Journal of Affective Disorders 221 (2017) 107–114

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

Suicidal thoughts and behaviors among women firefighters: An examination of associated features and comparison of pre-career and career prevalence rates

Ian H. Stanley[a,*], Melanie A. Hom[a], Sally Spencer-Thomas[b], Thomas E. Joiner[a]

[a] Department of Psychology, Florida State University, Tallahassee, FL, USA
[b] Sally Spencer-Thomas, LLC, Denver, CO, USA

ARTICLE INFO

Keywords:
Firefighters
First responders
Suicide
Workplace
Occupation

ABSTRACT

Background: Women protective service workers die by suicide at a higher rate than women workers in other occupational groups. However, no study has examined rates and correlates of suicidal thoughts and behaviors among women firefighters, despite the potential for these data to inform suicide screening, prevention, and intervention initiatives. The purpose of this study is to describe and compare pre-career and career rates of suicidal thoughts and behaviors and identify their sociodemographic and occupational correlates among women firefighters.

Methods: Data were obtained from 313 current U.S. women firefighters who completed a web-based survey (mean age = 37.30y, SD = 9.70y, 92.7% White).

Results: Pre-career rates of suicide ideation, plans, attempts, and non-suicidal self-injury (NSSI) were found to be 28.4%, 10.2%, 5.8%, and 11.2%, respectively. Career rates of suicide ideation, plans, attempts, and NSSI were found to be 37.7%, 10.9%, 3.5%, and 9.3%, respectively. Pre-career rates of suicide ideation (OR = 4.760, 95% CI = 2.820–8.034, $p < 0.001$), plans (OR = 4.867, 95% CI = 2.067–11.463, $p < 0.001$), attempts (OR = 7.175, 95% CI = 1.726–29.828, $p = 0.007$), and NSSI (OR = 9.676, 95% CI = 4.130–22.670, $p < 0.001$) were significantly associated with career suicidality. With few exceptions, neither sociodemographic characteristics nor firefighter experiences were associated with career suicidal symptoms.

Limitations: Study limitations include a cross-sectional design and convenience sample recruitment strategy.

Conclusions: Women firefighters report elevated rates of suicidal thoughts and behaviors. Suicidal symptoms occurring prior to one's tenure as a firefighter—and not solely an aspect of firefighter career experiences—should be considered in suicide risk screening, prevention, and intervention initiatives. Studies examining modifiable suicide risk factors and correlates (e.g., psychiatric symptoms, workplace harassment) are needed.

1. Introduction

Nearly one million individuals worldwide and over 40,000 individuals in the United States (U.S.) die by suicide annually (Centers for Disease Control and Prevention CDC, 2017,World Health Organization WHO, 2014). Moreover, an estimated 9.8 million individuals in the U.S. think about suicide each year, among whom approximately 2.7 million make a suicide plan and 1.4 million make a nonfatal suicide attempt (Piscopo et al., 2016). The emotional effects of suicide on the bereaved are profound (Cerel et al., 2008; Hom et al., 2017), and its economic effects are widespread (e.g., lost work productivity; CDC, 2014); thus, efforts are needed to enhance suicide prevention efforts. Indeed, given the high rates of suicidality (i.e., suicidal thoughts and behaviors) among U.S. adults, recent policy statements have advocated specifically for the examination of at-risk subgroups (US Department of Health and Human Services, 2012), including high-risk occupational groups (McIntosh et al., 2016; Milner et al., 2015, 2013; Tiesman et al., 2015).

Emerging research suggests that of occupational groups, first responder populations may be at particularly elevated suicide risk (Stanley et al., 2016). For example, a recent study of 1027 career and volunteer firefighters in the U.S. found rates of suicide ideation, plans, attempts, and non-suicidal self-injury (NSSI) since beginning one's career as a firefighter to be 46.8%, 19.2%, 15.5%, and 16.4%, respectively (Stanley et al., 2015). Of note, the vast majority of participants in this sample were men (i.e., 91.2%; Stanley et al., 2015), which is generally consistent with the demographic makeup of the U.S. fire service

* Corresponding author.
E-mail address: stanley@psy.fsu.edu (I.H. Stanley).

http://dx.doi.org/10.1016/j.jad.2017.06.016
Received 19 February 2017; Received in revised form 3 May 2017; Accepted 11 June 2017
Available online 15 June 2017
0165-0327/

(Haynes and Stein, 2016). Though this and other research have represented important initial steps in better understanding suicide risk among firefighters, more research is needed on the health of women firefighters, in particular (Jahnke et al., 2012).

A recent CDC report on suicide rates by occupational groups provides a compelling reason to study women firefighters as a distinct group (McIntosh et al., 2016). This report revealed that, among women workers, the highest rate of death by suicide was among protective service workers—a group inclusive of firefighters (McIntosh et al., 2016). Indeed, the researchers concluded that suicide prevention activities should focus on women workers in protective service roles. Nevertheless, there is a paucity of research on suicidality and its associated features among women protective service workers, including women firefighters (Stanley et al., 2016).

The import of examining women firefighters, specifically, is augmented by a call in the 2015 National Fire Service Research Agenda to identify "individuals within the fire service who are at a higher risk for specific occupational injury/illness/disease" (National Fallen Firefighters Foundation, 2016). Women firefighters—who comprise approximately 7% of the fire service (82,550 of 1,134,400 firefighters; Haynes and Stein, 2016)—represent one potentially at-risk group (Jahnke et al., 2012). Possible reasons for differential health outcomes among women firefighters include gender-based discrimination and sexual harassment (Jahnke et al., 2012).

1.1. Pre-career and career suicidality

Examining rates of suicidal thoughts and behaviors is important to understand the degree to which women firefighters may experience suicidal symptoms. Importantly, rates of suicidal thoughts and behaviors within a particular occupational group do not necessarily signal that the thoughts and/or behaviors *onset* during one's vocational tenure, nor do the rates indicate that the occupation *caused* one's suicidality. In this regard, and consistent with the approach of investigations into suicidality among U.S. military personnel (Bryan et al., 2014; Nock et al., 2014), it is imperative to determine the degree to which pre-career suicidal symptoms predict career suicidal symptoms.

1.2. Putative correlates of suicidality

Beyond examining rates of suicidal thoughts and behaviors among women firefighters, the identification of correlates of suicide risk in this population will be critical in informing suicide screening, prevention, and intervention efforts. The fire service milieu may present unique experiences that influence suicide risk (Henderson et al., 2016). Although research examining suicidality among firefighters is sparse (Stanley et al., 2016), several investigations have identified the following factors as contributing to risk for suicidality among firefighters: the concurrent provision of Emergency Medical Services (EMS; Kimbrel et al., 2016; Stanley et al., 2015); membership in a volunteer compared to career department (Stanley et al., 2017, 2015); and years of service, and relatedly, rank (Martin et al., 2016; Stanley et al., 2015). Past research among the general population has established demographic risk factors (e.g., sexual minority status (King et al., 2008) and protective factors (e.g., marital status (Kposowa, 2000), number of children (Høyer and Lund, 1993; Qin and Mortensen, 2003) for suicidality. However, the relation of these characteristics and suicidality have not been examined among women firefighters, specifically.

1.3. The present study

Given the need for research to understand and identify potential leverage points for suicide screening, prevention, and intervention efforts among women firefighters, the overarching aim of the present study is to investigate the prevalence and associated features of suicidal thoughts and behaviors among U.S. women firefighters. Specifically, this study aims to: (1) describe rates of suicidal thoughts and behaviors prior to (i.e., pre-career) and since (i.e., career) beginning one's work as a firefighter (both assessed retroactively); (2) describe associations between pre-career and career suicidal thoughts and behaviors; and (3) identify sociodemographic and occupational correlates of career suicidal thoughts and behaviors. Given that previous studies of correlates of suicidality among firefighters have utilized predominantly male samples, we approached the present study without any *a priori* hypotheses.

2. Methods

2.1. Participants and procedures

Women firefighters were invited to participate in the present study through various web-based announcements (e.g., listserv, social media) posted by firefighter and suicide prevention organizations (September–November, 2016). Interested individuals were initially presented with a web-based consent form that required them to correctly answer five comprehension questions to proceed with the survey. The first two survey questions served as screening items. Individuals who reported they are a current firefighter (volunteer or paid) and who identify as female were able to proceed with the survey. Eligible participants then completed a 30-min battery of self-report measures assessing demographic and occupational characteristics; experiences with suicidal thoughts and behaviors; past and current psychiatric symptoms; and other psychological constructs. Study participation occurred via Qualtrics, a secure web-based survey platform. At the conclusion of the survey, participants were presented with a debriefing form listing national mental health resources (e.g., 1-800-273-TALK; Gould et al., 2012; Joiner et al., 2007). They were also given the option of providing their email address to be entered into a raffle for one of fifteen $20 Amazon.com gift cards. Past research among firefighters has found that giving individuals the option to provide an email address, and thereby disclose potentially identifiable information, does not appear to systematically preclude participation from individuals reporting more severe suicidal and suicide-related symptoms (Hom et al., 2016a). The University's Institutional Review Board approved study procedures.

Ideally an investigation of this scope would utilize a nationally representative sample derived from rigorous epidemiological methods such as probability sampling strategies (Kessler et al., 2005), as well as the prospective delineation of risk and protective factors as compared to correlates (Kraemer et al., 1997). However, this novel investigation represents an initial step in elucidating patterns and associated features of suicidality among women firefighters, a potentially high-risk group for suicide. Indeed, as noted, the CDC has identified that of women workers, those in protective service roles (e.g., firefighters) die by suicide at rates higher than any other occupational group (McIntosh et al., 2016).

2.2. Measures

Demographics overview. A self-report questionnaire was administered to participants to assess for demographic characteristics (e.g., age, race/ethnicity, sexual orientation, marital status, number of children, education), past and current military service experiences, and firefighter-specific characteristics (e.g., total years of service, department type, firefighter type, rank, certification as an Emergency Medical Technician [EMT] or paramedic). The firefighter characteristics assessed were consistent with questionnaires administered by several leading firefighter organizations, such as the NFFF, as well as past research (Stanley et al., 2015).

Self-Injurious Thoughts and Behaviors Interview—Short Form (SITBI-SF; Nock et al., 2007). The SITBI-SF is a comprehensive 72-item measure assessing the nature and timing of past suicidal thoughts and behaviors. Questions were modified to specify two timeframes of

interest: (1) pre-career (i.e., "Before becoming a firefighter…"); and (2) career (i.e., "Since becoming a firefighter…"). Single items were utilized to assess for the presence/absence of suicide ideation (i.e., "…did you ever have thoughts of killing yourself?"), plans (i.e., "…did you ever actually make a plan to kill yourself?"), and attempts (i.e., "…did you ever make an actual attempt to kill yourself in which you had at least some intent to die?"), as well as NSSI (i.e., "…did you ever actually engage in non-suicidal self-injury [i.e., purposely hurting yourself without wanting to die; for example, cutting or burning]?"). Response options for these questions were Yes/No. Although the SITBI-SF was originally developed as an interview measure, it has been widely used as a self-report measure (Zetterqvist et al., 2013), including in web-based surveys of firefighters (Stanley et al., 2015). Moreover, the single-item questions used in the present study mirror the single-item assessments of suicidality utilized in large-scale epidemiological studies of suicidality among the U.S. general population (Kessler et al., 2005). Given that single items were used, internal consistency statistics were indeterminable for this sample. However, past research has established high internal consistency among the full SITBI-SF (α = 0.84–0.89) as well as concurrent validity (Nock et al., 2007).

2.3. Data analytic plan

Descriptive statistics were utilized to describe the sample's demographic characteristics; firefighter-specific characteristics; and pre-career and career prevalence estimates of suicidal thoughts and behaviors. Logistic regression was used to determine associations between pre-career and career rates of suicidal thoughts and behaviors. Finally, logistic regression and chi-squared tests of independence were employed to examine correlates of suicidal thoughts and behaviors. Missing data were minimal (< 2%) and handled using listwise deletion. All analyses were conducted in SPSS version 20.

3. Results

Participant sociodemographic characteristics are presented in Table 1, and participant firefighter-specific characteristics are presented in Table 2. Pre-career and career prevalence rates of suicidal thoughts and behaviors are presented in Table 3.

3.1. Pre-career and career prevalence rates of suicidal thoughts and behaviors

Pre-career prevalence rates of suicide ideation, plans, attempts, and NSSI were found to be 28.4%, 10.2%, 5.8%, and 11.2%, respectively. Career prevalence rates of suicide ideation, plans, attempts, and NSSI were found to be 37.7%, 10.9%, 3.5%, and 9.3%, respectively.

3.2. Comparison of pre-career and career rates of suicidal thoughts and behaviors

Pre-career prevalence rates of suicide ideation (OR = 4.760, 95% CI = 2.820–8.034, $p < 0.001$), plans (OR = 4.867, 95% CI = 2.067–11.463, $p < 0.001$), attempts (OR = 7.175, 95% CI = 1.726–29.828, $p = 0.007$), and NSSI (OR = 9.676, 95% CI = 4.130–22.670, $p < 0.001$) were significant predictors of career prevalence rates.

3.3. Sociodemographic correlates of career suicidal thoughts and behaviors

Age. Firefighters who were younger were significantly more likely to report career suicide ideation (b = −0.027, SE = 0.012, $p = 0.026$). Age was not significantly related to career suicide plans (b = −0.006, SE = 0.019, $p = 0.745$), attempts (b = 0.007, SE = 0.032, $p = 0.833$), or NSSI (b = −0.034, SE = 0.021, $p = 0.111$).

Race/ethnicity. Firefighters who identified as White/Caucasian were not significantly more or less likely than those who did not to report career suicide ideation (OR = 0.973, 95% CI = 0.392–2.237, $p = 0.883$), plans (OR = 0.798, 95% CI = 0.224–2.840, $p = 0.727$), attempts (OR = 0.786, 95% CI = 0.096–6.422, $p = 0.822$), or NSSI (OR = 1.078, 95% CI = 0.240–4.848, $p = 0.922$).

Sexual orientation. Firefighters who identified as heterosexual/straight were not significantly more or less likely than those who identified as lesbian, gay, or bisexual (LGB) to report career suicide ideation (OR = 1.124, 95% CI = 0.534–2.367, $p = 0.758$), plans (OR = 0.864, 95% CI = 0.284–2.633, $p = 0.797$), attempts (OR = 1.264, 95% CI = 0.157–10.195, $p = 0.826$), or NSSI (OR = 0.762, 95% CI = 0.248–2.339, $p = 0.635$).

Marital status. Married firefighters were significantly less likely than never married firefighters to report career suicide ideation (OR = 0.567, 95% CI = 0.339–0.949, $p = 0.031$); there were no significant group differences for career suicide plans (OR = 0.908, 95% CI = 0.391–2.109, $p = 0.823$), attempts (OR = 2.190, 95% CI = 0.446–10.760, $p = 0.334$), or NSSI (OR = 0.698, 95% CI = 0.300–1.625, $p = 0.404$).

Married firefighters were not significantly more or less likely than divorced/separated firefighters to report career suicide ideation (OR = 0.746, 95% CI = 0.385–1.448, $p = 0.387$), plans (OR = 0.454, 95% CI = 0.185–1.112, $p = 0.084$), attempts (OR = 1.061, 95% CI = 0.213–5.283, $p = 0.942$), or NSSI (OR = 0.768, 95% CI = 0.259–2.272, $p = 0.633$). Divorced/separated firefighters were not significantly more or less likely than never married firefighters to report career suicide ideation (OR = 0.760, 95% CI = 0.378–1.527, $p = 0.441$), plans (OR = 2.002, 95% CI = 0.756–5.308, $p = 0.163$), attempts (OR = 2.064, 95% CI = 0.282–15.108, $p = 0.476$), or NSSI (OR = 0.909, 95% CI = 0.297–2.779, $p = 0.867$).

Children. Firefighters who reported having children were significantly less likely than those reporting having no children to report

Table 1
Women firefighter sociodemographic characteristics (N = 313).

Characteristic	Value
Age, Mean (SD) [Range: 18y-59y]	37.30y (9.70y)
Race/Ethnicity, No. (Valid %)	
White/Caucasian	290 (92.7%)
Black/African American	9 (2.9%)
Hispanic or Latino/a	5 (1.6%)
Asian/Pacific Islander	1 (0.3%)
Native American or Alaska Native	2 (0.6%)
Other	6 (1.9%)
Sexual Orientation, No. (Valid %)	
Heterosexual/Straight	271 (86.6%)
Gay/Lesbian/Homosexual	27 (8.6%)
Bisexual	7 (2.2%)
Not Sure	2 (0.6%)
Decline to State	6 (1.9%)
Marital Status, No. (Valid %)	
Married	162 (51.8%)
Divorced or Separated	49 (15.7%)
Widowed	3 (1.0%)
Never Married	99 (31.6%)
Children, No. (Valid %)	
Yes (Mean: 2.17, SD: 1.10, Range: 1–6)	151 (48.2%)
No	162 (51.8%)
Education, No. (Valid %)	
High School Graduate/GED	7 (2.2%)
Some College	65 (20.8%)
2-Year College	89 (28.4%)
4-Year College	95 (30.4%)
Post-Graduate Education	57 (18.2%)
Military Service Status, No. (Valid %)	
Active Duty	1 (0.3%)
Reserves	4 (1.3%)
National Guard	1 (0.3%)
Veteran or Retiree	14 (4.5%)
Civilian/No Military Service Record	292 (93.6%)

Table 2
Women firefighter occupational characteristics (N = 313).

Characteristic	Value
Total Years of Service, Mean (SD)[a] [Range: 1y-39y]	12.34y (8.20y)
Estimated Hours Per Week of Firefighter Service, Mean (SD)[b]	41.09h (26.37h)
Fire Department Type, No. (Valid %)	
Career	129 (41.2%)
Volunteer	80 (25.6%)
Combination (Career and Volunteer)	93 (29.7%)
Wildland	11 (3.5%)
Current Firefighter Type, No. (Valid %)[c]	
Career	202 (64.5%)
Volunteer	106 (33.9%)
Paid, On-Call	50 (16.0%)
Other	7 (2.2%)
Structural Rank, No. (Valid %)	
No Structural Rank	23 (7.4%)
Firefighter I	39 (12.5%)
Firefighter II	101 (32.4%)
Engineer/Technician/Chauffeur	43 (13.8%)
Sergeant	1 (0.3%)
Lieutenant	35 (11.2%)
Captain	27 (8.6%)
Chief or Higher[d]	21 (6.7%)
Other	22 (7.1%)
Missing	1 (–)
Department EMS, No. (Valid %)	
Yes, Full Service EMS – ALS	144 (46.0%)
Yes, Full Service EMS – BLS	41 (13.1%)
Yes, Respond to EMS/No Transport	83 (26.5%)
Yes, Other	16 (5.1%)
No	29 (9.3%)
Certified as EMT/Paramedic, No. (Valid %)	
Yes, EMT	157 (50.2%)
Yes, Paramedic	72 (23.0%)
Yes, EMT and Paramedic	36 (11.5%)
No	48 (15.3%)
Geographic Location of Service, No. (Valid %)	
Large City (Population ≥ 250,000)	67 (21.5%)
Mid-Size City (Population < 250,000)	44 (14.1%)
Urban Fringe of Larger City	32 (10.3%)
Urban Fringe of Mid-Size City	17 (5.4%)
Large Town (Population ≥ 25,000)	35 (11.2%)
Small Town (Population 2500–25,000)	65 (20.8%)
Rural, Outside Large/Mid-Size City	49 (15.7%)
Rural, Inside Large/Mid-Size City	3 (1.0)
Missing	1 (–)
Geographic Region of Service, No. (Valid %)	
New England (ME, VT, NH, MA, CT, RI)	18 (5.9%)
Middle Atlantic (NY, PA, NJ)	26 (8.5%)
West North Central (ND, SD, NE, KS, MN, IA, MO)	44 (14.4%)
East North Central (WI, MI, IL, IN, OH)	38 (12.5%)
South Atlantic (MD, DE, WV, DC, VA, NC, SC, GA, FL)	83 (27.2%)
East South Central (KY, TX, MS, AL)	7 (2.3%)
West South Central (OK, AR, TX, LA)	11 (3.6%)
Mountain (MT, ID, WY, NV, UT, CO, AZ, NM)	45 (14.8%)
Pacific (WA, OR, CA, AK, HI)	33 (10.8%)
Missing	8 (–)
Estimated Number of Women Firefighters in Department, Mean (SD)	24.58 (51.15)

Note. ALS = Advanced Life Support; BLS = Basic Life Support; EMS = Emergency Medical Services; EMT = Emergency Medical Technician.
[a] Data are missing for one respondent (n = 312).
[b] Data are missing for four respondents (n = 309).
[c] Responses are not mutually exclusive; thus, total valid % exceeds 100%.
[d] "Chief or Higher" includes respondents who identified as a Battalion Chief, Assistant Chief, Deputy Chief, or Chief. Responses were collapsed to protect the confidentiality of these low N groups.

career suicide ideation (OR = 0.548, 95% CI = 0.344–0.872, p = 0.011). There were no significant group differences for career suicide plans (OR = 1.082, 95% CI = 0.531–2.206, p = 0.828), suicide attempts (OR = 0.603, 95% CI = 0.173–2.101, p = 0.427), or NSSI (OR = 1.001, 95% CI = 0.466–2.151, p = 0.997).

Table 3
Pre-career and career prevalence rates of suicide ideation, plans, attempts, and non-suicidal self-injury among women firefighters (N = 313).

	Pre-career rates (Valid %)	Career rates (Valid %)	Association of pre-career and career rates
Suicide ideation	28.4%	37.7%	OR = 4.760, p < 0.001
Suicide plans	10.2%	10.9%	OR = 4.867, p < 0.001
Suicide attempts	5.8%	3.5%	OR = 7.175, p = 0.007
Non-suicidal self-injury	11.2%	9.3%	OR = 9.676, p < 0.001

Among respondents who reported having children, the total number of children was not associated with career suicide ideation (b = 0.250, SE = 0.157, p = 0.111), plans (b = 0.248, SE = 0.211, p = 0.242), or NSSI (b = 0.097, SE = 0.243, p = 0.688); however, more children was associated with a greater likelihood of reporting a career suicide attempt (b = 0.771, SE = 0.351, p = 0.028).

Educational attainment. There were no significant differences between levels of educational attainment and rates of career suicide ideation (χ^2 = 2.603, df = 4, p = 0.626), plans (χ^2 = 4.712, df = 4, p = 0.318), attempts (χ^2 = 3.957, df = 4, p = 0.412), or NSSI (χ^2 = 3.957, df = 4, p = 0.412).

3.4. Occupational correlates of career suicidal thoughts and behaviors

Years of firefighter service. The number of years of service as a firefighter was not significantly associated with career suicide ideation (b = −0.013, SE = 0.014, p = 0.384), plans (b = −0.003, SE = 0.022, p = 0.906), attempts (b = 0.039, SE = 0.035, p = 0.261), or NSSI (b = 0.001, SE = 0.024, p = 0.983).

Hours per week of firefighter service. The number of hours working per week as a firefighter was not significantly associated with career suicide ideation (b = 0.000, SE = 0.004, p = 0.930), plans (b = −0.002, SE = 0.007, p = 0.784), attempts (b = 0.000, SE = 0.012, p = 0.982), or NSSI (b = 0.005, SE = 0.007, p = 0.449).

Fire department type. Firefighters who were members of a career-only department were not significantly more or less likely than those who were members of volunteer-only departments to report career suicide ideation (OR = 0.893, 95% CI = 0.500–1.594, p = 0.702), plans (OR = 0.921, 95% CI = 0.392–2.163, p = 0.850), attempts (OR = 1.252, 95% CI = 0.304–5.153, p = 0.756), or NSSI (OR = 1.261, 95% CI = 0.415–3.831, p = 0.683). Firefighters who were members of a career-only department were not significantly more or less likely than those who were members of a hybrid department (i.e., career and volunteer firefighters) to report career suicide ideation (OR = 0.811, 95% CI = 0.467–1.407, p = 0.456), plans (OR = 1.228, 95% CI = 0.513–2.940, p = 0.645), attempts (OR = 2.220, 95% CI = 0.438–11.250, p = 0.336), or NSSI (OR = 0.567, 95% CI = 0.234–1.375, p = 0.209). Firefighters who were members of a volunteer-only department were not significantly more or less likely than those who were members of a hybrid department to report career suicide ideation (OR = 0.908, 95% CI = 0.491–1.678, p = 0.758), plans (OR = 1.333, 95% CI = 0.513–3.464, p = 0.555), attempts (OR = 1.773, 95% CI = 0.289–10.884, p = 0.536), or NSSI (OR = 0.450, 95% CI = 0.151–1.338, p = 0.151).

Structural rank. There were no significant differences between structural ranks and rates of career suicide ideation (χ^2 = 19.605, df = 11, p = 0.051), plans (χ^2 = 5.780, df = 11, p = 0.888), attempts (χ^2 = 4.953, df = 11, p = 0.933), or NSSI (χ^2 = 10.382, df = 11, p = 0.496).

Department emergency medical services. Firefighters whose department provides EMS (i.e., full-service [ALS or BLS], responds to EMS but does not transport, or other) were not significantly more or less likely than those whose do not to report career suicide ideation (OR =

0.722, 95% CI = 0.334–1.560, p = 0.407), plans (OR = 0.546, 95% CI = 0.193–1.540, p = 0.253), attempts (OR = 0.442, 95% CI = 0.091–2.150, p = 0.312), or NSSI (OR = 0.873, 95% CI = 0.247–3.083, p = 0.833).

Emergency medical technician/paramedic certification. Firefighters with EMS certification (i.e., emergency medical technician [EMT], paramedic, or both) were not significantly more or less likely than those without EMS certification to report career suicide ideation (OR = 1.178, 95% CI = 0.599–2.315, p = 0.636), plans (OR = 1.887, 95% CI = 0.534–6.669, p = 0.324), attempts (OR = 0.697, 95% CI = 0.131–3.710, p = 0.672), or NSSI (OR = 0.628, 95% CI = 0.228–1.734, p = 0.369).

Number of women firefighters in department. The number of other women firefighters in a respondent's department was not significantly associated with career suicide ideation (b = −0.002, SE = 0.002, p = 0.471), plans (b = −0.001, SE = 0.004, p = 0.821), attempts (b = 0.001, SE = 0.005, p = 0.780), or NSSI (b = −0.008, SE = 0.007, p = 0.221).

4. Discussion

Utilizing a sample of women firefighters, this study aimed to (1) describe rates of suicidal thoughts and behaviors prior to (i.e., pre-career) and since (i.e., career) beginning work as a firefighter; (2) describe associations between pre-career and career suicidal thoughts and behaviors; and (3) identify sociodemographic and occupational correlates of career suicidal thoughts and behaviors.

Our investigation revealed relatively high pre-career and career rates of suicide ideation (28.4%; 37.7%), plans (10.2%; 10.9%), attempts (5.8%; 3.5%), and NSSI (11.2%; 9.3%) among women firefighters. Strikingly, these rates appear elevated compared to U.S. adult general population lifetime prevalence rates of suicide ideation (5.6–13.4%), plans (3.9%), and attempts (1.9–8.7%; Nock et al., 2008a, 2008b), as well as NSSI (5.9%; Klonsky, 2011). The contrast is particularly stark in considering that prevalence rates identified in this study encapsulated a shorter duration than U.S. general population studies (i.e., pre-career versus career versus lifetime). In interpreting our findings, it is critical to consider potential biases of the "healthy worker effect" (Li and Sung, 1999; Pearce et al., 2007). That is, an occupational group such as women firefighters may represent a relatively healthier group than the general population since firefighters may undergo a pre-enlistment screening that yields a healthier workforce. On the other hand, the general population includes those who are similarly healthy as well as those who are unemployed and/or have an unremitting serious mental illness. This consideration underscores concerns regarding the elevated rates of suicidal ideation, plans, attempts, and NSSI in this sample of women firefighters. That is, the healthy worker effect would suggest that rates of suicidal thoughts and behaviors should be *lower* among women firefighters. Of note, the current study did not employ a representative sampling strategy. As a result, definitive conclusions cannot be established regarding rates of suicidal thoughts and behaviors among U.S. women firefighters broadly. Even so, this study represents an important first step in understanding the potential scope of the problem of suicidality among women firefighters. It also signals a critical need to bolster suicide prevention research and efforts in this occupational group (see McIntosh et al., 2016).

In comparison to prior investigations of U.S. firefighters, career rates of suicide ideation, plans, attempts, and NSSI in this study were lower than those found in a large nationwide study of predominantly male U.S. firefighters (46.8%, 19.2%, 15.5%, and 16.4%, respectively; Stanley et al., 2015). Conversely, our pre-career and career rates were higher than those of suicide ideation (9.8%; 9.1%) and attempts (1.4%; 0.7%) identified among firefighter/EMS personnel in a single, all-career U.S. fire department (Martin et al., 2016). These discrepancies highlight the importance of utilizing representative sampling strategies moving forward. However, that both the study by Stanley et al. (2015) and the current study employed a nationwide survey approach with relatively large sample sizes (i.e., 1027 men and women firefighters and 313 women firefighters, respectively) suggests that suicidality may represent a significant issue among firefighters that is deserving of further empirical attention.

Notably, by identifying rates of pre-career suicidal thoughts and behaviors, our investigation extends prior research on risk correlates among firefighters. It is particularly notable that, in this study, the occurrence of pre-career suicidal thoughts and behaviors were strong predictors of career suicidal thoughts and behaviors. That is, pre-career rates of suicide ideation (OR = 4.760, 95% CI = 2.820–8.034, p < 0.001), plans (OR = 4.867, 95% CI = 2.067–11.463, p < 0.001), attempts (OR = 7.175, 95% CI = 1.726–29.828, p = 0.007), and NSSI (OR = 9.676, 95% CI = 4.130–22.670, p < 0.001) were significant predictors of career rates. This finding implicates prior suicide risk—rather than solely an aspect of firefighter career experiences—as a factor that may confer risk for subsequent suicidal thoughts and behaviors during one's career. That pre-career suicidality predicts career suicidality is likely not a finding specific to women firefighters but instead reflects the complex etiology of suicidality (see Van Orden et al., 2010) and the reality that suicidality affects all segments of the population (CDC, 2017). Indeed, these results also align with prior empirical studies in analog occupational groups (e.g., military service members). For instance, an epidemiological study of men and women U.S. Army personnel found that most service members with post-enlistment suicidal thoughts and behaviors reported pre-enlistments onsets (47.0–58.2%; Nock et al., 2014). Together with our study, these findings emphasize the importance of considering pre-career risk factors when delineating the nature of career suicide risk.

Importantly, although pre-career suicidality predicted career suicidality, the rates of suicide attempts and NSSI were actually lower for career versus pre-career estimates and the rates of suicidal thoughts and plans were higher for career versus pre-career estimates. This pattern—that is, increases in suicidal thinking but decreases in suicidal behavior—is also seen among women with children (Borges et al., 2008); it is proposed that increases in suicidal thinking observed from pre-career to career may underscore the high levels of stress inherent in firefighting. Given that different mechanisms likely account for cognitive (i.e., ideation, plans) versus behavioral (i.e., attempts, NSSI) outcomes (i.e., the "ideation-to-action framework;" Klonsky et al., 2016; Klonsky and May, 2014; Nock et al., 2016), it might be that facets of the fire service are actually protective against engaging in suicidal behaviors.

In terms of risk correlates, with few exceptions, neither sociodemographic nor firefighter-specific characteristics were significantly associated with career suicidal thoughts and behaviors. Only marital status, having children, and age demonstrated significant relationships to career suicidality. Specifically, women firefighters who reported being married and having children were significantly less likely to report suicidal ideation. These findings are consistent with research suggesting that being unmarried is associated with greater risk for suicide (Nock et al., 2008a) and that the presence of children may serve as a protective factor, particularly among women (Qin and Mortensen, 2003). Additionally, meaningful social connection is posited to protect against suicide risk (Joiner, 2005; Van Orden et al., 2010), including among firefighters (Carpenter et al., 2015; Chu et al., 2016). Interestingly, having a greater number of children was associated with career suicide attempts in this study. Given past studies indicating that younger children may augment the protective effects of children against suicidal thoughts and behaviors (Qin and Mortensen, 2003), further work is needed to delineate the implications of our finding (e.g., by probing for detailed information regarding a firefighter's children). In addition, younger age was associated with increased likelihood of reporting career suicidal ideation, consistent with a prior cross-national epidemiological study (Nock et al., 2008a). Although speculative, it is possible that younger age confers increased risk for suicidal thoughts

among firefighters due to the experience of stress while transitioning into the fire service (see Stanley et al., 2015). Finally, that correlates identified in a predominately male firefighter sample (Stanley et al., 2015) were not found in this all-women firefighter sample suggests sample-specific characteristics, of which the most obvious is sex. Thus, these patterns of results provide further rationale for the examination of women firefighters as a distinct occupational group rather than a group subsumed under firefighters at large (e.g., Jahnke et al., 2012). Moreover, these non-significant findings may highlight the need to move beyond static factors in the conceptualization of suicide risk among firefighters.

Collectively, these findings offer implications for screening, prevention, and intervention initiatives to address the problem of suicide among women firefighters. First, this study indicates that it may be important to assess for suicide ideation, plans, attempts, and NSSI among women firefighters since they may occur at elevated rates in this population. In particular, since pre-career suicidal thoughts and behaviors were shown to predict career risk, it may be useful to conduct suicide risk screening at the time of entry into the fire service. The goal of such screening would not be to exclude individuals from becoming firefighters but to allow for the provision of resources to decrease morbidity and mortality. A prior study of men and women firefighters with a history of career suicidal thoughts and behaviors revealed that the majority sought mental health services during their firefighting careers (Hom et al., 2016b). It is possible, then, that women firefighters with a history of suicidality would be similarly receptive to use of mental health services, a key vehicle by which efficacious interventions to reduce suicide risk can be delivered (see Hom et al., 2015a, 2015b). One promising approach to increasing mental health services use among firefighters is Project Reach Out, a video-based intervention (Gulliver et al., 2016).

Second, in terms of prevention focus, the relatively few sociodemographic and occupational correlates of career suicidal thoughts and behaviors suggest that rather than focusing suicide prevention efforts on specific sociodemographic or occupational subgroups, it may be more useful to identify other factors associated with risk that are modifiable. For instance, pre-career suicide risk was identified in this study as one potential leverage point that can be therapeutically addressed. Although the identification of static risk correlates (e.g., sex, race/ethnicity) may aid in focusing the target of prevention efforts (i.e., who should receive care), these characteristics are limited in their capacity to inform the development of intervention approaches. Instead, in line with current directions in suicide prevention research (Franklin et al., 2017), identification of short-term modifiable risk correlates at individual (e.g., psychiatric symptoms) and departmental (e.g., workplace harassment) levels may be more clinically useful and impactful from a public health perspective. Further research is needed, however, to identify these modifiable risk correlates.

Finally, it is worth noting that clinical utility of screening and prevention efforts hinges in part on the existence of interventions with demonstrated efficacy to reduce suicide risk. Though there exist numerous efficacious interventions to mitigate suicide risk (see Brown and Jager-Hyman, 2014, for review), research investigating the efficacy and effectiveness of these interventions among women firefighters is lacking (see also Haugen et al., 2012).[1] Similarly, though a recent systematic review of workplace suicide prevention programs identified 13 such programs, there remains a dearth of evidence supporting their impact on reducing suicide rates (Milner et al., 2015). Due to these gaps in the literature, the CDC has called for the empirical investigations of potential interventions that may prevent suicide among high-risk occupational groups—among them being women in protective service occupations (McIntosh et al., 2016). We look forward to these efforts since identification of a high-risk group (i.e., women firefighters) is not sufficient to effect meaningful changes in suicide-related outcomes.

4.1. Limitations and future directions

The limitations of this study should also be noted. First, due to lack of access to a centralized database of U.S. women firefighters (e.g., similar to military databases), this study represents a convenience sample; thus, results may not be representative of U.S. women firefighters as an occupational group. On this point, this sample predominantly identified as White, limiting generalizability to other racial and ethnic groups; indeed, rates of suicide vary as a function of race, with individuals identifying as White or American Indian being at elevated risk (CDC, 2017). Second, research suggests that single-item measures of suicide attempt history may yield inconsistent or inaccurate results (Hom et al., 2015a; Millner et al., 2015). In this regard, clinical interviews to allow for follow-up questioning and clarification of terms may be useful to include in future studies in this domain. Third, low rates of specific variables in this sample (e.g., suicide attempts) may have limited our power to detect significant effects. Thus, we recommend studies that replicate these findings in larger samples of women firefighters. Fourth, it is important to emphasize that both pre-career and career rates of suicidal thoughts and behaviors were assessed retroactively, and thus are subject to recall biases. Lastly, our study only included current women firefighters. Consequently, rates of career suicide ideation, plans, attempts, and NSSI identified in this study may not necessarily represent all thoughts and behaviors that might occur over the course of participants' careers. Therefore, the inclusion of retired women firefighters in futures studies may enhance our current findings.

With regard to future research, we look forward to investigations of the relationship between psychiatric symptoms and suicide risk among women firefighters. These associations will be especially crucial to probe in light of evidence indicating that posttraumatic stress symptoms (Boffa et al., 2017), sleep disturbances (Hom et al., 2016c), and depression symptoms (Hom et al., 2016c) were elevated in predominantly male firefighter samples. Other factors, including exposure to suicide attempts and fatalities (Kimbrel et al., 2016; Stanley et al., 2015) and being bereaved by suicide (Cerel et al., 2008; Hom et al., 2017) also warrant investigation among women firefighters. We also previously noted the potential relevance and explanatory power of the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010) and conjectures regarding self-sacrificial tendencies (Joiner et al., 2016) for understanding suicide risk among women firefighters. Importantly, issues such as gender-based discrimination and workplace bullying should be examined as potential contributors to suicide risk among this unique population (Leach et al., 2016), Studies testing these frameworks and their propositions will be important in illuminating acute risk factors as well as predisposing factors that may overlap with a tendency to enter the fire service. Ultimately, by triangulating efforts both within the fire service and across comparable protective service occupational groups, we aim to bolster suicide prevention efforts among women firefighters.

Role of funders

The funders had no role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

Acknowledgements

This work was supported in part by the Military Suicide Research Consortium (MSRC), an effort supported by the Office of the Assistant Secretary of Defense for Health Affairs under Award no. (W81XWH-10-2-0181, W81XWH-16-2-0003). Opinions, interpretations, conclusions

[1] The reader is referred to Henderson et al. (2016) for considerations regarding mental health provider competencies when working with firefighters.

and recommendations are those of the authors and are not necessarily endorsed by the MSRC or the Department of Defense. The authors are indebted to the Carson J Spencer Foundation for their support of this research. The authors also acknowledge the assistance in participant recruitment from various fire service organizations, including the International Association of Women in Fire & Emergency Service (iWomen) and the National Fallen Firefighters Foundation (NFFF).

References

Boffa, J.W., Stanley, I.H., Hom, M.A., Norr, A.M., Joiner, T.E., Schmidt, N.B., 2017. PTSD symptoms and suicidal thoughts and behaviors among firefighters. J. Psychiatr. Res. 84, 277–283. http://dx.doi.org/10.1016/j.jpsychires.2016.10.014.

Borges, G., Angst, J., Nock, M.K., Ruscio, A.M., Kessler, R.C., 2008. Risk factors for the incidence and persistence of suicide-related outcomes: a 10-year follow-up study using the National Comorbidity Surveys. J. Affect. Disord. 105, 25–33. http://dx.doi.org/10.1016/j.jad.2007.01.036.

Brown, G.K., Jager-Hyman, S., 2014. Evidence-based psychotherapies for suicide prevention: future directions. Am. J. Prev. Med. 47, S186–S194. http://dx.doi.org/10.1016/j.amepre.2014.06.008.

Bryan, C.J., Bryan, A.O., Ray-Sannerud, B.N., Etienne, N., Morrow, C.E., 2014. Suicide attempts before joining the military increase risk for suicide attempts and severity of suicidal ideation among military personnel and veterans. Compr. Psychiatry 55, 534–541. http://dx.doi.org/10.1016/j.comppsych.2013.10.006.

Carpenter, G.S.J., Carpenter, T.P., Kimbrel, N.A., Flynn, E.J., Pennington, M.L., Cammarata, C., Zimering, R.T., Kamholz, B.W., Gulliver, S.B., 2015. Social support, stress, and suicidal ideation in professional firefighters. Am. J. Health Behav. 39, 191–196. http://dx.doi.org/10.5993/AJHB.39.2.5.

Centers for Disease Control and Prevention [CDC], 2014. WISQARS: Cost of Injury Reports.

Centers for Disease Control and Prevention [CDC], 2017. WISQARS: Web-Based Injury Statistics Query and Reporting System.

Cerel, J., Jordan, J.R., Duberstein, P.R., 2008. The impact of suicide on the family. Crisis 29, 38–44. http://dx.doi.org/10.1027/0227-5910.29.1.38.

Chu, C., Buchman-Schmitt, J.M., Hom, M.A., Stanley, I.H., Joiner, T.E., 2016. A test of the interpersonal theory of suicide in a large sample of current firefighters. Psychiatry Res. 240, 26–33. http://dx.doi.org/10.1016/j.psychres.2016.03.041.

Franklin, J.C., Ribeiro, J.D., Fox, K.R., Bentley, K.H., Kleiman, E.M., Jaroszewski, A.C., Chang, B.P., Nock, M.K., 2017. Risk Factors for Suicidal Thoughts and Behaviors: A Meta-Analysis of 50 Years of Research. Psychol. Bull. 143 (2), 187–232.

Gould, M.S., Munfakh, J.L.H., Kleinman, M., Lake, A.M., 2012. National suicide prevention lifeline: enhancing mental health care for suicidal individuals and other people in crisis. Suicide Life-Threat. Behav. 42, 22–35. http://dx.doi.org/10.1111/j.1943-278X.2011.00068.x.

Gulliver, S.B., Cammarata, C.M., Leto, F., Ostiguy, W.J., Flynn, E.J., Carpenter, G.S.J., Kamholz, B.W., Zimering, R.T., Kimbrel, N.A., 2016. Project reach out: a training program to increase behavioral health utilization among professional firefighters. Int. J. Stress Manag. 23, 65–83. http://dx.doi.org/10.1037/a0039731.

Haugen, P.T., Evces, M., Weiss, D.S., 2012. Treating posttraumatic stress disorder in first responders: a systematic review. Clin. Psychol. Rev. 32, 370–380. http://dx.doi.org/10.1016/j.cpr.2012.04.001.

Haynes, H.J.G., Stein, G.P., 2016. US Fire Department Profile 2014. Quincy, MA.

Henderson, S.N., Van Hasselt, V.B., LeDuc, T.J., Couwels, J., 2016. Firefighter suicide: understanding cultural challenges for mental health professionals. Prof. Psychol. Res. Pract. http://dx.doi.org/10.1037/pro0000072.

Hom, M.A., Joiner, T.E., Bernert, R.A., 2015a. Limitations of a single-item assessment of suicide attempt history: implications for standardized suicide risk assessment. Psychol. Assess. 4. http://dx.doi.org/10.1037/pas0000241.

Hom, M.A., Stanley, I.H., Joiner, T.E., 2015b. Evaluating factors and interventions that influence help-seeking and mental health service utilization among suicidal individuals: a review of the literature. Clin. Psychol. Rev. 40, 28–39. http://dx.doi.org/10.1016/j.cpr.2015.05.006.

Hom, M.A., Stanley, I.H., Joiner, T.E., 2016a. The web-based assessment of suicidal and suicide-related symptoms: factors associated with disclosing identifying information to receive study compensation. J. Personal. Assess. http://dx.doi.org/10.1080/00223891.2016.1180528.

Hom, M.A., Stanley, I.H., Ringer, F.B., Joiner, T.E., 2016b. Mental health service use among firefighters with suicidal thoughts and behaviors. Psychiatr. Serv. 67, 688–691. http://dx.doi.org/10.1176/appi.ps.201500177.

Hom, M.A., Stanley, I.H., Rogers, M.L., Tzoneva, M., Bernert, R.A., Joiner, T.E., 2016c. The association between sleep disturbances and depression among firefighters: emotion dysregulation as an explanatory factor. J. Clin. Sleep Med. 12, 235–245. http://dx.doi.org/10.5664/jcsm.5492.

Hom, M.A., Stanley, I.H., Gutierrez, P.M., Joiner, T.E., 2017. Exploring the association between exposure to suicide and suicide risk among military service members and veterans. J. Affect. Disord. 207, 327–335. http://dx.doi.org/10.1016/j.jad.2016.09.043.

Høyer, G., Lund, E., 1993. Suicide among women related to number of children in marriage. Arch. Gen. Psychiatry 50, 134. http://dx.doi.org/10.1001/archpsyc.1993.01820140060006.

Jahnke, S.A., Poston, W.C., Haddock, C.K., Jitnarin, N., Hyder, M.L., Horvath, C., 2012. The health of women in the US fire service. BMC Women's Health 12, 39. http://dx.doi.org/10.1186/1472-6874-12-39.

Joiner, T.E., 2005. Why People Die by Suicide. Harvard University Press, Cambridge, MA.

Joiner, T.E., Kalafat, J., Draper, J., Stokes, H., Knudson, M., Berman, A.L., McKeon, R., 2007. Establishing standards for the assessment of suicide risk among callers to the National Suicide Prevention Lifeline. Suicide Life Threat. Behav. 37, 353–365. http://dx.doi.org/10.1521/suli.2007.37.3.353.

Joiner, T.E., Hom, M.A., Hagan, C.R., Silva, C., 2016. Suicide as a derangement of the self-sacrificial aspect of eusociality. Psychol. Rev. 123, 235–254. http://dx.doi.org/10.1037/rev0000020.

Kessler, R.C., Berglund, P., Borges, G., Nock, M., Wang, P.S., 2005. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990–1992 to 2001–2003. JAMA 293, 2487–2495. http://dx.doi.org/10.1001/jama.293.20.2487.

Kimbrel, N.A., Pennington, M.L., Cammarata, C.M., Leto, F., Ostiguy, W.J., Gulliver, S.B., 2016. Is cumulative exposure to suicide attempts and deaths a risk factor for suicidal behavior among firefighters? A preliminary study. Suicide Life-Threat. Behav. 46, 669–677. http://dx.doi.org/10.1111/sltb.12248.

King, M., Semlyen, J., Tai, S.S., Killaspy, H., Osborn, D., Popelyuk, D., Nazareth, I., 2008. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. BMC Psychiatry 8, 70. http://dx.doi.org/10.1186/1471-244X-8-70.

Klonsky, E.D., 2011. Non-suicidal self-injury in United States adults: prevalence, sociodemographics, topography and functions. Psychol. Med. 41, 1981–1986. http://dx.doi.org/10.1017/S0033291710002497.

Klonsky, E.D., May, A.M., 2014. Differentiating suicide attempters from suicide ideators: a critical frontier for suicidology research. Suicide Life-Threat. Behav. 44, 1–5. http://dx.doi.org/10.1111/sltb.12068.

Klonsky, E.D., May, A.M., Saffer, B.Y., 2016. Suicide, suicide attempts, and suicidal ideation. Annu. Rev. Clin. Psychol. 12. http://dx.doi.org/10.1146/annurev-clinpsy-021815-093204.

Kposowa, A.J., 2000. Marital status and suicide in the National Longitudinal Mortality Study. J. Epidemiol. Community Health 54, 254–261. http://dx.doi.org/10.1136/jech.54.4.254.

Kraemer, H.C., Kazdin, A.E., Offord, D.R., Kessler, R.C., Jensen, P.S., Kupfer, D.J., 1997. Coming to terms with the terms of risk. Arch. Gen. Psychiatry 54, 337–343. http://dx.doi.org/10.1001/archpsyc.1997.01830160065009.

Leach, L.S., Poyser, C., Butterworth, P., 2016. Workplace bullying and the association with suicidal ideation/thoughts and behaviour: a systematic review. Occup. Environ. Med. http://dx.doi.org/10.1136/oemed-2016-103726.

Li, C.-Y., Sung, F.-C., 1999. A review of the healthy worker effect in occupational epidemiology. Occup. Med. 49, 225–229. http://dx.doi.org/10.1093/occmed/49.4.225.

Martin, C.E., Tran, J.K., Buser, S.J., 2016. Correlates of suicidality in firefighter/EMS personnel. J. Affect. Disord. 208, 177–183. http://dx.doi.org/10.1016/j.jad.2016.08.078.

McIntosh, W.L., Spies, E., Stone, D.M., Lokey, C.N., Trudeau, A.-R.T., Bartholow, B., 2016. Suicide rates by occupational group — 17 States, 2012. Morb. Mortal. Wkly. Rep. 65, 641–645.

Millner, A.J., Lee, M.D., Nock, M.K., 2015. SingleiItem measurement of suicidal behaviors: validity and consequences of misclassification. PLoS One 10, e0141606. http://dx.doi.org/10.1371/journal.pone.0141606.

Milner, A., Spittal, M.J., Pirkis, J., LaMontagne, A.D., 2013. Suicide by occupation: systematic review and meta-analysis. Br. J. Psychiatry 203, 409–416. http://dx.doi.org/10.1192/bjp.bp.113.128405.

Milner, A., Page, K., Spencer-Thomas, S., Lamotagne, A.D., 2015. Workplace suicide prevention: a systematic review of published and unpublished activities. Health Promot. Int. 30, 29–37. http://dx.doi.org/10.1093/heapro/dau085.

National Fallen Firefighters Foundation, 2016. 2015 National Fire Service Research Agenda.

Nock, M.K., Holmberg, E.B., Photos, V.I., Michel, B.D., 2007. Self-injurious thoughts and behaviors interview: development, reliability, and validity in an adolescent sample. Psychol. Assess. 19, 309–317. http://dx.doi.org/10.1037/1040-3590.19.3.309.

Nock, M.K., Borges, G., Bromet, E.J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W.-T., de Girolamo, G., Gluzman, S., de Graaf, R., Gureje, O., Haro, J.M., Huang, Y., Karam, E., Kessler, R.C., Lepine, J.P., Levinson, D., Medina-Mora, M.E., Ono, Y., Posada-Villa, J., Williams, D., 2008a. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. Br. J. Psychiatry 192, 98–105. http://dx.doi.org/10.1192/bjp.bp.107.040113.

Nock, M.K., Borges, G., Bromet, E.J., Cha, C.B., Kessler, R.C., Lee, S., 2008b. Suicide and suicidal behavior. Epidemiol. Rev. 30, 133–154. http://dx.doi.org/10.1093/epirev/mxn002.

Nock, M.K., Stein, M.B., Heeringa, S.G., Ursano, R.J., Colpe, L.J., Fullerton, C.S., Hwang, I., Naifeh, J.A., Sampson, N.A., Schoenbaum, M., Zaslavsky, A.M., Kessler, R.C., 2014. Prevalence and correlates of suicidal behavior among soldiers: results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). JAMA Psychiatry 71, 514–522. http://dx.doi.org/10.1001/jamapsychiatry.2014.30.

Nock, M.K., Kessler, R.C., Franklin, J.C., 2016. Risk factors for suicide ideation differ from those for the transition to suicide attempt: the importance of creativity, rigor, and urgency in suicide research. Clin. Psychol. Sci. Pract. 23, 31–34. http://dx.doi.org/10.1111/cpsp.12133.

Pearce, N., Checkoway, H., Kriebel, D., 2007. Bias in occupational epidemiology studies. Occup. Environ. Med. 64, 562–568. http://dx.doi.org/10.1136/oem.2006.026690.

Piscopo, K., Lipari, R.N., Cooney, J., Glasheen, C., 2016. Suicidal Thoughts and Behavior among Adults: Results from the 2015 National Survey on Drug Use and Health. NSDUH Data Rev.

Qin, P., Mortensen, P.B., 2003. The impact of parental status on the risk of completed suicide. Arch. Gen. Psychiatry 60, 797–802. http://dx.doi.org/10.1001/archpsyc.60.8.797.

Stanley, I.H., Hom, M.A., Hagan, C.R., Joiner, T.E., 2015. Career prevalence and

correlates of suicidal thoughts and behaviors among firefighters. J. Affect. Disord. 187, 163–171. http://dx.doi.org/10.1016/j.jad.2015.08.007.

Stanley, I.H., Hom, M.A., Joiner, T.E., 2016. A systematic review of suicidal thoughts and behaviors among police officers, firefighters, EMTs, and paramedics. Clin. Psychol. Rev. 44, 25–44. http://dx.doi.org/10.1016/j.cpr.2015.12.002.

Stanley, I.H., Boffa, J.W., Hom, M.A., Kimbrel, N.A., Joiner, T.E., 2017. Differences in psychiatric symptoms and barriers to mental health care between volunteer and career firefighters. Psychiatry Res. 247, 236–242. http://dx.doi.org/10.1016/j.psychres.2016.11.037.

Tiesman, H.M., Konda, S., Hartley, D., Menéndez, C.C., Ridenour, M., Hendricks, S., 2015. Suicide in U.S workplaces, 2003–2010. Am. J. Prev. Med. 48, 674–682. http://dx.doi.org/10.1016/j.amepre.2014.12.011.

US Department of Health and Human Services Office of the Surgeon General and National Action Alliance for Suicide Prevention, 2012. National Strategy for Suicide Prevention 2012: Goals and Objectives for Action. Washington, DC.

Van Orden, K.A., Witte, T.K., Cukrowicz, K.C., Braithwaite, S.R., Selby, E.A., Joiner, T.E., 2010. The interpersonal theory of suicide. Psychol. Rev. 117, 575–600. http://dx.doi.org/10.1037/a0018697.

World Health Organization [WHO], 2014. Preventing Suicide: A Global Imperative. WHO Press, Luxembourg.

Zetterqvist, M., Lundh, L.G., Dahlström, O., Svedin, C.G., 2013. Prevalence and function of non-suicidal self-injury (NSSI) in a community sample of adolescents, using suggested DSM-5 criteria for a potential NSSI disorder. J. Abnorm. Child Psychol. 41, 759–773. http://dx.doi.org/10.1007/s10802-013-9712-5.