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COVID in US Nursing Homes: The Power of Data

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- Collaborators
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Purpose

- Background to Nursing Home Preparedness
- Competing Narratives regarding cause of outbreaks
- Importance of Data to Diagnosing the Problem and Prescribing a Solution to Ameliorate it
- The Influence of Data on the Debate: Study Findings

Americans' Perceptions of Nursing Homes

- Shaped by periodic scandals from local to national
- The fault of the facility, the industry or poor regulation
- Physician scandals (e.g. opioid prescribing) don't tar all doctors; NH scandals do condemn all providers

The “bad” Nursing Home Narrative: COVID-19

- Deaths in Kirkland Nursing Home (Seattle) were a shock and blamed on facility (fined)
- Inadequate infection control practices blamed on facility training and under-staffing
- NH blamed for inadequate supply of PPE
- Newspapers and CMS report that more deaths are occurring in low quality homes
- Extra funding from CMS [COVID cases are automatic Medicare]

nytimes.com/2020/04/17/us/coronavirus-nursing-homes.html?searchResultPosition=2

The Coronavirus Outbreak › | Latest Updates | Maps and Cases | States Reopening | Everything We Know | Answers to Your Questions

'They're Death Pits': Virus Claims at Least 7,000 Lives in U.S. Nursing Homes

More than six weeks after the first coronavirus deaths in a nursing home, outbreaks unfold across the country. About a fifth of U.S. virus deaths are linked to nursing facilities.

Desperate Need for Data

- Brown establishes Agreement with Genesis HealthCare to download EMR nightly
- Collaborative Commitment: Brown's Analytic prowess serves Genesis Operations
- Genesis Clinical Leadership, IT staff work with Brown investigators
- By May analyses of March and April data available

Variation in SARS-CoV-2 Prevalence in U.S. Skilled Nursing Facilities

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OBJECTIVE: To identify county and facility factors associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreaks in skilled nursing facilities (SNFs).

DESIGN: Cross-sectional study linking county SARS-CoV-2 prevalence data, administrative data, state reports of SNF outbreaks, and data from Genesis HealthCare, a large multistate provider of post-acute and long-term care. State data are reported as of April 21, 2020; Genesis data are reported as of May 4, 2020.

SETTING AND PARTICIPANTS: The Genesis sample consisted of 341 SNFs in 25 states, including a subset of 64 SNFs that underwent universal testing of all residents. The non-Genesis sample included all other SNFs (n = 3,016) in the 12 states where Genesis operates that released the names of SNFs with outbreaks.

MEASUREMENTS: For Genesis and non-Genesis SNFs: any outbreak (one or more residents testing positive for SARS-CoV-2). For Genesis SNFs only: number of confirmed cases, SNF case fatality rate, and prevalence after universal testing.

RESULTS: One hundred eighteen (34.6%) Genesis SNFs and 640 (21.2%) non-Genesis SNFs had outbreaks. A difference in county prevalence of 1,000 cases per 100,000 (1%) was associated with a 33.6 percentage point (95% confidence interval (CI) = 9.6–57.7 percentage point; $P = .008$) difference in the probability of an outbreak for Genesis and non-Genesis SNFs combined, and a difference of 12.5 cases per facility (95% CI = 4.4–20.8 cases; $P = .003$) for Genesis SNFs. A 10-bed difference in facility size was associated with a 0.9 percentage point (95% CI = 0.6–1.2 percentage point; $P < .001$) difference in the probability of outbreak. We found no consistent relationship between Nursing Home Compare Five-Star ratings or past infection control deficiency citations and probability or severity of outbreak.

CONCLUSIONS: Larger SNFs and SNFs in areas of high SARS-CoV-2 prevalence are at high risk for outbreaks and must have access to universal testing to detect cases, implement mitigation strategies, and prevent further potentially avoidable cases and related complications. J Am Geriatr Soc 00:1-7, 2020.

Keywords: COVID-19; facility; nursing home; long-term care; SARS-CoV-2; skilled nursing

Association of skilled nursing facility characteristics and county SARS-CoV-2 prevalence with the probability of a facility having at least one resident with SARS-CoV-19 (n=3,357)

Characteristic	Marginal Effect	Standard Error	95% CI		P
No. Beds (10s)	0.90	0.159	0.576	1.230	<0.001
Admissions/bed	0.09	0.663	-1.276	1.455	0.89
Mean resident age	0.22	0.116	-0.022	0.456	0.07
% Black	0.19	0.095	-0.003	0.386	0.05
% dementia	-0.03	0.051	-0.130	0.079	0.62
1-2 Star-rating for health inspections (Ref. 3)	0.67	1.388	-2.191	3.525	0.64
4-5 Star-rating for health inspections (Ref. 3)	-2.88	1.058	-5.062	-0.702	0.01
1-2 Star-rating for staffing (Ref. 3)	0.57	1.570	-2.664	3.802	0.72
4-5 Star-rating staffing (Ref. 3)	-1.91	1.597	-5.195	1.383	0.24
Inspection control deficiency	1.10	1.790	-2.586	4.788	0.54
County Prevalence (%)	33.64	11.683	9.574	57.698	0.008

Determinants of an Outbreak

- General Agreement that County Community Prevalence of SARS-CoV-2 most important predictor of an Outbreak
- CMS-CDC facility level data now interpreted accordingly
- Systematic Review of 25+ papers on topic reveal substantial methods failings of those finding large quality effects (although press still blames the ”bad apples”)

Screening/Testing for SARS-CoV-2

- Geriatric Patients have low temperatures
- CDC Temperature Thresholds for Testing NH residents too high
- Genesis introduced symptom screening at change of shift
- Brown Analysts tracked Temperature in relation to Testing Date
- Similar Analyses done in VA CLCs (Nursing Homes)

Temperature Screening for SARS-CoV-2 in Nursing Homes: Evidence from Two National Cohorts

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BACKGROUND/OBJECTIVES: Infection screening tools classically define fever as 38.0°C (100.4°F). Frail older adults may not mount the same febrile response to systemic infection as younger or healthier individuals. We evaluate temperature trends among nursing home (NH) residents undergoing diagnostic SARS-CoV-2 testing and describe the diagnostic accuracy of temperature measurements for predicting test-confirmed SARS-CoV-2 infection.

DESIGN: Retrospective cohort study evaluating diagnostic accuracy of pre–SARS-CoV-2 testing temperature changes.

SETTING: Two separate NH cohorts tested diagnostically (e.g., for symptoms) for SARS-CoV-2.

PARTICIPANTS

Veterans residing in Veterans Affairs (VA) managed NHs and residents in a private national chain of community NHs.

MEASUREMENTS: For both cohorts, we determined the sensitivity, specificity, and Youden's index with different temperature cutoffs for SARS-CoV-2 polymerase chain reaction results.

RESULTS: The VA cohort consisted of 1,301 residents in 134 facilities from March 1, 2020, to May 14, 2020, with 25% confirmed for SARS-CoV-2. The community cohort included 3,368 residents spread across 282 facilities from February 18, 2020, to June 9, 2020, and 42% were confirmed for SARS-CoV-2. The VA cohort was younger, less White, and mostly male. A temperature testing threshold of 37.2°C has better sensitivity for SARS-CoV-2, 76% and 34% in the VA and community NH, respectively, versus 38.0°C with 43% and 12% sensitivity, respectively.

CONCLUSION: A definition of 38.0°C for fever in NH screening tools should be lowered to improve predictive accuracy for SARS-CoV-2 infection. Stakeholders should carefully consider the impact of adopting lower testing thresholds on testing availability, cost, and burden on staff and residents. Temperatures alone have relatively low sensitivity/specificity, and we advocate any threshold be used as part of a screening tool, along with other signs and symptoms of infection. J Am Geriatr Soc 68:2716-2720, 2020.

Keywords: nursing homes; aged 80 and older; temperature; COVID-19; SARS-CoV-2

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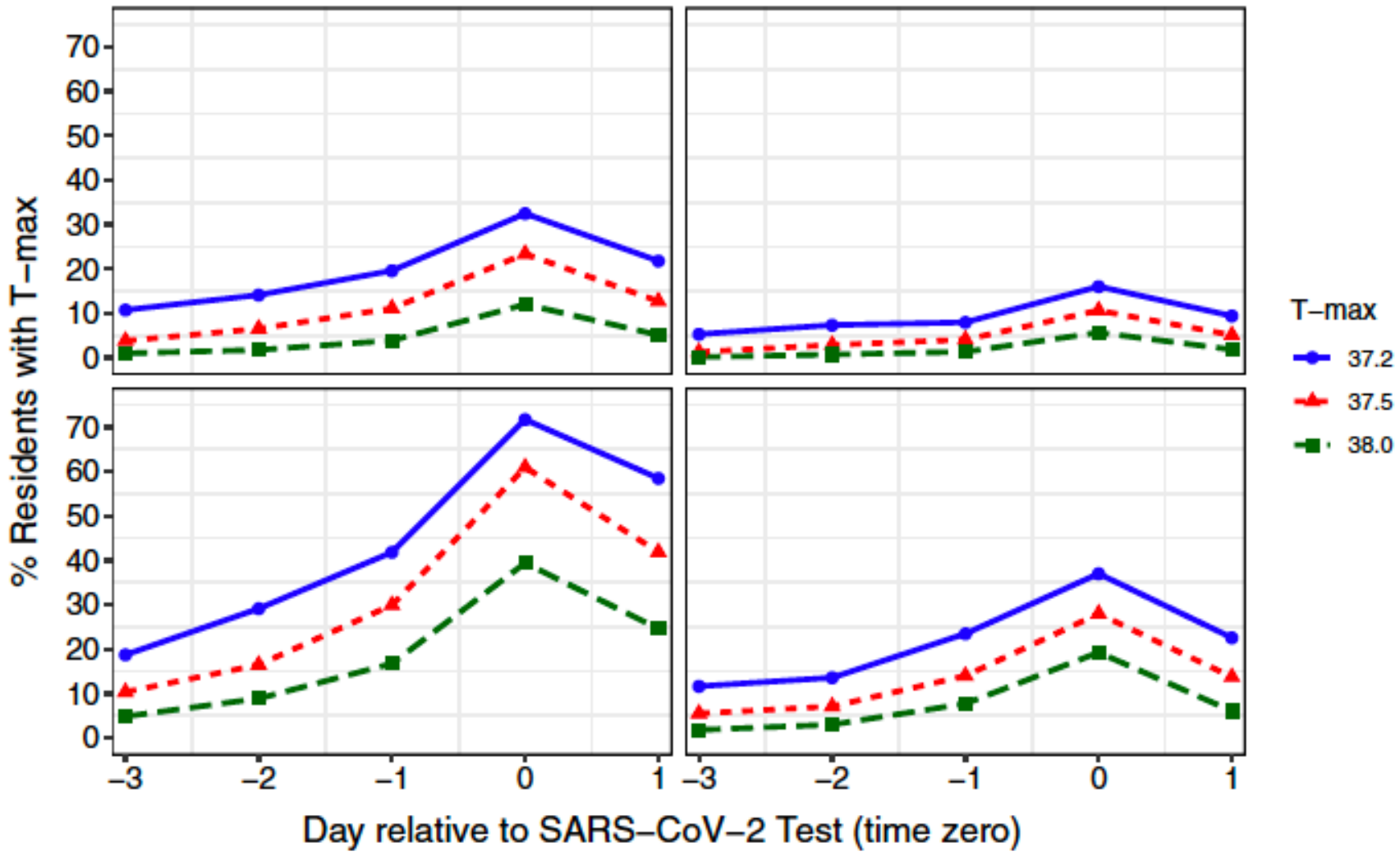


Figure 1. Percentage of residents meeting different temperature thresholds relative to SARS-CoV-2 testing. Day 0 is the date of SARS-CoV-2 test. T-max, maximum temperature in Celsius observed in a 24-hour period. Top panel shows community nursing homes; bottom panel shows Veterans Affairs nursing homes.

Asymptomatic Transmission Complicated Cohorting of Symptomatic Positive Cases

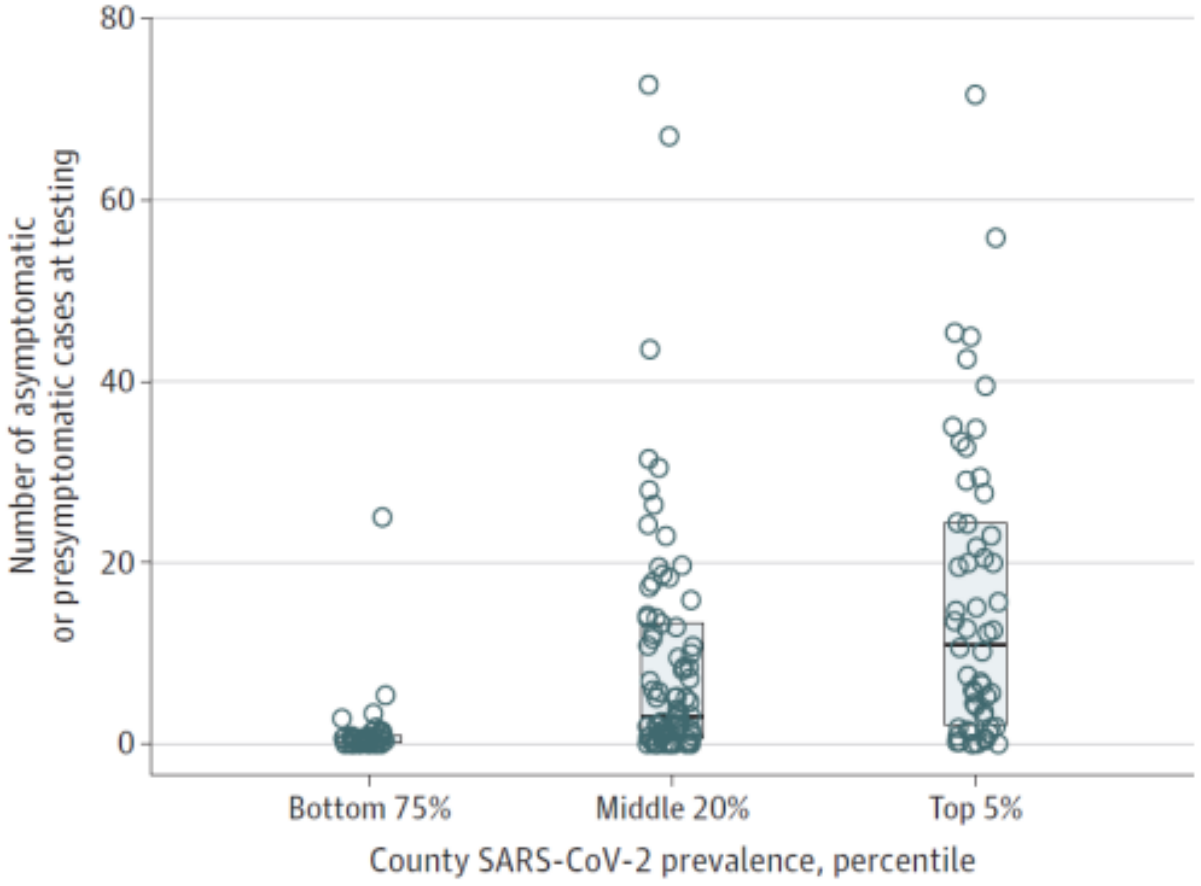
- Initially CDC advised Screening for Symptoms
- Inadequate Supply of Testing Kits
- Random ”Sweep” testing of Genesis facilities
- Found high proportions of Asymptomatic Residents
- Like Symptomatic cases, more frequent in counties with high SARS-CoV-2 prevalence

Percentage of cumulative SARS-CoV-2 resident cases (n=6,651) who were asymptomatic, pre-symptomatic, or symptomatic at time of testing in SNFs (N = 189) with different testing strategies

	Skilled Nursing Facility Testing Strategy				
	Facility-wide point prevalence surveys (N=68)	Unit-based point prevalence surveys (N=25)	Testing triggered by symptoms or exposure only (N=96)	Total (N=349)	P
Asymptomatic	(40.5%)	(37.%)	(22.2%)	(41.8%)	< .001
Pre-symptomatic	(19.3%)	(16.3%)	(4.2%)	(10.6%)	
Symptomatic	(39.8%)	(46.7%)	(73.6%)	(47.6%)	
Total cases	(100%)	(100%)	(100%)	(100%)	

More asymptomatic cases detected in counties with higher virus prevalence

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



Mortality-Case Fatality Rates

- Among Community population, mortality rates are highest among those with co-morbidities and advanced age

- NH population is Both OLD and SICK and functionally impaired

- But, still lots of variation …

JAMA Internal Medicine | Original Investigation

Risk Factors Associated With All-Cause 30-Day Mortality in Nursing Home Residents With COVID-19

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IMPORTANCE The coronavirus disease 2019 (COVID-19) pandemic has severely affected nursing homes. Vulnerable nursing home residents are at high risk for adverse outcomes, but improved understanding is needed to identify risk factors for mortality among nursing home residents.

OBJECTIVE To identify risk factors for 30-day all-cause mortality among US nursing home residents with COVID-19.

DESIGN, SETTING, AND PARTICIPANTS This cohort study was conducted at 351 US nursing homes among 5256 nursing home residents with COVID-19–related symptoms who had severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection confirmed by polymerase chain reaction testing between March 16 and September 15, 2020.

EXPOSURES Resident-level characteristics, including age, sex, race/ethnicity, symptoms, chronic conditions, and physical and cognitive function.

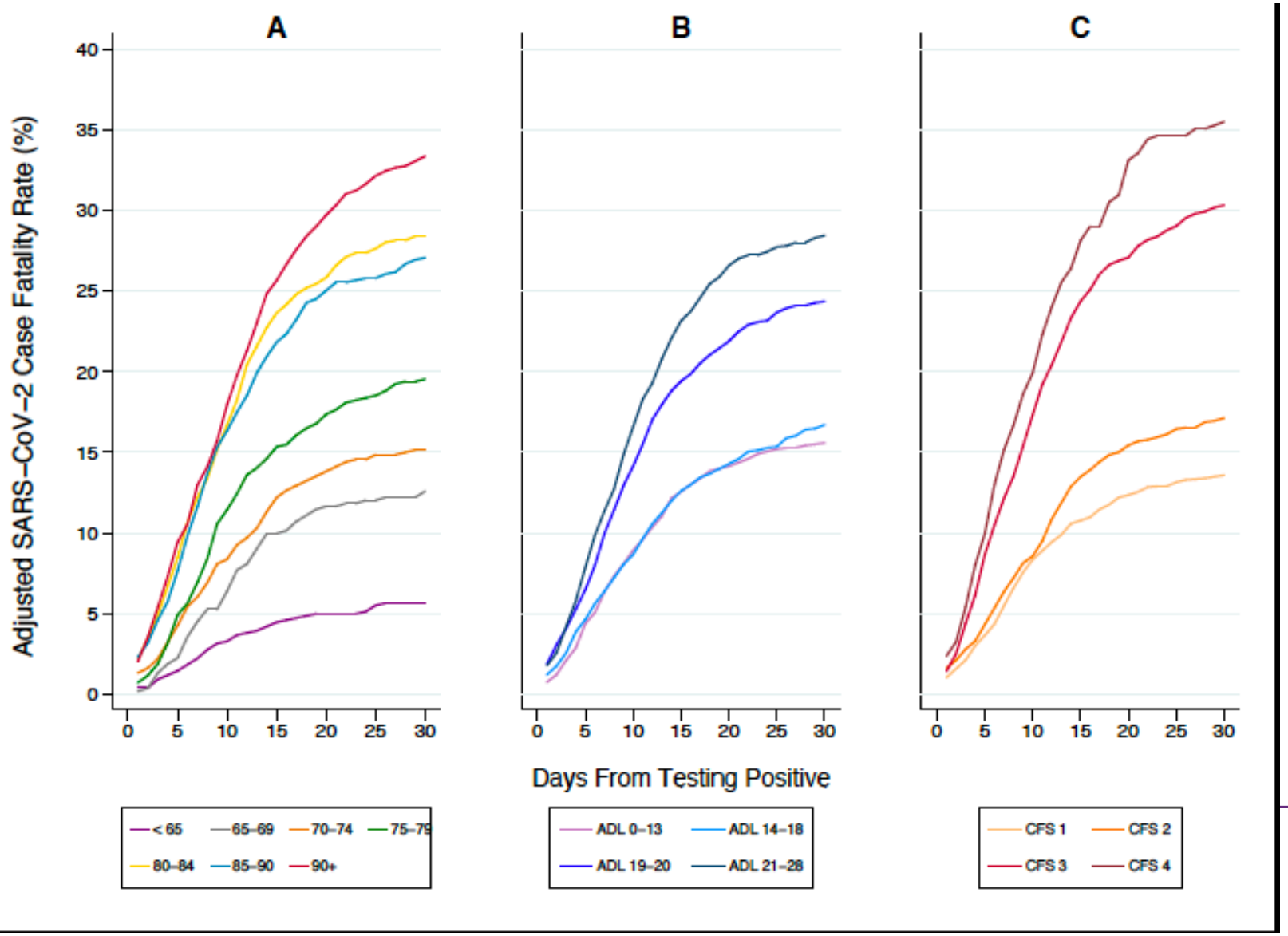
MAIN OUTCOMES AND MEASURES Death due to any cause within 30 days of the first positive SARS-CoV-2 test result.

RESULTS The study included 5256 nursing home residents (3185 women [61%]; median age, 79 years [interquartile range, 69-88 years]; and 3741 White residents [71%], 909 Black residents [17%], and 586 individuals of other races/ethnicities [11%]) with COVID-19. Compared with residents aged 75 to 79 years, the odds of death were 1.46 (95% CI, 1.14-1.86) times higher for residents aged 80 to 84 years, 1.59 (95% CI, 1.25-2.03) times higher for residents aged 85 to 89 years, and 2.14 (95% CI, 1.70-2.69) times higher for residents aged 90 years or older. Women had lower risk for 30-day mortality than men (odds ratio [OR], 0.69 [95% CI, 0.60-0.80]). Two comorbidities were associated with mortality: diabetes (OR, 1.21 [95% CI, 1.05-1.40]) and chronic kidney disease (OR, 1.33 [95%, 1.11-1.61]). Fever (OR, 1.66 [95% CI, 1.41-1.96]), shortness of breath (OR, 2.52 [95% CI, 2.00-3.16]), tachycardia (OR, 1.31 [95% CI, 1.04-1.64]), and hypoxia (OR, 2.05 [95% CI, 1.68-2.50]) were also associated with increased risk of 30-day mortality. Compared with cognitively intact residents, the odds of death among residents with moderate cognitive impairment were 2.09 (95% CI, 1.68-2.59) times higher, and the odds of death among residents with severe cognitive impairment were 2.79 (95% CI, 2.14-3.66) times higher. Compared with residents with no or limited impairment in physical function, the odds of death among residents with moderate impairment were 1.49 (95% CI, 1.18-1.88) times higher, and the odds of death among residents with severe impairment were 1.64 (95% CI, 1.30-2.08) times higher.

CONCLUSIONS AND RELEVANCE In this cohort study of US nursing home residents with COVID-19, increased age, male sex, and impaired cognitive and physical function were independently associated with mortality. Understanding these risk factors can aid in the development of clinical prediction models of mortality in this population.

+ Invited Commentary
+ Supplemental content

Cumulative Mortality Rates by Age Group (A), Categories of Physical Functioning (B), and Categories of Cognitive Functioning (C).



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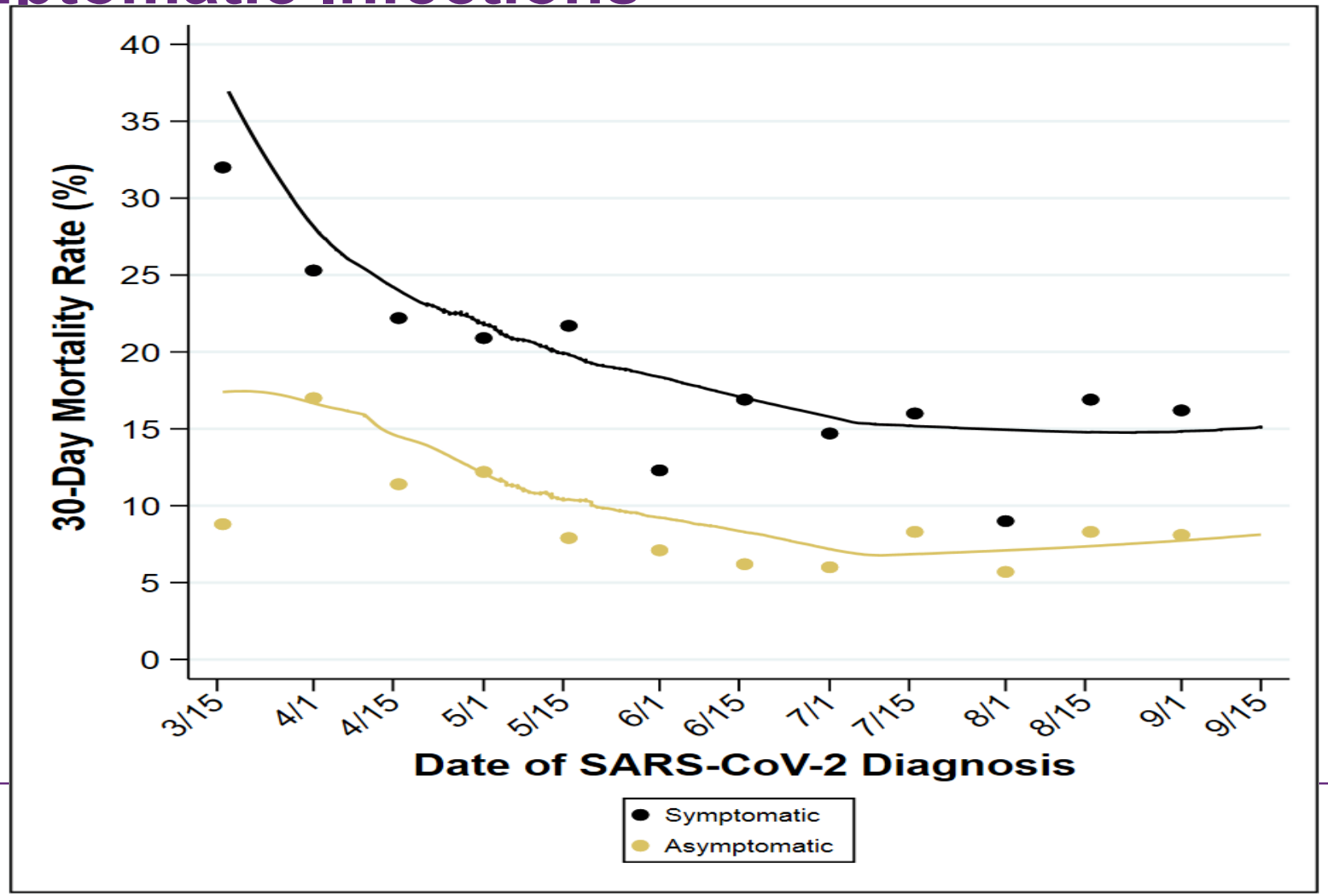
Semi-monthly Trends in 30-Day SARS-CoV-2-related Mortality and Asymptomatic Infection Rates: Genesis HealthCare

Date of Diagnosis	No. Patients	% Infections Asymptomatic	30-Day Death Rate (%)	Relative Risk
3/16 to 3/31	271	25.1	26.2	1.15
4/1 to 4/15	1781	29.6	22.9	Referent
4/16 to 4/30	2589	42.2	17.7	0.77
5/1 to 5/15	2500	64.4	15.3	0.67
5/16 to 5/31	729	58.8	13.6	0.59
6/1 to 6/15	407	62.2	9.1	0.40
6/16 to 6/30	452	60.6	10.4	0.46
7/1 to 7/15	580	71.9	8.4	0.37
7/16 to 7/31	469	61.4	11.3	0.49
8/1 to 8/15	353	59.2	7.1	0.31
8/16 to 8/31	443	60.0	11.7	0.51
9/1 to 9/15	302	61.3	11.3	0.49

Relationship between SARS-CoV-2 Diagnosis Date and 30-Day Mortality among Residents with Symptomatic and Asymptomatic Infections



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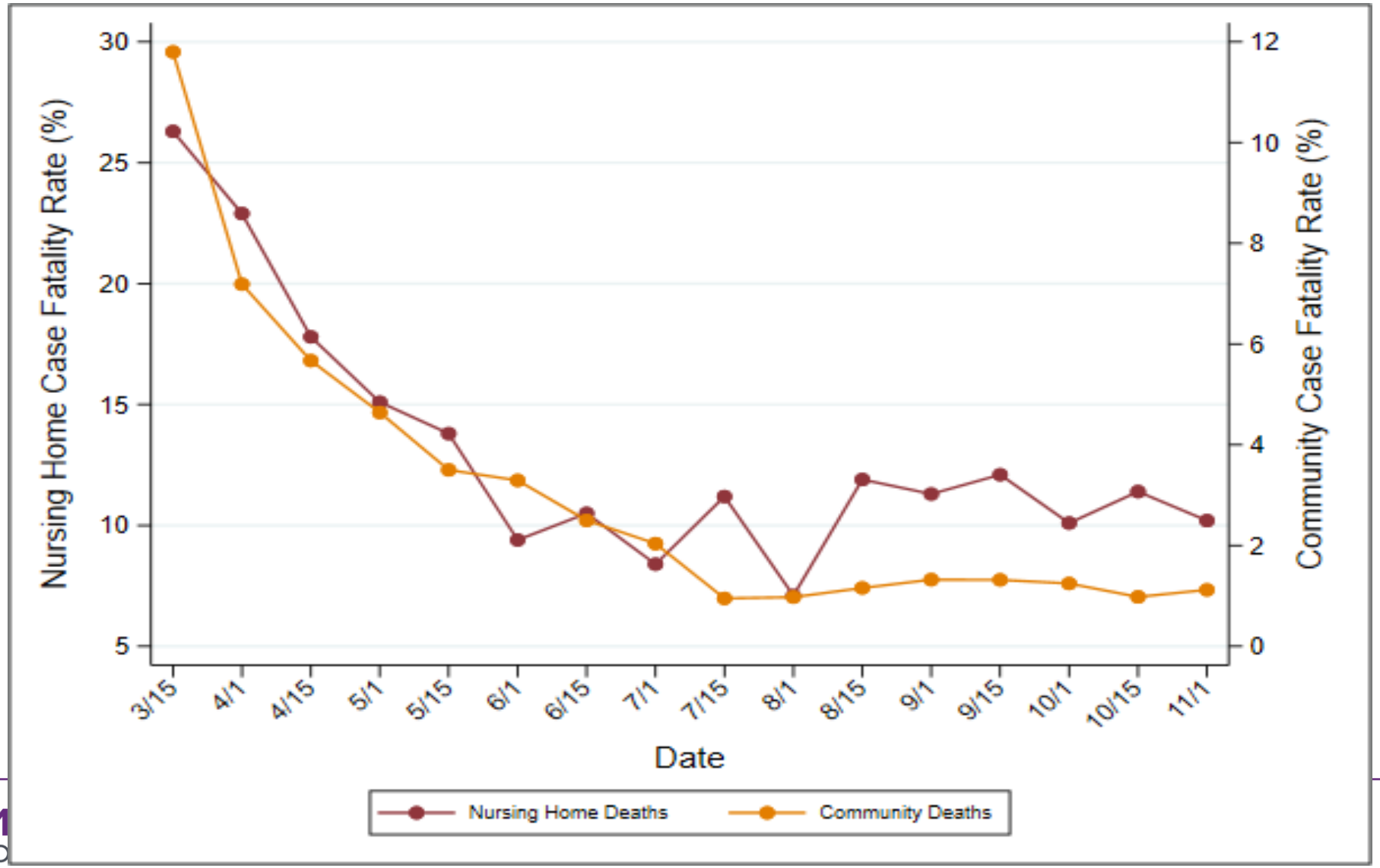
Changing Community & NH Case Fatality Rates



Summary

- Vaccinations well underway in all US nursing homes
- Early results suggest >80% of residents accepting vaccine
- BUT, highly variable between facility STAFF vaccination rates
- Very likely will be additional outbreaks in the future.

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Thank You. Questions?