Steering, Rowing, and Bailing Water:
The Role of Government Regulation and Ownership in COVID-19 Outcomes in Nursing Homes

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ABSTRACT

Studies of organizations with limited capacity operating in uncertain environments and hit by crises can contribute important insights into public administration. Based on a large-N quantitative analysis of U.S. nursing homes, which became ground zero of the COVID-19 pandemic, this article examines the effect of government regulation, ownership, and several distinct management strategies on organizational capacity to curb the threats posed by the pandemic. Using hybrid datasets including nursing home data, administrator surveys, COVID-19 outcome data, a COVID-19 regulatory stringency index, and U.S. Census Bureau data, our analysis show that restrictive COVID-19 state government policies and public/nonprofit ownership help minimize environmental threats and reduce COVID-19 impacts. Yet, management strategies—external management, innovation management, distributive leadership, and regulation management—have only modest effects on COVID-19 outcomes. These findings inform our understanding of how organizations operate at the margins and the impact of management on outcomes during a crisis.

Keywords: Crisis Management, Public-Private Comparison, Health Regulation, COVID-19

Running Head: Regulation, Ownership, and COVID-19

INTRODUCTION

Organizations are designed to take generally disparate and unorganized inputs and create order and predictability to achieve some end (Gerth and Mills 2014; Perrow 1986). Organizations are systems of stability, and some forms of organization such as traditional bureaucracies are designed to work best in stable environments to produce predictable outputs (Woodward 1970). Yet we have substantial evidence that organizational environments are not stable (Aldrich 1979; Dess and Beard 1984), that public problems (e.g., pandemics, populist movements, climate change, security threats, interrelated economic systems) often span the scope of many organizations, and that these conditions create wicked problems without patterned solutions (Weber and Khademian 2008). Many of the most interesting organizational problems and, by analogy, public administration problems occur when organizations face environmental challenges that may limit the efficacy of regularized patterns. The thesis of this article is that we can learn a great deal about organizations at their boundary conditions, where they face problems that they are ill-equipped to handle and where the probability of failure is high (McCrea 2020, 2022; Meier and Bohte 2003; Mellahi and Wilkinson 2004; Ryu and Johansen 2017). This suggests the value in studying organizations and managers under extreme stress—those dealing with crisis situations with limited capacity (McCrea 2022; Meier, O'Toole, and Hicklin 2010; O'Toole and Meier 2010; Pfeffer and Salancik 1978; Thompson 2003).

Across policy areas, public organizations often face turbulent environments and deal with difficult and at times intractable problems, with inadequate resources and little political support at their disposal. Even in a wealthy post-industrial nation such as the United States, such organizations exist in child protective services (Afifi et al. 2015), substance abuse treatment (McCrea 2020; Miller and Moulton 2014), corrections (Koerner and Johnston 2022; Sabbe, Moyson, and Schiffino 2021), public health (Ling and Walker 2013), elder care (Amirkhanyan et al. 2020), and a wide variety of other areas. Similar issues affect the delivery of public services by nonprofits with limited capacity (Fredericksen and London 2000; Paynter and Berner 2014; Rivenbark and Menter 2006). By studying how crises test the limits of organizations, researchers can contribute new insights into public administration and organizational management. U.S. nursing homes serving chronically ill, largely elderly populations during the COVID-19 pandemic make an ideal case for such a study.

Nursing home care is among the policy fields where the government's involvement—direct public ownership, stringent industry regulation, and effective management—has been linked to improved service outcomes (e.g., Amirkhanyan et al. 2018, 2019; Amirkhanyan, Meier, and O'Toole 2017; Roberts et al. 2022). Nursing homes became ground zero of the COVID-19 pandemic, accounting for almost a third of the massive loss of human lives in the U.S. as well as worldwide (Chidambaram and Garfield 2021). In response, the U.S. added COVID-19 outcomes to the standard roster of federally mandated performance measures that are closely monitored and publicly reported by nursing home administrators and government regulators (1). Minimizing COVID-19 client and staff cases and deaths has, therefore, become a central management objective and a measure of how effective these organizations are at buffering and responding to major environmental shocks.

This article contributes to the limited and largely descriptive and qualitative body of work on the role of organizational management during the national or transboundary crises of the 21st Century. By conducting a large-N quantitative analysis, we offer more systematic evidence of how organizations cope with such crises and the impact of effective management practices on their outcomes. In particular, we contribute to this emergent literature by asking: When new threats like COVID-19 arise, are government regulation, ownership, and management effective at minimizing adverse outcomes? Our analysis examines the relationships between state COVID-19 regulations, facility ownership, distinct management strategies, and COVID-19 cases and deaths among nursing home residents in 2020, the first year of the pandemic. The hybrid data for this study combine (1) the Centers for Medicare and Medicaid Services' (CMS) Nursing Home Compare data, (2) COVID-19 Nursing Home Data from the Centers for Disease Control and Prevention (CDC), (3) the Texas A&M University (TAMU) Nursing Home Administrator Survey, (4) the Oxford COVID-19 Government Response Tracker, and (5) the American Community Survey (ACS) from the U.S. Census Bureau.

We find that nursing facilities in states with more restrictive COVID-19 policies had significantly lower levels of COVID-19 cases and deaths, suggesting that government regulation can help minimize the environmental threats affecting nursing facilities' operations. However, the impact of certain management practices has, at best, only modest effects on minimizing COVID-19 cases and deaths, despite previous crisis management and nursing home research showing their efficacy. On the other hand, consistent with existing research on nursing care quality, public and nonprofit nursing homes had significantly lower levels of COVID-19 client cases and deaths in 2020 compared to for-profit homes. This suggests that orientation towards service quality (as opposed to profit) creates investments in resources and policies (that is, capacity) that improve the resilience of these organizations facing negative environmental shocks. Thus, in an industry that has historically struggled with effective management and performance, environmental forces involving the government's steering and rowing actions, along with relevant nonprofit and advocacy work, proved more effective than management at protecting organizations from a major public health calamity.

RESPONDING TO THE CHALLENGES OF THE COVID-19 CRISIS

While pursuing their missions, public service organizations respond to a changing and often challenging environment primarily by the means of creating order (Savage 1971). The proliferation of internal and external pressures to achieve order, however, hampers organizational change, often reducing innovation to limited, gradual additions to established structures and routines (Wilson 1989). Reflecting this trend, for over a century, public administration research has primarily aimed at understanding bureaucracies rather than adhocracies, pushing the study of crises to the periphery of the field (Boin and Lodge 2016; Rosenthal 2003). As transboundary crises become more prevalent, researchers call for a broadening of the field’s agenda to incorporate new theories and empirical evidence on leading public service organizations during turbulent times (Boin and Lodge 2016; Broekema 2016; Tokakis, Polychroniou, and Boustras 2018). These inquiries investigate how organizations and managers can learn to thrive in volatile environments by matching internal structures, resources, and managerial strategies to shifting environmental characteristics (Barasa et al. 2018; Donaldson 2001; Lawrence and Lorsch 1967). In healthcare, immigration, natural disaster preparedness, education, and other policy fields, administrative expertise and capacity are examined as key factors curbing the effects of environmental volatility (Andrews et al. 2009; Andrews et al. 2013; Hawes and Testa 2020; Meier and O’Toole 2009; Meier, O’Toole, and Hicklin 2010; Moulick and Taylor 2017; O’Toole and Meier 2010; Ryu and Christensen 2019). This study contributes to this growing literature in the context of the COVID-19 pandemic.

Taking millions of lives around the world, the COVID-19 pandemic has all the attributes of a major crisis that profoundly affected individuals, organizations, and nations. Given these costly consequences, the need for a response and resolution has been urgent, yet the pandemic’s ambiguous and unpredictable nature has impeded progress at every turn (Boin and Lodge 2016; Christensen, Lægreid, and Rykkja 2016; Dzigbede, Gehl, and Willoughby 2020; Mizrahi, Vigoda-Gadot, and Cohen 2021; Rosenthal 2003; Schomaker and Bauer 2020; Tokakis et al. 2018; Van der Vaal 2020). The crisis response was further complicated by the unique transboundary scope of the pandemic, its politicized nature, and the attendant media coverage (Alsan et al. 2021; Boin and Lodge 2016; Christensen et al. 2016; Linnenluecke and Griffiths 2013; Rosenthal 2003; Schomaker and Bauer 2020). The pandemic has also had a dramatic impact on organizations, both revealing and causing gaping holes in public institutions and services, particularly in healthcare (Fanelli et al. 2020; Young, Wiley, and Searing 2020). Like other recent crises in the U.S., such as the 9/11 terrorist attacks, Hurricane Katrina, and the Great Recession, the wicked problems of the COVID-19 pandemic have reaffirmed the need and provided a context to understand how public service organizations can learn and succeed in pursuing their missions (Broekema 2016; Christensen et al. 2016; Van der Vaal 2020).

Existing literature on organizational theory and public management has focused on the critical role of "buffering" activities in a turbulent environment (Meier and O'Toole 2008; O'Toole and Meier 2003; Thompson 2003). Buffering has both an externally oriented dimension and an internal management dimension. The former highlights the need to build institutionalized systems to buffer external shocks (Selznick 1949, 1957). The latter pays particular attention to a "defender" approach to dealing with turbulence (Miles and Snow 1978) or a prospecting approach that matches management practices with environmental demands (Amirkhanyan et al. 2019). The crisis management literature has described and investigated four larger categories of managerial action: (1) external organizational buffering efforts, (2) internal learning and change,

(3) personnel management in a crisis, and (4) reliance on government and government regulation (Christensen, Lægreid, and Rykkja 2016; Fanelli et al. 2020).

The first category includes various forms of interorganizational activity in the context of environmental turbulence—horizontal coordination, collaboration, communication, or networking—aimed at bringing together disparate organizations to engage in the pursuit of joint goals (Christensen, Danielsen, Lægreid, and Rykkja 2016; Christensen, Lægreid, and Rykkja, 2016; Entress, Tyler, and Sadiq 2020). While relevant to the broader field of public administration, interorganizational activity is particularly central to crisis management. Such coordinated action is particularly suited for tackling wicked problems by reducing uncertainty, facilitating intra-crisis learning, information sharing, and alignment of strategies, bringing service closer to people, better integrating resources, and helping private citizens optimize available resources (Christensen, Danielsen, Lægreid, and Rykkja 2016; Eriksson et al. 2021; Lee, Yeo, and Na 2020; Schomaker and Bauer 2020). These benefits as well as their weaknesses have been noted in the context of the recent public health emergency.

The second prominent category of crisis management approaches deals with organizational change and learning. As the environment suddenly and drastically changes, organizations and managers must learn about their situation by acquiring, analyzing, and codifying new knowledge and assessing risk, and then apply new insights into action, all while navigating a range of political, administrative, individual, and contextual factors (Broekema 2016; Christensen, Lægreid, and Rykkja, 2016; Duit 2016; Fanelli et al. 2020). Learning can then contribute to innovation, where reorganizing processes and resources is critical to effective crisis response. Additionally, the exchange of positive experiences and best practices with various civil society entities, government agencies, and private enterprises can facilitate the accumulation and interpretation of knowledge during turbulent times (Fanelli et al. 2020; Schomaker and Bauer 2020). Given the involvement of numerous actors in crisis response, sensemaking capabilities may be distributed much like other roles in networks (Linnenluecke and Griffiths 2013). Studies of the COVID-19 pandemic and other recent crises—once again, commonly descriptive and qualitative—document learning and adaptation at individual and organizational levels, as well as by different levels of government (Casula and Pazos-Vidal 2021; Dzigbede, Gehl, and Willoughby 2020; Lee et al. 2020; Tokakis, et al. 2018).

Leading people in organizations is the third prominent category of crisis management response (Boin and Lodge 2016; Tokakis et al. 2018). The COVID-19 crisis has taken a toll on workers and placed additional demands on supervisors, calling for greater psychological support and resources for employees (Entress, Tyler, and Sadiq 2020; Reinhardt et al., 2022), clearer communication during uncertainty (Fanelli et al. 2020), proactive responses to staffing shortages and staff burnout, and an "all-hands-on-deck" approach to operations (Reinhardt et al., 2022). Specific leadership styles may be effective during crises, including the ability to lead and make decisions in conditions of extraordinary stress and maintain institutional and policy continuity, all while showing emotional intelligence and a positive outlook in a crisis (Tokakis et al. 2018; Van der Vaal 2020).

Finally, public organizations and their managers' experiences are closely tied to the political, legal, and financial constraints influencing their work (Boyne 2003), most prominently the regulatory environment. In a crisis, government policies and interventions are crucial: regulators inform and educate the public, provide guidance on private actors' behavior, and impose consequences using a variety of instruments (Liou and Liou 2022). In a public health crisis, government is a major stakeholder and sets conditions on how public revenues are spent, monitors diseases, communicates to organizations and individuals on safety practices, and provides or supports access to preventative care and treatment (Liou and Liou 2022). Beyond the regulations prompted directly by the crisis, industry-specific regulations—such as those related to staffing or service reimbursement structures—influence how organizations and people experience environmental turbulence (Reinhardt et al., 2022; Van der Vaal 2020). Both the regulations, as well as the managerial strategies for exploiting or resisting these regulations, can contribute to organizational outcomes.

In this study, we contribute to this line of work by examining the role of regulation, management practices, and organizational sector in nursing home care. The nursing home field faced considerable challenges during the recent pandemic, likely due to the high-contact nature of nursing home care and residents' increased vulnerability to infectious disease (Gorges and Konetzka 2020). By November 2021, CMS recorded over 722,000 COVID-19 cases (roughly 50% of U.S. nursing home residents) and over 139,000 COVID-19 deaths (roughly 10% of U.S. nursing home residents) (CMS 2021a) (2). Thus, research on COVID-19 in nursing homes is a critical case of how management in stressed organizations reacts to a crisis.

FACTORS AFFECTING COVID-19 OUTCOMES IN U.S. NURSING HOMES

Nursing homes provide vital health services for highly vulnerable clients. Yet they are significantly under-resourced and have been subject to persistent concerns about the quality of care over the last several decades (GAO 2000; Konetzka, Yan, and Werner 2021; Polivka et al. 2003). In an effort to revolutionize nursing home quality and oversight, the Centers for Medicare & Medicaid Services (CMS) launched the Nursing Home Compare initiative in 1998 and the five-star rating system a decade later, a comprehensive yet interpretable system designed to measure quality across several dimensions (CMS 2023). Noncompliance, however, remains an issue in the industry (GAO 2003, 2007; Grabowski and Town 2011), setting the stage for continued cross-disciplinary research into the determinants of nursing care quality, including in health economics (e.g., Decker 2008; Grabowski et al. 2013; Lin 2014), healthcare management (e.g., Bos et al. 2017), health policy (e.g., Koren 2010; Stevens and Grabowski 2008), gerontology (e.g., Castle 2001; Castle and Engberg 2008), and public administration and policy (e.g., Amirkhanyan 2008; Amirkhanyan, Kim, and Lambright 2008; Amirkhanyan et al. 2018, 2020; Song, Meier, and Amirkhanyan 2020). This body of work points to several major correlates including regulation, organizational ownership, and management.

State Regulations

While most U.S. nursing homes are for-profit, the industry is nonetheless characterized by a high degree of publicness (Bozeman and Bretschneider 1994), as experts report that the majority of nursing home revenues come from the federal Medicaid and Medicare programs (Collelo 2022; Harris-Kojetin et al. 2019). Public funding, along with the informational asymmetries present in the industry, requires a rigorous regulatory regime to ensure that these services prioritize the interests of clients. In public administration research, government regulation is a key factor in public service improvement (Boyne 2003) and has led to specific instances of successful reform in the nursing home industry (e.g., Hawks 2018). For example, a recent study of the federal National Background Check Program (NBCP), which aims at strengthening states' background checks for patient care providers in nursing homes, found that regulatory deficiencies and five-star ratings improved significantly in states that received the NBCP grant (Roberts et al. 2022).

Before the pandemic, government regulation was an important part of federal and state agencies' performance management toolkits, working to constrain providers' behavior as well as enhance the general perception of the market for current and prospective stakeholders (Roberts et al. 2022). In the years before the pandemic, nursing home regulations improved in some aspects and declined in others (Musumeci and Chidambaram 2020; Stevenson and Cheng 2021). As the COVID-19 threat grew in early 2020, government entities in the U.S. and abroad funded and designed innovative nursing home programs and enacted numerous policies regulating individual behavior (Lipsitz et al. 2020; Lyng et al. 2021; Musumeci and Chidambaram 2020; Sonnenfeld et al. 2021). As with broader quality assurance efforts, these programs reaffirm that nursing homes are not solitary actors in responding to the COVID-19 crisis: governments regulate both the internal workings of facilities (providing resources and guidelines, limiting visitation, creating incident tracking systems, and facilitating coproduction by organizations or individuals; see CMS 2021b), as well as the broader organizational environment (closing schools and public transit, restricting public gatherings and travel, and imposing stay-at-home orders and masking requirements). These interventions improve the capacity of organizations to respond to crises and limit the transmission of the virus.

Indirectly, state-level restrictions could also impose institutional— coercive, mimetic, or normative—pressures on fully or partially publicly-funded facilities to make and enforce more restrictive policies protecting their clients and staff. Thus, we expect that nursing homes located in states with stricter COVID-19 regulatory measures are likely to experience lower numbers of both cases and deaths among residents. Our hypothesis regarding state-level COVID-19 restrictions is as follows:

> *H1: Nursing homes operating in states with more COVID-19 regulatory restrictions will have fewer COVID-19 cases and deaths.*

Organizational Ownership

Organizational ownership is a key attribute that has proved central to nursing home outcomes; ceteris paribus, public and nonprofit facilities have consistently provided better care than for-profit homes (Amirkhanyan 2008; Amirkhanyan, Kim, and Lambright 2008; Amirkhanyan et al. 2018; Barron and West 2017; Figueroa et al. 2018; Grabowski et al. 2013; in Sweden see Broms, Dahlström, and Nistotskaya 2024). Amirkhanyan and colleagues (2008, 2018) show that nonprofit homes care for more private-pay or Medicare-funded clientele and can afford to prioritize quality over efficiency (Salamon 2003; Steinberg 2006), whereas for-profit homes, on average, have a higher Medicaid census and tend to prioritize cost savings over quality care and resident well-being (Amirkhanyan 2008; Bos et al. 2017; Broms, Dahlström, and Nistotskaya 2024; Decker 2008). When quality and access are a zero-sum game (Amirkhanyan, Kim, and Lambright 2008), systematic barriers to care relegate more disadvantaged patients to poorer-quality homes (Scanlon 1980). Where for-profit facilities continue to prioritize efficiency over serving disadvantaged clientele, facility sector will likely remain a significant predictor of care outcomes during the COVID-19 pandemic.

Organizational ownership could be an important determinant of health outcomes during the pandemic, as it determines resources, managerial priorities, and structural protections. Government organizations, in prioritizing predictability through rules and routines, have complex functions to buffer environmental changes while providing a safety net for the most vulnerable groups (O'Toole and Meier 2003). Private organizations and their stakeholders, however, generally prioritize profits over all else (Broms, Dahlström, and Nistotskaya 2024), limiting their ability to deal with environmental shocks relative to their public sector counterparts (Meier and O'Toole 2011). Studies find that for-profit nursing homes have had higher infection and mortality rates than other sectors (Das Gupta et al. 2021; Gopal, Ham, and Yaraghi 2021; cf. Abrams et al. 2020; Morciano et al. 2021), indicating that poor performance pre-pandemic correlates with poor performance during the pandemic. This may be due to several factors within the private sector, including lower staffing and resources due to financial challenges (Das Gupta et al. 2021) and related cost-cutting strategies (Meier and O'Toole 2009). Indeed, in an emergency, organizations with less slack will have limited flexibility to move resources into pressing problem areas. Furthermore, where customer satisfaction is paramount, for-profit managers could choose to forego important yet unpopular health measures like visitation bans.

Several studies confirm that facilities with better staffing and fewer regulatory deficiencies experience better COVID-19 outcomes (Das Gupta et al. 2021; Figueroa et al. 2020; He et al. 2020; Li et al. 2020; Williams et al. 2021; cf. Abrams et al. 2020; Konetzka et al. 2021) (3). Conversely, poorly rated facilities are likely to take risks during the pandemic, such as admitting new patients despite staff and PPE shortages (Gibson and Greene 2021). Historically, public and nonprofit facilities have, on average, delivered better care than for-profits, and we therefore expect that focusing on quality care might lead to fewer COVID-19 cases and deaths among residents in public and nonprofit facilities (4).

H2: Public and nonprofit nursing home ownership is associated with fewer COVID-19 cases and deaths compared to for-profit ownership.

Organizational Management

Nursing home administrators play a crucial role in setting policies and structures for operations, allocating resources, and leading organizations toward achieving better outcomes. Prior to the pandemic, studies of management in nursing homes identified several factors influencing performance, including innovation management (Amirkhanyan et al. 2018; Cheon et al., 2021), turnover and training (Spilsbury et al. 2011), goal ambiguity and multiplicity (Song et al. 2020), and workplace stability (Castle and Engberg 2008). One can expect that organizational management strategies create a capacity to deal with unanticipated environmental shocks, even when overall effectiveness is reduced. This study explores whether four specific management areas are as strongly linked to COVID-19 outcomes as they have been to pre-pandemic performance, both in the nursing home industry as well as public management more broadly.

First, reflecting the arguments in the crisis management literature, one salient management factor is the capacity to manage outward—pursuing boundary work, buffering the organization from external threats, procuring resources, and managing collaborations (Castle, Ferguson, and Hughes 2009; Moore 1995; Rainey and Steinbauer 1999). Because the challenges caused by the COVID-19 pandemic altered nursing homes' external environment, administrators' *external management* capacities may be instrumental in minimizing the COVID-19 impacts.

Second, to capture the learning and flexibility capacities discussed in the crisis management research, we ask if innovation—administrators' propensity to apply new technologies, search for new opportunities, and adopt new ideas and practices—can affect COVID-19 outcomes. *Innovation management* has been linked to care quality improvement, cost reduction, patient-focused care, systems improvement, non-Medicaid admission census, and error reduction in nursing homes (Amirkhanyan et al. 2018; Baril, Gascon, and Brouillette 2014; Berry 1994; Deutschman 2005; Gabris et al.1999; Stewart and Kringas 2003). In the context of major environmental turbulence, the ability to adapt—to look for new ideas, empower staff, and promote organizational change—can be critical in reducing COVID-19 cases and deaths.

Third, we examine the role of *participatory management* as a strategy that can enhance organizational performance via improved job satisfaction, staff engagement, and reduced conflict and ambiguity (Brewer and Selden 2000; Dearden et al. 1999; Gronn 2008; Harris 2008; Rondeau and Wagar 2001; Tomlinson 2012). Despite the difficulty of conceptualizing the plethora of leadership and personnel management strategies (Forbes, Hill, and Lynn 2006; Lynn, Heinrich, and Hill 2000), a general consensus is that when managers and staff have engaged in shared management (Teo et al. 2017), a strong internal cadre of administrative staff who can manage day-to-day operations permits leaders to focus on dealing with environmental turbulence.

Finally, with the prominent role of government regulation and action in crisis management, administrators' capacity for regulatory compliance should be relevant. In the past, *regulation management*—better knowledge and internalization of regulatory standards, positive views of government regulation, and frequent communication with regulators—has been linked to star ratings and regulatory violations in U.S. nursing homes (Amirkhanyan, Meier, and O'Toole 2017). This effect is especially strong in nongovernmental facilities, highlighting the role of government regulation of publicly funded private providers. When managers understand regulatory standards and perceive them as fair, they generally are more committed to compliance, less resistant to regulation, correct performance gaps earlier, have a clearer picture of regulatory expectations, and, therefore, do better programmatically (Amirkhanyan, Meier, and O'Toole 2017; Anderson 2015; Scholz and Pinney 1995). Such regulatory expertise and compliance, developed and maintained in the context of nursing care quality assurance and assessment, will likely correlate with COVID-19 policy compliance and COVID-19 outcomes.

While these arguments support the likely impact of the four management strategies on cases and deaths in nursing facilities, we also recognize that management's influence might in fact be limited during an unprecedented massive external shock. The COVID-19 crisis posed major operational, staffing, financial, and compliance challenges, introduced additional goals and priorities, and in other ways, increased the level of goal ambiguity. Prior research shows that the positive effect of management on service quality in nursing homes decreases when administrators face high levels of goal ambiguity and multiplicity; the negative effect is "particularly strong for the managers' efforts to deal with external influences" (Song, Meier, and Amirkhanyan 2020, 1192). With respect to organizational management, our hypothesis is as follows:

> *H3: Higher levels of external management, innovation management, participatory management, and regulation management will be associated with fewer COVID-19 cases and deaths in nursing homes.*

METHODS

Data

This study combines five datasets to examine the role of government regulation, organizational ownership, and management in shaping COVID-19 outcomes. First, we use the Nursing Home Compare (NHC) database from the CMS (5). NHC, part of the quality assessment and certification process of long-term care providers in the U.S., is an unbalanced facility-level panel dataset that includes facility characteristics such as ownership, number of beds, staffing hours, Medicare and Medicaid certification status, and quality indicators. For the base model, we use the January 2020 NHC data file, which contains the most recent data as of that date (largely from inspections conducted in the 15 months prior to January 2020). For the management model, we use the January 2017 NHC data to match it to the 2017 TAMU Nursing Home Administrator Survey.

Second, this study uses COVID-19 Nursing Home Data from the Centers for Disease Control and Prevention (CDC). Specifically, we use the Nursing Home COVID-19 Public File collected through the CDC's National Healthcare Safety Network (NHSN) Long Term Care Facility (LTCF) COVID-19 Module (6). The data include nursing home-level COVID outcomes including the number of residents who tested positive for COVID-19, the number of residents who died from COVID-19, as well as data on facility staff COVID-19 outcomes. Data have been updated weekly at the facility level since May 2020.

Third, we use the 2017 TAMU Nursing Home Administrator Survey (NHAS). The survey includes reports of 545 nursing home administrators' managerial practices, performance, and environmental challenges. With a sampling list of all operating governmental nursing homes (N = 903) and a random sample of 1,000 nonprofit and 1,000 for-profit homes, 545 administrators responded (18.77 %) and the sample is representative of the population (see Table A1 in the Online Appendix).

Fourth, we use the Oxford COVID-19 Government Response Tracker (OxCGRT; Hale et al. 2021), which includes information on regulatory actions governments have taken to respond to COVID-19 across the world (7). We use the 2020 stringency index that captures the strictness of U.S. states' COVID-19 policies. Lastly, this study uses the 2019 American Community Survey (ACS) from the U.S. Census to control for county-level demographic and socioeconomic characteristics, such as poverty rates, information on the elderly population, and racial composition (8).

Measures

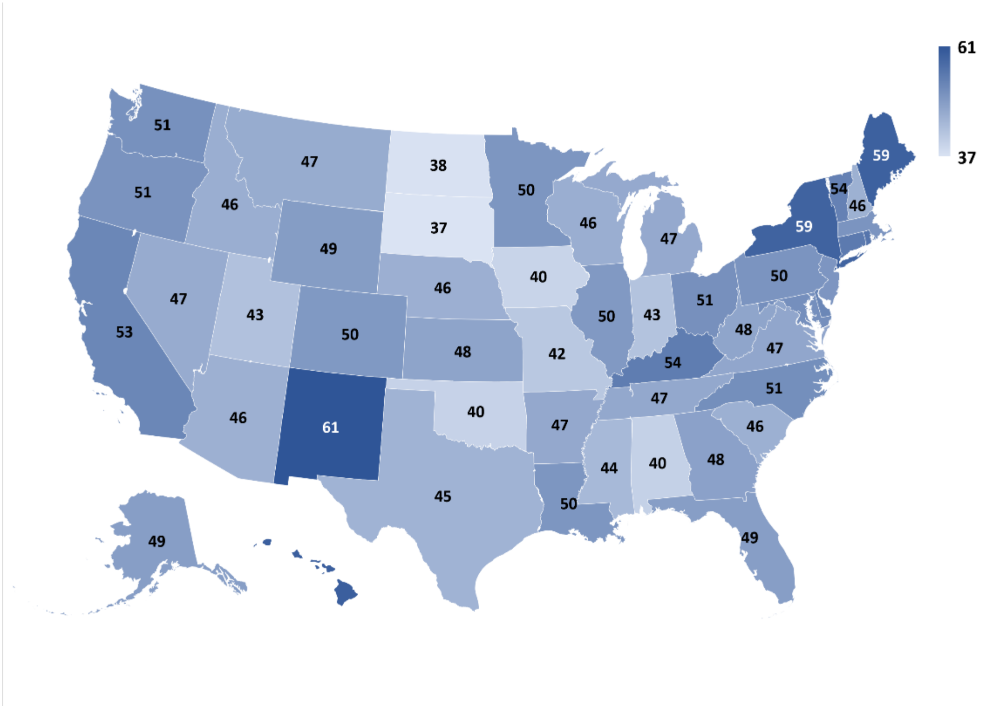
COVID-19 Outcomes

The dependent variables we use include (1) the total number of residents who tested positive for COVID-19 in 2020 (logged) and (2) the total number of residents who died from COVID-19 in 2020 (logged) in each facility. The COVID-19 Nursing Home Data have been updated weekly, and we use the total confirmed cases and deaths between May and the end of December 2020. We use 2020 COVID outcomes for several reasons. First, we aim to explore how ownership and management matter during an unprecedented crisis, where organizations have had less time to plan in the early phase of the pandemic. Second, nursing home residents had access to the COVID-19 vaccine when it was approved by the FDA in December 2020; thus, focusing on the pre-vaccine era can help us isolate the impact of managerial and organizational factors on COVID-19 outcomes. Third, our management variables come from the 2017 Nursing Home Administrator Survey, so the 2020 COVID data minimizes the gap between management actions and outcomes.

Stringency of COVID-19 Government Regulation

We use the OxCGRT "stringency index" to capture the strictness of COVID-19 policies across nine indicators: school, workplace, and public transit closings, canceled public events, restrictions on gathering size and domestic or international travel, stay-at-home requirements, and the presence of public information campaigns. These measures are combined and rescaled to a value from 0 to 100 (with 100 being the strictest). Using the monthly state-level stringency index, we calculate the average annual index by adding monthly scores and dividing by 12. Figure 1 shows this index across states.

Figure 1. Average Stringency Index Across States, 2020.



Organizational Ownership

Using NHC data on facility sector (ownership status), we create three dummy variables for public, nonprofit, and for-profit sectors (yes = 1, no = 0). All models include public and nonprofit nursing homes, with for-profit used as a reference group.

Management

Building on prior research, we focus on external management, innovation management, participatory management, and regulation management. The *external management* variable uses the NHAS items dealing with unexpected events and disturbances, limiting their influence, and controlling external factors. Responses to these survey questions are a 4-point scale from "strongly agree" coded as 4 to "strongly disagree" coded as 1. The items loaded on a single factor with an eigenvalue of 1.56 (Table A2 in the Online Appendix). The *innovation management* variable uses the NHAS items on managers' propensity to adopt new ideas, practices, and technology, and to search for new opportunities, measured on a 4-point scale (as noted above) (Amirkhanyan, Kim, and Lambright 2008). All survey items loaded on a single factor with an eigenvalue of 1.96 (Table A2 in the Online Appendix). *Participatory management* refers to managers' propensity to share information and decision-making with other stakeholders. To measure this, we use the NHAS survey items on managers' efforts to involve staff in the decision-making process, welcome customer feedback, and participate in reconciling disagreements (see Amirkhanyan, Kim, and Lambright 2008). These items are rated on a 4-point scale (as described above). Factor analysis produces a single factor with an eigenvalue of 2.01 (see Table A2 in the Online Appendix). Finally, we examine the role of managers' regulatory capacity (see Amirkhanyan, Meier, and O'Toole 2017). In the NHAS, nursing home administrators were asked about the extent to which they resisted unreasonable regulations, whether regulatory standards were inadequate, and whether compliance with regulation was burdensome, among others. The factor analysis of these items produces a two-factor solution (Table A2 in the Online Appendix). The measure we include in all regressions reflects *regulatory resistance* (the opposite of regulatory management capacity).

Facility Controls

We control for numerous facility characteristics, including the pre-pandemic quality of nursing homes (five-star ratings and regulatory health violations, logged), non-COVID deaths (a facility's total deaths minus total COVID deaths, logged), and the number of staff COVID cases (logged). The models also consider facility structure and resources. Larger facilities with more beds and residents are likely to have more COVID-19 confirmed cases and deaths. Therefore, we control for the logged number of federally certified beds and the logged number of residents in each nursing home. As staffing shortage has long been a challenge in U.S. long-term care, we include total nursing hours per resident per day. As a proxy of facility age, we use years since Medicare or Medicaid certification. We also control for whether a nursing home changed ownership in the last 12 months (yes=1, no=0). Finally, our regressions account for facility certification status. It is expected to affect COVID-19 outcomes because it determines facilities' eligibility to bill Medicare, which covers testing and treatment for COVID-19 (CMS 2022; Cubanski and Freed 2022). Additionally, the models control for nursing homes' affiliation with a hospital (coded as 1, otherwise 0).

County and State Controls

We include several variables to account for the characteristics of communities where nursing homes operate. Health literature has suggested that population density is a key predictor of healthcare access and quality. We include population density per square mile (in 1,000s) in all models. Following Amirkhanyan (2008) and Song (2023), we measure market competition using the Herfindahl-Hirschman Index (HHI): we calculate the sum of squared market shares (the number of certified beds) for each county and then reverse it so that higher values reflect greater competition. We also control for the percentage of people aged 65 and older in each county, as the size of the elderly population is critical for understanding COVID-19 outcomes and the demand for long-term care services. Additionally, we include the percentage of Whites in the county population and the percentage of people in poverty. Since health coverage is closely related to COVID-19 cases and deaths, we include the percentage of the county population with no health insurance. Among the state-level controls, we include the total 2020 confirmed COVID-19 cases (logged) and the total population (logged) for each state. Table A3 in the Online Appendix shows descriptive statistics for all variables.

Model Specification

The unit of analysis for this study is the facility. Due to their skewed distribution, the dependent variables (the number of COVID-19 cases and deaths among facility residents) are log-transformed to fit the linear regression model. Robust standard errors are clustered by county to address heteroscedasticity. In the first model, we regress state regulatory stringency, nursing home ownership, and facility-level, county-level, and state-level controls on COVID-19 outcomes. In the second model, we add management strategies to test the role of management in COVID-19 outcomes.

FINDINGS

Prior to performing a comprehensive regression analysis, we first present a comparison of total COVID-19 cases and deaths (from May to December 2020) across public, nonprofit, and for-profit sectors. Table 1 shows that, as of December 2020, on average, for-profit homes reported 37.6 COVID-19 cases, whereas public and nonprofit nursing homes reported 28.4 (24.5% fewer) and 27.0 (28.2% fewer) cases, respectively. While the gap is smaller, for-profit homes also reported more COVID-19 deaths (6.9), with approximately 14.5% lower for public homes and 11.6% lower for nonprofits. In Table 2, we compare the COVID-19 cases and deaths across facility five-star ratings. As expected, given that health and safety violations are part of the five-star rating measure, nursing homes with higher ratings have fewer COVID-19 cases and deaths.

Table 1. COVID-19 Resident Cases and Deaths by Nursing Home Ownership

	Total COVID-19 Resident Cases		Total COVID-19 Resident Deaths	
	Mean	SD	Mean	SD
Public nursing homes	28.4	34.8	5.9	9.9
Nonprofit nursing homes	27.0	29.1	6.1	8.9
For-profit nursing homes	37.6	33.4	6.9	9.0

Note: N = 15,232; Year = 2020

Table 2. COVID-19 Resident Cases and Deaths by Five-Star Rating

	Total COVID-19 Resident Cases		Total COVID-19 Resident Deaths	
	Mean	SD	Mean	SD
1-star nursing homes	41.0	35.4	7.6	9.3
2-star nursing homes	38.5	33.2	7.5	9.4
3-star nursing homes	36.2	32.8	6.9	9.2
4-star nursing homes	33.3	31.5	6.6	9.3
5-star nursing homes	26.5	29.7	5.5	8.4

Note: N = 15,023; Year = 2020

Table 3 reports the results of our regression analysis. Models 1 and 2 show our findings for the total number of 2020 COVID-19 cases among residents, and Models 3 and 4 show results for the total number of resident deaths from 2020 COVID-19. Both cases and deaths are logged in all regression models. Models 1 and 3 control for nursing home quality (five-star quality ratings), while Models 2 and 4 include both five-star ratings and the number of health deficiencies as an alternative measure of quality to show the impact of quality ratings that are not linked to health deficiencies (e.g., those linked to staffing and clinical quality measures).

Our models perform well, explaining roughly half of the variation in COVID-19 outcomes in over 14,600 nursing homes (adjusted R-squared values range from 0.41 to 0.62). Models 1 and 2 in Table 3 show that state COVID-19 restrictions are negatively associated with

COVID-19 cases in nursing homes. Governments took action to limit the spread of COVID-19, and these actions varied by state and likely affected the seriousness of the environmental shock that nursing homes faced. A standard deviation increase in the regulation stringency index is associated with approximately a 4.6% drop in reported COVID-19 cases in nursing homes. While there is a negative correlation between the government regulation stringency index and the number of COVID-19 cases, no such correlation exists with the number of COVID-19 deaths (Hypothesis 1 partially supported).

In Models 1 and 2 in Table 3, the coefficient for public nursing homes is negative and significant, suggesting that public facilities, on average, have fewer COVID-19 cases than their for-profit counterparts, holding all other factors constant. We find no difference between public and for-profit nursing homes in terms of COVID-19 deaths (Models 3 and 4). The coefficient of nonprofit nursing homes is negative and significant for both outcomes, indicating that nonprofits have fewer COVID-19 cases and deaths than for-profits. Thus, we find partial support for Hypothesis 2.

Given the log transformation of the variables, the coefficients reflect effect size; reported cases are 18.3% lower in public facilities and 22.6% lower in nonprofits when controlling for all other factors in Table 3, Model 1. We note that, even with controls, the nonprofit estimate in Table 3 is close to that in Table 1, suggesting that it is nonprofit status rather than anything in the model that is the source of the difference. For public facilities, the larger drop in the relative effect size suggests that public homes are more affected by certain controls.

When facilities are compliant with patient health and safety regulations across all areas of nursing homes—as reflected in 5-star ratings—they are better able to recognize and respond to COVID-19 threats. Model 1 shows that a one unit increase in the five-star ratings is associated with a 3.4% decrease in COVID-19 cases and a 2.6% decrease in deaths. The substantive difference between a 5-star and a 1-star-rated facility is 13.6% for cases and 10.4% for deaths. To further probe how the five-star rating's impact might affect outcomes, we add the health deficiencies measure—the number of regulatory health violations identified by state inspectors, which is one component of the 5-star ratings (Models 2 and 4). We find that its relationships with cases and deaths are statistically insignificant. This might suggest that staffing and clinical quality measures—the other two elements of the five-star rating system—are the more important regulatory compliance elements and likely reflect the value of personnel capacity for such contingencies.

Facility characteristics also have a significant relationship with COVID-19 outcomes. The numbers of non-COVID-19 deaths and staff COVID-19 cases are positively and significantly related to the number of resident COVID-19 cases and deaths. Larger nursing homes (measured in number of beds) also tend to have higher COVID-19 cases and deaths, whereas facilities with more residents do not. Additionally, nursing homes with higher staffing hours per resident are less likely to report COVID-19 cases and deaths, while older facilities are more likely to report COVID-19 cases and deaths. Nursing homes certified by Medicaid (but not Medicare) have fewer cases and deaths compared to homes certified by both Medicaid and Medicare.

County characteristics also play a significant role in shaping COVID-19 outcomes. Population density is negatively related to COVID-19 cases in facilities, and the percentage of Whites has a negative relationship with both COVID-19 cases and deaths. COVID-19 cases and deaths are also higher in more competitive (less concentrated) nursing home markets. While seemingly counterintuitive, these findings are consistent with prior research suggesting that

Table 3. Government Regulation, Facility Ownership, and Resident COVID-19 Outcomes

	Total COVID-19 Cases		Total COVID-19 Deaths	
	Model 1	Model 2	Model 3	Model 4
Regulatory stringency	-0.009***	-0.009***	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Public nursing home	-0.183***	-0.183***	-0.012	-0.012
	(0.033)	(0.033)	(0.035)	(0.035)
Nonprofit nursing home	-0.226***	-0.226***	-0.041*	-0.041*
	(0.019)	(0.019)	(0.019)	(0.019)
Five-star quality rating	-0.034***	-0.035***	-0.026***	-0.030***
	(0.006)	(0.007)	(0.006)	(0.007)
Health deficiencies		-0.003		-0.012
		(0.011)		(0.013)
Non-COVID-19 deaths among residents	0.028***	0.028***	0.078***	0.078***
	(0.008)	(0.008)	(0.010)	(0.010)
Total COVID-19 cases among staff	1.173***	1.173***	0.745***	0.745***
	(0.016)	(0.016)	(0.014)	(0.014)
Number of federally certified beds	0.093*	0.093*	0.107*	0.109*
	(0.040)	(0.040)	(0.047)	(0.047)
Total number of residents	-0.028	-0.029	-0.014	-0.015
	(0.040)	(0.040)	(0.046)	(0.046)
Staffing hours per resident per day	-0.208***	-0.208***	-0.146***	-0.145***
	(0.013)	(0.013)	(0.011)	(0.011)
Years since certification	0.001*	0.001*	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Changed Ownership in last 12 months	0.009	0.009	0.001	0.002
	(0.041)	(0.041)	(0.043)	(0.043)
Certification status: Medicare only	-0.047	-0.048	0.009	0.006
	(0.041)	(0.041)	(0.045)	(0.045)
Certification status: Medicaid only	-0.144*	-0.144*	-0.242***	-0.242***
	(0.059)	(0.059)	(0.070)	(0.070)
Hospital affiliated home	-0.021	-0.021	0.005	0.004
	(0.046)	(0.046)	(0.039)	(0.039)
Population density	-0.016***	-0.016***	-0.003	-0.003
	(0.005)	(0.005)	(0.003)	(0.003)
Market competition	0.114**	0.114**	0.110**	0.112**
	(0.039)	(0.039)	(0.042)	(0.042)
Elderly population	0.001	0.001	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
White population	-0.003***	-0.003***	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Uninsured population	-0.003	-0.003	-0.007*	-0.007*
	(0.003)	(0.003)	(0.003)	(0.003)
Population in poverty	-0.005	-0.005	-0.009*	-0.009*
	(0.003)	(0.003)	(0.004)	(0.004)
State total COVID-19 cases	-0.118***	-0.118***	-0.131***	-0.132***
	(0.019)	(0.019)	(0.020)	(0.020)
State population	0.112***	0.112***	0.048*	0.050**
	(0.019)	(0.019)	(0.019)	(0.019)
Constant	0.311	0.316	0.411	0.434+
	(0.211)	(0.210)	(0.250)	(0.253)
Adjusted R-squared	0.621	0.621	0.411	0.411
N	14,620	14,620	14,620	14,620

Note: Robust standard errors are clustered by county and shown in parentheses.
Two-tailed test; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

higher competition, in a highly imperfect nursing home market plagued with informational asymmetries, often leads to more regulatory violations and lower care quality (Song 2023). Additionally, nursing homes report fewer COVID-19 deaths in areas where fewer are insured. Interestingly, the poverty rate is negatively linked to COVID-19 deaths in nursing facilities (keeping COVID-19 cases and deaths in the community constant), possibly because of differences in life expectancy or likelihood of using nursing homes. Among the state-level variables, state population has a positive and significant coefficient: nursing homes in more heavily populated states report more COVID-19 cases and deaths. However, the total number of state-level COVID-19 cases is negatively and significantly related to cases and deaths in nursing home residents.

Table 4 shows the effect of management on COVID-19 outcomes. Here, we exclude quality variables and staff COVID-19 cases as they might be mediating factors in the relationship between management and COVID-19 outcomes. All other controls from Table 3 are included (and their coefficients are shown in Table A4 in the Online Appendix). In this model, public facilities have significantly fewer COVID-19 cases and deaths compared to for-profit facilities, once again providing partial support for Hypothesis 1. The negative relationship between regulatory stringency and COVID-19 cases and deaths also persists in this model, supporting Hypothesis 2.

There is limited evidence to support Hypothesis 3: participatory management (e.g., empowering staff and decentralized decision-making) is related to fewer COVID-19 cases (Model 1) but not to deaths (Model 2), suggesting that facilities where managers share decision-making with their staff tend to have fewer COVID-19 cases. The relative influence of participatory management is notable, where a one standard deviation increase predicts 18.4%

fewer cases. Innovation management and external management are not significantly related to COVID-19 outcomes. Nursing home administrators' regulatory resistance (the reverse of regulatory capacity or receptivity) does not affect COVID-19 cases but is negatively associated with COVID-19 deaths ($p<0.01$).

Table 4. Management, Resistance to Regulation, and Resident COVID-19 Outcomes

	Total COVID-19 Cases	Total COVID-19 Deaths
	Model 1	Model 2
Regulatory stringency	-0.066***	-0.044***
	(0.017)	(0.013)
Public nursing home	-0.547**	-0.310*
	(0.174)	(0.147)
Nonprofit nursing home	-0.229	-0.103
	(0.171)	(0.134)
External management	-0.062	-0.070
	(0.069)	(0.055)
Innovation management	0.005	0.020
	(0.071)	(0.057)
Participatory management	-0.184**	-0.058
	(0.065)	(0.054)
Resistance to regulation (F1)	-0.041	-0.092+
	(0.068)	(0.055)
Resistance to regulation (F2)	0.053	-0.011
	(0.069)	(0.051)
Constant	-0.788	0.446
	(1.422)	(1.112)
Facility-level control variables	Yes	Yes
County-level control variables	Yes	Yes
State-level control variables	Yes	Yes
Adjusted R-squared	0.252	0.170
N	436	436

Note: Robust standard errors are clustered by county and shown in parentheses.
Two-tailed test; + $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

DISCUSSION AND IMPLICATIONS

The COVID-19 pandemic has caused considerable and likely long-term harm to the U.S. nursing home industry, with a significant loss of life and other adverse health outcomes. The context provides a critical opportunity to examine how highly stressed organizations with limited capacity sustain service delivery in times of crisis. Thus, our study examines the effect of government regulation, government ownership, and organizational management on COVID-19 deaths and cases in U.S. nursing homes. While mortality is the outcome policymakers ultimately seek to minimize in a pandemic, both outcomes we use in our study—cases and deaths—are highly relevant in the context of senior and chronic care. In addition to the short-term decline in quality of life associated with infection, COVID-19 can have negative long-term health effects, influencing individuals' quality of life and life expectancy (CDC 2022). A greater prevalence of COVID-19 cases in nursing homes also translates into higher government expenditures for Medicaid and/or Medicare programs and more limited resources for regular day-to-day operations and quality assurance. This raises the need to examine both COVID-19 cases and deaths. Overall, we find that for-profit ownership in a market serving vulnerable clients undermines COVID-19 outcomes (especially cases), while government regulation minimizes environmental threats to these facilities. Some aspects of management, in addition, still matter at the margins.

The findings of this study offer important implications for public administration theory and practice, particularly in similar crisis contexts. First, our analysis suggests that organizational sector remains a prominent factor in determining COVID-19 outcomes, just as it has been a key factor in influencing other measures of nursing care quality and performance (e.g., Amirkhanyan 2008; Amirkhanyan, Kim, and Lambright 2008; Barron and West 2017; Broms, Dahlström, and Nistotskaya 2024). Sector-wide incentives and values, along with state policies, appear to have a strong and positive effect on containing cases and deaths in nursing homes. For example, our findings might suggest that public and nonprofit organizations are less likely to engage in cost-minimizing strategies, have a greater commitment to quality of care, and provide more benefits and support to staff. The leadership structures of nonprofit and public organizations may also enforce accountability mechanisms that go beyond a focus on financial solvency and profitability. Thus, nonprofit boards of trustees or county governments may set expectations related to regulatory compliance regarding safety and quality, as well as have more concern with reputation and standing in their local and professional communities. These sector-wide norms and sector-specific governance structures, therefore, may encourage a greater commitment to investing resources for protecting the administration, residents, and staff, or greater prioritization of professional values and health measures over customer appeasement (e.g., neglecting visitation bans).

Additionally, the findings of this study suggest that government regulation matters; it plays a role in limiting negative influences and in improving COVID-19 outcomes in U.S. nursing homes both in terms of prior compliance with health and safety standards and in public health responses in the community. COVID-19 restrictions imposed by states aimed at containing the spread of infection in the community, including masking, social distancing, and limiting public gatherings, are associated with fewer COVID-19 cases among nursing home residents. Such efforts to reduce transmission in the community likely result in less exposure to nursing home staff and administrators. This may also translate into more reliable levels of staffing, consistent use of specialized equipment, fewer visitations, and more resources dedicated to core functions.

While government regulation and ownership matter, our findings suggest only a modest impact of management strategies on COVID-19 outcomes. The significance of the participatory management measure likely means that administrators can rely on and delegate to qualified mid-level personnel: individuals who can oversee and ensure that staffing levels are maintained despite the pandemic, manage clients' complex medical needs, and address client isolation and quality of life. This allows top executives to focus more on the pressures of the pandemic:

learning about the virus and the best practices to contain it, setting new organizational policies, raising additional funding, and acquiring PPE and other resources. The effect of resistance to regulation (a negative relationship with COVID-19 deaths) may imply that strict, involved, hands-on state supervision of poor-performing facilities is burdensome for some administrators but offers tangible benefits in the midst of a crisis.

Overall, however, our analysis suggests that the evidence for the effect of management is limited. Management is likely to be more effective in stable situations, where procedures and strategies can be formulated in an incremental manner or in cases where organizations have extensive management capacity. Innovation may be easier in placid environments rather than during a comprehensively catastrophic event—even a well-managed Pompeii would end in disaster. Even in open, resource-rich organizational cultures amidst stable environments, the adoption of innovation requires careful assessment. Effective leaders need time to make decisions on whether new procedures and technology are a good fit and what policy and structural changes are needed to incorporate new ideas into action. By contrast, when organizations that generally operate in stable environments must quickly react to an avalanche of environmental demands and threats, they will likely need a new skill set that goes beyond routine technical or managerial adjustments.

During the COVID-19 pandemic, about half of nursing home clients in the U.S. fell ill, and nearly one in ten of those died (CMS 2021). Those who survived likely had persistent health complications and greater care demands. While management generally matters, it simply is not a panacea in an industry that is not known for exceptional management (Grabowski & Town 2011; Polivka et al. 2003). In a field where government has historically played many of its crucial societal roles—from steering to rowing—in ensuring that citizens are served well during a global pandemic, government regulation and service provision, along with nonprofit action, have become more powerful sources of organizational resilience and improvement than organizational management.

Several other factors appear to influence COVID-19 outcomes in nursing homes. More staffing hours per resident per day (after controlling for staff infections) resulted in fewer COVID-19 cases among residents. Thus, staffing and nursing care continue to matter not only for care quality but also in preventing the spread of infection. The number of non-COVID-19 deaths is another factor influencing nursing home performance during a pandemic. The more severely ill the residents are in a facility, the higher their chances for infection and death from COVID-19. Nursing homes with higher star ratings tend to experience fewer COVID-19 cases and deaths, suggesting that high-quality facilities outperform low-quality facilities in a crisis.

We note several limitations of this study which merit future research. First, we rely on the federal CDC's counts of COVID-19 cases and deaths, which might not be fully accurate, particularly early in the pandemic when reporting was less precise. However, we use total 2020 measures from the weekly data that likely gained accuracy over the course of the year. Second, our measures of management in the management models come from a nursing home NHAS conducted in 2017. It is possible that the gap between management practices and outcomes is too large; yet an argument could be made that effective management outcomes rarely have immediate effects and are more likely to be observed in the long run. We opted to focus on COVID-19 cases and deaths from 2020 to help minimize the gap between NHAS and our COVID-19 NHC data. Additionally, we calculated correlations between nursing home variables in 2020 and those in previous years and found consistently high correlations, with most exceeding 0.90. This suggests a high degree of stability in facility characteristics over time.

Finally, although our measures encompass several essential management strategies, they do not specifically account for COVID-19-related challenges, such as staffing shortages during the pandemic, nor do they deal with environmental challenges, such as elevated COVID-19 rates in the county. Future research should delve deeper into alternative conceptualizations of organizational management and its effects on COVID-19 outcomes using both quantitative and qualitative methodology.

This research sheds light on the literature on nursing home care, public-private comparisons, as well as organizational theory by examining how organizations respond to extreme environmental turbulence with the potential to overwhelm the system. The findings of this study highlight the significant role of public service entities (government and nonprofit organizations) and government regulation in mitigating the impact of environmental shocks, suggesting that efforts to improve nursing home care should include careful consideration of facility ownership and health regulations. This research also contributes to the ongoing debate over nursing home reforms (The White House 2022) by providing meaningful implications for efforts to improve the safety and quality of nursing home care and better serve vulnerable populations in the U.S.

DECLARATION OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

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NOTES

1. These measures include federal regulatory requirements and five-star ratings computed using a formula incorporating data on staffing, regulatory violations, and clinical care quality.
2. Thomas et al. (2021) estimate that assisted living mortality rates increased by 17% from 2019 to 2020.
3. Some higher-rated nursing homes still performed worse over time as their processes and strategies were worn away by the challenges of the pandemic (Das Gupta et al. 2021).
4. Other factors that drive nursing care quality are linked to COVID-19 outcomes: crowding (Brown et al. 2021), facility size and number of beds (Abrams et al. 2020; Harrington et al. 2020; Konetzka et al. 2021; Morciano et al. 2021), organizational environment before (Wang et al. 2019) and during the pandemic (Abrams et al. 2020; Gorges & Konetzka 2020; Konetzka et al. 2021; Williams et al. 2021), and staff infection rates (Piet et al. 2021).
5. For more details, see https://www.medicare.gov/nursinghomecompare.
6. For more details, see https://data.cms.gov/covid-19/covid-19-nursing-home-data.
7. For more details, see https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker.
8. For more details, see https://www.census.gov/programs-surveys/acs.

APPENDIX

Table A1. Comparison of All Certified US Nursing Homes to the Management Survey Sample

	Population (2017)			Sample (2017)		
	For-profit	Government	Nonprofit	For-profit	Government	Nonprofit
Number of health deficiencies	7.88	6.64	5.69	7.78	6.07	5.27
Five-star quality rating	2.98	3.40	3.70	2.96	3.70	3.72
Changed ownership in Last 12 Months (yes=1)	0.03	0.01	0.01	0.06	0.00	0.01
Number of certified Beds	110.48	109.42	96.59	106.25	100.14	87.31
Number of residents	89.06	88.39	82.04	84.64	85.85	73.87
Years since approved to provide Medicare/Medicaid	30.65	28.78	30.05	29.72	30.59	28.75
Certification: Medicare and Medicaid	0.96	0.88	0.88	0.94	0.84	0.88
Certification: Medicare only	0.03	0.02	0.09	0.04	0.01	0.07
Certification: Medicaid only	0.01	0.11	0.03	0.03	0.15	0.05
Hospital affiliated home (yes=1)	0.01	0.19	0.12	0.02	0.18	0.09
Staffing hours per resident per day	3.99	4.42	4.57	3.97	4.49	4.52

Note: Mean values are reported

Table A2. Factor-Analytical Results of Survey Items

Survey Item		Factor Loading
External management		
My role is to respond to various events and disturbances in the external environment of our nursing home.		0.50
I always try to limit the influence of external events on the staff and nurses.		0.77
I strive to control those factors outside the nursing home that could have an effect on my organization.		0.84
Eigenvalue		1.56
Innovation management		
Our nursing home is always among the first to adopt new ideas and practices.		0.86
Our nursing home is always among the first to adopt new technology.		0.83
We continually search for new opportunities to provide services to our community.		0.72
Eigenvalue		1.96
Participatory management		
I involve nursing and other non-managerial staff in my nursing home's decision-making process.		0.75
Residents' and families' feedback and outcomes are taken into consideration when revising policies.		0.85
Non-manager feedback is taken into consideration when revising policies.		0.85
Eigenvalue		2.01
Resistance to regulation	Factor1	Factor 2
[Reversed] I believe state inspectors did a good job administering the latest health inspection of our nursing home.	0.83	0.07
[Reversed] Our past state inspectors have generally been experts in nursing home quality.	0.81	0.18
[Reversed] Our past state inspectors have generally been consistent in their practices.	0.77	0.19
[Reversed] The number of deficiency citations assigned to our nursing home by the state inspectors during the latest inspection represents a fair measure of quality of our nursing home.	0.77	0.01
I believe state regulators' behavior is influenced by various political pressures.	0.03	0.70
State regulators often act in their own interest in order to maximize their own benefits.	0.36	0.69
We often show resistance towards unreasonable actions of state regulating agencies.	-0.05	0.63
Regulatory standards and inspections are inadequate to comprehensively measure nursing homes' performance.	0.35	0.48
Compliance with regulatory standards is extremely burdensome and often distracts us from our day-to-day work.	0.46	0.37
Eigenvalue	2.99	1.81

Table A3. Descriptive Statistics for All Variables

Variable	Mean	Std. Dev.	Min	Max	Source
Dependent variable					
Residents total COVID-19 cases (logged)	2.96	1.36	0	5.93	CDC
Residents total COVID-19 deaths (logged)	1.47	1.12	0	4.93	CDC
Independent variable					
Regulation stringency	48.58	4.58	37.27	61.02	OxCGRT
Public nursing home	0.06	-	0	1	NHC
Nonprofit nursing home	0.24	-	0	1	NHC
For-profit nursing home	0.70	-	0	1	NHC
External management	0	1	-2.04	2.41	NHAS
Innovation management	0	1	-3.22	2.03	NHAS
Participatory management	0	1	-3.17	1.23	NHAS
Resistance to regulation: F1	0	1	-2.43	3.21	NHAS
Resistance to regulation: F2	0	1	-3.22	2.79	NHAS
Facility-level controls					
Residents non-COVID-19 deaths (logged)	2.32	1.07	0	7.93	Centers for
Staff confirmed COVID-19 (logged)	3.14	0.84	0	5.74	CDC
Health deficiency (logged)	1.91	0.84	0	4.14	NHC
Five-star quality rating	3.16	1.42	1	5	NHC
Number of federally certified beds (logged)	4.55	0.53	1.61	7.24	NHC
Total number of Residents (logged)	4.33	0.56	1.03	6.63	NHC
Staffing hours per resident per day	3.86	0.92	1.51	12.32	NHC
Years since certification	30.78	12.62	2	54	NHC
Changed ownership in last 12 months (yes = 1; no = 0)	0.02	0.16	0	1	NHC
Certification status: Medicare and Medicaid	0.94	-	0	1	NHC
Certification status: Medicare only	0.04	-	0	1	NHC
Certification status: Medicaid only	0.02	-	0	1	NHC
Hospital affiliated home (yes = 1; no = 0)	0.04	-	0	1	NHC
County-level controls					
Population density per sq. mile (in 1,000s)	1.30	4.13	0.00	72.02	ACS
Market competition	0.80	0.24	0	1.00	ACS
Elderly population (%)	16.81	4.04	6.62	56.71	ACS
White population (%)	77.13	16.53	11.15	99.83	ACS
Uninsured population (%)	8.52	4.38	1.37	40.91	ACS
Poverty population (%)	9.18	3.16	1.87	28.62	ACS
State-level controls					
State total COVID-19 cases confirmed in 2020 (logged)	13.17	0.91	8.91	14.66	OxCGRT
State population in 2020 (logged)	15.92	0.98	13.27	17.49	OxCGRT

Note: Based on a sample of 14,620 nursing homes used in the analysis.

Table A4. Management, Resistance to Regulation, and Resident COVID-19 Outcomes: Complete Table

Independent Variables	Total COVID-19 Cases	Total COVID-19 Deaths
	Model 1	Model 2
Regulatory stringency	-0.066***	-0.044***
	(0.017)	(0.013)
Public nursing home	-0.547**	-0.310*
	(0.174)	(0.147)
Nonprofit nursing home	-0.229	-0.103
	(0.171)	(0.134)
External management	-0.062	-0.070
	(0.069)	(0.055)
Innovation management	0.005	0.020
	(0.071)	(0.057)
Participatory management	-0.184**	-0.058
	(0.065)	(0.054)
Resistance to regulation: F1	-0.041	-0.092+
	(0.068)	(0.055)
Resistance to regulation: F2	0.053	-0.011
	(0.069)	(0.051)
Non-COVID-19 deaths among residents	0.114	0.112*
	(0.073)	(0.053)
Federally certified beds	0.559+	-0.226
	(0.338)	(0.263)
Residents in the facility	0.394	0.790**
	(0.310)	(0.258)
Staff hours per resident per day	0.062	0.009
	(0.073)	(0.054)
Years since certification	-0.004	-0.000
	(0.006)	(0.005)
Changed ownership in last 12 months	-0.171	0.060
	(0.460)	(0.411)
Certification status: Medicare only	-0.361	0.009
	(0.311)	(0.235)
Certification status: Medicaid only	-0.019	-0.143
	(0.291)	(0.224)
Hospital-affiliated home	-0.259	-0.148
	(0.231)	(0.179)
Population density	0.001	-0.005
	(0.009)	(0.007)
Market competition	0.192	0.283
	(0.283)	(0.219)
Elderly population	0.005	0.001
	(0.015)	(0.013)
White population	-0.003	-0.003
	(0.005)	(0.004)
Uninsured population	0.023	0.002
	(0.017)	(0.015)
Population in poverty	-0.000	-0.001
	(0.017)	(0.014)

State COVID-19 cases	0.020	-0.088
	(0.127)	(0.091)
State population	0.117	0.108
	(0.102)	(0.076)
Constant	-0.788	0.446
	(1.422)	(1.112)
Adjusted R-squared	0.252	0.170
N	436	436

Note: Robust standard errors are clustered by county and shown in parentheses.
Two-tailed test; + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

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