

UPDATE:
**RAPID RESPONSE REPORT ON COVID-19
IN NEW BRUNSWICK
APRIL 14, 2020**



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PROJECT TITLE

Update: Rapid response report on COVID-19 in New Brunswick: April 14, 2020

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INTRODUCTION

This rapid response report provides updated projections estimating the trajectory COVID-19 could follow in New Brunswick (NB) if the province has outcomes similar to those of countries and provinces that have to date contained infections relatively successfully. Studying the experiences of the locations presented below can help inform how the disease could continue to progress in NB. Variables considered include COVID-19 infections, hospitalizations, critical care cases, and cases requiring mechanical ventilation. The regions considered in our projection estimates include South Korea, Germany, Australia, Denmark, and British Columbia (BC) as well as Nova Scotia (NS) as our Maritime neighbor.

As background to our projections and to motivate our choice of comparison group of countries, in Section 2 we present data on a range of measures for NB and select countries, as well as the other Canadian provinces. Those measures include rates of infection, testing, critical care, mortality, and the number of daily new cases since preventive measures were first implemented. We examine how NB compares to South Korea, Germany, Denmark, Australia, Canada as a whole, and the individual Canadian provinces. We also include Iceland, as it was one of the first countries to conduct testing across a random sample of its entire population.

Our key conclusion is that NB's case levels will remain relatively low and within the health system's capacity to provide necessary treatment to those who need it. Social distancing and related measures, tracking and quarantining of affected individuals, and NB's population density have resulted in an incidence rate that is predicted to remain among the lowest in Canada.

The original report containing projections from March 31, 2020 is available online at <https://www.nbirdt.ca/post/nb-irdt-covid-projections-show-good-news-for-nb>.

Projections

Below, we examine COVID-19 outcomes in regions with healthcare systems and control measures similar to those in New Brunswick. Since the release of our first projections, it has become clear that worst-case scenarios like those in Italy and Spain are unlikely to apply to NB. As such, the projections included below are motivated by COVID-19 success stories so far, relatively speaking.

The countries in the tables below were chosen as comparable to NB for the following reasons:

- South Korea is included because it is the most advanced in terms of disease trajectory and continues to serve as an example for COVID-19 mitigation.
- Australia is included because its case load has remained low relative to its population despite a high level of urbanization.
- Denmark and Germany are included because they have demographics similar to NB (although, they also have different trajectories – while Denmark is considering how to lift restrictions, Germany has acknowledged that they do not yet have transmission under control).
- Nova Scotia is included as our closest Maritime neighbour as a comparator.

- British Columbia is included as the Canadian province furthest along in its disease trajectory (and possibly the first Canadian success story in terms of COVID containment and management).

In short, the estimated number of cases based on South Korea demonstrates the impact of excellent infection control measures. The range presented in the Germany row represents a scenario with similar demographics where COVID-19 is not yet contained. Denmark was initially a middle-ground scenario that has progressed to a moderate success story since our first reporting. Given that COVID is progressing at different rates and contained to a different extent across Canada, BC and NS have been included as relevant Canadian comparisons. Above all, each group chosen for comparison has practiced similarly rigorous social distancing and other measures.

Based on this information, in Table 1, we present a range in which COVID-19 rates in NB *could* fall in the next ten days (i.e., April 23, 2020).

Table 1: 10-Day Projected Range of Outcomes for NB based on Outcomes in South Korea, Germany, Australia, Denmark, Nova Scotia, and British Columbia

Country / Province	Age groups	Cases	Hospitalized	ICU / Critical	Requiring mechanical ventilation	Mortality*	Mortality (Alt)**
South Korea	<60	87	9	2			
	60+	45	15	4			
	All ages	132	24	6	2	4	12
Germany	<60	321	32	9			
	60+	166	56	15			
	All ages	487	88	24	6	15	44
Australia	<60	120	12	3			
	60+	62	21	6			
	All ages	182	33	9	2	5	16
Denmark	<60	152	15	4			
	60+	79	27	7			
	All ages	231	42	11	3	7	21
Nova Scotia	<60	215	21	6			
	60+	111	37	10			
	All ages	325	59	16	4	10	29
British Columbia	<60	123	12	3			
	60+	63	21	6			
	All ages	186	33	9	2	6	17

As of April 13, 2020

*Mortality as deaths determined by 3% CFR if defined as total deaths/total infected

**Mortality as deaths determined by 9% CFR if defined as total deaths/(total deaths+total recovered)

Similarly, in Table 2, we present a range in which COVID-19 rates could fall when New Brunswick reaches the highest case rate of the pandemic – based on the highest cases observed elsewhere as of April 13, 2020.

Table 2: Project Range of Highest Case Rate* Outcomes for NB based on Outcomes in South Korea, Germany, Australia, Denmark, Nova Scotia, and British Columbia

Country / Province	Age groups	Cases	Hospitalized	ICU / Critical	Requiring mechanical ventilation	Mortality**	Mortality (Alt)***
South Korea	<60	104	10	3			
	60+	54	18	5			
	All ages	158	28	8	2	5	14
Germany	<60	753	74	21			
	60+	388	131	35			
	All ages	1141	205	55	14	34	103
Australia	<60	127	13	3			
	60+	66	22	6			
	All ages	193	35	9	2	6	17
Denmark	<60	546	54	15			
	60+	281	95	25			
	All ages	827	149	40	10	25	74
Nova Scotia	<60	251	25	7			
	60+	129	44	12			
	All ages	380	68	18	5	11	34
British Columbia	<60	149	15	4			
	60+	77	26	7			
	All ages	226	41	11	3	7	20

*As of April 13, 2020

**Mortality as deaths determined by 3% CFR if defined as total deaths/total infected

***Mortality as deaths determined by 9% CFR if defined as total deaths/(total deaths+total recovered)

The scenarios presented in the two tables above show projected potential outcomes for New Brunswick in terms of expected cases, hospitalizations, ICU/critical care admissions, mechanical ventilation, and death if our case rate trajectory follows those of the countries listed – South Korea, Germany, Australia, Denmark, Nova Scotia, and British Columbia. The estimates presented in both tables have been standardized to the NB population.

In providing the above calculations, we incorporate revised estimates from the Public Health Agency of Canada's (PHAC) projections.ⁱ As of April 13, PHAC estimated that

- 34% of COVID-19 cases are over 60 years old,
- 18% of all confirmed cases are hospitalized,
- 27% of all hospitalizations are admitted to the ICU, and
- 7% of all hospitalizations require mechanical ventilation.

PHAC also estimates a case fatality rate (that is, total deaths per total infected) of 3%. However, to improve the accuracy of this estimate, we provide a second mortality estimate above, which is defined by total deaths per total deaths + recoveries. According to this second definition, the mortality rate amounts to 9% for Canada. By presenting a lower and upper bound of mortality rates, we hope to capture the range in which mortality estimates are most likely to fall.

Our calculations by age group further take into consideration PHAC's estimates that infected individuals over 60 years of age make up

- 64% of all hospitalizations,
- 63% of all ICU admissions, and
- 94% of deaths.

Based on the projections in Tables 1 and 2 above, we see that if the trajectory of COVID-19 cases in NB follows a best-case scenario – represented by outcomes observed in South Korea, Australia, and BC – our province will continue to be within its capacity to meet the required hospitalizations and ICU admissions expected. If we follow the same trajectory and assume a fatality rate of 3%, the number of deaths in ten days could range between four and six – with a range between 12 and 17 if we assume 9% fatality.

Further, at the highest case rate – based on the highest cases observed as of April 13 – the number of deaths could range between five and seven (assuming 3% fatality) or between 14 and 20 (assuming 9% fatality).¹

While the ranges based on outcomes in South Korea, Australia, and BC present best-case scenarios for NB, the trajectory based on outcomes in Germany represents a worst-case scenario for the province. If NB follows Germany's trajectory during its highest case rate, the province would be beyond capacity for hospitalizations, as NB currently has 194 acute care beds reserved for COVID-19 patients, and this projection estimates the province would need 205.

It should be noted that the highest case rate refers to the highest observed rates *thus far*. It is possible the countries and provinces examined have not yet reached their peaks. If this is the case, it is possible NB could expect to surpass capacity in other scenarios as time goes on.

These estimates will continue to be updated as newer data become available and maximum infection rates are estimated more accurately. Likewise, the hospitalization and ICU admissions presented above must be interpreted with caution, as the rates published by PHAC lag behind real-time data. This estimate will become more accurate as more data become available.

While this range of outcomes presents potential situations for which New Brunswick should prepare, the existing literature suggests that differences in COVID-19 outcomes depend on a number of factors – many of which could impact (either increase or decrease) the trajectory of COVID-19 in our province. These factors are discussed in the original March 31 report.²

Depictions of various COVID-19 rates in the regions discussed, and others, are presented below.

¹ Once more, these estimates refer to the trajectories based on outcomes in South Korea, Australia, and BC.

² Bhuiyan, E.M., Christensen, E., Daigle, B., Magalhaes, S., McDonald, T., Miah, P., & Somayaji, C. (2020). Rapid response report on COVID-19 in New Brunswick: March 31, 2020. Fredericton, NB: New Brunswick Institute for Research, Data and Training. Retrieved from <https://www.nbirdt.ca/post/nb-irdt-covid-projections-show-good-news-for-nb>.

COVID-19 INFECTIONS, TESTS, CRITICAL CARE, AND MORTALITY RATES

By Country

The mitigation of COVID-19 is a combination of different measures, such as screening, isolating vulnerable populations, and other preventive measures, including social controls and the timing of their implementation.

In the figures below, the infections, screenings, critical care cases, and mortality rates of various countries are provided per 1,000 population. In South Korea, where rates remain relatively low, the government conducted thorough tests (i.e., screenings of symptomatic and asymptomatic individuals) and implemented preventive measures at an early stage of the outbreak, thus managing to suppress an increase in the number of cases.

Likewise, even though Germany and Iceland have been experiencing rising numbers of infection, both countries conducted a relatively high number of tests and implemented early preventive measures (including isolating vulnerable populations). Thus, the mortality rates in these countries have remained relatively low. Iceland – which has the highest rate of testing – has the lowest mortality rate per 1,000 infected while showing the largest number of identified infections per 1,000.

While Iceland is not considered in this iteration of NB projection estimates, its unique situation provides a valuable comparison moving forward. NB has primarily been testing symptomatic people and selected others based on potential exposure. Iceland, on the other hand, has undertaken mass testing of both symptomatic and asymptomatic individuals, resulting in a much higher rate of identified infections.

Figure 1: Total COVID-19 Infections per 1,000 (total population), by country

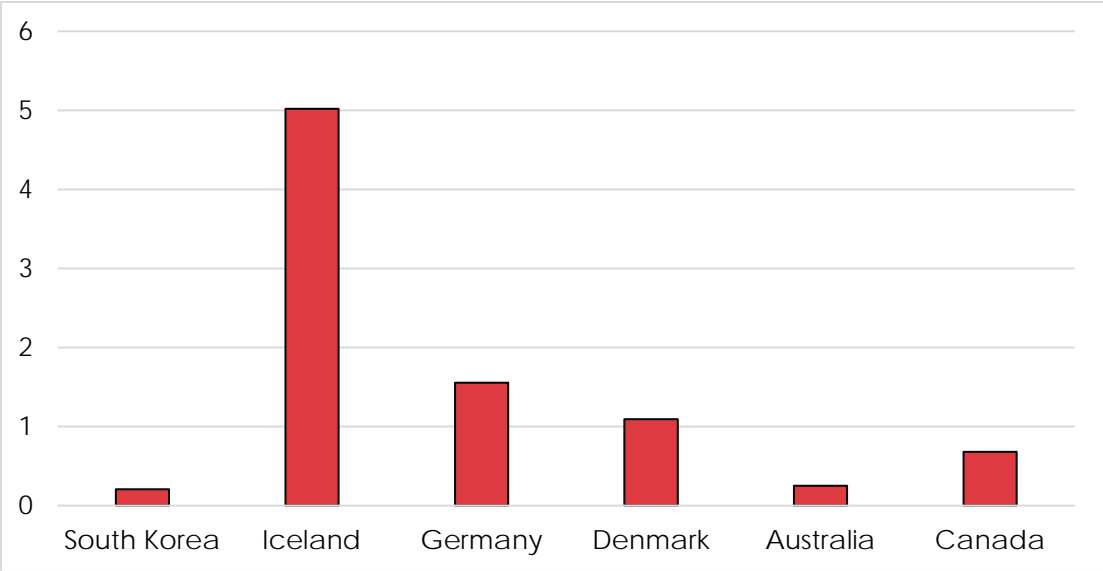


Figure 2: Tests per 1,000 (total population), by country

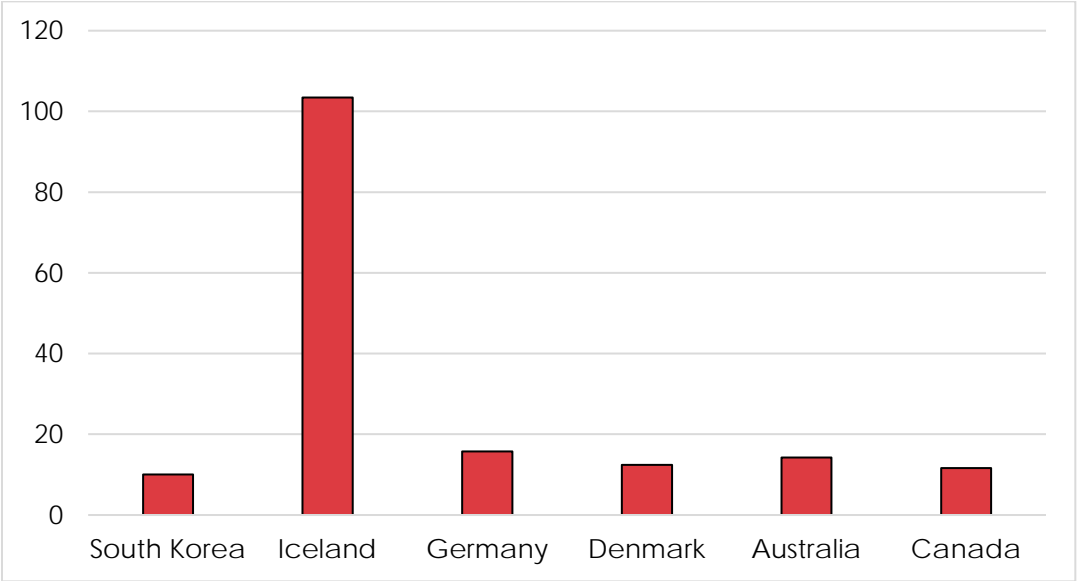


Figure 3: Critical Care per 1,000 (active infections), by country

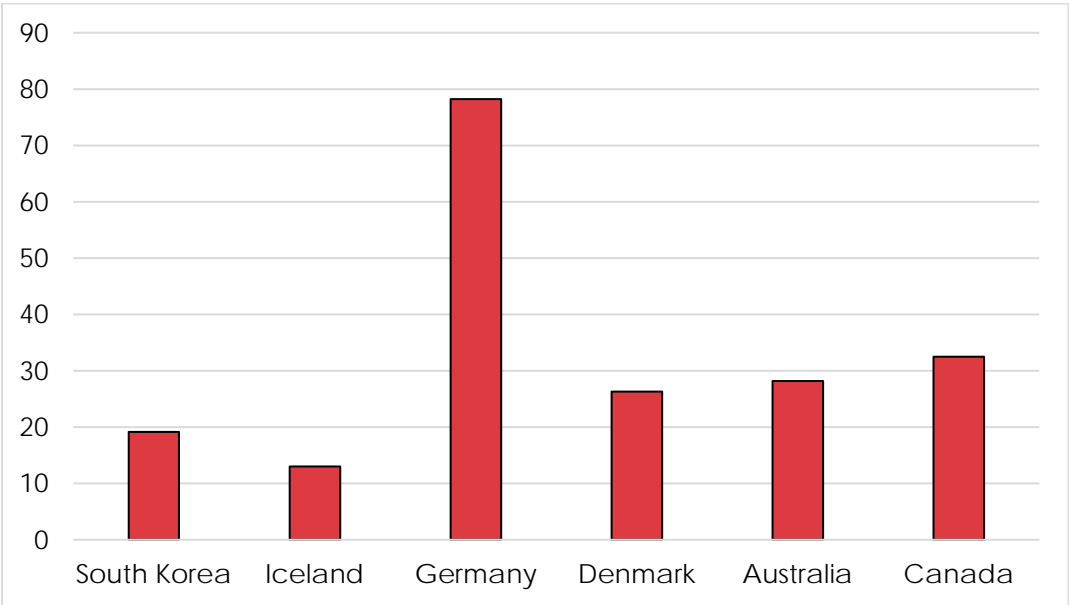


Figure 4: Mortality rate per 1,000 (total population), by country

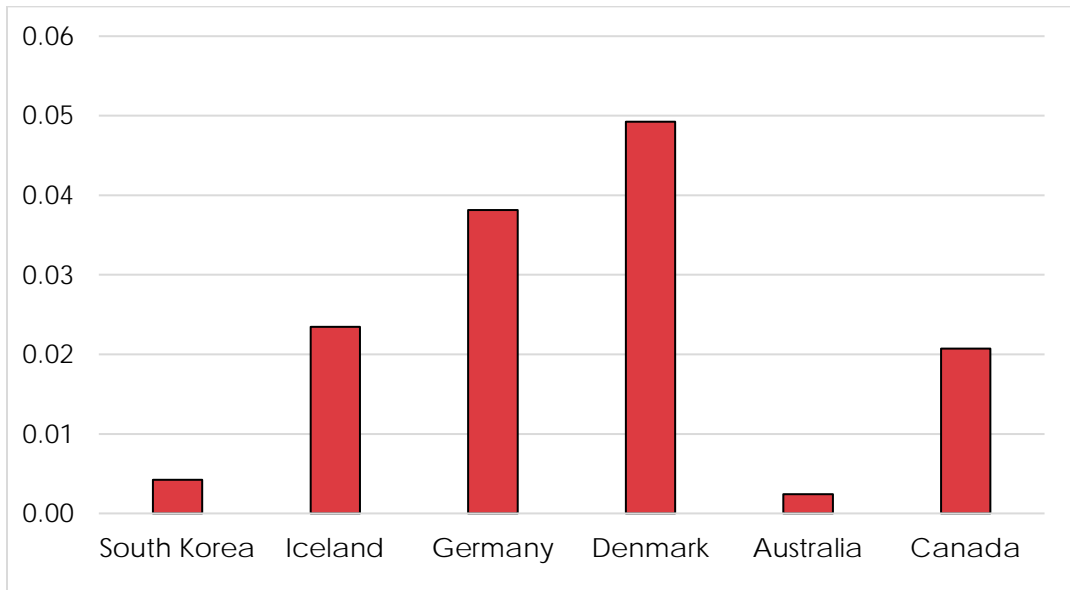
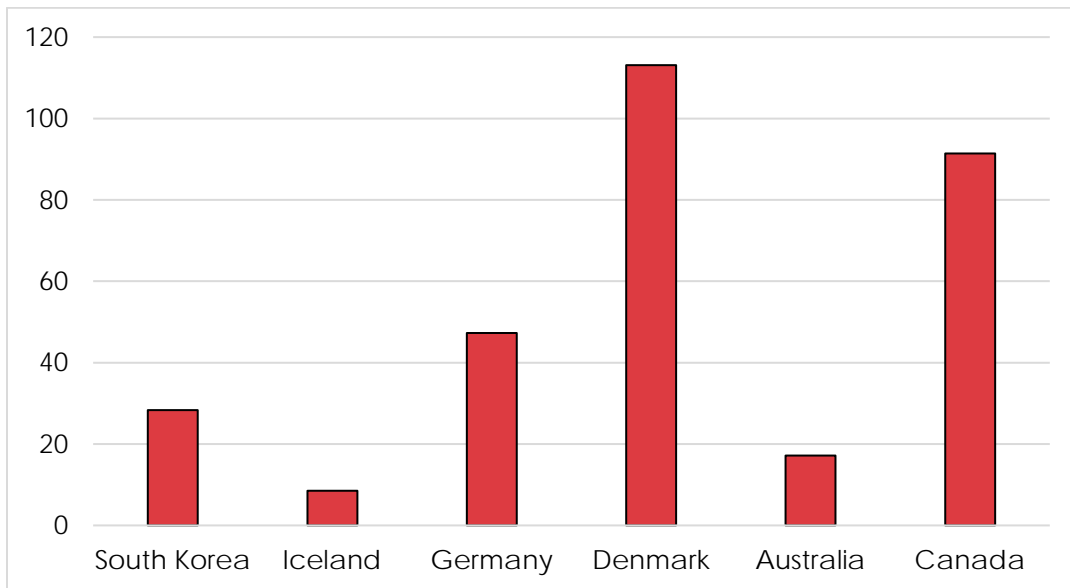


Figure 5: Mortality rate (CFR)³ per 1,000 (infected people), by country



³ Calculating mortality rates while an epidemic is ongoing is complicated, as the outcomes of current cases are not yet determined (i.e., individuals currently battling COVID-19 have neither died nor recovered). Therefore, the mortality rates presented above (Crude Fatality Ratio = Deaths/(Death + Recovered) reflect the outcomes of cases from a previous point in time – not the outcomes at present. The number of recoveries in various countries (e.g., Finland, Norway) could be lagging in the data, whereas the number of cases and deaths is more readily available. For more information on calculating mortality rates, see <https://www.worldometers.info/coronavirus/coronavirus-death-rate/#correct>.

By Province

In the figures below, we see that BC conducted fewer tests (per 1,000 population) than Quebec. However, BC also took greater preventive measures compared to both Quebec and Ontario. On March 12, BC recommended against all non-essential travel outside Canada before the scheduled spring break in the province, whereas Quebec did not make similar recommendations – possibly because its spring break was scheduled earlier in the year and therefore at an earlier stage of the outbreak. With a combination of early preventive measures and screenings, BC managed to mitigate the impact of the virus in terms of infections and deaths compared to both Ontario and Quebec.

New Brunswick conducted a number of tests similar to that of BC (per 1,000 population) and likewise implemented preventive measures early, such as recommending closing all public spaces and certain businesses on March 16 (4 days after the province's first confirmed case). A state of emergency declaration followed on March 19, as opposed to Nova Scotia's later declaration (on March 22, around one week after its first confirmed case). It would appear that after an initial increase, the number of daily cases remained low in New Brunswick. NB also has a lower number of cumulative cases (per 1,000 population) compared to Nova Scotia.

Figure 6: Total COVID-19 Infections per 1,000 (total population), by province

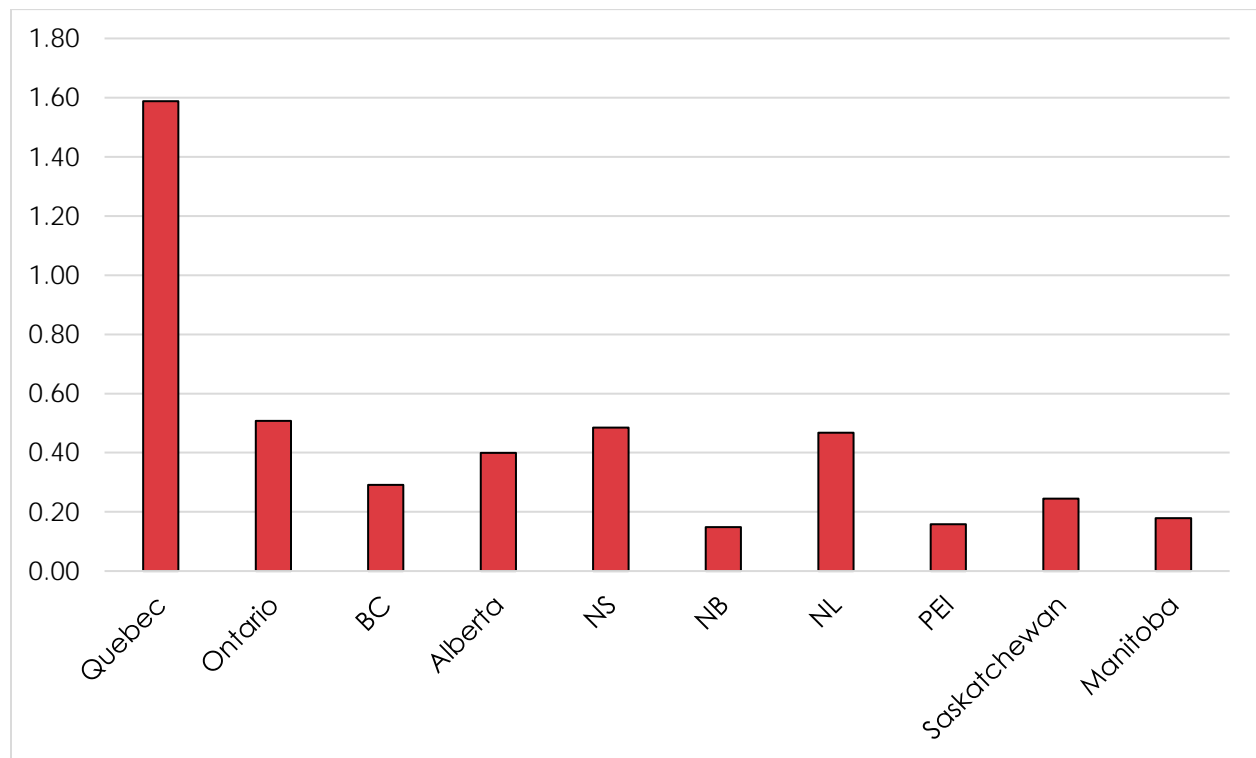


Figure 7: Tests per 1,000 (total population), by province

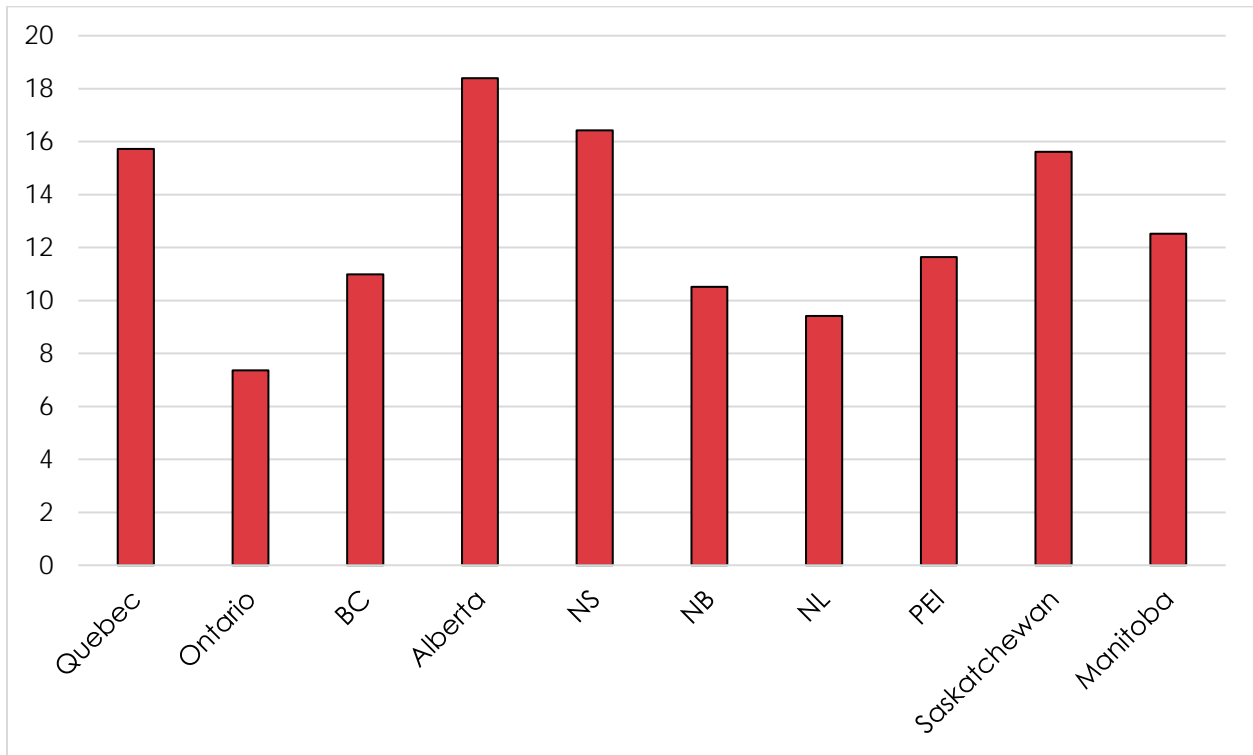
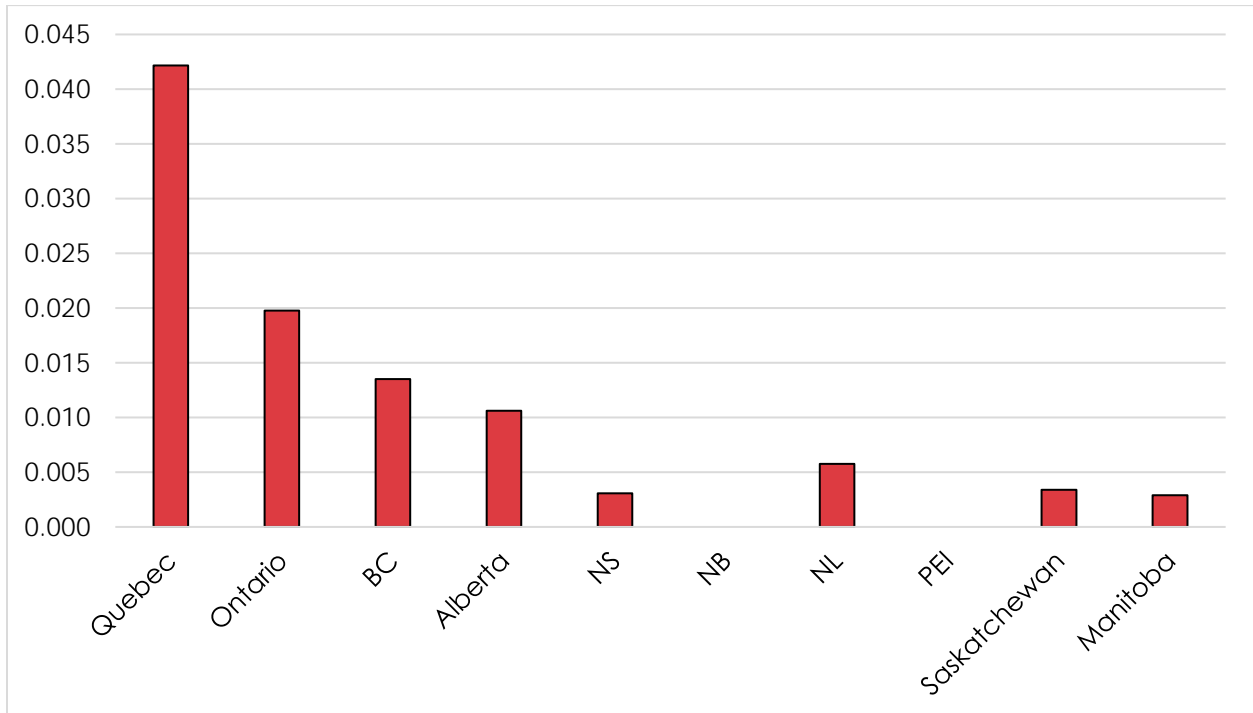


Figure 8: Mortality rate per 1,000 (total population), by province



NEW CASES SINCE RESTRICTIONS WERE FIRST IMPLEMENTED

Since its state of emergency was first declared on March 19, 2020, NB proceeded to experience a peak number of new cases on March 29 (as of April 13, 2020). Since March 29, however, the number of new cases has dropped steadily in the province. The same cannot be said for Nova Scotia; since implementing a state of emergency on March 22, its number of daily new cases has been increasing.

Overall, it appears as though NB followed the same pattern as Australia in the sense that it experienced a rise in the daily number of new cases after declaring a state of emergency, likely attributable to the time lag between developing symptoms and detection. After that, however, NB saw a gradual decline.

Figure 9: New cases in New Brunswick

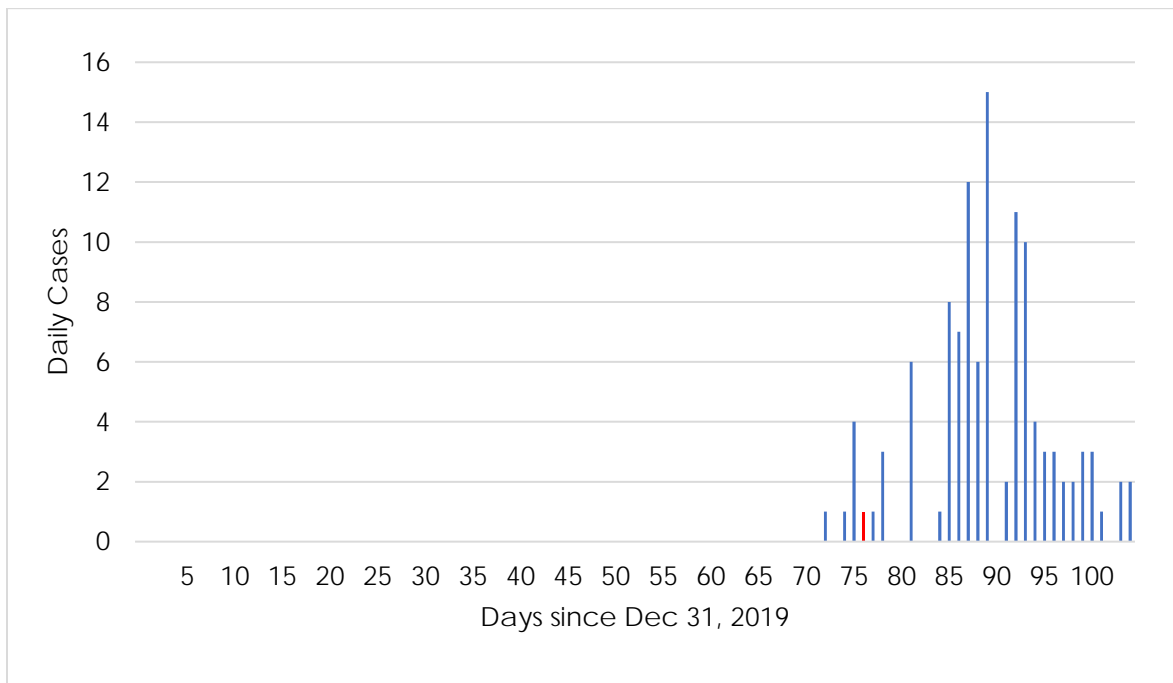


Figure 10: New cases in Nova Scotia

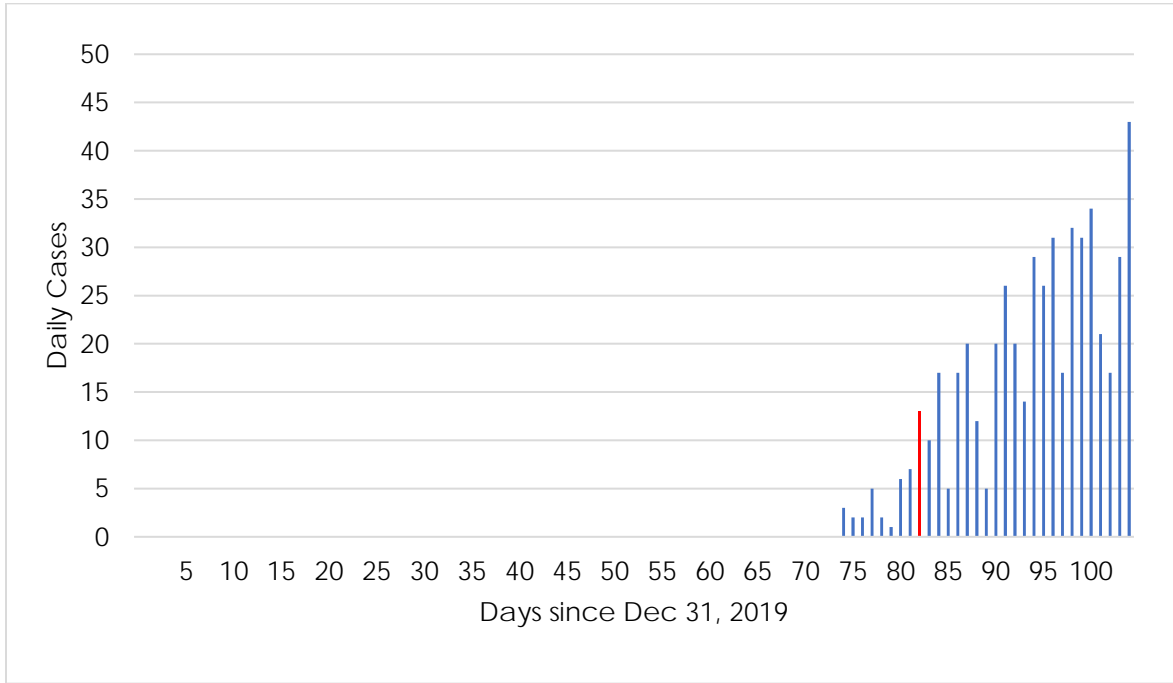


Figure 11: New cases in Canada

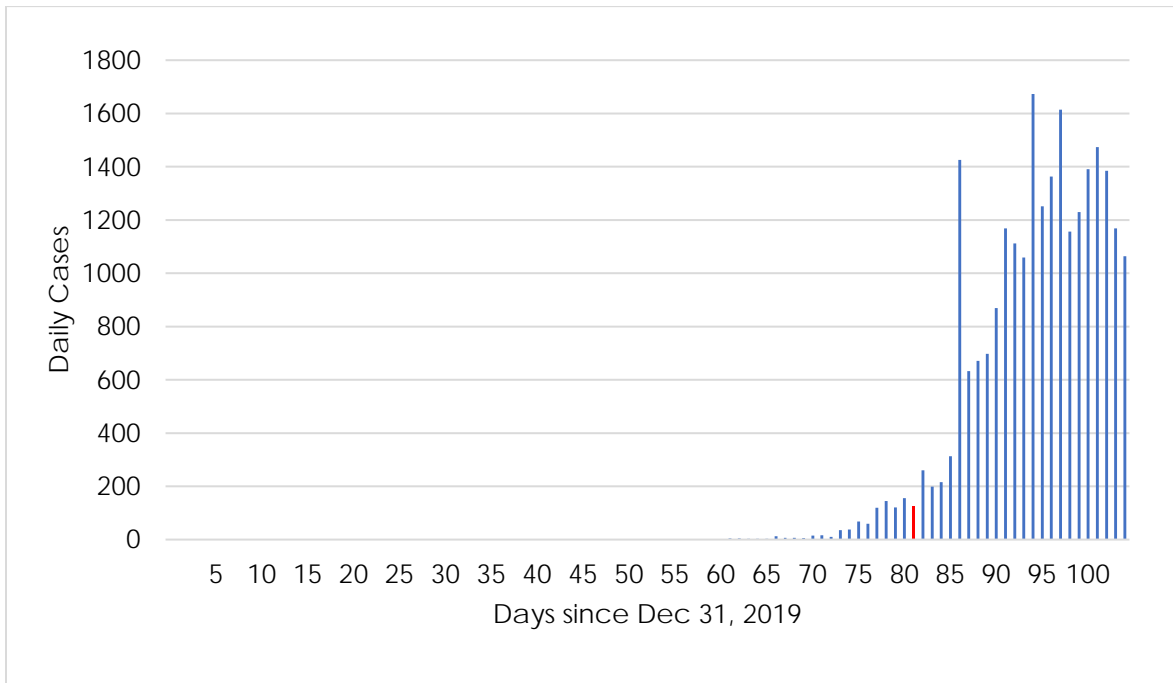


Figure 12: New cases in South Korea

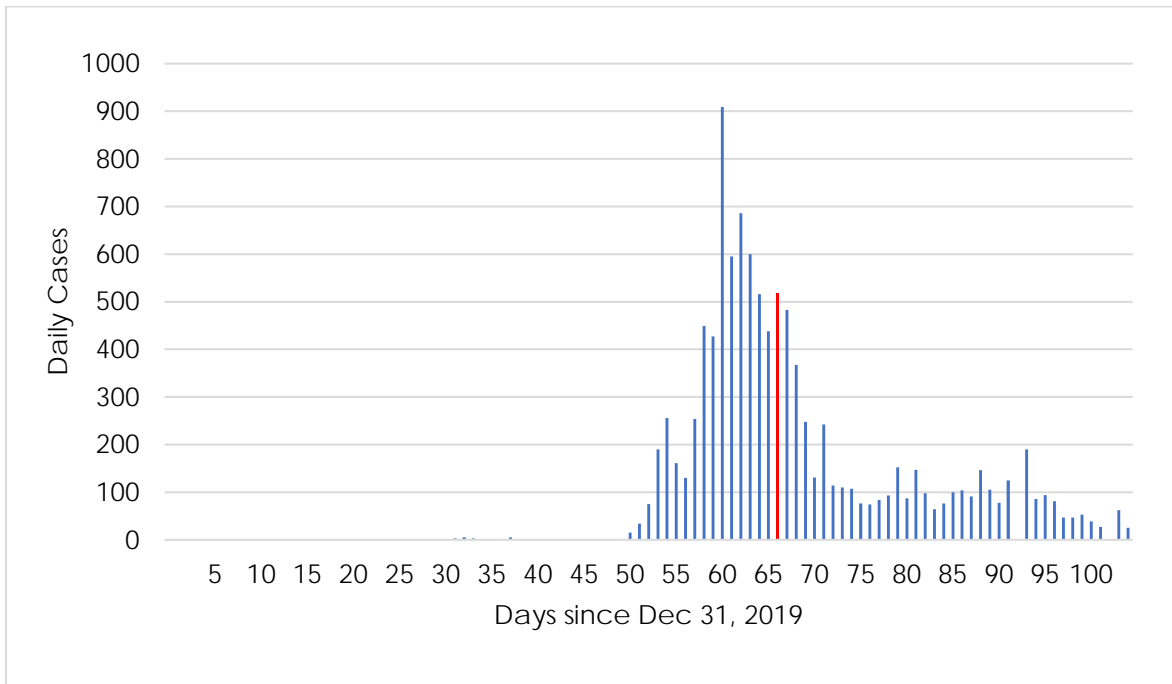


Figure 13: New cases in Iceland

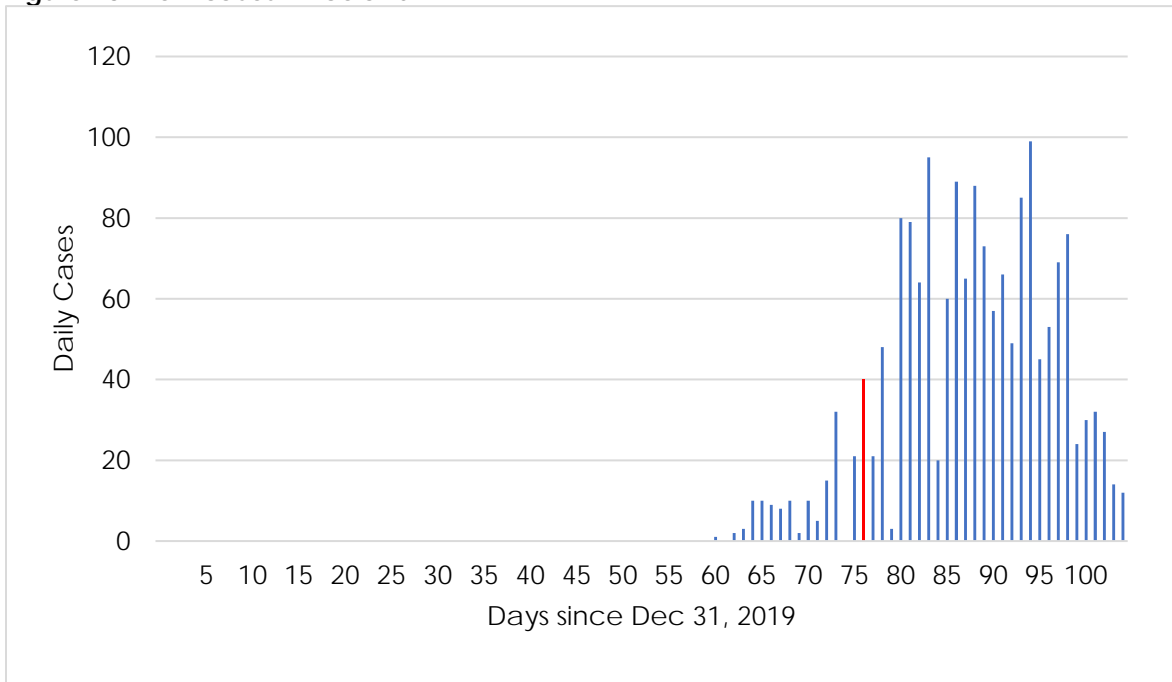


Figure 14: New cases in Germany

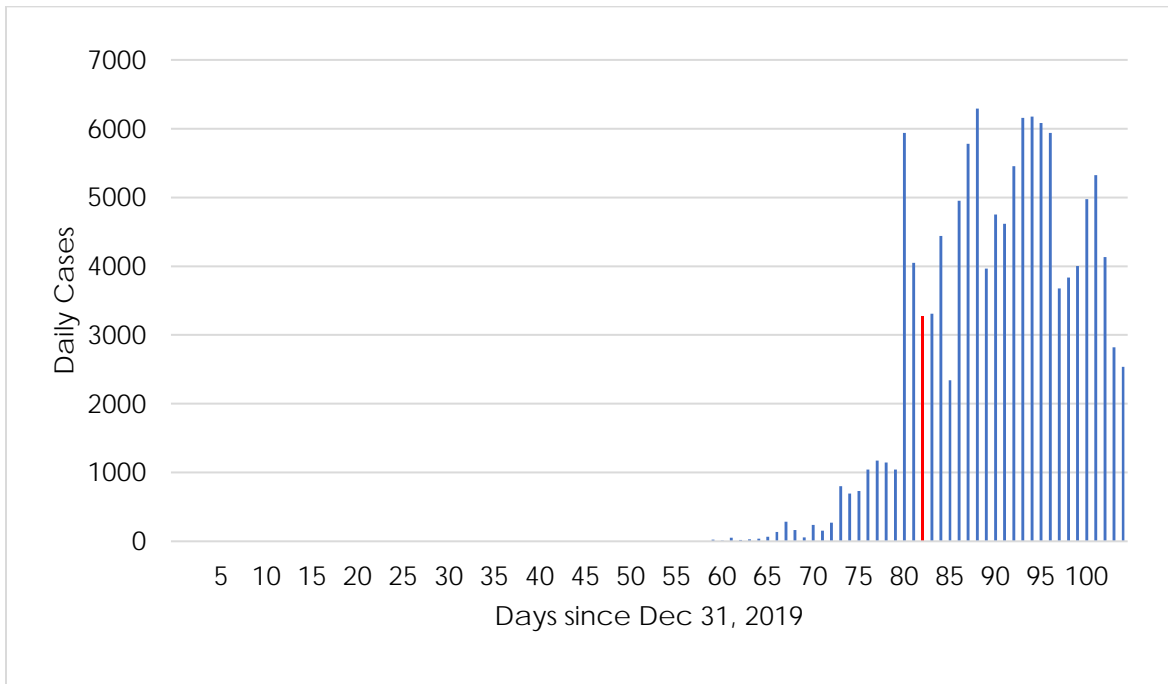


Figure 15: New cases in Denmark

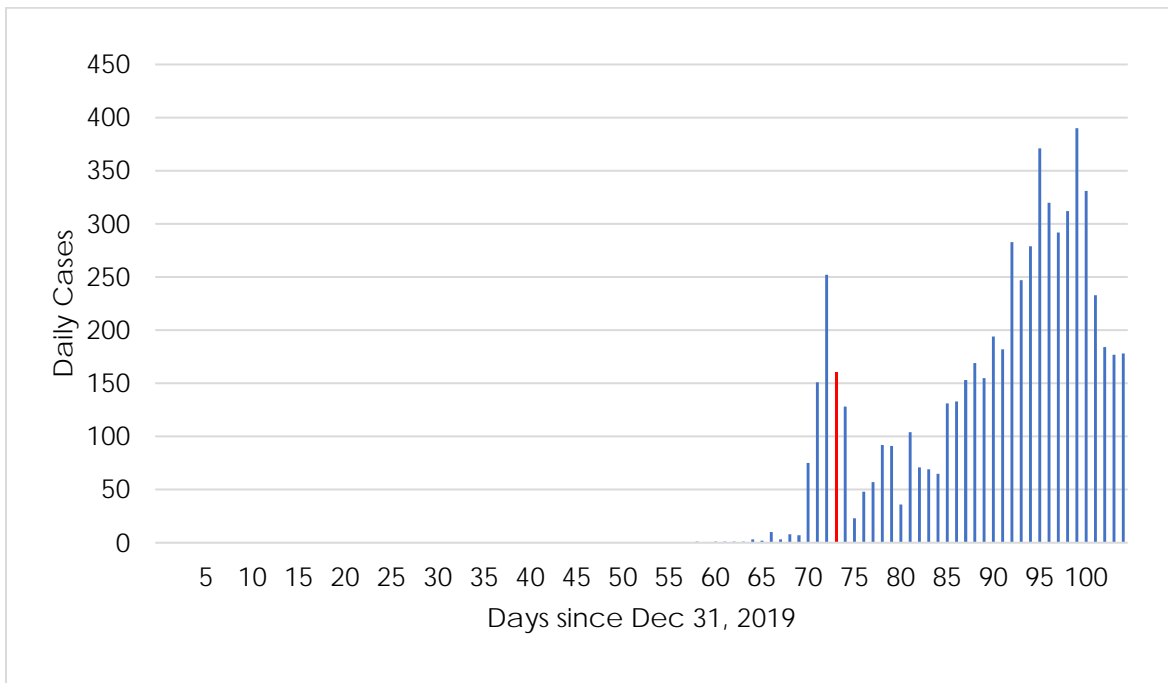
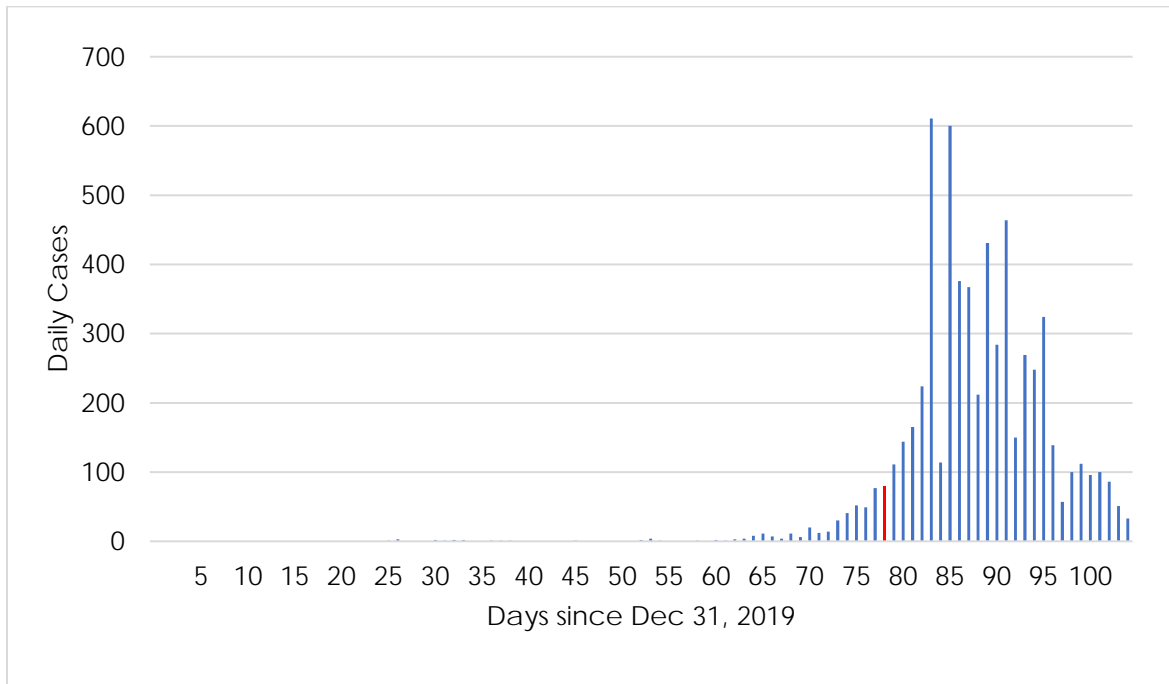


Figure 16: New cases in Australia



¹ <https://www.canada.ca/content/dam/phac-aspc/documents/services/diseases/2019-novel-coronavirus-infection/surv-covid19-epi-update-2020-04-13-eng.pdf>