Association of Nursing Home Characteristics With Staff and Resident COVID-19 Vaccination Coverage

Vaccines have been instrumental in reducing COVID-19 cases and related deaths among US nursing home residents. However, low vaccination coverage among nursing home staff, who may introduce COVID-19 into facilities, could contribute to future outbreaks, especially in the presence of more transmissible variants. Maximizing vaccination coverage among nursing home staff and residents is critical because of the extreme vulnerability of this population to COVID-19, but little is known about which nursing homes have been successful at achieving high vaccination coverage.

Methods | We performed a cross-sectional analysis of federal National Healthcare Safety Network facility-level data through the week ending July 18, 2021, combined with other publicly available data sets (eMethods 1 in the Supplement). We examined the percentage of completed COVID-19 vaccinations among nursing home residents and different staff types at each facility, including all health care personnel eligible to work in the nursing home in the prior week, registered nurses and licensed practical nurses, certified nursing assistants (CNAs), therapists, and physicians and independent practitioners. Estimated means were weighted by the relevant population size (resident census and staff counts). Per Harvard University institutional policy, institutional review board approval and written informed consent were not required owing to use of publicly available data. This study was informed by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies.

We examined the association between weighted group vaccination coverage and facility characteristics using multivariate linear regressions. The regressions included state fixed effects to account for the state variation in vaccine availability and other policies. Facility characteristics of interest included ownership status, overall quality rating, demographic characteristics of residents and staff, percentage of direct care

Figure 1. Distribution of Completed Vaccination Coverage Among Nursing Home Residents and Staff

Orange diamonds denote weighted estimates of average vaccination coverages for each group. Weights are obtained from the corresponding number of staff members or residents within each facility reported in the National Healthcare Safety Network data.

Figure 2. Estimated Changes in Resident and Health Care Staff Vaccination Coverages by Selected Nursing Home Characteristics

<table>
<thead>
<tr>
<th>Facility characteristics</th>
<th>Estimate</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>For-profit, 70.3%</td>
<td>-2.53</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Facility size (for 10-bed increase), 107.0 (60.7)</td>
<td>-3.29</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Part of chain, 54.5%</td>
<td>-0.05</td>
<td>.11</td>
</tr>
<tr>
<td>Overall quality rating, 3.2 (1.4)</td>
<td>-0.03</td>
<td>.31</td>
</tr>
<tr>
<td>Staff size (for 10-employee increase), 134.6 (76.5)</td>
<td>-1.98</td>
<td>.004</td>
</tr>
<tr>
<td>Staff COVID-19–related deaths per 100 beds, 0.1 (0.8)</td>
<td>-2.51</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Resident COVID-19–related deaths per 100 beds, 8.2 (9.0)</td>
<td>1.37</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Staff characteristics (for 10 percentage point increase)c</td>
<td>1.23</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Licensed practical nurse percentage, 22.5% (8.4%)</td>
<td>-2.7</td>
<td>.007</td>
</tr>
<tr>
<td>Registered nurse percentage, 17.8% (8.5%)</td>
<td>-1.89</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Contract staff percentage, 11.5% (18.6%)</td>
<td>-0.85</td>
<td>.09</td>
</tr>
<tr>
<td>Percentage with &gt;33 wk tenure, 52.0% (19.3%)</td>
<td>0.39</td>
<td>.02</td>
</tr>
<tr>
<td>Non-White percentage, 29.8% (24.0%)</td>
<td>-0.54</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Age &lt;29 y percentage, 22.4% (8.9%)</td>
<td>0.00</td>
<td>.99</td>
</tr>
<tr>
<td>Female percentage, 79.4% (9.6%)</td>
<td>-0.02</td>
<td>.85</td>
</tr>
<tr>
<td>Resident characteristics (for 10 percentage point increase)d</td>
<td>-0.34</td>
<td>.02</td>
</tr>
<tr>
<td>Percentage with Medicaid, 60.0% (22.8%)</td>
<td>0.19</td>
<td>.02</td>
</tr>
<tr>
<td>Non-White percentage, 20.0% (21.9%)</td>
<td>-0.49</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>County characteristics</td>
<td>-0.83</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Republican vote margin (2020 presidential election), 6.3 (35.8)</td>
<td>-1.42</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Adult vaccination coverage, 53.0 (13.8)</td>
<td>-0.13</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

The Figure presents adjusted marginal changes and associated 95% CIs in resident and health care staff vaccination coverages as a function of nursing home characteristics using the most recent week of vaccination data available for each facility (n = 14 900) through the week ending July 18, 2021. Unless otherwise indicated, data in the left column are mean (SD) values. Marginal changes in coverage are estimated using linear regressions that include the variables presented here and state fixed effects. Models are weighted by changes in coverage are estimated using linear regressions that include the characteristics of interest.

Results | Among the more than 14 900 nursing homes reporting vaccination data by July 18, 2021, 60.0% of staff and 81.4% of residents were fully vaccinated on average (Figure 1). Average vaccination coverage was lowest among CNAs (49.2%) and registered nurses and licensed practical nurses (61.0%), with higher coverages noted among therapists (70.9%) and physicians and independent practitioners (77.3%).

After adjustment, for-profit ownership was associated with a decrease of 2.5 (95% CI, −3.2 to 1.8) and 3.3 (95% CI, −4.0 to 2.6) percentage points for staff and resident vaccination coverages, respectively, compared with nonprofit facilities (Figure 2). Each additional Medicare star rating was associated with a 1.4 (95% CI, 1.0–1.8) and 1.2 (95% CI, 1.0–1.4) percentage point increase in staff and resident vaccination coverages, respectively. A 10 percentage point increase in longer-tenured staff was associated with increases of 1.5 (95% CI, –1.2 to 4.2) percentage points for staff and resident vaccination coverages, respectively. A 10 percentage point increase in longer-tenured staff was associated with increases of 1.5 (95% CI, –1.2 to 4.2) percentage points for staff and resident vaccination coverages, respectively.
1.2-1.9) and 0.6 (95% CI, 0.5-0.8) percentage points in staff and resident vaccination coverages, respectively. Greater percentages of staff and residents who were non-White (ie, American Indian or Alaska Native, Asian, Black, Pacific Islander or Native Hawaiian, and 2 or more races) were associated with lower vaccination coverages for both groups (Figure 2). A 10 percentage point increase in the county adult vaccination coverage was associated with increases of 2.7 (95% CI, 2.3-3.2) and 1.4 (95% CI, 1.0-1.8) percentage points in staff and resident vaccination coverages, respectively, while a 10 percentage point increase in Republican vote margin in the 2020 presidential election was associated with a decrease of 1.4 (95% CI, −1.8 to −1.1) percentage points in staff vaccination coverage.

**Discussion** | Results of this cross-sectional study demonstrate that COVID-19 vaccination coverage among health care staff in nursing homes lagged relative to resident coverage, with the lowest coverage among CNAs, who constitute the majority of direct caregivers. We found that nonprofit and nonchain nursing homes, facilities with higher Medicare star ratings, and facilities with longer-tenured staff achieved greater vaccine coverage, suggesting that organizational characteristics, including ownership structure, quality, and ability to retain staff, may be key in facilities’ ability to vaccinate residents and staff. However, the present findings suggest that facilities are also subject to broader challenges to vaccine acceptance in the community because facility coverages were strongly associated with county-wide vaccination coverage and staff coverage was strongly associated with 2020 presidential election voting patterns.

President Biden recently announced that the US Department of Health and Human Services is developing new requirements that nursing homes mandate COVID-19 vaccinations for staff as a condition for receiving reimbursement from Medicare and Medicaid. This study provides information about the scope of current vaccine refusal, the key correlates of low vaccine take-up, and the types of facilities most likely to be affected by this new requirement. This analysis is limited by the potential for unobserved confounders, which limits generalizability of the findings, and by the use of facility-level data, which limits our precision in estimating individual-level correlates of take-up.

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**Correction:** This article was corrected on November 1, 2021, to fix data errors in Figure 2.

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**Author Contributions:** Dr McGarry had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Concept and design:** McGarry, Barnett, Gandhi.

**Acquisition, analysis, or interpretation of data:** All authors.

**Drafting of the manuscript:** McGarry, Shen, Gandhi.

**Critical revision of the manuscript for important intellectual content:** All authors.

**Statistical analysis:** McGarry, Shen, Gandhi.

**Administrative, technical, or material support:** McGarry, Gandhi.

**Supervision:** McGarry, Gandhi.

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**Additional Information:** Complete linear regression results are available from the corresponding author on request.


**Editor’s Note**

**COVID-19 Vaccination Coverage Among Nursing Home Staff**

In this issue of *JAMA Internal Medicine*, McGarry et al show that COVID-19 vaccination rates among nursing home staff are unacceptably low, falling considerably behind that of nursing home residents. At less than 50%, the rates are lowest among certified nursing assistants (CNAs), who provide the most direct care. Certified nursing assistants bathe, dress, and groom residents. They help them eat. Physical distancing is impossible. A CNA with a positive SARS-CoV-2 test result is highly likely to transmit COVID-19 to a resident. For this reason, nursing homes would be the most sensible place to introduce a vaccine mandate, because unvaccinated nursing home staff pre-
sent an imminent risk to the vulnerable residents in their care. A recent Biden administration initiative that would make federal funding for nursing homes contingent on the vaccination of their employees is an important step.2

Certified nursing assistants work extremely hard and have an immense positive influence on the care of nursing home residents. In general, CNAs are sorely underpaid and receive inadequate benefits, including sick leave.3 We believe low voluntary vaccination rates among CNAs suggests a failure of nursing home owners to effectively partner with their most essential workers and provides one more indication of the need to improve the pay and working conditions of this group.

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HEALTH CARE POLICY AND LAW

Estimated Medicare Spending on Cancer Drug Indications With a Confirmed Lack of Clinical Benefit After US Food and Drug Administration Accelerated Approval

The accelerated approval (AA) pathway expedites the market entry of new drugs by allowing the US Food and Drug Administration (FDA) to grant approval using surrogate end points (eg, progression-free survival) that are “reasonably likely” to predict clinical benefit (eg, overall survival [OS]).1 Drug manufacturers are required to confirm clinical benefit after approval. Since December 2020, the FDA has reevaluated 10 AA indications with a confirmed lack of OS benefit of 4 drugs used to treat cancer: atezolizumab (breast and urothelial [cisplatin-ineligible and cisplatin-eligible] cancer), durvalumab (urothelial cancer), nivolumab (hepatocellular and lung cancer), and pembrolizumab (gastric, hepatocellular, lung, and urothelial cancer). This reevaluation resulted in voluntary manufacturer withdrawals of atezolizumab for urothelial cancer, durvalumab for urothelial cancer, and nivolumab and pembrolizumab for lung cancer.2 In April 2021, the FDA Oncologic Drugs Advisory Committee (ODAC) considered the approval status of the 6 remaining AA indications. The ODAC members voted to withdraw 2 indications (pembrolizumab for gastric cancer and nivolumab for hepatocellular cancer), and they cited poor trial designs and the lack of other treatment options as reasons for retaining the remaining 4 indications (atezolizumab for breast and urothelial [cisplatin-ineligible] cancer and pembrolizumab for hepatocellular and urothelial cancer).3 Although the FDA is not obliged to follow ODAC recommendations, it typically does so.

In this study, we estimated Medicare spending on the 10 AA cancer drug indications reevaluated by the FDA in 2021, all of which have a confirmed lack of OS benefit.4

Methods | We extracted aggregated annual spending for atezolizumab, durvalumab, nivolumab, and pembrolizumab from the Medicare Part B and Part D Spending Dashboards for 2017 to 2019. Medicare spending data do not include information on indications. To estimate spending shares for relevant indications in each year, we extracted medical and pharmacy claims for each drug in each year among the Medicare Advantage (MA) population covered by a large US insurer from OptumInsight Clinformatics data. Medicare Advantage data include diagnosis codes with inpatient, outpatient, and pharmacy claims. We used MA claims to calculate relative annual proportions of claims with relevant indication-specific International Statistical Classification of Diseases, Tenth Revision codes and treatment histories after the relevant indication approval dates. We then applied annual indication shares in the MA population to annual Medicare Part B and Part D spending. We used the consumer price index for prescription drugs to adjust annual spending estimates to 2020 US dollars. See eFigures 1 and 2 and the eTable in the Supplement for details on our analytic strategy.

This exploratory study was approved by the Harvard Pilgrim Health Care Institutional Review Board. Because we used publicly available data or deidentified claims data, this study was determined to not constitute human participants research by the Harvard Pilgrim Health Care Institutional Review Board and thus did not require informed consent.

Results | Estimated monthly Medicare drug reimbursement ranged from approximately $9850 to $13 400 in 2019 based on the 2019 average sales price (Table). Between 2017 and 2019, Medicare spending on the 10 AA indications increased to an estimated inflation-adjusted $569 million, of which $171 million corresponded to indications voluntarily withdrawn by manufacturers and $398 million corresponded to indications reevaluated by the FDA (Figure). The 4 indications that ODAC voted to retain accounted for $345 million.

Discussion | Between 2017 and 2019, Medicare Parts B and D cumulatively spent at least $569 million on the 10 cancer drug indications with a confirmed lack of OS benefit after...