



Nursing Home Resident and Staff Covid-19 Cases After the First Vaccination Clinic

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Feb 4, 2021

Executive Summary

Nursing home residents and staff have been disproportionately affected by the COVID-19 pandemic. On December 1, 2020, the Advisory Committee on Immunization Practices (ACIP) recommended that long term care residents and staff be among the first group to receive the COVID-19 vaccine, as part of Phase 1a distribution. The two vaccines that have received Emergency Use Authorization (EUA) by the U.S. Food & Drug Administration (FDA) to-date are approximately 95% effective in preventing symptomatic disease and both require two doses. Data from the FDA EUA applications also suggest that symptoms decrease two weeks after receiving dose 1, corresponding to the time antibody levels increase to protective levels.

The federal government initiated the Pharmacy Partnership for Long-Term Care Program to vaccinate residents and staff in long term care facilities, including nursing homes. The government enlisted CVS, Walgreens, and other long-term care pharmacies to schedule on-site clinics and administer the vaccine starting one week after the FDA issued EUA for the Pfizer vaccine. The first clinics in long term care facilities began the week of December 18, 2020.

The vaccines' effectiveness on reducing spread and infections is currently unknown. We compared the weekly rate of new COVID infections among staff and residents in nursing homes that held a vaccine clinic to nursing homes in the same county that had not yet held a clinic to examine if new test-positive cases (e.g., spread or transmission) decreased.

We found that COVID-19 cases decreased at a faster rate among both residents and staff associated with nursing homes that had completed their first clinic, compared to those nursing homes that had not yet administered the vaccine. Looking at 797 nursing homes that conducted their first vaccination clinic from December 18, 2020 to December 27, 2020 and comparing them to nursing homes in the same county that had not yet conducted a clinic (1,709 facilities), the vaccinated nursing homes saw a larger decline in new resident and staff cases of COVID-19 three weeks after the vaccine clinics were held. Vaccinated nursing homes experienced a 48% decline in new resident cases three weeks after the first clinic, compared to a 21% decline among non-vaccinated nursing homes located in the same county. Similarly, new staff cases declined by 33% in vaccinated nursing homes compared to 18% in non-vaccinated facilities. As more follow-up data becomes available, further study is needed to determine if the trends following the first week clinics are seen in subsequent clinics.

This analysis is the first to look at the relationship between the COVID-19 vaccines and spread in long term care. The findings suggest that transmission may decline within three weeks after receiving the first dose of the vaccine. Further evaluations are needed to confirm this finding. Data and funding to complete more in-depth analyses needs to be made available to the research community. Without evidence on the vaccine effectiveness in long term care on spread, morbidity and mortality, restrictive policies on visitors, communal dining, group activities, and community outings may continue.

Introduction

The coronavirus disease 2019, COVID-19, has disproportionately impacted the elderly and frail, particularly those receiving care in long term care (LTC) settings in the US and internationally.^{1, 2} Some estimate that over 100,000 LTC residents have died due to COVID-19, accounting for up to 40% of all COVID-19 deaths in the U.S.³ Evidence from the first half of 2020 found that outbreaks in LTC facilities were associated with the rates of COVID-19 in the community.^{4, 5} This association has persisted during the most recent surge in cases in the fall of 2020.⁶ Therefore, a vaccine, coupled with reductions in community spread and standard infection prevention precautions, provides the most promising approach to preventing the deleterious impact of COVID-19 in LTC residents and staff.

The U.S. Food & Drug Administration (FDA) granted Emergency Use Authorization (EUA) for two mRNA vaccines in December of 2020, BNT162b2 and mRNA-1273, manufactured by Pfizer-BioNTech and Moderna, respectively.^{7, 8} Due to high risk for COVID-19 morbidity and mortality for LTC residents and staff, on December 1, 2020 the Advisory Committee on Immunization Practices (ACIP) recommended prioritizing long-term care residents and staff to receive the vaccine as part of Phase 1a.⁹ In order to streamline vaccine distribution, the Center for Disease Control and Prevention (CDC) launched the Pharmacy Partnership for Long Term Care Program, a public-private partnership among CDC, CVS Pharmacy, Managed Health Care Associates, Inc. and Walgreens. LTC facilities signed up for participation in the program starting in November 2020.¹⁰ Through the program, pharmacies will administer vaccines to LTC residents and staff at three designated clinic days. The program aimed to provide on-site COVID-19 vaccination of residents and staff members at enrolled LTCFs in 54 jurisdictions (49 states, 4 cities, and one territory).¹¹ On December 18, 2020, within one week of the Pfizer-BioNTech EUAs, the Partnership started administering vaccines in nursing homes across the country.¹¹

Both vaccines use mRNA to stimulate the immune system to produce antibodies against the spike glycoprotein for the coronavirus, SARs-CoV-2.^{7, 8} The Pfizer-BioNTech vaccine requires two shots administered 21 days apart.⁷ Similarly, the Moderna vaccine also requires two shots, but the shots are administered 28 days apart.⁸ Both Pfizer-BioNTech and Moderna trials reported near 95% effectiveness at preventing symptomatic COVID-19.^{7, 8} However, the trials did not evaluate the impact of the respective vaccines on disease spread.

In both trials, new COVID-19 infections among those vaccinated were infrequent 14 days after receiving the vaccine.¹² This corresponds to the 10 to 14 days the human body takes to develop antibody levels thought to prevent illness.¹³ While two doses are required to achieve nearly 95% effectiveness, the vaccine was found to be effective in preventing symptomatic disease after the first dose, albeit at lower levels of effectiveness (52% for both Pfizer and Moderna).^{7, 8, 12} This raises the possibility that COVID-19 cases may decrease in nursing homes two weeks after the administration of the first dose to residents and staff.

To evaluate this possibility, we used Center for Medicare and Medicaid Services (CMS) National Healthcare Safety Network (NHSN) national data, which collects COVID-19 data from nursing homes on cases, among other information. We examined the rate of new, positive COVID-19 cases among residents and staff three weeks after the Program's vaccine clinics compared to rates of COVID-19 infections in nursing homes in the same county but that did not yet hold vaccine clinics.

Methods

In accordance with CMS regulations, nursing homes are required to test all their staff and residents at a frequency based on the county COVID-19 rate.¹⁴ The NHSN Public File captures this weekly COVID-19 related data such as new staff and resident COVID-19 test positive cases reported by LTC facilities to the CDC NHSN system.^{15, 16}

In our evaluation, we utilized the latest CMS NHSN Public File data released on January 28, 2021 that contained staff and resident new COVID-19 infections up to the week of January 17, 2021. We linked NHSN data for each facility with the Care Compare Nursing Home Five-Star data released on January 27, 2021 and Certification and Survey Provider Enhanced Reports (CASPER) data and the 2020Q3 PBJ Daily Staffing to obtain facility characteristic data.^{17, 18}

We linked this data with the latest CMS Long Term Care Minimum Data Set (MDS) 3.0 from 2020Q1 to calculate the proportion of residents identifying as a racial minority or Hispanic non-white ethnicity.¹⁹ The MDS instrument is a standardized, comprehensive assessment that must be completed for all persons who receive care in a Medicare and/or Medicaid-certified nursing facility, capturing information about residents' demographic and clinical status.^{20, 21} We define racial minority defined as: Asian, African American, American Indian or Alaskan Native, Native Hawaiian or Pacific Islander alone, or more than one race. We characterized facilities as having low, medium, medium-high, or high proportion of residents based on quartiles from the national distribution of any racial minority and for Hispanic non-white.²²

We used vaccine clinic schedule data from the CDC Tiberius system used for nursing homes participating in the CDC Pharmacy Partnership for Long Term Care Program containing information on 11,490 nursing homes. We then created an analytic cohort based on the schedule of the vaccination clinics taking place during the first week of the program (12/18/20 to 12/27/20). We created a comparison group, composed of facilities located in the same county that did not have a first vaccination clinic during that period. Facilities not participating in the federal vaccine program, were excluded as vaccination clinic dates were not available.

States approved the start date for the partnership and also selected either the Pfizer or Moderna vaccine for use in the program. Scheduling of clinics was then done by the long-term care pharmacy partners with a goal scheduling >90% of all skilled nursing facilities (SNFs) in the state within 4 weeks of the start date.

Since the CMS NHSN Public file provides weekly data for each facility for each week, we calculated the 7-day rate of new resident cases per 1,000 as the number of new resident confirmed cases over the resident census, starting from November 22, 2020 until January 17, 2021. We created the 7-day rate of new staff cases as the number of new staff confirmed cases divided by the total FTE nursing staff from PBJ for each facility.

We compared differences in facility characteristics between groups using chi-square tests. All analyses were done using SAS 9.4.

Results

There were 797 LTC facilities that received the Pfizer vaccine during the first week of the program (12/18/20 to 12/27/20) and 1,709 SNFs in the same county that did not have a vaccine clinic scheduled.

We found that the trends in new COVID-19 infections among residents started to decline before the vaccine clinics but was greater in the SNFs that held vaccine clinics the first week of the program compared to the SNFs that did not have a vaccine clinic in the same county (Figure 1). Three weeks after the first vaccine clinic the rates of new COVID-19 infection dropped more in the 797 SNFs that held vaccine clinic compared to those that did not in the same county (48% vs 21%, respectively).

Similar patterns of trends were evident when we analyzed the proportion of new cases among staff (Figure 2). More specifically, the proportion of new cases of COVID-19 declined more in SNFs that held clinics the first week compared to those that did not in the same county. Three weeks after the first vaccine clinic the rates of new COVID-19 infection dropped more in the NH that held vaccine clinic compared to those that did not (33% vs 18%, respectively).

We did not find any differences in the size, facility type, or ownership of facilities having their vaccine clinics in the first week of the program compared to SNFs in the same county who did not (Table 1). However, we observe a higher proportion of facilities holding vaccination clinics were rural as compared to those who did not hold a vaccination clinic in the same period (21.3% vs 12.4% respectively, $p < 0.01$). Furthermore, a higher proportion of facilities that did not have a vaccination clinic cared for a high proportion of racial minorities on average as compared to those facilities who did have vaccine clinics (27.7% vs. 21.6%, $p < 0.01$), but we did not see a significant statistically significant difference for facilities taking care of a higher proportion of Hispanic non-white residents.

Table 1. Facility Characteristics of SNFs Holding and Not Holding Vaccine Clinics in the Same County

Facility Characteristic		First Vaccine Clinic Week of Dec. 21				P-value
		Vaccination Clinic		No Vaccination Clinic		
		N	%	N	%	
Total		797		1709		
Bed Size	<=50 Beds	79	9.9	145	8.5	
	50-120 Beds	434	54.5	984	57.6	
	>120 Beds	284	35.6	580	33.9	0.27
Government or Not-For-Profit	No	598	75.0	1305	76.4	
	Yes	199	25.0	404	23.6	0.47
Urban	No	170	21.3	212	12.4	
	Yes	627	78.7	1494	87.4	<0.01
Multi-Facility Ownership	No	335	42.0	769	45.0	
	Yes	462	58.0	940	55.0	0.16
Hospital-Based	No	783	98.2	1677	98.1	
	Yes	14	1.8	32	1.9	0.84
CCRC	No	722	90.6	1560	91.3	
	Yes	75	9.4	149	8.7	0.57
VA SNF	No	700	87.8	1504	88.0	
	Yes	97	12.2	202	11.8	0.81
Racial Minority	Low	173	21.7	270	15.8	
	Medium	221	27.7	449	26.3	
	Medium-High	230	28.9	509	29.8	
	High	172	21.6	474	27.7	<0.01
Hispanic Non-White	Low	235	29.5	448	26.2	
	Medium	146	18.3	301	17.6	
	Medium-High	231	29.0	506	29.6	
	High	184	23.1	447	26.2	0.22

Figure 1. Rates of Resident COVID-19 Infections

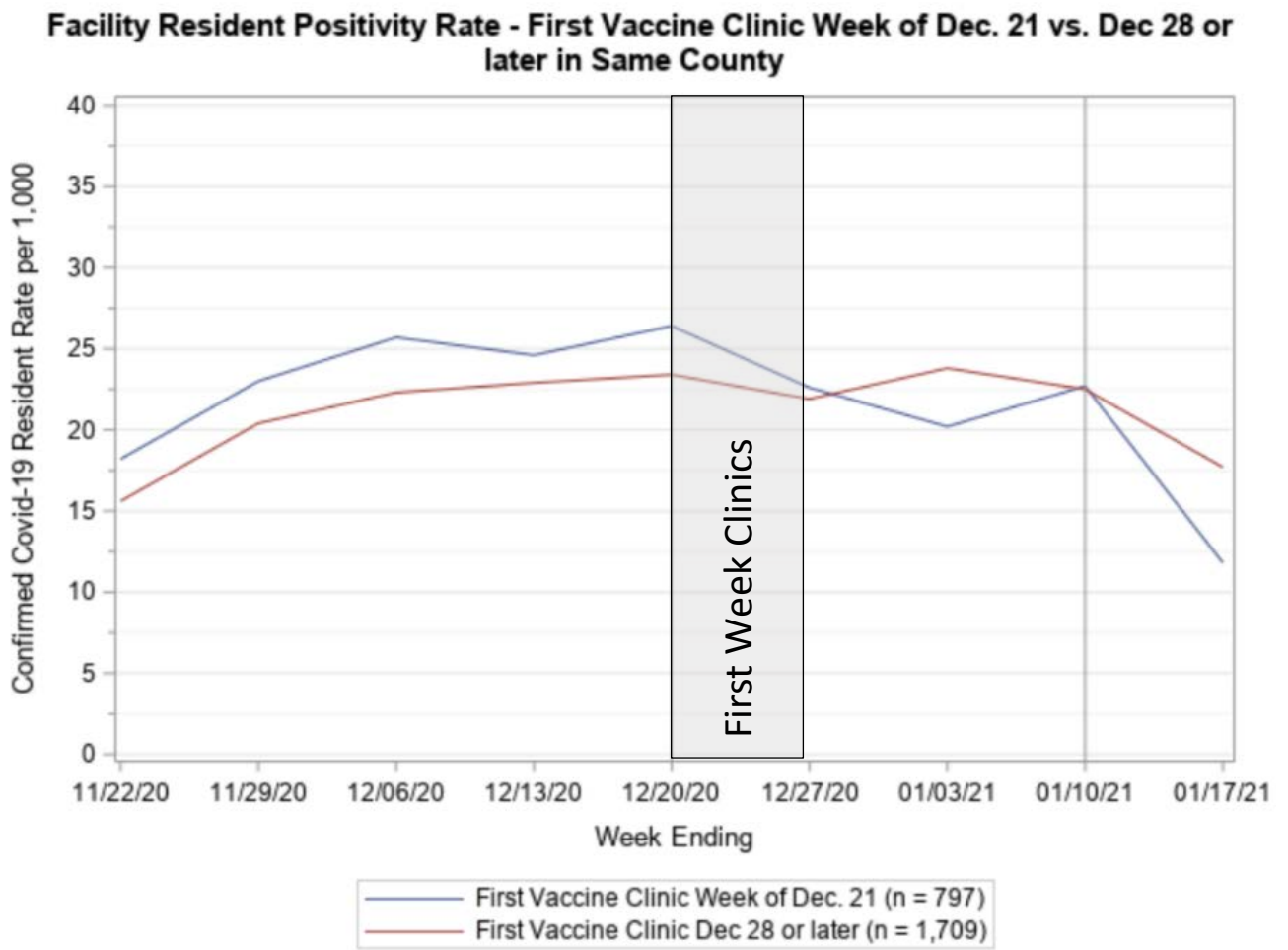
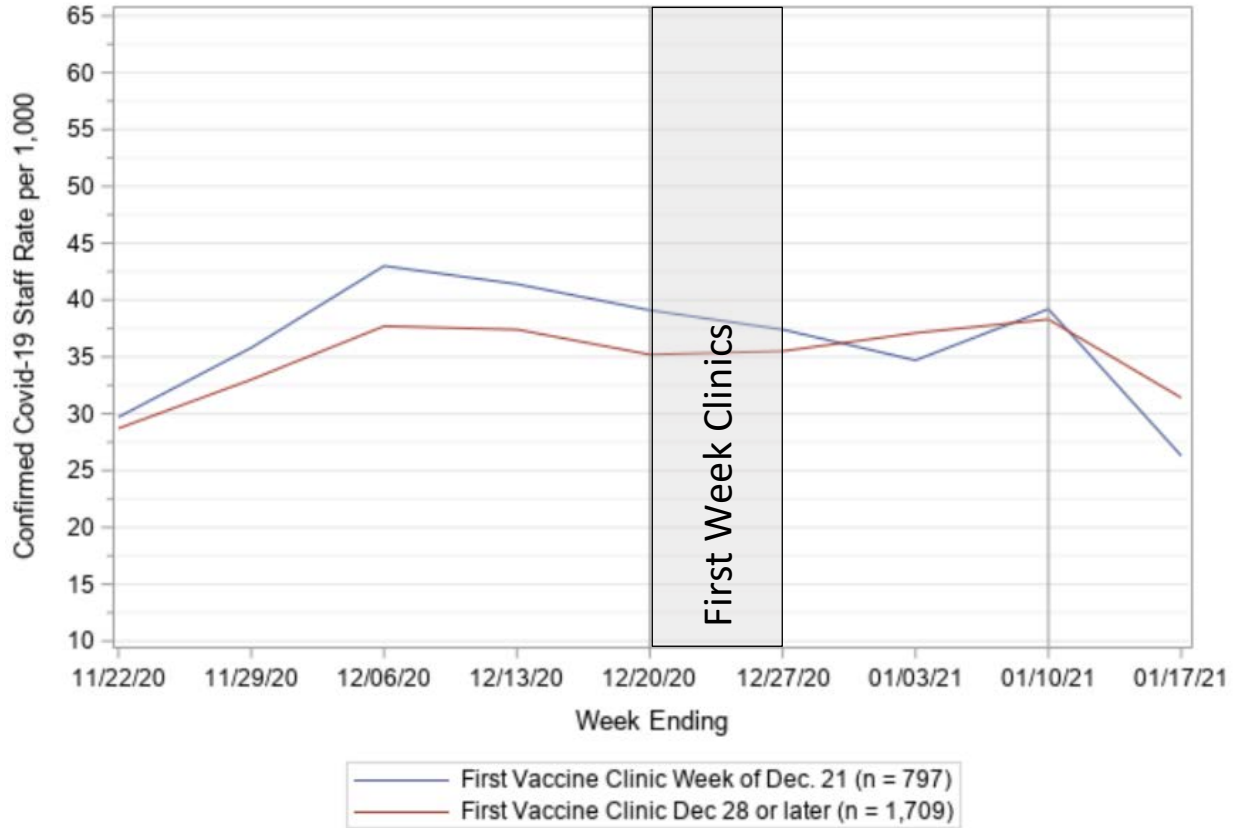


Figure 2. Rates of Staff COVID-19 Infections

Facility Staff Positivity Rate - First Vaccine Clinic Week of Dec. 21 vs. Dec 28 or later in Same County



Discussion

While the two FDA-approved for EUA vaccines require two doses to achieve 95% efficacy, data from the trials show that they are effective after a single dose, albeit at lower level.^{7, 8} Also, since antibody levels do not rise to protective levels until approximately two weeks after exposure to the SARS-CoV-2 virus,²³ the protective effect of the vaccine should not be seen until two weeks after vaccination.^{7, 8, 12} Therefore, we examined the change in the rate of new COVID-19 infections among staff and residents in nursing homes that had three weeks of follow-up data on COVID infections.

We found that in the third week after COVID-19 vaccine clinics were held in 797 SNFs that the rates of new staff and resident COVID-19 infections dropped more than in facilities without a vaccination clinic in the same county. As more follow-up data becomes available, we will need to assess if the trends in the first week clinics continue and are also seen in the second week clinics.

We compared the rates of new COVID-19 infection of SNFs in the same county because the rate of infection in the county has been previously shown to be one of the strongest predictors of resident and staff cases of COVID-19.^{4, 6} Other characteristics that have been shown related to infection rates in SNFs include larger bed size, urban location and minority populations.⁵ We saw that a higher proportion of facilities that held vaccine clinics in the first distribution week were rural and had lower proportions of minorities. The effect of these differences on the overall COVID-19 resident and staff infection rates observed are unknown and warrant further exploration.

Another benefit of comparing LTC facilities in the same county is that we control for the testing frequency for COVID-19 because CMS requires all nursing homes to test residents and staff at the same frequency based on the rate of COVID-19 in the community.^{14, 16} Per CMS guidance, the frequency of surveillance testing staff and residents for COVID-19 does not change after a vaccination clinic. As such, the rate of testing should be similar in SNFs with vaccine clinics and those without vaccine clinics that are in the same county. Thus, differences in COVID-19 infections are unlikely to be due to differences in test frequency among residents or staff.

Our evaluation did not examine the relationship between vaccine uptake among residents and staff with infection rates. The vaccine uptake among staff is much less than among residents.¹¹ There is wider variation in vaccination rates for both staff and residents. Our findings would be bolstered if there is a greater drop in COVID-19 infections among facilities with high vaccination rates of staff and resident compared to those with low vaccination rates. Unfortunately, data on individual facility vaccination rates is not readily available to conduct such an analysis.

Ideally, evaluations should compare the effect of individual resident or staff who were and were not vaccinated on the rate of COVID infections over time, but unfortunately such data at the individual person level is not currently available.

We also did not look at the relationship of COVID-related mortality because changes in mortality lag approximately two weeks after COVID-19 infection. As more follow-up time accrues, we aim to extend this analysis to include mortality. Both vaccines were shown to decrease severe disease,^{8, 9} which we anticipate will translate into drops in COVID-related mortality among residents and staff who were vaccinated compared to those not vaccinated.

This analysis is the first look at the relationship between the COVID-19 vaccine and spread in long term care, and it suggests that spread may be decreased starting three weeks after receiving the first dose of the vaccine. While promising, further evaluations are needed to confirm this finding.

Policy Implications

Evaluation on vaccine effectiveness in the LTC setting needs to be a priority. Without evidence on the vaccine effectiveness in long term care on spread, morbidity and mortality, restrictive policies intended to prevent spread such as limits on visitors, communal dining, group activities, and community outings may continue. The unintended effect these policies have had on the residents in SNFs support the need to rapidly determine when these policies can be lifted.

Data and funding to complete more in-depth analyses needs to be made available to the research community to determine if these preliminary findings showing a decrease in spread hold up in later clinics and after the second dose of the vaccine.

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