Terrorism, Natural Disasters and Substance Use

General Populations

Cardenas, J., Williams, K., Wilson, J.P., Fanouraki, G., and Singh A. (2003). PTSD, major depressive symptoms, and substance abuse following September 11, 2001, in a midwestern university population. *International Journal of Emergency Mental Health.* 5(1):15-28.

This research investigated the prevalence of Posttraumatic Stress Disorder (PTSD), Major Depressive Disorder (MDD) and substance abuse in a midwestern university population following the terrorist attacks on September 11, 2001, in New York City and Washington, DC. Three-hundred five subjects volunteered to complete a questionnaire which measured nine areas of psychosocial functioning which included demographics, personality, PTSD, MDD, prior traumatic experiences, alcohol and drug use, psychiatric history and treatment, and current attitudes towards government, religion, the economy, and how children were affected by the events. The participants lived in a large urban city over which United Flight 93 circled before crashing in Pennsylvania due to terrorist attacks. The subjects were forced to evacuate their university and city due to attacks on New York and errant United Flight 93. The study also replicated the first two national studies on PTSD prevalence (Schuster, et al., 2002; Galea, et al., 2002). The results found a prevalence rate of 5.9% for probable PTSD, matching identically previous national surveys. There were higher levels of PTSD and MDD for females, those with less education and who were single or unmarried, and those who had a prior history of mental health problems or psychological trauma. PTSD and MDD were associated with higher levels of alcohol and drug use since September 11. Relations to active duty military personnel appear to moderate the perception of threat, suggesting the importance of affiliative kinship patterns to coping with stress. Finally, the concept of geographic and psychological proximity to the 'zone of danger' is discussed.

Deren, S., Shedlin, M., Hamilton, T., and Hagan, H. (2002). Impact of the September 11th attacks in New York City on drug users: A preliminary assessment. *Journal of Urban Health.* 79(3):409-12.

An exploratory assessment of the impact of the September 11th attacks in New York City on drug users, including their perceptions of changes in drug use, drug availability, police activities, and access to services, was undertaken. Methods included focus groups with drug users and acquired immunodeficiency syndrome (AIDS) outreach worker supervisors and surveys of service providers. Results indicated that, while there was some immediate concern about the potential impact on drug availability, there was no perceived scarcity, although some drug users did report a decrease in drug purity. Responses included increased use of drugs and increased demand for drug treatment. The wide range of responses indicates that continued monitoring of the impact may be needed to assess long-term effects

Factor, S.H., Wu, Y., Monserrate, J., Edwards, V., Cuevas, Y., Del Vecchio, S., and Vlahov, D. (2002). Drug use frequency among street-recruited heroin and cocaine users in Harlem and the Bronx before and after September 11, 2001. *Journal of Urban Health.* 79(3):404-8.

We determined if illicit drug use frequency changes after a disaster by comparing drug use frequency in two street-recruited samples of heroin and cocaine users, ages 15-40 years. The

users were interviewed between July 11 and November 11 and divided into before- and after-September 11th groups for analysis. The before and after groups were similar in the mean number of days of drug use per month (sniff cocaine 6.8 days vs. 9.4 days, respectively, P =.17; snorted heroin 13.9 vs. 14.0, respectively, P =.96; smoked crack 16.9 vs. 15.6, respectively, P =.96; and smoked marijuana 17.5 vs. 15.3, respectively, P =.36) and in the proportion of daily users: sniffed cocaine 10% versus 17%, respectively (P =.28); snorted heroin 47% versus 40%, respectively (P =.91); smoked crack 33% versus 37%, respectively (P =.68); and smoked marijuana 47% versus 40%, respectively (P =.41). Among street-recruited heroin and cocaine users in Harlem and the Bronx, the frequency of drug use did not increase following the events of September 11, 2001.

Godleski, L.S. (1997). Tornado disasters and stress response. *Journal of the Kentucky Medical Association*. 95(4):145-8.

Each year, a number of tornados rip through Kentucky, leaving fear, destruction, and human injury in their path. Persons who endure these catastrophes often experience a variety of stress responses. The psychological and medical sequelae include depression, acute and post-traumatic stress disorders, substance abuse, anxiety, and somatization. It is especially important for the Kentucky practitioner to be able to recognize and screen for pathology following a tornado disaster in order to provide leadership in ascertaining treatment for such stress responses.

Joseph, S., Yule, W., Williams, R., and Hodgkinson, P. (1993). Increased substance use in survivors of the Herald of Free Enterprise disaster. *British Journal of Medical Psychology.* 66(Pt 2):185-91.

Cross-sectional data are reported on 73 survivors of the Herald of Free Enterprise disaster. Many reported an increase in their consumption of alcohol, cigarettes, sleeping tablets, antidepressants and tranquillizers at six and 30 months. The level of increased use was, however, lower at 30 months than at six months, although this was less evident for alcohol and cigarettes than the other substances. In addition, self-reports of increased substance use are associated with higher levels of psychological distress as measured by the General Health Questionnaire and the Impact of Events Scale. It is suggested that substance use might help to maintain subsequent psychological distress.

Pfefferbaum, B., Vinekar, S.S., Trautman, R.P., Lensgraf, S.J., Reddy, C., Patel, N., and Ford, A.L. (2002). The effect of loss and trauma on substance use behavior in individuals seeking support services after the 1995 Oklahoma City bombing. *Annals of Clinical Psychiatry.* 14(2):89-95.

In this study, we examined the effect of trauma exposure on substance use behaviors, specifically tobacco and alcohol use, in a group of 84 individuals who sought supportive services after the 1995 Oklahoma City bombing. A self-report instrument was used to assess demographics, sensory exposure, injury, interpersonal exposure through relationship with victims, peritraumatic reaction, grief, posttraumatic stress, worry about safety, functional impairment, and changes in smoking and drinking. Those who reported increased smoking had higher scores on peritraumatic reaction, grief, posttraumatic stress, worry about safety, and trouble functioning. Those who reported increased alcohol intake had higher scores on injury, peritraumatic reaction, grief, posttraumatic stress, worry about safety, and trouble functioning. Sensory exposure and interpersonal exposure were not significantly different

between those with and without increased smoking or drinking. Although no causal relationship can be assumed, our findings indicate an association of grief and posttraumatic stress with increased substance use behaviors in disaster victims.

Schuster, M.A., Stein, B.D., Jaycox, L.H., Collins, R.L., Marshall, G.N., Elliot, M.N., Zhou, A.J., Kanouse, D.E., Morrison, J.L., and Berry, S.H. (2001). A national survey of stress reactions after the September 11, 2001, terrorist attacks. ***New England Journal of Medicine.*** **345(20):1507-12.**

BACKGROUND: People who are not present at a traumatic event may also experience stress reactions. We assessed the immediate mental health effects of the terrorist attacks on September 11, 2001. METHODS: Using random-digit dialing three to five days after September 11, we interviewed a nationally representative sample of 569 U.S. adults about their reactions to the terrorist attacks and their perceptions of their children's reactions. RESULTS: Forty-four percent of the adults reported one or more substantial stress symptoms; 91 percent had one or more symptoms to at least some degree. Respondents throughout the country reported stress syndromes. They coped by talking with others (98 percent), turning to religion (90 percent), participating in group activities (60 percent), and making donations (36 percent). Eighty-five percent of parents reported that they or other adults in the household had talked to their children about the attacks for an hour or more; 34 percent restricted their children's television viewing. Thirty-five percent of children had one or more stress symptoms, and 47 percent were worried about their own safety or the safety of loved ones. CONCLUSIONS: After the September 11 terrorist attacks, Americans across the country, including children, had substantial symptoms of stress. Even clinicians who practice in regions that are far from the recent attacks should be prepared to assist people with trauma-related symptoms of stress.

Vlahov, D., Galea, S., Resnick, H., Ahern, J., Boscarino, J.A., Bucuvalas, M., Gold, J., and Kilpatrick, D. (2002). Increased use of cigarettes, alcohol, and marijuana among Manhattan, New York, residents after the September 11th terrorist attacks. ***American Journal of Epidemiology.*** **155(11):988-96.**

The September 11, 2001, terrorist attacks were the largest human-made disaster in the United States since the Civil War. Studies after earlier disasters have reported rates of psychological disorders in the acute postdisaster period. However, data on postdisaster increases in substance use are sparse. A random digit dial telephone survey was conducted to estimate the prevalence of increased cigarette smoking, alcohol consumption, and marijuana use among residents of Manhattan, New York City, 5-8 weeks after the attacks. Among 988 persons included, 28.8% reported an increase in use of any of these three substances, 9.7% reported an increase in smoking, 24.6% reported an increase in alcohol consumption, and 3.2% reported an increase in marijuana use. Persons who increased smoking of cigarettes and marijuana were more likely to experience posttraumatic stress disorder than were those who did not (24.2% vs. 5.6% posttraumatic stress disorder for cigarettes; 36.0% vs. 6.6% for marijuana). Depression was more common among those who increased than for those who did not increase cigarette smoking (22.1 vs. 8.2%), alcohol consumption (15.5 vs. 8.3%), and marijuana smoking (22.3 vs. 9.4%). The results of this study suggest a substantial increase in substance use in the acute postdisaster period after the September 11th attacks. Increase in use of different substances may be associated with the presence of different comorbid psychiatric conditions.

Weiss, L., Fabri, A., McCoy, K., Coffin, P., Netherland, J., and Finkelstein, R. (2002). A vulnerable population in a time of crisis: Drug users and the attacks on the World Trade Center. *Journal of Urban Health*. 79(3):392-403.

In this article, we present preliminary findings from a qualitative study focused on the impact of the World Trade Center attacks on New York City residents who are current or former users of heroin, crack, and other forms of cocaine. In it, we present data describing their responses to and feelings about the attacks, changes in drug use after the attacks, and factors affecting changes in use. Our analysis is based on 57 open-ended interviews conducted between October 2001 and February 2002. The majority of study participants reported that the attacks had a significant emotional impact on them, causing anxiety, sadness, and anger. Several described practical impacts as well, including significant reductions in income. On September 11th and the weeks and months that followed, several participants who had been actively using did increase their use of heroin, crack, and/or other forms of cocaine. Reductions in use were, however, as common over time as were increases. There was some relapse among former users, but this was limited to those who had stopped using drugs within the 6 months immediately preceding the attacks. A diverse set of factors interacted to control use. For some participants, these factors were internal, relating to their individual motivations and drug use experiences. Other participants were essentially forced to limit use by marked reductions in income. For others, access to health and social service professionals, as well as drug treatment, proved to be key.

Zywiak, W.H., Stout, R.L., Trefry, W.B., LaGrutta, J.E., Lawson, C.C., Khan, N., Swift, R.M., and Schneider, R.J. (2003). Alcohol relapses associated with September 11, 2001: A case report. *Substance Abuse.* 24(2):123-8.

The timing of the terrible events of September 11, 2001 (9-11), and an ongoing randomized clinical trial of case monitoring have allowed a prospective examination of the effects of trauma upon the relapse rates of a group of clients following alcohol detoxification. The clients studied in this report were enrolled in case monitoring prior to 9-11. Case monitoring consists of telephone contacts on a tapering schedule designed to help clients avoid relapses, reduce the severity of relapses that do occur, and get clients back into treatment, at less intense levels, than would occur without case monitoring. For those clients completing a telephone contact before and a telephone contact after 9-11, none of the clients drank between detox discharge and 9-11, while 42% drank by the first telephone contact after 9-11. Data from another study were analyzed and results counter the rival hypothesis that the case monitoring study results reflect an annual seasonal effect. Results suggest that terrorist events may lead to a greater likelihood of relapse for those in alcohol recovery. These effects may be ameliorated by public education and outreach.

Women

Brown, V.B., Melchior, L.A., Reback, C., and Huba, G.J. (1994). Psychological functioning and substance abuse before and after the 1992 Los Angeles riot in a community sample of women. *Journal of Psychoactive Drugs.* 26(4):431-7.

An ongoing study of interventions designed to increase nontraditional social supports among women at high risk for HIV infection was in the field during the 1992 Los Angeles riot in

those neighborhoods most affected by the urban unrest. Using data from structured interviews, the psychosocial characteristics, drug abuse patterns, and distress levels among the women who were recruited for the project in the six months before and after the riot were examined. While substance abuse levels among participants did not increase or decrease as a function of the riot, there were a smaller number of social supports and marginally greater levels of already high psychological distress. Women in the community specifically mentioned a lack of social supports from counselors available in affected areas after the riot. An ethnographic analysis discusses the experience of the participants in the community during the same period of time. Problems in social supports are pointed out. The results are discussed in terms of a general theory of service provision by increasing nontraditional social supports, especially immediately after a major cataclysm.

Children and Adolescents

Green, B.L., Grace, M.C., Vary, M.G., Kramer, T.L., Gleser, G.C., and Leonard. A.C. (1994). Children of disaster in the second decade: a 17-year follow-up of Buffalo Creek survivors. *Journal of the American Academy of Child Adolescent Psychiatry.* 33(1):71-9.

OBJECTIVE: To conduct a long-term follow-up of child survivors of a devastating human-caused disaster. METHOD: Child survivors (2-15) of the Buffalo Creek dam collapse, first evaluated in 1974, 2 years postdisaster, were reevaluated 17 years postdisaster when they were adults. Of the original 207 children, 99 were located and reevaluated using ratings on the Psychiatric Evaluation Form, the Impact of Event Scale, and the SCL-90 and lifetime and current diagnoses from the Structured Clinical Interview for DSM-III-R. RESULTS: Ratings of psychiatric symptoms at the two points in time showed significant decreases in overall severity ratings and in anxiety, belligerence, somatic concerns, and agitation. A few symptoms, not present in the child sample, increased over time (substance abuse, suicidal ideation). The current rate of disaster-related post-traumatic stress disorder (PTSD) was 7%, down from a postflood rate of 32%. There were no differences by age group in current psychological status; however, women evidenced more PTSD-related symptoms than did men. All current PTSD cases were women. Comparisons with similar subjects from a nonexposed community showed no differences. CONCLUSIONS: The findings indicated that the children studied, although having shown earlier effects, had "recovered" from the event by the time of long-term follow-up.

Reijneveld, S.A., Crone, M.R., Verhulst, F.C., and Verloove-Vanhorick, S.P. (2003). The effect of a severe disaster on the mental health of adolescents: A controlled study. *Lancet.* 362(9385):691-6.

BACKGROUND: Disasters greatly affect the mental health of children and adolescents, but quantification of such effects is difficult. Using prospective predisaster and postdisaster data for affected and control populations, we aimed to assess the effects of a severe disaster on the mental health and substance use of adolescents. METHODS: In January, 2001, a fire in a cafe in Volendam, Netherlands, wounded 250 adolescents and killed 14. In the 15 months before the disaster, all grade 2 students (aged 12-15 years) from a school in Volendam (of whom 31 were in the cafe during the fire), and from two other schools, had been selected as controls for a study. 124 Volendam students and 830 from the other two schools had provided data for substance use, and completed the youth self-report (YSR) questionnaire

about behavioural and emotional problems. 5 months after the disaster, we obtained follow-up data from 91 (response rate 73.4%) Volendam adolescents and 643 (77.5%) controls from the other two schools. The primary outcome measures were changes in score in YSR categories of total problems, alcohol misuse, smoking, and substance use. We compared changes in scores between groups using logistic regression. FINDINGS: Volendam adolescents had larger increases in clinical scores than controls for total problems (odds ratio 1.82, 95% CI 1.01-3.29, p=0.045) and excessive use of alcohol (4.57, 2.73-7.64, p<0.0001), but not for smoking or use of marijuana, MDMA (ecstasy), and sedatives. Increases in YSR scores were largest for being anxious or depressed (2.85, 1.23-6.61), incoherent thinking (2.16, 1.09-4.30), and aggressive behaviour (3.30, 1.30-8.36). Intention-to-treat analyses showed significantly larger for increases in rates of excessive drinking and YSR symptom subscales in Volendam adolescents than controls. Effects were mostly similar in victims and their classmates. INTERPRETATION: Mental health interventions after disasters should address anxiety, depression, thought problems, aggression, and alcohol abuse of directly affected adolescents and their peer group.

First Responders

North, C.S., Tivis, L., McMillen, J.C., Pfefferbaum, B., Spitznagel, E.L., Cox, J., Nixon, S., Bunch, K.P., and Smith, E.M. (2002). Psychiatric disorders in rescue workers after the Oklahoma City bombing. ***American Journal of Psychiatry.*** **159(5):857-9.**

OBJECTIVE: Psychiatric disorders were studied in a volunteer group of 181 firefighters who served as rescue/recovery workers after the Oklahoma City bombing. METHOD: Approximately 34 months after the disaster, the authors retrospectively assessed psychopathology both before and after the bombing with the Diagnostic Interview Schedule. Findings for male rescue workers were compared with those of male primary victims who had been in the direct path of the blast and who had been assessed with the same instrument. RESULTS: The prevalence of posttraumatic stress disorder related to the bombing was significantly lower in male rescue workers (13%) than in male primary victims (23%). High rates of alcohol disorders (postdisaster: 24%; lifetime: 47%) were seen among all rescue workers, with virtually no new cases occurring after the bombing. CONCLUSIONS: The resilience seen in firefighters may be related to their career selection, their preparedness and experience, the fewer injuries they suffered, and postdisaster mental health interventions. However, alcohol disorders were endemic before the disaster, indicating a need for ongoing programs targeting this problem.

Stress and Substance Use

General Populations

Anisman, H. and Merali, Z. (1999). Understanding stress: Characteristics and caveats. *Alcohol Research and Health*. 23(4):241-9.

Exposure to stressful situations is among the most common human experiences. These types of situations can range from unexpected calamitites to routine daily annoyances. In response to stressors, a series of behavioral, neurochemical, and immunological changes occur that ought to serve in an adaptive capacity. However, if those systems become overly taxed, the organism may become vulnerable to pathology. Likewise, the biological changes, if sufficiently sustained, may themselves adversely affect the organism's well-being. Several factors may dictate an individual's response to environmental stressors, including characteristics of the stressor (i.e., type of stressor and its controlability, predictability, and chronicity); biological factors (i.e., age, gender, and genetics); and the subject's previous stressor history and early life experiences. Research on the physiological and psychological responses to different types of stressful stimuli is presented, focuing particularly on processes that may be relevant to the development of alcohol use disorders. Stressful events may profoundly influence the use of alcohol and other drugs (AODs). For example, the resumption of AOD use after a lengthy period of abstinence may reflect a person's attempt to self-medicate to attenuate the adverse psychological consequences of stressors (e.g., anxiety). Alternatively, stress may increase the reinforcing effects of AODs.

Brady, K.T. and Sonne, S.C. (1999). The role of stress in alcohol use, alcoholism treatment, and relapse. *Alcohol Research and Health*. 23(4):263-71.

Addiction to alcohol or other drugs (AODs) is a complex problem determined by multiple factors, including psychological and physiological components. Stress is considered a major contributor to the initiation and continuation of AOD use as well as to relapse. Many studies that have demonstrated an association between AOD use and stress have been unable to establish a causal relationship between the two. However, stress and the body's response to it most likely play a role in the vulnerability to initial AOD use, initiation of AOD abuse treatment, and relapse in recovering AOD users. This relationship probably is mediated, at least in part, by common neurochemical systems, such as the serotonin, dopamine, and opiate peptide systems, as well as the hypothalamic-pituitary-adrenal (HPA) axis. Further exploration of these connections should lead to important pharmacological developments in the prevention and treatment of AOD abuse. Studies indicate that treatment techniques which foster coping skills, problem-solving skills, and social support play a pivotal role in successful treatment. In the future, individualized treatment approaches that emphasize stress management strategies in those patients in whom a clear connection between stress and relapse exists will become particularly important.

Brown, S.A., Vik, P.W., Patterson, T.L., Grant, I., and Schuckit, M.A. (1995). Stress, vulnerability and adult alcohol relapse. *Journal of Studies on Alcohol*. 56(5):538-45.

OBJECTIVE: Alcoholics experiencing highly threatening or chronic psychosocial stress following treatment are more likely to relapse than abstaining individuals not experiencing such stress. Expanding upon this stress-relapse hypothesis, we predicted that individual risk and protective characteristics would contribute to vulnerability to relapse in alcoholic men confronted with significant life adversity. The present investigation examined the relationship between psychosocial vulnerability and return to drinking. METHOD: A group of abstinent male alcoholics (N = 67) who experienced marked life adversity that posed a severe and/or chronic threat participated in this study. Men completed a psychosocial assessment first as an inpatient in treatment for alcohol dependence, and again at 3 months and 1 year following discharge. RESULTS: Among alcoholic men exposed to severe psychosocial stressors, those with higher composite psychosocial vulnerability scores were more likely to subsequently relapse than those with lower vulnerability scores. Additionally, men who improved in psychosocial functioning following treatment had better outcomes than men whose vulnerability increased. In particular, coping, self-efficacy and social support most consistently predicted relapse among this sample of severely stressed abstaining alcoholics. CONCLUSIONS: These findings supported the stress-vulnerability model of relapse. Results indicated that improvement in psychosocial domains (e.g., coping skills, social networks, perceived ability to tolerate relapse-risk situations) enhanced the ability of these men to remain abstinent despite severe stress. This study highlights the importance of cognitive and behavioral interventions for increasing improvement in these psychosocial domains.

Conrod, P.J., Pihl, R.O., and Ditto, B. (1995). Autonomic reactivity and alcohol-induced dampening in men at risk for alcoholism and men at risk for hypertension. *Alcoholism, Clinical and Experimental Research*. 19(2):482-9.

Both sons of male alcoholics with multigenerational family history of male alcoholism (MFH) and sons of essential hypertensives (HTs) exhibit elevated psychophysiological reactivity to stress when compared with male controls (FH-). MFHs also demonstrate a significant baseline heart rate increase and stress-response dampening following alcohol consumption. The present study investigates the specificity of this alcohol-induced psychophysiological response pattern by testing these two risk groups in a shock response paradigm, both sober and alcohol-intoxicated. A repeated measures analysis of variance on sober and alcohol-intoxicated heart rate reactivity yielded a significant risk by alcohol interaction, indicating that alcohol consumption led to a greater decrease in reactivity in the MFH group compared with the HT and FH- groups. Similar results were obtained for muscle tension measures. MFHs also displayed greater increases in resting baseline heart rate and muscle tension when alcohol intoxicated. The results may reflect a sensitivity to negatively and positively reinforcing effects of alcohol specific to individuals with multigenerational familial histories of alcoholism.

DeVries, A.C., Glasper, E.R., and Detillion, C.E. (2003). Social modulation of stress responses. *Physiology and Behavior*. 79(3):399-407.

Social interactions can profoundly affect the hypothalamic-pituitary-adrenal (HPA) axis. Although most research on social modulation of glucocorticoid concentrations has focused on the consequences of exposure to stressful social stimuli, there is a growing body of literature which suggests that social support in humans and affiliative behaviors in some animals can provide a buffer against stress and have a positive impact on measures of health and well-being. This review will compare HPA axis activity among individuals for whom social relationships are maintained through aggressive displays, such as dominance hierarchies, vs. individuals engaging in high levels of prosocial behavior. We also will examine oxytocin, a neuropeptide that is well known for promoting social behavior, as the physiological link between positive social interactions and suppression of the HPA axis. Despite many examples of social interaction modulating the HPA axis and improving health outcomes, there is relatively little known regarding the underlying mechanisms through which social behavior can provide a buffer against stress-related disease.

Fouquereau, E., Fernandez, A., Mullet, E., and Sorum, P.C. (2003). Stress and the urge to drink. *Addictive Behaviors*. 28(4):669-85.

OBJECTIVE: Understanding why people drink alcohol is important for the health and safety of individuals and the public. The aim of this study was to examine from a cognitive point of view the hypothesized link between drinking and stress. METHODS: 25 scenarios were constructed by combining two items, either two life-change events or a social situation and an emotional state. In the initial three experiments, 159 male and 43 female alcoholics and 157 male and 93 female nonalcoholics in France judged the degree to which these scenarios were stressful and subsequently the degree to which they stimulated an urge to drink. In the final experiment, 126 of the male alcoholics were studied at the beginning and end of an inpatient alcohol rehabilitation program. RESULTS: The alcoholics and nonalcoholics, regardless of gender, assigned similar stress values to the scenarios and used the same cognitive rules for combining the stress associated with two items (disjunctive rules for two life-change events and additive ones for a personal emotion combined with a social situation). They differed, however, in how they judged the urge to drink. The nonalcoholics reported little stimulus to drink from any combination of items, whereas the alcoholics not only perceived the individual items as stimulating an urge to drink but also used the same cognitive rule in judging the combined urge to drink of two items as they used in judging the combined stress. After completing rehabilitation, the alcoholics judged the combinations of life-change events as stimulating less stress and less urge to drink. Nevertheless, they continued to use a disjunctive combination rule. CONCLUSIONS: Stress and drinking are linked at a fundamental cognitive level among alcoholics, though not among nonalcoholics. Alcoholics should be helped to recognize this link, to reduce their feelings of stress, and to find outlets other than drink.

Frone, M.R. (1999). Work stress and alcohol use. *Alcohol Research and Health*. 23(4):284-91.

Employees who drink heavily or who abuse or are dependent on alcohol can undermine a workforce's overall health and productivity. To better understand the reasons behind employee abusive drinking and to develop more effective ways of preventing problem

drinking in the workforce, researchers have developed a number of paradigms that guide their research. One such paradigm is the alienation/stress paradigm, which suggests that employee alcohol use may be a direct or indirect response to physical and psychosocial qualities of the work environment. Although in the alcohol literature, work alienation and work stress traditionally have been treated as separate paradigms, compelling reasons support subsuming the work-alienation paradigm under a general work-stress paradigm. Researchers have developed several models to explain the relationship between work stress and alcohol consumption: the simple cause-effect model, the mediation model, the moderation model, and the moderated mediation model. Of these, the moderated mediation model particularly stands out, because it simultaneously addresses the two fundamental issues of how and when work stressors are related to alcohol use. Recent research supports a relation of work-related stressors to elevated alcohol consumption and problem drinking. Future research should focus on the relation between work stressors and alcohol use among adolescents and young adults, because they are just entering the workforce and are the most likely to engage in heavy drinking. Longitudinal studies also are needed to better explain the relation between work stress and alcohol use.

Goeders, N.E. (2003). The impact of stress on addiction. *European Neuropsychopharmacology*. 13(6):435-41.

This article will review data obtained from both clinical and preclinical investigations demonstrating that exposure to stress has a significant impact on drug addiction. The preclinical literature suggests that stress increases reward associated with psychomotor stimulants, possibly through a process similar to sensitization. While it is not conclusive that a similar process occurs in humans, a growing clinical literature indicates that there is a link between substance abuse and stress. One explanation for the high concordance between stress-related disorders and drug addiction is the self-medication hypothesis, which suggests that a dually diagnosed person often uses the abused substance to cope with tension associated with life stressors or to relieve symptoms of anxiety and depression resulting from a traumatic event. However, another characteristic of self-administration is that drug delivery and its subsequent effects on the hypothalamo-pituitary-adrenal (HPA) axis are under the direct control of the individual. This controlled activation of the HPA axis may result in the production of an internal state of arousal or stimulation that is actually sought by the individual (i.e., the sensation-seeking hypothesis). During abstinence, exposure to stressors or drug-associated cues can stimulate the HPA axis to remind the individual about the effects of the abused substance, thus producing craving and promoting relapse. Continued investigations into how stress and the subsequent activation of the HPA axis impact addiction will result in the identification of more effective and efficient treatment for substance abuse in humans. Stress reduction, either alone or in combination with pharmacotherapies targeting the HPA axis may prove beneficial in reducing cravings and promoting abstinence in individuals seeking treatment for addiction.

Goeders, N.E. (2002). Stress and cocaine addiction. *Journal of Pharmacology and Experimental Therapeutics*. 301(3):785-9.

The hypothalamo-pituitary-adrenal (HPA) axis is involved in all aspects of cocaine self-administration. Corticosterone seems to be crucial for the acquisition of drug use since self-

administration does not occur unless this stress hormone is increased above a critical reward threshold. Increasing circulating levels of corticosterone also augments sensitivity to low doses of cocaine, possibly from a sensitization-associated phenomenon involving dopamine, suggesting that exposure to stress can increase individual vulnerability to cocaine. Drugs affecting the synthesis and/or secretion of corticosterone decrease ongoing, low-dose cocaine self-administration. When higher doses falling on the descending limb of the cocaine dose-response curve are self-administered, plasma corticosterone can still reach this reward threshold even when synthesis is inhibited and drug intake is not affected. Corticotropin-releasing hormone (CRH) seems to play a more prominent role in the maintenance of cocaine self-administration and may even be involved in the incentive motivation for the drug. Corticosterone and CRH are also critical for the stress- and cue-induced reinstatement of extinguished cocaine-seeking behavior. Therefore, cocaine self-administration may represent an attempt to seek out specific sensations, with the internal state produced being very similar to that perceived by individuals who engage in risky, thrill-seeking behavior. During abstinence, exposure to stressors or cocaine-associated cues can stimulate the HPA axis to remind the individual about the effects of cocaine, thus producing craving and promoting relapse. Stress reduction, either alone or in combination with pharmacotherapies targeting the HPA axis may prove beneficial in reducing cravings and promoting abstinence in individuals seeking treatment for cocaine addiction.

Jose, B.S., van Oers, H.A., van de Mheen, H.D., Garretsen, H.F., and Mackenbach, J.P. (2000). Stressors and alcohol consumption. *Alcohol and Alcoholism*. 35(3):307-12.

The objective of this study was to examine the relationship between negative life events and chronic stressors and drinking behaviour. Data suggested that some life events (getting divorced) and some chronic stressors (financial difficulties, unfavourable marital status, and unfavourable employment status) were positively related to abstinence among men and women. Furthermore, some life events (being a victim of a crime, decrease in financial position, divorce or reporting two or more life events) were positively associated with heavy drinking among men. Chronic stressors, such as unfavourable marital status and unfavourable employment status, were also related to heavy drinking among both men and women. Results presented here suggest that people under stressful conditions are more likely to either abstain or drink heavily rather than to drink lightly or moderately.

Kassel, J.D., Stroud, L.R., and Paronis, C.A. (2003). Smoking, stress, and negative affect: correlation, causation, and context across stages of smoking. *Psychological Bulletin*. 129(2):270-304.

This transdisciplinary review of the literature addresses the questions, Do stress and negative affect (NA) promote smoking? and Does smoking genuinely relieve stress and NA? Drawing on both human and animal literatures, the authors examine these questions across three developmental stages of smoking--initiation, maintenance, and relapse. Methodological and conceptual distinctions relating to within- and between-subjects levels of analyses are emphasized throughout the review. Potential mechanisms underlying links between stress and NA and smoking are also reviewed. Relative to direct-effect explanations, the authors argue that contextual mediator-moderator approaches hold greater potential for elucidating complex associations between NA and stress and smoking. The authors conclude with

recommendations for research initiatives that draw on more sophisticated theories and methodologies.

Kosten, T.R., Rounsaville, B.J., and Kleber, H.D. (1986). A 2.5-year follow-up of depression, life crises, and treatment effects on abstinence among opioid addicts. *Archives of General Psychiatry*. 43(8):733-8.

Follow-up studies have suggested that treatment increases addicts' likelihood of remaining abstinent and that depression and life crises are associated with decreased abstinence. An important issue is to what extent receiving treatment can ameliorate psychosocial risk factors such as life crises and depression and decrease ex-addicts' vulnerability to continued drug abuse. In our 2.5-year follow-up of 268 opiate addicts, drug abuse treatment was generally associated with increased abstinence, and life crises and depression were significant risk factors for continued drug abuse. The impact of these risk factors, however, was ameliorated by drug abuse treatment. Although life crises had a greater impact than depression, these two risk factors had additive effects in increasing the risk for continued drug abuse. Among the types of life crises, arguments and losses ("exits") had very strong additive effects with depression as predictors of drug abuse.

Kreek, M.J. (1996). Opiates, opioids and addiction. *Molecular Psychiatry*. 1(3):232-54.

Increasing our knowledge about the major addictive diseases, opiate and cocaine addiction and alcoholism, is of great importance from a public, as well as personal health perspective. Each disease is associated with profound and negative impacts on physical and mental health and also each has devastating social and economic consequences. Each of these addictive diseases has been associated with major infectious diseases including AIDS, hepatitis B, C, D and G, either through parenteral or sexual transmission. Since 1967, we have addressed the research question related to our early hypotheses on the development of an addiction, that atypical responsitivity to stress and stressors may play a central role in the acquisition and persistence of, and relapse to, drug abuse. We have been conducting studies both in humans and in animal models focused on the role of disruption of the stress responsive hypothalamic-pituitary-adrenal axis in opiate addiction, cocaine dependency and alcoholism. We also have conducted studies of the role of the endogenous opioid system in modulation of this axis, as well as the interaction of the endogenous opioid system with the dopaminergic system and other neurotransmitter and neuropeptides related to the reinforcing effects of drugs of abuse.

Linsky, A.S., Straus, M.A., and Colby, J.P., Jr. (1985). Stressful events, stressful conditions and alcohol problems in the United States: a partial test of Bales's theory. *Journal of Studies on Alcohol*. 46(1):72-80.

Bales's theory that sociostructural factors that produce stress for members of a society increase the rate of alcoholism is examined to explain variations in the levels of alcoholism in the 50 states. Two types of social stress are conceptualized and measured at the state level: The first, the "life events" model, is based on life changes that require adaptation. An index is described in which (negative) personal life events in 15 categories (e.g., divorce and plant closings) are aggregated for each state using macro measures. The second model is based on the idea of chronic stressful conditions, and is measured through the Measure of Status Integration and the Index of Relative Opportunities. Alcohol-related problems are measured

by death rates for cirrhosis, alcoholism and alcoholic psychosis, and by per capita alcohol consumption. Both stressful events and stressful conditions are correlated with all indicators of alcoholism at the state level, 19 of 20 correlations being in the theoretically expected direction. Correlations are enhanced when age, urbanicity, the percentage of Blacks, low income and education are controlled for. The three macro measures of stress taken together explain 27% of the variation in cirrhosis death rates, 14% of the variation in alcoholism and alcoholic psychosis death rates and 47% of the variation in alcohol consumption rates.

Liu, X. and Weiss, F. (2002). Addictive effect of stress and drug cues on reinstatement of ethanol seeking: exacerbation by history of dependence and role of concurrent activation of corticotropin-releasing factor and opioid mechanisms. *Journal of Neuroscience*. 22:7856-7861.

Stress and exposure to drug-related environmental stimuli have been implicated as critical factors in relapse to drug use. What has received little attention, however, is the significance of interactions between these factors for motivating drug-seeking behavior. To address this issue, a reinstatement model of relapse was used. Footshock stress and response-contingent presentation of an ethanol-associated light cue, acting as a conditioned stimulus (CS), effectively reinstated extinguished responding at a previously active, drug-paired lever in male Wistar rats. When response-contingent availability of the ethanol CS was preceded by footshock, additive effects of these stimuli on responding were observed. Both the individual and interactive effects of footshock and the CS were significantly greater in previously ethanol-dependent than in nondependent rats. Responding induced by the ethanol CS was selectively reversed by the nonselective opiate antagonist naltrexone, whereas the effects of footshock were selectively reversed by the corticotropin-releasing factor (CRF) antagonist d-Phe-CRF(12-41). However, both agents only partially reversed the enhanced drug-seeking response produced by the interactive effects of stress and the ethanol CS; full reversal required coadministration of d-Phe-CRF and naltrexone. The results document that stress and drug-related environmental stimuli interact to augment the resumption of drug seeking after extinction and suggest that this effect results from concurrent activation of opioid and CRF transmission.

Noone, M., Dua, J., and Markham, R. (1999). Stress, cognitive factors, and coping resources as predictors of relapse in alcoholics. *Addictive Behaviors*. 24(5):687-93.

One hundred alcohol-dependent individuals attending a detoxification unit were assessed on a variety of psychological, social and demographic variables. Sixty-one participants were contacted at follow-up over 1 year later. Alcohol consumption was assessed through self-report and corroborative information. Self-reported levels of stress and social support were also obtained. High self-efficacy predicted low levels of self reported drinking at follow-up. Negative coping predicted higher levels of drinking as reported by the corroborator. High levels of stress in the month prior to follow-up were related to self-reported poor drinking outcomes, while ongoing social support since treatment was associated with favorable drinking outcomes. Overall, higher levels of self-efficacy during detoxification and social support following treatment were the best predictors of a favourable drinking outcome.

Sayette, M.A. (1999). Does drinking reduce stress? *Alcohol Research and Health*. 23(4):250-5.

For centuries, people have used alcohol to relieve stress--that is, the interpretation of an event as signaling harm, loss, or threat. The organism usually responds to stress with a variety of behavioral, biological, and cognitive changes. Alcohol consumption can result in a stress-response dampening (SRD) effect, which can be assessed using various measures. Numerous individual differences and situational factors help determine the extent to which a person experiences SRD after consuming alcohol. Individual differences include a family history of alcoholism, personality traits, extent of self-consciousness, cognitive functioning, and gender. Situational factors influencing alcohol's SRD effect include distractions during a stressful situation and the timing of drinking and stress. The attention-allocation model and the appraisal disruption model have been advanced to explain the influence of those situational factors.

Self, D.W. (1998). Neural substrates of drug craving and relapse in drug addiction. *Annals of Medicine*. 30(4):379-89.

Drug addiction is characterized by motivational disturbances such as compulsive drug taking and episodes of intense drug craving. Recent advances using animal models of relapse have shown that drug-seeking behaviour can be triggered by drug-associated cues, by stress and by 'priming' injections of the drugs themselves, events also known to trigger drug craving in human drug addicts. Current evidence suggests that these stimuli all induce relapse, at least in part, by their common ability to activate the mesolimbic dopamine system. Drug-associated cues and stress can activate this system via neural circuits from the prefrontal cortex and amygdala and through activation of the hypothalamic-pituitary-adrenal axis. Our studies suggest that dopamine triggers relapse to drug-seeking behaviour by stimulating D2-dopamine receptors which inhibit the cyclic AMP second messenger pathway in the neurones of the nucleus accumbens. In contrast, compounds which activate D1 receptors prevent relapse to drug-seeking behaviour, possibly through satiation of reward pathways. Chronic neuroadaptations in dopamine receptor signalling pathways in the nucleus accumbens caused by repeated drug use are hypothesized to produce tolerance to the rewarding effects of D1-receptor stimulation, leading to increased drug intake during drug self-administration. Conversely, these same neuroadaptations are hypothesized to enhance drug craving by potentiating D2 receptor-mediated signals during abstinence. These findings identify D1 and D2-dopamine receptor mechanisms as potential targets for developing anticraving compounds to treat drug addiction.

Sinha, R. (2001). How does stress increase risk of drug abuse and relapse? *Psychopharmacology (Berlin)*. 158(4):343-59.

RATIONALE: The notion that stress leads to drug abuse in vulnerable individuals and relapse in addicts is not new. Most major theories of addiction postulate that stress plays an important role in increasing drug use and relapse. Several animal studies and some human laboratory studies have shown that stress exposure enhances drug self-administration. Although clinical observations suggest that exposure to stress increases drug use, and are associated with craving and relapse in addicts, human research in this area is largely correlational and at times contradictory. OBJECTIVE: Given the growing preclinical evidence that supports the key role of stress in substance abuse, careful examination of this

research area in humans is warranted. This paper examines empirical evidence on how stress may increase the vulnerability to drug abuse, and explores whether chronic drug abuse alters the stress response and coping in addicts, thereby increasing the likelihood of drug seeking and relapse. Unanswered questions on the association between stress and substance abuse in humans are identified. CONCLUSION: Preclinical research has shown that stress, in addition to drug itself, plays a key role in perpetuating drug abuse and relapse. However, the mechanisms underlying this association in humans remain unclear. A greater understanding of how stress may perpetuate drug abuse will likely have a significant impact on both prevention and treatment development in the field of addiction.

Söderpalm, A.H. and DeWit, H. (2002). Effects of stress and alcohol on subjective state in humans. *Alcoholism, Clinical and Experimental Research*. 26(6):818-826.

BACKGROUND: There is increasing evidence that stress and hypothalamic-pituitary-adrenal axis activation interact with drugs of abuse and influence drug-taking behaviors. Both studies with laboratory animals and survey data with alcohol users suggest that acute or chronic stressful events increase alcohol intake. One mechanism for the increase in alcohol intake may be that stress alters the subjective effects produced by the drug in ways that enhance the reinforcing properties of alcohol. Therefore, in this study we determined whether an acute social stressor alters subjective responses to ethanol in humans. The stressor was a modified version of the Trier Social Stress Test, an arithmetic task that increases cortisol levels. METHODS: Twenty male volunteers participated in two laboratory sessions, in which they performed the Trier Social Stress Test on one session and no task on the other session, immediately before consuming a beverage that contained ethanol (0.8 g/kg in juice) or placebo (juice alone). Eleven subjects received ethanol on both sessions, and nine subjects received placebo on both sessions. Primary dependent measures were self-report questionnaires of mood states. Salivary levels of cortisol were obtained to confirm the effectiveness of the stress procedure. RESULTS: Stress alone produced stimulant-like subjective effects. In the group who received ethanol, stress increased sedative-like effects and decreased stimulant-like effects. CONCLUSIONS: At this relatively high dose of ethanol, stress increased sedative effects of alcohol and did not increase desire for more alcohol. It is possible that in some individuals, the increased sedative effects after stress may increase the likelihood of consuming more alcohol. The effects of stress on consumption at this, or lower, doses of alcohol remain to be determined.

Spencer, R.L. and Hutchison, K.E. (1999). Alcohol, aging, and the stress response. *Alcohol Research and Health*. 23(4):272-83.

The body responds to stress through a hormone system called the hypothalamic-pituitary-adrenal (HPA) axis. Stimulation of this system results in the secretion of stress hormones (i.e., glucocorticoids). Chronic excessive glucocorticoid secretion can have adverse health effects, such as Cushing's syndrome. Alcohol intoxication activates the HPA axis and results in elevated glucocorticoid levels. Ironically, elevated levels of these stress hormones may contribute to alcohol's pleasurable effects. With chronic alcohol consumption, however, tolerance may develop to alcohol's HPA axis-activating effects. Chronic alcohol consumption, as well as chronic glucocorticoid exposure, can result in premature and/or exaggerated aging. Furthermore, the aging process affects a person's sensitivity to alcohol

and HPA axis function. Thus, a three-way interaction exists among alcohol consumption, HPA axis activity, and the aging process. The aging process may impair the HPA axis' ability to adapt to chronic alcohol exposure. Furthermore, HPA axis activation may contribute to the premature or exaggerated aging associated with chronic alcohol consumption.

Women

McKee, S.A., Maciejewski, P.K., Falba, T., and Mazure, C.M. (2003). Sex differences in the effects of stressful life events on changes in smoking status. *Addiction*. 98(6):847-55.

AIMS: Stressful life events known to be associated with substance use were examined to determine if there were sex-specific responses to stress resulting in changes in smoking status. PARTICIPANTS AND MEASUREMENTS: A community-based sample of ever smokers from the Americans' Changing Lives study (n = 1512, 45% female based on sample weights) was used to examine the interactive effects of sex and stressful life events on the likelihood of two outcomes; relapse among former smokers and failure to quit among current smokers. Logistic regression procedures were used to calculate odds ratios. Factors known to be associated with smoking status (e.g. depression, self-esteem, social support) were assessed as control variables. FINDINGS: In the sample of former smokers (n = 729) interpersonal loss events were associated with continued abstinence, whereas change of residence and adverse financial events were associated with increased occurrence of relapse. Women were more likely than men to relapse in response to a financial event. In the sample of current smokers (n = 783), financial events were associated with continued smoking, whereas health events were associated with increased likelihood of quitting. Women were more likely than men to continue smoking in the presence of an adverse financial event and less likely than men to quit in response to an adverse health event. CONCLUSIONS: Overall, stressful life events appear to have a greater deleterious effect on continued abstinence and the ability to quit smoking for women when compared to men. In particular, health and financial events are important risk factors for women and tobacco use.

Children and Adolescents

Aseltine, R.H., Jr. and Gore, S.L. (2000). The variable effects of stress on alcohol use from adolescence to early adulthood. *Substance Use and Misuse*. 35(5):643-68.

Despite evidence of a strong association between stress and level of drinking in adolescent populations, the role of stress in accounting for changes in drinking behavior throughout the adolescent years is unclear. This study uses a linear growth curve analysis to examine the determinants of within-individual changes in drinking frequency and binge drinking across five waves of data from a community sample of adolescents who were followed into young adulthood. Predictors of drinking include: stressful life events, parental and peer social support, and parental and peer relationship problems. Findings indicate significant effects of stressful life events and parental support and conflict on both the frequency and intensity of alcohol use. Although age-related changes in these variables coincide with changes in drinking behavior, they do not account for drinking variability over this period. Results from

conditional models demonstrate that the impact of the stress is contingent on age, and that the strong associations between drinking and stress evidenced during the high school years weaken considerably as individuals move into their late teens and early twenties. Discussion centers on the complex motivations for and facilitators of drinking as young people mature and change environments over the adolescent years.

PTSD and Substance Use

General Populations

Back, S.E., Dansky, B.S., Carroll, K.M., Foa, E.B., and Brady, K.T. (2001). Exposure therapy in the treatment of PTSD among cocaine-dependent individuals: Description of procedures. *Journal of Substance Abuse Treatment*. 21(1):35-45.

An estimated 30% to 50% of cocaine-dependent individuals meet criteria for lifetime PTSD. This comorbidity has detrimental effects on clinical presentation, and treatment course and outcome. Cocaine dependence is associated with increased rates of exposure to trauma, more severe symptoms, higher rates of treatment attrition and retraumatization, and greater vulnerability to PTSD when compared to other substance use disorders. These associations underscore the need for effective treatments that address issues particular to PTSD in a manner tolerable to cocaine-dependent individuals. This article describes a manualized psychotherapy developed specifically for individuals with PTSD and cocaine dependence. Concurrent Treatment of PTSD and Cocaine Dependence (CTPCD) provides coping skills training, cognitive restructuring techniques, and relapse prevention strategies to reduce cocaine use. In-vivo and imaginal exposure therapy techniques are incorporated to reduce PTSD symptom severity. Primary treatment goals include psychoeducation specific to the interrelationship between PTSD and cocaine dependence, and clinically meaningful reductions in cocaine use and PTSD symptomatology. Secondary goals include a reduction in HIV high-risk behaviors and improved functioning in associated areas, such as anger and negative affect management.

Brady, K.T. (2001). Comorbid posttraumatic stress disorder and substance use disorders. *Psychiatric Annals*. 31(5):313-319.

Posttraumatic stress disorder (PTSD) commonly co-occurs with other psychiatric disorders. Data from epidemiologic surveys indicate that the vast majority of individuals with PTSD meet criteria for at least one other psychiatric disorder, and a substantial percentage have 3 or more other psychiatric diagnoses. A number of different hypothetical constructs have been posited to explain this high comorbidity; for example, the self-medication hypothesis has often been applied to understand the relationship between PTSD and substance use disorders. There is a substantial amount of symptom overlap between PTSD and a number of other psychaiatric diasnoses, particularly major depressive disorder. It has been suggested that high rates of comorbitidty may be simply an epiphenonmenon of the diagnositic criteria used. In any case, this high degree of symptom overlap can contribute to diasgnostic confusion and, in particular, to the underdiagnosis of PTSD when trauma histories are not specifically obtained. The most common comorbid diagnoses are depressive disorders, substance use disorders, and other anxiety disorders. The comorbidity of PTSD and depressive disorders is of particular interest. Across a number of studies, these are the diorders most likely to co-occur with PTSD. It is also clear that depressive disorder can be a common and independent sequela of exposure to trauma and having a previous depressive disorder is a risk factor for the development of PTSD once exposure to a trauma occurs. The comorbidity of PTSD with substance use disorders is complex because while a withdrawal states exaggerate these

symptoms. Appropriate treatment of PTSD in substance abusers is a controversial issue because of the belief that addressing issues related to the trauma in early recovery can precipitate relapse. In conclusion, comorbidity in PTSD is the rule rather than the exception. This area warrants much further study since comorbid conditions may provide a rationale for the subtyping of individuals with PTSD to optimize treatment outcomes.

Brady, K.T., Dansky, B.S., Back, S.E., Foa, E.B., and Carroll, K.M. (2001). Exposure therapy in the treatment of PTSD among cocaine-dependent individuals: Preliminary findings. *Journal of Substance Abuse Treatment.* 21(1):47-54.

Individuals (n = 39) participated in an outpatient, 16-session individual, manual-guided psychotherapy designed to treat concurrent PTSD and cocaine dependence. Therapy consisted of a combination of imaginal and in-vivo exposure therapy techniques to treat PTSD symptoms and cognitive-behavioral techniques to treat cocaine dependence. Although the dropout rate was high, treatment completers (i.e., patients who attended at least 10 sessions; n = 15) demonstrated significant reductions in all PTSD symptom clusters and cocaine use from baseline to end of treatment. Significant reductions in depressive symptomatology, as measured by the Beck Depression Inventory, and psychiatric and cocaine use severity, as measured by the Addiction Severity Index, were also observed. These improvements in PTSD symptoms and cocaine use were maintained over a 6-month follow-up period among completers. The average pre- to posttreatment effect size was 1.80 for PTSD symptoms and 1.26 for drug and alcohol use severity. Baseline comparisons between treatment completers and noncompleters revealed significantly higher avoidance symptoms, as measured by the Impact of Events Scale, and fewer years of education among treatment noncompleters as compared to completers. This study provides preliminary evidence to suggest that exposure therapy can be used safely and may be effective in the treatment of PTSD in some individuals with cocaine dependence. However, the study is limited by the uncontrolled nature of the study design, small number of subjects, and high dropout rate.

Brady, K.T., Killeen, T.K., Brewerton, T., and Lucerini, S. (2000). Comorbidity of psychiatric disorders and posttraumatic stress disorder. *Journal of Clinical Psychiatry*. 61 Suppl (7):22-32.

Posttraumatic stress disorder (PTSD) commonly co-occurs with other psychiatric disorders. Data from epidemiologic surveys indicate that the vast majority of individuals with PTSD meet criteria for at least one other psychiatric disorder, and a substantial percentage have 3 or more other psychiatric diagnoses. A number of different hypothetical constructs have been posited to explain this high comorbidity; for example, the self-medication hypothesis has often been applied to understand the relationship between PTSD and substance use disorders. There is a substantial amount of symptom overlap between PTSD and a number of other psychiatric diagnoses, particularly major depressive disorder. It has been suggested that high rates of comorbidity may be simply an epiphenomenon of the diagnostic criteria used. In any case, this high degree of symptom overlap can contribute to diagnostic confusion and, in particular, to the underdiagnosis of PTSD when trauma histories are not specifically obtained. The most common comorbid diagnoses are depressive disorders, substance use disorders, and other anxiety disorders. The comorbidity of PTSD and depressive disorders is

of particular interest. Across a number of studies, these are the disorders most likely to co-occur with PTSD. It is also clear that depressive disorder can be a common and independent sequela of exposure to trauma and having a previous depressive disorder is a risk factor for the development of PTSD once exposure to a trauma occurs. The comorbidity of PTSD with substance use disorders is complex because while a substance use disorder may often develop as an attempt to self-medicate the painful symptoms of PTSD, withdrawal states exaggerate these symptoms. Appropriate treatment of PTSD in substance abusers is a controversial issue because of the belief that addressing issues related to the trauma in early recovery can precipitate relapse. In conclusion, comorbidity in PTSD is the rule rather than the exception. This area warrants much further study since comorbid conditions may provide a rationale for the subtyping of individuals with PTSD to optimize treatment outcomes.

Bremner, J.D., Innis, R.B., Southwick, S.M., Staib, L., Zoghbi, S. and Charney, D.S. (2000). Decreased benzodiazepine receptor binding in prefrontal cortex in combat-related posttraumatic stress disorder. ***American Journal of Psychiatry*****. 157(7):1120-6.**

OBJECTIVE: Animals exposed to stress exhibit a decrease in benzodiazepine receptor binding in the frontal cortex. No studies have examined central benzodiazepine receptor binding in patients with posttraumatic stress disorder (PTSD). The purpose of this study was to examine measures of benzodiazepine receptor binding in PTSD. METHOD: From 13 patients with Vietnam combat-related PTSD and 13 case-matched healthy comparison subjects, a quantitative measure related to benzodiazepine receptor binding (distribution volume) was obtained with single photon emission computed tomography (SPECT) imaging of [(123)I]iomazenil binding and measurement of radioligand concentration in plasma. Distribution volume image data were analyzed by means of statistical parametric mapping. RESULTS: Lower distribution volumes were found in the prefrontal cortex (Brodmann's area 9) of PTSD patients than in comparison subjects. CONCLUSIONS: These findings of lower values for the benzodiazepine receptor binding measure of distribution volume are consistent with fewer benzodiazepine receptors and/or reduced affinity of receptor binding in the medial prefrontal cortex in patients with PTSD. Alterations in benzodiazepine receptor function in this area may underlie many of the symptoms of PTSD.

Breslau, N., Davis, G.C., and Schultz, L.R. (2003). Posttraumatic stress disorder and the incidence of nicotine, alcohol, and other drug disorders in persons who have experienced trauma. ***Archives of General Psychiatry*****. 60(3):289-94.**

BACKGROUND: We examine whether exposure to traumatic events increases the risk for nicotine dependence or alcohol or other drug use disorders, independent of posttraumatic stress disorder (PTSD). METHODS: Data come from a longitudinal epidemiologic study of young adults in southeast Michigan. Prospective data covering a 10-year period and retrospective lifetime data gathered at baseline were used to estimate the risk for onset of substance use disorders in persons with PTSD and in persons exposed to trauma without PTSD, compared with persons who have not been exposed to trauma. The National Institute of Mental Health Diagnostic Interview Schedule for DSM-III-R was used. Logistic regression was used to analyze the prospective data, and Cox proportional hazards survival analysis with time-dependent variables was applied to the lifetime data. RESULTS: The prospective and retrospective data show an increased risk for the onset of nicotine

dependence and drug abuse or dependence in persons with PTSD, but no increased risk or a significantly (P =.004) lower risk (for nicotine dependence, in the prospective data) in persons exposed to trauma in the absence of PTSD, compared with unexposed persons. Exposure to trauma in either the presence or the absence of PTSD did not predict alcohol abuse or dependence. CONCLUSIONS: The findings do not support the hypothesis that exposure to traumatic events per se increases the risk for substance use disorders. A modestly elevated risk for nicotine dependence might be an exception. Posttraumatic stress disorder might be a causal risk factor for nicotine and drug use disorders or, alternatively, the co-occurrence of PTSD and these disorders might be influenced by shared risk factors other than traumatic exposure.

Brown, P.J. and Wolfe, J. (1994). Substance abuse and post-traumatic stress disorder comorbidity. *Drug and Alcohol Dependence*. 35(1):51-9.

This article reviews the extant literature on substance abusers with and without a comorbid diagnosis of post-traumatic stress disorder (PTSD) and reveals the discontinuity between clinical lore and empirical research. Included is an overview of PTSD-substance abuse theoretical models and comorbidity prevalence rates, as well as an evaluation of the comparative data on treatment outcome and psychosocial factors, such as coping skills, for PTSD versus non-PTSD substance abusers. In addition, we discuss the controversy surrounding sequential versus simultaneous treatment approaches for such 'dually-diagnosed' patients. We conclude by identifying gaps in current knowledge about the nature and impact of PTSD on substance abuse treatment outcome and outlining needs for future research.

Brown, P.J., Recupero, P.R., and Stout, R. (1995). PTSD substance abuse comorbidity and treatment utilization. *Addictive Behaviors*. 20(2):251-4.

The present study investigates the prevalence of posttraumatic stress disorder (PTSD) among a sample of treatment-seeking substance abusers and examines the relationship between PTSD comorbidity and rates of inpatient substance abuse treatment. Eighty-four patients (48 male and 36 female) admitted for detoxification at a private hospital were administered self-report measures of lifetime stressor events, PTSD symptomatology, and prior treatment history. Approximately one quarter of the sample was found to present with significant PTSD symptomatology. Women were more likely than men to have been physically and sexually abused, and women reported experiencing a greater number of traumatic events. Consequently, more women than men were classified as having possible PTSD. With respect to inpatient substance abuse treatment admission rates, the PTSD group reported a greater number of hospitalizations than their non-PTSD counterparts. Implications of these findings for routine trauma screening and more effective treatment for substance abusers with concomitant PTSD are highlighted.

Brown, P.J., Stout, R.L., and Gannon-Rowley, J. (1998). Substance use disorder-PTSD comorbidity. Patients' perceptions of symptom interplay and treatment issues. *Journal of Substance Abuse Treatment*. 15(5):445-8.

Forty-two patients with both a current substance use disorder (SUD) and posttraumatic stress disorder (PTSD) were asked about the interrelationship of their two disorders, their treatment preferences and experiences, as well as possible deterrents to receiving PTSD treatment.

Patients perceived their two disorders to be functionally related. They reported that when one disorder worsened, their other disorder was more likely to worsen; when one disorder improved, the other disorder similarly improved. Consistent with these perceptions, SUD-PTSD patients favored simultaneous treatment of their two disorders. The majority of SUD-PTSD patients were never referred to PTSD treatment. Although several possible deterrents to PTSD treatment were identified, only lack of trust appeared to differentiate PTSD treatment compliers versus noncompliers. Implications of these findings on referral and treatment practices are discussed.

Chilcoat, H.D. and Breslau, N. (1998). Posttraumatic stress disorder and drug disorders: Testing causal pathways. *Archives of General Psychiatry*. 55:913-7.

BACKGROUND: Although there is a high degree of comorbidity between posttraumatic stress disorder (PTSD) and drug use disorders, little is known about causal relationships between PTSD, exposure to traumatic events, and drug use disorders. METHODS: In a longitudinal study in southeast Michigan, 1007 adults aged 21 to 30 years were initially assessed in 1989 and were followed up 3 and 5 years later, in 1992 and 1994. Psychiatric disorders according to DSM-III-R criteria were measured by the National Institute of Mental Health Diagnostic Interview Schedule. To take into account temporal sequencing, the associations between PTSD, traumatic events, and drug use disorders were analyzed by using Cox proportional hazards models with time-dependent covariates. RESULTS: Posttraumatic stress disorder signaled an increased risk of drug abuse or dependence (hazards ratio, 4.5; 95% confidence interval, 2.6-7.6, adjusted for sex), whereas exposure to traumatic events in the absence of PTSD did not increase the risk of drug abuse or dependence. The risk for abuse or dependence was the highest for prescribed psychoactive drugs (hazards ratio, 13.0; 95% confidence interval, 5.3-32.0). There was no evidence that preexisting drug abuse or dependence increased the risk of subsequent exposure to traumatic events or the risk of PTSD after traumatic exposure. CONCLUSION: The results suggest that drug abuse or dependence in persons with PTSD might be the inadvertent result of efforts to medicate symptoms, although the possibility of shared vulnerability to PTSD and drug use disorders cannot be ruled out.

Coffey, S.F., Saladin, M.E., Drobes, D.J., Brady, K.T., Dansky, B.S., and Kilpatrick, D.G. (2002). Trauma and substance cue reactivity in individuals with comorbid posttraumatic stress disorder and cocaine or alcohol dependence. *Drug and Alcohol Dependence*. 65(2):115-27.

Although the high comorbidity of posttraumatic stress disorder (PTSD) and substance use disorders has been firmly established, no laboratory-based studies have been conducted to examine relationships between the two disorders. Using cue reactivity methodology, this study examined the impact of personalized trauma-image cues and in vivo drug cues on drug-related responding (e.g. craving) in individuals with PTSD and either crack cocaine (CD) or alcohol dependence (AD). CD and AD groups displayed reactivity to both trauma and drug cues when compared to neutral cues, including increased craving. However, the AD group was more reactive than the CD group to both classes of cues. The CD participants were more reactive to trauma-image cues if drug-related material was included in the image while the AD participants were reactive to the trauma cues regardless of drug-related content. It is

hypothesized that PTSD-related negative emotion may play a relatively more important role in the maintenance of AD when compared to CD. Evidence that substance dependent individuals with PTSD report increased substance craving in response to trauma memories is offered as a potential contributing factor in the poorer substance abuse treatment outcomes previously documented in this comorbid population.

Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., and Nelson, C.B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry*. 52:1048-1060.

BACKGROUND: Data were obtained on the general population epidemiology of DSM-III-R posttraumatic stress disorder (PTSD), including information on estimated life-time prevalence, the kinds of traumas most often associated with PTSD, sociodemographic correlates, the comorbidity of PTSD with other lifetime psychiatric disorders, and the duration of an index episode. METHODS: Modified versions of the DSM-III-R PTSD module from the Diagnostic Interview Schedule and of the Composite International Diagnostic Interview were administered to a representative national sample of 5877 persons aged 15 to 54 years in the part II subsample of the National Comorbidity Survey. RESULTS: The estimated lifetime prevalence of PTSD is 7.8%. Prevalence is elevated among women and the previously married. The traumas most commonly associated with PTSD are combat exposure and witnessing among men and rape and sexual molestation among women. Posttraumatic stress disorder is strongly comorbid with other lifetime DSM-III-R disorders. Survival analysis shows that more than one third of people with an index episode of PTSD fail to recover even after many years. CONCLUSIONS: Posttraumatic stress disorder is more prevalent than previously believed, and is often persistent. Progress in estimating age-at-onset distributions, cohort effects, and the conditional probabilities of PTSD from different types of trauma will require future epidemiologic studies to assess PTSD for all lifetime traumas rather than for only a small number of retrospectively reported "most serious" traumas.

Kozaric-Kovacic, D., Ljubin, T., and Grappe, M. (2000). Comorbidity of posttraumatic stress disorder and alcohol dependence in displaced persons. *Croatian Medical Journal*. 41(2):173-8.

AIM: To investigate in displaced persons a) the prevalence rate of current posttraumatic stress disorder (PTSD) and alcohol dependence; b) the relationship of alcohol dependence and current PTSD; and c) trauma exposure in relation to alcohol dependence comorbid to PTSD. METHODS: A group of displaced persons (157 men and 211 women) was interviewed using structured clinical interview based on DSM-III-R criteria for diagnosing PTSD and alcohol dependence, Watson's PTSD Questionnaire, and CAGE Questionnaire. RESULTS: Men showed higher prevalence rate of a current PTSD (50.3% of men vs. 36.5% of women, p=0.011), alcohol dependence (60.5% of men vs. 8.1% of women, p<0. 001), and alcohol dependence comorbid with PTSD (69.6% of men vs. 11. 7% of women, p<0.001). The rate of alcohol dependence increased in relation to current PTSD in men but not in women. Comorbidity of alcohol dependence and PTSD in women was influenced by alcohol-related problems before the war, whereas in men it was not influenced by any of the pre-war variables. The highest number of traumas was experienced by the displaced persons with a

current PTSD only, followed by those with PTSD and alcohol dependence. The lowest number of war traumas was experienced by displaced persons with alcohol dependence, but without current PTSD. CONCLUSION: War traumas may have a role in the development of alcohol dependence in displaced men with current PTSD. The number of war traumas had a strong effect on the development of PTSD. Sex is a relevant factor in studying comorbidity of current PTSD and alcohol dependence.

Maes, M., Delmeire, L., Mylle, J., and Altamuara, C. (2001). Risk and preventive factors of post-traumatic stress disorder (PTSD): Alcohol consumption and intoxication prior to a traumatic event diminishes the relative risk to develop PTSD in response to that trauma. *Journal of Affective Disorders*. 63(1-3):113-121.

BACKGROUND: Previous reports examined the effects of selected pre- (e.g. female gender, previous trauma), peri- (e.g. the horror of the trauma, threatened death) or post-exposure (e.g. the physical injury caused by the trauma) risk factors on the development of post-traumatic stress disorder (PTSD), an anxiety disorder associated with a traumatic event outside the range of usual human experience. We hypothesized that alcohol consumption prior to traumatic events may reduce the incidence rate of PTSD. The aim of this study was to examine the effects of the above risk factors and preventive factors, such as alcohol consumption, on the development of PTSD. METHODS: An epidemiological cohort study was carried out on 127 victims trapped in a ballroom fire. Data were collected, 7-9 months after the traumatic event, by means of the Composite International Diagnostic Interview (CIDI) and structured interviews, aimed to assess the above pre-, peri- and post-exposure factors. Logistic regression analysis was used to examine the association of PTSD with the etiologic factors and to delineate those risk factors which contribute most to the development of PTSD. RESULTS: Female gender, the number of previous trauma, a past history of simple phobia, threatened death, trauma exposure, hospitalization for trauma-induced injuries and the presence of burns increased the odds of PTSD, whereas a sense of control during the trauma, and alcohol consumption and intoxication decreased the odds of PTSD. Six factors made independent contributions to the prediction of PTSD, i.e. the number of previous trauma, a past history of simple phobia, loss of control (increase the odds), a sense of control, alcohol consumption and alcohol intoxication (decrease the odds). CONCLUSIONS: The results of this study show that the development of PTSD is determined by the effects of pre-, peri- and post-exposure risk factors and may be prevented by the effects of peri-traumatic factors, such as sense of control, alcohol consumption and intoxication.

McFarlane, A.C. (1998). Epidemiological evidence about the relationship between PTSD and alcohol abuse: The nature of the association. *Addictive Behaviors*. 23(6):813-25.

This article uses the Bradford Hill criteria for assessing causal associations to examine the nature of the relationship between PTSD and alcohol abuse. A series of studies are presented which examine this relationship. A cross-sectional study of 2,501 subjects in a community sample examined the relationship between at-risk drinking and 11 types of traumatic events. The traumatic events associated with at-risk drinking were involvement in life threatening accidents, witnessing severe injury, rape, being the victim of serious physical assault using the CIDI. In a longitudinal study of 469 firefighters exposed to a natural disaster, PTSD was associated with both an increase and decrease in alcohol consumption and PTSD rather than

exposure accounted for the changes in drinking behaviour. In three other populations, psychiatric inpatients, motor accident victims and female prisoners, the association between PTSD and alcohol abuse emphasised the clinical and public health importance of this relationship. The available evidence does nevertheless support the causal nature of this relationship. Other risk factors are necessary to predict alcohol abuse following exposure to traumatic events, although exposure to traumatic events can be caused by alcohol abuse.

Op Den Velde, W., Aarts, P.G., Falger, P.R., Hovens, J.E., Van Duijn, H., De Groen, J.H., and Van Duijn, M.A. (2002). Alcohol use, cigarette consumption and chronic post-traumatic stress disorder. *Alcohol and Alcoholism*. 37(4):355-61.

AIMS: The relationship between alcohol consumption, cigarette smoking and post-traumatic stress disorder (PTSD) was studied in 147 male former members of the civilian resistance against the Nazi occupation of Holland during World War II. METHODS: The subjects were interviewed at home. Measures included rating of current PTSD and a self-report measure of smoking and alcohol use. RESULTS: The weekly alcohol consumption reported by veterans was substantially below that of the general population. Furthermore, there was no significant difference in self-reported alcohol consumption between veterans with and without current PTSD. Cigarette smoking, however, was more prevalent in those with current PTSD. CONCLUSIONS: The absence in these veterans of a correlation between PTSD and alcohol consumption is contrary to the results of most studies on this subject. It may be related to the exclusion from organized resistance activities of people prone to the over-consumption of alcohol. It is hypothesized that, in trauma survivors, current substance use is associated with peri-traumatic patterns of psychological tension-reduction modes.

Ouimette, P.C., Moos, R.H., and Finney, J.W. (2000). Two-year mental health service use and course of remission in patients with substance use and posttraumatic stress disorders. *Journal of Studies on Alcohol*. 61(2): 247-53.

OBJECTIVE: Comorbid diagnoses of substance abuse/dependence and posttraumatic stress disorder (SUD-PTSD) adversely affect substance abuse patients' treatment outcomes. Recently, several practices have been recommended for the treatment of SUD-PTSD patients based on empirical findings, including providing PTSD-specific care. Accordingly, this study examines the association between outpatient PTSD treatment and the long-term course of SUD-PTSD patients. METHOD: Male substance abuse/dependence patients (N = 125) with a comorbid diagnosis of PTSD completed 1-and 2-year follow-ups. Based on these reports, 26 patients were stably remitted from substance abuse, 39 were partially remitted and 60 were not remitted at either follow-up. These three groups were compared on mental health service use indices gathered from patients' self-reports of inpatient treatment and nationwide Veterans Affairs (VA) databases abstracting outpatient visits. RESULTS: SUD-PTSD patients who attended more outpatient substance abuse, psychiatric and PTSD services in the first year following treatment (and cumulatively over the 2-year follow-up) were more likely to maintain a stable course of remission from substance use in the 2 years following inpatient SUD treatment. When the three types of sessions were examined in regression analyses, PTSD sessions in the second year and the total number of PTSD sessions over the 2 years following the index treatment episode emerged as the most significant predictors of remission. Self-help group participation was also associated with a remitted course for SUD-

PTSD patients. CONCLUSIONS: These data suggest that PTSD-focused treatment services are an essential treatment component for substance abuse/dependence patients with PTSD.

Ouimette, P.C., Moos, R.H., and Finney, J.W. (2003). PTSD treatment and 5-year remission among patients with substance use and posttraumatic stress disorders. *Journal of Consulting and Clinical Psychology*. 71(2):410-4.

Given the highest prevalence of comorbid substance use and posttraumatic stress disorders (SUD-PTSD), how to best treat these patients is a pressing concern for SUD providers. PTSD treatment may play an important role in patients' recovery. One hundred male SUD-PTSD patients who attended SUD treatment completed 1-, 2-, and 5-year follow-ups. Outpatient treatment information was gathered from Veterans Affairs databases. PTSD treatment and 12-Step group attendace in the 1st year predicted 5-year SUD remission. Patients who received PTSD treatment in the first 3 months following discharge and those who received treatment for a longer duration in Year 1 were more likely to be remitted in Year 5. The receipt of PTSD-focused treatment immediately after SUD treatment may enhance long-term remission.

Pfefferbaum, B., Vinekar, S.S., Trautman, R.P., Lensgraf, S.J., Reddy, C., Patel, N., and Ford, A.L. (2002). The effect of loss and trauma on substance use behavior in individuals seeking support services after the 1995 Oklahoma City bombing. *Annals of Clinical Psychiatry*. 14(2):89-95.

In this study, we examined the effect of trauma exposure on substance use behaviors, specifically tobacco and alcohol use, in a group of 84 individuals who sought supportive services after the 1995 Oklahoma City bombing. A self-report instrument was used to assess demographics, sensory exposure, injury, interpersonal exposure through relationship with victims, peritraumatic reaction, grief, posttraumatic stress, worry about safety, functional impairment, and changes in smoking and drinking. Those who reported increased smoking had higher scores on peritraumatic reaction, grief, posttraumatic stress, worry about safety, and trouble functioning. Those who reported increased alcohol intake had higher scores on injury, peritraumatic reaction, grief, posttraumatic stress, worry about safety, and trouble functioning. Sensory exposure and interpersonal exposure were not significantly different between those with and without increased smoking or drinking. Although no causal relationship can be assumed, our findings indicate an association of grief and posttraumatic stress with increased substance use behaviors in disaster victims.

Polles, A.G. and Smith, P.O. (1995). Treatment of coexisting substance dependence and posttraumatic stress disorder. *Psychiatric Services*. 46(7):729-30.

This paper describes the treatment of a physician who developed posttraumatic stress disorder (PTSD) and a polysubstance use disorder after he was shot and held hostage by a patient. Inpatient treatment combined pharmacological and behavioral approaches, including systematic re-exposure via talking about the event in therapy groups. Standard methods for achieving and maintaining abstinence were used, such as asking for and accepting peer support and discussing painful feelings. Cognitive aspects of treatment included education about interactions between the two conditions. After 12 weeks the physician was free of symptoms and had minimal anxiety when exposed to salient cues of the traumatic event.

Saxon, A.J., Davis, T.M., Sloan, K.L., McKnight, K.M., McFall, M.E., and Kivlahan, D.R. (2001). Trauma, symptoms of posttraumatic stress disorder and associated problems among incarcerated veterans. *Psychiatric Services*. 52(7):959-64.

OBJECTIVE: To help improve treatment for incarcerated veterans, the study examined exposure to trauma, symptoms of posttraumatic stress disorder (PTSD), functional status, and treatment history in a group of incarcerated veterans. METHODS: A convenience sample of 129 jailed veterans who agreed to receive outreach contact completed the Life Event History Questionnaire, the PTSD Checklist-Civilian Version (PCL-C), and the Addiction Severity Index. Participants who had scores of 50 or above on the PCL-C, designated as screening positive for PTSD, were compared with those whose scores were below 50, designated as screening negative for PTSD. RESULTS: Some 112 veterans (87 percent) reported traumatic experiences. A total of 51 veterans (39 percent) screened positive for PTSD, and 78 veterans (60 percent) screened negative. Compared with veterans who screened negative for PTSD, those who screened positive reported a greater variety of traumas; more serious current legal problems; a higher lifetime use of alcohol, cocaine, and heroin; higher recent expenditures on drugs; more psychiatric symptoms; and worse general health despite more previous psychiatric and medical treatment as well as treatment for substance abuse. CONCLUSIONS: The findings encourage the development of an improved treatment model to keep jailed veterans with PTSD from repeated incarceration.

Steindl, S.R., Young, R.M., Creamer, M., and Crompton, D. (2003). Hazardous alcohol use and treatment outcome in male combat veterans with posttraumatic stress disorder. *Journal of Traumatic Stress*. 16(1):27-34.

The relationship between alcohol problems and posttraumatic stress disorder (PTSD) remains unclear. Six hundred and eight combat veterans diagnosed with PTSD were assessed for PTSD symptoms and alcohol problems prior to group cognitive-behavioral treatment. They were reassessed 3 and 9 months after treatment. Participants were classified into low-risk and hazardous drinkers at each time point. Drinking status at intake did not predict PTSD symptoms at intake or follow-up. However, drinking status was associated with PTSD symptoms when both were assessed at follow-up. PTSD arousal symptoms were the only symptom cluster to differentiate drinking groups.

Stewart, S.H., Pihl, R.O., Conrod, P.J., and Dongier, M. (1998). Functional associations among trauma, PTSD, and substance-related disorders. *Addictive Behavior*. 23(6):797-812.

This review article presents several potential functional pathways which may explain the frequent co-occurrence of PTSD and substance abuse disorders in traumatized individuals. Emerging empirical studies which have examined these potential pathways are reviewed, including studies on relative order of onset, PTSD patients' perceptions of various drug effects, comparisons of PTSD patients with and without comorbid substance use disorders, and correlational studies examining the relations between severity of specific PTSD symptom clusters and substance disorder symptoms. Research on the acute and chronic effects of alcohol and other drugs on cognitive and physiological variables relevant to PTSD intrusion and arousal symptoms is reviewed to highlight ways in which these two sets of PTSD symptoms might be functionally interrelated with substance abuse. Finally, based on

these findings, recommendations are made for the treatment of individuals with comorbid PTSD-substance use disorders.

Stewart, S.H. (1996). Alcohol abuse in individuals exposed to trauma: a critical review. *Psychology Bulletin*. 120(1):83-112.

In this article, the author critically reviews studies on the relationship between exposure to trauma, posttraumatic stress disorder (PTSD), and alcohol abuse. After establishing that strong relationships exist between exposure to traumatic events and alcohol problems, and particularly between the diagnoses of PTSD and alcoholism, the author discusses various factors, theories, and possible mechanisms to account for these associations. Moreover, she discusses applications of these findings to the assessment and treatment of people exposed to trauma who abuse alcohol. Finally, the author outlines novel methods for testing theoretical hypotheses and makes suggestions for methodological improvements in future research.

Vlahov, D., Galea, S., Resnick, H., Ahern, J., Boscarino, J.A., Bucuvalas, M., Gold, J., and Kilpatrick, D. (2002). Increased use of cigarettes, alcohol, and marijuana among Manhattan, New York, residents after the September 11th terrorist attacks. *American Journal of Epidemiology*. 155(11):988-96.

The September 11, 2001, terrorist attacks were the largest human-made disaster in the United States since the Civil War. Studies after earlier disasters have reported rates of psychological disorders in the acute postdisaster period. However, data on postdisaster increases in substance use are sparse. A random digit dial telephone survey was conducted to estimate the prevalence of increased cigarette smoking, alcohol consumption, and marijuana use among residents of Manhattan, New York City, 5-8 weeks after the attacks. Among 988 persons included, 28.8% reported an increase in use of any of these three substances, 9.7% reported an increase in smoking, 24.6% reported an increase in alcohol consumption, and 3.2% reported an increase in marijuana use. Persons who increased smoking of cigarettes and marijuana were more likely to experience posttraumatic stress disorder than were those who did not (24.2% vs. 5.6% posttraumatic stress disorder for cigarettes; 36.0% vs. 6.6% for marijuana). Depression was more common among those who increased than for those who did not increase cigarette smoking (22.1 vs. 8.2%), alcohol consumption (15.5 vs. 8.3%), and marijuana smoking (22.3 vs. 9.4%). The results of this study suggest a substantial increase in substance use in the acute postdisaster period after the September 11th attacks. Increase in use of different substances may be associated with the presence of different comorbid psychiatric conditions.

Volpicelli, J., Balaraman, G., Hahn, J., Wallace, H. and Bux, D. (1999). The role of uncontrollable trauma in the development of PTSD and alcohol addiction. *Alcohol Research and Health*. 23(4):256-62.

After a traumatic event, people often report using alcohol to relieve their symptoms of anxiety, irritability, and depression. Alcohol may relieve these symptoms because drinking compensates for deficiencies in endorphin activity following a traumatic experience. Within minutes of exposure to a traumatic event there is an increase in the level of endorphins in the brain. During the time of the trauma, endorphin levels remain elevated and help numb the emotional and physical pain of the trauma. However, after the trauma is over, endorphin

levels gradually decrease and this may lead to a period of endorphin withdrawal that can last from hours to days. This period of endorphin withdrawal may produce emotional distress and contribute to other symptoms of posttraumatic stress disorder (PTSD). Because alcohol use increases endorphin activity, drinking following trauma may be used to compensate this endorphin withdrawal and thus avoid the associated emotional distress. This model has important implications for the treatment of PTSD and alcoholism.

Weiss, L., Fabri, A., McCoy, K., Coffin, P., Netherland, J., and Finkelstein, R. (2002). A vulnerable population in a time of crisis: Drug users and the attacks on the World Trade Center. *Journal of Urban Health*. 79(3):392-403.

In this article, we present preliminary findings from a qualitative study focused on the impact of the World Trade Center attacks on New York City residents who are current or former users of heroin, crack, and other forms of cocaine. In it, we present data describing their responses to and feelings about the attacks, changes in drug use after the attacks, and factors affecting changes in use. Our analysis is based on 57 open-ended interviews conducted between October 2001 and February 2002. The majority of study participants reported that the attacks had a significant emotional impact on them, causing anxiety, sadness, and anger. Several described practical impacts as well, including significant reductions in income. On September 11th and the weeks and months that followed, several participants who had been actively using did increase their use of heroin, crack, and/or other forms of cocaine. Reductions in use were, however, as common over time as were increases. There was some relapse among former users, but this was limited to those who had stopped using drugs within the 6 months immediately preceding the attacks. A diverse set of factors interacted to control use. For some participants, these factors were internal, relating to their individual motivations and drug use experiences. Other participants were essentially forced to limit use by marked reductions in income. For others, access to health and social service professionals, as well as drug treatment, proved to be key.

Zweben, J.E., Clark, H.W., and Smith, D.E. (1994). Traumatic experiences and substance abuse: Mapping the territory. *Journal of Psychoactive Drugs*. 26(4):327-44.

This article examines the relationships between various types of traumatic experiences and addictive behavior, with an eye to formulating effective treatment strategies. Interventions in the posttraumatic stress disorder (PTSD) and related fields are reviewed in an effort to understand how best to integrate them into substance abuse treatment. The recovery-oriented therapy model is used as a framework to define treatment tasks at each stage of the recovery process: how one addresses painful issues depends on the objective, given the recovery stage at hand. These tasks include making a commitment to abstinence, stopping alcohol and other drug use, consolidating abstinence and changing lifestyles, and addressing short- and long-term psychosocial issues. The article focuses on the clinical features of PTSD in an effort to enhance the practitioner's ability to address this disorder within the context of substance abuse treatment. Finally, recommendations are offered for training practitioners at varying skill levels in the addiction treatment field.

Women

Bollerud, K. (1990). A model for the treatment of trauma-related syndromes among chemically dependent inpatient women. *Journal of Substance Abuse Treatment.* 7(2):83-7.

The association of physical and sexual abuse with substance abuse has frequently been noted among chemically dependent women. Without diagnosis and treatment of the trauma, female substance abusers are vulnerable to relapse and/or revictimization. This paper describes a model for education and preliminary treatment of female victims of physical and sexual violence during the inpatient phase of chemical dependency treatment. The importance of addressing both addiction and trauma at the outset of substance abuse recovery is emphasized.

Brown, P.J. and Stout, R.L. (1996). Posttraumatic stress disorder and substance abuse relapse among women: A pilot study. *Psychology of Addictive Behaviors*. 10(2):124-28.

The authors compared substance-dependent women with and without a comorbid diagnosis of portraumatic stress disorder (PTSD) on their alcohol and drug use after inpatient substance abuse treatment. Participants were 31 women with diagnosed substance dependence disorder. Forty-two percent of the entire sample (n=13) met *DSM-III-R* criteria for current PTSD. Follow-up interviews revealed that approximately 70% of the women relapsed during the 3 months posttreatment. Although rates of relapse did not significantly differ by PTSD status, PTSD women were found to relapse more quicky than non-PTSD women. Although preliminary, study findings suggest that the presence of PTSD among substance-dependent women may have prognostic significance as well as important treatment implications.

Brown, V.B., Melchior, L.A., Reback, C., and Huba, G.J. (1994). Psychological functioning and substance abuse before and after the 1992 Los Angeles riot in a community sample of women. *Journal of Psychoactive Drugs*. 26(4):431-7.

An ongoing study of interventions designed to increase nontraditional social supports among women at high risk for HIV infection was in the field during the 1992 Los Angeles riot in those neighborhoods most affected by the urban unrest. Using data from structured interviews, the psychosocial characteristics, drug abuse patterns, and distress levels among the women who were recruited for the project in the six months before and after the riot were examined. While substance abuse levels among participants did not increase or decrease as a function of the riot, there were a smaller number of social supports and marginally greater levels of already high psychological distress. Women in the community specifically mentioned a lack of social supports from counselors available in affected areas after the riot. An ethnographic analysis discusses the experience of the participants in the community during the same period of time. Problems in social supports are pointed out. The results are discussed in terms of a general theory of service provision by increasing nontraditional social supports, especially immediately after a major cataclysm.

Children and Adolescents

Deykin, E.Y. and Buka, S.L. (1997). Prevalence and risk factors for posttraumatic stress disorder among chemically dependent adolescents. *American Journal of Psychiatry*. 154:752-57.

OBJECTIVE: This study ascertained the prevalence of posttraumatic stress disorder (PTSD) among chemically dependent adolescents and identified factors that influence the risk of PTSD after a qualifying trauma. METHOD: The study group consisted of 297 adolescents aged 15-19 years who met the DSM-III-R criteria for dependence on alcohol or other drugs and who were receiving treatment in seven publicly funded Massachusetts facilities. PTSD and other axis I diagnoses were assessed by the Diagnostic Interview Schedule. Data on risk factors were collected by a specially constructed interview schedule. RESULTS: The lifetime prevalence of PTSD was 29.6% (24.3% for males and 45.3% for females), and the current prevalence was 19.2% (12.2% for males and 40.0% for females). These prevalences reflect a high occurrence of traumatic exposures and a high case rate among those who experienced trauma. The risk of PTSD varied with the nature of the trauma, the number of traumas experienced, psychiatric comorbidity, and familial characteristics. The higher rate of PTSD among females was due to a greater frequency of rape, which carries a high risk of PTSD development, and to a high rate of comorbid conditions. CONCLUSIONS: The lifetime prevalence of PTSD among these chemically dependent adolescents is five times that reported for a community sample of adolescents. This extremely high rate provides new understanding of the etiologic connection between PTSD and chemical dependence and has implications for their treatment.

Reijneveld, S.A., Crone, M.R., Verhulst, F.C., and Verloove-Vanhorick, S.P. (2003). The effect of a severe disaster on the mental health of adolescents: A controlled study. *Lancet.* 362(9385):691-6.

BACKGROUND: Disasters greatly affect the mental health of children and adolescents, but quantification of such effects is difficult. Using prospective predisaster and postdisaster data for affected and control populations, we aimed to assess the effects of a severe disaster on the mental health and substance use of adolescents. METHODS: In January, 2001, a fire in a cafe in Volendam, Netherlands, wounded 250 adolescents and killed 14. In the 15 months before the disaster, all grade 2 students (aged 12-15 years) from a school in Volendam (of whom 31 were in the cafe during the fire), and from two other schools, had been selected as controls for a study. 124 Volendam students and 830 from the other two schools had provided data for substance use, and completed the youth self-report (YSR) questionnaire about behavioural and emotional problems. 5 months after the disaster, we obtained follow-up data from 91 (response rate 73.4%) Volendam adolescents and 643 (77.5%) controls from the other two schools. The primary outcome measures were changes in score in YSR categories of total problems, alcohol misuse, smoking, and substance use. We compared changes in scores between groups using logistic regression. FINDINGS: Volendam adolescents had larger increases in clinical scores than controls for total problems (odds ratio 1.82, 95% CI 1.01-3.29, p=0.045) and excessive use of alcohol (4.57, 2.73-7.64, p<0.0001), but not for smoking or use of marijuana, MDMA (ecstasy), and sedatives. Increases in YSR scores were largest for being anxious or depressed (2.85, 1.23-6.61), incoherent thinking

(2.16, 1.09-4.30), and aggressive behaviour (3.30, 1.30-8.36). Intention-to-treat analyses showed significantly larger for increases in rates of excessive drinking and YSR symptom subscales in Volendam adolescents than controls. Effects were mostly similar in victims and their classmates. INTERPRETATION: Mental health interventions after disasters should address anxiety, depression, thought problems, aggression, and alcohol abuse of directly affected adolescents and their peer group.

First Responders

Boxer, P.A. and Wild, D. (1993). Psychological distress and alcohol use among fire fighters. *Scandinavian Journal of Work, Environment and Health*. 19(2):121-5.

Few studies have investigated stressors to which fire fighters are subjected and the potential psychological consequences. One hundred and forty-five fire fighters were studied to enumerate potential occupational stressors, assess psychological distress and problems with alcohol use, and determine whether a relationship exists between these measures and self-reported stressors. Hearing that children are in a burning building was the highest ranked stressor. According to three self-report instruments, between 33 and 41% of the fire fighters were experiencing significant psychological distress, and 29% had possible or probable problems with alcohol use. These figures are significantly higher than would be expected in a typical community or working population. In a logistic regression analysis, no relationship was found between measures of psychological distress and alcohol use and the 10 most highly ranked work stressors.