

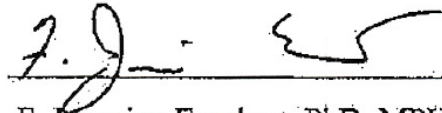
**The Global Impact of COVID-19 on the Mental Health of Healthcare Workers, A
Systematic Review**

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A proposal for a capstone project submitted to the faculty of Radford University

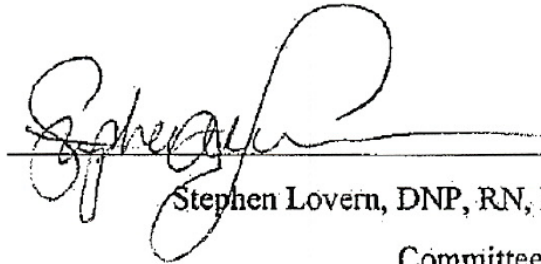
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Abstract

Poor mental health outcomes for healthcare workers (HCWs) have proven to be a critical side effect of the COVID-19 pandemic. As a result of increases in anxiety, stress, and depression rates, many countries have begun studying the effects of COVID-19 on mental health for HCWs; further, causal factors and interventional methods are being identified to potentially alleviate this new public health issue.

The purpose of this study is to conduct a systematic review of published literature from January 2020 through April 2022 to help understand the global impact of COVID-19 on HCWs' mental health. This was accomplished by identifying prevalence rates, affected populations, examining data globally, and discovering causal factors. Relevant studies were identified from several databases using keywords and were rated by two researchers, independent of each other to ensure the validity and quality of studies as well as the unbiased data collection of themes and information.

This review included 25 studies from around the world. Data extraction showed the most common mental health outcomes were anxiety, stress, and depression. Of the 25 studies included in this systematic review, 23 identified the mental health effects of stress, anxiety, and depression. The remaining two studies identified burnout and PTSD. Prevalence rate averages extracted from the studies showed 42.14% anxiety, 37.65% depression, and 51.8% stress. Some of the more frequently mentioned interventional methods were therapy, mindfulness, and self-care.

Findings from this review provide global data on the prevalence of poor mental health outcomes for HCWs, the global need for mental health support for HCWs, and potential methods of intervention. The findings from the review support the need to study interventional method effectiveness and implementation.

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List of Abbreviations

HCW	Healthcare Worker
PTSD	Post Traumatic Stress Disorder
MD	Medical Doctor
FNP	Family Nurse Practitioner
NP	Nurse Practitioner
PA	Physician Assistant
DO	Doctor of Osteopathy
H1N1	Influenza strain H1N1
SARS	Severe Acute Respiratory Disorder
MERS	Middle East Respiratory Syndrome
PPE	Personal Protective Equipment

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Introduction

The year 2020 reminded the world that healthcare workers (HCWs) are indispensable assets and incredibly essential, as they were the front line of care and defense during the COVID-19 pandemic. The World Health Organization (WHO, 2006a) defined HCWs as individuals who work to improve the health of a community and protect individuals from disease. HCWs include physicians, nurses, respiratory therapists, and a myriad of other professionals. WHO reported as of April 2022, 505,035,185 COVID-19 cases had been diagnosed, and there were 6,210,719 confirmed deaths due to COVID-19 (WHO, 2022h). Since the pandemic's beginning, the stress and workload on HCWs have increased dramatically due to increased patient loads caused by COVID-19. HCWs have cared for higher numbers of critically ill COVID-19 patients and acted in place of patients' families as emotional support, company during isolation, and offering comfort in their last hours compared to pre-COVID-19 rates (Lucchini et al., 2020). Due to isolation practices that prohibited families from visiting patients, HCWs stepped in for COVID-19 patients so that they did not suffer or die alone (Maben & Bridges, 2020).

In such a stressful and mentally taxing period in their professional lives, the mental health effect of working during the COVID-19 pandemic is a cause for concern (Sampaio et al., 2020). Studies from Portugal, the Philippines, and China have shown tremendous increases in nurses' and physicians' anxiety and stress levels during the COVID-19 pandemic (Labrague & De Los Santos, 2020; Liu et al., 2020; Sampaio et al., 2020). The rising global numbers of posttraumatic stress disorder (PTSD), traditional stress, anxiety, and depression cases have further made HCWs' mental health a great concern, as these mental health issues can affect an individual's overall quality of life, increase job burnout, and lower their life expectancy (Nasca et al., 2016; Lucchini et al., 2020).

This systematic review will focus on the effects of the COVID-19 pandemic on HCWs' mental health globally regarding PTSD, stress, anxiety, and depression. Viewing the effect of COVID-19 on the mental health of the HCW population from a global perspective is essential because nurses are a global community and disregarding that can be dangerous because pandemics do not respect global borders (Salvage & White, 2020). While the individuals themselves are from distinct cultures and backgrounds, they perform a similar job when they step into the HCW role (Salvage & White, 2020). This review includes studies that are focused on how HCWs' mental health has been affected, a comparison of findings from different areas worldwide to identify ways to decrease the psychological distress, and identifying which factors during the pandemic have contributed to increased distress. By highlighting the mental health impact of the COVID-19 pandemic, employers and advocacy agencies can be made aware of the global mental health ramifications of the pandemic, will be able to offer direct support to HCWs, and avoid mental health tolls in future pandemics.

Background

According to the WHO (2020c), more than 264 million people suffer from depression and mental health issues worldwide. Depression, along with anxiety, is the most common mental disorder in the United States (National Alliance on Mental Illness, 2017). The National Institute of Mental Health (2020) reported that in 2017, 17.3 million adults in the United States had at least one major depressive episode. It has been estimated that one in six adults will suffer from depression at some point in their lives (Centers for Disease Control and Prevention, 2018; Kessler et al., 2005).

Studies have shown that due to the level of stress in their jobs, healthcare providers are at elevated risk for depression and suicide (Burstyn and Holt, 2021; Davidson et al., 2019; Kalmoe et al., 2019). HCWs are experiencing high numbers of depression and anxiety globally. A study among 97,333 HCWs from 21 countries found that there was a high prevalence of depression,

anxiety, and PTSD among the participants (Li et al., 2021). Those who feel symptoms of depression and anxiety are likely to experience other effects. For example, increased stress and taxation on mental health leads to job burnout, an increase in alcohol and substance abuse, difficulty sleeping, and feelings of isolation (Kaiser Family Foundation, 2020). These pre-COVID-19 statistics support the need to study an at-risk population that suffers from mental health issues due to the nature of their work. Since the COVID-19 pandemic, the reported numbers of stress, depression, and anxiety in adults, especially HCWs, have increased dramatically (Firew et al., 2020).

The COVID-19 pandemic has been caused by the Coronavirus, SARS-CoV-2, a novel strain of Coronavirus that has spread across the world (WHO, 2021e). As previously mentioned, the current report from the WHO revealed the devastating number of confirmed cases (505,035,185 individuals) and deaths (6,210,719 individuals) from COVID-19 throughout the global population. COVID-19 originated in China in December 2019 and rampaged the globe through 2021, with a brief respite due to quarantine practices in early 2021, only to rage again in the second half of the year (WHO, 2021e). As the number of cases/deaths increase and the pandemic continues, so does the impact on the mental health of HCWs.

A review of studies among HCWs from multiple disciplines indicated that HCWs reported increased levels of stress, depression, and anxiety and expressed the need for interventions during the COVID-19 pandemic (Bohlken et al., 2020). In some other studies, HCWs have reported that since COVID-19 began, they have felt increased levels of compassion fatigue, burnout, occupation stress, and decreased job satisfaction (Ruiz-Fernández et al., 2020). A 2020 study from China that focused on the impact of COVID-19 found the prevalence of depression among frontline nurses in the emergency department to be 43.61% (An et al., 2020). Further, a 2020 study on factors associated with HCWs, COVID-19, and mental health revealed that among the participants (healthcare professionals), 24% had considered taking a leave of

absence, 34% felt unsafe due to infection control failures, and 27% felt stigmatized due to the nature of their work (Singh et al., 2020). These mental health symptoms are being reported in countries worldwide, supporting the need for a global review to highlight the necessity of interventions to aid the medical field and HCWs.

Statement of the Problem

HCWs are susceptible to mental health issues because of the tremendous amount of job stress associated with their work, especially during a pandemic. The COVID-19 pandemic has proven there is a global lack of resources to reduce HCWs' stress levels and manage mental health issues (Walton et al., 2020). If these mental health concerns are not addressed, advocated, and cared for, the preexisting shortage of HCWs will be exacerbated, which will put more pressure on an already taxed healthcare system. A further decline in the HCW population will create a universal public health concern and create a public health crisis (Norkiene et al., 2021). Frontline HCWs are expressing the desire to leave their jobs because of incurred workplace stress during the COVID-19 pandemic (He et al., 2020; Labrague & De Los Santos, 2021).

There is sufficient evidence to support the need to examine this issue from a global perspective. For example, Italian physicians participated in a study reviewing the impact of COVID-19 on physicians' well-being. In the United States, a 2020 study of New York City HCWs reported 57% of respondents suffered from significant stress, 48% were depressed, and 33% had increased anxiety due to working during the COVID-19 pandemic (Shechter et al., 2020). Further, a survey of Italian physicians from summer 2020 found that 93.8% of physicians experienced psychological distress (De Sio, 2020). An Australian study found that prevalence rates for depression, anxiety, and stress were high, and job dissatisfaction increased for HCWs during disease outbreaks (Maharaj et al., 2018). The study found that 32.4% of nurses reported depression, 41.2% anxiety, and 41.2% stress.

Examining the Problem Through Theoretical Framework(s)

The review will utilize frameworks related to occupational stress to show the relationship between stress and poor mental health outcomes for HCWs. The two theoretical frameworks used for this project are the job demand control theory and the person-environment fit theory.

Job Demand Control Theory

The theory of job demand control (JDC) explores the relationship between stress and causal factors in the workplace (Karasek, 1979). Karasek's (1979) model of job demand control suggests that the higher the job strain is, the higher the risk is for psychological and physical stress. The JDC constructs are based on job strain and its correlation with psychological stress.

Working during the COVID-19 pandemic, HCWs have been subject to incredible amounts of stress due to many issues. As in any pandemic, the sheer number of deaths and lack of preventable treatment has led to heightened frustration and anxiety (Walton et al., 2020). The COVID-19 pandemic has been impactful on HCWs' mental health, and professionals are concerned that due to increases in job stress, HCWs will be at risk for PTSD and post-traumatic stress symptoms (Carmassi et al., 2020).

Person-Environment Fit Theory

The person-environment fit (PEF) theory is based on interactional work-related stress. PEF proposes that stress, and subsequent mental health outcomes, increase as the workers' skills and resources do not fit the job they are tasked with or do not have the necessary resources to properly do their job (French et al., 1982). During the COVID-19 pandemic, healthcare workers assumed roles and levels of unprecedented stress. With family members barred from hospitals, HCWs stayed with hundreds of patients during their last moments (Lucchini et al., 2020), a task that they were not prepared to handle in such large numbers. Applying the PEF theory to this aspect of the COVID-19 pandemic and HCWs will focus on how unprepared HCWs were for the pandemic and the unbelievable tasks they faced.

In addition, HCWs were not outfitted with the necessary personal protective equipment (PPE) globally. The lack of proper PPE led to increases in stress, fear, and anxiety for many HCWs (Cohen & Rodgers, 2020). Not only were HCWs afraid of becoming infected themselves, but their lack of PPE increased their fears of infecting family members when they returned home from the front lines. This fear led to HCWs failing to report to work and leaving the medical field entirely (Cawcutt et al., 2020).

Significance of the Problem

Prior to the outbreak of COVID-19, the depression rate of HCWs, especially nurses, was found to be 18-20% (Letvak et al., 2012; Skinner & Scott, 1993). These feelings have contributed to increases in depression and anxiety. There is concern within the medical community that these perceptions leading to a loss of productivity will increase as the COVID-19 pandemic continues to plague the global community, leaving hospitals with staff shortages (American Association of Colleges of Nursing [AACN], 2020; McLemon, 2020).

HCWs have stepped up to comfort patients when the family cannot, often spending dying moments with people they barely know. This level of devotion and sacrifice leads to increased stress and risk of depression, leading to job burnout and career changes (Davidson et al., 2019). If HCWs' mental health issues are ignored, then a deadly nursing shortage will occur (AACN, 2020). Studies show that HCW shortages lead to decreased quality of care, increased medical errors, workload increases for remaining staff, mandatory overtime, and high turnover rates (Hughes, 2008; Lang et al., 2004). The review will attempt to discover the extent of HCWs' psychological distress regarding PTSD, depression, anxiety, and stress due to COVID-19 and subsequent dangers to the population and health of the HCW community.

Purpose and Significance of the Research

Purpose

In response to growing concerns from the medical community about the mental health of healthcare professionals during the COVID-19 pandemic, the purpose of this systematic review is to examine the levels of depression, anxiety, and stress of HCWs around the world through a lens focused on job stress, demand, and lack of preparation to handle the magnitude of this pandemic. This review examined studies from around the globe to draw comparisons and insights from data that have been collected to assess the global impact on the mental health of HCWs during the COVID-19 pandemic. The review examined studies that showed the relationship between mental health issues for HCWs due to lack of resources and job fit, being unprepared for a pandemic, lack of resources, and occupation stress as a result. Further, the review used findings from the examination to discuss the need for interventions for HCWs to prevent job abandonment and avoid exacerbation of the existing healthcare worker shortage.

Significance

The review sought to support the importance of addressing HCW mental health issues that result from stress, depression, and anxiety because of working during the COVID-19 pandemic and address impacts that result from poor HCW mental health outcomes. For example, the mental health of HCWs has been damaged enough to impact workforce numbers, resulting in a shortage due to job turnover; as a result, the population will suffer from a lack of access to care. Once the effects, and their prevalence, are identified, the research can serve to help healthcare organizations focus on strategies to lessen the impact on mental health.

The focus remained on procuring and exploring necessary resources to combat the loss of HCWs due to mental health issues because of working in COVID-19 pandemic settings. A review of existing studies showed the potential to preclude a change in employment practices to prevent HCW shortages and burnout due to depression, anxiety, and stress. The review attempted

to support the need for mental health support for HCW to assist in a decrease in job burnout and dissatisfaction and positively impact decreasing HCW shortages and retention.

Research Questions and Outcomes

RQ1. Which healthcare worker population reported higher stress levels, anxiety, depression, and PTSD?

O1. Examine which group (physician, nurse, respiratory therapist, etc.) reported a higher prevalence rate of mental health-related symptoms related to working during the COVID-19 pandemic.

RQ2. Are the mental health effects of working during COVID-19 consistent globally, or do they vary by location?

O2a. Review multiple studies from several global regions to determine if the mental health effects of working during the COVID-19 pandemic are universal or if there is a difference between geographic locations.

O2b. Explore areas with increased prevalence of stress, anxiety, and depression in HCWs and examine any factors that led to higher prevalence than other sites.

O2c. Explore areas with decreased prevalence of stress, anxiety, and depression in HCWs and examine any factors that led to lower prevalence than other sites.

RQ3. What factors have affected the stress, anxiety, and depression rates of HCWs during the COVID-19 pandemic?

O3a. Review existing studies to show if there has been reported data to suggest if the lack of PPE during the COVID-19 pandemic created increased stress levels for HCWs.

O3b. Review existing studies to examine how staff shortages have impacted the stress levels of HCWs during the COVID-19 pandemic.

O3c. Review existing studies to examine how being unprepared for job responsibilities during the COVID-19 pandemic affected the mental health of HCWs.

O3d. Review existing studies to examine how the fear of infected family members affected the stress level of HCWs.

Review of Literature

The World Health Organization estimates that as of December 2020 over 100,000 healthcare workers (HCWs) have lost their lives during the COVID-19 pandemic (WHO, 2021e). The pandemic has not only claimed the lives of healthcare professionals but has also affected their mental health. The increasing psychological distress of healthcare professionals is a mounting public health crisis (Pollock et al., 2020). Doctors and nurses are blaming themselves for increased patient deaths, for inability to provide workable treatments, and are exhausted from the increased workload coupled with an enormous emotional burden of combatting a virus with no standard treatment protocol (Reger et al., 2020). Studies regarding healthcare worker mental health outcomes have been in publication since the 1990s, and the outcomes, such as increased post-traumatic stress disorder (PTSD) and depression, have only worsened (Kingston, 2020; Maalouf et al., 2021). There are many reasons for the increase in poor mental health outcomes for HCWs. Such contributing factors include pandemics, increased workloads with electronic health records, and consistently worsening staffing shortages (Kingston, 2020). The increase in poor mental health outcomes has been exacerbated by the tremendous impact of the COVID-19 pandemic on healthcare facilities and the healthcare workers within them. Some mental health issues that have increasingly affected healthcare workers since the COVID-19 outbreak began in early 2020 are stress, depression, burnout, and compassion fatigue.

This review of existing literature will briefly provide a view of the mental health outcomes of healthcare workers during COVID-19. The focus of the review will be to examine global publications to assess the impact of working during the COVID-19 pandemic on the mental health of HCWs and to identify potential interventions, as well as potential for future research. The literature review will assess publications that are focused on the mental health of healthcare workers during the COVID-19 pandemic, non-pandemic times, and during previous pandemics in history. While there are rapid reviews and systematic reviews published regarding

HCWs and the mental health effects of working during the COVID-19 pandemic, there is not a systematic review that has recently reviewed mental health outcomes of HCWs during non-pandemic times, previous pandemics, and the COVID-19 pandemic.

Mental Health Impacts on Healthcare Workers During Non-Pandemic Times

During times when no pandemic has been declared, the mental health of healthcare workers is dramatically affected due to the high stress, demanding nature of their work (Palma et al., 2018; Shanafelt et al., 2016). There are many factors that can affect HCWs' mental health. Some of the health profession related mental health effects include stress, depression, burnout, and compassion fatigue.

Stress

The stress levels, their causal factors, and potential solutions have been the subject of numerous studies. Some of those causal factors were job-related distress, sleep pattern issues, and traumatic events. HCWs experienced disproportionate levels of stress compared to the rest of the population and were more likely to leave their job due to stress levels (Koinis et al., 2015). A systematic study published in 2015 that reviewed the emotional distress and burnout of intensive care HCWs found that there is probable cause to study the exact impact of trauma and emotional distress to seek out preventative strategies (van Mol et al., 2015). In addition, the most common type of stress for nurses is job stress related to colleagues, supply control, and administration (Khamisa et al., 2015; Tummers et al., 2001).

Job stress related to colleagues is a common theme. Most workers found colleagues as a primary source of stress in the work environment (Page et al., 2013). While coworkers may cause stress, management was found to be even more stress inducing. Overall, the most prominent source of job stress for HCWs is management/administration (Bhui et al., 2016). Further, nurses are more likely to experience poor work environments due to administrators' refusal or inability to properly staff a healthcare organization (Kanai-Pak et al., 2008).

Job stress can lead to other impairments for HCWs. In a 2020 study of Chinese nurses, it was found that sleep pattern interruption and insomnia were highly associated with job stress, job difficulty, and patient relationships (Deng et al., 2020). The effects on sleep have a direct relationship with stress effects. Daily increase in sleep quality prepares an individual to better handle the negative effects of stress and allows for a buffer from the side effects of stress in the workplace (Blaxton et al., 2017). Sleep deprivation has continued side effects that impact HCWs significantly. Consistent sleep deprivation consequences include mood changes, concentration issues, fatigue, irritability, and impaired thought processes (Sheldon et al., 2014; Stewart & Arora, 2019a.). Further, the interruption of regular sleeping habits exacerbates the symptoms of sleep deprivation. Nurses who work nightshift and rotating shifts are more likely to experience high job stress, insomnia, and fatigue than those who work a typical day shift work schedule (D'Ettoire et al., 2020). These issues with sleep can also lead to medical errors. Lack of sleep had a direct association with decreased performance, increased likelihood of medical error, and decreased patient safety (Kaneita & Ohida, 2011).

Increased levels of stress among healthcare workers have proven to be detrimental. A cohort study of Europe, Japan, and the United States found that increased levels of stress and working long hours are directly related to an elevated risk of cardiac issues including coronary heart disease and strokes (Kivimäki & Kawachial., 2015). Research from the American Academy of Psychiatry and Law reveals that increased levels of stress, PTSD, and acute stress had a direct correlation to performance deficits, difficulty performing cognitive tasks, memory impairment, as well as an overall increased threat of medical error (Regehr & LeBlancal., 2017). Traumatic events experienced by healthcare professionals can often lead to post traumatic stress disorder, commonly referred to as PTSD (Palma et al., 2018).

PTSD is often found in nurses who have experienced long-term stress, which in turn leads to feeling of burnout (Mealer et al., 2009). An Australian study of nurses found that of 102

individuals surveyed, 41.2% reported feelings of consistent anxiety due to their work (Maharaj et al., 2018). The study also found that high reported levels of stress, in conjunction with high reported levels of depression, led to poor mental health and decreased job performance. Lastly, a 10-year study of PTSD in HCWs found that HCWs have a significantly higher rate of PTSD than the rest of the population due to poor trauma training, heavy workloads, and lack of support from management and society (D'Ettorre et al., 2020).

Depression

The American Psychological Association (APA) described depression as a prevalent and serious mental illness that negatively affects the way an individual thinks, acts, and feels; further, mental illness is estimated to affect one in 15 adults (APA, 2021). Due to the demanding and high stress nature of their profession, healthcare professionals are an at-risk population for depression. Studies from South America and the United States convey that the HCW population demonstrates high rates of depression due to job strain and stress, lack of work life balance, and experiencing consistent traumas (da Silva et al., 2016; Hall et al., 2016).

New physicians are at high risk for depressive symptoms. An expansive study of newly minted physicians found that depressive symptoms ranged from 20.9% to 43.2% (Mata et al., 2015). A joint study from the University of Michigan and the Medical University of South Carolina found that physicians in their first year of rotations, or “intern year,” had increased depression scores that nearly doubled after 12 months from the initial scoring due to increased responsibility and job stress (University of Michigan, 2019).

The nurse sector of HCWs is perhaps the most vulnerable to experiencing depression. According to the World Health Organization, there are more than 28 million nurses in the world (WHO, 2020d). As such, the professional nursing community represents a large at-risk population. Studies show that registered nurses are twice as likely as any other profession to experience depression and/or depression symptoms (Brandford & Reed, 2016; Letvak et al.,

2012). Brandford and Reed (2016) and Letvak et al. (2012) reviewed nurses who worked in emergency departments, critical care units, medical offices, and many other units. Occupational hazard has been found to be a contributing factor in depression rates in nurses. Research based in Taiwan discovered a correlation between the types of traumas that nurses had witnessed during their career and depression rates. The study revealed that nurses who had assisted in high stress cases like cardiac arrest, trauma surgeries, pediatric oncology, and psychiatric patients were more likely to develop depression (Huang et al., 2018).

Unfortunately, HCWs are an at-risk population for suicide because of depression. A systematic review of physician and other HCW suicide found that physicians, especially female physicians, are at high risk for suicide and suicidal ideations (Dutheil et al., 2019). Burnout also plays a role in HCW depression and suicide. Burned out HCWs are not likely to seek mental healthcare treatment from professionals and will attempt to deal with their issues alone or self-medicate with substance abuse (Stehman et al., 2019); however, since 1980 the rate of physician suicide has decreased overall (Duarte & Pinto-Gouveia, 2020). The nurse population has not shared that upward trend. Data from 2016 shows that nurse suicides have increased since 1996. Female nurse suicide rates were 11.97 per 100,000 individuals, compared to the rest of the female population, 7.58 per 100,000 individuals, and more male nurse suicides, 39.8 per 100,000 individuals, versus the rest of the male population's suicide rate, 8.2 per 100,000 individuals (Davidson et al., 2019).

One of the more prominent reported causal factors of depression in HCWs is burnout. A cross-sectional study in Europe of physicians (those holding the degree of MD or DO) found that more than 10.3% of participants were affected by depression and 50.7% experienced burnout (Wurm et al., 2016). Additionally, numerous studies from around the world report that nurses who experience burnout also experience higher rates of depression (Li et al., 2018, Maharaj et al., 2018; Vasconcelos et al., 2018). These feelings of burnout coupled with depression have

been proven to lead to staffing issues. Researchers found that Brazilian nurses' depression rates had a direct correlation with increased absenteeism in the workplace (Oliveira Santana et al., 2020).

Burnout

The World Health Organization defines burnout as an occupation phenomenon that is based on factors that affect the health of an individual and is characterized by the symptoms of exhaustion, increased mental negativity towards one's job, and reduced efficacy at work (WHO, 2019b). The effects of burnout are found to be more prominent among those who work in the public service fields (Balch & Shanafelt, 2010). Burnout is a common symptom reported by healthcare professionals around the globe. The Agency for Healthcare Research and Quality found that burnout prevalence rates in 2015 were 70% for nurses, and 30-50% for physicians/nurse practitioners/physician assistants (Lyndon, 2015); however, a collaborative study from the American Medical Association and the Mayo Clinic found that 50% of physicians reported signs of burnout (Shanafelt et al., 2016).

The reasons for burnout in non-pandemic times were found to be due primarily to organizational issues, including staffing shortages, and conflicts between work and personal time (Shanafelt et al., 2009). Poor administration can lead to staff burnout as well. Inadequate staff management by administration leads to decreased staff morale and performance, which then leads to job dissatisfaction, decreased personalization with work related activities, and ultimately, burnout (Dye & Garman, 2014). Additionally, the relationship between burnout and staffing issues creates a dilemma. Burnout leads to staffing shortage, and staffing shortages lead to increased rates of burnout (Moss et al., 2016). Conversely, a study of hospital nurse burnout and patient satisfaction rates found that lower reported numbers of nurse burnout had a correlation with adequate numbers of staff and because of this, higher patient satisfaction survey scores were reported (Vahey et al., 2004).

Burnout is an important mental health condition to take note of due to the dangerous effect it has on HCWs. Physicians who are experiencing burnout are more likely to abuse alcohol and drugs and have increased rates of depression; in addition, suicide rates are higher in physicians suffering from burnout (Lacy & Chan, 2017). Furthermore, the effects of burnout lead to a multitude of public health concerns such as patient safety and medical errors. Hall et al. (2016) found that there was a significant correlation between HCW burnout's subsequent poor mental health effects, and increases in patient safety concerns, medical errors, and poor treatment outcomes. Additionally, burnout among physicians was reviewed from 2017 that utilized the Maslach Burnout Inventory questionnaire. The study found that more than 60% of practicing physicians reported high burnout levels (Lacy & Chan, 2018). Physician burnout is a result of a myriad of workplace-related issues. Drivers of physician burnout have been directly associated with exorbitant workloads, ineffective and inefficient organizational processes, clerical work overload, poor work-life balance, and lack of accountable leadership within an organization that leads to job dissatisfaction (West et al., 2018).

Job dissatisfaction is a causal factor of nurse burnout and job abandonment. A survey study of Taiwanese nurses found that most nurses were contemplating a career change, had made plans to pursue another career, or were planning to leave the field of nursing altogether (Chen et al., 2019). There are many reasons that HCWs experience job dissatisfaction. Another study from Portugal found that ethics and lack of input in the treatment decision making process was prominent in burnout rates for intensive care unit nurses (Teixeira et al., 2014). Job dissatisfaction for HCWs, coupled with burnout, can lead to other types of employment-related fatigue such as compassion fatigue, which has come to light in the last few decades as burnout studies continue and branch out.

Compassion Fatigue

Many HCWs suffer from compassion fatigue as a hazard of their work. Compassion fatigue is the convergence of stress, trauma, and burnout that results in physical and mental exhaustion, preventing an individual from being able to cope in certain environments (Cocker & Joss, 2016). Just as fatigue is the result of too little sleep, compassion fatigue is the result of decreased feelings of compassion, which leads to emotional distress (Gerard, 2017). Compassion fatigue can affect HCWs in many ways. Some ramifications of compassion fatigue include decreased standards of care for patients, poor relationships with coworkers, or other mental health effects such as PTSD, anxiety, and/or depression (Cocker & Joss, 2016). Mental exhaustion can lead to self-medication methods. Researchers found that nurses who suffer from compassion fatigue are likely to indulge in cigarettes, sleeping pills, energy drinks, anti-anxiety drugs, alcohol, and amphetamines (Jarrad et al., 2018).

As with burnout, compassion fatigue can lead to job performance issues. Nurses who suffer with compassion fatigue can find that their stress and attentiveness to their job can be placed in direct competition, often resulting in their job performance and level of patient care suffering (Cross, 2019; Nolte et al., 2017). This competition leads to job abandonment or poor work performance. Compassion fatigue places an organization at risk for staffing shortages, medical errors, patient abuse, and poor patient/caregiver relationships (Nolte et al., 2017). Compassion fatigue can be found in any HCW from physicians to nurses and caregivers. The most common place to find compassion fatigue is in hospice and palliative care arenas due to the nature of end-of-life care and the emotional toll that can take on the caregiver and patient (Cross, 2017). Compassion fatigue related to end-of-life care would also be common in fields like oncology and geriatric care as these fields also experience long-term care of a patient, often ending in death.

Mental Health Impacts During Previous Pandemics

Safety and Fear

Safety, and the worry of keeping family and loved ones safe, during a pandemic is a high stress factor. With the growing number of pandemics, epidemics, and untreatable disease, physicians' safety is causing fear and questions from within the medical practitioner community about their safety, while maintaining the duty to treat (Huber & Wynia, 2004). During an influenza outbreak in Germany, 28% of doctors and nurses would find it acceptable to leave their job during a pandemic to protect themselves and their family members (Ehrenstein et al., 2006). That fear extends outside of the hospital to local clinics. A survey of health department clinics in Maryland found that nearly 41% of their workers would not come to work if an influenza pandemic were declared to keep themselves and their families safe (Balicer et al., 2006). Singapore physicians were surveyed to assess their willingness to treat patients during Avian influenza outbreaks. The study found that 95% of physicians were worried about the risk to their health and 11.8% would consider ending their employment (Wong et al., 2008). Conversely, Wong et al. (2008) also found that most of the physicians would be willing to work through the Avian flu pandemic and accepted the risk of doing so. Canadian physicians were also somewhat hesitant to work during a proposed hypothetical pandemic. A survey of Canadian primary care doctors found that 53% would be willing to work in treatment centers during a pandemic; however, most felt unprepared to handle such an event (Hogg et al., 2006).

The fear of a pandemic created similar feelings among New York HCWs. A review of the SARS pandemic found that HCWs were least willing to report to work during the following proposed events: a smallpox epidemic, radiological event, SARS outbreak, or a chemical event (Qureshi et al., 2005). However, the study also found that HCWs were willing to risk their safety for many other catastrophic events. HCWs were most willing to report to work during snowstorms, mass casualty events, and environmental disasters (Qureshi et al., 2005). The urge

to protect oneself and one's family is strong and may supersede the call of duty to treat patients. Greek HCWs were found to be afraid of infecting their families more than themselves and were hesitant to treat patients during the H1N1 pandemic (Goulia et al., 2010).

When studying the Chinese Anti Ebola medical team in Liberia, Li et al. (2018) found that there are ways to ensure the safety of HCWs in healthcare disaster areas. The Chinese medical team was the only group to not have any members contract Ebola. This was accomplished with capable command systems, effective coordination of care, adequate equipment, proper training, and consistent research of HCW protection methods (Li et al., 2018). Japanese researchers found that it is critical to focus the safety of HCWs during a pandemic; further, they noted that HCWs reported that in order to feel safe and avoid stress, fear, and anxiety, they must have the proper PPE, information, and infection control guidelines (Matsuishi et al., 2012).

Anxiety and Stress

Generally, researchers of HCWs during pandemic groups levels of stress and anxiety together. One of the contributing factors to HCW stress and anxiety during previous pandemics was (mis)information given by the media that creates behaviors in the public that ultimately cause more harm than good and can lead to avoidable hospitalizations (Tasnim et al., 2020). An assessment of pandemic public health policies led researchers from India to conclude that information, or incorrect information, distributed to the public can have a significant impact on anxiety of HCW as it creates poor health behaviors in the public; for example, the improper use of medications to treat ailments and subsequent surges of patients due to the improper usage. During the 2009 H1N1 pandemic, an assessment of college students was performed at two points (September 2009 and February 2010) during the pandemic to assess the anxiety level of the students. The study found that at both points, the general anxiety level of college students within the sample had a high prevalence rate (Wheaton et al., 2012). Anxiety during the Zika virus

outbreak was found to be markedly higher in HCWs and the public (Blakey et al., 2017). The study from Li et al. (2018) found that HCWs were often scared and anxious working during the Ebola outbreak. Causes of emotional stress and subsequent anxiety were disruption of family communication and social networking, adapting to new cultural norms, and potential exposure (Li et al., 2018). Conversely, HCWs in the Netherlands were surveyed and found to not be anxious about being infected by the H1N1 pandemic and able to handle their increased workloads because they had proper support (Vinck et al., 2011)

Hospital workers during the 2009 influenza pandemic in Japan were found to be anxious about infections, workload, and exhaustion (Matsuishi et al., 2012). Similar results were found during a survey of Toronto-based physicians during the 2003 SARS outbreaks in Canada (Maunder et al., 2004). Fear of infection was a common theme in the study results from both Matsuishi and Maunder. Both studies concluded that it was essential for hospitals to reduce employee stress by offering proper protection and clear communication to avoid employee risk (Matsuishi et al., 2012; Maunder et al., 2003). During the SARS pandemic, HCWs experienced high levels of mental distress and PTSD because of increased levels of SARS related stress (Reynolds et al., 2008). Further, physicians in New York during the SARS pandemic reported that their own anxiety to treat patients could be alleviated with clear information and knowledge of the inherent risk. The study found that New York physicians would feel alleviation of anxiety to treat a SARS positive patient if they were aware of the risk of transmission and the likelihood of survival, and were provided proper infection control within the hospital (Straus et al., 2004).

HCWs experience a tremendous amount of stress during pandemics for many reasons, including fear of infection, isolation from family, lack of treatment for patients, and staff shortages (Maunder et al., 2004). Pandemic conditions place an enormous amount of stress on HCWs, especially critical care personnel. Previous outbreaks of SARS and the Middle Eastern Respiratory virus (MERS) led to an increase in the stress levels of ICU personnel in hospitals

(Maves et al., 2019). Additional studies support this as well. Saudi Arabian physicians reported that during the MERS outbreak, their medical staff reported significant levels of anxiety and stress due to fear for personal safety, lack of training, and lack of coping strategies (Khalid et al., 2016). While MERS is considered an epidemic and not a pandemic, there is evidence of psychological trauma for HCWs who worked during that time. The Korean Centers for Disease Control found that HCWs who had treated patients during the MERS were at significant risk for PTSD (Lee et al., 2018). There are additional psychological ailments that arise out of increased stress and anxiety. Hong Kong-based HCWs were found to not only have chronic stress and increased anxiety levels during the SARS pandemic, but they also reported higher levels of depression (McAlonan et al., 2007).

Social distancing and isolation practices have been identified as a HCW stressor during pandemics. HCWs in Taiwan reported that their highest stress levels during the SARS pandemic were directly related to having to quarantine and isolate from coworkers and family (Bai et al., 2004). Three years after the SARS pandemic, hospital employees in Beijing were studied to assess the effect of quarantine. Similarly, Canadian-based HCWs found quarantine to have stressful results. Toronto HCWs who had quarantined due to exposure were found to experience stigma and fear from non-healthcare professionals during SARS (Robertson et al., 2004). A common source of stigmatization for quarantined HCWs around the globe is lack of communication. During the H1N1 pandemic, it was found that lack of information and hype from the media increased stigma of HCWs (Johal, 2009). Researchers found that HCWs who had quarantined had high levels of depression when compared to others who did not quarantine during the pandemic (Liu et al., 2012).

Another cause of stress during a pandemic is lack of preparation from a global, national, state, local, or hospital purview. Greek HCWs revealed significantly increased stress levels during the H1N1 pandemic, with nurses reporting higher levels of stress than physicians; further,

nurses reported that their stress was largely dependent on not feeling prepared or having the proper supplies to deal with the pandemic (Goulia et al., 2010). Australian HCWs reported similar feelings during H1N1. Australian urgent and emergent care employees reported that they were highly stressed due to inadequate awareness of pandemic policies and the unorganized flow of the information that was given to them (Fitzgerald et al., 2012).

Finally, staffing issues are a hallmark of stress during pandemics or other outbreaks. Workforce reductions are likely to occur during pandemics due to infection, fear of infection, or burnout from increased workloads, which then places the burden of care on remaining staff, thereby increasing their stress levels (Felland et al., 2008; , Gomersall et al., 2006; Manuell et al., 2011). Garrett et al. (2009) found that during the H1N1 pandemic, HCWs affirmed that they were most likely to miss work due to safety concerns, lack of PPE, and to protect their families from infection (Garrett et al., 2009). Another study of Asian hospitals during H1N1 found there were ways to curb staffing issues. Lack of staffing can be mitigated by administration ensuring proper PPE is overstocked, hiring of additional staff prior to pandemic conditions, and making sure all necessary measures are taken to ensure employee safety as well as reduced risk of infection (Chua et al., 2004).

Mental Health During COVID-19

Previous Pandemics

According to the Centers for Disease Control and Prevention, there have been five global pandemics in the last century including COVID-19. Those pandemics were the 1918 Influenza pandemic of the H1N1 virus, the pandemic of 1957 of the H2N2 virus, the 1968 pandemic of the H3N2 virus, and the 2009 Swine flu pandemic of the H1N1 virus (CDC, 2021). Other outbreaks that almost reached pandemic status were the severe acute respiratory syndrome (SARS) outbreak from 2002-2003 and the Ebola outbreak from 2014-2016; however, the epidemics were limited and controlled so that they never reached full pandemics status (CDC, 2021). While some

may consider the HIV/AIDS virus to be a global pandemic, due to the longevity of the outbreak, it is a long-term public health issue, rather than a pandemic (Paules et al., 2017). COVID-19 has prevailed the longest of any pandemic in recent history. According to the CDC, the H1N1 pandemic lasted from April 2009 to August 2010 and the Ebola pandemic lasted from December 2013 to June 2016 (CDC, 2009, 2019). The COVID-19 pandemic began in December 2019 and is still active as of February 2022. While COVID-19 has not yet surpassed the Ebola pandemic, the case numbers are drastically different. The Ebola pandemic had less than 28,000 cases (CDC, 2019), whereas the COVID-19 pandemic has had more than 45 million cases in the United States (CDC, 2021) and 300 million cases around the world (WHO, 2021e). The COVID-19 pandemic is unique due to its global reach, significant case numbers, and lack of treatment methodology; all these factors that have led to increased stress on the healthcare system. As a result, the COVID-19 pandemic has also created global mental health effects for HCWs as they continue to fight a pandemic that has endured for more than 2 years, with new variants challenging the system and prolonging HCWs increased poor mental health.

Stress

HCWs are developing PTSD because of the psychological damage that COVID-19 has caused (Carmassi et al., 2020; Giorgi et al., 2020; Raudenská et al., 2020). PTSD has increased in the global HCW population as they have been repeatedly subjected to damage, exhaustion, and watching patients die over the last 2 years that the pandemic has raged (Raudenská et al., 2020). Working during COVID-19 had led to heightened emotional states for many HCWs. A review of qualitative studies reports that the pandemic has led to psychological issues like anxiety, fear, anger, and high levels of stress (Koontalay et al., 2021). Those most at risk for psychological distress are frontline HCWs who are consistently exposed to COVID-19, young HCWs who have not built up any professional resilience, and migrant HCWs who lack a familial support system in proximity (Giorgi et al., 2020).

Due to the highly contagious and infectious nature of COVID-19, HCWs have been met with stigma from the public. A systematic review of HCW burden during the pandemic showed that stigmatizing behaviors led to increased stress levels in HCWs and showed a mild correlation with increased depression rates (Carmassi et al., 2020). Healthcare professionals are afraid of spreading the virus as well, which has led to another contributing stressor, fear. The fear of bringing home COVID-19 to a family member or friend caused increased stress for many HCWs and disrupted their home lives significantly (Blackler et al., 2021). Fear, resulting in stress, was also strongly associated with workplace safety measures to protect HCWs from becoming infected with COVID-19. A cross-sectional study of HCWs in Japan found that the more workplace safety measures there were to protect employees, the safer they felt and vice versa; however, when there were several policies in place, but they were not properly communicated, stress levels were still high (Sasaki et al., 2020). Sasaki et al. (2020) suggested that mitigation of stress levels of HCWs caused by fear of infection can be resolved with clear and effective communication of workplace safety protocols regarding COVID-19.

As a means of coping, many HCWs turned to their families to express to them about the stresses of working during COVID-19 and sought support from their families. A survey of medical staff at New York City Medical Center found that families were unable to properly support their HCW relatives, as they did not have the proper skills to do so, and this led to increased tension between the HCW and their family, resulting in additional stress (Blackler et al., 2019). Babore et al. (2020) reported that HCWs with children reported lower levels of perceived stress and surmised that children allowed the HCWs to take a break from work and focus their attention on their family, rather than consistently thinking of the pandemic or work. Conversely, individuals without children or significant others reported higher levels of stress and anxiety than their counterparts with families (Barbore et al., 2020).

Depression

Depression rate increases due to a pandemic is not a novel phenomenon. Research from the SARS and COVID-19 pandemics revealed that depression rates in HCWs increased 23.1% during COVID-19 compared to rates assessed during SARS (Preti et al., 2020). Preti et al. (2020) examined the long-lasting ramifications of working during a pandemic. The study found that depressive symptoms related to pandemics can last for years and can have maladaptive behavioral consequences for HCWs (Preti et al., 2020). This is of concern for new HCWs who have entered the field in the last few years and are most susceptible to psychological distresses like depression as they are lacking built-up resilience due to inexperience (Savitsky et al., 2020). Psychological resilience is significantly more common in seasoned HCWs, and they are better equipped to handle the mental aspect of pandemics, experiencing feelings of depression for a much shorter time than other HCWs (Bozdağ & Ergun, 2020).

Respiratory therapists (RTs) have played a significant role in the treatment of COVID-19. As COVID-19 typically attacks the respiratory system of a patient, the use of ventilators and respirators has become a standard treatment modality (Burman, 2021), thus bringing respiratory therapists to the front lines, a place RTs have seldom been before in their professional lives. The primary role of a RT is to work with patients who have a respiratory illness and provide treatments to ease their breathing (U.S. Bureau of Labor Statistics, 2021). A cross-sectional review of Italian HCWs, during the COVID-19 pandemic, found that 47.1% of respiratory therapists reported feelings of depression and hopelessness (Farì t al., 2022).

Nurses and physicians in China reported similar findings of increased depression rates. The study found that women were more likely to have higher psychological distress scores and reported a higher rate of depression than their male counterparts (Lai et al., 2020). As the study was composed mostly of women, the researchers noted the potential bias and that it bore further research to see if the gender correlation was statistically significant. Research from Italy

reviewed perceived stress among healthcare professionals found that women reported higher rates of depression (Babore et al., 2020). Another study was found to have supported the idea that women are more susceptible to depression as HCWs than men. HCWs from India were surveyed and the results showed that while doctors, nurses, and paramedics had similar rates of depression, the females from each of those groups had comparably higher rates of depression (Chauhan et al., 2021).

Burnout

The World Health Organization defines burnout as a syndrome resulting from chronic workplace stress that is not being successfully managed and is characterized by exhaustion, feelings of cynicism and/or negativity, and decreased professional behaviors; however, burnout is not classified as a medical condition (WHO, 2022i). Physician burnout rates have increased because there was no treatment protocol for COVID-19 at the beginning of the pandemic. This led to increased deaths and isolation practices, which in turn have drained physicians physically and mentally (Kingston, 2020). Burnout has widespread reach and affects many areas for HCWs. Burnout is often strongly associated with poor work performance, absenteeism, and medical error; thus, burnout has a massive impact on healthcare systems around the world (Laboe et al., 2020). Burnout is often associated with job abandonment, which can be disastrous to healthcare systems and the public as there is already a global shortage of HCWs. Studies of Iranian emergency room nurses found that there is strong reason to believe that the burnout rate being witnessed will eventually lead to dramatic staffing issues and affect the quality of healthcare in Iran (Ahorsu et al., 2021). Staffing issues have been widely reported and the job abandonment numbers in healthcare are high. The Bureau of Labor Statistics reports that since the pandemic began, 450,000 employees have left the healthcare system (U.S. Bureau of Labor Statistics, 2021). This can be attributed to the high rates of burnout reported from studies recently published.

Globally, nurses have reported markedly higher numbers of burnout during COVID-19. A large-scale study of 12,596 nurses based in China and Taiwan found that they felt higher numbers of depersonalization because of burnout (Chen et al., 2021). The American Psychological Association defines depersonalization as a state of mind in which a person feels as though they are estranged from the outside world and is seen as a self-preservation method after a traumatic event (APA, 2021). Chen et al. (2021) suggested that depersonalization can be dangerous for HCWs because it withholds the personalized care aspect of nursing that is pertinent to quality patient care and can also contribute to medical errors. Additional studies of nurses from Spain have found increased levels of depersonalization associated with burnout and emotional exhaustion; however, the studies noted that resilience can be a protective factor against burnout (Luceño-Moreno et al., 2020; Miguel-Puga et al., 2021).

Other HCWs are reporting increased feelings of burnout as well. Australian physicians found that the increased stress levels from working during the COVID-19 pandemic led to significantly higher numbers of burnout than assessed in previous studies (Lewis et al., 2022). Further studies of clinical staff, like RTs, had found heightened reports of burnout as well. A review of respiratory therapists found that 79% reported burnout feelings during COVID-19, of that 10% were severe, 32% were moderate, and 37% reported mild feelings of burnout (Miller et al., 2021). A more recent study of India-based HCWs found that regardless of clinical position or title, HCWs who treated COVID-19 patients reported feelings of burnout at rates between 44.6% to 50% (Pooja et al., 2021). U.S.-based HCWs are reporting burnout, and subsequent plans to abandon their jobs, at alarming rates. A large study found that one in three MDs, NPs, and PAs plan to significantly reduce their working hours; further, one in five MDs and two in five nurses plan to stop practicing medicine completely (Sinsky et al., 2021). A recent study of U.S. physician suicide related to burnout found that peer support groups have been somewhat effective at reducing burnout feelings as a sense of camaraderie is built and allows for an

emotional support network of colleagues (Laboe et al., 2020). This allows hope that there are potential interventions with successful results in the works to mitigate burnout.

Preparedness

COVID-19 Lack Preparations

Inadequate preparations were a significant contributor to increased stress, depression, PTSD, and burnout for HCWs (Koontalay et al., 2021). During the initial stages of the COVID-19 pandemic, there had been a highly publicized lack of PPE for HCWs. Nurses reported having no facemasks, having to reuse masks, being denied PPE, or being berated by administration when asking for new PPE once theirs had worn out (Arnetz et al., 2020). Hospitals sent out pleas via social media and news outlets for donations of face shields, masks, and gloves. As there was little notice of the pandemic, or knowledge of the significant toll it would take, there was little time to prepare for such a harsh and enduring pandemic.

Global Pandemic Preparations

In April 2019, the World Health Organization called on the global community to step up preparation for future pandemics and noted that no one was as prepared as they should be (Vogel, 2019). Pandemic preparation is vital to combating potential virus attacks and to make certain that HCWs have the necessary supplies to do their work. After the 2009 influenza epidemic in Europe, research was conducted to assess the preparedness of the European health system if a new virus or a serious health crisis were to arise. It was determined that there was a need across Europe to create stronger pandemic preparation guidelines to prevent potential disasters in the future (Martin et al., 2010). Germany performed a similar assessment of the country's health system after the H1N1 influenza epidemic in 2009. The study found that while their response to the pandemic was favorable, there was concern for preparation of healthcare centers if they followed WHO guidelines in future epidemics (Schaade et al., 2010). Likewise, researchers in India conducted influenza pandemic preparation. Researchers found that the

country was ill prepared to handle a pandemic because of dense populations, lack of medical care in rural areas, and the absence of vaccine protocols (Fedson, 2019).

Countries with existing influenza vaccine programs and pandemic protocols participated in a global review to test their pandemic preparedness based on their response to previous influenza outbreaks/pandemics, vaccination distribution, and production as well as their use of technology in these endeavors. The review found that during the 2009 influenza pandemic, most of the participating countries were well equipped to handle the effects of the pandemic and would be able to prevent increases in morbidity and mortality associated with influenza (Porter et al., 2020). The same evaluation was made in the western Pacific region, focusing on China, Japan, South Korea, other pacific islands, and Australia. The evaluation found that some countries had WHO approved vaccination production and distribution, while others did not and would be at a significant disadvantage if an influenza pandemic were to occur again (Bell et al., 2018). Despite the results of this evaluation, Zhang et al. (2019) reported that the Chinese response to influenza outbreaks proves the country is aptly prepared to handle influenza pandemics. China's response to the 2009 pandemic was to initiate containment policies, quarantine foreign visitors, and quarantine those with respiratory symptoms in hospitals, which resulted in slowing the transmission of H1N1 and praise from the WHO for China's transparent efforts (Zhang et al., 2019).

Canada's pandemic preparation is well documented. The Canadian pandemic preparation is based on surveillance strategy and relies on data throughout the public health system to alert officials to potential outbreaks (Henry et al., 2018). Canada is known for its public healthcare system, Canadian Medicare. Using a national database, it is possible for officials to have access to healthcare data as it is all in the same electronic health record-based system (Ridic et al., 2012). The assessment of the Canadian preparation system shows that the government and public

health officials work closely together to monitor data, even so far as consistent monitoring of individual hospital admissions, to avoid potential outbreaks (Henry et al., 2018).

U.S. Preparation Methods

The United States has a three-prong response plan for pandemics. Pandemic response planning is focused on preparedness and communication, surveillance, and containment (Homeland Security Council, 2018). In preparation for handling outbreaks in the United States, epidemics or pandemics, the Centers for Disease Control employ stockpiling methods. The Strategic National Stockpile is part of federal infrastructure and stockpiles medical supplies to support communities in need (CDC, 2021). According to the U.S Department of Health and Human Services (2021), these stockpiles include personal protective equipment, medicines, ventilators, and equipment to create medical stations or field hospitals.

Conservative methods of preparation and prevention have been studied recently in the U.S. public school system. In June 2019, Faherty et al. examined the effects of social distancing on influenza transmission prevention, and for potential future pandemics, the study was conducted to determine if the flu could really be slowed by low impact measures. These measures included keeping students spaced apart from each other, increasing hand washing, and altering school schedules to keep students in separate groups. The study found that social distancing had negative impacts on the students' mental health and social development, that clear communication from public health officials would be needed in actual pandemic events that would require these measures to be put in place, and for social distancing measures to be fully successful, a community effort must be made to follow protocols (Faherty et al., 2019).

Technological preparation has taken the stage in the digital age. Pandemic risk calculations are an integral part of pandemic preparation. These calculations use geographic information systems, metagenomics, and mathematical models to help the healthcare community pinpoint probable hot spots that will emerge, which populations are at risk, and which pathogens

are undergoing evolution (Gonzalez et al., 2018). This is also known as infectious disease forecasting. Infection forecasting is used to anticipate seasonal epidemics and assess the potential for pandemics (Lutz et al., 2019). The study from Lutz et al. (2019) highlights several times that infection forecasting is only useful if it is handled correctly by public officials, the media, healthcare providers, and the public. If application of the infection forecasting is not properly used, then the health of the public will suffer and emergency conditions will be made worse (Lutz et al., 2019).

An additional technological pandemic preparation device is the assessment instrument, the Pandemic Influenza Evaluation tool, created by researchers to assess the strengths and weaknesses of a country's pandemic plans, identify areas of improvement, and assist in creating a plan with the most up-to-date guidelines (McKay et al., 2019). The authors' publication claimed that this is the only tool of its kind in use and upon review, and there truly is no other similar tool in publication to assess pandemic preparation strength within a country. The tool was designed to be used by government officials and public health agencies around the world to hold themselves accountable, to maintain the most up-to-date public health plans, and to address gaps in preparation methods (McKay et al., 2019). McKay et al. (2019) suggested this tool could be modified and used in future pandemic evaluations other than influenza.

Preparations for Previous Pandemics

During the H1N1 pandemic, hospitals saw increases in emergency department usage by 48% and mitigated this by turning other spaces within the hospital into non-influenza-related treatment areas and increasing physician staff numbers (Scarfone et al., 2011). Singapore's Ministry of Health makes sure that their health system is prepared for potential threats with exercises (Lum et al., 2016). In preparation for the H1N1 pandemic, a checklist was utilized by each hospital in Singapore to assess readiness. The checklist included establishing a pandemic task force focused on preparation, PPE availability and proper usage, assessment of internal

infrastructure and logistics to make sure each department was properly prepared, rapid response team drills, contact tracing workflows were established, clear lines of communication with other health systems were created, and human resources departments hired extra staff (Lum et al., 2016). According to Lum et al. (2016), these preparations allowed Singapore hospitals to combat the H1N1 pandemic successfully.

Hospital administrators in Israel were surveyed and found that they felt that they themselves were 87% capable of handling a pandemic and their hospitals were very prepared to handle potential influenza pandemics (Adini et al., 2014). United States-based emergency medical directors and their department heads do not share the same confidence level. Surveyed physicians reported that 56% were aware of a written plan for pandemic preparation and only 27% felt that their hospital was prepared to deal with a pandemic or any type of disease outbreak (Morton et al., 2020). A systematic study of pandemic preparations found that most countries were not prepared to handle a global pandemic. The study found that for healthcare systems to be prepared, there would need to be a focus on disease surveillance, increases in clinical support staff, and expansion of intensive care units (Kain & Fowler, 2019).

Surge planning is a critical component of pandemic preparation in any healthcare treatment facility. It is defined as the preparation for a large influx of patients with similar and/or specific illnesses and exposures of injuries (U.S. Department of Health and Human Services, 2021). To avoid disorganization and disruption of care, it is important to ensure the facility is well versed in surge plans and has proper triage plans for each department within the surge plan. Pandemic surges will stress a healthcare system and expose any weaknesses within that system (Fisher et al., 2011). Triage plans for pandemics will encourage efficient use of resources and effectual patient care delivery (Hamele et al., 2018). In addition to having a surge plan in place, communication infrastructure is necessary as well. Healthcare systems must establish means to clearly communicate plans and guidelines to all employees so that there is not a breakdown in

information (Christian et al., 2014). To test medical facilities' readiness for pandemic surges and triage plans, a tool was created to predict admissions and potential deaths known as the Pandemic Medical Early Warning Score (PMEWS; Venkatesan et al., 2015). The PMEWS tool scores each patient to determine their need for admission and/or intensive care admission (Challen et al., 2007).

A review of the H1N1 pandemic in Asia found that lack of preparation was the crux of care breakdowns within hospitals. There were several lessons that were learned from the pandemic response, including the fact that containment measures from other countries did little to slow the spread of H1N1, surveillance data was not properly monitored, and coordination of protocol was not communicated well (Fisher et al., 2011). Fisher et al. (2011) concluded that to prepare for the next pandemic, there would need to be improvement to preparations, enhancement to communication, and that improvements must be made to weak areas to avoid significant mortality rates during future outbreaks.

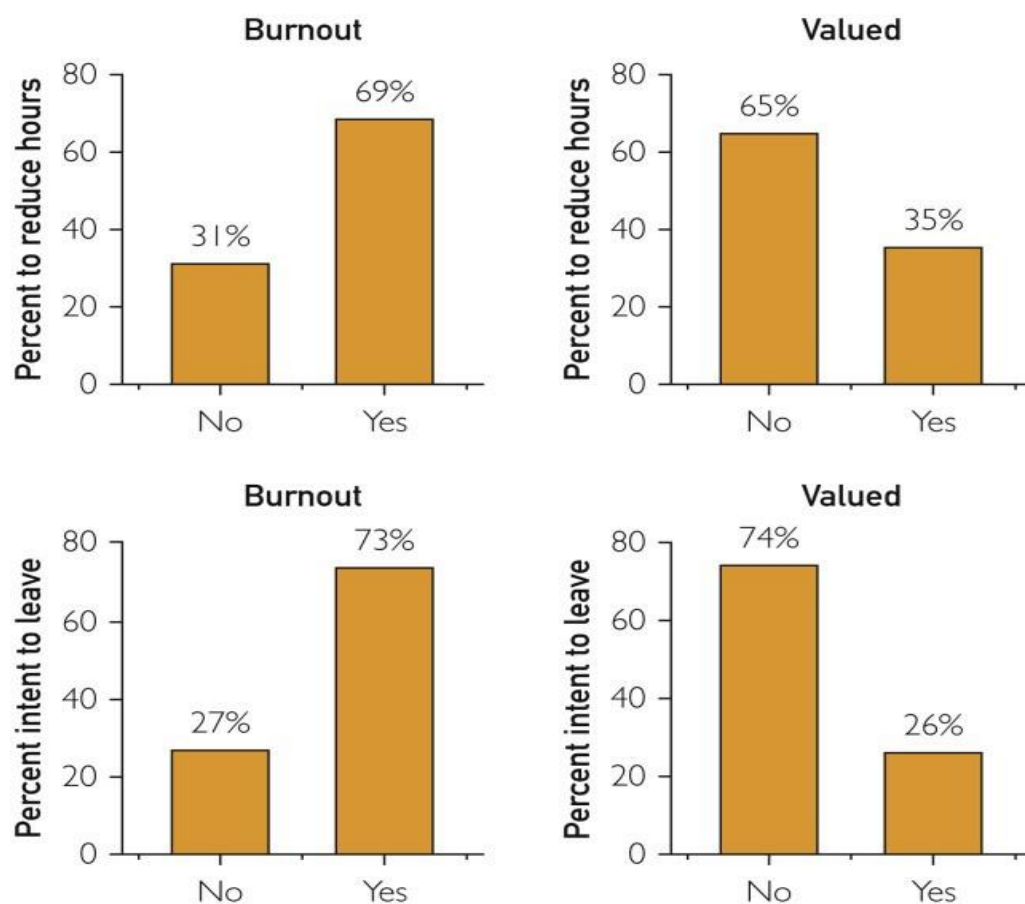
Findings From Previous Studies

Burnout and the resulting compassion fatigue are two of the leading publications about mental health detriments for HCWs. A Spanish-based study focused on critical care and emergency unit nurses found that 38.5% had experienced a high level of burnout, 10.5% experienced emotional exhaustion, 16.8% reported depersonalization, and 63.3% stated that they felt a low level of accomplishment (Cañadas-de la Fuente et al., 2018). Drs. Lacy and Chan found that in 2011, 45% of physicians reported burnout and in 2014, 54.4% of physicians reported burnout (Lacy & Chan, 2018). Further, other studies found that 45% of physicians reported at least one feeling of burnout and that emotional exhaustion was the highest after 11-20 years of practice categorized as the mid-career point (Dyrbye et al., 2013; Lacy & Chan, 2018; Peckham, 2015). However, a survey of U.S. HCWs during COVID-19 found that those who felt valued by their organization and were given proper support reported lower values of burnout

(Sinsky et al., 2021). The study from Sinsky et al. (2021) also reported that HCWs who felt valued and supported in their work did not plan to abandon their position (see Figure 1). Studies from the COVID-19 pandemic show that HCWs reported burnout rates between 44-80% (Miller et al., 2021; Pooja et al., 2021). This is a noted increase from studies from non-pandemic times and previous pandemics.

Figure 1

Relationship Between Burnout, Feeling Valued by One’s Organization, and Work Intentions of U.S. Physicians, Advanced Practice Providers, and Nurses (Sinsky et al., 2021)



A revolutionary study from Czechoslovakia surveyed 132 female physicians and nurses who worked with diabetic patients, which had never been done at that time. The unique aspect of the study is that for the first time, the phenomenon of “splitting” was associated with burnout and

depression in HCWs (Riethof et al., 2019). For this study, splitting was defined as a shift of consciousness to devaluation of some individuals and idealization of others to protect one's own mental state and being able to stabilize themselves in the stress of their work environment (Cohen et al., 2015; Riethof et al., 2019).

As previously mentioned, a 2018 study found that nurses who suffer from compassion fatigue are likely to use cigarettes, sleeping pills, energy drinks, anti-anxiety drugs, alcohol, and amphetamines as coping mechanisms (Jarrad et al., 2018). In additional studies of nurses and compassion fatigue, an interesting anomaly was found. A 2016 study of nurses in geriatric units found that newer nurses were more likely to exhibit signs of compassion fatigue than more experienced nurses (Kolthoff & Hickman, 2017). Surveyed European emergency unit nurses were found to report more inclusive results. The study sampled 87 nurses from different demographics, all of which worked in emergency and urgent care units at a university hospital; the study found that there were high levels of compassion fatigue in nurses from all ages and experience groups (Borges et al., 2019). Notably published was a large systematic study from the Journal of the American Medical Association, JAMA, that focused on the compassion fatigue of physicians. The study found that there was such variability in prevalence of burnout rates of physicians that there were no definitive results from the review, thus highlighting the need for future studies and standardization of measurement tools (Rotenstein et al., 2018).

Studies from previous pandemics have shown that poor mental health outcomes are exacerbated during pandemics. A survey of employees at a Japanese hospital in Kobe city during the H1N1 pandemic found that 94.1% of those HCWs felt stress and anxiety from lack of protection and 79.7% reported that they felt the hospital itself was not doing enough to protect the workers (Imai et al., 2010). A survey of Taiwanese HCWs during the SARS pandemic found that 20% of staff members felt they were stigmatized by neighbors because of their proximity to ill patients and 15% did not want to go home so their families would not be a risk of infection

(Bai et al., 2004). Results from Greek physicians surveyed during SARS revealed that 20.7% presented with moderate psychological distress, 6.7% of other medical staff had moderate to severe psychological distress, and 8.6% of nurses had severe psychological distress (Goulia et al., 2010). Research shows that COVID-19-related depression in HCWs found that COVID-19 depression rates were 21% higher than those during the SARS pandemic (Preti et al., 2020). Most studies found that HCWs were willing to accept the risks associated with care during a pandemic. A large study of over 10,000 HCWs in Singapore found that 76% perceived the risk of treating patients during SARS, but 69.5% responded that they were willing to accept that risk to care for their patients (Koh et al., 2005).

Interventions

Stress

Stress management training is a psychoeducation approach to using computer-based methods to help workers become aware of their stress and develop skills to cope (Umanodan et al., 2014). One method of stress reduction intervention is the application of computer-based training for HCWs. Maunder et al. (2010) reported that hospital-based HCWs have used a computer course to teach confidence improvement, efficiency, and identifying interpersonal issues, with the goal of improving coping skills and stress reduction. The review found that the program had neutral short-term effects and positive long-term effects.

Another method of stress intervention for HCWs is progressive muscle relaxation (PMR). PMR was developed by Edmund Jacobsen in the early 19th century and theorizes that by learning to reduce muscle tension, stress will lessen as well (Pawlow & Jones, 2002; Varvogli & Darviri, 2011). Associated with PMR is the use of yoga as an added intervention. An existing review using yoga to reduce HCW stress found that consistently practiced yoga reduced stress levels and had a positive effect on physical health as well as sleep patterns of HCWs (Cocchiara et al., 2019). Physical relaxation methods were found to have a higher impact on short-term

stress reduction than isolated muscle relaxation as suggested by Jacobsen. An analysis of relaxation methods for HCWs found that massage therapy and yoga were highly effective at reduced stress levels in the short and long term for HCWs (Ruotsalainen et al., 2015).

Mindfulness-based resilience training, focusing on inner thoughts to improve resilience in stressful situations, has shown promising preliminary results. Existing studies have been marked as preliminary and point to mindfulness based stress reduction (MBSR) as the current modality of treatment until further studies can be performed (Mistretta et al., 2018). Italian medical students were surveyed, and researchers reported promising results with the use of a MSBR offset called Focusing. Focusing relies on narrowing one's inner thought process to assess feelings and experiences to focus on the physiological response with the goal of identifying stress triggers, subsequently allowing one to control their own response to stressors (Rinaldi et al., 2019). The study showed promising results and was implemented as part of onboard training for several departments within Sant Andrea hospital in Rome. A qualitative study based in Brazil found that implementing a mindful meditation protocol yielded positive results. The goal of the study was to mitigate stress, and subsequent negative effects, for the nursing population in Sao Paola with daily guided and self-led meditation practices (dos Santos et al., 2016). The study used multiple scales to gauge levels of stress before and after meditation sessions. It was concluded that mindful meditation led to improved reactivity to stressful situations, more attentive perceptions of external experiences, and heightened awareness of actions and attitude, which had led to a more positive working environment for nurses (dos Santos et al., 2016).

Cognitive based therapy (CBT) has shown promise in the reduction of HCW stress as well. The American Psychological Association defined CBT as a form of treatment that is based on changing an individual's way of thinking to change their behavior or reactions to situations (APA, 2021). There is evidence that CBT is most effective as reducing work-related stress (Gu et al., 2017). CBT is like Focusing as the intent is to identify feelings. CBT stress management

involves the identification of how feelings, behavior, physical experiences, and thoughts contribute to one's stress level (Strauss et al., 2018). CBT was used in a study of nurses in Japan to assess its impact on stress-induced insomnia. The study found the CBT was helpful in reducing the stress level of nurses as well as their issues with insomnia (Kuribayashi et al., 2019).

Organizational based changes were found to have a tremendous impact on stress reduction for HCWs. By changing working conditions, organizational support, communication, and work schedules, it was found that HCW stress was significantly reduced (Ruotsalainen et al., 2015). Ruotsalainen et al. (2015) also found that changing the work schedule model from a 4-week plan to a 2-week plan allowed for greater flexibility for nurses and they were able to have consecutive days off. Research from the Mayo Clinic has shown that when organizational changes are made that focus on improvement for employees' welfare, positive impact is the result. When organizational values and change are focused on respect and employee health, there is a direct correlation between increased employee engagement and decreased stress levels (Kang et al., 2019). In addition, a critical organizational change in reducing HCW stress is maintaining proper staffing levels. When nursing staff was at full capacity, the stress level was significantly reduced, employee retention increased, and patient outcomes improved (Eslami et al., 2017). As previously noted, staff stress and burnout increase when an organization is not properly staffed. Evidence from Eslami et al. (2017) shows that staffing is an important intervention to stress reduction for HCWs.

Burnout

Burnout is often associated with stress for HCWs. Examination of organizational level and individual level burnout interventions for physicians resulted in a variety of solutions that were proven effective at reducing burnout levels for doctors. Successful intervention methods from an organizational level include work hour limits, optimized electronic health record

systems, non-clinical support staff to decrease administrative burden, work life balance, decreased work responsibilities outside of the healthcare facility, and having physicians in positions of leadership to promote respect in the workplace (West et al., 2018). West et al. (2018) also found that individual level interventions, based on the individual physician's particular needs and wants, were necessary as well. Some of those interventions include reducing work schedules to part time, delegation and prioritization of tasks, self-care, stress management training, and therapy (West et al., 2018). Canadian-based anesthesiologists found that self-care was a prominent interventional method in preventing burnout. The study found that self-care was essential to preventing and/or remedying burnout levels in healthcare professionals and called for self-care advocacy in hospital and medical clinics (Kuhn & Flanagan, 2017).

A systematic review of existing literature found that physician burnout significantly decreased with meaningful-based therapy interventions and coping strategies. Coping strategies are actions or thought processes that are used in stressful situations to control one's behavior (APA, 2021). This meant that physicians who changed their daily workflow and contributed a few more hours a day to activities in their line of work that were meaningful to them found that their burnout level decreased (Rothenberger, 2017). Implementation of a coping strategy was effective in reducing nurse burnout and had long-term effectiveness when reviewed in 6-month intervals (Lee et al., 2016). Some coping strategies nurses report using are venting to friends, family, or coworkers, relaxation, avoidance, spiritual support, professional support, engaging in demanding physical activities, and using humor (Mahfouz & Alsahli, 2016).

Depression

Depression intervention methods focused solely on HCWs are rare with most publications focusing on generalized approaches or a focus on other populations. The most successful, and popular, depression intervention methods include medication, psychotherapy, or a combination of the two (Cuijpers et al., 2020). One study of note of Japanese nurses suggests

that further interventions for depression in nurses are necessary due to the correlation between depression and sleep issues (Furihata et al., 2020). As previously noted, sleep pattern interruption can have a poor effect on patient outcomes, thus creating an organizational need to assess interventions for depression to ensure patient safety. Center et al. (2003) suggested that the reason for minimal interventions for depression in HCWs, especially physicians, is the stigma surrounding mental health for all healthcare professionals. The research states that often doctors, nurses, and other clinical staff do not seek mental health interventions for fear of it affecting their job or rebuke from their coworkers (Center et al., 2003). Additional systematic reviews of interventions focused on nursing staff called for future research and documentation of interventional methods dealing with depression as the information present was limited (Brook et al., 2019).

Compassion Fatigue

A review of 13 studies pertained to compassion fatigue interventions using stress-relieving methods of yoga, meditation, music therapy, or promotion of profession self-efficacy (Cocker & Joss, 2016). Cocker and Joss (2016) found that of these reviewed studies, there was little to no effect on compassion fatigue or stress levels. As with other mental health interventions, it is important to have a plan to guide the interventional methods to ensure efficacy. When planning a compassion fatigue intervention, it is necessary to assess the resource of the healthcare facility, seek out a mentor or mental health professional to supervise the plan, and contribute to self-care (Lombardo & Eyre, 2011).

The American Nursing Association advised that a successful compassion fatigue intervention must be tailored to the individual and recommended personalized assessments for HCWs (Lombardo & Eyre, 2011). Gender plays a role in compassion fatigue within the HCW population. Turkish obstetricians and gynecologists reported that women are much more susceptible to compassion fatigue than men and therefore require different interventions than

their male counterparts (Dirik et al., 2021). An additional study of Australian-based gynecologists found that psychiatrist-led discussion groups were effective in reducing compassion fatigue rates as well as burnout and stress (Allen et al., 2017). There are other methods of intervention that are more holistic and accessible at work, which is often the source of stress and compassion fatigue for HCWs. Relaxation rooms within healthcare centers have also been found to be a successful intervention method for compassion fatigue (Lombardo & Eyre, 2011).

Mindfulness-based interventions have had success with reducing the psychological symptoms of compassion fatigue for nurses. A 2016 study of oncology nurses found that when mindfulness-based exercises were tried, nurses felt an overall reduction in compassion fatigue, increased self-compassion, and reduced levels of burnout (Duarte & Pinto-Gouveia, 2016). Conversely, a review of existing studies contradicts these findings. A review of 31 studies found that there is little empirical evidence to suggest that mindfulness cognitive therapies have any effect on healthcare professionals and that there is a need to explore this method more rigorously to assess its effectiveness (Wentzel & Brysiewicz, 2017). An additional method of intervention is to rely on peers as pseudo therapists. Peer support was found to be the most effective method of compassion fatigue intervention and was also found to have a positive effect on retention (Aycock & Boyle, 2007).

Mitigation Tools

Mitigation tools to fight burnout, depression, and other mental health issues in HCWs have become increasingly popular. A review of existing literature found that web-based tools are becoming a prominent method of mitigation (Pospos et al., 2018). Pospos et al. (2018) reported that breathing tools, mediations applications, web-based CBT, and suicide prevention apps were used during their study, and each was comparable in effectiveness. An Australian study of web-based mental health services found that internet-based therapy was effective in the treatment of

depression and decreased the stigma toward seeking out mental health services; in addition, web-based mental health programs aided rural areas where practitioners were in short supply and provided cost-effective treatment for those who had previously avoided treatment due to lack of funds (Griffiths & Christensen, 2007). These web-based services are especially beneficial to HCWs in rural areas who may not have access to care, just like their patients, or they do not want to see a practitioner in their community due to stigma or fear of crossing professional boundaries.

A review of web-based mitigation tools found that those who had access to web tools, and participated in the study, had increased exercise times, positive behavior change, improved nutritional status, weight loss maintenance, and increased participation in their healthcare (Wantland et al., 2004). In support of this, a study from Cambridge University found that web-based mental health support programs were an effective tool in decreasing stigmatization of mental health issues and showed potential for increased seeking of treatment in person (Naslund et al., 2016). As noted, there is hesitation for HCWs to seek out treatment and this de-stigmatization would be beneficial and perhaps remove barriers to care for HCWs.

Common Theories and Methodologies

As a result of the compassion fatigue phenomenon, scholars have created the transactional model of physician compassion, which is a theoretical model that allows one to look at compassion in physicians through a lens that shows the physician as having varying levels of compassion in different situations as deemed appropriate (Fernando & Consedine, 2014). This newly minted framework allows for a varied approach to compassion fatigue study that looks at certain situations and responses, rather than quantifying the degree of lacking compassion. The goal of the framework is to allow future researchers to identify barriers and make better interventions designed to enhance compassion from physicians and decrease compassion fatigue (Fernando & Consedine, 2014).

The modified grounded theory approach (M-GTA) has been applied to studies seeking to explore interventions in HCW burnout. The theory is a variation of grounded theory, which is based on the collection of analysis of data for qualitative studies (Glaser & Strauss, 1967). Whereas grounded theory is based on strict coding procedures, M-GTA forms results from interpretations of the data presented (Kinoshita, 2003). By interpreting the data, rather than just presenting it, there is allowance for themes to emerge, rather than just statistical data. The M-GTA theory has led researchers to find that social needs are a key factor in mitigating burnout and further research is pending (Kung et al., 2019).

The most common methodology in the study of HCW mental health are survey tools or questionnaires. Through the research all previous studies employed a survey or questionnaire to obtain data from the HCW population. Some of those survey tools included the Perceived Stress Scale (Levenstein et al., 1993), the Maslach Burnout Inventory Human Services Survey for Medical Professionals (Maslach et al., 1997), Professional Quality of Life Scale (Stamm, 2010), Beck Depression Inventory (Beck & Steer, 1984), and the Depression Anxiety Stress Scale (Akin and Çetin, 2007). A detailed description of these tools and their purpose is detailed by the National Academy of Medicine's list of "Valid and Reliable Survey Instruments" (National Academy of Medicine, 2021). These validated survey tools were noted, in multiple studies, when examining peer-reviewed research throughout this review.

Thoughts/Conclusions of Previous Research

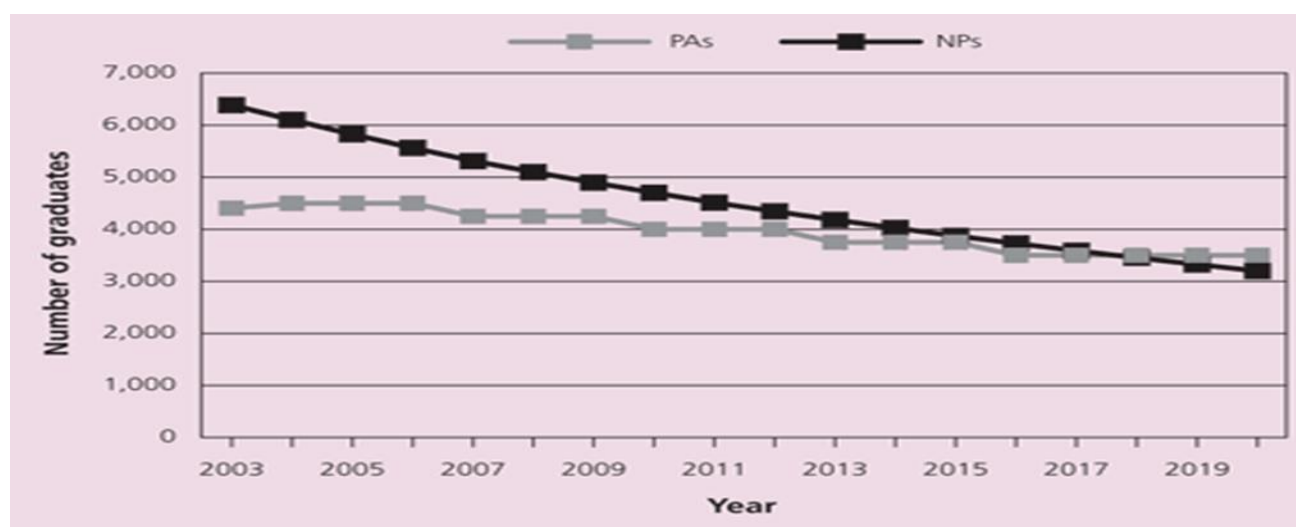
One study provided an oversimplification as a solution to job stress. Deng et al. (2019) reported that by removing job stress, job performance increased in Chinese hospitals and stress level decreased. The issue then becomes, how do you reduce stress in the healthcare workplace? Studies in the review show that stress affects sleep and sleep leads to medical errors, thus high stress begets medical errors (Blaxton et al., 2017; Kaneita & Ohida, 2011; Sheldon et al., 2014; Stewart & Arora, 2019). Interventions from the research show that therapies, self-care, and

exercise show slight mitigation of stress levels, however with minimally incremental improvement. This begs the need for effective interventions to be implemented to mitigate the negative mental health outcomes for HCWs. The research shows that existing interventions and mitigation tools have minimal effects. While each study proclaimed to be successful, the prevalence rate of stress for HCWs denounces their effectiveness. If the stress in the workplace cannot be mitigated with interventions, it is perhaps time to look at the causal factors of stress and how to eliminate them.

Job stress often leads to job abandonment (Chen et al., 2019). If stress levels continue to rise for HCWs, the job abandonment rate will also rise, which precludes solving any existing HCW shortages. In addition, there will not be enough new HCWs to fill the void. Research, prior to COVID-19, suggests that the rise of reported poor mental health outcomes for HCWs is to blame for the decreased numbers of individuals matriculating into health-related programs and the number of graduating advanced care practitioners (see Figure 2). As there is a noted shortage of HCWs at present, decreases in the number of healthcare professionals going forward will make the shortage drastically worse.

Figure 2

Number of Graduating PAs and NPs, 2003 to 2020

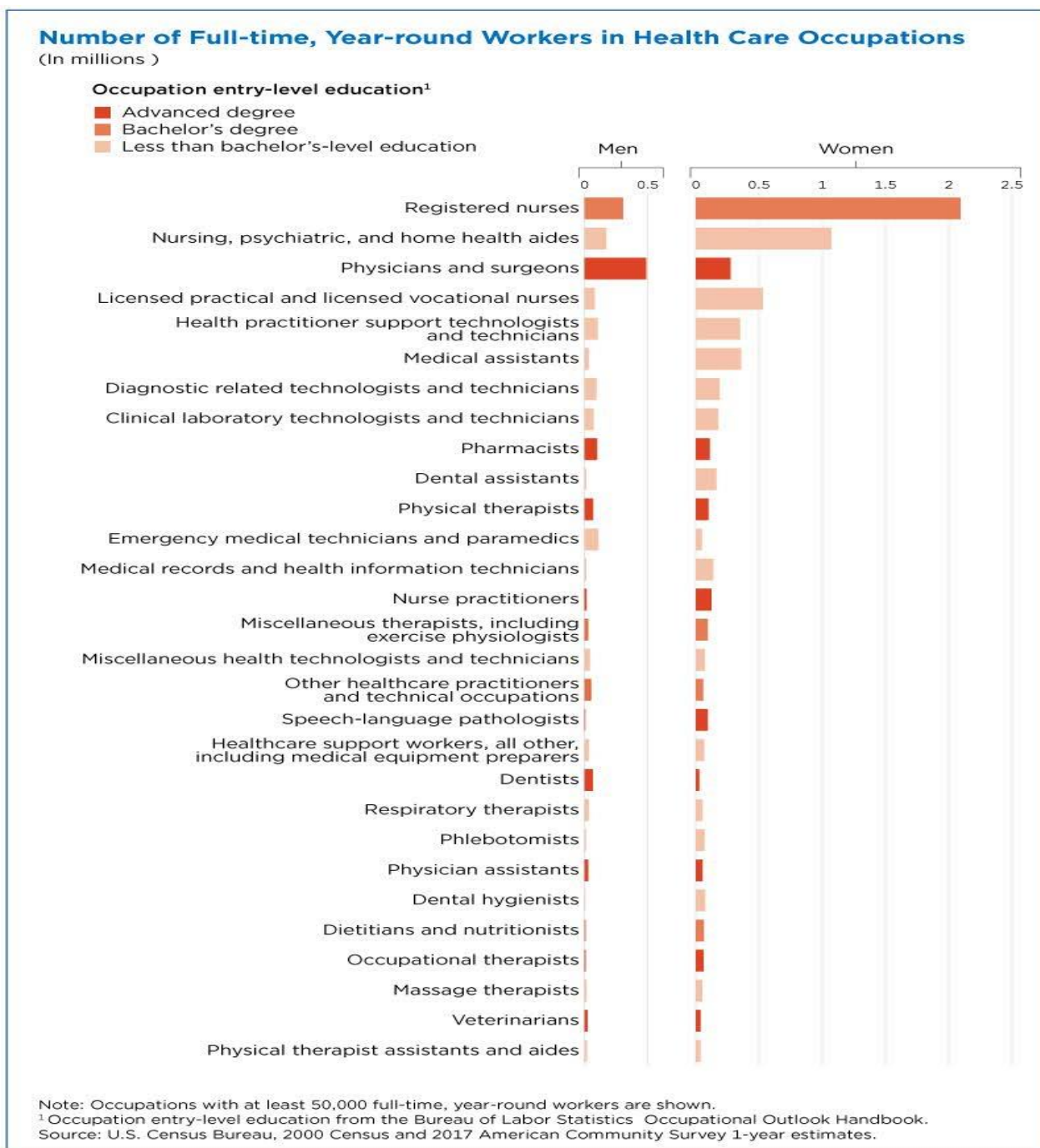


Note. PA = physician assistant; NP = nurse practitioner (Journal of American Family Physicians, 2005).

Three studies have shown that women are more likely to have feelings of depression or be diagnosed with depression during a pandemic (Barbore et al., 2020; Chauhan et al., 2021; Lai et al., 2020). This is of notable concern and makes women in healthcare a high-risk population. There are 2.5 million registered nurses in the United States, 85% of whom are women, and there are over 763,000 physicians, 33% of which are female (U.S. Census Bureau, 2021). The number of women in every practicing position in healthcare from RTs to NPs to PAs is increasing as time goes on (see Figure 3), creating a larger at-risk population. This alerts the need for effective interventions for depression for HCWs to prevent shortages when women leave healthcare due to the psychological distress incurred as a hazard of the job.

Figure 3

U.S. Census Bureau Number of Full-Time Healthcare Workers, 2017



Gaps in Literature

There is a significant gap in the literature for publications that specifically address the overall mental health of HCWs during previous pandemics, prior to COVID-19. Of the studies reviewed, most are focused on the incidence rates of mental health in HCWs with little focus on cause, mitigation, or intervention as evidenced in the brevity of the mitigation tools review section. As it stands, there is limited research that focuses on interventions for depression, stress, or anxiety in HCWs. Further, there is a lack of scholarly review of mitigation tools, specifically web or digital tools, used to combat poor mental health outcomes or resolution of existing mental health issues in HCWs.

Information available pertaining to mental health in previous pandemics is somewhat limited and focuses mainly on general results, rather than HCWs specifically. Some studies that were reviewed assess the impact of HCW mental health during medical disasters like Ebola outbreaks, which are defined as epidemics, rather than pandemics. When compared to publications pertaining to mental health of HCWs and COVID-19, there is a noticeable gap in the amount of literature available pertaining to previous pandemics. A comparative study found that COVID-19 had a much higher rate of published articles relating to mental health by over 300% when compared to SARS or H1N1 (Maalouf et al., 2021). Most of the available information prior to the COVID-19 pandemic, 2019, is tightly focused on nurses and physicians. There is limited attention paid to HCWs such as respiratory therapists, patient care technicians, nurse practitioners, or physician assistants. Granted, advanced practitioners like physician assistants and family nurse practitioners have become much more popular in recent years, but there is still little focus on that segment of the HCW population.

In addition, there is a noted lack of standardization of survey tools to allow for consistency of measurements and accuracy of results. Studies that are in publication are not taken into consideration because of the lack of congruence between studies to allow for a proper

standard. With each study, there is modification of an existing tool or the use of multiple tools to suit the needs of the researcher. This does not allow for standardization of results and lends to the lack of focus on the issues of HCW mental health outcomes. There is a need for national studies of HCWs' mental health to address the epidemic of stress, anxiety, and depression in HCWs and a call to action to seek out interventions to prevent burnout and job abandonment.

There is a notable lack of peer-reviewed studies that look specifically at respiratory therapists. Most articles in publication are from media outlets or self-published articles from hospitals or medical schools. Given the importance of RTs during the COVID pandemics and other influenza pandemics, there is a fundamental lack of focus on the mental health of RTs. In addition, there is a noticeable lack of literature pertaining to male nurses and HCWs who fall into the role of certified nursing assistant or patient care technician. Most reputable publications focus on physicians and nurses. While they are both essential populations in the healthcare field, they could not do the work they do without the aid of RTs, patient care technicians, or other support staff.

Overall, there is much information on the mental health of HCWS, mostly during the COVID-19 period. Even with the numerous publications, posed interventions, and mitigation tools, there is little to no research that has described a truly effective way to change the mental health outcomes for HCWs. As previously mentioned, there is not a standardization of surveys for HCW mental health and could be a potential effect of the dizzying array of publications that call for action but are unable to offer solutions. This is a paramount area of research for future qualitative studies to be undertaken in the future.

In summary, the COVID-19 pandemic is unlike other pandemics in history because of its endurance, death rates, and the effect that it has had on the mental health of HCWs. Unlike previous mass casualty pandemics, we are aware of the existence of poor mental health outcomes due to increased stress and occupational hazards, unlike the pandemics of the 1900s. Further, we

are now, more than ever, a global community, as is seen in the reviewed evidence showing the similarities in mental health outcomes for HCWs around the world and how those outcomes are leading to burnout and job abandonment. If these trends continue, healthcare systems around the world will suffer from increased shortages of HCWs, leading to poor patient outcomes and lack of access to care. It is valuable to review studies from around the world to analyze the effects of working during the COVID-19 pandemic to identify areas of concern and potential interventional methods and/or mitigation tools to help prevent further HCW shortages, to help HCWs who have chosen to remain in the field to care for patients and to avoid curtailing individuals from entering the field in the future.

Methodology

This research project was accomplished by conducting a systematic review of existing literature, published between 2020 and 2022, to identify publications related to COVID-19, healthcare workers, and mental health outcomes. The final number of articles reviewed was 25.

The review of current studies sought to answer the following research questions:

- 1) Which healthcare worker population reported higher levels of stress, depression, anxiety, and PTSD?
- 2) Were the mental health effects of working during COVID-19 consistent globally for HCWs, or do they vary?
- 3) What factors affected the stress, anxiety, and depression rates of HCWs during the COVID-19 pandemic?
- 4) What mental health intervention methods were shown to be most effective at mitigating poor mental health outcomes for HCWs?

Additionally, this chapter of the review discusses the design of the study, data collection methods, analysis procedures, and limitations of the research.

Study Design

The purpose of this systematic review was to assess the impact of working during the COVID-19 pandemic on the mental health of HCWs through existing literature. Articles were selected that fit specific inclusion criteria and pertain to a very specific set of search guidelines. There was minimal researcher bias due to the strict protocols for systematic reviews. As the goal was to review literature from around the world and assess the global impact of the subject, due to lack of research funds and support staff, the study could only be accomplished through a systematic review. Further, numerous studies from around the world have been performed, which allowed for enough data to support a systematic review as the chosen methodology and repeating those studies would be costly and redundant. Other types of studies such as quantitative or qualitative were not deemed appropriate to the study design as the research reviewed existing data, rather than creating new data to review.

Study Inclusion and Exclusion Criteria

Inclusion Criteria. Articles selected for this review were required to meet the following inclusion criteria: published in a peer-reviewed journal or credible website, published between 2020-2022, and English language publication or translation service available within the article. The review allowed randomized controlled trials, qualitative studies, interventional trials, cross-sectional studies, case studies, and non-randomized control studies. All studies included contained at least one valid mental health outcome, or the support for the need for interventions, and its subsequential relationship with COVID-19. In addition, articles were chosen that identified interventional methods related to mental health outcomes and working during COVID-19. Data from reputable databases like the Centers for Disease Control and Prevention, World Health Organization, or the National Institute of Health was also included. The PRISMA checklist (Page et al., 2021; see Appendix A) was used to ensure the quality of the sources used for this review.

Exclusion Criteria. Publications were excluded if they did not pertain specifically to COVID-19 and the effect on HCW mental health outcomes. Articles that were not available in English, or if an English translation was not available, were also excluded from review.

Exclusion criteria did not permit systematic reviews or meta-analysis, theoretical studies, or data from dissertations.

Data Collection

Studies relevant to the research were sourced from the following databases: PubMed, Medline, and Google Scholar. Articles publication dates between 2020 and 2022 were reviewed. The PubMed “articles that are similar” feature was used to identify potential sources. As this research was a systematic review of existing literature, with no involvement of actual human participants, there was no need for Institutional Review Board approval.

Each search database was used to source articles and various keywords were used during query. Please see Table 1 for the utilized search phrases and keywords.

Table 1*Search Strategy Databases and Keywords/Phrases*

Database	Keywords/Phrases
PubMed	COVID-19 and healthcare worker mental health COVID-19 and healthcare worker stress COVID-19 and healthcare worker anxiety COVID-19 and healthcare worker depression COVID-19 and healthcare worker PTSD COVID-19 and healthcare worker mental health outcomes COVID-19 and healthcare worker mental health intervention methods
Google Scholar	COVID-19 and healthcare worker mental health COVID-19 and healthcare worker stress COVID-19 and healthcare worker anxiety COVID-19 and healthcare worker depression COVID-19 and healthcare worker PTSD COVID-19 and healthcare worker mental health outcomes COVID-19 and healthcare worker mental health intervention methods
Medline	COVID-19 and healthcare worker mental health COVID-19 and healthcare worker stress COVID-19 and healthcare worker anxiety COVID-19 and healthcare worker depression COVID-19 and healthcare worker PTSD COVID-19 and healthcare worker mental health outcomes COVID-19 and healthcare worker mental health intervention methods

The number of articles identified was noted in an Excel document and reviewed for duplication exclusions. Each article was assessed to determine eligibility through inclusion and exclusion criteria based first on the title and subsequently by the article abstract. If the article was excluded based on title or abstract, the full article was read to ensure it did or did not meet inclusion criteria. Additionally, the reference section was reviewed to identify other potential

articles for inclusion in the review. All publications that met the entirety of the inclusion criteria were included in the systematic review. Each study that met the guidelines of approval was then entered into the Data Extraction Table (see Table 2). All relevant data from the sourced studies was then entered into the table and analyzed to assess the impact of working during COVID-19 on the mental health of HCWs. Based on the data extracted, several potential recommendations for interventions were identified, as well as causal factors, and prevalence rates for mental health outcomes.

Data Analysis

When the compilation of publications concluded, each study was assessed for quality. Given that different study types were reviewed, it was best that the assessment utilized a mixed methods appraisal tool (MMAT; Hong et al., 2018). This tool is designed to assess questions for various types of studies to evaluate their relevance and quality for a systematic review. Appendix B shows the tool and questions within it. Each study was screened according to the MMAT beginning with the screen questions to eliminate any studies that were not empirical. This allowed for a more detailed rating of each study (Hong et al., 2018). Each study was then assessed based on its design type, then the researcher and additional reviewer commented on the study, rather than score it, to assist with inter-rater reliability.

Inter-rater Reliability

An academic peer was chosen as the additional rater, who reviewed a sample of the chosen publications for this review. Data included the title of study, publication year, study location, sample size, study type and design, mental health effect and prevalence rate, relationship to job preparedness, resource shortages acknowledgement, barriers, job stress effects, interventional methods, and comments. The rater evaluated the sample and filled out the Data Extraction Table. Results were compared by the researcher and inter-rater. Of the six

studies that were evaluated by the inter-rater, three were determined to meet inclusion criteria and three were excluded (see Appendix C).

Table 2

Data Extraction Table

Publication					
Sample Size					
Location					
Design					
Population					
Mental Health Affect Identified					
Level of Mental Health Affect					
Job Preparedness					
Resource Shortage Addressed					
Barriers					
Job Stress Effects					
Interventional Method					
Comments					

Delimitations

The delimitations of this systematic review were to assess studies published between the years 2020 through 2022 and sought articles that assessed the impact of working during COVID-19 on the mental health of HCWs. Additional delimitations of the review have been mentioned previously. Briefly, those delimitations were English language publications, studies specifically

pertaining to HCW mental health outcomes during the COVID-19 pandemic, and were required to be peer reviewed. **Results**

This systematic review of literature was conducted to identify studies from around the world that focused on outcomes related to the mental health of HCWs during the COVID-19 pandemic and followed the PRISMA framework (see Appendix D). Initial searches yielded 17,863 publications dated January 2020 through April 2022. Initial review of titles and study type led to the exclusion of articles and left 178 publications to be reviewed for inclusion in the systematic review. From there, 125 records were omitted after abstract reviews. Finally, 28 publications were selected to be included in the review and assessed for by the researcher and inter-rater. After review by the researcher and inter-rater, three articles were excluded for not meeting the set inclusion criteria. Twenty-five articles that met inclusion criteria were approved for final assessment in the systematic review study (see Appendix E for modified PRISMA flow diagram). Each study was coded by the researcher and the inter-rater and a Kappa value of 1 was achieved. Inter-rater reliability is provided in Table 3 As previously mentioned, three articles were excluded from the review after the initial review by both researcher and inter-rater. Inter-rater reliability for the excluded studies can be reviewed in Appendix C.

Table 3

Kappa Score Date (Kappa Coefficients, 2021)

	Inclusion Criteria Present	Exclusion Criteria Present	Subtotal		Researcher	Inclusion Criteria Present	Exclusion Criteria Present	Subtotal
Inclusion Criteria Present	A	B	A+B	Interrater	Inclusion Criteria Present	6	0	6
Exclusion Criteria Present	C	D	C+D		Exclusion Criteria Present	0	0	0
SUBTOTAL	A+C	B+D	A+B+C+D		SUBTOTAL	6	0	6
						Kappa= 6-6/6-6=1		

Each of the 25 studies that met inclusion criteria for this review included studies that reviewed the impact on mental health for HCWs during the COVID-19 pandemic and either concluded the need for interventions or explored intervention methods to improve mental health outcomes. Many of the studies were survey-based, cross-sectional studies; however, there were also three mixed-methods studies, one qualitative study, and one randomized control study. Of the 25 studies, 12 were published in 2020, 10 in 2021, and three in 2022. Studies originated from the following countries: Australia, Canada, China, Egypt, France, Italy, Japan, Malaysia, Mexico, Poland, Romania, Spain, and the United States. Seven studies were selected from the United States, four from China, three from Spain, two from Canada, and one study from each of the remaining countries listed above. A narrative of each study's findings is provided below, with a summary of findings provided in the Data Extraction Table (Table 6).

Narrative of Findings for Individual Studies

Wankowicz et al. (2020) aimed to assess the mental health factors experienced by HCWs that affected anxiety levels. The study surveyed 441 HCWs from different departments within a hospital, including emergency, infectious, and intensive care. Results from the study revealed that 64.4% of participants reported feelings of anxiety and 70.7% reported feelings of depression. The study found that psychological distress effects included increases in stress, anxiety, depression, insomnia, fatigue, and co-morbidities such as cardiac issues. Wankowicz et al. (2020) called for interventional methods to address self-care and stress reduction for HCWs.

Chen et al. (2021) published the results of a large-scale survey that assessed psychological stressors for nurses working in China and Taiwan during COVID-19. Of the 12,956 nurses surveyed, 95.6% were women and each had cared for at least one patient with COVID-19. Results included 34.8% of participants experienced insomnia, 28.1% experienced increased feelings of chronic nervousness, 24.7% experienced emotional exhaustion, and finally, 17.9% of women and 22.3% of men experienced feelings of depersonalization. Chen et al.

(2021) found that women have a higher trauma response than men and called for psychological interventions to address this issue for future pandemic training. These trauma responses were attributed to a lack of pandemic training and fears of infection due to the virus and lack of PPE. Additional intervention methods were suggested, including self-care and mindfulness exercises.

Crowe et al. (2021) assessed the work-related mental health impact of COVID-19 on registered nurses in Canada. The study took place in a hospital in western Canada that provided direct inpatient care to individuals with COVID-19. One hundred nine participants were surveyed using the Impact of Events Scale and the Depression, Anxiety and Stress Scale. Results from the study showed that individuals reported the following: 14.7% reported mild feelings of depression, 26.6% moderate feelings of depression, and 15.6% severe to extreme feelings of depression. Additionally, 25.7% reported mild feelings of anxiety, 14.7% feelings of moderate anxiety, 5.5% feelings of severe anxiety, and 21.1% feelings of extremely severe anxiety. Finally, the study found that 16.5% of individuals reported feelings of mild stress, 15.6% feelings of moderate stress, 11% feelings of severe stress, and 11% feelings of extreme stress. Many individuals reported numerous barriers to their ability to perform their job, including fears of infections, fear of lack of PPE, unclear communication and rapidly changed policies from administration, and an inability to meet the care needs of the patient. The study concluded the need for intervention methods to decrease anxiety, stress, and depression for HCWs but did not support a particular method of intervention

Secosan et al. (2020) conducted a cross-sectional study aimed at investigating the relationship between mental health complaints of HCWs during the COVID-19 pandemic and subsequent levels of stress and insomnia. The study population consisted of 126 participants composed of physicians and nurses in the emergency and intensive care units. The study found that there were direct relationships between the stress of working in the pandemic and increases in secondary stress and insomnia. This relationship was found to be more common in those

HCWs who experienced isolation, anxiety, and illness during the pandemic. Finally, the study concluded through their mediation model that frontline medical staff had significant outbreaks of stress, which resulted in exhaustion and chronic insomnia.

Choi et al. (2022) directed a cross-sectional survey study of 1,191 HCWs in China from November 2020 to January 2021 at Wonkwang University Hospital. The study utilized the Hospital Anxiety and Depression Scale to assess anxiety and depression levels in participatory HCWs. Results from the study reported that 21.87% of nurses reported mild to moderate feelings of anxiety. Researchers found that nurses presented with higher scores for anxiety, depression, insomnia, and lower resiliency than physicians or administration. Additionally, it was found that increases in anxiety and stress are directly related to decreased resiliency and quality of life for HCWs; however, the conclusion stated that resilience was the most influential factor for quality of life. The study noted the need for mental health interventions and suggested educational programs and therapy to promote resilience levels in HCWs.

Mohd Fauzi et al. (2020) conducted a cross-sectional study to assess the COVID-19 effect on Malaysia-based doctors' mental health. The study reviewed levels of anxiety, depression, and stress, and their relationship with work demands. Data was collected at government-based health facilities in May 2020. The study employed a modified NASA Task Load Index, Occupational Fatigue Exhaustion Recovery scale, a modified Recovery Experience Questionnaire, and the Depression Anxiety Stress Scale. Results included 69.0% reported no feelings of depression, 70.3% reported no anxiety, and 76.5% reported no stress. Conversely, 17.2% reported feeling of moderate to very severe depression, 13.7% reported mild depression, 21.8% reported moderate to very severe anxiety, 7.9% reported mild anxiety, 14% reported moderate to very severe levels of stress, and 9.5% reported mild stress. The study noted the correlation between increased fatigue due to workload, familial demands, and anxiety/stress

levels for physicians. Finally, the study concluded that there was a need for targeted interventional methods to address fatigue causal factors and stress relief.

Guttormson et al. (2022) conducted a cross-sectional descriptive study that assessed the mental health impact of COVID-19 on critical care nurses in the United States. The study surveyed 498 nurses with an open-ended survey that collected data pointing to issues such as the lack of evidence-based treatment methods, lack of family presence at end-of-life care, inadequate leadership and organizational support, and increased emotional and physical distress. The study found that there was significant thematic feedback from the surveyed nurses to conclude that mental health had been affected by working in the pandemic and that nurses felt an increase in anxiety, stress, and exhaustion. Further, the survey found that sampled nurses felt as though there was a lack of organizational support to address these and supply shortage issues. The study determined the need for interventions to address the mental and physical well-being of nurses.

Pan et al. (2021) led a cross-sectional study of HCWs in Wuhan, China from December 2019 through April 2020. The study surveyed 667 HCWs in hospitals and other clinics through a web-based survey. The study utilized the WeChat app to avoid duplication and ensure identification of participants. The Post Traumatic Stress Disorder checklist tool was used to assess the level of PTSD found in workers and determine if it decreased over time. The study found that 13.7% of HCWS surveyed were dealing with PTSD. The survey found that participants who completed the survey subsequent times through the reporting period experienced a decrease in feelings of PTSD as time went on. Additional data reported during the study found that 44.4% of participants planned to seek therapy and 61.1% planned to resign from their position due to the mental health impact they had working during COVID-19. The study concluded the need for psychological interventions to address PTSD and causal factors through therapy and other psychological treatment methods.

Di Tella et al. (2020) conducted a cross-sectional study of physicians and nurses in Italy from March 19 through April 5, 2020. The study surveyed 145 individuals, 72 physicians and 73 nurses, through an online survey incorporating modified versions of several different survey tools. The study found that 40% reported feelings of depression and 47% reported feelings of increased stress. Additionally, it was found that female HCWs were more likely to experience increased feelings of depression and stress than their male counterparts. Di Tella et al. (2020) determined the interventional need for mental health support and psychosocial support to support HCWs in Italy.

Jiménez-Giménez et al. (2021) published a mixed methods study based in Spain at the Fundación Jiménez Díaz University Hospital. The study not only reviewed the relationship between COVID-19 and HCWs, but the effectiveness of mental health interventions for HCWs. The study found that 34.4% of participants reported feelings of depression and 46% reported feelings of stress. Additional mental health issues like anxiety and burnout were noted, but not measured for prevalence. Jiménez-Giménez et al. (2021) also described the mental health programs in place such as psychotherapy, mental health support teams, group therapy, and mindfulness training. The study showed initial programs put into place to assist with mental health distress had not yet shown statistical significance to support effectiveness to date; however, there are plans to continue monitoring methods in place. Further, the study concluded the need to explore other methods of assistance in order to meet the needs of the HCW population.

Hassamal et al. (2021) published a study focused on evaluating the prevalence of depression and anxiety in hospital workers. The United States-based study surveyed 1,232 HCWs from April to May 2020. The study found that 33% of participants reported feelings of anxiety, 21% reported feelings of depression, and 46% reported feelings of overwhelming stress. Hassamal et al. (2021) noted the strong correlation between significant levels of stress in HCWs

and feelings of depression and/or anxiety. Additionally, the study found that those with less work experience were more likely to develop anxiety, high stress, and depression. Physicians and advanced care providers (PA, NP) were less likely to develop depressive symptoms. Hassamal et al. (2021) stated the need for psychological interventional methods to be implemented for all hospital employees to increase staff well-being. The study did not list specific intervention methods.

Firew et al. (2020) published a study that focused on the relationship between PPE availability and HCW mental health during the COVID-19 pandemic. The cross-sectional survey reviewed responses from 1,043 participants in locations across the United States. Results from the study showed that 47.6% of respondents said the PPE was available whenever needed. Further, the study revealed that those who had access to PPE and were trained properly in how to use their PPE were less likely to experience feelings of chronic anxiety and stress. Those who did not have access to PPE when needed were more likely to experience heightened anxiety, stress, and feelings of depression. The study concluded that there is need for interventions aimed at supporting HCWs, especially regarding PPE, to avoid future mental health crises in the future.

Gago-Valiente et al. (2022) conducted a cross-sectional study in Spain that centered on physicians during COVID-19 and their perceived mental health and feelings of burnout. The study surveyed 128 specialty physicians from Huelva, Spain from April through June 2020. Results from the study showed that 47% of women and 45.5% of men surveyed had the potential to present as a non-psychotic psychiatric case. Gago-Valiente et al. (2022) described this as meaning the participant had significant enough anxiety, depression, and stress (or a combination of any of the three) to be a viable candidate for therapy services. Further, 17.5% of men reported feelings of burnout as well as 6% of women. Additionally, 44.5% of men and 41.8% of women reported emotional exhaustion and 40.8% of men and 26.9% of women reported increased feelings of depersonalization. Gago-Valiente et al. (2022) determined that women had better

mental health outcomes than men for this study and interventional methods were necessary for all HCWs. The following interventional methods were stated as potentially useful: psychosocial education, resiliency training programs, and preventative programs.

Mellins et al. (2020) conducted a mixed methods study in the United States that evaluated not only the mental health effect of COVID-19 on HCWs' mental health, but the effectiveness of a peer support program designed to support mental health and increase resilience in HCWs. Mellins et al. (2020) reported that 68% of program participants reported moderate to high levels of stress via survey. The program, CopeColumbia, aimed to provide peer support, mitigate emotional exhaustion, and address resiliency issues. This was accomplished through therapeutic programs like cognitive based therapy, group therapy, and crisis leadership training. During the study, 186 group therapy sessions were conducted with 1,500 participants cumulatively. Individual sessions were also conducted but unaccounted for. Mellins et al. (2020) stated that of those participating in any of the therapy-based programs, 76% felt that they had moderate to high levels of mental health improvement.

Evanoff et al. (2020) published a cross-sectional study that assessed the prevalence of anxiety, depression, stress, and work exhaustion of United States-based HCWs from April through June of 2020. The survey had 5,500 participants that included HCWs in clinical settings as well as those working from home. Data from the survey showed that 13% of participants reported moderate to high levels of stress, 15.9% reported moderate to high levels of depression, 43% reported high work exhaustion, and 13% reported moderate to high levels of stress. Evanoff et al. (2020) stated that although interventional methods to improve resilience and burnout rates were needed, it would be more effective to reduce workloads and increase resources.

Lai et al. (2020) focused their study on the factors associated with mental health outcomes for HCWs in China during the initial months of the COVID-19 pandemic. This cross-sectional study had 1,257 participants, with 522 of the participants being front line HCWs from

34 hospitals. The survey took place from January to February of 2020. Of those participants, 44.6% reported feelings of anxiety, 50.4% reported feelings of depression, and 71.5% reported feelings of psychological distress. Lai et al. (2020) stated that 34% of participants also reported moderate insomnia due to increased workloads, anxiety, and fear of infection. This study concluded that the need for interventional methods to promote mental health well-being for HCWs was necessary and should be implemented immediately. Potential intervention methods suggested by Lai et al. (2020) included telephone counseling sessions, internet and application-based therapy, and hotlines.

Diaz et al. (2022) conducted a cross-sectional study with 813 participants that focused on the relationship between HCWs, insomnia, and working during COVID-19. The study took place in New York City from April to May 2020. Results from the study found the following prevalence rates: 38.8% of participants experienced shortened sleep cycles (less than 6 hours per night), 72.8% reported insomnia, 57.95% reported acute stress, 33.8% reported feelings of depression, and 48.2% reported feelings of anxiety. The study noted several times that 80.6% of the participants were female and 56% were nurses. Diaz et al. (2022) concluded that there was enough data present to support that there is a strong correlation between the increased stress and/or anxiety caused by working during the COVID-19 pandemic and subsequent shortened sleep and/or insomnia. Diaz et al. (2022) did not suggest any intervention; however, the study concluded that there is a need to create programs to decrease anxiety and stress during pandemic events to in turn alleviate insomnia levels for HCWs.

Elkholy et al. (2021) conducted a study in Egypt to assess the mental health outcomes of Egyptian HCWs during COVID-19. This cross-sectional study surveyed 502 physicians and nurses, from 20 different hospitals, from April to May 2020. Among the participants, 67.7% reported anxiety symptoms, 77.2% reported depression symptoms, and 80.9% reported increased levels of stress. Elkholy et al. (2021) attributed the significantly elevated prevalence rates for this

study to the shortages of hospital beds, supplies, and personnel. There was no mention of interventions by the research; however, it did conclude that potential interventions were necessary.

Fiol-DeRoque et al. (2021) published a randomized control study based in Spain. The study had 482 participants that included physicians, nurses, and advanced care practitioners (NPs, PAs). This study conducted a blinded, parallel group trial where HCWs were randomly assigned to receive access to the intervention application, PsyCovidApp. The goal of the study was to measure the effectiveness of the app as an interventional method intended to mitigate poor mental health outcomes as well as collect data for prevalence rates of mental health outcomes. The study found that 51.9% reported feelings of anxiety, 42.7% reported feelings of depression, 60.6% reported feelings of stress, 40.2% reported symptoms associated with PTSD, and 58.5% reported feeling burnt out. Fiol-DeRoque et al. (2021) concluded the study stating that the PsyCovidApp reduced poor mental health outcomes in HCWs who were also participating in therapy and/or medication therapy; otherwise, the intervention was ineffective. Studies are ongoing to test the long-term result of the application's effectiveness.

Robles et al. (2021) conducted a cross-sectional study in Mexico intended to not only evaluate the mental health of HCWs during COVID-19 but to also determine risk factors for those mental health problems. The study surveyed 5,398 HCWs from April to May 2020. The following results were found: 37.7% of participants reported feelings of depression, 37.5% of participants reported symptoms associated with PTSD, 16% of frontline workers reported suicidal thoughts, and 16.7% of nurses reported feelings of high anxiety. Robles et al. (2021) also found that 52.1% of participants reported having had insomnia since the pandemic began. Further, 12% of frontline HCWs reported increased use of alcohol in relation to feelings of anxiety and depression. The study concluded the need for interventional methods to alleviate poor mental health outcomes. Robles et al. (2021) suggested the following potential methods of

intervention: therapy via Zoom, telephone, or other telehealth avenues, to avoid access to care issues.

Holton et al. (2021) published a cross-sectional study that surveyed 668 Australian HCWs from May to June 2020. The study's purpose was to study the psychological well-being of HCWs in hospitals during the COVID-19 pandemic. Results from the study found that 72% of participants reported feelings of depression, 70% reported feelings of stress, and 57% reported feelings of anxiety. Holton et al. (2021) found that nurses and midwives had significantly higher anxiety scores when compared to doctors and other HCWs. Additionally, the study found that 30% of participants reported feelings of psychological distress. Holton et al. (2021) concluded that interventional methods should be targeted to be most effective in the COVID-19 pandemic and to be used in future pandemics. Specific methods of intervention were not mentioned.

Viswanathan et al. (2020) conducted a qualitative study in the United States to assess the effectiveness of telehealth interventions for HCWs during COVID-19 as well as identification of mental health outcomes. The study had 130 participants and took place in March 2020. The study found that participating HCWs had increased anxiety, stress, fear, decreased resilience, and depersonalization rates. As the study was qualitative, the prevalence rates were not tracked by Viswanathan et al. (2020). Three different therapy methods were employed in the study: group, individual, and telehealth. Viswanathan et al. (2020) determined that telehealth, group, and individual therapy programs showed initial promise in boosting resilience levels and lowering anxiety levels for HCWs.

Azoulay et al. (2020) conducted a cross-sectional study in France to assess the prevalence of anxiety, depression, and other mental health outcomes. The study surveyed HCWs from April 2020 to May 2020. This study focused heavily on the nurse population as 47.2% of participants were nurses and 21.1% were nursing assistants. Participants of the survey were found to have the following prevalence rates: 50.4% reported feelings of anxiety, 30.4% reported feelings of

depression, and 32% reported feelings of peritraumatic dissociation. Azoulay et al. (2020) concluded the need for interventional methods to address mental health distress for HCWs; however, specific intervention methods were not described.

Styra et al. (2021) conducted a study in Toronto, Canada that employed a cross-sectional survey method of HCWs from May 2020 through July 2020. Of the 3,852 participants, the study sought to include individuals who had worked in the previous SARS pandemic. The data from the study showed that those who had worked during the SARS pandemic did not report higher levels of mental health affect than those who had never worked during a pandemic. Those who participated in the study reported moderate to severe prevalence rates of anxiety (24.6%), depression (31.5%), and PTSD (50.2%). When compared to data previously obtained during the 2003 SARS pandemic, Styra et al. (2021) found that those who participated in the study who had worked during SARS reported lower scores of PTSD, anxiety, and depression. As a result, Styra et al. (2021) supported the implementation of resiliency training to prepare for pandemics or mass casualty events. The study also explored the use of mental health interventions and found that a buddy system (pairing two HCWs together to support one another) was effective at increasing resiliency and decreasing feelings of stress and anxiety. Other interventional methods suggested were simulation-based training and psychological support check-ins to assess the need for individual services.

Matsumoto et al. (2021) conducted a cross-sectional survey in Japan to assess levels of anxiety, depression, and stress. The study surveyed 588 HCWs from April to June 2020 at the Tokyo Medical University Hospital. Matsumoto et al. (2021) found that 98.5% of all participants reported mild levels of stress and of those, 8% of participants reported feelings of moderate to severe stress, and 6.8% reported feelings of depression. The study noted that females and older HCWs were at higher risk for anxiety, stress, and depression. Matsumoto et al. (2021) concluded

that there is an urgent need for psychological support for HCWs to maintain mental health. A specific interventional method was not stated.

Summary: Data Extraction Table for Studies Included in Systematic Review

Publication	Wankowicz et al., 2020	Chen et al., 2021	Crowe et al., 2021	Secosan et al., 2020	Choi et al., 2022
Sample Size	441	12,596	109	126	1191
Location	Poland	China and Taiwan	Canada	Romania	China
Design	Cross Sectional	Cross Sectional	Convergent parallel mixed methods	Cross Sectional	Cross Sectional
Population	Physician, Nurse, RT	Nurse	Nurse	Physician, Nurse	Physician, Nurse, Administration
Mental Health Affect Identified	Anxiety Depression Stress	Burnout	Anxiety Depression Stress	Anxiety Depression Stress	Anxiety Depression
Level of Mental Health Affect	64.4% reported feelings of anxiety 70.7% reported feelings of depression	Not stated in a statistical percentage	67% reported feelings of anxiety feelings 57% reported feelings of depression 54% reported feelings of stress	Not stated in a statistical percentage	21.87% of nurses reported feelings of anxiety
Job Preparedness	Lack of pandemic prep training PPE Shortage	Lack of pandemic prep training	PPE policy updates contradictory Unfamiliar with isolation practices Lack of trust in administration	Lack of pandemic and patient surge preparation PPE Shortage	Lack of resiliency training
Resource Shortage Addressed	Yes	Yes	Yes	Yes	No
Barriers	Short staffing PPE Availability	PPE Availability Fear of infection	Unable to stay safe while meeting patient care needs/PPE Availability Unclear communication Unable to meet patient needs Rapidly changing policies	PPE Availability Lack of organization support	Increased workload
Job Stress Effects	Burnout Fear of infection of family members	Depersonalization Trauma response due to lack of training Insomnia increased due to stress	Lack of PPE created stress and anxiety Fear of infection of self and family	Lack of preparation created stress that led to increased prevalence of insomnia Implementation of numerous policies caused stress	Insomnia increased due to stress levels increasing
Interventional Method	Self-care Stress reduction	Self-care Mindfulness	Concluded the need for intervention methods	Stated the need for intervention methods	Called for intervention methods to be reviewed and put in place
Comments	Increased tobacco usage Increased reported insomnia	Trauma responses were higher in women than men Called for psychological support	Female 89.9% Male 10.1% ICU setting	Correlation of stress, insomnia, and mental health disturbances	Interventions suggested: educational programs & therapy to promote resilience Direct correlation between quality of life and medical care given

Publication	Mohd Fauzi et al., 2020	Guttormson et al., 2022	Pan et al., 2021	Di Tella et al., 2020	Jiménez -Gimenez et al., 2021
Sample Size	419	498	667	145	928
Location	Malaysia	USA	China	Italy	Spain
Design	Cross Sectional	Cross Sectional	Cross Sectional	Cross Sectional	Mixed Methods
Population	Physician	Nurse	Physician, Nurse, Non-Clinical HCW	Physician, Nurse	Physician, Nurse, Hospital Workers
Mental Health Affect Identified	Anxiety Depression Stress	Anxiety Stress	PTSD	Depression Stress	Anxiety Depression Stress PTSD
Level of Mental Health Affect	29.7% reported feelings of anxiety 30.9% reported feelings of depression 23.5% reported feelings of stress.	Not stated in a statistical percentage, but noted anxiety and stress	13.7% prevalence of PTSD	40% reported feeling of depression 47% reported feelings of stress	34.4% reported feeling of depression 46% reported feelings of stress
Job Preparedness	Lack of prep for pandemic work demand	Lack of organization support Lack of end-of-life care training Lack of treatment methods	Lack of pandemic training	Increased workload Isolation practices End of life care	Lack of resilience training
Resource Shortage Addressed	Yes	Yes	Yes	Yes	No
Barriers	Short staffing	PPE Shortage Ventilator shortage Short staffing	PPE Availability	PPE Availability	Access to mental healthcare for staff
Job Stress Effects	Work demand led to stress and insomnia Emotional demand increased stress Physical demand increases stress	Moral distress Mental exhaustion Psychological trauma Fear of infection	Fear of infection	Fear of infection	Burnout Fear of infection Emotional exhaustion
Interventional Method	Targeted interventions focused on fatigue and stress	Stated interventions are need for mental well being	Psychological Assistance/Therapy	Mental health support and psychosocial support	Psychoeducational Distribution Mental Health Support Teams Group therapy Individual therapy Mindfulness
Comments	Family infection concerns Familial demands created stress	Patient family absence & emotional distress resiliency Lack of support systems	Insomnia, poor quality of life, 44.4% planned to seek therapy 61.1% planned to resign COVID related PTSD decreases over time	Older females more likely to report higher levels of PTSD	Recommends: Easily accessible therapy, therapeutic spaces, resilience training and self-care increases

Publication	Hassamal et al., 2021	Firew et al., 2020	Gago Valiente et al., 2022	Mellins et al., 2020	Evanoff et al., 2020
Sample Size	1232	1043	128	1500	5500
Location	USA	USA	Spain	USA	USA
Design	Cross Sectional	Cross Sectional	Cross Sectional	Mixed Methods	Cross Sectional
Population	Physician, Nurse, NP, PA, Non-Clinical Staff	Physician, Nurse, PA, EMT	Physician	Physician, Nurse, PA, NP	Physician, Nurse, NP, PA
Mental Health Affect Identified	Anxiety Depression Stress	Anxiety Stress Depression	Burnout Stress	Anxiety Depression Stress Burnout	Anxiety Depression Burnout
Level of Mental Health Affect	33% reported feelings of anxiety 21% reported feelings of depression 46% reported feelings of stress	Not stated in statistical percentage	Burnout prevalence rates Men 17.5% Women 6% Emotional exhaustion prevalence Men 44.5% Women 41.8%	68% reported moderate to high levels of stress	13% reported moderate to high levels of stress 13% reported moderate to high levels of anxiety 15.9% reported moderate to high levels of depression
Job Preparedness	Lack of training Increased workload	PPE Training Increased workload	Lack of resilience training	Limited Training Insufficient PPE Training Limited medical equipment (vents) Increased workload	Minimal pandemic preparations
Resource Shortage Addressed	Yes	Yes	Yes	Yes	Yes
Barriers	Lack of pandemic training, coping skills and resilience Staff shortage	PPE Availability PPE Adequacy	Short staffing	PPE Availability Time constraints Short staffing	PPE Access
Job Stress Effects	Fear of infection Decreased resilience	Fear of infection	Emotional exhaustion	Stress due to workload increase	Workload increases
Interventional Method	Stated the need for administration to put mental health interventions into practice	Stated the need for interventions for HCWs	Psychosocial education Training programs Preventative programs	Group Therapy Cognitive Behavioral Therapy Peer support groups Resilience Training	Intervention method training for supervisors
Comments	Staff with significant stress were more likely to have feelings of depression and anxiety	Reported lower anxiety & depression levels when infection precautions were taken at home 25.7% increased alcohol use	Concluded that men had a worse mental health state than women in the study	Moral injury HCW stigma re: seeking mental health services	Stress increases due to children being homeschooled, childcare access due to shutdowns, access to food and essential supplies Overall well-being worsened reported by 58.3%

Publication	Lai et al., 2020	Diaz et al., 2022	Elkholy et al., 2020	Fiol-DeRoque et al., 2021	Robles et al., 2021
Sample Size	1257	813	502	482	5938
Location	China	USA	Egypt	Spain	Mexico
Design	Cross Sectional	Cross Sectional	Cross Sectional	Randomized Controlled Trial	Cross Sectional
Population	Physician, Nurse	Physician, Nurse, NP, PA	Physician, Nurse	Physician, Nurse, Nurse Assistant	Physician, Nurse
Mental Health Affect Identified	Depression Anxiety	Anxiety Depression Stress	Anxiety Depression Stress	Anxiety Depression Stress	Anxiety Depression PTSD
Level of Mental Health Affect	44.6% reported feelings of anxiety 50.4% reported feelings of depression 71.5% reported feelings of Psychological Distress	48.2% reported feelings of anxiety 33.8% reported feelings of depression 57.9% reported feelings of stress	67.7% reported anxiety symptoms 77.2% reported depression symptoms 80.9% reported increased stress levels	51.9% reported feelings of anxiety 42.7% reported feelings of depression 60.6% reported feelings of stress 40.2% reported symptoms associated with PTSD 58.5% reported burnout	37.7% reported feelings of depression 37.5% reported symptoms associated with PTSD 16% of front-line workers reported suicidal thoughts 16.7% of nurses reported feelings of high anxiety
Job Preparedness	Lack of pandemic training Supply shortages PPE Availability	Increased stress factors: pandemic, patient volume	No standard care methodology for COVID-19	Lack of training to deal with mental health side effects of a pandemic	Lacked biosafety equipment Short staffed Lack of training for equipment provided
Resource Shortage Addressed	Yes	No	Yes	No	Yes
Barriers	Supply shortages	No	Supply shortages Short staff Lack of hospital beds	No	Supply shortage
Job Stress Effects	Risk of infection Insomnia	Insomnia 83.3% prevalence	Risk of infection to self and family members Lack of sleep Social isolation	Workloads during pandemic Fear of infection	Increase in need for interventions Increase in insomnia, substance abuse
Interventional Method	Counseling via phone, internet and application based Hotlines	Stated the need for psychological intervention for future pandemics	Concluded the need was present for interventions	PsyCovid App Clinicoverly App Psychotherapy	Therapy via Zoom or telephone
Comments	Frontline HCWs were found to be at increased risk of depression, anxiety, insomnia, and distress	Interventions should be developed to decrease insomnia levels	Females experiences higher rates of severe anxiety, depression, and stress ICU physicians had the highest levels of stress and anxiety	26.6% reported insomnia Effective when used with evidence-based therapy	52.1% reported insomnia 12% of front line HCWs reported increased alcohol use

Publication	Holton et al., 2021	Viswanathan et al., 2020	Azoulay et al., 2020	Styra et al., 2021	Matsumoto et al., 2021
Sample Size	668	130	1058	3852	588
Location	Australia	USA	France	Canada	Japan
Design	Cross Sectional	Qualitative	Cross Sectional	Cross Sectional	Cross Sectional
Population	Physicians, Nurses, Allied Health	Physician, Nurse	Physician, Nurse	Physician, Nurses, PT, NP, Non-Clinical HCWs	Physician, Nurse, Other Clinical Staff
Mental Health Affect Identified	Anxiety	Anxiety Stress	Anxiety Depression	Anxiety Depression PTSD Burnout	Anxiety Depression Stress
Level of Mental Health Affect	72% reported feelings of depression 70% reported feelings of stress 57% reported feelings of anxiety	Not stated as a percentage	50.4% reported feelings of anxiety 30.4% reported feelings of depression 32% reported feelings of peritraumatic dissociation	Prevalence of Moderate/Severe Score 24.6% Anxiety 31.5% Depression 50.2% PTSD	8% reported feelings of moderate to severe stress 6.8% reported feelings of depression 98.5% reported mild stress
Job Preparedness	Lack of PPE Lack of pandemic preparation Lack of PPE training	No	Lack of PPE	Isolation/social distancing	Lack of communication and information to non-doctor workers led to stress
Resource Shortage Addressed	Yes	No	Yes	Yes	No
Barriers	Communication Lack of administrative support	Lack of Organizational support	Lack of Communication from Administration	PPE Availability	Lack of resilience in non-clinical staff
Job Stress Effects	Concern for physical well being Risk of infection	Social distancing led to feelings of distress and lack of support	Decreased resilience Inability to process emotions Psychological burden	Stress due to quarantine Fear of infection	Fear of infecting family members Social distancing from family caused stress
Interventional Method	Stated the need for well-being benefits and mental health intervention methods	Group Therapy Individual Therapy Telehealth therapy Mindfulness	Stated the need for psychological intervention for future pandemics	Buddy system Resilience training Simulation based training Psychological support check ins	Stated the urgent need for support for mental health services for hospital workers
Comments	Nurses had higher anxiety levels than physicians	Telehealth and group therapy showed promise in boosting resilience and lowering anxiety	Concluded the need for better pandemic prep in hospitals, communities to help HCWs in future events	84.2% female respondents 28.8% of nurse respondents worked during SARS pandemic 25.7% increased alcohol use	Found that having more time off from work and sufficient rest decreased the risk of severe stress and depression

Study Findings and Research Questions

Research Question 1

Research Question 1 asked, “Which healthcare worker population reported higher stress levels, anxiety, depression, and PTSD?” Twenty-three of the included studies addressed mental health outcomes that incorporated nurses as participants; further, five studies supported that nurse HCWs have the highest levels of reported poor mental health outcomes of the HCW population (Chen et al., 2021; Crowe et al., 2021; Choi et al., 2022; Guttormson et al., 2022; Holton et al., 2021). Conversely, Elkholy et al. (2020) found that ICU physicians have the highest rates of anxiety and stress symptoms; however, this sample size is significantly smaller than those of the combined studies of Chen et al. (2021), Crowe et al. (2021), Choi et al. (2022), and Guttormson et al. (2022), which aggregately is 14,394 participants. **Conclusion:** Most studies in the review did not break down the number of participants by type, but simply stated the types of HCWs included in the study.

Research Question 2

Research Question 2 asked, “Are the mental health effects of working during COVID-19 consistent globally or do they vary by location?” Twenty-one of the included studies identified anxiety, 19 studies identified depression, and 16 identified stress as mental health outcomes. Other mental health effects identified in the review were burnout and PTSD. Given that 92% of the studies in this review identified anxiety, 76% identified depression, and 64% identified stress as the key mental health outcomes of working during the COVID-19 pandemic, it is clear there is significant information to support the mental health effects of working during COVID-19 are similar globally and vary in prevalence. This variation in prevalence could be attributed to the number of COVID-19 cases in the area at that time and what stage of the pandemic the survey took place in. Data in the extraction table supports that anxiety, depression, and stress are the most common outcomes for this review. One study did vary distinctly from the majority. The

Japan-based study from Matsumoto et al. (2021) showed the lowest reported numbers for feelings of depression and moderate to severe stress, compared to the rest of the included studies. Additionally, the study by Choi et al. (2022) showed 21.87% anxiety levels compared to 57% reported anxiety feelings from the Australian-based study by Holton et al. (2021).

Conclusion: As most studies show similar results, the mental health effects of anxiety, depression, and stress are consistent across the globe.

Research Question 3

Research Question 3 asked, “What factors have affected the stress, anxiety, and depression rates of HCWs during the COVID-19 pandemic?” The research shows that there were numerous factors that affected stress, anxiety, and depression. The most prevalent in the studies reviewed were PPE availability, fear of infection, lack of pandemic training, isolation practices, end of life care, increased workloads, and lack of organizational support (see Data Extraction Tables). Secosan et al. (2020) determined that poor mental health outcomes were a direct result of PPE shortages, staffing shortages, and lack of preparation to handle a pandemic of this magnitude. Other studies cited lack of communication (Crowe et al., 2021), lack of treatment methods/modalities (Guttormson et al., 2022), and limited medical equipment such as ventilators (Mellins et al., 2020) as the sources of psychological distress.

Conclusion: All the factors combined attributed to the increase in poor mental health outcomes for HCWs during the COVID-19 pandemic.

Biases and Limitation of Included Studies

Each of the studies in this review reported limitations; they are as follows:

- Lack of baseline statistics from previous pandemics
- Sample populations do not often include all types of HCWs and leads to under-representation
- Data was gathered from one location or country at a time, rather than several for comparison
- Cross-sectional surveys lend to correlations rather than identification of causal factors
- Cross-sectional surveys do not allow for accurate follow-up as the same participants are often not available
- Generalization of results when they were collected one location within an area, such as a single hospital
- Cross-sectional studies lack longitudinal analysis of data
 - Lack of long-term data; most studies were only for a few months during the pandemic
- Intervention programs may have lacked effectiveness due to lack of awareness or stigma to seek mental health services
- Some participants may have been lost in studies that reviewed data over a several week program
- Surveys did not include proportionate participants from different HCW populations, such as equal numbers of doctors and nurses participating

Summary of Findings

Aggregately, the studies synthesized had 41,811 combined participants. Twenty of the studies utilized a cross-sectional study design method and the remaining five utilized mixed methods, quantitative, and random control designs. Of the 25 studies included in this systematic review, 23 identified the mental health effects of stress, anxiety, and depression. The remaining two identified PTSD and burnout, both of which have been identified as side effects of increased psychological distress (WHO, 2022i). Thirteen of the 25 studies noted PPE shortages; however, Firew et al. (2020) explored the relationship between resource shortages (PPE) and the effect on HCWs' mental health. Five of the studies' outcomes (Fiol-DeRoque et al., 2021; Jiménez - Gimenez et al., 2021; Mellins et al., 2020; Styra et al., 2021; ; Viswanathan et al., 2020) in the review used interventional methods to assess the impact of working during the COVID-19 pandemic on HCWs and the potential to alleviate the effects of poor mental health outcomes.

Reported prevalence levels of anxiety for this review ranged from 13%-67.7% with an overall average of 42.14% of participants reporting feelings of anxiety. The U.S.-based study by Evanoff et al. (2020) reported the lowest prevalence for anxiety and the Egypt study by Elkholy et al. (2020) reported the highest prevalence levels for feelings of anxiety. Feelings of depression prevalence levels ranged from 6.8%-77.2% with an average of 37.65% participants reporting feelings of depression. The Japan-based study from Matusomoto et al. (2021) reported the lowest depression prevalence rates and the study from Elkholy et al. (2020) reported the highest levels. Feelings of stress ranged from 8%-98.5% and averaged 51.8%. Again, the Japan based study from Matsumoto et al. (2021) reported the lowest prevalence rates for feelings of high stress; however, this study also reported the highest rates of mild feelings of stress. Burnout rates were noted in two studies, both based in Spain (Fiol-DeRoque et al., 2021 and Gago Valeinte et al., 2022) and ranged from 41.8%-58.55% prevalence.

Causal workplace stressors were listed in most of the studies reviewed, the most common being PPE-related issues as 13 of the studies documented a lack of PPE, PPE availability, or PPE training to be an issue in the workplace. Firew et al. (2020) was the only study to note that the adequacy of available PPE was insufficient to meet the needs of HCWs during COVID-19. Access to PPE within a facility was also a job stress factor (Evanoff et al., 2020) as HCWs were not able to access available PPE without permission from administration. The lack of PPE, or access to, was found in 11 studies that also identified fear of infection as a stressor in the workplace. Additionally, proper PPE training was also an issue for two studies (Firew et al., 2020; Mellins et al., 2020), both of which were U.S.-based analyses.

Interventional methods found from the reviewed studies were lacking data to prove effectiveness; however, several different methods were mentioned as potential approaches to alleviate HCWs' mental health struggles. Self-care was noted by three different studies (Chen et al., 2021; Jiménez Gimenez et al., 2021; Wankowicz et al., 2020). Stress reduction was noted by one study (Wankowicz et al., 2020), and two studies listed mindfulness practices (Chen et al., 2021; Jiménez -Gimenez et al., 2021) as possible intervention methods. Therapy was the most frequently noted method of intervention and was found in seven studies from the review (Choi et al., 2022; Fiol-DeRoque et al., 2021; Jiménez -Gimenez et al., 2021; Mellins et al., 2020; Pan et al., 2021; Robles et al., 2021; Viswanathan et al., 2020). Resilience training was stated as a potential intervention by five studies (Choi et al., 2022; Jiménez -Gimenez et al., 2021; Mellins et al., 2020; Styra et al., 2021; Viswanathan et al., 2020). Finally, the study from Styra et al. (2021) noted a unique intervention of the buddy system, which was shown to improve the overall mental health of HCWs by a range of 15%-31%. Styra et al. (2021) also described psychological support check-in as an effective method of reducing long-term anxiety and stress in Canadian HCWs.

In summary, mental health outcomes for HCWs during the COVID-19 pandemic have not only noted concerning increases in poor mental health, but also identified several factors that have played a role in creating job stress. The outcomes of anxiety, depression, and stress were the most frequently noted. Additionally, the most observed intervention method was therapy in 28% of the studies observed followed by several other methods; however, effectiveness had not been proven.

Discussion

Numerous calls have been made by the healthcare community that they need help. This systematic review is evidence of the mental health burden that HCWs have been carrying throughout the COVID-19 pandemic. Despite calls to action, there has been little implementation of successful programs to help HCWs alleviate, and more importantly prevent, mental health issues. This lack of action is due in part to the stigma surrounding the field of mental health (Center et al., 2003). Mental health has long been a societal and medical taboo. Due to the pandemic and the toll it has taken on mental health, HCWs have been combating rising rates of anxiety, depression, and stress. Reviews of this nature seek to call attention to a growing public health crisis.

This systematic review is unique in that it assessed the mental health of HCWs during the COVID-19 pandemic from a global perspective; further, the secondary focus lies in identifying potential interventional methods. To the researcher's knowledge, this makes the review the first of its kind. In addition, existing systematic reviews were done as rapid review and very early in the pandemic and did not have lengthy data to examine. Careful consideration was taken to avoid using studies that had been used in previous reviews. The goal of the study was to identify prevalence rates of mental health outcomes from around the world to show the reach of the impact of COVID-19 on HCWs and to support the need for interventions. Further, this review encompassed more studies than previously published rapid reviews. This provided more data for evaluation. In this study, 20 of the 25 studies specifically stated prevalence rates for mental health outcomes; however, the remaining five identified outcomes sans prevalence.

To answer the research questions posed (pp. 14-15), the synthesis of collected data supports answers for all the presented queries. Nurses were recognized as the most at-risk health population within the HCW community. As most frontline HCWs are nurses, the risk for poor mental health outcomes is much greater for the nursing populace (Lai et al., 2020). In addition,

the most common mental health effects/outcomes identified were anxiety, stress, depression, and burnout. Prevalence rates for these outcomes varied by country (Table 6); however, the variance was minimal with exception of qualifying of mild versus moderate rates. Overall, prevalence rates were similar around the world. This evidence is vital in the efforts to pinpoint interventional methods that would aid in reducing those mental health effects for HCWs. While only one showed the effectiveness of an interventional program (Styra et al., 2021), the need is still supported by the many calls for intervention by the other studies in the review. Finally, many factors were identified as having affected the anxiety, depression, and stress rates of HCWs. The primary factor was the lack of PPE (and training on proper use), which led to an increase in stress and anxiety due to fear of infection and fear of infecting one's family and/or loved ones. Secondary factors included lack of staffing, no set standard of treatment or care for COVID-19, lack of pandemic preparation and training, increased workloads leading to increased stress, lack of support from management, and lack of communication.

As stated in the review of literature, depression has been a health issue for HCWs for many years. As the nature of the work is incredibly stressful and emotionally taxing, depression, or depressive symptoms are often identified in HCWs. Research shows that depression rates since COVID-19 have increased by 21% (Preti et al., 2020). Several studies show that depression rates were notably high during the pandemic (Crowe et al., 2021; Fiol-DeRoque et al., 2021; Lai et al., 2020). Depression prevalence rates ranged from 6.8%-77.2% with an average of 37.65%. While this is due to many factors, lack of resiliency is a major contributor. New or less seasoned healthcare workers have low resiliency to depression (Savitsky et al., 2020). The review shows that lack of resiliency was a significant job stressor for HCWs around the world. Increased depression rates also lead to increases in HCW suicides. Suicidal thoughts increased by 16% in frontline healthcare workers (Robles et al., 2021). Given that suicide rates for physicians have fallen since the 1980s (Duarte & Pinto-Gouveia, 2020), it is concerning that there has been an

increase during the pandemic. This information also supports the need for interventional methods to support HCWs.

Because of the increase in anxiety, depression, and stress, there had also been a subsequent rise in reported feelings of insomnia. The review of literature shows that insomnia is often a side effect of increased poor mental health. Insomnia leads to several issues like medical errors, depersonalization, and job stress (Deng et al., 2020). Ten of the studies from the review showed increases in reported rates of insomnia, with one study showing as much as an 83.8% prevalence rate (Diaz et al., 2020). Given the increase in prevalence rates and the existing link between insomnia and job stress, job abandonment, medical errors, and decreases in patient safety outcomes, there is sufficient evidence to support the need to implement interventional measures to address insomnia and its causal factors. Ignoring this would create a negative cyclical relationship for HCWs with mental health issues and subsequent insomnia, which would create significant problems for the medical field.

An additional side effect of increased prevalence of anxiety, depression, and stress is the massive increase in burnout. Burnout has not only increased in the number of studies related to it, but also in workplace discussion. Since the pandemic, there have been numerous studies, articles, and conversations about feelings of burnout in relation to HCWs. Eight of the studies in this review identified burnout as a mental effect due to COVID-19 job stress. Several studies identified burnout rates, with 58.5% being the highest in the Spain based study from Fiol-DeRogque et al. (2021). The World Health Organization describes burnout as the result of increased workplace stress, its effect on mental health, and subsequent work-related issues regarding performance and likeability (WHO, 2022i). As HCWs have seen a significant increase in job stress in relation to the pandemic, there has been a notable increase in burnout rates and job abandonment. One of the studies in this review found that 61.1% of HCWs planned to resign from their position and seek work elsewhere due to workplace stress. Job abandonment is a trend

that could lead to massive issues for global healthcare systems that were already experiencing shortages prior to the pandemic. Burnout, and resulting job abandonment, will exacerbate short staffing issues and shortages around the world. Short staffing is a vicious cycle that places inordinate burdens on existing employees until they burn out, and the cycle repeats again and again until the issue is solved.

Additionally, to deal with their mental health, HCWs have turned to substance abuse to cope (Kaiser Family Foundation, 2020). This harmful behavior was also seen prior to the pandemic. With burnout rate increasing, providers have been turning to substance abuse more frequently (Stehman et al., 2019); however, working during the pandemic has exacerbated abuse. Studies from this review (Wankowicz et al., 2020) show that during the COVID-19 pandemic, HCWs in Poland increased tobacco usage and there was increased consumption of alcohol use in HCWs from Mexico and Canada (Robles et al., 2021; Styra et al., 2021). Styra et al. (2021) stated that alcohol use for their participant group had increased by 25.7% since the beginning of COVID-19. Choi et al. (2022) called for intervention programs for HCWs in order to combat feelings of depression during the pandemic and after, to avoid future depressive episodes for HCWs.

Unlike previous pandemics and non-pandemic times in healthcare, this is the first time that HCWs have had to cope with massive shortages and increased use of PPE. As previously noted, 13 of the studies for this review identified PPE shortages and availability as a job stress factor for HCWs. Guttormson et al.'s (2022) U.S.-based study of nurses found that 76.5% experience PPE shortages. The World Health Organization identified that there was a significant shortage of PPE at the beginning of the pandemic in March 2020 (WHO, 2022j). Shortages like these led to fears of infections of family and themselves. Twelve studies from this review identified fear of infection as a significant cause of stress and anxiety in their lives during the pandemic. This was due largely in part to the lack of availability of PPE (Di Tella et al., 2020;

Pan et al., 2021). To avoid future supply chain issues like this, and to protect HCWs in future pandemics, there is sufficient evidence within this review to support the need for healthcare organizations to continue to stock PPE and similar supplies. If another pandemic should occur or the COVID-19 pandemic would increase in numbers, there is ample time to take advantage of pandemic preparations while transmission rates are low. Further, hospitals should take into advisement how much PPE was used during the pandemic and ensure that they have at least that much in storage to be prepared for the future.

Through the review, the identification of at-risk genders presented itself. Numerous studies identified females as higher-risk individuals for several negative health outcomes. The review of literature previously noted that females were more likely to suffer from depression and compassion fatigue. Chen et al. (2021) noted in their study of nurses in China and Taiwan that women were more likely to have trauma responses because of working in the COVID-19 pandemic and would therefore require mental health interventions in the near future. Older women were also found to be more likely to report symptoms and/or feelings of PTSD than men (Di Tella et al., 2020). Additionally, women were more likely to experience symptoms of severe anxiety and stress than men (Elkholy et al., 2020). Conversely, the study from Gago Valiente et al. (2022) stated that men have worsened mental health due to working during the pandemic; however, many studies reviewed, as well as the review of literature, support the concept that women are the most at-risk population in healthcare. As the majority of women are nurses, there is potential bias in the statistics of this information; however, that does not distract from the evidence that women in healthcare are suffering from mental health issues due to COVID-19. As women make up the majority of the medical field, proper care should be taken to address their psychological well-being.

There have been several studies over the years, prior to the COVID-19 , that have demonstrated the need for mental health interventions for HCWs (Hall et al., 2019; Palma et al.,

2018; Shanafelt et al., 2016). Previous interventions showed that mindfulness-based exercises and computer program exercises show positive long-term effects (dos Santos et al., 2016; Maunder et al., 2010). By evaluating the mental health outcomes of HCWs, there can be education and advocacy for future implementation of effective programs and interventional methods. The study from Styra et al. (2021) was especially unique because it introduced a novel intervention. Other studies frequently mentioned therapy, mindfulness, and selfcare; however, Styra et al. (2021) introduced the “Buddy System.” This system was created to partner two healthcare workers together to create an interprofessional support system. This intervention method received positive feedback and would be easily implemented in the workplace, as it was described to require minimal funding and oversight.

Areas for Future Research

There is sufficient evidence to support the need for future research in this area. The researcher believes that this work can serve as a foundation to be expounded upon by other researchers as more data is published regarding the subject matter. Additionally, there is sufficient evidence to support the need for future work on identification of interventions, as well as testing the efficacy of existing intervention methods. As evidenced in this review, programs, or studies focused on nurses are necessary. This would be beneficial in the medical field and promote the mental well-being of HCWs.

Strengths

The strength of this study lies in the rigidity of the study protocol. Criteria for inclusion and exclusion were clearly defined to obtain studies that would provide exceptional data for the purposes of this systematic review. Additionally, this study is strong due to its timeliness. Assessing the impact of the COVID-19 pandemic, while it was occurring, provided timely information and significant amounts of data to assess, although not all were appropriate for this study. Another strength of the study is the global perspective. By reviewing studies from around

the world, the sheer impact of COVID-19 on HCWs can be seen. In an increasingly global health community, addressing the mental health of HCWs has shown to be similar throughout the world. Hence, identifying effective methods of treating mental health, interventions to relieve mental health distress, and identification of causal factors is paramount to the well-being of the global medical community. Finally, this study's strength lies in its goal to identify interventional methods in an effort to promote advocacy and implantation of programs for the betterment of HCWs' mental well-being.

Limitations

A prominent limitation of this study is a lack of standardization of the study designs being reviewed, due to the nature of systematic reviews (Bartolucci et al., 2010). Each study is performed by different researchers from around the world, with different survey tools, different populations, and different intentions of study. Unless the same study was administered by the same research team to HCWs around the world, it is not possible to standardize the results of a study of this nature. As the data is retrospective surveillance data, there is interpretation bias as well. This bias is diffused with the use of an inter-rater to ensure the validity of studies and proper thematic analysis. Further, a potential limitation of this study is the variance in survey tools used by the researchers in each study. Again, as there is no standardization of studies, different survey tools could preclude study bias depending on the purpose of the survey tool and whether it was used properly by the primary research team.

Another potential limitation of this study is the presentation of data from the beginning of the COVID-19 pandemic, rather than throughout. Many studies selected for this review obtained data in the spring to summer months of the COVID-19 pandemic. Data that is more current has yet to be validated and peer reviewed. Further, the lack of studies that were peer reviewed to provide data for review was significant. This limited this review in how many publications were available to assess that met set inclusion and exclusion criteria. This can be attributed to the

newness of the COVID-19 pandemic and the subsequent lack of primary data. Additionally, there is a lack of assessment of how cultural behaviors could influence the results of these studies. As the review is global, there are sure to be cultural differences and stigmas regarding mental health, but the brevity of this review did not allow for what would surely be an extensive dive into cultural norms. However, these limitations lend to the need for future research that could examine data from the entire span of the pandemic to retrospectively address mental health prevalence, causal factors, and affected populations.

Conclusions

This systematic review adds to the body of evidence that COVID-19 has significantly impacted the mental health of HCWs, causal factors for this, and potential interventional methods. Previous research was rapidly reviewed and did not include existing data from a global perspective; however, there is still a significant gap in the literature for recent data for longitudinal studies and comparison. There is significant need for more recent information and data to permit an encompassing review of the impact on the mental health of HCWs.

The studies synthesized for this review offer a new perspective and a review of data from around the world. The study showed that there were significant prevalence rates of mental health effects such as anxiety, depression, and stress. Secondary effects were also identified (i.e., burnout and PTSD). It was found that nurses, as a population, had higher prevalence rates of mental health distress. Additionally, the review found that female HCWs are more likely to deal with mental health issues and should be addressed as an at-risk population. This is most likely due to most nurses being female. Causal factors for mental health effects were found to be PPE shortages, job stress, lack of training and resiliency, and lack of pandemic preparation.

Data reviewed for this review also showed that there are similarities in mental health effects around the world, supporting the need for global efforts to explore and implement interventional methods to address these issues. While numerous studies spoke to the need for interventions to be put into place, there was little information available as to current practices. Many interventional methods were suggested and studied; however, there is a considerable need to explore efficacy to allow for future implementation. Continued efforts to explore interventional methods and alleviate the causal factors of poor mental health for HCWs will play a significant role in the future of the medical field.

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Appendix A

PRISMA Checklist 2020 (PRISMA, 2020)

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	
Search strategy	7	Present the full search strategies for all databases, registers, and websites, including any filters and limits used.	
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g., for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	
	10b	List and define all other variables for which data were sought (e.g., participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	
Effect measures	12	Specify for each outcome the effect measure(s) (e.g., risk ratio, mean difference) used in the synthesis or presentation of results.	
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g., tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	

	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g., subgroup analysis, meta-regression).	
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	
Study characteristics	17	Cite each included study and present its characteristics.	
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimates and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	
Results of syntheses	20a	For each synthesis, briefly summarize the characteristics and risk of bias among contributing studies.	
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g., confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	
	23b	Discuss any limitations of the evidence included in the review.	
	23c	Discuss any limitations of the review processes used.	

	23d	Discuss implications of the results for practice, policy, and future research.	
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	
Competing interests	26	Declare any competing interests of review authors.	
Availability of data, code, and other materials	27	Report which of the following are publicly available and where they can be found template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	

Appendix B

Mixed Methods Appraisal Tool, version 2018 (Hong et al., 2018)

Category of Study Design	Methodological Quality Criteria	Responses			
		Yes	No	Can't Tell	Comments
Screening Questions (for all studies)	S1. Are there clear research questions? S2. Do the collected data allow to address the research questions?				
Qualitative	1.1. Is the qualitative approach appropriate to answer the research question? 1.2. Are the qualitative data collection methods adequate to address the research question? 1.3. Are the findings adequately derived from the data? 1.4. Is the interpretation of results sufficiently substantiated by data? 1.5. Is there coherence between qualitative data sources, collection, analysis, and interpretation?				
Quantitative Randomized Control Trials	2.1. Is randomization appropriately performed? 2.2. Are the groups comparable at baseline? 2.3. Are there complete outcome data? 2.4. Are outcome assessors blinded to the intervention provided? 2.5 Did the participants adhere to the assigned intervention?				

<p>Quantitative non-randomized</p>	<p>3.1. Are the participants representative of the target population? 3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)? 3.3. Are there complete outcome data? 3.4. Are the confounders accounted for in the design and analysis? 3.5. During the study period, is the intervention administered (or exposure occurred) as intended?</p>				
<p>Quantitative descriptive</p>	<p>4.1. Is the sampling strategy relevant to address the research question? 4.2. Is the sample representative of the target population? 4.3. Are the measurements appropriate? 4.4. Is the risk of nonresponse bias low? 4.5. Is the statistical analysis appropriate to answer the research question?</p>				

<p>Mixed methods</p>	<p>5.1. Is there an adequate rationale for using a mixed methods design to address the research question?</p> <p>5.2. Are the different components of the study effectively integrated to answer the research question?</p> <p>5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?</p> <p>5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?</p> <p>5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?</p>				

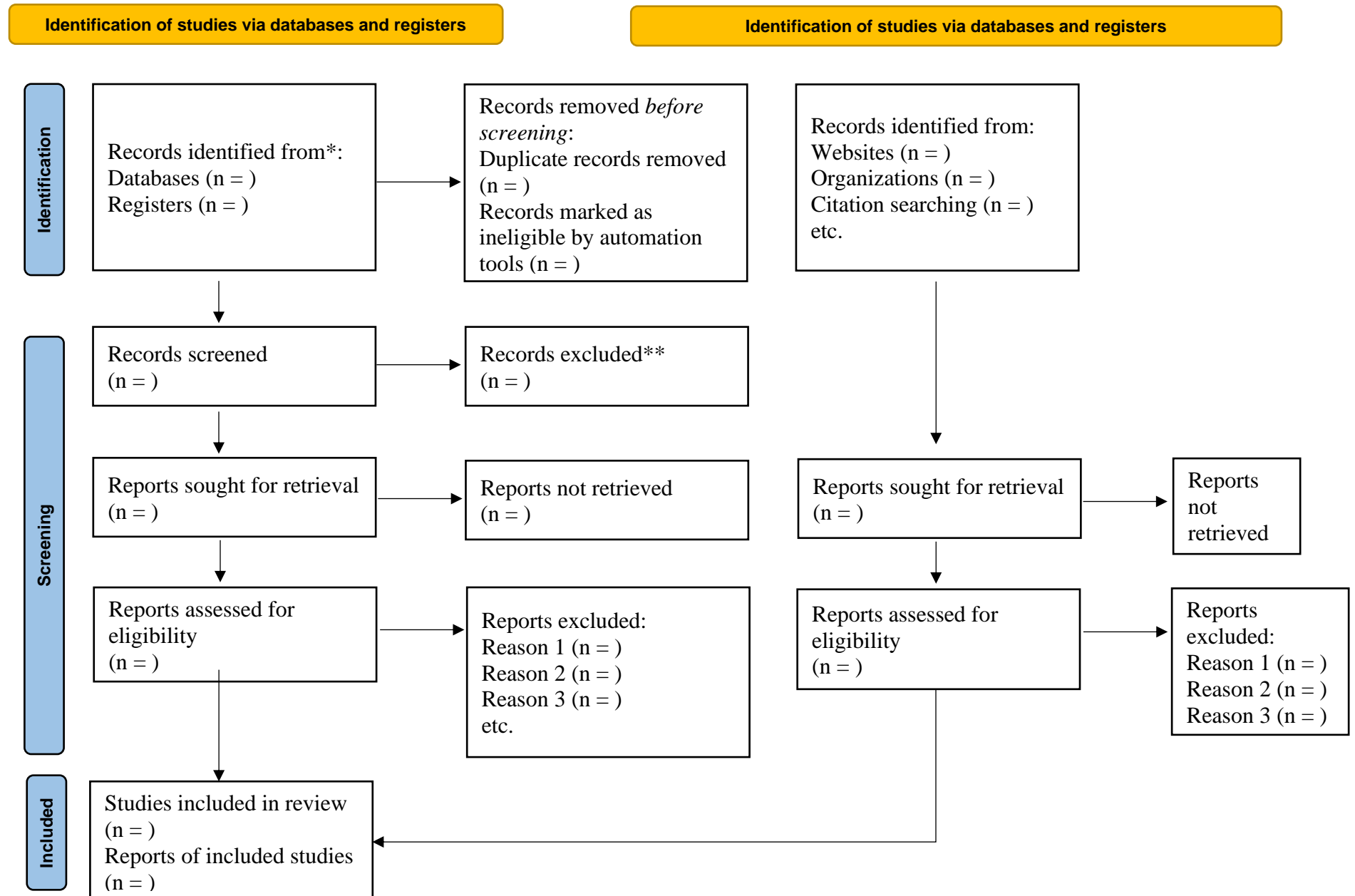
Appendix C

Kappa Interrater Data

Included Studies							
STUDY TITLE	Peer Reviewed	Published between 2020-2022	English Language or Translation	Study Design	Mental Health Outcome	COVID-19 Relationship	
Chen et al., 2021	yes	yes	yes	yes	yes	yes	
Di Tella et al., 2020	yes	yes	yes	yes	yes	yes	
Styra et al., 2020	yes	yes	yes	yes	yes	yes	
Excluded Studies							
STUDY TITLE	Peer Reviewed	Published between 2020-2022	English Language or Translation	Study Type	Mental Health Outcome	COVID-19 Relationship	
Santoso et al., 2021	yes	yes	yes	no	yes	yes	Reason: Meta Analysis
Wang et al., 2019	yes	no	yes	yes	yes	yes	Reason: Published 2019
Kunzler et al., 2021	yes	yes	yes	no	no	yes	Reason: Meta Analysis

Appendix D

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers and other sources (Page et al., 2021).



Appendix E

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers and other sources (Page et al., 2021).

