Nursing Homes and COVID-19: The Role of Staff Size in Outbreaks and Resident Deaths

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Disclosure Statement

• I have no relevant financial interests to disclose
Objectives

• To describe current challenges facing US nursing homes due to the COVID pandemic

• To describe the impact of staff size of COVID-19 outbreaks in nursing homes

• To describe potential clinical and policy responses that could reduce outbreak risk by reducing nursing home traffic
Acknowledgements

• Coauthors
  • Michael Barnett
  • Ashvin Gandhi
  • David Grabowski
Background
Ground Zero of the Pandemic

• Older adults with multiple impairments and chronic conditions

• Close quarters
  • Shared rooms, communal spaces, staff that move between rooms

• Long-standing quality concerns
  • Low reimbursement (Medicaid)

• Inadequate Resources
Severe Staffing And Personal Protective Equipment Shortages Faced By Nursing Homes During The COVID-19 Pandemic

ABSTRACT The coronavirus disease 2019 (COVID-19) pandemic continues to devastate US nursing homes. Adequate personal protective equipment (PPE) and staffing levels are critical to protect nursing home residents and staff. Despite the importance of these basic measures, few national data are available concerning the state of nursing homes with respect to these resources. This article presents results from a new national database containing data from 98 percent of US nursing homes. We find that more than one in five nursing homes reports a severe shortage of PPE and any shortage of staff. Rates of both staff and PPE shortages did not meaningfully improve from May to July 2020. Facilities with COVID-19 cases among residents and staff, as well as those serving more Medicaid recipients and those with lower quality scores, were more likely to report shortages. Policies aimed at providing resources to obtain additional direct care staff and PPE for these vulnerable nursing homes, particularly in areas with rising community COVID-19 case rates, are needed to reduce the national COVID-19 death toll.
Policy Responses

• Severe visitation restrictions

• Emergency PPE shipments (summer 2020)

• Point of Care Antigen Test Kits (August-September 2020)

• Rules and regulations
  • Staff testing, resident testing, quarantine/isolation protocols, resident cohorting
Policy Impact?

• Some evidence that the proportion of COVID deaths tied to LTC facilities has declined
  • 45% → 35%
Weekly Nursing Home COVID-19 Deaths

Graph showing weekly nursing home COVID-19 deaths from 5/31/2020 to 11/30/2020.
Study Motivation

• Pressing need to understand what contributes to outbreaks within nursing homes
  • Shape policies while waiting for vaccine rollout and immune response
  • Inform policies for future viral outbreaks

• Current evidence suggests staffing patterns play an important role
Role of Staff – Staffing as Quality Measure

• Staff shortages may facilitate spread within nursing homes
  • Staff moving in and out of more rooms, sections of the facility

• Higher skill mix may prevent spread
  • Better infection control, use of PPE

• Higher staffing levels and greater use of RNs associated fewer outbreaks and deaths (Gorges and Konetzka, 2020; Li et al. 2020; Figueroa et al. 2020)
Role of Staff – Link to Community

- Clear link between community COVID rates and nursing home rates (Gorges and Konetzka, 2020)
  - Facility lockdowns → staff are main link between community and facility
- Higher staffing levels → greater probability of having any COVID cases (Gorges and Konetzka, 2020)
- Staff working in multiple facilities an important source of viral spread (Chen, Chevalier, Long, 2020)
- Facilities may vary in the number of individuals coming and going from the facility, even with intense visitor restrictions
  - Each new person = new potential exposure
Study Objective

• What is the role of unique individuals in/out of nursing homes (i.e., nursing home traffic) in explaining variation in COVID cases and deaths?

• What is the effect of staff size on COVID outcomes relative to conventional staffing measures?
Methods
Data

- CMS/CDC National Healthcare Safety Network Nursing Home COVID-19 Surveys
  - COVID cases and deaths

- Individual-level Payroll-based Journal Staffing Data (PBJ)

- LTCFocus.org, Nursing Home Compare

- County COVID Case Rate Data (NYTimes database)
Measures - Outcomes

- Resident Cases per 100 Beds
- Staff Cases per 100 Beds
- Resident Deaths per 100 Beds
- Weekly and cumulative rates
Measures – Staff Size

• Individual-level PBJ data allows for the identification of unique employees who work on a given day
  • Employee types include: nurses, nurse aides, therapists, social workers, NPs, PAs, MDs, medical directors, housekeeping, and administrators

  • Employed and contracted staff

• Average count of unique employees per day in each facility in Q4 2019
  • Categorized into quartiles within the full sample of U.S. nursing homes (~15,000 facilities)
Measures – Covariates

• Hours of direct care (CNA, LPN, RN) per resident day (HPRD) in Q4 2019 (quartiles)

• % of direct care hours provided by a nurse (RN/LPN)

• # of admissions per day, staff turnover, bed size, 5-star quality score, profit status, other facility controls

• County Case Rates
Sample

• Restrict to facilities that did not have any resident cases by the end of the first week of June (~50% of facilities)

  • Missing data for initial wave of the pandemic
    • CMS/CDC data collection started in May 2020

• Study window: June-September
Analysis

- Examine the relationship between weekly case/death rates and staff size
  - Linear probability models
  - Facility covariates, county fixed effects, and weekly county case rates

- Examine the relationship between cumulative case/death rates (as of end of September 2020) and staff size
  - Linear probability models
  - Facility covariates and county fixed effects

- Robustness checks
  - Expand sample to all facilities, restrict samples to inter-deciles of staff size, use alternative measures of staff size
Results
<table>
<thead>
<tr>
<th>N</th>
<th>Low</th>
<th>2</th>
<th>3</th>
<th>High</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,454</td>
<td>2,011</td>
<td>1,679</td>
<td>1,056</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Average Number of Unique Employees per Day**

<table>
<thead>
<tr>
<th>Bed Size (N (%))</th>
<th>1-50</th>
<th>51-100</th>
<th>101-150</th>
<th>151-200</th>
<th>201+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,122 (45.7%)</td>
<td>1,128 (46.0%)</td>
<td>194 (7.9%)</td>
<td>10 (0.4%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td></td>
<td>166 (8.3%)</td>
<td>1,268 (63.1%)</td>
<td>535 (26.6%)</td>
<td>41 (2.0%)</td>
<td>1 (&lt;1%)</td>
</tr>
<tr>
<td></td>
<td>32 (1.9%)</td>
<td>646 (38.5%)</td>
<td>883 (52.6%)</td>
<td>102 (6.1%)</td>
<td>16 (1.0%)</td>
</tr>
<tr>
<td></td>
<td>11 (1.0%)</td>
<td>147 (13.9%)</td>
<td>528 (50.0%)</td>
<td>279 (26.4%)</td>
<td>91 (8.6%)</td>
</tr>
</tbody>
</table>

**Profit Status (N (%))**

<table>
<thead>
<tr>
<th>Non-Profit</th>
<th>698 (28.4%)</th>
<th>393 (19.5%)</th>
<th>334 (19.9%)</th>
<th>276 (26.1%)</th>
<th>&lt;0.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Owned</td>
<td>238 (9.7%)</td>
<td>105 (5.2%)</td>
<td>97 (5.8%)</td>
<td>63 (6.0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>For Profit</td>
<td>1,518 (61.9%)</td>
<td>1,513 (75.2%)</td>
<td>1,248 (74.3%)</td>
<td>717 (67.9%)</td>
<td></td>
</tr>
</tbody>
</table>

**Overall Quality Rating (N (%))**

| 1 | 310 (12.6%) | 166 (8.3%) | 119 (7.1%) | 79 (7.5%) | <0.001 |
| 2 | 359 (14.6%) | 372 (18.5%) | 312 (18.6%) | 128 (12.1%) |         |
| 3 | 414 (16.9%) | 424 (21.1%) | 343 (20.4%) | 189 (17.9%) |         |
| 4 | 422 (17.2%) | 355 (17.7%) | 293 (17.5%) | 190 (18.0%) |         |
| 5 | 517 (21.1%) | 424 (21.1%) | 369 (22.0%) | 234 (22.2%) |         |
| Missing | 714 (29.1%) | 415 (20.6%) | 349 (20.8%) | 309 (29.3%) |         |
Cumulative Cases per 100 Beds

- Quartile 1 (Lowest)
- Quartile 4 (Highest)

Resident COVID-19 Cases

- 2
- 3
Resident COVID-19 Deaths

Cumulative Deaths per 100 Beds

- Quartile 1 (Lowest)
- 2
- 3
- Quartile 4 (Highest)
Staff Cases

Cases per 100 Beds

Staff Size
Direct Care Hours per Resident Day
Share of Direct Care Hours Provided by Nurses

Quartile 1 (Lowest)  2  3  Quartile 4 (Highest)
<table>
<thead>
<tr>
<th># of Other Staff per Day</th>
<th>Resident COVID Cases per 100 Beds</th>
<th>Resident COVID Deaths per 100 Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (lowest)</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>2</td>
<td>0.201</td>
<td>0.110</td>
</tr>
<tr>
<td>3</td>
<td>1.154</td>
<td><strong>0.510</strong></td>
</tr>
<tr>
<td>4 (highest)</td>
<td>2.289**</td>
<td><strong>0.697</strong>*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># of Therapy Staff per Day</th>
<th>Resident COVID Cases per 100 Beds</th>
<th>Resident COVID Deaths per 100 Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (lowest)</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>2</td>
<td>-0.099</td>
<td>0.033</td>
</tr>
<tr>
<td>3</td>
<td>0.011</td>
<td>-0.138</td>
</tr>
<tr>
<td>4 (highest)</td>
<td>-0.631</td>
<td>-0.002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># of Direct Care Staff per Day</th>
<th>Resident COVID Cases per 100 Beds</th>
<th>Resident COVID Deaths per 100 Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (lowest)</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>2</td>
<td>2.038**</td>
<td>0.230</td>
</tr>
<tr>
<td>3</td>
<td>4.583***</td>
<td>0.460</td>
</tr>
<tr>
<td>4 (highest)</td>
<td>6.943***</td>
<td><strong>0.790</strong>*</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1
Discussion
Summary

• Staff size is strongly associated with COVID-19 outcomes
  • Comparing the highest to lowest staff size facilities:
    • Resident Cases – 81% higher
    • Staff Cases – 65% higher
    • Resident Deaths – 100% higher

• Direct care staff size is the strongest predictor
  • Size of staff not directly involved in resident care also matters

• No significant effects noted for staffing quality measures after controlling for staff size
Implications

• For a given staffing level, more employees = more chances for virus to enter the facility

• Simple relationship may be relatively more important than direct care staffing level, skill mix of the staff

• Findings don’t suggest we should reduce staffing levels
  • Provide given level of staff with fewer bodies
Policy Responses

• Improve staff “efficiency”
  • Full time staff (rather than part time)
  • Restrict staff from working in multiple facilities
  • Reduce staff turnover

• Consider all nursing home staff, not just those who come in close contact with residents
  • Shift non-essential employees to remote work
  • Importance of staff vaccination (even among non-direct care staff)

• Staff size may not be easy to substantially change
  • Greater financial investment in nursing homes
Limitations

• Staff size measured prior to the pandemic
  • May not capture actual traffic in/out of homes during pandemic
  • Reduces concerns about confounding (i.e., outbreaks may cause reduced traffic)

• PBJ data does not include some important types of support staff (i.e., food services)
Conclusion

• Staff size (the number of unique individuals working in a nursing home on a given day) is an important predictor of COVID outcomes in nursing homes.

• Efforts to reduce the number of potential exposures should be prioritized when considering policy responses to viral outbreaks.

• Importance of vaccinating all staff within facilities.

• Improving staffing consistency and continuity should be long-term goals for improving the quality of nursing home care.
  • Higher wages for nursing home staff.
Questions