Prevalence and Correlates of Fire-Setting in the United States: Results From the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

Carlos Blanco, MD, PhD; Analucia A. Alegria, BS; Nancy M. Petry, PhD; Jon E. Grant, MD, JD; H. Blair Simpson, MD, PhD; Shang-Min Liu, MS; Bridget F. Grant, PhD; and Deborah S. Hasin, PhD

Objective: To estimate the prevalence, sociodemographic correlates, comorbidity, and rates of mental health service utilization of fire-setters in the general population.

Method: A face-to-face survey of more than 43,000 adults aged 18 years and older residing in households was conducted during the 2001–2002 period. Diagnoses of mood, anxiety, substance use disorders, and personality disorders were based on the Alcohol Use Disorder and Associated Disabilities Interview Schedule-*DSM-IV* Version (AUDADIS-IV).

Results: The prevalence of lifetime fire-setting in the US population was 1.13 (95% CI, 1.0–1.3). Being male, never married, and US-born and having a yearly income over $70,000 were risk factors for lifetime fire-setting, while being Asian or Hispanic and older than 30 years were protective factors for lifetime fire-setting. The strongest associations with fire-setting were with disorders often associated with deficits in impulse control, such as antisocial personality disorder (ASPD) (odds ratio [OR] = 21.8; CI, 6.6–28.5), drug dependence (OR = 7.6; 95% CI, 5.2–10.9), bipolar disorder (OR = 5.6; 95% CI, 4.0–7.9), and pathological gambling (OR = 4.8; 95% CI, 2.4–9.5). Associations between fire-setting and all antisocial behaviors were positive and significant. A lifetime history of fire-setting, even in the absence of an ASPD diagnosis, was strongly associated with substantial rates of Axis I comorbidity, a history of antisocial behavior, a family history of other antisocial behaviors, decreased functioning, and higher treatment-seeking rates.

Conclusions: Our findings suggest that fire-setting may be better understood as a behavioral manifestation of a broader impaired control syndrome and part of the externalizing spectrum. Fire-setting and other antisocial behaviors tend to be strongly associated with each other and increase the risk of lifetime and current psychiatric disorders, even in the absence of a *DSM-IV* diagnosis of ASPD.

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Corresponding author: *Carlos Blanco, MD, PhD, New York State Psychiatric Institute, 1051 Riverside Drive, Box 69, New York, NY 10032 (cb255@columbia.edu).*

Fire-setting, defined as starting a fire on purpose to destroy someone else's property or just to see it burn, often results in property damage, injury, or death of the fire-setter or other people.[1] *Fire-setting* and *pyromania* are sometimes used synonymously, yet there are important differences between them. *Fire-setting* is defined by a behavior, regardless of its motivation. By contrast, *pyromania* has a narrower meaning and refers to a psychiatric diagnosis characterized by recurrent failure to resist impulses to set fires, tension before setting the fire, and satisfaction and relief after doing it.[2] Furthermore, the fire is not set to express anger or vengeance or to improve one's living circumstances. Nationally, an estimated 31,500 fires are set intentionally in any given year. These fires lead to several hundred civilian deaths each year and close to 1 billion dollars in property loss, making fire-setting in the United States a problem of national importance.[3] Some data suggest that the incidence of fire-setting may be increasing.[4,5]

Along with enuresis and cruelty with animals, fire-setting is 1 of the 3 behaviors commonly referred as the McDonald triad for sociopathy.[6] In a recent study, Dadds and Fraser[7] found that fire-setting in childhood was associated with chronic antisocial behavior. Not surprisingly, people who intentionally set fires often experience severe social and legal problems. Moreover, fire-setting appears to be related to emotional distress, but the relationship of fire-setting to other behaviors and psychiatric disorders is poorly understood.[1] Previous studies have suggested that the lifetime prevalence of fire-setting may be 3%–26% in psychiatric patients[8,9] and that a history of fire-setting may be more common among unemployed, unmarried male youths.[1,10,11] Partially based on those studies, it has been hypothesized that fire-setting may be a manifestation of impulsivity,[12–14] psychopathy,[15] or affective[16,17] or obsessive-compulsive spectrum disorder.[18] However, because

prior research was conducted almost exclusively on clinical samples or on convicted arsonists,[11,13,19] the prevalence, demographic correlates, comorbidity, and rates of mental health service utilization of fire-setters in the general population are unknown.

The purpose of this study was to fill these gaps in knowledge. Specifically, we sought to (1) estimate the prevalence and demographic correlates of fire-setting in the general population, (2) examine antisocial behaviors associated with fire-setting, (3) investigate the lifetime and 12-month prevalence of psychiatric disorders associated with fire-setting and level of psychosocial functioning in individuals with a lifetime history of fire-setting, and (4) estimate lifetime prevalence and 12-month rates of mental health treatment-seeking among individuals with a lifetime history of fire-setting.

METHOD

Sample

The 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a nationally representative sample of the adult population of the United States conducted by the US Census Bureau, under the direction of the National Institute of Alcoholism and Alcohol Abuse (NIAAA), as described in detail elsewhere.[20,21] The research protocol, including informed consent procedures, received full ethical review and approval from the US Census Bureau and the US Office of Management and Budget.

Diagnostic Assessment

Sociodemographic measures included age, sex, race/ethnicity, nativity (US-born vs foreign-born), marital status, place of residence, and region of the country. Socioeconomic measures included education, family income measured as a continuous variable, and insurance type.

All lifetime psychiatric diagnoses were made according to *DSM-IV* criteria using the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-*DSM-IV* version (AUDADIS-IV), a valid and reliable fully structured diagnostic interview designed for use by professional interviewers who are not clinicians. Diagnoses included in the AUDADIS-IV can be separated into 3 groups: (1) substance use disorders (including any alcohol abuse/dependence, any drug abuse/dependence, and any nicotine dependence); (2) mood disorders (including major depressive disorder, dysthymia, and bipolar disorder); and (3) anxiety disorders (including panic disorder, social anxiety disorder, specific phobia, and generalized anxiety disorder). The test-retest reliability and validity of AUDADIS-IV measures of *DSM-IV* disorders are adequate, as detailed elsewhere.[22–28] Test-retest reliability and validity were good for major depressive disorder ($\kappa = 0.65–0.73$)[22] and reliability ($\kappa > 0.74$) and validity were good to excellent for substance use disorders.[22–24,29] Reliability was fair to excellent for other mood and anxiety disorders ($\kappa = 0.40–0.60$) and personality disorders ($\kappa = 0.40–0.67$).[22,23] Due to concerns about the validity of psychotic diagnoses in general population surveys, as well as length of the interview, possible psychotic disorders were assessed by asking the respondent if the respondent was ever told by a doctor or other health professional that he or she had schizophrenia or a psychotic disorder.

Embedded in the antisocial personality disorder section was the following question: "Did you ever start a fire on purpose to destroy someone else's property or just to see it burn?" This was queried to all NESARC respondents. Individuals who answered yes to this question were further asked, "Has this happened since you were 15?" While test-retest reliability of individual items is unavailable, the computed Cronbach α for the ASPD symptoms was 0.86, indicating excellent internal consistency for the ASPD section. This value was unchanged when the fire-setting item was excluded, suggesting high reliability for the item. All respondents on the NESARC were asked about a lifetime history of a broad range of other antisocial behaviors, as well as family history of antisocial behavior. The NESARC interview also used the Short Form 12v2 (SF-12v2) to generate measures of disability using the Physical Component Summary (PCS), Mental Health scale, Role Emotional scale, and Social Functioning scale. The Short Form-12v2 is a reliable and valid measure of current disability widely used in population surveys.[30,31]

To estimate rates of mental health service utilization, respondents were classified as receiving treatment if they sought help from a counselor, therapist, doctor, or psychologist or from an emergency room; if they reported being hospitalized for a psychiatric disorder at least 1 night; or if they reported being prescribed medications for a psychological problem.

Statistical Analyses

Weighted percentages and means were computed to derive sociodemographic and clinical characteristics of respondents with and without a lifetime history of fire-setting. Standard errors and 95% CIs for all analyses were estimated using SUDAAN,[32] a software package that uses Taylor series linearization to adjust for the design effects of complex sample surveys like the NESARC. Because the combined standard error of 2 means (or percentages) is always equal to or less than the sum of the standard errors of those 2 means, we conservatively consider that 2 CIs that share a boundary or do not overlap to be significantly different from one another.[33] We consider ORs significant whose CIs do not cross 1.[33] Logistic regressions were conducted to adjust the ORs for sociodemographic variables that were significantly different between individuals with and without lifetime history of fire-setting.

To examine whether the correlates of fire-setting were due to its association with antisocial personality disorder (ASPD), all analyses were repeated excluding individuals

Table 1. Sociodemographic Characteristics of Individuals With and Without a Lifetime History of Fire-Setting in the National Epidemiologic Survey on Alcohol and Related Conditions

	Fire-Setters, N = 407		General Population, N = 41,552			
Characteristic	%	95% CI	%	95% CI	OR	95% CI
Sex						
Male	82.1	77.4–85.9	47.4	46.8–48.1	5.1	3.8–6.8
Female (ref)	17.9	14.1–22.6	52.6	51.9–53.2	1.0	1.0–1.0
Race/ethnicity						
White (ref)	80.5	74.9–85.0	70.9	67.6–74.0	1.0	1.0–1.0
Black	8.6	6.0–12.2	11.0	9.8–12.4	0.7	0.5–1.0
Native American	2.2	1.0–4.6	2.1	1.8–2.4	0.9	0.4–1.9
Asian	1.5	0.5–4.3	4.4	3.5–5.7	0.3	0.1–0.9
Hispanic	7.3	4.7–11.0	11.6	9.3–14.3	0.6	0.4–0.8
Nativity						
US-born (ref)	94.2	88.7–97.1	85.3	82.1–88.1	2.8	1.4–5.7
Foreign-born					1.0	1.0–1.0
Age, y						
18–29 (ref)	37.7	31.6–44.2	21.7	21.0–22.5	1.0	1.0–1.0
30–44	32.0	26.6–38.0	30.8	30.1–31.5	0.6	0.4–0.8
45–64	26.1	20.9–32.1	31.1	30.5–31.7	0.5	0.3–0.7
65+	4.2	2.4–7.1	16.4	15.7–17.1	0.2	0.1–0.3
Education						
Less than high school	12.9	9.6–17.1	15.5	14.6–16.5	0.8	0.6–1.0
High school graduate	27.4	21.8–33.7	29.3	28.2–30.5	0.9	0.6–1.2
Some college or higher	59.7	53.8–65.3	55.1	53.8–56.4	1.0	1.0–1.0
Personal income, $						
0–19,999	42.5	36.2–49.1	47.3	46.1–48.5	1.0	1.0–1.0
20,000–34,999	25.9	20.3–32.5	22.6	21.8–23.3	1.3	0.9–1.8
35,000–69,999	19.7	15.5–24.7	22.0	21.3–22.8	1.0	0.7–1.4
≥ 70,000	11.8	8.3–16.6	8.1	7.4–8.9	1.6	1.1–2.5
Family income, $						
0–19,999 (ref)	24.1	19.0–30.2	23.4	22.4–24.3	1.0	1.0–1.0
20,000–34,999	16.3	12.4–21.3	20.2	19.6–20.9	0.8	0.5–1.1
35,000–69,999	35.4	29.5–41.8	32.2	31.5–32.8	1.1	0.8–1.5
≥ 70,000	24.1	19.2–29.8	24.3	22.9–25.7	1.0	0.7–1.4
Marital status						
Married/cohabiting	54.5	48.2–60.6	62.0	61.1–63.0	1.0	1.0–1.0
Widowed/separated/divorced	11.1	8.1–15.1	17.4	17.0–17.9	0.7	0.5–1.0
Never married	34.4	28.5–40.8	20.5	19.6–21.5	1.9	1.4–2.6
Urbanicity						
Urban	82.1	75.7–87.0	80.2	76.7–83.2	1.0	1.0–1.0
Rural	17.9	13.0–24.3	19.8	16.8–23.3	0.9	0.6–1.2
Region						
Northeast	12.7	7.6–20.5	19.8	13.9–27.5	0.4	0.3–0.6
Midwest	22.1	15.9–29.9	23.2	17.4–30.1	0.7	0.5–0.9
South	33.4	25.5–42.3	35.1	29.0–41.9	0.7	0.5–0.9
West (ref)	31.9	23.0–42.2	21.9	15.7–29.7	1.0	1.0–1.0
Insurance						
Private (ref)	64.5	58.4–70.1	68.3	66.8–69.8	1.0	1.0–1.0
Public	12.1	8.9–16.1	12.9	12.2–13.6	1.0	0.7–1.4
No insurance	23.4	18.3–29.4	18.8	17.6–20.0	1.3	1.0–1.8

Abbreviations: OR = odds ratio, ref = reference.

with a diagnosis of ASPD. Because these 2 sets of analyses resulted in a nearly identical pattern of significant ORs, only the results from the full sample are presented.

RESULTS

Sociodemographic Characteristics

Table 1 shows prevalence and sociodemographic characteristics of individuals with and without a lifetime history of fire-setting. The overall lifetime prevalence of fire-setting in the general population was 1.13%. When individuals with ASPD where excluded from the analysis, fire-setting prevalence decreased by about half, to 0.55%. As shown in Table 1, rates of lifetime history of fire-setting were significantly higher in men than women. Being never married, US-born, or with a yearly income over $70,000 also increased the risk for fire-setting. Furthermore, rates of lifetime history of fire-setting were significantly lower in blacks, Hispanics, and Asians when compared with non-Hispanic whites, in respondents aged 30 years and older relative to those from 18 to 29 years old and to respondents living in the Northeast, Midwest, and South of the US when compared with those living in the West region of the country.

Table 2. Clinical Characteristics of Individuals With and Without a Lifetime History of Fire-Setting in the National Epidemiologic Survey on Alcohol and Related Conditions

	Fire-Setters, N = 407		General Population, N = 41,552					
Other Antisocial Behavior	%	95% CI	%	95% CI	OR	95% CI	AOR[a]	95% CI
Cut class and leave without permission	61.4	55.5–67.0	21.5	20.8–22.2	5.8	4.5–7.5	4.1	3.2–5.4
Stay out late at night	62.6	56.5–68.3	25.4	24.5–26.3	4.9	3.8–6.5	3.5	2.6–4.6
Bully/push people	34.1	28.5–40.2	5.9	5.6–6.3	8.2	6.3–10.8	5.4	4.1–7.2
Run away from home overnight	26.4	21.4–32.2	4.9	4.6–5.2	7.0	5.3–9.3	5.8	4.3–7.8
Be absent from work/school a lot	32.8	26.8–39.5	6.6	6.2–7.0	6.9	5.2–9.3	5.0	3.7–6.8
Quit a job without knowing where to find another	42.1	36.4–48.0	11.3	10.7–11.9	5.7	4.5–7.3	4.1	3.1–5.4
Quit a school program without knowing what to do next	19.0	15.2–23.4	3.6	3.4–4.0	6.2	4.7–8.1	4.5	3.3–6.1
Travel around more than 1 month without plans	17.9	13.8–22.8	3.3	3.0–3.5	6.4	4.7–8.7	4.1	3.0–5.7
Have no regular place to live for at least 1 month	20.0	15.6–25.2	2.6	2.3–2.8	9.5	7.0–12.9	6.6	4.8–9.1
Live with others at least 1 month	37.9	32.0–44.1	10.9	10.2–11.6	5.0	3.9–6.4	4.0	3.1–5.1
Lie a lot	33.3	27.5–39.7	5.0	4.7–5.3	9.5	7.2–12.7	7.3	5.3–10.0
Use a false or made-up name/alias	19.6	15.1–25.2	1.9	1.8–2.1	12.3	8.8–17.1	9.2	6.5–12.9
Scam/con someone for money	18.9	14.5–24.2	1.3	1.2–1.5	17.5	12.6–24.1	10.6	7.3–15.3
Do things that could have easily hurt you/others	53.1	46.8–59.3	13.7	12.7–14.7	7.1	5.5–9.2	4.6	3.5–6.1
Get 3+ traffic tickets for reckless driving/ causing accidents	23.4	18.9–28.6	8.5	7.9–9.29	3.3	2.4–4.4	2.0	1.5–2.7
Have driver's license suspended/revoked	26.4	21.7–31.7	7.6	7.1–8.1	4.4	3.4–5.7	2.6	2.0–3.5
Destroy others' property	49.6	43.5–55.7	3.2	2.9–3.5	29.5	22.8–38.4	18.4	13.7–24.8
Fail to pay off your debts	24.1	18.8–30.5	3.9	3.6–4.3	7.7	5.6–10.8	5.8	4.0–8.3
Steal anything from others	56.8	50.1–63.2	8.5	7.9–9.0	14.2	10.7–18.9	9.9	7.3–13.4
Forge someone's signature	14.2	10.5–18.9	2.0	1.8–2.2	8.1	5.7–11.5	5.9	4.0–8.7
Shoplift	58.2	51.8–64.3	10.8	10.1–11.5	11.5	8.8–15.0	8.1	6.1–10.8
Rob/mug someone or snatch a purse	4.6	2.8–7.3	0.2	0.2–0.3	19.4	10.9–34.4	12.4	6.8–22.7
Make money illegally	27.9	22.5–34.1	2.5	2.3–2.7	15.2	11.1–20.8	8.7	6.1–12.2
Do anything that you could be arrested for	76.2	70.5–81.0	14.8	14.0–15.8	18.4	13.7–24.6	12.1	8.8–16.6
Force someone to have sex	1.4	0.6–3.4	0.1	0.1–0.2	11.6	4.4–30.5	11.0	3.6–33.3
Get into lots of fights that you started	21.0	16.4–26.5	2.6	2.4–2.9	10.0	7.2–13.8	6.6	4.6–9.6
Get into a fight that came to swapping blows with others	18.9	15.1–23.4	6.5	6.1–7.0	3.4	2.5–4.5	3.2	2.3–4.3
Use a weapon in a fight	21.3	16.8–26.7	2.5	2.3–2.7	10.7	7.8–14.6	7.7	5.5–10.8
Hit someone so hard that you injure them	34.9	29.2–41.1	5.7	5.3–6.1	8.9	6.7–11.8	5.2	3.8–7.1
Harass/threaten/blackmail someone	21.5	16.5–27.69	1.5	1.3–1.7	18.0	12.8–25.2	12.4	8.4–18.4
Physically hurt others on purpose	34.8	29.1–41.0	4.7	4.4–5.1	10.8	8.2–14.1	6.5	4.9–8.6
Hurt an animal on purpose	17.6	13.0–23.4	1.6	1.5–1.8	12.8	8.9–18.5	7.5	5.1–11.0
Fire-setting persisted after age 15								
Yes	38.1	31.8–44.7						
No	61.9	55.3–68.2						
Family history of antisocial behavior	49.0	43.1–54.9	17.6	16.7–18.5	4.5	3.5–5.7	4.2	3.3–5.4

[a]Odds ratios adjusted for sex, race, nativity, age, personal income, marital status, and region.
Abbreviations: AOR = adjusted odds ratio, OR = odds ratio.

Table 2 shows that, in most cases, individuals reported fire-setting occurring before age 15 but, in a substantial proportion of the cases (38%), fire-setting persisted after that age. Individuals with a history of fire-setting were more likely to have a family history of antisocial behaviors, as shown by both the adjusted ORs (AORs) and unadjusted ORs

Associated Antisocial Behaviors

Table 2 describes clinical characteristics of individuals with and without a lifetime history of fire-setting. The prevalence of all antisocial behaviors was higher among individuals with a history of fire-setting than among those without it. For both groups, the most common behavior was staying out at night against parental advice, which was endorsed by 61.4% of individuals with a history of fire-setting and 21.5% of those without a history of fire-setting. The behavior most strongly associated with fire-setting, as measured by the OR, was destroying other people's property (OR = 29.5). Even after adjustment for sociodemographic factors, this association remained strong and significant (AOR = 18.4). Besides destroying someone's property, the behaviors more strongly associated with fire-setting were robbing, mugging, or purse-snatching (OR = 19.4) and harassing, threatening, or blackmailing someone (OR = 18.0). When respondents with ASPD were excluded from the analyses, individuals with a history of fire-setting continued to show significantly greater rates of every antisocial behavior assessed than those individuals without a history of fire-setting (data available upon request).

Comorbidity and Treatment-Seeking

The vast majority of individuals with a lifetime history of fire-setting (95.1%) had a lifetime history of at least 1 psychiatric diagnosis (Axis I or II diagnosis), compared to 53.5% of the individuals who did not endorse ever intentionally setting a fire (Table 3). Both lifetime Axis I and Axis II disorders were more common among fire-setters than among nonfire-setters (90.9% vs 51.2% for Axis I, and 68.9%

Table 3. Lifetime Psychiatric Comorbidity of Individuals With and Without a Lifetime History of Fire-Setting in the National Epidemiologic Survey on Alcohol and Related Conditions

	Fire-Setters, N = 407		General Population, N = 41,552		Sociodemographic Characteristics[a]		Sociodemographic Characteristic and Other Psychiatric Disorders[b]	
Comorbid Psychiatric Disorders	%	SE	%	SE	AOR	95% CI	AOR	95% CI
Any psychiatric diagnosis	95.1	1.3	53.6	0.9	12.8	7.3–22.4	12.8	7.3–22.4
Any Axis I diagnosis	90.9	1.9	51.2	0.9	7.2	4.5–11.5	3.6	2.2–5.9
Any substance use disorder	80.4	2.5	38.2	0.8	4.3	3.0–6.3	2.5	1.7–3.6
Any alcohol use disorder	71.7	3.0	29.9	0.8	3.8	2.7–5.3	1.6	1.1–2.3
Alcohol abuse	27.4	2.8	17.8	0.5	1.2	0.9–1.6	0.9	0.7–1.3
Alcohol dependence	44.3	3.2	12.2	0.4	3.5	2.6–4.7	1.3	1.0–1.8
Any drug use disorder	48.4	3.0	10.0	0.3	5.4	4.0–7.2	2.4	1.8–3.3
Drug abuse	26.3	2.5	7.6	0.3	2.6	1.9–3.5	1.3	0.9–1.8
Drug dependence	22.2	2.7	2.4	0.1	7.6	5.2–10.9	2.6	1.8–3.7
Nicotine dependence	43.0	3.1	17.6	0.5	2.7	2.0–3.7	1.0	0.8–1.4
Any mood disorder	40.3	3.2	18.5	0.4	3.3	2.5–4.29	1.0	0.8–1.4
Major depressive disorder	15.9	2.1	13.5	0.3	1.4	1.0–1.9	0.7	0.5–1.0
Bipolar disorder	23.0	2.9	4.3	0.2	5.6	4.0–7.9	1.6	1.1–2.2
Dysthymia	7.7	1.6	3.2	0.1	3.1	1.9–5.0	1.3	0.8–2.2
Any anxiety disorder	32.9	3.1	17.4	0.5	2.7	2.0–3.6	0.9	0.7–1.3
Panic disorder	13.3	2.0	5.3	0.2	3.3	2.3–4.8	1.3	0.9–2.1
Social phobia	10.7	2.3	5.0	0.2	2.1	1.3–3.5	0.7	0.4–1.2
Specific phobia	18.2	2.2	9.5	0.3	2.5	1.9–3.4	1.1	0.8–1.6
Generalized anxiety disorder	7.4	1.5	4.2	0.2	2.1	1.3–3.3	0.7	0.4–1.2
Conduct disorder	9.0	1.7	1.0	0.1	6.9	4.4–10.9	6.1	3.6–10.4
Pathological gambling	2.7	0.8	0.4	0.0	4.8	2.4–9.5	1.4	0.6–3.0
Psychotic disorder	1.6	0.6	0.3	0.0	5.0	2.2–11.4	1.3	0.5–3.4
Any personality disorder	68.9	2.7	14.5	0.3	11.2	8.8–14.2	7.9	5.9–10.6
Avoidant	6.7	1.6	2.4	0.1	2.6	1.6–4.4	0.6	0.3–1.5
Dependant	1.9	0.7	0.5	0.1	3.3	1.4–7.9	0.5	0.2–1.5
Obsessive-compulsive	30.4	2.9	7.8	0.2	4.7	3.6–6.2	2.2	1.5–3.1
Paranoid	17.2	2.3	4.4	0.2	4.4	3.1–6.2	1.0	0.6–1.7
Schizoid	11.0	1.6	3.1	0.1	3.4	2.4–4.9	0.9	0.5–1.7
Histrionic	12.1	1.9	1.8	0.1	5.8	4.0–8.6	1.5	0.9–2.7
Antisocial	51.5	2.9	3.2	0.1	21.8	16.6–28.5	14.3	10.1–20.3

[a]Odds ratios adjusted for sex, race, nativity, age, personal income, marital status, and region.
[b]Odds ratios adjusted for sex, race, nativity, age, personal income, marital status, region, and other psychiatric disorders.
Abbreviation: AOR = adjusted odds ratio.

vs 14.5% for Axis II disorders, respectively). In both groups, the most prevalent disorder category was "any alcohol use disorder." However, the strongest associations between fire-setting and any psychiatric diagnoses were found for ASPD even when adjusting for sociodemographic characteristics (AOR = 21.8) and drug dependence (AOR = 7.6). Other disorders often associated with deficits in impulse control, such as pathological gambling (AOR = 4.8) and bipolar disorder (AOR = 5.7) were also strongly associated with fire-setting when sociodemographic characteristics were adjusted for. Associations with anxiety disorders, although also significant, were of smaller magnitude.

As shown in Table 4, a similar pattern was observed when examining current, rather than lifetime, comorbid diagnoses of Axis I disorders in adjusted ORs. Individuals with a history of fire-setting were significantly more likely than those without a history of fire-setting to have lower scores on Social Functioning, Role Emotional, and Mental Health scales on the SF-12 v2 after sociodemographic characteristics were adjusted for.

Table 5 shows treatment-seeking characteristics of individuals with a lifetime history of fire-setting. Lifetime rates of mental health treatment-seeking were significantly higher among fire-setters than among the individuals without a lifetime history of fire-setting across all treatment settings regardless of whether lifetime or past-year timeframe was considered (45.7% versus 18.8%, respectively). Similarly, fire-setting in the absence of ASPD was significantly associated with lifetime and current psychiatric disorders, social and mental health low scores, and mental health service utilization even after adjusting for sociodemographic factors (data not shown).

DISCUSSION

This is the first national study to examine the prevalence and characteristics of fire-setting in the US general population. We found that (1) the prevalence of fire-setting in the general population was about 1%; (2) individuals with a lifetime history of fire-setting, even those without ASPD, were more likely than the individuals without a history of fire-setting to engage in other antisocial behaviors; (3) almost all individuals with a lifetime history of fire-setting had lifetime or current psychiatric comorbidity (even when

Table 4. Twelve-Month Psychiatric Comorbidity of Individuals With and Without a Lifetime History of Fire-Setting in the National Epidemiologic Survey on Alcohol and Related Conditions

	Fire-Setters, N = 407		General Population, N = 41,552		Sociodemographic Characteristics[a]		Sociodemographic Characteristics and Other Psychiatric Disorders[b]	
Comorbid Psychiatric Disorders	%	SE	%	SE	AOR	95% CI	AOR	95% CI
Any Axis I diagnosis	63.7	2.9	29.7	0.6	3.4	2.6–4.4	1.7	1.2–2.2
Any substance use disorder	47.3	3.1	18.6	0.5	2.6	2.0–3.5	1.6	1.1–2.1
Any alcohol use disorder	27.7	2.7	8.2	0.2	2.4	1.8–3.3	1.3	0.9–1.8
Alcohol abuse	10.8	2.2	4.6	0.2	1.5	0.9–2.4	1.1	0.7–1.9
Alcohol dependence	16.9	2.0	3.6	0.1	3.0	2.2–4.0	1.2	0.8–1.7
Any drug use disorder	13.9	2.2	1.9	0.1	4.7	2.9–7.4	1.8	1.0–3.1
Drug abuse	10.2	2.0	1.5	0.1	4.0	2.3–6.7	1.6	0.9–3.0
Drug dependence	7.2	1.6	0.6	0.1	7.8	4.4–13.8	2.2	1.1–4.7
Nicotine dependence	34.5	3.0	12.6	0.4	2.7	2.0–3.7	1.4	1.0–1.9
Any mood disorder	22.7	2.4	8.4	0.2	3.3	2.5–4.4	1.2	0.8–1.7
Major depressive disorder	8.5	1.6	5.3	0.2	1.8	1.2–2.7	0.8	0.5–1.4
Bipolar	12.8	2.1	2.6	0.1	4.7	3.2–6.8	1.3	0.8–2.1
Dysthymia	3.8	1.3	1.3	0.1	3.6	1.7–7.3	1.4	0.6–3.1
Any anxiety disorder	21.7	2.6	11.2	0.3	2.5	1.8–3.4	0.9	0.6–1.3
Panic disorder	6.9	1.3	2.2	0.1	3.9	2.5–5.9	1.8	1.1–3.0
Social phobia	4.2	1.0	2.8	0.1	1.5	0.9–2.6	0.5	0.3–0.9
Specific phobia	13.4	2.0	7.2	0.3	2.3	1.6–3.3	1.1	0.8–1.6
Generalized anxiety disorder	3.7	1.1	2.1	0.1	2.1	1.1–3.8	0.6	0.3–1.3
Pathological gambling	1.6	0.6	0.1	0.0	7.8	3.3–18.6	2.7	1.0–7.0
	Mean	SE	Mean	SE	Wald *F*	*P* Value	Wald *F*	*P* Value
Social Functioning Scale	49.9	0.6	51.8	0.1	20.15	< .0001	0.07	.7983
Role Emotional Scale	49.9	0.6	51.0	0.1	12.58	.0007	2.15	.1477
Mental Health Scale	49.4	0.7	52.2	0.1	28.36	< .0001	0.88	.3510
Physical Component Summary	51.3	0.6	50.6	0.1	3.79	.0559	0.12	.7333

[a]Odds ratios adjusted for sex, race, nativity, age, personal income, marital status, and region.
[b]Odds ratios adjusted for sex, race, nativity, age, personal income, marital status, region, and other psychiatric disorders.
Abbreviation: AOR = adjusted odds ratio.

Table 5. Treatment Correlates of Individuals With and Without a Lifetime History of Fire-Setting in the National Epidemiologic Survey on Alcohol and Related Conditions

	Fire-Setters, N = 407		General Population, N = 41,552					
Treatment Correlate	%	95% CI	%	95% CI	OR	95% CI	AOR[a]	95% CI
Any mental health treatment (lifetime)	45.7	39.5–52.1	18.8	18.0–19.7	3.6	2.8–4.7	4.1	3.1–5.5
Any mental health treatment (12-month)	6.9	4.4–10.6	1.0	0.8–1.1	7.6	4.5–12.7	4.8	2.7–8.5
Any psychiatric hospitalization (lifetime)	15.6	12.3–19.6	3.8	3.6–4.1	4.6	3.5–6.2	4.7	3.5–6.2
Any psychiatric hospitalization (12-month)	1.9	0.9–4.0	0.2	0.2–0.3	8.1	3.6–18.0	5.0	2.1–12.0
Any emergency room visit (lifetime)	15.5	11.9–19.9	5.0	4.6–5.3	3.5	2.5–4.9	3.5	2.5–4.9
Any emergency room visit (12-month)	2.7	1.2–6.0	0.2	0.1–0.2	15.2	6.2–37.3	8.7	3.1–24.4
Any prescribed psychotropic medication (lifetime)	21.0	16.4–26.5	12.0	11.3–12.7	1.9	1.5–2.6	2.7	2.0–3.6
Outpatient treatment (lifetime)	38.9	33.1–45.1	16.1	15.3–16.8	3.3	2.6–4.3	3.8	2.9–5.0
Outpatient treatment (12-month)	5.1	3.0–8.5	0.8	0.7–0.9	6.8	3.8–12.0	4.3	2.4–7.9
Inpatient treatment (lifetime)	22.9	18.4–28.0	4.7	4.4–5.1	6.0	4.5–8.0	5.1	3.8–6.9
Inpatient treatment (12-month)	3.7	2.1–6.6	0.5	0.4–0.6	7.8	4.1–14.8	4.5	2.2–9.4

[a]Odds ratios adjusted for sex, race, nativity, age, personal income, marital status, and region.
Abbreviation: AOR = adjusted odds ratio, OR = odds ratio.

those with ASPD were excluded from the analysis); and (4) approximately half of the individuals with a lifetime history of fire-setting have used mental health services at some point of their lives, more than 3 times the rate in individuals without a history of fire-setting.

Confirming results from clinical samples,[11] we found that individuals with a history of fire-setting were more likely than those without a history of fire-setting to be male, young, and never married. Sex differences may be due a greater rate of impulsivity and risk-taking behaviors among men,[34,35] while the relationship of a lifetime history fire-setting and young age in this study may indicate a birth cohort effect of the youngest group, a recall bias of remote events, or higher mortality of fire-setters in the oldest age group.[36] Although about 60% of cases of fire-settings occurred before age 15, almost 40% of the cases persisted after that age.

In accord with previous research in clinical samples,[11,13,37,38] we found that individuals with a history of fire-setting were significantly more likely to have other psychiatric disorders associated with impaired impulse control, such as substance use disorders, bipolar disorder,

pathological gambling, and ASPD, even after adjusting for other psychiatric disorders. Dysthymia and anxiety disorders had the weakest association with fire-setting in this study. Although obsessive-compulsive disorder was not assessed in the NESARC, obsessive-compulsive personality disorder (OCPD) was. Fire-setting was significantly associated with OCPD, but its association with ASPD was much stronger, suggesting that fire-setting may be closer to disorders of impulsivity than to obsessive-compulsive spectrum disorders. These findings are supported by the strong association of fire-setting with other antisocial behaviors reported in this study. Overall, these data are consistent with prior research indicating that antisocial behavior, substance use, and impulsivity share a common underlying vulnerability.[39–41] These findings suggest that fire-setting may be better understood as a behavioral manifestation of a broader impaired control syndrome and part of the externalizing spectrum rather than the internalizing spectrum disorders.

The finding that a lifetime history of fire-setting and a family history of antisocial behaviors, even in the absence of an ASPD diagnosis, were strongly associated with a history of other antisocial behaviors and substantial Axis I comorbidity, raises questions about the current conceptualization of ASPD. About one half of the individuals with a lifetime history of fire-setting met criteria for ASPD. Removal of those individuals from the analysis diminished the strength but not the direction or significance of our findings regarding psychiatric comorbidity, associated antisocial behaviors, or treatment-seeking (data available upon request). Consistent with the recommendations of the *DSM-V* Research Planning Nomenclature Work Group to conduct research on dimensional models of existing typologies[42,43] and specifically on the conceptualization of ASPD[44,45] and on the broader category of externalizing disorders,[39,45] our findings suggest that antisocial behaviors tend to be strongly associated with each other and increase the risk of lifetime and current psychiatric disorders, even in the absence of a *DSM-IV* diagnosis of APSD. These findings underscore the importance of antisocial syndromes of behaviors currently considered subthreshold. There may be certain nosologic advantages of a dimensional rather than a categorical conceptualization of ASPD.[46] Future research should examine the clinical, research and policy-making utility of dimensional, categorical, or a combination of both approaches to better define ASPD and the implications of selecting specific diagnostic thresholds.

Our study also identified higher rates of lifetime and past-year treatment utilization across a broad range of service settings. Respondents in the NESARC study were not specifically asked whether they sought treatment for other reasons but rather if they sought treatment for any Axis I disorder. Based on prior reports,[1] it appears that very few individuals seek treatment for fire-setting, and, when they seek treatment for other reasons, they are rarely queried about their history of fire-setting behavior. Given the high rates of comorbidity, disability, and treatment utilization of individuals with a lifetime history of fire-setting documented in this study, it seems important to screen for a history of fire-setting among psychiatric patients.

This study has the limitations common to most large-scale surveys. First, information was based on self-report, potentially resulting in overestimation or underestimation of the true rates of fire-setting. The NESARC did not examine the reliability of individual items. However, the ASPD module of the AUDADIS, which contained the fire-setting questions, had a $\kappa = 0.67$, which compares favorably with other standardized assessments of ASPD.[29] Furthermore, the reliability of the ASPD module, as measured by Cronbach α, was 0.86, and it did not change whether or not the fire-setting questions were included in the calculation, supporting the reliability of the fire-setting questions. Third, because the NESARC sample included only civilian households and quarters populations, information on individuals in prison, who may have higher rates of fire-setting, was unavailable. Fourth, frequency, severity, and the negative consequences of fire-setting were not assessed, leaving the possibility that the behavior occurred only once in the individual's life and/or might not have resulted in substantive damages. Even with this broad definition, the results of the study suggest that a lifetime history of fire-setting is strongly associated with high rates of psychopathology and treatment-seeking. At present, little is known about fire-setting or pyromania in the general population. Longitudinal data are needed to examine the course of fire-setting and to distinguish individuals with fire-setting from those who develop pyromania. Differences between individuals who set fires and those with the diagnosis of pyromania could inform the need for a broader definition of *DSM-IV* pyromania. Fifth, Wave 1 of the NESARC did not include data on borderline personality disorder or attention-deficit/hyperactivity disorder, both of which are associated with high levels of impulsivity. Finally, because the questions about fire-setting were embedded in the ASPD module, the associations detected in this study could have been better explained as correlates of ASPD. However, removal of individuals with ASPD did not change the pattern of associations, suggesting that our findings reflect true associations with fire-setting. Future research should evaluate whether the associations found in this study could be also be explained as correlates of pyromania.

Despite these limitations, our study constitutes a critical step toward improving the understanding of the prevalence and characteristics of fire-setting behavior in the United States. The study found high rates of other antisocial behaviors and comorbidity with externalizing spectrum disorders in a large, nationally representative sample of the general population. Given the legal and social consequences of fire-setting, its associated disability and high rates of treatment-seeking, and its cost to society, the results of this study suggest that more attention may be needed to address the needs of individuals with a history of fire-setting.

Author affiliations: Department of Psychiatry, New York State Psychiatric Institute, College of Physicians and Surgeons of Columbia University, New York (Drs Blanco, Simpson, and Hasin and Mss Alegria and Liu); University of Connecticut Health Center, Farmington (Dr Petry); Department of Psychiatry, University of Minnesota, Minneapolis (Dr J. Grant); and Laboratory of Epidemiology and Biometry, Division of Intramural Clinical and Biological Research, National Institute on Alcohol Abuse and Alcoholism (NIAAA), National Institutes of Health (NIH), Bethesda, Maryland (Dr B. Grant).

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REFERENCES

1. Barker A. *Arson: A Review of the Psychiatric Literature*. London, United Kingdom: Oxford University Press; 1994.
2. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Fourth Edition, Text Revision. Washington, DC: American Psychiatric Association; 2000.
3. United States Fire Administration. http://www.usfa.dhs.gov/ accessed September 10, 2007.
4. Prins H. *Fire Rising: Its Motivation and Management*. London, United Kingdom: Routledge; 1994.
5. Grant JE. Dissociative symptoms in kleptomania. *Psychol Rep*. 2004;94(1):77–82.
6. Hellman DS, Blackman N. Enuresis, firesetting and cruelty to animals: a triad predictive of adult crime. *Am J Psychiatry*. 1966;122(12): 1431–1435.
7. Dadds MR, Fraser JA. Fire interest, fire setting and psychopathology in Australian children: a normative study. *Aust N Z J Psychiatry*. 2006;40(6–7):581–586.
8. Grant JE, Levine L, Kim D, et al. Impulse control disorders in adult psychiatric inpatients. *Am J Psychiatry*. 2005;162(11):2184–2188.
9. Geller JL, Bertsch G. Fire-setting behavior in the histories of a state hospital population. *Am J Psychiatry*. 1985;142(4):464–468.
10. Räsänen P, Hirvenoja R, Hakko H, et al. A portrait of the juvenile arsonist. *Forensic Sci Int*. 1995;73(1):41–47.
11. Lejoyeux M, McLoughlin M, Ades J. Pyromania. In: Hollander E, Stein D, eds. *Clinical Manual of Impulse-Control Disorders*. Washington, DC: APPI; 2005.
12. Lewis N, Yarnell H. *Pathological Fire Setting (pyromania)*. New York, NY: Coolidge Foundation; 1951.
13. Ritchie EC, Huff TG. Psychiatric aspects of arsonists. *J Forensic Sci*. 1999;44(4):733–740.
14. Taylor JL, Thorne I, Robertson A, et al. Evaluation of a group intervention for convicted arsonists with mild and borderline intellectual disabilities. *Crim Behav Ment Health*. 2002;12(4):282–293.
15. Forehand R, Wierson M, Frame CL, et al. Juvenile firesetting: a unique syndrome or an advanced level of antisocial behavior? *Behav Res Ther*. 1991;29(2):125–128.
16. McElroy SL, Hudson JI, Pope H Jr, et al. The DSM-III-R impulse control disorders not elsewhere classified: clinical characteristics and relationship to other psychiatric disorders. *Am J Psychiatry*. 1992;149(3):318–327.
17. McElroy S, Satlin A, Pope H, et al. Disorders of impulse control. In: Hollander E, Stein D, eds. *Impulsivity and Aggression*. New York, NY: Wiley; 1995.
18. Hollander E, ed. *Obsessive-Compulsive Related Disorders*. Washington, DC: American Psychiatric Press; 1993.
19. Leong GB. A psychiatric study of persons charged with arson. *J Forensic Sci*. 1992;37(5):1319–1326.
20. Grant B, Moore T, Kaplan K. *Source and Accuracy Statement: Wave 1 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)*. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2003.
21. Grant BF, Stinson FS, Dawson DA, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry*. 2004;61(8):807–816.
22. Canino G, Bravo M, Ramírez R, et al. The Spanish Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability and concordance with clinical diagnoses in a Hispanic population. *J Stud Alcohol*. 1999;60(6):790–799.
23. Grant BF, Harford TC, Dawson DA, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. *Drug Alcohol Depend*. 1995;39(1):37–44.
24. Cottler LB, Grant BF, Blaine J, et al. Concordance of DSM-IV alcohol and drug use disorder criteria and diagnoses as measured by AUDADIS-ADR, CIDI and SCAN. *Drug Alcohol Depend*. 1997;47(3):195–205.
25. Hasin D, Grant BF, Cottler L, et al. Nosological comparisons of alcohol and drug diagnoses: a multisite, multi-instrument international study. *Drug Alcohol Depend*. 1997;47(3):217–226.
26. Pull CB, Saunders JB, Mavreas V, et al. Concordance between ICD-10 alcohol and drug use disorder criteria and diagnoses as measured by the AUDADIS-ADR, CIDI and SCAN: results of a cross-national study. *Drug Alcohol Depend*. 1997;47(3):207–216.
27. Vrasti R, Grant BF, Chatterji S, et al. Reliability of the Romanian version of the alcohol module of the WHO Alcohol Use Disorder and Associated Disabilities: Interview Schedule–Alcohol/Drug-Revised. *Eur Addict Res*. 1998;4(4):144–149.
28. Ruan WJ, Goldstein RB, Chou SP, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): Reliability of new psychiatric diagnostic modules and risk factors in a general population sample. *Drug Alcohol Depend*. 2008;92(1-3):27–36.
29. Grant BF, Dawson DA, Stinson FS, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug Alcohol Depend*. 2003;71(1):7–16.
30. Ware JE, Turner-Bowker DM, Gandek B. *How to Score Version 2 of the SF-12 Health Survey*. Lincoln, RI: Quality Metrics; 2002.
31. Ware J Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care*. 1996;34(3):220–233.
32. Research Triangle Institute. *Software for Survey Data Analysis (SUDAAN), Version 9.0*. NC: Research Triangle Institute Research Triangle Park; 2004.
33. Agresti A. *Categorical Data Analysis*. 2nd ed. John Hoboken, NJ: Wiley & Sons, Inc.; 2002.
34. Zuckerman M, Kuhlman DM. Personality and risk-taking: common biosocial factors. *J Pers*. 2000;68(6):999–1029.
35. Mościcki EK. Gender differences in completed and attempted suicides. *Ann Epidemiol*. 1994;4(2):152–158.
36. Rice JP, Neuman RJ, Saccone NL, et al. Age and birth cohort effects on rates of alcohol dependence. *Alcohol Clin Exp Res*. 2003;27(1):93–99.
37. Virkkunen M, Eggert M, Rawlings R, et al. A prospective follow-up study of alcoholic violent offenders and fire setters. *Arch Gen Psychiatry*. 1996;53(6):523–529.
38. Geller JL. Pathological firesetting in adults. *Int J Law Psychiatry*. 1992;15(3):283–302.
39. Krueger RF, Markon KE, Patrick CJ, et al. Externalizing psychopathology in adulthood: a dimensional-spectrum conceptualization and its implications for DSM-V. *J Abnorm Psychol*. 2005;114(4):537–550.
40. Krueger RF. The structure of common mental disorders. *Arch Gen Psychiatry*. 1999;56(10):921–926.
41. Kendler KS, Davis CG, Kessler RC. The familial aggregation of common psychiatric and substance use disorders in the National Comorbidity Survey: a family history study. *Br J Psychiatry*. 1997;170(6):541–548.
42. Rounsaville B, Alarcon R, Andrews G, et al. Basic nomenclature issues for DSM-V. In: Kendell RE, Kendler K, eds. *A Research Agenda for*

DSM-V. Washington, DC: American Psychiatric Association; 2002.
43. Widiger T, Simonsen E, Krueger R, et al. Personality disorder research agenda for DSM-V. In: Widiger T, Simonsen E, Sirovatka P, et al, eds. *Dimensional Models of Personality Disorders*. Washington, DC: American Psychiatric Association; 2005.
44. Marcus DK, Lilienfeld SO, Edens JF, et al. Is antisocial personality disorder continuous or categorical? A taxometric analysis. *Psychol Med*. 2006;36(11):1571–1581.
45. Bucholz KK, Hesselbrock VM, Heath AC, et al. A latent class analysis of antisocial personality disorder symptom data from a multi-centre family study of alcoholism. *Addiction*. 2000;95(4):553–567.
46. Markon KE, Krueger RF. Categorical and continuous models of liability to externalizing disorders: a direct comparison in NESARC. *Arch Gen Psychiatry*. 2005;62(12):1352–1359.