

CORRESPONDENCE

Incident SARS-CoV-2 Infection among mRNA-Vaccinated and Unvaccinated Nursing Home Residents

TO THE EDITOR: Since the deployment of the messenger RNA (mRNA) vaccines against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)^{1,2} in nursing homes nationwide starting in mid-December 2020, aggregate public data have shown decreases in the incidence of cases of SARS-CoV-2 infection and related deaths.³ However, there have been minimal individual-level data available for understanding vaccine effectiveness in nursing home residents, who were absent from the clinical trials and who often have reduced immune responses.⁴ Using electronic health record data from Genesis HealthCare, a large long-term care provider in the United States, we report the incidence of SARS-CoV-2 infection among vaccinated residents and unvaccinated residents of 280 nursing homes across 21 states.

From immunization records, we identified residents who had received at least one dose of mRNA vaccine as of February 15, 2021; those who had received both doses by February 15, 2021; and those who were present at their facility on the day of the first vaccination clinic but who were not vaccinated as of March 31, 2021. We identified incident SARS-CoV-2 infections through March 31, 2021, on the basis of polymerase-chain-reaction assay and antigen-test records. Residents were tested every 3 to 7 days when there were confirmed cases in their facility and were tested if they had any new symptoms or potential exposure. Residents who had been infected in the 90 days before the study window were excluded. We counted incident infections after receipt of each dose among vaccinated residents and after the date of the first vaccination clinic among unvaccinated residents. Nurses assessed residents daily and documented new symptoms in structured change-in-condition notes. From these notes, we deemed residents to be symptomatic if SARS-CoV-2–related symptoms developed during the period from 5 days before to 14 days after a positive test. Detailed methods are described in the Supplementary Ap-

pendix, available with the full text of this letter at NEJM.org.

The sample included 18,242 residents who received at least one dose of mRNA vaccine; 14,669 residents (80.4%) received the Pfizer–BioNTech vaccine, and 3573 (19.6%) received the Moderna vaccine. Of these 18,242 residents, 13,048 also received the second dose of vaccine. A total of 3990 residents were unvaccinated. Table S1 in the Supplementary Appendix summarizes the characteristics of the residents.

The incidence of infection decreased over time among both vaccinated residents and unvaccinated residents (Table 1). After receipt of the first vaccine dose, there were 822 incident cases (4.5% of vaccinated residents) within 0 to 14 days and 250 cases (1.4%) at 15 to 28 days. Among the 13,048 residents who received both doses of vaccine, there were 130 incident cases (1.0% of vaccinated residents) within 0 to 14 days after receipt of the second dose and 38 cases (0.3%) after 14 days (which included 19 cases occurring 15 to 21 days after receipt of the second dose) (Fig. S1). Among unvaccinated residents, incident cases decreased from 173 cases (4.3% of unvaccinated residents) within 0 to 14 days after the first vaccination clinic to 12 cases (0.3%) at more than 42 days after the clinic.

Across all the study groups, most infections were asymptomatic, and the incidence of both asymptomatic and symptomatic infections decreased. Nursing homes that were located in counties with the highest incidence of SARS-CoV-2 infection had the most incident cases but still had large decreases (Table S2). We observed inconsistent patterns in the incidence of infection among residents relative to rates of vaccination among staff members (Table S3).

These findings show the real-world effectiveness of the mRNA vaccines in reducing the incidence of asymptomatic and symptomatic SARS-CoV-2 infections in a vulnerable nursing home population. Our observation of a reduced incidence of infection among unvaccinated residents

Table 1. Incident SARS-CoV-2 Infection among Nursing Home Residents According to Vaccination Status.*				
Variable	Total	Asymptomatic SARS-CoV-2 Infection	Symptomatic SARS-CoV-2 Infection	Percent of Infected Residents Who Were Asymptomatic
Residents vaccinated with ≥1 dose				
No. of residents	18,242			
Positive test after receipt of first dose — no. (%)				
At 0–14 days	822 (4.5)	587 (3.2)	235 (1.3)	71.4
At 15–28 days	250 (1.4)	179 (1.0)	71 (0.4)	71.6
Residents vaccinated with 2 doses				
No. of residents	13,048			
Positive test after receipt of second dose — no. (%)				
At 0–14 days	130 (1.0)	110 (0.8)	20 (0.2)	84.6
At >14 days	38 (0.3)	29 (0.2)	9 (0.1)	76.3
Unvaccinated residents				
No. of residents	3,990			
Positive test after first vaccination clinic — no. (%)				
At 0–14 days	173 (4.3)	115 (2.9)	58 (1.5)	66.5
At 15–28 days	69 (1.7)	42 (1.1)	27 (0.7)	60.9
At 29–42 days	16 (0.4)	13 (0.3)	3 (0.1)	81.2
At >42 days	12 (0.3)	10 (0.3)	2 (0.1)	83.3

* Vaccinations were received as of February 15, 2021; the testing and symptom data are as of March 31, 2021. A total of 14,669 residents received the Pfizer–BioNTech vaccine, and 3573 received the Moderna vaccine, both of which are based on messenger RNA (mRNA). Unvaccinated residents were those who were present at their facility on the day of the first vaccination clinic and who were not vaccinated as of March 31, 2021. The sample includes residents who had no history of incident severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in the 90 days before receipt of the first dose for vaccinated residents or in the 90 days before the date of the first vaccination clinic for unvaccinated residents. The 1072 residents who tested positive between the first and second vaccine doses were excluded from the analysis for the period after the second dose. All the residents were assessed daily by nurses who documented new symptoms in structured change-in-condition notes in the electronic health record. Residents were considered to be symptomatic if they had new symptoms related to SARS-CoV-2 infection from 5 days before to 14 days after the positive test. Residents were tested every 3 to 7 days when there were confirmed cases in their facility and were tested if they had any new symptoms or potential exposure. In the 9 fully vaccinated residents with incident symptomatic infection, the symptoms included cough (in 4 residents), fever (in 2), hypoxemia (in 2), tachycardia (in 2), and diarrhea (in 2). Of these 9 residents, 2 were hospitalized; all 9 were alive 30 days after testing positive.

suggests that robust vaccine coverage among residents and staff, together with the continued use of face masks and other infection-control measures, is likely to afford protection for small numbers of unvaccinated residents in congregate settings. Still, the continued observation of incident cases after vaccination highlights the critical need for ongoing vaccination programs and surveillance testing in nursing homes to mitigate future outbreaks.

Elizabeth M. White, Ph.D., A.P.R.N.
Xiaofei Yang, Sc.M.

Brown University School of Public Health
Providence, RI
elizabeth_white@brown.edu

Carolyn Blackman, M.D.

Richard A. Feifer, M.D., M.P.H.

Genesis HealthCare
Kennett Square, PA

Stefan Gravenstein, M.D., M.P.H.

Alpert Medical School of Brown University
Providence, RI

Vincent Mor, Ph.D.

Brown University School of Public Health
Providence, RI

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