

# Letters

## RESEARCH LETTER

### Asymptomatic and Presymptomatic Severe Acute Respiratory Syndrome Coronavirus 2 Infection Rates in a Multistate Sample of Skilled Nursing Facilities

Asymptomatic transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may be a major contributing factor in skilled nursing facility (SNF) outbreaks. However, limited knowledge exists regarding the prevalence of



Supplemental content

asymptomatic and presymptomatic infection in this setting. Although an estimated 40% to 45% of SARS-CoV-2 infections in the general population are asymptomatic at time of testing,<sup>1</sup> a small number of US and international reports have documented higher asymptomatic rates in SNFs.<sup>2-5</sup> We examined asymptomatic and presymptomatic infection rates in a large multistate sample of US SNFs, and examined variation in case counts by SARS-CoV-2 prevalence in the counties where SNFs are located.

**Methods** | We used data from Genesis HealthCare, a multistate long-term care provider with roughly 350 SNFs. By combining electronic medical record data with daily infection logs that recorded testing dates and results, we identified all unique resident cases of SARS-CoV-2 confirmed by polymerase chain reaction testing between March 16, 2020, and July 15, 2020. This study was approved by the Brown University institutional review board, which waived the requirement for participant informed consent because all data were deidentified.

All residents underwent nursing assessments at least twice daily. We classified residents as having new SARS-CoV-2-related symptoms if nurses documented in a structured change in condition note any of the symptoms listed in the eMethods in the Supplement. Residents were classified as symptomatic

at presentation if they had new symptoms within 5 days before their first positive test date, presymptomatic if they had no symptoms in the 5 days before testing but developed symptoms within 14 days thereafter, and asymptomatic if they had no symptoms from 5 days pretest to 14 days posttest.

Test availability varied regionally and temporally. We analyzed cumulative case counts for SNFs that underwent 1 or more point-prevalence surveys, either facility-wide (all residents tested) or unit-based (all residents on specific units tested without testing the whole house). The cumulative case count includes cases detected during surveys plus those detected during symptom- or exposure-driven testing at any time from March 16, 2020, to July 15, 2020. We report the percentage of cumulative cases who were asymptomatic, presymptomatic, and symptomatic at presentation.

In addition, we describe variation in counts of combined asymptomatic and presymptomatic cases at time of initial survey for SNFs that underwent facility-wide testing, across counties located in the top 5%, middle 20%, and bottom 75% of US counties for SARS-CoV-2 prevalence. County data were obtained from the Johns Hopkins University Coronavirus Resource Center (<https://coronavirus.jhu.edu>).

**Results** | As of July 15, 2020, 182 SNFs in 20 states had at least 1 SARS-CoV-2 case and underwent some form of a point prevalence survey, with a cumulative total of 5403 unique resident cases (Table). Overall, 2194 (40.6%) cases were asymptomatic, 1033 (19.1%) were presymptomatic, and 2176 (40.3%) were symptomatic at presentation. The SNFs that underwent at least 1 facility-wide survey (N = 173) identified slightly higher cumulative rates of asymptomatic and presymptomatic infection than SNFs limited to unit-based surveys (N = 9) (P = .02). Of the 5011 cases identified in SNFs with facility-wide testing, 2049 (40.9%) were asymptomatic, 969 (19.3%) were presymptomatic, and

Table. Percentage of 5403 Cumulative SARS-CoV-2 Resident Cases Who Were Asymptomatic, Presymptomatic, or Symptomatic at Time of Initial Test in SNFs That Underwent at Least 1 Unit-Based or Facility-Wide Point Prevalence Survey as of July 15<sup>a</sup>

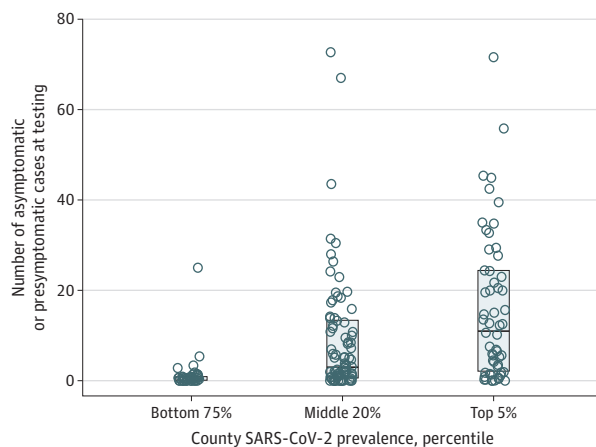
	No. (%)			
	Skilled nursing facility testing type			
Variable	1 Or more unit-based point prevalence surveys (n = 9)	1 Or more facility-wide point prevalence surveys (n = 173)	Total (n = 182)	P value
Asymptomatic	145 (37.0)	2049 (40.9)	2194 (40.6)	.02
Presymptomatic	64 (16.3)	969 (19.3)	1033 (19.1)	
Symptomatic	183 (46.7)	1993 (39.8)	2176 (40.3)	
Total cases	392 (100.0)	5011 (100.0)	5403 (100.0)	

Abbreviations: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; SNF, skilled nursing facility.

<sup>a</sup> Counts represent the cumulative number of resident cases across SNFs in 2 testing categories: those who underwent 1 or more unit-based point prevalence surveys without ever undergoing facility-wide testing, and those who underwent 1 or more facility-wide point prevalence surveys. The cumulative case count includes cases detected during survey plus those detected during symptom- or exposure-driven testing at any time from March

16, 2020, to July 15, 2020. A case is a resident who was positive for SARS-CoV-2 on polymerase chain reaction testing. For residents who were tested multiple times, the first positive test date was used to determine symptom status. A resident was asymptomatic if they had no new symptoms from 5 days before testing to 14 days after testing; presymptomatic if they had no new symptoms in the 5 days prior to testing but developed symptoms up to 14 days after testing; and symptomatic if they had new symptoms in the 5 days prior to testing. The P value of an overall Pearson  $\chi^2$  test is shown.

**Figure. Variation in Counts of Residents With SARS-CoV-2 Who Were Asymptomatic or Presymptomatic at Time of First Facility-Wide Point Prevalence Survey (N = 173), by County SARS-CoV-2 Prevalence**



SARS-CoV-2 indicates severe acute respiratory syndrome coronavirus 2; SNF, skilled nursing facility. Each point represents an individual SNF, showing the combined count of asymptomatic and presymptomatic SARS-CoV-2 resident cases at time of first facility-wide point prevalence survey. A resident was asymptomatic if they had no new symptoms from 5 days before testing to 14 days after testing; presymptomatic if they had no new symptoms in the 5 days prior to testing but developed symptoms up to 14 days after testing. The SNFs that underwent unit-based point prevalence surveys only are not included. The SNFs are stratified based on whether the county in which the SNF was located was in the top 5th, middle 20th, or bottom 75th percentile of US counties for SARS-CoV-2 prevalence as of the date of the SNF's first point prevalence survey. Data as of July 15, 2020.

1993 (39.8%) were symptomatic at presentation. Of the 392 cases identified in SNFs with unit-based testing 145 (37.0%) were asymptomatic, 64 (16.3%) were presymptomatic, and 183 (46.7%) were symptomatic at presentation.

Among the 173 SNFs that underwent facility-wide surveys, those in counties with higher SARS-CoV-2 prevalence generally had higher combined counts of asymptomatic and presymptomatic cases at their initial survey than SNFs in counties with lower prevalence (**Figure**).

**Discussion** | We observed high asymptomatic and presymptomatic SARS-CoV-2 infection rates in a large multistate sample of SNFs, demonstrating the importance of universal testing for identifying and isolating cases. The SNFs located in areas with high SARS-CoV-2 prevalence detected higher numbers of asymptomatic and presymptomatic cases during initial point prevalence surveys, building on emerging evidence that SNF location is an important predictor of outbreaks.<sup>6</sup>

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

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- Oran DP, Topol EJ. Prevalence of asymptomatic SARS-CoV-2 infection: a narrative review. *Ann Intern Med*. 2020; [Epub ahead of print]. doi:[10.7326/M20-3012](https://doi.org/10.7326/M20-3012)
- Dora AV, Winnett A, Jatt LP, et al. Universal and serial laboratory testing for SARS-CoV-2 at a long-term care skilled nursing facility for veterans—Los Angeles, California, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(21):651-655. doi:[10.15585/mmwr.mm6921e1](https://doi.org/10.15585/mmwr.mm6921e1)
- Comas-Herrera A, Zalakaín J, Litwin C, Hsu AT, Lane N, Fernández JL. Mortality associated with COVID-19 outbreaks in care homes: early international evidence. 2020; <https://itccovid.org/wp-content/uploads/2020/05/Mortality-associated-with-COVID-3-May-final-5.pdf>. Accessed May 7, 2020.
- Arons MM, Hatfield KM, Reddy SC, et al; Public Health—Seattle and King County and CDC COVID-19 Investigation Team. Presymptomatic SARS-CoV-2 infections and transmission in a skilled nursing facility. *N Engl J Med*. 2020;382(22):2081-2090. doi:[10.1056/NEJMoa2008457](https://doi.org/10.1056/NEJMoa2008457)
- Bigelow BF, Tang O, Barshick B, et al. Outcomes of universal COVID-19 testing following detection of incident cases in 11 long-term care facilities. *JAMA Intern Med*. 2020. doi:[10.1001/jamainternmed.2020.3738](https://doi.org/10.1001/jamainternmed.2020.3738)
- White EM, Kosar CM, Feifer RA, et al Variation in SARS-CoV-2 prevalence in US skilled nursing facilities. *JAGS*. Published online July 16, 2020. doi:[10.1111/jgs.16752](https://doi.org/10.1111/jgs.16752)