Sleep disturbance, alcohol use, burnout, and posttraumatic stress among international humanitarian aid workers

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Abstract

International humanitarian aid workers (iHAWs) are professionals often exposed to considerable stress and trauma while delivering humanitarian support to populations in distress. Many studies support the deleterious association between sleep disturbances, alcohol use, posttraumatic stress symptoms (PTSS), and emotional exhaustion (EE). Considering the lack of research on this topic among iHAWs, we conducted an exploratory study to examine relationships among the aforementioned variables in iHAWs.

One hundred participants reflected on their on-mission experiences retrospectively while completing the Pittsburgh Sleep Quality Index (PSQI), the PSQI addendum for PTSD (PSQI-A), Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5), the Maslach Burnout Inventory (MBI), and the quantity-frequency measure for alcohol. Questionnaire completion rates ranged from 33% to 55%. Stepwise regression models were used to analyze the association between two outcome variables, PCL-5 daytime symptoms and EE measured by the MBI, and predictor variables, alcohol use, and PSQI global, and PSQI-A scores. Independent t-tests were conducted to assess difference in on- and off-mission health behaviors, namely sleep disturbance, alcohol, and marijuana use among iHAWs. Spearman regressions were used to examine the association between aid worker career length and PSQI global score as well as relationship between PCL-5 and MBI. False Discovery Rate was adopted to adjust for alpha inflation.

Stepwise regression analyses indicated a significant association between PCL-5 daytime symptoms and PSQI global score after accounting for alcohol use ($\Delta R^2 = 0.139$, $p = 0.039$). Furthermore, PCL-5 daytime symptoms were significantly correlated with PSQI-A score after controlling for PSQI global score and alcohol use ($\Delta R^2 = 0.320$, $p < 0.000$). Additionally, EE was significantly correlated with PSQI after accounting for alcohol use ($\Delta R^2 = 0.140$, $p = 0.034$). We did not find a significant difference between on- and off-mission sleep quality, alcohol use, or marijuana use among iHAWs. However, based on Spearman regression, the aid-working career length was significantly correlated with the PSQI component five, sleep disturbance ($\rho = 0.451$, $p = 0.003$).

Our results corroborate previous findings on the association between sleep disturbances, emotional exhaustion, and PTSS among populations such as first responders, medical professionals, and military personnel. Aid workers and their mental health could benefit from further attention among the research community, especially given the recent increase in conflicts worldwide. While the humanitarian community works on shifting mental health stigmas, sleep health optimization could be an interim step in encouraging iHAWs to seek care. Additionally, the current study focuses on international staff, but the experience of national staff cannot be neglected.

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Table of Contents

List of Tables

List of Figures

Chapter I.

Introduction

International humanitarian aid workers (iHAWs) are skilled professionals delivering humanitarian support to populations in distress. Humanitarian support consists of responding to natural disasters, war, conflict, or long-term impact of poverty, hunger, and diseases. iHAWs take on a high level of risk during assignments and are exposed to direct or secondary traumatic stress in addition to physically and mentally exhausting work conditions (Korff et al., 2015). The elevated level of stress and trauma exposure is likely related to an increase in psychological distress, depression, anxiety, burnout, suicide, posttraumatic stress, and dysfunctional coping such as hazardous cigarette and alcohol use (Guisolan et al., 2022; Korff et al., 2015; Lopes Cardozo et al., 2012; Macpherson & Burkle, 2021; Young et al., 2022). In 2021, the Médecins Sans Frontières (MSF) Management Team conducted a prospective observational study to investigate the health of its international staff after short-term (<1 year) medical emergency assignments across 27 countries (De Jong et al., 2021). Mental health disorders identified among study participants post-assignment included alcohol use disorder, substance use disorder, major depressive disorder, panic disorder, agoraphobia, general anxiety disorder, and posttraumatic stress disorder (PTSD). While the rate of PTSD is relatively low among iHAW, subclinical yet significant posttraumatic stress symptoms (PTSS) were commonly observed (Greene-Cramer et al., 2021).

A growing body of evidence has suggested both stress and interrupted circadian rhythm to lead to mental health problems (McEwen, 2000; McEwen, 2004; McEwen &

Karatsoreos, 2015). The compounding stressors taken on by iHAWs in the workplace are well-documented (Korff et al., 2015; Macpherson & Burkle, 2021). Unfortunately, there is a lack of research assessing disrupted circadian rhythm or sleep disturbance and its effect on mental health in iHAWs. The only available data examining sleep health among iHAWs was a two-question assessment conducted by the United Nations High Commissioner for Refugees (UNHCR) in 2012 that reported up to 47% of iHAWs had difficulty sleeping or slept more than usual (Welton-Mitchell, 2013). Among professionals with jobs similar to that of humanitarian work such as first responders or medical personnel in emergency departments, there is a higher rate of sleep disturbances observed ranging from 33.5% to 44.2%, a number much higher than in the general population (Aernout et al., 2021; Matsumoto & Chin, 2019; Qiu et al., 2020). Furthermore, research has repeatedly suggested that sleep disturbance could lead to decline in cognitive performance, deterioration in health outcome and psychopathology as well as an exacerbated level of burnout in this population (Feldman et al., 2021; Gates et al., 2018; Philibert, 2005; Trockel et al., 2020; Vela-Bueno et al., 2008). It is possible that the combination of elevated stress and disturbed sleep contributes to the plethora of mental health issues observed within the iHAW community.

Terminology

International Humanitarian Aid Worker (iHAW): skilled professionals in various job functions, such as engineers, physicians, psychologists, nurses, midwifes, epidemiologists, water and sanitation experts, architects, finance, administration, or human resources personnel, providing humanitarian assistance to populations suffering from natural disaster, war, conflict, or extreme poverty. This group of individuals holds

managerial positions overseeing the work of local national staff in humanitarian organizations and are dispatched to projects based not of their own country of origin.

Allostatic Load Model: the model that proposes that cumulative stress overstimulates the body's allostatic system which in turn disrupts its ability to maintain homeostasis and subsequently leads to problems in mental and physical health (McEwen, 2000; McEwen, 2004; McEwen & Karatsoreos, 2015).

Burnout: psychological distress resulting from chronic occupation-related stress in which one feels emotionally exhausted, detached, or unaccomplished (Maslach & Leiter, 2016; World Health Organization, 2022).

Acute stress disorder (ASD): a disorder that is developed three days to one month after experiencing a traumatic event with symptoms including intrusion, negative mood, dissociation, avoidance or arousal symptoms (American Psychiatric Association, 2013).

Posttraumatic stress symptom (PTSS): symptoms of PTSD that fall under the categories of intrusion, avoidance, negative cognition and mood, and hyperarousal as categorized under the 5th edition Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013).

Sleep Disturbances: subjective sleep complaints or observed sleep behaviors that consist of difficulty initiating or maintaining sleep, early morning awakenings without return to sleep, fragmented sleep, light sleep, sensations such as cramps or pain experienced at night, anxiety at night, excessive sleep, daytime fatigue, irregular sleep schedule, nonrestorative sleep, nightmares, or excessive movement at night (Buysse et al., 1989; Koffel & Watson, 2010).

International humanitarian work often exposes one to considerable and cumulative stress that could potentially lead to maladaptive psychological and behavioral functioning. iHAWs respond to humanitarian emergencies in which populations are in dire need of assistance to secure basic shelter, food, water, medicine, and safety. This includes but is not limited to providing medical assistance in war zones, area of conflict or natural disaster, managing water and food distribution for malnourished populations, carrying out vaccine campaigns, responding to disease outbreaks such as COVID, Ebola, and more. The number of iHAW has tripled over the past 20 years from increased governmental and private sector spending (Hoelscher et al., 2015), and more importantly, as a result of an upsurge in needs around the world such as the Ukraine-Russia war or the recent conflict in Sudan and Gaza (Haq, 2023; UNHCR, 2023).` The risk of working as an iHAW has increased dramatically over the past 10 years due to increase attacks on aid workers (Stoddard et al., 2022). According to the Safeguarding Health in Conflict Coalition and Insecurity Insight, there was a 45% increase in reported incidents of violence against health facilities and health workers in conflict zones in 2022 compared to 2021 (Safeguarding Health in Conflict Coalition, 2022). These violent acts include deliberate destruction or looting of health facilities, indiscriminate bombing of areas where health facilities are located, as well as arresting, kidnapping, killing, and threats against aid workers. The complexity of recent humanitarian work has also intensified due to an increase in co-occurring natural and human-made disasters such as the 2018 earthquake and tribal fighting in Papua New Guinea, the 2019 Ebola outbreak in the Democratic Republic of Congo during civil conflict, or the ongoing global COVID

outbreak in addition to existing problems around the world (UN Office for the Coordination of Humanitarian Affairs, 2018; Wells et al., 2019).

Specific risks and stressors taken on by iHAWs vary depending on project type and location. For example, incidence of iHAW injury, kidnapping, or death is much higher in Afghanistan, Somalia, South Sudan, and Syria (Guidero, 2022). Nonetheless, there are many reports of overall growing trends of attack and violence against iHAW in the recent years (Safeguarding Health in Conflict Coalition, 2022; Hoelscher et al., 2015; Macpherson & Burkle, 2021; Stoddard et al., 2022). Sexual harassment within the humanitarian workplace has also created another layer of issues faced within the iHAW community (Laville, 2016). In addition to the direct exposure to threats and trauma, iHAWs are indirectly exposed to the trauma experienced by the population they serve. Since iHAWs are often dispatched to novel and unfamiliar locations, stress related to acculturation, acclimatization, or separation from friends and family are common. Furthermore, iHAWs often report work-related stress such as overtime, shift work, poor working condition, lack of organizational structure, lack of support from supervisor, and more (Jachens, 2019; Young & Pakenham, 2021). These accumulated risks of trauma and stress exposure have the potential to disrupt sleep, prompt maladaptive coping behaviors, or lead to problems in mental health among iHAWs.

Mental Health Concerns in iHAW

The mental health impact of humanitarian work is well documented given the increased complexity of the humanitarian context as well as the elevated risks and stressors involved. In particular, past research repeatedly called for attention to burnout and PTSD as a result of occupational stress and trauma associated with humanitarian

work (Connorton et al., 2012; De Jong et al., 2021; Jachens, 2019; Jachens et al., 2016, 2019; Lopes Cardozo et al., 2012; Macpherson & Burkle, 2021; Surya et al., 2017). A longitudinal study assessed the mental health consequences of humanitarian work based on 212 iHAWs from 19 organizations and found high levels of chronic stress taken on by iHAWs contributed to increased risk of burnout, psychological distress, and depression (Lopes Cardozo et al., 2012). Furthermore, humanitarian work is also associated with significant PTSS even though not many iHAWs met the full diagnostic criterion for PTSD (Greene-Cramer et al., 2021).

Burnout is a frequently reported problem associated with humanitarian work. It is defined as emotional, mental and physical exhaustion due to chronic work-related stress where one identified as being emotionally exhausted, detached, or feeling unaccomplished (Maslach & Leiter, 2016; World Health Organization, 2022). A prospective study identified thinking of work during leisure time as well as high work demands to significantly associate with burnout (Söderström et al., 2012). These are common characteristics of the humanitarian work context. For instance, iHAWs both work and live with their colleagues and among populations they aim to serve during assignments and are constantly reminded of the risk and danger associated with humanitarian work even after scheduled work hours.

In 2016, the UNHCR estimated that 9% to 43% of aid workers are at risk for burnout (Dubravka et al., 2016). In 2019, Jachens and colleagues disseminated a survey to international and national employees of an international humanitarian organization operating across more than 100 different locations worldwide to assess burnout among its staff. The study reported iHAWs experienced significantly higher levels of emotional

exhaustion and reduced personal accomplishment compared to national staff such that 34.1% of iHAWs were at risk of emotional exhaustion, 48.0% of reduced personal accomplishment, and 10.4% of depersonalization (Jachens et al., 2019). What's more, a 2021 prospective study found that iHAWs experienced elevated level of burnout, particularly in the form of emotional exhaustion and reduced personal accomplishment, immediately after an assignment ended compared to at the start of assignment (De Jong et al., 2021). At two-month follow-up, these iHAWs experienced further increase in level of burnout compared to immediately after assignment, positing a potential causal relationship between humanitarian aid work and burnout. This suggests that burnout is a persistent problem for iHAWs during and after assignment where simply taking a break from missions might not be enough to reverse the impact.

Compared to an increase in level of burnout from pre- to post-assignment, iHAWs experience elevated PTSS at all stages of assignment. While some research suggests that PTSD is not as significant an issue for iHAWs given the prevalence of those meeting full diagnostic criteria is lower compared to other mental health problems (De Jong et al., 2021; Greene-Cramer et al., 2021), the elevated rate of significant PTSS continued to be an issue for the community and renders additional investigation necessary (Antares Foundation, 2013; Greene-Cramer et al., 2021). Further, heterogeneity within the PTSD diagnosis could imply that simply meeting criteria across all symptom clusters may sometime be less debilitating than having severe symptoms in any one single cluster such as severe nightmares (El-Solh, 2018; Zoellner et al., 2014). In 2013, the Antares Foundation estimated 30% of iHAWs experienced significant PTSS while UNHCR reported a 36% prevalence of PTSD among staff (Dubravka et al., 2016; Antares

Foundation, 2013). The Center for Disease Control and Prevention conducted a four-year longitudinal research project with 19 nongovernmental and humanitarian organizations that deployed staff on international assignments lasting three to 12 months (Greene-Cramer et al., 2021). The research measured PTSS pre-deployment, post-deployment, and at three to six months follow-up. Of 154 participants, the study found low prevalence of PTSD (1.3%) yet elevated intrusion (17.9%, 29.1%, 18.5%) and hyperarousal (21. 2%, 32.5%, 28.5%) symptoms compared to avoidance (2.0%, 4.0%, 4.6%) at pre-deployment, post-deployment, and follow-up, respectively. Overall, preliminary data indicated PTSS, not PTSD, to be a continual issue observed among iHAWs.

However, a few things need to be considered before drawing the conclusion that PTSD is not a problem for iHAWs. First, it is important to note that full diagnostic criteria for PTSD are not met until at least 6 months after experiencing a traumatic event (American Psychiatric Association, 2013). For those experiencing marked dissociation, arousal, avoidance, negative mood, or intrusion symptoms, immediately or up to one month after experiencing trauma, Acute Stress Disorder, not PTSD, is diagnosed (American Psychiatric Association, 2013). Given that the follow-up assessments in this study ranged from three to six months, the study might not have fully captured the extent of PTSD endured by iHAWs. Second, many iHAWs take a one- to six-month break before being deployed to another field mission. It is possible that those suffering from full-blown PTSD were left out of the study pool as a result of having already returned to field assignments. Third, the high prevalence of intrusion and hyperarousal symptoms at pre-deployment might be an indication of accumulated PTSS from previous deployments, which means a longer follow-up period might be necessary. Fourth, while avoidance

symptoms are relatively less significant in this assessment, it is possible that the humanitarian work itself is a form of avoidance for iHAW which likely excluded iHAW from meeting full PTSD diagnostic criterion while on the job. Studies have shown that homecoming stress is one of the most significant predictors of PTSD among U.S. Vietnam war veterans and veterans from Somalia peacekeeping missions (Bolton et al., 2002; Johnson et al., 1997). It could be that those that met the full PTSD diagnostic criteria have already left the humanitarian sector. Finally, research assessing the mental health of iHAWs, especially stress-related mental illness such as PTSD, has consistently been lacking and more research is needed (Macpherson & Burkle, 2021). Therefore, while existing data suggests PTSD might not be an issue statistically among iHAWs, the high prevalence of severe PTSS warrants further assessment and avenue for preventative care. Moreover, identifying mechanisms that underlie the occurrence of PTSS and burnout could improve our understanding of how best to support iHAW mental health.

Sleep Health in iHAW

Disruption of sleep, an innate behavior influenced by both our physiology and environment, could be a common denominator of the different negative mental health effects associated with humanitarian work. According to the allostatic load model, stress and perturbations of the circadian rhythm could negatively impact one's health cumulatively in the long run (McEwen, 2000; McEwen, 2004). Moreover, poor sleep itself is a chronic stressor (McEwen & Karatsoreos, 2015). Sleep disturbance is a frequent problem observed in people diagnosed with elevated levels of clinical burnout or mental illness such as PTSD, alcohol use disorder, depression, or anxiety (Chakravorty et al., 2016; Freeman et al., 2020; Jansson-Fröjmark & Lindblom, 2008). It is also identified

as a risk factor for the etiology and perpetuation of mental illnesses including PTSD, alcohol use disorder, depression, and anxiety given their bidirectional relationships (Freeman et al., 2020; Hertenstein et al., 2019; Slavish et al., 2022).

Unfortunately, the nature and context of humanitarian work might create more impediments to sleep health for iHAWs. Since humanitarian work often entails emergency responses, the work schedule mimics that of first responders or medical personnel where shiftwork and interrupted sleep is more often the norm than the exception. Among first responders, physicians, and medical professionals, research posits that disrupted sleep or lack of sleep negatively affects cognitive performance, burnout, health outcome, and psychopathology (Feldman et al., 2021; Gates et al., 2018; Philibert, 2005; Trockel et al., 2020; Vela-Bueno et al., 2008). For physicians, the occurrence of sleep disturbances ranges from 36.0% to 42.7%, and those who worked in an emergency department reported a higher range from 33.5% to 44.2% (Qiu et al., 2020). These numbers are much higher than the general population where sleep disturbances, such as subjective short sleep duration and insomnia, range from 7.5% to 9.6% and 2.3% to 25.5%, respectively (Aernout et al., 2021; Matsumoto & Chin, 2019). UNHCR conducted a survey in 2012 among staff deployed to Bangladesh and Pakistan and reported that 47% of the staff experienced difficulty sleeping or sleeping more than usual, a number even higher than physicians working in emergency departments (Welton-Mitchell, 2013). Overall, the elevated reports on sleep disturbances among iHAWs could be associated with the frequently observed mental health problems in which sleep disturbance could act as a mechanism in the development and continuation of these issues.

Studies have revealed that sleep disturbances are associated with and act as a risk factor for burnout. According to several large samples size cohort and cross-sectional studies among shift workers, those who screened positive for sleep disorders were more likely to make errors at work, experience increased odds of burnout and reduced odds of professional fulfillment (Peterson et al., 2019; Rajaratnam et al., 2011; Weaver et al., 2023; Weaver et al., 2020). In a study with a sample of 240 physicians from 70 different medical centers in Madrid, Spain, one in five primary care physicians scored high on burnout, and this high burnout score was associated with insomnia and poor sleep quality (Vela-Bueno et al., 2008). In addition, a longitudinal study of 1,258 participants identified insomnia as a predictor for future burnout among the general population (Jansson-Fröjmark & Lindblom, 2010). Furthermore, having less than six hours of sleep was identified as a main risk factor for developing clinical burnout according to a prospective study that followed 388 individuals working in a technology company (Söderström et al., 2012). Sleep also plays an important role in the improvement of burnout as well as return to work. Among 55 employees that were on extended sick leave due to clinical burnout in the Netherlands, those who reported trouble falling asleep or less refreshing sleep were less likely to return to full-time work after a 6-month work break (Sonnenschein et al., 2008). Overall, evidence suggests sleep plays an important role in the progression and recovery process of burnout.

Sleep disturbances are also common problems endured by those diagnosed with PTSD. Insomnia—a hyperarousal symptom—and nightmares—an intrusion symptom—are both diagnostic criteria for PTSD (American Psychiatric Association, 2013). These are the two elevated symptom categories observed among iHAWs at all phases of

deployment (Greene-Cramer et al., 2021). Several prospective studies on military and civilian populations found sleep disturbances experienced prior to trauma exposure significantly elevate the risk of developing PTSD (Gehrman et al., 2013; Koffel et al., 2013; Neylan et al., 2021; van Liempt, 2012; van Liempt et al., 2013). For example, a 2013 longitudinal study following 15,204 military personnel found those who slept less than six hours or experienced insomnia symptoms pre-deployment had significantly greater odds of developing PTSD (Gehrman et al., 2013). A 2021 prospective study also identified nightmares, insomnia, and sleep stress reactivity as significant predictors to subsequent development of PTSD among 666 civilians after motor vehicle collisions (Neylan et al., 2021). Finally, a 2022 systematic review assessed six research studies and found consistently that short and poor sleep predicts greater next-day PTSS (Slavish et al., 2022). On the other hand, greater daytime PTSS predicted poor sleep and nightmares on the same night. Considering that many iHAWs reported significant PTSS but fell short of a full PTSD diagnosis, examining the extent of sleep disturbances endured by this population could provide humanitarian organizations knowledge to prevent the subsequent development of PTSD among staff. It is possible that iHAWs suffer from sleep disturbances which in turn contribute to the observed significant PTSS and burnout. Additionally, the elevated PTSS either leads to or exacerbates existing insomnia and nightmares, perpetuating mental health problems. However, to our knowledge, the furthest extent in investigating sleep disturbances among iHAW is merely a two-question assessment conducted by UNHCR in 2012 (Welton-Mitchell, 2013).

iHAW Alcohol Use

While research assessing sleep in iHAWs has been lacking, alcohol use is a frequently observed and well-accepted maladaptive coping strategy for stress relief among iHAWs. Research has repeatedly recorded hazardous alcohol consumption and called for interventions to reduce heavy drinking among this population (Cardozo et al., 2005; Connorton et al., 2012; De Jong et al., 2021; Guisolan et al., 2022; Jachens et al., 2016). In 2005, Cardozo and colleagues conducted a cross-sectional study of 410 iHAWs and 429 national staff in Kosovar, Albania to assess the mental health of both international and national humanitarian aid workers (Cardozo et al., 2005). The study found that the rate of possible alcohol abuse is much higher among iHAWs compared to national staff where 16.2% of iHAWs reported consuming alcohol hazardously compared to 1.6% among national staff. Based on a 2015 internal staff health survey, the UNHCR found one in four staff at risk for hazardous drinking (Dubravka et al., 2016). Further, depending on assignment location, the risk of hazardous drinking ranges from 26% to 51% among iHAWs. Finally, MSF conducted a mental and physical health assessment of 618 iHAWs working across 76 countries and found 13% of the survey respondents met diagnostic criteria for alcohol use disorder (De Jong et al., 2021). This is much higher compared to the 4% alcohol use disorder rate among the general global population (Steel et al., 2014). This finding again corroborated previous studies that reported elevated levels of mild to severe alcohol use disorder among iHAWs (Biron et al., 2011; Cardozo et al., 2005). The frequent, maladaptive, yet widely accepted behavior in using alcohol to manage stress might be related to the mental health problems observed within the iHAW community, including burnout and PTSS.

Based on the allostatic load model, effective stress management tools and healthy sleep pattern are protective factors to mental health problems (McEwen, 2004). From the perspective of this model, humanitarian work and living condition are not only highly stressful but also have the potential to impede one's circadian rhythm which could subsequently impact one's mental health. What's more, iHAW's hazardous alcohol use as a widely accepted method of coping might negatively affect their sleep health and mental health outcome. According to several large sample-size cohort studies, hazardous alcohol use was associated with a higher level of burnout among medical professionals (Jackson et al., 2016; Pedersen et al., 2016). Furthermore, alcohol use disorder and PTSD comorbidity is widely recognized where alcohol is seen as a self-medicating tool for PTSD (Debell et al., 2014; Hawn et al., 2020). Additionally, alcohol is often used to self-medicate for sleep which, contrary to the intended effect, worsens sleep disturbances and subsequently creates a negative feedback loop that further deteriorates one's sleep and mental health (Chakravorty et al., 2016). Taken together, alcohol use is not only directly associated with deteriorating mental health outcomes but also interrupts sleep and indirectly interferes with sleep's role in mental health recovery.

Alcohol use has been shown to relate to burnout as well as PTSS among various working populations. In a cohort study of 4,402 medical students in the US, emotional exhaustion and the depersonalization aspect of burnout were significantly associated with alcohol abuse (Jackson et al., 2016). The same association was found in 1841 Danish physicians where those who reported moderate to severe burnout were more likely to partake in risky alcohol consumption (Pedersen et al., 2016). Furthermore, there was a dose dependent relationship between alcohol use and the emotional exhaustion as well as

personal accomplishment dimension of burnout where those reporting higher levels of emotional exhaustion and diminished personal accomplishment were likely to consume alcohol in a riskier manner. A similar relationship can be observed between alcohol consumption and PTSD. According to a systematic review of 42 papers published between 2007 and 2012, there was strong evidence suggesting a significant association between alcohol misuse and severity of avoidance and hyperarousal symptoms in PTSD (Debell et al., 2014). However, the authors concluded there was mixed evidence in the relationship between alcohol misuse and intrusion symptoms in PTSD, a symptom category reported to be more severe among iHAWs.

Complicating the relationship between alcohol use and mental health problems, alcohol consumption is also connected to one's sleep health. Sleep disturbance is a well-recognized issue in addiction, including alcohol addiction (Arnedt et al., 2007; Chakravorty et al., 2016). A literature review based on 135 manuscripts published between 1967 and 2015 found a plethora of evidence positing the deleterious cycle between sleep complaints and alcohol dependence whereby one feeds into the other (Chakravorty et al., 2016). Moreover, the review found multiple studies reporting that sleep disturbances predicted future alcohol consumption given that alcohol is often used to self-medicate for insomnia. Individuals with alcohol dependence also reported experiencing insomnia prior to the onset of alcohol dependence (Chakravorty et al., 2016). Conversely, those experiencing alcohol dependence reported subsequent insomnia symptoms based on longitudinal data (Janson et al., 2001). Taken together, alcohol use might play a role in the relationship between sleep disturbances and mental health among iHAWs. Hence, an assessment of both sleep and alcohol consumption and their

association with burnout as well as PTSS could improve our understanding of health behaviors contributing to adverse mental health outcomes related to humanitarian work.

Study Aims and Hypotheses

The cumulative trauma and stress, including poor or lack of sleep, associated with humanitarian work could negatively affect the mental health of iHAW. Sleep disturbances are frequently observed and sometimes part of the diagnostic criteria in mental health problems such as burnout, PTSS, and alcohol abuse. Furthermore, sleep disturbances can also be classified as stressors that lead to the development and perpetuation of symptoms in burnout and PTSS. It is likely that to manage the compounding trauma and stress from humanitarian work, iHAWs develop dysfunctional behaviors, particularly hazardous alcohol use, as a way of coping. As a result, this study will examine the association between two health behaviors, sleep disturbances and alcohol consumption, with two commonly reported mental health problems, burnout and PTSS, in iHAWs.

The current study was of an exploratory nature. To explore the relationships between sleep disturbances, alcohol use, PTSS, and burnout, the study utilized a retrospective cross-sectional method whereby participants complete questionnaires by recalling their experiences during the last month of their last assignment. Five hypothesis families were created to assess the relationships. First, under the PSQI family, we hypothesized that PTSD-specific sleep disturbance as measured by the Pittsburgh Sleep Quality Index addendum for PTSD (PSQI-A) accounts for a significant proportion of variance in daytime symptoms of PTSD, as measured by the PCL-5, after accounting for alcohol use, as measured by the quantity-frequency measure, and sleep disturbance, as

measured by the Pittsburgh Sleep Quality Index (PSQI). We also hypothesized that sleep disturbance, as measured by the PSQI, accounts for a significant portion of emotional exhaustion, as measured by the Maslach Burnout Inventory (MBI), after accounting for alcohol use. Second, under the health behavior family, the study hypothesized that there is a significant difference between on-mission and off-mission sleep disturbance, alcohol use, and marijuana use. Third, under the career length family, we postulated that the iHAW career length is positively associated with PTSS, measured by the PCL-5, and EE, DP, and PA, measured by the MBI. Fourth, under the sleep disturbance family, we hypothesized that the PSQI component five, sleep disturbance, has a positive association with PTSS and burnout. Finally, under the mental health family, we postulated there is a significant positive correlation between PTSS and burnout.

Significance of the Study

Stigma associated with mental health often prevents iHAWs from seeking help (Cockcroft-McKay & Eiroa-Orosa, 2021; De Jong et al., 2021; Macpherson & Burkle, 2021). Even though psychological distress and adverse mental health consequences of humanitarian work are well-recognized, barriers often prevent iHAWs from receiving the needed mental health support. These obstacles include shame and embarrassment for seeking psychological support, lack of self-awareness in needing to seek care given the normalization of distress associated with humanitarian work, perceived lack of confidentiality for seeking psychological support, the martyr mindset associated with humanitarian work, and more (Cockcroft-McKay & Eiroa-Orosa, 2021; Macpherson & Burkle, 2021). As a result, many not only call for more research on ways to attenuate psychological problems arising from aid work but also for novel avenues to promote the

health and well-being of iHAWs (De Jong et al., 2021; Macpherson & Burkle, 2021; Young et al., 2022). Consequently, understanding the relationship between iHAW sleep and metal health could provide humanitarian organizations with additional information to promote iHAW well-being.

As iHAWs work to provide essential care to populations that are forcibly displaced or without access to basic needs, it is important that the management team of humanitarian organizations look for novel avenues to improve and advocate for the health and wellness of its staff. If sleep disturbance and hazardous alcohol use is linked to high burnout and PTSS observed in iHAWs, a focus on ameliorating sleep disturbances and introducing alternative coping strategies to replace alcohol use could be a non-stigmatizing way of improving mental health in the iHAW community. Furthermore, sleep health promotion could be an inexpensive, and cost-saving avenue to cultivate the health and wellness of iHAW. A cross-sectional telephone survey of 7428 employed individuals found that sleep disturbance, particularly insomnia, was associated with deteriorating work performance that is equivalent to an estimated 11.3 days of lost work with a capital value of $2280 per person every year without taking inflation into account (Kessler et al., 2011). Ergo, assessing the relationship between sleep disturbances with burnout and PTSS among iHAWs as well as alcohol's impact on these health outcomes could provide the management team with a potential win-win solution to these ubiquitous mental health concerns.

Chapter II.

Methods

This is a cross-sectional retrospective study examining the relationship between two commonly observed mental health problems, PTSS and burnout, and two health behaviors, sleep disturbance and alcohol use. The current study was approved by the Harvard Committee on Human Subjects on January 24th, 2023. Participant recruitment. took place after the approval from the Institutional Review Boards starting February 1st, 2023, to May 31st, 2023.

Participants

Participants consisted of individuals of 18 years or older with no upper age limit who had been on at least one international humanitarian assignment in the past five years with governmental or non-governmental organizations. Participants were all fluent in English and had experience working in an environment where English was the main language for communication.

Social media such as Reddit Humanitarian forum, Humanitarian Women's Network Facebook group, Fifty Shades of Aid Facebook group, and professional network including the MSF Association were used for the recruitment of participants. There was no payment made to study participants.

Measures

This study utilized seven questionnaires for assessment. Of the seven questionnaires, five were validated and widely used in the research community while one was for demographic data collection and another an optional open-ended commentary for participant reflection at the end of the survey.

Demographics

Information on demographics was collected to assess possible confounding factors in the study. We were concerned with several influencing factors in the study, including length of last mission, location of mission, job type, and total time working as an iHAW. Other factors collected in the demographic questionnaire included age, sex, and religion. Information on religion was collected for the purpose of it being an influential factor in alcohol consumption given that certain religions do not allow alcohol consumption.

Posttraumatic Stress Symptoms (PTSS)

To assess the severity of PTSS experienced by iHAW, the PTSD Checklist for DSM-5 (PCL-5) was adopted (Blevins et al., 2015). The PCL-5 is a 20-item self-reported checklist assessing symptoms of PTSD using the DSM-5 diagnostic criterion. The PCL-5 utilizes a 5-point Likert scale ranging from 0 for “not at all” to 5 for “extreme”. The PCL-5 has good test-retest reliability, convergent validity, divergent reliability, and internal consistency with a Cronbach alpha of 0.94 (Blevins et al., 2015).

Burnout

The Maslach Burnout Inventory (MBI) was used to assess the level of burnout experienced by iHAW (Maslach et al., 1981). The MBI is a 22-item inventory capturing three dimensions of burnout: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA) (Maslach et al., 1981). The inventory items are answered on 6-point Likert scales ranging from 0 for "never" to 6 for "always". The MBI has a good construct, factorial and congruent validity when compared to other measures for burnout (Schaufeli & Van Dierendonck, 1993). It also shows good internal consistency with Cronbach alpha ranging from 0.67 to 0.86 (Omoluabi & Coker, 2009; Schutte et al., 2010).

Sleep Disturbance

Sleep disturbance was measured by the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989). The PSQI is a 19-item self-reported questionnaire measuring the quality and patterns of sleep in adults by assessing seven areas of sleep: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The PSQI shows good test-retest reliability, internal consistency and reliability with a Cronbach alpha of 0.83 for the seven components of sleep measured (Backhaus et al., 2002; Buysse et al., 1989). A PSQI score of five or higher indicates clinically significant sleep disturbance (Buysse et al., 1989).

PTSD-specific Sleep Disturbance

The PSQI addendum for PTSD (PSQI-A) was used to assess PTSD-specific sleep disturbances related to disruptive nocturnal behaviors. The PSQI-A is a seven-item

questionnaire that shows good internal consistency and convergent validity with other standardized PTSD measures (Germain et al., 2005). There is a Cronbach alpha of 0.85 for the seven items on the PSQI-A (Germain et al., 2005).

Alcohol and Substance Use

Alcohol use in the past month and during international humanitarian assignment were assessed using the Quantity and Frequency (QF) method. The QF has been shown to be an easy, useful, and accurate tool to examine the pattern and level of alcohol consumption among adults recalling alcohol intakes when compared to other measures such as the graduated frequency (GF) questionnaire as used by the World Health Organization (Poikolainen et al., 2002). The QF identifies more light drinkers with less classification inconsistencies related to gender or problematic drinking compared to the GF (Heeb & Gmel, 2005). Additionally, a yes or no question assessing the use of marijuana while one is on and off assignment was used to explore possible coping alternative to alcohol use.

Open-ended Commentary

An open-ended comment section was provided to study participants to voluntarily reflect on their experiences working as an iHAW and aspects of humanitarian work that they believe to have affected their sleep health, mental health, or alcohol use.

Procedures

Invitations to fill out the research survey anonymously were sent out to members of the MSF Association and members of online forums for aid workers as outlined above

in the participant section. Qualtrics was used to carry out the research survey. Participants that met the screening criteria as described in the participant section were asked to complete the Demographic section and the PSQI for the past 30 days. Subsequently, participants were asked to imagine themselves being back at their most recent assignment while filling out the remaining set of questionnaires, including the MBI, PCL-5, and PSQI-A. For those who were not on mission while completing the survey, participants were asked to fill out an additional PSQI questionnaire in which they were asked to reflect on the last 30 days of their sleep quality during their last mission. Upon completion of the questionnaires, an open-ended comment section was provided to participants to voluntarily reflect on how their humanitarian work experiences might have impacted their sleep and mental health. Each assessment was scored by the investigator in accordance with the scoring key of each validated questionnaire.

Data Analysis

Statistical Package for the Social Sciences (SPSS, version 26) was used to carry out all analyses to examine our hypotheses. There are five families of hypotheses as follows:

a. The PSQI family, our primary hypothesis family (two hypotheses) postulated the contribution of sleep disturbance in the variances of iHAW mental health outcome which are identified as our primary outcome variables, PTSD daytime symptoms and emotion exhaustion.

    Hypothesis 1 (H1): PTSD-specific sleep disturbance accounts for a significant portion of variance of the PTSD daytime symptom after accounting for sleep quality and alcohol use.

Hypothesis 2 (H2): Sleep quality accounts for a significant portion of variance of emotional exhaustion after accounting for alcohol use.

b. The health behaviors family, our secondary hypothesis family (three hypotheses), postulated that there is a significant difference in health behaviors when iHAWs are on versus off mission.

Hypothesis 3 (H3): There is a significant difference in sleep quality when iHAWs are on versus when they are off mission.

Hypothesis 4 (H4): There is a significant difference in alcohol use when iHAWs are on versus when they are off mission.

Hypothesis 5 (H5): There is a significant difference in marijuana use when iHAWs are on versus when they are off mission.

c. The career length family, our third hypothesis family (15 hypotheses), examined the strength of association between iHAW career length and iHAW sleep quality, PTSS, and burnout.

Hypothesis 6 (H6): There is a significant correlation between the length of one's aid work career and the PSQI global score as well as the seven components representing different aspects of sleep disturbance that makes up the global PSQI score. H6.1 to H6.7 represents the correlation hypotheses between aid worker career length and PSQI component one to component seven.

Hypothesis 7 (H7): There is a significant correlation between the length of one's humanitarian career and the three aspects of burnout as measured by EE (H7.1), DP (H7.2), PA (H7.3).

Hypothesis 8 (H8): There is a significant correlation between the length of one's humanitarian career and the PCL-5 global score (H8.1) as well as separate PCL-5 symptom categories, including category B, intrusion symptoms, (H8.2), category C, avoidance symptom, (H8.3), category D, negative mood and cognition symptoms, (H8.4), and category E, hyperarousal symptoms (H8.5).

d. The sleep disturbance family, our fourth hypothesis family (7 hypotheses), examined the strength of association between PSQI component five, sleep disturbance, and the breakdown of the PCL-5 symptom categories and burnout as identified as EE, DA, and PA.

Hypothesis 9 (H9): There is a significant correlation between the PSQI component five score, sleep disturbance, and separate PCL-5 symptom categories, including category B, intrusion symptoms, (H9.1), category C, avoidance symptom, (H9.2), category D, negative mood and cognition symptoms, (H9.3), and category E, hyperarousal symptoms excluding item 20 – "Trouble falling or staying asleep" (H9.4).

Hypothesis 10 (H10): There is a significant correlation between the PSQI component five score, sleep disturbance, and burnout as measured by EE (H10.1), DA (H10.2), PA (H10.3).

e. The mental health family, our fifth hypothesis family (3 hypotheses), examined the strength of association between the PCL-5 global score and burnout as identified as EE, DA, and PA.

Hypothesis 11 (H11): There is a significant correlation between the PCL-5 global score and EE (11.1), DA (11.2), and PA (H11.3).

An alpha of 0.05 was used to evaluate the result of the statistical analyses and when significant testing was not appropriate, bootstrap confidence interval analysis was used to provide a more robust estimate of standard error. To account for the number of erroneous rejections in the current study given the presence of multiple testing, the False Discovery Rate (FDR) procedure was used to control for the probability of a false rejection to our null hypotheses given a rejection was made (Benjamini & Hochberg, 1995). As suggested by Benjamini and Hochberg (1995), FDR is suitable for situations where multiple subgroups are being tested to discover as many significant differences as possible for subsequent operational decisions without the requirement of having an overall decision being made based on the findings. Furthermore, compared to a more conservative method to control for Type I error such as the Bonferroni procedure, the FDR considers the number of erroneous rejections to our null hypothesis as opposed to the number of hypotheses tested or whether an error was made (Benjamini & Hochberg, 1995).

A descriptive analysis was conducted to understand the demographics of study population with respect to the mean, median, standard deviation, minimum and maximum of outcome measures. To examine the first PSQI hypothesis family, H1 and H2, we conducted two stepwise regression analyses. For H1, Model I used PCL-5 daytime symptom by excluding item two – "Repeated, disturbing dreams of the stressful experience"– and item 20 – "Trouble falling or staying asleep"– as the primary outcome variable. Model I consisted of three steps of variable entry: step one consisted of entering

alcohol use; step two included entering the PSQI global score; and step three included entering PSQI-A into the model. The purpose of this analysis was to explore whether PSQI-A contributes a significant proportion of variance in PCL-5 daytime symptom. To examine H2, Model II used the EE dimension of the MBI as the outcome variable. Model II consisted of two steps of variable entry: step one consisted of entering alcohol use and step two included entering the PSQI global score. The purpose of this analysis was to assess whether sleep quality as measured by PSQI attributes a significant proportion of variance in EE. Both H1 and H2 were assessed by examining the change of R^2 value (ΔR^2).

Scatterplots were graphed to examine the assumption of linearity between predictor and outcome variables and the Shapiro-Wilk tests were used to assess for normality of the variables. A bivariate correlation table was made to assess the strength of associations between alcohol use, PSQI, PSQI-A, PCL-5 daytime symptoms, and EE. Given that the Shapiro-Wilk test indicated non-normality in the PSQI global score and EE, non-parametric Spearman regression was used to report the bivariate correlations between predictor and outcome variables. The H1 outcome variable, PCL-5 daytime symptoms sufficiently met assumptions of normality. The H2 outcome variable, EE, did not meet assumption of normality, hence bootstrap technique was used in replace of p-value to provide a more robust standard error in our assessment. Skewness and kurtosis were assessed using the SPSS descriptive function for skewness and kurtosis with a threshold of +/- 1. The assumption for multicollinearity was examined using the Variance Inflation Factor (VIF) with a threshold of 10. Participants with missing data and identified outliers were excluded from analysis.

For the second health behavior hypothesis family, H3 and H4, an independent t-test was conducted to examine whether there is a difference between on mission and off mission sleep quality and alcohol use respectively. The same linearity and normality test mentioned above was conducted for H3 and H4. Given the small sample size, bootstrapped confidence interval was used to provide a more robust estimate of standard error in our assessment. For the third career length, the fourth sleep disturbance, and the fifth mental health hypotheses families, H5 to H10, Spearman regression was used to assess the correlations between variables given that not all variables met the Shapiro-Wilk normality test. The False Discovery Rate (FDR) procedure was used to assess the significance of Spearman correlations.

Chapter III.

Results

A total of 100 people responded to the survey. Of the 100 participants that started the survey, 79 met inclusion criteria, 55 finished the demographics section, 43 finished the demographics and PSQI in the past 30 days survey, 39 filled out the demographics, PSQI in the past 30 days, and the MBI section, 33 filled out an additional PCL-5 section, and 31 filled out the PSQI addendum for PTSD survey. Of the 33 that completed up to the PCL-5 section, 19 were not in mission at the time of taking the survey and completed an additional retrospective PSQI survey where participants were asked to fill out another set of PSQI for their sleep experience during their last mission. A total of 31 participants completed the entirety of the survey. The total completion rate was approximately 30%. Table 1 illustrated the sample size, mean, minimum value, maximum value, and standard deviation of each variable.

Of those who completed the demographic section of the survey (Table 2), 69.1% (*n*=38) were female and 30.9% (*n*=17) were male. 23 participants were from Europe, 17 were from the Americas, 9 were from Asia Pacific Region, 3 from the Africa Region, 2 from the Middle East, and 4 preferred not to answer. 27 (49.1%) participants worked in Africa regions for their previous or current mission with the majority in Sudan, South Sudan and the Democratic Republic of Congo, 10 (18.2%) in the Asia Pacific and Central Asia region, 7 (12.7%) in Central and South America, 7 (12.7%) in the Middle East, and

4 (7.3%) in Europe. Table 2 provided the demographics information of the current study participants.

Table 1. Descriptive Analysis for Questionnaires

	N	Mean	Median	Min	Max	S.D.
PSQI Subjective Sleep Quality - last 30 days	43	1.40	1	0	3	0.70
PSQI Sleep Latency - last 30 days	43	1.60	2	0	3	1.03
PSQI Sleep Duration - last 30 days	43	0.84	0	0	4	1.13
PSQI Sleep Efficiency - last 30 days	43	0.60	0	0	2	0.79
PSQI Sleep Disturbance - last 30 days	43	1.28	1	0	2	0.55
PSQI Sleep Medication - last 30 days	43	0.74	0	0	3	1.12
PSQI Daytime Dysfunction - last 30 days	43	1.47	1	0	3	0.88
PSQI Global Score - last 30 days	43	7.93	7	1	16	3.78
MBI Emotional Exhaustion	39	26.69	25	9	50	11.52
MBI Depersonalization	39	10.44	10	0	22	6.25
MBI Personal Accomplishment	39	29.28	30	11	41	7.64
PCL-B Intrusion	33	4.64	3	0	14	4.31
PCL-5-C Avoidance	33	1.97	1	0	7	2.30
PCL-5-D Negative Mood	33	8.39	7	0	23	7.02
PCL-5-E Hyperarousal	33	8.09	8	0	17	5.78
PCL-5 Global Score	33	23.09	23	1	58	17.50
PCL-5 Daytime symptoms	33	21.6	20	0	54	16.80
PSQI-A	31	4.10	4	0	16	3.82
Alcohol use on mission	31	7.10	2	0	100	17.92
Alcohol use off mission	31	8.61	4	0	80	15.47
Marijuana use on mission	31	0.29	0	0	1	0.46
Marijuana use off mission	31	0.06	0	0	1	0.25
PSQI Subjective Sleep Quality - last mission	19	1.74	2	1	3	0.73
PSQI Sleep Latency - last mission	19	1.11	1	0	3	0.99
PSQI Sleep Duration - last mission	19	1.37	1	0	4	1.54
PSQI Sleep Efficiency - last mission	19	0.63	0	0	3	0.90
PSQI Sleep Disturbance - last mission	19	1.47	2	0	3	0.77
PSQI Sleep Medication - last mission	19	0.58	0	0	3	0.96
PSQI Daytime Dysfunction - last mission	19	1.53	2	0	3	1.07
PSQI Global Score - last mission	19	8.42	7	1	21	4.50

PSQI, Pittsburgh Sleep Quality Index; PCL-5, PTSD checklist for DSM-5; MBI, Maslach Burnout Inventory; PSQI-A, PSQI addendum for PTSD.

The average and median length of humanitarian career among study participants was 8.6 and 7.0 years respectively. The average and median length of mission was 16.4 and 10.0 months, respectively. 49.1% (*n*=27) of participants had directly or indirectly

experienced at least one traumatic experience prior to becoming an iHAW while 80.0% (*n*=44) of participants had directly or indirectly experienced at least one traumatic experience while working as an iHAW.

Table 2. Demographics of Study Participants

Demographics	*n*	%
Sex		
Female	38	69.1%
Male	17	30.9%
Country of Origin		
Africa Region	3	5.5%
America Region	17	16.4%
Asia Pacific Region	9	16.4%
European Region	23	41.8%
Middle East	2	3.6%
Prefer not to answer	1	1.8%
Religion		
Christian	20	36.4%
Muslim	5	9.1%
Others	19	34.5%
Prefer not to answer	11	20.0%
Location of previous mission		
Africa Region	27	49.1%
Asia Pacific and Central Asia Region	10	18.2%
Central and South American Region	7	12.7%
European Region	4	7.3%
Middle East	7	12.7%
Job type during mission		
Medical	13	23.6%
Non-medical	42	76.4%
Trauma exposure prior to first mission		
Yes	27	49.1%
No	28	50.9%
Trauma exposure during humanitarian work		
Yes	44	80.0%
No	11	20.0%

As shown in figure 1, there was a linear relationship between the PSQI global score in the past 30 days and the PCL-5 global score, PCL-5 daytime symptoms, and its

four symptom categories. PSQI global score also had a linear relationship with EE and PA but not DP. Additionally, the PSQI-A had a linear relationship with PCL-5 daytime symptoms.

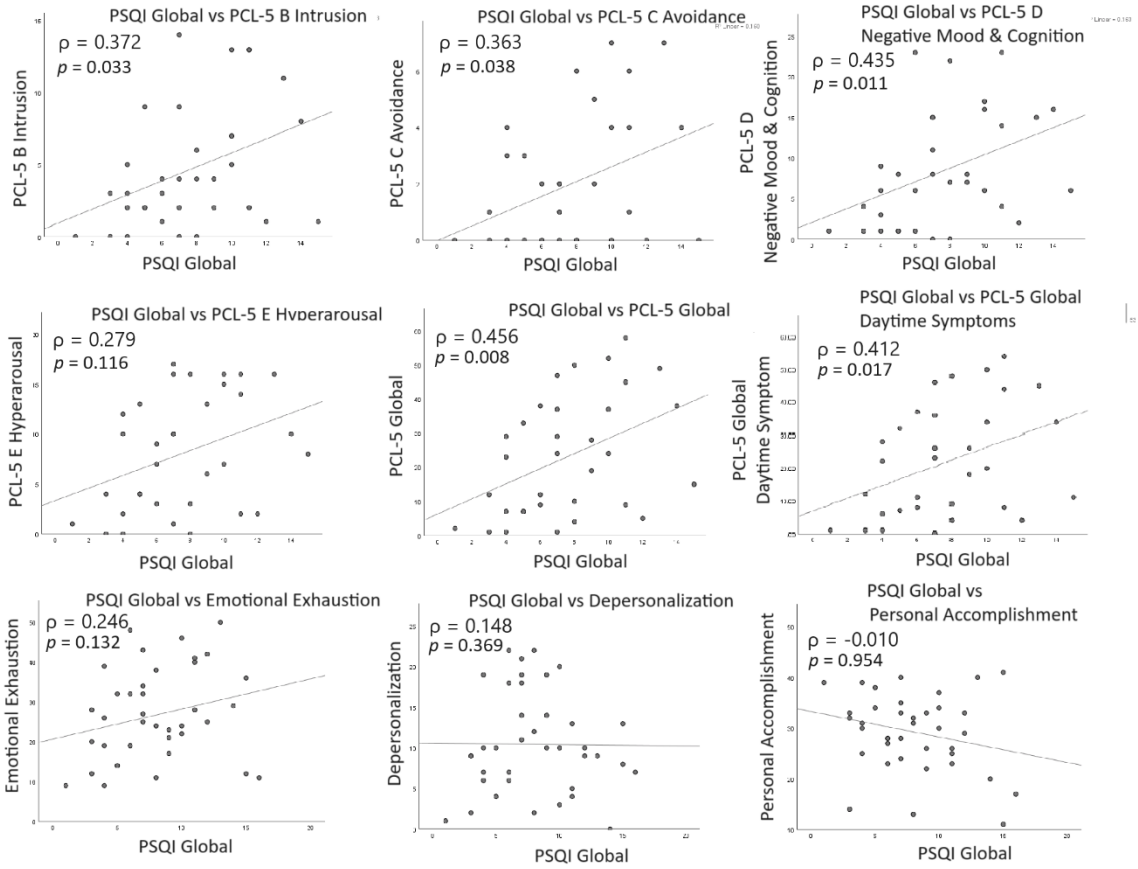

Figure 1. Scatterplots Assessing Assumptions of Linearity Between Variables

PSQI Global, Pittsburgh Sleep Quality Index global score; PCL-5 B, PTSD checklist for DSM-5 symptom category B; PCL-5 C, PTSD checklist for DSM-5 symptom category C; PCL-5 D, PTSD checklist for DSM-5 symptom category D; PCL-5 E, PTSD checklist for DSM-5 symptom category E; PCL-5 Global, PTSD checklist for DSM-5 global score.

Upon examining the Shapiro-Wilk test for normality (Table 3), the PSQI global score, EE, DP, and PA were the four variables that did not meet assumption of normality. Each of the PSQI seven components, the four PCL-5 symptom categories, the PSQI-A, and alcohol use were all normally distributed. Consequently, the Spearman regression method was used to examine the correlations between variables.

Table 3. Shapiro-Wilk Test of Normality

Variables	**statistics**	**df**	**Sig.**
Aid length	.571	55	.000
Mission length	.888	54	.000
PSQI comp 1-30 days	.793	43	.000
PSQI comp 2-30 days	.876	43	.000
PSQI comp 3-30 days	.730	43	.000
PSQI comp 4-30 days	.710	43	.000
PSQI comp 5-30 days	.716	43	.000
PSQI comp 6-30 days	.677	43	.000
PSQI comp 7-30 days	.870	43	.000
PSQI global score-30 days	.966	43	.225
PSQI-A	.888	31	.004
PCL5 – B	.866	33	.001
PCL5 – C	.817	33	.000
PCL5 – D	.902	33	.006
PCL5 – E	.911	33	.010
PCL5 global score daytime symptoms	.919	33	.017
MBI – EE	.963	39	.223
MBI – DP	.948	39	.070
MBI – PA	.957	39	.147
PSQI comp 1-on mission	.793	19	.001
PSQI comp 2- on mission	.863	19	.011
PSQI comp 3- on mission	.776	19	.001
PSQI comp 4- on mission	.733	19	.000
PSQI comp 5- on mission	.854	19	.008
PSQI comp 6- on mission	.656	19	.000
PSQI comp 7- on mission	.881	19	.022
PSQI global score- on mission	.893	19	.036
Alcohol on mission	.379	31	.000
Alcohol off mission	.554	31	.000

df, degrees of freedom; Sig, Significance value; Aid length, length of iHAW total career; Mission length, Length of previous mission; -30 days, experience reflected in the past 30 days; -on mission, experience reflected during last mission; PSQI, Pittsburgh Sleep Quality Index; PSQI Comp 1, PSQI component one sleep quality; PSQI Comp 2, PSQI

component two sleep latency; PSQI Comp 3, PSQI component three sleep duration; PSQI Comp 4, PSQI component four sleep efficiency; PSQI Comp 5, PSQI component five sleep disturbance; PSQI Comp 6, PSQI component six sleep medication; PSQI Comp 7, PSQI component seven daytime dysfunction; PSQI-A, PSQI addendum for PTSD; PCL-5 – B, PTSD checklist for DSM-5 symptom category B; PCL-5 – C, PTSD checklist for DSM-5 symptom category C; PCL-5 – D, PTSD checklist for DSM-5 symptom category D; PCL-5 – E, PTSD checklist for DSM-5 symptom category E.

Spearman's rho correlations as shown in Table 4 suggested that there was a positive correlation between the PCL-5 daytime symptom and the PSQI global score (ρ=0.41, 95% CI [0.08, 0.68]) as well as the PSQI-A (ρ =0.76, 95% CI [0.50, 0.87]). On the other hand, EE had a positive correlation with PSQI-A (ρ =0.39, 95% CI [0.04, 0.64]) but not the PSQI global score (ρ =0.25, 95% CI [-0.09, 0.57]). Nonetheless, we included the PSQI global score in our stepwise regression analysis based previous research findings which suggested an association between PSQI and EE.

Table 4. Spearman Correlation Table – PSQI, PCL-5, and MBI

Variable		PSQI Comp1	PSQI Comp2	PSQI Comp3	PSQI Comp4	PSQI Comp5	PSQI Comp6	PSQI Comp7	PSQI Global	PSQI-A
PCL-5-B	ρ	.437*	.281	-.023	.080	.488**	.152	.192	.372*	.754**b
	Sig.	.011	.113	.900	.657	.004	.398	.285	.033	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.078	-.074	-.389	-.262	.170	-.201	-.155	.032	.546
	CI(U)	.739	.586	.326	.450	.731	.470	.498	.665	.880
PCL-5-C	ρ	.276	.154	.028	.056	.515**	.236	.357*	.363*	.654**
	Sig.	.120	.394	.879	.758	.002	.186	.041	.038	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	-.070	-.232	-.304	-.297	.160	-.148	.014	.034	.431
	CI(U)	.602	.532	.310	.432	.758	.583	.644	.673	.813
PCL-5-D	ρ	.405*	.194	.072	.126	.623**	.151	.452**	.435*	.726**
	Sig.	.020	.280	.690	.486	.000	.400	.008	.011	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.088	-.208	-.239	-.226	.380	-.219	.157	.132	.545
	CI(U)	.668	.559	.375	.462	.786	.496	.715	.682	.870
PCL-5-E	ρ	.323	.167	.111	.100	.541**a	.138	.396*	.279a	.696**
	Sig.	.066	.352	.538	.580	.001	.443	.023	.116	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	-.012	-.176	-.222	-.270	.262	-.218	.087	-.082	.453
	CI(U)	.608	.510	.429	.443	.751	.469	.679	.568	.847
PCL-5-global Score	ρ	.428*	.235	.099	.151	.634**	.173	.396*	.456**	.769**
	Sig.	.013	.188	.583	.403	.000	.336	.023	.008	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.115	-.162	-.248	-.207	.387	-.220	.087	.122	.576
	CI(U)	.697	.591	.417	.471	.793	.508	.672	.718	.874

PCL-5 daytime symptoms	ρ	.391*	.183	.076	.127	.622**	.143	.392*	.412*	.758**b
	Sig.	.025	.308	.674	.482	.000	.426	.024	.017	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.074	-.209	-.272	-.216	.368	-.246	.080	.080	.549
	CI(U)	.670	.545	.399	.450	.790	.478	.675	.684	.867
MBI-EE	ρ	.310	.073	-.011	.052	.288	.004	.512**	.246	.391*
	Sig.	.055	.659	.947	.755	.075	.980	.001	.132	.030
	N	39	39	39	39	39	39	39	39	31
	CI(L)	-.006	-.272	-.310	-.281	-.060	-.384	.323	-.099	.043
	CI(U)	.623	.417	.300	.391	.581	.328	.672	.571	.638
MBI-DP	ρ	.243	.041	-.040	.039	.162	-.137	.482**	.148	.429*
	Sig.	.136	.806	.807	.814	.324	.405	.002	.369	.016
	N	39	39	39	39	39	39	39	39	31
	CI(L)	-.090	-.278	-.369	-.281	-.184	-.455	.269	-.217	.037
	CI(U)	.565	.357	.299	.348	.483	.179	.668	.502	.712
MBI-PA	ρ	.047	-.172	-.061	-.116	.297	-.261	.449**	-.010	-.164
	Sig.	.777	.296	.710	.482	.066	.108	.004	.954	.377
	N	39	39	39	39	39	39	39	39	31
	CI(L)	-.234	-.475	-.290	-.423	-.007	-.486	.128	-.284	-.515
	CI(U)	.394	.159	.188	.259	.549	-.007	.736	.316	.188

*Sig, Significance; CI(L), lower bound of confidence interval; CI(U), upper bound of confidence interval; PSQI, Pittsburgh Sleep Quality Index; PSQI Comp 1, PSQI component one sleep quality; PSQI Comp 2, PSQI component two sleep latency; PSQI Comp 3, PSQI component three sleep duration; PSQI Comp 4, PSQI component four sleep efficiency; PSQI Comp 5, PSQI component five sleep disturbance; PSQI Comp 6, PSQI component six sleep medication; PSQI Comp 7, PSQI component seven daytime dysfunction; PSQI Global, PSQI Global Score; PSQI-A, PSQI addendum for PTSD; PCL-5 – B, PTSD checklist for DSM-5 symptom category B; PCL-5 – C, PTSD checklist for DSM-5 symptom category C; PCL-5 – D, PTSD checklist for DSM-5 symptom category D; PCL-5 – E, PTSD checklist for DSM-5 symptom category E; MBI, Maslach Burnout Inventory; EE, Emotional Exhaustion; DP, Depersonalization; PA, Personal Accomplishment; *p < 0.05; ** p < 0.01; [a] exclude item 20– "Trouble falling or staying asleep"; [b] exclude item 2– "Repeated, disturbing dreams of the stressful experience".*

Different statistical models and methods were adopted to examine the hypotheses under the current study. Table 5 summarized the different models used for the categories of hypotheses and the variables used for the corresponding hypothesis tests.

Table 5. Summary of Current Study Hypotheses

Hypothesis Family	Hypothesis	Variables included in analysis	Statistical Method
A. PSQI	H1	Outcome: PCL-5 Daytime Symptoms Predictor: Alcohol use, PSQI, PSQI-A	Model I. Stepwise regression
	H2	Outcome: EE Predictor: Alcohol use, PSQI	Model II. Stepwise regression
B. Health Behaviors	H3	PSQI-30days, PSQI-on mission	Model III. Independent t-test
	H4	Alcohol use on mission, Alcohol use off mission	Model IV. Independent t-test
	H5	Marijuana use on mission, Marijuana use off mission	Model V. Independent t-test
C. Career Length	H6.1	Aid length, PSQI component 1 subjective sleep quality	Spearman regression
	H6.2	Aid length, PSQI component 2 sleep latency	
	H6.3	Aid length, PSQI component 3 sleep duration	
	H6.4	Aid length, PSQI component 4 sleep efficiency	
	H6.5	Aid length, PSQI component 5 sleep disturbance	
	H6.6	Aid length, PSQI component 6 sleep medication	
	H6.7	Aid length, PSQI component 7 daytime disturbance	
	H7.1	Aid length, EE	
	H7.2	Aid length, DP	
	H7.3	Aid length, PA	
	H8.1	Aid length, PCL-5 Global Score	
	H8.2	Aid length, PCL-5 Cluster B intrusion symptoms	
	H8.3	Aid length, PCL-5 Cluster C avoidance symptoms	
	H8.4	Aid length, PCL-5 Cluster D negative mood and cognition symptoms	
	H8.5	Aid length, PCL-5 Cluster E hyperarousal symptoms	
D. Sleep Disturbance	H9.1	PSQI Component 5, PCL-5 Cluster B intrusion symptoms	
	H9.2	PSQI Component 5, PCL-5 Cluster C avoidance symptoms	
	H9.3	PSQI Component 5, PCL-5 Cluster D negative mood and cognition symptoms	

	H9.4	PSQI Component 5, PCL-5 Cluster E hyperarousal symptoms*	
	H9.5	PSQI Component 5, PCL-5 Gloal Score	
	H10.1	PSQI Component 5, EE	
	H10.2	PSQI Component 5, DP	
	H10.3	PSQI Component 5, PA	
E. Mental Health	H11.1	PCL-5 Global Score, EE	
	H11.2	PCL-5 Global Score, DP	
	H11.3	PCL-5 Global Score, PA	

*PCL-5, PTSD checklist for DSM-5; PSQI, Pittsburgh Sleep Quality Index; PSQI-A, PSQI addendum for PTSD; EE, Emotional Exhaustion; DP, Depersonalization; PA, Personal Accomplishment; -30 days, experience reflected in the past 30 days; -on mission, experience reflected during last mission; *excluding item 20– "Trouble falling or staying asleep".*

Model I. Stepwise Regression of PCL-5 Daytime Symptoms

Table 6 summarized the variables entered into the stepwise regression model to assess our hypothesis, H1, that the PSQI-A accounts for a significant proportion of the variance in PCL-5 daytime symptoms after accounting for alcohol use and the PSQI. VIF ranged between 1.000 and 1.234 indicating our models met the assumption of multicollinearity. Step one consisted of entering the alcohol use variable into the model. Alcohol use did not account for a significant portion of the variance in PCL-5 daytime symptoms (Adjusted. R^2 = -0.005; $F_{[1,29]}$ = 0.863, p = 0.360). Step two entered the PSQI global score into the model. This new model consisted of alcohol use and the PSQI global score as the predictor variables. Step two accounted for a significant increase in the proportion of the variance in PCL-5 daytime symptoms (ΔR^2 = 0.139, p = 0.039). Step three entered the final variable, PSQI-A. This final model included alcohol use, the PSQI global score, and the PSQI-A. Step three accounted for a significant increase in the proportion of the variance in PCL-5 daytime symptoms (ΔR^2 = 0.320, p < 0.000). Our results suggested the PSQI accounted for a significant proportion of the variance in PCL-

5 daytime symptoms after accounting for alcohol use. In addition, the PSQI-A accounted for a significant proportion of the variance in PCL-5 daytime symptoms after controlling for alcohol use and the PSQI.

Table 6. Stepwise Regression Model Summary, Analysis of Variance (ANOVA), and Steps for PCL-5 Daytime Symptoms

Model Summary		R^2	Adj. R^2	ΔR^2	F Change	Sig F Change
Model 1		0.170	-0.005	0.029	0.863	0.360
Model 2		0.410	0.108	0.139	4.677	0.039*
Model 3		0.698	0.431	0.320	16.849	0.000**
ANOVA		SS	df	Mean Square	F	Sig
Model 1	Regression	253.023	1	253.023	0.863	0.360
	Residual	8498.461	29	293.050		
	Total	8751.484	30			
Model 2	Regression	1469.417	2	734.709	2.825	0.076
	Residual	7282.067	28	260.074		
	Total	8751.484	30			
Model 3	Regression	4267.514	3	1422.505	8.566	0.000**
	Residual	4483.970	27	166.073		
	Total	8751.484	30			
Steps and added predictor variable		B	beta	CI		VIF
Step 1: Alcohol Use		0.162	0.170	(-0.195, 0.519)		1.000
Step 2: PSQI Global Score		1.971	0.377	(0.104, 3.838)		1.021
Step 3: PSQI-A		2.812	0.628	(1.407, 4.218)		1.234

Adj. R^2, Adjusted R^2; Sig., significant value; ANOVA, analysis of variance; SS, sum of squares, df, degrees of freedom; CI, confidence interval; VIF, variance inflation factor; $^{*}p < 0.05$; $^{**}p < 0.01$

Model II. Stepwise Regression of EE

Table 7 summarized the variables entered into the stepwise regression model to assess our hypothesis, H2, that the PSQI global score accounts for a significant proportion of the variance in EE after accounting for alcohol use. VIF ranged between 1.000 and 1.021 indicating our models met the assumption of multicollinearity. Step one consisted of entering the alcohol use variable into the model. Alcohol use did not account

for a significant portion of the variance in EE (Adj. $R^2 = 0.022$; $F_{[1,29]} = 1.668$, $p = 0.270$). Step two entered the PSQI global score into the model. This new model consisted of alcohol use and the PSQI global score as the predictor variables. Step two accounted for a significant increase in the proportion of the variance in EE ($\Delta R^2 = 0.140$, $p = 0.034$). Our analyses supported the hypothesis that PSQI global score accounts for a significant proportion of the variance in EE.

Table 7. Stepwise Regression Steps and Analysis of Variance (ANOVA) Model Summary for EE

Model Summary		R^2	Adj. R^2	ΔR^2	F Change	Sig F Change
Model 1		0.054	0.022	0.054	1.668	0.207
Model 2		0.197	0.140	0.143	4.980	0.034*
ANOVA		SS	df	Mean Square	F	Sig
Model 1	Regression	250.785	1	250.785	1.668	0.207
	Residual	4359.989	29	150.344		
	Total	4610.774	30			
Model 2	Regression	909.201	2	454.601	3.439	0.046*
	Residual	3701.573	28	132.199		
	Total	4610.774	30			
Steps and added predictor variable		B	beta	CI		VIF
Step 1: Alcohol Use		0.161	0.233	(-0.094,0.417)		1.000
Step 2: PSQI Global Score		1.450	0.382	(0.119, 2.781)		1.021

*Adj. R2, Adjusted R2; Sig, significant value; ANOVA, analysis of variance; SS, sum of squres; df, degrees of freedom; CI, confidence interval; VIF, variance inflation factor; *p < 0.05*

Model III. to V. Independent *t* Test of iHAW Health Behaviors On- and Off-mission

To examine the health behavior hypothesis family, H3, H4, and H5, an independent t-test was performed for each hypothesis. Given the small sample size of the current study, test of homogeneity was omitted and bootstrapped confidence intervals without assuming equal variances using 1,000 iterations and a 0.05 significance level was

reported to account for a more robust standard error. Upon examining the mean difference and the bootstrapped confidence interval, we concluded that there is no significant difference between the mean PSQI global scores (H3) nor alcohol (H4) or marijuana use (H5) for iHAWs on or off mission (Table 8). Table 8 summarized the statistical findings for the health behavior hypothesis family H3 through H5.

Table 8. Bootstrap for Independent Samples Test – PSQI, alcohol, and Marijuana Use On vs Off Assignment

Hypothesis	Model		Mean Difference	Bias	S.E.	95% CI	
						Lower	Upper
3	III.	PSQI Global Score	-.491	-.034	1.185	-2.949	1.679
4	IV.	Alcohol use	2.2333	0.0626	1.7126	-0.9816	5.6492
5	V.	Marijuana use	-0.226	0.007	0.091	-0.396	-0.038

S.E., standard errors; CI, confidence interval.

Spearman Regression Findings

Table 9 summarized the spearman regression results for the career length hypothesis family which postulated length of aid-working career length is significantly positively correlated with PSQI component score one through seven, the PSQI global score, EE, DP, PA, the PCL-5 global score, and the PCL-5 symptom categories B through E. Using the FDR procedure, we ranked the *p*-values of all 16 hypothesis tests under the career length hypothesis family. H6.5 was the first and highest ranked *p*-value ($p = 0.003$) to satisfy the FDR controlled alpha level at 0.05 as

$$p_{(1)} = 0.003 \leq \frac{1}{16} 0.05 = 0.003.$$

Thus, we rejected hypotheses under the career length hypothesis family with *p*-value less than or equal to 0.003. Based on the FDR-controlled alpha level, PSQI component five, sleep disturbance, had a moderate positive correlation with iHAW career

length in years (ρ = 0.451, p = 0.003). Using the FDR-adjusted alpha instead of an alpha value of 0.05, we failed to reject H6.3, PSQI component three sleep duration (ρ = 0.315, p = 0.042) and H6.8, PSQI global score (ρ = 0.331, p = 0.032) that would otherwise have not been rejected under a 0.05 alpha value. We rejected all other hypotheses under the career length hypothesis family.

Table 9. Spearman Rho's Correlation Table – Aid Worker Career Length

Hypothesis	Variable		Mission Length (months)	Aid Length (years)	Hypothesis	Variable		Mission Length (months)	Aid Length (years)
H6.1	PSQI Component 1 sleep quality	ρ	.127	.282	H7.1	EE	ρ	.039	.011
		Sig.	.423	.070			Sig.	.815	.948
		N	42	42			N	39	39
		CI(L)	-.170	-.015			CI(L)	-.319	-.298
		CI(U)	.394	.555			CI(U)	.389	.317
H6.2	PSQI Component 2 sleep latency	ρ	.260	.152	H7.2	DP	ρ	-.171	.019
		Sig.	.097	.337			Sig.	.298	.907
		N	42	42			N	39	39
		CI(L)	-.007	-.177			CI(L)	-.437	-.319
		CI(U)	.510	.431			CI(U)	.121	.344
H6.3	PSQI Component 3 sleep duration	ρ	-.018	.315*	H7.3	PA	ρ	-.162	-.100
		Sig.	.910	.042			Sig.	.323	.545
		N	42	42			N	39	39
		CI(L)	-.356	-.009			CI(L)	-.505	-.421
		CI(U)	.352	.607			CI(U)	.232	.232
H6.4	PSQI Component 4 sleep efficiency	ρ	-.030	.111	H8.1	PCL-5 Global Score	ρ	.196	.217
		Sig.	.851	.486			Sig.	.274	.226
		N	42	42			N	33	33
		CI(L)	-.359	-.222			CI(L)	-.222	-.165
		CI(U)	.317	.421			CI(U)	.593	.580
H6.5	PSQI Component 5 sleep disturbance	ρ	.161	.451**	H8.2	PCL-5 B	ρ	.138	.171
		Sig.	.308	.003			Sig.	.443	.342
		N	42	42			N	33	33
		CI(L)	-.123	.181			CI(L)	-.303	-.194
		CI(U)	.413	.671			CI(U)	.527	.497
H6.6	PSQI Component 6 sleep medication	ρ	.086	.232	H8.3	PCL-5 C	ρ	.187	.193
		Sig.	.588	.139			Sig.	.296	.282
		N	42	42			N	33	33
		CI(L)	-.227	-.066			CI(L)	-.182	-.177
		CI(U)	.419	.527			CI(U)	.526	.574

H6.7	PSQI Component 7 daytime disturbance	ρ	.068	.069	H8.4	PCL-5 D	ρ	.161	.253
		Sig.	.670	.664			Sig.	.372	.156
		N	42	42			N	33	33
		CI(L)	-.237	-.228			CI(L)	-.212	-.125
		CI(U)	.371	.366			CI(U)	.503	.617
H6.8	PSQI Global Score	ρ	.128	.331*	H8.5	PCL-5 E	ρ	.230	.156
		Sig.	.419	.032			Sig.	.198	.385
		N	42	42			N	33	33
		CI(L)	-.189	.000			CI(L)	-.148	-.240
		CI(U)	.447	.605			CI(U)	.613	.528

*PSQI, Pittsburgh Sleep Quality Index; PCL-5, PTSD checklist for DSM-5, B, PCL-5 symptom category B intrusion; C, PCL-5 symptom category C avoidance; D, , PCL-5 symptom category D negative mood and cognition; E, , PCL-5 symptom category E hyperarousal; Sig, Significance; CI(L), lower limit of confidence interval; CI(U), upper limit of confidence interval; *p<0.05; **p<0.003.*

Table 10 summarized the spearman regression results for the sleep disturbance hypothesis family which postulated the PSQI component five, sleep disturbance, is positively correlated with the PCL-5 cluster B intrusion symptoms (H9.1), C avoidance symptoms (H9.2), D negative mood and cognition symptoms (H9.3), E hyperarousal symptoms (H9.4), PCL-5 global score (H9.5), EE (H10.1), and DP (H10.2) Furthermore, H10.3 hypothesized that the PSQI component five score, sleep disturbance, is negatively correlated with PA. Using the FDR procedure, we ranked the *p*-values of all eight hypothesis tests under the sleep disturbance hypothesis family. H9.1 was the fifth and highest ranked *p*-value ($p = 0.004$) to satisfy the FDR controlled alpha level at 0.05 as

$$p_{(5)} = 0.004 \leq \frac{5}{8}0.05 = 0.03.$$

Thus, we rejected our hypotheses under the sleep disturbance hypothesis family with *p*-value less than or equal to 0.03. Based on the FDR-controlled alpha level, PSQI component five, sleep disturbance, had a moderate positive correlation with PCL-5 cluster B intrusion symptoms (H9.1; $\rho = 0.488$, $p = 0.004$), PCL-5 cluster C avoidance symptoms (H9.2; $\rho = 0.515$, $p = 0.002$), PCL-5 cluster D negative mood and cognition symptoms (H9.3; $\rho = 0.623$, $p = 0.000$), PCL-5 cluster E hyperarousal symptoms excluding item 20– "Trouble falling or staying asleep" (H9.4; $\rho = 0.541$, $p = 0.000$), and PCL-5 global score excluding item 20– "Trouble falling or staying asleep" (H9.5; $\rho = 0.634$, $p = 0.000$). There was no significant correlation between PSQI component five, sleep disturbance, and EE (H10.1; $\rho = 0.288$, $p = 0.075$), H10.2, DP (H10.2; $\rho = 0.162$, $p = 0.324$), nor PA (H10.3; $\rho = -0.297$, $p = 0.066$).

Table 10. Spearman Rho's Correlation Table – PSQI

Variable		PSQI Comp1	PSQI Comp2	PSQI Comp3	PSQI Comp4	PSQI Comp5	PSQI Comp6	PSQI Comp7	PSQI Global	PSQI-A
PCL-5 B	ρ	.437*	.281	-.023	.080	.488**	.152	.192	.372*	.754*[b]
	Sig.	.011	.113	.900	.657	.004	.398	.285	.033	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.078	-.074	-.389	-.262	.170	-.201	-.155	.032	.546
	CI(U)	.739	.586	.326	.450	.731	.470	.498	.665	.880
PCL-5 C	ρ	.276	.154	.028	.056	.515**	.236	.357*	.363*	.654*
	Sig.	.120	.394	.879	.758	.002	.186	.041	.038	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	-.070	-.232	-.304	-.297	.160	-.148	.014	.034	.431
	CI(U)	.602	.532	.310	.432	.758	.583	.644	.673	.813
PCL-5 D	ρ	.405*	.194	.072	.126	.623**	.151	.452*	.435*	.726*
	Sig.	.020	.280	.690	.486	.000	.400	.008	.011	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.088	-.208	-.239	-.226	.380	-.219	.157	.132	.545
	CI(U)	.668	.559	.375	.462	.786	.496	.715	.682	.870
PCL-5 E	ρ	.323	.167	.111	.100	.541**[a]	.138	.396*	.279[a]	.696*
	Sig.	.066	.352	.538	.580	.001	.443	.023	.116	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	-.012	-.176	-.222	-.270	.262	-.218	.087	-.082	.453
	CI(U)	.608	.510	.429	.443	.751	.469	.679	.568	.847
PCL-5 Global	ρ	.428*	.235	.099	.151	.634**[a]	.173	.396*	.456* [a]	.769*
	Sig.	.013	.188	.583	.403	.000	.336	.023	.008	.000
	N	33	33	33	33	33	33	33	33	31
	CI(L)	.115	-.162	-.248	-.207	.387	-.220	.087	.122	.576
	CI(U)	.697	.591	.417	.471	.793	.508	.672	.718	.874
EE	ρ	.310	.073	-.011	.052	.288	.004	.512*	.246	.391*
	Sig.	.055	.659	.947	.755	.075	.980	.001	.132	.030
	N	39	39	39	39	39	39	39	39	31
	CI(L)	-.006	-.272	-.310	-.281	-.060	-.384	.323	-.099	.043

	CI(U)	.623	.417	.300	.391	.581	.328	.672	.571	.638
DP	ρ	.243	.041	-.040	.039	.162	-.137	.482*	.148	.429*
	Sig.	.136	.806	.807	.814	.324	.405	.002	.369	.016
	N	39	39	39	39	39	39	39	39	31
	CI(L)	-.090	-.278	-.369	-.281	-.184	-.455	.269	-.217	.037
	CI(U)	.565	.357	.299	.348	.483	.179	.668	.502	.712
PA	ρ	.047	-.172	-.061	-.116	.297	-.261	-.449*	-.010	-.164
	Sig.	.777	.296	.710	.482	.066	.108	.004	.954	.377
	N	39	39	39	39	39	39	39	39	31
	CI(L)	-.234	-.475	-.290	-.423	-.007	-.486	.128	-.284	-.515
	CI(U)	.394	.159	.188	.259	.549	-.007	.736	.316	.188

*PSQI, Pittsburgh Sleep Quality Index; PCL-5, PTSD checklist for DSM-5, B, PCL-5 symptom category B intrusion; C, PCL-5 symptom category C avoidance; D, , PCL-5 symptom category D negative mood and cognition; E, , PCL-5 symptom category E hyperarousal; PSQI-A, PSQI addendum for PTSD; EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; Sig, Significance; CI(L), lower bound of confidence interval; CI(U), upper bound of confidence interval; *p<0.05; **p<0.03, [a] exclude item 20– "Trouble falling or staying asleep"; [b] exclude item 2– "Repeated, disturbing dreams of the stressful experience".*

In addition to our hypotheses, we examined the significance in the association between variables in Table 10 using the same FDR control procedure for a 0.05 alpha level. Using an FDR-adjusted *p*-value of 0.0125, we found that there were significant positive correlations between the PSQI global score and the PCL-5 global score (ρ = 0.456, p = 0.008) as well as the PCL-5 cluster D negative mood and cognition symptoms (ρ = 0.435, p = 0.011). Based on an FDR-adjusted *p*-value of 0.044, there were significant positive correlations between the PSQI component seven, daytime disturbance, and the PCL-5 global score (ρ = 0.456, p = 0.008), PCL-5 cluster C avoidance symptoms (ρ = 0.357, p = 0.041), PCL-5 cluster D negative mood and cognition symptoms (ρ = 0.452, p = 0.008), PCL-5 cluster E hyperarousal symptoms (ρ = 0.396, p = 0.023), EE (ρ = 0.512, p = 0.001), and DP (ρ = 0.482, p = 0.002). There was also a significant negative association between PSQI component seven, daytime disturbance, and PA (ρ = -0.449, p = 0.004). Finally, with an FDR-adjusted *p*-value of 0.044, we also found significant positive correlations between the PSQI-A and the PCL-5 global score (ρ = 0.769, p = 0.000), PCL-5 cluster B intrusion symptoms excluding item 2– "Repeated, disturbing dreams of the stressful experience" (ρ = 0.754, p = 0.000), PCL-5 cluster C avoidance symptoms (ρ = 0.654, p = 0.000), PCL-5 cluster D negative mood and cognition symptoms (ρ = 0.726, p = 0.000), PCL-5 cluster E hyperarousal symptoms (ρ = 0.696, p = 0.000), EE (ρ = 0.391, p = 0.030), and DP (ρ = 0.429, p = 0.016).

Table 11 summarized the spearman regression results for the mental health hypothesis family which postulated that the PCL-5 global score is positively correlated with EE (H11.1), DP (H11.2), and negatively correlated with PA (H11.3). Using the FDR procedure, we ranked the *p*-values of all three hypothesis tests under the mental health

hypothesis family. H11.1 was the first and highest ranked *p*-value ($p = 0.001$) to satisfy the FDR-controlled alpha level at 0.05 as

$$p_{(1)} = 0.001 \leq \frac{1}{3}0.05 = 0.017.$$

Thus, we rejected our null hypotheses under the mental health hypothesis family with *p*-value less than or equal to 0.017. Based on the FDR-adjusted alpha level, the PCL-5 global score has a moderate positive correlation with EE ($\rho = 0.531$, $p = 0.001$). We failed to reject the null hypothesis for H11.2 and H11.3.

Table 11. Spearman Rho's Correlation Table – PCL-5 and Burnout

Variables		Emotional Exhaustion	Depersonalization	Personal Accomplishment
PCL-5	ρ	.531*	.339	-.270
	Sig.	.001	.053	.129
	N	33	33	33
	CI(L)	.219	-.021	-.625
	CI(U)	.738	.651	.146

*PCL-5, PTSD checklist for DSM-5; Sig, Significance; CI(L), lower bound of confidence interval; CI(U), upper bound of confidence interval; *p<0.017.*

Table 12 summarized findings to our hypotheses under all hypothesis families. Based on the current study, after accounting for alcohol use, the PSQI explained a significant proportion of the variance in PCL-5 daytime symptoms among iHAWs. The PSQI-A further explained a significant proportion of the variance in PCL-5 daytime symptoms after accounting for the PSQI and alcohol use. The PSQI also explained a significant proportion of the variance in EE after accounting for alcohol use. Looking at the relationship between iHAW career length and the seven PSQI components, the PSQI component five, sleep disturbance, had a significant positive correlation with iHAW career length. When focusing on PSQI component five, sleep disturbance, we found

significant positive correlations with the PCL-5 global score as well as each individual symptom cluster that made up the PCL-5 global score. Finally, there was a positive association between the PCL-5 global score and EE. There was no significant difference in the PSQI global score, alcohol use, nor marijuana use among iHAW on- and off-mission.

Table 12. Summary of Current Study Findings

Hypothesis Family	Hypothesis	Finding
A	H1*	The PSQI accounted for a significant proportion of the variance in PCL-5 daytime symptoms after controlling for alcohol use. Further, the PSQI-A accounted for a significant proportion of the variance in PCL-5 daytime symptoms after controlling for alcohol use and the PSQI.
	H2*	The PSQI accounted for a significant proportion of variance in EE among iHAWs after controlling for alcohol use.
B	H3	There is no significant difference between on mission or off mission PSQI score among iHAWs.
	H4	There is no significant difference between on mission or off mission alcohol use among iHAWs.
	H5	There is no significant difference between on mission or off mission marijuana use among iHAWs.
C	H6.1	We do not find a significant positive correlation between iHAW career length and the PSQI component one, subjective sleep quality.
	H6.2	We do not find a significant positive correlation between iHAW career length and the PSQI component two, sleep latency.
	H6.3	We do not find a significant positive correlation between iHAW career length and the PSQI component three, sleep duration.
	H6.4	We do not find a significant positive correlation between iHAW career length and the PSQI component four, sleep efficiency.
	H6.5*	There is a significant positive correlation between iHAW career length and the PSQI component five, sleep disturbance.
	H6.6	We do not find a significant positive correlation between iHAW career length and the PSQI component six, sleep medication.
	H6.7	We do not find a significant positive correlation between iHAW career length and the PSQI component seven, daytime disturbance.
	H7.1	We do not find a significant positive correlation between iHAW career length and EE.
	H7.2	We do not find a significant positive correlation between iHAW career length and DP.
	H7.3	We do not find a significant positive correlation between iHAW career length and PA.
	H8.1	We do not find a significant positive correlation between iHAW career length and the PCL-5 global score.
	H8.2	We do not find a significant positive correlation between iHAW career length and the PCL-5 cluster B intrusion symptoms.

	H8.3	We do not find a significant positive correlation between iHAW career length and the PCL-5 cluster C avoidance symptoms.
	H8.4	We do not find a significant positive correlation between iHAW career length and the PCL-5 cluster D negative mood and cognition symptoms.
	H8.5	We do not find a significant positive correlation between iHAW career length and the PCL-5 E hyperarousal symptoms.
D	H9.1*	There is a significant positive correlation between the PSQI component five, sleep disturbance, and the PCL-5 cluster B intrusion symptoms.
	H9.2*	There is a significant positive correlation between the PSQI component five, sleep disturbance, and the PCL-5 cluster C avoidance symptoms.
	H9.3*	There is a significant positive correlation between the PSQI component five, sleep disturbance, and the PCL-5 cluster D negative mood and cognition symptoms.
	H9.4*	There is a significant positive correlation between the PSQI component five, sleep disturbance, and the PCL-5 cluster E hyperarousal symptoms excluding item 20– "Trouble falling or staying asleep".
	H9.5*	There is a significant positive correlation between the PSQI component five, sleep disturbance, and the PCL-5 global score.
	H10.1	We do not find a significant positive correlation between the PSQI component five, sleep disturbance, and EE.
	H10.2	We do not find a significant positive correlation between the PSQI component five, sleep disturbance, and DP.
	H10.3	We do not find a significant positive correlation between the PSQI component five, sleep disturbance, and PA.
E	H11.1*	There is a significant positive correlation between the PCL-5 global score and EE.
	H11.2	We do not find a significant positive correlation between the PCL-5 global score and DP.
	H11.3	We do not find a significant positive correlation between the PCL-5 global score and PA.

*PCL-5, PTSD checklist for DSM-5; PSQI, Pittsburgh Sleep Quality Index; PSQI-A, PSQI addendum for PTSD; EE, Emotional Exhaustion; DP, Depersonalization; PA, Personal Accomplishment; *Hypothesis with significant finding.*

Chapter IV.

Discussion

The current study investigated the relationship between two health behaviors, alcohol use and sleep disturbance, measured by the PSQI and the PSQI-A, with two commonly observed mental health problems seen among iHAWs, PTSS, measured by the PCL-5 daytime symptoms, and EE, measured by the MBI. Stepwise regression analyses indicated sleep disturbance, measured by the PSQI global score, accounted for a significant proportion of variance in PCL-5 daytime symptoms after accounting for alcohol use. In addition, the stepwise regression analysis showed that PTSD-specific sleep disturbance, measured by PSQI-A, was significantly associated with PCL-5 daytime symptoms after controlling for PSQI and alcohol use. The PSQI was also significantly correlated with EE after controlling for alcohol use. We did not find any significant difference in on- and off-mission sleep disturbance, alcohol use, nor marijuana use among iHAWs. However, there was a significant correlation between iHAW career length and the PSQI component five, sleep disturbance. Significant correlations were also found between the PSQI component five, sleep disturbance, and the PCL-5 global score, the PCL-5 symptom cluster B intrusion symptoms, cluster C avoidance symptoms, cluster D negative mood and cognition symptoms, and cluster E hyperarousal symptoms. No associations between the PSQI component five and EE, DP, and PA, measured by the MBI, were found. Nonetheless, there was a significant positive correlation between EE and the PCL-5 global score.

Sleep disturbance, measured by the PSQI, was significantly positively correlated with the PCL-5 daytime symptoms among iHAWs after accounting for alcohol use. In addition, PTSD-specific sleep disturbance, measured by the PSQI-A, was also positively correlated with the PCL-5 daytime symptoms after controlling for the PSQI and alcohol use. Furthermore, sleep disturbance was significantly associated with EE among the present iHAW sample after controlling for alcohol use. The current findings are consistent with a large body of research conducted among various populations such as first responders, emergency response professionals, and the military personnel (Khan et al., 2020; Messman et al., 2023; Slavish et al., 2022; Wolkow et al., 2019). However, to our understanding no research on the relationship between sleep disturbance and PTSS or EE had been conducted among iHAWs. PTSS and burnout are two commonly reported adverse mental health challenges outside of hazardous alcohol consumption among iHAWs (Connorton et al., 2012; De Jong et al., 2021; Jachens, 2019; Jachens et al., 2016, 2019; Lopes Cardozo et al., 2012; Macpherson & Burkle, 2021; Surya et al., 2017). The current study indicated sleep disturbance could be an overlapping problematic behavior associated with the severity of these commonly observed mental health problems.

What's more, our data suggested that there were no significant differences in iHAW on- and off-mission health behaviors, sleep disturbance, alcohol use, or marijuana use. This showed that iHAWs experience similar levels of sleep disturbances even when they are no longer exposed to environments or working conditions that often disrupt sleep or encourage maladaptive coping behaviors. Taken together, behavioral interventions focused on sleep or alcohol use, particularly when iHAWs are off mission, could be a needed and potential avenue to improve iHAW wellbeing.

Our current findings indicated that the longer iHAWs worked in international humanitarian aid, the more likely they experienced sleep disturbance, specifically measured by the PSQI component five sleep disturbance. Such association should be alarming to the aid community given a plethora of research have connected sleep disturbance to mental health problems (Feldman et al., 2021; Gates et al., 2018; Philibert, 2005; Slavish et al., 2022; Trockel et al., 2020; Vela-Bueno et al., 2008). This relationship was also observed in the current study where the PSQI component five, sleep disturbance, was positively correlated with the PCL-5 global score as well as each individual PCL-5 symptom cluster, namely cluster B intrusion symptoms, cluster C avoidance symptoms, cluster D negative mood and cognition symptoms, and cluster E hyperarousal symptoms. However, given the cross-sectional and retrospective nature of the current study, we could not determine the temporal association between one's career length, sleep quality, and mental health outcomes. Nonetheless, this study provided an initial understanding of the potential connection. Humanitarian work, like that of first responders, medical professionals, or military personnel, is often not conducive to quality sleep due to the emergency or shift-work aspect of the job. It is possible that the length of one's career in similar job categories leads to poor sleep, which serves as a gateway to subsequent adverse mental health problems. Future research into evidence-based thresholds measured by career length and sleep quality could potentially serve as an early warning sign for preventative interventions to avert mental health problems in careers related to emergency or humanitarian response.

Within individual components of the PSQI, namely subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication, and daytime

disturbance, those who scored higher on sleep disturbance, component five, were more likely to report higher PTSS severity, measured by the PCL-5, under all symptom clusters. In addition, the PSQI component seven, daytime disturbance, was also positively associated with PTSS severity, EE, DP, and negatively associated with PA, measured by the MBI. Previous research had advocated for utilizing a multidimensional structure of the PSQI such as the three-factor scoring model in assessing health outcomes to avoid overlooking significant sleep impairment only present in specific PSQI factors (Casement et al., 2012; Cole et al., 2006). These three factors are 1) sleep efficiency, composed by the PSQI sleep duration and sleep efficiency components; 2) perceived sleep quality, composed by the PSQI subjective sleep quality, sleep latency, and sleep medication components; and 3) daily disturbances, measured by the PSQI sleep disturbance and daytime disturbance components (Casement et al., 2012; Cole et al., 2006). A cross-sectional study of 513 nurses in China found the third factor, daily disturbances, increased significantly among those who had previously worked in a shiftwork capacity (Zhang et al., 2016). Among 802 trauma-exposed firefighters, PTSD symptom severity was also significantly related to high daily disturbances as composed by the PSQI sleep disturbance and daytime disturbance components (Healy & Vujanovic, 2021). The current study corroborated previous findings in which PTSS is significantly related to specific PSQI sleep disturbance and daytime disturbance components identified as the daily disturbances factor. It is possible that among those working in shiftwork or emergency response, those who experience more severe PTSS are more likely to report sleep problems categorized under the daily disturbances factor. Thus, targeted interventions to improve sleep disturbance and daytime disturbance might be helpful for

iHAWs suffering from PTSS yet hesitant to seek care as a first step towards mental health improvement.

When looking at the relationship between EE and PTSS, measured by the MBI and PCL-5 respectively, the more iHAWs experienced EE the more likely they were to report higher severity of PTSS. Past studies repeatedly found associations between burnout and PTSD in which some suggested burnout to be a risk factor to the subsequent development of PTSD and others posited burnout mediates the relationship between stress and PTSD (Dubravka et al., 2016; Hilton et al., 2022; Joshi & Sharma, 2020; Li et al., 2021; Wolkow et al., 2019; Yang et al., 2022). In 2019, Wolkow and colleagues conducted a cross-sectional study examining the relationship between sleep disturbances, mental health outcomes, and burnout among 6,307 firefighters (Wolkow et al., 2019). They found those with a mental health diagnosis such as PTSD, anxiety, or depression were at a greater risk of EE while having slept during overnight work ameliorated the impact of high burnout. While the direction of relationship between EE and PTSS is still unclear, the adverse impact of experiencing both EE and PTSS on one's wellbeing is unequivocal. In addition to the negative consequences to one's wellness, studies also found burnout and mental health problems to impact one's performance, standards of work, and work quality in the workplace (Maslach, 2018). This creates tangible economic loss to organizations and even industries with employees identified at high risk of experiencing burnout and adverse mental health problems (Kessler et al., 2011; Neill et al., 2022). As such, the current study provided additional evidence to incentivize humanitarian organizations in confronting an unfortunately ubiquitous challenge endured by many iHAWs.

Surprisingly, we did not find alcohol use significantly explained the variance in PCL5- daytime symptoms nor EE. Among participants who provided feedback in the qualitative section of the survey, those who commented on alcohol use all reported heavier alcohol consumption as a way to cope with the stress of working in the field. This corroborated the findings of a 2016 UNHCR report where alcohol use was not correlated with PTSD diagnosis but was positively associated with EE and negatively associated with PA (Dubravka et al., 2016). However, according to research investigating the relationship between alcohol use and PTSS among 639 firefighters, both PTSS and severity of sleep disturbance were associated with alcohol use and using alcohol as a way to cope (Smith et al., 2018). Additionally, Smith and colleagues found that PTSS severity was associated with alcohol-use severity and a tendency to use alcohol for coping, particularly when significant sleep disturbance was present. It is possible that there is an interaction effect between sleep disturbance and alcohol use in relation to PTSS severity. Unfortunately, given the current study design and small sample size, such interaction was not examined. The retrospective and subjective-report nature of the current study might obscure participants' alcohol use and its relationship to their experience in burnout or PTSS. For example, one might have acquired a healthier way of coping depending on one's humanitarian career length. One participant noted drinking much more at the start of their career compared to 20 years later. Overall, future research should continue to assess the role of sleep disturbance in PTSS, alcohol use and burnout using a larger sample size and a prospective study design.

In 2012, the Norwegian court ruled the Norwegian Refugee Council liable for its Canadian staff's kidnapping and injury in Kenya and emphasized an aid organization's

legal responsibility to protect staff against reasonably foreseeable risks regardless of one's nationality or mission location (Merkelbach & Kemp, 2016). This case highlighted aid organizations' ethical and legal responsibility of duty to care in preparing for and mitigating the adverse impact of working in environments that are complex, stressful, and at times dangerous (Broussard et al., 2019; Merkelbach & Kemp, 2016). Adverse impacts should include both the physical and psychological harm that comes with the humanitarian work condition. Based on the qualitative (comment) section of the current study, participants reported receiving no or minimal direct mental health support from employers and some expressed improved mental health only after a longer time away from assignments. In 2016, UNHCR reported 48% of its staff recognized the need for mental health care whereas only 26% of these staff spoke to a counselor (Dubravka et al., 2016). This means only 12% of the UNHCR staff received mental health care while 23% to 31% were urged to contact mental health services for anxiety, depression, PTSD, burnout, or hazardous alcohol use (Dubravka et al., 2016). Even though duty to care has been a popular concept among the humanitarian community, actions to increase the reach of care continues to be a struggle and novel non-stigmatizing approaches to encourage care could benefit those who are hesitant to seek care.

Across studies, there was a consensus that the main barrier to seeking care was stigma towards mental health where one feared to be perceived as weak or uncommitted (Cockcroft-McKay & Eiroa-Orosa, 2021; Dubravka et al., 2016; Macpherson & Burkle, 2021; Stevens et al., 2022). Such fear unfortunately is sometimes warranted since Cockcroft and colleagues found both real and perceived repercussions upon seeking mental health care including impact on professional relationships with peers and career

progression (Cockcroft-McKay & Eiroa-Orosa, 2021). De-stigmatizing mental health care can be an important yet arduous process. Therefore, while organizations work on shifting the cultural stigma around mental health, providing a non-stigmatizing avenue for recognizing the need to seek care through the lens of sleep health optimization, particularly when one is on break between missions, might be needed as an interim step.

As the current study suggested, sleep disturbance was significantly correlated with iHAW's career longevity, PTSS, and burnout. The humanitarian community has repeatedly called for efforts to identify risk factors, health behaviors, and probable sources of stress that impact mental health problems associated with humanitarian work (Jachens, 2019; Macpherson & Burkle, 2021). However, our understanding of sleep, a genetically hardwired behavior that directly contributes to one's well-being and experience of chronic stress, among the humanitarian community is limited. To our knowledge, this is the first study to investigate in depth the iHAWs' experience in sleep disturbances as well as its association with common aid-work-related mental health concerns. Ergo, more research is needed.

While the current study focused on iHAWs, it is important to acknowledge that more than 90% of the humanitarian workforce consists of national staff who often are directly exposed to the emergency event itself in addition to the humanitarian work they have taken on (Active Learning Network for Accountability and Performance in Humanitarian (ALNAP), 2022). There is often a difference in stressors and mental health outcomes observed between national and international staff. For example, international staff were identified to be at a higher risk for hazardous alcohol use compared to national staff (Dubravka et al., 2016). Therefore, we decided to focus on iHAWs for the current

study. Nonetheless, studies found that symptoms of mental illness among national staff is often as high as those living in internally displaced persons camps during active conflict (Ager et al., 2012). UNHCR also reported national staff were at a higher risk for PTSD compared to international staff (Dubravka et al., 2016). As a result, future efforts to investigate national staff's cultural attitude towards sleep health and the relationship between sleep and mental health problems among national staff cannot be neglected.

Limitations

While, to our knowledge, this is the first study to comprehensively examine the relationship between different aspects of sleep disturbance and various mental health concerns within the iHAW population, there are a few limitations in this study that might have led to less reliable results. First and foremost, the current study is not well-powered due to small sample size. Even though steps were taken to ensure a more robust estimate of standard error such as bootstrapping, which is more sensitive to small sample sizes, the resampled bootstrap dataset is still performed based on the original sample and therefore might not be representative of the population's true characteristics and variability. The current study is exploratory in nature. As a result, a well-powered study based on the current hypothesis generating findings is the next step for investigation. Second, the study design is retrospective in nature. Therefore, recall bias might obscure the true relationship between variables. Furthermore, selection bias might also be present whereby respondents that chose to participate in and finish the survey may have had certain characteristics or experiences. There is also a temporal ambiguity among the relationships between variables in the current retrospective study and therefore causality cannot be generalized.

Future Directions

Despite the limitations, this study provided a glimpse into the potential role sleep plays in common mental health complaints among iHAWs. Given the mental health stigma permeating the humanitarian community, promoting sleep health could be an alternative route of improving iHAW health and wellness as the community continues to normalize mental health stigma. One of the reasons for the small sample size in this study is the length of the survey. While 100 people participated in the study, only 31 completed the entire survey. Since long surveys could deter survey completion, subsequent studies could focus on using the PSQI and the PSQI-A, two instruments found to significantly account for the variance in PTSS and burnout in the current study, to assess for sleep disturbance. This could shorten survey length, encourage survey completion, and increase the sample size and statistical power. Furthermore, a longitudinal assessment of the temporal relationship between sleep disturbance with burnout and PTSS could provide humanitarian organizations insight into whether and when to include a mandatory sleep hygiene guideline or psychoeducation during pre- or post-deployment debriefing. This is important since Cockcroft and colleagues found that standardized, systematic, and mandatory support mechanisms likely encourage staff in seeking support when needed (Cockcroft-McKay & Eiroa-Orosa, 2021). Additionally, given the stigma within the humanitarian community, a softening of language in sleep health psychoeducation is particularly important (Cockcroft-McKay & Eiroa-Orosa, 2021; Shriane et al., 2023). Finally, while this study focused on iHAW, understanding the impact of sleep quality on burnout and PTSS among national staff cannot be overlooked. Overall, there is a

significant lack of understanding on the topic of sleep and mental health among both international and national aid workers and more research is warranted.

Appendix 1.

Demographics Information

1. Have you ever worked in an environment where you had to communicate using English?
   - ☐ Yes
   - ☐ No
2. When was the last time you went on a mission as an international humanitarian aid worker?
   - ☐ 2022
   - ☐ 2021
   - ☐ 2020
   - ☐ 2019
   - ☐ 2018
   - ☐ Before 2018
   - ☐ Never
3. Current Age: _____
4. Sex
   - ☐ Male
   - ☐ Female v
   - ☐ Prefer not to answer
5. What is your country of origin? _____
6. What is your religion?
   - ☐ Muslim
   - ☐ Christianity
   - ☐ Judaism
   - ☐ Buddhism
   - ☐ Others. Please Specify _____
7. What was the location of the previous mission you went on? _____
8. What was the length of your previous mission? _____Months
9. What was your job title during your previous mission? _Volunteer_____
10. How long have you been working as an international humanitarian aid worker? ____Months _____Years
11. Have you directly or indirectly experienced any traumatic experiences such as natural disaster, sexual assault, physical assault, combat or exposure to war zone, severe human suffering, life threatening illness or injury before becoming an international humanitarian aid worker?
12. Have you directly or indirectly experienced any traumatic experiences such as natural disaster, sexual assault, physical assault, combat or exposure to war zone, severe human suffering, life threatening illness or injury during your time working as an international humanitarian aid worker?

Appendix 2.

Pittsburgh Sleep Quality Index

Instructions: The following questions relate to your usual sleep habits during the *last month of your humanitarian assignment* only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the *last month of your humanitarian assignment*,

1. When have you usually gone to bed? _____
2. How long (in minutes) has it taken you to fall asleep each night? _____
3. When have you usually gotten up in the morning? _____
4. How many hours of actual sleep did you get that night? (This may be different than the number of hours you spend in bed) _____

5. During the ***last month of your humanitarian assignment***, how often have you had trouble sleeping because you…	Not during the past month (0)	Less than once a week (1)	Once or twice a week (2)	Three or more times a week (3)
a. Cannot get to sleep within 30 minutes				
b. Wake up in the middle of the night or early morning				
c. Have to get up to use the bathroom				
d. Cannot breathe comfortably				
e. Cough or snore loudly				
f. Feel too cold				
g. Feel too hot				
h. Have bad dreams				
i. Have pain				
j. Other reason(s), please describe, including how often you have had trouble sleeping because of this reason(s):				
6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
	Very good (0)	Fairly good (1)	Fairly bad (2)	Very bad (3)
9. During the past month, how would you rate your sleep quality overall?				

Appendix 3.

Maslach Burnout Inventory

How do you perceive your work? Are you exhausted? How capable are you of shaping your relationship to others? To what degree are you personally fulfilled? Indicate how frequently the following statements apply to you and add the points indicated on top of the respective box:

0 = Never
1 = At least a few times a year
2 = At least once a month
3 = Several times a month
4 = Once a week
5 = Several times a week
6 = Every day

	0	1	2	3	4	5	6
1 – I feel emotionally exhausted because of my work							
2 – I feel worn out at the end of a working day							
3 – I feel tired as soon as I get up in the morning and see a new working day stretched out in front of me							
4 – I can easily understand the actions of my colleagues/supervisors							
5 – I get the feeling that I treat some clients/colleagues impersonally, as if they were objects							
6 – Working with people the whole day is stressful for me							
07 – I deal with other people's problems successfully							
08 – I feel burned out because of my work							
09 – I feel that I influence other people positively through my work							
10. I have become more callous to people since I have started doing this job							
11 – I'm afraid that my work makes me emotionally harder							
12 – I feel full of energy							
13 – I feel frustrated by my work							
14 – I get the feeling that I work too hard							
15 – I'm not really interested in what is going on with many of my colleagues							
16 – Being in direct contact with people at work is too stressful							
17 – I find it easy to build a relaxed atmosphere in my working environment							
18 – I feel stimulated when I been working closely with my colleagues							
19 – I have achieved many rewarding objectives in my work							
20 – I feel as if I'm at my wits'end							
21 – In my work I am very relaxed when dealing with emotional problems							
22 – I have the feeling that my colleagues blame me for some of their problems							

Appendix 4.

PTSD Checklist for DSM-5 (PCL-5)

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the last month of your assignment.

In the past month of your assignment, how much were you bothered by:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated, disturbing, and unwanted memories of the stressful experience?					
2. Repeated, disturbing dreams of the stressful experience?					
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?					
4. Feeling very upset when something reminded you of the stressful experience?					
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?					
6. Avoiding memories, thoughts, or feelings related to the stressful experience?					
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?					
8. Trouble remembering important parts of the stressful experience?					
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?					
10. Blaming yourself or someone else for the stressful experience or what happened after it?					
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?					
12. Loss of interest in activities that you used to enjoy?					
13. Feeling distant or cut off from other people?					

14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?					
15. Irritable behavior, angry outbursts, or acting aggressively?					
16. Taking too many risks or doing things that could cause you harm?					
17. Being "superalert" or watchful or on guard?					
18. Feeling jumpy or easily startled?					
19. Having difficulty concentrating?					
20. Trouble falling or staying asleep?					

Appendix 5.

Pittsburgh Sleep Quality Index Addendum for PTSD

Please answer the following additional questions regarding your sleep in ***your current or the last month of your previous assignment***. Include any observations from your bedpartner/ roommate.

1. During your ***current or the last month of your previous assignment***, how often have you had trouble sleeping because you...

	Not at all (0)	Less than once a week (1)	Once or twice a week (2)	Three or more times a week (3)
a. Feel hot flashes	○	○	○	○
b. Feel general nervousness	○	○	○	○
c. Had memories or nightmares of a traumatic experience	○	○	○	○
d. Had severe anxiety or panic, not related to traumatic memories:	○	○	○	○
e. Had bad dreams, not related to traumatic memories	○	○	○	○
f. Had episodes of terror or screaming during sleep without fully awakening	○	○	○	○
g. Had episodes of "acting out" your dreams, such as kicking, punching, running, or screaming	○	○	○	○

2. If you had memories or nightmares of a traumatic experience during sleep....

	None	Very little	Moderate	Severe
a. How much anxiety did you feel during the memories/nightmares?	○	○	○	○
b. How much anger did you feel during the memories/nightmares?	○	○	○	○

c. What time of night did most memories/ nightmares occur?

Early in the night	Middle of the night	Late night, near morning	No particular time
○	○	○	○

Appendix 6.

Quantity-Frequency Questionnaire

On average, how many alcoholic beverages did you consume on a drinking day while you are ***not*** on humanitarian assignment?

On average, how many days per week did you drink alcoholic beverages while you are ***not*** on humanitarian assignment?

Do you smoke marijuana while you are ***not*** on humanitarian assignment?

- ○ Yes
- ○ No

On average, how many alcoholic beverages did you consume on a drinking day ***during your current or previous assignment***?

On average, how many days per week did you drink alcoholic beverages ***during your current or previous assignment?***

Do you smoke marijuana while you ***are*** on humanitarian assignment?

- ○ Yes
- ○ No

Appendix 7.

Open-ended Commentary

How do you think your humanitarian work experiences might have impacted your sleep health, mental health, or alcohol use? (Optional)

Please be advised to leave out any specific details regarding your experiences during the humanitarian assignment such as names, ID number, or other identifiable information in this section. By leaving out identifiable information, we could ensure your anonymity and minimize the risk of anyone re-identifying you based on the information provided in this section.

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