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Revealing the divide: Contrasting COVID-19 outcomes in Green Houses and traditional nursing homes in the United States

Yuchi Young, DrPH[a,*], Wan-Hsiang Hsu, PhD[a,b], Ashley Shayya, MPH[a], Virgile Barnes, MPH[a], Taylor Perre, MSW, MPH[a,c], Thomas O'Grady, PhD[d,e]

[a] Department of Health Policy, Management, & Behavior, State University of New York at Albany, School of Public Health, Rensselaer, NY 12144, USA
[b] Bureau of Environmental and Occupational Epidemiology, New York State Department of Health, Albany, NY 12237, USA
[c] Home Care Association of New York State, Albany, NY 12207, USA
[d] Department of Epidemiology & Biostatistics, State University of New York at Albany, School of Public Health, Rensselaer, NY 12144, USA
[e] Bureau of HIV/AIDS Epidemiology, New York State Department of Health, Albany, NY 12237, USA

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ABSTRACT

Introduction: This study compares COVID-19 case and mortality rates in Green Houses (GHs) and traditional nursing homes (NHs) during the COVID-19 pandemic.
Methods: CMS data from 10 states (June 2020 to September 2022) were analyzed for GHs (n = 19), small NHs (n = 266), and large NHs (n = 2,932). Multivariate Poisson regressions with GEE were used.
Results: Participants (mean age 73.4) were predominantly female (57.8 %) and White (78.2 %). Small and large NHs had a significantly higher COVID-19 case risk (RR = 1.61; 95 % CI 1.25–2.08 and RR = 1.75; 95 % CI 1.36–2.24, respectively) compared to GHs. Large NHs also had an increased mortality risk (RR = 1.67; 95 % CI 1.01–2.77) compared to GHs, with no difference found between GHs and small NHs.
Conclusion: After adjusting for age, gender, and ADL disability, GHs demonstrated lower COVID-19 case and mortality rates than traditional NHs, likely due to their unique features, including person-centered care, size, and physical structure.

Introduction

The COVID-19 pandemic has had a significant impact on the United States (US), resulting in 6,176,518 hospitalizations and 1,132,507 deaths as of June 3, 2023.[1] Older adults and individuals with comorbidities, such as cardiovascular disease, chronic respiratory disease, and/or chronic kidney disease, experienced worse outcomes and a higher COVID-19 mortality rate compared to populations without comorbidities.[2] It is important to note that as individuals age, the severity of chronic conditions worsens, and functional disabilities progress. Consequently, many individuals become unable to perform daily self-care tasks, necessitating assistance from others. As they require more assistance in managing their medical conditions and performing self-care tasks, some seek long-term care (LTC) in different settings depending on personal preference, affordability, and care need. LTC can be provided by informal, unpaid caregivers like family members or professional hired caregivers like home health aides or Registered Nurses. LTC is designed to meet the health care and social needs of individuals who typically have one or more ongoing health conditions or have a need for assistance with daily living tasks like toileting, bathing, and transferring, among others.

For some older adults, home care is appropriate, while others transition to nursing homes or other types of LTC facilities to meet their health and personal care needs.[3] Given the continuing growth of the aging population, ensuring high-quality care and providing diverse options for care modalities are critical concerns for individuals, families, caregivers, policymakers, and governments.

In general, there are two different nursing home care models in the US: Green Houses (GHs) and traditional nursing homes (NHs). These facilities differ in terms of physical structure, size, and care approach. GH homes, designed to resemble houses or apartments, create a home-like setting for residents, promoting a sense of belonging and community participation.[4,5] The GH model emphasizes a more intimate environment, with small households and private rooms for residents, home-like furnishings and amenities, communal space, and outdoor space where residents can socialize and engage in activities. GHs are typically smaller in scale, housing 10–12 residents on only one or more levels. This allows caregivers to provide additional personalized care to residents while also fostering closer bonds between residents and caregivers.[4,5] In contrast, traditional NHs in

*Corresponding author.
E-mail address: yyoung@albany.edu (Y. Young).

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the US have an average of 108 beds, accommodating a larger number of residents.[4,6] They are often housed in larger, multistory buildings with long corridors and a centralized nursing station, resembling the layout of traditional medical institutions.

Although traditional NHs and GHs provide the same level of skilled nursing care and related therapies, the care approach differs between the two. The GH care model empowers caregivers called Shahbazim[7,8] who provide direct resident care including cleaning, laundry, meal preparation, staff scheduling, and other activities.[8] The GH care model is person-centered and caregivers are cross-trained to provide various types of care to residents, including personal assistance, nursing care, and household tasks.[8,9] This care model promotes residents' independence and autonomy. The higher staff-to-resident ratio in GHs allows for meaningful relationships between residents and caregivers to be formed.[9,8] These relationships extend to interactions among residents, family, and friends, creating a sense of community in GHs.

In contrast, traditional NHs often follow a more task-oriented approach to care. With lower staff-to-resident ratios, it may be challenging to provide individualized attention to residents, leaving less room for intimate personal relationships between caregivers and care recipients. Caregivers in traditional NHs typically specialize in specific tasks such as nursing and personal care. Others provide facility cleaning and meal preparation. This increases the number of people entering the nursing facilities with the focus being primarily on meeting residents' medical and basic care needs rather than fostering relationships as in the GH.[8]

Based on the significant differences between GHs and traditional NHs, one would expect variations in residents' health outcomes. The COVID-19 pandemic may actuate more differences between the two models. COVID-19 case and mortality data collected by the Centers for Medicare & Medicaid Services (CMS) offer the opportunity to examine the impact of the nursing home care model (GHs vs. traditional NHs) on COVID-19 outcomes.

Previous GH studies primarily focus on NH characteristics, quality ratings, staffing levels, access to personal protective equipment (PPE), and individual and structural risk factors associated with COVID-19 case and mortality rates.[10–14] However, only two studies have quantified the differences in case and mortality rates between GHs and traditional NHs. Zimmerman and colleagues[15] reported lower case and mortality rates in GHs compared to NHs, but their study was limited to a six-month period and preceded vaccine interventions. Another study by Young and colleagues[16] also found lower COVID-19 incidence and mortality rates in GHs compared to traditional NHs, but their study was limited to New York State and did not explore multivariate models.

To bridge these gaps, this study aims to better understand the difference in COVID-19 case and mortality rates in GHs and traditional NHs across the US utilizing multivariate models. We hypothesize that residents in GHs will have lower case and mortality rates compared to those in traditional NHs.

Methods

This study examined COVID-19 case and mortality rates in GHs and traditional NHs across the US using publicly available data. Institutional Review Board approval was not required for this study.

Study Setting. GHs and NHs from 10 states in the United States

Study Design and Data Sources. This is a prospective study using secondary data analysis. Two data sources: (1) CMS' Nursing Home Minimum Dataset (MDS) from June 1, 2020 to September 30, 2022 and (2) Brown University's LTCFocus Data in 2020. LTCFocus is sponsored by the National Institute on Aging (1P01AG027296) through a cooperative agreement with the Brown University School of Public Health. GHs were identified using the Green House Project's directory.[7]

Inclusion Criteria. There are a total of 3,217 nursing facilities included in this study. NH facility inclusion criteria were (1) NHs located in states in the US having both GHs and traditional NHs (2) Facilities where COVID-19 cases and deaths were reported separately for GHs and traditional NHs, if a facility had both GH and traditional NH beds (3) GHs that were classified as skilled nursing facilities (not as assisted living facilities) and (4) GHs and NHs in the CMS dataset that were matched to the Brown University dataset for sociodemographic variables and activities of daily living (ADL) disability scores. With these inclusion criteria, the GHs and traditional NHs included in the study were located across ten states: Alabama, Arkansas, Colorado, Massachusetts, Mississippi, New York, Ohio, Tennessee, Virginia, and Wyoming.

Measurements

Independent variables. Nursing facility is a categorical variable. Nursing facility type was grouped into three categories: GHs vs. small traditional NHs ($\leq$ 50 beds) vs. large traditional NHs (>50 beds). This nursing home bed cutoff grouping method is similar to previous studies that investigated the impact of NH care models on COVID-19 case and mortality rates[15,16] and enables the comparison of this study with the two previous studies.

Outcome variables. The two primary outcome variables were COVID-19 case and mortality rates which were created from the CMS MDS data. Case rates were calculated using the total number of confirmed cases divided by the total number of occupied beds in the same period (i.e., resident-weeks) multiplied by 1000. Mortality rates were calculated as the total number of deaths due to COVID-19 in a given week(s) divided by resident-weeks in the same period multiplied by 1000. All CMS data were calculated quarterly. Cases and deaths reported before June 1, 2020, and after September 30, 2022, were excluded. The case and mortality rates were aggregated on a facility level.

Control variables. Age, gender, and activities of daily living (ADL) disability score were obtained from Brown University's LTCFocus 2020 dataset. The data were aggregated on a facility level. Functional disability was assessed using the facilities' average long-stay ADL disability scores for all residents admitted during the calendar year. The ADL disability score (e.g., dressing, mobility, transfer, locomotion, etc.) ranged from 0 to 28, with higher average long-stay ADL scores indicating higher care needs and a higher level of functional disability.[17]

Data analysis. Univariate and bivariate analyses, including χ^2 test statistics, Fisher's exact tests, and ANOVAs, were performed to organize the data and assess the association between the variables of interest and the outcome variables. Variables that were significantly associated with the outcome variables at the bivariate level and/or those with clinical importance were included in the multivariate model. The associations between the type of nursing home and COVID-19 case and mortality rates were examined using Poisson regressions with the generalized estimating equation (GEE) model. The models were adjusted for age, gender, ADL disability score, and time (representing the elapsed time since the start of the study). To account for intra-facility correlation, a first-order autoregressive correlation structure was chosen based on goodness of fit (QICu). It is noteworthy that similar results were obtained with different correlation structures. All analyses were conducted using SAS 9.4.

Results

Table 1 presents selected sociodemographic and facility characteristics of the nursing homes under study. The average age of all

Table 1
Selected sociodemographic and facility characteristics of US Nursing Homes stratified by nursing home size (N = 3,217)

	Overall (n = 3217)	Green House (n = 19)	Small Traditional Nursing Home (n = 266)	Large Traditional Nursing Home (n = 2932)	*p value*
Average Age	78.38	83.79	80.31	78.18	<.0001
Average Percent Female	57.78 %	67.43 %	61.45 %	57.43 %	<.0001
Average Percent White	78.21 %	89.56 %	88.43 %	77.27 %	<.0001
Average long ADL score	17.45	17.21	16.70	17.52	<.0001

nursing home residents was 78.4 years old. Approximately 58 % were female, 78 % were White, and the average ADL disability score of long-stay residents was 17.5. The average age of GH residents was significantly older (83.8 years; $p < .0001$) than the residents of small traditional NHs (80.3 years) and large traditional NHs (78.2 years). The proportion of female residents in GH facilities was significantly higher than residents of small or large NHs (67.4 % vs. 61.5 % vs. 57.4 %, respectively; $p < .0001$); similarly, there was a higher proportion of White residents in GHs compared to small and large NHs (89.56 % vs. 88.43 % vs. 77.27 %, respectively; $p < .0001$). Furthermore, GH residents had a higher average ADL score (17.2) than residents in small NHs (16.7), indicating GH residents were more disabled than the residents of small NHs, but slightly less disabled than the residents of large NHs (17.5; $p < .0001$).

Fig. 1 shows the COVID-19 monthly case rates among GHs, small NHs, and large NHs from June 2020 to September 2022, before adjusting for covariates. Over the 28-month study period, GHs had lower average monthly case rates than small NHs for 23 months, which means that in 81.2 % (23/28) of the entire study time, GHs had lower monthly case rates than small NHs. Similarly, GHs had lower monthly case rates than large NHs for 24 months, or 85.7 % (24/28) of the study period. GH performed better in this aspect. During the COVID-19 peak in December 2020, the case rates in GHs (12.2/1000 beds) were substantially lower than both small NHs (41.9/1000 beds) and large NHs (32.8/1000 beds). Additionally, the peak mean case rates for GHs (27.2/1000 beds) were lower than for both small NHs (41.9/1000 beds) and large NHs (35.6/1000 beds).

Fig. 2 depicts the COVID-19 monthly mortality rates among GHs, small NHs, and large NHs from June 2020 to September 2022, before adjusting for covariates. The comparison of mortality rates in GHs with traditional NHs is concordant with results for case rates (see Fig. 1) over the study period. GHs had lower mortality rates than small and large NHs for 78.6 % and 85.7 %, respectively, over the 28 months. The highest mortality rates observed were 2.2 times greater in small NHs and 1.5 times greater in large NHs compared to GHs.

Table 2 presents the results of two GEE Poisson regressions for case rate and mortality rate adjusting for age, gender, ADL disability score, and time in the model. The results indicate that nursing home type was significantly associated with COVID-19 case rates. Compared to GH residents, large NH residents had a 1.75 times higher

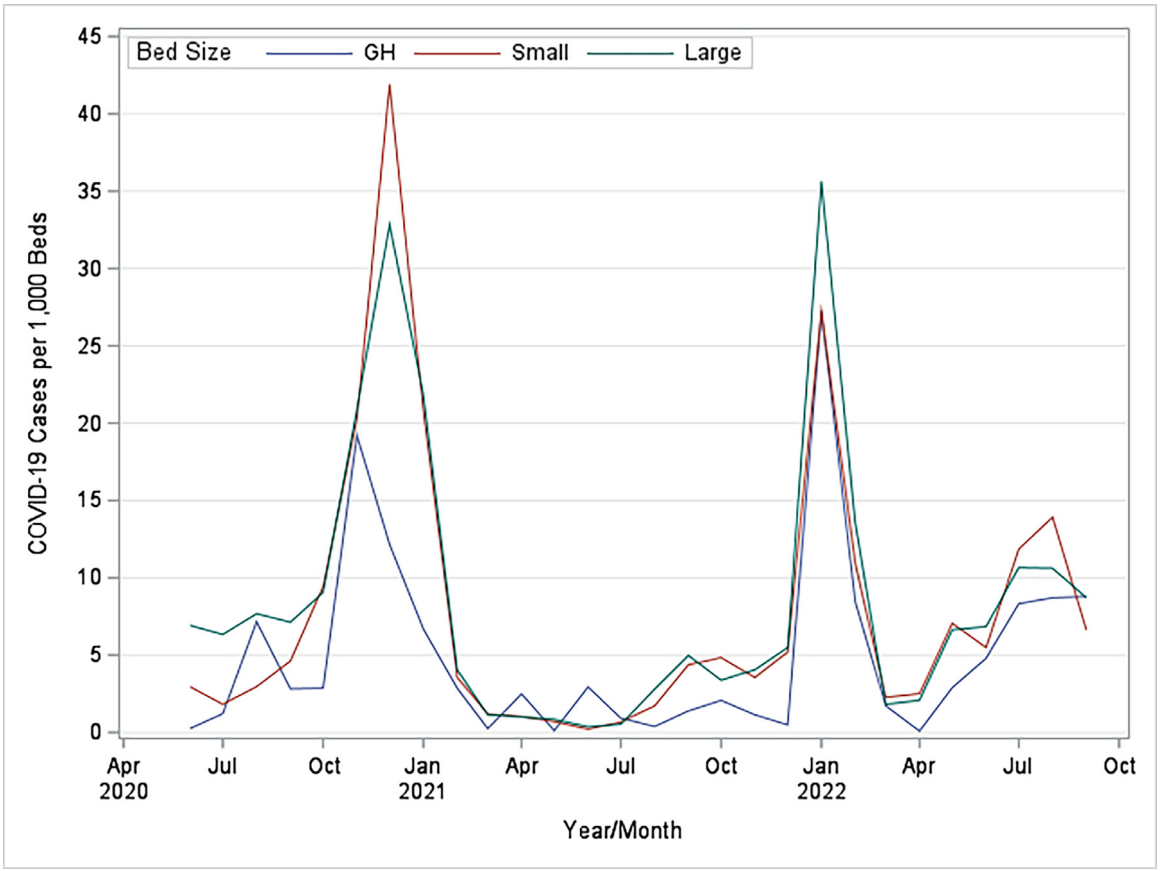

Fig. 1. Monthly COVID-19 case incident rates in small and large nursing homes and Green Houses

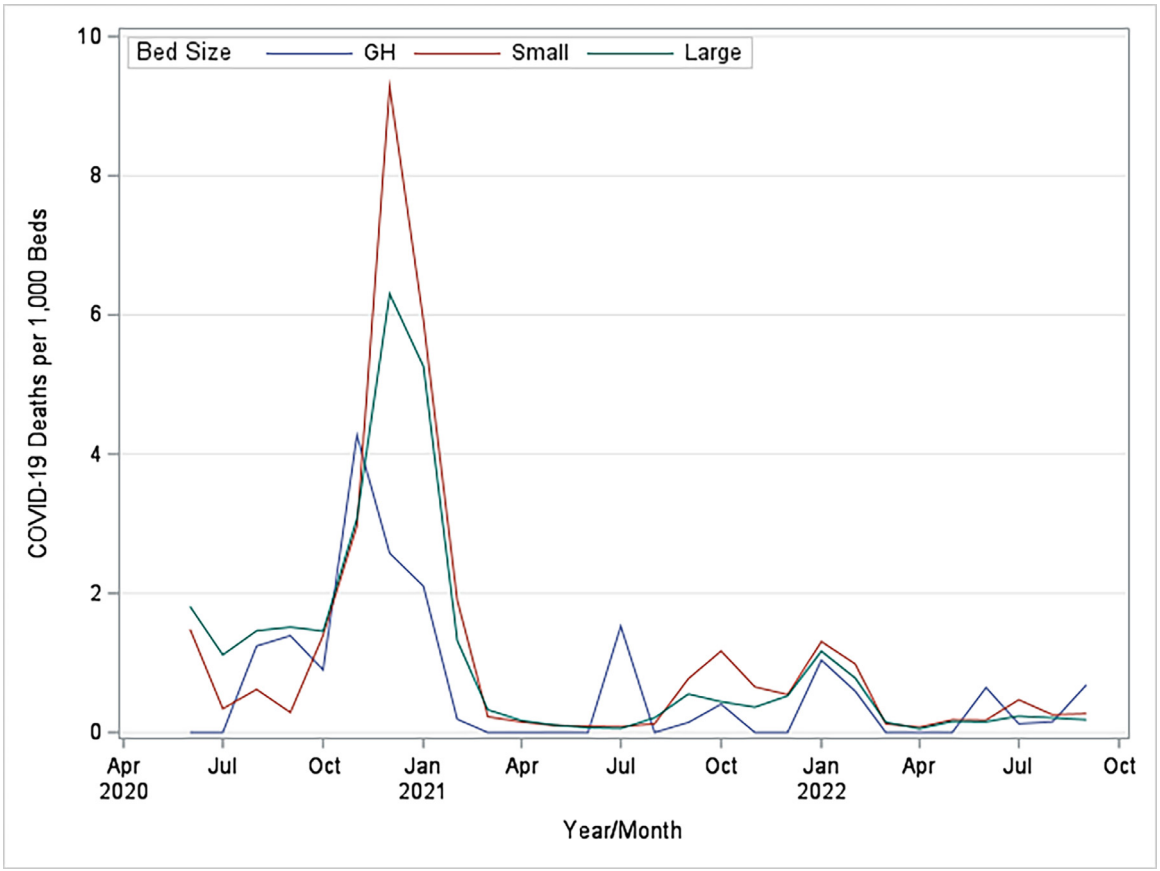

Fig. 2. Monthly COVID-19 mortality incident rates in small and large nursing homes and Green Houses.

risk of contracting COVID-19 (RR 1.75, 95 % CI 1.36–2.24, $p < .0001$). Similarly, residents of small NHs had a 1.61 times higher risk of contracting COVID-19 compared to GH residents (RR 1.61, 95 % CI 1.25–2.08, $p = .0002$).

Residents of large NHs had a 1.67 times higher risk of dying from COVID-19 compared to GH residents (RR 1.67, 95 % CI 1.01–2.77, $p = .047$). Although residents of small NHs also had a 1.58 times higher risk of death compared to GH residents (RR 1.58, 95 % CI 0.94–2.67, $p = .09$), the difference did not reach the level of statistical significance.

Fig. 3 illustrates the change in COVID-19 case rates per 1000 beds over time while adjusting for covariates in the model. A noticeable decline in COVID-19 case rates was observed over time for GH, small NH, and large NH. Large NH recorded the highest case rate, standing at 8.58 COVID cases per 1000 beds in the second quarter of 2020, and it decreased to 8.07 COVID cases per 1000 beds by the third quarter of 2022. In comparison, GH consistently exhibited the lowest rates when compared to both small and large NH. GH reported 5.32 COVID cases per 1000 beds in the second quarter of 2020, and it declined to 5.02 COVID cases per 1000 beds over the same period. These findings regarding adjusted COVID-19 case rates align with those of the unadjusted rates in Fig. 1, where GH consistently showed the lowest COVID-19 case rates, large NH had the highest rates, and small NH fell in between.

Fig. 4 illustrates the change in COVID-19 mortality rates per 1000 beds over time while adjusting for covariates in the model. Overall, the adjusted mortality rate exhibited a decline throughout the study period for all three types of nursing homes. In comparison, GH consistently maintained the lowest mortality rate, while small NH reported the highest mortality rate and large NH fell in between these two categories. In the second quarter of 2020, small NH had the mortality rate of 2.93 COVID deaths per 1000 beds, and it progressively

Table 2
Generalized estimating equation poisson regressions predicting COVID-19 case and mortality rates in nursing homes.

Parameter	Relative Risk	Lower Relative Risk	Upper Relative Risk	*p value*
A. COVID-19 Case Rates				
Intercept	0.01	0.01	0.02	<.0001
Large NH (ref = GH)	1.75	1.36	2.24	<.0001
Small NH (ref = GH)	1.61	1.25	2.08	.0002
Time	0.99	0.98	0.99	.03
B. COVID-19 Mortality Rates				
Intercept	0.001	0.00079	0.00350	<.0001
Large NH (ref = GH)	1.67	1.01	2.77	.047
Small NH (ref = GH)	1.58	0.94	2.67	.09
Time	0.76	0.75	0.77	<.0001

Note. Age, gender, ADL disability score were adjusted in the model for COVID-19 case and mortality relative risks.

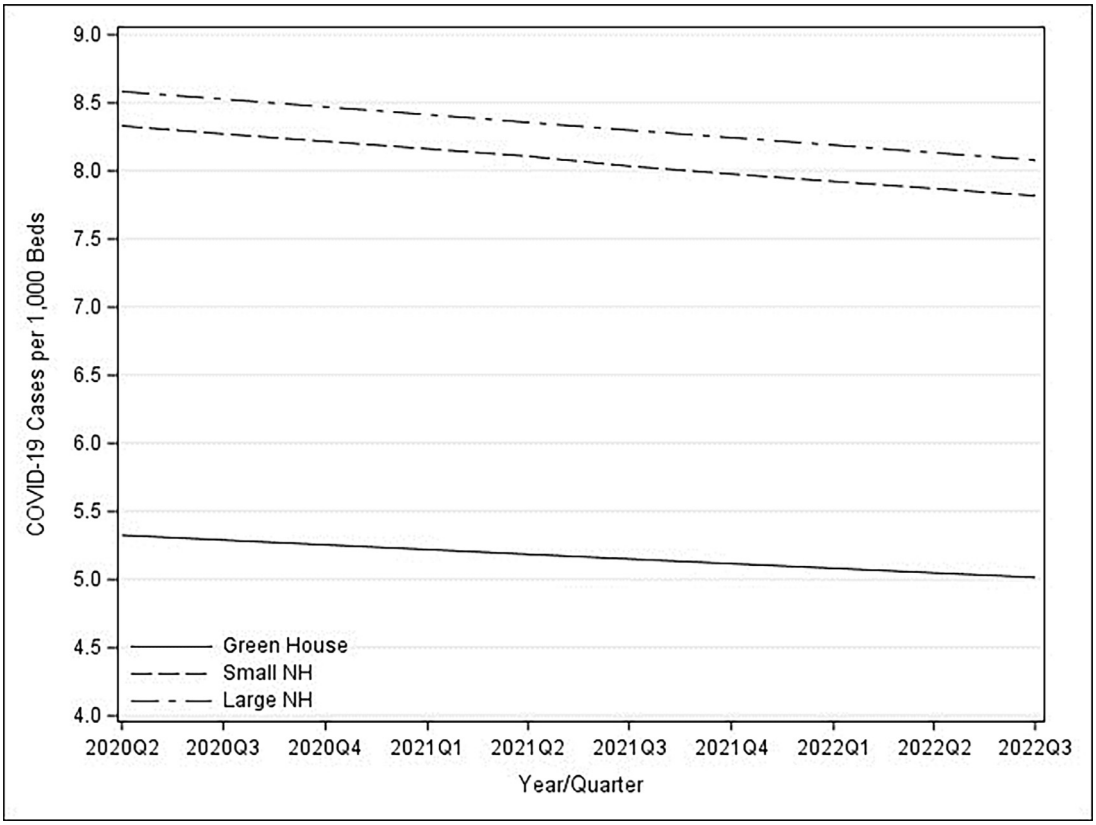

Fig. 3. Adjusted COVID-19 case rates per 1000 beds over time among GHs, Small NHs, and Large NHs.The multivariate model adjusts for age, gender, race, and ADL (Activities of Daily Living) disability scores.

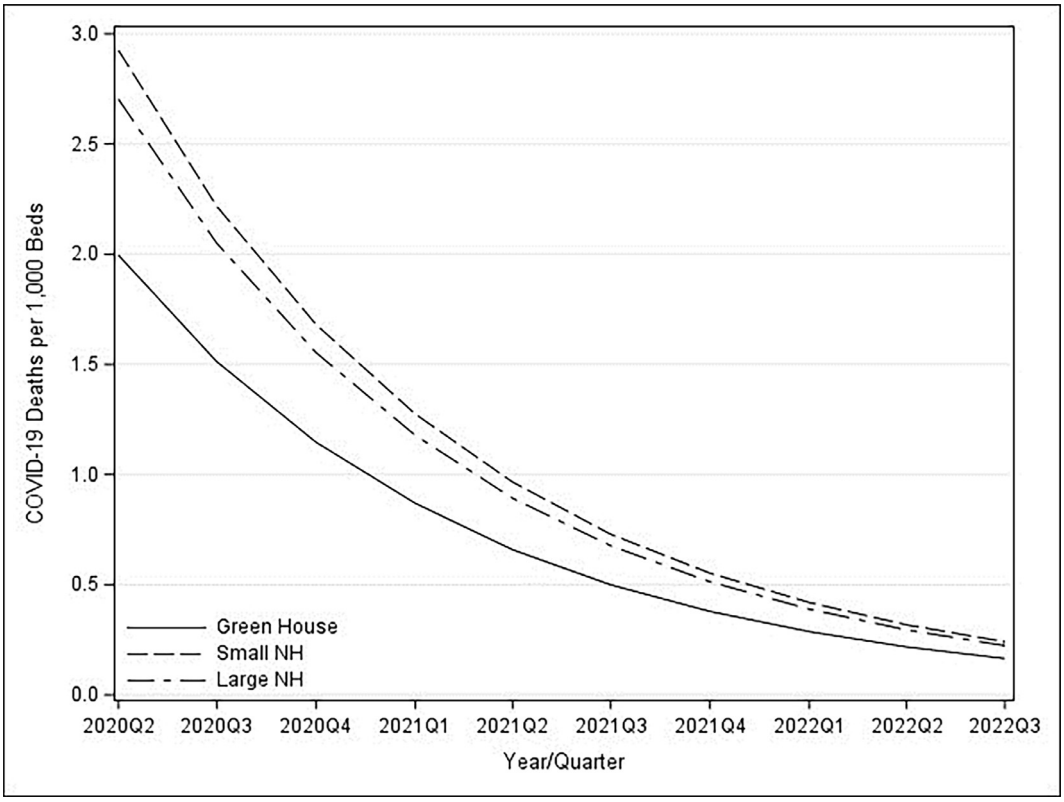

Fig. 4. Adjusted COVID-19 death rates per 1000 beds over time among GHs, Small NHs, and Large NHs.The multivariate model adjusts for age, gender, race, and ADL (Activities of Daily Living) disability scores.

decreased over time to 0.24 COVID deaths per 1000 beds in the third quarter of 2022. GH had the lowest mortality rate, with 1.99 COVID deaths per 1000 beds in the second quarter of 2020, and remarkably, this figure decreased to 0.16 COVID death per 1000 beds by the third quarter of 2022.

These findings regarding adjusted COVID-19 death rates align with those of the unadjusted rates in Fig. 2, where GH consistently displayed the lowest COVID-19 death rates, small NH had the highest rates, and large NH was positioned in between. It's important to note that the decline in COVID-19 death rates coincided with the availability of COVID-19 vaccines in December 2020, with nursing home residents being a priority for vaccination.

Discussion

This study builds upon our previous research which compared COVID-19 case and mortality rates among residents of GHs, small NHs, and large NHs in New York State (NYS).[16] The previous study's bivariate analyses revealed significantly lower COVID-19 case and mortality rates among GH residents compared to both small (≤50 beds) and large NHs (>50 beds). However, the previous study had limitations as it only included NHs in NYS, of which only three were GHs. The current study expanded the scope of the previous study by encompassing 19 GHs across 10 states and conducting multivariate analyses adjusting for age, gender, ADL disability score and time.

The study contributes to the literature by

1. Providing empirical evidence of the GH model's effectiveness in preventing COVID-19 cases and deaths, compared to traditional NHs.
2. Identifying and discussing barriers to a broader adoption of GHs: market demand, construction/operation costs, reimbursement, and regulatory complexities.

The discussion will focus on the following two areas: (1) the unique features of the GH and care approach (2) the barriers to a broader adoption of GHs in the US.

What are the unique characteristics of the Green House care model and how do they impact COVID-19 outcomes?

After adjusting for age, gender, ADL disability, and time in the multivariate models, GHs continued to stand out with lower COVID-19 case and mortality rates when compared to small and large NHs. GHs typically house 10–12 residents and feature an independent physical structure with private rooms/bath and shared living spaces that ensure privacy while promoting social interaction.[4,7] These unique independent physical structures may provide better protection from COVID by reducing the risk of transmission of the virus. Additionally, the Shahbazim offer person-centered care to their residents. Shahbazim are responsible for household duties in addition to meeting residents' ADL needs. This person-centered care model not only provides potentially better health outcomes for GH residents but also gives responsibility and independent decision-making to the Shahbazim.[9,18,19,20] It also facilitates mutual respect among caregivers and residents, leading to higher job satisfaction and lower turnover rates among Shahbazim.[5,20] These unique features of GHs, small size, physical structure, and care delivery model, may contribute to lower COVID-19 case and mortality rates of residents in the GHs compared to traditional NHs.

Overall, the GH model offers a homier and more intimate environment with smaller-sized dwellings that enable person-centered care and relationship-building, while traditional NHs are larger and more institutionally structured. NH care may lean toward a more task-oriented approach that aims for efficiency. These different care models may shed some light on why GHs are doing better than traditional NHs in terms of health outcomes.

That said, the care model design and implementation in GHs is not uniform. It can vary from one GH to another, including the coordination of care between nurses and Shahbazim. Bowers and Nolet found that communication and care coordination between nurses and Shahbazim were not always well implemented in GHs.[8] They also noted a lack of clear guidance on best practices from regulators, providers, or consumers, as well as limited outcome evaluation of the "cultural change care model."[8] These findings were supported by Cohen et al., who emphasized that the variation in care model complicates efforts to evaluate outcomes.[4] Despite these concerns, our study's COVID-19 data results provide evidence that the GH model of care is a better model for preventing COVID-19 incidence and deaths compared to the traditional NH model of care.

Considering the better outcomes of the GH model, why are there so few GHs being built? What are the barriers to broader GH adoption in the US?

Based on our study's results, the residents of GHs have approximately half the rate of COVID-19 case and mortality rates when compared to traditional NHs, regardless of traditional NH size. These results are consistent with previous studies.[15,16] Additionally, other studies have found that GHs are effective in reducing hospital admissions, direct care staff turnover,[18,19,20] and Medicare (Part A) spending.[9] That said, if the GH model is more effective in preventing COVID-19,[15,16] along with these other benefits, why are there not more GHs? We approach this question from numerous perspectives, considering market demand, construction/operating costs, payers, and regulatory complexities.

Market demand

The Baby Boomer Generation (BBG), born between 1946 and 1964, will have all reached age 65 by 2029. At this time, the estimated 73 million older adults in the US, including the pre-BBG, will comprise 20 % of the total population, an increase from 14 % in 2012.[21] On average, Americans reaching age 65 today will need $138,000/year for their future care.[22] About one-third of people reaching age 65 are expected to need LTC services for more than 2 years and will incur higher LTC costs.[22] Those who use paid LTC services, whether through home- and community-based services or institutional care, are among the most expensive participants in Medicare and Medicaid programs.[23] This increasing aging population serves as the driving force for the LTC market, and consequently, the demand for LTC services is expected to rise.

Currently, there are only 74 GH facilities (a total of 346 GH home units) across all 50 states in the US,[7] housing about 4100 residents nationwide, which is less than 1 % of the NH population.[24] Given the many positive outcomes that are associated with the GH model,[5,9,16,18,20] it is assumed that older adults, caregivers, family members, and policymakers would want more GHs available to meet the LTC needs of vulnerable populations. As the aging population continues to increase, the market demand is a guarantee; however, there are potential barriers that may discourage entrepreneurs from investing in GHs possibly explaining why there are few GHs in the US.

Construction and operating costs

Despite the potential market demand, building and operating GHs requires significant upfront investments and ongoing expenses, posing financial risks and challenges in land acquisition, construction and operating costs, staffing, and regulatory compliance.

Land acquisition. Identifying and acquiring suitable land for GH construction can be a complex task due to the limited availability of suitable land, high costs of land acquisition, zoning and regulatory compliance, community resistance, infrastructure requirements, and other considerations. Overcoming these obstacles can be challenging, time consuming, and costly.

Construction and operating cost. Building new GHs or converting existing facilities into GHs can be expensive due to the need for specialized design features. The initial investment required may deter investors from pursuing the GH model. The GH model contains small households with private rooms for residents, home-like furnishings and amenities, communal space, kitchens, and outdoor space where residents can socialize and engage in activities. All these features create additional expenditures, increasing the overall costs. The expense of building one nursing home is multiplied by the number of GHs. For example, instead of the one institutional-size kitchen needed for a NH, there would be a need for one kitchen per GH home, and each of those kitchens would need to be inspected and monitored to meet the Department of Health and Occupational Safety and Health Administration (OSHA) requirements. Instead of internet and cable for one facility, each GH home would require its own installation and monthly fees, etc. These additional costs add up.

Staffing. Given the difference in philosophies and practices in traditional NHs and GHs, it is sometimes challenging for staff to adapt to the multiple roles they will play in the GH model. The Shahbazim are part of a self-managed team, working independently and collectively. The Shahbazim cross-task training is more complex, expensive, and time-consuming. For example, the kitchen operation training of Shahbazim must be in compliance with commercial kitchen operation regulations. They must buy into the GH person-centered care philosophy that differs from the traditional NH where each staff member is most likely trained for a singular task for the purpose of efficiency. Compensation rates for Shahbazim are higher than traditional NH staff. These staffing expenses add to the overall operating costs.

Payor sources

In general, there are five sources of payors for GH and NH services: (1) private pay – individuals paying out-of-pocket (2) Medicare – covers short-term stays or rehabilitative care in GHs, typically following a hospital stay (3) Medicaid – covers LTC services, including GH residency, for eligible individuals (4) Veterans Administration (VA) – benefits cover eligible military veterans, and (5) private LTC Insurance – covers institutional care. Payments are not standardized across programs and extensive documentation is imposed by government programs. Multiple payor sources make the claims process complex and cumbersome. In addition, reimbursement systems and funding mechanisms designed for traditional NHs may not align well with the GH model; this may hinder financial support and appropriate reimbursement rates. For example, in New York State, Medicaid pays approximately equal rates for Medicaid recipients whether they reside in GHs or Traditional NHs. With the higher capital and operational costs of GHs, investors may question the return on their investment.

Standardized Medicaid payment policies may discourage more investors from buying into the GH concept.

Previous studies found that the adaptation of the GH model reduces Medicare Part A hospitalization and skilled nursing facility (SNF) spending,[9] 30-days readmissions,[18] and potential preventable hospitalizations.[25] If Medicare Part A cost savings could be confirmed by larger studies, could GHs request a higher reimbursement rate from Medicaid or a value-based payment method based on the quality of care provided in GHs? Vice versa, since Medicaid can provide Medicare cost-sharing assistance, secondary insurance, premium assistance, etc., would it be possible for Medicare Part A to share the cost savings with GHs due to their reduced hospitalizations, readmissions, etc.?

In addition, the COVID-19 pandemic may have introduced new considerations and uncertainties for investors in the LTC sector, affecting their willingness to invest in new GH facilities. Overall, market viability, financial risks, and reimbursement challenges may contribute to cautious investor attitudes. For example, because of the shortage of nursing assistants/caregivers, some GH facilities had to reduce their number of homes.

Regulatory considerations and compliance

The healthcare industry is subject to various regulations, policies, and licensing requirements that can hinder decision-making for investors. The LTC and NH industry is heavily regulated in each state. Regulatory factors play a significant role in the establishment and operation of GHs, with variations in regulations and licensing requirements across states. Entrepreneurs seeking to establish GHs must navigate complex regulatory frameworks, including compliance standards, and licensing processes, which can impact their decision-making. The NH sector requires obtaining a certificate of need (CON) before proposing creations or expansions of healthcare facilities. A CON is needed to avoid unnecessary expansion or duplicative services within an area, and it can be a daunting and challenging task. Navigating these regulatory complexities and ensuring compliance can be time-consuming, resource-intensive, and expensive, which further negatively affects the attractiveness of investing in GHs.

Conclusion

The GH model has demonstrated promising outcomes with lower COVID-19 case and mortality rates, fewer hospital admissions, lower caregiver turnover rates, and potential cost savings for CMS when compared to traditional NHs. However, the limited number of GHs in the US can be attributed to various factors including market demand, cost of construction and financing, and the regulatory environment. While the GH model offers compelling benefits, the aforementioned factors must be addressed to allow for an environment that is conducive to GH investment/expansion, thus benefitting more individuals who need LTC services. This potential for expanding the GH model of care warrants further discussion.

Study limitations

Some limitations of this study should be acknowledged.

Generalizability of the Study: Our study's inclusion criteria were limited to the ten states with coexisting GHs and traditional NHs. This selection aimed to avoid overrepresentation of traditional nursing homes, limiting the applicability of our results to states with similar configurations.

Secondary data use limitations

Integration of Multiple Datasets: A significant limitation of our study arises from our reliance on secondary data sources. The CMS data did not include critical social demographic information, necessitating the integration of the Brown University dataset to address this gap. The use of two datasets not originally designed for our specific study introduces the inherent risk of overlooking essential variables.

Limited GH Inclusion: Challenges arose when including GHs in our study. Some facilities operated both GHs and traditional NHs under a single NH license, preventing the differentiation of case and death rates in GHs. As a result, GH data was excluded from our analysis.

Exclusion of Continuing Care Retirement Community GHs: Furthermore, some GHs in the CMS data were categorized under "continuing care retirement community nursing homes." The care model for these continuing care retirement community GHs remained unclear, leading to their exclusion from our study due to this ambiguity.

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Declaration of Competing Interest

The authors declare no competing interests.

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