

Predictors of the timing of the first COVID-19 case and death in long-term care homes in Ontario

Introduction: The COVID-19 pandemic has impacted the delivery of healthcare provisions worldwide and has, especially, hit the long-term care sector hard, where a large number of residents, who are particularly vulnerable and susceptible to COVID-19, have fallen ill and died. In Canada as well as in other countries, seniors in long-term care facilities have been disproportionately impacted by the COVID-19 pandemic, accounting for a large share of the mortality reported in this country. However, a detailed study investigating the relationship between healthcare provisions and mortality rate among seniors on long-term care across Ontario is still lacking.

Aims: This study aimed to identify predictors of the timing of the first COVID-19 case and mortality rate in long-term care homes across Ontario, Canada during the first and second pandemic waves. As well, this study aimed to test for associations between the preparedness of health systems, and, in particular, long-term care facilities, and the government pandemic responses.

Methodology: Data for daily resident cases and deaths in each long-term care home was extracted and used to calculate the timing of the first case, the per capita mortality rate in the first wave and the per capita mortality rate in the second wave. Predictors pertaining to resident demographics and long-term care facility characteristics (such as inspection types and funding) for 627 long-term care facilities were extracted from publicly available data sources. Univariable and multivariable Cox proportional hazards regression models were used to determine the hazard ratios (HRs) and 95% confidence intervals (CIs) for the individual predictors of timing of the first case. For the COVID-19 mortality analysis, a generalized linear mixed model (GLMM) with a Poisson distribution was used to identify predictors of per capita mortality rate in the first and second pandemic waves. R (R Foundation for Statistical Computing) was used in all statistical analyses and R packages used for model fitting included survival, lme4, nnet, and mgcv.

Results: The univariable model identified 20 predictors with 14 being risk factors and six being protective factors. Notably, in the multivariable model, an earlier first case was detected in facilities that had Infection Prevention and Control (IPAC) inspection non-compliances (HR = 1.106, 95% CI 1.015–1.205), a larger size (HR = 1.183, 95% CI 1.07–1.309), were located in urban areas (HR = 1.141, 95% CI 1.032–1.261), had a staff shortage (HR = 1.224, 95% CI 1.122–1.336), and PPE shortage (HR = 1.313, 95% CI 1.197–1.441).

Conclusion: The pandemic has revealed major cracks in the long-term care home system. Residents were isolated from their loved ones, received substandard care, and did not receive the protection they needed. The identification and analysis of predictors to better understand the shortfalls of the current long-term care sector are paramount in informing policies that have the potential to protect our seniors from communicable diseases heading into the future.