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COVID-19 in California's Nursing Homes:
Factors Associated with Cases and Deaths

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About Cal Hospital Compare

For more than a decade, Cal Hospital Compare has been providing Californians with objective hospital performance ratings. Cal Hospital Compare is a nonprofit organization governed by a multi-stakeholder board that includes representatives of hospitals, purchasers, consumer groups, and health plans. It uses an open and collaborative process to aggregate public data and establish relevant measures and scoring. To learn more, visit www.calhospitalcompare.org.

About the Foundation

The California Health Care Foundation is dedicated to advancing meaningful, measurable improvements in the way the health care delivery system provides care to the people of California, particularly those with low incomes and those whose needs are not well served by the status quo. We work to ensure that people have access to the care they need, when they need it, at a price they can afford.

CHCF informs policymakers and industry leaders, invests in ideas and innovations, and connects with changemakers to create a more responsive, patient-centered health care system.

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Executive Summary

Nursing homes have been carrying the heaviest burden of COVID-19 cases and deaths compared to other health facilities in California and across the nation. According to the California Department of Public Health (CDPH), the state has had a cumulative 29,232 COVID-19-positive nursing home residents and 4,835 coronavirus-related deaths through November 15.[1]

To better understand the factors behind the spread of COVID-19 in California nursing homes, Cal Hospital Compare (CHC), in partnership with IBM Watson Health and the University of California, San Francisco (collectively known as the CHC Project Team), studied COVID-19 data from more than 800 nursing homes at two distinct points in time during the pandemic — once in May 2020 and once in August 2020.

Overall Findings

The study found significant spread of coronavirus between May and August, when the number of COVID-19 cases and deaths in nursing homes more than doubled. In May, a quarter (25%) of the nursing homes studied had one or more residents with COVID-19, and 16% had at least one resident death attributable to the coronavirus. By August, 66% of facilities had a COVID-19 case, and 37% had at least one resident who had died of COVID-19.

The study notes that several facility and resident characteristics were associated with higher COVID-19 cases and deaths — including ownership status, nursing home size, staffing levels, and resident demographics. The most dominant factors in the spread of the coronavirus evolved as the pandemic progressed. For example, earlier in the pandemic, ownership status was most correlated with large numbers of cases and deaths, while in August the biggest driver was resident demographics.

The study, commissioned by the California Health Care Foundation, underscores the importance of continued research to understand the evolving dynamics of the pandemic. The researchers also made a series of recommendations for addressing these issues.

Definitions and Methodology

Nursing homes provide skilled nursing services to people who require either short-term care (e.g., recovery after surgery) or long-term care that includes clinical care and residential services.

To assess factors that put nursing home residents at increased risk of infection and mortality from COVID-19, the CHC Project Team analyzed multiple explanatory factors at two points in time: May 24, 2020, and August 9, 2020.

The study population included 1,150 nursing homes across California. For the analyses, only nursing homes with complete data for all variables were used, resulting in a sample size of 825 nursing homes (May) and 841 nursing homes (August).

Major Factors Driving COVID-19 Case and Death Rates

Ownership status. Early in the pandemic, for-profit nursing homes had COVID-19 case rates five to six times higher than those of nonprofit and government-run nursing homes. This was true of both independent nursing homes and those that are part of a corporate chain.

Nursing home size. At the August time point, larger nursing homes (those with more than 99 licensed beds) had case rates at least 55% greater than those with 68 or fewer licensed beds. Both the COVID-19 case rate and death rate were consistently higher for larger nursing homes versus smaller facilities.

Staffing levels. COVID-19 case rates were significantly higher in nursing homes with staffing levels below those recommended for registered nurses (0.8 registered nurse hours per resident day) and total nursing staff (4.1 hours per resident day). In May, nursing homes with total staff levels at or below 3.8 hours per resident day had about twice the case rates of homes with staffing levels greater than 4.4 hours per resident day. As the pandemic progressed, nursing homes with adequate registered nurse (RN) staffing had greater protection against COVID-19 cases and deaths: In August, nursing homes with RN staffing greater than 0.7 hours per resident day had 50% fewer COVID-19 cases than those with fewer RN hours per resident day.

Resident demographics. As the pandemic spread, some demographic factors of the nursing home population became more significant risk factors.

- *Age.* In August, nursing homes with more than 45% of residents age 85 years or older had almost a 50% higher COVID-19 case rate and a 70% higher COVID-19 death rate.
- *Gender.* Between the May and August time points, nursing homes with more than 49% male residents experienced a more than 2.5-fold increase in COVID-19 case rates.
- *Race/ethnicity.* The COVID-19 case rate was disproportionately higher in nursing homes with a higher percentage of Black or Latinx residents. In May, nursing homes with more than 2% Black residents had COVID-19 case rates that were about three times higher than facilities with 2% or less Black residents. By August, nursing homes with more than 26% Latinx residents had a 57% higher case rate than those with 6% or less Latinx residents.

Recommendations in Five Key Areas

Based on the research results, the CHC Project Team developed a series of recommendations aimed at meaningfully improving the quality of care in nursing homes during the current pandemic and going forward. Most can be implemented immediately.

Ownership oversight. The project team recommends that CDPH immediately strengthen oversight, especially in at-risk facilities, over minimum federal nursing home standards, including staffing, infection control, sanitation, and emergency requirements. The report also recommends giving the Department of Health Care Services (DHCS) more authority to increase annual financial disclosure requirements for nursing homes and increase financial controls on cost centers.

Facility size and design. The study suggests CDPH should launch a collaborative learning program among nursing homes to share effective practices that prevent and reduce the spread of infections. It also suggests nursing homes should reduce the number of residents within their largest facilities and increase the use of private rooms. The study also recommends establishing a statewide task force to study the feasibility and financial mechanisms for the future modernization, redesign, and rebuilding of nursing homes to reduce the size of facilities.

Staffing. The project team suggests that CDPH immediately require all nursing homes to meet Centers for Medicare & Medicaid Services requirements that facilities "have sufficient nursing staff with the appropriate competencies and skills sets." Additionally, DHCS should develop pathways for nursing homes to reduce turnover and increase their staffing levels over the next two years by redesigning the Medi-Cal reimbursement system. The report also says CDPH should allow select family members and friends to be deemed essential workers in a time of crisis to supplement resident care.

Health equity promotion and infection prevention. The study recommends that CDPH take a variety of steps to promote equity. Given the disproportionate number of COVID-19 infections in nursing homes with a large proportion of Black and Latinx residents, CDPH should ensure all facilities test staff weekly for COVID-19 and require at least annual training on issues from infection control to culturally sensitive care. CDPH should also distribute vaccines to residents and staff in the highest-risk facilities first.

Transparency and public reporting of data. To make nursing home data more consistent and easier to access, the study recommends that CDPH develop a one-stop nursing home information dashboard, updated weekly, to monitor COVID-19 or other infectious disease outbreaks in nursing homes.

The pandemic has magnified long-standing operational challenges and exposed systemic vulnerabilities in nursing homes.

Background

Nursing homes — compared to other health care facilities — have been carrying the heaviest burden of COVID-19 cases and deaths in California and across the nation. Nursing homes provide skilled nursing services to people who require either short-term care (e.g., recovery after surgery) or long-term care that includes clinical care and residential services. As of November 15, 2020, the California Department of Public Health (CDPH) reported a cumulative 29,232 COVID-19-positive nursing home residents and 4,835 COVID-19-related deaths since January 2020.[2] Although nursing home residents are less than one-half of 1% of the state's population, about 26% of all COVID-19-related deaths in California occur in these facilities.[3]

Challenges in providing high-quality care in California's nursing homes predate the current pandemic, which has magnified long-standing operational challenges and exposed systemic vulnerabilities in skilled nursing.[4]

To understand and support meaningful quality improvement in the state's nursing homes, Cal Hospital Compare (CHC), in partnership with IBM Watson Health and the University of California, San Francisco (collectively known as the CHC Project Team), analyzed numerous potential factors that may have put California nursing home residents at increased risk of infection and mortality from COVID-19. The work was commissioned by the California Health Care Foundation.

Factors that affect quality of care and outcomes in these facilities have been studied for decades. To understand these factors and their effect in a non-pandemic environment, the CHC Project Team conducted a comprehensive literature review. Key findings from this literature review include the following:

- Higher nurse staffing levels improve resident outcomes.
- For-profit ownership is associated with resident outcomes and quality well below average.
- Medi-Cal coverage, particularly for "dual-eligible" Californians,[5] is associated with longer lengths of stay and poor resident outcomes.
- The number of nursing home citations and deficiencies is directly correlated with poor resident outcomes.
- People of color tend to receive care in lower-performing nursing homes.

While early COVID-19 research in nursing homes has pointed to these and other factors as being associated with worse outcomes, the CHC Project Team explored a broader list of possible explanatory factors, using publicly available national and state data. They evaluated the impact of these factors on COVID-19 infections and deaths, and how the impact of these factors changed as the pandemic evolved.

To guide the analysis and interpret the results, the CHC Project Team convened a multistakeholder advisory committee representing a diverse cross-section of perspectives. Members included patient and family advisers, long-term care advocates, subject matter experts, researchers, and representatives from labor organizations, Medicare and Medi-Cal health plans, quality improvement organizations, and state agencies (see Appendix A). The advisory committee provided input on study design, reviewed results, and discussed recommendations, but was not asked to formally endorse this report or its recommendations, which are the authors' alone.

Methodology

To assess factors that put nursing home residents at increased risk of infection and mortality from COVID-19, the CHC Project Team analyzed multiple explanatory factors at two points in time: May 24, 2020, and August 9, 2020 (see Tables 1 and 2). The May 24 data are the earliest data available from the Centers for Medicare & Medicaid Services (CMS) after the onset of the pandemic in early 2020. The August 9 data were the most recently available data at the time of running the analyses. Regression modeling[6] was used to examine both (1) explanatory factors, by quartile, at each of the two time points and (2) changes in explanatory factors *between* the two time points as the pandemic progressed. See Appendix B for a full list of explanatory factors examined.

The study population included 1,150 nursing homes across California. For the analyses, only nursing homes with complete data for all variables were used, resulting in a sample size of 825 nursing homes for May 24, 2020, and 841 nursing homes at the August 9, 2020, time point.

Table 1. Outcome Measures

Number of nursing home residents who…

- Tested positive for COVID-19
- Died with suspected or laboratory-confirmed COVID-19, regardless of place of death

Table 2. Primary Explanatory Factors

	MEASURE
External	▸ County-level COVID-19 case rate
Facility	▸ Size (number of licensed beds) ▸ Chain and ownership status ▸ Fines, deficiencies, complaints ▸ Percentage of short-stay residents who were rehospitalized after a nursing home admission ▸ Payer source
Staffing	▸ Nursing turnover ▸ Registered nurse (RN) staffing ▸ Total nurse staffing
Resident	▸ Age ▸ Gender ▸ Race/ethnicity

Key Results

At the first time point, May 24, a quarter (25%) of the nursing homes in the study had at least one resident with COVID-19, and 16% had at least one resident death attributable to it. By the August 9 time point, almost two-thirds (66%) of the nursing homes had at least one resident with COVID-19, and 37% had at least one COVID-19 resident death. Such resident deaths were counted whether or not they occurred in the nursing home. The study found strong relationships between the case and death rates and several explanatory factors. The key findings are summarized below (the complete results appear in Appendix C).

Facility Ownership

Early in the pandemic, for-profit nursing homes, both independent ones and those that are part of a corporate chain, had COVID-19 case rates that were five to six times higher in comparison to nonprofit and government-run nursing homes. The ownership status of a nursing home had the greatest impact on COVID-19 case rate, over and above nursing home size (number of beds), county COVID-19 case rate, resident racial composition, average age of residents, and other factors examined in this project. While the reasons for these differences are not clear, this finding is consistent with other COVID-19 studies.[7]

Early in the pandemic, for-profit nursing homes, both independent ones and those that are part of a corporate chain, had COVID-19 case rates that were five to six times higher in comparison to nonprofit and government-run nursing homes.

Facility Size

The COVID-19 case rate and death rate were consistently higher for larger nursing homes (those with more than 99 licensed beds) versus smaller facilities (those with 68 or fewer licensed beds). At the August 9 time point, larger nursing homes had COVID-19 case rates at least 55% greater than smaller facilities. This finding is consistent with previous studies on the impact of facility size on nursing home quality and performance.[8] Although the CHC Project Team study did not examine facility design, such as the use of multiresident rooms and shared bathrooms, design was found to be a factor in a previous study.[9] Also, larger facilities present greater opportunities for staff to transmit infections among residents, reinforcing the crucial importance of all-staff training on infection control.

The COVID-19 case rate and death rate were consistently higher for larger nursing homes (those with more than 99 licensed beds) versus smaller facilities (those with 68 or fewer licensed beds).

Staffing

Throughout the pandemic, nursing home staffing levels were strongly correlated with COVID-19 case rates and deaths. California law currently requires nursing homes with 99 or fewer licensed beds to have one registered nurse (RN) on duty during the day seven days a week and one licensed vocational nurse (LVN) on duty evenings and nights. Facilities licensed for 100 beds or more must have one RN on duty 24 hours per day. All nursing homes must have a daily minimum of 3.5 total staffing hours per resident day (HPRD)[10] or a daily minimum of 2.4 HPRD for certified nursing assistants (CNAs) and 1.1 HPRD for LVNs or both (since 2018), although waivers may be requested for nursing shortages or resident acuity.[11] California nursing homes have been held to staffing standards and waiver requirements before and during the current pandemic. However, experts recommend, at a minimum, 0.8 RN HPRD and 4.1 total staffing HPRD for optimal resident care.[12]

Early in the pandemic, nursing homes with total nurse staffing (RN, LVN, and CNA) at or below 3.8 HPRD had about twice the case rates of homes with staffing greater than 4.4 HPRD. As the pandemic progressed, RN staffing provided greater protection against COVID-19 cases and deaths. In August, nursing homes with RN staffing greater than 0.7 HPRD had almost 50% fewer COVID-19 cases than those with 0.4 HPRD or less. While the analysis did not reveal why total nurse staffing was more important early on and RN staffing more important as the pandemic evolved, the authors hypothesized that later in the pandemic, more was known about the prevention and treatment of COVID-19, and personal protective equipment (PPE) and testing became more readily available. Also, facilities with higher RN staffing may have been better

able to provide the necessary supervision, training, and infection control to incorporate the equipment and knowledge that resulted in lower case rates. The findings of higher total and RN staffing being associated with fewer infections, deaths, and outbreaks are consistent with other COVID-19 research in the nursing home environment.[13]

The data also showed that, in August, nursing homes with RN turnover greater than 50% had 30% higher COVID-19 case rates compared to those with the lowest nursing turnover. This finding is consistent with numerous studies on nursing home quality.[14]

The COVID-19 case rate and death rate were lower for nursing homes with higher levels of RN HPRD (greater than 0.7 HPRD). The gap between nursing homes with high levels of staffing versus low levels became wider over time, which points to the protective effect of RN staffing against COVID-19 infections and deaths. It is important to note that California currently allows facilities to be given workforce shortage and resident acuity waivers that can reduce staffing levels to well below evidence-based standards.[15]

Resident Demographics

As the pandemic spread, some demographic factors of the nursing home population — age, gender, and race/ethnicity — became more significant risk factors, while nursing home characteristics, such as ownership status, no longer played a significant role in COVID-19 case rates.

- *Age.* People age 85 and older are at highest risk of serious illness from COVID-19.[16] In August, nursing homes with more than 45% of residents age 85 and older had a 50% higher COVID-19 case rate and a 70% higher COVID-19 death rate.
- *Gender.* Between the May and August time points, nursing homes with more than 49% male residents experienced a more than 2.5-fold increase in COVID-19 case rates.
- *Race/ethnicity.* People in certain racial and ethnic groups are at higher risk of being infected with COVID-19 and dying from it.[17] In May, nursing homes with more than 2% Black residents had COVID-19 case rates that were about three times higher than facilities with 2% or less Black residents. By August, nursing homes with more than 26% Latinx residents had COVID-19 case rates that were 57% higher than facilities with 6% or less Latinx residents.

Study and Data Limitations

This project used publicly reported data at the facility level. Without resident-level data, certain explanatory factors could only be measured at the facility level. In addition, due to rapid changes in nursing home reporting requirements related to COVID-19, the data accuracy is unknown. The data limitations are as follows:

Payer source. The financial reports provided by California's Office of Statewide Health Planning and Development (OSHPD) do not separate Medi-Cal Managed Care from Medicare and private managed care plans.* Therefore, strong correlations between payer source and COVID-19 cases and deaths could not be made.

Resident characteristics. This project used OSHPD nursing home utilization data on resident characteristics (which is collected for December 31 of each year) to obtain age, gender, and race/ethnicity.* The number of residents with mental illness, Alzheimer's, and developmental disabilities did not appear to be accurate to either the CHC Project Team or the advisory group and was therefore excluded from this study. Moreover, nursing home resident utilization data on one day per year may not be representative of the data throughout the year.

Other. Detailed data on testing, access to personal protective equipment (PPE), and staffing during the pandemic were not available.

**2018 - Pivot Table - Long-Term Care Annual Financial Data*, CHHS Open Data Portal, accessed July 31, 2020.

Recommendations

Based on these results and the existing research, the CHC Project Team developed a series of recommendations aimed at meaningfully improving the quality of care in nursing homes during the current pandemic and going forward. Most can be acted upon immediately, while others could be implemented over the next 12 to 24 months.

The following recommendations are intended for policymakers, care improvement organizations — such as ombudsman organizations, resident/family advocacy groups, and quality improvement organizations — and nursing home administrators.

Ownership Oversight

- Policymakers should give the Department of Health Care Services (DHCS) the authority to increase the annual financial disclosure of nursing homes by requiring a consolidated financial report for all related party organizations and entities — including management, property, and parent companies — in the coming year.

- DHCS should be given authority to establish financial controls on cost centers for each nursing home company rather than only cost controls on the Medi-Cal expenditures.

- Policymakers should consider creating a targeted medical loss ratio threshold for all nursing home payers.

- The California Department of Public Health (CDPH) should immediately strengthen regulatory oversight, especially in at-risk facilities,[18] to ensure that all facilities meet minimum federal nursing home standards for quality, including staffing, infection control, sanitation, and emergency requirements.

Facility Size and Design

- CDPH should immediately augment a collaborative learning program among California nursing homes and Quality Improvement Organizations (QIOs) to share effective practices — given the current facility size and design — to prevent infections and reduce spread of infections.

- Where feasible — and recognizing that this may have financial consequences for the facility — nursing homes should immediately reduce the number of residents within the largest facilities and increase the number of residents living in private rooms.
  - Prioritize cohorting COVID-19 cases in separate areas of the facility.
  - Enlarge the amount of open space so that residents can maintain social distance, including during permissible visits with family and friends.

- California's Office of Statewide Health Planning and Development (OSHPD) should conduct a survey of nursing homes on the age of buildings, their size and design, the number of residents per room and bathroom, and other building features.

- For the long term, California could establish a statewide task force to study the feasibility and financial mechanisms for the future modernization, redesign, and rebuilding of nursing homes to reduce the size of facilities, develop single rooms for residents, and expand shared spaces to allow for greater social distancing.

Staffing

- DHCS should develop a pathway for nursing homes to increase their staffing levels to evidence-based levels over the next two years by redesigning the Medi-Cal reimbursement system.

- CDPH should immediately require nursing homes to meet CMS requirements that "the facility must have sufficient nursing staff with the appropriate competencies and skills sets to provide nursing and related services to assure resident safety and attain or maintain the highest practicable physical, mental, and psychosocial well-being of each resident, as determined by resident assessments and individual plans of care and considering the number, acuity and diagnoses of the facility's resident population in accordance with the facility assessment."[19]

- CDPH and DHCS should be given authority to eliminate workforce shortage and resident acuity waivers for nursing homes over the next two years by using Medi-Cal direct care wage and benefit pass-throughs.

- DHCS should require nursing homes to reduce average annual nursing turnover rates to 25% within two years by using Medi-Cal direct care wage and benefit pass-throughs.

- CDPH should obtain nursing home Payroll Based Journal data submitted to CMS to monitor and enforce nursing home staffing requirements.

- CDPH should promote skill enhancement (i.e., provide opportunities for staff to obtain related certifications, training, and other professional development), especially related to infection prevention.

- CDPH should allow select family members and friends to be deemed essential workers in a time of crisis to supplement resident care. Physical separation from family and other loved ones has taken a physical and emotional toll on residents during the COVID-19 pandemic. Residents may feel socially isolated, leading to increased risk for depression, anxiety, and other expressions of distress.[20]

Health Equity Promotion and Infection Prevention

- CDPH should distribute vaccines to residents and staff in at-risk facilities first.

- CDPH should consider enhanced oversight for at-risk facilities based on a new understanding of factors associated with COVID-19 infections and death. Oversight can include targeted educational, operational, and infection prevention support and monitoring to prevent outbreaks.

- CDPH should strengthen training protocols to ensure that all nursing home staff are knowledgeable about infection control, sanitation, and emergency requirements. It can require trainings to be at least annual and meet other goals, such as being culturally sensitive. The designated infection preventionist can be required to have certification by the Certification Board of Infection Control and Epidemiology.

- CDPH should immediately ensure that all facilities follow CDPH guidance for testing staff weekly for COVID-19.

- CDPH should immediately evaluate and report other health care–associated infections in nursing homes similar to existing protocols in the hospital community.

Need for More and Better Data, More Transparency

Although California has some nursing home information on public dashboards, these are not all located in one area and are not easy for consumers to use. County nursing home data and CMS nursing home data are more precise, with the exact number of COVID-19 infections, while CDPH masks numbers under 11 for the same facilities.

To make data more consistent and easier to access, the CHC Project Team recommends that the CDPH publish more-detailed information, weekly, to monitor COVID-19 or other infectious disease outbreaks in nursing homes. A one-stop nursing home information dashboard, updated at least weekly, with data available for the public by download or application programming interface, could include the following:

- Number of residents, number of infections and deaths for residents (and staff)
- PPE supply
- Staffing hours per resident day using the Payroll Based Journal data files and staffing waivers
- Weekly number of tests and testing results for residents and staff

Health insurance payment data are critical to understanding the dynamics of care in nursing homes. The literature review revealed that nursing homes with a

high proportion of residents eligible for and enrolled in both Medicare and Medi-Cal have longer lengths of stay and poorer resident outcomes.[21] Currently, reports provided by OSHPD do not allow researchers to differentiate resident days by Medi-Cal Managed Care, Medicare, and private managed care plans. Furthermore, the state appears to have conflicting data definitions and/or data submission guidance for Medi-Cal managed care plans.

The following recommendations could help make data more useful:

- OSHPD and DHCS could send a joint All Facilities Letter indicating the optimal strategy for reporting Medi-Cal managed care utilization and standardizing data definitions.
- OSHPD could replace its annual nursing home utilization survey with the CMS Minimum Data Set quarterly to summarize and publicly report the total number of residents by demographics (with race and ethnicity data reported as a combined single category), resident conditions, medical conditions, limitations in activities of daily living, nursing care needs, and therapy needs.

Research Recommendations

Several important studies on nursing homes and COVID-19 could be conducted to inform policymakers, consumers, and providers, including the following:

- A repeat of this study in the mid-fall to determine if the explanatory factors have continued to evolve and how. A time series methodology may be appropriate.
- Qualitative studies examining the impact of high-priority potential explanatory variables where public data or well-described measures do not exist. This could include how unique nursing home management, policies, and practices may have impacted COVID-19 case and death rates. Examples:
  - Visitation policies
  - PPE use and other infection prevention practices
  - Staff training practices
- Case studies of nursing homes considered at-risk facilities with no COVID-19 cases (which may reveal best practices) as well as low-risk facilities with outbreaks to determine potentially modifiable factors, practices, infrastructure, or other features.
- Analyses that support a more accurate assessment of the impact of Medi-Cal as the payer, given the lower reimbursement rates and challenges Medi-Cal enrollees face accessing health care. Analyses, using Medi-Cal as a proxy for income, could reveal economic disparities resulting in COVID-19-related health disparities. As described below, related data availability issues separating Medi-Cal Managed Care from other managed care would need to be resolved.
- Evaluation of excess deaths of California nursing home residents during the pandemic, quantifying the types of non-COVID-19 excess deaths.
- Estimation of the impact of specific policy changes on COVID-19 infection and death rates.
- A study of the impact of hospital COVID-19 admissions from and discharges to nursing homes on COVID-19 infection rates and deaths.
- A formal data validation study in a sample of nursing home data submissions for the Centers for Disease Control and Prevention's new public database, the National Healthcare Safety Network COVID-19 module,[22] commissioned by CDPH.

Conclusions

The findings in this study demonstrate that specific facility and resident characteristics are associated with higher COVID-19 case and death rates. The characteristics changed as the pandemic progressed, which underscores the importance of continued, rapid-cycle research to understand the evolving dynamics of the pandemic.

The recommendations in this report represent policy actions and operational changes, both immediate and longer term, that can be taken to prevent and mitigate the pandemic's impact on nursing home staff and residents.

Finally, the results of the study can be used to identify nursing homes at greatest risk of infection and mortality. This information can be used to develop protocols to mitigate the impact of the pandemic on nursing home residents and staff. While these facilities are presently dealing with the COVID-19 pandemic, use of predictive analytics and enhanced infection prevention protocols would allow nursing homes to improve care — particularly for groups of residents known to be especially vulnerable to poor outcomes — and be better equipped to deal with future pandemics and other crises.

Appendix A. Long-Term Care Advisory Committee

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Appendix B. Study Variables, by Domain

This list contains all variables considered for the purpose of this study. Shaded variables were included in the final study.

VARIABLE	LABEL	SOURCE
AGE		
PCT_LT65	Percentage of Residents <65 Years of Age	OSHPD LTC Utilization
PCT_65_84	Percentage of Residents 65–84 Years of Age	OSHPD LTC Utilization
PCT_GE85	Percentage of Residents ≥85 Years of Age	OSHPD LTC Utilization
CITATIONS/FINES/COMPLAINTS		
ABUSE_ICON	Cited for Abuse or Neglect at High Harm Level or Potential Harm Level (yes/no)	CMS NHC
FINE_CNT	Number of Fines	CMS NHC
FINE_TOT	Total Amount of Fines in Dollars	CMS NHC
PENALTY_NUMBER	Number of Fines	CDPH
TOTAL_AMOUNT_DUE_FINAL	Total Amount of Fines in Dollars	CDPH
INTAKEID_complaints	Total Number of Complaints	CDPH
INTAKEID_incidents	Total Number of Incidents	CDPH
FINE_CNT_ANY	Any Fines	CMS NHC
COUNTY COVID		
COMM_County_Covid_Case_Rate	County-Level COVID-19 Cases per 100,000	CDPH & CA Demographics
COMM_County_Covid_Death_Rate	County-Level COVID-19 Deaths per 100,000	CDPH & CA Demographics
DEFICIENCIES/INCIDENTS		
SFFStatus	Special Focus Facility Status	CMS NHC
Total_Deficiencies	Total Deficiencies	CMS NHC
Total_Deficiencies_SCOPE	Number of Deficiencies, Categories F–L	CMS NHC
Total_Deficiencies_TAG	Number of Deficiencies, Infection Control	CMS NHC
Total_Deficiencies_ClinCare	Number of Clinical Care Deficiencies	CMS NHC
Total_Deficiencies_Emergency	Number of Emergency Deficiencies	CMS NHC
Total_Deficiencies_Other	Number of Other Deficiencies	CMS NHC
ETHNICITY		
TOTAL_HISPANIC_PERCENT	Percentage of Residents Hispanic*	OSHPD LTC Utilization
TOT_NON_HISPANIC_PERCENT	Percentage of Residents Non-Hispanic*	OSHPD LTC Utilization
TOT_UNKNOWN_ETHNICITY_PERCENT	Percentage of Residents Unknown Ethnicity	OSHPD LTC Utilization

*Report authors use the term *Latinx*.

VARIABLE	LABEL	SOURCE
FINANCIAL		
SW_NRSG_PER_NET_PT_REV	Nursing Salaries as a Percentage of Net Revenue	OSHPD LTC Financial
NET_INCOME_PER_NET_PT_REV	Net Income Divided by Net Revenue	OSHPD LTC Financial
Waiver_Patient	Patient-Needs Waiver Submitted	CDPH
Waiver_Staffing	Staffing Waiver Submitted	CDPH
GENDER		
MALES_TOT	Total Number of Male Residents	OSHPD LTC Utilization
FEMALES_TOT	Total Number of Female Residents	OSHPD LTC Utilization
MALES_PERCENT	Percentage of Male Residents	OSHPD LTC Utilization
FEMALES_PERCENT	Percentage of Female Residents	OSHPD LTC Utilization
LOCATION		
COUNTY	County	OSHPD LTC Utilization
OWNERSHIP		
CHOW_LAST_12MOS	Facility Changed Ownership in Last 12 Months (yes/no)	OSHPD LTC Utilization
LICEE_TOC	Licensee Type of Control (investor/nonprofit)	OSHPD LTC Utilization
MLT_OWND_FAC_ORG_SW	Part of Chain (yes/no)	CMS CASPER
CHAIN_OWNERSHIP	Part of Chain by Licensee Type of Control (investor/nonprofit)	CMS CASPER & OSHPD LTC Utilization
PAYER		
MEDICARE_PATS_PERCENT	Percentage of Medicare Residents	OSHPD LTC Utilization
MEDI_CAL_PATS_PERCENT	Percentage of Medi-Cal Residents	OSHPD LTC Utilization
MANAGED_CARE_PATS_PERCENT	Percentage of Managed Care Residents	OSHPD LTC Utilization
ALL_OTHER_PATS_PERCENT	Percentage of Other Payer Residents	OSHPD LTC Utilization
PRIVATE_SELF_PERCENT	Percentage of Private or Self-Pay Residents	OSHPD LTC Utilization
QUALITY		
SCORE_ADJUSTED_521	Percentage of Short-Stay Residents Who Were Rehospitalized After a Nursing Home Admission	CMS NHC
SCORE_ADJUSTED_522	Percentage of Short-Stay Residents Who Had an Outpatient Emergency Department Visit	CMS NHC
SCORE_ADJUSTED_551	Number of Hospitalizations per 1,000 Long-Stay Resident Days	CMS NHC
SCORE_ADJUSTED_552	Number of Outpatient Emergency Department Visits per 1,000 Long-Stay Resident Days	CMS NHC
S_004_01_PPR_PD_RSRR	Potentially Preventable Readmission Rate	CMS NHC

VARIABLE	LABEL	SOURCE
RACE		
WHITE_PERCENT	Percentage of White Residents	OSHPD LTC Utilization
BLACK_PERCENT	Percentage of Black Residents	OSHPD LTC Utilization
ASIAN_PERCENT	Percentage of Asian Residents	OSHPD LTC Utilization
OTHER_PERCENT	Percentage of Other Race Residents	OSHPD LTC Utilization
SIZE		
PT_TRNOVER	Resident Turnover (admissions/census, as of 12/31/19)	OSHPD LTC Utilization
TOT_PATS	Total Number of Residents	OSHPD LTC Utilization
BED_END	Licensed Beds	OSHPD LTC Financial
OCCUP	Occupancy Rate	OSHPD LTC Financial
SNF COVID		
RES_WK_COV_ADM	Weekly Residents Previously Hospitalized with COVID-19	CMS NHC
RES_TOT_COV_ADM	Cumulative Residents Previously Hospitalized with COVID-19	CMS NHC
RES_WK_COV_CONF	Weekly Resident Confirmed COVID-19 Cases	CMS NHC
RES_TOT_COV_CONF	Cumulative Resident Confirmed COVID-19 Cases	CMS NHC
RES_WK_COV_SUSP	Weekly Resident Suspected COVID-19 Cases	CMS NHC
RES_TOT_COV_SUSP	Cumulative Resident Suspected COVID-19 Cases	CMS NHC
RES_WK_ALL_DTH	Weekly Resident Deaths	CMS NHC
RES_TOT_ALL_DTH	Cumulative Resident Deaths	CMS NHC
RES_WK_COV_DTH	Weekly Resident COVID-19 Deaths	CMS NHC
RES_TOT_COV_DTH	Cumulative Resident COVID-19 Deaths	CMS NHC
STF_WK_COV_CONF	Weekly Staff Confirmed COVID-19 Cases	CMS NHC
STF_TOT_COV_CONF	Cumulative Staff Confirmed COVID-19 Cases	CMS NHC
STF_WK_COV_DTH	Weekly Staff COVID-19 Deaths	CMS NHC
STF_TOT_COV_DTH	Cumulative Staff COVID-19 Deaths	CMS NHC
SNF COVID OUTCOME		
RES_TOT_COV_CONF_1000RES	Total Confirmed, Cumulative COVID-19 Cases per 1,000 Residents	CMS NHC
RES_TOT_COV_DTH_1000RES	Total Confirmed, Cumulative COVID-19 Deaths per 1,000 Residents	CMS NHC

VARIABLE	LABEL	SOURCE
SNF COVID PPE SHORTAGE		
WK_SPLY_N95	PPE Shortage: One-Week Supply of N95 Masks	CMS NHC
WK_SPLY_SRGMSK	PPE Shortage: One-Week Supply of Surgical Masks	CMS NHC
WK_SPLY_EYEPR	PPE Shortage: One-Week Supply of Eye Protection (including face shields and goggles)	CMS NHC
WK_SPLY_GWN	PPE Shortage: One-Week Supply of Gowns	CMS NHC
WK_SPLY_GLV	PPE Shortage: One-Week Supply of Gloves	CMS NHC
WK_SPLY_HSAN	PPE Shortage: One-Week Supply of Alcohol-Based Hand Sanitizer	CMS NHC
WK_SPLY_VENT	PPE Shortage: One-Week Supply of Ventilator Supplies (including tubing)	CMS NHC
SHRT_RNSTF	Shortage of Nursing Staff (registered nurse, licensed practical nurse, and vocational nurse)	CMS NHC
SHRT_AID	Shortage of Aides (certified nursing assistant, nurse's aide, medication aide, and medication technician)	CMS NHC
ANY_PPE_SHORTAGE	PPE Shortage: One-Week Supply of Any PPE	CMS NHC
STAFFING		
EMP_NRSG_TURNOVER	Nursing Staff Turnover	OSHPD LTC Financial
RNHRD	Reported RN Staffing Hours per Resident Day (HPRD)	CMS NHC
TOTHRD	Reported Total Nurse Staffing HPRD	CMS NHC
RNHRD_hi	Reported RN Staffing HPRD >0.75	CMS NHC
TOTHRD_hi	Reported Total Nurse Staffing HPRD >4.1	CMS NHC

Appendix C. Results over Time

	MAY 24, 2020	AUGUST 9, 2020
COVID-19 Case Rate		
External	Nursing homes located in counties within the highest quartile of community case rate had two times the case rate of facilities located in counties within the lower three quartiles of community case rate.	Community case rate continued to influence nursing home case rate. Nursing homes located in counties within the highest quartile of community case rate had a 33% higher case rate than facilities located in counties within the lower three quartiles of community case rate.
Facility	For-profit nursing homes had case rates that were five (chain) to six (non-chain) times higher than those of nonprofit and government-run facilities. Larger facilities, as measured by the number of licensed beds, had higher case rates than smaller facilities.	Facility size continued to impact case rates, with the largest facilities (i.e., those having >99 beds) having case rates that were at least 55% greater than those of the smallest facilities (i.e., those having ≤68 beds). An interesting finding was seen in nursing homes that received a fine between June 2017 and March 2020: They had a case rate that was 20% lower than that in nursing homes that did not receive a fine.
Staffing	Nursing homes with the highest total nurse staffing (i.e., >4.4 HPRD) had case rates that were half those of facilities with the lowest total staffing (i.e., ≤3.8 HPRD).	Higher levels of RN staffing (i.e., >0.7 HPRD) was protective, decreasing the case rate by almost half. Nursing homes with higher nursing turnover (i.e., >50%) had a 30% higher case rate than nursing homes with the lowest nursing turnover (i.e., ≤35%).
Resident Demographics	Nursing homes with a higher percentage of Black residents (i.e., >2%) had case rates that were three times higher than those of nursing homes with the lowest percentage of Black residents (i.e., ≤2%). A high percentage of Black residents in the nursing home had a greater impact on case rates than the county-level case rate.	Facilities having the highest percentage of male residents (i.e., >48%) had case rates that were 65% higher than those of facilities with the lowest percentage of male residents (i.e., ≤33%). Nursing homes with greater than 2% of Black residents had case rates that were approximately 25% to 40% higher than those of facilities with 2% or less Black residents. Facilities with the highest percentage of Latinx residents (i.e., >26%) had case rates that were 57% higher than facilities with 6% or less Latinx residents. Age also began influencing case rates, with those facilities having the greatest percentage of older residents (i.e., >45% of the residents were ≥85) having almost a 50% higher case rate when controlling for the other age groups.

	MAY 24, 2020	AUGUST 9, 2020
COVID-19 Death Rate		
External	Nursing homes located in counties within the highest quartile of community case rate had 3.5 times the death rate of facilities located in counties within the lower three quartiles of community case rate.	Nursing homes located in counties within the highest quartile of community case rate had death rates that were almost 2.4 times higher than those of facilities located in counties within the lower three quartiles of community case rate.
Facility	—	Facility size influenced the number of deaths, with larger facilities (i.e., those with >99 beds) having death rates that were almost two times higher than the death rates of facilities with 68 or fewer beds. Another factor influencing the death rate at the August time point was a greater tendency to rehospitalize short-stay residents after a nursing home admission. Nursing homes in the third quartile of short-stay rehospitalization had a death rate that was 1.5 times that of nursing homes in the bottom quartile of short-stay rehospitalization. The information for the clinical quality measure "Percentage of Short-Stay Residents Who Were Rehospitalized After a Nursing Home Admission" was obtained at the end of 2019, predating the COVID-19 pandemic.
Staffing	—	As seen with the case rate analysis, higher RN staffing (i.e., >0.7 HPRD) had a protective effect, decreasing the death rate by half.
Resident Demographics	Nursing homes caring for a higher percentage of Medicare residents (i.e., >23%) had a death rate that was 2.4 times higher than that of facilities with the lowest percentage of Medicare residents (i.e., ≤9%). Nursing homes caring for a higher percentage of Black residents (i.e., >6%) had death rates that were more than three times higher than nursing homes caring for 2% or fewer Black residents.	Age was the only resident characteristic influencing death rates in August. Nursing homes with the highest percentage of residents older than 85 (i.e., >45%) had a resident death rate that was 1.7 times higher than that of nursing homes with the largest percentage of residents younger than 85.

Endnotes

1. California Department of Public Health, COVID-19 by the Numbers Dashboard – California Wide and Skilled Nursing Facilities, accessed November 18, 2020.
2. Ibid.
3. Ibid.
4. Centers for Medicare & Medicaid Services, Nursing Home Compare, accessed September 30, 2020.
5. "Dual-eligible enrollees" are Californians enrolled in both Medicare and full-benefit Medi-Cal, California's Medicaid program. There are about 1.4 million such persons.
6. Regression analysis allows statisticians to examine the relationship between factors to estimate the influence of one or more independent variables on a dependent variable.
7. Charlene Harrington, John F. Schnelle, Margaret McGregor, et al., "The Need for Higher Minimum Staffing Standards in U.S. Nursing Homes," *Health Services Insights* 9 (2016): 13–9; Elizabeth M. White, Cyrus M. Kosar, Richard A. Feifer, et al., "Variation in SARS-CoV-2 Prevalence in US Skilled Nursing Facilities," *J Am Geriatr Soc* 68:10 (2020): 2167–73; Hannah R. Abrams, Lacey Loomer, Ashvin Gandhi, and David Grabowski, "Characteristics of US Nursing Homes with COVID-19 Cases," *J Am Geriatr Soc* 68:8 (2020): 1653–56; Mengying He, Yumeng Li, and Fang Fang, "Is There a Link Between Nursing Home Reported Quality and COVID-19 Cases? Evidence from California Skilled Nursing Facilities," *J Am Med Dir Assoc* 21:7 (2020): 905–8.
8. Charlene Harrington, John F. Schnelle, Margaret McGregor, et al., "The Need for Higher Minimum Staffing Standards in U.S. Nursing Homes," *Health Services Insights* 9 (2016): 13–19; Charlene Harrington, Leslie Ross, Susan Chapman, et al., "Nursing Staffing and Coronavirus Infections in California Nursing Homes," *Policy, Politics, & Nursing Practice* 21:2 (2020): 174–86; Elizabeth M. White, Cyrus M. Kosar, Richard A. Feifer, et al., "Variation in SARS-CoV-2 Prevalence in US Skilled Nursing Facilities," *J Am Geriatr Soc* 68:10 (2020): 2167–73; Hannah R. Abrams, Lacey Loomer, Ashvin Gandhi, and David Grabowski, "Characteristics of US Nursing Homes with COVID-19 Cases," *J Am Geriatr Soc* 68:8 (2020): 1653–56; Mengying He, Yumeng Li, and Fang Fang, "Is There a Link Between Nursing Home Reported Quality and COVID-19 Cases? Evidence from California Skilled Nursing Facilities," *J Am Med Dir Assoc* 21:7 (2020): 905–8.
9. N.M. Stall, A. Jones, K.A. Brown, P.A. Rochon, and A.P. Costa, "For-Profit Long-Term Care Homes and the Risk of COVID-19 Outbreaks and Resident Deaths," *CMAJ* 192:33 (2020): 946–55.
10. Total staffing hours per resident day (HPRD) combines staffing hours for registered nurses (RNs), licensed vocational nurses (LVNs), and certified nursing assistants (CNAs).
11. California Legislative Information, AB-2079 Skilled Nursing Facilities: Staffing, accessed November 3, 2020.
12. Charlene Harrington, John F. Schnelle, Margaret McGregor, et al., "The Need for Higher Minimum Staffing Standards in U.S. Nursing Homes," *Health Services Insights* 9 (2016): 13–9.
13. Charlene Harrington, Leslie Ross, Susan Chapman, et al., "Nursing Staffing and Coronavirus Infections in California Nursing Homes," *Policy, Politics, & Nursing Practice* 21:2 (2020): 174–86; Jose F. Figueroa, Rishi K. Wadhere, Irene Papanicolas, et al., "Association of Nursing Home Ratings on Health Inspections, Quality of Care, and Nurse Staffing with COVID-19 Cases," *JAMA* 324:11 (2020): 1103–5; Mengying He, Yumeng Li, and Fang Fang, "Is There a Link Between Nursing Home Reported Quality and COVID-19 Cases? Evidence from California Skilled Nursing Facilities," *J Am Med Dir Assoc* 21:7 (2020): 905–8; Momotazur Rahman, Pedro Gozalo, Denise Tyler, et al., "Dual Eligibility, Selection of Skilled Nursing Facility, and Length of Medicare Paid Post-acute Stay," *Medical Care Research and Review* 71:4 (2014): 384–401; Rebecca J. Gorges and R. Tamara Konetzka, "Staffing Levels and COVID-19 Cases and Outbreaks in US Nursing Homes," *J Am Geriatr Soc* (2020): doi:10.1111/jgs.16787 [Epub ahead of print]; Yue Li, Helena Temkin-Greener, Gao Shan, et al., "COVID-19 Infections and Deaths Among Connecticut Nursing Home Residents: Facility Correlates," *J Am Geriatr Soc* 68:9 (2020): 1899–906.
14. Nancy Lerner, Meg Johantgen, Alison Trinkoff, et al. "Are Nursing Home Survey Deficiencies Higher in Facilities with Greater Staff Turnover?," *J Am Medical Dir Association* 15:2 (2014): 102–7; Nicholas Castle, "Use of Agency Staff in Nursing Homes," *Res Gerontological Nurs* 2:3 (2009): 192–201; Nicholas Castle and John Engberg, "The Influence of Staffing Characteristics on Quality of Care in Nursing Homes," *Health Servs Res* 42 (2007): 1822–47.
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16. Centers for Disease Control and Prevention, Coronavirus Disease 2019 (COVID-19): Older Adults, updated September 11, 2020.
17. Centers for Disease Control and Prevention, Coronavirus Disease 2019 (COVID-19): Health Equity Considerations and Racial and Ethnic Minority Groups, updated July 24, 2020.
18. Based on this study, "at-risk" nursing homes have the highest number of significant explanatory factors that put them at increased risk for COVID-19 cases and deaths. They are distinguished from "low-risk" nursing homes, which have a lower number of explanatory factors.
19. Centers for Medicare & Medicaid Services, *State Operations Manual: Appendix PP - Guidance to Surveyors for Long Term Care Facilities* (PDF), §483.35 Nursing Services, published 2017, accessed November 3, 2020.

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21. Momotazur Rahman, Pedro Gozalo, Denise Tyler, et al., "Dual Eligibility, Selection of Skilled Nursing Facility, and Length of Medicare Paid Post-acute Stay," *Medical Care Research and Review* 71:4 (2014): 384–401.

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