

Food and Drug Administration indication to protect against smallpox and monkeypox (9). However, the JYNNEOS and ACAM2000 vaccines present disparate challenges. Specifically, the JYNNEOS vaccine is administered as a 2-dose regimen that shows a mild side effect profile, and the ACAM2000 vaccine is a single inoculation that can induce severe adverse effects. However, because of persistent JYNNEOS shortages hampering preexposure and postexposure prophylaxis efforts, vaccination with ACAM2000 might be an option in locales that urgently need immunizations protective against monkeypox. The efficacy of either vaccine in the current outbreak remains unknown.

Although vaccination is foundational for preventing infectious disease, this case highlights that vaccination alone does not guarantee immunity from monkeypox. Public health leaders should temper expectations that vaccination alone will end the outbreak. Vaccine should complement, not replace, public health campaigns that aim to minimize high-risk health behaviors.

### Acknowledgments

We thank Jeanne Slusher and Stanley Conklin for providing assistance in the clinic, Patricia Vu and Karla Vegacolon for proactively developing a clinical plan for managing monkeypox patients, and Gavriella Simantov for assistance and guidance with laboratory testing.

### About the Author

Dr. Turner is a transitional year intern physician at Madigan Army Medical Center in Tacoma, WA. His research interests include thyroid pathology and long-term neurologic sequela of spaceflight.

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Address for correspondence: Robert Haynes, Public Health Clinical Services, 9025 Fifth St, Joint Base Lewis-McChord, WA 98431, USA; email: robert.c.haynes53.mil@health.mil

## Vaccine Effectiveness against SARS-CoV-2 Variant P.1 in Nursing-Facility Residents, Washington, USA, April 2021

James W. Lewis, Julie Loughran, Li Deng, Jasmine Varghese, Shauna Clark, Casandra Harrison, Molly Gacetta, John A. Jernigan, Katherine E. Fleming-Dutra

Author affiliations: Public Health Seattle and King County, Seattle, Washington, USA (J.W. Lewis, J. Loughran, S. Clark, C. Harrison, M. Gacetta); Centers for Disease Control and Prevention, Atlanta, Georgia, USA (L. Deng, J. Varghese, J.A. Jernigan, K.E. Fleming-Dutra)

DOI: <https://doi.org/10.3201/eid2811.221043>

A SARS-CoV-2 P.1 (Gamma) variant outbreak occurred at a skilled nursing facility in Washington, USA, in April 2021. Effectiveness of 2 doses of mRNA vaccines against P.1 infection among residents in this outbreak was 75.0% (95% CI 44.5%–88.7%), similar to effectiveness for other pre-Delta variants among long-term care residents.

COVID-19 mRNA vaccines demonstrated high efficacy (>94%) against COVID-19 in clinical trials (1,2). However, initial observational vaccine effectiveness (VE) estimates against infection among residents of skilled nursing facilities (SNFs), a high-risk population, were lower, 53%–75% (3). A local health department in Washington, USA, investigated a COVID-19 outbreak of the P.1 (Gamma) variant in April 2021 in an SNF and estimated VE of 2 mRNA vaccine doses against SARS-CoV-2 infection. The Centers for Disease Control and Prevention reviewed the activity to confirm it was conducted consistent with applicable federal law and organizational policy. This investigation was defined as having met the requirements for public health surveillance as outlined in 45 C.F.R. part 46.102(l) (2).

Daily symptom screening of residents and staff had been ongoing in this SNF since March 2020. Routine antigen testing of symptomatic residents with BinaxNOW tests (Abbott Diagnostics, <https://www.diagnostics.abbott>) was performed upon symptom recognition; routine testing of staff was ongoing. Nucleic acid amplification test (NAAT) confirmation of all positive antigen results and antigen negative results for symptomatic persons was performed. The outbreak index case was a symptomatic fully vaccinated resident identified on April 16, 2021. All residents and staff were tested immediately and again every 3–7 days for the duration of the outbreak period, April 15–May 9, 2021.

We defined a case as a positive SARS-CoV-2 antigen or NAAT result in a resident of the SNF. The local health jurisdiction requested viral whole-genome sequencing (WGS) for all positive specimens. Washington State Department of Health Public Health Laboratories and their partners identified SARS-CoV-2 variant status for individual cases

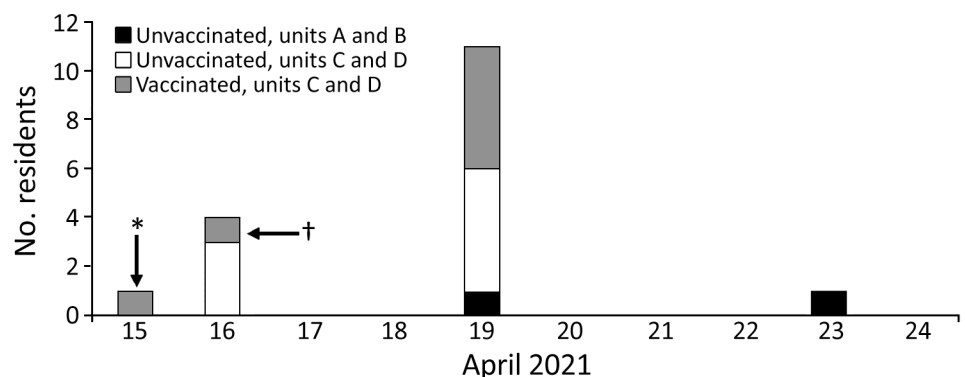
through WGS and recorded cases in the Washington Disease Reporting System.

The SNF conducted vaccination clinics on January 12, February 2, and February 23, 2021. We defined vaccination status as fully vaccinated with 2 doses, if receipt of second vaccine dose was  $\geq 14$  days before the outbreak began (4), and unvaccinated if no COVID-19 vaccine had been received before or during the outbreak. We excluded from the VE analysis residents who were partially vaccinated (i.e., who had received 1 vaccine dose or had received a second dose  $\leq 14$  days before the outbreak). We ascertained vaccination status through Washington Immunization Information System and facility medical records. We obtained age, race, ethnicity, and comorbidity information from facility medical records.

We calculated VE for 2 mRNA vaccine doses on the basis of relative risk (RR) of infection in vaccinated versus unvaccinated residents using a log-binomial model and adjusted for potential confounders of age (<85 vs.  $\geq 85$  years) and race (White vs. all other residents with nonmissing race). We used the equation  $VE = 100\% \times (1 - RR)$ . We conducted a separate analysis limited to WGS-confirmed P.1 cases to estimate VE against P.1 infection.

Of 63 residents present during the outbreak, 43 (68%) were fully vaccinated with 2 doses and 16 (25%) were unvaccinated; we excluded 4 partially vaccinated residents from the analysis. Thirty-six (84%) of 43 vaccinated residents received vaccination during the onsite clinics. Seven residents (16%) were fully vaccinated at other locations. Nineteen residents tested positive for SARS-CoV-2 during the outbreak (Figure; Appendix Figure, <https://wwwnc.cdc.gov/EID/article/28/11/22-1043-App1.pdf>); 2 of those were partially vaccinated and excluded from analysis. Of the 17 included outbreak

**Figure.** Date of first positive SARS-CoV-2 specimen collection among residents in a skilled nursing facility, Washington, April 2021. Cases shown are restricted to the 17 resident cases included in vaccine effectiveness (VE) analysis. Testing was concentrated on point prevalence survey days. Units A and B were long-stay units; units C and D were short-stay units. Asterisk (\*) indicates a resident who was discharged from a short-stay unit and later tested positive at an area hospital; dagger (†) indicates a resident who tested positive after symptom screening.



**Table.** Characteristics of residents in a skilled nursing facility included in a SARS-CoV-2 vaccine effectiveness analysis, Washington, USA, April 2021\*

Characteristic	No. (%) fully vaccinated	No. (%) unvaccinated
Residents present during outbreak	43	16
Sex		
M	15 (35)	7 (44)
F	28 (65)	9 (56)
Age group, y		
60–74	7 (16)	4 (25)
75–84	14 (33)	6 (38)
≥85	22 (51)	6 (38)
Race†		
Asian	5 (12)	0
Black or African-American	0	2 (13)
White	36 (84)	13 (81)
Other	1 (2)	0
Unknown	1 (2)	1 (6)
Underlying health conditions		
Hypertension	32 (75)	10 (63)
Neurologic disease	32 (75)	15 (94)
Cardiovascular disease	27 (63)	13 (81)
Diabetes	14 (33)	3 (19)
Asthma, COPD, sleep apnea, other chronic respiratory disease	12 (28)	7 (44)
Obesity	7 (16)	4 (25)
Autoimmune condition	5 (12)	0
Cancer	2 (5)	1 (6)
Immunosuppressive disease or medication	2 (5)	0
End-stage renal disease requiring dialysis	0	1 (6)
Other, nonneurologic condition	42 (98)	16 (100)
≥2 underlying conditions	43 (100)	16 (100)
Unit		
Unit A, long-stay unit	15 (35)	4 (25)
Unit B, long-stay unit	16 (37)	4 (25)
Unit C, short-stay unit	10 (23)	4 (25)
Unit D, short-stay unit	2 (5)	4 (25)
History of prior SARS COV-2 infection‡	13 (30)	3 (19)
Tested positive for SARS COV-2 during outbreak period	7 (16)	10 (63)

\*Four residents who were partially vaccinated (received 1 dose of COVID-19 vaccine) were excluded from this analysis. COPD, chronic obstructive pulmonary disease.

†No residents reported Hispanic or Latino ethnicity. Data for ethnicity was highly missing; 25 (58%) vaccinated residents and 8 (50%) unvaccinated residents were of unknown ethnicity.

‡All previous infections were >3 mo before start of outbreak (before January 13, 2021).

cases, 7 were in fully vaccinated residents. Thirteen (77%) of 17 outbreak cases had WGS data; all were identified as P.1 lineage.

Most of the 59 residents included in the analysis were White (83%) and female (63%); the age range was ≥60 years (Table). Ethnicity was unknown for 56% of residents. All residents had ≥2 underlying health conditions that may increase risk for severe COVID-19.

The attack rate in unvaccinated residents was 63% (10/16) versus 16% (7/43) in fully vaccinated residents (adjusted RR 4.0, 95% CI 1.8–8.9). Unadjusted VE against infection was 74.0% (95% CI 43.4%–88.0%). Age-adjusted and race-adjusted VE against infection among 57 residents (excluding 2 residents with unknown race) was 75.0% (95% CI 44.5%–88.7%). Age- and race-adjusted VE against WGS-confirmed P.1 infection among 53 residents (excluding 2 residents with unknown race) was 80.0% (95% CI 46.4%–92.6%). In this outbreak, vac-

ination was associated with decreased likelihood of infection. Our estimated VE of 75% (95% CI 45%–89%) against infection is consistent with other findings of mRNA VE against infection with other pre-Delta variants among residents of SNFs (3–7).

The first limitation of our study is that unvaccinated residents might have differed from vaccinated in ways we did not measure, including in the use of mitigation behaviors. In addition, the demographics of residents in this facility may differ from the broader general long-term care resident population.

In conclusion, our evaluation indicates that receiving 2 mRNA vaccine doses was effective in reducing the likelihood of testing positive for SARS-CoV-2 during an outbreak of P.1 lineage variant in an SNF. VE against P.1 is comparable to that against other pre-Delta SARS-CoV-2 variants among long-term care residents.

## Acknowledgments

We are grateful to the staff and residents of the SNF described in this study. We thank the Washington State Department of Health Office of Communicable Disease Epidemiology Staff who worked to collect specimens for WGS and provided data for the project. We also thank the Washington State Department of Health Public Health Laboratories COVID-19 Team who generated the SARS-CoV-2 genomic data and shared this data to GISAID.

This work was funded by the Centers for Disease Control and Prevention and Public Health Seattle and King County.

## About the Author

Dr. Lewis is a board-certified physician in internal medicine, infectious disease, and preventive medicine. He is currently the health officer for the Snohomish County Health District; prior to this position and during the initial composition of this article he was a medical epidemiologist at Public Health Seattle & King County helping to oversee the response to the SARS-CoV-2 pandemic in healthcare settings.

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Address for correspondence: James Lewis, 3020 Rucker Ave, Ste 206, Everett, WA 98201, USA; email: [jlewis@snohd.org](mailto:jlewis@snohd.org); Katherine Fleming-Dutra, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop H24-6, Atlanta, GA 30329-4027, USA; email: [ftu2@cdc.gov](mailto:ftu2@cdc.gov)

## Reinfections with Different SARS-CoV-2 Omicron Subvariants, France

Nhu Ngoc Nguyen, Linda Houhamdi, Léa Delorme, Philippe Colson, Philippe Gautret

Author affiliations: Aix Marseille University, Marseille, France; Institut Hospitalo-Universitaire Méditerranée Infection, Marseille

DOI: <https://doi.org/10.3201/eid2811.221109>

We describe 188 patients in France who were successfully infected with different SARS-CoV-2 Omicron subvariants, including BA.1, BA.2, and BA.5. Time between 2 infections was  $\leq 90$  days for 50 (26.6%) patients and  $< 60$  days for 28 (14.9%) patients. This finding suggests that definitions for SARS-CoV-2 reinfection require revision.

In Belgium, 96 cases of early SARS-CoV-2 reinfection were reported during December 1, 2021–March 10, 2022; the cases had a median of 47 days (range 17–65 days) between 2 positive samples (1). Five of those cases indicated primary infections with Omicron subvariant BA.1, followed by Omicron BA.2 reinfections. In addition, we previously reported that the reinfection risk with Omicron was 6-fold higher than with other SARS-CoV-2 variants (2). In this study, we describe cases of COVID-19 reinfection with different Omicron subvari-

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## Appendix

A local health department in Washington State investigated a COVID-19 outbreak of the P.1 (Gamma) variant in April 2021 in a skilled-nursing facility and estimated vaccine effectiveness of 2 mRNA vaccine doses against SARS-CoV-2 infection. Six residents with SARS-CoV-2 infection were hospitalized, 4 of whom were unvaccinated. Onsite vaccination clinics were held on January 12, February 2, and February 23, 2021.

There were 4 deaths among residents with SARS-CoV-2 infection, all of whom were unvaccinated; one decedent was on comfort care at the time of their SARS-CoV-2 diagnosis and declined treatment.

Infection prevention and control measures implemented during the outbreak included increased testing frequency, cohorting of residents by SARS-CoV-2 status, placement of positive and exposed residents on transmission-based precautions, dedicating staff to specific units, and pausing communal dining and activities.

Staff cases were not included in the analysis. Fifty-seven of 68 staff (84%) were fully vaccinated with 2 Pfizer-BioNTech vaccine doses, and 2 staff (3%) were partially vaccinated. Ten of 68 staff (15%) tested positive during the outbreak; none required hospitalization and 6 were fully vaccinated. Whole-genome sequencing was performed for 8; all were identified as P.1 lineage.