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NURSING HOME CLOSURES DID NOT INCREASE IN 2020 AND 2021, DESPITE FINANCIAL CHALLENGES CAUSED BY THE COVID-19 PANDEMIC

KEY POINTS

- Nursing homes faced many financial challenges throughout the COVID-19 pandemic, but closures did not increase during 2020 and 2021.
- There was some evidence that nursing homes that were more impacted by COVID-19 were more likely to close.
- Some nursing home characteristics were associated with a higher likelihood of closure, including location in an urban area, smaller in size, with lower occupancy rate, and lower percentage of residents with Medicare as the primary payer. Previous work examining factors associated with closures from before the COVID-19 pandemic identified some of the same factors.
- There are several explanations for the absence of additional closures during 2020 and 2021.
  - Nursing homes used several strategies to mitigate staffing shortages, including freezing admissions and closing portions of facilities.
  - Federal and state financial assistance to nursing homes likely prevented or delayed closures.

BACKGROUND

Nursing homes experienced unprecedented financial challenges during the COVID-19 pandemic, raising concerns about a potential increase in nursing home closures. The COVID-19 pandemic resulted in lower occupancy rates and revenue in nursing homes,[1] because fewer older adults entered long-term nursing home care or utilized short-term post-acute care due to postponed procedures. At the same time, the pandemic raised operating costs with new expenditures on personal protective equipment (PPE), cleaning supplies, and COVID-19 tests; and exacerbated existing staffing shortages, resulting in increased costs to attract and retain workers.[2] In an August 2020 industry survey,[2] over one-half of nursing homes reported currently operating at a loss, and three-fourths expressed concern about their ability to sustain operations for another year.

Nursing homes provide vital services for beneficiaries with long-term care needs and those with short-term needs for rehabilitative care. Nursing home closures can result in worse health outcomes for residents because of disruptions in care or stress and trauma from relocation.[3,4] Additionally, closures can result in immediate and prolonged access issues. For example, in some remote and less populous locations, the closure of a nursing home would require residents to move long distances to find another nursing home or seek an alternative arrangement. Further, the demand for nursing home care is expected to increase in the coming decade, with the population age 75+ predicted to grow by almost 40%, and the 80-84 age group alone growing 55%.[5] Although home and community-based services (HCBS) may partially meet care needs, nursing homes will continue to be needed for older adults with complex care needs and chronic health conditions such as dementia.

Several studies have examined patterns in nursing home closures over the past decade, prior to the COVID-19 pandemic. One study examined closures from 2015 through 2019 and found an increase in closures with a concentration in certain states and rural areas.5 Another study based on data from 2008 through 2018 found that, on average, closed nursing homes had lower bed counts and lower occupancy levels compared with open nursing homes.[6] A more recent study by the Office of the Assistant Secretary for Planning and Evaluation (ASPE) found that the number of nursing home closures was relatively stable at an average of 0.82% of all facilities each year from 2011 through 2017, and then increased to 0.96% in 2018 and 1.34% in 2019.[7] The study identified several facility-level risk factors for closure, including location in an urban area, higher percentages of non-White and Medicaid residents, and worse quality according to the Centers for Medicare & Medicaid Services (CMS) Health Inspection Surveys.

We conducted the present study to understand trends and patterns in nursing home closures during the COVID-19 pandemic. We interviewed nursing home industry experts and providers to obtain insights about the financial and operational challenges experienced by nursing home operators during the pandemic, and their perspectives on federal and state policies that may have affected closures during the pandemic. We also examined the frequency of closures from 2020 through 2021. Lastly, we identified facility-level factors associated with closures during 2020 and 2021, including those related to the impact of COVID-19 on specific nursing homes, such as reported staffing shortages during the pandemic and the extent of COVID-19 infections in the nursing home.

DATA AND METHODS

This issue brief integrates quantitative analysis of nursing home data with interviews of nursing home industry experts and nursing home providers. Our study population included facilities certified only as skilled nursing facilities (SNFs-only), serving primarily Medicare beneficiaries who need post-acute rehabilitation after a hospital stay; facilities certified only as nursing facilities (NFs-only), serving primarily Medicaid beneficiaries who need long-term personal and custodial care; and nursing homes dually certified as both SNFs and NFs (SNFs/NFs). We excluded hospital-based nursing homes due to differences in organization structures and business practices that could have unique effects on closures. Our final sample included 16,361 unique nursing homes from 2011 through 2021, of which 671 (4.1%) were SNFs-only, 570 (3.5%) were NFs-only, and 15,120 (92.4%) were dually certified SNFs/NFs.

We identified closures using the Provider of Service (POS) files and defined closures as all documented terminations from the Medicare and Medicaid programs, whether voluntary or involuntary. Terminations may result from mergers and acquisitions, and facilities may continue to operate under a different identification. We first identified nursing homes with both a termination date and non-zero termination code. The termination code is zero for active facilities and non-zero for terminated facility. We then classified a nursing home as “closed” in the year of the termination date if there was no subsequent certification survey within 18 months of the termination date.

Additionally, in the absence of a record with both a termination date and non-zero termination code, we considered a nursing home to be closed in the year of the last certification survey if more than 5 years passed between the last survey and the end of the study period (December 2021). This method cannot be used to identify closures for facilities active as of 2017 as there is not five years of data available. However, the impact of this limitation is minimal as this method only identified 16 closures from 2011 to 2017.

We used descriptive statistical analyses to examine the frequency of closures annually, both overall and disaggregated by state and by nursing home characteristics such as profit status. We then conducted bivariate and multivariate logistic regression analyses to identify nursing home characteristics associated with closures during the COVID-19 pandemic in 2020 and 2021. We obtained characteristics from the Provider Data Catalog

(PDC), LTCFocus, National Survey of Long-Term Care Providers (NSLTCP),[a] the CMS COVID-19 Nursing Home dataset, and USAFacts. Characteristics included nursing home size (certified bed count), quality (CMS 5-star nursing home ratings for health inspections, staffing, and quality measures), and resident characteristics (e.g., acuity of residents and percent of minority residents); the state-level availability of nursing home alternatives (adult day service centers and residential care facilities); and pandemic-specific characteristics (e.g., the average weekly proportion of residents with COVID-19,). A comprehensive list of characteristics and their data sources can be found in ***Appendix A***. Our primary multivariate regression predicted the probability of a facility closing in 2020 or 2021, based on independent variables (see ***Table A-1*** and ***A-2***) which were measured before 2020 (POS variables[b] were based on 2020 data but these variables are unlikely to change). We conducted an additional regression using only 2021 closures to examine the COVID-19 pandemic-specific characteristics. Weekly reporting of COVID-19 characteristics began in May 2020, and we averaged a facility's weekly rate from May 2020 through the end of 2021 or until the last week that there were records for the facility. We report our results using odds ratios. For a given facility characteristic, an odds ratio (OR) of less than 1 indicates the characteristic is associated with a lower likelihood of closure, relative to the reference, while an odds ratio greater than 1 indicates the characteristics is associated with a higher likelihood of closure. We compared our findings to the findings of the previous ASPE study of closures from 2011 through 2019 to determine whether findings were unique to the pandemic or a continuation of prior trends. We present the full model specifications and results in ***Appendix A***.

To learn more about the impact of the COVID-19 pandemic on closures, we interviewed eight experts, including two non-governmental industry stakeholders and six providers, and conducted thematic analysis. Interviews focused on financial and operational challenges during the COVID-19 pandemic that contributed to closures; nursing home characteristics associated with closures; federal or state policies that assisted nursing homes to maintain operations; and ongoing pandemic-related challenges. After each interview, the team cleaned the transcripts, highlighted key findings, and summarized those themes across all interviewees. These key points are highlighted throughout the findings presented in this brief.

LIMITATIONS

A limitation in our study was that our "closure" definition includes mergers and acquisitions. In POS data, mergers and acquisitions and voluntary closures have the same termination code value. This limits our understanding of whether nursing homes ceased to function or whether they simply transferred ownership. This is particularly relevant during 2018 and 2019, when we see relatively higher rates of "closures" compared to all other years coinciding with numerous news reports of mergers and acquisitions during that same period.

This study included a small sample of two industry experts and six providers, limiting the perspectives that are captured to inform our understanding of the challenges nursing homes encountered that may lead to closures during the pandemic. In addition, interviewees could not comment on our analytical findings, given that our interviews preceded data analysis.

We note that some level of closure is to be expected even in the absence of the pandemic for reasons such as poor performance and oversupply at the local level. We cannot, however, determine the reason for a particular nursing home's closure, whether or not it was directly related to the COVID-19 pandemic, or the appropriateness of closures.

[a] Survey years 2012, 2014, and 2016 were used in this study. This dataset is now known as the National Post-acute and Long-term Care Study.

[b] POS characteristics include urban-rural location and profit status.

FINDINGS

Nursing Homes Faced Many Financial Challenges Throughout the Pandemic

Nursing home providers and industry experts described four key financial challenges that impacted nursing home costs, affecting their financial viability during the pandemic.

Use of Costly Contract Staffing

Because of challenges related to staffing shortages, previous ASPE research has shown that increased use of contract staffing occurred in the first year of the pandemic.[6] All interviewees indicated that contract staffing rates for nursing staff (registered nurses, licensed practical nurses, and certified nursing assistants) doubled to tripled compared to their pre-pandemic amounts and directly affected their operations and future financial stability. A recent industry report also confirms contract staffing costs increased 2-3 times over pre-pandemic costs.[7]

A non-profit provider described the effects of contract staffing on their finances: *"… the exorbitant cost of [contract] agency staff to just staff our buildings has been a significant financial drain. We've spent about 4 million, year to date, and we still have a few months left in this fiscal year."*

A for-profit provider described: *"The last time we had contract labor in our company was [the early 80s]… We haven't had it for 30 years and…we peaked out at 1.6 million per month [during the pandemic]."*

Increased PPE and COVID-19 Testing Costs

Almost all industry experts and providers indicated that supply chain challenges resulted in increased PPE costs which also affected their operations and expenditures. Interviewees shared that PPE costs have doubled throughout the pandemic and were only starting to level off as of Spring 2022. A few providers and industry experts noted that extra costs were also incurred to test residents and staff for COVID-19 throughout the pandemic. Multiple industry experts and providers noted that supplies were not only expensive, but difficult to find and purchase, especially at the beginning of the pandemic (early to mid-2020). Generally, interviewees were also appreciative of federal and state policies to help fund PPE and testing but always said more was needed throughout the pandemic, especially as supply chain challenges contributed to increased costs for PPE.

Reduced Occupancy Rates

Experts and providers described how decreases in resident census, occurring early in the pandemic, resulted in lost revenue for nursing homes. Industry and news reports confirm reductions in nursing home census during the pandemic.[8,9] Census reductions resulted for the following primary reasons: fewer elective surgeries resulting in diminishing discharges to nursing homes for rehabilitation; resident deaths due to COVID-19; and resident discharges by family members. As needed, admissions were also stopped or limited because of nursing home COVID-19 outbreaks.

An industry expert described a "ripple effect" in operations and financial stability, from the start of the pandemic onward, stating: *"You had this complete ripple effect, and when you aren't able to have your beds filled in order to keep your census up, and you don't have staff to take care of them, you cannot bring in people to keep your census up… You're just trying to survive."*

Increased Resources Expended to Manage Changing Infection Guidance

Almost all providers and industry experts described having to invest substantial staff time into interpreting and implementing the frequently updated infection control guidance and regulations throughout each COVID-19 wave and variant. Previous research confirms that staffing dedicated to following and implementing new infection control protocols increased in 2020.[10] Staff burnout was also reported to occur as a result.

Nursing Home Closures Did Not Increase in 2020 or 2021

Despite the challenges faced by nursing homes, there was not an increase in closures in 2020 and 2021 (***Table 1***). There were 128 closures in 2020 (0.86% of nursing homes) and 139 closures in 2021 (0.94% of nursing homes), which is similar to annual closure rates from 2011 through 2019. In fact, closure rates in 2020 and 2021 decreased from 2019, which had 200 closures (1.34% of nursing homes).

Table 1. Nursing Home Closures, 2011–2021

Year	Total Number of Nursing Homes	Number of Closures	Percent of Nursing Homes Closed
2011	14,771	124	0.84%
2012	14,776	141	0.95%
2013	14,796	109	0.74%
2014	14,843	110	0.74%
2015	14,882	126	0.85%
2016	14,924	126	0.84%
2017	14,938	113	0.76%
2018	14,969	143	0.96%
2019	14,939	200	1.34%
2020	14,833	128	0.86%
2021	14,799	139	0.94%

Trends in Closure Rates for Specific Subgroups of Nursing Homes Were Similar throughout the Study Period

We also examined 2020 and 2021 closures by nursing home characteristics such as provider type (NFs-only, SNFs-only and SNF/NFs), profit status, urban-rural location, and chain status. While closure rates varied by characteristic, the closure patterns of facilities with a given characteristic in 2020 and 2021 were similar to patterns observed in facilities with that characteristic from 2011 through 2019 (results not shown) or to patterns observed in facilities overall (described above). There was no indication of a disproportionate impact of the pandemic on nursing homes with certain characteristics (e.g., for-profit facilities).

There Was Some Evidence that Nursing Homes with Greater COVID-19 Impacts Were More Likely to Close in 2021

Staffing Shortages

Although nursing home providers and industry experts emphasized staffing challenges and the high cost of staffing, nursing home-reported staffing shortages, recorded in the CMS COVID-19 dataset, was not a strong predictor of closure. We divided nursing homes into four groups (known as quartiles) based on lower vs. higher rates of staff shortages; we found no large differences in closure rates in 2021 across these quartiles. However, as shown in ***Table 2***, there were somewhat fewer closures among facilities within the second quartile of reported staff shortages compared to facilities in the first, third, and fourth quartiles--fewer than 0.80% of facilities in the former group closed, compared to over 0.90% in each of the three latter groups. After adjusting for other factors, nursing homes reporting the most frequent staff shortages (fourth quartile) were statistically

significantly more likely to close in 2021 than nursing homes reporting a moderate frequency of shortages (second quartile) (OR=2.24[c]).

Table 2. Relationship Between Percent of Weeks with Staff Shortage and Nursing Home Closure			
Quartile	**% Weeks Reporting Staff Shortages**	**% Closures in 2021**	**Odds Ratio**
1 (lowest percent)	0.00% to <1.19%	0.93%	1.520
2	1.19% to <4.76%	0.77%	Reference
3	4.76% to <32.14%	1.02%	1.959
4 (highest percent)	32.14% to 100%	0.98%	2.243*
*p < 0.05, ** p< 0.01, *** p < 0.001			

COVID-19 Infections

There was some evidence that a higher number of COVID-19 cases among residents and staff was associated with closures. In comparing unadjusted rates, nursing homes with the fewest and with the most COVID-19 cases among residents (first and fourth quartiles) were most likely to close in 2021 (1.28% and 1.41%, respectively, compared to fewer than 0.60% in the middle quartiles) (***Table 3***), and the same pattern held for COVID-19 cases among staff (1.00% and 1.44%, respectively, compared to fewer than 0.80% in the middle quartiles) (***Table 4***). When controlling for other characteristics, nursing homes with the highest rates of COVID-19 cases among residents and staff (fourth quartile) were statistically significantly more likely to close than nursing homes with a moderate number of cases (second quartile) (OR=2.56 for resident cases; OR=1.93 for staff cases). Contrary to expectations, closure rates were also higher among nursing homes with the fewest COVID-19 cases (first quartile), although these differences were not statistically significant.

Table 3. Relationship Between Resident-confirmed COVID-19 Cases (per 1,000 residents) and Nursing Home Closures			
Quartile	**COVID-19 Cases per 1,000**	**% Closures in 2021**	**Odds Ratio**
1 (lowest average)	0.00 to <4.63	1.28%	1.692
2	4.63 to <8.59	0.54%	Reference
3	8.59 to <11.70	0.38%	0.861
4 (highest average)	11.70 to 353.62	1.41%	2.560**
*p < 0.05, ** p< 0.01, *** p < 0.001			

[c] An Odds Ratio greater than 1 indicates higher likelihood of closure than the comparison group, with higher Odds Ratios indicating a greater risk of closures. In this case, an Odds Ratio of 2.24 means that nursing homes in the fourth quartile of reported staff shortages had odds of closing more than twice those of nursing homes in the second quartile.

Table 4. Relationship Between Staff-confirmed COVID-19 Cases (per bed) and Nursing Home Closure			
Quartile	**COVID-19 Cases per Bed**	**% Closures in 2021**	**Odds Ratio**
1 (lowest percent)	0.000 to <0.004	1.00%	1.360
2	0.004 to <0.005	0.79%	Reference
3	0.005 to <0.007	0.41%	0.797
4 (highest percent)	0.007 to 0.250	1.44%	1.931*
*p < 0.05, ** p< 0.01, *** p < 0.001			

Vaccination

Nursing homes with the lowest and highest resident vaccination rates (first and fourth quartiles) as of June 2021 were most likely to close in the second half of 2021 (0.36% and 0.34%, respectively, compared to ≤0.25% in the middle quartiles) (***Table 5***). Nursing homes with the lowest staff vaccination rates were most likely to close (0.42%, compared to <0.30% in the other quartiles) (***Table 6***). The odd ratios and statistical significance of vaccination results are unknown. Because vaccination data was not available until June 2021, we did not include it in the regression examining closures in 2021. This would require restricting our sample size to closures in just the second half of 2021, which is too small to assess statistical significance. For these reasons, we present only bivariate analysis results for vaccination and suggest examining this characteristic further when more data is available.

Table 5. Relationship Between Percent Resident Vaccination and Nursing Home Closure		
Quartile	**% Vaccinated**	**% Closures in Second Half of 2021**
1 (lowest percent)	0.00% to <73.90%	0.36%
2	73.90% to <84.38%	0.25%
3	84.38% to <91.77%	0.20%
4 (highest percent)	91.77% to 100.00%	0.34%

Table 6. Relationship Between Percent Staff Vaccination and Nursing Home Closure		
Quartile	**% Vaccinated**	**% Closures in Second Half of 2021**
1 (lowest percent)	0.00% to <43.12%	0.42%
2	43.12% to <57.58%	0.25%
3	57.58% to <72.41%	0.17%
4 (highest percent)	72.41% to 100.00%	0.28%

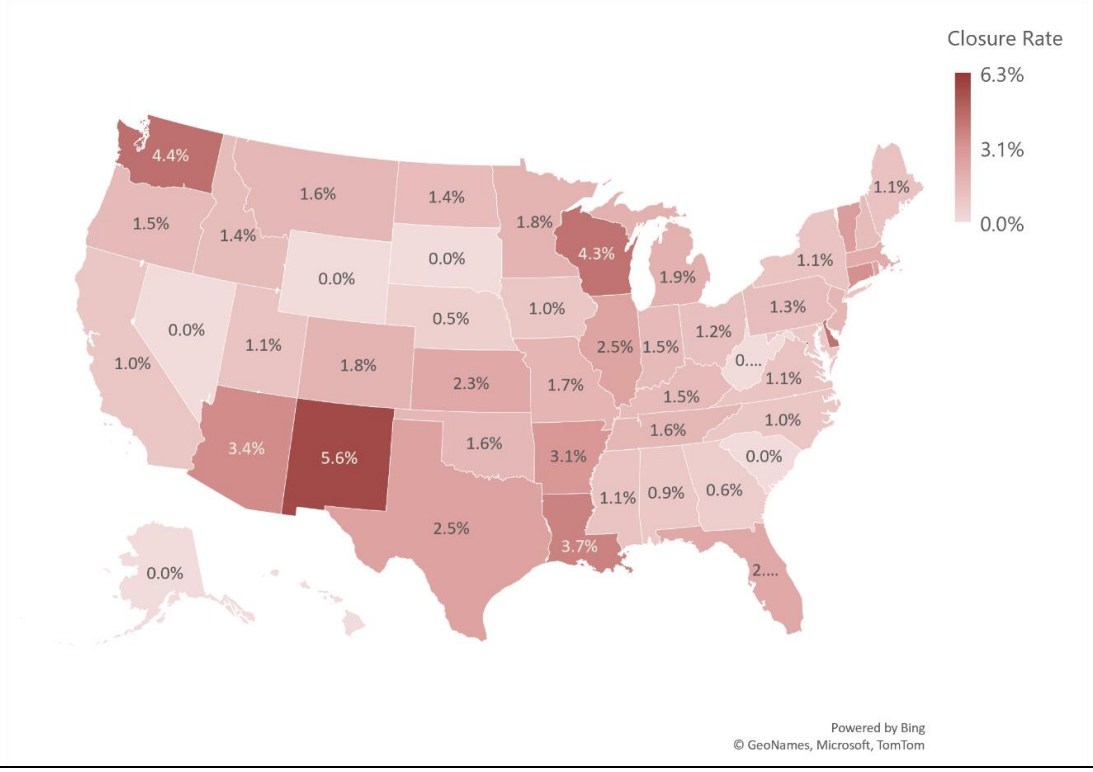
Several Nursing Home Characteristics Were Associated with Closures in 2020 and 2021, and Many of These Were also Associated with Closures Pre-Pandemic

State

There was no clear geographical trend in closures in 2020 and 2021 (***Figure 1***). This breaks from the trend seen from 2011 through 2019, where states in the middle and western United States had higher nursing home closure rates (many >10%) than states in the eastern United States (many <5%).[7] The highest closure rates in 2020 and 2021 were observed in Washington D.C., New Mexico, and Washington state. New Mexico and

Washington state had relatively high closure rates (14.46% and 11.30%, respectively) from 2011 through 2019 as well,[7] and thus these higher rates may not be attributable to the pandemic. Seven states had no closures in 2020 and 2021.

Figure 1. Percent of Facilities that Closed by State, 2020–2021



Urban/Rural

Urban nursing homes were more likely to close than rural nursing homes during 2020 and 2021 (OR=2.31, p=<0.0001).[d] One explanation may be market factors specific to urban areas that impact closure rates, such as increased competition from other nursing homes or alternative services. This finding is consistent with the results of the 2011-2019 ASPE analysis,[5] and thus is not unique to the pandemic.[e]

During interviews, providers and industry experts described differences in the impacts of pandemic-associated challenges on rural and urban nursing homes. Most providers indicated that nursing homes in rural locations would be more adversely affected by the pandemic and more likely to close. Although we found that urban nursing homes were more likely to close, as in pre-COVID times, there still may have been COVID-19 related challenges unique to rural nursing homes. Similarly, one industry expert agreed stating rural nursing homes, in general, serve higher percentages of Medicaid residents than urban facilities, and were most affected by staffing turnover and competition during the pandemic, which increased their reliance on contract staff, likely disproportionately increasing their operational expenses. Most providers were in agreement that being under-resourced is a strong predictor of closure and that under-resourced nursing homes can be found in any

[d] The odds ratios we report for urban/ rural and for the other variables we report in this section can be found in ***Table A-4***. An odds ratio less than 1 indicates lower likelihood of closure than the comparison group, with Odds Ratios closer to zero indicating lower risk of closures.

[e] The 2011-2019 analysis refers to the multivariate regression and thus reflect findings after adjusting for other factors.

geographic location. Their commonality is resource scarcity and dependence on higher Medicaid reimbursement.

Percentage of Medicare and High Acuity Residents

Nursing homes with a higher percentage of Medicare residents in 2019 (second, third and fourth quartile) were less likely to close than nursing homes with the lowest percentages of Medicare residents (first quartile) (OR=0.535, OR=0.573 and OR=0.587, respectively; p=<0.05).[f] In the 2011-2019 ASPE analysis,[7] the percentage of Medicare residents was not a statistically significant predictor of closure, but higher percentages of Medicaid residents were associated with statistically significant increases in the likelihood of closure. Nursing homes with the highest percentages of high acuity residents in 2019 (fourth quartile) were less likely to close than nursing homes with the lowest percentages of these residents (first quartile) (OR=0.515, p<0.05). This finding is consistent with the results of the 2011-2019 ASPE analysis.[7] These findings may reflect relative reimbursement levels for these residents. Medicare payments for post-acute care are higher than Medicaid payments for long-term care, and Medicare and Medicaid pay more for residents with higher care needs. Nursing homes with more Medicare and high acuity residents prior to the pandemic may have been in a better financial position to address the challenges of the pandemic. An industry expert noted nursing homes that are more reliant on Medicaid than Medicare reimbursement could be at risk for more closures based on their recent internal analysis.

> ***A nursing home industry expert said this about nursing homes that are more dependent on Medicaid as compared to Medicare:*** *"When you get to less than 75 [Medicare] admissions a year, that Medicare margin's not helping you at all, you're completely dependent on your Medicaid rates… And it's one of the strongest predictors in almost all the analyses that are out there."*

Size and Occupancy Rate

Larger nursing homes with higher certified bed counts (second, third and fourth quartile) were less likely to close than nursing homes with the fewest beds in the lowest quartile (OR=0.54, OR=0.345 and OR=0.27, respectively; p=<0.01). Similarly, nursing homes with higher occupancy rates in 2019 (second, third and fourth quartile) were less likely to close than nursing homes with the lowest rates, in the lowest quartile (OR=0.281, OR=0.21 and OR=0.126, respectively; p<0.0001). Both of these findings were consistent with the results of the 2011-2019 ASPE analysis.[7] Both nursing homes with a higher certified bed count and higher occupancy rates earn more revenue, and even following declines in resident census during the pandemic, may have continued to have relatively higher census and occupancy rates. Larger nursing homes may also have greater ability to financially or physically restructure than smaller nursing homes, protecting them from market disruptions. Several of the individuals interviewed also noted that smaller nursing homes may be at greater risk of closure, regardless of the pandemic. One provider said "I'd say your larger buildings, just by the physical nature of them had more options to isolate and to create COVID-19 units and do things, whereas in smaller buildings, you didn't have a whole lot of options. And when you have a small building and you have the 50 employees and you lose 30 employees, 20 employees, you've got trouble."

> ***A nursing home provider described how some nursing home characteristics combined relate to nursing home closures:*** *"There's a lot of parallels, small and rural communities… Medicaid rates are 70–80% [of the population] and the workforce is absolutely evaporated."*

[f] Quartile ranges for all variables can be found in ***Appendix Table A-3***. For example, the highest quartile of percent of Medicare residents included nursing homes above 15.6%.

Five-Star Quality Ratings

Through the CMS Care Compare Nursing Home Five-Star Quality Rating System, nursing homes receive star ratings based on health inspections, quality measures, and staffing. Nursing homes in the lowest (1 star) health inspection ratings reported in January 2020 were more likely to close than nursing homes with mid-range (3 stars) health inspection ratings (OR=2.422, p=<0.001). One explanation is that lower quality nursing homes may be subject to more fines and involuntary closures. This finding was consistent with the results of the 2011-2019 ASPE analyses.[7]

In contrast, nursing homes with the highest (4 and 5 stars) staffing ratings reported in January 2020 were more likely to close than nursing homes with mid-range (3 stars) staffing ratings (OR=1.962 and OR=2.552, respectively; p<0.01). One explanation is that the staffing levels needed to reach the highest staffing stars may be a financial burden. In the 2011-2019 ASPE analyses, facilities with 2-star staffing ratings were less likely to close and nursing homes with 4 and 5 stars were more likely to close than nursing homes with 1 star.[7]

A nursing home provider described how they made staff wages more competitive to decrease their reliance on contract staff: *"So we realized early a year and a half ago that this contract labor is so expensive.… It took us about 6 months, but we did a across the board increases on CNAs, especially. And why wouldn't we? I mean, you can't live today with $12 or $11 an hour, you live on that."*

Presence of Nursing Home Alternatives

We examined state-level concentrations (defined as number of providers per 1,000 adults age 65 and older) of the following nursing home alternatives: adult day service centers, home health providers, and residential care facilities. The availability of these alternatives increases competition for residents and reflects the extent to which states have transitioned Medicaid dollars from nursing homes to HCBS. Interestingly though, we found that nursing homes in states with the most residential care facilities (fourth quartile) in 2016 were less likely to close than nursing homes in states with the fewest residential care facilities (OR=0.456, p=0.001). The availability of other nursing home alternatives did not predict closure. In the 2011-2019 analysis, the availability of nursing home alternatives, regardless of type, also did not predict closure.[7]

Nursing Homes Employed Several Strategies to Remain Viable During 2020 and 2021

Findings from our interviews described how nursing homes implemented strategies to stabilize their nursing home and chain finances, and helped to explain why more nursing homes did not close. They also described how COVID-19 funding affected the financial stability of nursing homes throughout the pandemic.

Nursing Homes Used Several Approaches to Manage Staffing Shortages

Throughout the pandemic, nursing homes have intentionally reduced their resident census to respond to staffing shortages. Some providers described freezing admissions; most providers described how they closed some part(s) of their nursing home.

One provider explained how infection control guidance was an additional investment of staff time: *"One of the biggest challenges other than staffing has been the guidance and regulatory changes over the course of the pandemic… the numerous [and] excessive guidance changes and in many cases conflicting. They're very confusing. They require someone to really gain a level of expertise to be able to navigate and provide guidance."*

Providers also invested in additional wages and compensation to recruit new nursing staff or to maintain existing staff. They cited increased salaries and benefits, pay transparency on job postings, and schedule flexibility as strategies to attract workers. One provider described their efforts to recruit international nurses to help secure their workforce, particularly as a strategy to avoid the costs of contract staff.

Nursing Homes Invested More Financial Resources Toward Infection Control

Most providers reported investing staff time to interpret and implement rapidly changing infection control guidance. All stakeholders described how the constant updating of federal, state, and local guidance affected their operations. A few providers described vaccine encouragement as an important strategy to prevent closures because vaccination reduced the spread of infection, reducing avoidable hospitalizations and resident deaths, and helped to stabilize census overall. One provider shared that they had a very high rate of vaccination and booster rates among their residents and staff, though there were initial challenges with staff vaccination rates, particularly in rural communities. Another provider said that the availability of vaccinations resulted in improved health outcomes for their residents, thus helping to stabilize their census.

State and Federal Policies Helped Nursing Homes Stabilize Finances and Maintain Occupancy Rates

Federal and state funds (e.g., the Coronavirus Aid, Relief, and Economic Security Act [CARES Act], American Rescue Plan, the Provider Relief Fund [PRF], and the Paycheck Protection Plan) assisted nursing homes to prevent closures. Providers cited benefits from the PRF and other COVID-19 relief payments that helped to maintain their financial stability. Providers and industry experts all described the funding assistance policies as helpful, but "not enough" to meet what providers needed. A few providers with nursing homes in multiple states described disparities in Medicaid rates and increases across states, suggesting that in states with lower Medicaid rates, this could be a factor affecting operations and closures. Medicaid rates that increased during the pandemic were still insufficient according to most providers. The only non-funding policy that was identified as helpful by multiple industry experts and providers was the CMS Section 1135 temporary 3-day stay waiver[g] which helped nursing homes to maintain occupancy throughout the pandemic.

> ***One for-profit provider described the effect of federal funding on their nursing home operations:*** *"… but if it were not for the federal relief funds, the PRF, the CARES Act and that money that came into us, like 12 or 13 million dollars, if it weren't for that we'd be out of business."*

CONCLUSION

Nursing home providers faced many financial challenges throughout the pandemic. Industry experts and providers agree that all nursing homes, regardless of nursing home characteristics, were affected by mounting financial pressures particularly because of costs related to increased contract staffing rates, PPE and testing, low occupancy rates, and dedicating resources to constantly changing infection control guidance. However, despite these challenges, closures did not increase in 2020 and 2021. This study found that nursing homes located in an urban area, smaller in size, with lower occupancy rate, and lower percentage of residents with Medicare as a primary payer were more likely to close in 2020 and 2021. According to most stakeholders interviewed in this study, federal and state stimulus funding (e.g., CARES Act) assisted in preventing closures and extending the financial life of facilities. Nursing homes also employed strategies to control their operational costs and prevent closures, including partial closures to respond to ongoing staffing shortages. Many interviewees expressed concern that nursing homes may close later in 2022 and into 2023 as a result of federal and state stimulus funding ending (predicted by providers and industry experts at the time of our interviews). This is consistent with findings of a June 2022 survey, in which 73% of nursing homes were concerned about closing due to staffing related challenges.[13] However, reimbursement changes may help prevent closure. Several states have increased Medicaid reimbursements recently, and additional states are

[g] CMS implemented temporary waivers in response to challenges experienced by nursing homes during the COVID-19 pandemic. This particular waiver applied to SNFs only and waived the requirement for a 3-day hospital inpatient stay for patients who need to be transferred to a SNF as a result of the effect of a disaster or emergency.

working to rebase Medicaid rates in 2023.[14] CMS has consistently proposed updates to the federal payment rates for the Prospective Payment System.[15] Our study had several limitations, including the inclusion of mergers and acquisitions in our closure definition and the limited sample of interviewees. Future research should continue to explore the effects of the COVID-19 pandemic on nursing home closures.

APPENDIX A. QUANTITATIVE METHODS

In this appendix, we provide additional information about our study sample construction, the independent variables used in our models, and our full model specifications and results.

Details on Study Sample

Our study population included all non-hospital-based nursing homes in the United States from 2011-2021. Nursing homes were defined as facilities that were SNFs-only, NFs-only or facilities dually certified as both SNFs and NFs (SNFs/NFs). We identified nursing homes using POS files (2011-2021), which are yearly facility-level files containing records for each nursing home operating each year. Each record has information about provider type (SNFs-only, NFs-only or SNFs/NFs), hospital-based status, most recent certification date, and if applicable, information about termination, including a termination date and termination code. We performed extensive data cleaning to address data anomalies including missing records, termination dates appearing in incorrect data files (based on years), providers that were surveyed and closed within a day, and other types of problematic data. We excluded facilities in the years they were hospital-based. Our final sample included 16,361 unique nursing homes from 2011-2021, of which 671 (4.1%) were SNFs-only, 570 (3.5%) were NFs-only, and 15,120 (92.4%) were dually certified SNFs/NFs.

We created a longitudinal file (facility-year level) to measure closures from 2011-2021, and a cross-sectional file (facility-level) to study factors associated with nursing home closures during 2020-2021 to identify factors associated with closures.

Identification of Closure

We identified closures using the POS files and captured all documented terminations from the Medicare and Medicaid programs, whether voluntary or involuntary. We first identified nursing homes with both a termination date and valid termination code indicating closure (non-missing and non-zero). We then used the presence of certification surveys to determine if these nursing homes were permanently closed. If a survey occurred within 540 days (~18 months) of the termination date, the nursing home was determined to be still active. If no survey occurred within 540 days, the nursing home was determined to be closed in the year of the termination date. We identified additional closures, in the absence of a termination date and termination code combination, through lapses in certification surveys. Specifically, if more than 1,825 days (~5 years) passed between the nursing home's last certification survey and the end of the study period (December 2021), the nursing home was considered closed in the year of the last certification survey. This was a rare occurrence as we found the majority of closures had both a termination date and code combination. From 2011-2017, only 16 of 834 closures were identified using gaps in certification surveys.

The POS termination code categorizes closures based on reason for closure. One caveat is that the largest category is a combination of two different closure types with different meanings for the purposes of this study. The termination code labelled "01=voluntary-merger, closure" includes both voluntary closures and mergers. We confirmed the meaning of this code with the dataset owners. Mergers are a closure in the sense that the original business entity (Medicare Identification Number and Tax Identification Number) ends, but the facility itself continues to function. The POS data did not allow us to separate true closures from mergers. This was noted above in the limitations section.

Independent Variables

We defined a number of independent variables to study factors associated with nursing home closures. Characteristics for inclusion in our models were selected based on conceptual relevance, data integrity and correlation with other characteristics. POS, PDC, and LTCFocus data provided characteristics pertaining to the ownership type, quality, case mix of residents and facility size for each facility. NSLTCP provided state-level

information about nursing home alternatives. These characteristics were also included in the previous ASPE study of closures from 2011-2019.[5] Additionally, we examined characteristics directly related to the COVID-19 pandemic. The CMS COVID-19 Nursing Home dataset provided facility-level information about staff shortages, COVID-19 cases and vaccination, and USAFacts provided county-level information on COVID-19 deaths. All characteristics are displayed below in ***Tables A-1*** and ***A-2***. Although we show the descriptive statistics for the continuous variables in ***Table A-1***, in the models, we categorized these continuous variables into quartiles.

Most characteristics were defined using pre-pandemic data. Characteristics from LTCFocus were defined using the 2019 values; if 2019 values were missing, 2018 values were used. Characteristics from PDC were defined using January 2020 values; if January 2020 values were missing, January 2019 values were used. The NSLTCP survey was conducted biennially and publicly available from 2012-2016. We selected the value from the 2016 survey. These characteristics were standardized to display provider count per 1,000 individuals age 65+. Information on state populations was obtained from the American Community Survey.

Characteristics from POS such as urban-rural location and ownership type were not expected to change frequently over the study period. These characteristics were defined using the latest file year of a facility, which was 2021 for the majority of facilities and 2020 for facilities closing in 2020. A combined profit chain variable was created. Additionally, we defined the facility as having a recent ownership change if they had a change in ownership date in the last 5 years (on or after January 1, 2017).

The CMS COVID-19 Nursing Home data is a weekly facility-level file, starting in May 2020. We examined data through the last week of 2021 or the last week reported for the facility, in cases of closure. For resident COVID-19 cases, we computed the average number of cases per 1,000. For staff COVID-19 cases, we computed the average number of cases per beds. For staff shortages, we computed the percent of weeks with a staff shortage, defined as a shortage in aides, clinical staff, nursing staff or other staff. Vaccination was recorded as the percent with a completed vaccination as of June 2021.

Statistical Modelling

We used descriptive statistical analyses to examine closures from 2011-2021, both overall and disaggregated by state and by nursing home characteristics such as profit status. We then conducted bivariate and multivariate logistic regression analyses to identify nursing home characteristics associated with closures during the COVID-19 pandemic. For these analyses, we examined closures during 2020-2021 and closures in 2021 separately. We isolated 2021 because the characteristics directly related to COVID-19 could only be defined using data from the middle of 2020. It may not be appropriate to predict 2020 closures based on these measures because facilities that closed early in 2020 for non-pandemic reasons had lower COVID-19 rates, since they closed before there was an opportunity for outbreaks. By 2021, we assume that all facilities were impacted by the pandemic. We conducted bivariate analyses for each closure timeframe, as displayed in ***Table A-3***. Our primary multivariate regression predicted closures in 2020-2021, based on independent variables not directly measuring COVID-19 and primarily measured before 2020. This regression included 12,778 facilities. We conducted an additional regression using only 2021 closures to examine the characteristics directly related to the COVID-19 pandemic. This regression included 12,634 facilities. Full multivariate regression results are displayed in ***Table A-4***.

Table A-1. Continuous Variable Distributions							
Characteristic	Data Source	Mean	Minimum	25th Percentile	50th Percentile	75th Percentile	Maximum
Acuity Index	LTCFocus	12.14	0.00	11.58	12.28	12.90	22.50
Percent of Minority Residents	LTCFocus	21.44	0.00	3.57	13.21	33.06	100.00
Percent of Residents with Low Cognitive Impairment	LTCFocus	38.13	0.00	29.79	37.14	45.45	100.00
Percent of Medicaid Residents	LTCFocus	61.11	0.00	50.65	65.35	77.08	100.00
Percent of Medicare Residents	LTCFocus	12.23	0.00	5.26	9.47	15.60	100.00
Occupancy Rate	LTCFocus	80.33	3.33	72.08	84.14	91.67	100.00
Certified Bed Count	POS	107.35	1.00	66.00	100.00	128.00	874.00
Adult Day Service Center Provider Count (per 1,000 aged 65+)	NSLTCP	0.09	0.01	0.05	0.07	0.11	0.24
Home Health Provider Count (per 1,000 aged 65+)	NSLTCP	0.29	0.03	0.15	0.24	0.39	0.89
Residential Care Community Provider Count (per 1,000 aged 65+)	NSLTCP	0.53	0.10	0.30	0.36	0.70	2.64
Nursing Home Provider Count (per 1,000 aged 65+)	NSLTCP	0.37	0.14	0.25	0.36	0.46	0.78
Percent of Weeks with Staffing Shortage	CMS COVID-19	21.93	0.00	1.19	4.76	32.14	100.00
Resident Confirmed COVID-19 Cases (per 1,000 residents)	CMS COVID-19	8.56	0.00	4.63	8.59	11.70	353.62
Staff Confirmed COVID-19 Cases (per bed)	CMS COVID-19	0.01	0.00	0.00	0.01	0.01	0.25
Average Monthly COVID-19 Deaths in the County (per 100k population)	USAFacts	12.19	0.00	8.70	11.74	15.08	49.41
Percent Resident Vaccination	CMS COVID-19	80.49	0.00	73.90	84.38	91.77	100.00
Percent Staff Vaccination	CMS COVID-19	57.09	0.00	43.12	57.58	72.41	100.00

Table A-2. Categorical Variable Distributions				
Characteristic		**N**	**% of Facilities**	**Data Source**
Urban/Rural Location	Rural	4,022	26.89%	POS
	Urban	10,934	73.11%	
Ownership Change in Last 5 Years	No Changes	12,535	83.81%	POS
	Changes	2,421	16.19%	
Profit and Chain Affiliation Status	For-Profit Chain	6,838	45.72%	POS
	Non-Profit Chain	1,897	12.68%	
	For-Profit Non-Chain	4,020	26.88%	
	Non-Profit Non-Chain	2,201	14.72%	
CMS 5-Star Health Inspection Rating	1 star	3,005	20.42%	PDC
	2 stars	3,559	24.19%	
	3 stars	3,342	22.71%	
	4 stars	3,368	22.89%	
	5 stars	1,439	9.78%	
CMS 5-Star Staffing Rating	1 star	2,087	14.21%	PDC
	2 stars	3,799	25.86%	
	3 stars	4,089	27.83%	
	4 stars	3,262	22.20%	
	5 stars	1,454	9.90%	
CMS 5-Star Quality Measures Rating	1 star	956	6.50%	PDC
	2 stars	2,187	14.87%	
	3 stars	3,056	20.77%	
	4 stars	3,806	25.87%	
	5 stars	4,706	31.99%	

Table A-3. Bivariate Analyses Results--Factors Associated with Nursing Home Closures			
Characteristic	**Quartile Range**	**Percent of Closure in 2020 and 2021**	**Percent of Closures in 2021 Only**
Urban-Rural Location	**N/A**		
Reference Group: Rural		1.69%	0.82%
Urban		1.82%	0.97%
Ownership Change in the Last Five Years	**N/A**		
Reference Group: No Changes		1.76%	0.89%
Changes		1.94%	1.16%
Profit and Chain Affiliation Status	**N/A**		
Reference Group: For-Profit Chain		1.70%	1.04%
Non-Profit Chain		1.42%	0.84%
For-Profit Non-Chain		1.77%	0.72%
Non-Profit Non-Chain		2.41%	1.04%
CMS 5-Star Health Inspection Rating	**N/A**		
Reference Group: 3-Star Rating		1.38%	0.78%
1-Star Rating		2.30%	0.97%
2-Star Rating		1.66%	0.84%
4-Star Rating		1.54%	0.98%
5-Star Rating		2.43%	1.18%
CMS 5-Star Staffing Rating	**N/A**		
Reference Group: 3-Star Rating		1.12%	0.51%
1-Star Rating		2.59%	1.05%
2-Star Rating		0.89%	0.45%
4-Star Rating		2.27%	1.26%
5-Star Rating		3.37%	2.20%
CMS 5-Star Quality Measures Rating	**N/A**		
Reference Group: 3-Star Rating		1.57%	0.88%
1-Star Rating		3.14%	1.36%
2-Star Rating		1.65%	0.78%
4-Star Rating		1.73%	0.89%
5-Star Rating		1.70%	0.91%
Acuity Index in Quartiles			
Reference Group: 1st Quartile	0.00 to <11.58	2.31%	0.94%
2nd Quartile	11.58 to <12.28	1.57%	0.74%
3rd Quartile	12.28 to <12.90	1.68%	1.05%
4th Quartile	12.90 to 22.50	1.48%	0.88%
Percent of Minority Residents in Quartiles			
Reference Group: 1st Quartile (fewest minority residents)	0.00 to <3.57%	1.98%	1.31%
2nd Quartile	3.57% to <13.21%	1.57%	0.79%
3rd Quartile	13.21% to <33.06%	1.63%	0.73%
4th Quartile (most minority residents)	33.06% to 100%	1.57%	0.73%

Table A-3 (*continued*)			
Characteristic	**Quartile Range**	**Percent of Closure in 2020 and 2021**	**Percent of Closures in 2021 Only**
Percent of Residents with Low Cognitive Impairment in Quartiles			
Reference Group: 1st Quartile	0.00% to <29.79%	1.14%	0.52%
2nd Quartile	29.79% to <37.14%	1.36%	0.65%
3rd Quartile	37.14% to <45.45%	1.26%	0.74%
4th Quartile	45.45% to 100%	1.75%	1.04%
Percent of Medicaid Residents in Quartiles			
Reference Group: 1st Quartile	0.00% to <50.65%	2.25%	1.34%
2nd Quartile	50.65% to <65.35%	1.28%	0.57%
3rd Quartile	65.35% to <77.08%	1.25%	0.68%
4th Quartile	77.08% to 100%	2.25%	1.03%
Percent of Medicare Residents in Quartiles			
Reference Group: 1st Quartile	0.00% to <5.26%	2.73%	1.15%
2nd Quartile	5.26% to <9.47%	1.28%	0.60%
3rd Quartile	9.47% to <15.60%	1.08%	0.60%
4th Quartile	15.60% to 100%	1.97%	1.28%
Occupancy Rate in Quartiles			
Reference Group: 1st Quartile	3.33% to <72.08%	3.93%	1.85%
2nd Quartile	72.08% to <84.14%	1.48%	0.83%
3rd Quartile	84.14% to <91.67%	0.89%	0.47%
4th Quartile	91.67% to <100%	0.74%	0.47%
Certified Bed Count in Quartiles			
Reference Group: 1st Quartile	1 to <66	3.45%	2.05%
2nd Quartile	66 to <100	1.52%	0.72%
3rd Quartile	100 to <128	1.16%	0.53%
4th Quartile	128 to <874	1.06%	0.45%
Adult Day Service Center Provider Count in Quartiles (per 1,000 Aged 65+)			
Reference Group: 1st Quartile	0.01 to <0.05	2.05%	1.02%
2nd Quartile	0.05 to <0.07	1.62%	0.74%
3rd Quartile	0.07 to <0.11	1.68%	0.99%
4th Quartile	0.11 to <0.24	1.79%	0.94%
Home Health Provider Count in Quartiles (per 1,000 Aged 65+)			
Reference Group: 1st Quartile	0.03 to <0.15	1.62%	0.91%
2nd Quartile	0.15 to <0.24	1.85%	1.00%
3rd Quartile	0.24 to <0.39	1.67%	0.93%
4th Quartile	0.39 to <0.89	2.00%	0.88%

Table A-3 (*continued*)			
Characteristic	**Quartile Range**	**Percent of Closure in 2020 and 2021**	**Percent of Closures in 2021 Only**
Residential Care Community Provider Count (per 1,000 Aged 65+)			
Reference Group: 1st Quartile	0.10 to <0.30	1.83%	1.05%
2nd Quartile	0.30 to <0.36	1.69%	0.94%
3rd Quartile	0.36 to <0.70	1.75%	0.83%
4th Quartile	0.70 to <2.64	1.82%	0.90%
Nursing Home Provider Count in Quartiles (per 1,000 Aged 65+)			
Reference Group: 1st Quartile	0.14 to <0.25	1.58%	0.91%
2nd Quartile	0.25 to <0.36	1.49%	0.66%
3rd Quartile	0.36 to <0.46	2.55%	1.26%
4th Quartile	0.46 to <0.78	1.50%	0.87%
Percent of Weeks with Staff Shortages in Quartiles			
Reference Group: 2nd Quartile	1.19% to <4.76%		0.77%
1st Quartile	0.00% to <1.19%		0.93%
3rd Quartile	4.76% to <32.14%		1.02%
4th Quartile	32.14% to 100%		0.98%
Resident Confirmed COVID-19 Cases in Quartiles (per 1,000 Residents)			
Reference Group: 2nd Quartile	4.63 to <8.59		0.54%
1st Quartile	0.00 to <4.63		1.28%
3rd Quartile	8.59 to <11.70		0.38%
4th Quartile	11.70 to 353.62		1.41%
Staff Confirmed COVID-19 Cases in Quartiles (per bed)			
Reference Group: 2nd Quartile	0.004 to <0.005		0.79%
1st Quartile	0.000 to <0.004		1.00%
3rd Quartile	0.005 to <0.007		0.41%
4th Quartile	0.007 to 0.250		1.44%
Average Monthly COVID-19 Deaths in the County (per 100k Population)			
Reference Group: 2nd Quartile	8.70 to <11.74		0.85%
1st Quartile	0.00 to <8.70		0.92%
3rd Quartile	11.74 to <15.08		1.13%
4th Quartile	15.08 to <49.41		0.83%
Resident Vaccination[1]			
Reference Group: 2nd Quartile	73.90% to <84.38%		0.25%
1st Quartile	0.00% to <73.90%		0.36%
3rd Quartile	84.38% to <91.77%		0.20%
4th Quartile	91.77% to 100.00%		0.34%

Table A-3 (*continued*)			
Characteristic	**Quartile Range**	**Percent of Closure in 2020 and 2021**	**Percent of Closures in 2021 Only**
Staff Vaccination[1]			
Reference Group: 2nd Quartile	43.12% to <57.58%		0.25%
1st Quartile	0.00% to <43.12%		0.42%
3rd Quartile	57.58% to <72.41%		0.17%
4th Quartile	72.41% to 100.00%		0.28%

1. Due to data availability, vaccination was measured as of June 2021. The bivariate analyses for these variables examine closures after June 2021 rather than all of 2021.

Table A-4. Multivariate Regression Results--Factors Associated with Nursing Home Closures				
Characteristics	Closures in 2020 and 2021		Closures in 2021 Only	
	Odds Ratio	P-value	Odds Ratio	P-value
Urban-Rural Location				
Reference Group: Rural				
Urban	2.306***	<0.0001	2.585**	0.0027
Ownership Change in the Last 5 Years				
Reference Group: No Changes				
Changes	1.017	0.9328	1.441	0.1761
Profit and Chain Affiliation Status				
Reference Group: For-Profit Chain				
Non-Profit Chain	0.844	0.5609	0.631	0.2363
For-Profit Non-Chain	1.138	0.4940	0.769	0.3363
Non-Profit Non-Chain	1.220	0.4113	0.806	0.5188
CMS 5-Star Health Inspection Rating				
Reference Group: 3-Star Rating				
1-Star Rating	2.442***	0.0004	1.963	0.0548
2-Star Rating	1.613	0.0631	1.594	0.1724
4-Star Rating	1.260	0.3937	1.282	0.4813
5-Star Rating	1.332	0.3892	1.089	0.8484
CMS 5-Star Staffing Rating				
Reference Group: 3-Star Rating				
1-Star Rating	1.550	0.0944	1.634	0.1951
2-Star Rating	0.832	0.4851	0.847	0.6604
4-Star Rating	1.962**	0.0035	2.648**	0.0030
5-Star Rating	2.552**	0.0015	3.687**	0.0011
CMS 5-Star Quality Measures Rating				
Reference Group: 3-Star Rating				
1-Star Rating	1.538	0.1347	1.380	0.4178
2-Star Rating	0.832	0.4941	0.816	0.5764
4-Star Rating	1.063	0.7959	0.695	0.2881
5-Star Rating	1.056	0.8163	1.002	0.9960
Acuity Index in Quartiles				
Reference Group: 1st Quartile				
2nd Quartile	0.743	0.1713	0.649	0.1813
3rd Quartile	0.955	0.8371	1.388	0.2535
4th Quartile	0.515*	0.0101	0.656	0.2290
Percent of Minority Residents in Quartiles				
Reference Group: 1st Quartile (fewest minority residents)				
2nd Quartile	0.869	0.5522	0.678	0.1995
3rd Quartile	1.030	0.9047	0.615	0.1378
4th Quartile (most minority residents)	1.106	0.7097	0.917	0.8076

Table A-4 (*continued*)				
Characteristics	Closures in 2020 and 2021		Closures in 2021 Only	
	Odds Ratio	P-value	Odds Ratio	P-value
Percent of Residents with Low Cognitive Impairment in Quartiles				
Reference Group: 1st Quartile				
2nd Quartile	1.087	0.7232	1.053	0.8797
3rd Quartile	0.900	0.6670	1.076	0.8315
4th Quartile	1.025	0.9179	1.183	0.6138
Percent of Medicaid Residents in Quartiles				
Reference Group: 1st Quartile				
2nd Quartile	0.953	0.8473	0.941	0.8617
3rd Quartile	0.847	0.5391	1.166	0.6691
4th Quartile	1.241	0.4258	1.356	0.4320
Percent of Medicare Residents in Quartiles				
Reference Group: 1st Quartile				
2nd Quartile	0.535**	0.0047	0.699	0.2750
3rd Quartile	0.573*	0.0158	0.791	0.4718
4th Quartile	0.587*	0.0359	1.116	0.7477
Occupancy Rate in Quartiles				
Reference Group: 1st Quartile				
2nd Quartile	0.281***	<0.0001	0.349***	0.0002
3rd Quartile	0.210***	<0.0001	0.248***	<0.0001
4th Quartile	0.126***	<0.0001	0.147***	<0.0001
Certified Bed Count in Quartiles				
Reference Group: 1st Quartile				
2nd Quartile	0.540**	0.0039	0.442**	0.0047
3rd Quartile	0.345***	<0.0001	0.289***	0.0002
4th Quartile	0.270***	<0.0001	0.233***	<0.0001
Adult Day Service Center Provider Count in Quartiles (per 1,000 Aged 65+)				
Reference Group: 1st Quartile				
2nd Quartile	1.590	0.1028	1.277	0.5765
3rd Quartile	1.099	0.7384	1.856	0.1177
4th Quartile	1.114	0.7040	1.789	0.1668
Home Health Provider Count in Quartiles (per 1,000 Aged 65+)				
Reference Group: 1st Quartile				
2nd Quartile	0.912	0.7466	1.031	0.9399
3rd Quartile	1.004	0.9882	1.262	0.5320
4th Quartile	0.504	0.0915	0.573	0.3391

Table A-4 (*continued*)				
Characteristics	Closures in 2020 and 2021		Closures in 2021 Only	
	Odds Ratio	P-value	Odds Ratio	P-value
Residential Care Community Provider Count (per 1,000 Aged 65+)				
Reference Group: 1st Quartile				
2nd Quartile	0.834	0.5967	1.279	0.6206
3rd Quartile	0.673	0.1042	0.588	0.1369
4th Quartile	0.456***	0.0010	0.246***	0.0001
Nursing Home Provider Count in Quartiles (per 1,000 Aged 65+)				
Reference Group: 1st Quartile				
2nd Quartile	0.618	0.0778	0.494	0.0676
3rd Quartile	1.470	0.1817	1.014	0.9740
4th Quartile	0.621	0.1463	0.569	0.2055
Percent of Weeks with Staff Shortages in Quartiles				
Reference Group: 2nd Quartile				
1st Quartile			1.520	0.2558
3rd Quartile			1.959	0.0511
4th Quartile			2.243*	0.0219
Resident Confirmed COVID-19 Cases in Quartiles (per 1,000 Residents)				
Reference Group: 2nd Quartile				
1st Quartile			1.692	0.1265
3rd Quartile			0.861	0.7093
4th Quartile			2.560**	0.0044
Staff Confirmed COVID-19 Cases in Quartiles (per bed)				
Reference Group: 2nd Quartile				
1st Quartile			1.360	0.3611
3rd Quartile			0.797	0.5454
4th Quartile			1.931*	0.0438
Average Monthly COVID-19 Deaths in the County (per 100k Population)				
Reference Group: 2nd Quartile				
1st Quartile			1.129	0.7166
3rd Quartile			1.423	0.2479
4th Quartile			1.168	0.6540
* p < 0.05, ** p< 0.01, *** p < 0.001.				

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