ARTICLE

Gun Carrying and Conduct Disorder: A Highly Combustible Combination?

Implications for Juvenile Justice and Mental and Public Health

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Objectives: To examine concealed gun carrying between the ages of 12 and 17 years in a population of clinic-referred boys, many of whom qualified for a disruptive behavior disorder, including conduct disorder (CD); to identify factors and diagnoses related to concealed gun carrying; and to examine the extent to which gun carrying is associated with crime in adulthood.

Design: Longitudinal follow-up study.

Setting: Pittsburgh, Pa, and Athens and Atlanta, Ga.

Participants: One hundred seventy-seven clinic-referred boys, first assessed between the ages of 7 and 12 years and followed up yearly until the age of 19 years.

Main Outcome Measures: Violence, property offenses, and drug charges in adulthood.

Results: Between the ages of 12 and 17 years, 1 in 5 participants carried a concealed gun, and the annual prevalence increased linearly with age. More than half (61.1%) carried a gun for 1 year only. Gun carrying was significantly (incident rate ratio, 3.93%; 95% confidence interval, 1.60-9.60) associated with CD. Conduct disorder, maternal psychopathy, victimization, and parental monitoring increased the risk of gun carrying by a factor of 8. Adult crime was best predicted by gun carrying, CD, and parental monitoring. Gun carrying predicted drug charges, but not violence or property offenses.

Conclusions: Even though the carrying of handguns by juveniles is prohibited, young men with symptoms of CD are more likely to carry guns than young men without CD. The findings are discussed in terms of the need for the inclusion of gun carrying among the symptoms of CD.

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CONDUCT DISORDER (CD) IS a psychiatric diagnosis that is defined as a repetitive and persistent pattern of behavior in which the basic rights of others and major age-appropriate societal norms or rules are violated. The symptoms of CD include "has used a weapon that can cause serious physical harm,"[1(p90)] but do not mention the carrying of a concealed gun. Of all weapons used by juveniles, guns probably have the highest lethal impact. Yet, little is known about how many boys with CD illegally carry concealed guns before the age of 18 and to what extent their gun carrying is associated with violence. These issues are important because many CD boys have problems in controlling their impulsivity. Once these boys obtain a gun, they are potentially among the highest-risk groups to inflict violence on others or threaten others with violence. We see concealed gun carrying by CD boys as a problem for juvenile justice, a threat to public health, and a challenge for mental health professionals. (We will use the term gun carrying to mean concealed gun carrying.)

Several studies[2-5] have linked delinquency, violence, and homicide rates to increased levels of the carrying of handguns in populations of males. Blumstein and Cork[2] have shown that nationally, gun-related homicides by juveniles, in contrast to non–gun-related homicides by juveniles, have increased, starting in 1987. Longitudinal research[4] shows that serious crime is higher during periods in which juveniles carry a gun.

Little is known, however, about the degree to which mental health problems, particularly CD, in childhood and adolescence increase the risk of gun carrying and violence. Bailey et al[6] showed that students who brought a weapon to school were more likely to participate in fights and damage school property compared with students who did not bring a weapon to school. However, studies linking diagnoses in young populations to gun carrying seem to be lacking. Males with CD, probably because of their disruptive and aggressive be-

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havior, are at high risk for illegally carrying a gun during adolescence. Several studies have emphasized that CD is overrepresented among the most serious delinquents, such as homicide offenders.[7] Three quarters of homicides are committed with a handgun, which is similar to national figures.[5] More is known about the predictors of violence, which also include alcohol use, early problem behavior, poor family relationships, and poor school bonding.[8-10] It is not known, however, whether these and possibly other predictors apply to young men with CD who carry guns. Also, we do not know whether gun carrying during adolescence also increases the risk of delinquency during adulthood. We do not want to imply that gun carrying by CD boys must lead to their increased offending. The key issue, however, is whether gun carrying is associated with later criminality over and above what could be predicted based on earlier conduct problems alone. If there is a relationship between CD, gun carrying, and later delinquency, including violence, then this would have implications for juvenile justice, mental health services, and public health. **Figure 1** summarizes the conceptual model and hypotheses governing this article.

This article addresses the following questions: What is the prevalence of illegal concealed handgun carrying in a population of clinic-referred boys before the age of 18, and which psychiatric diagnoses are particularly associated with gun carrying? Which factors in their lives are associated with gun carrying? How delinquent and violent in adulthood are those with a psychiatric diagnosis in childhood, and is this related to earlier handgun carrying? And, does gun carrying mediate the risk of adverse criminal outcomes for CD boys in terms of violence, property offending, and drug charges in adulthood?

METHODS

The data were collected as part of the Developmental Trends Study (Loeber et al[11] provide details). One hundred seventy-seven clinically referred boys, aged 7 to 12 years at the initial assessment in 1987, were interviewed annually until the age of 19. Because of a funding cut in year 5, interviews were not administered. The average retention rate between years 2 and 13 was 91.9%, ranging from 97.7% in year 2 to 80.2% in year 12. Half (54.2%) of the sample was recruited from one site in Pennsylvania, and the other half from 2 sites in Georgia. Participants had to live with at least one biological parent and could not have a history of mental retardation or psychosis. Participants were 29.9% African American and 70.1% white. Approximately 52.5% of the participants lived in urban environments, 56.5% were not living with their biological father, and 40.7% came from families within the lowest 2 categories of the Hollingshead Four Factor Index of Social Status (A. B. Hollingshead, PhD, unpublished data, 1975). At the initial assessment, 38.4% of the participants met the criteria for *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*, CD, 65.0% for attention-deficit/hyperactivity disorder (ADHD), 34.5% for either overanxious disorder (OAD) or separation anxiety disorder (SAD), and 12.4% for either dysthymia or major depressive disorder.

Parent and child interviews were conducted until the child reached the age of 18 years; at the ages of 18 and 19 years, the child was interviewed alone, using measures designed for adults. Years 1 through 4 also included teacher interviews. No data were available from year 5 because of funding restrictions. The Institutional Review Board of the University of Pittsburgh gave approval and provided an annual review of the protocol. In all cases, parents and participants consented to participate.

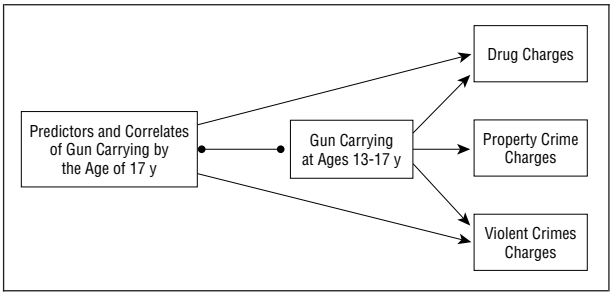

Figure 1. Schematic diagram of the hypothesized model for gun carrying.

MEASURES

Table 1 provides a summary of the constructs and measures used in the study. Within the drug charges construct, possession of a controlled substance, possession of a controlled substance device, possession with intent to deliver a controlled substance, and possession of drug paraphernalia were included. Alcohol-related charges were excluded. Because of the relatively few drug sales charges combined with the cross-sectional nature of this variable, we used the combined use and sales charges for the drug charges construct.

The mean age of participants when criminally charged was 19.86 (SD, 1.93) years. Seventeen participants were charged with crimes before their age 17 assessment. Because we wanted to be predictive from gun carrying and its correlates to later crimes, we conducted the analyses with and without these participants. Their exclusion changed the results of only one model.

ANALYSES

The outcome variable of gun carrying, as a panel variable between the ages of 13 and 17, was examined using a generalized estimating equation negative binomial model, with a logit link and robust estimator of variance. An exchangeable correlation structure was chosen based on the relatively small number of cases but many observations in the data set (Rabe-Hesketh and Everitt[19] provide details). Grouping for all analyses was based on participant identification, and age was used to designate time.

Variables were tested for their independent relationship with gun carrying. Those found significant were then tested simultaneously within domains. To assess interactions, log likelihood tests were performed to compare models with and without the interaction term, and χ^2 distributions of the differences in the models were used to determine the adequacy of the interaction in the model. Following a procedure outlined by Aiken and West,[20] interactions were tested by transforming the variables so they were centered around their means. Those variables significant within the domain-level models were tested in a final model of predictors and correlates of gun carrying.

Variables retained as correlates of gun carrying, along with gun carrying itself, were tested as predictors of overall criminal charges in young adulthood and as individual categories of criminal charges. These models were negative binomial regressions, clustering on the participant.

RESULTS

Table 2 shows the prevalence of gun carrying and child psychiatric diagnoses by age. As is evident, the rates for all diagnoses decreased over time. At the age of 17, oppositional defiant disorder (ODD), CD, and ADHD were

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Table 1. Constructs and Measures Used

Construct	Measure	Informant	Study Years	Scoring (Range)
Gun carrying	SRD[12,13]	Child	3-13	Continuous number of times a concealed gun was carried (0-99)
Adult criminality				
Total charges	State and federal criminal records	Official records	After year 13	Continuous and includes total charges (0-26)
Property crimes charges	State and federal criminal records	Official records	After year 13	Continuous (0-16)
Drug charges	State and federal criminal records	Official records	After year 13	Continuous; includes use and sales charges and excludes alcohol-related charges (0-14)
Violence charges	State and federal criminal records	Official records	After year 13	Continuous (0-7)
Attention-deficit/ hyperactivity disorder	DISC-P[14]	Parent	1-11 (assessments through the age of 17 y)	Dichotomous; algorithmic determination using *DSM-III-R* criteria
Conduct disorder	DISC-C[14] and DISC-P	Parent and child	1-11 (assessments through the age of 17 y)	Dichotomous; 3 *DSM-III-R* symptoms present during the past 6 mo
Dysthymia	DISC-C and DISC-P	Parent and child	1-11 (assessments through the age of 17 y)	Dichotomous; 3 *DSM-III-R* symptoms present during the past 6 mo
Depression	DISC-C and DISC-P	Parent and child	1-11 (assessments through the age of 17 y)	Dichotomous; 5 *DSM-III-R* symptoms present during the past 6 mo
Oppositional defiant disorder	DISC-P	Parent	1-11 (assessments through the age of 17 y)	Dichotomous; 5 *DSM-III-R* symptoms present during the past 6 mo
Overanxious disorder	DISC-C and DISC-P	Parent and child	1-11 (assessments through the age of 17 y)	Dichotomous; 4 *DSM-III-R* symptoms present during the past 6 mo
Separation anxiety disorder	DISC-C and DISC-P	Parent and child	1-11 (assessments through the age of 17 y)	Dichotomous; 3 *DSM-III-R* symptoms present during the past 6 mo
IQ	WISC-R[15]	Child assessment	1	Continuous score (70-151)
Adolescent violence	SRD	Child self-report	3-13	Continuous sum of hitting, attacking with a weapon, throwing objects, strong-arming, participating in gang fighting, and rape (1-161)
Tobacco use	Substance use questionnaire	Child self-report	3-13	Continuous number of days of use during the past year (0-365)
Alcohol use	Substance use questionnaire	Child self-report	3-13	Continuous number of days of use during the past year (0-365)
Marijuana use	Substance use questionnaire	Child self-report	3-13	Continuous number of days of use during the past year (0-365)
Hard drug use	Substance use questionnaire	Child self-report	3-13	Continuous number of days of use during the past year (0-365)
Marijuana sales	Substance use questionnaire	Child self-report	3-13	Continuous number of days sold during the past year (0-365)
Hard drug sales	Substance use questionnaire	Child self-report	3-13	Continuous number of days sold during the past year (0-365)
Victimization	Victimization questionnaire	Parent report	4-13	Continuous sum of having been teased, bullied, mugged, injured, or sexually molested (0-25)
Parent psychopathy	MMPI[16]	Administration to parent	1	Mean *t* scores of F and 4 and 9 scales of MMPI (43.7-87.0)

(continued)

most prevalent, with 31.7% meeting the criteria for ODD, 19.5% for CD, and 17.7% for ADHD.

PREVALENCE OF ILLEGAL GUN CARRYING AND ASSOCIATION WITH PSYCHIATRIC DISORDERS

Across the ages of 12 to 17 years, 36 (20.3%) of 177 participants carried a concealed gun at least once. Gun carrying started as early as the age of 10 and, as shown in **Figure 2**, there is an almost linear increase in gun carrying to the age of 17. By the age of 17, the prevalence of gun carrying had increased to approximately 12.2%; however, gun-carrying episodes varied greatly over time. **Figure 3** shows that of all gun carriers, 61.1% reported carrying guns for only 1 year, 30.5% for 2 years, and only 8.4% for 3 to 4 years.

In bivariate regression models, gun carrying was significantly associated with CD (incident rate ratio [IRR], 3.93; 95% confidence interval [CI], 1.60-9.60), and was significantly and inversely related to OAD (IRR, 0.03; 95% CI, 0.01-0.10). Gun carrying was not significantly associated with ODD ($P=.62$), dysthymia ($P=.48$), depression ($P=.53$), SAD ($P=.47$), or ADHD ($P=.34$).

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Table 1. Constructs and Measures Used (cont)

Construct	Measure	Informant	Study Years	Scoring (Range)
APD				
Maternal	SCID[17]	Maternal self-report	1	Dichotomous; presence or absence of the diagnosis
Paternal	SCID	Maternal report	1	Dichotomous; presence or absence of the diagnosis
Psychopathological features				
Maternal	SCID	Maternal self-report	1	Dichotomous; presence or absence of depression, mania, psychosis, generalized anxiety, social phobia, panic, or obsessive-compulsive disorder
Paternal	SCID	Maternal report	1	Dichotomous; presence or absence of depression, mania, psychosis, generalized anxiety, social phobia, panic, or obsessive-compulsive disorder
Parental alcohol abuse	SCID	Maternal report	1	Criteria for *DSM-III-R* alcohol abuse met by mother or father
Parental drug abuse	SCID	Maternal report	1	Criteria for *DSM-III-R* abuse of other substances met by mother or father
Parental monitoring	Parenting questionnaire[18]	Parent report	1-13	Sum; higher scores indicate better monitoring (0-28)
Harsh discipline	Parenting questionnaire	Parent report	1-13	Frequency of slapping, spanking, hitting; higher scores indicate greater frequency of harsh discipline (0-3)
Communication	Parenting questionnaire	Parent report	1-13	Continuous; higher scores indicate greater satisfaction with and engagement in communication behaviors (18-39)
SES	Hollingshead scales*	Parent report	1-13	Educational level and occupation of mother and father (maternal education and occupation repeated from year 1 measure) (11-66)
Urban residence	Demographic questionnaire	1990 US census figures	1-13	Urban if population density is >100/02.6 km^2
Race	Demographic questionnaire	Parent report	1-13	NA
Maternal age	Demographic questionnaire	Parent report	1-13	Age at birth of first child (14-38)
Household yearly income	Demographic questionnaire	Parent report	1-13	($2548-$375 000)

Abbreviations: APD, antisocial personality disorder; DISC-C, Diagnostic Interview Schedule for Children (child version); DISC-P, Diagnostic Interview Schedule for Children (parent version); *DSM-III-R*, *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*; MMPI, Minnesota Multiphasic Personality Inventory; NA, data not applicable; SCID, Structured Clinical Interview for *DSM-III-R*; SES, socioeconomic status; SRD, self-reported delinquency questionnaire; WISC-R, Wechsler Intelligence Scale for Children–Revised.

*A. B. Hollingshead, unpublished data, 1975.

Table 2. Prevalence Rates of Gun Carrying and Psychiatric Diagnoses by Age

	Age, y*						
Variable	12 (N = 177)	13 (n = 146)	14 (n = 145)	15 (n = 141)	16 (n = 133)	17 (n = 164)	Cumulative by the Age of 17 y (N = 177)
Gun carrying	1.1 (2)	1.4 (2)	6.9 (10)	4.3 (6)	10.5 (14)	12.2 (20)	
Child psychopathological diagnosis							
Conduct disorder	37.9 (67)	33.6 (49)	31.7 (46)	29.8 (42)	25.6 (34)	19.5 (32)	65.0 (115)
Oppositional defiant disorder	88.7 (157)	58.2 (85)	52.4 (76)	46.1 (65)	34.6 (46)	31.7 (52)	91.0 (161)
Attention-deficit/hyperactivity disorder	76.8 (136)	44.5 (65)	34.5 (50)	31.9 (45)	24.1 (32)	17.7 (29)	82.5 (146)
Major depressive episode	32.8 (58)	13.0 (19)	16.6 (24)	14.9 (21)	8.3 (11)	9.1 (15)	53.7 (95)
Dysthymia	25.4 (45)	8.2 (12)	9.7 (14)	5.7 (8)	4.5 (6)	3.0 (5)	41.8 (74)
Separation anxiety disorder	40.1 (71)	15.1 (22)	13.1 (19)	10.6 (15)	3.0 (4)	6.1 (10)	54.2 (96)
Overanxious disorder	67.8 (120)	27.4 (40)	20.7 (30)	17.0 (24)	9.8 (13)	6.7 (11)	76.3 (135)

*Data are given as percentage (number) of participants. Variation in the number of participants at each age results from a funding cut in year 5, during which participants would have been ages 11 to 16 years, and from typical factors associated with attrition.

OTHER CORRELATES OF GUN CARRYING

Bivariate analyses of correlates of concealed gun carrying within the domains of demographic characteristics, parental functioning, parenting, child functioning, substance use, and victimization were conducted. Significant correlates of gun carrying were as follows: adolescent violent behavior (IRR, 1.13; 95% CI, 1.12-1.14); the demographic variables of African American ethnicity (IRR, 2.68; 95% CI, 1.14-6.32), socioeconomic status (IRR, 0.60; 95% CI, 0.44-0.82), and urban residence (IRR, 4.45; 95% CI, 1.44-13.75); and the participant's age (IRR, 1.76; 95%

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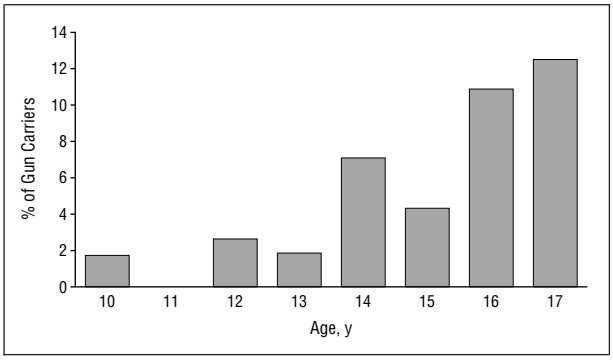

Figure 2. Prevalence of concealed gun carrying. The number of subjects for each age was as follows: 10 years, n=60; 11 years, n=63; 12 years, n=76; 13 years, n=146; 14 years, n=145; 15 years, n=141; 16 years, n=133; and 17 years, n=164.

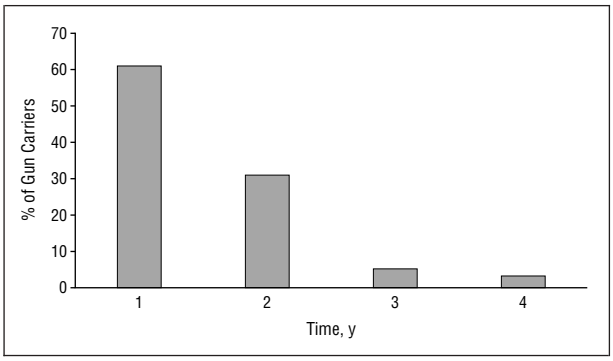

Figure 3. Time spent gun carrying.

CI, 1.40-2.22), such that each year increase in age was associated with a 76% increase in the rate of gun carrying. No significant interactions were found among the demographic variables. Regression analyses of socioeconomic status, ethnicity, and urban residence predicting gun carrying, controlling for age, showed that only socioeconomic status remained significant ($P<.001$).

Bivariate analyses using variables in the parental psychiatric disorders domain showed that scores on the maternal psychopathy index (IRR, 1.04; 95% CI, 1.01-1.09) were significantly correlated to the participant's rate of concealed gun carrying. Also, the victimization index (IRR, 0.91; 95% CI, 0.82-0.99) showed that as victimization scores increased there was a decrease in the rate of gun carrying. Within the parenting domain, only parental monitoring (inversely related) (IRR, 0.90; 95% CI, 0.84-0.96) was associated with gun carrying.

The final regression model of correlates of gun carrying, controlling for age (IRR, 1.69; 95% CI, 1.28-2.25), was as follows. The strongest correlates of gun carrying were adolescent violent behaviors (IRR, 1.07; 95% CI, 1.06-1.08) and CD (IRR, 5.24; 95% CI, 1.77-15.50), followed by victimization (inversely related) (IRR, 0.83; 95% CI, 0.75-0.93), maternal psychopathy (IRR, 1.06; 95% CI, 1.02-1.10), and parental monitoring (IRR, 0.86; 95% CI, 0.78-0.95). African American ethnicity, socioeconomic status, urban residence, and OAD were significant at the bivariate level, but were removed from the regression model. The following variables were not significant at the bivariate level: household income, marital status, maternal psychopathy, countercontrol, harsh discipline, marijuana use, alcohol use, hard drug use, tobacco use, and IQ. The main effects model indicates that there is greater than a 5-fold increase in the incident rate of gun carrying among males with CD compared with those without CD. In observations in which CD criteria were vs were not met, gun carrying occurred a mean of 7.43 (SD, 24.6) vs 1.66 (SD, 12.0) times. As parental monitoring increased by 1 U, the incident rate of gun carrying decreased by 14%. A significant ($P=.02$) interaction was found between victimization and maternal psychopathy in their effect on gun carrying (**Figure 4**). The interaction showed that for males with a high score on victimization, maternal psychopathy did little to influence gun carrying. On the other hand, for those with lower levels of reported victimization, higher scores of maternal psychopathy were associated with greater rates of gun carrying. In terms of the model, however, a likelihood ratio test showed that the interaction term did not significantly change the goodness of fit of the model; therefore, it was not retained in the model.

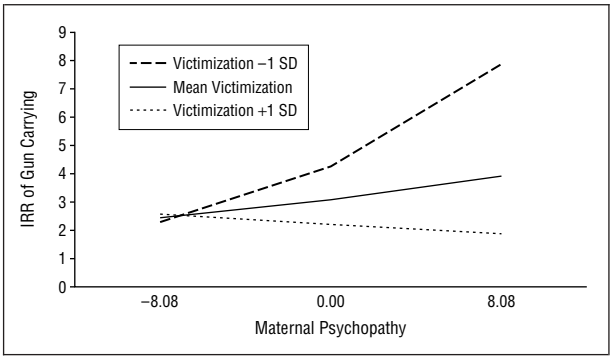

Figure 4. Interaction of victimization and maternal psychopathy on gun carrying. IRR indicates incident rate ratio.

ADULT CRIMINAL OUTCOMES OF ADOLESCENT PSYCHOPATHY

The number of arrests per participant ranged from 0 to 16 (mean, 1.57; SD, 2.58). Nearly half (84 boys [47.5%]) of our sample was arrested at least once in adulthood, 55 (31.1%) had at least 2 arrests, and 37 (20.9%) had 3 or more arrests. First adult arrests occurred early, with 70.2% (59/84) of those with an adult criminal record having their first adult arrest by the age of 19. For those with an arrest, the number of charges ranged from 1 to 26 (mean, 7.04; SD, 6.12), and one quarter of those with an arrest had more than 11 charges. Regarding specific categories of charges, of those with any arrests, 41 (48.8%) were charged with violence, 49 (58.3%) with property crimes, and 43 (51.2%) with drug charges. Only 9 (10.7%) of 84 boys were charged with gun offenses, among whom was one participant charged with murder.

Conduct disorder (IRR, 2.26; 95% CI, 1.70-3.02) and ODD (IRR, 1.77; 95% CI, 1.21-2.58) were significantly related to the total number of charges. Overanxious disorder was also significant, but was inversely related to charges (IRR, 0.64; 95% CI, 0.43-0.97). Major depression was marginally, and inversely, related (IRR, 0.66;

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95% CI, 0.43-1.04). The disorders of SAD (P=.58), dysthymia (P=.72), and ADHD (P=.14) were not significantly related to adult criminal charges. Regarding specific types of crimes, CD (IRR, 2.22; 95% CI, 1.27-3.88), ODD (IRR, 1.76; 95% CI, 1.02-3.06), and SAD (IRR, 1.60; 95% CI, 1.01-2.50) were predictive. Predicting drug charges, CD (IRR, 2.44; 95% CI, 1.48-3.99), ODD (IRR, 1.73; 95% CI, 1.01-2.97), and major depressive episodes (inversely related) (IRR, 0.34; 95% CI, 0.12-0.99) were significant. Overanxious disorder (IRR, 0.50; 95% CI, 0.21-1.17) was inversely and marginally associated with drug charges. Conduct disorder (IRR, 2.79; 95% CI, 1.94-4.03) and, marginally, ODD (IRR, 1.81; 95% CI, 0.93-3.51) and major depressive episodes (IRR, 0.59; 95% CI, 0.31-1.15) were associated with violent crimes.

EARLIER GUN CARRYING AND ADULT CRIMINAL OUTCOMES

To what degree will earlier gun carrying predict adult criminal outcomes when correlates of gun carrying are included? Predicting from the main effects model to criminal charges, gun carrying (IRR, 1.01; 95% CI, 1.00-1.01), CD (IRR, 1.97; 95% CI, 1.44-2.69), and parental monitoring (inversely related) (IRR, 0.95; 95% CI, 0.91-0.98) remained significant, while adolescent violent behavior, maternal psychopathy, victimization, and age (IRR, 0.98; 95% CI, 0.92-1.04) did not. (The data include cases in which one or more youth assessments were conducted after the first arrest. Exclusion of cases with such circumstances did not result in the addition or removal of any variables to this model.) A significant (P=.02) interaction was found between gun carrying and parental monitoring; high gun carrying in the presence of parental monitoring was associated with elevated rates of criminal outcomes. However, comparing the likelihood ratios of the models suggested that the interaction term did not contribute significantly to the overall model (χ^2=1.4, P=.02) and was, therefore, not retained.

We then examined the prediction of specific categories of charges (**Table 3**). When predicting property crime charges, only CD remained significant. When predicting violent charges, victimization (inversely related), parental monitoring (inversely related), and CD remained significant, while gun carrying, maternal psychopathy, and age did not. Finally, the prediction of counts of drug charges showed significant main effects for gun carrying (IRR, 1.02; 95% CI, 1.01-1.03), parental monitoring (inversely related) (IRR, 0.90; 95% CI, 0.85-0.97), victimization (inversely related) (IRR, 0.92; 95% CI, 0.86-0.99), and CD (IRR, 2.11; 95% CI, 1.26-3.56). An interaction term involving gun carrying and parental monitoring (**Figure 5**) was significant (IRR, 1.00; 95% CI, 1.00-1.01), and improved the overall model (χ^2=3.68, P=.05) (Table 3).

Because some participants had criminal charges before the age of 17, we reran the analyses to examine whether this overlap had influenced the findings. Only in the case of the model predicting drug charges did their exclusion make a difference: victimization was no longer associated with drug charges when these participants were excluded from the analyses.

Table 3. Predicting From the Gun-Carrying Model to Categories of Adult Criminal Charges*

Variable	IRR (95% CI)
Property Crime Charges	
Conduct disorder	2.22 (1.27-3.88)
Gun carrying†	0.99 (0.98-1.01)
Age†	1.01 (0.95-1.08)
Violent Charges	
Conduct disorder	2.85 (1.92-4.22)
Victimization†	0.89 (0.83-0.95)
Parental monitoring†	0.89 (0.83-0.96)
Gun carrying†	1.00 (0.99-1.01)
Age†	0.87 (0.72-1.03)
Drug Charges	
Gun carrying†	0.96 (0.92-0.99)
Victimization†	0.93 (0.85-0.99)
Parental monitoring†	0.89 (0.83-0.96)
Conduct disorder	2.06 (1.22-3.49)
Gun carrying × monitoring interaction	1.00 (1.00-1.01)
Age†	0.92 (0.81-1.04)

Abbreviations: CI, confidence interval; IRR, incident rate ratio.
*Only variables that were identified as correlates of gun carrying, and gun carrying itself, were tested against criminal outcomes in these models. These include assessments conducted after the first arrest. Exclusion of such cases changed only the model predicting drug charges, in which victimization was no longer significant.
†Continuously scaled variables.

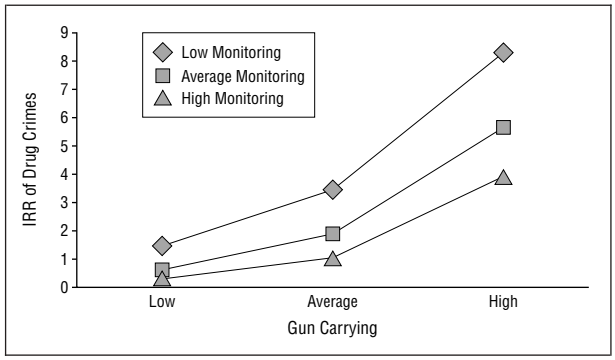

Figure 5. Interaction of gun carrying by parental monitoring in the prediction of drug crimes. IRR indicates incident rate ratio.

GUN CARRYING AS A MEDIATOR OF THE RELATIONSHIP BETWEEN CD AND LATER CRIMINALITY

Finally, we wanted to examine whether gun carrying mediated the link between CD and adult criminal charges (Figure 1). Including gun carrying in models with CD as predictors of later adult crimes resulted in better-fitting models. In no cases did gun carrying fully mediate the relationship, and in the case of predicting property crimes and violent charges, gun carrying had no influence on the relationship, because it was not significant (P=.90 and .78, respectively) in the model. In the case of overall charges and of drug charges, specific statistical tests of mediation confirm that gun carrying serves as a partial mediator of the relationship (overall charges: Sobel test statistic=2.46, P=.01; and drug charges: Sobel test statistic=2.31, P=.02).

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COMMENT

The study found that about 1 in 5 boys (20.3%) carried a concealed handgun before the age of 18. This compares with 18% in a national survey[21] of 16 000 students in grades 9 through 12. However, the percentages are not entirely comparable because large school-based studies encompass a wider variety of youth compared with clinic-referred samples. Also, the results of cross-sectional population surveys are difficult to compare with populations followed up longitudinally from childhood to adulthood. The best we can say is that in the present study, gun carrying by this population of clinic-referred boys is modestly high.

Many of those carrying a gun did so at a young age. The youngest in this sample was at the age of 10; after that age, gun carrying increased linearly to a prevalence of 12.2% at the age of 17. Gun carrying was transitory: only a few gun-carrying boys (8.3%) carried a gun for 3 or more years, which is slightly higher than observed in the Rochester Youth Development Study.[4]

Of all psychiatric diagnoses, only CD was positively associated with gun carrying. This specific link probably rests on the association between delinquent-type symptoms of CD, reflecting a delinquent lifestyle, and gun carrying. Concealed gun carrying, as measured in this study, excluded the use of sporting guns. Conduct disorder, even when controlling for self-reported violent behavior, maternal psychopathy, victimization, and parental monitoring, increased the risk of gun carrying by a factor of 5.

In an earlier article[22] based on data from the first wave of the present longitudinal study, the boys who met *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*, criteria for CD in wave 1 were divided into 2 groups based on whether they also met *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*, criteria for SAD or OAD. In wave 1, boys with CD and anxiety disorder were viewed as less aggressive, had fewer police contacts, and had been suspended from school less often than other boys with CD. We interpreted this finding in terms of the model of behavioral inhibition by Gray,[23] regarding anxiety as an inhibitor of behavior in the presence of signals of punishment or nonreward. The present finding that OAD (but not SAD) is inversely related to gun carrying and the number of arrests through late adolescence is an important confirmation of the earlier finding. Future studies of processes underlying OAD, or generalized anxiety disorder, that potentially inhibit serious conduct problems could be highly important to psychological models of antisocial behavior.

Almost half of the boys in the study (47.5%) had been arrested as adults, and half of those with any charges were charged with a violent crime. However, only 1 in 10 of those charged were charged with gun offenses. Adult crime was best predicted by gun carrying, CD, and parental monitoring. Also, for males who had lower levels of reported victimization, higher maternal psychopathy was associated with greater rates of gun carrying. Gun carrying predicted drug charges, but not violence or property offenses. Gun carrying, over and above CD, predicted later crime, particularly drug charges. Because of relatively low counts of drug dealing, we could not clearly distinguish between drug charges for possession or drug dealing. However, we believe that there is a greater link between gun carrying and drug dealing than between gun carrying and possession of drugs, because of the inherent dangers of victimization and robbery associated with drug dealing rather than use or possession. Nevertheless, we cannot exclude the possibility that drug possession identified some who were dealers as well. This point should be addressed in future studies.

In summary, the results show that several factors associated with gun carrying in general populations also applied to this clinic-referred sample. What is new is that CD, which often can be observed earlier than patterns of delinquent acts, was uniquely predictive of gun carrying.

The study has several limitations. It consists of a relatively small clinically referred sample, which may limit the generalizability of the findings, and measures of self-reported delinquency and gun carrying began in year 3. Even though self-reports of gun carrying are used in survey studies,[24] the degree to which it is underreported or overreported remains unclear. On the positive side, self-reports of gun carrying have predictive utility, as shown in this study.

Even though the carrying of handguns by juveniles is prohibited, the pediatric and psychiatric literature has not sufficiently addressed the extent to which youth with symptoms of CD are likely to carry guns. We make the case that gun carrying, even if it is transitory and independent of CD, is predictive of adult crime, particularly drug charges, in a clinical sample of young men. If replicated, these findings would support the inclusion of concealed gun carrying as a symptom of CD in a future revision of *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. We also argue that preventing youth who qualify for CD from carrying concealed guns should be of the highest priority. We realize, however,

What This Study Adds

Even though concealed gun carrying is not a symptom of CD, it has the potential of inflicting lethal harm. Studies on gun carrying by children and adolescents who qualify for CD seem unavailable. It is unclear to what extent gun carrying predicts adult crime and whether CD carries additional risk. These issues were examined in a sample of clinic-referred boys, who were followed up into adulthood. Results show that between the ages of 12 and 17, 1 in 5 of the young men carried a concealed gun, which linearly increased with age. More than half (61.1%) of the young men carried a gun for 1 year only. Gun carrying was significantly associated with CD. Conduct disorder, maternal psychopathy, victimization, and parental monitoring increased the risk of gun carrying by a factor of 8. Adult crime was best predicted by gun carrying, CD, and parental monitoring. Gun carrying predicted drug charges, but not violence or property offenses. Implications are discussed for clinical assessments and for the future symptom range of the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*.

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that such prohibitions are only as effective as enforcement can be put in place. We recommend that a dialogue be started between professional organizations representing pediatricians, psychiatrists, and other mental health workers and local police and juvenile justice personnel to target gun-carrying CD youth as a method to reduce and prevent crime in communities.

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