Health care costs for COVID-19 in British Columbia and Ontario, Canada: An inter-provincial population-based cohort study

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COMPETING INTERESTS

The authors have no competing interests to declare.

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Abstract

Background: COVID-19 has imposed substantial health and economic burdens. We estimated publicly-funded health care costs in two Canadian provinces during the pandemic's first wave.

Methods: In this retrospective cohort study, individuals with their first positive SARS-CoV-2 test by June 30, 2020 in British Columbia (BC) and Ontario laboratory test data were linked to healthcare administrative databases and matched to negative/untested controls. Cases were stratified by the highest level of initial care: community, long-term care (LTC), hospital (without intensive care unit (ICU), and ICU. Mean per person health care costs for cases and controls, mean net (COVID-19-attributable) costs stratified by baseline characteristics, and total costs for all cases were estimated from 30 days pre-index date up to 120 days post-index in 30-day periods through July 31, 2020.

Results: We identified 2,465 matched cases in BC and 28,893 in Ontario. In both provinces, individuals' mean age was 53 years and 56% were female. The highest mean net costs in the first 30 days post-index were $22,129 and $15,750 for hospital cases (N=326, N=2,926), and $65,871 and $56,088 for ICU cases (N=139, N=944), in BC and Ontario, respectively. Net costs increased with age and comorbidity. Total costs from 30 days pre-index date to 30 days post-index for COVID-19 cases were $22,128,330 (BC) and $175,778,210 (Ontario).

Interpretation: Our estimates of health care costs of COVID-19 in BC and Ontario are essential to assess the economic impacts of practices and policies to reduce the spread and severity of COVID-19, and for healthcare system planning.

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Introduction

The COVID-19 pandemic continues to have unprecedented effects on social and health care systems[1-4]. The first wave had vastly different caseloads in British Columbia (BC)[5] and Ontario[6], two Canadian provinces representing over half of the population[7]

COVID-19 has been identified as a significant driver of increasing health care expenditures in Canada[8]. The total cost of COVID-19-related hospitalization was estimated at more than $317 million from January to November 2020 in Canada (excluding Quebec)[9] with $40 million in BC and $202 million in Ontario. The average cost per hospital stay with and without intensive care unit (ICU) admission was $47,000 and $14,000 in BC, and $49,000 and $15,000 in Ontario[9], significantly exceeding the cost of a standard hospital stay in 2018 ($6,464 in BC and $5,484 in Ontario[10]).

Costs of all health care resources for individuals with COVID-19 are unknown and are essential for economic evaluations of COVID-19 management strategies and evidence-based health care planning and decision-making. The objective of this study was to describe direct health care costs for COVID-19 in BC and Ontario during its first wave from January to June 2020.

Methods

This was a retrospective matched cohort study conducted from the health system perspective using linked administrative data and COVID-19 testing data.

Cohorts and data

Individuals who tested positive for SARS-CoV-2 up to June 30, 2020 were identified from the BC Ministry of Health COVID-19 Test Lab Data[11,12] and the Ontario Laboratory

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Information System (OLIS) COVID-19 databases[13]. Their index date was the date of the first specimen that tested positive.

Cases were excluded if they had an invalid or missing provincial health insurance number (BC Medical Services Plan (MSP)[14] or Ontario Health Insurance Plan (OHIP)[15]), did not reside in the province of diagnosis at index date, or had incomplete provincial health insurance coverage for one year before the index date.

In each province, datasets included individual-level population-based records of health care services and demographics (Appendix 1a). In BC, linked data were provided through Population Data BC[12,14,16-21] and analyzed by the BC research team. In Ontario, these datasets were linked using unique encoded identifiers and analyzed at ICES[22]. ICES is an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement.

Each case was greedy-matched[23] to up to four controls (Appendix 1b) using age, sex, residence in long-term care (Appendix 1c) and a propensity score containing comorbidity (John's Hopkins' Adjusted Clinical Groups® System (ACG®) version 10 Aggregated Diagnosis Groups (ADGs) (Appendix 1d) and Resource Utilization Band[24]), and geographic and socioeconomic factors (Appendix 1e). For each individual, we also calculated an ADG score, which assigns positive or negative weights to the ADGs depending on the magnitude and direction of their association with the probability of one-year mortality[24].

We stratified COVID-19 cases by highest level of care received during the first 14 days after index date[25]: 1) hospitalization with days in the ICU; 2) hospitalization without ICU days; 3) LTC facilities); and 4) community (Appendix 1f).

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Cases and controls were censored at the case's death date, end of their MSP or OHIP registration, or July 31, 2020, whichever occurred earliest.

Costs

We used standard methods for estimating health care costs from administrative data in BC and Ontario[26]. Resources included hospitalization, emergency department visits, physician services, outpatient prescription drugs, and others (Appendix 1g).

Mean and median costs were calculated for cases and controls in each 30-day period from 30 days before index date up to 120 days after index date. Patients who were observed for at least one day in a 30 day-period before death or censoring contributed to the costs for that period, with no adjustment for days of observation.

Mean net costs (mean difference between the cost for a COVID-19 patient and their matched controls) and 95% confidence intervals were estimated using generalized estimating equations to account for matched clusters. Mean net costs were estimated by 30-day period and cumulatively over the total observation time. Net costs in the first 30 days post-index date were stratified by level of care, age, sex, and comorbidity.

Total cohort-level costs for initial care were calculated by summing the costs of all cases for the 30 days pre-index and first 30 days post-index.

Ethics

This study was approved by Research Ethics Boards at BC Cancer and the University Health Network.

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Results

Cohort characteristics

After applying exclusion criteria, there were 2,465 cases in BC and 28,893 in Ontario (Figure S1). Their mean ages were 53.4 years (standard deviation (SD) 21.8) (BC) and 53.7 (22.7) (Ontario), and 56% of both cohorts were female. In both provinces, over 95% of cases lived in urban areas. In BC and Ontario, respectively, 45% and 51% of cases lived in neighbourhoods in the two lowest income quintiles (Table 1). On their index date, 288 (11.7%) of BC cases and 5,152 (17.8%) of Ontario cases were LTC home residents. The mean (SD) follow-up time was 99.5 (38.0) and 83.1 (33.5) days in BC and Ontario, respectively.

Cases were matched with one (0.2% of cases) to four controls (98.7% of cases) in both provinces. Balance was achieved in all covariates, with standardized differences <0.10[27].

Within the first 14 days of their positive test, 13.2% and 10.1% of cases were hospitalized without ICU days, and 5.6% and 3.3% were hospitalized with ICU days (Table 1, Table S1), in BC and Ontario, respectively. Also, 86% to 87% of LTC residents remained in the LTC level of care group.

In both provinces, over 60% of cases in the ICU groups were male. In the LTC groups, over 66% of cases were female, with older mean ages and higher mean ADG comorbidity scores[24] than other cases (Table 1).

Mean health care costs per person

During the pre-index period, mean costs in BC and Ontario, respectively, were $4,494 and $5,391 for cases in the hospital group, and $302 and $260 for those in the community group

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(Table 2, Table S2). Health care for cases in the pre-index period may be for diagnosis and treatment of early symptoms of COVID-19.

In the 30 days after index date, the mean cost per case increased to $66,324 and $56,716 in the ICU group, and $23,015 and $17,050 in the hospital group, in BC and Ontario, respectively (Table 2, Table S2). In the first month post-index date, hospitalization costs represented approximately 80-90% of total costs for the ICU and hospital patients. In the community group, physician services and ED visits were the costliest resources post-index date (Table 2).

Net health care costs

During the pre-index period, mean net costs in BC and Ontario, respectively, were $3,133 and $3,628 for cases in the hospital group, and $966 and $2,493 for those in the ICU group (Table 3). In the first 30 days post-index date net costs were highest for the ICU groups at $65,828 and $56,088 in BC and Ontario, respectively, and lowest for the community groups at $117 and $161 (Table 3). By 90-120 days, net costs for the ICU groups remained higher than during the pre-index period, at $2,329 (BC) and $3,562 (Ontario).

The net costs for the LTC group in BC were negative pre-index date (-$397) and positive for the next 90 days, before becoming negative (Table 3). In Ontario, net costs were -$748 in the pre-index period, and higher in the first 30 days post-index with -$327.

Net cumulative costs

The mean net cumulative costs for COVID-19 cases in the first 120 days post-index date were, in BC and Ontario, respectively: $90,056 and $96,308 (ICU group); $33,640 and $28,329

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(hospital group); -$46 and $-1,105 (LTC group); and $96 and $487 (community group) (Figure 1, Table S3).

Stratified net costs for first 30 days

Mean net costs in the first 30 days post-index date increased with age up to 70 to 79 years and then decreased (Figure 3A). Mean net costs ranged from $287 for cases aged 19 years and under to $21,250 for 70–79-year-olds in BC, and from $248 for cases aged 19 years and under to $8,914 for 70–79-year-olds in Ontario (Table S4).

The mean net costs for males were almost twice those for females ($9,939 vs $4,613 in BC and $4,752 vs $2,520 in Ontario) (Table S4). Comorbidity greatly increased net costs with a downturn in BC for the highest comorbidity level (Figure 3B) (Table S4).

Total costs for initial care for all COVID-19 cases

Across all levels of care, the total health care costs from 30 days pre-index date to 30 days post-index were $22,128,330 in BC and $175,778,210 in Ontario, for 2,465 and 28,893 cases, respectively, diagnosed from January to June 30, 2020 (Figure 2). Total *net* costs attributable to COVID-19 were $17,651,803 in BC and $111,204,497 in Ontario.

Interpretation

This study provides comprehensive population-based estimates of health care costs for COVID-19 cases in four levels of initial care in two Canadian provinces in the first wave of the pandemic.

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Total costs for initial care

Total costs to the health care system depend on the number of cases and mean cost per case. As of June 30, 2020, approximately 0.27% of the Canadian population had been infected with COVID-19[28]. Our COVID-19 cases represented approximately 0.05% and 0.2% of the BC and Ontario populations, respectively, over the same period[7]. BC was initially more effective than Ontario at flattening the pandemic curve, with earlier public health restrictions[29], and better management in LTC facilities[30].

Ontario's case load contributed to a higher health system cost during the first wave, compared with BC. The aggregate cost for initial care (30 days pre-index date and 30 days after) for all COVID-19 cases diagnosed from January to June 30, 2020 was $22,128,330 in BC and $175,778,210 in Ontario. These amounts are approximately 0.10% and 0.27% of the respective provincial annual 2020 budgets for health care[31,32].

COVID-19 and influenza have similar symptoms[33] although patients hospitalized for COVID-19 are more likely to develop acute respiratory failure, be admitted to the ICU and die in hospital[34,35]. In 2018, 1,429 patients were hospitalized for influenza in BC and 4,320 in Ontario. The mean costs per hospitalization were $4,572 (BC) and $3,613 (Ontario)[36], resulting in budget impacts of $6.5 million in BC and $15.6 million in Ontario. Also, 541 patients were hospitalized with respiratory failure in BC and 2,743 in Ontario. At average hospitalization costs of $30,113 (BC) and $26,746 (Ontario), the total cost for hospitalization was $16.3 million in BC and $73.4 million in Ontario[36]. Per patient COVID-19 hospitalization costs were higher than influenza, and similar to respiratory failure, yet COVID-19 contributed to larger portions of provincial health care budgets due to higher case numbers.

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Mean costs per patient

The mean costs in the first 30-days post-index date for the hospital and ICU groups were higher in BC than in Ontario, driven by higher hospitalization costs. The mean hospitalization costs in Ontario were comparable to the estimated mean costs of a COVID-19-related hospital stay from the Canadian Institute for Health Information (CIHI)[9] and from a retrospective study among Medicare beneficiaries in the United States[37], but hospitalization costs for BC were higher. In recent years, BC's hospital costs have been higher than the national average[10], with the highest-ranked quality of healthcare in Canada[38]. In contrast, Ontario has the lowest cost per standard hospital stay of all provinces and territories[10]. However, post-COVID-19 costs of a standard hospital stay have yet to be reported by CIHI.

Effects of case characteristics

During the period of our study, more female than male cases of COVID-19 were reported in Canada[39], but males had worse clinical outcomes[39-41], similar to the Medicare study[37]. Higher proportions of males in the higher level of care groups could have accounted for the higher net costs for males than females in our study.

In both provinces, mean net costs in the first 30 days peaked at 70 to 79 years and then decreased. Our findings of lower costs amongst those 80 years and over were similar to the Medicare study[37]. Older adults receive less aggressive care in hospital than younger adults and tend to have higher mortality[37,42,43].

Long-term care

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LTC home residents experienced high risks of infection and mortality and low rates of hospitalization and ICU admittance[44] during the first wave of COVID-19 in Ontario.

Our costs analyses suggested that LTC residents in Ontario who remained in LTC during the first two weeks post-index received less health care than their LTC-residing controls. Ontario LTC facilities experienced a 30% decrease in transfers to hospitals between March 1 and August 31, 2020 compared to the previous year[45], probably due to provincial "care in place" recommendations that discouraged hospital transfers, and individual residents' advance directives that included do-not-hospitalize orders[45].

LTC facilities in BC were better prepared for the pandemic than those in Ontario, with fewer shared rooms, fewer for-profit LTC homes, comprehensive (BC) vs risk-based (Ontario) inspection, and a more stable health system organizational structure[30,46]. Pandemic-response messaging, including limiting workers to a single LTC home and initiating infection and control policies, was more consistent in BC and began on April 10, 2020 in BC and April 15, 2020 in Ontario[30,47,48].

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Limitations

We included cases with positive SARS-CoV-2 test results in OLIS[13], and BC COVID lab test database[12] which numbered fewer than those reported by provincial agencies. Besides, testing was limited during early stages of COVID-19 and cases were missed.

We used administrative databases, which do not capture indirect or out-of-pocket health care costs[49], except for out-of-pocket prescription drug costs for BC residents.

Our hospital-based cost estimates used CIHI's Resource Intensity Weights (RIW) method, which relies on unit costs derived from previous years' data. The effects of COVID-19

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on these parameters are yet to be reflected in the RIW. COVID-19-related expenditures, such as pandemic pay for health care workers, personal protective equipment, and nasophayngeal swab kits[50], were not captured in our cost estimates.

Strengths

We captured direct costs for almost all health care resources for most COVID-19 positive individuals in two populous Canadian provinces during the first wave[7]. Despite differing health care costs and structures, the similar case demographics suggest that differences in management strategies between BC and Ontario could be further explored to strengthen future pandemic responses.

This inter-provincial comparison adds to the literature of BC-Ontario COVID-19[29,30], and healthcare costing studies[51]. Our study contributes relevant and actionable information on COVID-19 attributable costs in two Canadian provinces based on level of care, age, and comorbidity. Our results set a benchmark for the per-person costs of COVID-19-attributable health resource utilization, which provide policymakers with robust estimates for effective system planning for upcoming COVID-19 waves.

Conclusions

Reducing both the number and severity of cases is required to mitigate the impact of COVID-19 on health care budgets. Understanding health care costs can help assess the value of different interventions and policies to reduce the spread and severity of COVID-19, and plan for recurrent COVID-19 waves.

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Table 1.

a) British Columbia - Demographic and clinical characteristics of COVID-19 cases by highest level of care, and matched controls, at index date.

				COVID-19 cases by highest level of care			
	Covid-19 cases (N= 2,465)	Controls (N=9,846)	**SMD**	**Community (N=1,752) (71%)**	**LTC (N = 248) (10%)**	**Hospital (N=326) (13%)**	**ICU (N=139) (6%)**
Age in years							
Mean (SD)	53.4 (21.8)	53.4 (21.7)	0.00	45.3 (17.9)	85.3 (9.2)	67.9 (17.7)	65.1 (14.4)
Median (IQR)	52 (36-69)	52 (36-69)		45 (33-57)	87 (80-92)	71 (55-82)	68 (58-74)
Sex (N, %)							
Female	1,372 (55.7)	5,483 (55.7)	0.00	1,007 (57.5)	168 (67.7)	142 (43.6)	55 (39.6)
Male	1,093 (44.3)	4,363 (44.3)		745 (42.5)	80 (32.3)	184 (56.4)	84 (60.4)
Rurality of residence from Statistics Canada rural flag (N, %)							
Urban	2,356 (95.6)	9,355 (95.0)	0.03	1,668 (95.2)	248 (100.0)	310 (95.1)	130 (93.5)
Rural/small town	109 (4.4)	491 (5)		84 (4.8)	0 (0)	16 (4.9)	9 (6.5)
Neighbourhood income quintile (N, %)							
1 (lowest)	601 (24.4)	2,436 (24.7)	0.03	370 (21.1)	111 (44.8)	89 (27.3)	31 (27.3)
2	503 (20.4)	2,001 (20.3)		384 (21.9)	39 (15.7)	53 (16.3)	27 (19.4)
3	515 (20.9)	2,046 (20.8)		355 (20.3)	60 (24.2)	72 (22.1)	28 (20.1)
4	434 (17.6)	1,773 (18.0)		328 (18.7)	23 (9.3)	64 (19.6)	19 (13.7)
5 (highest)	383 (15.5)	1,478 (15.0)		291 (16.6)	15 (6.0)	≤47 (≤14.4)[1]	≤33 (≤23.7)[1]
Missing	29 (1.2)	112 (1.1)		24 (1.4)	0 (0)	≤6[1]	≤6[1]
Place of residence at index date (N, %)							
Community	2,177 (88.3)	8,705 (88.4)	0.00	1,752 (100.0)	0 (0)	≤325 (≤99.7)[1]	≤138 (≤99.2)[1]
Long-term care	288 (11.7)	1,141 (11.6)		0 (0)	248 (100.0)	≤35 (≤10.7)[1]	≤6[1]
ADG score							
Mean (SD)	10.35 (13.1)	11.4 (14.1)	0.08	6.3 (10.2)	26.7 (11.9)	18.5 (14.3)	13 (12)
Median (IQR)	6 (1-18)	7 (1-19)		4 (0 – 11)	26 (18-35)	17 (7-27)	11 (4-18)

Abbreviations- ADG: Adjusted Diagnostic Groups; ICU: intensive care unit; IQR: interquartile range; LTC: long-term care, N: number of patients; SD: standard deviation.

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[1] numbers and percentages have been suppressed so that cell sizes ≤6 are not reported and cannot be calculated

b) Ontario - Demographic and clinical characteristics of COVID-19 cases by highest level of care, and matched controls, at index date.

	Covid-19 cases (N=28,893)	Controls (N=115,098)	Standardized Difference	COVID-19 cases by highest level of care			
				Community (N=20,545, 71%)	LTC (N = 4,478, 15%)	Hospital (N=2,926, 10%)	ICU (N=944, 3%)
Age in years							
Mean (SD)	53.7 (22.7)	53.6 (22.7)	0.00	44.5 (18.1)	83.3 (10.8)	69.7 (17.8)	62.9 (13.6)
Median (IQR)	53 (35-71)	53 (35-70)	0.00	45 (30-57)	86 (78-91)	73 (58-84)	63 (55-73)
Sex (N, %)							
Female	16,219 (56.1)	64,661 (56.2)	0.00	11,457 (55.8)	2,963 (66.2)	1,454 (49.7)	345 (36.5)
Male	12,674 (43.9)	50,437 (43.8)		9,008 (44.2)	1,515 (33.8)	1,472 (50.3)	599 (63.5)
Rurality of residence from Statistics Canada rural flag (N, %)							
Urban	27,911 (96.6)	109,596 (95.2)	0.07	19,814 (96.4)	4,337 (96.9)	2,852 (97.5)	908 (96.2)
Rural/small town	982 (3.4)	5,502 (4.8)		731 (3.6)	141 (3.1)	74 (2.5)	36 (3.8)
Neighbourhood income quintile (N, %)							
1 (lowest)	8,232 (28.5)	32,281 (28.0)	0.03	5,736 (27.9)	1,350 (30.1)	874 (29.9)	272 (28.8)
2	6,457 (22.3)	25,666 (22.3)		4,382 (21.3)	1,174 (26.2)	681 (23.3)	220 (23.3)
3	5,820 (20.1)	22,341 (19.4)		4,225 (20.6)	847 (18.9)	574 (19.6)	174 (18.4)
4	4,409 (15.3)	18,273 (15.9)		3,366 (16.4)	468 (10.5)	413 (14.1)	162 (17.2)
5 (highest)	3,975 (13.8)	16,530 (14.4)		2,836 (13.8)	639 (14.3)	384 (13.1)	116 (12.3)
Missing	0 (0.0)	7 (0.0)		0 (0)	0 (0)	0 (0)	0 (0)
Place of residence at index date (N, %)							
Home (community)	23,741 (82.2)	94,887 (82.4)	0.01	20,545 (100)	0 (0)	2,232 (79.4)	873 (92.5)
Long-term care	5,152 (17.8)	20,211 (17.6)		0 (0)	4,478 (100.0)	603 (20.6)	71 (7.5)
ADG score							
Mean (SD)	11.3 (14.1)	12.3 (14.9	0.07	6.7 (10.0)	24.4 (15.0)	21.8 (17.8)	15.7 (15.3)
Median (IQR)	6 (1-18)	7 (1-20)	0.06	4 (0–10)	20 (16-34)	19 (7-34)	12 (4-23)

Abbreviations - ADG: Adjusted Diagnostic Groups; ICU: intensive care unit; IQR: interquartile range; LTC: long-term care, N: number of patients; SD: standard deviation.

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Table 2 Mean cost by resource for 30 days pre-index date and the first 30 days after index date for COVID-19 cases, by highest level of care, in British Columbia and Ontario

	British Columbia				Ontario			
Mean costs (SD)	Community	LTC	Hospital	ICU	Community	LTC	Hospital	ICU
Day -30 to Day -1								
Hospitalization[1]	122 (1,563)	128 (1,152)	3,309 (7,900)	1,088 (4,226)	43 (660)	158 (1,531)	2,785 (8,378)	1,880 (8,549)
ED visits	18 (84)	7 (55)	120 (237)	87 (175)	27 (117)	11 (83)	238 (380)	194 (371)
Physician services[2]	51 (178)	103 (194)	301 (462)	197 (643)	62 (217)	156 (260)	604 (1,360)	411 (1,116)
Outpatient clinics[3]	Not available				37 (618)	59 (600)	256 (1,194)	223 (1,166)
Home care	19 (368)	95 (463)	136 (552)	13 (75)	29 (325)	28 (173)	290 (1,143)	112 (489)
LTC & CCC	8 (205)	5,045 (1,062)	367 (1,331)	152 (887)	NR	4,224 (4,395)	941 (1,604)	359 (880)
Outpatient prescription drugs	53 (182)	134 (275)	142 (240)	128 (251)	35 (296)	168 (434)	186 (536)	214 (947)
Other[4]	30 (164)	33 (83)	120 (303)	83 (236)	26 (680)	33 (803)	91 (1,252)	52 (1,000)
Total[5]	302 (1,983)	5,545 (1,693)	4,494 (8,447)	1,749 (5,153)	260 (1,519)	4,836 (2,370)	5,391 (10,016)	3,446 (10,007)
Day 1 to Day 30								
Hospitalization[1]	24 (400)	415 (4,342)	20,324 (21,543)	60,587 (42,095)	41 (661)	171 (1,316)	14,078 (10,078)	50,463 (35,000)
ED visits	78 (167)	16 (74)	308 (257)	323 (223)	79 (185)	28 (129)	474 (414)	551 (371)
Physician services[2]	115 (190)	201 (352)	1,547 (1,712)	4,512 (2,742)	134 (297)	219 (351)	1,558 (1,348)	4,963 (3,641)
Outpatient clinics[3]	Not available				42 (381)	100 (614)	285 (703)	459 (796)
Home care	26 (311)	75 (442)	191 (641)	56 (175)	25 (292)	14 (111)	159 (440)	72 (243)
LTC & CCC	6 (167)	3,957 (1,885)	308 (1,158)	90 (598)	NR	3,420 (4,392)	303 (909)	102 (461)
Outpatient prescription drugs	57 (180)	132 (174)	125 (277)	69 (128)	34 (278)	146 (302)	125 (627)	60 (286)
Other[4]	33 (74)	46 (81)	212 (413)	688 (986)	27 (751)	34 (849)	70 (1170)	46 (989)
Total[5]	339 (726)	4,842 (4,981)	23,015 (22,895)	66,324 (43,992)	381 (1,393)	4,132 (2,695)	17,050 (11,103)	56,716 (37,128)

[1] Hospitalization includes same-day surgery. Mean costs for same-day surgery were available separately in Ontario and were small in comparison to inpatient costs and often not reportable due to small cell size

[2] Includes GP/FP and specialist services

[3] Outpatient clinics include cancer clinics, dialysis clinics, and other ambulatory clinics; Data available for Ontario only

[4] In Ontario, other includes OHIP-covered non-physicians and laboratory tests, as well as New Drug Funding Program drugs and mental health inpatient services. In BC, other includes records for diagnostic procedures, procedures, and other services.

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[5] Mean total cost may not equal the sum of the mean costs for all resources due to rounding.

Abbreviations: CCC: Complex continuing care; ED: emergency department; ICU: intensive care unit; LTC: long term care; MSP: Medical Services Plan; NR: not reportable because of small cell size to comply with ICES privacy rules; OHIP: Ontario Health Insurance Plan.

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Table 3. Mean net costs for each 30-day period before and after index date for COVID-19 cases by highest level of care, in British Columbia and Ontario

	British Columbia				Ontario			
Mean cost (95% CI)								
Interval (days)	Community	LTC	Hospital	ICU	Community	LTC	Hospital	ICU
pre-index	19 (-77, 115)	-397 (-805, 11)	3,133 (2,250, 4,016)	966 (140, 1,792)	34 (11, 57)	-748 (-846, -650)	3,628 (3,263, 3,995)	2,493 (1,849, 3,136)
1 to 30	117 (70, 164)	319 (-280, 919)	22,010 (19,512, 24,509)	65,828 (58,535, 73,122)	161 (140, 183)	-327 (-410, -244)	15,750 (15,354, 16,147)	56,088 (53,721, 58,455)
31 to 60	21 (-51, 94)	561 (-642, 1,765)	5,275 (3,498, 7,052)	17,981 (12,856, 23,107)	65 (36, 93)	-83 (-227, -60)	5,213 (4,793, 5,632)	22,255 (19,925, 24,585)
61 to 90	-18 (-81, 45)	349 (-329, 1,027)	2,177 (894, 3,460)	4,099 (1,460, 6,739)	34 (8, 61)	-85 (-235, -64)	2,584 (2,262, 2,906)	7,785 (7,074, 10,495)
90 to 120	24 (-62, 109)	-347 (-685, -9)	1,012 (238, 1,785)	2,329 (529, 4,130)	40 (12, 68)	-107 (-224, -9)	1,373 (1,063, 1,683)	3,562 (2,371, 4,754)

Abbreviations- CI: confidence interval; ICU: intensive care unit; LTC: long term care

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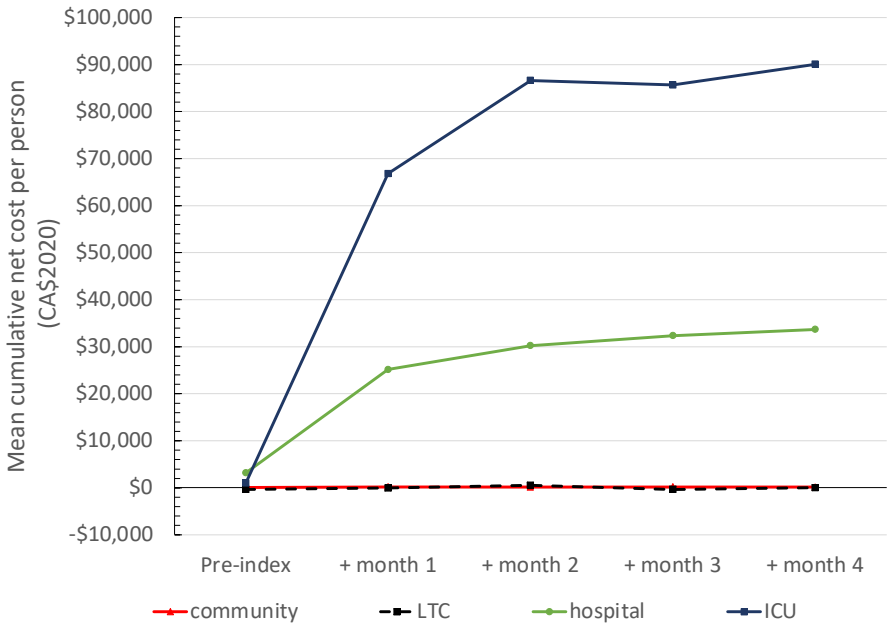
Figure 1. Mean cumulative net costs per person from 30 days before index date to 120 days after index date for COVID-19 cases, by highest level of care, in a) British Columbia and b) Ontario.

a) British Columbia



b) Ontario

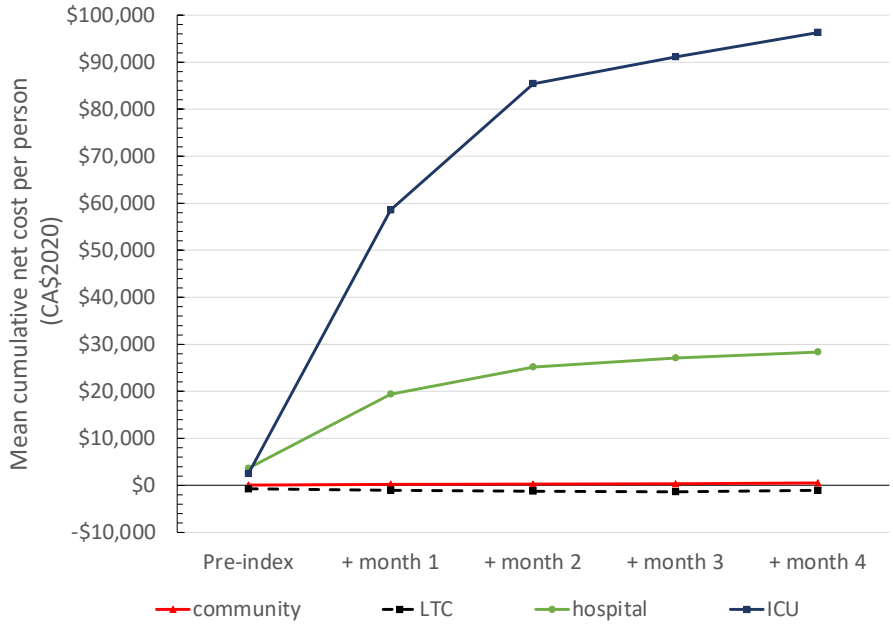
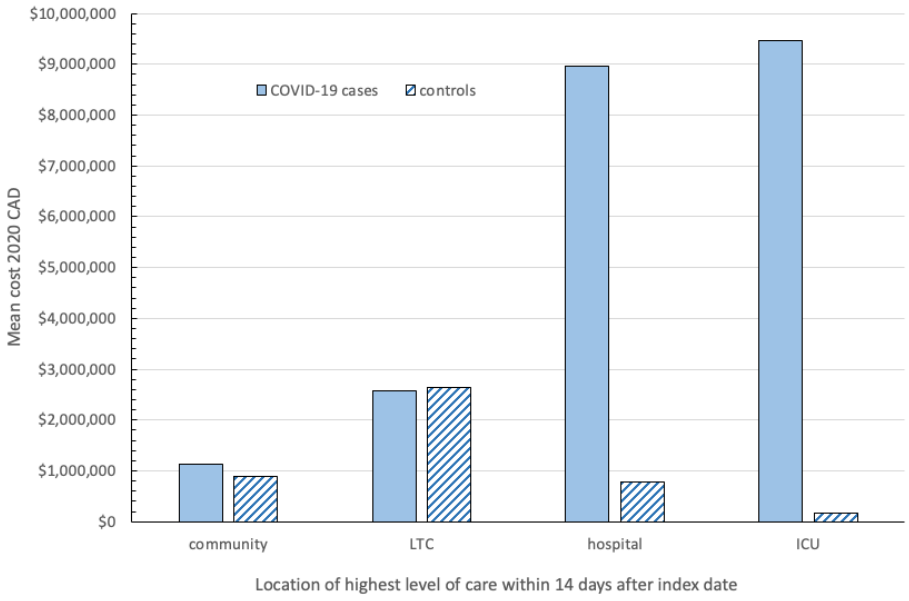


Figure 2. Mean costs for initial care (pre-index and month 1) for all COVID-19 cases (solid columns) and controls (striped columns) by highest level of care, in a) British Columbia (N = 2,465) and b) Ontario (N = 28,893)

(a) British Columbia



b) Ontario

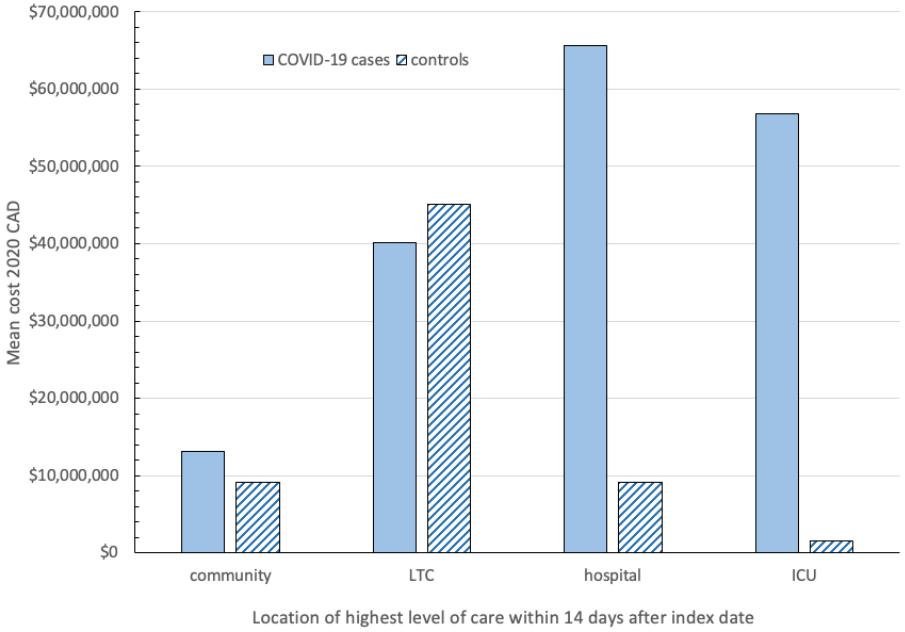
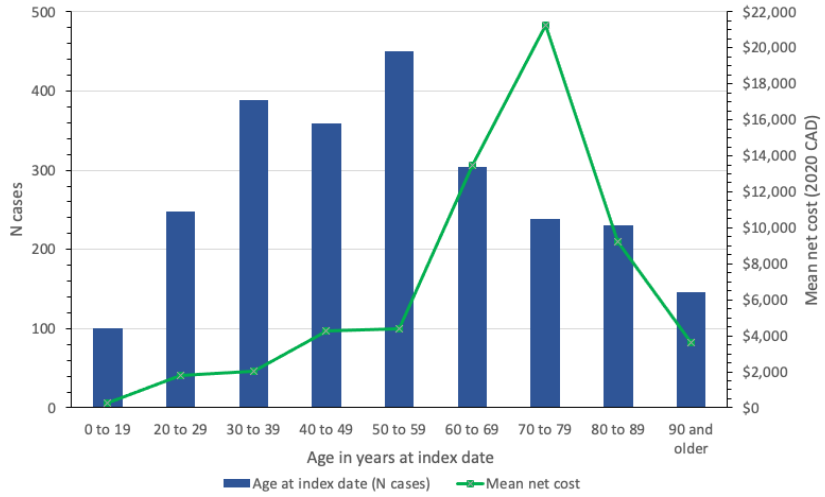


Figure 3A. Mean net costs in the first 30 days after index date and number of COVID-19 cases by age at index date in a) British Columbia; b) Ontario

a) British Columbia



b) Ontario

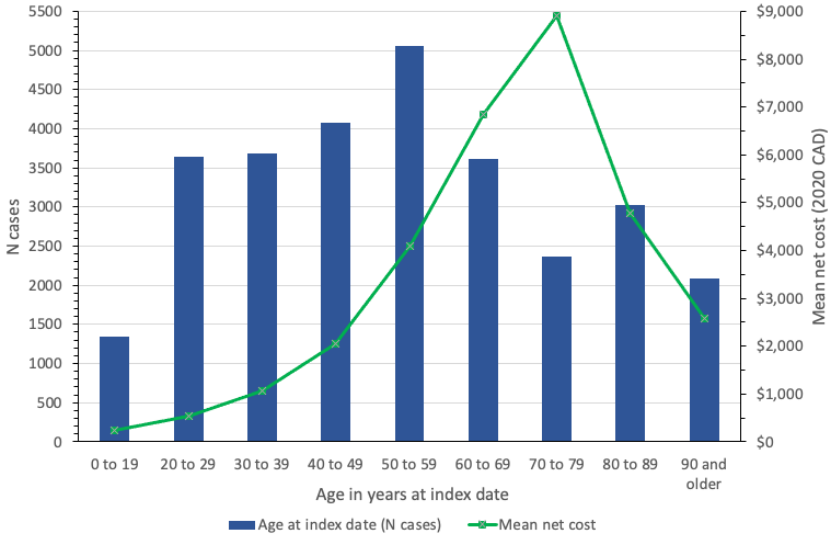
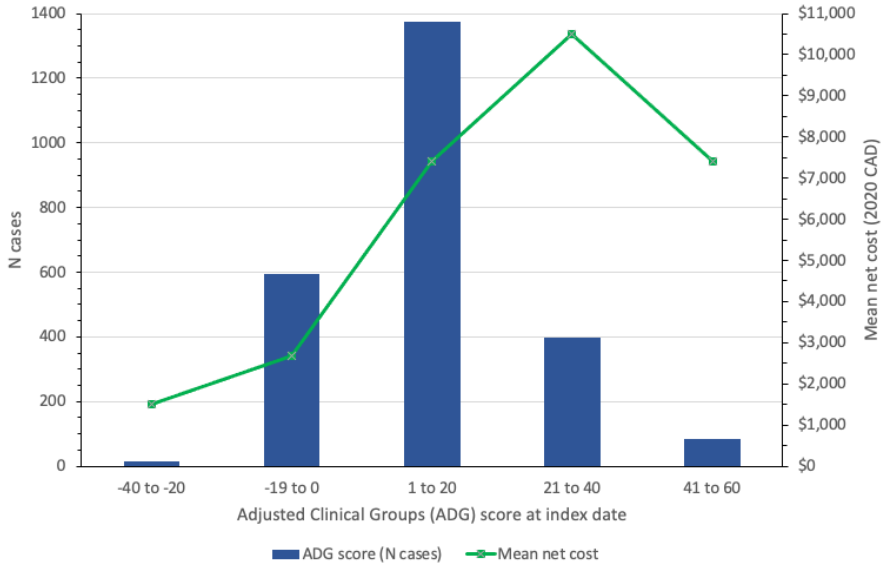
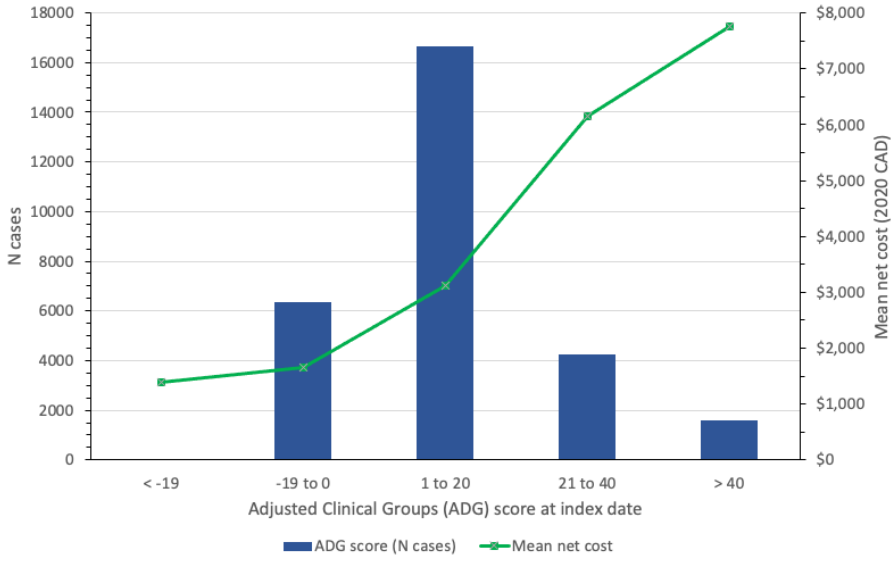


Figure 3B Mean net costs in the first 30 days after index date and number of COVID-19 cases by Adjusted Diagnostic Group score at index date, in a) British Columbia; b) Ontario

a) British Columbia



b) Ontario



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Appendix 1b- Matching strategy for COVID-19 cases and controls in British Columbia and Ontario
Appendix 1c - Determination of place of residence at index date for COVID-19 cases and controls in British Columbia and Ontario
Appendix 1d - Comorbidity
Appendix 1e - Variables describing residence and socioeconomic factors in British Columbia and Ontario
Appendix 1f - Criteria for highest level of care for COVID-19 cases in British Columbia and Ontario
Appendix 1g - Resources and costing methods in British Columbia and Ontario

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Table S1- Characteristics of COVID-19 cases and matched controls for each level of care: a) British Columbia, b) Ontario

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Table S3- Cumulative costs
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b) Cumulative net costs by level of care for COVID-19 cases in British Columbia and Ontario

Table S4- Mean net costs during the first 30 days after index date, stratified by level of care and characteristics at index date, in British Columbia and Ontario.

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Appendix 1a) Administrative databases in British Columbia and Ontario

Resource	British Columbia (BC)	Ontario	
	Database		Description
Cohort characteristics	Medical Services Plan (MSP) Consolidation file[14]	Registered Persons Database	Demographic information on residents enrolled in the provincial health insurance plan (MSP in BC; OHIP in Ontario)
COVID testing	COVID-19 Test Lab data[12]	Ontario Laboratory Information System (OLIS)	Lab test requests and results for COVID-19 (SARS-CoV-2) using real-time polymerase chain reaction testing.
Hospital separations and Same-Day surgery	Canadian Institute for Health Information – Discharge Abstract Database (CIHI-DAD)[20]	Canadian Institute for Health Information – Discharge Abstract Database (CIHI-DAD), and NACRS same-day surgery	Information on all inpatient hospital discharges, including clinical and demographic information. Each record has 25 fields for acute and chronic diagnoses, coded using ICD-10-CA. Dates of admission to ICUs (if any) are also recorded in the hospital discharge records. In Ontario, visits to same-day surgery clinics are recorded in NACRS.
Ambulatory care	Canadian Institute for Health Information – National Ambulatory Care Reporting System (CIHI-NACRS) [21]	Canadian Institute for Health Information – National Ambulatory Care Reporting System (CIHI-NACRS)	Information on all hospital and community-based ambulatory care clinics, including emergency departments (Ontario and BC), and dialysis and cancer clinics (Ontario only)
Outpatient prescription drugs	PharmaNet[16]	Ontario Drug Benefits Claims (ODB)	PharmaNet data include outpatient prescription drug claims, including cost. PharmaNet captures all prescription drugs dispensed in community pharmacies and hospital outpatient pharmacies in BC. Eligible individuals for the ODB include those aged 65 and older, residents of LTC

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			homes and homes for special care, and recipients of professional home care services, social assistance services, and the Trillium Drug Program. A flag in each prescription record identifies prescriptions provided to LTC residents.
Physician services	Medical Services Plan (MSP) payment information file[17]	Ontario Health Insurance Plan (OHIP) Claims Database	The MSP file contains data on all medically necessary services provided to individuals under BC's universal health insurance program. The OHIP database contains claims submitted by physicians with a fee code that describes the service provided. Office visits and services provided in ambulatory clinics, LTC facilities, and acute care and chronic care hospitals are included, as well as house calls, telephone visits and virtual visits. OHIP-covered non-physician health care practitioners can submit claims under specific circumstances. Records of medically necessary laboratory tests performed at community laboratories are included in the OHIP database.
Long-term care (LTC) services	Home and Community care - Minimum Reporting Requirements database (HCC-MRR)[18]	Canadian Institute for Health Information - Continuing Care Reporting System (CCRS)	The HCC-MRR contains demographic and resource utilization data on publicly-funded clients of long-term care facilities and home care. The CCRS contains demographic, clinical, functional and resource utilization information on people receiving continuing

			care services in hospitals or LTC facilities.
Inpatient mental health services	N/A	Ontario Mental Health Reporting System (OMHRS)	The OMHRS database contains records of stays in adult designated inpatient mental health beds. Data include diagnoses and living arrangements prior to admission and following discharge.
Cancer systemic therapy	N/A	New Drug Funding Program data (NDFP)	The NDFP covers new expensive injectable chemotherapy drugs administered in cancer centres and hospitals and includes the cost of each drug.

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Appendix 1b) Matching strategy for COVID-19 cases and controls in British Columbia and Ontario

Potential controls (the general population in BC and Ontario, registered for MSP and OHIP respectively) were randomly assigned pseudo-index dates based on the distribution of case index dates. Cases and controls were hard-matched on sex, place of residence at index date (Appendix 1b), age on index date (+/- 5 years), calendar week of index/pseudo-index date (+/-1 week), and on the logit of the propensity score within a caliper width of 0.1 standard deviation. Propensity scores for a positive SARS-CoV-2 test were computed from multimorbidity using John's Hopkins' Adjusted Clinical Groups® System (ACG®) version 10 Aggregated Diagnosis Groups (ADGs) (Appendix 1d) and Resource Utilization Band[24], and geographic and socioeconomic factors (Appendix 1e). The quality of the matching was evaluated using weighted standardized differences[27].

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Appendix 1c) Determination of Place of Residence at index date for COVID-19 cases and controls in British Columbia and Ontario

Residence	BC Data	Ontario Data	Variable(s) and values
Long-term care (LTC)	HCC-MRR	CCRS ODB OHIP	At least one of the following: CCRS: Admission date prior to the index date, and discharge date after the index date or no discharge date (person is still residing in LTC); ODB: LTC flag on prescription in ODB within 90 days before the index date; Claim for a physician service dated within 90 days before index date with fee code indicating service was provided in a LTC residence and the institution code in the claim designating a LTC residence. HCC-MRR: Resident of facility care with no service end date before index date.
Home (community)			Does not meet criteria for long-term care

Abbreviations: BC: British Columbia; CCRS: Continuing Care Reporting System; LTC: long term care; ODB: Ontario Drug Benefit; OHIP: Ontario Health Insurance Plan; HCC-MRR: Home and Community Care Minimum Reporting Requirements.

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Appendix 1d) Comorbidity

The John's Hopkins' Adjusted Clinical Groups® System (ACG®) software uses the diagnosis codes found in inpatient and same day surgery hospital discharge records, emergency department visit records and physician claims to assign 32 Aggregated Diagnosis Group ADG) binary variables to each individual. ADGs are determined by five clinical dimensions: 1) duration of the condition, 2) severity of the condition, 3) diagnostic certainty, 4) etiology of the condition, and 5) specialty care involvement[24].

In BC, we used diagnosis codes found in records from the Canadian Institute for Health Information - Discharge Abstract Database (CIHI-DAD) and MSP Payment Information Files, in the year before index date for cases and the year before pseudo-index date for potential controls, to assign the ADGs. In Ontario, we used diagnosis codes found in records from the Canadian Institute for Health Information - Discharge Abstract Database (CIHI-DAD), CIHI - National Ambulatory Care Reporting System database (CIHI-NACRS), and Ontario Health Insurance Plan (OHIP) Physicians' Claims database in the year before index date for cases and the year before pseudo-index date for potential controls, to assign the ADGs. In both provinces, we used the 32 ADGs in the propensity score to match controls to cases.

We also used the point-scoring system developed by Austin and van Walraven[24] to calculate an ADG comorbidity score for each patient and control.

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Appendix 1e) Variables describing residence and socioeconomic factors in British Columbia and Ontario

Variable	British Columbia	Ontario
Rurality of residence Statistics Canada definition[52]	Dissemination blocks with a population of ≥1000 and ≥400 persons per square kilometre, and adjacent areas with a population of ≥1000 and ≥400 employees per square kilometre, such that the cluster of areas has ≥400 persons per square kilometre, are designated urban. All other areas are rural.	
Postal code rural indicator[53]	The second character of Canada's six-digit postal codes is a number. A zero indicates a wide-area rural region.	
Rurality Index of Ontario (RIO)[54]	N/A	<40 = not rural area; ≥40 = rural area
Health authority	Health Authority	Local Health Integration Network (LHIN)[55]
Neighbourhood income quintile	Neighbourhood income quintile, based on the 2016 Canadian census	

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Appendix 1f) Criteria for highest level of care for COVID-19 cases in British Columbia and Ontario

Location of highest level of care	Database	Variables assessed
Hospitalized with ICU (ICU) in Ontario and BC	DAD	Hospitalization with ICU admission between 1 day before index date and 14 days after index date. To ensure that the ICU stay is due to COVID-19, the ICU stay must start between 1 day prior to the positive test (i.e. patient was admitted to the ICU and then tested positive) and 14 days after the positive test (i.e. patient tested positive and then admitted to the ICU within 14 days).
Hospitalized with no ICU (hospital) in Ontario and BC	DAD	Hospitalization with no ICU admission between 1 day before and 14 days after index date. Includes patients who were infected while already in the hospital as well as those admitted to the hospital after infection.
LTC in Ontario*	CCRS ODB OHIP	At least one of the following: CCRS: Admission date with no discharge date before Index date; ODB: LTC flag on prescription in ODB, within 90 days before Index date OHIP record with fee code beginning with 'W' within 90 days before index date and the institution code in the OHIP claim having a type of NH (nursing home) or HF (home for the aged).
LTC in BC*	HCC-MRR	Resident of facility care with no service end date before index date.
Community in Ontario and BC	-	Does not meet criteria for any of the above for each respective province.

Abbreviations: CCRS: Continuing Care Reporting System; DAD: Discharge Abstract Database; ICU: Intensive Care Unit; LTC: long term care; ODB: Ontario Drug Benefit; OHIP: Ontario Health Insurance Plan; HCC: Home and community care; MRR: minimum reporting requirements.
*If an LTC resident was transferred to the hospital (with or without ICU admission) on or within 14 days after their index date, the patient will be categorized under "hospitalized with/ with no ICU", accordingly.

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Appendix 1g) Resources and costing methods in British Columbia and Ontario

Resource Category	Database		
	British Columbia	Ontario	Costing methods
Cancer clinic, dialysis clinic	N/A	CIHI-NACRS	RIW × CPWC 2018 × inflation using the CPI for health care. The CPWC was extrapolated to 2020 using data from 2002 to 2018.
Outpatient clinic visits	N/A	CIHI-NACRS	Cost per visit in 2018 adjusted for inflation using the CPI for health care.
Physician services (general/family practice and specialties) and OHIP-covered non-physician services	MSP Payment Information File	OHIP Claims Database	Ontario: Costs for 2018 were adjusted for inflation using the CPI for health care services. BC: Paid amounts were used as they appeared in the data, using the current Payment Schedule at the time of the claim (including temporary COVID-19-related changes)
Emergency department visits	CIHI-NACRS emergency department visits	CIHI-NACRS emergency department visits	Ontario: RIW × CPWC × inflation using the CPI for health care. The CPWC was extrapolated to 2020 using data from 2002 to 2018. ED visits in March 2020 with a main diagnosis of COVID (U07) were not assigned an RIW. An estimated value was assigned using the relationship between triage level and RIW observed for other ED visits (R-square = 0.30). BC: RIW was not available in the BC data; a mean cost per ED visit (adjusted for inflation using the CPI for health care services) was applied to records in the NACRS data [56]
Inpatient hospitalization and same day surgery	CIHI-DAD and SDS	CIHI-DAD and SDS	Both provinces: RIW × CSHS × inflation using the CPI for health care. The CSHS was extrapolated to 2020 using data from 2002 to 2018 (Ontario) and 2014 to 2018 (BC). Ontario inpatient hospitalization: Hospital discharges in March 2020 with a most responsible diagnosis of COVID (U07*) were not assigned an RIW. An estimated value was assigned using the relationship between length of stay and RIW observed for other hospital stays (R-square = 0.47).

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			Ontario SDS: RIW × CPWC × inflation using the CPI for health care. The CPWC was extrapolated to 2020 using data from 2002 to 2018.
Mental health inpatient care	N/A	Ontario Mental Health Reporting System	Weighted days × cost per weighted day ×inflation using the CPI for health care. Weighted days were estimated using the relationship between actual days and weighted days observed for 2018 data (R-square = 0.98). Cost per weighted day was extrapolated to 2020 from earlier costs.
Outpatient prescription drugs	PharmaNet	Ontario Drug Benefit Program database	Ontario: Total paid × inflation using the CPI for medicinal and pharmaceutical products. BC: Total costs (ingredient cost plus fees) paid by both PharmaCare and private payment.
Cancer chemotherapy drugs covered by the New Drug Funding Program	N/A	New Drug Funding Program data N/A in BC	Drug cost × inflation using the CPI for medicinal and pharmaceutical products.
Laboratory tests	MSP Payment Information File	OHIP laboratory tests	Ontario: Average costs for 2018 were adjusted for inflation using the CPI for health care services. BC: Paid amounts were used as they appeared in the data, using the current Payment Schedule at the time of the claim (including temporary COVID-19-related changes).
Home Care	Home and community care-Minimum Reporting Require-ments.	Home Care Database	Ontario: Cost for a given service × inflation. The most recent available costs are for 2018. These were used, adjusted for inflation using the CPI for health care services. BC: Costs were calculated at an average hourly rate for home support services and an average cost per visit for home nursing and other health professional services, using published values adjusted for inflation using the CPI for health care

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			services[57]. Costs were distributed uniformly across the service period (from service start date to the service end date or end of observation period).
Long-term care	Home and community care-Minimum Reporting Require-ments.	CCRS data	Ontario: Weighted days ×cost per weighted day × inflation using the CPI for health care. Days in LTC were obtained from the CCRS data, assuming that a missing discharge date means that the person is still in LTC. The relationship between weighted days and actual days was estimated using the observed relationship for 2019 (R-square = 0.89). The cost per weighted day was extrapolated to 2020 using data from earlier years. BC: Costs were calculated at an average daily rate[57], adjusted for inflation using the CPI for health care services, applied to each day of the service period (from service start date to the service end date or end of observation period).
Complex continuing care	N/A	CCRS data	Weighted days × cost per weighted day × inflation using the CPI for health care. Days in CCC were obtained from the CCRS data, assuming that a missing discharge date means that the person is still in the CCC facility. The relationship between weighted days and actual days was estimated using the observed relationship for 2018 (R-square = 0.90). The cost per weighted day was extrapolated from data from earlier years.

BC: British Columbia; CCC: Complex Continuing Care; CCRS: Continuing Care Reporting System; CIHI: Canadian Institute for Health Information; CPI: Consumer Price Index; CPWC: cost per weighted case; DAD: Discharge Abstract Database; ED: emergency department; LTC: long-term care; MSP: Medical Services Plan; NACRS: National Ambulatory Care Reporting System; OHIP: Ontario Health Insurance Plan; RIW: Resource Intensity Weight; SDS: same day surgery.

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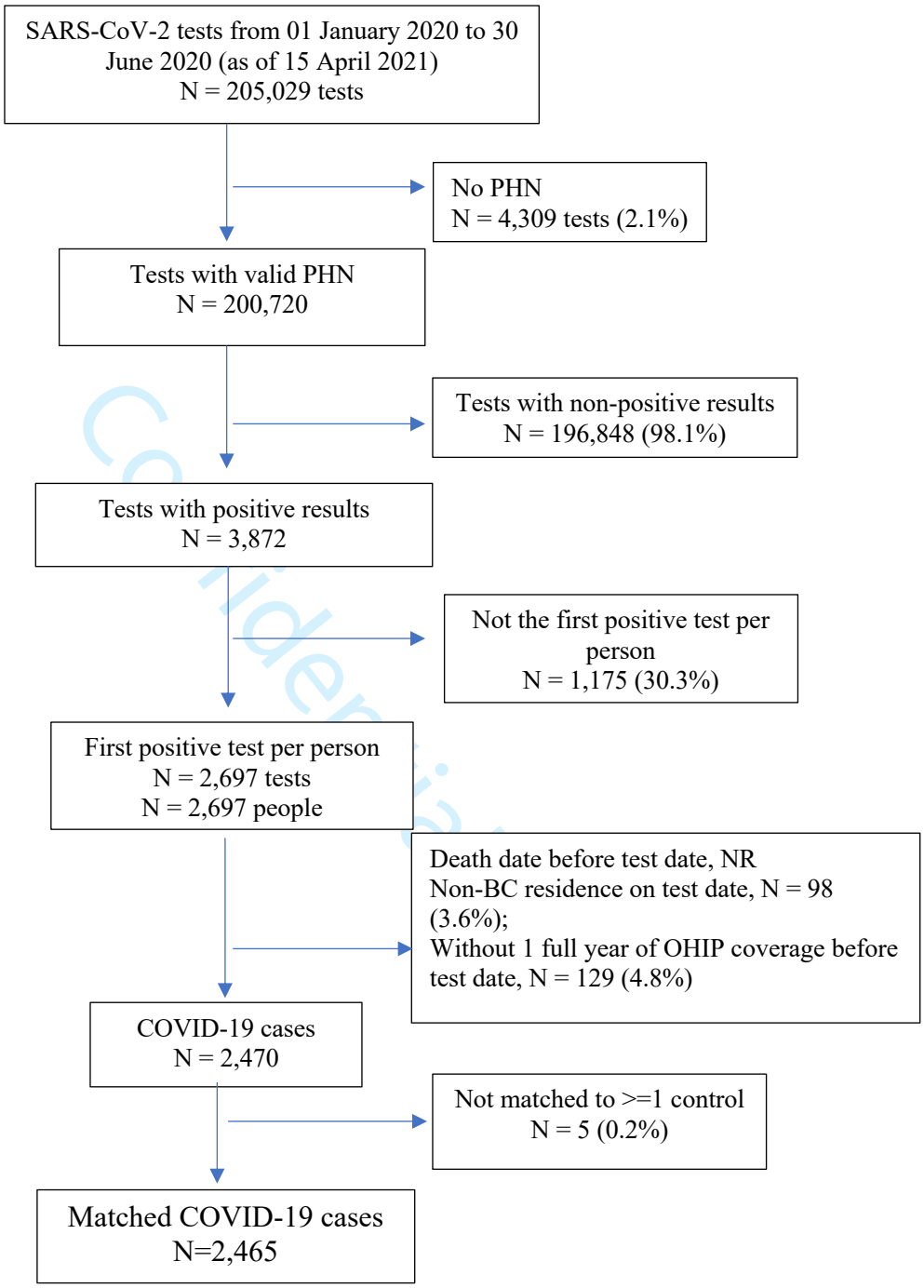
Figure S1 - Cohort selection process

a) in British Columbia



Abbreviations: BC: British Columbia; MSP: Medical Services Plan; NR: not reported (≤ 5 cases); PHN: Personal Health Number

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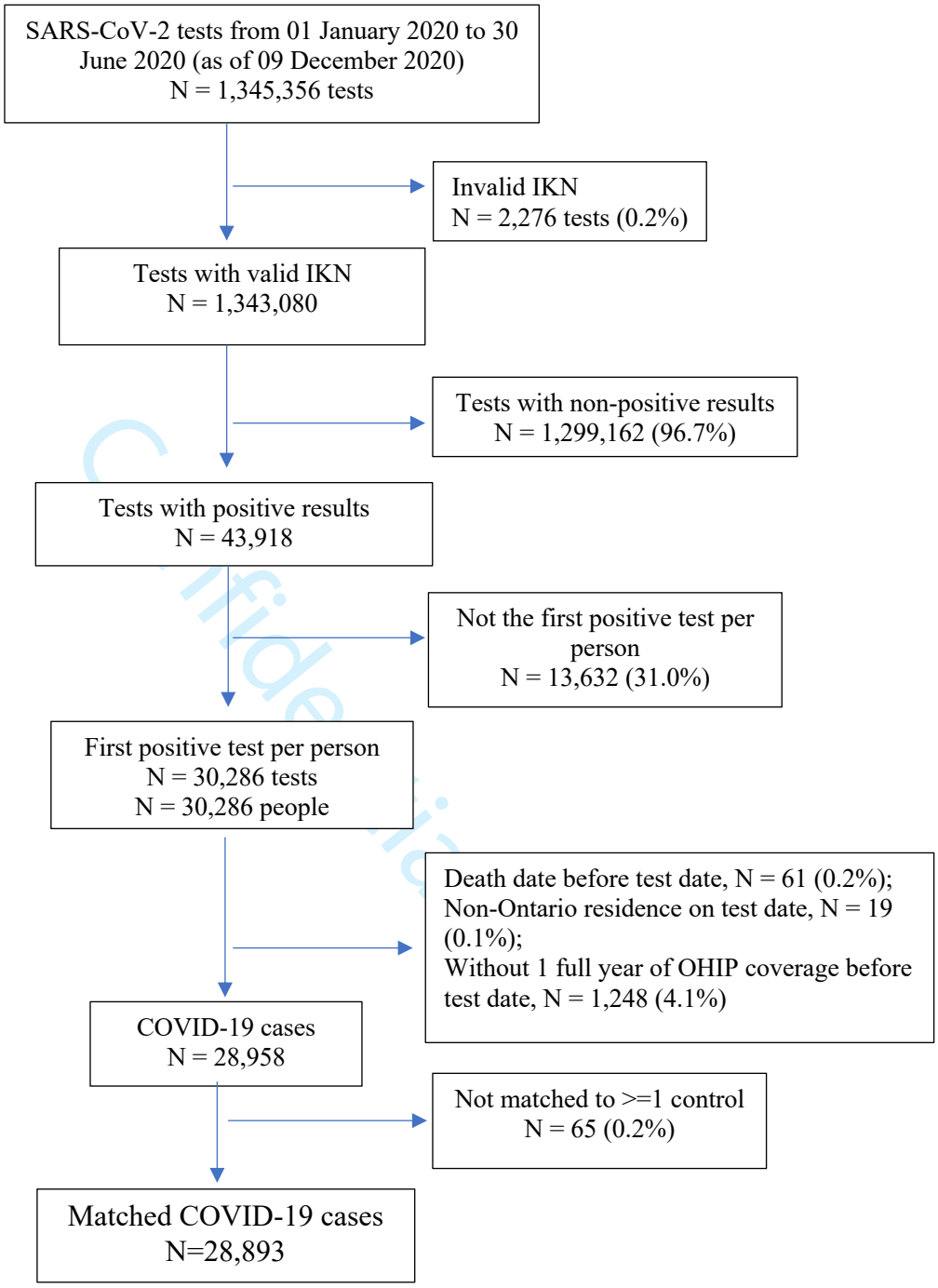
b) in Ontario



Abbreviations: IKN: ICES Key number (anonymous identifier used to link databases); OHIP: Ontario Health Insurance Plan

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Table S1: British Columbia - Characteristics of COVID-19 cases and matched controls for each level of care

a) Community

Variable	Value	Controls	Cases
Age at index date			
	Mean ± SD	45(18)	45(18)
	Median (IQR)	45(33-57)	45(33-57)
Sex N (%)			
	Female	4,028 (57%)	1,007 (57%)
	Male	2,980 (43%)	745 (43%)
Rural/Small Town N (%)			
	Not rural	6,649 (95%)	1,668 (95%)
	Rural	359 (5%)	84 (5%)
Rurality of residence (postal code) N (%)			
	Not rural	6,685 (95%)	1,679 (96%)
	Rural	323 (5%)	73 (4%)
Health Authority N (%)			
	Interior	500 (7%)	122 (7%)
	Fraser	3,536 (50%)	966 (55%)
	Vancouver Coastal	2,347 (33%)	524 (30%)
	Vancouver Island	441 (6%)	98 (6%)
	Northern	184 (3%)	42 (2%)
Neighbourhood income quintile N (%)			
	1-lowest	1,645 (23%)	370 (21%)
	2	1,428 (20%)	384 (22%)
	3	1,478 (21%)	355 (20%)
	4	1,316 (19%)	328 (19%)
	5-highest	1,052 (15%)	291 (17%)
	Missing	89 (1%)	24 (1%)
RUB N (%)			
	0	554 (8%)	126 (7%)
	1	419 (6%)	103 (6%)
	2	1,127 (16%)	330 (19%)
	3	3,800 (54%)	962 (55%)
	4	768 (11%)	166 (9%)

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	5	340 (5%)	65 (4%)
ADG score			
	Mean ± SD	7(11)	6(10)
	Median (IQR)	4(0-13)	4(0-11)
	Mean ± SD	104(32)	104(32)
	Median (IQR)	110(87-130)	111(88-130)

b) Long-term care

Variable	**Value**	**Controls**	**Cases**
Age at index date			
	Mean ± SD	85(9)	85(9)
	Median (IQR)	87(80-92)	87(80-92)
Sex N (%)			
	Female	672 (68%)	168 (68%)
	Male	320 (32%)	80 (32%)
Rural/Small Town N (%)			
	Not rural	964 (97%)	248 (100%)
	Rural	28 (3%)	NR
	Not rural	963 (97%)	246 (99%)
	Rural	29 (3%)	NR
Health Authority N (%)			
	Interior	66 (7%)	NR
	Fraser	522 (53%)	85 (34%)
	Vancouver Coastal	348 (35%)	162 (65%)
	Vancouver Island	49 (5%)	NR
	Northern	7 (1%)	NR
	1-lowest	335 (34%)	111 (45%)
	2	202 (20%)	39 (16%)
	3	183 (18%)	60 (24%)
	4	152 (15%)	23 (9%)
	5-highest	113 (11%)	15 (6%)
	missing	6 (1%)	NR
RUB N (%)			
	0	NR	NR
	1	NR	NR
	2	NR	NR
	3	254 (26%)	88 (35%)
	4	299 (30%)	82 (33%)

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	5	435 (44%)	76 (31%)
ADG score			
	Mean ± SD	31(12)	27(12)
	Median (IQR)	31(22-39)	26(18-35)
Number of days of follow-up after Index date			
	Mean ± SD	67(49)	70(50)
	Median (IQR)	74(13-118)	79(14-120)

b) Hospital

Variable	**Value**	**Controls**	**Cases**
Age at index date			
	Mean ± SD	85(9)	85(9)
	Median (IQR)	87(80-92)	87(80-92)
Sex N (%)			
	Female	672 (68%)	168 (68%)
	Male	320 (32%)	80 (32%)
Rural/Small Town N (%)			
	Not rural	964 (97%)	248 (100%)
	Rural	28 (3%)	NR
	Not rural	963 (97%)	246 (99%)
	Rural	29 (3%)	NR
Health Authority N (%)			
	Interior	66 (7%)	NR
	Fraser	522 (53%)	85 (34%)
	Vancouver Coastal	348 (35%)	162 (65%)
	Vancouver Island	49 (5%)	NR
	Northern	7 (1%)	NR
	1-lowest	335 (34%)	111 (45%)
	2	202 (20%)	39 (16%)
	3	183 (18%)	60 (24%)
	4	152 (15%)	23 (9%)
	5-highest	113 (11%)	15 (6%)
		6 (1%)	NR

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RUB N (%)			
	0	NR	NR
	1	NR	NR
	2	NR	NR
	3	254 (26%)	88 (35%)
	4	299 (30%)	82 (33%)
	5	435 (44%)	76 (31%)
ADG score			
	Mean ± SD	31(12)	27(12)
	Median (IQR)	31(22-39)	26(18-35)
Number of days of follow-up after Index date			
	Mean ± SD	67(49)	70(50)
	Median (IQR)	74(13-118)	79(14-120)

c) Intensive Care Unit

Variable	**Value**	**Controls**	**Cases**
Age at index date			
	Mean ± SD	65(14)	65(14)
	Median (IQR)	68(58-74)	68(58-74)
Sex N (%)			
	Female	220 (40%)	55 (40%)
	Male	336 (60%)	84 (60%)
Rural/Small Town N (%)			
	Not rural	510 (94%)	130 (94%)
	Rural	46 (6%)	9 (6%)
Rurality of residence (postal code) N (%)			
	Not rural	518 (95%)	132 (95%)
	Rural	38 (5%)	7 (5%)
Health Authority N (%)			
	Interior	57 (8%)	11 (8%)
	Fraser	248 (32%)	44 (32%)
	Vancouver Coastal	187 (48%)	67 (48%)

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	Vancouver Island	46 (6%)	9 (6%)
	Northern	18 (6%)	8 (6%)
Neighbourhood income quintile N (%)			
	1-lowest	119 (22%)	31 (22%)
	2	106 (19%)	27 (19%)
	3	119 (20%)	28 (20%)
	4	92 (14%)	19 (14%)
	5-highest	112 (22%)	31 (22%)
	9-missing	8 (%)	NR
RUB N (%)			
	0	24 (4%)	6 (4%)
	1	16 (%)	NR
	2	61 (8%)	11 (8%)
	3	274 (56%)	78 (56%)
	4	101 (14%)	19 (14%)
	5	80 (15%)	21 (15%)
ADG score			
	Mean ± SD	14(13)	13(12)
	Median (IQR)	12(4-22)	11(4-18)
Number of days of follow-up after Index date			
	Mean ± SD	100(44)	100(44)
	Median (IQR)	122(73-130)	122(73-130)

Abbreviations: ADG: Adjusted Diagnostic Group; IQR: Interquartile range; SD: standard deviation; RUB: Resource utilization band

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Table S1: Ontario - Characteristics of COVID-19 cases and matched controls for each level of care

a) Community

Variable	Value	Controls N=82,148	Cases N=20,545
Age at index date			
	Mean ± SD	44.49 ± 18.13	44.49 ± 18.13
	Median (IQR)	45 (30-57)	45 (30-57)
	Female	45,805 (55.8%)	11,457 (55.8%)
	Male	36,343 (44.2%)	9,088 (44.2%)
Neighbourhood income quintile N (%)			
	1-lowest	21,744 (26.5%)	5,736 (27.9%)
	2	18,197 (22.2%)	4,382 (21.3%)
	3	16,632 (20.2%)	4,225 (20.6%)
	4	13,396 (16.3%)	3,366 (16.4%)
	5-highest	12,176 (14.8%)	2,836 (13.8%)
Rural/Small Town N (%)			
	Not rural	78,710 (95.8%)	19,814 (96.4%)
	Rural	3,438 (4.2%)	731 (3.6%)
Rurality of residence (postal code) N (%)			
	Not rural	76,573 (93.2%)	19,342 (94.1%)
	Rural	5,575 (6.8%)	1,203 (5.9%)
Local Health Integration Network N (%)			
	Erie St. Clair	3,495 (4.3%)	971 (4.7%)
	South West	2,692 (3.3%)	582 (2.8%)
	Waterloo Wellington	3,564 (4.3%)	879 (4.3%)
	Hamilton Niagara Haldimand Brant	5,585 (6.8%)	1,363 (6.6%)
	Central West	11,341 (13.8%)	3,525 (17.2%)
	Mississauga Halton	8,437 (10.3%)	2,030 (9.9%)
	Toronto Central	9,259 (11.3%)	2,165 (10.5%)
	Central West	16,547 (20.1%)	4,195 (20.4%)
	Central East	11,356 (13.8%)	2,710 (13.2%)
	South East	1,198 (1.5%)	248 (1.2%)
	Champlain	5,992 (7.3%)	1,335 (6.5%)
	North Simcoe Muskoka	1,227 (1.5%)	278 (1.4%)
	North East	954 (1.2%)	158 (0.8%)
	North West	493 (0.6%)	106 (0.5%)

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	missing	8 (0.0%)	0 (0.0%)
Residence at time of testing N (%)			
	Community	82,148 (100%)	20,545 (100%)
ADG score			
	Mean ± SD	7.53 ± 10.91	6.68 ± 10.05
	Median (IQR)	4 (0-12)	4 (0-10)
RUB	0	10,501 (12.8%)	2,173 (10.6%)
	1	4,327 (5.3%)	1,391 (6.8%)
	2	16,500 (20.1%)	4,624 (22.5%)
	3	38,854 (47.3%)	9,955 (48.5%)
	4	8,660 (10.5%)	1,740 (8.5%)
	5	3,306 (4.0%)	662 (3.2%)
Number of days of follow-up after Index date			
	Mean ± SD	87.43 ± 28.00	87.45 ± 27.98
	Median (IQR)	91 (66-109)	91 (66-109)

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b) Long-term care

Variable	**Value**	**Controls N=17,609**	**Cases. N=4,478**
Age at index date			
	Mean ± SD	83.54 ± 10.43	83.34 ± 10.80
	Median (IQR)	86 (78-91)	86 (78-91)
Sex N (%)			
	Female	11,719 (66.6%)	2,963 (66.2%)
	Male	5,890 (33.4%)	1,515 (33.8%)
Neighbourhood income quintile N (%)			
	1-lowest	6,023 (34.2%)	1,350 (30.1%)
	2	3,941 (22.4%)	1,174 (26.2%)
	3	2,822 (16.0%)	847 (18.9%)
	4	2,582 (14.7%)	468 (10.5%)
	5-highest	2,237 (12.7%)	639 (14.3%)
Rural/Small Town N (%)			
	Not rural	16,232 (92.2%)	4,337 (96.9%)
	Rural	1,377 (7.8%)	141 (3.1%)
Rural postal code N (%)			

	Not rural	16,024 (91.0%)	4,115 (91.9%)
	Rural	1,585 (9.0%)	363 (8.1%)
Local Health Integration Network N (%)			
	Erie St. Clair	1,032 (5.9%)	159 (3.6%)
	South West	1,033 (5.9%)	81 (1.8%)
	Waterloo Wellington	890 (5.1%)	177 (4.0%)
	Hamilton Niagara Haldimand Brant	2,009 (11.4%)	155 (3.5%)
	Central West	1,121 (6.4%)	348 (7.8%)
	Mississauga Halton	1,165 (6.6%)	537 (12.0%)
	Toronto Central	1,891 (10.7%)	587 (13.1%)
	Central West	2,417 (13.7%)	958 (21.4%)
	Central East	2,623 (14.9%)	938 (20.9%)
	South East	562 (3.2%)	31 (0.7%)
	Champlain	1,763 (10.0%)	452 (10.1%)
	North Simcoe Muskoka	475 (2.7%)	35 (0.8%)
	North East	433 (2.5%)	<=20
	North West	194 (1.1%)	NR
	missing	1 (0.0%)	0 (0.0%)
Residence at index date N (%)			
	Long-term care	17,609 (100%)	4,478 (100%)
ADG score			
	Mean ± SD	28.96 ± 15.11	24.44 ± 15.01
	Median (IQR)	26 (16-40)	20 (16-34)
RUB N (%)	0	76 (0.4%)	72 (1.6%)
	1	48 (0.3%)	23 (0.5%)
	2	504 (2.9%)	300 (6.7%)
	3	8,021 (45.6%)	2,318 (51.8%)
	4	3,012 (17.1%)	686 (15.3%)
	5	5,948 (33.8%)	1,079 (24.1%)
Number of days from index date to end of follow-up			
	Mean ± SD	70.43 ± 41.76	70.87 ± 41.78
	Median (IQR)	86 (20-107)	87 (20-107)

c) Hospital

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Variable	Value	Controls N=11,584	Cases N=2,926
Age at index date			
	Mean ± SD	69.65 ± 17.79	69.69 ± 17.78
	Median (IQR)	73 (58-84)	73 (58-84)
Sex N (%)			
	Female	5,768 (49.8%)	1,454 (49.7%)
	Male	5,816 (50.2%)	1,472 (50.3%)
Neighbourhood income quintile N (%)			
	1-lowest	3,454 (29.8%)	874 (29.9%)
	2	2,694 (23.3%)	681 (23.3%)
	3	2,168 (18.7%)	574 (19.6%)
	4	1,694 (14.6%)	413 (14.1%)
	5-highest	1,574 (13.6%)	384 (13.1%)
Rural/Small Town N (%)			
	No	11,088 (95.7%)	2,852 (97.5%)
	Yes	496 (4.3%)	74 (2.5%)
Rural postal code N (%)			
	Not rural	10,808 (93.3%)	2,799 (95.7%)
	Rural	776 (6.7%)	127 (4.3%)
Local Health Integration Network N (%)			
	Erie St. Clair	520 (4.5%)	124 (4.2%)
	South West	402 (3.5%)	92 (3.1%)
	Waterloo Wellington	478 (4.1%)	109 (3.7%)
	Hamilton Niagara Haldimand Brant	869 (7.5%)	218 (7.5%)
	Central West	1,419 (12.2%)	350 (12.0%)
	Mississauga Halton	1,060 (9.2%)	324 (11.1%)
	Toronto Central	1,392 (12.0%)	468 (16.0%)
	Central West	2,229 (19.2%)	625 (21.4%)
	Central East	1,802 (15.6%)	353 (12.1%)
	South East	170 (1.5%)	29 (1.0%)
	Champlain	852 (7.4%)	166 (5.7%)
	North Simcoe Muskoka	176 (1.5%)	23 (0.8%)
	North East	148 (1.3%)	29 (1.0%)
	North West	67 (0.6%)	15 (0.5%)

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	missing	0 (0.0%)	1 (0.0%)
Residence at index date N (%)			
	Long-term care	2,333 (20.1%)	603 (20.6%)
	Community	9,251 (79.9%)	2,323 (79.4%)
ADG score			
	Mean ± SD	20.24 ± 17.02	21.83 ± 17.75
	Median (IQR)	17 (6-32)	19 (7-34)
RUB N (%)			
	0	561 (4.8%)	85 (2.9%)
	1	179 (1.5%)	49 (1.7%)
	2	1,058 (9.1%)	269 (9.2%)
	3	5,165 (44.6%)	1,168 (39.9%)
	4	1,914 (16.5%)	542 (18.5%)
	5	2,707 (23.4%)	813 (27.8%)
Number of days from index date to end of follow-up			
	Mean ± SD	75.78 ± 41.90	75.72 ± 41.88
	Median (IQR)	87 (41-111)	87 (41-111)

d) Intensive Care Unit

Variable	**Value**	**Controls N=3,757**	**Cases N=944**
Age at index date			
	Mean ± SD	62.91 ± 13.59	62.90 ± 13.60
	Median (IQR)	63 (55-73)	63 (55-73)
Sex N (%)			
	Female	1,369 (36.4%)	345 (36.5%)
	Male	2,388 (63.6%)	599 (63.5%)
Neighbourhood income quintile N (%)			
	1-lowest	1,060 (28.2%)	272 (28.8%)
	2	834 (22.2%)	220 (23.3%)
	3	719 (19.1%)	174 (18.4%)
	4	601 (16.0%)	162 (17.2%)
	5-highest	543 (14.5%)	116 (12.3%)
Rural/Small Town N (%)			
	No	3,566 (94.9%)	908 (96.2%)
	Yes	191 (5.1%)	36 (3.8%)
Rural postal code N (%)			
	No	3,450 (91.8%)	901 (95.4%)
	Yes	307 (8.2%)	43 (4.6%)
Local Health Integration Network N (%)			

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	Erie St. Clair	178 (4.7%)	30 (3.2%)
	South West	144 (3.8%)	29 (3.1%)
	Waterloo Wellington	148 (3.9%)	42 (4.4%)
	Hamilton Niagara Haldimand Brant	273 (7.3%)	68 (7.2%)
	Central West	477 (12.7%)	109 (11.5%)
	Mississauga Halton	341 (9.1%)	84 (8.9%)
	Toronto Central	434 (11.6%)	140 (14.8%)
	Central West	741 (19.7%)	199 (21.1%)
	Central East	548 (14.6%)	150 (15.9%)
	South East	51 (1.4%)	15 (1.6%)
	Champlain	281 (7.5%)	51 (5.4%)
	North Simcoe Muskoka	75 (2.0%)	12 (1.3%)
	North East	50 (1.3%)	<=14
	North West	16 (0.4%)	NR
Residence at index date N (%)			
	Long-term care	269 (7.2%)	71 (7.5%)
	community	3,488 (92.8%)	873 (92.5%)
ADG score			
	Mean ± SD	14.27 ± 13.87	15.69 ± 15.33
	Median (IQR)	10 (4-22)	12 (4-23)
RUB	0	252 (6.7%)	56 (5.9%)
	1	90 (2.4%)	19 (2.0%)
	2	471 (12.5%)	120 (12.7%)
	3	1,943 (51.7%)	469 (49.7%)
	4	520 (13.8%)	135 (14.3%)
	5	481 (12.8%)	145 (15.4%)
Number of days of follow-up after Index date			
	Mean ± SD	69.72 ± 46.75	69.60 ± 46.80
	Median (IQR)	77 (18-115)	76 (18-115)

Abbreviations: ADG, Adjusted Diagnostic Group; IQR, interquartile range; NR, not reportable due to small cell size (<6); RUB: Resource Utility Band; SD, standard deviation.

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Table S2. Mean and median per person cost for each 30-day period before and after index date for COVID-19 cases by highest level of care, and matched controls, in a) British Columbia b) Ontario.

a) British Columbia

	Covid-19 Community cases	Controls for cases in community	Covid-19 LTC cases	Controls for cases in LTC	Covid-19 hospital cases	Controls for cases in Hospital	Covid-19 ICU cases	Controls for cases in ICU
Pre-index (Day -30 to Day -1)								
N patients	1,752	7,005	248	984	326	1,301	139	556
Mean cost (SD)	302 (1,983)	283 (1,804)	5,545 (1,693)	5,942 (5,348)	4,494 (8,447)	1,361 (3,650)	1,749 (5,153)	783 (3,184)
Median cost (Q1-Q3)	35 (0-155)	0 (0-130)	5,462 (5,363-5,611)	5,440 (5,337-5,680)	499 (139-5,401)	145 (0-598)	228 (35-660)	84 (0-323)
Day 1(Index date) to 30								
N patients	1,752	7,005	248	983	326	1,301	139	556
Mean cost (SD)	339 (726)	222 (1,327)	4,842 (4,981)	4,523 (3,969)	23,015 (22,895)	1,004 (3,125)	66,324 (43,992)	496 (2,213)
Median cost (Q1-Q3)	149 (58-401)	0 (0-111)	5,446 (2,401-5,675)	5,330 (2,116-5,506)	15,402 (12,313-25,880)	100 (0-446)	61,379 (27,219-103,766)	40 (0-258)
Days 31 to 60								
N patients	1,733	6,921	167	641	284	1,126	118	471
Mean cost (SD)	247 (1,400)	226 (1,283)	5,719 (7,733)	5,157 (4,058)	6,238 (15,409)	963 (2,960)	18,483 (28,613)	502 (2,435)
Median cost (Q1-Q3)	32 (0-160)	0 (0-115)	5,434 (5,311-5,640)	5,394 (4,275-5,571)	520 (117-4,151)	107 (0-455)	935 (276-31,923)	49 (0-230)
Days 61 to 90								
N patients	1,530	6,106	138	520	259	1,026	107	426
Mean cost (SD)	224 (1,097)	242 (1,157)	5,645 (3,915)	5,297 (3,168)	3,059 (10,611)	882 (2,643)	4,525 (14,039)	426 (1,364)
Median cost (Q1-Q3)	32 (0-154)	0 (0-126)	5,443 (5,316-5,572)	5,388 (4,947-5,629)	379 (55-1,327)	97 (0-411)	842 (183-1,432)	41 (0-260)
Days 91 to 120								
N patients	1,290	5,141	110	406	240	946	101	402

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Mean cost (SD)	226 (1,483)	202 (1,229)	4,526 (1,900)	4,873 (3,915)	1,718 (6,395)	706 (2,358)	2,930 (9,228)	600 (2,898)
Median cost (Q1-Q3)	0 (0-132)	0 (0-102)	5,380 (3,726-5,512)	5,332 (2,992-5,547)	236 (36-873)	73 (0-344)	322 (69-970)	41 (0-234)

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b) Ontario

	Covid-19 Community cases	Controls for cases in Community	Covid-19 LTC cases	Controls for cases in LTC	Covid-19 Hospital cases	Controls for cases in Hospital	Covid-19 ICU cases	Controls for cases in ICU
Pre-index (Day -30 to Day -1)								
N patients	20,545	82,148	4,478	17,609	2,926	11,584	944	3,757
Mean cost	260	227	4,836	5,607	5,391	1,787	3,446	1,003
(SD)	(1,519)	(894)	(2,370)	(2,320)	(10,016)	(2,027)	(10,007)	(2,300)
Median cost	0	0	4,407	4,394	1,733	125	330	26
(IQR)	(0-98)	(0-39)	(4,306-4,594)	(4,298- 4,635)	(159-5,100)	(0-2,262)	(39–2,736)	(0-274)
Days 1 (Index date) to Day 30								
N patients	20,545	82,148	4,478	17 ,609	2,926	11,584	944	3,757
Mean cost	381	220	4,132	4,475	17,050	1317	56,717	651
(SD)	(1,393)	(858)	(2,695)	(2,030)	(11,103)	(1,714)	(37,128)	(1,728)
Median cost	90	0	4,361	4,317	14,378	86	51,953	0
(IQR)	(24-367)	(0 -40)	(2,994-4,605)	(2,894-4,513)	(10,228-22,391)	(0-906)	(22,658-87,797)	(0-156)
Days 31 to 60								
N patients	20,443	81,724	3,269	12,813	2,289	9,067	644	2,569
Mean cost	281	217	5,058	5,160	6,540	1,335	22,847	604
(SD)	(1,935)	(805)	(3,792)	(2,064)	(10,885)	(1,933)	(30,235)	(1,749)
Median cost	0	0	4,390	4,366	617	75	5,910	0
(IQR)	(0-85)	(0-43)	(4,290-4,591)	(4,261- 4,593)	(72-9,264)	(0-714)	(204-40,551)	(0-141)
Days 61 to 90								
N patients	16,765	67,013	3,006	11,742	2,013	7,976	545	2,175
Mean cost	243	208	4,658	4,760	3,799	1,229	9,299	520
(SD)	(1,640)	(757)	(3,893)	(2,072)	(7,828)	(1,788)	(20,427)	(1,067)
Median cost	0	0	4,316	4,316	392	69	393	0
(IQR)	(0-70)	(0-39)	(4,025-4,519)	(3,832-4,527)	(39-3,339)	(0-652)	(66-5,517)	(0-157)
Days 91 to 120								
N patients	10,516	42,040	2,129	8,266	1,402	5,556	420	1,674
Mean cost	210	170	2,868	2,976	2,164	787	3,986	425
(SD)	(1,360)	(653)	(2,715)	(1,564)	(5,887)	(1,584)	(12,571)	(990)
Median cost	0	0	2,617	2,616	202	37	254	0
(IQR)	(0-57)	(0-33)	(1,583-3,448)	(1,457-3,490)	(0-1,090)	(0-417)	(7-1,253)	(0-107)

Abbreviations: ICU: intensive care unit; IQR; interquartile range; LTC: long term care; N: number; SD: standard deviation

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Table S3. Mean cumulative costs

a) Mean cumulative costs by highest level of care for COVID-19 cases in British Columbia and Ontario

	BC				Ontario			
	Community	**LTC**	**Hospital**	**ICU**	**Community**	**LTC**	**Hospital**	**ICU**
Pre-index (-30 to -1)								
N	1,752	248	326	139	20,545	4,478	2,926	944
Mean (SD)	302 (1,983)	5,545 (1,693)	4,494 (8,447)	1,749 (5,153)	244 (1,496)	4,818 (1,496)	5,353 (2,366)	3,356 (9,915)
Median (IQR)	35 (0-155)	5,462 (5,363-5,611)	499 (139-5,401)	228 (35-660)	0 (0-80)	4,393 (4,296-4,580)	1,659 (140-5,048)	284 (39–2,659)
Up to day 30								
N	1,752	248	326	139	20,545	4,478	2,926	944
Mean (SD)	641 (2,319)	10,387 (5,391)	27,509 (24,635)	68,073 (44,330)	610 (2,523)	8,932 (4,226)	22,368 (17,009)	60,043 (38,509)
Median (IQR)	250 (90-562)	10,862 (7,967-11,239)	18,064 (13,828-30,377)	65,812 (27,526-104,487)	156 (39-471)	8,712 (7,864-9,133)	17,136 (12,795-27,382)	56,613 (24,449-92,024)
Up to day 60								
N	1,733	167	284	118	20,443	3,269	2,289	644
Mean (SD)	802 (2,415)	17,373 (13,160)	33,334 (35,596)	88,118 (65,584)	860 (3,900)	14,820 (7,076)	29,082 (25,202)	87,404 (57,714)
Median (IQR)	336 (122-725)	16,448 (16,051-17,043)	18,935 (14,081-34,706)	81,722 (29,226-123,981)	204 (39-576)	13,264 (12,923-12,923)	19,222 (13,252-39,981)	93,725 (28,942-123,241)
Up to day 90								
N	1,530	138	259	107	16,765	3,006	2,013	545
Mean (SD)	1,077 (2,981)	22,250 (7,281)	35,908 (43,375)	87,632 (66,822)	1,124 (5,145)	19,612 (9,844)	32,121 (28,378)	93,668 (70,511)

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Median (IQR)	436 (159-961)	21,971 (21,384-22,624)	19,166 (14,371-33,144)	79,301 (29,920-119,285)	272 (68-712)	17,550 (17,023-18,421)	19,825 (13,393-43,402)	95,953 (28,903-130,096)
Up to day 120								
N	1,290	110	240	101	10,516	2,129	1,402	420
Mean (SD)	1,296 (3,507)	27,526 (8,399)	37,791 (48,458)	92,604 (72,081)	1,437 (6,536)	23,171 (11,962)	33,848 (33,047)	99,409 (74,588)
Median (IQR)	521 (219-1,145)	27,280 (26,251-27,932)	19,325 (14,723-33,763)	85,398 (31,774-121,958)	365 (97-889)	20,539 (19,466-21,889)	18,892 (13,473-43,528)	97,557 (30,640-136,768)

Abbreviations: ICU, intensive care unit; IQR, interquartile range; LTC, long term care; SD, standard deviation

b) Mean net cumulative costs by level of care for COVID-19 cases in British Columbia and Ontario

	BC				**Ontario**			
	Community	**LTC**	**Hospital**	**ICU**	**Community**	**LTC**	**Hospital**	**ICU**
Up to index date	19 (-77, 115)	-397 (-805, 11)	3,133 (2,250, 4,016)	966 (140, 1,792)	34 (11, 57)	-748 (-846-650)	3,628 (3,263, 3,995)	2,493 (1,849, 3,136)
Up to day 30	130 (6, 254)	-82 (-857, 692)	25,128 (22,439, 27,816)	66,793 (59,409, 74,177)	195 (156, 235)	-1,073 (-1233, -913)	19,376 (18,760, 19,992)	58,587 (56,116-61,057)
Up to 60	116 (-15, 247)	484 (-1,676, 2,644)	30,217 (26,103, 34,332)	86,612 (74,851, 98,372)	250 (190, 309)	-1,263 (-1,571, -955)	25,164 (24,177-26,151)	85,439 (80,970-89,908)
Up to 90	128 (-47, 302)	-396 (-2,046, 1,254)	32,309 (27,079, 37,539)	85,644 (73,094, 98,194)	312 (227, 398)	-1,401 (-1,832, -970)	27,091 (25,934, 28,248)	91,138 (85,202-97,073)
Up to day 120	96 (-129, 320)	-46 (-2,085, 1,993)	33,640 (27,607, 39,672)	90,056 (76,146, 103,967)	487 (353, 622)	-1,105 (-1,708, 502)	28,329 (26,705, 29,954)	96,308 (89,162-103,454)

Abbreviations: CI, confidence interval; ICU, intensive care unit; LTC, long term care

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Table S4 - Mean net costs during the first 30 days after index date, stratified by level of care and characteristics at index date, in British Columbia and Ontario

	BC			Ontario		
Variable	**N cases**	**Estimated mean net cost (Standard Error)**	**95%CI**	**N cases**	**Estimated mean net cost (Standard Error)**	**95%CI**
Level of care group						
ICU	139	65,828(3,721)	(58,535-73,122)	944	56,088(1,208)	(53,721-58,455)
hospital	326	22,010(1,275)	(19,512-24,509)	2926	15,750(202)	(15,354-16,147)
Long-Term Care	248	319(306)	(-280-919)	4478	-327(42)	(-410--244)
community	1752	117(24)	(70-164)	20545	161(11)	(140-183)
Age in years						
0 to 19	101	287(181)	(-68-641)	1337	248(49)	(151-345)
20 to 29	248	1,807(683)	(468-3,145)	3647	547(75)	(401-694)
30 to 39	388	2,020(610)	(826-3,215)	3678	1,064(120)	(829-1,300)
40 to 49	359	4,291(909)	(2,508-6,073)	4083	2,058(163)	(1,739-2,377)
50 to 59	450	4,406(768)	(2,900-5,912)	5053	4,097(216)	(3,673-4,520)
60 to 69	304	13,485(1,873)	(9,814-17,155)	3619	6,837(338)	(6,175-7,500)
70 to 79	239	21,250(2,217)	(16,904-25,596)	2372	8,914(418)	(8,094-9,734)
80 to 89	230	9,227(1,212)	(6,852-11,602)	3024	4,784(209)	(4,374-5,193)
90 and older	146	3,595(748)	(2,129-5,061)	2080	2,576(153)	(2,277-2,876)
Sex						
male	1372	9,393(777)	(7,870-10,917)	12674	4,752(143)	(4,472-5,033)
female	1093	4,613(438)	(3,755-5,471)	16219	2,520(82)	(2,360-2,680)
Income quintile						
1 (lowest income)	601	7,381(906)	(5,605-9,157)	8232	3,535(145)	(3,252-3,818)
2	503	5,430(790)	(3,881-6,978)	6457	3,637(172)	(3,299-3,975)
3	515	6,969(936)	(5,134-8,804)	5820	3,251(161)	(2,937-3,566)

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4	434	5,837(872)	(4,128-7,546)	4409	3,726(211)	(3,313-4,138)
5 (highest income)	383	7,781(1,268)	(5,296-10,265)	3975	3,309(209)	(2,900-3,718)
missing	29					
Residence at index date						
Long-term care	288	2,964(626)	(1,737-4,191)	5152	1,916(116)	(1,688-2,144)
Homeless/shelter	NA	NA	NA	186	7,405(1,164)	(5,124-9,687)
Home (community)	2177	7,239(473)	(6,312-8,165)	23555	3,802(92)	(3,622-3,981)
Adjusted Diagnostic Groups score						
-40 to -20	13	1,511(1,328)	(-1,093-4,115)	55	1,394(617)	(185-2,603)
-19 to 0	594	2,674(610)	(1,478-3,869)	6363	1,648(121)	(1,411-1,886)
1 to 20	1376	7,408(596)	(6,239-8,577)	16,666	3,129(103)	(2,927-3,332)
21 to 40	397	10,509(1,265)	(8,029-12,989)	4,228	6,151(242)	(5,677-6,626)
41 to 76	85	7,405(1,752)	(3,972-10,838)	1,581	7,751(399)	(6,968-8,533)

Abbreviations: CI, confidence interval; ICU, intensive care unit

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