Rapid Review: What risk factors are associated with COVID-19 outbreaks and mortality in long-term care facilities and what strategies mitigate risk?

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Please Note: An update of this review may be available. Access the most current version of this review by visiting the National Collaborating Centre for Methods and Tools COVID-19 Rapid Evidence Service at the above link.

Executive Summary

Background

Older adults have the highest rates of mortality due to the coronavirus disease 2019 (COVID-19) and long-term care (LTC) facilities were particularly affected by high rates of infection and mortality in the first wave of the pandemic. To date, strategies used by certain facilities and jurisdictions have shown preliminary evidence of efficacy at reducing risk of infections and outbreaks. Understanding risk factors for infections and outbreaks at the resident, facility and community level will facilitate the development of strategies to help mitigate this risk.

This rapid review was produced to support public health decision makers' response to the COVID-19 pandemic. This review seeks to identify, appraise, and summarize emerging research evidence to support evidence-informed decision making.

This rapid review includes evidence available up to October 5, 2020 to answer the question: **What risk factors are associated with COVID-19 outbreaks and mortality in LTC facilities and what strategies mitigate risk?**

Key Points

What risk factors are associated with COVID-19 outbreaks and mortality in LTC facilities?
- Across studies, incidence in the surrounding community was found to have the strongest association with COVID-19 infections and/or outbreaks in LTC settings. The certainty of the evidence is moderate (GRADE).
- Several resident-level factors including, racial/ethnic minority status, older age, male sex, receipt of Medicaid or Medicare were associated with risk of COVID-19 infections, outbreaks and mortality; severity of impairment was associated with infections and outbreaks, but not mortality. The certainty of the evidence is low (GRADE) and may change as more data become available.
- At the organizational level, increased staffing, particularly Registered Nurse (RN) staffing was consistently associated with reduced risk of COVID-19 infections, outbreaks and mortality while for-profit status, and facility size/density was consistently associated with increased risk of COVID-19 infections, outbreaks and mortality. The certainty of the evidence is low (GRADE) and may change as more data become available.

What strategies mitigate risk of outbreaks and mortality within LTC?
- Most guideline recommendations include surveillance, monitoring and evaluation of staff and resident symptoms, and use of personal protective equipment (PPE). The certainty of the evidence is low (GRADE) and may change as more data become available. Other interventions demonstrating some effect on decreased infection rates within syntheses and a small number of single studies include promotion of hand hygiene, enhanced cleaning measures, social distancing, and cohorting. The certainty of the evidence is low (GRADE) and may change as more data become available.
- Technological platforms and tools (e.g., digital contact tracing, apps, heat maps) are being developed and show potential for decreased transmission through efficient case and/or contact identification that further informs infection control planning strategies. The certainty of the evidence is very low (GRADE) and may change as more data become available.

Overview of Evidence and Knowledge Gaps

What risk factors are associated with COVID-19 outbreaks and mortality in LTC facilities?
- In several studies, adjusting for levels of community transmission in multivariate models reduced or eliminated the estimated associations between organization-level factors and risk of outbreaks or mortality. This is an important confounding factor that should be accounted for in future studies. Within studies that did not adjust for community transmission, large variations were observed between geographic regions which could be explained by variations in community transmission.
- Across studies, there was a large variation in the potential confounders controlled for in the analyses and the way various risk factors and confounding factors were measured, making it difficult to compare the strength of the relationship across studies.
- Resident-level risk factors for infection were often measured at the group level and may not correspond to individual-level risk of contracting or dying from COVID-19.
- Several studies from the US compared five-star facility ratings between sites with and without COVID-19 infections and outbreaks; several studies found that lower overall facility quality, history of fines/complaints, substandard cleaning practices, and having external staff brought in were associated with increased risk of COVID-19 cases, outbreaks and mortality within the facility.
- Facility size (reported as number of residents or beds) was consistently associated with increased risk of infections and mortality; however, it is unclear whether it is the absolute number of residents or beds within a facility or whether density of residents within the facility, or the ratio of residents to staff is the key driver of transmission.

What strategies mitigate risk of outbreaks and mortality within LTC?
- Findings from two narrative syntheses (low to moderate quality) report a variety of interventions to decrease infection transmission in LTC. Common interventions across syntheses were promotion of hand hygiene and regular/enhanced environmental cleaning. Both syntheses included studies conducted in the context of COVID-19, as well as other respiratory infections. Notably, the quality of included evidence in syntheses was very low or not reported. Further evidence is needed on the effect of restricting staff movement between multiple long-term care facilities.
- Single studies consisted primarily of cohort or quasi-experimental designs. A number of interventions were described with the potential to decreased COVID-19 transmission:
  - Proactive facility-wide active screening and testing of residents and staff
  - Infection control audits
  - Compliance with proper use of masks and other personal protective equipment
  - Cohorting
  - Technological tools (i.e., digital contact tracing, COVID-19 app tool)
  - Social distancing
  - Enforcement of maximum occupancy in small areas
  - Voluntary staff self-confinement in facilities (i.e., spending $\geq$ 7 days a week and 24 hours a day in the facility; sleeping in unused areas
- There was no evidence found related to visitor restriction policies.
- Most studies did not address potential confounding factors at the resident, organizational, or community level that may influence measured outcomes of implemented infection control interventions.

Methods

Research Questions

1. What risk factors are associated with COVID-19 outbreaks and mortality in LTC facilities?
2. What strategies mitigate risk of outbreaks and mortality within LTC?

Search

On October 5, 2020, the following databases were searched:
- Pubmed's curated COVID-19 literature hub: [LitCovid](#)
- [Trip Medical Database](#)
- World Health Organization's [Global literature on coronavirus disease](#)
- Joanna Briggs Institute [COVID-19 Special Collection](#)
- [COVID-19 Evidence Alerts](#) from McMaster PLUS™
- [Public Health +](#)
- [COVID-19 Living Overview of the Evidence (L·OVE)](#)
- [McMaster Health Forum](#)
- Cochrane Rapid Reviews [Question Bank](#)
- [Prospero Registry of Systematic Reviews](#)
- NCCMT [COVID-19 Rapid Evidence Reviews](#)
- [MedRxiv preprint server](#)
- NCCDH [Equity-informed Responses to COVID-19](#)
- NCCEH [Environmental Health Resources for the COVID-19 Pandemic](#)
- NCCHPP [Public Health Ethics and COVID-19](#)
- NCCID [Public Health Quick Links](#)
- NCCID [Disease Debrief](#)
- NCCIH [Updates on COVID-19](#)
- [Uncover (USHER Network for COVID-19 Evidence Reviews](#))
- [Morbidity and Mortality Weekly Report (MMWR)](#)
- [Institute national d'excellence en santé et en services sociaux (INESSS)](#)
- [Institut national de santé publique du Québec (INSPQ)](#)
- [Guidelines International Network (GIN) Library](#)
- [BC Centre for Disease Control (BCCDC)](#)

A copy of the search strategy is available at this [link](#).

Study Selection Criteria

The search results were first screened for recent guidelines and syntheses. Single studies were included if no syntheses were available, or if single studies were published after the search was conducted in the included syntheses. English-language, peer-reviewed sources and sources published ahead-of-print before peer review were included. Surveillance sources were excluded. When available, findings from syntheses and clinical practice guidelines are presented first, as these take into account the available body of evidence and, therefore, can be applied broadly to populations and settings.

	Inclusion Criteria	Exclusion Criteria
Population	Residents and staff in LTC facilities (defined as a non-hospital setting where care is provided to assist with activities of daily living)	Hospital or rehabilitation wards
Intervention	Resident, organizational and community-level risk factors (including modifiable and non-modifiable) Strategies to reduce introduction of infection, transmission of infection, mortality	Non-COVID-19 related
Comparisons	-	
Outcomes	Outbreaks / cases	

Data Extraction and Synthesis

Data relevant to the research question, such as study design, setting, location, population characteristics, interventions or exposure and outcomes were extracted when reported. We synthesized the results narratively due to the variation in methodology and outcomes for the included studies.

Appraisal of Evidence Quality

We evaluated the quality of included evidence using critical appraisal tools as indicated by the study design below. Quality assessment was completed by one reviewer and verified by a second reviewer. Conflicts were resolved through discussion.

Study Design	Critical Appraisal Tool
Synthesis	Assessing the Methodological Quality of Systematic Reviews (AMSTAR) AMSTAR 1 Tool
Cohort	Joanna Briggs Institute (JBI) Checklist for Cohort Studies
Cross sectional	Joanna Briggs Institute (JBI) Checklist for Cross Sectional Studies
Quasi-experimental	Joanna Briggs Institute (JBI) Checklist for Quasi-Experimental Studies

Completed quality assessments for each included study are available on request.

The Grading of Recommendations, Assessment, Development and Evaluations (GRADE) approach was used to assess the certainty in the findings based on eight key domains.

In the GRADE approach to quality of evidence, **observational studies,** as included in this review, provide **low quality** evidence, and this assessment can be further reduced based on other domains:
- High risk of bias
- Inconsistency in effects
- Indirectness of interventions/outcomes
- Imprecision in effect estimate
- Publication bias

and can be upgraded based on:
- Large effect
- Dose-response relationship
- Accounting for confounding.

The overall certainty in the evidence for each outcome was determined taking into account the characteristics of the available evidence (observational studies, some not peer-reviewed, unaccounted-for potential confounding factors, different tests and testing protocols, lack of valid comparison groups). A judgement of 'overall certainty is very low' means that the findings are very likely to change as more evidence accumulates.

Findings

Summary of Evidence Quality

This document includes two completed syntheses, four in-progress syntheses and 32 single studies for a total of 38 publications addressing two distinct questions. The quality of the evidence included in this review is as follows:

Question	Evidence included		Overall certainty in evidence
What are risk factors that are associated with outbreaks and deaths in LTC?	Completed syntheses In progress syntheses Single studies	0 3 26	Low-moderate
What strategies can prevent introduction of and transmission within LTC?	Completed syntheses In progress syntheses Single studies	2 1 7	Very low-low

Warning

Given the need to make emerging COVID-19 evidence quickly available, many emerging studies have not been peer reviewed. As such, we advise caution when using and interpreting the evidence included in this rapid review. We have provided a summary of overall certainty of the evidence to support the process of decision making. Where possible, make decisions using the highest quality evidence available.

Question 1: What risk factors are associated with COVID-19 outbreaks and mortality in LTC facilities?

Table 1: Single Studies

Reference	Date Released	Study Design	Population and Setting	Summary of findings	Quality Rating:
Shallcross, L., Burke, D., Abbott, O., Donaldson, A., Hallatt, G., Hayward, A., … Thorne, S. (2020). Risk factors associated with SARS-CoV-2 infection and outbreaks in Long Term Care Facilities in England: a national survey. *Preprint.*	Oct 4, 2020	Cross sectional	5126 facilities providing dementia care, England	From March–June 2020, period prevalence of infection was 10.5% (95%Confidence Interval (CI): 9.9 to 11.1) in residents and 3.8% (95%CI: 3.4 to 4.2) in staff with 53.1% of facilities reporting at least 1 case and 9.2% reporting large outbreaks. Risk factors for resident infection include: • Residents in socially deprived quintile, Odds Ratio (OR): 1.08, 95%CI: 1.03, 1.14 • For profit, vs. not for profit, OR: 1.19, 95%CI: 1.12, 1.26 • Lower staff to bed ratio, OR: 1.22, 95%CI: 1.16, 1.28 • Employment of agency nurses, OR: 1.57, 95%CI: 1.48, 1.66 • Employment of other agency staff, OR: 1.28, 95%CI: 1.12, 1.37 • Staff care for both infected and uninfected residents, OR: 1.30, 95%CI: 1.23, 1.37 • Cleaning frequency of communal touchpoints < 1/day, OR: 1.15, 95%CI: 1.03, 1.28 • Cleaning staff rooms < 1/day, OR: 1.24, 95%CI: 1.14, 1.34 • Staff personal protective equipment (PPE) only with infected residents, vs. all the time, OR: 1.20, 95%CI: 1.05, 1.37 • Full PPE for infected residents, OR: 3.60, 95%CI: 3.34, 3.88 • Full PPE for all residents, OR: 1.42, 95%CI: 1.37, 1.48 • Inability to isolate a resident, OR: 1.33, 95%CI: 1.28, 1.38 • New admissions, OR: 1.012, 95%CI: 1.010, 1.014 Risk factors for large outbreaks (>20 cases or 1/3 of residents) include: • Employment of agency nurses, OR: 1.85, 95%CI: 1.23, 2.77 • Full PPE for all residents, OR: 1.44, 95%CI: 1.08, 1.91 • Full PPE for infected residents, OR: 1.62, 95%CI: 1.24, 2.11 Analyses adjusted for known confounders (e.g., resident and facility level risk factors).	Low

Yue, L., Cen, X., Cai, X., & Temkin-Greener, H. (2020). Racial and Ethnic Disparities in COVID-19 Infections and Deaths Across U.S. Nursing Homes. *Journal of the American Geriatrics Society,* Epub ahead of print.	Sep 21, 2020	Cross sectional	12 576 facilities, USA	Data were reported for one week, May 25-31, 2020. 93% of facilities had zero new cases. • Facilities with a high proportion of racial/ethnic minority residents had more COVID-19 related resident cases (mean 1.5 vs. 0.4 in highest vs. lowest quartile), resident deaths (mean 0.4 vs. 0.1 in highest vs. lowest quartile) and staff cases (1.3 vs. 0.7 in highest vs. lowest quartile). All differences were statistically significant. • Facilities with higher proportions of racial/ethnic minority residents tended to be larger, for-profit facilities, affiliated with a chain, have more Medicaid residents and lower nurse staffing hours and were in counties with more COVID-19 cases and deaths. Analyses adjusted for county- and facility-level characteristics.	Moderate
Temkin-Greener, H., Guo, W., Mao, Y., Cai, X., & Li, Y. (2020). COVID-19 Pandemic in Assisted Living Communities: Results from Seven States. *Journal of the American Geriatrics Society.* Epub ahead of print.	Sep 21, 2020	Cohort	4865 facilities, USA	This study compared characteristics of facilities with and without cases. Across states, fewer than 10% of facilities reported a case. After controlling for resident characteristics and county-level COVID-19 rates, the odds of having a resident case increased with: • Average resident age, OR: 1.05, 95%CI: 1.02, 1.08 • Number of residents, 9-29 vs. < 9 residents, OR: 1.82, 95%CI: 1.22, 2.72; >30 vs. < 9 residents, OR: 2.78, 95%CI: 1.85, 4.18 • % Residents with congestive heart failure, OR: 1.14, 95%CI: 1.04, 1.25 • Community spread, cases/1000, OR: 1.17, 95%CI: 1.10, 1.24 Total number of cases (in facilities with at least 1 case) was associated with: • % male residents, OR: 1.03, 95%CI: 1.00, 1.06 • % black/Hispanic residents, OR: 1.08, 95%CI: 1.05, 1.11 • % residents with dementia, COPD, obesity (OR range 1.04 to 1.09) Odds of at least 1 death was associated with: • % Medicare only residents, OR: 1.10, 95%CI: 1.01, 1.19 • Number of residents (9-29 vs. < 9 residents, OR: 1.78, 95%CI: 1.02, 3.10; >30 vs. < 9 residents, OR: 2.83, 95%CI: 1.62, 4.93) • % residents with dementia, OR: 1.14, 95%CI: 1.02, 1.26) • Community COVID-19 deaths/1000, OR: 4.44, 95%CI: 2.93, 6.71	High

| Bui, D., See, I., Hesse, E., Varela, K., Harvey, R., August, E., … Atkins, A. (2020). Association Between CMS Quality Ratings and COVID-19 Outbreaks in Nursing Homes — West Virginia, March 17–June 11, 2020. *MMWR. Morbidity and Mortality Weekly Report*, *69*(37), 1300–1304. | Sep 18, 2020 | Cohort | 123 facilities, West Virginia, USA | This study examined the risk of COVID-19 infections and outbreaks based on Centers for Medicare & Medicaid Services star quality ratings from March-June 2020. 11% of facilities reported outbreaks.

Compared to those with no outbreaks, facilities with an outbreak had:
• Higher number of beds (104.1 vs. 84.6)
• Higher number of residents (92.2 vs. 75.6)
• Fewer nurse hours per resident per day (1.9 vs. 2.2)
• Higher county-level incidence (177.8 vs. 105.1 per 100 000)
• Lower overall star quality ratings
• More historical substantiated complaints (4.8 vs. 1.3)
• More health inspection deficiencies (14.9 vs. 10.5)
• Specific health inspection deficiencies that were different between outbreak and non-outbreak facilities were
 o Quality of life and care (3.8 vs. 2.4)
 o Resident assessment and care planning (3.5 vs. 2.2)

All differences statistically significant but analyses not adjusted for known confounders. | Moderate |
| Lipsitz, L.A., Lujan, A.M., Dufour, A., Abrahams, G., Magliozzi, H., Herndon, L., & Dar, M. (2020). Stemming the Tide of COVID-19 Infections in Massachusetts Nursing Homes. *Journal of the American Geriatrics Society*, Epub ahead of print. | Sep 15, 2020 | Quasi-experimental | 360 facilities, Massachusetts, USA | This study compared factors associated with infection and mortality rates over 9 weeks.

Key components that increased infections included:
• Lack of cohorting, OR: 3.0, 95 %CI: 1.34, 6.71
• Inappropriate PPE use, OR: 2.16, 95%CI: 1.42, 3.30
• Community prevalence

Weekly mortality rates were associated with:
• Inappropriate PPE use, OR: 3.20, 95%CI: 1.87, 5.48
• Community prevalence

Analyses not adjusted for known confounders. | Low |

Shen, K. (2020). [Relationship between nursing home COVID-19 outbreaks and staff neighborhood characteristics](). *Preprint.*	Sep 11, 2020	Cross sectional	7154 Medicare and Medicaid-certified facilities, USA	Determinants of COVID-19 deaths per facility were estimated using data to July, 2020. 25-75% of facilities were infected per state. Factors associated with higher death rate include: • Average community-transmission where staff live • Community transmission where LTC facility located • Proportion of residents who are nonwhite • Average severity of residents' impairment • Occupancy rate of facility OR or RR not reported. Analyses adjusted for state-level factors.	Low
Dean, A., Venkataramani, A., & Kimmel, S. (2020). [Mortality Rates From COVID-19 Are Lower In Unionized Nursing Homes](). *Health Affairs.* Epub ahead of print.	Sep 10, 2020	Cross sectional	355 facilities, New York State, USA	This study examines the association between the presence of health care worker unions and COVID-19 mortality rates. The presence of a health care union was associated with: • Lower mortality (absolute difference -1.29%, 95%CI: -2.41, -0.17 • Fewer infections: -50.1 cases/ 1 000 residents, 95%CI: -96.2, -3.9 Analyses adjusted for known confounders.	Moderate
Heras, E., Garibaldi, P., Boix, M., Valero, O., Castillo, J., Curbelo, Y., … Pique, J.M. (2020). [COVID-19 mortality risk factors in older people in a long-term care center](). *Preprint.*	Sep 9, 2020	Cross sectional	n=100 residents with confirmed COVID-19, Andorra	This study reports on factors that predict COVID-19 mortality from March 15-June 5, 2020. Risk of mortality was associated with: • Male gender, OR: 38.1, CI not reported • Lymphopenia, OR: 6.55, CI not reported • Treatment with hydroxychloroquine and azithromycin, OR: 0.04, CI not reported • Barthel's index, OR: 0.92, CI not reported Analyses adjusted for known confounders.	Moderate

| Emmerson, C., Adamson, J.P., Turner, D., Gravenor, M.B, Salmon, J., Cottrell, S., … Williams, C.J. (2020). [Risk factors for outbreaks of COVID-19 in care homes following hospital discharge: a national cohort analysis](). *Preprint.* | Aug 26, 2020 | Cohort | n = 3,115 hospital discharges to 1,068 facilities, UK | This study followed hospital discharges to LTC to observe COVID-19 outbreaks from Feb 22-Jun 27, 2020. 30.1% of facilities experienced an outbreak.

A discharge from hospital was not associated with the risk of outbreak after adjusting for facility characteristics.

Factors associated with risk of outbreak include:
• Number of residents (10-24 vs. <10, Hazard Ratio (HR): 3.40, 95%CI: 1.99, -5.80; 25-29 vs. < 10 residents, HR: 8.25, 95%CI: 4.93, 13·81; 50+ vs. < 10, HR: 17.35, 95%CI: 9.65, 31.19)
• Local health board (proxy for community transmission)

Analyses adjusted for known confounders. | Moderate |
| Shi, S.M., Bakaev, I., Chen, H., Travison, T.G, & Berry, S.D. (2020). [Risk Factors, Presentation, and Course of Coronavirus Disease 2019 in a Large, Academic Long-Term Care Facility](). *The Journal of Post-Acute and Long-Term Care Medicine, 21*(10), 1378-1383. | Aug 25, 2020 | Retrospective Cohort | n = 389 residents, USA | This study described risk factors associated with COVID-19 in LTC residents. All residents were tested between March and May 2020, 37.5% tested positive.

Factors associated with risk of infection after adjusting for confounders include:
• Male sex, Relative Risk (RR): 1.80, 95%CI: 1.07, 3.05
• Bowel incontinence, RR: 1.97, 95%CI: 1.10, 3.52
• % staff living in a high prevalence community (per 10% increase): RR: 1.06, 95%CI: 1.04, 1.08

Mortality rates increased with frailty (16.7% in pre-frail, 22.2% in moderately frail, and 50.0% in frail; p < .001). | High |

Sugg, M., Spaulding, T., Lane, S., Runkle, J., Harden, S., Hege, A., & Iyer, L. (2020). [Mapping community-level determinants of COVID-19 transmission in nursing homes: A multi-scale approach](). *The Science of the Total Environment*, *752*, 141946.	Aug 25, 2020	Cross sectional	13,709 facilities, USA	This study explored the association between facility- and county-level place-based variables and COVID-19 cases in LTC. 40% of facilities reported at least one case. Clustering of cases was similar to county-level clustering among the general population. Facility level factors associated with risk of COVID-19 include: • Number of fines in 2020, RR= 1.13, 95%CI: 1.07, 1.19 • Licensed Practical Nurse staffing, RR: 1.07, 95%CI: 1.00, 1.15 • Total staff levels, RR: 0.86, 95%CI: 0.78, 0.94 County-level factors associated with risk of COVID-19 include: • County COVID-19 rate, RR: 1.83, 95%CI: 1.70, 1.97 • Per-capita income, RR: 2.20, 95%CI: 2.00, 2.42 • County unemployment rate, RR 1.26, 95%CI: 1.16, 1.36 • Average household size, RR: 1.18, 95%CI: 1.07, 1.31 • % population African American, RR: 1.30, 95%CI: 1.20, 1.41 • Population per sq. mile, RR: 1.10, 95%CI: 1.00, 1.20 All analyses adjusted for known confounders.	High
Stall, N., Jones, A., Brown, K., Rochon, P., & Costa, A. (2020). [For-profit long-term care homes and the risk of COVID-19 outbreaks and resident deaths](). *Canadian Medical Association Journal*, *192*(33), E946–E955.	Aug 17, 2020	Cohort	623 facilities, Ontario, Canada; n = 75,676 residents	This study explored the association between for-profit vs. not-for-profit status on outbreaks, resident infections and deaths. 30.5% of facilities reported outbreaks. Outbreaks were not associated with profit status of home, but were associated (after adjusting for confounders) with: • Rate of COVID-19 in the public health region, OR: 1.91, 95%CI: 1.19, 3.05 • Number of residents, OR: 1.38, 95%CI: 1.18,1.61 • Older design standards of facility, OR: 1.55, 95%CI: 1.01, 2.38 • Local population size (<10 000 vs. >500 000, OR: 0.39, 95%CI: 0.18, 0.83; 10 000 – 499 999, OR: 0.56, 95%CI: 0.33, 0.95) Extent of outbreaks and mortality was associated with for-profit status after adjusting for number of residents, design standards, and chain ownership.	High

Figueroa, J.F., Wadhera, R.K., & Papanicolas, I., Riley, K., Zheng, J., Orav, E.J., & Jha, A.K. (2020). Association of Nursing Home Ratings on Health Inspections, Quality of Care, and Nurse Staffing With COVID-19 Cases. *The Journal of the American Medical Association Network, 324*(11), 1103-1105.	Aug 10, 2020	Cohort	4254 facilities, USA	This study explored the association between health inspections, quality ratings and nurse staffing and number of COVID-19 cases. Higher total nursing hours/resident/day and RN hours/resident/day were associated with lower odds of resident COVID-19 cases (OR: 0.82, 95%CI: 0.70, 0.95 after adjustment for facility size and county-level effects. There was no association between health inspection or quality measure ratings and COVID-19 cases.	Moderate
Gorges, R.J., & Konetzka, R.T. (2020). Staffing Levels and COVID-19 Cases and Outbreaks in U.S. Nursing Homes. *Journal of the American Geriatrics Society,* Epub ahead of print.	Aug 8, 2020	Cohort	13,167 facilities, USA	This study explored the association between nursing staff and confirmed COVID-19 cases, outbreaks and mortality. 71% of facilities had at least one case; of those, 25% experienced an outbreak (>1 case per 10 certified beds, or >1 confirmed and suspected case per 5 certified beds, or >10 deaths). Factors associated with risk of a case include: • Lowest tertile of total nursing hours, OR: 0.83 • Highest tertile of RN/Total nursing hours, OR: 1.22 • County-level cases (Highest vs. lowest quartile, OR: 6.20) • Number of beds, OR: 1.01 Factors associated with outbreaks include: • Highest tertile of total nursing hours, OR: 0.82 • County-level cases (Highest vs. lowest quartile, OR: 6.32) Factors associated with mortality include: • High total nursing hours (marginal effect (ME) = -1.06) • County-level cases (Highest vs. lowest quartile, ME = 6.10 Analyses adjusted for known confounders, but CI not reported. Authors note the decreased risk of infection with lower total staff hours may be related to fewer individuals coming in and out of the building and potentially introducing the virus, while increased staffing may help to control outbreaks and provide care.	Moderate

| Harrington, C., Ross, L., Chapman, S., Halifax, E., Spurlock, B., & Bakerjian, D. (2020). Nurse Staffing and Coronavirus Infections in California Nursing Homes. *Policy, Politics & Nursing Practice, 21*(3), 174–186. | Aug 1, 2020 | Cross sectional | 1091 facilities, USA | The purpose of this study was to examine the characteristics of facilities with and without COVID-19. 24.9% of facilities reported at least one case.

Factors associated with confirmed COVID-19 cases include:
• RN staffing levels < 0.75 hours/resident/day, OR: 2.06, 95%CI: 1.31, 3.30
• Resident health deficiencies, OR: 1.02, 95%CI: 1.00, 1.04
• Total beds, OR: 1.01, 95%CI: 1.00, 1.01
• Medicare five-star nurse staffing rating, OR: 0.83, 95%CI: 0.72, 0.97
• Medicare five-star RN staff rating, OR: 0.82, 95%CI: 0.71, 0.94

Analyses adjusted for known confounders, including community transmission. | Moderate |
| Chatterjee, P., Kelly, S., Qi, M., & Werner, R.M. (2020). Characteristics and Quality of US Nursing Homes Reporting Cases of Coronavirus Disease 2019 (COVID-19). *The Journal of the American Medical Association Network Open, 3*(7), e2016930. | Jul 29, 2020 | Cross sectional | 8943 facilities, 23 states, USA | This study describes the characteristics and quality of facilities with COVID-19 cases from April 22–29, 2020. 33.8% reported ≥ 1 cases.

Facilities that reported COVID-19 cases had:
• Residents with higher mean (SD) health deficiencies, 67.0 (67.6) vs. 56.2 (68.7)
• More emergency preparedness deficiencies, 3.9 (3.6) vs. 3.2 (3.4)
• More reported incidents 2.4 (4.7) vs. 1.1 (3.1)
• More substantiated complaints 5.7 (9.5) vs. 4.0 (7.4)
• For-profit facilities, 78.9% vs 69.1%
• Higher mean (SD) % of Medicaid-insured residents 59.3% (25.2%) vs 56.7% (24.1%)
• Higher county-level infection rates (505.6 vs. 231.3 per 100 000

There were no differences in outcome by staffing, overall 5-star ratings, or star ratings of deficiencies. Statistical significance is not reported, and analyses were not adjusted for known confounders. | Moderate |

Fisman, D.N., Bogoch, I., Lapointe-Shaw, L., McCready, J., & Tuite, A.R. (2020). Risk Factors Associated With Mortality Among Residents With Coronavirus Disease 2019 (COVID-19) in Long-term Care Facilities in Ontario, Canada. *The Journal of the American Medical Association Network Open, 3*(7), e2015957.	Jul 22, 2020	Cohort	627 facilities, Canada	This study compared COVID-19 mortality in facilities vs. community. 43.4% of facilities reported at least one case in resident or staff. There was no association between presence of COVID-19 in a facility and number of beds, region, or for-profit status. Resident mortality was associated with: • Staff cases with a 2-day lag, RR: 1.20; 95%CI: 1.14, 1.26 • Staff cases with a 6-day lag, RR=1.17; 95%CI: 1.11, 1.26 Definition of 'lag' is unclear but appears to be lag between testing and results. Analyses were not adjusted for known confounders.	Moderate
White, E., Kosar, C., Feifer, R., Blackman, C., Gravenstein, S., Ouslander, J., & Mor, V. (2020). Variation in SARS-CoV -2 Prevalence in U.S. Skilled Nursing Facilities. *Journal of the American Geriatrics Society.* Epub ahead of print.	Jul 16, 2020	Cross sectional	3357 facilities, USA	This study identified county and facility factors associated with COVID-19 outbreaks in skilled nursing facilities. 22.6% of facilities reported at least one case. Factors associated with probability of at least one case include: • County prevalence, for every 1,000 cases per 100,000, probability increased 33.6%, 95%CI: 9.6, 57.7 • Facility size, for every 10-bed increase, probability increased 0.9%, 95%CI: 0.6, 1.2) • Higher star-rating for health inspections was associated with a 2.9% decrease in probability of a case, 95%CI: -5.1, -0.7 Factors associated with number of cases include: • County prevalence, per 1000 cases per 100 000, number of resident cases increases by 12.6, 95%CI: 4.4, 20.8 • Facility size, for every 10-bed increase, the number of cases increase by 2.0, 95%CI: 0.9, 3.0 • Date of first county case, early county cases were associated with fewer resident cases Analyses were only adjusted for state.	High

Dutey-Magni, P.F., Williams, H., Jhass, A., Rait, G., Hemingway, H., Hayward, A.C., & Shallcross, L. (2020). Covid-19 infection and attributable mortality in UK Long Term Care Facilities: Cohort study using active surveillance and electronic records (March-June 2020). *Preprint.*	Jul 15, 2020	Cohort	n = 9,339 residents and n = 11,604 staff across 179 facilities, UK	The purpose of this study was to assess risk factors for COVID-19 infection in residents and staff. 10.2% (95%CI: 9.6, 10.8) of residents, and 5.0% (95%CI: 4.7, 5.5) of staff had confirmed infections. Factors independently associated with risk of infection include: • Male sex, HR: 1.32, 95%CI: 1.11, 1.56 • Age 75-84 vs. <75, HR: 1.32, 95%CI: 1.03, 1.71; 85-94 vs. <75, HR: 1.42, 95%CI: 1.10, 1.82; 95+ vs. <75, HR: 1.43, 95%CI: 1.01, 2.03 • Bed type, nursing vs. residential, HR: 1.40, 95%CI: 1.15, 1.70 • Facility size, 45-59 beds vs. 20-34 beds, HR: 1.59, 95%CI: 1.27, 1.99; 70-85 beds vs. 20-34 beds, HR: 1.87, 95%CI: 1.44, 2.43 • Average 85-100 residents per 100 rooms vs. 70-85 residents per 100 rooms, HR: 2.48, 95%CI: 1.84, 3.33; >100 residents per 100 rooms vs. 70-85 residents per 100 rooms, HR: 9.28, 95%CI: 6.20, 13.90 • Bed to staff ratio, HR: 8.22, 95%CI: 4.62, 14.63 Factors independently associated with all-cause mortality include: • Male sex, HR: 1.44, 95%CI: 1.30, 1.59 • Age 75-84 vs. <75, HR: 1.36, 95%CI: 1.14, 1.61; 85-94 vs. <75, HR: 1.75, 95%CI: 1.49, 2.06; 95+ vs. <75, HR: 2.32, 95%CI: 1.88, 2.85 • Bed type, nursing vs. residential, HR: 1.36, 95%CI: 1.21, 1.54 Analyses were adjusted for known confounders.	Moderate
Rolland, Y., Lacoste, M., De Mauleon, A., Ghisolfi, A., De Souto Barreto, P., Blain, H., & Villars, H. (n.d.). Guidance for the Prevention of the COVID-19 Epidemic in Long-Term Care Facilities: A Short-Term Prospective Study. *The Journal of Nutrition, Health & Aging, 24,* 812-816.	Jul 13, 2020	Cross sectional	124 facilities, France	This study compared the association between self-reported adherence to COVID-19 guidance and resident COVID-19 cases. 24.2% of facilities had at least one case. Facilities with no cases were more likely to: • Be publicly funded, OR: 0.39, 95%CI: 0.20, 0.73 • Have organized staff within zones within the facilities, OR: 0.19, 95%CI: 0.07, 0.48 • Have higher reported implementation of preventative measures in the facility, OR: 0.65, 95%CI: 0.43, 0.98) Analyses were adjusted for known confounders.	Low

| Brown, K.A., Jones, A., Daneman, N., Chan, A.K., Schwartz, K.L, Garber, G.E., … Stall, N.M. (2020). Association Between Nursing Home Crowding and COVID-19 Infection and Mortality in Ontario, Canada. *Preprint.* | Jun 23, 2020 | Cohort | n = 78,000 residents of 618 facilities, Canada | This study explored the relationship between crowding in facilities and incidence of COVID-19 from March 29-May 20, 2020. Infections were distributed unevenly; 86% of infections occurred in 10% of facilities.

Factors associated with incidence include:
• Regional incidence, 4th vs. 1st quartile, RR: 4.11, 95%CI: 1.01, 16.67
• Community population size, >500 000 vs. <10 000, RR: 4.63, 95%CI: 1.05, 20.44
• Private, for profit vs. municipal ownership, RR: 2.40, 95%CI: 1.14, 5.06
• Crowding index, highest vs. lowest quintile, RR: 2.06, 95%CI: 1.15, 3.67

Factors associated with mortality include:
• Private, for-profit vs. municipal ownership, RR: 2.60, 95%CI: 1.04, 6.51
• Crowding index, highest vs. lowest, RR: 2.06, 95%CI: 1.05, 4.07

Factors associated with presence of at least one infection include:
• Community population size, >500 000 vs. < 10 000, OR: 5.17, 95%CI: 2.06, 12.94

Analyses were adjusted for known confounders. | High |

| Brainard, J.S., Rushton, S., Winters, T., & Hunter, P.R. (2020). Introduction to and spread of COVID-19 in care homes in Norfolk, UK. *Preprint.* | Jun 18, 2020 | Cross sectional | 248 facilities, UK | The study examined the relationship between staffing and PPE introduction and spread of COVID-19. 10% of facilities had a COVID-19 case between April 5 and May 6, 2020.

Time to first infection was associated with the number of non-care workers (e.g., cooks, maintenance, administrative) employed. Compared to those with <10, 11-20 non-care workers, HR: 6.50, 95%CI: 2.61, 16.17; 21-30 non-care workers, HR: 9.87, 95%CI: 3.22, 30.22; >31 non-care workers, HR: 18.93, 95%CI: 2.36, 151.9.

Daily increment in cases was associated with:
• Reduced availability eye protection (OR: 1.66, 95%C: 1.29, 2.13) and facemasks (OR: 1.26, 95%CI: 1.09, 1.46)
• Number of care workers employed, per 1-unit increase OR: 1.04, 95%CI: 1.02, 1.05
• Number of nurses employed, per 1-unit increase OR: 1.18, CI: 1.13, 1.24

Cases were not laboratory confirmed but based on home manager's judgement. Analyses not adjusted for other known confounders. | Moderate |
| Li, Y., Temkin-Greener, H., Shan, G., Cai, X. (2020). COVID-19 Infections and Deaths among Connecticut Nursing Home Residents: Facility Correlates. *Journal of the American Geriatrics Society, 68*(9), 1899-1906. | Jun 18, 2020 | Cross sectional | 215 facilities, USA | This study explored associations between facility and resident characteristics and COVID-19 cases and mortality. 50.2% of facilities reported at least one case by April 16, 2020.

After controlling for facility and county covariates, no relationship was found between RN staffing, five-star ratings, or % of Medicaid and racial/ethnic minority residents and confirmed cases or mortality.

Among facilities with at least *one confirmed* case, case counts were associated with:
• RN staff, per 20-min increase, RR: 0.78, 95%CI: 0.68, 0.89
• Star rating, 4- or 5-star vs. < 4, RR = 0.87, 95%CI: 0.78. 0.97
• High % Medicaid residents, RR: 1.16, 95%CI: 1.02, 1.32
• High % racial/ethnic minority residents, RR: 1.15, 95%CI: 1.03, 1.29

No statistically significant associations were found for mortality. | Moderate |

| He, M., Li, Y., & Fang, F. (2020). Is There a Link between Nursing Home Reported Quality and COVID-19 Cases? Evidence from California Skilled Nursing Facilities. *The Journal of Post-Acute and Long-Term Care Medicine, 21*(7), 905-908. | Jun 15, 2020 | Cohort | 1223 facilities, USA | This study explored the relationship between facility quality and COVID-19 cases and mortality. 35% of facilities reported ≥ 1 case.

Factors associated with COVID-19 amongst residents include:
• Quality ratings, 5-star vs 3-star, OR: 0.41, 95%CI: 0.27, 0.62; 4-star vs. 3-star, OR: 0.66, 95%CI: 0.44, 0.98
• Bed occupancy, per 1-bed increase, OR: 1.009, 95%CI: 1.006, 1.012
• % non-white residents, >59.5% vs. <59.5%, OR: 1.95, 95%CI: 1.49, 2.55

Factors associated with COVID-19 mortality include:
• Quality ratings, 5-star vs. 3-star, OR: 0.30, 95%CI: 0.18, 0.48
• Bed occupancy, per 1-bed increase, OR: 1.006, 95%CI: 1.003, 1.009
• % white residents, <59.5 vs. >59.5, OR: 1.64, 95%CI: 1.21, 2.23)
• For-profit status, OR: 1.69, 95%CI: 1.01, 3.00

Analyses were adjusted for known confounders. | High |
| Unruh, M.A., Yun, H., Zhang, Y., Braun, R.T., & Jung, H.Y. (2020). Nursing Home Characteristics Associated With COVID-19 Deaths in Connecticut, New Jersey, and New York. *The Journal of Post-Acute and Long-Term Care Medicine, 21*(7), 1001-1003. | Jun 15, 2020 | Cross sectional | 1162 facilities, USA | This study compared facilities with 6+ deaths to those with < 6. 15.8% had 6 or more deaths.

Factors associated with having 6+ COVID-19 deaths include:
• % Medicaid residents, highest vs. lowest quintile, 8.6%-point increase, 95%CI: 1.1, 16.1
• Mean resident ADL scores, for every 1-unit increase, 2.6%-point increase, 95%CI: 1.4, 3.8
• Total beds, per bed +0.1%-point increase, 95%CI: 0.00, 0.1
• Occupancy rate, per resident +0.3%-point increase, 95%CI: 0.1, 0.5
• For-profit status, +4.8%-point increase vs. not for profit, 95%CI: 0.8, 8.8
• Probabilities higher in New Jersey (+12.5, 95%CI: 1.5, 23.6) and lower in New York (-7.8, 95%CI: -15.6, 0.0) compared to Connecticut

Analyses were adjusted for known confounders. | Moderate |

| Abrams, H.R., Loomer, L., Gandhi, A., & Grabowski, D.C. (2020). Characteristics of U.S. Nursing Homes with COVID-19 Cases. *Journal of the American Geriatrics Society, 68*(8), 1653-1656. | Jun 2, 2020 | Cross sectional | 9,395 facilities, 30 states, USA | This study compared characteristics of facilities with and without COVID-19 cases. 31.4% of facilities had a COVID-19 case.

Factors associated with presence of a case include:
• Facility size, >150 beds vs. < 50 beds, OR: 6.52; 50-150 beds vs. <50 beds, OR: 2.63
• Urban vs rural location, OR: 3.22
• Higher % black residents, OR: 2.05
• Chain vs. non-chain OR: 0.89
• Geographic location, ORs varied by state

Factors associated with outbreak size include:
• Facility size, >150 beds vs. < 50 beds, % point change: -10.8; 50-150 beds vs. <50 beds, $ point change: -15.9
• For profit vs. non-profit, % point change: 1.9
• Geographic location, % point change varied by state

Analyses were not adjusted for any confounders. All factors were statistically significant, but CI not reported. | Moderate |

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Table 2: In-progress Syntheses

Title	Anticipated Release Date	Description of Document
Wu, J., Bourouiba, L., McCarthy, Z., Nah, K., Alavinejad, M., Tosato, M., & Bragazzi, N.L. (2020). *COVID-19 in long-term care facilities: a systematic review and meta-analysis of the literature*. PROSPERO, CRD42020192091.	Aug 16, 2020	This review will explore characteristics of COVID-19 cases and outbreaks in LTC facilities, in terms of seroprevalence, symptoms, hospitalization rates and case fatality rates for residents, staff and visitors.
Gomes, Z., Aithal, S., Antonipillai, V., Kurmi, K., & Baumann, A. (2020). *Prognostic factors associated with morbidity and mortality due to COVID-19 infection in adults using long-term care facilities: a systematic review*. PROSPERO, CRD42020198170.	Oct 29, 2020	This review seeks to identify key prognostic factors associated with COVID-19 that result in higher morbidity and mortality among residents and staff and the strength of association of same. Potential factors to be examined include: • Lifestyle • Environmental factors • Sociodemographic factors • Personal characteristics • Comorbid health conditions • Mental health • Availability/use of personal protective equipment (PPE) • Facility policies (testing, isolation, care ratio) • Infection control practices Subgroup analysis will be conducted for gender, ethnicity, age group, geographical region, and facility type (public vs. private).
Rashidul Hashan, M., Smoll, N., King, C., Ockenden-Muldoon, H., Walker, J., Booy, R., & Khandaker, G. (2020). *Epidemiology and clinical features of COVID-19 outbreaks in aged care facilities: a systematic review and meta-analysis*. PROSPERO, CRD42020211424.	Oct 30, 2020	This review will examine the global epidemiological burden of COVID-19 in LTC facilities, the clinical manifestations of outbreaks among residents and the risk factors associated with adverse outcomes for COVID-19 outbreaks in LTC (such as prevalence of co-morbidities). Subgroup analysis will be conducted on any available data.

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Question 2: What strategies mitigate risk of outbreaks and mortality within LTC?

Table 3: Syntheses

Reference	Date Released	Description of Included Studies	Summary of Findings	Quality Rating: Synthesis	Quality Rating: Included Studies
Rios, P., Radhakrishnan, A., Williams, C., Ramkissoon, N., Pham, B., Cormack, G.V., … Tricco, A.C. (2020). Preventing the transmission of COVID-19 and other coronaviruses in older adults aged 60 years and above living in long-term care: a rapid review. *Systematic Reviews, 9*(1), 1–8.	Sep 25, 2020 (Search completed Jul 31, 2020)	This rapid review included 9 clinical practice guidelines (CPG) from: - Government agencies (n=3) - Medical associations (n=3) - Non-profit research trusts (n=2) - International health organizations (n=1)	The most common recommendations among CPGs were: - Surveillance, monitoring, and evaluation of symptoms in staff and residents - Mandated personal protective equipment (PPE) use - Social distancing/isolation or cohorting among residents - Enhanced cleaning - Promotion of hand and respiratory hygiene measures - Sick leave policies Further evidence needed on impact of restricting staff movement between multiple facilities.	Moderate	Very low
Koshkouei, M., Abel, L., & Pilbeam, C. (2020). How can pandemic spreads be contained in care homes?	Apr 14, 2020, (Search date not reported)	This rapid review included: 30 studies (study designs and countries not reported)	Measures such as hand hygiene, regular cleaning, and limiting staff movement between facilities may reduce infection spread. Further evidence is needed regarding restrictions on visitors and testing of staff.	Low	Not reported

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Table 4: In-progress Syntheses

Title	Anticipated Release Date	Setting	Description of Document
Frazer, K., Lachlan, M., Stokes, D., Crowley, E., & Kelleher, C.C. (2020). _Systematic review of measures to protect older people in long term care facilities from COVID 19_. PROSPERO, _CRD42020191569._	Aug 31, 2020	Facilities	This review will explore what infection control measures have been used in facilities to reduce transmission of infectious disease (specifically respiratory illness from SARS-CoV-2/COVID-19). It will also explore the effect of infection control measures on morbidity and mortality.

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Table 5: Single Studies

Reference	Date Released	Study Design	Population	Setting	Summary of findings	Quality Rating:
Telford, C., Onwubiko, U., Holland, D., Turner, K., Prieto, J., Smith, S., … Shah, S. (2020). Preventing COVID-19 Outbreaks in Long-Term Care Facilities Through Preemptive Testing of Residents and Staff Members — Fulton County, Georgia, March–May 2020. *Morbidity and Mortality Weekly Report*, *69*(37), 1296–1299.	Sep 18, 2020	Quasi experimental	28 facilities	Georgia, USA	Facility-wide COVID-19 testing for residents and staff was conducted: • As a response measure in 15 facilities after a confirmed case was identified (testing based on previous symptomatic screening) • As a prevention measure in 13 facilities with no confirmed cases Prevalence of cases was significantly higher among 'response' facilities (28.0% residents; 7.4%; staff) compared to 'preventive' facilities (0.5% residents; 1.0% staff). After 4 weeks of follow-up screening, overall prevalence was significantly lower in the "preventive" facilities (1.5% residents; 1.7% staff) compared to "response" facilities (42.4% residents; 11.8% and staff).	Low

Lipsitz, L.A., Lujan, A.M., Dufour, A., Abrahams, G., Magliozzi, H., Herndon, L., & Dar, M. (2020). [Stemming the Tide of COVID-19 Infections in Massachusetts Nursing Homes](). *Journal of the American Geriatrics Society,* Epub ahead of print.	Sep 15, 2020	Quasi-experimental	360 facilities	Massachusetts, USA	All facilities completed an infection control checklist at baseline. Payment incentives were attached to passing unannounced monthly or more infection control audits, COVID-19 testing of >90% of residents and staff, provision of key data and providing residents with technology for virtual visits with family and friends. Sites that had previous infection control deficiencies or failed an initial audit received additional support through onsite and virtual infection control consultations. All sites had access to weekly webinars and continuous Q&A communication, as well as PPE, staffing and testing resources. For every 1-point increase in the infection control checklist score, there was a decrease in weekly infection rate (8%, p = .0007) and decrease in weekly mortality rate (3%, p=0.179). Greater compliance with PPE and cohorting was associated with large reductions in infections.	Low
Wilmink, G., Summer, I., Marsyla, D., Sukhu, S., Grote, J., Zobel, G., … & Movva, S. (2020). [Real-Time Digital Contact Tracing: Development of a System to Control COVID-19 Outbreaks in Nursing Homes and Long-Term Care Facilities](). *JMIR Public Health and Surveillance, 6*(3), e20828.	Aug 25, 2020	Quasi experimental	n=120 individuals (80 residents; 40 staff)	Simulated model	A simulation model was developed to compare the effectiveness of a digital contact tracing system to other transmission control approaches (e.g., symptom mapping, manual contact tracing, polymerase chain reaction testing) in long term care facilities. The digital contact tracing system was more effective in reducing COVID-19 transmission, with a lower number of new cases and lower mortality rate, compared to other approaches, likely due to its speed and efficiency in identifying cases. Symptom-based screening alone was the least effective method resulting in the highest number of new cases and mortality in the simulation model.	Low

Telford, C.T., Bystrom, C., Fox, T., Wiggins-Benn, S., McCloud, M., Holland, D.P., & Shah, S. (2020). Assessment of Infection Prevention and Control Protocols, Procedures, and Implementation in Response to the COVID-19 Pandemic in Twenty-three Long-term Care Facilities in Fulton County, Georgia. *Preprint.*	Aug 15, 2020	Cohort	23 facilities	Georgia, USA	Among 23 facilities that reported 1 or more COVID-19 infections, implementation of infection prevention control was greatest for screening measures and lowest for disinfection. Facilities with lower prevalence of COVID-19 infections had greater implementation of social distancing and PPE measures compared to facilities with higher prevalence of infections. Lower prevalence facilities also had greater implementation of: • Enforcement of maximum occupancy in small, enclosed areas • Droplet/contact precaution signage in specific areas • Frequent training and audits of proper mask usage by staff • Proper use of masks by staff in COVID-19 and non-COVID-19 units • Adequate supply of PPE	Low
Belmin, J., Um-Din, N., Donadio, C., Magri, M., Nghiem, Q., Oquendo, B., Pariel, S., & Lafuente-Lafuente, C. (2020). Coronavirus Disease 2019 Outcomes in French Nursing Homes That Implemented Staff Confinement With Residents. *The Journal of the American Medical Association Network Open*, *3*(8), e2017533.	Aug 13, 2020	Quasi experimental	17 facilities (n = 1250 residents; n = 94 staff) 9513 facilities (n = 695,060 residents; n = 385,290 staff)	France	Facilities that implemented voluntary staff self-confinement with residents (≥7 days) were compared to facilities which did not. Only 1 (5.8%) facility in which self-confinement occurred reported cases of COVID-19, compared with 4,599 (48.3%) facilities with no self-confinement (p < 0.001). Lower rates among residents were found in facilities with staff self-confinement compared to those without for: • Confirmed cases (0.4% vs 4.4%) • Possible cases (0% vs 4.6%) • Mortality (0.4% vs 1.8%; OR: 0.22, 95%CI 0.09, 0.53 A lower rate of confirmed or possible cases among staff was also found in facilities with staff self-confinement compared to those without (1.6% vs 7.6%).	Low

| Echeverría, P., Mas Bergas, M., Puig, J., Isnard, M., Massot, M., Vedia, C., ... & Negredo, E. (2020). COVIDApp as an Innovative Strategy for the Management and Follow-Up of COVID-19 Cases in Long-Term Care Facilities in Catalonia: Implementation Study. *JMIR Public Health and Surveillance*, *6*(3), e21163. | Jul 17, 2020 | Quasi experimental | 196 facilities (169 long terms care facilities and 27 facilities for people with a physical or mental disability) | Catalonia, Spain | Care facilities collaborated with 64 primary care teams in the use of a COVID-19 App tool aimed at monitoring residents' clinical symptoms for early detection of suspected cases, managing care, and monitoring potential transmission within facilities.

In the month following commencement of app use, there was an increase in suspected cases in Week 1, but a decrease in weeks 3 and 4. Confirmed cases increased up until the end of week 3, then remained stable. Total deaths and deaths among suspected/confirmed cases increased over the first half of the month, then decreased.

There was also a decrease in the number of facilities classified as "high-risk" for COVID-19 over the month. | Moderate |
| Caspi, G., Chen, J., Liverant-Taub, S., Shina, A., & Caspi, O. (2020). Heat Maps for Surveillance and Prevention of COVID-19 Spread in Nursing Homes and Assisted Living Facilities. *The Journal of Post-Acute and Long-Term Care Medicine, 21*(7), 986-988. | May 25, 2020 | Quasi experimental | Not reported | Israel | Authors have developed a real-time heat mapping website which captures data regarding the number of confirmed cases (residents and/or staff) in facilities within a specified time period, as well as the rate of growth in cases in a facility.

This tool could be used by officials to monitor trends in facility transmission and determine whether transmission may be occurring across facilities within a specific geographic area, allowing further investigation. | Low |

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