



Contents lists available at ScienceDirect

# Safety and Health at Work

journal homepage: [www.e-shaw.net](http://www.e-shaw.net)

Original article

## Norms about Alcohol Use among US Firefighters

Christopher K. Haddock<sup>1,\*</sup>, Nattinee Jitnarin<sup>1</sup>, Raul Caetano<sup>2</sup>, Sara A. Jahnke<sup>1</sup>,  
Brittany S. Hollerbach<sup>1</sup>, Christopher M. Kaipust<sup>1</sup>, Walker S.C. Poston<sup>1</sup>

<sup>1</sup> Center for Fire, Rescue, & EMS Health Research, NDRI-USA, 1920 West 143rd Street, Suite 120, Leawood, KS 66224, USA

<sup>2</sup> Prevention Research Center, Pacific Institute for Research and Evaluation, 2150 Shattuck Avenue, Suite 601, Berkeley, CA 94704, USA



### ARTICLE INFO

#### Article history:

Received 13 April 2022

Received in revised form

24 August 2022

Accepted 28 August 2022

Available online 21 September 2022

#### Keywords:

alcohol  
firefighter  
norms  
occupation

### ABSTRACT

**Background:** Problem drinking is a perennial concern in the US fire service. A large literature has documented the importance of addressing alcohol norms in intervention research. The purpose of this study was to explore alcohol norms in a national cohort of firefighters (FFs) to inform intervention development in this occupational group.

**Methods:** Data were from a national online survey of career and volunteer FFs (N = 674). Participants were recruited through national fire service listservs and a database of FFs who had agreed to be contacted for research.

**Results:** When asked about “acceptable” levels of alcohol consumption, FFs on average suggested levels which exceeded public health guidelines. Further, approximately half of career and volunteer FFs believed that, at least under some circumstances, drinking until intoxicated was normative. When asked how long should elapse between a FFs last drink and reporting for duty, the average suggested lag was 11.2 hours (sd = 4.6). However, among male volunteer FFs who reported heavy drinking, the average was 6.68 hours (sd = 4.77).

**Conclusions:** Given the high prevalence of heavy and binge drinking in the fire service, it is not surprising that the alcohol norms found in this study were consistent with a culture of drinking. Participants’ reports of alcohol use among their peers were consistent with the actual prevalence of problem drinking. Thus, education and prevention efforts in this occupation should focus on changing norms about alcohol use, including linking heavy drinking to other health and safety issues they face.

© 2022 Occupational Safety and Health Research Institute, Published by Elsevier Korea LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### 1. Introduction

The mission of the US Fire Service is to respond to unpredictable, volatile, and extremely dangerous environments requiring rapid and evolving responses. While firefighters (FFs) were once primarily tasked with responding to fires, they now serve as the front line of defense for mass shootings, natural disasters, medical emergencies, technical rescues, hazardous materials incidents, terrorist attacks, and a wide range of community assistance missions [1]. Responding to these calls take an emotional toll on FFs, resulting in high rates of mental health challenges such as post-traumatic stress disorder [2,3] and depression [4–6]. Formative research conducted in the fire service suggests that a consequence

of stressful working conditions and prevalent mental health challenges is high rates of heavy and binge drinking [7].

A large literature documents that FFs have among the highest rates of heavy and binge drinking of all occupations [4,8–11]. For instance, three recent surveillance studies examined alcohol use among FFs. The first survey was conducted with 656 male FFs from 24 fire departments randomly selected from the International Association of Fire Chief’s Missouri Valley (seven state) region. Results indicated over 50% of career FFs reported recent heavy (3+ drinks/day men, 2+ for women) or binge drinking (5+ drinks for men, 4+ for women on a single occasion of about 2 hours), while 9% of FFs who drank, self-reported driving while intoxicated in the past 30 days. A second study assessed alcohol use among FFs in 20 career fire departments

Christopher K. Haddock: <https://orcid.org/0000-0002-4885-8335>; Nattinee Jitnarin: <https://orcid.org/0000-0001-6010-773X>; Raul Caetano: <https://orcid.org/0000-0002-5036-5249>; Sara A. Jahnke: <https://orcid.org/0000-0002-2739-2345>; Brittany S. Hollerbach: <https://orcid.org/0000-0002-6350-8210>; Christopher M. Kaipust: <https://orcid.org/0000-0001-8080-1489>; Walker S.C. Poston: <https://orcid.org/0000-0002-6610-3649>

\* Corresponding author. Center for Fire, Rescue and EMS Health Research, NDRI-USA, Inc., 1920 West 143rd Street, Suite 120, Leawood, KS 66224, USA.

E-mail address: [ckhaddockphd@gmail.com](mailto:ckhaddockphd@gmail.com) (C.K. Haddock).

across the nation (N = 1,002) [8]. The prevalence of past 30-day heavy (44.7%) and binge drinking (50.2%) was similar to the study conducted in the Missouri Valley region. Among FFs who reported a binge drinking episode in the past 30 days, 72.5% reported multiple episodes. Finally, a large (N = 1,913) online health survey of women FFs across the US [12] found that nearly 40% reported binge drinking in the previous month and 4.3% self-reported driving while intoxicated. The prevalence of binge drinking among women FFs was nearly three-fold higher than those found among women in the general population [12]. Given the findings of these large surveillance studies, it is not surprising that smaller studies have found that over 25% of FFs screen positive for possible alcohol use disorder [13,14].

Given the high rates of alcohol use in the fire service, it is unfortunate that no tailored, empirically based alcohol abuse prevention or intervention programs have been developed for FFs. Alcohol researchers and the National Institute for Alcohol Abuse and Alcoholism have highlighted the promise of implementing alcohol use disorder prevention strategies in the workplace [15]. We were funded by the Federal Emergency Management Agency to create components for an alcohol awareness and prevention intervention tailored to the occupational culture of the fire service. As part of that research, we sought to assess alcohol use norms among FFs. According to a social norms approach, peer influence is driven more by what we think others in our social network do and believe than by their actual behavior and beliefs [16]. A large literature has documented the importance of addressing alcohol norms in intervention research generally [17–20] and in occupational settings specifically [21–23]. This paper provides data from the first study of alcohol norms among US FFs.

## 2. Materials and methods

### 2.1. Human subjects approval

The research protocol for this study was approved by the institutional review boards of the Pacific Institute for Research and Evaluation and NDRI-USA.

#### Sampling methods

The survey was conducted in April–May 2021 and was funded by a grant from the Department of Homeland Security/Federal Emergency Management Agency (EMW-2018-FP-00593). There is no central registry of FFs that can be used to derive a sampling frame and fire departments typically will not provide contact information without prior approval from their personnel. Thus, recruitment strategies for this survey were identical to those used in our previously published fire service research [12,24,25]. Strategies included recruitment through our large database of FFs who have agreed to be contacted for research and national fire service listservs (e.g., [www.firefighterclosecalls.com](http://www.firefighterclosecalls.com)). Currently active career or volunteer FFs were eligible to participate. All participants were sent a link to a web-based survey. A total of 674 FFs completed the survey. To preserve anonymity of participants given the sensitive nature of many survey items and the relatively small number of FFs in certain subgroups (e.g., women), we did not ask FFs to identify the fire department in which they serve.

#### Web-based survey protocol

The survey was conducted via the Qualtrics platform [26]. The survey assessed basic demographics and personal alcohol use based on items used in previous fire service alcohol studies [9,12,27]. Estimates of the percentage of FFs in the participant's department who are abstinent and binge drink, beliefs about the

**Table 1**  
Demographics and alcohol use for firefighters

Characteristics	% ; mean (SD)		
	Total (N = 674)	Male (n = 468)	Female (n = 204)
<b>Demographics</b>			
Age (y)	44.27 (11.16)	44.86 (11.68)	42.76 (9.70)
Married	76.93	82.18	64.71
White, non-Hispanic	93.26	93.33	93.03
Percent Career firefighters	63.16	59.65	71.29
<b>Rank</b>			
Any firefighter	45.37	41.29	54.68
Any Company officer	28.51	27.96	30.05
Any Chief	21.94	26.88	10.34
Other	4.18	3.87	4.93
<b>Education</b>			
High school	6.68	8.55	2.45
Some college or tech school	45.85	50.64	34.31
College graduate	31.90	29.49	37.75
Advanced degree	15.58	11.32	25.49
<b>Alcohol use</b>			
Any alcohol use in the past 30 days	79.73	82.58	73.53
Average drinking days/month	11.07 (7.80)	11.19 (7.71)	10.81 (8.03)
<b>Drinking level</b>			
Abstinent	20.83	17.96	26.87
Moderate	30.93	37.25	16.91
Heavy	48.24	44.79	56.22
Binge drinking	43.47	46.43	37.31

Note: Percentages may not sum to 100 due to rounding.

maximum number of drinking days per months, and drinks on any one occasion and attitudes toward intoxication were adapted from the *Campus Survey of Alcohol and Other Drug Norms* [28]. According to the US Department of Education, this survey is one of the most frequently used validated surveys of alcohol and drug norms for college students [29] and the items have demonstrated high internal consistency [30]. Note that the prevalence rates for abstinence and binge drinking reflect the participant's beliefs about prevalence and are not actual prevalence rates; thus, they were not standardized based on prevalence in the general public. In both the tobacco [31–33] and alcohol [16,34] literatures, estimates of the prevalence of peer substance use reflect how normative use is perceived, and these estimates are associated with the risk of substance misuse. Ratings of negative alcohol consequences were adapted from the *Rutgers Alcohol Problem Index* [35]. Based on research by Rinker and colleagues [35], FFs rated *Rutgers Alcohol Problem Index* items based on a 7-point Likert scale, ranging from -3 (*extremely negative/bad*) to +3 (*extremely positive/good*,  $\alpha = 0.94$ ). This measure has been used extensively as a measure of alcohol-related problems experienced by adolescents and young adults and the items have demonstrated high internal consistency [35] and criterion-related validity [36]. In addition, we created items assessing the number of hours participants believed there should be between a FF's last drink and going on shift (for career FFs) or responding to a call (for volunteer FFs) for this research.

#### Statistical approach

Data cleaning and analysis was conducted in R 4.1.2 [37]. Participants were presented the definition of a standard drink in the survey [38], which is based on the amount necessary to consume 14 grams of pure alcohol. Given that most career FFs work 24–72 hour shifts and at minimum 10 days per month where they are not allowed to drink, we defined level of use consist with previous fire service alcohol research [8,9]. First, we asked whether they had drunk alcohol in the past 30 days. Those who responded 'no' were categorized as abstinent. Next, for those who reported drinking in

**Table 2**  
Perceptions about level of alcohol consumption and intoxication: career firefighters

	Gender	Drinking level				p-values <sup>†</sup>
		Total	Abstinent	Moderate	Heavy	
<b>Attitudes about level of consumption (mean (SD))</b>						
Acceptable highest numbers of drinking days per month	Male	10.9 (7.76)	6.16 (5.67) <sup>a</sup>	13.1 (8.55) <sup>b</sup>	10.5 (6.99) <sup>c</sup>	<0.001
	Female	10.0 (7.59)	6.32 (6.57) <sup>a</sup>	10.1 (6.07) <sup>ab</sup>	11.6 (7.85) <sup>b</sup>	<0.01
Acceptable maximum numbers of drink on one occasion	Male	3.35 (1.68)	2.60 (1.19) <sup>a</sup>	2.90 (1.14) <sup>a</sup>	3.92 (1.94) <sup>b</sup>	<0.001
	Female	2.72 (1.30)	2.21 (1.07) <sup>a</sup>	2.00 (0.603) <sup>a</sup>	3.14 (1.37) <sup>b</sup>	<0.001
<b>Predicted percentage of department who are abstinent and who binge drink</b>						
Percentage who are abstinent	Male	18.9 (20.8)	21.0 (25.4)	17.5 (18.4)	19.4 (21.2)	0.567
	Female	16.0 (17.6)	14.4 (16.8)	16.0 (19.7)	19.4 (21.2)	0.805
Percentage who binge drink	Male	57.4 (23.2)	60.4 (21.9) <sup>a</sup>	50.1 (23.5) <sup>b</sup>	62.1 (22.0) <sup>a</sup>	<0.001
	Female	59.9 (23.8)	66.1 (20.9)	51.4 (25.2)	59.3 (24.1)	0.057
<b>Attitudes about intoxication (% for column)</b>						
Intoxication not ever acceptable	Male	29.8	46.7	37.6	19.0	<0.001 <sup>‡</sup>
	Female	43.6	65.8	39.1	35.2	<0.01 <sup>‡</sup>
Intoxication acceptable if doesn't interfere with responsibilities	Male	67.0	51.5	60.7	76.5	
	Female	53.0	31.6	60.9	60.2	
Intoxication acceptable even if interferes with responsibilities	Male	3.2	2.2	1.7	4.6	
	Female	3.4	2.6	0	4.6	

<sup>†</sup> Differences between drinking categories. Note: Cells with different superscripts denote significantly different ( $p < 0.05$ , Tukey HSD) means within gender among row drinking categories. Percentages may not add to 100 due to rounding.

<sup>‡</sup> Chi-square tests within gender for whether firefighters from different drinking levels significantly differ in the proportion who think intoxication is never acceptable.

the past 30 days, we asked how much they drank on average on the days where they consumed alcohol. Responses were categorized as either moderate (one drink per day for women or two per day for men on average past 30 days) or heavy (two or more drinks per day for women and three or more for men on average past 30 days) [39]. Binge drinking was defined as four or more drinks for women or five or more drinks for men on a single occasion of about two hours in the past 30 days [39]. Analyses were stratified by career versus volunteer FFs, gender, and participant drinking level. Comparisons between groups were conducted using ANOVA/*t*-tests for continuous and chi-square tests for discrete outcomes. Data visualizations were created in the R package ggplot2 [40].

### 3. Results

#### 3.1. Participants

Table 1 provides demographic and fire service characteristics of the sample. Our sample overrepresented both career and female FFs compared to national estimates [41]. Alcohol use among the participants was similar to that found in our previous national surveillance studies of FFs [8,9,12].

#### Acceptable levels of alcohol consumption

Table 2 presents career FFs' perceptions of acceptable alcohol consumption. For both acceptable number of drinking days per month and maximum number of drinks on one occasion, levels were significantly associated with the FF's own consumption. For instance, among males, the average acceptable number of drinking days was nearly 71% higher for heavy drinkers compared to those who were abstinent. For maximum number of drinks on an occasion, FFs in all categories believed that intake greater than two drinks was acceptable, with male heavy drinkers having the highest average at nearly four drinks.

#### Predicted percentage of department FFs who are abstinent or binge drink

Table 2 also presents the predicted percentage of career FFs who are abstinent or binge drink. Estimates of the percentage of

abstinent FFs were not significantly related to a FFs' drinking level. However, for males, drinking level was significantly related to the predicted percentage of FFs who binge drink ( $p < 0.001$ ), with abstinent and heavy drinkers predicting binge rates ten percentage points higher than moderate drinkers. Overall, career FFs predicted that more than half of the FFs in their department binge drank.

#### Attitudes about intoxication

A large majority of both male and female career FFs believed that alcohol intoxication was acceptable if it did not interfere with responsibilities (Table 2). Beliefs that intoxication was never acceptable were significantly related to drinking level of the participants, with far fewer heavy drinkers reporting that intoxication was never acceptable compared to abstinent FFs (46.7% of abstinent vs. 19.0% for heavy drinkers for men,  $p < 0.001$ ; 65.8% of abstinent vs. 35.2% for heavy drinkers for women,  $p < 0.01$ ). Among heavy drinkers, nearly 5% thought that intoxication was acceptable under any circumstance.

Table 3 presents results for beliefs about alcohol consumption, percent of department who are abstinent and binge drink and intoxication among volunteer FFs. The pattern of results was similar to that found among career FFs. Overall, both male and female volunteers believed in a slightly lower level of alcohol consumption was acceptable compared to career FFs. However, the only significant difference was for male career versus male volunteer FFs for average acceptable maximum number of drinks on one occasion (3.35 vs. 2.72,  $t = 4.0$ ,  $p < 0.001$ ). Like males in the career service, male volunteers who drank moderately predicted a lower percentage of FFs in their department binge drank compared to abstinent or heavy drinkers ( $p < 0.05$ ).

However, volunteers generally, like career FFs, predicted that a large percentage of the FFs in their department binge drank. For attitudes about intoxication, male volunteers overall were more likely to endorse that intoxication is never acceptable than male career FFs (52.1 vs. 29.8;  $\chi^2 = 17.5$ ,  $p < .001$ ). In contrast, there was no statistically significant difference between female volunteer and career FFs on the acceptability of intoxication. Beliefs that intoxication was never acceptable were only significantly different among drinking categories for volunteer males (78.1% of abstinent vs. 31.7% for heavy drinkers), not females.

**Table 3**  
Perceptions about level of alcohol consumption and intoxication: volunteer firefighters

	Gender	Drinking level				p-values <sup>†</sup>
		Total	Abstinent	Moderate	Heavy	
<b>Attitudes about level of consumption (mean (SD))</b>						
Acceptable highest numbers of drinking days per month	Male	9.91 (8.87)	5.28 (6.78) <sup>a</sup>	12.6 (9.49) <sup>b</sup>	10.6 (8.34) <sup>b</sup>	0.001
	Female	9.17 (7.86)	6.07 (6.42)	13.1 (8.76)	9.36 (7.76)	0.09
Acceptable maximum numbers of drink on one occasion	Male	2.72 (1.35)	2.0 (1.14) <sup>a</sup>	2.49 (0.86) <sup>a</sup>	3.55 (1.52) <sup>b</sup>	<0.001
	Female	2.33 (1.23)	2.0 (1.36)	2.6 (1.07)	2.41 (1.22)	0.46
<b>Predicted percentage of department who are abstinent and who binge drink (mean (SD))</b>						
Percentage who are abstinent	Male	23.1 (20.8)	23.2 (22.7)	22.8 (21.9)	23.2 (18.2)	0.995
	Female	15.8 (16.2)	22.6 (22.6)	10.7 (7.2)	13.8 (13.2)	0.152
Percentage who binge drink	Male	45.1 (26.1)	47.6 (28.1) <sup>ab</sup>	37.6 (26.1) <sup>a</sup>	51.1 (23.1) <sup>b</sup>	0.047
	Female	46.6 (25.7)	50.1 (30.3)	44.2 (24.7)	45.4 (23.9)	0.829
<b>Attitudes about intoxication (% for column)</b>						
Intoxication not ever acceptable	Male	52.1	78.1	52.3	31.7	<0.001 <sup>‡</sup>
	Female	50.0	64.3	50.0	40.9	0.39
Intoxication acceptable if doesn't interfere with responsibilities	Male	47.0	21.9	47.7	65.9	
	Female	50.0	35.7	50.0	59.1	
Intoxication acceptable even if interferes with responsibilities	Male	0.9	0	0	2.4	
	Female	0	0	0	0	

<sup>†</sup> Differences between drinking categories. Note: Cells with different superscripts denote significantly different ( $p < 0.05$ , Tukey HSD) means within gender among row drinking categories. Percentages may not add to 100 due to rounding.

<sup>‡</sup> Chi-square tests within gender for whether firefighters from different drinking levels significantly differ in the proportion who think intoxication is never acceptable.

*Norms for alcohol-related consequences*

Table 4 provides career FFs' ratings of alcohol related consequences. The top five most negatively related consequences were reporting to work intoxicated, getting into fights, neglecting responsibilities, driving after four drinks, and having a memory lapse. Regardless of a FFs' own drinking level, the only consequence that was related positively was trying to cut down or quit drinking. The average rating of both male and female heavy drinkers was at least negative two (-2), reflecting a 'very negative' rating for almost all

items. The most negatively rated consequences were similar for volunteer FFs (Table 5), except that being dependent on alcohol replaced memory lapses in their top five. Otherwise, the pattern of results for volunteer FFs was consistent with their career counterparts.

*Time from drink to shift (career) or call (volunteer)*

Fig. 1 provides average and interquartile range (i.e., middle 50% of the distribution) for the participants' estimate of required lag

**Table 4**  
Perceived norms for alcohol-related consequences: career firefighters

Item <sup>‡</sup>	All firefighters Overall rank*	Mean (SD) <sup>†</sup>					
		Male firefighters			Female firefighters		
		Abstinent	Moderate	Heavy	Abstinent	Moderate	Heavy
1. Got into fights	2	-2.78 (0.58)	-2.74 (0.67)	-2.35 (1.09)	-2.63 (0.75)	-2.73 (0.77)	-2.55 (0.92)
2. Work drunk	1	-2.93 (0.27)	-2.90 (0.44)	-2.71 (0.79)	-2.89 (0.46)	-2.96 (0.21)	-2.87 (0.70)
3. Cause shame	8	-2.60 (0.55)	-2.46 (0.90)	-2.18 (1.05)	-2.66 (0.58)	-2.77 (0.53)	-2.55 (0.68)
4. Neglect responsibilities	3	-2.70 (0.52)	-2.63 (0.73)	-2.31 (0.93)	-2.78 (0.53)	-2.86 (0.35)	-2.56 (0.91)
5. Relatives avoid	10	-2.53 (0.78)	-2.58 (0.87)	-2.08 (1.18)	-2.66 (0.78)	-2.64 (0.85)	-2.29 (1.09)
6. Need more alcohol	18	-2.50 (0.88)	-2.21 (1.14)	-1.44 (1.44)	-2.53 (0.92)	-2.43 (0.93)	-2.15 (1.06)
7. Tried to control	21	-1.43 (1.65)	-0.65 (1.57)	-0.37 (1.54)	-1.24 (1.82)	-1.32 (1.39)	-0.86 (1.77)
8. Withdrawal	14	-2.15 (1.48)	-2.23 (1.12)	-1.92 (1.33)	-2.37 (0.91)	-2.59 (1.05)	-2.44 (1.17)
9. Personality change	16	-2.39 (0.91)	-2.31 (0.99)	-1.68 (1.41)	-2.47 (0.92)	-1.91 (1.30)	-2.38 (1.07)
10. Felt had a problem	20	-1.95 (1.64)	-1.87 (1.61)	-1.46 (1.57)	-2.13 (1.46)	-1.81 (1.86)	-2.17 (1.31)
11. Cut down/quit	22	0.26 (2.20)	-0.06 (1.70)	0.21 (1.63)	0.05 (2.31)	-0.19 (1.99)	0.11 (1.92)
12. Memory lapse	5	-2.80 (0.57)	-2.62 (0.70)	-2.03 (1.30)	-2.63 (0.82)	-2.86 (0.36)	-2.74 (0.82)
13. Passed out	6	-2.71 (0.61)	-2.59 (0.72)	-2.06 (1.26)	-2.66 (0.75)	-2.76 (0.70)	-2.60 (0.93)
14. Argument with friend	13	-2.61 (0.55)	-2.54 (0.74)	-1.95 (1.25)	-2.45 (0.92)	-2.43 (0.81)	-2.21 (1.07)
15. Kept drinking	15	-2.50 (0.73)	-2.33 (0.96)	-1.77 (1.20)	-2.50 (0.80)	-2.14 (0.85)	-2.22 (1.08)
16. Going crazy	12	-2.79 (0.47)	-2.52 (0.84)	-1.91 (1.27)	-2.53 (0.80)	-2.43 (0.75)	-2.39 (1.08)
17. Dependent on alcohol	7	-2.82 (0.46)	-2.56 (0.88)	-2.05 (1.22)	-2.68 (0.78)	-2.86 (0.36)	-2.57 (1.01)
18. Told to cut down	17	-2.24 (1.44)	-2.73 (1.17)	-1.62 (1.27)	-2.27 (1.07)	-2.38 (1.12)	-2.18 (1.36)
19. Drove after two drinks	19	-2.55 (0.76)	-1.93 (1.23)	-1.44 (1.34)	-2.44 (0.89)	-2.71 (0.56)	-2.09 (1.03)
20. Drove after four drinks	4	-2.92 (0.36)	-2.68 (0.83)	-2.08 (1.24)	-2.84 (0.50)	-3.00 (0.00)	-2.69 (0.93)
21. Spent too much	11	-2.66 (0.63)	-2.54 (0.83)	-2.11 (1.16)	-2.45 (0.83)	-2.43 (0.93)	-2.33 (1.18)
22. Missed work	9	-2.53 (0.76)	-2.57 (0.86)	-2.08 (1.23)	-2.62 (0.72)	-2.52 (1.03)	-2.39 (1.06)

\* 1 = Most to 22 = Least Negative.

<sup>†</sup> Scores ranged from -3 (Extremely Negative) to +3 (Extremely Positive).

<sup>‡</sup> See Appendix 1 for details.

**Table 5**  
Perceived norms for alcohol-related consequences: volunteer firefighters

Item <sup>†</sup>	All firefighters Overall rank*	Mean (SD) <sup>‡</sup>					
		Male firefighters			Female firefighters		
		Abstinent	Moderate	Heavy	Abstinent	Moderate	Heavy
1. Got into fights	3	-2.53 (1.22)	-2.37 (1.04)	-2.40 (0.92)	-3.00 (0.00)	-2.60 (0.70)	-2.55 (1.10)
2. Work drunk	1	-2.77 (0.90)	-2.66 (0.83)	-2.45 (0.89)	-3.00 (0.00)	-2.90 (0.32)	-2.75 (0.72)
3. Cause shame	11	-2.20 (1.56)	-2.32 (0.96)	-2.05 (0.91)	-2.75 (0.62)	-2.40 (0.70)	-2.60 (0.75)
4. Neglect responsibilities	5	-2.48 (1.09)	-2.51 (0.81)	-2.32 (0.82)	-2.75 (0.62)	-2.30 (0.95)	-2.60 (0.75)
5. Relatives avoid	13	-2.02 (1.42)	-2.07 (1.25)	-2.30 (1.13)	-2.42 (1.17)	-2.10 (1.37)	-2.25 (1.02)
6. Need more alcohol	15	-2.33 (1.47)	-2.15 (1.17)	-1.54 (1.24)	-2.58 (0.67)	-2.40 (0.70)	-2.30 (1.03)
7. Tried to control	21	-0.87 (1.70)	-0.37 (1.67)	-0.08 (1.55)	-0.75 (1.55)	-0.10 (2.13)	-1.20 (1.51)
8. Withdrawal	18	-1.62 (1.59)	-1.95 (1.36)	-1.81 (1.27)	-2.33 (1.23)	-2.30 (0.95)	-2.10 (1.07)
9. Personality change	17	-1.97 (1.61)	-1.83 (1.45)	-1.68 (1.31)	-2.83 (0.39)	-2.00 (1.16)	-2.25 (1.16)
10. Felt had a problem	20	-1.67 (1.95)	-1.17 (1.88)	-1.27 (1.61)	-1.75 (1.82)	-1.50 (1.51)	-2.35 (1.18)
11. Cut down/quit	22	0.77 (2.00)	0.22 (1.90)	0.14 (1.67)	1.33 (1.88)	1.00 (1.56)	-0.90 (1.55)
12. Memory lapse	7	-2.40 (1.25)	-2.54 (0.90)	-1.95 (1.27)	-2.75 (0.45)	-2.80 (0.42)	-2.70 (0.73)
13. Passed out	6	-2.60 (0.93)	-2.54 (0.84)	-2.05 (1.33)	-2.83 (0.39)	-2.70 (0.48)	-2.25 (1.02)
14. Argument with friend	12	-2.30 (1.39)	-2.27 (0.92)	-2.00 (1.11)	-2.67 (0.65)	-2.40 (0.70)	-2.35 (0.99)
15. Kept drinking	14	-2.23 (1.59)	-2.34 (0.88)	-1.68 (1.11)	-2.75 (0.45)	-2.20 (0.92)	-2.35 (1.04)
16. Going crazy	10	-2.40 (1.19)	-2.39 (0.97)	-1.92 (1.04)	-2.83 (0.39)	-2.30 (0.95)	-2.45 (0.83)
17. Dependent on alcohol	4	-2.53 (1.25)	-2.54 (0.75)	-2.11 (1.05)	-2.92 (0.29)	-2.80 (0.42)	-2.60 (0.82)
18. Told to cut down	19	-1.47 (1.78)	-1.93 (1.31)	-1.73 (1.41)	-2.08 (1.24)	-2.10 (1.29)	-2.20 (1.47)
19. Drove after two drinks	16	-2.38 (1.29)	-2.20 (1.01)	-1.05 (1.43)	-2.58 (0.90)	-2.10 (0.99)	-2.40 (0.94)
20. Drove after four drinks	2	-2.63 (1.16)	-2.63 (0.77)	-1.95 (1.29)	-2.75 (0.87)	-2.80 (0.42)	-2.75 (0.79)
21. Spent too much	9	-2.70 (0.70)	-2.35 (1.03)	-2.16 (1.01)	-2.50 (1.00)	-2.22 (0.83)	-2.35 (0.88)
22. Missed work	8	-2.50 (1.01)	-2.49 (0.87)	-2.11 (0.99)	-2.75 (0.87)	-2.40 (0.97)	-2.32 (0.89)

\* 1 = Most to 22 = Least Negative.

† Scores ranged from -3 (Extremely Negative) to +3 (Extremely Positive).

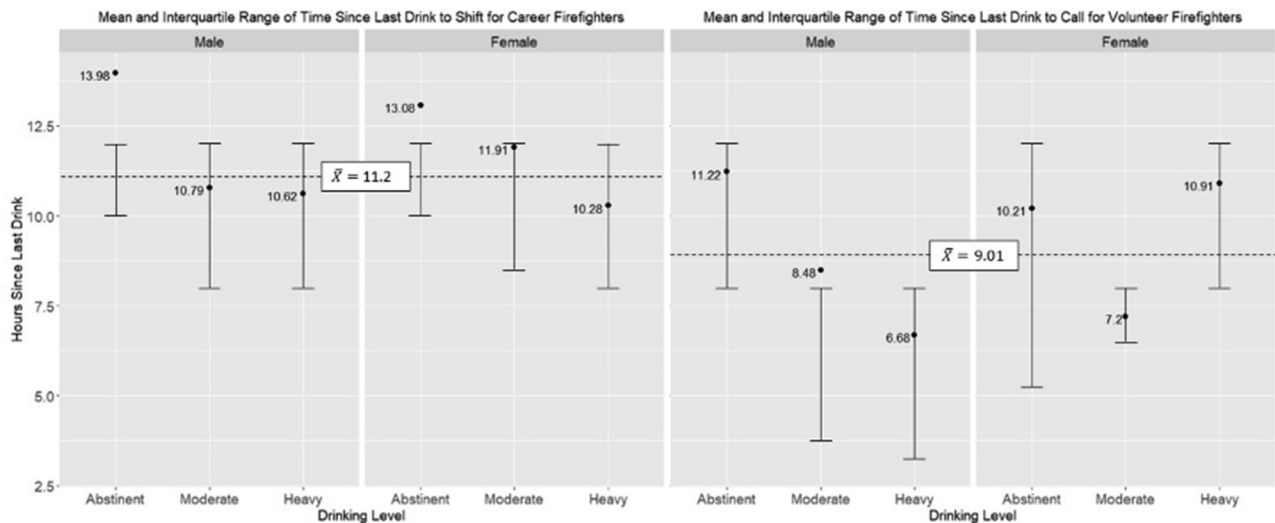
‡ See Appendix 1 for details.

times from a FFs last drink of alcohol until reporting for duty. Lag times differed significantly by a FFs' drinking level for both males ( $p < 0.001$ ) and females ( $p < 0.05$ ). Overall, career FFs suggested an average lag between last drink and going on shift of 11.2 hours ( $sd = 4.6$ ). Fig. 1 provides similar data for volunteer FFs. Although lag times varied by drinking level for both males and females, the differences were not statistically significant (due to smaller sample sizes). Overall, volunteer FFs suggested a shorter lag time (9.01 hours,  $sd = 8.48$ ) from a drink to a call than career FF suggested

from a drink to reporting for a shift. Male volunteer FFs who drank heavy suggested the shortest lag time among all FFs (6.68 hours,  $sd = 4.77$ ).

**4. Discussion**

The results of this research were largely consistent with the meme that the fire service has a culture of drinking. When asked about 'acceptable' levels of alcohol consumption, FFs on average



Notes: Interquartile range denotes the middle 50% of the ordered values, or the 25<sup>th</sup> to 75<sup>th</sup> percentiles. Dotted line represents the mean value for career and volunteer firefighter subgroups.

**Fig. 1.** Time from last drink to shift (career) or call response (volunteer).



suggested levels which would be considered excessive by National Institute for Alcohol Abuse and Alcoholism guidelines [42]. Male career FFs, for example, believed that intakes above three drinks per day were an acceptable level of consumption. Furthermore, a large percentage of both career and volunteer FFs believed that, at least under some circumstances, drinking until intoxicated was acceptable. Overall, however, volunteer FFs were less likely to view intoxication as acceptable compared to career FFs.

Given the high prevalence of heavy and binge drinking and norms which are consistent with a culture of drinking, a more nuanced approach to alcohol norms is necessary for this occupational group. For instance, in the literature on adolescent cigarette use, many believe that smoking is more prevalent than it is and those who overestimate the prevalence of smoking among their peers are significantly more likely to smoke [43]. Thus, an effective intervention is to correct misperceptions about the prevalence of smoking to denormalize its use. However, while perceived prevalence of binge drinking reported by FFs was large, it was only a small overestimate. FFs recognize that heavy and binge drinking are common among their peers as part of their occupational culture [8,9]. In fact, when FFs hear the standard definition of binge drinking, that definition is often met with disbelief and statements claiming that level of consumption is normative [44]. Thus, education about healthy levels of alcohol use and how heavy drinking is linked other health and safety issues they face (e.g., sleep, cancer, accidents) appears to be a more promising method to change norms in this population. Awareness interventions that challenge the current norms about alcohol use in the fire service should be developed and tested.

The most negatively evaluated alcohol-related consequences by both career and volunteer FFs were reporting to work intoxicated, getting into fights, neglecting responsibilities, and driving after four drinks. The strong negative attitudes toward reporting to work intoxicated or hungover and for neglecting responsibilities suggest that sensitizing FFs to how heavy drinking greatly raises the odds of these outcomes may motivate personnel to moderate their drinking. Leveraging the norms that neglecting your work as a FF or reporting to a call or shift intoxicated are negatively perceived by other FFs may serve to promote more mindful alcohol use. For example, we found that career FFs on average thought there should be an 11.2-hour lag between the last drinking and reporting for duty, while volunteers believed that there should be a 9-hour lag before responding to a call. Given the frequency of shifts among career FFs (i.e., approximately 10 per month) and the fact that volunteers could receive a call at any time, either abstinence or moderate drinking may motivate a FF to not violate these occupational norms. Also, we encourage national fire service organizations to establish regulations about the lag between alcohol intake and reporting for duty or responding to a call (e.g., at least 12 hours from bottle to duty). Finally, given that volunteer FFs believed there should be a much (i.e., 2-hour) shorter lag between drinking and responding to a call compared to their career counterparts, national fire service organizations should address the unique challenges of drinking and volunteer firefighting.

## Funding

This study was funded by a grant from the Assistance to Firefighters Grants program managed by the Federal Emergency Management Agency in the Department of Homeland Security (EMW-2018-FP-00593).

## Conflict of interest

The authors have no conflict of interest to declare.

## Acknowledgments

The authors would like to thank the firefighters who participated in this research and Chief Billy Goldfeder for assisting with recruitment.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.shaw.2022.08.008>.

## References

- [1] Karter M, National Fire Protection Association. Fire loss in the United States during; 2011; 2013.
- [2] North CS, et al. Coping, functioning, and adjustment of rescue workers after the Oklahoma City bombing. *J Trauma Stress* 2002;15(3):171–5.
- [3] North CS, et al. Psychiatric disorders in rescue workers after the Oklahoma City bombing. *Am J Psychiatry* 2002;159(5):857–9.
- [4] Carey MG, et al. Sleep problems, depression, substance use, social bonding, and quality of life in professional firefighters. *J Occup Environ Med* 2011;53(8):928–33.
- [5] Haddock CK, et al. Tobacco use among firefighters in the central United States. *Am J Ind Med* 2011;54(9):697–706.
- [6] Pyle S, et al. Depressive symptoms, self-rated mental health, daily functioning and job satisfaction among firefighters. *Int J Fire Serv Leadersh Manage* 2009;3(1):19–24.
- [7] Regehr C, Hill J, Glancy GD. Individual predictors of traumatic reactions in firefighters. *J Nerv Ment Dis* 2000;188(6):333–9.
- [8] Haddock CK, et al. Alcohol use and caloric intake from alcohol in a national cohort of U.S. career firefighters. *J Stud Alcohol Drugs* 2015;76(3):360–6.
- [9] Haddock CK, et al. Alcohol use among firefighters in the Central United States. *Occup Med (Lond)* 2012;62(8):661–4.
- [10] Jahnke S, Poston WC, Haddock CK. Perceptions of alcohol use among US firefighters. *J Substance Abuse Alcoholism* 2014;2(2).
- [11] Piazza-Gardner AK, et al. Covariates of alcohol consumption among career firefighters. *Occup Med (Lond)* 2014;64(8):580–2.
- [12] Haddock CK, et al. Alcohol use and problem drinking among women firefighters. *Womens Health Issues*; 2017.
- [13] Boxer PA, Wild D. Psychological distress and alcohol use among fire fighters. *Scand J Work Environ Health* 1993;19(2):121–5.
- [14] Bacharach SB, Zelko H. On the front line: the work of first responders in a post 9/11 world; 2004.
- [15] Roman P, Blum T. The workplace and alcohol problem prevention; 2002.
- [16] Haug S, et al. Overestimation of drinking norms and its association with alcohol consumption in apprentices. *Alcohol Alcohol* 2011;46(2):204–9.
- [17] Perkins HW. Social norms and the prevention of alcohol misuse in collegiate contexts. *J Stud Alcohol Suppl* 2002;(14):164–72.
- [18] Lee CM, et al. The social norms of alcohol-related negative consequences. *Psychol Addict Behav* 2010;24(2):342–8.
- [19] Anderson P, et al. Changing collective social norms in favour of reduced harmful use of alcohol: a review of reviews. *Alcohol Alcohol* 2018;53(3):326–32.
- [20] Wolter C, et al. Finding the right balance: a social norms intervention to reduce heavy drinking in university students. *Front Public Health* 2021;9.
- [21] Ames GM, Grube JW, Moore RS. Social control and workplace drinking norms: a comparison of two organizational cultures. *J Stud Alcohol* 2000;61(2):203–19.
- [22] Trice HM, Sonnenstuhl WJ. On the construction of drinking norms in work organizations. *J Stud Alcohol* 1990;51(3):201–20.
- [23] Frone MR. Does a permissive workplace substance use climate affect employees who do not use alcohol and drugs at work? A U.S. national study. *Psychol Addict Behav* 2009;23(2):386–90.
- [24] Jahnke SA, et al. The prevalence and health impacts of frequent work discrimination and harassment among women firefighters in the US fire service. *BioMed Research International* 2019;2019. 6740207-6740207.
- [25] Jahnke SA, et al. *Maternal and child health among female Firefighters in the U.S.* Maternal and child health. *Journal* 2018;22(6):922–31.
- [26] Qualtrics XM. Qualtrics XM platform; 2021. 29 December 2021]; Available from, [www.qualtrics.com](http://www.qualtrics.com).
- [27] Haddock, C.K., et al., Alcohol use and caloric intake from alcohol in a national cohort of U.S. Career Firefighters. *J Stud Alcohol Drugs*, in press.
- [28] Core Institute SIU *Campus survey of alcohol and other drugs*; 2000.
- [29] The higher education center for alcohol and other drug abuse and violence prevention methods for assessing college student use of alcohol and other drugs; 2008.
- [30] Ghee AC, Johnson CS. Emotional intelligence: a moderator of perceived alcohol peer norms and alcohol use. *J Drug Educ* 2008;38(1):71–83.
- [31] Wang MP, et al. Overestimation of peer smoking prevalence predicts smoking initiation among primary school students in Hong Kong. *J Adolesc Health* 2011;48(4):418–20.

- [32] Lai MK, Ho SY, Lam TH. Perceived peer smoking prevalence and its association with smoking behaviours and intentions in Hong Kong Chinese adolescents. *Addiction* 2004;99(9):1195–205.
- [33] Reid JL, Manske SR, Leatherdale ST. Factors related to adolescents' estimation of peer smoking prevalence. *Health Educ Res* 2008;23(1):81–93.
- [34] Ecker AH, Cohen AS, Buckner JD. Overestimation of close friend drinking problems in the prediction of one's own drinking problems. *Addict Behaviors* 2017;64:107–10.
- [35] Rinker DV, et al. Evaluations and perceptions of others' evaluations of negative alcohol-related consequences predict negative alcohol-related consequences among college drinkers. *J Stud Alcohol Drugs* 2017;78(2):249–57.
- [36] Shono Y, et al. The Rutgers alcohol problem Index for adolescent alcohol and drug problems: a comprehensive modern psychometric study. *J Stud Alcohol Drugs* 2018;79(4):658–63.
- [37] R Core Team. The R project for statistical consulting; 2021.
- [38] National Institute on alcohol abuse and alcoholism *What is a standard drink?*; 2022.
- [39] National Institute on Alcohol Abuse and Alcoholism. Drinking levels defined. Available from, <https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking> 2021; 2021.
- [40] Wickham H. *ggplot2* 2018. February 22, 2018]; Available from: <https://www.ggplot2.org>; 2018.
- [41] National Fire Protection Agency *U.S. Fire department profile*; 2020.
- [42] NIAAA. Drinking Patterns and their definitions. *Alcohol Res Curr Rev* 2018.
- [43] Elsey H, et al. Do children overestimate the extent of smoking among their peers? A feasibility study of the social norms approach to prevent smoking. *Addict Behav* 2015;41:7–11.
- [44] Jahnke SA, Poston WC, Haddock CK. Perceptions of alcohol use among US firefighters. *J Substance Abuse Alcoholism* 2014;2(2):1012.