Firesetting in Adolescence and Being Aggressive, Shy, and Rejected by Peers: New Epidemiologic Evidence from a National Sample Survey

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This population-based case control study examined the hypothesis that the occurrence of firesetting might be greater in youths who exhibit a combination of shyness and aggressiveness and may be complicated by peer rejection. The study's self-report data were from a nationally representative sample survey conducted in 1995. There were 284 cases involving 12- to 17-year-old youths who self-reported recent firesetting, regardless of their intentions. Control subjects were 4,207 youths with no such history. After subjects were matched according to age and neighborhood, conditional logistic regressions were used for estimation. Moderate to strong associations were observed between firesetting and both shyness and aggressiveness (odds ratio [OR] = 6.6; 95% confidence interval [CI] = 2.2–20.4) and feeling highly rejected by peers (OR = 14.5, 95% CI = 3.5–59.6). Independently, boys were 3.8 times more likely to be firesetters ($p = .001$). Although this cross-sectional study revealed associations of firesetting with shyness and aggressiveness, with evidence of a possibly separate influence of peer rejection, correlation should not be construed as causation. More longitudinal research is needed to clarify temporal sequencing of these characteristics. Prevention trials may indicate whether firesetting can be reduced by amelioration of socially maladaptive behavior and peer rejection as manifested in the child and teenage years.

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Arson is a largely unpredictable and dangerous act that produces significant loss of life, injury, property damage, and other severe consequences for families and communities. The objectives of the present study were to examine a nationally representative epidemiologic sample of youth aged 12 to 17 years to estimate the prevalence of firesetting, examine the demographic characteristics of firesetters, and estimate the strength of association between firesetting and a combination of three characteristics: shyness, aggressiveness, and feelings of rejection by peers.

Firesetting in childhood and adolescence is a relatively rare phenomenon, compared with psychiatric disturbances such as anxiety and depression. Nevertheless, the associated potential risk of harm to self and others is great. In consequence, firesetting is a subject of great concern. In the 1980s, Wooden and Berkey[1] reported that the incidence of firesetting by minors was increasing in the United States. The arson arrest rate involving juveniles in 1990 was greater than in any year in the 1980s. From 1996 to 1998, approximately 45 percent of all arson arrestees were juveniles, making arson the index crime with the highest percentage of juvenile involvement (Federal Bureau of Investigation, 1996–1998).[2] The majority (89%) of juvenile arrestees for arson are males and more than half (66%) are under the age of 15 (Federal Bureau of Investigation, 1999).[2]

There are very few community sample studies of firesetting. Our literature review disclosed no evidence from nationally representative epidemiologic

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survey samples that took into account community-level and personal characteristics of youth. Rather, most of the studies of children who set fires have drawn samples from inpatient settings,[3–7] outpatient settings,[8–10] community mental health centers,[11] legal records,[12,13] and psychiatric populations.[14] In surveying psychiatric outpatient populations, clinical investigators have reported the prevalence of firesetting among children to be 2.4[15] and 3.3 percent.[16] Kolko and Kazdin[17] found a much higher incidence and greater prevalence among child psychiatric inpatients than in outpatients.

Two school surveys stand as exceptions to the general rule about the lack of nonclinical samples in research on arson among youth. Whereas the term firesetting is reserved for intentional acts planned to produce a disturbance or to bring about damage or harm, the term fire play is defined as having other involvement with fire and fire materials.[18] Kafry *et al.*[19] interviewed 139 children in kindergarten, second grade, and fourth grade. Sixty percent had participated in unsupervised fire play, and 77 percent reported being present while their friends engaged in fire play. Cole *et al.*[20] surveyed 77 school-attending children in first through eighth grades and found that 38 percent had been involved in at least one unsupervised fire play activity.

Several lines of evidence indicate that adolescent boys may be at higher risk for firesetting.[21,22] Other individual features of temperament, parental psychopathological factors, social and environmental factors, and possible neurochemical predispositions also have been hypothesized to be causes of childhood firesetting.[23] Feeling angry, ignored, sad, or depressed were also commonly reported before acts of firesetting.[5] Moreover, Heath *et al.*[24] observed that firesetters in child psychiatric treatment settings tended to come from larger families of lower socioeconomic status than did nonfiresetting patients.

It has been proposed that adolescents who demonstrate higher levels of aggression are more likely to be arsonists than those who exhibit lower levels of aggression. Besides, although aggression is often regarded as overt conduct-disordered behavior, firesetting acts can be described as covert. Indeed, firesetting tends to be one part of a constellation of other conduct problems, possibly encompassed by the problem-behavior syndrome described by Jessor and Jessor.[25] For example, in one study, five percent of children with conduct problems in an outpatient setting were involved in firesetting.[14] Approximately 74 percent of childhood firesetters had diagnoses of conduct disorders. Nevertheless, although firesetting occurred as one element of a persistent pattern of disturbed behavior in which the basic rights of others and age-appropriate societal norms were violated,[23] underlying motivations, psychopathological factors, or psychological disturbances also may be involved considerably in arson.[21]

Associations between firesetting and being aggressive, shy, or socially withdrawn, have not been explored explicitly, although the combination of shyness (social withdrawal) and aggressiveness (misbehavior) has been prominent in the research of the Woodlawn project team. Based on the Woodlawn project's prospective studies of a community sample, the combination of being shy and aggressive in early childhood was found to signal an increased risk for later delinquency, criminality, antisocial behaviors, and heavier use of alcohol and other drugs.[26–29] On this basis, it is reasonable to hypothesize that the traits of shyness and aggressiveness also place children at higher risk of engaging in firesetting, for firesetting may be one expression of delinquent or antisocial behaviors.

Based on evidence that peer rejection in childhood has predicted various maladaptive outcomes in adolescence and adulthood, including delinquency and psychiatric disturbances,[30] it is plausible that it also may play a role in firesetting. Aggressive behavior toward peers is one of the traits that characterize rejected children. Compared with their classmates' behavior, that of rejected children often tends to be more disruptive, aggressive, and socially inappropriate.[31,32] Rejected children may be more likely to engage in delinquent acts, including firesetting, specifically. For example, Nurcombe[33] studied 21 children who set fires and described their behavior as a reaction to frustration caused by situations such as rejection, loss of parents, and social disorganization. Clinical studies have suggested that lack of social competence and difficulties in interpersonal relations are more frequently reported by firesetters.[30] Comparing firesetters with other hospitalized children with psychological disorders, Kolko *et al.*[34] observed that firesetters had poorly developed social skills.

Based on previous research, a conceptual model can be formed that posits that children who are both shy and aggressive may get into fights, break rules, and display delinquent behavior more often, which

in turn, may be related to feeling rejected. This combination of factors could thus place shy, aggressive, and rejected children at higher risk for a range of disturbances in mental health and behavior, including firesetting.

Our approach has been to start a new line of epidemiologic research on the suspected causal determinants or risk factors for firesetting. We begin this initiative with the strengths of a large, recent, nationally representative sample of youths 12 to 17 years of age, who were administered the Achenbach Youth Self-Report, an extensively used instrument that taps essentially the same constructs as the Child Behavior Check List (CBCL). After producing firesetting prevalence estimates and studying demographic correlates of firesetting, we estimated the suspected association that might link shyness, aggressiveness, and peer rejection to firesetting. Admittedly, several factors, including the narrow cross-sectional character of the national survey data sets a limit on causal inference. More will be learned from the prospective studies and randomized preventive trials we hope will follow in this new line of research.

Methods

The source of the study data is the nationally representative sample assembled by the Substance Abuse and Mental Health Services Administration (SAMHSA) for the 1995 National Household Survey on Drug Abuse (NHSDA).[35] This survey was primarily administered to assess the prevalence and correlates of drug use in the United States. The sample for the NHSDA was from the civilian and noninstitutionalized residential population aged 12 years and older within the United States ($n = 17{,}747$). Multistage area probability sampling was used to recruit participants in this survey and to ensure that desired sample sizes were achieved for certain subpopulations (e.g., Hispanics). Throughout the course of the study, the respondent's privacy, anonymity, and confidentiality were strictly protected, with certain strategies adopted to ensure high response rates. The protocol to analyze secondary anonymous data from the NHSDA was reviewed and approved by the Committee on Human Research, the Institutional Review Board of the Johns Hopkins Unversity Bloomberg School of Public Health. More information on the NHSDA, its reference population, and its sampling design can be found in SAMHSA's published reports.[35]

Sample

In 1995, the NHSDA was used to elicit information from a sample of 4,595 respondents aged 12 to 17 years. Respondents aged 18 or more were excluded from the analyses because they were not asked questions about firesetting. An additional 104 youths who did not answer these questions were excluded as well.

Measures

After participants were recruited and provided informed consent, the NHSDA interviewers administered the standardized self-report assessment. The privacy of responses is emphasized in the introduction to the survey and during the interview session and is enforced by interview procedures, especially when questions are of a sensitive nature. Respondents are asked to mark and record responses privately on answer sheets after listening to questions read aloud by the interviewer. Except for unusual circumstances (e.g., very limited literacy), interviewers did not record or read the respondents' completed answers, which were sealed in secure envelopes immediately after the interview session.

As part of this interview, respondents aged 12 to 17 years were given an adapted survey research version of the Youth Self Report (YSR), which included a list of 112 questions about problems and experiences of children and teenagers. Based on reports from Achenbach and Edelbrock,[36] test-retest reliability for this measure over a six-month period was 0.69. Evidence was also shown of convergent validity, with significant correlations reported between parent and clinician ratings obtained at intake and six-month follow-up.

The Appendix contains several item sets that were selected from the YSR for this study, including a question about setting fires in the six months before the interview session. It should be noted that the firesetting assessment may be limited in its ability to distinguish between fire play and firesetting or between experimenting or playing with fire and intentionally destructive firesetting. Other items from the YSR were used to assess shyness, enduring teasing, difficulty in getting along with other children, and fighting. As with all self-report instruments, these items may be subject to the participant's interpretation.

Statistical Analyses

A case control approach was used to investigate the association between firesetting and the characteristics of interest. There were 284 children (6.3% of the sample) who reported having set a fire at least once in the past six months. Control subjects were the remaining 4,207 children, who did not report setting a fire.

For the traits of shyness and aggressiveness as well as being rejected by peers, variables were both dichotomized (i.e., true versus untrue) and categorized into three levels: no reported problems, a moderate level of problems, and a higher level of problems.

Initial cross-tabulations examined firesetters and control subjects with respect to demographic characteristics and shyness, aggressiveness, and feelings of rejection. Logistic regression models were used to estimate the strength of association between firesetting acts and shyness, aggressiveness, and feelings of rejection. The strength of association was estimated by the odds ratio (OR) and the associated 95 percent confidence interval (CI). Probabilities were used as an aid to interpretation. Variance estimates took the complex survey design and sampling weights into account (i.e., the STATA[37] procedure svyset, specifically designed to set variables for survey data, was used for this purpose). The final analysis matched youths on: (1) census tract of residence (hereinafter, neighborhood) to constrain the influence of shared features of the local area environment (e.g., neighborhood-level socioeconomic status); and (2) age strata to constrain age-related cohort-specific variation. Multiple regression models were developed to take into account male-female differences and possible variation linked to race-ethnicity. The result of this approach (i.e., the conditional form of multiple logistic regression) is a sharper focus on the individual-level personal and behavioral characteristics of shyness, aggressiveness, and rejection by peers.[38,39] All potential two-way interactions have been evaluated within the framework of an exploratory multiple logistic regression. Regression diagnostics were run on the final model as a check on overly influential observations (e.g., using graphs, checking of residuals).[40]

Results

Based on the data from this nationally representative survey sample of young people aged 12 to 17 years, the prevalence of recent self-reported firesetting was estimated to be 6.3 percent (95% CI = 5.6–7.0). For boys, the prevalence estimate was 8.4 percent (95% CI = 7.3–9.6); for girls it was 4.2 percent (95% CI = 3.3–5.0). The relationship across age strata was as follows: for 12- to 13-year-olds, estimated prevalence was 6.8 percent (95% CI = 5.5–8.1); for 14- to 15-year-olds, 7.1 percent (95% CI = 5.8–8.3), and for 16- to 17-year-olds, 5 percent (95% CI = 3.9, 6.2). Regarding race-ethnicity, the observed prevalence estimates were highest for whites (6.9%, 95% CI = 6.0, 7.8) and less for blacks (4.8%, 95% CI = 3.5–6.1) and the remaining race-ethnicity groups, designated "other" (5.0%, 95% CI = 2.0–8.1).

Table 1 Selected Characteristics of Youthful Firesetters and Control Subjects

	Firesetters (n = 284)	Nonfiresetters (n = 4,207)	P
Age, years (mean ± SD)	14.2 ± 1.56	14.5 ± 1.67	0.010
Sex			
Female	93 (32.7)	2137 (50.8)	<0.001
Male	191 (67.3)	2070 (49.2)	
Race			
White	222 (78.2)	2986 (71.0)	0.034
Black	52 (18.3)	1032 (24.5)	
Other	10 (3.5)	189 (4.5)	
Region			
South	103 (36.3)	1778 (42.3)	0.119
Northeast	40 (14.1)	639 (15.2)	
North central	61 (21.5)	810 (19.3)	
West	80 (28.2)	980 (23.3)	
Levels of shyness			
Lower	126 (44.7)	2170 (51.8)	0.096
Medium	121 (42.9)	1597 (38.1)	
Higher	35 (12.4)	425 (10.1)	
Levels of aggressive behavior			
Lower	155 (55.0)	3647 (86.9)	<0.001
Medium	96 (34.0)	435 (10.4)	
Higher	31 (11.0)	113 (2.7)	
Levels of peer rejection			
Lower	126 (45.0)	2910 (69.7)	<0.001
Medium	119 (42.5)	1131 (27.1)	
Higher	35 (12.5)	132 (3.2)	

Data on 4,491 unmatched subjects, excluding 104 subjects who were missing in the firesetting question, were from the NHSDA for youths aged 12–17 years (1995). There are 17, 14, and 38 cases missing in the shyness, aggressive behavior, and peer rejection items, respectively. Data are the number of subjects, with the percentage of the total group in parentheses.

Table 1 characterizes the cases (recent firesetters) versus control subjects, regarding demographic variables, shyness, aggressiveness, and rejection by peers. In these analyses, firesetters were more likely to be younger ($p = .01$), male ($p < .001$), and white ($p = .034$); to show aggressive behavior ($p < .001$); and to

feel rejected by their peers ($p < .001$) than were control subjects.

Multiple logistic regression models were used to estimate the strength of the association between firesetting and shyness, aggressiveness, and feelings of being rejected by peers. In Table 2, the crude and adjusted OR estimates for demographic characteristics and other variables of interest are displayed. In the crude, unadjusted models, the odds of setting fires was an estimated six times higher for youths with moderate levels of aggression and an estimated eight times higher for youths with higher levels of aggression, compared with those who were not aggressive (both $p < .001$). Youths who felt rejected by peers also were more likely to be recent firesetters. Estimated ORs comparing moderate and higher levels of rejection with lower levels of rejection were 2.1 ($p < .001$) and 4.1 ($p < .001$), respectively. As seen in Table 2, youths who reported shyness, starting fights, or being rejected by peers at moderate and high levels were more likely to be firesetters than were youth who were at the lowest level, even after statistical adjustment for other listed variables.

Table 3 presents results from the conditional logistic regression analyses in which shared aspects of local neighborhood and age were constrained by grouping the respondents into matched sets. Youths were sorted into three subgroups based on their answers to the shyness, aggressiveness, and rejection items (i.e., lowest level, moderate level, and higher level). The strength of association between firesetting and shyness and/or aggressiveness was estimated by using conditional logistic regression models appropriate to the matched set data, but with no statistical adjustment for peer rejection in Table 3. For the initial crude estimates with a reference category of youths with low levels of aggression and low levels of shy or socially withdrawn behavior, youths who were intermediate in aggressiveness but not shyness were an estimated 3.5 times more likely to set fires ($p = .009$), whereas youths who were both shy and aggressive (i.e., both moderate and high levels combined) were an estimated 6.6 times more likely to set fires ($p = .001$). After we held constant sex and race, we found that youths who were moderately aggressive but not shy were an estimated 4.2 times more likely to set fires (odds ratio, OR = 4.2; $p = .006$). Statistical adjustment for sex and race had no appreciable influence on the estimated association between firesetting and the combined moderate and high levels of

Table 2 Estimated Associations Between Recent Firesetting and Selected Influences

Variables	*n* (%)	Unadjusted Odds Ratio (95% CI)	*P*	Adjusted Odds Ratio (95% CI)	*P*
Age	4,491 (100.0)	0.9 (0.8–1.0)	0.077	0.9 (0.8–1.0)	0.220
Sex					
Female	2,230 (49.6)	1.0		1.0	
Male	2,261 (50.4)	2.6 (1.9–3.7)	<0.001	2.5 (1.7–3.5)	<0.001
Race					
White	3,208 (71.4)	1.0		1.0	
Black	1,084 (24.1)	0.6 (0.4–1.0)	0.031	0.7 (0.4–1.1)	0.105
Other	199 (4.5)	0.7 (0.3–1.5)	0.306	0.5 (0.2–1.3)	0.163
Region					
South	1,881 (41.9)	1.0		1.0	
Northeast	679 (15.1)	1.1 (0.7–1.9)	0.656	1.3 (0.8–2.2)	0.304
North central	871 (19.4)	1.4 (0.9–2.3)	0.129	1.4 (0.9–2.2)	0.183
West	1,060 (23.6)	1.5 (0.9–2.6)	0.134	1.5 (0.9–2.6)	0.127
Levels of shyness					
Lower	2,296 (51.3)	1.0		1.0	
Medium	1,718 (38.4)	1.4 (1.0–2.0)	0.085	1.5 (1.0–2.3)	0.039
Higher	460 (10.3)	1.4 (0.9–2.1)	0.161	1.6 (1.0–2.4)	0.044
Levels of aggressive behavior					
Lower	3,802 (84.9)	1.0		1.0	
Medium	531 (11.9)	6.0 (4.1–8.8)	<0.001	5.0 (3.3–7.6)	<0.001
Higher	144 (3.2)	8.0 (4.3–15.1)	<0.001	6.5 (3.4–12.3)	<0.001
Levels of peer rejection					
Lower	3,036 (68.2)	1.0		1.0	
Medium	1,250 (28.1)	2.1 (1.6–2.8)	<0.001	1.6 (1.2–2.1)	0.003
Higher	167 (3.7)	4.1 (2.7–6.4)	<0.001	2.2 (1.3–3.7)	0.004

Data are from the NHSDA of youths aged 12–17 years ($n = 4,491$), 1995.

Table 3 Estimated Associations between Recent Firesetting and Levels of Shyness and Aggression

Variables	Unadjusted Odds Ratio (95% CI)	*P*	Adjusted Odds Ratio (95% CI)	*P*
Lowest level of shyness and aggression	1.0		1.0	
Moderate level of shyness, lowest aggression	1.3 (0.6–2.7)	0.508	1.6 (0.7–3.7)	0.224
High level of shyness, lowest aggression	1.1 (0.3–3.5)	0.866	1.3 (0.4–4.6)	0.666
Moderate level of aggression, lowest shyness	3.5 (1.4–8.8)	0.009	4.2 (1.5–11.5)	0.006
High level of aggression, lowest shyness	3.5 (0.5–26.2)	0.225	4.8 (0.4–52.8)	0.203
Combined moderate and high levels of shyness and aggression	6.6 (2.3–19.5)	0.001	6.5 (2.1–20.1)	0.001

Models are adjusted for sex and race, and matching for age and neighborhood has been used to hold constant age as well as shared features of the local residential environments. Data are from the NHSDA of youths aged 12–17 years (n = 4,491), 1995.

shyness and aggressiveness (estimated OR = 6.5; p = .001).

In the next analysis, four groups of youth were formed, based on dichotomous coding of traits (i.e., lowest levels versus combined moderate and high levels) of shyness and aggressiveness: (1) neither shy nor aggressive (i.e., lowest levels of shyness and aggressiveness); (2) shy only (i.e., combined moderate and high levels of shyness but not aggressiveness); (3) aggressive only (i.e., combined moderate and high levels of aggressiveness but not shyness); and (4) both shy and aggressive (i.e., combined moderate and high levels of shyness and aggressiveness). With the regression model used to control for sex and race-ethnicity and with matching for age and residence, the odds of being a firesetter were an estimated 4.2 times higher in respondents who were aggressive only, compared with youths who were neither shy nor aggressive (p = .005). The odds of being a firesetter were an estimated 6.6 times higher in children who were shy and aggressive, compared with the reference group with no shyness or aggressiveness (p = .001). The shy trait by itself was not associated with increased odds of being a firesetter (OR = 1.6, p = .246). A moderate level of peer rejection was associated with a modest excess of firesetting (OR = 2.1; p = .029), whereas highly rejected youths were an estimated 14.5 times more likely to set fires (p < .001) than were youths with low levels of peer rejection.

Next, the regression model was used to control for sex, race-ethnicity, and levels of peer rejection, as shown in the Model II estimates in Table 3. Youths who were aggressive only or were both shy and aggressive were more likely to be firesetters (OR = 3.3, p = .031 and OR = 4.0, p = .028, respectively). After we controlled for demographic variables and shy and aggressive traits, we found that children who felt highly rejected were an estimated 10.9 times more likely to be firesetters (p = .002; Table 4). In this analysis, boys were an estimated 3.8 times more likely than girls to set fires (p = .001), with the shyness, aggressive, and peer rejection characteristics held constant (data not shown in a table).

In a final adjusted regression model, shyness, aggressiveness, and peer rejection were investigated concurrently to help separate their possible effects. In this analysis, the reference group is specified to be youths at the lowest levels of aggressiveness, shyness, and peer rejection, whom we hypothesized to be least involved in firesetting. Compared with this reference

Table 4 Estimated Associations between Recent Firesetting, the Combination of Shy and Aggressive Behaviors, and Peer Rejection

Variables	Model I Initial OR* (95% CI)	*P*	Model II Adjusted OR† (95% CI)	*P*
Shy/Aggressive behavior				
Lowest level of shyness and aggression	1.0		1.0	
Moderate and high levels of shyness, lowest aggression	1.6 (0.7–3.4)	0.246	1.4 (0.6–3.2)	0.449
Moderate and high levels of aggression, lowest shyness	4.2 (1.6–11.4)	0.005	3.3 (1.1–10.0)	0.031
Combined moderate and high levels of shyness and aggression	6.6 (2.2–20.4)	0.001	4.0 (1.2–13.9)	0.028
Peer Rejection				
Not rejected	1.0		1.0	
Moderately rejected	2.1 (1.1–4.2)	0.029	1.8 (0.9–3.9)	0.113
Highly rejected	14.5 (3.5–59.6)	<0.001	10.9 (2.3–51.2)	0.002

*Estimates from Model I were adjusted for both sex and race; residence and age held constant by matching.
†Estimates from Model II were adjusted for sex, race, and all other variables listed in the table; residence and age held constant by matching.
Data are from the NHSDA Youths aged 12–17 years (n = 4,491), 1995.

group, the youths with moderate-to-high levels of aggression, shyness, and feelings of being rejected by peers were an estimated 13.1 times more likely to be firesetters ($p = .001$). When the level of shyness and peer rejection was low, youths with moderate-to-high aggressiveness were an estimated 4.5 times more likely to be firesetters ($p = .03$). When the level of aggressiveness was low, youths with the combination of moderate-to-high shyness and feelings of rejection were an estimated 3.4 times more likely to be firesetters ($p = .026$), whereas when the level of shyness was low, youths with moderate-to-high aggressiveness plus moderate-to-high feelings of rejection were an estimated 5.3 times more likely to be firesetters ($p = .02$). In this analysis, neither shyness by itself nor peer rejection by itself was associated with recent firesetting (for shyness only, OR = 1.0, $p = .979$; for peer rejection only, OR = 1.7, $p = .483$).

Discussion

The main findings of this study were: (1) an estimated six percent of 12- to 17-year-old children in this nationally representative sample reported having recently set a fire; (2) consistent with our hypotheses, youth with the combination of shyness and aggressiveness were more likely to be firesetters than were those who were neither shy nor aggressive; (3) youths with moderate-to-high feelings of rejection by their peers were more likely to be firesetters than were those with lower levels; (4) aggressive youth who were not shy were more likely to be recent firesetters, but this was not the case for nonaggressive shy youths; and (5) the triple combination of shyness, aggressiveness, and feelings of peer rejection were more strongly associated with firesetting (OR = 13.1; $p = .001$). Finally, boys were more likely than girls to be recent firesetters, without consideration of the associations just described, and whites were disproportionately represented among recent firesetters in this nationally representative epidemiologic sample.

Several limitations of this study merit attention before a more detailed consideration of the results. First, the use of cross-sectional data limited our ability to know the temporal sequence of the association between firesetting and shyness, aggressiveness, and/or feelings of peer rejection. Another limitation of the study pertains to the measurement of firesetting as well as of shyness, aggressiveness, and rejection. These characteristics are based on a limited subset of questions in the YSR, and even stronger associations might be found with more complete and psychometrically more powerful assessments. By their nature (i.e., basis on self-reported data) the measurements used in this study may be incomplete because of problems of accuracy and completeness of reporting and may be subject to the participant's interpretation. Further, the method of measuring firesetting in this study is limited in its ability to distinguish between fire play and firesetting or between experimenting or playing with fire and intentionally destructive firesetting. This study did not include measurement of familial information, such as parental supervision or monitoring, which may be influential, because they seem to be involved in youthful maladaptation.[41] Nevertheless, in light of the generally robust associations observed in this study with relatively simple measurements, it now should be possible to refine assessments of this type for more probing prospective or longitudinal research that can resolve matters of temporal sequencing and extend the suspected array of determining influences.

Despite these limitations, the evidence that youth who are shy and aggressive and/or rejected by peers are more likely to be firesetters is deserving of future exploration. Inherent in these findings are public health implications for early identification and prevention. In this study, the incidence of firesetting was higher among youths characterized by aggressive behavior only and somewhat higher among youths who were both shy and aggressive than among youths who were neither shy nor aggressive, even when peer rejection was held constant. These findings are consistent with the previous idea that aggression plays an important part in socially maladaptive conduct, of which firesetting is an understudied component. However, it is important to note that being shy by itself was not associated with firesetting, unless it was combined with aggressiveness. In contrast, firesetting associations involving aggressive behavior and peer rejection were apparent even in the absence of shyness. Indeed, having feelings of peer rejection alone was associated with an increased risk of firesetting, even after adjusting for traits of shyness and aggressiveness. Youth with the combination of shyness and peer rejection and those with aggressiveness and peer rejection were more likely to set fires. The strongest associations with being a firesetter involved the triple combination of moderate-to-high shyness, aggressiveness, and peer rejection.

In new research on arson, emphasis should be placed on contextual studies of children themselves, their families, and their school and community environments as well. Previous researchers have argued that a history of adverse familial environment, such as paternal abuse, an absent mother, domestic violence, single-parent families, marital conflict, seriously dysfunctional family dynamics, limited parental supervision and monitoring, and parental mental disorders such as depression and alcohol and drug abuse, may also lead children to use inappropriate strategies or exhibit problematic behavior such as firesetting in response to a stressful environment.[38,42–43] Identification of causal processes and mechanisms can follow an elucidation of risk factors such as these. For example Barnett and Spitzer[20] and Hill *et al.*[49] have estimated that 50 percent of firesetting occurs under the influence of alcohol, and the involvement of other disinhibiting drugs is plausible. New research on arson can examine these and other questions that will help us to understand this complex behavior, which is of considerable public safety and public health significance.

This study presents evidence of a moderately strong association between firesetting in adolescence and being shy and aggressive as well as feeling rejected by peers. An important next step will be a longitudinal study of these associations. Thereafter, the most definitive evidence can be sought through randomized trials in which we seek to modify early shyness, aggressiveness, and peer rejection to gain subsequent reduced risk of firesetting and associated maladaptive behavior.[50]

We do not want to leave the impression that this new epidemiologic evidence has immediate clinical or practical implications for forensic psychiatrists or other clinicians who are interested in firesetting and arson. This new evidence takes us a step in the direction of identifying potentially modifiable causal antecedents for these forms of socially maladaptive behavior. If confirmed, this evidence may help promote a greater understanding of the life histories of youths or adults who come to the attention of forensic psychiatrists after arrest or prosecution for delinquent or criminal arson. Whether life histories that include peer rejection, social isolation, and prior aggressive behavior should be regarded as mitigating circumstances in the forensic context is a judgment call in a domain of professional practice that is well beyond the bounds of this initial step in a new line of epidemiologic research on the early origins of firesetting.

Appendix: Measurement of Items Used to Assess Constructs Under Study

Before the YSR was administered, participants were told: "below is a list of items that describe young people. Think about whether each item describes you now or within the past six months." Each item was followed by the choices "not true," "somewhat or sometimes true," or "very true or often true." From the YSR, we extracted the following subset of items for this study:

Firesetting: "I set fires."

Aggression: "I get in many fights."

Peer rejection: "I get teased a lot; I don't get along with other kids."

Shy or socially withdrawn: "I am shy."

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