

# Attention-Deficit/Hyperactivity Disorder, Conduct Disorder, and Young Adult Intimate Partner Violence

Xiangming Fang, PhD; Greta M. Massetti, PhD; Lijing Ouyang, PhD; Scott D. Grosse, PhD; James A. Mercy, PhD

**Context:** Studies based on clinical samples suggest a connection between childhood attention-deficit/hyperactivity disorder (ADHD) and later intimate partner violence (IPV) perpetration.

**Objective:** To examine the association between retrospectively reported childhood ADHD and conduct disorder (CD) symptoms and the perpetration of physical IPV in a population-based sample of young adults.

**Design, Setting, and Participants:** The study population consisted of 11 238 participants (mean [SD] age, 22.0 [1.7] years) in the National Longitudinal Study of Adolescent Health. Multinomial logistic regressions and propensity score matching were used to analyze the relationships of IPV with symptoms of ADHD domains (hyperactive/impulsive and inattentive) and symptoms of CD as well as with ADHD and CD dichotomized on the basis of symptom criteria.

**Main Outcome Measures:** Respondents' answers to the 2 questions in the wave III survey reflecting perpetration of physical violence toward a partner were used to define IPV perpetration. Intimate partner violence perpetration resulting in injury or not was assessed with a follow-up question.

**Results:** Conduct disorder significantly predicted IPV perpetration both with and without injury. Controlling for CD and hyperactivity/impulsivity, inattention independently predicted young adult IPV perpetration without injury. Controlling for inattention and CD, no significant relationship between hyperactivity/impulsivity and IPV perpetration without injury was found. Results were different regarding IPV perpetration resulting in injury. Hyperactivity/impulsivity, but not inattention, independently predicted IPV perpetration resulting in injury. In categorical analyses, CD predicted both types of IPV, and ADHD significantly predicted IPV perpetration resulting in injury but did not significantly predict IPV perpetration without injury.

**Conclusions:** Conduct disorder is consistently associated with violence in intimate relationships. Controlling for CD, there is also an association between ADHD and IPV. Results suggest the need for services and treatment strategies that specifically address the risks for violence and promote healthy intimate relationships for youths with CD and ADHD.

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**Author Affiliations:** National Center for Injury Prevention and Control (Drs Fang, Massetti, and Mercy) and National Center on Birth Defects and Developmental Disabilities (Drs Ouyang and Grosse), Centers for Disease Control and Prevention, Atlanta, Georgia.

**I**NTIMATE PARTNER VIOLENCE (IPV) is a serious public health problem affecting millions of people each year in the United States. It can be defined as physical, sexual, or psychological harm by a current or former partner or spouse.<sup>1</sup> It results in approximately 2 million injuries requiring medical attention and 1500 deaths annually.<sup>2,3</sup> Other potential consequences of IPV include posttraumatic stress disorder, depression, reproductive health problems, irritable bowel syndrome, and chronic pain.<sup>4-6</sup> The costs of IPV against women alone exceed an estimated \$8.3 billion (2003 dollars) per year.<sup>7,8</sup>

As recognition of IPV as a serious problem increases, research has identified various risk factors for IPV perpetration, including history of being maltreated or witnessing IPV during childhood, youth

conduct problems or antisocial behaviors, family poverty, parental education, low social capital, and traditional sex role norms.<sup>2,9-12</sup> However, one potential factor that has received little research attention is the presence of childhood attention-deficit/hyperactivity disorder (ADHD) symptoms.

Attention-deficit/hyperactivity disorder is the most commonly diagnosed neurobehavioral disorder in childhood, present in 3% to 10% of children in the United States.<sup>13</sup> Children and adolescents with ADHD experience impairment in many functional areas and studies document that impairments often persist through adolescence and young adulthood, resulting in adverse outcomes such as impaired academic functioning, low self-esteem, poor social functioning, tobacco, drug, and alcohol abuse, delinquency, and conduct

problems.<sup>13,14</sup> Studies have found that aggressive criminal offenders have higher rates of ADHD symptoms in childhood<sup>15</sup> and that childhood ADHD predicts self-reported violence and violent offending convictions longitudinally.<sup>16</sup> While research has documented a connection between childhood ADHD and later violence, these findings have largely focused on violence outside intimate relationships. Given the risk of later interpersonal violence in youths with elevated levels of ADHD symptoms, these may also increase the risk for IPV.

Only a small number of studies have examined the association of ADHD symptoms with the risk for IPV. In a sample of 65 males in a court-mandated domestic violence treatment program, Mandell<sup>17</sup> found that 94% had ADHD scores above a clinical cutoff. In a college sample of 157 students, Theriault and Holmberg<sup>18</sup> found that the presence of ADHD symptoms was a small but significant predictor of physical relationship aggression. While both studies suggest a connection between childhood ADHD and physical IPV, there are a number of limitations to the conclusions that can be drawn. First, both studies were based on small, selected samples rather than population samples. Findings thus have limited generalizability, and results should be replicated with larger, representative samples. Second, neither study distinguished between inattention (IA) and hyperactivity/impulsivity (HI) in the relationship between ADHD symptoms and partner aggression. Previous studies have shown that the relationship between ADHD and other health outcomes such as smoking and substance abuse are domain-specific associations, with relationships related to IA or HI specifically.<sup>19-22</sup> Likewise, a previous study using the same data set as the present study showed a much stronger association of child neglect and abuse with IA symptoms than with hyperactivity.<sup>23</sup>

This article investigates whether links between childhood ADHD and young adult physical IPV perpetration may be attributable to IA or to HI. Furthermore, given the comorbidity between conduct disorder (CD) and ADHD (estimated at 25%-75%),<sup>24,25</sup> it is critical to explore whether ADHD is associated with young adult IPV when the co-occurrence with CD is taken into account or whether the ADHD-IPV relationship is fully accounted for by CD symptoms. Studies examining the relationships between ADHD and outcomes associated with violence, such as substance use and abuse, have reported inconsistent findings with respect to the role of CD. For example, while some studies have reported that the relationship between ADHD and outcomes disappears when the presence of CD and other externalizing problems is taken into account, others have found that ADHD is an independent longitudinal predictor even after controlling for CD. In addition, studies have found that ADHD and CD in combination may constitute a higher risk for negative outcomes than either disorder alone.<sup>26</sup> As CD is a consistent predictor of IPV perpetration,<sup>27,28</sup> the issue of the predictive relationship between ADHD independent of and comorbid with CD is an important one to explore.

This study used a US longitudinal and nationally representative sample to examine the relationships between different types of childhood ADHD symptoms and

young adult physical IPV perpetration (resulting in injury or without injury). This study further examined whether childhood ADHD symptoms predict IPV when comorbidity with CD is considered.

## METHODS

### DATA SOURCE AND STUDY SAMPLE

We used data from the National Longitudinal Study of Adolescent Health (Add Health), a longitudinal study following a nationally representative probability sample of adolescents in grades 7 through 12 in the 1994-1995 school year.<sup>29</sup> There are 3 waves of Add Health data available, collected from April to December 1995, from April to August 1996, and from August 2001 to April 2002. The mean ages of participants during the 3 waves of data collection were 15.7 years, 16.2 years, and 22.0 years, respectively.

Of the 18 835 adolescents who participated in wave I and were eligible for wave III interview, 2167 individuals could not be located for wave III and 1228 individuals were located but did not participate (eg, were unavailable after repeated attempts; had language barriers; were institutionalized or incarcerated). In addition, 1109 individuals refused to participate, and data could not be used for another 9 individuals because of data anomalies. Thus, there were 14 322 participants (76% of the original sample) at wave III.<sup>30</sup> Analyses of nonresponse indicate that the wave III sample adequately represents the same population as the wave I sample when final sampling weights are used to compute population estimates.<sup>30</sup>

Our study was based on 14 322 participants interviewed during wave I and wave III. Participants were asked in wave III to report an inventory of all sexual or romantic relationships during the past 6 years (since wave I). Participants answered detailed questions (including the IPV questions used in the present analyses) for sexual relationships and for those relationships participants identified as the 2 most important (detailed information about relationship selection is available on the Add Health study Web site, <http://www.cpc.unc.edu/projects/addhealth/>).

To investigate the relationship between ADHD and young adult IPV perpetration, 2584 participants were excluded because they reported no relationships during the preceding 6 years. This reduced the sample for analyses to 11 738 participants. An additional 500 respondents were excluded because they were missing information on outcome variables or covariates, resulting in a final analysis sample of 11 238 participants. For data analysis, data describing participants' sociodemographic characteristics and CD symptom self-reports from wave I of the Add Health study were combined with wave III self-reported IPV perpetration and retrospective reports of childhood ADHD symptoms.

## MEASURES

### Physical IPV Perpetration

In wave III, in a computer-assisted self-interview, respondents answered 2 questions reflecting physical IPV perpetration for each sexual or important intimate relationship during the past 6 years: "How often (if the romantic or sexual relationship lasted for more than a year, add 'in the past year') have you threatened your partner with violence, pushed or shoved him or her, or thrown something at him or her that could hurt?" and "How often (if the romantic or sexual relationship lasted for more than a year, add 'in the past year') have you slapped, hit, or kicked your partner?" The following scale was used for questions re-

lated to the respondent's perpetration of IPV: score of 0, never; score of 1, once; score of 2, twice; score of 3, 3 to 5 times; score of 4, 6 to 10 times; score of 5, 11 to 20 times; score of 6, 20 or more times; and score of 7, did not happen in the past year but happened prior to that. Responses for each question were re-coded into 2 categories (yes for scores of 1-7; no for scores of 0) for regression analysis. Perpetration of IPV was defined as the respondent answering yes to either of the 2 questions. Perpetration of IPV resulting in injury was assessed with a follow-up question: "How often has your partner had an injury such as a sprain, bruise, or cut because of a fight with you?" For those respondents who reported IPV perpetration at least once during the preceding 6 years, this information was used to code whether the respondent had perpetrated any IPV resulting in injury (yes for  $\geq 1$  time; no for never).

The severity of IPV has been found to be associated with a variety of mental, physical, and social consequences.<sup>31</sup> One crude indicator of IPV severity is whether a physical injury occurs. According to a national survey, approximately 30% of women who were injured as a result of IPV received health care for their injuries.<sup>2</sup> Physical injuries are associated with both the duration of abuse and dangerousness of the tactics used to inflict abuse (eg, slap vs kick vs use of a weapon).<sup>31</sup> Therefore, IPV with injury was included as an outcome category in this study to determine whether ADHD was associated with more severe IPV. We classified the respondents into 3 mutually exclusive categories: (1) no IPV perpetration history (no reported history of IPV perpetration within any relationship during the preceding 6 years); (2) IPV perpetration without injury (respondent reported IPV toward a partner at least once during the preceding 6 years and did not report violence resulting in injury); and (3) IPV perpetration resulting in injury (respondent reported IPV toward a partner at least once during the preceding 6 years and reported violence resulting in injury at least once).

### ADHD and CD Symptoms

In wave III, participants retrospectively reported ADHD symptoms experienced between ages 5 and 12 years using a symptom checklist. Participants reported the frequency of each *DSM-IV* symptom of ADHD on a 4-point Likert scale: never or rarely; sometimes; often; or very often. One item (spiteful or vindictive) is not actually an ADHD symptom and was therefore excluded from analyses, while 1 *DSM-IV* impulsivity symptom (often interrupts or intrudes on others) was mistakenly excluded from the survey. Analyses thus included 9 IA and 8 HI symptoms. Consistent with prior studies using symptom checklists,<sup>21,32</sup> a symptom was considered present if it was experienced often or very often. The total number of symptoms reported (0-9 for IA; 0-8 for HI) was used to examine the relationship between ADHD symptoms and IPV. For categorical analyses, ADHD diagnostic categories were created by categorizing participants who reported 6 or more symptoms of IA, HI, or both (consistent with *DSM-IV* ADHD diagnostic criteria).

The measure of CD was also a symptom checklist, which included responses to the 13 *DSM-IV* CD symptoms collected at wave I. Participants were divided into CD diagnostic categories if they reported 3 or more symptoms of CD (consistent with *DSM-IV* criteria).

### Sociodemographic Factors

Several sociodemographic factors that have documented associations in the literature with IPV perpetration<sup>33,34</sup> from the wave I assessment were included to control for potential confounders. These sociodemographic factors included race/ethnicity, family structure, primary caregiver education, biological fa-

**Table 1. Sociodemographic Characteristics, Attention-Deficit Hyperactivity Disorder Symptoms, Conduct Disorder Symptoms, and Intimate Partner Violence Perpetration History for the Sample**

Variable	Value
No IPV perpetration history, % (95% CI)	72.9 (72.1-73.7)
IPV without injury, % (95% CI)	21.6 (20.8-22.4)
IPV resulting in injury, % (95% CI)	5.5 (5.1-5.9)
ADHD diagnostic category, % (95% CI)	8.4 (7.8-8.9)
CD diagnostic category, % (95% CI)	12.4 (11.8-13.0)
Sex, % (95% CI)	
Female	50.4 (49.4-51.3)
Male	49.6 (48.7-50.6)
Race/ethnicity, % (95% CI)	
Hispanic	11.5 (10.9-12.1)
Non-Hispanic white	68.8 (68.0-69.7)
Non-Hispanic black	14.6 (14.0-15.3)
Non-Hispanic other	5.1 (4.7-5.4)
Primary caregiver education, % (95% CI)	
<High school	15.2 (14.5-15.9)
High school or equivalent	33.0 (32.2-33.9)
Some college	27.9 (27.1-28.8)
$\geq$ College graduate	23.8 (23.0-24.6)
Family income index, % (95% CI)	
$\leq 1$ FPL	13.6 (13.0-14.2)
1 to $\leq 2$ FPL	18.2 (17.5-18.9)
2 to $\leq 4$ FPL	44.8 (43.9-45.8)
$> 4$ FPL	23.4 (22.6-24.2)
Family structure, % (95% CI)	
Two biological parents	51.7 (50.7-52.6)
Two parents with $\geq 1$ nonbiological	22.5 (21.8-23.3)
Single parent or other	25.8 (25.0-26.6)
Jailed father, % (95% CI)	
Ever served in jail	12.6 (12.0-13.2)
Not served in jail	81.9 (81.2-82.7)
Missing data	5.5 (5.1-5.9)
Symptoms, mean (SD)	
IA	1.23 (1.91)
HI	1.69 (1.90)
CD	0.94 (1.45)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; CD, conduct disorder; CI, confidence interval; FPL, federal poverty level; HI, hyperactivity/impulsivity; IA, inattention; IPV, intimate partner violence.

ther's history of incarceration, family size-adjusted income relative to federal poverty level, sex, and birth year dummies (to capture cohort effects). Response categories for each of these variables are provided in **Table 1**. Missing data for the father incarceration variable were treated as a separate category because 6% of the data were missing. Also, missing data for family income were imputed as a continuous variable on the basis of an equation predicting income based on race/ethnicity, region, urban or rural status, family structure, receipt of public assistance, and whether the residence was well kept.

### STATISTICAL ANALYSIS

Multinomial logistic regressions were used to analyze the relationships among childhood ADHD (IA or HI symptoms), CD symptoms, and young adult IPV perpetration, controlling for sociodemographic factors. The outcome variable was whether the respondents reported no IPV perpetration, perpetrated IPV without injury, or perpetrated IPV resulting in injury. Because the distributions of IA, HI, and CD symptoms were highly skewed with most participants reporting no symptoms, we log-transformed the symptom counts to reduce skewness and then

**Table 2. Weighted Estimates of Attention-Deficit/Hyperactivity Disorder and Conduct Disorder Characteristics by No Intimate Partner Violence Perpetration History, Intimate Partner Violence Perpetration Without Injury, and Intimate Partner Violence Perpetration Resulting in Injury**

Category	IPV Perpetration History, No. (%)			Unadjusted OR (95% CI)	
	Never	IPV Without Injury	IPV Resulting in Injury	IPV Without Injury vs Never	IPV Resulting in Injury vs Never
ADHD diagnostic category					
No	7552 (73.4)	2204 (21.4)	538 (5.2)		
Yes <sup>a</sup>	641 (67.9)	223 (23.6)	80 (8.5)	1.19 (1.01-1.40) <sup>b</sup>	1.75 (1.35-2.25) <sup>c</sup>
CD diagnostic category					
No	7318 (74.3)	2060 (20.9)	466 (4.7)		
Yes <sup>a</sup>	875 (62.8)	367 (26.3)	152 (10.9)	1.49 (1.30-1.70) <sup>c</sup>	2.82 (2.31-3.44) <sup>c</sup>
Comorbid ADHD and CD categories					
No	8061 (73.1)	2370 (21.5)	593 (5.4)		
Yes <sup>a</sup>	132 (61.7)	57 (26.6)	25 (11.7)	1.47 (1.05-2.03) <sup>b</sup>	2.57 (1.59-4.01) <sup>c</sup>

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; CD, conduct disorder; CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.  
<sup>a</sup>For the unadjusted OR, the reference category for each yes variable is the absence of the condition (eg, yes for ADHD vs no for ADHD; yes for CD vs no for CD).  
<sup>b</sup> $P < .05$ .  
<sup>c</sup> $P < .01$ .

converted them to standard scores to facilitate interpretations of the corresponding adjusted odds ratios (ORs).<sup>20</sup>

We also conducted multinomial logistic regressions using ADHD and CD diagnostic categories as dummy variables. Finally, to test the robustness of the multinomial logistic regression results, we ran analyses with diagnostic categories using propensity score 1-to-1 matched samples. Propensity score matching is a method used to approximate a randomized controlled setting where cases (subjects with ADHD or CD) and controls (subjects without ADHD or CD) were compared on IPV perpetration (without injury or resulting in injury). Successful matching can reduce bias introduced by systematic differences between subjects with ADHD (or CD) and those without ADHD (or CD) with respect to confounding covariates. A user-supplied routine in Stata software, PSMATCH2, was used to perform nearest-neighbor propensity score matching.<sup>35</sup> The propensity score method does not incorporate the survey design (sample weights or cluster effect) because propensity score matching uses only a matched subset of the full sample.

To assess sex differences in the associations among ADHD, CD, and IPV perpetration, sex  $\times$  symptom dimension (or sex  $\times$  diagnostic category) terms were added to each multinomial logistic regression model. No significant interactions were found between sex and each of the ADHD and CD symptom dimensions or diagnostic categories in any model tested. Results indicated that the associations among ADHD, CD, and IPV perpetration were similar for males and females. Therefore, only results of regression models including main effects are presented.

Analyses were conducted with Stata SE version 9 statistical software (StataCorp LP, College Station, Texas). The Stata software allows for control of survey design effects of individuals clustered in sampling units of school and stratification of geographic region. Poststratification weights were applied to generate nationally representative estimates, except for the propensity score-matched estimates.

## RESULTS

### SAMPLE CHARACTERISTICS AND SEX DIFFERENCES

Table 1 presents weighted prevalence estimates and 95% confidence intervals (or standard deviations) of self-

reported ADHD symptoms, CD symptoms, IPV perpetration, and other sample characteristics. The weighted percentages of respondents reporting ADHD symptoms and CD symptoms above DSM-IV cutoffs were 8.4% and 12.4% respectively, which were similar to previously reported prevalence rates.<sup>21,36,37</sup> Similarly, the reported rate of IPV perpetration (27.1%, including IPV perpetration both without injury and resulting in injury) appears comparable to prevalence data of IPV victimization from other national surveys.<sup>38</sup>

### BIVARIATE ANALYSES

**Table 2** presents the unadjusted bivariate relationships between ADHD and CD diagnostic categories and IPV perpetration. Both ADHD and CD were significantly associated with higher risk of IPV with and without injury. For predicting IPV resulting in injury, the unadjusted effect sizes for ADHD (OR=1.75) and CD (OR=2.82) are comparable to those for sex (OR=1.71), race (black vs white; OR=2.19), family structure (single parent vs both biological parents; OR=1.80), parent education level (less than high school vs college; OR=2.03), and family poverty status ( $\leq 100\%$  vs  $\leq 400\%$ ; OR=2.47).

### MULTINOMIAL LOGISTIC REGRESSIONS

**Table 3** presents the adjusted ORs and 95% confidence intervals for the associations among IA and HI symptoms, CD symptoms, and IPV perpetration after controlling for sociodemographic factors. Although HI symptoms significantly predicted young adult IPV perpetration without injury in the partially adjusted model (controlling for only sociodemographic factors, not CD and IA), the association was not significant when IA and CD symptoms were controlled. However, IA symptoms significantly predicted IPV perpetration without injury even when HI and CD symptoms were controlled, with a 1-SD increase in the logarithm of IA symptoms increasing the odds of IPV perpetration without injury by 9%.



**Table 3. Cluster-Adjusted Multinomial Logistic Regressions to Estimate the Associations Among Attention-Deficit/Hyperactivity Disorder Symptoms, Conduct Disorder Symptoms, and Intimate Partner Violence Perpetration**

Symptom Dimension	OR (95% CI)	
	IPV Perpetration Without Injury <sup>a</sup>	IPV Perpetration Resulting in Injury <sup>a</sup>
IA symptom dimension <sup>b</sup>		
Partially adjusted <sup>c</sup>	1.16 (1.09-1.24) <sup>d</sup>	1.29 (1.17-1.42) <sup>d</sup>
Fully adjusted <sup>e</sup>	1.09 (1.01-1.18) <sup>f</sup>	1.08 (0.94-1.24)
HI symptom dimension <sup>b</sup>		
Partially adjusted <sup>c</sup>	1.13 (1.06-1.21) <sup>d</sup>	1.34 (1.20-1.51) <sup>d</sup>
Fully adjusted <sup>e</sup>	1.04 (0.96-1.13)	1.20 (1.03-1.40) <sup>f</sup>
CD symptom dimension <sup>b</sup>		
Partially adjusted <sup>c</sup>	1.41 (1.33-1.49) <sup>d</sup>	1.69 (1.53-1.87) <sup>d</sup>
Fully adjusted <sup>e</sup>	1.39 (1.31-1.47) <sup>d</sup>	1.63 (1.47-1.82) <sup>d</sup>

Abbreviations: CD, conduct disorder; CI, confidence interval; HI, hyperactivity/impulsivity; IA, inattention; IPV, intimate partner violence; OR, odds ratio.

<sup>a</sup>The reference category is those who had no IPV perpetration history.

<sup>b</sup>Symptom counts were log-transformed and converted to standard scores to reduce the skewness of their distributions.

<sup>c</sup>For partially adjusted ORs, analyses were adjusted for sociodemographic factors only (race, sex, age cohort, family structure, whether the biological father was ever jailed, parent education level, and family size-adjusted poverty status).

<sup>d</sup> $P < .01$ .

<sup>e</sup>For fully adjusted ORs, analyses were adjusted for sociodemographic factors as well as attention-deficit/hyperactivity disorder symptom and CD symptom dimensions.

<sup>f</sup> $P < .05$ .

Conduct disorder symptoms significantly and independently predicted IPV perpetration without injury. A 1-SD increase in the logarithm of CD symptoms was associated with a 39% increase in the odds of IPV perpetration without injury after adjusting for HI and IA.

A different pattern of results was found when associations of HI and IA symptoms with IPV perpetration resulting in injury were analyzed. Hyperactivity/impulsivity significantly predicted IPV perpetration resulting in injury after controlling for IA and CD, while IA was not significantly associated with IPV perpetration resulting in injury after controlling for HI and CD. Conduct disorder significantly predicted IPV perpetration resulting in injury after controlling for HI and IA, with a 1-SD increase in the logarithm of CD symptoms increasing the odds of IPV perpetration resulting in injury by 63%.

The upper half of **Table 4** presents the adjusted ORs and 95% confidence intervals for the associations between ADHD diagnostic categories, CD diagnostic categories, and IPV perpetration controlling for sociodemographic factors. Attention-deficit/hyperactivity disorder was not significantly associated with IPV perpetration without injury, while CD significantly increased the odds of IPV perpetration without injury by 95% when controlling for ADHD. In analyses predicting IPV perpetration resulting in injury, ADHD significantly predicted IPV perpetration resulting in injury (OR=1.71) and remained a significant predictor when controlling for CD (OR=1.53). Conduct disorder tripled the odds of IPV perpetration resulting in injury (OR=3.20) when controlling for ADHD.

**Table 4. Cluster-Adjusted Multinomial Logistic Regressions to Estimate the Associations Among Attention-Deficit/Hyperactivity Disorder Diagnostic Category, Conduct Disorder Diagnostic Category, and Intimate Partner Violence Perpetration**

Category	OR (95% CI)	
	IPV Perpetration Without Injury <sup>a</sup>	IPV Perpetration Resulting in Injury <sup>a</sup>
ADHD diagnostic category		
Partially adjusted <sup>b</sup>	1.16 (0.94-1.43)	1.71 (1.16-2.53) <sup>c</sup>
Fully adjusted <sup>d</sup>	1.09 (0.87-1.35)	1.53 (1.04-2.28) <sup>e</sup>
CD diagnostic category		
Partially adjusted <sup>b</sup>	1.97 (1.63-2.37) <sup>c</sup>	3.30 (2.60-4.19) <sup>c</sup>
Fully adjusted <sup>d</sup>	1.95 (1.62-2.36) <sup>c</sup>	3.20 (2.50-4.11) <sup>c</sup>
Comorbid ADHD and CD categories		
ADHD only	1.08 (0.85-1.38)	1.81 (1.08-3.04) <sup>e</sup>
CD only	1.96 (1.58-2.44) <sup>c</sup>	3.49 (2.66-4.58) <sup>c</sup>
ADHD and CD	2.10 (1.42-3.10) <sup>c</sup>	3.75 (2.15-6.56) <sup>c</sup>

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; CD, conduct disorder; CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

<sup>a</sup>The reference category is those who had no IPV perpetration history.

<sup>b</sup>For partially adjusted ORs, analyses were adjusted for sociodemographic factors only (race, sex, age cohort, family structure, whether the biological father was ever jailed, parent education level, and family size-adjusted poverty status).

<sup>c</sup> $P < .01$ .

<sup>d</sup>For fully adjusted ORs, analyses were adjusted for sociodemographic factors as well as ADHD and CD diagnostic categories.

<sup>e</sup> $P < .05$ .

To further examine the unique effect of ADHD on IPV perpetration, we classified the respondents into 4 mutually exclusive categories based on ADHD and CD symptoms: (1) no ADHD or CD (no symptom counts above DSM-IV criteria for either ADHD or CD; 81.2% of the sample); (2) ADHD only (symptom counts above DSM-IV criteria for ADHD but not CD; 6.4% of the sample); (3) CD only (symptom counts above DSM-IV criteria for CD but not ADHD; 10.5% of the sample); or (4) ADHD and CD (symptom counts above DSM-IV criteria for both ADHD and CD; 1.9% of the sample). The lower half of Table 4 shows the results of multinomial logistic regressions on the ADHD and CD categories in predicting IPV perpetration, controlling for sociodemographic factors. The ADHD only category was not a significant predictor of IPV perpetration without injury, whereas both the CD only category and the ADHD and CD category significantly predicted IPV perpetration without injury. The ADHD only category significantly and uniquely predicted IPV perpetration resulting in injury (OR=1.81). The results were consistent with those from analyses examining ADHD and CD diagnostic categories separately, suggesting that ADHD by itself is not a significant predictor of IPV perpetration without injury. However, the ADHD only category significantly predicted IPV perpetration resulting in injury, as did the CD only category and the ADHD and CD category.

#### PROPENSITY SCORE MATCHING

After applying 1-to-1 propensity score matching, no differences on matching variables between the subjects with

**Table 5. Propensity Score 1-to-1 Matched Sample to Estimate the Associations Among Attention-Deficit/Hyperactivity Disorder Diagnostic Category, Conduct Disorder Diagnostic Category, and Intimate Partner Violence Perpetration**

Category	IPV Perpetration Without Injury <sup>a</sup>		IPV Perpetration Resulting in Injury <sup>a</sup>	
	Cases, No. <sup>b</sup>	OR (95% CI)	Cases, No. <sup>b</sup>	OR (95% CI)
ADHD diagnostic category				
Matched on sociodemographic factors	782	1.23 (0.93-1.63)	659	1.99 (1.26-3.14) <sup>c</sup>
Matched on sociodemographic factors and CD category	782	1.18 (0.90-1.55)	659	1.87 (1.16-3.01) <sup>d</sup>
CD diagnostic category				
Matched on sociodemographic factors	1254	2.12 (1.71-2.63) <sup>c</sup>	1029	2.78 (1.96-3.94) <sup>c</sup>
Matched on sociodemographic factors and ADHD category	1254	1.93 (1.56-2.38) <sup>c</sup>	1029	2.51 (1.78-3.55) <sup>c</sup>
Comorbid ADHD and CD categories				
ADHD only	619	1.19 (0.86-1.65)	531	1.82 (1.02-3.25) <sup>d</sup>
CD only	1091	2.02 (1.61-2.54) <sup>c</sup>	901	2.36 (1.65-3.37) <sup>c</sup>
ADHD and CD	163	2.92 (1.64-5.18) <sup>c</sup>	128	3.76 (1.35-10.49) <sup>c</sup>

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; CD, conduct disorder; CI, confidence interval; IPV, intimate partner violence; OR, odds ratio.

<sup>a</sup>The reference category is those who had no IPV perpetration history.

<sup>b</sup>Because a 1-to-1 matched sample is used, the number of controls is equal to the number of cases.

<sup>c</sup> $P < .01$ .

<sup>d</sup> $P < .05$ .

ADHD and/or CD and the control subjects were statistically significant, which suggested that the overall matching process was successful. The magnitudes and significance of the ORs obtained from the propensity score matching (**Table 5**) are similar to those obtained from the full-sample multinomial logistic regressions, suggesting that the results are robust.

#### COMMENT

This study examined the relationships among childhood ADHD, CD, and IPV perpetration in young adulthood using a population-based US sample. Consistent with prior studies,<sup>28</sup> CD was associated with IPV with and without injury. Furthermore, retrospectively reported IA symptoms appeared to uniquely contribute to IPV perpetration without injury after controlling for HI and CD symptoms. The significant partial relationship between HI symptoms and IPV perpetration without injury disappeared when IA and CD symptoms were controlled. The associations with IPV perpetration resulting in injury were in the opposite direction; HI symptoms significantly and uniquely predicted IPV perpetration resulting in injury, whereas the relationship between IA symptoms and IPV perpetration resulting in injury was not significant when HI and CD symptoms were controlled. There were no significant sex interactions in these relationships, suggesting similar relationships among ADHD, CD, and IPV perpetration for males and females. Our findings suggest that IA and HI are differentially predictive of IPV without injury and IPV resulting in injury, controlling for CD. Results indicate that difficulties with IA are associated with IPV without injury but not with IPV resulting in injury. Further research is needed to understand the connection between IA and IPV without injury and why this association is not found for more severe forms of violence. While HI was not significantly associated with IPV perpetration without injury controlling for CD and IA, the difference in ORs between HI and IA was minimal (1.04 vs 1.09, respectively).

Intimate partner violence resulting in injury was uniquely associated with HI but not IA. These findings indicate that impulse control problems constitute a higher risk for perpetration of serious violence. Impulse control problems have been linked to impulsive aggression and problems with emotion regulation and frustration tolerance.<sup>39</sup> As a limitation to our findings regarding impulsivity, there are only 3 symptoms of impulsivity in the *DSM-IV*, compared with 9 symptoms of IA and 6 of hyperactivity. Additionally, due to error, the survey included only 2 of the 3 impulsivity symptoms. As a result, the measurement of impulsivity in our data was limited. In fact, the association between impulse control problems and IPV may be higher. Future studies are needed to examine the specific phenomena (verbal impulsivity, relationship conflict, impulsive aggression) underlying the associations between IA, HI, and IPV of differing severity. Research is also needed to examine such associations in diagnosed samples.

The analyses using categorical classification of ADHD in predicting IPV perpetration indicated that the relationship between ADHD and IPV perpetration without injury is not significant. However, ADHD alone (ie, ADHD without CD) was a significant predictor of IPV perpetration resulting in injury. The association between probable ADHD and IPV perpetration resulting in injury may further reflect the contribution of impulsive aggression and emotion dysregulation.

Our study makes an important contribution to the literature in understanding the role of ADHD symptoms in the development of IPV. As predicted, CD symptoms were a strong and consistent risk factor for violence; ADHD symptoms and particularly ADHD without the presence of CD also constituted a significant risk for IPV. As intervention and violence prevention efforts often focus on conduct problems, youths with ADHD symptoms alone may not receive important services to address the development of healthy, nonviolent relationships. These findings are consistent with those of longitudinal prospective studies showing that children with ADHD but not CD are still at increased risk

for antisocial behavior and criminality in adulthood.<sup>40</sup> Additionally, propensity score matching analyses indicate that comorbid ADHD and CD had the largest risk ratios, particularly for IPV resulting in injury.

These findings suggest that co-occurring disorders may confer additional risk, consistent with previous findings that comorbid samples constitute a more virulent form of either ADHD or CD.<sup>25</sup> Given the complex etiological nature of the relationship between ADHD and CD, our results highlight the importance of understanding the separate and combined effects of different forms of severe psychopathology on the development of violence. These data cannot discern patterns of causality, particularly with regard to the association of ADHD and CD as well as whether CD might mediate the influence of ADHD on IPV. Future epidemiological studies with better diagnostic information are needed to expand on these findings.

One limitation of this study involved the retrospective self-report of ADHD symptoms. There was no information on childhood ADHD diagnosis and treatment to validate the data. It might be particularly burdensome for youths with ADHD to recall childhood experiences. Furthermore, there is a lack of consensus on the most valid approaches to establishing ADHD diagnosis in adolescence and adulthood, with the role of self-report data under dispute. Our study used an ADHD symptom checklist rather than diagnoses using clinician assessments. In particular, there was no measurement of the impairment or cross-situationality criteria for ADHD. Therefore, our findings address self-report symptoms and cannot be equated with a clinical diagnosis of ADHD. Nonetheless, previous research has demonstrated that the ADHD items in the Add Health data have adequate reliability and validity in terms of current ADHD treatment and prevalence.<sup>21</sup> Furthermore, while multimethod assessments are preferable in diagnosing ADHD and CD, the use of symptom self-reports is common in clinical practice when assessing older adolescents and adults. Given the criterion that ADHD symptoms must have been present prior to age 7 years, retrospective reports are often necessary. Research has also supported the reliability and validity of self-reports in adulthood.<sup>41,42</sup>

The measures of IPV are an additional limitation. Intimate partner violence was assessed using only self-reports and thus are subject to all possible biases and limitations inherent to this form of measurement, such as recall bias, social desirability, and reporting bias.<sup>43</sup> As another concern, this study is limited in the number of questions available to define IPV. The 3 questions in the Add Health study do not capture all forms of partner violence assessed by validated scales for IPV, and no information was collected about the causes or function of violence.<sup>43</sup> Future work is needed to replicate our findings with data using validated scales and to examine causes and contextual influences of IPV.

Another limitation is that IPV was primarily measured on a subset of relationships. It is unclear whether the study findings would be the same with a more diverse sample of relationships. However, the rate of IPV perpetration based on the sexual or important relationships is consistent with prevalence data of IPV victimization from other national surveys.<sup>38</sup> An additional limitation is the potential for selection bias in that the study

focuses on young adults who reported intimate relationships in the preceding 6 years. However, the study examined the distribution of ADHD and CD between those who reported intimate relationships and those who did not and found that the percentage of those reporting ADHD and CD were approximately equal (not statistically significant). Moreover, participants who remained in the sample did not differ from those who were excluded with respect to age (mean, 21.8 vs 21.9 years, respectively), sex (50% vs 53% female, respectively), and race/ethnicity (69% vs 61% white, respectively).

Finally, imputation methods were used for handling the more than 20% of missing values of reported family income. To check the robustness of results, we performed the statistical analysis with complete data only (ie, limited to those who reported family income). The magnitudes and significance of the ORs obtained from the complete case analysis are similar to those obtained from analysis using imputation, providing some assurance that imputation had little effect on study conclusions.

Our findings have important implications for intervention and prevention. Evidence-based treatment for ADHD includes stimulant medication, behavioral parent training, and school-based behavioral treatment.<sup>44</sup> While these approaches are effective in reducing the impairment of children with ADHD, there are very few evidence-based treatment approaches for adolescents.<sup>44-46</sup> Our findings suggest that youths with ADHD are at significant risk for experiencing partner conflict and perpetrating IPV, yet involvement in romantic relationships typically begins in adolescence, when youths with ADHD are least likely to receive treatment. These findings provide support for the need to continue evidence-based services for adolescents with ADHD and to address healthy relationship skills. The same is true for CD as services often do not extend into adolescence and typically focus on delinquency prevention but have less explicit emphasis on development of healthy, nonviolent dating relationships. Couples in whom 1 partner experiences clinically significant levels of IA, HI, and/or conduct problems may be at elevated risk for IPV. Traditional approaches to prevent IPV may not be sufficient for those couples if they do not address the specific issues related to ADHD and CD.

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**Correspondence:** Xiangming Fang, PhD, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Hwy, MS F-63, Atlanta, GA 30341 (xfang@cdc.gov).

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