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RESEARCH ARTICLE

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"Breaking down in tears, soaked in sweat, and sick from the heat": Media-based composite narratives of first responders working during the 2021 Heat Dome

Emily J. Tetzlaff MHK[1,2] | Casey Cassan BSc[1] | Nicholas Goulet BSc[1,2] | Melissa Gorman MPH[2] | Brooks Hogya MA[3] | Glen P. Kenny PhD[1,4]

[1]Human and Environmental Physiology Research Unit, School of Human Kinetics, Faculty of Health Sciences, University of Ottawa, Ottawa, Ontario, Canada

[2]Heat Division, Climate Change and Innovation Bureau, Healthy Environments and Consumer Safety Branch, Safe Environments Directorate, Health Canada, Ottawa, Ontario, Canada

[3]BC Emergency Health Services, Provincial Health Services Authority, Vancouver, British Columbia, Canada

[4]Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

Correspondence
Glen P. Kenny, PhD, School of Human Kinetics, Faculty of Health Sciences, University of Ottawa, 125 University Private, Ottawa, ON K1N 6N5, Canada.
Email: gkenny@uottawa.ca

Abstract

Background: During the summer of 2021, a deadly, unprecedented multiday Heat Dome engulfed western Canada. As a result of this extreme heat event (EHE), emergency dispatchers received an unparalleled increase in incoming 911 calls for ambulance, police, and fire (as first responders) services to attend to hundreds of heat-vulnerable community members succumbing to the heat. With 103 all-time heat records broken during this EHE and indoor temperatures of nearly 40°C, the first responders attending these calls faced extensive job demands and highly challenging operating conditions. Initial investigations have explored the health system-level impacts; however, little has been done to explore the impact on the first responders themselves. Therefore, this study aimed to improve our understanding of EHEs' impacts on the operational capabilities and health of first responders, specifically police, fire, ambulance, and dispatch services.

Methods: A systematized review and content analysis of media articles published on the 2021 Heat Dome in Canada was conducted ($n = 2909$), and four media-based composite narratives were developed highlighting police, fire, ambulance, and dispatch services. The Job Demands-Resources (JD-R) model was applied as a theoretical framework for occupational burnout.

Results: The media-based composite narratives highlighted that first responders faced record-breaking call volumes, increased mental-health-related claims, and exhaustive heat-related physiological stress. Using the JD-R model as a theoretical framework for occupational burnout, we identified three measures of stressful job demand: work overload (e.g., the surge in call volume, firefighters responding to medical emergencies), emotional demands (e.g., severe medical emergencies, sudden deaths, unresponsive patients, distraught family members), and physical demands (e.g., resuscitation in personal protective equipment, heat-related illness).

Conclusion: The experiences described underscore the importance of supporting first responders during work in extreme heat conditions. These findings have

important implications for addressing rising rates of burnout during and following public health crises, such as EHEs, a problem that is increasingly being recognized as a threat to the Canadian public healthcare system.

KEYWORDS

emergency medical services, extreme heat event, first responders, heat wave, public safety

1 | INTRODUCTION

Extreme heat events (EHEs) are a significant threat to public and occupational health and safety, increasing in frequency, duration, and severity with climate change.[1,2] This was evident across western North America in 2021, when the unprecedented multiday Heat Dome became the deadliest EHE in Canadian history, resulting in 619 confirmed heat-related deaths in British Columbia (BC) alone.[3] Widespread impacts were experienced during this EHE,[4] including incoming 911 call volumes doubling the typical daily averages for ambulance, police, and fire (as first responders) services and a peak call volume of 11,970 calls achieved in one day,[3] which was increased from 6000–7000 calls in the days before and following the EHE.[5] There were also significant call transfer delays from E-Comm (the 911 dispatch service provider) to BC Emergency Health Services (BCEHS) and numerous callers were placed on hold.[3] Investigative notes also identified that 911 calls for an ambulance were made in 72% of heat-related deaths, with paramedics dispatched to 74% of events, but in at least 50 instances, it took more than 30 minutes for scene attendance and in six cases—no ambulance was available.[3] With 103 all-time heat records broken during this EHE, including Canada's highest ever recorded temperature at 49.6°C[6] and indoor temperatures of nearly 40°C,[1] not only were first responders facing extensive job demands, but highly challenging operating conditions as well.

Workers, including first responders, who perform physically demanding tasks (e.g., life-saving resuscitations) or work in non-climate-controlled environments (e.g., unairconditioned homes) are particularly vulnerable to adverse health outcomes (e.g., heat-related illnesses).[7] Engaging in intense physical labor in hot environments is associated with elevated levels of thermal strain and a greater burden on the cardiovascular system, evidenced by marked increases in body core temperature and heart rate, respectively.[8] Consequently, this heightened physiological strain raises the likelihood of heat-related illnesses in the workplace, with risk four to seven times higher during hot weather where ambient temperatures exceed 35.5°C.[9] The threat posed by extreme heat is further exacerbated for first responders as they may have limited recourse or ability to adapt, including opportunities to rest and recover when faced with a high volume of calls which result in response initiation (i.e., ambulances dispatched to the scene) during an EHE.[10] Inherently, heat stress management is complicated in the field for first responders due to the dynamic and unpredictable nature of the work performed as defined by the level of physical effort and shift duration. Additionally, first responders often perform these tasks in various environmental conditions, such as outdoors under direct sun and on hot pavement, or indoors on the top floor of a poorly insulated flat roof apartment with no air conditioning. Further, the typical shifts and work schedules of first responders pose additional challenges,[11–13] which may compound the effects of operating during an EHE, as they may not allow for sufficient time to achieve adequate recovery between shifts, leading to overexertion, premature fatigue, and impairment in the worker's capacity to dissipate heat.[14] Although, in most occupations in Canada, work shift requirements are set by provincial/territorial employment standards acts, heat stress management is enforced by additional occupational health and safety legislation, individual agencies, and union agreements, which may alter shift schedules and heat interventions (e.g., ability to apply work to rest regimes). However, specific occupations in some jurisdictions may also not be covered by these regulations, especially during emergency situations. Therefore, first responders inherently face additional challenges when managing heat stress.

Many first responders are also required to wear personal protective equipment (PPE), which limits evaporative heat loss from the body to the environment and increases the risk of heat-related illness and injury.[14,15] To compound the risk posed by donning PPE further, during the 2021 Heat Dome, the COVID-19 pandemic was ongoing and required first responders to wear additional PPE (e.g., N95 masks, gowns, face shields). Therefore, EHEs pose a multifaceted risk to first responders as they are required to perform their regular duties in the heat as the front line of emergency medical care for the public, and they also face an added demand due to the increase in service needs, especially when multiple public health crises intersect. While all provinces and territories in Canada have occupational health and safety authorities, which enact and enforce standards to protect workers from workplace health hazards, including heat exposure, in some instances, these requirements may not provide adequate protection from extreme temperatures and during prolonged emergency states. As a result, there is a grey area of what is expected of first responders during an EHE—in particular, what level of personal risk they should endure in the heat.

One way to view this risk is through the Job Demands-Resources (JD-R) model. Based on the assumption that every occupation, regardless of setting, has specific risk factors associated with job stress or burnout, the JD-R model classifies these risk factors into two general categories: job demands and job resources.[16] Job demands encompass a job's physical, social, or organizational elements that necessitate continuous physical or mental exertion,

thereby leading to physiological and psychological burdens.[16] In contrast, job resources encompass a job's physical, psychological, social, or organizational elements that serve a functional purpose in attaining work objectives.[16] These resources help offset job demands and the resulting physiological and psychological costs or facilitate personal growth and development. Further, the JD-R model indicates that regardless of the type of job or occupation, job stress or burnout develops when specific job demands are unsustainably high and certain job resources are limited. Therefore, it is likely that the significant demands placed on first responders during an EHE, like the 2021 Heat Dome, would likely result in adverse physical and mental health outcomes[17,18]—however, to date, there is limited data available on the impacts to first responders.

Due to the lack of available data, there is a need to consider alternative data sets which could be used to explore the impacts of EHEs on first responders. Recently, authors engaged in multiple disciplines have used media articles published during EHEs to investigate various impacts.[19–24] However, this data source has yet to be used to consider the impact on first responders but offers the potential to highlight public awareness and discourse related to occupational heat stress and firsthand accounts from first responders who experience excessive physical and psychological stress while working in hot environments. Nevertheless, due to the wide breadth of publications, this type of data source can result in a considerably large data set and thus may make it challenging to see the full scope of the situation. To overcome this challenge, authors in other disciplines have used content analysis, which is a qualitative technique where data from several sources (including the media[25]) can be quantified and analyzed to identify key concepts and themes.[26] The findings can then be presented in various ways, including through the development and presentation of composite narratives, where data from several sources is used to tell a story framed as that of a single entity.[27] Composite narratives have been used in various disciplines, including sharing the voices of groups in the healthcare sector and their concerns about working conditions[28,29] and providing a way of connecting to and understanding experiences by creating stories from the parts of multiple lives.[30] For example, a study by Creese et al.[27] recently demonstrated that many healthcare professionals exhibited signs of overexertion and fatigue (i.e., burnout) during the COVID-19 pandemic, including poorer mental health and reduced occupational functioning and conveyed the findings through a series of composite narratives.[27]

Therefore, we conducted a Canada-wide scan of media articles on the 2021 Heat Dome and developed media-based composite narratives of first responders to help better understand the experiences of first responders working during the EHE. We then applied the JD-R model as a theoretical framework of burnout to improve our understanding of the impacts that EHEs have on the operational capabilities and health of first responders, specifically police, fire, ambulance, and dispatch services. This is particularly important in the context of current climate projections of more frequent and intense EHEs in Canada, a temperate climate region unaccustomed to extreme heat.

2 | MATERIALS AND METHODS

This project draws on a subset of data collected for an extensive media-based analysis of the 2021 Heat Dome in Canada.[19]

2.1 | Data collection

A comprehensive search was conducted on five subscription news databases and gray-literature sources to identify digital media articles published in Canada on the 2021 Heat Dome between June 1, 2021 and February 26, 2022 (see Supporting Information for full search strategy). Articles from the broader study data set ($n = 2909$) that included content related to workers/workplace settings were identified as information-rich cases for this secondary analysis. Keywords were based on Statistics Canada National Occupation Classification definitions for firefighters, police, paramedics, and dispatchers (Table 1).[31] The resulting data set included 433 articles, representing 18% of the larger data set.

2.2 | Content analysis

During the full-text screening, the authors created a working codebook of concepts, positive indicators, and textual examples inductively. This codebook was circulated to all authors for review and agreement. Modifications were made to collapse and expand codes as needed. The codebook and articles were then uploaded to NVivo (Release 1.6.2; QSR International), and a trial coding was completed by two independent coders (E. J. T. and N. G.) to ensure consistency (reliability) and validity of the category definitions. The authors then co-coded 500 articles (~10%) from the whole data set and ran a coding comparison query to determine intercoder reliability for each independent subanalysis. The authors achieved a kappa coefficient of 0.84 for this subanalysis, indicating a "very good/excellent" agreement.[32] All articles were then fully coded in combination with the broader impact analysis. After primary coding was complete, the authors reviewed the occupational codes and identified all references related to first responders (and support personnel). These references were isolated for secondary analysis, and the data were thematically coded into additional subcategories by two authors (E. J. T. and C. C.) (Table 1).

2.3 | Development of composite narratives

The coded findings are presented in the form of four composite narratives crafted to illustrate the shared themes and experiences found within the data set of 433 articles. These narratives are intended to summarize key issues and concepts simply, quickly, and effectively.[33] The narratives were then interpreted using the JD-R model of occupational burnout (Figure 1).

TABLE 1 First responder classification, definitions, and key terms.

Classification	Definition	Key terms
Paramedic (*n* = 243)	An individual who was employed or formally engaged as a volunteer, auxiliary or reservist by a provincial, territorial, regional, municipal, or Indigenous paramedic or ambulance service to perform duties related to the administration of prehospital emergency medical care to patients with injuries or medical illnesses, including transportation to hospitals or other medical facilities for another emergency medical care.	Advanced Care Paramedic; Ambulance Attendant; Ambulance Crew; Ambulance Paramedic; Ambulance Paramedics Union; Ambulance Services; Ambulance Station; Ambulances; Chief Paramedic; Emergency Medical Attendant (EMA); Emergency Medical Services (EMS); Emergency Medical Technician (EMT); Emergency Responder; First Responder; Paramedic; Paramedics' Union; Rural Paramedics
Firefighter (*n* = 139)	An individual employed or formally engaged as a volunteer, auxiliary or reservist by a provincial, territorial, regional, municipal, or Indigenous fire service to perform firefighting and fire prevention activities and assist in other emergencies. This may include those who plan, organize, direct, and control firefighting operations and fire prevention activities.	Fire and Emergency Services; Fire and Protective Services; Fire Chief; Fire Crew; Fire Department; Fire Dispatch Staff; Fire Hall; Fire Lines; Fire Marshal; Fire Paramedic Service; Fire Rescue; Fire Rescue Chief; Fire Rescue Personnel; Fire Rescue Services; Fire Truck; Firefighting Teams; Firefighter (or Fire Fighter); Professional Firefighters Association
Police officer (*n* = 133)	An individual employed or formally engaged as a volunteer, auxiliary or reservist by a provincial, territorial, regional, municipal, or Indigenous police service to perform duties that protect the public; detect, prevent, or investigate crime; or perform other policing activities. This may include those who plan, organize, direct, and control police force administration and police activities.	Auxiliary Constables; Beat Officers; Community Constables; Community Service Officers; Constable; Front-Line Officers; Investigators; Mounties; Peace Officers; Police; Police Chief; Police Corporal; Police Department; Police Detachment; Police Officers; Police Patrol; Police Sergeant; Police Services; Reserve Constables; Royal Canadian Mounted Police (RCMP); Supernumerary Special Constables; Tribal Police
Dispatcher (*n* = 94)	Dispatchers operate radios and other telecommunication equipment to dispatch emergency vehicles and coordinate the activities of drivers and other personnel. They are employed by police, fire and health departments, other emergency service agencies, taxi, delivery and courier services, trucking and utility companies, and other commercial and industrial establishments.	911; 911 Calls; 911 Dispatch Center; 911 Operators; Call Taker; Dispatchers; Dispatch Center; Dispatch Services; E-Comm 911; Emergency Call Taker; Emergency-Call Taking Center; Emergency Calls; HealthLink

Note: Definitions based on Statistics Canada (20).

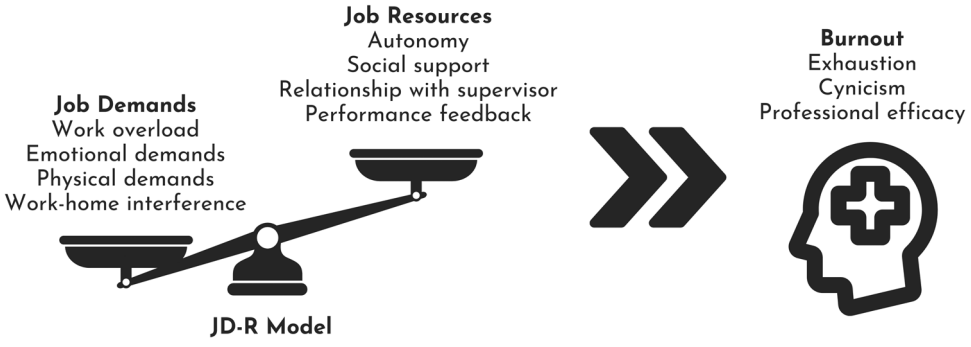

FIGURE 1 Measurements used in the Job Demands-Resources (JD-R) model of occupational burnout, according to Bakker et al.[16]

3 | RESULTS

Four occupational first responder narratives are presented below to convey the findings from the coded data. These accounts are told as stories, with each composite based on quotations from the digital media data set. Minor modifications to the quotes allowed several sources to be woven together as if they were from a single article. Further, as articles were published over a multiweek period, tense changes were applied as necessary, along with terminology changes for correctness. Thus, the stories mix quotations from various locations (cities/provinces), departments, and media interviewees. It is important to acknowledge that the data could have been combined differently to create other composites.[30] Although different combinations were considered and explored, the final composites were chosen as they were thought to convey the range of views and positions revealed by the data and to provide contrasting accounts

where warranted.[30] At the beginning of each narrative is a short description of the sources on which the composite is based.

3.1 | Firefighters

The *Firefighter Services* story is a composite of 186 references from 139 articles from regional fire services in British Columbia, Alberta, Saskatchewan, and Manitoba.

During the height of the Heat Dome, fire services across the region were engaged in providing critical medical care to support the overwhelmed paramedic services. As a result, departments received a significant increase in high-acuity cardiac emergencies and sudden deaths attributed to heat. Patients were presented with severe dehydration and life-threatening core body temperatures. Some crews were responding to unresponsive patients with heat stroke who went into cardiac arrest. Firefighters administered oxygen and cold compresses. They saved many lives that night, but some patients died waiting for paramedic crews as the firefighters, in some cases, just couldn't or weren't authorized to provide particular medical care.

Firefighters sat with the elderly and medically vulnerable patients needing paramedic care as they died because there was nothing else they could do. In other cases, they sat with dead bodies, sometimes for hours, waiting for a coroner to relieve them. They saw patients in peril and dying, and family members distraught because they were not getting a service they put their faith and trust in—the emergency 911 pre-hospital care system. Although firefighters are not permitted to place patients in their rigs, some crews were so overwhelmed across the region that they were seen loading people up and bringing them to the hospital themselves. Other units called taxis' to get people to the hospital, with a firefighter accompanying them.

Within 24 hours, fire crews responded to triple the number of calls in a typical weekday—of which the majority were medical calls. One call required firefighters to wait on the scene with a patient for more than 11 hours for an ambulance to arrive and transport an older adult suffering from heat exhaustion to the hospital. The delays were so long that many residents arrived at fire stations begging for first responders to attend to their loved ones. In one case, an older man died as firefighters tried to revive him outside their firehall. One Fire Chief reported that on the fourth day of the extreme heat warning, smouldering under temperatures so catastrophically unusual that even young, healthy people were vomiting, losing consciousness and struggling to breathe. Every fire truck in the city was out on medical calls; not a single station had a truck on hand in the event of an actual fire.

On top of supporting emergency medical calls, Fire Rescue Services were also receiving calls of animals and people left in vehicles, and numerous water rescues, as people flocked to the water to cool down. Calls also spiked for electrical failures and fires caused by air conditioners and fans working overtime, as well as calls to perform building protective services, such as hosing down facility roofs. Fire services were also popping up around towns and in various parks to use their water systems as much-needed misting stations for people to cool off in the blistering heat or set up outdoor cooling stations with shady umbrellas and water bottles. Crews also performed wellness checks at shelters and harm reduction sites while handing out water and freezies whenever available.

In combination, this stretched service capacity impacted the remaining resources available for fire responses. Despite this, firefighters still answered calls for fires caused by discarded cigarettes and others related to dry grass and vegetation. Battling these fires in heavy gear and temperature extremes posed the risk of elevated body temperatures even before entering the burning structures. Crews were rotated more frequently to ensure firefighters got breaks and removed their bunker coats between job duties as needed. Where available, crews were relieved by outlying fire stations. The added physical stress on the crews with the heat made the work challenging and forced firefighters to push themselves to the limit. For many, it would be remembered as some of the most stressful days of their careers.

3.2 | Police

The *Police Services* story is a composite of 408 references from 133 articles from various regional police services in British Columbia, Alberta, Saskatchewan, and Manitoba.

The sweltering heat wave that has settled over Western Canada for several days is believed to have contributed to hundreds of sudden death calls that police responded to in homes all over the region. Several police services in Western Canada redeployed dozens of officers, including members from other sections, such as investigations, and calling officers at home to deal with the backlog and assist victims of this intense heat—most of the victims being 70 years or older were home alone.

In some cases, out-of-town family members phoned the police to say they could not reach elderly loved ones. The police would get into the homes and find the person deceased from the impacts of the severe heat, often sitting in a chair, on a couch or on the bed. Because of the overwhelming number of calls, some of the deceased were left inside their homes waiting for police officers to handle other back-to-back sudden death calls—as the officers could not leave one scene until a coroner could become available to take over the investigation. Once the coroner had arrived, the officers would head back out to their cars and would be immediately sent to another sudden death call linked to the oppressive heat wave. Officers could barely keep up responding to one death after another.

Since the heavy heat set in, the heat-related deaths depleted front-line resources and severely delayed response time. This demand stretched police resources thin, with officers doing everything they could to keep up with the calls. Police pleaded to the public to be mindful when calling 911 because resources were scant for heat-related emergencies. It was a very intense week of unprecedented challenges. Police were tapped out in of responding to calls—periods of extensive wait times were seen across the region, with some areas reporting people waiting two hours on hold for police emergency lines. Police officers with more than 15 years of service reported never experiencing the volume of sudden deaths that came in in such a short period.

Beyond attending sudden-death calls, police officers across the region were also tasked with hand-delivering heat-health information postcards to vulnerable citizens. They formed dedicated teams to reach out to seniors and other vulnerable citizens who do not have air conditioning during the heat wave to check on their well-being. While all-time temperature records were topping 49°C in some areas, local detachments sent officers out with extra water for community members, including officers patrolling the streets to respond to people distressed because of the heat. Considering the weather, police were also urging families with children to be cautious with open windows in homes, as a 14-month-old boy was injured after falling from an open window without a screen. Since the blistering heatwave descended on the province, police were also tasked with responding to drownings as people flocked to the water to cool down and numerous incidents where pets were left in vehicles on hot days, further compounding the demand on the detachments.

3.3 | Paramedics

The *Paramedic Services* story is a composite of 850 references from 243 articles from various regional paramedic services in British Columbia, Alberta, Saskatchewan, and Manitoba.

The heat wave created an incredibly challenging situation for the province's paramedics. Not only did they have to adjust to the challenges of the COVID-19 pandemic, but they were also on the front line of the opioid overdose emergency and heat death calls. Over 600 excess deaths were recorded during the heat wave, mostly older adults living alone. Some waited hours for an ambulance, with one paramedic saying there was a time when first responders had hundreds of calls pending—meaning a member of the public called 911, call-takers coded the severity, but no ambulance was available to be dispatched or there were not enough dispatchers to keep up with the volume. Paramedics were overwhelmed as calls for ambulance services increased dramatically. One paramedic said he's never seen a spike in emergency cases like the one fuelled by the ferocious heat wave that broiled western Canada. Paramedics and other medical staff had to contend with all the extra heat-related cases on top of the other summertime injuries and illnesses. As a result, some people waited hours for an ambulance, and paramedics as the medical triage system continued to reprioritize responses—sometimes leaving lower-priority calls unattended for hours. Not only were they dealing with escalated call volumes and a decrease in ambulance units available, but, at the other end, the available ones were tied up at the hospitals for longer because the hospital was overloaded, and they couldn't triage and hand off patients and be free again. Staff in those services were backlogged, waiting for patients to be seen in emergency rooms.

Some crews were responding to unresponsive patients with heat stroke that ended up progressing into cardiac arrest. Numerous deaths were attributed to the heat on the scene, and seniors baking in their homes without air conditioning. Ambulances continually responded to calls related to heat exhaustion and heat stroke for days. EMS crews also responded to more water-related emergencies, including boating accidents and drownings, as people attempted to cool down by boating and swimming in nearby waterbodies.

First responders were breaking down in tears at their paramedic stations, removing their shirts to cool down, and even vomiting from the effects of the heat. They were physically exhausted: paramedics were wearing their uniforms and plastic gowns on top and other PPE while entering residences as hot as 45°C to resuscitate people. They were soaked in sweat, wearing a respirator, face shield, plastic gloves, and a plastic gown, and some got sick from the heat. Even in regular weather, that's very taxing, but imagine during the Heat Dome. Paramedics said these shifts also took an emotional toll.

3.4 | Dispatchers

The *Dispatcher Services* story is a composite of 266 references from 94 articles from various regional dispatching services in British Columbia, Alberta, Saskatchewan, and Manitoba.

> E-Comm 911 are supposed to be a lifeline for the public—there to support callers in their time of need whether they need police, fire or paramedics. But due to the record-breaking heat, dispatchers had hundreds of calls waiting for a response at any moment. Between the heat wave, the province-wide restart from COVID-19, and a 911 operator staffing shortage, there simply weren't enough dispatchers to get to these calls as quickly as needed. The extended wait times resulted in significant delays for individuals calling 911, which was also challenging for call takers who were tied up and, therefore, helpless to assist others. The record-high temperatures during the historic heat wave took their toll on 911 operators, as they were stretched to the limit in their ability to answer them all. The record-breaking number of calls had dispatchers and call takers under incredible stress.
>
> Dispatchers were absolutely at wit's end, and many had to take stress leave from their experiences during the record high temperatures. Requests for mental health assistance for dispatchers have spiked since the heat wave. One agency reported that mental-health-related claims now represent about half of all long-term disability claims reported. However, dispatchers had significant challenges accessing mental health resources during a highly stressful time. The issue has reached a clear breaking point.

4 | DISCUSSION

This study content analyzed media articles published on the 2021 Heat Dome to better understand the operational capabilities and health of emergency responders—police, fire, ambulance, and dispatch services—during an EHE. Based on our analysis of over 400 articles, and as highlighted through the presented composite narratives, we found that emergency medical service providers faced record-breaking call volumes, increased mental-health-related claims, and exhaustive heat-related physiological stress. Using the JD-R model as a theoretical framework for occupational burnout, we identified three measures of stressful job demand: work overload, emotional demands, and physical demands (Figure 1). These findings have important implications for addressing rising rates of burnout during and following public health crises (e.g., EHEs). This common problem is increasingly being recognized as a threat to healthcare systems.[34] Notably, the experiences described underscore the importance of supporting first responders and improving their working conditions during disaster conditions such as an EHE. The following sections highlight the key themes from these narratives.

4.1 | Work overload

In the context of the JD-R model of occupational burnout, work overload is a significant factor contributing to burnout among employees.[34] Work overload is when individuals have excessive job demands and responsibilities that exceed their capacity to cope and perform effectively. By analyzing the composite narratives of firefighters, police, paramedics, and dispatchers during the 2021 Heat Dome, we can observe several elements related to work overload. All the professions mentioned experiencing a surge in demands and calls due to the EHE. Firefighters had to respond to many medical emergencies, including cardiac arrests and heat-related incidents. Police had to handle a backlog of sudden death calls, attend to drownings, deliver heat-health information, and respond to incidents related to pets and children in distress. Paramedics faced a substantial increase in emergency cases, particularly heat-related illnesses and deaths. The E-Comm Dispatchers had record-breaking incoming 911 calls waiting for a response due to the EHE.[3] Altogether, this surge in workload often required professionals to work extended shifts and go without breaks, leading to physical and mental fatigue.

Bakker et al. demonstrated that all job resources (i.e., autonomy, social support, relationship with supervisor, performance feedback) are adequate at buffering the impact of work overload on exhaustion.[16] Concurrently, this study's observations draw particular attention to the lack of human resources within the emergency medical services system during the 2021 Heat Dome, which was already strained due to the COVID-19 pandemic and opioid overdose emergency. This elucidates that the existing emergency response infrastructure may not be prepared for unanticipated challenges, such as during climate events. The resulting work overload mainly stemmed from having to cover extra shifts, which has previously been associated with higher burnout among emergency medical service providers[35] and nurses.[36] Petrino et al.[34] indicate a distinct association between insufficient human resources and the extent of reported burnout. Specifically, their pancontinental survey showed that individuals who reported "frequent understaffing in their workplace" had a tenfold higher risk of burnout than those without staffing issues.[34]

Additionally, the narratives also demonstrated that during the 2021 Heat Dome, the demanding workload was interconnected among all first responders, as well as other health professionals, such as coroners and hospital staff. For example, there were numerous cases of paramedics and firefighters being required to wait on scene with a deceased patient until relieved by available police and coroners, rather than clearing the scene to be available to respond to other sick or injured patients. Similarly, interdependencies were

also captured in the media articles at the transition between prehospital and hospital care. For example, in various cases paramedics brought patients to the hospital but the emergency rooms were at capacity. The paramedics were then required to wait for triage and for a spot to be found for their patient before they could leave and become available for additional jobs or a break. Considering the predicted increase in EHE severity, duration, and frequency, our findings highlight the need to address the continued understaffing among first responders, as well as emphasize that heat action response planning must consider the interdisciplinary requirements of working together during disaster events.

4.2 | Emotional demands

The composite narratives highlight the presence of high job demands and insufficient resources to cope with the workload, which can lead to burnout if sustained over time. The professionals described in the narratives were exposed to prolonged periods of intense work, time pressures, resource depletion, and emotional strain. In the context of the JD-R model, emotional strain refers to the frequency of psychological and emotional impacts that individuals experience due to their work demands and circumstances.[16] During the 2021 Heat Dome, firefighters, police, paramedics, and dispatchers were exposed to distressing and challenging situations. They encountered scenes of severe medical emergencies, sudden deaths, unresponsive patients, and distraught family members. Although these professions commonly deal with emotional stress (e.g., first responders experience posttraumatic stress two times the rate of the average population)[37,38], the demand during the 2021 Heat Dome further appears to have exacerbated the concern. Notably, the dispatcher narrative highlights that difficulties were faced in accessing mental health support during an incredibly stressful period, and an increasing number of employees took stress leaves after the EHE. Others have also found similar findings,[34] despite evidence that such resources effectively prevent and cope with burnout among health workers.[39] Addressing emotional strain requires providing adequate support systems, such as access to mental health resources and peer-support networks, to help first responders cope with the emotional demands of their work and prevent burnout.[40]

4.3 | Physical demands

Physical strain can stem from physical demands and challenges that workers experience because of their responsibilities. First responders are often required to carry out physically demanding tasks such as rescuing individuals, standing or walking for prolonged periods, and performing life-saving measures (e.g., resuscitation) while donning heavy protective gear and equipment. This includes bunker coats, helmets, respirators, face shields, and other PPE. The intense EHE combined with the weight and insulating properties of the gear can lead to increased body heat storage,[41] exacerbating physical exertion and fatigue over time. During the 2021 Heat Dome, firefighters, police, and paramedics were exposed to prolonged intense heat while performing physically demanding tasks, placing significant strain on the body. Working in such extreme heat can lead to dehydration, heat exhaustion, heat stroke, and other heat-related illnesses[9] including traumatic injuries (e.g., fractures due to falls caused by heat-induced fatigue).[42] Thus, by considering the JD-R model and its implications, organizations, and policymakers can develop comprehensive strategies to address the physical demands experienced by first responders during EHEs, such as training in heat-related safety protocols, hydration policies, and medical support.

4.4 | Limitations and further research

This study provides novel insight into the experiences of first responders working during an EHE in Canada and how their operational capabilities and health were affected. However, some important limitations are evident within this study and its findings. First, the context of this analysis was the 2021 Heat Dome, and more specifically, its impact on first responders operating in western Canada, as reported by the media. Thus, due to the qualitative design, data source, and geographic context analyzed, the findings may have limitations in their generalizability. Further research involving other sources and direct consultation with first responders who have worked during EHEs would build a more holistic picture of the impacts on their operational capabilities and health.

Second, we acknowledge that despite the strong theoretical foundation of narrative investigations,[43] the use of compositive narratives in occupational health and safety research has been limited to date and thus may present as a more novel methodology for some readers. However, we chose to use composite narratives because they provide a "way in" to research for readers, introducing them to complex findings that can be further investigated.[44] In this case, the narratives distilled and weaved together hundreds of news articles to help the reader understand how first responders were impacted, with contextual examples provided by the narrative threads. However, composite narratives do have limitations to address, such as the reliance on the skill of the researcher to create narratives that are effective, while still accurately reflecting the sources perspectives.[30] To minimize this concern, we attempted to present detailed methods to demonstrate the rigor of the approach through transparency to the reader in how they were constructed (e.g., directly citing the number of sources referenced to construct each narrative).[45]

Third, we used media articles for the construction of the presented narratives. Media articles by nature present a bias to the reader influenced by the journalists and editors' perspective, along with the bias of those they may have interviewed or sourced.[46,47] Therefore, the findings must be interpreted in the context of these potential influences. For example, these influences may have minimized the voices and experiences of first responders to promote the narrative of appropriate responses or may have heightened reporting on the impacts to emphasize or demonstrate critique of the

public safety response. However, we feel that this opens doors for future inquiries on the perspective and decision-making of journalists reporting during EHEs and would provide a valuable contribution to existing literature on reporting on occupational health and safety in the media.

Lastly, as our analysis only included content specifically reported in the media, there may have been other strategies and resources, such as health and safety guidelines, policy documents, or standard operating procedures, influencing the first responders that may not have been captured in this data set and analysis. Future work should seek to directly, and critically analyze the heat management strategies used by agencies governing first responders. For example, inquiries into training resources available to these workers on identifying the signs and symptoms of heat-related illnesses in themselves and co-workers or administrative controls employed to modify work arrangements would be valuable.

5 | CONCLUSION

Through the review and consolidation of thousands of media-based stories on the 2021 Heat Dome, our findings show how this record-breaking EHE impacted the operational capabilities and health of paramedics, firefighters, police, and dispatchers. First responders faced significant work overload, emotional demands and exhaustive heat-related physical stress when responding during the record-breaking EHE. The strain experienced was further exacerbated by the existing stresses and requirements (e.g., PPE) related to the ongoing COVID-19 pandemic. These findings thus have important implications for addressing rising rates of burnout during and following public health crises, such as EHEs, a problem that is increasingly being recognized as a threat to the Canadian public healthcare system.

While the findings may be specific to first responders in British Columbia working during the 2021 Heat Dome, they underscore the importance of supporting first responders during any EHE, as well as during other disasters. Therefore, prioritizing planning for such situations to ensure less reactive approaches are relied upon is a critically important step to help protect the health and wellbeing of first responders, as well as the public that rely upon them during EHEs. Such planning may include considerations related to PPE and warm weather uniforms or other equipment upgrades (e.g., wearable cooling strategies), options for flexibility in shift patterns, or medical guidelines on safe work practices for peer and self-assessment. With projected rises in the frequency and intensity of EHEs,[2] the development of new guidelines for first responder safety that are reflective of our changing climate are needed to ensure we are putting our first responders first.

AUTHOR CONTRIBUTIONS

Emily J. Tetzlaff: Conceptualization; methodology; investigation; writing—original draft; visualization. **Casey Cassan**: Investigation; writing—review & editing. **Nicholas Goulet**: Investigation; writing—review & editing. **Melissa Gorman**: Writing—review & editing, supervision. **Brooks Hogya**: Writing—review & editing. **Glen P. Kenny**: Writing—review & editing, supervision, project administration. All persons designated as authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship, and all those who qualify are listed.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

John Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Emily J. Tetzlaff http://orcid.org/0000-0002-4192-474X
Nicholas Goulet http://orcid.org/0000-0003-1941-3174
Melissa Gorman http://orcid.org/0009-0006-9045-4656
Glen P. Kenny https://orcid.org/0000-0001-8683-6973

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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