Mathematica
Progress Together

Understanding the spread of COVID-19 within nursing homes

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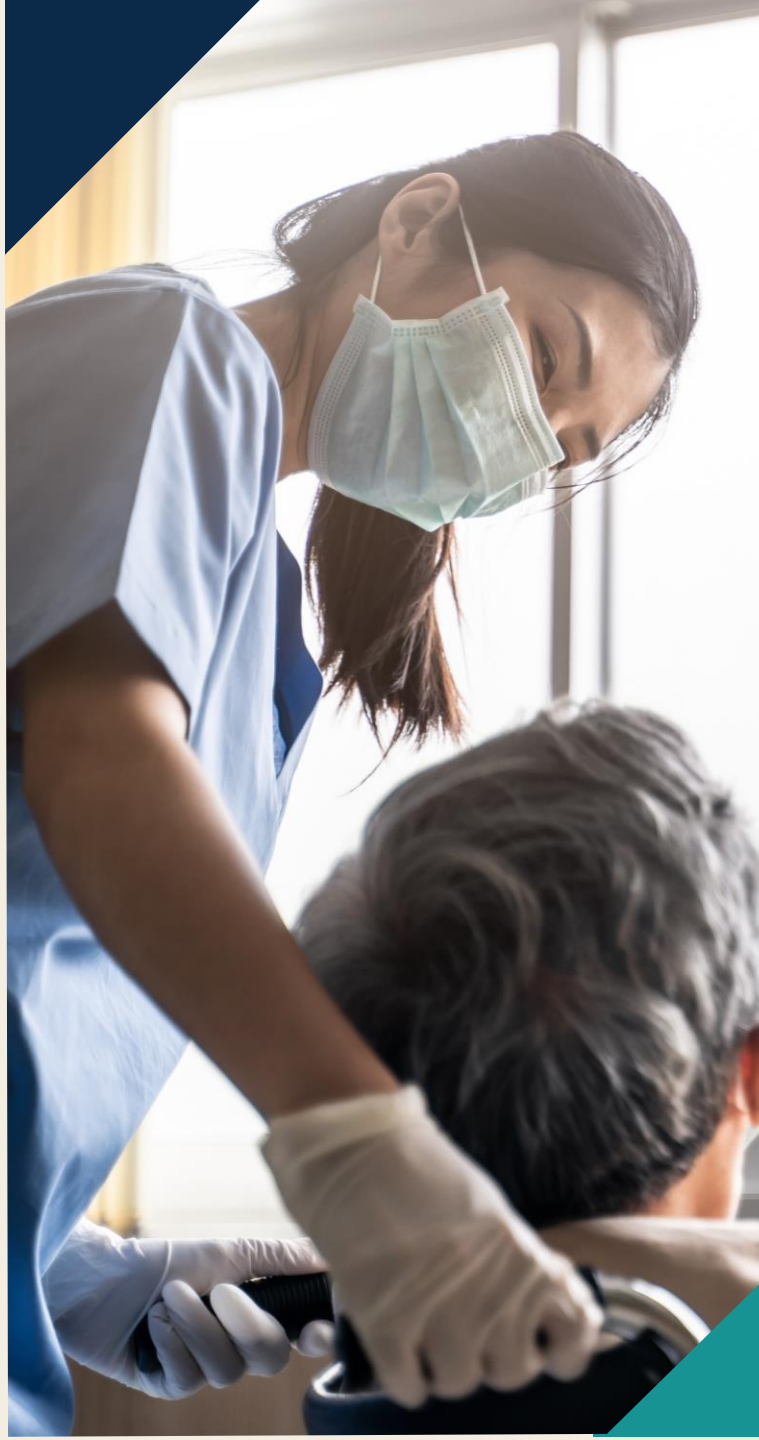


Research Objective

Assess the characteristics that make particular nursing homes, as well as individual residents within nursing homes, more likely to become infected with COVID-19 or die of the virus.

Background and Motivation

- **Older adults living in long-term care (LTC) facilities are at greater risk of complications from COVID-19 than non-residents.**
  - The increased risk comes from underlying clinical conditions, the transmissible nature of the virus, and the frequent interactions common in congregate care.
- **COVID-19 has had a disproportionate impact on residents of nursing homes and assisted living facilities.**
  - Nationwide, about 34 percent of all COVID-19 deaths have occurred among LTC residents.
- **We sought to explore the factors both at the facility-level and at the resident-level associated with cases and deaths from COVID-19 in nursing homes.**

Data Sources

- **We focus on patterns in 212 nursing homes in Connecticut and 21,808 residents in those facilities as of March 9, 2020**
- **Facility-level data sources**
  - Total cases and deaths reported by the facility to the Connecticut Department of Health from March through July 2020
  - Nursing Home Compare and LTCFocus data including geographic location, size, profit and chain status, and star ratings
- **Resident-level data sources**
  - Minimum Data Set (MDS) assessments to identify residents and their characteristics (demographic and health characteristics)
  - Facility-reported data on resident infections and state vital records on deaths
- **We were able to match over 90 percent of people who tested positive or died in resident assessment data**

Study Design

- **Facility-level multivariate regression model with primary outcomes of cases and deaths per licensed bed at the nursing home-level**
  - Feature selection model to identify which characteristics were most important to improving the predictive power of the model
  - Characteristics identified by the feature selection model as being important are included in the regression
  - Aggregated some individual level characteristics to the facility level
- **Resident-level linear regression model with nursing home fixed effect to predict which individual residents contracted COVID-19 or died**
  - Use residents present on March 9, 2020 in the facility to limit any potential selection bias or reverse causality

Select nursing home resident characteristics

	All residents	Tested positive	Died
Age (years)	78.3	78.3	82.6
Male	38.5%	38.4%	43.8%
Non-Hispanic White	82.3%	78.8%	80.7%
Non-Hispanic Black	10.8%	13.1%	12.9%
Hispanic	6.0%	7.2%	5.2%
Heart/circulation diagnosis	52.7%	52.4%	57.7%
Musculoskeletal diagnosis	25.0%	31.0%	32.4%
Has cognitive impairment	37.3%	43.3%	54.8%
Had a recent fall	14.6%	17.8%	20.2%

- **Risk factors in nursing home residents are consistent with those observed in the general population (e.g., age, underlying clinical conditions).**
- **Residents with cognitive impairment or recent falls were disproportionately more likely to test positive and die.**

Receiving care in the community increased the likelihood of COVID-19 cases and deaths

Resident characteristics	Number of cases per licensed bed	Number of deaths per licensed bed
Male	+	+
Getting dialysis or cancer treatments	+*	+*
Had a recent fall	+	+
Had a recent pressure ulcer	+*	+*
Had any depressive symptoms	–	–*
Lost control of bladder	–	+

Note: Characteristics are the average for all residents in each nursing home as of March 9, 2020.

- **Nursing homes with more residents who left the facility for medical treatments had more cases and deaths.**
- **Average age and racial/ethnic composition of residents were not important to understanding variation in outcomes.**
- **All these characteristics were important to understanding the variation in cases or deaths across nursing homes and were therefore included in the regression model.**

+ correlated with more cases or deaths
– correlated with fewer cases or deaths
*** statistically significant at the 10 percent level**

Certain nursing home characteristics were correlated with COVID-19 outcomes

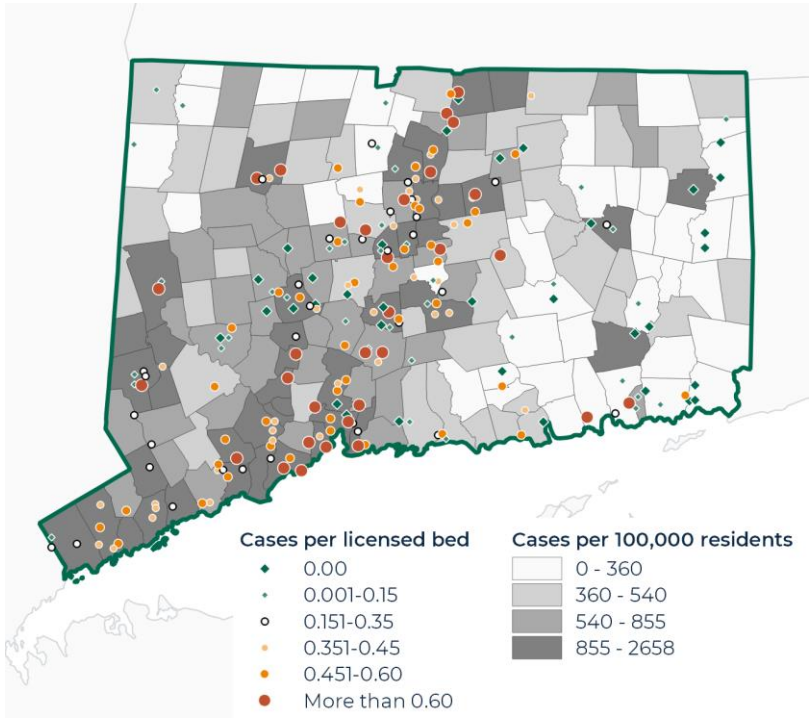
Nursing home characteristics	Number of cases per licensed bed	Number of deaths per licensed bed
Town cases per 100,000 residents	+*	+*
Town median household income	+*	+*
Profit status	+	+
Chain affiliation	+	+
High health inspection rating	–	–
High staff rating	–*	–*
High quality measure rating	+	+
Total residents as of 3/9/20	+*	+*
Share of licensed beds filled as of 3/9/20	+*	+*

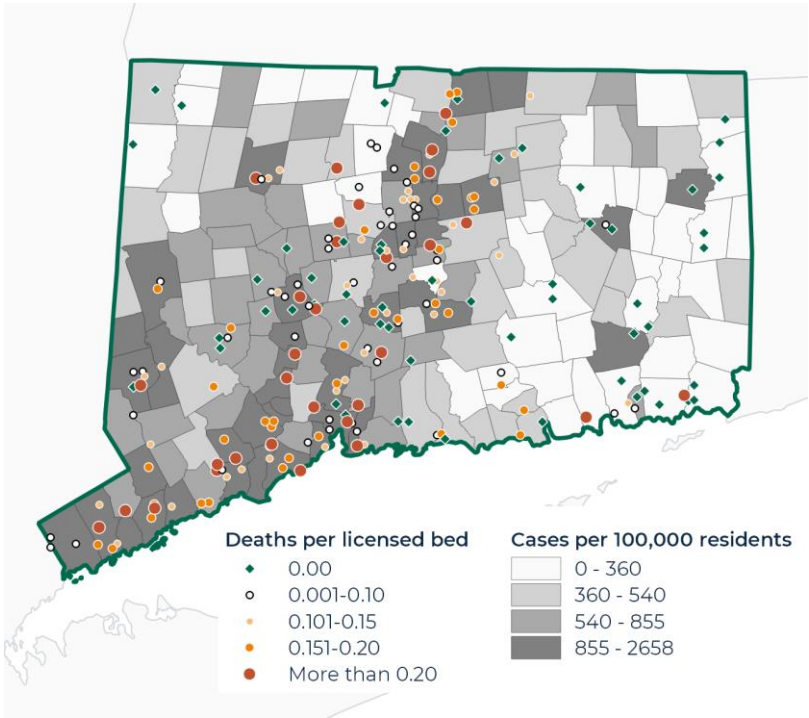
- **Nursing homes with greater exposure to COVID-19 in the surrounding community had more cases and deaths.**
- **Nursing homes with higher staffing ratings were better able to limit the spread of COVID-19.**
- **All these characteristics were important to understanding the variation in cases or deaths across nursing homes and were therefore included in the regression model.**

+ correlated with more cases or deaths
– correlated with fewer cases or deaths
*** statistically significant at the 10 percent level**

Prevalence of COVID-19 in the surrounding community was a major predictor of its effect on nursing homes

Nursing homes in towns with more cases per person in the community as a whole had more cases and deaths per licensed nursing home bed.

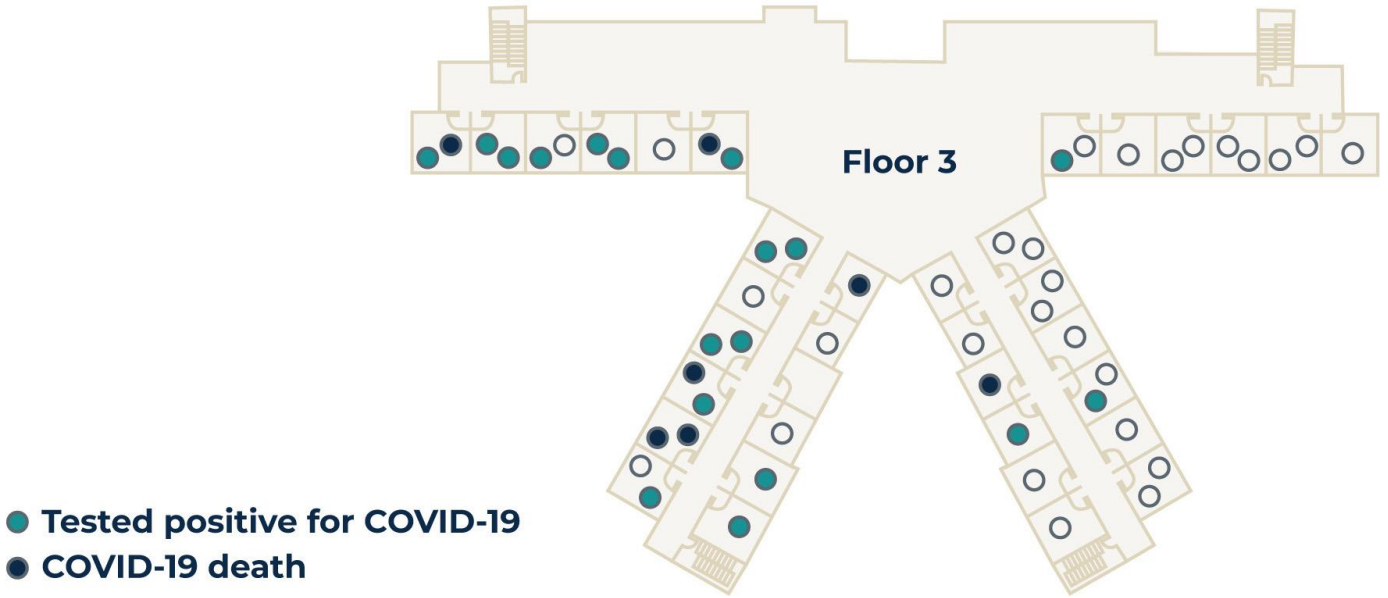




Sources: Mathematica's analysis of nursing-home reported data included in Connecticut's FLIS system and DPH Vital Records data.
Notes: The relationship was highly statistically significant for cases (p = 0.003) and deaths (p = 0.004). Deaths include both confirmed and probable deaths attributable to COVID-19. Cases in each town exclude all cases reported in nursing homes and assisted living facilities within that town.

Case study: COVID-19 cases and deaths in one nursing home

- This case study underscores the ability to limit the extent of an outbreak within a facility.
- Staff and physical proximity to others who became infected might play an important role in the spread of COVID-19.
- However, risk of contracting COVID-19 in each facility is random to some extent.



Conclusions and Implications for Policy

- **Findings emphasize the need to carefully monitor entry and exit from the facility and importance of clear guidelines on the appropriate use of PPE and other precautionary measures**
- **Facilities with a higher share of their licensed beds filled should implement policies to minimize intra-facility spread**
- **Facilities with higher staffing ratings had fewer cases and deaths per licensed bed, consistent with previous evidence**
  - Suggests that regulators should consider increased minimum staffing requirements