COVID-19 in Canada: Modelling Update

April 28, 2020

Data and modelling are guiding Canada's response to COVID-19

- Earlier this month, we shared with Canadians information from our modelling work on COVID-19

- This presentation aims to provide an update on that important work

- The data continue to reinforce the critical message that the measures we are taking now remain essential to controlling Canada's COVID-19 epidemic:

  > physical (social) distancing,

  > detection and isolation of cases,

  > tracing and quarantine of contacts, and

 > preventing importation of infection from other countries.

Reminder of our strategy for this phase of the epidemic: Control epidemic, increase health care system capacity

Control the epidemic

Measures to reduce the number of people a person infects to < 1 to end onward transmission (e.g., physical distancing, travel restrictions, self isolation)
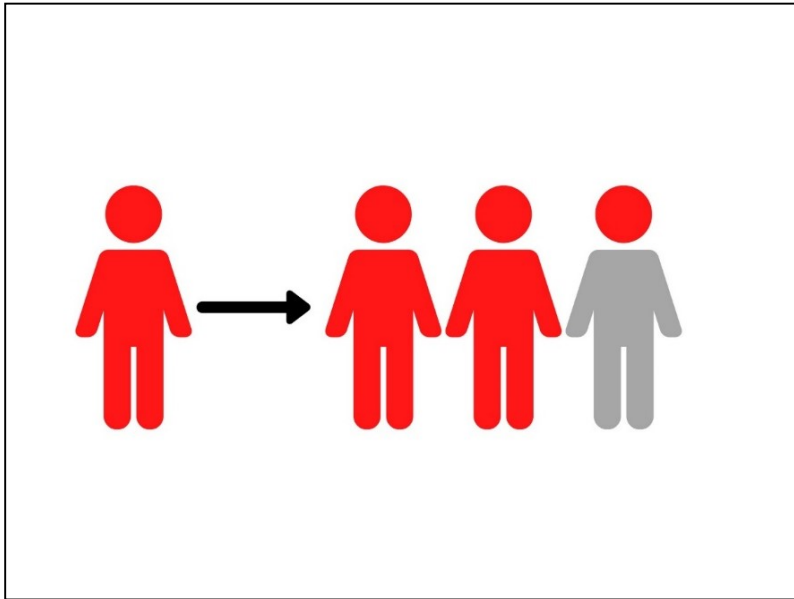
Increase health care capacity

Measures to increase the health care hard assets (e.g., ventilators) and health human resources
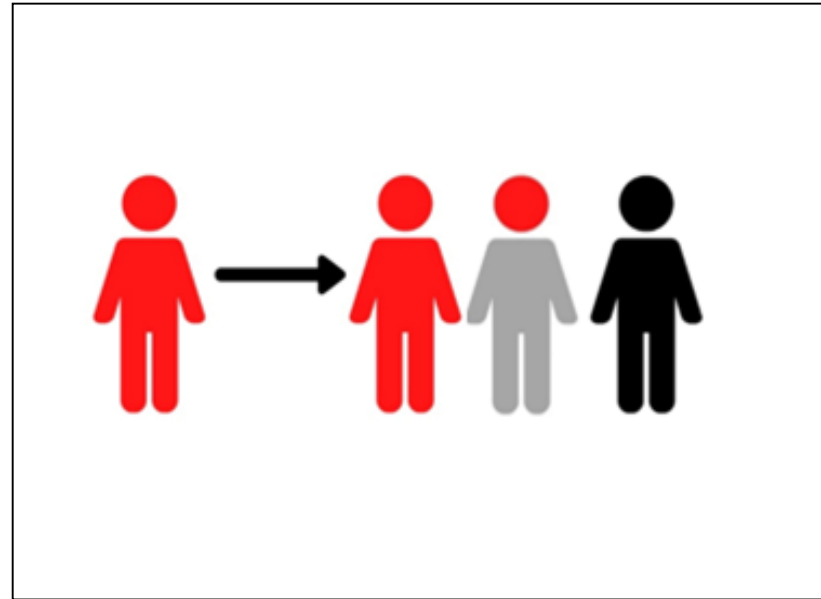

Number of new cases

Health Care System Capacity

Time
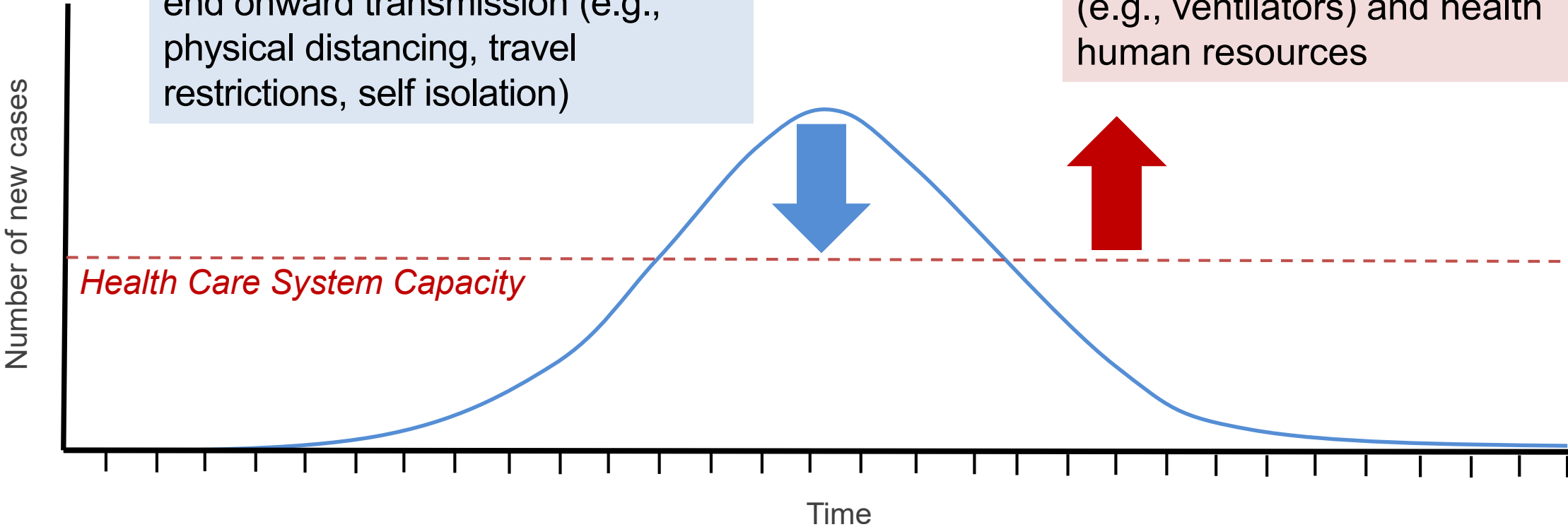
If each person infects fewer than one person on average, the epidemic dies out
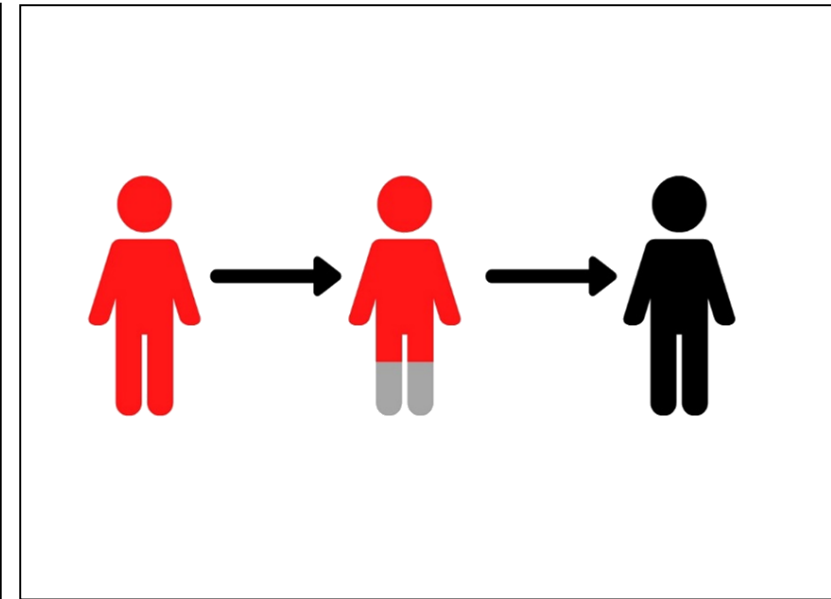
Where we've been → **Where we are now** → **Where we want to be**

Prior to stronger public health measures, each infected person (case) in Canada infected 2.19 other people on average

Today, **stronger controls including physical distancing** and **self-isolation** are helping to reduce the average number of people each case infects to just above 1
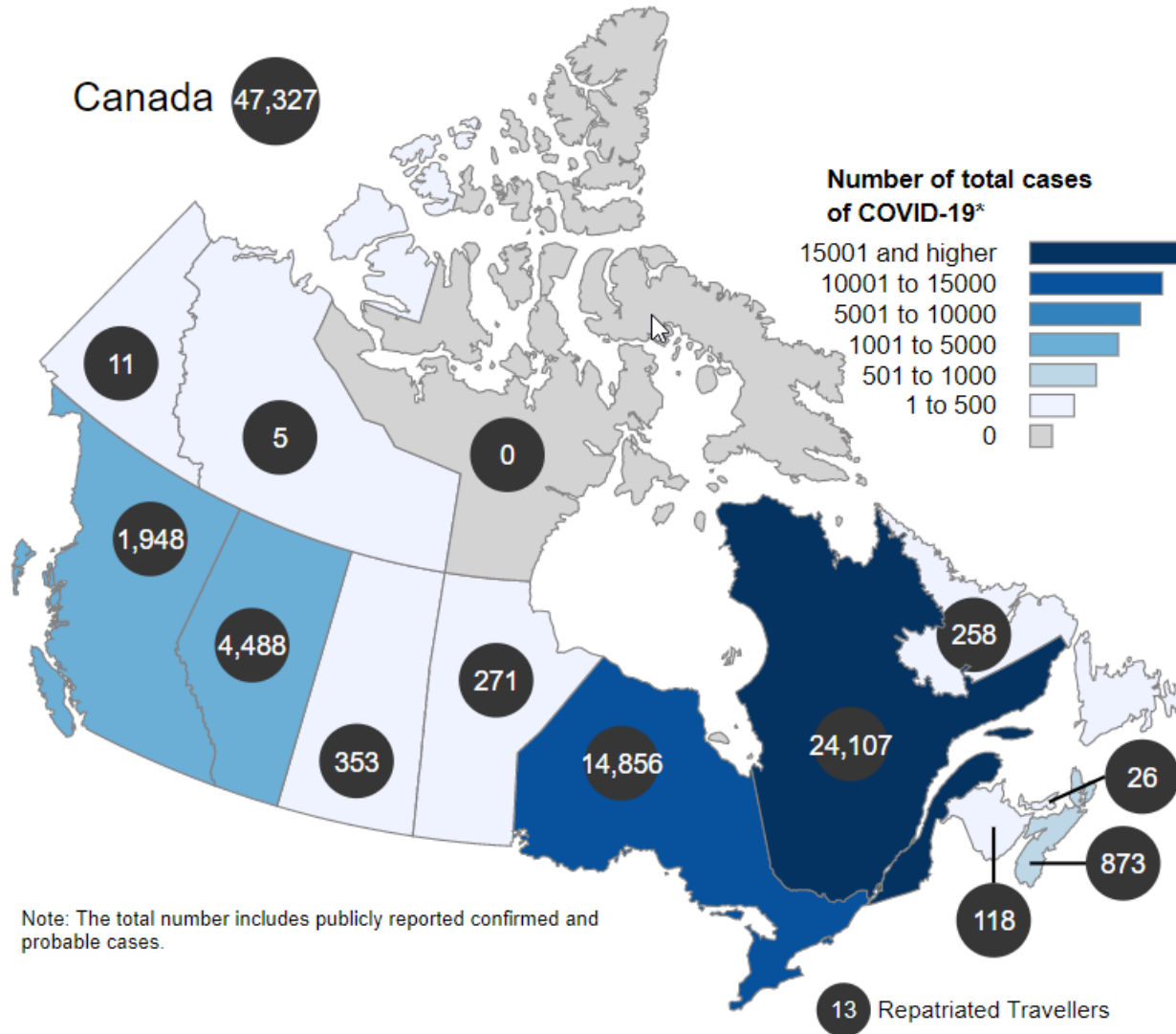
Goal: Each person infects fewer than one person on average; epidemic dies out

Epidemiology

THE PANDEMIC IN CANADA TODAY

National overview, by province/territory, age and gender

Number of total cases of COVID-19*

Range	
15001 and higher	
10001 to 15000	
5001 to 10000	
1001 to 5000	
501 to 1000	
1 to 500	
0	

Canada 47,327

11
5
0
1,948
4,488
271
353
14,856
24,107
258
26
873
118
13 Repatriated Travellers

Note: The total number includes publicly reported confirmed and probable cases.

Data as of April 27, 2020: 11:00
Source: Provincial and Territorial websites

Median age	52 years (<1 to 111)
Females	55%
Males	45%
Other gender	<1%

Age and gender available for 26,650 and 26,650 cases, respectively

Deaths	2,617 (5.5%)
Hospitalisations	2,795 (17.1%)*
ICU Admissions	692 (4.2%)*

*Of 16,348 detailed case reports for which hospitalization status was available

Older Canadians and males are at greater risk of severe outcomes

- **Individuals aged ≥ 60 years comprise:**
  - 1,018 (95%) of 1,072 deaths*
  - 1,811 (66%) of 2,747 hospital admissions*
  - 429 (63%) of 679 ICU admissions*

- **2,012 (79%) of 2,561 deaths are linked to** long-term care and seniors' homes (as of April 26)
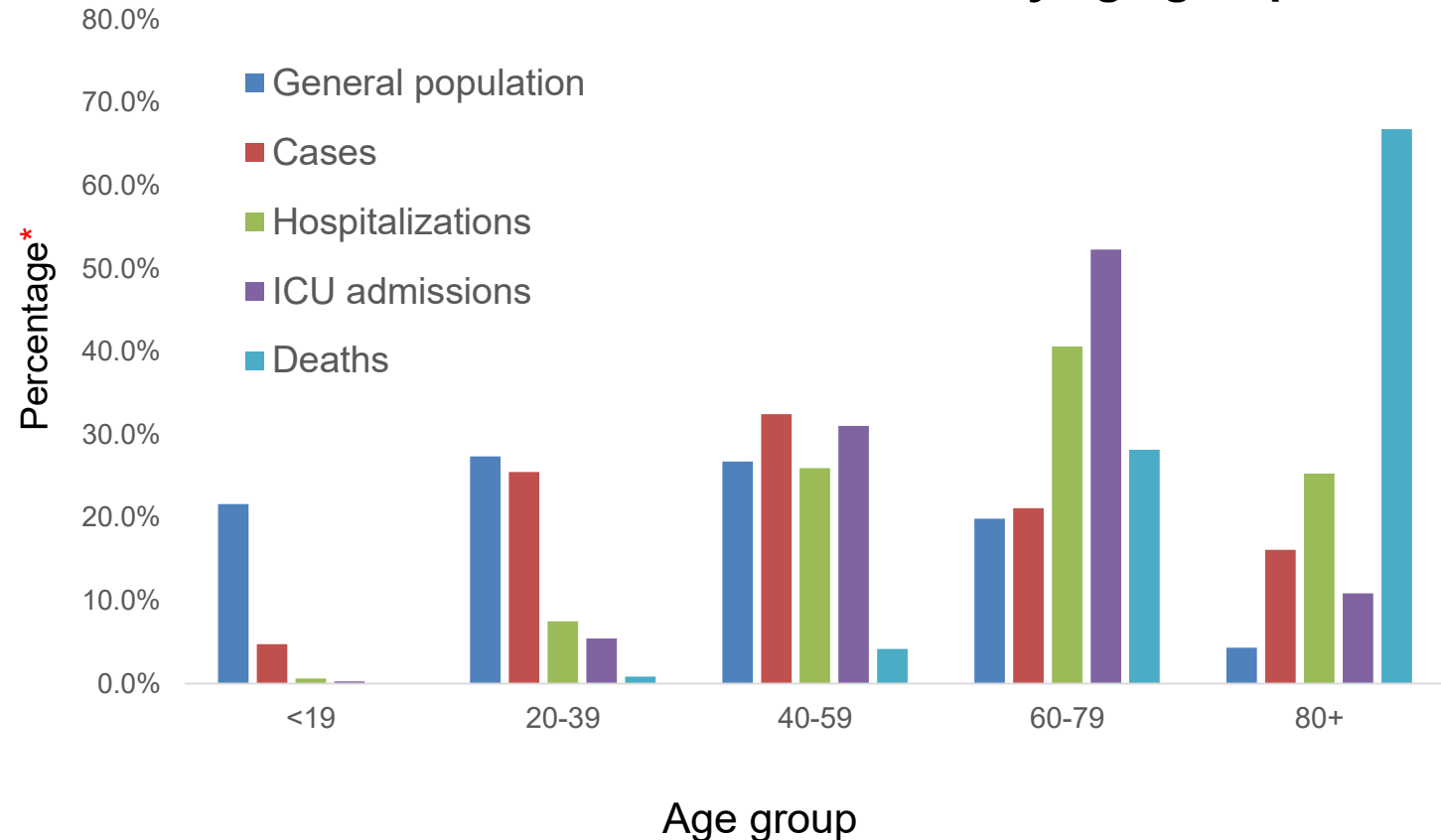
- **Males are more likely to be admitted to hospital**
  - 20% of male vs. 14% of female cases are hospitalised
  - 6% of male vs. 3% of female cases are admitted to the ICU

- **74% of hospitalized cases reported one or more underlying health condition,** but no one is immune to severe outcomes of COVID-19

Data as of April 27, 2020: 15:30

Distribution of COVID-19 cases by age group

Legend:
- General population
- Cases
- Hospitalizations
- ICU admissions
- Deaths

Y-axis: Percentage*
X-axis: Age group (<19, 20-39, 40-59, 60-79, 80+)

*Age information available for 26,340 cases, 2,747 hospitalizations, 679 ICU admissions and 1,072 deaths
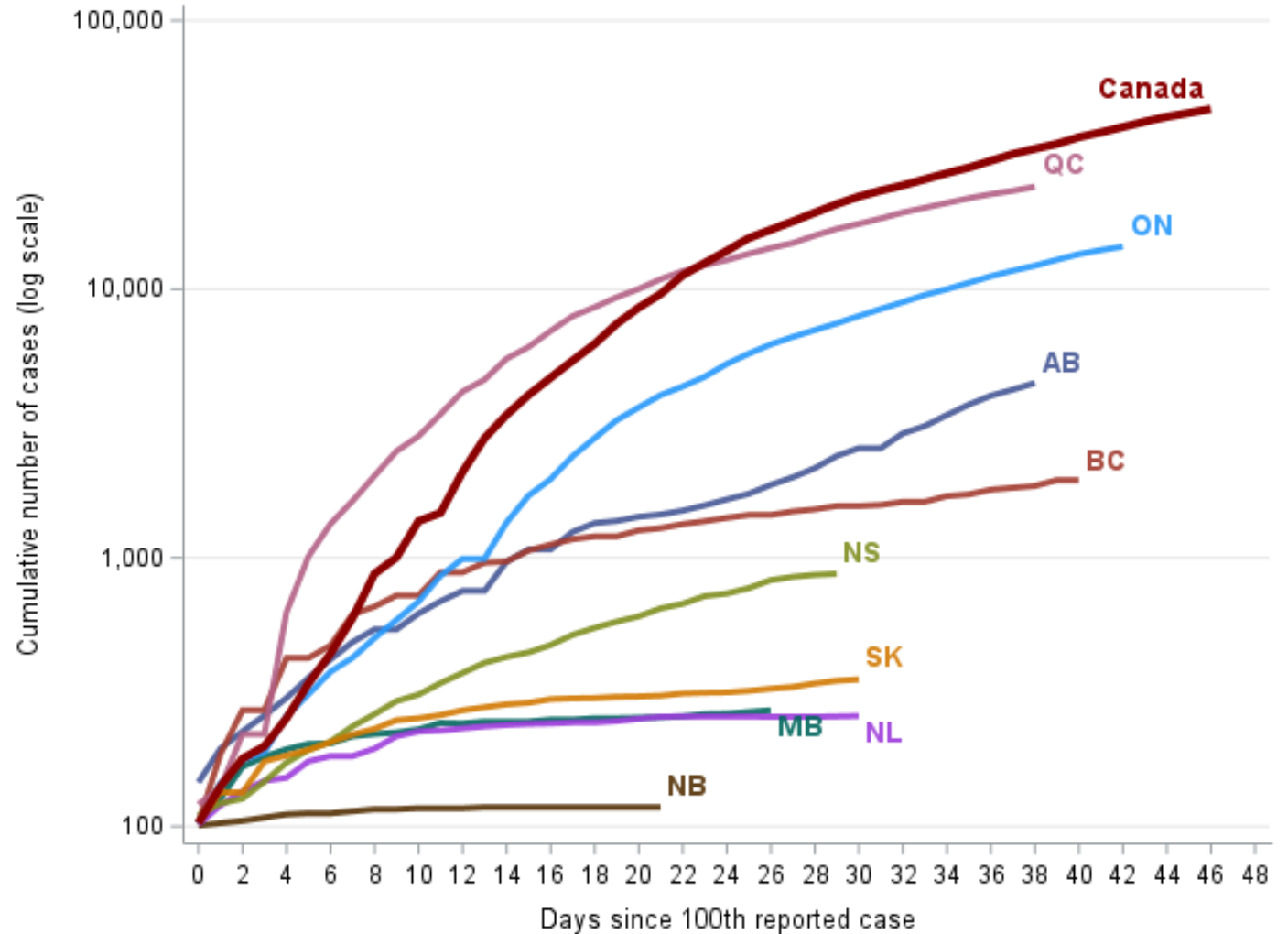
Canada has several regional epidemics

Epidemic growth has levelled off in several provinces

Cases in Quebec, Ontario and Alberta are driving recent national epidemic growth

There is no community transmission occurring in Prince Edward Island, the Northwest Territories or the Yukon

There have been no cases reported to date in Nunavut

Data as of April 27, 2020: 15:30

Driving forces behind regional epidemics

- **Outbreaks in long-term care and seniors' homes** where older medically vulnerable adults reside

    > Driving recent epidemic growth in Quebec, Ontario and Nova Scotia currently

    > Responsible for the majority (79%) of deaths country-wide

- **Outbreaks in other congregate living and work settings** involving vulnerable populations with inadequate space for physical distancing including:

    > Shelters serving people experiencing homelessness in Toronto

    > Correctional facilities in British Columbia, Quebec and Ontario

    > Work settings and associated congregate housing for workers in Alberta and British Columbia

Canada's epidemic growth is slower than many international partners

Comparable countries whose epidemics began earlier were chosen for this comparison.

Growth is declining across most comparison countries shown in the figure, likely due to strong public health and global measures.

Canada's epidemic growth is slowing. Although previously doubling every 3 days early in the epidemic, the **number of cases in Canada is now doubling every 16 days**.

Notes:
• Reported cases are impacted by the number of tests conducted, and changes in testing practices.
• These data are presented on a logarithm scale. Log scales show relative values instead of absolute ones

Data as of April 27, 2020: 15:30
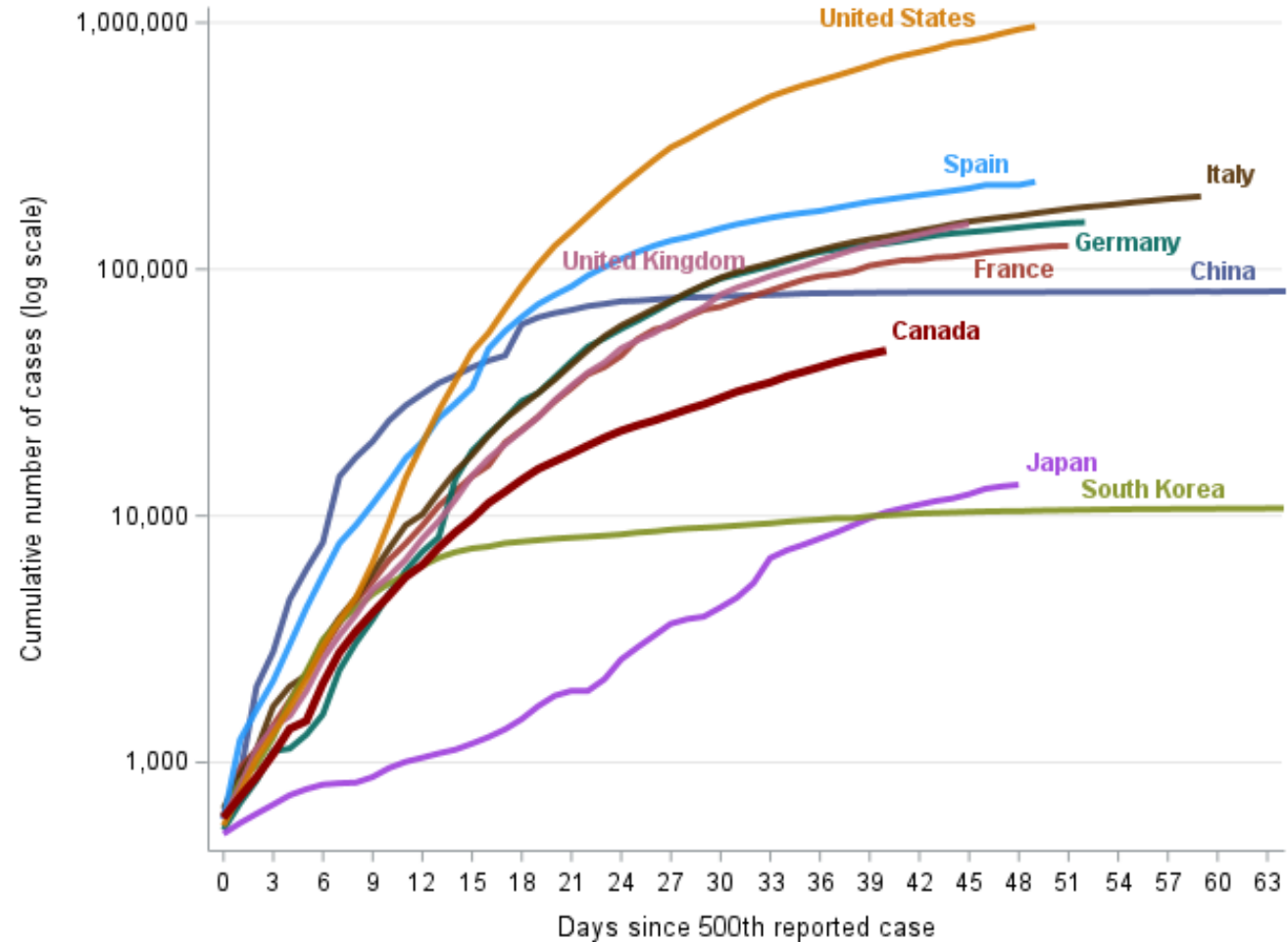
The number of cases in Canada is doubling every 16 days

Looking Forward

MODELLING SCENARIOS

Canada's approach to modelling

- Models cannot predict what will happen, but can help us understand what might happen to ensure we can plan for worst cases and drive public health action to achieve the best possible outcome

- Models can support decisions on public health measures and help the health care sector plan for the number of expected COVID-19 patients

- Reminder – Canada is using two modelling approaches:

  > **Forecasting models** use data to estimate how many new cases we might expect to see in the coming week

  > **Dynamic models** show how the epidemic might unfold over the coming months, using knowledge of how the virus behaves and of the potential impact of public health measures

- Important to recognize that models have inherent limitations (e.g., simulate controlled scenarios, not real world)

Forecasting the short-term epidemic trajectories

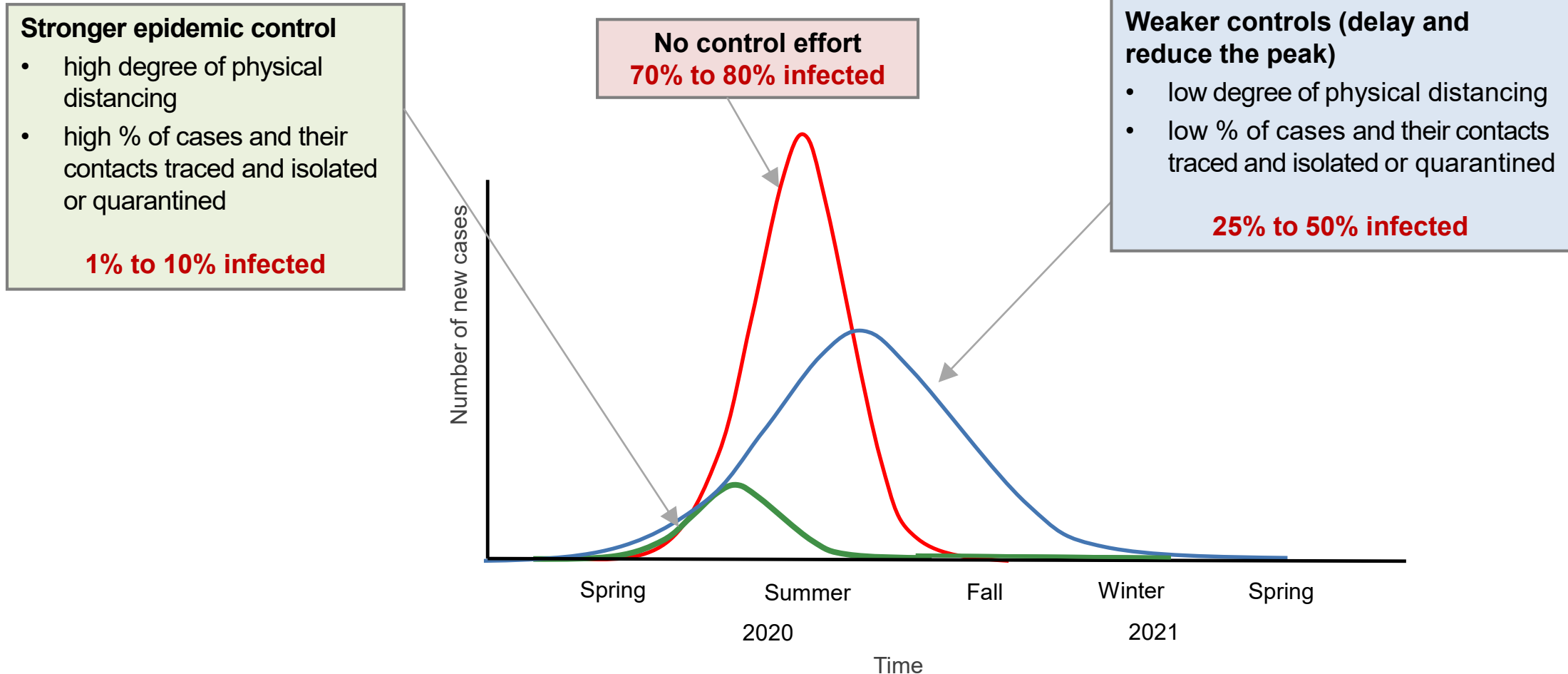## 53,196 to 66,835 cases by May 5
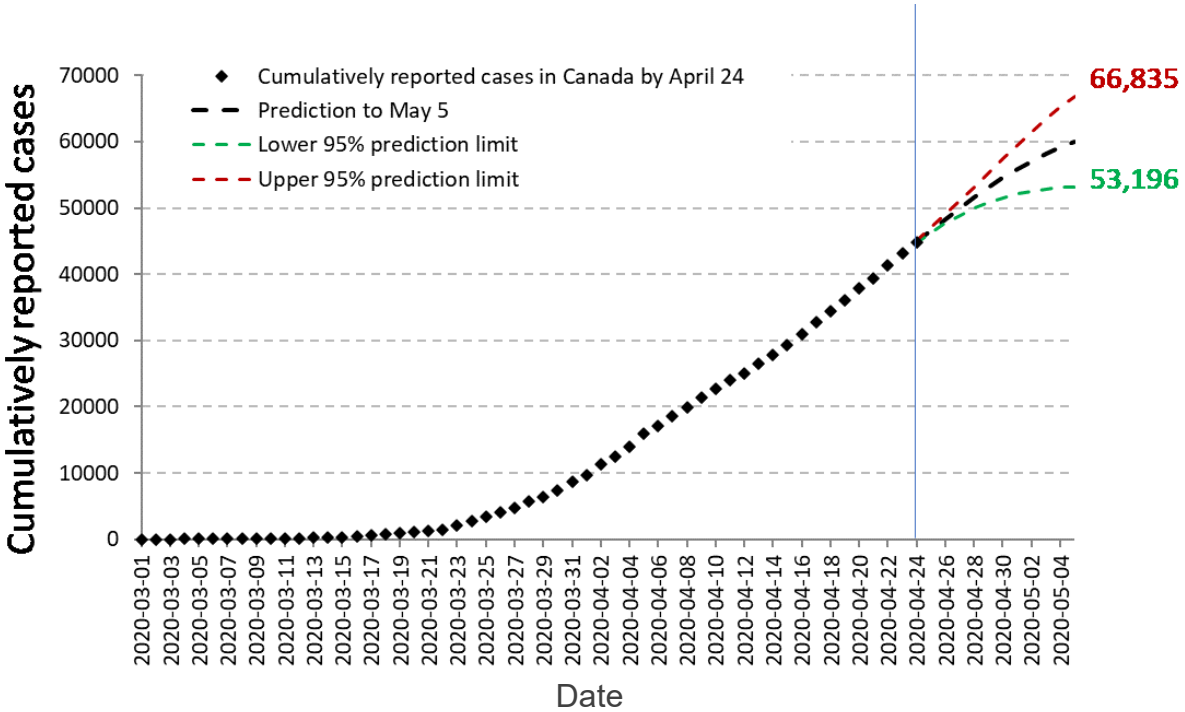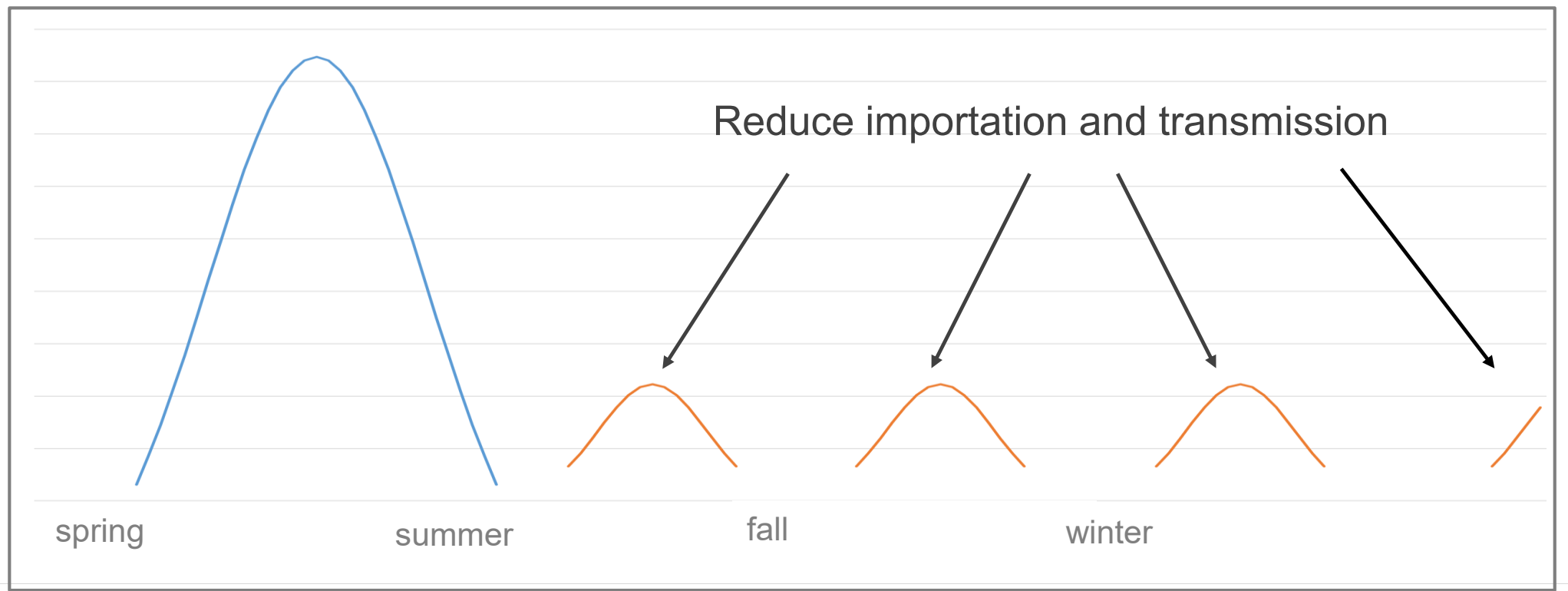
3,277 to 3,883 deaths by May 5
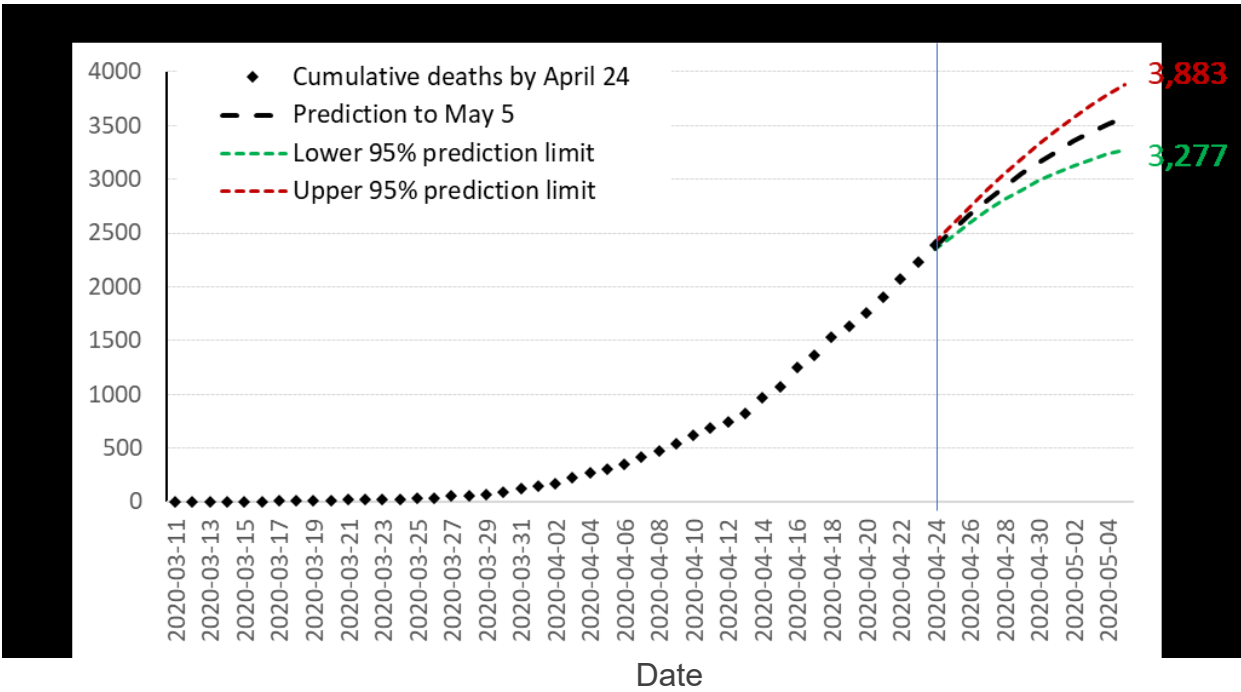
Modelled scenarios show the impact of public health measures

Models help us identify which combinations of public health measures, applied with what intensity, are most likely to reinforce epidemic control

Stronger epidemic control
- high degree of physical distancing
- high % of cases and their contacts traced and isolated or quarantined

1% to 10% infected

No control effort
70% to 80% infected

Weaker controls (delay and reduce the peak)
- low degree of physical distancing
- low % of cases and their contacts traced and isolated or quarantined

25% to 50% infected

Number of new cases

Spring   Summer   Fall   Winter   Spring

2020   2021

Time

Our ambition: Early and rapid epidemic control

Reduce importation and transmission

spring summer fall winter

With early epidemic control, responses to outbreaks will likely continue to be required over time

Summary

- We continue to monitor the situation closely, and will evaluate, learn, and adapt as we go.

- Canada is making progress to slow the spread and bring the epidemic under control, thanks to the commitment of Canadians, who are following public health advice to protect themselves and others.

- **It is critically important that we maintain our current public health measures** until we have achieved epidemic control for the first wave.

- Relaxing controls too quickly could squander our collective efforts to date and put us at risk of future epidemic waves.

What we do together now to stop the spread of the virus will determine the overall impact of COVID-19 on the health of all Canadians

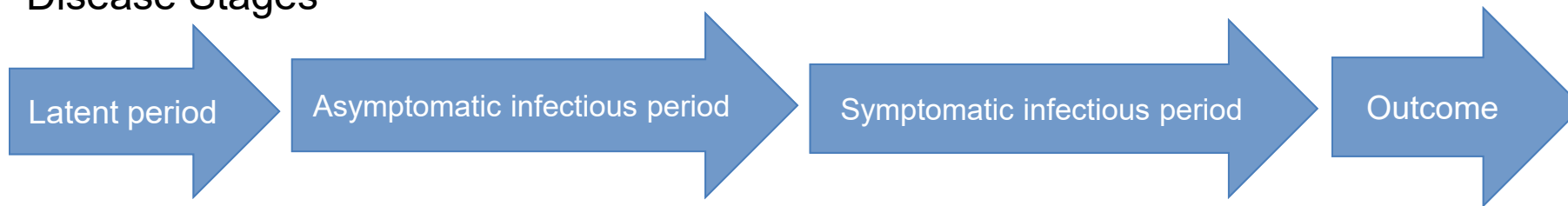# ANNEX

Dynamic models of scenarios

Model moves people through different states of infection. All start out as susceptible.

Individuals are then exposed. They either become infected, or remain susceptible.

Disease Stages

| Latent period | Asymptomatic infectious period | Symptomatic infectious period | Outcome |

The duration of each stage has an impact on the speed of spread of the disease. The models are run with different values for these periods.

Mitigating factors

Model includes factors that reduce transmission, with different scenarios for different levels of public health measures possible. Hospitalization in the models is also assumed to include no further transmission.

Exacerbating factors

Model includes factors that increase transmission, i.e., the movement of infectious (symptomatic / asymptomatic) people, where contacts take place (e.g., school, work, etc.).
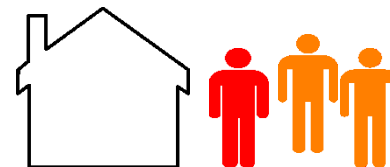
Modelled scenarios—varied public health measures

- A series of models were used to generate a number of scenarios including three key scenarios: 'no control', 'weaker controls (delay and reduce the peak)', and 'stronger epidemic control'. This lets us estimate the range of the population infected and the potential duration of the epidemic.

- Other interventions, such as border controls and domestic travel restrictions, have also been explored in modelling studies

- We continue to use models on an ongoing basis to help us identify which combinations of public health measures, applied with what intensity, are most likely to reinforce epidemic control

Stronger epidemic control models include:

- A high degree of physical distancing

- A high proportion of cases identified and isolated

- A high proportion of contacts traced and quarantined

Weaker control models include:

- A low degree of physical distancing

- A low proportion of cases identified and isolated

- A low proportion of contacts traced and quarantined

Cumulative deaths under different scenarios over the course of pandemic
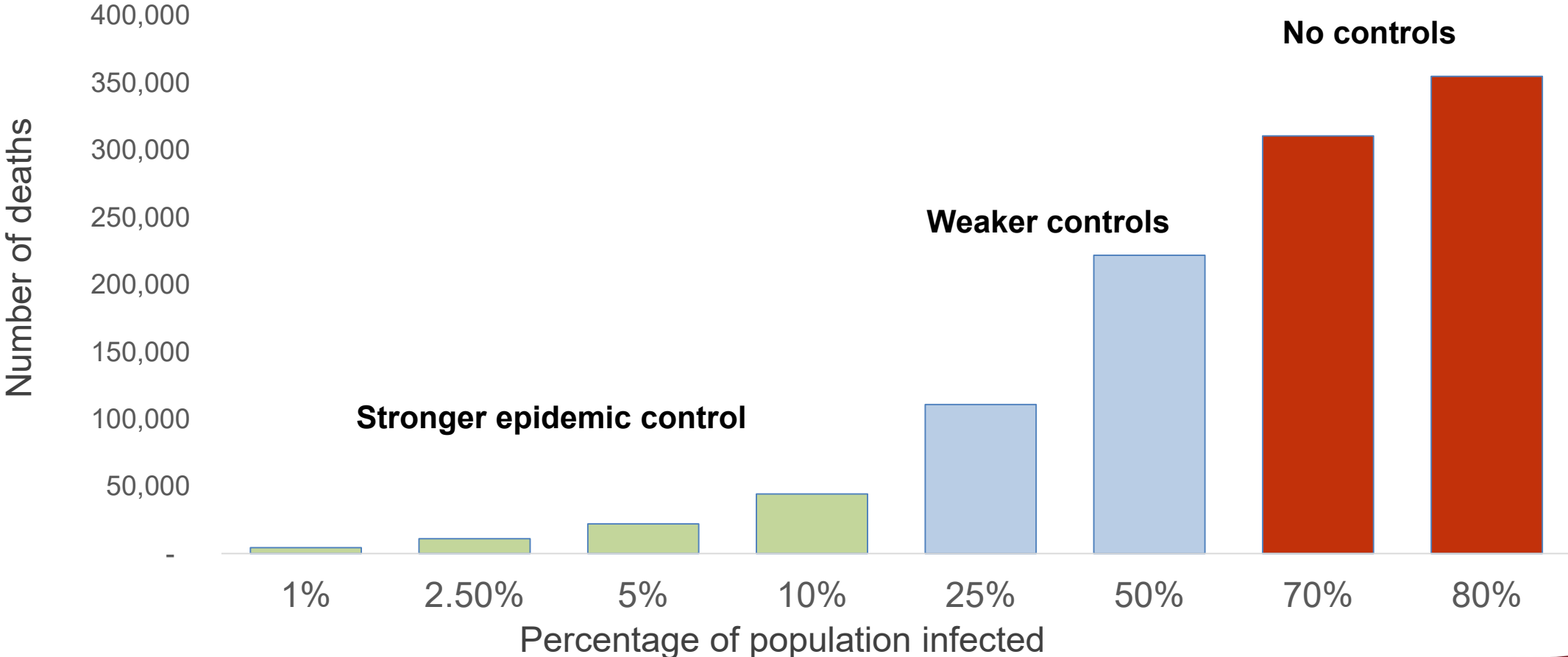
Scenarios show a range of impact for Canada over the course of the pandemic

	Overall % of the population infected							
	1%	**2.5%**	**5%**	**10%**	**25%**	**50%**	**70%**	**80%**
All cases	376,000	940,000	1,879,000	3,759,000	9,397,000	18,795,000	26,312,000	30,071,000
Hospitalized	29,000	73,000	146,000	292,000	730,000	1,461,000	2,045,000	2,337,000
ICU	9,000	23,000	46,000	92,000	229,000	459,000	642,000	734,000
Deaths	4,000	11,000	22,000	44,000	111,000	222,000	311,000	355,000
	Stronger epidemic controls				**Weaker controls**		**No controls**	

- Estimates are based on different attack rates obtained in model simulations with different levels of public health measures

- Assumptions: 7.8% of all cases are hospitalised; 2.4% of cases require ICU care; and 1.2% of all cases die (based on Imperial College London estimates of age-related variations in severity)

- Deaths for 25% to 80% scenarios are underestimates because the case fatality rate (proportion of cases who will die) is likely to rise as health care capacity is exceeded