47–48</sup> community violence,<sup>49</sup> peer delinquency,<sup>50</sup> accessibility to emergency care, or attitudes towards seeking help from “the system” (i.e., police),<sup>51</sup> which should be tested in future studies.

Several features of this study warrant attention when interpreting the results. First, the sample represents young men who grew up in an inner city, and approximately half were prone to antisocial behavior at screening. Thus, the results may not generalize to lower-risk males, females, or youth who live in different environments. Moreover, any individuals who experienced childhood maltreatment after age 13 were excluded due to a lack of comparable information for the youngest cohort and also to establish the hypothesized temporal order between the predictor and mediators. Thornberry et al.<sup>21</sup> found that maltreatment during adolescence had significant effects on substance use, violence, and suicidal thoughts. Therefore, the effects of childhood maltreatment on the outcomes in this study may have been underestimated. In addition, although the measures improved on those of previous studies because they included both official and reported data from diverse sources, measures of heavy drinking, drug use, drug selling, and violent injuries were based only on youth self reports. Nonetheless, reliability and validity of self-report data has been established in many studies.<sup>52</sup> Due to a relatively small sample size, this study did not examine whether different types, severity, and age of childhood maltreatment, as well as receiving foster, care might

affect the risk of premature death and violent injuries among maltreated individuals. Future research with larger samples should examine these potential moderators.

Despite these limitations, this study contributes compelling evidence supporting childhood maltreatment as a key risk factor for both violent injuries and death during young adulthood in a contemporary sample. In addition, violent offending during adolescence appears to be an important mediator. Violent offending and being a victim of violence, however, are intertwined and mutually influence each other.<sup>20</sup> Adolescent violent offending is strongly correlated to violent crime in adulthood, especially for maltreated individuals,<sup>24</sup> which in turn increases the risk of violent injuries and mortality. Accordingly, it is imperative to provide targeted prevention for maltreated youth to help them deal with their maltreatment experience and reduce their involvement in adolescent risk behaviors and later violent offending. In addition, social policies should focus on alleviating fundamental structural problems (e.g., poverty, single parenting, community violence, difficulties in accessing health care) that contribute to childhood maltreatment, as well as to the risk of death and injuries for maltreated individuals.

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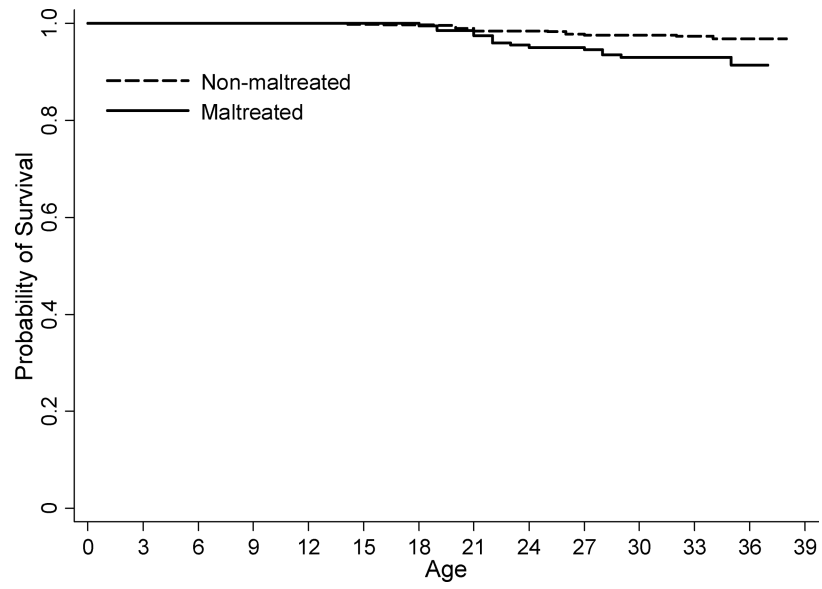
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**Figure 1.**  
Kaplan-Meier Estimate of Survival Probabilities among Maltreated and Non-maltreated Young Men  
\*Survival curves between the two groups differed significantly (Log-rank=9.72,  $P=.002$ ).

**Table 1**

## Characteristics of Participants by Childhood Maltreatment

Characteristics	Mean (SD), %		P value	
	Maltreated (n = 212)	Non-maltreated (n = 711)		
Demographic controls	Age at screening	9.8 (3.3)	9.2 (3.2)	< .05
	Black	48.5	37.6	< .01
	White/other/mixed race/ethnicity	51.5	62.4	
	Parental SES	29.4 (12.9)	37.6 (13.5)	< .001
	Youngest cohort	51.9	40.6	< .01
	Oldest cohort	48.1	59.4	
Household dysfunction up to adolescence	Not living with two biological parents	87.6	65.0	< .001
	Caretaker's alcohol/drug problems	18.3	8.9	< .001
	Caretaker's mental health problems	28.7	17.9	< .01
	Caretaker's incarceration	10.9	2.1	< .001
	Household dysfunction score	1.5 (0.9)	0.9 (0.7)	< .001
Mediators during adolescence	Heavy drinking	45.5	42.2	.42
	Hard drug use	19.3	13.9	.06
	Hard drug selling	29.7	17.6	< .001
	Violent offending	51.0	30.7	< .001
Outcomes during young adulthood	Violent injuries <sup>a</sup>	18.8	11.1	< .01
	Premature death <sup>b</sup>	7.4	2.5	< .01

Abbreviations: SES, socioeconomic status.

<sup>a</sup>Study participants (n = 854) are those who had violent injury information between ages 18 and 28.

<sup>b</sup>Study participants (n = 911) are those who had death information between age 18 and July 27, 2010.

**Table 2**

**Bivariate Correlations for All Variables in Multivariate Analysis<sup>a</sup>**

	1	2	3	4	5	6	7	8	9	10	11	12
1. Childhood Maltreatment	1.00											
2. Heavy drinking	.05	1.00										
3. Hard drug use	.13	.50*	1.00									
4. Hard drug selling	.23*	.38*	.39*	1.00								
5. Violent offending	.30*	.35*	.19*	.48*	1.00							
6. Age at screening	-.07	.08*	.03	.04	.17*	1.00						
7. Youngest cohort <sup>b</sup>	.16*	-.16*	-.07	-.05	-.23*	-.97	1.00					
8 Black <sup>c</sup>	.16*	-.36*	-.32*	.45*	.27*	.03	.02	1.00				
9. Parental SES	-.25*	.01	.09*	-.18*	-.17*	-.01	-.04	-.23*	1.00			
10. Household dysfunction	.27*	-.002	-.005	.12*	.17*	-.19*	.21*	.22*	-.18*	1.00		
11. Violent injuries	.20*	.10	.02	.43*	.43*	.10*	-.18*	.32*	-.11*	.03	1.00	
12. Premature death	.27*	.03	-.02	.30*	.35*	.03	-.09	.41*	-.03	.06	.13	1.00

<sup>a</sup>Three forms of correlation are used, depending on the characteristics of variables: the Pearson correlation between two continuous variables, the point-biserial correlation between a dichotomous and a continuous variable, and the tetrachoric correlation for two dichotomous variables.

<sup>b</sup>Oldest cohort is the reference group.

<sup>c</sup>White and other race/ethnic groups is the reference group.

\*  $P < .05$ .

**Table 3**Direct and Mediated Effects of Childhood Maltreatment on Violent Injuries<sup>a,d</sup>

	Risk Ratio (95% CI)					
	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
Childhood Maltreatment	1.61 (1.10–2.35)	1.57 (1.07–2.29)	1.58 (1.08–2.32)	1.44 (1.005–2.07)	1.43 (0.99–2.08)	1.32 (0.93–1.89)
Mediators						
Heavy drinking		1.44 (1.02–2.05)				1.00 (0.71–1.42)
Hard drug Use			1.19 (0.72–1.97)			
Hard drug selling				2.36 (1.64–3.40)		1.89 (1.30–2.75)
Violent offending					2.63 (1.79–3.86)	2.27 (1.51–3.40)
Covariates						
Age at screening	1.01 (0.82–1.24)	1.00 (0.82–1.22)	1.01 (0.82–1.23)	0.96 (0.79–1.17)	0.97 (0.80–1.18)	0.94 (0.77–1.15)
Youngest cohort <sup>b</sup>	0.62 (0.16–2.39)	0.63 (0.17–2.33)	0.62 (0.16–2.37)	0.49 (0.13–1.84)	0.57 (0.16–2.07)	0.50 (0.14–1.83)
Black <sup>c</sup>	2.22 (1.46–3.37)	2.45 (1.60–3.75)	2.28 (1.49–3.49)	1.86 (1.21–2.87)	2.02 (1.34–3.06)	1.79 (1.15–2.78)
Parental SES	0.99 (0.98–1.00)	0.99 (0.98–1.00)	0.99 (0.98–1.00)	0.99 (0.98–1.00)	0.99 (0.98–1.00)	0.99 (0.98–1.01)
Household dysfunction	0.96 (0.75–1.22)	0.95 (0.75–1.20)	0.95 (0.74–1.21)	0.92 (0.74–1.15)	0.85 (0.66–1.09)	0.84 (0.67–1.06)

Abbreviations: CI, confidence interval; SES, socioeconomic status.

<sup>a</sup>Study participants (n = 854) are those who had violent injury information between ages 18 and 28.<sup>b</sup>Oldest cohort is the reference group.<sup>c</sup>White and other race/ethnic groups is the reference group.<sup>d</sup>Panel 1 shows the effect of childhood maltreatment on violent injuries while controlling for covariates. Panels 2 through 5 show the effect of childhood maltreatment on violent injuries while separately controlling for plausible mediators: heavy drinking, hard drug use, hard drug selling, and violent offending, respectively. Panel 6 shows the effect of childhood maltreatment on violent injuries while controlling for all significant mediators from panels 2 through 5 ( $p < .05$ ).



**Table 4**Direct and Mediated Effects of Childhood Maltreatment on Premature Death<sup>a, d</sup>

	Hazard Ratio (95% CI)				
	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5
Childhood Maltreatment	2.85 (1.37–5.93)	2.83 (1.36–5.90)	2.86 (1.37–5.97)	2.68 (1.29–5.57)	2.54 (1.21–5.34)
Mediators					
Heavy drinking		1.25 (0.62–2.52)			
Hard drug Use			0.94 (0.33–2.73)		
Hard drug selling				1.66 (0.80–3.44)	
Violent offending					2.66 (1.24–5.68)
Covariates					
Age at screening	0.97 (0.64–1.46)	0.97 (0.64–1.45)	0.97 (0.64–1.46)	0.96 (0.64–1.44)	0.94 (0.63–1.41)
Youngest cohort <sup>b</sup>	0.55 (0.04–8.09)	0.55 (0.04–7.92)	0.54 (0.04–8.08)	0.53 (0.04–7.60)	0.53 (0.04–7.47)
Black <sup>c</sup>	4.55 (1.72–12.04)	4.81 (1.79–12.93)	4.51 (1.68–12.08)	4.09 (1.52–11.00)	4.21 (1.58–11.20)
Parental SES	1.01 (0.98–1.03)	1.01 (0.98–1.03)	1.01 (0.98–1.03)	1.01 (0.98–1.03)	1.01 (0.98–1.04)
Household dysfunction	1.13 (0.70–1.81)	1.13 (0.70–1.80)	1.13 (0.70–1.82)	1.13 (0.71–1.79)	1.02 (0.63–1.67)

Abbreviations: CI, confidence interval; SES, socioeconomic status.

<sup>a</sup>Study participants (n = 911) are those who had death information between age 18 and July 27, 2010.<sup>b</sup>Oldest cohort is the reference group.<sup>c</sup>White and other race/ethnic groups is the reference group.<sup>d</sup>Panel 1 shows the effect of childhood maltreatment on premature death while controlling for covariates. Panels 2 through 5 show the effect of childhood maltreatment on premature death while separately controlling for plausible mediators: heavy drinking, hard drug use, hard drug selling, and violent offending, respectively. Because only violent offending was a significant mediator, there was no reason to test any of the mediators in combination.