THE ACUTE AND LONG-TERM HEALTHCARE COSTS ATTRIBUTABLE TO COVID-19 IN ONTARIO, CANADA: A POPULATION-BASED MATCHED COHORT STUDY

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INTRODUCTION

- Health impact of SARS-CoV-2 ranges from asymptomatic to long-term disability, with the potential to cause substantial long-term costs.
- Data on long-term COVID-19 attributable health system costs remain scarce.

OBJECTIVE

To characterize COVID-19-attributable costs from the Ontario, Canada, health system perspective.

METHODS

Design:

- Population-based, propensity-score matched cohort study using health administrative data
- Incidence-based, phase-based costing approach

Outcomes: COVID-19-attributable healthcare costs (2023 Canadian Dollars)

Cohort:

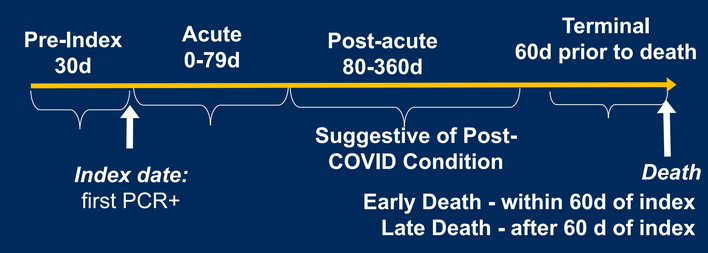
- **Exposed Individuals**:
  - Positive SARS-CoV-2 PCR test Jan and Dec 2020
  - Excluding hospital-acquired SARS-CoV-2
- **Unexposed Individuals:**
  - 50% random sample from the general population under the universal Ontario Health Insurance Plan (approx. 16 M) Jan 2016 and Dec 2018
  - Pre-pandemic accrual period to account for changes in health services during pandemic and avoid contamination bias

Matching:

- Hard- and propensity score matching, 1:1
- Match on index date
- Re-match on death date for terminal phase

Analysis:

- Phase length defined by joinpoint analysis and expert opinion



- Generalized estimating equation model to estimate the mean attributable cost and 95%CI
  - Per phase of care, standardized to 10 days
  - Survival-adjusted, one-year
- Cost categories: inpatient hospital care, outpatient hospital care, emergency department visits, physician services, medications, rehabilitation, complex care, home care, long-term care, other

RESULTS

Cohort and Cohort Characteristics:

- 181,979 Ontario residents tested positive for SARS-CoV-2 Jan-Dec 2020; 165,838 met eligibility criteria; 3,357 died
- Main cohort: 159,817 exposed|159,817 unexposed individuals (96% matching rate)
- Terminal phase cohort: 3,114 exposed|3,114 unexposed individuals (93% matching rate)
- Matched cohort was well-balanced, no standardized differences above 0.1.

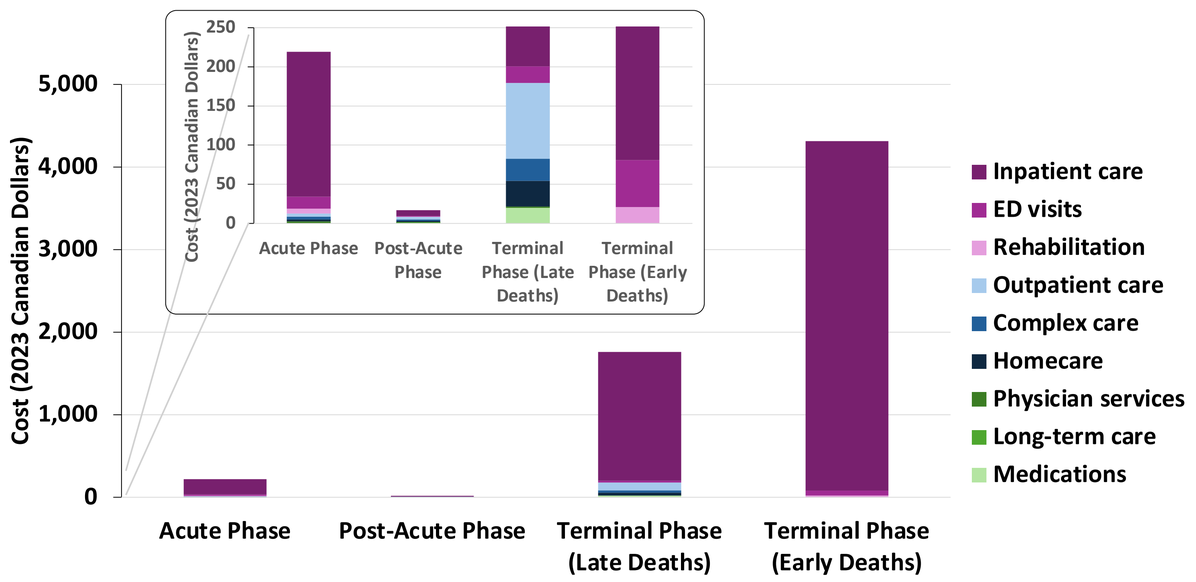
Characteristic	Main Cohort (Matched Exposed)	Terminal Phase Cohort (Matched Exposed)
N	159,817	3,114
Age, mean (SD)	40.4 ± 19.8	76.9 ± 14.6 years
Female sex	50.7%	44.9%
ACG, median (IQR)	4.9 ± 3.5	9.0 (6.0-12.0)
Frail	2.3%	33.9%
Very high resource utilization	5.7%	48.2%
Rural residence	3.5%	3.7%
Immigrant	37.8%	23.1%
Lowest neighbourhood income quintile	24.5%	28.6%

ACG: adjusted clinical groups; IQR; interquartile range; N: number of observations, sd: standard deviation

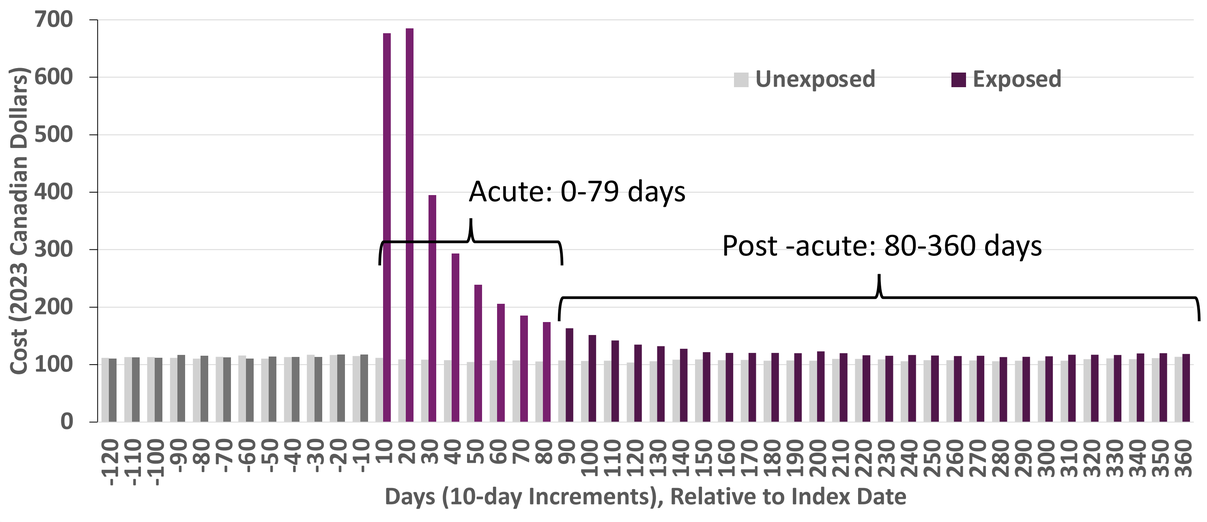
Health Outcomes:

- Within 14 days of the index date
  - 5.1% of the matched exposed cohort were hospitalized
  - 26.5% of those hospitalized were admitted to an intensive care unit (ICU)
- Overall, during the follow-up, 2% of the matched cohort died:
  - 20.1% of those who were hospitalized <14 days of index date (no ICU admission)
  - 39.1% of those admitted to an ICU.

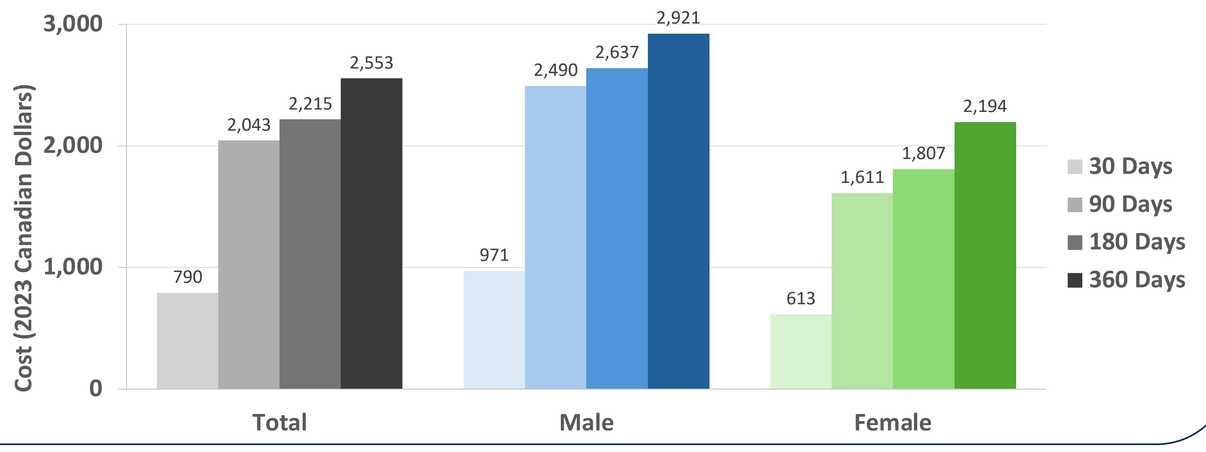
COVID-19-attributable Healthcare Costs, Total and by Phase of Care



Healthcare Costs for Matched Exposed and Unexposed Individuals



COVID-19-attributable Healthcare Costs, Survival-adjusted



CONCLUSION

- SARS-CoV-2 infection is associated with increased healthcare costs in the year following onset
- Differential cost patterns in the acute and post-acute phases, consistent with the clinical understanding of long COVID-19
- Understanding phase-specific costs can inform pandemic planning

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