EMERGENCY PREPAREDNESS IN NURSING HOMES: THE ASSOCIATION BETWEEN EMERGENCY PREPAREDNESS STANDARDS COMPLIANCE AND THE COVID-19 PANDEMIC

by

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ABSTRACT

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The COVID-19 pandemic exposed weaknesses in the U.S. public health infrastructure and demonstrated that various groups may be disproportionately affected by a public health emergency. Specifically, the pandemic highlighted the vulnerability of older adults, particularly those living in long-term care facilities. Although nursing homes house less than 1% of the nation's population, they account for 40% of COVID-19 deaths. To encourage comprehensive and collaborative emergency preparedness planning in nursing homes, which face unique challenges in safeguarding residents' health, the Centers for Medicare and Medicaid Services (CMS) established regulatory standards for emergency preparedness programs (E-Tags) that must be achieved by all certified long-term care facilities. This study explored the relationship between compliance with these standards and incidence of COVID-19 morbidity and mortality within nursing homes after controlling for facility characteristics, as well as how prior experiences with federally declared disasters affected compliance.

This quantitative, correlational study included 14,754 certified nursing homes and utilized multiple secondary datasets obtained from CMS (Fire Safety Deficiencies, Nursing Home COVID-19 Public File, and Provider Information) and the Federal Emergency Management Agency (FEMA). Incidence proportions of COVID-19 morbidity and mortality among residents were calculated and two multiple linear regression models were analyzed to

evaluate whether the number of deficiencies in a nursing home was associated with these incidence proportions after controlling for region, facility size, and ownership type. A Pearson chi square analysis was conducted to assess the correlation between the number of deficiencies cited and previous federally declared disasters.

This study found that the number of citations received by nursing homes for E-Tag deficiencies was significantly and positively associated with COVID-19 morbidity and mortality among residents, although the effect size was small. Region, facility size, and ownership type were significant predictors of morbidity and mortality. *Training and Testing* and *Emergency Plan* elements were shown to be the most important predictors of morbidity and mortality, reflecting the need for an all-hazards approach to emergency planning within nursing homes and for inclusion of these facilities in community-level preparedness efforts by local and state emergency management and public health agencies. Previous experience with federally declared disasters was not associated with compliance with emergency preparedness standards.

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare and Medicaid Services
COVID-19	Coronavirus disease identified in 2019
FEMA	Federal Emergency Management Agency
HHS	U.S. Department of Health and Human Services
IP	Infection preventionist
IPC	Infection prevention and control
NHSN	National Healthcare Safety Network
OIG	U.S. Office of the Inspector General
PPE	Personal protective equipment

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Chapter 1: Introduction to the Study

Background

The COVID-19 pandemic (hereafter "the pandemic") exposed the weaknesses of the public health infrastructure in the United States and the divide between it and clinical care systems (Clancy et al., 2021). Many researchers attribute these weaknesses to chronic underinvestment in public health (Clancy et al., 2021; Dixon et al., 2020; Isasi et al., 2021). Despite numerous events that tested the resilience of such infrastructure around the globe (e.g., Hurricanes Katrina, Rita, Irma, and Sandy; SARS-CoV-1; the H1N1 flu pandemic; and MERS-CoV, Ebola, and Zika Virus outbreaks), per capita funding for public health emergency preparedness in the U.S. decreased in recent decades (Dixon et al., 2020; Isasi et al., 2021).

The pandemic provided numerous examples of how various groups may be disproportionately and adversely affected by a public health emergency. Specifically, COVID-19 highlighted the vulnerability of older adults, particularly those living in long-term care facilities. In the U.S., approximately 1.3 million individuals live in over 15,000 nursing homes (Davidson & Szanton, 2020; Kaiser Family Foundation, 2022). Nursing homes and other types of long-term care facilities (i.e., skilled nursing facilities and assisted living communities) became a focal point of tragedy from the very beginning of the pandemic when 167 cases were identified and 35 individuals died during a single outbreak in a King County, Washington nursing home in February 2020 (Davidson & Szanton, 2020; Mitchell et al., 2020). During the first year of the pandemic, 94% of nursing homes experienced multiple outbreaks, with most lasting longer than 5 weeks (Dicken, 2021a) and infecting the majority of residents (Ibrahim & Aitken, 2021).

The number of people living in nursing homes in the U.S. is among the highest in the world (Davidson & Szanton, 2020) and, although these facilities house less than 1% of the

nation's population, they account for 40% of COVID-19 deaths (Jones et al., 2021). Older adults are at disproportionately greater risk of morbidity, mortality, and hospitalization during all types of disasters and emergencies (Kusmaul et al., 2021; Lane & McGrady, 2018; Skarha et al., 2021; Walsh, 2020), not just infectious disease outbreaks. Nursing homes face unique challenges in safeguarding residents' health (Walsh, 2020). The inherent and unique complexities that accompany the care of America's aging population are not unrecognized in the emergency preparedness community, however a consistent lack of engagement with nursing homes to prepare for disasters that affect these facilities and their vulnerable residents is identified as a serious and concerning issue throughout the literature (Ibrahim & Aitken, 2021; Jones et al., 2021; Pierce et al., 2017; Volkman et al., 2012; Wasserman & Konetzka, 2022).

To encourage more comprehensive and collaborative emergency preparedness planning in nursing homes, the Centers for Medicare and Medicaid Services (CMS) established regulatory standards for emergency preparedness programs that must be achieved by all certified long-term care facilities. These standards finalized in 2017 and are intended to provide guidelines on how to prepare for a disaster (e.g., programs, policies and procedures, communication, training and testing). All facilities were required to establish emergency preparedness programs within one year (CMS, 2021) and, in order to qualify as a Medicare supplier and receive reimbursement for care provided to residents, must assess their plan annually to guarantee an all-hazards approach, which incorporates abilities, limits, planning, and preparing for both internal and external situations (Federal Register, 2016).

Despite these regulatory requirements and tailored guidance provided by Centers for Disease Control and Prevention (CDC) to long-term care facilities for the prevention and control of COVID-19 (NCIRD, 2020), evidence suggests that there remains a gap in the application of

emergency preparedness program components that resulted in a lack of coordination and inadequate response to the pandemic by nursing homes (Harrington et al, 2017). Levels of preparedness among nursing homes and the extent to which emergency plans detail its components varies widely across facilities (Blake et al., 2018; Peterson et al., 2021). Yet, preparedness has not been directly linked to patient-centered outcomes in nursing homes. Almost all of the existing literature that attempt to identify predictors of COVID-19 morbidity and mortality in these settings focus on resident or facility-level characteristics and fail to include emergency preparedness as potential factors (Konetzka et al., 2021). Calls for additional investigation have been made by researchers to further understand the impact of the CMS final rule to require nursing homes and other long-term care facilities to develop and maintain an emergency preparedness program (Heckman et al., 2021). This study sought to address this gap in the literature, quantify nursing home compliance with CMS regulations, and explore the relationship between compliance and COVID-19 morbidity and mortality reported within these facilities in order to inform future pandemic strategies to safeguard this vulnerable population.

Problem Statement

The COVID-19 pandemic resulted in what is often called a "perfect storm" (Ouslander & Grabowski, 2020, p. 2153) or a "disaster within a disaster" (Ibrahim & Aitken, 2021, p. 1831) as medical services in nursing homes across the country were negatively affected due to internal and external factors (Ibrahim & Aitken, 2021; Miller et al., 2021). All long-term care facilities, including nursing homes, are required to develop and maintain emergency preparedness programs adhering to regulatory standards set forth by CMS in 2016 (CMS, 2021). These standards are intended to lessen negative outcomes, such as morbidity and mortality, in the face of disaster (Lane & McGrady, 2016), yet preventive measures and plans seeking to mitigate

infection failed to control the spread of the pandemic within these facilities, resulting in excess morbidity and mortality among residents (Jones et al., 2021). Incidence rates of infection among nursing home residents ranged from 0 – 71% and case fatality rates from 0 – 34% (Ibrahim & Aitken, 2021). Because the virus characteristics and affected population do not substantially differ among facilities, this wide variation in morbidity and mortality suggests that there are other contributing factors (Ibrahim & Aitken, 2021). To understand why such high and variable rates occurred so that responses to future emergencies yield better patient-centered results, it is critical to examine nursing home compliance with CMS emergency preparedness program standards and the impact of compliance on COVID-19 morbidity and mortality.

Purpose of the Study

The purpose of this study was to explore compliance with the CMS emergency preparedness program standards among nursing homes in the U.S. and how prior experiences with federally declared disasters may affect compliance, as well as to evaluate the relationship between compliance and incidence of COVID-19 morbidity and mortality after controlling for important facility characteristics (i.e., region, facility size, and ownership type). Secondary data that included nursing home citations related to CMS emergency preparedness program standards, federally declared disasters in the U.S., and COVID-19 outcomes as reported by nursing homes to CDC's National Healthcare Safety Network (NHSN) were analyzed to inform federal, state, and local governments about the degree of influence that compliance with regulatory standards has on patient-centered outcomes, specifically the prevention of morbidity and mortality among nursing home residents. This research was unique because it focused on an area of emergency preparedness that has previously received little attention (Konetzka et al., 2021; Pierce et al., 2017). No prior studies directly measuring the relationship between compliance with CMS

emergency preparedness program requirements and morbidity and mortality outcomes in nursing home residents exist.

Significance of the Study

Although emergency preparedness has been studied among nursing homes in the global context (Gilissen et al., 2020; OECD, 2021) and in various other contexts such as home health care agencies (Shang et al., 2020), the CMS emergency preparedness program standards have not been evaluated on a national level in response to a public health emergency in the U.S. This study is among one of the first to assess the relationship between compliance with emergency preparedness program standards in nursing homes and patient-centered outcomes during or after a public health emergency, specifically COVID-19 morbidity and mortality among residents. COVID-19 exhibited a severely negative impact on nursing homes in the U.S. and current research focuses primarily on infection control standards and practices. Exploring the relationship between CMS emergency preparedness program standards and COVID-19 morbidity and mortality among nursing home residents will provide useful information for nursing homes and federal, state, and local governments in planning for future emergencies.

Definition of Key Terms

Key terms used throughout this manuscript are defined below.

All-hazards approach: An integrated approach to emergency preparedness planning that focuses on aspects that are critical to preparedness for a full spectrum of emergencies, including internal emergencies, man-made emergencies, or natural disasters (CMS, 2017)

Disaster (or emergency): A destructive event that overwhelms available resources in a facility or community (CMS, 2017; Ibrahim & Aitken, 2021)

Emergency preparedness program: An approach of a facility or community to meet the health and safety needs of a population that provides guidance on how to respond to emergency situations (CMS, 2017)

Long-term care facility: A residential institution that provides various types of care to individuals who are unable to live independently; includes nursing homes, skilled nursing facilities, assisted living communities, hospice facilities, etc. (Volkman et al., 2012)

Nursing home: A residential, congregate healthcare facility that provides skilled medical, nursing, and personal care for the elderly or persons with chronic illness or disability who are unable to live on their own and is certified by the Centers for Medicare and Medicaid Services; typically provides the highest level of medical care for older adults of any setting outside an acute care hospital (CMS, 2022a; Kusmaul et al., 2021; Lane & McGrady, 2016; Volkman et al., 2012; Walters et al., 2022)

Preparedness: Capability of the public health and healthcare systems, communities, and individuals to prevent, protect against, quickly respond to, and recover from health emergencies, particularly those whose scale, timing, or unpredictability threatens to overwhelm routine capabilities (Nelson et al., 2007)

Skilled nursing facility: A healthcare facility that provides skilled nursing care and related services to patients who require medical, nursing, or rehabilitative services but that do not need the level of care provided in a hospital setting (CMS, 2022a).

Theoretical Framework

To examine the relationship between compliance with CMS emergency preparedness standards and COVID-19 morbidity and mortality among nursing home residents, this research applied General Systems Theory and Complexity Theory. General Systems Theory (GST) was

developed by a biologist named Bertalanffy in the mid-20th century in an effort to understand the relationship among various components of a system and their impact on behavior, instead of viewing each component as an isolated entity (Bertalanffy, 1968). Specifically, Bertalanffy (1968) believed that systems interact with and are influenced by their environments. Katz and Kahn (1966) were the first to apply GST to organizational behavior. GST describes several elements that comprise a system including the system itself, input, environment, throughput, and output.

System has been defined differently by numerous scholars; however, this study utilized Skyttner's (1996) definition of a system as "a set of interacting units or elements that form an integrated whole intended to perform some function(s)" (p. 16). *Inputs* are what is placed into a system to achieve an *output*, which is produced by a process of *throughput*. *Environment* describes any external elements that may affect part or all of a system. Complexity theory is an extension of systems theory in that it not only considers "the whole as the sum of its parts" but that "the whole [may be] different from the sum of its parts and their interactions" (Richardson, 2004, p. 77). Complexity theory allows for systems to be adaptable to their environments and utilize feedback loops to modify behavior (or throughputs). It also recognizes the unpredictability, or chaos, of environments, conditions, and behaviors (Turner & Baker, 2019).

Using these concepts, this research defined 1) the *system* as the nursing home in which the units are administrators and staff whose function is to care for and safeguard residents, 2) the *input* as the CMS emergency preparedness program standards, 3) the *throughput* as the level of compliance with these standards, 4) the *environment* as the COVID-19 pandemic and previous experiences with federally declared disasters, and 5) the *output* as the facility's ability to manage COVID-19 as measured by morbidity and mortality among residents (Figure 1). Following

Bertalanffy's (1968) theory, the researcher proposed that nursing homes comply with CMS emergency preparedness standards to varying degrees (*throughput*), which affects the relationship between these standards (*input*) and facilities' ability to care for and safeguard residents (*output*). Previous experiences with federally declared disasters (*environment*) may have improved facilities' readiness and response to the pandemic, resulting in better patient-centered outcomes (*output*). Furthermore, the COVID-19 pandemic (*environment*) likely influenced the nursing homes (*system*) such that compliance and patient outcomes should be investigated within the context of the pandemic.

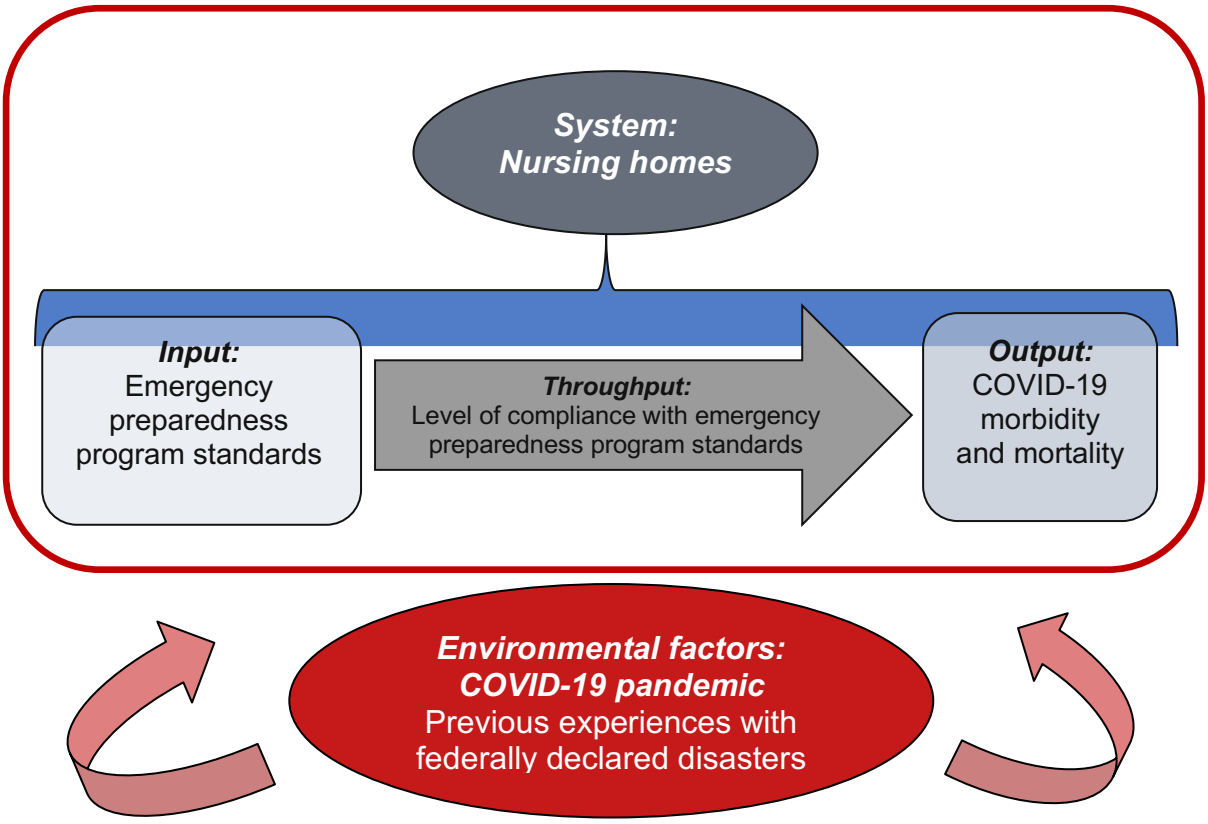

Figure 1: Schematic of General Systems Theory and Complexity Theory used in the Current Study

Because much of emergency preparedness is dynamic, complexity theory provided additional insight into determining how this system of nursing homes was impacted by the COVID-19 pandemic (Khan et al, 2018). For example, the scope and magnitude of the pandemic was unpredictable, particularly with the diverse mitigation measures enacted and enforced throughout the U.S. Funding, staff with previous experiences of disaster response, and social and cultural infrastructure also changed significantly over the course of the pandemic, resulting in further chaos and uncertainty. Recognition that emergency preparedness in nursing homes is a complex and chaotic system, grounded in the elements of general systems theory, provided a multi-theoretical framework for understanding the relationship between compliance with CMS emergency preparedness program standards in nursing homes and COVID-19 morbidity and mortality among residents.

Chapter 2: Literature Review

Literature Review Search Strategy

The purpose of this literature review was to understand the current compliance, gaps, and concerns related to emergency preparedness programs in nursing homes. Four databases - COVID-19 in America: Response, Issues, and Law, EBSCO, Embase, and PubMed Central - were searched using the following keywords: *nursing home*, *long-term care facility*, and *emergency preparedness*. Inclusion criteria for this literature review consisted of 1) years of publication between January 2017 – June 2022, 2) focus on U.S. nursing homes or long-term care facilities, 3) written in English, and 4) availability of a full-text version of the publication. Although a number of articles prior to 2017 exist regarding emergency preparedness within nursing homes, this study focused on compliance with CMS emergency preparedness program requirements that were finalized in late 2016. Therefore, literature prior to this date was excluded from the review.

A total of 324 publications were obtained using the search strategy detailed above. An initial abstract review resulted in the exclusion of articles not related to nursing homes (n = 131) or emergency preparedness (n = 73), focused outside of the U.S. (n = 52), whose full-text was unavailable (n = 3), and those otherwise not relevant to this study (n = 24). Additional publications were obtained using a snowball methodology. In total, 41 full-text publications were reviewed and are summarized below.

Development of Federal Emergency Preparedness Standards for Nursing Homes

Following a number of disasters occurring in the 1990s and 2000s, such as the September 11, 2001 terrorist attacks and the Gulf Coast hurricanes in 2005, and numerous studies indicating that nursing home residents experienced dramatically higher rates of morbidity, mortality, and

hospitalization than other populations, the Centers for Medicare and Medicaid Services (CMS), an agency within the U.S. Department of Health and Human Services (HHS), created an Emergency Preparedness Checklist in 2006 to assist healthcare facilities, including long-term care organizations, with planning for disasters (CMS, 2007; Lane & McGrady, 2018). A 2012 report from the U.S. Office of the Inspector General (OIG) found that only half of checklist items were included in existing nursing home emergency plans (Lane & McGrady, 2016) and, only in 2014, after further disasters occurred and continued to highlight the disproportionately negative outcomes among nursing home residents did CMS require nursing homes to complete tasks associated with the checklist (Lane & McGrady, 2016; Lane & McGrady, 2018).

Several notable disasters occurred in the years following the development of the Emergency Preparedness Checklist, including Midwestern flooding in 2008, the H1N1 influenza pandemic in 2009, and Hurricane Sandy in 2012. In 2013, the American College of Healthcare Executives advised medical services directors – which are present in both hospitals and long-term care facilities – to participate in planning and disaster management projects to ensure a quality emergency plan that addresses their facility needs. However, the language within this statement focused almost exclusively on hospitals (ACHE, 2022). Additionally, a study conducted in 2014 in which nursing home staff provided a self-assessment of emergency preparedness within their facility showed that gaps in implementation remained. Fifteen percent of facilities did not have an all-hazards approach to planning and were not prepared for the various types of disasters that could affect their facility and residents. Only 38% of nursing homes reported having access to state and local emergency planning regulations and requirements (Lane & McGrady, 2016).

CMS again reviewed the existing emergency preparedness guidance and regulations for healthcare facilities and found them to be lacking. Regulatory requirements did not account for variation in the level of emergency preparedness among different types of healthcare providers, including long-term care facilities, and were "not comprehensive enough to address the complexities of the actual emergencies" (Federal Register, 2016, p. 63861). As a result, a proposed rule was released in 2013 and, in 2016, CMS issued a final rule that "establish[es] a comprehensive, consistent, flexible, and dynamic regulatory approach to emergency preparedness and response that incorporates the lessons learned from the past, combined with the proven best practices of the present" and focuses on safeguarding human resources, maintaining business continuity, and protecting physical resources (Federal Register, 2016, p. 63861).

All long-term care facilities, including nursing homes, must comply with the CMS rule under the authority of the Social Security Act. Six elements of an emergency preparedness program which must be reviewed and updated annually were defined: 1) emergency plan, 2) policies and procedures, 3) communication plan, 4) training and testing, 5) emergency and standby power systems, and 6) integrated health system (TRACIE, 2022). Specific requirements are known as E-Tags, which are denoted with a number. Table 1 provides a list of each E-Tag (n = 26) and the element with which it corresponds (see Appendix A for the regulatory text associated with each E-Tag). [*NB:* Some E-Tags are not required of long-term care facilities and have been excluded from the table below.] These tags are used by federal and state surveyors to assess compliance as of November 2017, allowing facilities one year to establish an emergency preparedness program that complies with requirements.

Table 1: CMS Required Elements of Emergency Preparedness Programs in Nursing Homes and Associated E-Tags

Element	E-Tag Number	E-Tag Description
Emergency Plan	1	Establish an emergency preparedness program
	4	Develop and maintain an emergency preparedness program
	6	Conduct risk assessment and an all-hazards approach
	7	Address patient/client population and determine types of services needed
	9	Include a process for emergency preparedness collaboration
Policies and Procedures	13	Develop emergency preparedness policies and procedures
	15	Address subsistence needs for staff and patients
	18	Establish procedures for tracking staff and patients during an emergency
	20	Establish policies and procedures including evacuation
	22	Establish policies and procedures for sheltering
	23	Establish policies and procedures for medical documentation
	24	Establish policies and procedures for volunteers
	25	Create arrangements with other facilities to receive patients
	26	Establish roles under a waiver declared by secretary
Communication Plan	29	Develop a communication plan
	30	List the names and contact information of those in the facility
	31	Provide emergency officials' contact information
	32	Provide primary/alternate means for communication
	33	Establish methods for sharing information
	34	Provide a means of sharing information on occupancy/needs
	35	Provide family notifications of emergency plan
Training and Testing	36	Establish emergency preparedness training and testing
	37	Establish staff and initial training requirements
	39	Conduct testing and exercise requirements
Emergency and Standby Power Systems	41	Implement emergency and standby power systems
Integrated Health System	42	Meet the requirements of an integrated health system

Although not part of the emergency preparedness program requirements set forth for nursing homes, CMS also implemented a requirement in 2016 that these facilities have at least one designated individual who is responsible for infection prevention and control (IPC) and who meets minimum standards of training (Federal Register, 2016). A 2019 addition to the rule further required that all emergency preparedness plans include a provision for addressing emerging infectious diseases (Walsh, 2020). No additional E-Tags were developed to ensure inclusion of such provisions; this modification is encapsulated within E-Tag 6 ("Conduct risk assessment and an all-hazards approach").

Compliance with Emergency Preparedness Program Standards Prior to the COVID-19 Pandemic

Since implementation of the CMS standards in 2016, research concerning nursing homes and emergency preparedness has continued to focus almost exclusively on natural disasters including hurricanes (Dosa et al., 2020; Peterson et al., 2021; Soto & Galindo, 2018), floods (Grossman et al., 2021), heatwaves (Okwuofu-Thomas et al., 2017), fire or explosions (Evans et al., 2018, Prot & Clements, 2016), and resulting issues such as power loss (Skarha et al., 2021). This focus is also reflected in the plans created by nursing homes (Lane & McGrady, 2016), wherein a minority of facilities showed evidence of emergency preparedness programs that considered known outbreak risks (e.g., influenza) or emerging infectious diseases such as COVID-19. The few studies that have assessed levels of preparedness in nursing homes and the extent to which their emergency plans are detailed suggest wide variation across facilities (Blake et al., 2018; Peterson et al., 2021).

In Ohio, a 2016 study of skilled nursing facilities discovered that more than 99% reported having an emergency preparedness plan (E-Tag 1), 96% had reviewed their plan, and 89% of

plans included communication procedures for staff, residents, and families (related to E-Tags 29, 32, and 35). However, 25% of facilities had not conducted or participated in an emergency planning drill or exercise (E-Tag 39) and 43% of facility plans did not include provisions for sufficient staffing during emergencies (E-Tag 37). The lowest level of compliance was observed among items related to communication and collaboration with partner agencies. Only 28% of nursing homes had worked with a local emergency management agency to develop their preparedness plan and fewer than one in five facilities (15%) reported having contact with their regional healthcare coalition (related to E-Tags 9, 25, 31, 33, 34, and 42). Furthermore, a list of disasters that were assessed as part of the study included only natural and man-made disasters; emergencies related to infectious disease outbreaks were not assessed (E-Tag 6) (Kennedy et al., 2021).

A 2018 survey of long-term care facilities in Kentucky found that 92% had an emergency plan which included a communication plan (related to E-Tags 1, 29, 32, and 35). As in Ohio, the primary focus of emergency preparedness plans was on natural disasters but improvements in planning since 2014 were observed and could be attributable to the newly instituted CMS standards. In Kentucky, nearly three-fourths of facilities (72.5%) addressed pandemic influenza in their emergency preparedness plans although only 20% included “other disease outbreaks” (E-Tag 6). A greater proportion of long-term care facilities in Kentucky reported discussing their emergency plans with local emergency management agencies, hospitals, and public health departments (50-68%) as well as healthcare coalitions, state emergency management, state public health departments, and county emergency operations centers (28-36%) (Shiels, 2018) than in the Ohio study. However, the proportion of long-term care facilities who reported

collaboration with other agencies still demonstrated relatively low levels of compliance with this component of the CMS emergency preparedness program standards.

The final available study from recent years that assessed emergency preparedness in nursing homes emerged from Michigan. Researchers conducted a pair of surveys of nursing homes in 2007 and early March 2020, just as the COVID-19 pandemic began to spread throughout the U.S. The proportion of facilities that did not have a pandemic response plan, either as a separate strategy or as part of their primary emergency preparedness plan, had decreased from 51% in 2007 to just 2% in March 2020 (E-Tag 6). While it is unclear whether these pandemic-focused strategies were in place prior to the threat of COVID-19, it is worth noting that the vast majority of facilities in Michigan reported having a plan prior to their facility being impacted by the pandemic. Additionally, this study found that 94% of facilities had a designated staff member who was responsible for the pandemic plan and 85% had stockpiled supplies to some degree (related to E-Tags 7 and 22). Nursing homes were more likely to have stockpiles of surgical masks (84%), alcohol-based hand sanitizer (81%), gloves (81%), and gowns (80%) than N95 respirators (43%), although what constituted a stockpile was not well-defined. While the proportion of nursing homes that had conducted pandemic or outbreak exercises increased from 8% in 2007 to 36% in 2020, this still represented a significant gap in compliance (E-Tags 36 and 39). Between 85 – 98% of facilities reported utilizing guidance from CDC or state and local public health departments, although only 56 – 86% had established communication lines with state and local public health (related to E-Tags 8, 25, 29, 31, 33, 42) (Jones et al., 2020).

Challenges to Implementation of Emergency Preparedness Program Standards

Researchers have identified several challenges that nursing homes face in efforts to achieve compliance with CMS standards. Some of these challenges are inherent to the facility due to the population that resides in nursing homes, while others are systemic issues created by the historical exclusion of nursing homes in emergency preparedness programs.

Older adults are at disproportionately greater risk of morbidity, mortality, and hospitalization during all types of disasters and emergencies and nursing homes face unique challenges in safeguarding residents' health (Kusmaul et al., 2021; Lane & McGrady, 2018; Skarha et al., 2021; Walsh, 2020). By nature, nursing homes are high density, congregate settings where both the residential structure (e.g., shared rooms, bathrooms, and dining facilities) and personal needs for communal activities and social interaction to prevent further physical and mental decline create an opportunity for infectious diseases such as COVID-19 to spread quickly and effectively (Anderson et al., 2020; Chu et al., 2020; Davidson & Szanton, 2020; Dicken, 2021b; Gray-Miceli et al., 2021; Ibrahim & Aitken, 2021; Isasi et al., 2021; National Academies, 2022). Limited IPC resources and infrastructure, inadequate staff training and education specific to care of nursing home residents, and a propensity for staff movement between residents to provide hands-on care (e.g., feeding and bathing residents, administering medications) exacerbate these physical and social environmental challenges by providing chances for greater transmission of disease (Ibrahim & Aitken, 2021; Jones et al., 2021; National Academies, 2022; Zolot, 2020). Additionally, nursing home residents typically have poor health status defined by multiple comorbidities (e.g., Alzheimer's disease, depression, hypertension, heart disease, diabetes, and arthritis), frailty, impaired mental status, and low functional abilities related to communication and motor skills, which contribute to worse outcomes from infection as well as

traumas such as evacuation or disruption of medical services (Gray-Miceli et al., 2021; Ibrahim & Aitken, 2021; Jones et al., 2021; Volkman et al., 2012; Walters et al., 2022; Zolot, 2020).

A second inherent challenge to adequate emergency preparedness among nursing homes is the chronic shortage of trained staff to provide necessary medical care to residents while responding to a crisis (Davidson & Szanton, 2020; National Academies, 2022). Because of funding limitations and a lack of educational requirements focusing on geriatric populations and their unique needs, nursing homes often rely on minimally trained clinical staff such as licensed practical nurses (LPN) and certified nursing assistants (CNA) to provide direct care to residents (National Academies, 2022; Rubano et al., 2022). In fact, CNAs - the nursing profession with the least qualifications and receiving the lowest remuneration - provide more than 90% of direct care to residents (Gray-Miceli et al., 2021). These staff are often inadequately trained on even the most basic of clinical care and IPC principles such as handwashing (Rubano et al., 2022); understanding and implementing emergency preparedness principles is beyond the capabilities of many of these staff without frequent, tailored training. Furthermore, applying basic IPC strategies (i.e., wearing a face mask and performing active surveillance for symptoms) often requires resident participation and untrained, poorly paid staff may be unmotivated to overcome these difficulties (Walters et al., 2022; Zolot, 2020). High staff turnover further limits nursing home staff's capacity to developing, maintaining, and executing emergency plans (Gray-Miceli et al., 2021; Jones et al., 2021; National Academies, 2022).

Many challenges that nursing homes face, however, have been created by their historical exclusion from emergency preparedness programs and partnerships. Despite calls to prioritize and integrate nursing homes and other long-term care facilities into emergency preparedness activities by researchers and government agencies alike (Jones et al., 2021; Kennedy, 2017;

Volkman et al., 2012; Walsh, 2020), there has been a consistent and substantial gap in funding, knowledge and skills transfer, and engagement of this sector by traditional emergency management and public health agencies (National Academies, 2022; Okwuofu-Thomas et al., 2017; Volkman et al., 2012; Walsh, 2020; Wasserman & Konetzka, 2022). In practice, nursing homes have been treated as non-essential, non-healthcare facilities (Volkman et al., 2012) and excluded, whether through intentional exclusion or passive omission, from community emergency preparedness plans. For example, a literature review of heat wave response plans around the world identified two plans from the U.S. Even though the impact of heat waves was known to be most severe among older adults, particularly those who are residents of nursing homes, neither heat wave response plan contained specific provisions for nursing homes or other long-term care facilities (Okwuofu-Thomas et al., 2017). In a comprehensive report on nursing home quality, the National Academies of Sciences, Engineering, and Medicine suggested that this exclusion may be due to the perception of nursing homes as businesses rather than healthcare organizations, stemming from their origins as poorhouses to care for older adults and other individuals without family means for care (National Academies, 2022).

This exclusion of nursing homes has been observed at all levels of government. Despite CMS standards requiring long-term care facilities to develop an emergency preparedness plan that includes collaboration and partnership with other agencies and to be part of “an integrated health system” (CMS, 2021), a checklist for community resilience published by CDC in 2017 instructs these facilities to “minimize dependence on external help and maximize self-resilience" (Toner et al., 2017). Traditional emergency preparedness programs often overlook critical aspects of addressing nursing homes’ concerns such as epidemic capacity, development and skills of personnel, appropriate communication methods, and use or accessibility to ongoing

training (Ibrahim & Aitken, 2021). Hospitals and healthcare coalitions have received funding and participated in planning, drills, and exercises related to disasters for decades; long-term care facilities have not had this benefit (Kennedy, 2017; Lane & McGrady, 2016; National Academies, 2022; Walsh, 2020; Wasserman & Konetzka, 2022). Instead, they must often conduct their planning efforts with little or no input or coordination with public health and emergency management agencies (Blake et al., 2018) and are forced to shoulder the majority of the cost burden associated with emergency planning while payors (e.g., Medicare, private insurers) reap the cost savings (Walters et al., 2022).

Complying with CMS standards therefore presents a significant challenge for nursing homes, as they generally lack the background in emergency preparedness terminology and principles, experience with testing plans and conducting exercises, and knowledge of how to build and maintain relationships with emergency management and public health partners (Johnson, 2017; National Academies, 2022; Walsh, 2020). In a 2020 study, CDC found that nursing home administrators and staff lacked the specialized knowledge needed to operationalize emergency guidance (Walters et al., 2022), yet administrators, directors of nursing, and IPC coordinators comprise more than 90% of those responsible for preparedness in nursing homes. Emergency preparedness staff were responsible for emergency plans in only 7% of nursing homes (Jones et al., 2020). When dealing with a disaster of infectious origin, as in the COVID-19 pandemic, IPC coordinators play an even more important role in preparedness (Volkman et al., 2012). However, less than half of long-term care facilities reported having an infection preventionist (IP) on their emergency management committee (Volkman et al., 2012). Compounding this dearth of representation is the fact that nursing homes are less likely to have full-time IPC coverage compared to acute care hospitals (National Academies, 2022; Volkman et

al., 2012) and, among nursing home IPs that were employed by facilities, almost half (44%) did not have nursing-home specific training on IPC principles (Agarwal et al., 2020).

Other studies have shown that nursing homes also lack the infrastructure and supplies necessary to adequately respond to a disaster (Mitchell et al., 2020; Walters et al., 2022) and were unaware of external resources available to them during a disaster (Blake et al., 2018). As a result, achieving compliance with CMS standards can create apprehension, confusion, and stress on nursing homes (Shiels, 2018) with little support from the preparedness community. Nursing home staff often feel like "outsiders" among emergency preparedness partners (Walsh, 2020) and report difficulty forming relationships that could improve their facility plans (Johnson, 2017). Even when these facilities do feel prepared for an emergency, it may be an instance of "not knowing what they don't know". For example, a self-assessment of nursing homes found that facilities, on average, rated themselves as a 7.4 on a 1 – 10 scale of preparedness despite only 38% having copies of local or state emergency preparedness plans and requirements (Lane & McGrady, 2016). Nursing homes and other long-term care facilities need additional training, technical assistance, oversight, and enforcement in order to meet preparedness standards and gain an appropriate level of understanding of processes and protocols (Clancy et al., 2021; National Academies, 2022; Rubano et al., 2022).

A fundamental challenge in engaging with the emergency preparedness community is the variation in lead agency. Depending on the type and scale of a disaster and jurisdictional agreements, different agencies within the federal, state, or local governments may assume command (Clancy et al., 2021). These agencies produce and distribute information and guidance concerning a response which, particularly in the early days or weeks of a disaster, may change frequently. This can result in inconsistent or even contradictory guidance for partners, including

nursing homes (Jones et al., 2021; National Academies, 2022; Rubano et al., 2022), leaving them to interpret the guidance on their own. Notably, CMS standards indicate *what* should be addressed in emergency preparedness programs in nursing homes but they do not include which disciplines or staff members should be involved in the planning process (Kusmaul et al., 2021).

In an editorial published in 2020, Walsh (2020) placed the onus of promoting collaboration with nursing homes and ensuring their compliance with CMS standards on traditional emergency preparedness agencies, including hospitals, healthcare coalitions, and state and local public health and emergency management officials. Officials in Washington state agreed and credited their effectiveness in "flattening the curve" to their early coordination and engagement with long-term care facilities (Mitchell et al., 2020). Similarly, researchers in Michigan suggest that hospitals should incorporate nursing homes into their drills and exercises (Jones et al., 2021).

Real World Results of Emergency Preparedness Plans in Nursing Homes During COVID-19

Although literature shows some improvement in emergency preparedness programs in nursing homes (Shiels, 2018; Jones et al., 2020), there is often a gap between having a comprehensive written plan and effectively *executing* that plan in a real-world situation like the COVID-19 pandemic (Kusmaul et al., 2021; Lane & McGrady, 2016; Walsh, 2020). Hands-on implementation of plan components requires more than simply "paper compliance" (Wasserman & Konetzka, 2022, p. 832) and "checking boxes" (Walsh, 2020, p. 184). Unpredictable events, including pandemics, require a modified or improvised response to adapt to changing needs and guidance (Lane & McGrady, 2018; Jones et al., 2021), which facilities may not be capable of achieving if they are already struggling to develop and maintain a standard emergency plan

(Shiels, 2018). A global review of government evaluations of the COVID-19 response indicated that, when emergency preparedness plans were implemented, they were frequently deficient and led to difficulties in responding quickly (OECD, 2022). While Jones et al.'s (2021) study of nursing homes in Michigan found that two-thirds of facilities (67.6%) felt their pandemic response plans addressed the actual issues "very well", a national study showed that few staff agreed that their facility had policies that adequately guided the facility through the pandemic (Miller et al., 2021; Quigley et al., 2020). Almost all nursing homes reported having separate COVID plans (54%) or including COVID in their standard emergency preparedness plan (46%) but fewer than one-third (29%) had conducted COVID exercises to test those plans (Quigley et al., 2020).

Many of the issues related to the implementation of emergency preparedness plans stemmed from the federal government, filtering down to state and local public health agencies and, ultimately, to long-term care and other facilities (Dixon et al., 2020; Morrissey & Rivera-Agosto, 2021). Most states struggled to determine the most effective distribution of limited resources throughout the population and, as a result, to specific settings such as nursing homes (Ibrahim & Aitken, 2021). One of the largest failures in preparedness during the COVID-19 pandemic in the U.S. was the ongoing shortage of personal protective equipment (PPE) necessary to prevent transmission of the virus (National Academies, 2022). Multiple surveys of nursing homes across the U.S. occurred in the early months of the pandemic, when almost three-fourths of facilities (72%) reported inadequate PPE supplies (Quigley et al., 2020). Most notably, 90% of nursing homes reported not having enough N95 respirators (58 - 90%), gowns (82 - 90%), face guards or eye protection (88%), alcohol-based sanitizer (67%), surgical masks (31 - 64%), or gloves (39%) (LeRose et al., 2021; Quigley et al., 2020). These PPE shortages were

more prominent in facilities with larger social vulnerabilities and likely led to breaches in infection control practices, resulting in increased transmission of COVID-19 (LeRose et al., 2021). Because staff were not provided with the appropriate equipment needed to keep themselves and residents safe, outbreaks proliferated in nursing homes. Two-thirds of these outbreaks have been attributed to initial infections among staff which then spread throughout the facility (Dicken, 2021a). Despite some improvements in securing and distributing PPE (Dicken, 2021b), almost 70% of facilities reported still having a shortage of gowns (83.5%), alcohol-based sanitizer (59.3%), and N95 respirators (51.7%) after a full year of the pandemic (Jones et al., 2021).

Interestingly, almost half of nursing homes (48.4%) reported that they relied on the local community – not public health or corporate leadership – to obtain necessary supplies (Jones et al., 2021). This represents a catastrophic failure in community and facility-level emergency plans, as timely and appropriate allocation of resources is essential to minimizing negative outcomes (Ibrahim & Aitken, 2021). Multiple reports state that, despite being recognized as a public health priority at the beginning of the response, nursing homes were not prioritized and federal, state, and local governments failed to allocate adequate PPE supplies to these facilities (Morrissey et al., 2021; National Academies, 2022; Walters et al., 2022; Zolot, 2020) even though COVID-19 was proven to spread quickly and effectively in congregate settings (Mitchell et al., 2020). Instead, governments - particularly the federal government - ignored long-term care facilities pleas for assistance (Zolot, 2020) and prioritized hospitals and other acute health services in the battle for PPE based on anticipated hospital surges (Gray-Miceli et al., 2021; Ibrahim & Aitken, 2021; Jones et al., 2021; Wasserman & Konetzka, 2022). Nursing homes were, in effect, expected to obtain their own supplies despite rising costs and decreased funding

(Wasserman & Konetzka, 2022; Zolot, 2020), just as they were during Hurricane Irma in 2017 (Peterson et al., 2021).

A similar trend was observed with respect to COVID-19 testing supplies. Despite administrators' insistence that the high cost of testing was not sustainable (Dicken, 2021b), HHS only began requiring routine testing of staff and residents, and therefore provision of supplies to do so, in September 2020 (Dicken, 2021a; National Academies, 2022). In fact, a full three months after the pandemic demonstrated an affinity for nursing homes, only 42.7% of facilities were able to test symptomatic residents and a paltry 25% had enough resources to perform surveillance testing of all residents and staff (Jones et al., 2021). The result of this was continued asymptomatic transmission and a higher number of cases associated with outbreaks. Among facilities who were able to control an outbreak of COVID-19 within 5 weeks, the mean number of cases was 13, whereas facilities who had outbreaks lasting longer than 5 weeks reported a mean of 56 cases, more than a four-fold increase (Dicken, 2021a).

Additional challenges to implementation of emergency plans within nursing homes included staffing shortages and bidirectional information sharing (National Academies, 2022). In March 2020, researchers reported that 83% of nursing homes expected significant staff shortages (Quigley et al, 2020) and, by May 2020, nearly two-thirds of facilities (63%) had experienced staff resignations, especially among staff who provided direct patient care (Jones et al., 2021). Approximately 20% of nursing homes also experienced a shortage of nurse aids and other support staff (Dicken, 2021b). CMS requires that all nursing homes have at least one individual who is responsible for IPC (Federal Register, 2016). However, these coordinators were found to have responsibilities beyond their IPC tasks of reviewing and implementing guidance, overseeing infection control programs for residents and staff, and managing active outbreaks

(National Academies, 2022). They frequently held other leadership roles, including director of nursing (32%) and facility administrator (27%), and were able to dedicate less than 50% of their working hours to IPC (Quigley et al., 2020; Rubano et al., 2022; Walters et al., 2022). Fewer than 40% of IPC coordinators received formal training in infection prevention (Quigley et al., 2020).

Due to the nature of the pandemic, scientists and public health officials learned more about the SARS-CoV-2 virus and COVID-19 infections at a rapid pace and, therefore, released new guidance in quick succession. Nursing home staff were often not aware of the most recent guidance (Miller et al., 2021) and did not receive timely updates from administrators or corporate offices (Jones et al., 2021). Approximately half of nursing homes (51%) relied on CDC guidance but only 4.4% reported use of information from state or local health departments (Jones et al., 2021). Federal guidance took precedence over local guidance, suggesting that, even among facilities that reported good communication with public health officials (72.8 - 96%) and hospitals (52.2 - 87%), communication and collaboration were ineffective (Jones et al., 2021; Quigley et al., 2020). Likewise, preparedness data from nursing homes (e.g., number of beds, N95 respirators, or ventilators) was scarce in the early months of the pandemic, limiting public health's ability to adequately prioritize funding and resources (Dixon et al., 2020; National Academies, 2022).

Almost all of the literature that attempts to identify predictors of COVID-19 morbidity and mortality in nursing homes fails to include emergency preparedness as a possible factor. IPC is also monitored and enforced by CMS through a set of regulations referred to as F-Tags (CMS, 2022b). F-Tags related to IPC have been reported as the most common type of deficiency cited by federal and state surveyors in nursing homes. In fact, 82% of all nursing homes received at

least one F-tag citation between 2013-2017 (Dicken, 2020). Similarly, more than two-thirds of nursing homes (83%) were found to have at least one gap in ICP during a CDC evaluation performed between April and June 2020. The most common items that failed to meet standards were core infection prevention and control practices such as hand hygiene and environmental cleaning (Walters et al., 2022), which is consistent with other literature (Rubano et al., 2022). Lapses in resident monitoring, screening, and cohorting to prevent the spread of disease were also present in almost half of facilities (47%) (Walters et al., 2022). However, multiple studies have analyzed the relationship between IPC citations and the number or rate of COVID-19 cases or deaths in nursing homes and failed to find a significant association (Dicken, 2021a; Konetzka et al., 2021; Walters et al., 2022; Wasserman & Konetzka, 2022).

A systematic literature review of articles published between January 2020 and June 2021 identified 36 empirical studies that assessed long-term care facility-level factors associated with COVID-19 cases and deaths, including 34 studies focused exclusively on nursing homes. Researchers found that the most consistent and influential predictor of COVID-19 morbidity and mortality among nursing homes was community prevalence of infection. In fact, every study that included a direct measure of community prevalence or an area effect found a significant relationship with risk among nursing homes (Chatterjee et al., 2020; Dicken, 2021b; Ibrahim & Aitken, 2021; Konetzka et al., 2021). The second predictor that was consistently significant across studies was facility size, wherein larger facilities had a higher probability of a COVID-19 outbreak and a larger number of cases than smaller facilities (Dicken, 2021a; Ibrahim & Aitken, 2021; Konetzka et al., 2021). Additionally, racial composition of facilities was determined to significantly affect rates of morbidity and mortality in nursing homes; however, this was largely explained by community prevalence and social vulnerability factors (Konetzka et al., 2021). For

example, a May 2020 in Detroit, Michigan found that skilled nursing facilities with a higher social vulnerability reported significantly greater shortages of PPE, which may have led to breaches in or unconventional infection control practices resulting in increased transmission, particularly from inadequately protected staff to residents (LeRose et al., 2021).

Measures of overall quality and staffing quality were assessed in more than a dozen studies but few significant relationships were found with COVID-19 morbidity or mortality, contrary to most assessments of patient-related outcomes from other disasters (Iyanda & Boakye, 2022; Konetzka et al., 2021). Although some early studies did report an association (Chatterjee et al., 2020; Khairat et al., 2021; Morrissey et al., 2021), elements of the study design caused these results to be flawed or of limited generalizability (Konetzka et al., 2021). However, a more comprehensive study of the first two years of the pandemic suggested that lower overall quality ratings were significantly associated with increased mortality among residents (Iyanda & Boakye, 2022). Staffing availability did not appear to prevent outbreaks in nursing homes (Konetzka et al., 2021) and, in fact, staff likely increased the likelihood of COVID-19 entering and spreading throughout a facility as they often sought concurrent employment from multiple nursing homes (Konetzka et al., 2021; Rubano et al., 2022). On average, nursing home staff who were employed by a corporation worked in 7 different facilities; this has been estimated to have caused a 49% increase in infections among these facilities (Rubano et al., 2022).

Mixed results were reported regarding ownership type. Chatterjee et al (2020) found that for-profit facilities were more likely to report having at least one case of COVID-19 on or before April 2020 than facilities with other ownership, although a literature review indicated that the most rigorous study to assess this relationship reported that for-profit nursing homes had *better* morbidity outcomes (i.e., fewer cases) due to increased access to PPE and testing, centralized

decision-making, and other organizational attributes (Konetzka et al., 2021). A more recent study published in 2022 provided further support that for-profit facilities fared better than non-profit or government-owned facilities, wherein the incidence rate ratio of COVID-19 deaths in government-owned nursing homes was 22.3% and only 6.4% in for-profit nursing homes (Iyanda & Boakye, 2022). A geospatial relationship has also been reported in the literature, with higher mortality occurring in nursing homes in the Northeast (Iyanda & Boakye, 2022) and variation among states in the number of outbreaks occurring within long-term care facilities (Dicken, 2021a).

Summary

Despite the CMS emergency preparedness program standards implemented in 2017 that sought to assist nursing homes and other long-term care facilities in planning for disasters, substantial failures of existing emergency preparedness plans at the federal, state, and local level occurred during the COVID-19 pandemic and resulted in disproportionately negative outcomes for nursing home residents. Nursing homes demonstrated moderate or better compliance with these standards in recent years, although they continue to face significant challenges to prepare and maintain emergency preparedness plans, particularly with respect to implementation and collaboration with traditional public health and emergency preparedness partners. This suggests that current guidance and regulatory actions may be insufficient to minimize harm to nursing home residents and to prevent loss of life. However, no studies directly measuring the relationship between CMS emergency preparedness program standards and morbidity and mortality outcomes among this population have been published.

Chapter 3: Research Methods

Research Design

This study was a quantitative, correlational study design, which involves investigating how variables relate to each other using numerical and statistical methods without changing or manipulating the variables. The primary advantage of this type of research is that complex relationships between variables can be more easily understood, even when there are multiple variables under investigation (Gurwitz, 2020). This study was also retrospective and longitudinal in nature because it captures events that occurred previously over an extended period of time.

Secondary data were used to determine compliance with CMS emergency preparedness program standards among nursing homes in the U.S. between 2017 – 2021 and how prior experiences with federally declared disasters may have affected compliance, as well as to evaluate the relationship between compliance and incidence of COVID-19 morbidity and mortality among nursing home residents after controlling for region, facility size, and ownership type. Despite the data not being initially designed or collected for the purposes of this study, secondary data often contain useful elements that can offer critical insight in analyzing additional outcomes (Garg et al., 2020). Use of secondary data has many advantages, such as reducing the amount of time and resources used to collect data as well as contact with external participants (Wang et al., 2020). However, limitations include the possibility that the data are not sufficient to answer the research questions or present inherent bias due to the methods by which they were collected or stored.

Research Questions and Hypotheses

Three research questions were used to guide this study. A brief rationale for each research question and the associated hypotheses are presented below.

RQ1: How did prior experiences with federally declared disasters affect compliance with CMS emergency preparedness program standards among nursing homes in the U.S. between 2017-2021 after controlling for region?

Many types of disasters, including COVID-19 but also natural disasters such as hurricanes, floods, and heat waves, have been proven to disproportionately affect long-term care facility residents and other older adults (Kusmaul et al., 2021; Lane & McGrady, 2018; Okwuofu-Thomas et al, 2017; Pierce et al., 2017; Skarha et al., 2021; Walsh, 2020). A study conducted in 2014 found that, although the relationship was not statistically significant, nursing homes that had experienced a previous disaster had slightly higher self-assessed ratings of preparedness than facilities that had not (Lane & McGrady, 2016). These facilities may have an increased recognition of the risk associated with disasters and a greater likelihood of understanding the advantages of meeting CMS standards (Sahin, 2006). Therefore, the researcher expected that nursing homes in states with a higher number of federally declared disasters in recent years (2012 – 2021) may demonstrate more compliance with CMS emergency preparedness standards than facilities with less experience with disasters. The alternative hypothesis for this research question was:

> $H1_a$: The mean number of CMS emergency preparedness program deficiencies in nursing homes in states with a higher number of federally declared disasters over the last ten years (2012 – 2021) will be lower than the mean number of deficiencies in states that had experienced fewer disasters.

RQ2: What, if any, is the association between compliance with CMS emergency preparedness program standards and COVID-19 morbidity and mortality among residents of nursing homes in the U.S. after controlling for region, facility size, and ownership type?

The purpose of the CMS emergency preparedness standards is to improve a facility's response to disaster such as the COVID-19 pandemic (CMS, 2021; Federal Register, 2016). Therefore, it was anticipated that nursing homes with a higher number of deficiencies also experienced a higher rate of COVID-19 morbidity and mortality. Previous literature reported facility size as one of the most consistent predictors of morbidity (Dicken, 2021a; Ibrahim & Aitken, 2021; Konetzka et al., 2021). Geographic variation and ownership type were also found to be significantly associated with patient-centered outcomes, although this relationship is less clear (Chatterjee et al., 2020; Dicken, 2021a; Iyanda & Boakye, 2022; Konetzka et al., 2021). Based on these studies, the three characteristics of region, facility size, and ownership type were included as control variables in this analysis. The alternative hypotheses for this research question were:

> $H2_a$: The number of CMS emergency preparedness program deficiencies in nursing homes will be positively associated with the incidence of COVID-19 morbidity among residents after controlling for region, facility size, and ownership type.
>
> $H3_a$: The number of CMS emergency preparedness program deficiencies in nursing homes will be positively associated with the incidence of COVID-19 mortality among residents after controlling for region, facility size, and ownership type.

RQ3: How do different types of CMS emergency preparedness program deficiencies impact COVID-19 morbidity and mortality among residents of nursing homes in the U.S. after controlling for region, facility size, and ownership type?

Each element of the CMS emergency preparedness standards (i.e., emergency plan, policies and procedures, communication plan, training and testing, emergency and standby power systems, and integrated health system) addresses a different aspect of preparedness and

response (CMS, 2021). Therefore, it is plausible that these elements may have varying degrees of association with COVID-19 morbidity and mortality. As in the previous research question, region, facility size, and ownership type were included as control variables in this analysis. The alternative hypotheses for this research question were:

$H4_a$: The number of CMS emergency preparedness program deficiencies corresponding to the *Emergency Plan* element in nursing homes will be positively associated with the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type.

$H5_a$: The number of CMS emergency preparedness program deficiencies corresponding to the *Policies and Procedures* element in nursing homes will be positively associated with the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type.

$H6_a$: The number of CMS emergency preparedness program deficiencies corresponding to the *Communication Plan* element in nursing homes will be positively associated with the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type.

$H7_a$: The number of CMS emergency preparedness program deficiencies corresponding to the *Training and Testing* element in nursing homes will be positively associated with the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type.

$H8_a$: The number of CMS emergency preparedness program deficiencies corresponding to the *Emergency and Standby Power Systems* element in nursing homes will be

positively associated with the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type.

$H9_a$: The number of CMS emergency preparedness program deficiencies corresponding to the *Integrated Health System* element in nursing homes will be positively associated with the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type.

Population and Sample

The population of interest for this study was all nursing homes in the U.S. that were certified by CMS (n = 15,454) as of December 2021. All nursing homes have a mandate to provide COVID-19 data and other facility information (e.g., number of certified beds) to CDC's NHSN, which then become publicly available through the CMS website. After linking relevant datasets by federal provider number, a unique alphanumeric identifier assigned by CMS to each facility, a total of n = 15,242 nursing homes were represented. Nursing homes were excluded from analysis if they did not provide adequate COVID-19 morbidity and mortality data (n = 3) or had missing information related to emergency preparedness deficiencies (n = 99), resulting in an initial sample size of n = 15,140, or 99.3% of certified nursing homes in the U.S. Further exclusions are presented in the *Results* section; the final sample size was n = 14,754, or 95.5% of certified nursing homes in the U.S.

Instrumentation

This study utilized secondary data contained within a number of datasets accessed through the CMS website (CMS, 2022c), including the Fire Safety Deficiencies, Nursing Home COVID-19 Public File, and Provider Information, as well as the Federal Emergency Management Agency (FEMA) website (FEMA, 2022). Data regarding compliance with CMS

emergency preparedness program standards represented a five-year period (2017-2021). Because this included a number of years prior to the emergence of the pandemic in the U.S. (2017-2019) as well as years during the pandemic (2020-2021), the researcher was able to assess the pattern of compliance in nursing homes, providing more validity to the relationship between compliance and COVID-19 morbidity and mortality. If only pandemic years were included in this analysis, it could be reasoned that COVID-19 may have impacted nursing homes' compliance rather than compliance impacting COVID-19 outcomes. CMS began requiring weekly submissions of COVID-19 morbidity and mortality data from nursing homes on May 8, 2020; the requirement to report data prior to this date was optional (Dicken, 2021b). The dataset including COVID-19 morbidity and mortality information used in this analysis contained data from May 8, 2020 – December 26, 2021 and represented the cumulative number of COVID-19 cases and deaths reported by facilities during this time.

Data related to the number of federally declared disasters within a state included a ten-year period of time (2012-2021). It was expected that this range would provide valuable information about the number of disasters a facility may have faced without exceeding a reasonable estimate of staff experience considering the high turnover reported among nursing homes (Gray-Miceli et al., 2021; Jones et al., 2021) and the resulting loss in institutional knowledge. Finally, provider information (i.e., number of certified beds, average number of residents per day, ownership type) from December 2019 was used in this study, representing the most recent available data prior to the pandemic. Table 2 provides a description of each dataset, including the years of data obtained.

Table 2: Datasets Obtained for the Current Study

Name of Dataset	Description	Year(s)

Federally Declared Disasters	A list of federally declared disasters occurring within the United States and its territories.	2012-2021
Fire Safety Deficiencies	A list of nursing home fire safety citations, including the nursing home that received the citation, the associated inspection date, citation tag number and description, scope and severity, the current status of the citation and the correction date.	2017-2021
Nursing Home COVID-19 Public File	Data reported by nursing homes to the CDC's National Healthcare Safety Network (NHSN) Long Term Care Facility (LTCF) COVID-19 Module.	2020-2021
Provider Information	General information on currently active nursing homes, including number of certified beds, quality measure scores, staffing and other information used in the Five-Star Rating System.	2019

Operationalization of Variables

Table 3 describes the variables that were used in this study. The first dependent variable was COVID-19 morbidity, measured as the incidence proportion of confirmed COVID-19 cases reported by a facility between May 2020 – December 2021. Morbidity incidence proportion was calculated using the following formula:

$$\frac{\text{Total number of confirmed COVID-19 cases}}{\text{(Average number of residents per day)} \quad X \quad \text{(Median length of stay)}}$$

Similarly, the second dependent variable was COVID-19 mortality, measured as the incidence proportion of COVID-19 deaths reported by a facility between May 2020 – December 2021. Mortality incidence proportion was calculated using the following formula:

$$\frac{\text{Total number of COVID-19 deaths}}{}$$

(Average number of residents per day) X (Median length of stay)

The median length of stay among nursing home residents was reported by Kelly et al. (2010) as 5 months (IQR 1 – 20 months). Median was chosen instead of mean (13.7 months, SD = 18.4 months) because of the reported outliers in the aforementioned study and because it resulted in fewer outliers in the calculations made to estimate morbidity and mortality incidence proportions for the current study.

The overall number of deficiencies for which a facility received a citation between 2017-2021 was calculated from a line list of individual citations recorded by surveyors during this timeframe, as were individual variables which tallied the number of deficiencies for each element: emergency plan, policies and procedures, communication plan, training and testing, emergency and standby power systems, and integrated health system. Region was derived from the HHS regions that have been established to promote communication and coordination among jurisdictions (US DHHS, 2021). The ten HHS regions were condensed into five geographic regions for the purposes of this study: Northeast, Midwest, South, West, and West Coast. Facility size was measured as the number of certified beds in a facility in December 2019. The number of federally declared disasters previously experienced by nursing homes was estimated based on the state in which a facility was located and included both major disaster declarations and emergency declarations made within that state (FEMA, 2022).

Table 3: Operational Definition of Variables

Variable	Description	Measurement Type	Designation	Values	Source
id	Federal provider number	Nominal	Identifier / linking variable	Alphanumeric characters	Provider Information dataset
ep_def	Overall number of emergency preparedness deficiencies	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
ep_def_ep_ct	Number of emergency preparedness deficiencies related to the 'Emergency Plan' sub-category	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
ep_def_pp_ct	Number of emergency preparedness deficiencies related to the 'Policies and Procedures' sub-category	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
ep_def_cp_ct	Number of emergency preparedness deficiencies related to the 'Communication Plan' sub-category	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
ep_def_tt_ct	Number of emergency preparedness deficiencies related to the 'Training and Testing' sub-category	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
ep_def_eps_ct	Number of emergency preparedness deficiencies related to the 'Emergency Power System' sub-category	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
ep_def_ihs_ct	Number of emergency preparedness deficiencies related to the 'Integrated Healthcare System' sub-category	Interval	Independent variable	Sum of individual occurrences of deficiencies	Fire Safety Deficiencies dataset
tot_declar	Number of federally declared disasters within the state where nursing home is located between 2012 - 2021	Interval	Independent variable	Positive integer	Federally Declared Disasters dataset
case_ip	Incidence proportion (cumulative incidence) of residents with laboratory positive COVID-19 (confirmed) since January 1, 2020	Interval (proportion)	Dependent variable	Positive integer	Nursing Home COVID-19 Public File dataset
death_ip	Incidence proportion (cumulative incidence) of residents with suspected or laboratory positive COVID-19 who died in the facility or another location since January 1, 2020	Interval (proportion)	Dependent variable	Positive integer	Nursing Home COVID-19 Public File dataset

state	State where nursing home is located	Categorical	Independent variable	All 50 U.S. states	Provider Information dataset
region	Region where nursing home is located	Categorical	Independent variable	Northeast (1) Midwest (2) South (3) West (4) West Coast (5)	Derived from Department of Health and Human Services Regions
beds	Total number of resident beds in the facility as reported by the provider	Interval	Control variable	Positive integer	Nursing Home COVID-19 Public File dataset
own	Nature of the organization that operates a facility	Categorical	Control variable	For-profit (1) Non-profit (2) Government (3)	Provider Information dataset

Data Accessibility and Permissions

All data obtained for this study were publicly available and posted without restriction on the CMS and FEMA websites (CMS, 2022; FEMA 2022). All information contained within these datasets are public record.

Data Collection and Management

Data used for this study were collected through existing sources. Data were linked by federal provider number, a unique reference number assigned to each nursing home by CMS. Because no personal identifying information was contained within the datasets used, data were stored on a local computer and a backup was kept on an external drive. IBM SPSS Statistics for Windows Version 28.0 was used for data management and analysis.

Data Analysis

Because of the large size of the dataset, the distribution of data – even if violating the normality assumption – does not result in major bias and can be ignored (Ghasemi & Zahediasl, 2012). Therefore, parametric procedures were used throughout the analysis. Outliers were assessed and reported for the two dependent variables, COVID-19 morbidity and mortality, using a combination of histograms, statistical calculations of ≥3 standard deviations from the mean, and contextual information about the pandemic. In addition, the presence of outliers in continuous independent variables were explored; however, detected outliers in these variables (i.e., number of certified beds and number of federally declared disasters) were believed to be plausible and were therefore not removed in order to retain true variability in the dataset.

Descriptive statistics (e.g., mean, standard deviation, frequency, and proportion) were used to understand facility characteristics of nursing homes (i.e., location, size, and ownership), the number and type of emergency preparedness program, or E-Tag, deficiencies reported within each facility, and the number of federally declared disasters by state. Pearson chi square tests and one-way Analysis of Variance (ANOVA) were used to determine whether any significant differences in the characteristics of nursing homes existed among facilities by region or between the expected and observed number of E-Tag deficiencies by element.

To address RQ1, the mean number of emergency preparedness program deficiencies reported within nursing homes was calculated for each state. Zero-order and partial Pearson correlations were performed to determine whether the mean number of deficiencies was correlated with the number of federally declared disasters within a state, with and without controlling for region. A Pearson correlation measures the strength and direction of a linear relationship between two continuous variables and ranges between -1 to +1. Correlation

coefficients between ±0.3 and ±0.5 were considered 'low correlation', ±0.5 to ±0.7 as 'moderate correlation', and greater than or equal to ±0.7 as 'strong correlation.' Correlation coefficients and *p* values are reported.

The incidence proportions for COVID-19 morbidity and mortality among nursing home residents were described using means and standard deviations. To evaluate whether the number of emergency preparedness program deficiencies in a nursing home was associated with these incidence proportions after controlling for region, facility size, and ownership type (RQ2), two separate multiple linear regression models were analyzed. The incidence proportion of cases or deaths served as the dependent variable, the number of E-Tag deficiencies was the independent variable, and region, number of certified beds, and ownership type were included as control variables. Similarly, multiple linear regression was used to assess the relationship between each type of deficiency (i.e., emergency plan, policies and procedures, communication plan, training and testing, emergency and standby power systems, and integrated health system) and the incidence proportion of COVID-19 morbidity or mortality after controlling for region, facility size, and ownership type (RQ3). The Northeast region and for-profit ownership were used as the reference categories in all regression models. Coefficients, standard errors, and *p* values of each predictor variable are reported, as well as the fit statistics and effect size for each regression model. All analyses were performed using IBM SPSS Statistics for Windows Version 28.0 and a *p* value of $< .05$ was considered significant for all statistical tests.

Power Analysis

With a final sample size of n = 14,754, this study achieved 100% power for detecting statistical significance from all analyses. G*Power was used for calculating projected power with

the following inputs: a Type I error rate (α) = 0.05, R^2 = 0.037, and nine predictor variables in regression analyses.

Ethical Considerations

This study utilized secondary data, therefore the procedures for data collection are not as strict as when dealing directly with participants. The researcher extracted data from online sources. Use and disposal of the data was at the discretion of the research study since all information was publicly available. Detailed ethical procedures that apply to data collected from human participants are not relevant.

Threats to Validity and Reliability

Validity is related to the accuracy of the measurement tools. In this study, the primary threats to validity included external factors that may affect facility planning and operations and potential reporting bias. External factors or unplanned events may negatively impact a nursing home's internal planning and operations, which could then affect their medical supply and other aspects of adequate care provision. Examples of external factors may include a natural disaster (e.g., an ice storm that causes a power outage) or a national shortage of medical supplies (e.g., face masks or ventilators). Secondly, the primary dependent variables (i.e., COVID-19 morbidity and mortality) were self-reported by nursing homes to NHSN. Thus, there is potential for reporting bias that may affect the validity of the results.

Reliability is related to how stable or constant a measure is. In this study, possible threats to reliability include reporting errors and changes in the characteristics of nursing home residents. Reporting errors, such as over- or under-reporting the number of COVID-19 cases or deaths that occurred, may be intentional or unintentional. The measures used in this research were cumulative incidences of morbidity and mortality and provide more reliable estimates than

any single weekly estimate. However, if the characteristics of residents changed throughout the data collection period (e.g., more residents with comorbidities), this may create an error that reduces the reliability of the study results.

Limitations and Delimitations

Because this study utilized secondary data that were publicly available, it was limited to the type and amount of data available from nursing homes as reported to CDC's NHSN. Furthermore, this study was a preliminary examination to determine the relationship between two factors. The relationships discovered in this study simply identified a correlation between compliance with CMS emergency preparedness standards and COVID-19 morbidity and mortality among nursing home residents. It was not able to prove a causal effect.

Summary

This quantitative, correlational research study utilized secondary data to address three research questions and nine associated hypotheses related to compliance with CMS emergency preparedness program standards and COVID-19 morbidity and mortality among nursing homes in the U.S. Over 95% of certified nursing homes were included in analysis, which provided 100% power for detecting significance.

Chapter 4: Results

Prior to analysis, the two dependent variables, incidence proportion of COVID-19 morbidity and mortality, were assessed for the presence of outliers. The distribution of morbidity incidence proportion was positively skewed with a long tail to the right (i.e., larger values)). Seventy-one facilities (0.4%) had an incidence proportion ≥3 standard deviations from the mean, or greater than 39%. However, many of these were reasonable considering rates previously reported in the literature (Ibrahim & Aitken, 2021). Eight facilities (0.05%) had proportions of greater than 100%; it was assumed that these facilities misreported their morbidity data or had a significantly different pattern of residency than other facilities and were therefore excluded from further analysis.

The same approach was used to assess COVID-19 mortality incidence proportion. Over 300 facilities (n = 306, 2%) had an incidence proportion ≥3 standard deviations from the mean, or greater than 8%. These ranged from 8 – 40%, which were reasonable (Ibrahim & Aitken, 2021). No facility was excluded based on calculations of COVID-19 mortality. A further 378 facilities (2.5%) were excluded because morbidity and mortality proportions could not be calculated due to missing data. The final sample used in analysis included n = 14,754 facilities.

Nursing Home Facility Characteristics

Of the 14,754 nursing homes included in this study, nearly two-thirds were located in the Midwest (n = 4,657, 31.6%) and the Southern U.S. (n = 4,588, 31.1%). Approximately 20% (n = 3,143, 21.3%) were located in the Northeast, 12.1% (n = 1,780) on the West Coast, and 4.0% (n = 586) in the Western U.S (see Appendix B). Seventy percent of facilities (n = 10,365, 70.2%) were for-profit. One-fourth of facilities (n = 3,447, 23.4%) recorded non-profit status while only 6.4% (n = 942) were owned and operated by government agencies. There was a significant

different in ownership type among regions ($\chi^2 = 604.5$, $p < .000$). For example, a larger proportion of nursing homes in the South were for-profit whereas the Western U.S. reported a greater proportion of government-operated facilities as compared to other regions (Table 4).

The mean number of certified beds within nursing homes was 107.5 (SD = 60.7) with a range of 2 – 1,389. Half of facilities housed between 66 – 128 beds. The mean number of federally declared disasters that occurred between 2012-2021 in the state where nursing homes were located was 16.8 (SD = 8.2) with a range of 5 – 37. As with ownership type, a significant difference in both facility size ($F(4, 14749) = 23{,}000$, $p < .000$) and the number of federally declared disasters ($F(4, 14749) = 24{,}000$, $p < .000$) by region was discovered.

Table 4: Descriptive Characteristics of Nursing Homes in the Study Sample (n = 14,754)

	Total (n = 14,754)	Northeast (n = 3,143)	Midwest (n = 4,657)	South (n = 4,588)	West (n = 586)	West Coast (n = 1,780)	*P*
				Mean (SD)			
Number of certified beds	107.5 (60.7)	133.7 (87.5)	94.1 (50.8%)	109.9 (43.7)	82.7 (76.0)	98.6 (52.6)	.000*
Number of federally declared disasters	16.8 (8.2)	13.2 (3.8)	10.7 (4.6)	23.1 (5.9)	11.9 (4.3)	24.4 (9.3)	.000*
				N (%)			
Ownership type							.000$^{\delta}$
For-profit	10,365 (70.2)	2,118 (67.4)	2,884 (61.9)	3,598 (78.4)	321 (54.8)	1,444 (81.1)	
Non-profit	3,447 (23.4)	927 (29.5)	1,355 (29.1)	720 (15.7)	194 (33.1)	251 (14.1)	
Government	942 (6.4)	98 (3.1)	418 (9.0)	270 (5.9)	71 (12.1)	85 (4.8)	

*Analysis of Variance (ANOVA) $^{\delta}$ Pearson's chi square analysis

Compliance with Emergency Preparedness Standards

A total of 28,483 emergency preparedness program, or E-Tag, deficiencies were recorded among nursing homes in the study sample. The mean number of deficiencies cited within a single facility was 1.41 (SD = 2.84) with a range of 0 – 31. Over half of facilities (n = 8,827, 59.8%) were not cited for any deficiencies between 2017 – 2021. Among nursing homes with at least one E-Tag deficiency, the mean was 3.50 (SD = 3.57).

The most frequently cited deficiencies were E-Tags 39 ("Conduct testing and exercise requirements") and 15 ("Address subsistence needs for staff and patients") while the least frequently cited deficiency was E-Tag 42 ("Meet the requirements of an integrated health system") (Figure 2). Citations related to *Policies and Procedures* comprised one-third of total deficiencies (n = 9,444, 33.2%), followed by *Training and Testing* (n = 6,162, 21.6%), *Communication Plan* (n = 5,851, 20.5%), *Emergency Plan* (n = 5,343, 18.8%), *Emergency and Standby Power Systems* (n = 1,634, 5.7%), and *Integrated Health System* (n = 49, 0.2%). Although *Training and Testing* comprised only 12% of CMS emergency preparedness program requirements, it accounted for over 20% of citations. Conversely, *Communication Plan* comprised 27% of requirements but accounted for only 20% of citations (Figure 3).

Most E-Tag deficiencies were cited in 2018 (n = 10,925, 38.4%) and 2019 (n = 9,472, 33.2%). Significant differences were observed in the proportion of emergency preparedness program elements that were cited each year (Figure 4). For example, the proportion of citations related to *Communication Plan* and *Emergency and Standby Power Systems* increased between 2017 and 2021 while the other four elements saw a general decline in the proportion of citations.

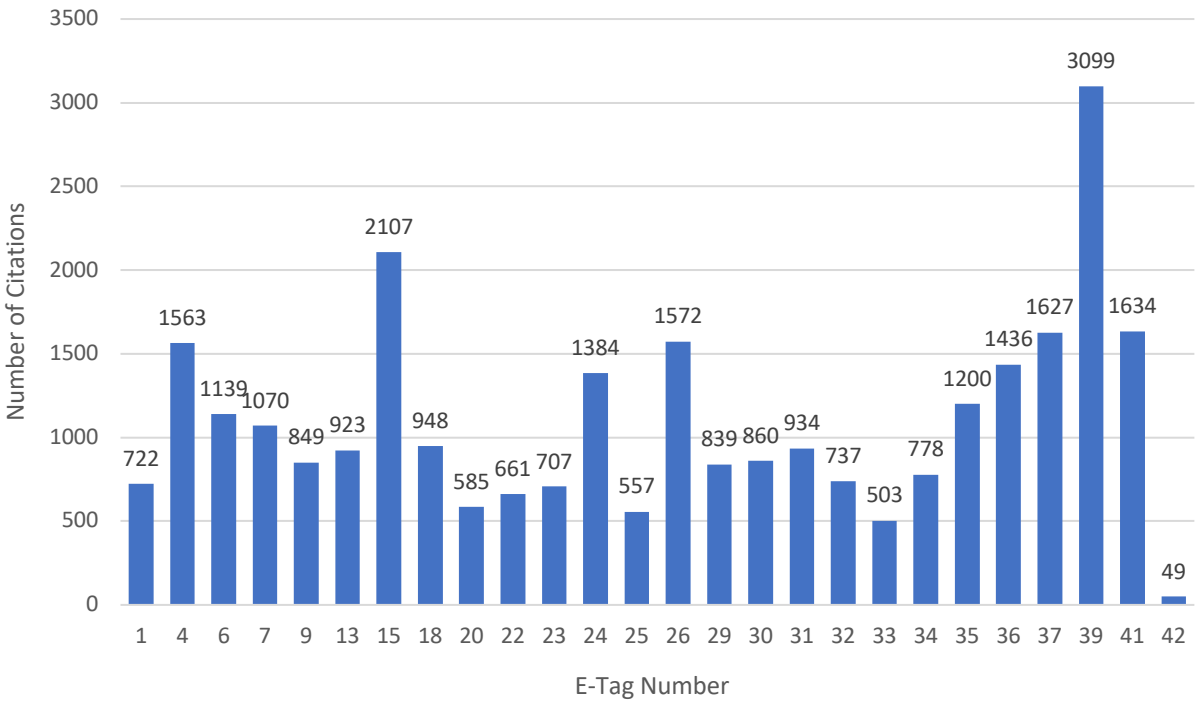

Figure 2: Number of Citations among Nursing Homes by E-Tag Number (2017-2021)

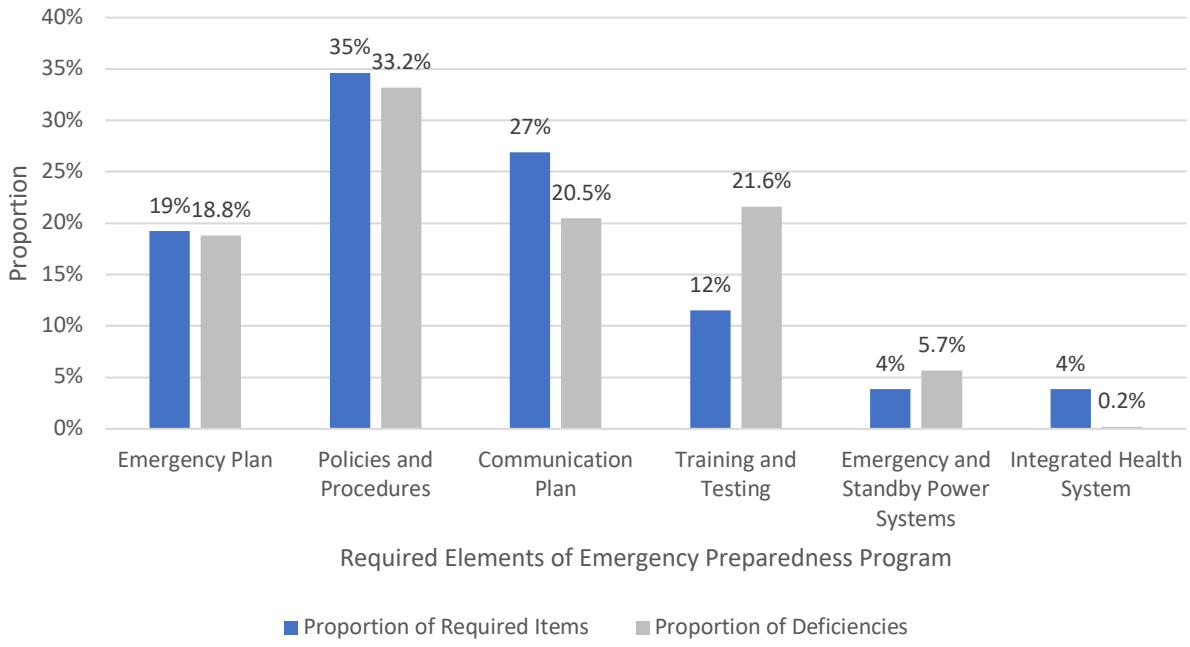

Figure 3: Proportion of Expected versus Observed Citations among Nursing Homes by Emergency Preparedness Program Element (2017-2021)

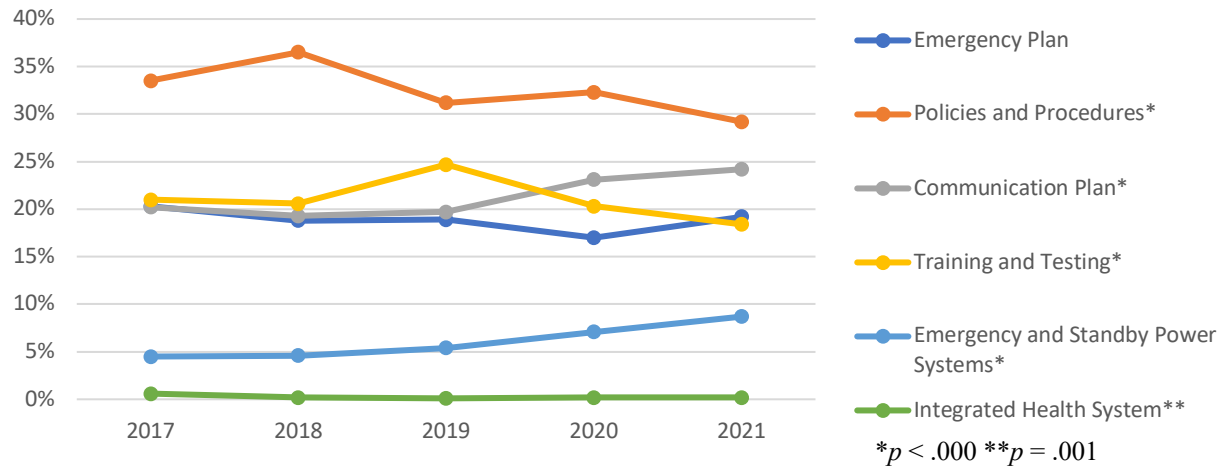

Figure 4: Proportion of Citations among Nursing Homes by Emergency Preparedness Program Element and Year (2017-2021)

Prior Experiences with Federally Declared Disasters

Between 2012 – 2021, the number of federally declared disasters that occurred within a state ranged from 5 – 37. The mean number of federally declared disasters among states was 15.0 (SD = 7.4). The zero-order Pearson correlation between the number of federally declared disasters in a state and the mean number of E-Tag deficiencies among nursing homes within that state was not significant (r = -0.21, p = .14), nor was the partial correlation after controlling for region (r = -0.25, p = .08) (Figure 5). Therefore, we fail to reject the null hypothesis for RQ1 that the mean number of CMS emergency preparedness program deficiencies in nursing homes was not significantly correlated with the number of federally declared disasters over the last ten years (2012 – 2021) in the state in which the nursing home operates.

COVID-19 Morbidity and Mortality in Nursing Homes

The mean incidence proportion of COVID-19 morbidity (i.e., confirmed cases) was 0.12 (SD = 0.08), meaning that, on average, 12% of residents in a nursing home were confirmed as COVID-19 cases between May 8, 2020 – December 26, 2021. The mean incidence proportion of COVID-19 mortality (i.e., deaths) during the same timeframe was 0.02 (SD = 0.02), or 2% of

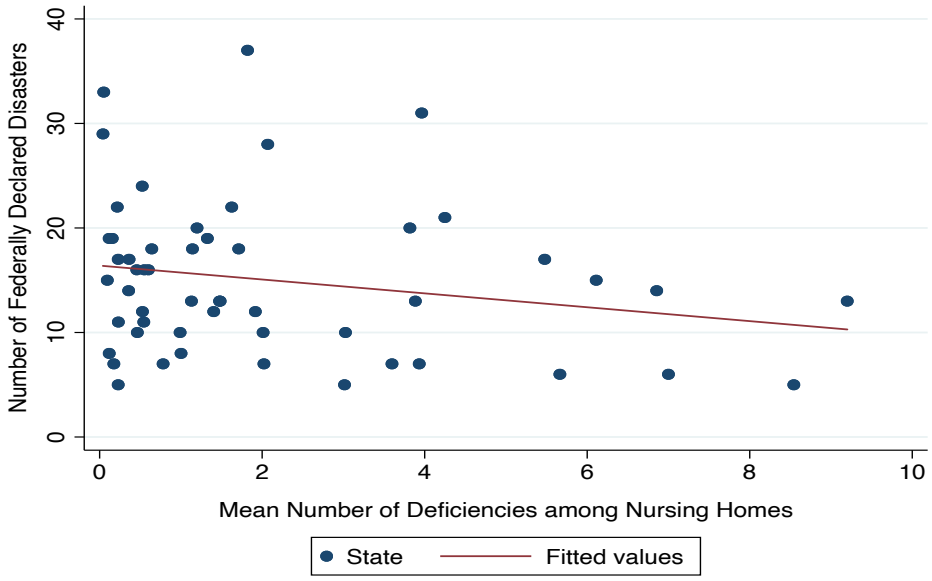

Figure 5: Scatterplot of Emergency Preparedness Program Deficiencies and Federally Declared Disasters among Nursing Homes by State

residents. Multivariate linear regression revealed that the number of emergency preparedness program deficiencies cited among nursing homes was significantly and positively associated with the incidence proportion of both COVID-19 morbidity and mortality after controlling for region, facility size, and ownership type (Table 5). For every E-Tag deficiency, COVID-19 morbidity increased by 0.06% ($p < .000$) over the intercept value of 12.8%. In other words, a nursing home that received four E-Tag citations between 2017-2021 (i.e., the mean number of deficiencies reported among facilities) was predicted to have an increase in COVID-19 morbidity from 12.8% to 13.0%, holding all other variables constant. Similarly, for each recorded E-Tag deficiency, COVID-19 mortality increased by 0.01% ($p = .035$) over the intercept value of 2.5%.

The three control variables (i.e., region, facility size, and ownership type) were also found to be significant predictors of COVID-19 morbidity and mortality. For example, assuming the number of E-Tag deficiencies, beds, and ownership type remain constant within a facility, a

Table 5: Multivariate Linear Regression Results using Total Number of Emergency Preparedness Program Deficiencies to Predict COVID-19 Morbidity and Mortality among Nursing Home Residents

	COVID-19 Morbidity				COVID-19 Mortality			
	Coeff	Std Err	*P*	Effect Size	Coeff	Std Err	*P*	Effect Size
Overall number of E-Tag deficiencies	0.0006	0.0002	.000	0.0009	0.0001	0.0000	.035	0.0003
Region (ref = Northeast)				0.0095				0.0080
Midwest	0.0129	0.0018	.000		0.0003	0.0006	.638	
South	0.0165	0.0017	.000		-0.0020	0.0005	.000	
West	0.0004	0.0034	.891		-0.0001	0.0011	.885	
West Coast	-0.0004	0.0023	.858		-0.0065	0.0007	.000	
Number of certified beds	-0.0001	0.0000	.000	0.0022	-0.0000	0.0000	.074	0.0002
Ownership type (ref = For-profit)				0.0240				0.0009
Non-profit	-0.0266	0.0015	.000		-0.0012	0.0005	.012	
Government	-0.0226	0.0025	.000		-0.0025	0.0008	.002	
Constant	0.1276	0.0020	.000		0.0253	0.0006	.000	
Model fit								
Model statistic		$F(8, 14745) = 72.22$				$F(8, 14745) = 16.01$		
Adjusted R^2		*0.0372*				0.0081		
P value		.000				.000		

nursing home in the Midwest had an increase in morbidity of 1.3% and a facility in the Southern U.S. had an increase in morbidity of 1.6% as compared to a facility in the Northeast (the reference group). However, the Southern U.S. (β = -0.002, $p < .000$) and the West Coast (β = -0.006, $p < .000$) demonstrated significantly lower mortality than the Northeast. Larger facilities were discovered to have a reduction in morbidity (β = -0.0001, $p < .000$) but facility size was not significantly related to mortality. Finally, for-profit nursing

homes were estimated to have worse outcomes than non-profit homes were estimated to have worse outcomes than non-profit or government-operated facilities with respect to both morbidity and mortality.

Based on these results, we reject the null hypotheses for RQ2 and accept the alternative hypotheses ($H2_a$ and $H3_a$) that the number of CMS emergency preparedness program deficiencies in nursing homes was positively associated with both the incidence of COVID-19 morbidity and mortality among residents after controlling for region, facility size, and ownership type. However, model fit statistics and analysis of effect size indicate that, while these models are statistically significant ($p < .000$), the E-Tag deficiencies and facility characteristics included in the model explain only 3.7% of the variance (R^2) in morbidity and 0.8% of the variance in mortality. Furthermore, the effect size of the number of E-Tag deficiencies on morbidity is only 0.0009, denoting that these deficiencies only account for 0.09% of the variance among facilities. The effect size on mortality is even smaller at 0.0003, or 0.03% of the variance.

A second set of multivariate linear regression models considered each of the six CMS emergency preparedness program elements as separate variables (Table 6). Results of these models revealed that the number of *Emergency Plan* ($\beta = 0.0021$, $p = .040$) and *Training and Testing* ($\beta = 0.0023$, $p = .012$) deficiencies cited among nursing homes were significant predictors of the incidence of COVID-19 morbidity. *Training and Testing* also showed a positive association with the incidence of COVID-19 mortality ($\beta = 0.0007$, $p = .013$). Region, facility size, and ownership type exhibited significance and followed the same patterns that were observed in the first set of models where the total number of E-Tag deficiencies was used as the primary independent variable.

Table 6: Multivariate Linear Regression Results using Deficiencies in Individual Emergency Preparedness Program Elements to Predict COVID-19 Morbidity and Mortality among Nursing Home Residents

	COVID-19 Morbidity				COVID-19 Mortality			
	Coeff	Std Err	*P*	Effect Size	Coeff	Std Err	*P*	Effect Size
Emergency Plan deficiencies	0.0021	0.0010	.040	0.0003	0.0000	0.0003	.997	0.0000
Policies and Procedures deficiencies	-0.0006	0.0007	.324	0.0001	0.0000	0.0002	.984	0.0000
Communication Plan deficiencies	0.0002	0.0009	.795	0.0000	0.0000	0.0003	.875	0.0000
Training and Testing deficiencies	0.0023	0.0009	.012	0.0004	0.0007	0.0003	.013	0.0004
Emergency Preparedness Systems deficiencies	0.0016	0.0019	.414	0.0000	-0.0002	0.0006	.781	0.0000
Integrated Health System deficiencies	-0.0093	0.0111	.399	0.0000	-0.0048	0.0035	.168	0.0001
Region (ref = Northeast)				0.0091				0.0077
Midwest	0.0125	0.0018	.000		0.0002	0.0006	.735	
South	0.0163	0.0017	.000		-0.0020	0.0005	.000	
West	0.0003	0.0034	.938		-0.0002	0.0011	.868	
West Coast	-0.0006	0.0023	.779		-0.0065	0.0007	.000	
Number of certified beds	-0.0001	0.0000	.000	0.0022	0.0000	0.0000	.072	0.0002
Ownership type (ref = For-profit)				0.0232				0.0009
Non-profit	-0.0262	0.0015	.000		-0.0011	0.0005	.019	
Government	-0.0223	0.0025	.000		-0.0024	0.0008	.002	
Constant	0.1275	0.0020	.000		0.0253	0.0006	.000	
Model fit								
Model statistic		$F(8, 14745) = 45.18$				$F(8, 14745) = 10{,}37$		
Adjusted R^2		*0.0375*				0.0082		
P value		.0000				.0000		

Based on these results, we reject the null hypotheses in favor of the alternative hypotheses $H4_a$ and $H7_a$ associated with RQ3. The number of CMS emergency preparedness program deficiencies corresponding to the Emergency Plan and Training and Testing elements in nursing homes were positively associated with the incidence of COVID-19 morbidity and, in the case of Training and Testing, with mortality among residents after controlling for region, facility size, and ownership type. The remaining null hypotheses associated with RQ3 ($H5_0$, $H6_0$, $H8_0$, and $H9_0$) were not rejected due to a lack of significance between those specific CMS emergency preparedness program elements and COVID-19 morbidity and mortality among nursing home residents. As with the first set of regression models, these models demonstrated statistical significance ($p < .000$) but accounted for less than 4% of the variance in morbidity and mortality observed within nursing homes. Likewise, the effect size for each variable that showed significance was small.

A post-hoc sensitivity analysis using only deficiencies from the years prior to the COVID-19 pandemic (2017-2019) to predict COVID-19 morbidity and mortality among nursing home residents did not demonstrate different results from those reported above, or significantly alter or improve model fit statistics.

Summary

Among the 14,754 nursing homes included in this study, over 40% received one or more citations for CMS emergency preparedness program, or E-Tag, deficiencies between 2017-2021. No relationship between the number of E-Tag deficiencies and the number of federally declared disasters that had previously occurred within the state was exhibited. However, increased deficiencies showed a statistically significant relationship with increased COVID-19 morbidity and mortality among nursing home residents, even after controlling for region, facility size, and

ownership type. These three control variables were also found to have a significant effect on patient-centered outcomes. Program items related to the *Emergency Plan* and *Training and Testing* elements demonstrated the most significant relationships with morbidity and mortality, although effect sizes for all relationships were quite small. The researcher failed to reject the null hypothesis for RQ1 but rejected the null in favor of the alternative hypotheses for RQ2 and, partially, for RQ3.

Chapter 5: Discussion

The purpose of this study was to explore compliance with CMS emergency preparedness program standards among nursing homes in the U.S. and how prior experiences with federally declared disasters may affect compliance, as well as to evaluate the relationship between compliance with these standards and incidence of COVID-19 morbidity and mortality among nursing home residents. This study contributes to the body of literature by being one of the first to assess the relationship between compliance with emergency preparedness program standards in nursing homes and patient-centered outcomes during or after a public health emergency, specifically COVID-19 morbidity and mortality among residents (Heckman et al., 2021; Konetzka et al., 2021; Pierce et al., 2017). The principal findings of this study provide insight into the influence of previous federally declared disasters on compliance with CMS emergency preparedness standards among nursing homes and the impact of such compliance on COVID-19 morbidity and mortality among residents. An interpretation of the findings, limitations of the current study, and recommendations for future study are discussed in this chapter.

Interpretation of Findings

The results of this study support previous claims that the CMS emergency preparedness program standards are inadequate and do not address the underlying issues that contribute to poor outcomes in nursing homes during and after an emergency (Clancy et al., 2021; Lane & McGrady, 2018; National Academies, 2022; Skarha et al., 2021). Over half of facilities were not cited for any deficiencies during the study period (2017 – 2021) and, among those who did receive at least one citation, the mean number of deficiencies was 3.50. The most frequently cited deficiencies were E-Tags 39 (“Conduct testing and exercise requirements”) and 15 (“Address subsistence needs for staff and patients”). It is unsurprising that E-Tag 39 was

commonly cited, as previous literature overwhelmingly reports that nursing homes and other long-term care facilities have been consistently underfunded, excluded from opportunities for knowledge and skills transfer, and disengaged from traditional emergency preparedness partners such as emergency management and public health agencies (Kennedy, 2017; Kennedy et al., 2021; Lane & McGrady, 2016; National Academies, 2022; Okwuofu-Thomas et al., 2017; Volkman et al., 2012; Walsh, 2020; Wasserman & Konetzka, 2022), resulting in the lack of knowledge, skills, and resources necessary to conduct testing and exercises related to their emergency plans (Quigley et al., 2020). While the least frequently cited deficiency was E-Tag 42 ("Meet the requirements of an integrated health system"), seemingly in contradiction to the above consensus of exclusion, this E-Tag is relevant only for facilities that are part of a larger long-term care network that has its own emergency preparedness program to which each member facility is expected to adhere (TRACIE, 2022). It does not describe the relationship that a nursing home has with other healthcare and preparedness partners (i.e., hospitals, emergency management, state and local public health jurisdictions).

Similarly, citations related to *Policies and Procedures* comprised one-third of total deficiencies while *Training and Testing* (including E-Tag 39) comprised nearly one-fourth of total deficiencies. In fact, although *Training and Testing* comprised only 12% of CMS emergency preparedness program requirements, it accounted for over 20% of citations, indicating that nursing homes disproportionately failed to meet this component of preparedness standards. This further supports the argument that the historical and continued exclusion of nursing homes and long-term care facilities from community emergency preparedness planning efforts (whether a local, state, or federal community of partners) has led to their inability to

effectively develop and test adequate emergency preparedness policies and procedures (National Academies, 2022).

The researcher hypothesized that states which had experienced a higher number of federally declared disasters in recent years would demonstrate a higher degree of compliance with CMS emergency preparedness standards than facilities with less experience with disasters (RQ1). However, this hypothesis was not supported by the study findings and the researcher failed to reject the null hypothesis. Both zero-order and partial correlation analysis demonstrated a non-significant relationship between the number of federally declared disasters in a state and the mean number of E-Tag deficiencies among nursing homes located within that state. There may be multiple explanations for these findings. First, nursing home staff generally experience high turnover (Gray-Miceli et al., 2021; Jones et al., 2021; National Academies, 2022). This study included federally declared disasters over a 10-year period (2012 – 2021) whereas annual turnover of nursing home administrators has been reported to be between 20 – 40% with an average tenure of 3.5 years (National Academies, 2022) and annual turnover among clinical and support staff may be as high as 140% (Gandhi et al., 2021). Higher turnover among nursing home management has been associated with higher turnover of nursing staff (Castle, 2005). Therefore, staff may not have actually experienced prior disasters as a nursing home employee. Previous experience with disaster was not directly measured as part of this study due to the use of secondary data; the number of prior federally declared disasters was used as a proxy indicator of experience.

A second explanation may be that most federally declared disasters are related to natural or man-made disasters (e.g., hurricane, flood, heat wave, fire) rather than infectious disease and the experience gained from natural disasters is not transferrable to the COVID-19 pandemic

response. For example, the pandemic has been a prolonged disaster whereas the response to and recovery from most natural disasters lasts for only days or weeks. Finally, the underlying presumption that facilities which have experienced previous disasters have an increased recognition of the associated risk and a greater likelihood of understanding the advantages of meeting CMS standards (Sahin, 2006) may be incorrect.

The second research question assessed the relationship between compliance with CMS emergency preparedness program standards in nursing homes and COVID-19 morbidity and mortality among residents. The incidence proportions of COVID-19 morbidity and mortality were calculated as 0.12 and 0.02 in this study, which were consistent with previously published estimates of the global incidence rates (morbidity = 0 – 71%; mortality = 0 – 33%) among nursing home residents (Ibrahim & Aitken, 2021; Iyanda & Boakye, 2022). Compliance with CMS emergency preparedness program standards, measured as the number of E-Tag deficiencies cited among nursing homes, was significantly and positively associated with COVID-19 morbidity ($p < .000$) and mortality ($p = .035$) and the null hypothesis was rejected in favor of the alternative. However, the practical significance of this relationship is quite small. For every E-Tag deficiency, COVID-19 morbidity increased by only 0.06% and mortality by only 0.01%, and the effect size of the number of E-Tag deficiencies was only 0.0009 and 0.0003, respectively. Although Jester et al. (2021) reported that residents of nursing homes with a higher number of ICP deficiencies generally had a greater risk of becoming ill from infectious disease, previous studies assessing the relationship between compliance with IPC standards and COVID-19 morbidity and mortality failed to find a significant association (Dicken, 2021a; Konetzka et al., 2021; Walters et al., 2022; Wasserman & Konetzka, 2022); the current study suggests that

emergency preparedness program standards are similarly unrelated to meaningful differences in patient-centered outcomes.

This study did provide further evidence that region, facility size, and ownership type are important factors in nursing home outcomes. The Northeast U.S. was found to have significantly higher COVID-19 mortality than other regions ($p < .000$), consistent with findings reported by Ivanda & Boakye (2022). Facility size has been shown to be a significant and positive predictor of COVID-19 outcomes among nursing home residents in a number of studies (Dicken, 2021a; Ibrahim & Aitken, 2021; Konetzka et al., 2021). In contrast, this study found that facility size was negatively associated with COVID-19 morbidity ($p < .000$) and was not significantly related to mortality ($p = .07$). Ibrahim & Aitken (2021) proposed that larger facilities may have greater access to resources and staffing during a disaster, resulting in better outcomes, but research shows that the majority of nursing homes – regardless of size – struggled to obtain adequate PPE and testing resources (Dicken, 2021b; Jones et al., 2021; LeRose et al., 2021; National Academies, 2022; Quigley et al., 2020). Thus, facility size may have a negative impact on COVID-19 morbidity, as seen in this study, due to the increased risk of virus introduction through higher numbers of staff and visitors as well as an increased risk of transmission because of increased movement of staff between a larger number of residents (Ibrahim & Aitken, 2021).

Similarly, the current study found that for-profit nursing homes had significantly worse outcomes than non-profit or government owned facilities, partially in support of previously published literature (Iyanda & Boakye, 2022; Konetzka et al., 2021). Iyanda & Boakye (2022) found that for-profit nursing homes had significantly higher COVID-19 mortality than non-profit facilities, as in our study, but far lower mortality than government-owned facilities. A systematic review by Konetzka and colleagues (2021) reported that for-profit nursing homes had fewer

COVID-19 cases than facilities with other ownership; however, these improved outcomes were attributed to increased access to PPE and testing resources which, as discussed above, was not true for the majority of nursing homes in the U.S.

Because each element of the CMS emergency preparedness program standards (i.e., emergency plan, policies and procedures, communication plan, training and testing, emergency and standby power systems, and integrated health system) addresses a different aspect of preparedness and response, the researcher hypothesized that these elements may have varying degrees of association with COVID-19 morbidity and mortality (RQ3). *Training and Testing* deficiencies were found to have a statistically significant impact on both COVID-19 morbidity (p = .012) and mortality (p = .013). *Emergency Plan* deficiencies were also found to be associated with COVID-19 morbidity (p = .040), although no other elements showed significance with mortality. Region, facility size, and ownership type exhibited significance and followed the same patterns that were discussed above.

These findings were not unexpected since nursing homes disproportionately failed to meet *Training and Testing* standards. Despite the requirement for nursing homes to have a designated IPC practitioner who meets the minimum standards of training (Federal Register, 2016) and who is involved in emergency preparedness planning to meet the provision for addressing emerging infectious diseases in their facility plan (Walsh, 2020), fewer than half of all long-term care facilities reported having an IP on their emergency management committee (Volkman et al., 2012). Among facilities who did have IPC representation, almost half of those practitioners did not have nursing-home specific training on IPC principles (Agarwal et al., 2020). Instead, nursing homes often rely on minimally trained clinical staff (e.g., LPNs, CNAs) to provide direct care to residents; these staff are often inadequately trained on basic clinical care

and ICP, and even less trained on emergency preparedness principles (National Academies, 2022; Rubano et al., 2022). Gaps persist in knowledge and skill at the management level as well, wherein nursing home administrators and staff have been shown to lack the specialized knowledge needed to operationalize emergency guidance (Walters et al., 2022). Herzig and colleagues (2016) reported that most nursing homes provide training only at employee orientation; regular and ongoing ICP and emergency preparedness training was uncommon. In an emergency such as the COVID-19 pandemic, this lack of training on both emergency preparedness and ICP principles may exacerbate the impact *of Training and Testing* deficiencies and lead to an increased risk for disease transmission (Jones et al., 2021; Walters et al., 2022).

This may also help to explain why *Emergency Plan* deficiencies demonstrated a significant impact on COVID-19 morbidity. The lack of an all-hazards approach and inclusion of an ICP practitioner in planning efforts may have led to increased morbidity. A 2018 study of long-term care facilities in Kentucky reported that more than 25% of facilities did not include any infectious diseases in their emergency plan, and only 20% included diseases other than influenza (Shiels, 2018). Jones et al. (2020) found that 51% of nursing homes in Michigan did not have a pandemic emergency preparedness plan in 2017, although only 2% did not have such a plan in March 2020. This suggests that planning efforts related to pandemic diseases are reactive, counter to the fundamental purpose of emergency preparedness planning.

Interestingly, this study found that *Policies and Procedures* and *Communication Plan* deficiencies, which ranked within the top three most cited elements of emergency preparedness programs, did not have a statistically significant impact on COVID-19 morbidity or mortality. This may be explained by the rapid pace of updates to policies and procedures specific to long-term care facilities that were released by CMS, CDC, and state or local public health and

emergency management agencies, resulting in inconsistent or even contradictory guidance that was not communicated to or within nursing homes (Bern-Klug et al., 2021; Jones et al., 2021; Mitchell et al., 2021; Rubano et al., 2022). In other words, all nursing homes may have failed to demonstrate adequate preparedness related to policies, procedures, and communication due to the fast-paced nature of the pandemic, regardless of whether they had received previous citations for deficiencies in these aspects, causing these two elements to be non-significant predictors of COVID-19 morbidity and mortality.

Despite four elements of emergency preparedness programs being statistically insignificant when considered individually (i.e., policies and procedures, communication plan, emergency and standby power systems, integrated health system), these findings do not negate the importance of meeting these particular requirements. The National Academies of Sciences, Engineering, and Medicine purport that, although perhaps not sufficient to improve outcomes, compliance with emergency preparedness and IPC standards is still important (National Academies, 2022). Indeed, the statistical significance of the models predicting COVID-19 morbidity and mortality from a measure of overall compliance in this study suggests that meeting the CMS emergency preparedness program standards *as a whole* contributes to the prevention or mitigation of negative patient-centered outcomes but is not sufficient to spur a significant *practical* improvement among residents.

Implications for Nursing Homes and the Emergency Preparedness Community

The findings from this study have several important implications for nursing home owners/administrators, emergency preparedness partners, and policymakers. There are several implications based on the findings from this study. Each of the implications will be discussed in the following subsections.

Nursing Homes Should Designate a Trained Individual to Lead Their Emergency Preparedness Efforts and Engage This Person in Emergency Planning Efforts

The present study found that the most frequently cited deficiencies were E-Tags 39 ("Conduct testing and exercise requirements") and 15 ("Address subsistence needs for staff and patients"). These findings indicate that nursing homes may be struggling with training and testing requirements and addressing the needs of their staff and patients during and after an emergency. By designating a trained individual to lead emergency preparedness efforts, nursing homes can ensure that the requirements are met and that their staff and patients are adequately prepared for disasters and other emergencies. The designee can help ensure that training and support are provided to improve the overall preparedness of the nursing home.

Nursing homes should conduct regular Training and Exercises to improve their emergency preparedness skills and abilities

The study found that the most frequently cited deficiencies were related to conducting testing and exercise requirements, indicating a lack of knowledge, skills, and resources among nursing home staff. The study also found that there was no statistically significant relationship between the number of federally declared disasters in a state and the mean number of deficiencies among nursing homes located within that state, which suggests that experience with disasters may not be a reliable indicator of preparedness and that other factors, such as training and support, may play a role in improving preparedness. Regular training and exercises could help improve these skills and improve the overall preparedness of the nursing homes in responding to emergencies.

The CMS Emergency Preparedness Program Standards Should be Revised to Adequately Address the Underlying Issues That Contribute to Poor Outcomes in Nursing Homes During and After an Emergency

Limitations

While this study provides insight into the relationship between compliance with CMS emergency preparedness program standards in nursing homes and COVID-19 morbidity and mortality among their residents, the present study has a few limitations. First, the study utilized secondary data comprised primarily of self-reported morbidity and mortality statistics from nursing homes to CMS. Thus, reporting bias or errors may affect the validity and reliability of the results. Furthermore, CMS only began requiring nursing homes to report these statistics in May 2020 (Dicken, 2021b), which may have led to an underreporting of COVID-19 cases and deaths that occurred in the first few months of the pandemic, during which time nursing homes and other long-term care facilities were greatly affected. This likely led to underestimating the true incidence proportion of COVID-19 morbidity and mortality. Likewise, one study reported that the daily occupancy of nursing homes was lower during the pandemic than before (Jones et al., 2021), which may have led to a further underestimation of the calculated incidence proportions.

The second limitation of this study was related to the absence of other important predictors of morbidity and mortality. Most significantly, this study did not include measures of community prevalence, which is the most consistent predictor of COVID-19 morbidity (Chatterjee et al., 2020; Konetzka et al., 2021). Because the present analysis estimated the overall incidence proportion of morbidity and mortality between May 2020 – December 2021 (i.e., a point estimate) rather than trends over time (i.e., a time-series analysis), researchers were

unable to include an accurate measure of community prevalence as this fluctuated throughout the pandemic. This study also did not include characteristics concerning resident populations (e.g., comorbidities, mental or physical impairments, age), which may have varied among facilities and over time. The absence of these predictors may have affected the multiple linear regression models used to assess the relationship between compliance and COVID-19 morbidity and mortality.

Thirdly, the study only looked at compliance with CMS emergency preparedness program standards, but other factors could affect disaster preparedness and response in nursing homes. For example, the study did not consider the impact of staffing levels and training, infection control protocols, access to personal protective equipment, state and local regulations or policies, and support from local emergency response agencies. As a result, the study may have missed the important roles of these factors in determining a facility's response to a disaster.

Recommendations for Future Studies

One potential future research direction would be to conduct studies utilizing primary data collected to assess compliance with emergency preparedness program standards on COVID-19 morbidity and mortality. For example, a prospective study to asses compliance with CMS emergency preparedness program standards in nursing homes in real-time and to evaluate the relationship between compliance and patient-centered outcomes during an actual public health emergency. This study design would provide more accurate and relevant data on the effectiveness of emergency preparedness efforts in nursing homes and allow for the ability to make recommendations for improvements in emergency preparedness policies and procedures.

Additionally, future research could focus on the effectiveness of different emergency preparedness strategies, such as training and exercises, in improving compliance with CMS

emergency preparedness program standards and reducing morbidity and mortality among nursing home residents during a public health emergency. This research could involve conducting a randomized controlled trial in which nursing homes are assigned to receive different emergency preparedness interventions, and their compliance with program standards and patient outcomes are compared.

Conclusion

This study provides evidence on the relationship between compliance with CMS emergency preparedness program standards among nursing homes in the U.S. and COVID-19 morbidity and mortality that supports ongoing efforts to assess the adequacy of CMS standards, oversight, and enforcement. The number of citations received by nursing homes for E-Tag deficiencies was significantly and positively associated with COVID-19 morbidity and mortality among residents, although the effect size was small. Region, facility size, and ownership type were found to be significant predictors of morbidity and mortality as well, consistent with previous research. Specifically, *Training and Testing* and *Emergency Plan* elements were shown to be the most important predictors of morbidity and mortality. Previous experience with federally declared disasters was not associated with compliance with emergency preparedness standards among nursing homes.

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Appendix A: Regulatory Text Associated with Centers for Medicare and Medicaid Services (CMS) E-Tags

Table 7: Description and Regulatory Text Associated with E-Tags

E-Tag Number	E-Tag Description	Regulatory Text
1	Establish an emergency preparedness program	The facility must comply with all applicable Federal, State and local emergency preparedness requirements. The facility must establish and maintain a comprehensive emergency preparedness program that meets the requirements of this section. The emergency preparedness program must include, but not be limited to, the following elements:
4	Develop and maintain an emergency preparedness program	(a) The LTC facility must develop and maintain an emergency preparedness plan that must be reviewed, and updated at least annually. The plan must do all of the following:
6	Conduct risk assessment and an all-hazards approach	(1) Be based on and include a documented, facility-based and community-based risk assessment, utilizing an all-hazards approach, including missing residents. (2) Include strategies for addressing emergency events identified by the risk assessment.
7	Address patient/client population and determine types of services needed	(3) Address patient/client population, including, but not limited to, persons at-risk; the type of services the facility has the ability to provide in an emergency; and continuity of operations, including delegations of authority and succession plans.
9	Include a process for emergency preparedness collaboration	(4) Include a process for cooperation and collaboration with local, tribal, regional, State, and Federal emergency preparedness officials' efforts to maintain an integrated response during a disaster or emergency situation.
13	Develop emergency preparedness policies and procedures	(b) Facilities must develop and implement emergency preparedness policies and procedures, based on the emergency plan set forth in paragraph (a) of this section, risk assessment at paragraph (a)(1) of this section, and the communication plan at paragraph (c) of this section. The policies and procedures must be reviewed and updated at least annually. At a minimum, the policies and procedures must address the following:
18	Establish procedures for tracking staff and patients during an emergency	(2) A system to track the location of on-duty staff and sheltered residents in the LTC case curing and after an emergency. If on-duty staff and sheltered residents are relocated during the emergency, the LTC must document the specific name and location of the receiving facility or other location.
20	Establish policies and procedures including evacuation	(3) Safe evacuation from the facility, which includes consideration of care and treatment needs of evacuees; staff responsibilities; transportation; identification of evacuation location(s); and primary and alternate means of communication with external sources of assistance.
22	Establish policies and procedures for sheltering	(4) A means to shelter in place for patients, staff, and volunteers who remain in the facility.

23	Establish policies and procedures for medical documentation	(5) A system of medical documentation that preserves patient information, protects confidentiality of patient information, and secures and maintains availability of records.
24	Establish policies and procedures for volunteers	(6) The use of volunteers in an emergency or other emergency staffing strategies, including the process and role for integration of State and Federally designated health care professionals to address surge needs during an emergency.
25	Create arrangements with other facilities to receive patients	(7) The development of arrangements with other facilities and other providers to receive patients in the event of limitations or cessation of operations to maintain the continuity of services to facility patients.
26	Establish roles under a waiver declared by secretary	(8) The role of the facility under a waiver declared by the Secretary, in accordance with section 1135 of the Act, in the provision of care and treatment at an alternate care site identified by emergency management officials.
29	Develop a communication plan	(c) The facility must develop and maintain an emergency preparedness communication plan that complies with Federal, State and local laws and must be reviewed and updated at least annually. The communication plan must include all of the following:
30	List the names and contact information of those in the facility	(1) Names and contact information for the following: (i) Staff. (ii) Entities providing services under arrangement. (iii) Patients' physicians. (iv) Other facilities. (v) Volunteers.
31	Provide emergency officials' contact information	(2) Contact information for the following: (i) Federal, State, tribal, regional, or local emergency preparedness staff. (ii) The State Licensing and Certification Agency. (iii) The Office of the State Long-Term Care Ombudsman. (iv) Other sources of assistance.
32	Provide primary/alternate means for communication	(3) Primary and alternate means for communicating with the following: (i) Facility staff. (ii) Federal, State, tribal, regional, and local emergency management agencies.
33	Establish methods for sharing information	(4) A method for sharing information and medical documentation for patients under the facility's care, as necessary, with other health providers to maintain the continuity of care. (5) A means of providing information about the general condition and location of patients under the facility's care as permitted under 45 CR 164.510(b)(4).

34	Provide a means of sharing information on occupancy/needs	(6) A means of providing information about the facility's occupancy, needs, and its ability to provide assistance, to the authority having jurisdiction, the Incident Command Center, or designee.
35	Provide family notifications of emergency plan	(7) A method for sharing information from the emergency plan, that the facility has determined is appropriate, with residents [or clients] and their families or representatives.
36	Establish emergency preparedness training and testing	(d) The facility must develop and maintain an emergency preparedness training and testing program that is based on the emergency plan set forth in paragraph (a) of this section, risk assessment at paragraph (a)(1) of this section, policies and procedures at paragraph (b) of this section, and the communication plan at paragraph (c) of this section. The training and testing program must be reviewed and updated at least annually.
37	Establish staff and initial training requirements	(1) The facility must do all of the following: (i) Initial training in emergency preparedness policies and procedures to all new and existing staff, individuals providing services under arrangement, and volunteers, consistent with their expected role. (ii) Provide emergency preparedness training at least annually. (iii) Maintain documentation of all emergency preparedness training. (iv) Demonstrate staff knowledge of emergency procedures.
39	Conduct testing and exercise requirements	(2) The LTC facility must conduct exercises to test the emergency plan at least twice per year, including unannounced staff drills using the emergency procedures. The LTC facility must do all of the following: (i) Participate in an annual full-scale exercise that is community-based; or (A) When a community-based exercise is not accessible, conduct an annual individual, facility-based functional exercise. (B) If the LTC facility experiences an actual natural or man-made emergency that requires activation of the emergency plan, the LTC facility is exempt from engaging its next required full-scale community-based or individual, facility-based functional exercise following the onset of the actual event. (ii) Conduct an additional exercise that may include but is not limited to the following: (A) A second full-scale exercise that is community-based or an individual, facility-based functional exercise. (B) A mock disaster drill. (C) A tabletop exercise or workshop that is led by a facilitator includes a group discussion, using a narrated, clinically-relevant emergency scenario, and a set of problem statements, directed messages, or prepared questions designed to challenge an emergency plan. (iii) Analyze the LTC facility's response to and maintain documentation of all drills, tabletop exercises, and emergency events, and revise the LTC facility's emergency plan, as needed.

41	Implement emergency and standby power systems	(e) The LTC facility must implement emergency and standby power systems based on the emergency plan set forth in paragraph (a) of this section. (1) The generator must be located in accordance with the location requirements found in the Health Care Facilities Code (NFPA 99 and Tentative Interim Amendments TIA 12-2, TIA 12-3, TIA 12-4, TIA 12-5, and TIA 12-6), Life Safety Code (NFPA 101 and Tentative Interim Amendments TIA 12-1, TIA 12-2, TIA 12-3, and TIA 12-4), and NFPA 110, when a new structure is built or when an existing structure or building is renovated. (2) The LTC facility must implement the emergency power system inspection, testing, and maintenance requirements found in the Health Care Facilities Code, NFPA 110, and Life Safety Code. (3) LTC facilities that maintain an onsite fuel source to power emergency generators must have a plan for how it will keep emergency power systems operational during the emergency, unless it evacuates.
42	Meet the requirements of an integrated health system	(e) If a facility is part of a healthcare system consisting of multiple separately certified healthcare facilities that elects to have a unified and integrated emergency preparedness program, the facility may choose to participate in the healthcare system's coordinated emergency preparedness program. If elected, the unified and integrated emergency preparedness program must do all of the following: (1) Demonstrate that each separately certified facility within the system actively participated in the development of the unified and integrated emergency preparedness program. (2) Be developed and maintained in a manner that takes into account each separately certified facility's unique circumstances, patient populations, and services offered. (3) Demonstrate that each separately certified facility is capable of actively using the unified and integrated emergency preparedness program and is in compliance with the program. (4) Include a unified and integrated emergency plan that meets the requirements of paragraphs (a)(2), (3), and (4) of this section. The unified and integrated emergency plan must also be based on and include the following: (i) A documented community-based risk assessment, utilizing an all-hazards approach. (ii) A documented individual facility-based risk assessment for each separately certified facility within the health system, utilizing an all-hazards approach. (5) Include integrated policies and procedures that meet the requirements set forth in paragraph (b) of this section, a coordinated communication plan, and training and testing programs that meet the requirements of paragraphs (c) and (d) of this section, respectively.

Appendix B: Region, Number of Nursing Homes, and Federally Declared Disasters by State

Table 8: Region, Number of Nursing Homes, and Federally Declared Disasters by State

State	Region	Nursing Homes	Federally Declared Disasters
Alabama	South	223	24
Alaska	West Coast	18	15
Arizona	West Coast	138	7
Arkansas	South	212	18
California	West Coast	1,125	31
Colorado	West	209	10
Connecticut	Northeast	207	13
Delaware	Northeast	40	7
District of Columbia	Northeast	15	7
Florida	South	669	28
Georgia	South	353	17
Guam	West Coast	1	6
Hawaii	West Coast	42	14
Idaho	West Coast	78	10
Illinois	Midwest	681	6
Indiana	Midwest	514	5
Iowa	Midwest	418	20
Kansas	Midwest	306	17
Kentucky	South	275	17
Louisiana	South	257	33
Maine	Northeast	92	7
Maryland	Northeast	221	11
Massachusetts	Northeast	369	13
Michigan	Midwest	426	10
Minnesota	Midwest	354	12
Mississippi	South	194	29
Missouri	Midwest	504	13
Montana	West	69	14
Nebraska	Midwest	182	18
Nevada	West Coast	59	5
New Hampshire	Northeast	70	16
New Jersey	Northeast	349	12
New Mexico	South	66	20
New York	Northeast	604	19
North Carolina	South	417	19
North Dakota	West	74	15
Ohio	Midwest	928	8

Oklahoma	South	284	37
Oregon	West Coast	122	13
Pennsylvania	Northeast	670	10
Puerto Rico	Northeast	5	13
Rhode Island	Northeast	76	8
South Carolina	South	182	16
South Dakota	West	103	19
Tennessee	South	305	18
Texas	South	1,151	22
Utah	West	96	7
Vermont	Northeast	35	16
Virginia	Northeast	275	12
Washington	West Coast	197	21
West Virginia	Northeast	115	22
Wisconsin	Midwest	344	11
Wyoming	West	35	5