

# STAY OR GO: NURSING HOMES' NATURAL DISASTER RESPONSE IN A CHANGING CLIMATE

D.A. HARRIS<sup>1</sup>, G.A. WELLENIUS<sup>2</sup>

1. Department of Epidemiology, Dalla Lana School of Public Health, University of Toronto, Toronto, ON, CA; 2. Department of Epidemiology, School of Public Health, Brown University, Providence, RI, USA. Corresponding author: Daniel Harris, MPH, Department of Epidemiology, Dalla Lana School of Public Health, University of Toronto, (781) 733-5291 [daniel.harris@mail.utoronto.ca](mailto:daniel.harris@mail.utoronto.ca), [daniel\\_harris2@alumni.brown.edu](mailto:daniel_harris2@alumni.brown.edu)

**Abstract:** The Centers for Medicare & Medicaid Services (CMS) reported 15,634 certified nursing homes in the United States in 2014. Approximately 1.4 million older adults reside in nursing homes due to a variety of clinical and social factors. Older adults who transition into nursing home care tend to have a greater prevalence of cognitive and physical morbidities, such as cognitive impairment and chronic obstructive pulmonary disease. Given their clinical vulnerabilities, nursing home residents are at an increased risk of adverse events due to climate change. Major hurricane systems over the past several decades have contributed to significant and avoidable loss of life among nursing homes residents. Currently, evidence from both the qualitative and quantitative literatures consistently suggest that the evacuation of nursing homes residents leads to greater morbidity and mortality compared to sheltering in place due to a host of clinical and environmental factors. However, as extreme weather events intensify due to climate change, policy makers, health officials, and nursing homes will need to reassess their disaster plans amidst the increasing risk of facility damage and need for evacuation from worsening storm systems. In this commentary we review the evidence regarding the risks of sheltering in place versus evacuation during extreme weather events and propose that climate-change projections be integrated into the conversation and development of nursing home disaster preparation.

**Key words:** Climate change, nursing home, evacuation, shelter in place.

## Introduction

Older adults living in nursing homes are at an increased risk of adverse health outcomes as a result of extreme weather events such as hurricanes and severe storms. Since Hurricanes Katrina and Rita in the United States, several studies and reports have compared the health risks of evacuating nursing home residents versus sheltering in place (1-3). These studies have shown that with adequate preparations, sheltering in place tends to be safer compared to evacuation procedures, leading local health departments to advocate and prioritize this method of hurricane response (4). However, if extreme weather events become more frequent and more severe, as currently projected under climate change scenarios (5), will sheltering in place remain the preferred response to extreme weather events? In other words, what is the future generalizability of previous studies' findings in the context of a changing climate?

Our aims in this commentary are to briefly review the history and population of nursing homes, survey past research measuring the effects of evacuation compared to sheltering in place, and ultimately propose that future legislative decisions and recommendations for nursing homes' hurricane response be proactively informed by climate science.

## The challenges of nursing home evacuation

In 2014, the Centers for Medicare & Medicaid Services (CMS) reported that there were 15,634 certified nursing homes in the United States, serving approximately 1.4 million nursing

home residents (6). Notably, among the older adults living in nursing homes, 7.8% were older than 95 years old, 69.3% had three or more impairments of activities of daily living, and 61.4% had moderate to severe cognitive impairment (6). The high prevalence of poor physical and cognitive health lends insight into the medical complexity and vulnerability of older adults living in nursing homes.

The fragility of the nursing home population has facilitated a number of tragedies during past hurricanes. Evacuating a medically complex senior population is associated with several adverse health outcomes (7). As one nurse administrator expressed, maneuvering older adults into buses for transport is not only a formidable task, but also risky, as this population cannot quickly evacuate a bus during a secondary emergency (2). For example, these risks became a reality when twenty-four nursing home residents died when their evacuation bus caught fire during Hurricane Katrina (8).

The quantitative and qualitative evidence regarding the impact of evacuation on nursing home residents has been consistent in highlighting the risks and challenges of evacuating nursing home residents. One qualitative study of twenty nursing home administrators affected by Hurricane Katrina reported consistent themes of inadequate support from government response teams, challenges associated with evacuating a medically acute population, and poor staff retention (2). Similarly, a report by the Office of Inspector General (OIG) of twenty nursing homes in the Gulf States (Alabama, Florida, Louisiana, Mississippi, and Texas), revealed that evacuation

led to unforeseen problems with contractual agreements with transportation services (9). Among the thirteen facilities reporting prior contracts with transportation services, five were unable to access the contracted service due to “overbooking”, as several other nursing homes contracted with the same transportation service. The OIG report also noted that nursing homes reported evacuation taking substantially longer than anticipated, with the median journey to a new host facility taking 3 hours. One nursing home detailed an arduous 19-hour evacuation, marred by numerous vehicle failures, ill residents, 100-degree temperatures, and diminishing supplies. A more recent study that quantified the increase in morbidity and mortality associated with evacuation during hurricanes found that 90-days after Hurricanes Katrina, Gustav, Rita and Ike, evacuation was associated with a 2.7% to 5.3% higher risk of death and a 1.8% to 8.3% higher risk of hospitalization compared to non-hurricane periods (3).

### Sheltering in place

In contrast to evacuation, prior studies have shown that nursing homes residents who sheltered in place during extreme weather events have had better health outcomes compared to their evacuated peers (3). One qualitative study of nursing home administrators affected by Hurricanes Katrina and Rita found that only one of eleven (9%) nursing homes that sheltered in place reported being concerned about resident morbidity and mortality, whereas six of fifteen (40%) administrators who evacuated reported morbidity and mortality as a concern.

Although the results from these previous studies and reports identify the high risk associated with evacuating this vulnerable population, sheltering in place is not without danger. The most prevalent concerns from nursing home administrators who sheltered in place during Hurricanes Katrina and Rita were facility damage, reduced staffing, and limited supplies (2). Many of the concerns and risks associated with sheltering in place are related to the local government’s recovery time and sustainability of resources within the nursing home. For example, in one Florida nursing home, staff were able to care for residents during Hurricane Irma, but limited power resources, high temperatures, and a slow emergency response after the storm contributed to the unnecessary loss of eight lives (10). Clearly, sheltering in place is not without risk, with its success often dependent on external factors, such as the storm’s relative impact and community-level disaster planning and execution. However, the many negative findings evaluating evacuation suggests that keeping residents in place is perhaps, on average the lesser of two risks, leading health systems to recommend that nursing homes prepare accordingly and shelter in place (4).

### Introducing climate science into disaster preparedness

We propose that a crucial element is missing from the interpretation of past research findings and the implementation of current and future emergency preparedness policies. Increasing temperatures intensify extreme weather events, such as hurricanes, and pose significant risks to population health (especially for vulnerable populations like older adults) (11, 12). Although some nursing homes may have withstood hurricanes in the past, climate projections suggest that further increases in storm system intensity will likely render more catastrophic infrastructural damage (5). Moreover, barriers such as limited supplies and limited support from emergency services will likely worsen as infrastructural damage from severe storms becomes more widespread. Therefore, in the context of a rapidly changing climate, the debate regarding evacuation versus sheltering in place deepens in complexity, requiring substantially greater thought and preparation into the drafting of legislation, allocation of resources, and initiation of disaster plans. Addressing these challenges is not just a matter of policy or legislation. Nursing homes should consider and invest in their own emergency preparedness in advance, in the context of a diverse set of growing climate-related threats. This may include infrastructural improvements to be able to better shelter in place.

As the literature currently stands, the debate between evacuation or sheltering in place during a hurricane or severe storm appears to favor the latter; however, as extreme weather events become more common and more severe due to climate change, the relative risks become markedly less clear, highlighting the need to develop policies that extend beyond past experience and take into account the hazards projected for the future. Moreover, the debate of whether or not to evacuate or shelter in place must move beyond the minds of nursing home administrators and be brought into a wider discussion of how to weigh and consider evacuation amidst worsening storm systems, especially as other climate-related threats also exist for this population (e.g., extreme heat, heavy precipitation, and displacement from sea level rise). Now is the time to begin crafting climate-informed policies, and not rely previous findings unlikely to generalize to a changing climate.

*Funding:* The authors have no funding source(s) to report.

*Acknowledgements:* The authors would like to acknowledge Geetika Kalloo for reviewing and providing thoughtful feedback on earlier drafts. Authors DAH and GAW contributed equally to the conception, writing, and revision of the commentary.

*Conflict of Interest:* None to declare.

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