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The Influence Of Indirect Collective Trauma On First Responders' Alcohol Use

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Abstract: *Previous research has suggested increased risk for negative outcomes such as increased alcohol use among first responders who are involved with the response to a community disaster; however, it is not clear how indirect exposure to a critical incident impacts first responders. This work examined the impact of secondary or indirect trauma on changes in alcohol use among urban firefighters who were not directly involved in the response to a large scale community-level disaster. Firefighters enrolled in larger trial of health outcomes whose interview period coincided with the crash of a commercial airplane were the basis for the current report. Aggregate level data on changes in alcohol consumption for these firefighters were examined pre- and post-incident. There was a significant increase in alcohol use following the critical incident. This increase did not occur immediately; it was observed within several days and peaked about 8 days post-incident. Post-hoc analyses revealed that the increased alcohol consumption persisted for several months, finally returning to pre-incident levels by 8 months post-incident. Indirect trauma effects, likely operationalized in part through the "brotherhood" of the firefighters, clearly placed firefighters at risk for negative outcomes following a disaster. Intervention/prevention efforts aimed at distress reduction among first responders should not solely focus on responders with direct involvement in a disaster. [International Journal of Emergency Mental Health, 2012, 14(1), pp. 21-28].*

Key words: *alcohol consumption; first responders; disaster; critical incident*

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First responders face a variety of traumatic, critical incidents in their daily job tasks. Polk and Mitchell (2008) describe critical incidents as "severe events that can overwhelm a person's or group's ability to cope" and that these events "disrupt normal functions" (page 9). These incidents include events such as fires, shootings, and accidents that may impact a smaller number of people or limited geographical area, but these incidents can also include larger scale events that impact a greater number of people and wider geographical area such as a whole community. Previous research has sug-

gested that contextual elements, such as event type, duration of the event, etc., can impact the psychological and physical responses among first responders to such events (Benedek, Fullerton, & Ursano, 2007).

Among community samples, there is evidence of a dose-response curve between with individuals with greater levels of exposure having greater levels of psychological impairment (Shore, Tatum, & Vollmer, 1986). Similarly, high exposure among rescue workers has also been found to be significantly related to psychological impairment. For example, Fullerton and colleagues (Fullerton, Ursano, & Wang, 2004) examined acute stress disorder, post-traumatic stress disorder (PTSD); and depression among disaster/ rescue workers following an airline disaster and found that exposed workers had higher rates of depression 7 months post-disaster and that those with high exposure were more likely to develop PTSD. Important, however, is the finding that unexposed comparison subjects also had significant rates of depression, PTSD or acute stress disorder (20.4%). These rates are significantly higher compared to the population in general. Thus, indirect exposure (i.e., individuals without direct involvement with the response) to large scale critical incidents can increase risk among individuals.

Given the anxiety reducing impact of alcohol, (Kushner, Abrams, & Borchardt, 2000) it is possible that increased alcohol intake following a critical incident is used by some as a coping mechanism (Carpenter & Basin, 1999). However, it has been suggested that the short term anxiety reducing impacts from alcohol may, in fact, lead to greater levels of anxiety and a greater likelihood of problematic alcohol use in the long term (Kushner et al., 2000). This complex association between stress/anxiety and alcohol use may be exacerbated by critical incidents. Grieger and colleagues (Grieger, Fullerton, Ursano, & Reeves, 2003) found a significant relationship between alcohol use and acute stress disorder among hospital staff following a series of sniper attacks in Washington, DC. In general, higher levels of alcohol use among first responders is also not uncommon. For example, Boxer and Wild (1993) found that 29% of a sample 145 firefighters had possible or probable problematic alcohol use. Additionally, we have also found high levels of heavy drinking and hazardous drinking among a sample of urban firefighters (Carey, Al-Zaiti, Dean, Sessanna, & Finnell, 2011).

Social networks and alcohol use are also highly related. For example, we have found that the number of heavy drinkers in a social network is longitudinally predictive of heavy drinking and problem drinking (Leonard & Homish, 2008) and that changes in drinking longitudinally impact changes in the social network (Homish & Leonard, 2008a). The significant interrelationship between social networks and alcohol may be particularly important for firefighters, individuals who, unlike other professionals, work and live together during their shifts at the fire houses. Firefighters tend to have strong social bonds and develop a "brotherhood"—that is, a strong interpersonal connection that is deeply rooted among firefighters (Crosby, 2007a). The social connections among firefighters may help to reduce stress (Regehr, Hill, Knott, & Sault, 2003); however, it is also possible that negative coping mechanisms (e.g., heavy alcohol use) may also spread among this interconnected group of individuals. Because of the strong emotional bonds among firefighters and within firehouses, emotional contagion, the concept whereby one person's emotional state influences another, (Fletcher, 2009; Hatfield, Cacioppo, & Rapson, 1994) may also impact firefighters' health, health behaviors, and well-being.

Given high occupational stress, tight bonds among firefighters, extended work hours in which firefighters work and live with each other during their shifts, it is also possible that health behaviors of one firefighter influence other firefighters. This may promote positive behavior; however, it is also possible that negative behaviors (e.g., using alcohol as a coping mechanism) can spread. The tight bond, or brotherhood, could also place firefighters at risk when another of their brotherhood is involved in a critical incident. For example, collective trauma describes an event that disrupts "social life that damages the bonds attaching people together and impairs the prevailing sense of communality" (Myers, 1994, p. 1). There is also evidence that individuals who are unaffected directly by a disaster can be negatively impacted (Myers, 1991). This has been described as "vicarious traumatization," "secondary traumatization," or "compassion fatigue" (Palm, Polusny, & Follette, 2004). The indirect impact of trauma can affect family, friends, or work colleagues. Thus, firefighters, with their tight bonds and extended time together, may be particularly vulnerable to secondary trauma and, subsequently, may have increased negative health behaviors (e.g., increased alcohol use).

Using a sample of urban, paid firefighters, the goal of this research was to examine changes in alcohol use following a critical incident. Importantly, however, this research will examine how secondary traumatization or indirect exposure,

operationalized through the "brotherhood" of firefighters, is related to changes in alcohol use pre- and post-critical incident. It is hypothesized that firefighters not directly involved in the response to a critical incident will experience an increase in alcohol use following the event.

METHOD

Subjects for this report were enrolled in an ongoing, larger study. The SAFFE study (**S**urveying and **A**ssessing **F**irefighters **F**itness and **E**lectrocardiogram) is a National Institute of Health-funded cross-sectional descriptive study to characterize firefighters' physiological responses while on-duty (Carey, Al-Zaiti, & Butler, 2010). The SAFFE study recruited firefighters from 13 firehouses in a metropolitan area of nearly 300,000 residents. Each firehouse had approximately 45 firefighters in 4 platoons that work in an extended rotating shifts schedule, 2 day shifts (10 hours), 2 night shifts (14 hours), followed by 4 off-duty days.

All firefighters were eligible to participate. Recruitment was based on non-probability sampling; however, to minimize sampling bias, every possible effort was made to approach all eligible firefighters until the full sample was obtained. The research team, composed of the principal investigator and four research assistants, travelled among the firehouses and recruited from all platoons. In a quiet, private room, consent was obtained and six paper-and-pencil surveys were completed. The research protocol was approved by the State University of New York at Buffalo's Institutional Review Board. The surveys were used to assess sleep problems, substance use (alcohol, caffeine, and nicotine), social bonding, and quality of life (physical and mental well-being). The current report focuses on changes in alcohol use.

Participants

A sample of 112 urban, paid firefighters (n=112, 16% of target population) was enrolled from six different fire houses from the fire department. All firefighters completed the six paper-and-pencil surveys. The firefighters were 43.6 + 7.7 years old. The majority of the sample consisted of men (95% male). In terms of race/ethnicity, the sample was 81% Caucasian, 13% African American, and 6% Hispanic. The sample's demographics were similar to that of the fire department as a whole.

Outcome Measure: Alcohol Use

The Time Line Follow Back (TLFB; Sobell, Maisto, Sobell, & Cooper, 1979) survey was used to characterize alcohol use. TLFB uses a calendar to estimate the daily alcohol use over the past two weeks, beginning from the day of recruitment. To aid in recall, the TLFB approach personalizes calendars for each participant by placing personally relevant events on the calendar (e.g., birthday, parties, etc.). Working backwards, the firefighters recorded for every day the number of alcoholic drinks; reported as a standard drink, for example, one 12 oz beer equaled one drink. Thus, the TLFB captures 14 days of alcohol use per firefighter. Although interview data is available for over a one year period, the current analysis focuses on a one month time frame (two weeks pre and post critical incident (described below)).

Critical Incident

The critical incident for this report was the crash of a commercial plane. Based on information from a panel convened by the National Transportation Safety Board(Babcock, 2009), Continental Connection flight 3407, operated by Colgan Air, Inc., crashed at 10:17 PM, Eastern Standard Time on February 12, 2009 in Clarence Center, NY. The flight was on an instrument approach to Runway 23 at the Buffalo-Niagara International Airport, Buffalo, NY. The flight originated from Liberty International Airport, Newark, New Jersey. Four flight crew members, 45 passengers and one person on the ground were fatally injured. It is important to note that the incident occurred outside of the jurisdiction of the city fire department (the sample for the SAFFE Study); however, given the magnitude of the event, one team was deployed to the scene to assist in extinguishing the massive fire. It should be noted that all firefighters who responded to the incident were invited to participate in a confidential critical incident stress management program which spans the 3 phases of the crisis spectrum: pre-crisis phase, acute crisis phase, and post-crisis phase. These firefighters were not included in the current analyses.

Statistical Analysis

An Autoregressive Integrated Moving Average Model (ARIMA; Box, Jenkins, & Reinsel, 1994) was used to determine if there was a statistically significant difference

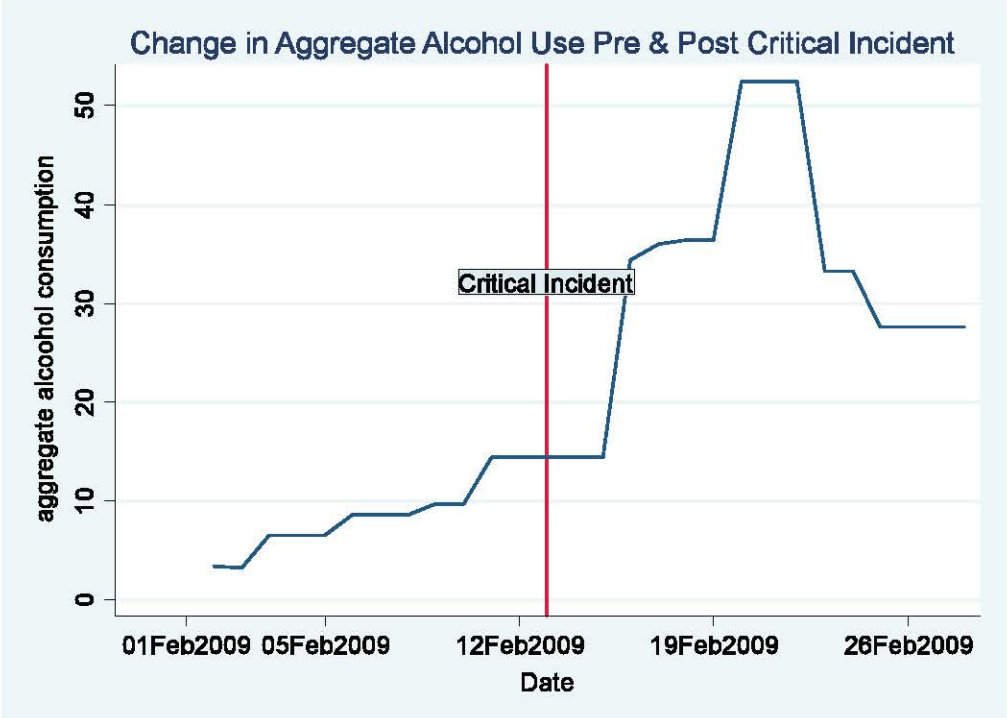
in aggregate group-level alcohol use pre and post critical incident. Unlike other longitudinal data analysis models (e.g., multilevel regression model) that focus on changes among individuals, ARIMA models are designed to examine time series data about groups. As described in more detail below, the larger study was not designed to consider pre-post alcohol use following a disaster as it would not be possible to predict the timing of the disaster; therefore, participants in the ongoing study whose assessment window overlapped our critical incident were eligible for the study. Thus, statements of change are generalized to the group and the ARIMA model is ideal for addressing group changes. All statistical analyses were performed with Stata (Version 11.2 MP). .

RESULTS

In the full sample, the majority of the firefighters used alcohol at least once in the previous 2 week period (78.5%, n= 88). The average number of standard alcoholic drinks per drinking day was 1.6 (+1.7 standard alcoholic drinks per day, range 0.0-9.7). Slightly more than half (56%) reported heavy drinking (5 or more drinks on an occasion) at least once in the 14 day period. For the current report, we were interested in changes in drinking 2 weeks prior and 2 weeks following the critical incident (plane crash described above). Although the SAFFE is a cross-sectional study, the two week daily data from the TLFB allows for the analysis of changes in alcohol use pre and post critical incident using aggregate time series analyses. Thus, firefighters who were interviewed at least one month following the incident provided data for the current report (the TLFB captured two weeks' worth of data, therefore, 2 weeks beyond the observation window would provide one day of data).

To ensure that the firefighters in the current report generalized to the larger sample of firefighters, we compared alcohol use among those in the current report (those who were interviewed within one month of the critical incident) and those who were interviewed either earlier than 2 weeks prior to the critical or at least one month after the critical incident). The proportion that drank any alcohol was not significantly different among the two groups (75.0% vs. 73.1%, NS). Additionally, there were no statistically significant differences in heavy drinking (five or more drinks) among the two groups (61.7% vs. 50.0%, NS). In the ARIMA model, there was evidence that alcohol use among these firefighters

Figure 1.



significantly increased pre to post critical incident (regression coefficient = 13.6; 95% confidence interval: 8.7-18.6; $p < .001$; Figure 1).

As shown in Figure 1, the increase in alcohol use did not immediately occur, but appeared after several days. After the peak occurred (about 8 days post-critical incident, there appeared to be a decline in alcohol use). To examine when aggregate drinking in the firefighters returned to pre-critical incident levels, two additional post-hoc ARIMA models were used with larger observation windows In the first post-hoc ARIMA model, the observation windowed was extended to May, 2009, three months post incident. A significant effect of the critical incident on changes in aggregate alcohol use over time remained (regression coefficient = 8.3; 95% confidence interval: 1.01-16.7; $p < .05$); however, there was a reduction in magnitude of the increase (as indicated by the smaller regression coefficient compared to the first model). In the final model, the observation window was widened to cover the period ending October 4. In this model, the critical incident was no longer significant, thus, by 6 months post incident, aggregate alcohol use retuned to pre-event levels.

DISCUSSION

It is well established that the Nation's public health needs are protected by a diverse array of disciplines. First responders, a key component of public health, face a variety of traumatic incidents in their everyday work. For example, Regehr and colleagues (2000) found that 78% of firefighters had been exposed to at least one critical incident. There is evidence that, as a result of exposure to such events, higher rates of mental health and substance use issues arise (Andrew et al., 2008; Benedek et al., 2007; Boxer & Wild, 1993). It is less clear how critical incidents impact the health behaviors of first responders without a direct role in the incident.

The purpose of this work was to examine the potential impact of a critical incident on alcohol use among firefighters without direct involvement in a large, community-wide disaster. In the current report, there was evidence that, following a plane crash, firefighters increased their alcohol consumption. Although the firefighters for this report were not directly involved in the response to the plane crash, one response team from their department and more than a dozen volunteer fire departments responded to the crash. Thus, although the firefighters for the current report were not directly involved, others in their "brotherhood" were directly involved. Interestingly, the increase in alcohol use was not within the first 24 hours of the critical incident, but rather delayed by several days. This suggests the vicarious trauma effect was intensified as stories of involvement in the incident circulated among the responders. This phenomenon is similar to the media effect that occurs after a large disaster where increased media exposure, even among the uninvolved, increases the likelihood of distress (Heckathorn, 2002).

First responders and firefighters in particular, are a tight knit group of individuals. This "brotherhood" is defined among firefighters as a common willingness to face danger and to do whatever is necessary to help one another (Crosby, 2007b). This tight bond may develop, in part, because of the extended time which firefighters spend together at the firehouse. This close connection can provide firefighters with a strong social network in which coping and emotional healing can occur following traumatic events. Further, some studies have found that when lower levels of support (i.e., those firefighters who feel a less close connection) exist among firefighters, this makes them more vulnerable to depression and stress (Regehr et al., 2000).

In addition to decreased social support leading to increased distress, it is also possible that the nature of the social network may increase distress. For example, emotional contagion, whereby one person's negative health outcomes are associated with an increased likelihood of a close other's negative health outcome, is more likely to occur among closely connected individuals. There is evidence among family systems that one person's negative health behaviors have a direct impact on others in the family network (Homish & Leonard, 2008b; Homish, Leonard, & Kearns-Bodkin, 2006). Similarly, the notion of vicarious or secondary trauma may explain the apparent "spread" of negative health behaviors among closely connected social networks such as the "brotherhood" among urban firefighters.

In the current report, we also found that the increases in alcohol use were persistent post-critical incident. The return to pre-incident drinking levels did not occur until about 7 months. This long lasting impact of a disaster is not uncommon. For example, McFarlane (1988) assessed firefighters 4 and 8 months after a large brush fire disaster and found elevated symptoms of PTSD at both of these assessments. Similarly, Fullerton and colleagues (Fullerton et al., 2004) found higher rates of PTSD and depression among disaster works 13 months after their response to an airplane crash.

Higher baseline rates of alcohol use, coupled with job stress brought about by extended shifts, rotating schedules, and critical incidents, place firefighters at an increased risk for negative health outcomes such as depression or alcohol abuse/dependence. Further, there is evidence that increases in alcohol use following disaster are associated with higher levels of depressive symptoms as well as PTSD symptoms (Cardenas, Williams, Wilson, Fanouraki, & Singh, 2003). Alcohol abuse/dependence may also lead to an increased risk for suicide (Pompili et al., 2010).

There are several key implications of the current research. First, organizational support for wellness can be important for promoting health. Efforts to minimize alcohol use and instead support healthy life styles and promote resiliency can be achieved in part by the organization's provision of pre-incident training and during/post-incident critical incident stress management services for both on-scene and off-scene responders. Further, education about alcohol use should be provided to firefighters early, ideally during the firefighters period as new recruits. Additional elements of a successful early intervention program include a strategic approach, a comprehensive package of tactics, procedures, and interventions, organizational endorsement of the program, and follow-up and referral programs (Mitchell, 2004). The background of the provider may also have implications for how messages of resiliency are communicated. For example, while some departments have Employee Assistance Programs (EAP), many responders do not trust EAP staff to understand the nature of their work, and therefore opt to forego the availability of this resource. The effectiveness, therefore, of critical incident stress management programs can be enhanced via the use of specially trained firefighters to serve as Peer Counselors. The effectiveness of peer support is believed to derive from a variety of psychosocial processes including social support, experiential knowledge, social learning theory, social comparison theory, and the helper-therapy principle. Individuals are more comfortable interacting with others who share common characteristics with themselves, in order to establish a sense of normalcy (Salzer, 2002). Second, the principles of self-care should include provisions for dealing with vicarious trauma. Self-care is training to help responders before, during, and after critical incidents (Vernberg et al., 2008). It tends to focus on four different areas: personal, health, family and work (Vernberg et al., 2008). It is also important to note that principles of self-care should be provided to all individuals who may deal with difficult or traumatic circumstances. Given the potential for critical incidents to impact a larger group of first responders than simply those directly involved, self-care training that includes information on vicarious trauma should be offered to all individuals charged with dealing with the public during an emergency. Third, the impact of a critical incident on health may not occur immediately following the critical incident. As noted in the current report, the increase in alcohol use was not apparent for several days following the incident. Finally, the negative health consequence of critical incidents may extend to a long duration; therefore, responders should be offered services to assist them for extended periods beyond the critical incident. In other work, we found that responders to a critical incident often benefit from having additional mental health services available for at least 10 months post-incident (Hornish, Frazer, McCartan, & Billittier, 2010).

There are several limitations that must be considered when interpreting the findings from the current report. The current report relied on aggregated time series analysis; thus, information about individual firefighters cannot be evaluated from the current work. This analytic technique, however, was able to appropriately assess pre-and post- critical incident changes in alcohol use. Because the larger main study was an ongoing, cross-sectional design, we were not able to use a pre-post study design to capture changes in alcohol use among the same individuals over time. However, given the two-week daily data assessments of alcohol use, we were able to examine alcohol use for all firefighters whose two-week window of data collection overlapped the observation window before or after the critical incident.

Another limitation is that the sample focuses solely on urban, paid firefighters. It is also not clear how these findings may translate to other groups of responders. Despite these limitations, this research allowed us to consider a topic that has not been addressed in the literature—the impact of a critical incident on alcohol use among firefighters without direct exposure to the event. Future work should examine other health outcomes, such as Posttraumatic Stress Disorder symptomatology, depressive symptomatology, and other substance use behaviors of first responders whose colleagues have been involved in a critical incident response.

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