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Table 1

| Features                     | Percent of Population | aOR  | \( P \) Value | Confidence Low | Confidence High |
|------------------------------|-----------------------|------|--------------|----------------|-----------------|
| Antithrombotic use           |                       |      |              |                |                 |
| Age category:                |                       |      |              |                |                 |
| 65–69 y                      | 10.7%                 | 1.41 | <0.001       | 1.06           | 1.88            |
| 70–74 y                      | 13.1%                 | 1.70 | <0.001       | 1.30           | 2.23            |
| 75–79 y                      | 14.9%                 | 1.79 | <0.001       | 1.38           | 2.34            |
| 80–84 y                      | 14.7%                 | 2.42 | <0.001       | 1.87           | 3.15            |
| 85–89 y                      | 15.5%                 | 3.03 | <0.001       | 2.35           | 3.93            |
| 90 y and older               | 19.1%                 | 3.71 | <0.001       | 2.89           | 4.79            |
| <65 y                        | 12.0%                 |     |              |                |                 |
| Sex:                         |                       |      |              |                |                 |
| Male                         | 35.6%                 | 1.69 | <0.001       | 1.49           | 1.92            |
| Female                       | 64.4%                 |     |              |                |                 |
| Medical conditions:          |                       |      |              |                |                 |
| Cancer                       | 12.3%                 | 0.72 | <0.001       | 0.60           | 0.87            |
| CKD                          | 30.3%                 | 1.70 | <0.001       | 1.50           | 1.93            |
| COPD                         | 48.7%                 | 1.07 | 0.41         | 0.85           | 1.30            |
| CAD CHF                      | 42.8%                 | 1.13 | <0.05        | 1.00           | 1.28            |
| Thrombosis                   | 4.0%                  | 0.76 | 0.06         | 0.54           | 1.04            |

CAD, coronary artery disease; CHF, congestive heart failure; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease.

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Excess Mortality in Long-Term Care Residents With and Without Personal Contact With Family or Friends During the COVID-19 Pandemic

Despite evidence of disparities in excess mortality during the COVID-19 pandemic, less is known about the unequal impacts within long-term care (LTC). Even pre-pandemic, many residents experienced loneliness and social isolation. The most isolated—those without living family or friends, or who are geographically distant or estranged from them—often receive increased care and support from LTC staff. With the demands of COVID-19, these efforts may not have been possible to sustain. This may have led already socially vulnerable residents to be disproportionately affected by COVID-19, especially without family and friends to advocate for needed care or provide emotional support. Our objective was to compare excess mortality early in the COVID-19 pandemic in LTC residents with and without personal contact with family or friends.

Methods

We conducted an interrupted time series analysis to evaluate changes in all-cause mortality rates of LTC residents with and without contact with family or friends in Ontario, Canada, from January 1, 2017, to September 30, 2020. Residents were identified using the Continuing Care Reporting System database. Although pandemic-related restrictions in LTC (eg, visitor bans, suspension of congregate dining) led to widespread social isolation of residents, most remained in contact with family and friends virtually or by phone. We defined residents as having no personal contact (including phone calls) with family and friends in the past 7 days if the assessor indicated “yes” to item F2E (absence of personal contact with family or friends), based on their most recent annual assessment and venous thromboembolism from the Resident Assessment Instrument Minimum Dataset (version 2.0). Item F2E is a reliable measure of family or friend contact. We found 93.5% agreement across annual assessments over a 5-year lookback window and 95.8% agreement between the last 2 assessments (Supplementary Table 1), with a prevalence- and bias-adjusted Kappa coefficient of 0.92 (95% CI 0.91, 0.92) (Supplementary Table 2). Deaths were ascertained using Ontario’s Registered Persons Database and other health administrative databases. These datasets were linked using unique encoded identifiers and analyzed at ICES.

We used March 14, 2020, as the deadline for implementation of an infection prevention and control intervention in Ontario as COVID-19 began to spread in the community, to define the pre-pandemic and pandemic periods. Segmented regression models with autocorrelated errors were fitted for each resident group to...
evaluate changes in mortality rates. Models included time in months (prepandemic trend), intervention period (prepandemic vs pandemic, representing the change in rates just after March 14, 2020), an interaction between the intervention period and time (pandemic trend, representing time elapsed since March 14, and season (October–March, April–September) as explanatory variables.

Excess mortality in the pandemic period was calculated in each group as absolute and relative differences in observed and expected mortality, based on pre-COVID-19 trends. We calculated the difference in excess mortality in residents with and without family or friend contact using a difference-in-differences analysis. Resident characteristics were compared using standardized differences (SD); differences >0.10 were considered meaningful.7 Data use was authorized under section 45 of Ontario’s Personal Health Information Protection Act and did not require ethics review.

Results

As of March 14, 2020, 2.3% (1550/67,589) of residents had no personal contact with family or friends (mean and range across study: 2.9%, 2.3%–5.9%). These residents were younger [mean (standard deviation): 81.9 (9.2) years vs 85.4 (8.3), SD (p < 0.01)], less often women (63.0% vs 70.4%, SD = 0.16), and had fewer comorbid conditions [3.6 (1.9) vs 4.0 (1.9), SD = 0.20], but were similar to residents with family or friend contact in physical function [activities of daily living score, 17.0 (7.0) vs 17.6 (6.7), SD = 0.09] and dementia prevalence [75.2% vs 72.5%, SD = 0.06].

During the pandemic period, there was a 57.8% relative increase (absolute change, 12.6 excess deaths per 1000) in mortality in residents without family or friend contact and a 17.1% increase (4.8 deaths per 1000) in residents with family or friend contact, representing 34.8% greater excess mortality in residents without personal contact with family or friends (difference-in-difference, 7.8 deaths per 1000) (Table 1). Patterns were consistent across sexes and in residents ≥85 years (data not shown). Excess mortality was highest in April, returning to pre—COVID-19 levels by June–July when community transmission was low. Overall, 9.5% (54/567) of deaths in residents without family or friend contact occurred in those with confirmed COVID-19 compared with 13.4% (1788/13,337) of deaths in residents with family or friend contact. Residents without family or friend contact had lower hospital transfer rates prior to death in April and May despite similar rates in March (data not shown).

Discussion

LTC residents without personal contact with family or friends experienced 35% greater excess mortality early in the COVID-19 pandemic relative to residents who had personal contact with family or friends. These residents may have experienced reduced access8 and/or other deficiencies in care (eg, delayed treatment decisions)9 if stripped of the extra care typically provided by staff, and with no family or friends to advocate for needed care. They may have also been less resilient to pandemic-related stressors because of their isolation; loneliness and social isolation have been shown to increase the risk for premature mortality.10

Although our findings were consistent across sex and age strata and residents without family or friend contact were younger and generally healthier, unmeasured factors may be driving observed differences. Further research is needed to understand underlying mechanisms to minimize further harm to socially vulnerable residents.

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Table 1

| Month | Residents With Personal Contact With Family or Friends | Residents Without Personal Contact With Family or Friends | Difference-in-Differences |
|-------|--------------------------------------------------------|---------------------------------------------------------|---------------------------|
|       | Rate/1000 Residents | Excess Mortality | Rate/1000 Residents | Excess Mortality | Absolute Rate Difference (95% CI) |
|       | Observed | Expected† | Absolute Rate Difference (95% CI) | Observed | Expected† | Absolute Rate Difference (95% CI) |
| Overall | 32.8 | 28.0 | 4.8 (4.0, 5.6) | 34.3 | 21.8 | 12.6 (8.9, 16.2) | 7.8 (4.1, 11.5) |
| March | 38.5 | 33.3 | 5.2 (2.3, 8.1) | 50.3 | 25.7 | 24.7 (5.2, 44.1) | 19.4 (–0.2, 39.1) |
| April | 48.2 | 28.2 | 20.0 (17.0, 23.0) | 55.1 | 23.5 | 31.6 (13.6, 49.5) | 11.5 (–6.7, 29.8) |
| May | 34.2 | 27.0 | 7.6 (2.9, 13.3) | 38.1 | 19.9 | 18.2 (3.8, 32.6) | 12.5 (–2.1, 27.2) |
| June | 26.1 | 26.1 | 0.0 (–2.5, 2.6) | 34.9 | 21.5 | 13.3 (0.1, 26.6) | 13.3 (–0.2, 26.8) |
| July | 26.1 | 27.1 | –1.0 (–3.6, 1.7) | 27.3 | 22.3 | 5.0 (–6.7, 16.1) | 5.9 (–6.0, 17.8) |
| August | 26.7 | 27.5 | –0.8 (–3.4, 1.9) | 24.3 | 20.5 | 3.8 (–6.5, 14.1) | 4.5 (–6.1, 15.2) |
| September | 29.7 | 26.9 | 2.8 (0.1, 5.5) | 28.7 | 21.1 | 7.6 (2.6, 17.9) | 4.8 (–5.8, 15.4) |

*As of March 1, 2020, a total of 77,291 residents lived in Ontario’s 623 licensed LTC homes, where they received personal and nursing care, subsidized accommodations, and prescription medications through a publicly funded program. At the start of the pandemic period (March 14, 2020), 67,589 Ontario nursing home residents were alive and had an annual Resident Assessment Instrument Minimum Dataset (RAI-MDS) assessment—66,039 had personal contact with family and friends and 1550 had no contact.

†Expected mortality rates were estimated based on pre-COVID-19 trend (January 1, 2017—March 13, 2020) using segmented regression models with autocorrelated errors and seasonality adjustment.

1Relative percentage change, calculated as (observed — expected)/expected, of 17.1% (95% CI 14.1, 20.1).

2Relative percentage change of 57.8% (95% CI 36.8, 78.8).

3Relative difference-in-difference, calculated as [(34.3/21.8)/(32.8/28.0)], of 34.8%.

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Supplementary Table 1
Measurement of Within-Individual Reliability of Item F2E Over Repeated Annual Assessments Based on Both a 5-Year Lookback Window and the Last 2 Assessments

| Last Assessment Year* | Assessments Looking Back 5 y | Last 2 Assessments |
|-----------------------|-----------------------------|-------------------|
|                       | n                           | Percentage Agreement | n                          | Percentage Agreement |
| 2017                  | 27,044                      | 94.8               | 20,356                     | 97.3               |
| 2018                  | 27,162                      | 95.3               | 20,215                     | 97.7               |
| 2019                  | 36,573                      | 95.5               | 27,349                     | 97.8               |
| 2020                  | 74,598                      | 91.4               | 62,623                     | 93.7               |
| Overall               | 165,377                     | 93.5               | 130,543                    | 95.8               |

*The year in which the residents’ last (or most recent) annual assessment was completed. A 5-year lookback window from the last assessment year was used to calculate percentage agreement among all completed annual assessments.

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Supplementary Table 2
Prevalence- and Bias-Adjusted Kappa Coefficient Based on the Last 2 Annual Assessments of Item F2E, Over the Study Period

| Last Assessment Year* | Kappa (95% CI) |
|-----------------------|---------------|
| 2017                  | 0.95 (0.94, 0.95) |
| 2018                  | 0.95 (0.95, 0.96) |
| 2019                  | 0.96 (0.95, 0.96) |
| 2020                  | 0.87 (0.87, 0.88) |
| Overall               | 0.92 (0.91, 0.92) |

*The year in which the residents’ last (or most recent) annual assessment was completed.