

# COVID-19 : Critical Care and Acute Care Hospitalization Modelling

March 27, 2020

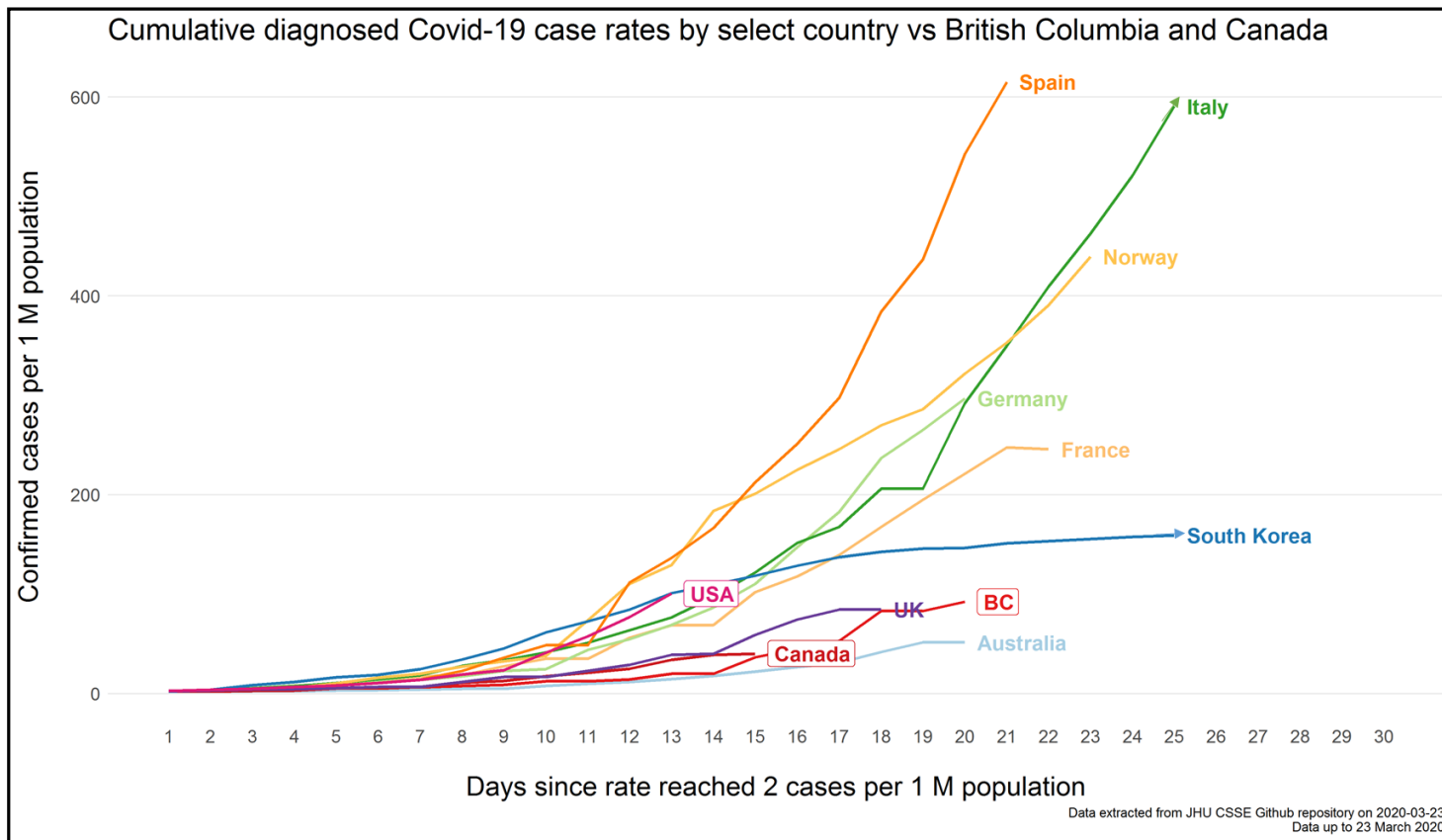


# What do we know?

What we know about other populations around the globe? And how does this compare to what is happening in B.C.?

- The BCCDC continues to track and model the global, Canada and B.C. case rates on an ongoing basis.
- B.C.'s rate of growth is being positively impacted by the public health measures adopted over the past few weeks.

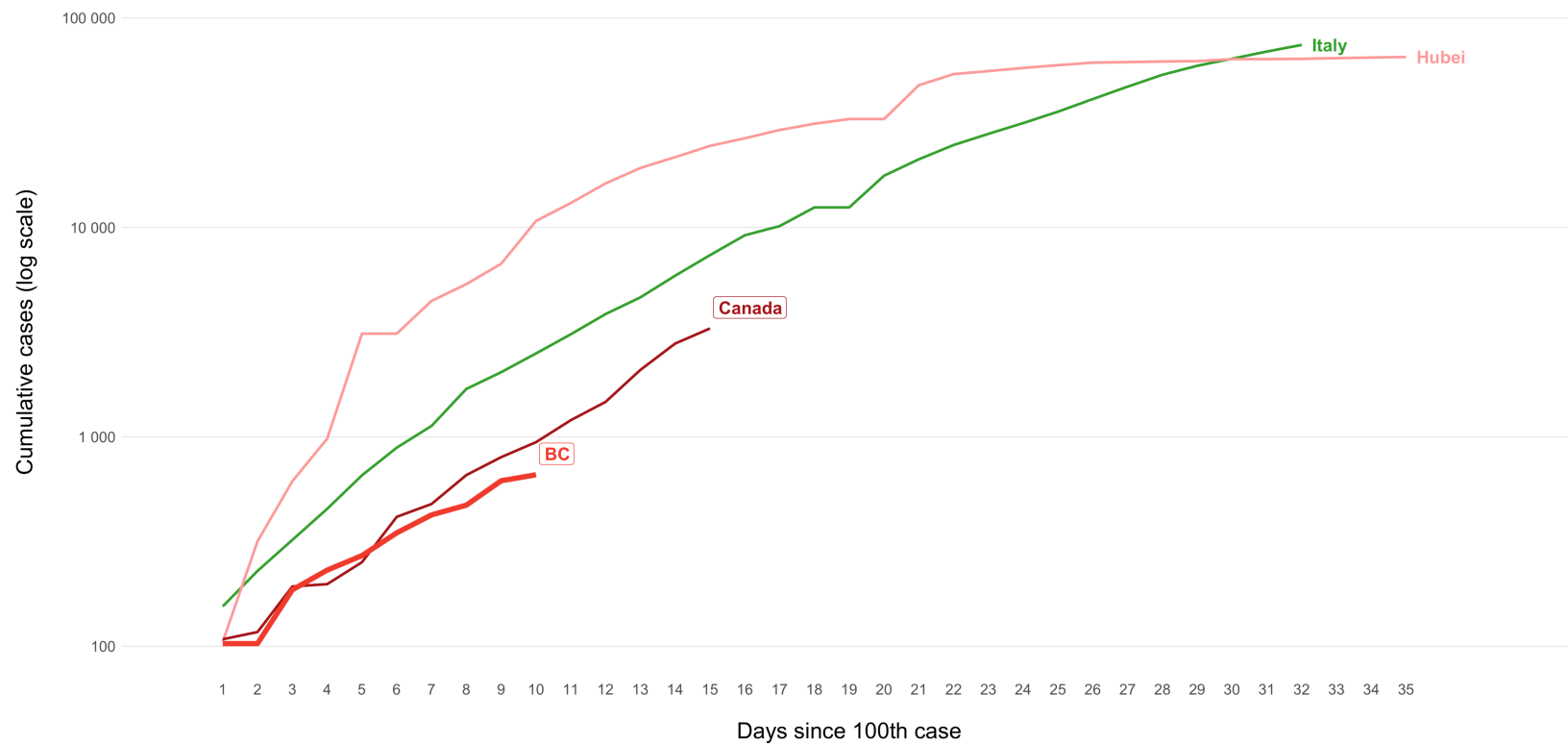
# COVID-19 Case Rate Comparison



Note: As per March 23, 2020. This represents cumulative/total cases; not new/incident cases per day.

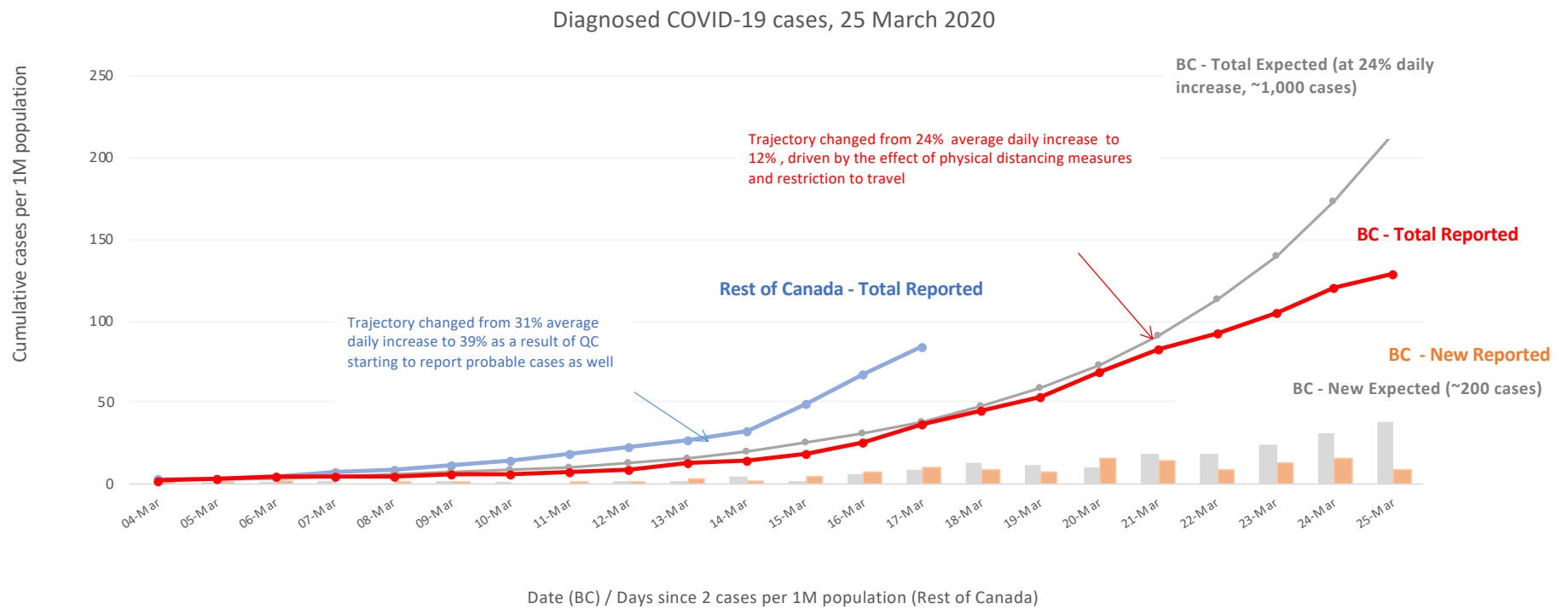
# COVID-19 Case Rate Comparison

Cumulative diagnosed Covid-19 cases by select country vs British Columbia and Canada



Data extracted from JHU CSSE Github repository on 2020-03-26  
Officially reported numbers used for BC Mar 21 and 25

# COVID-19 Cases in B.C.



Rates on 25 March: Total reported = 130 cases per 1M population; Expected = 215.

# Conclusions on Expected Rates of Growth

- There is some and growing evidence that public health measures being taken in B.C. are having the desired impact on transmission rates taking us below expected rates of growth.
- Notwithstanding for planning purposes, there is value in planning our response based on higher rates from reference jurisdictions of Hubei and Northern Italy (cases and hospitalization).

# B.C.'s Capacity to Meet Demand

A Provincial Critical Care Working Group of over 20 medical directors, executive leads and clinical specialists responsible for ICUs and high acuity units along with an Epidemic Modelling team from BCCDC and an Operational Capacity Modelling team from has assessed our capacity as a province against four scenarios: South Korea; Hubei, Northern Italy (cases and hospitalizations).

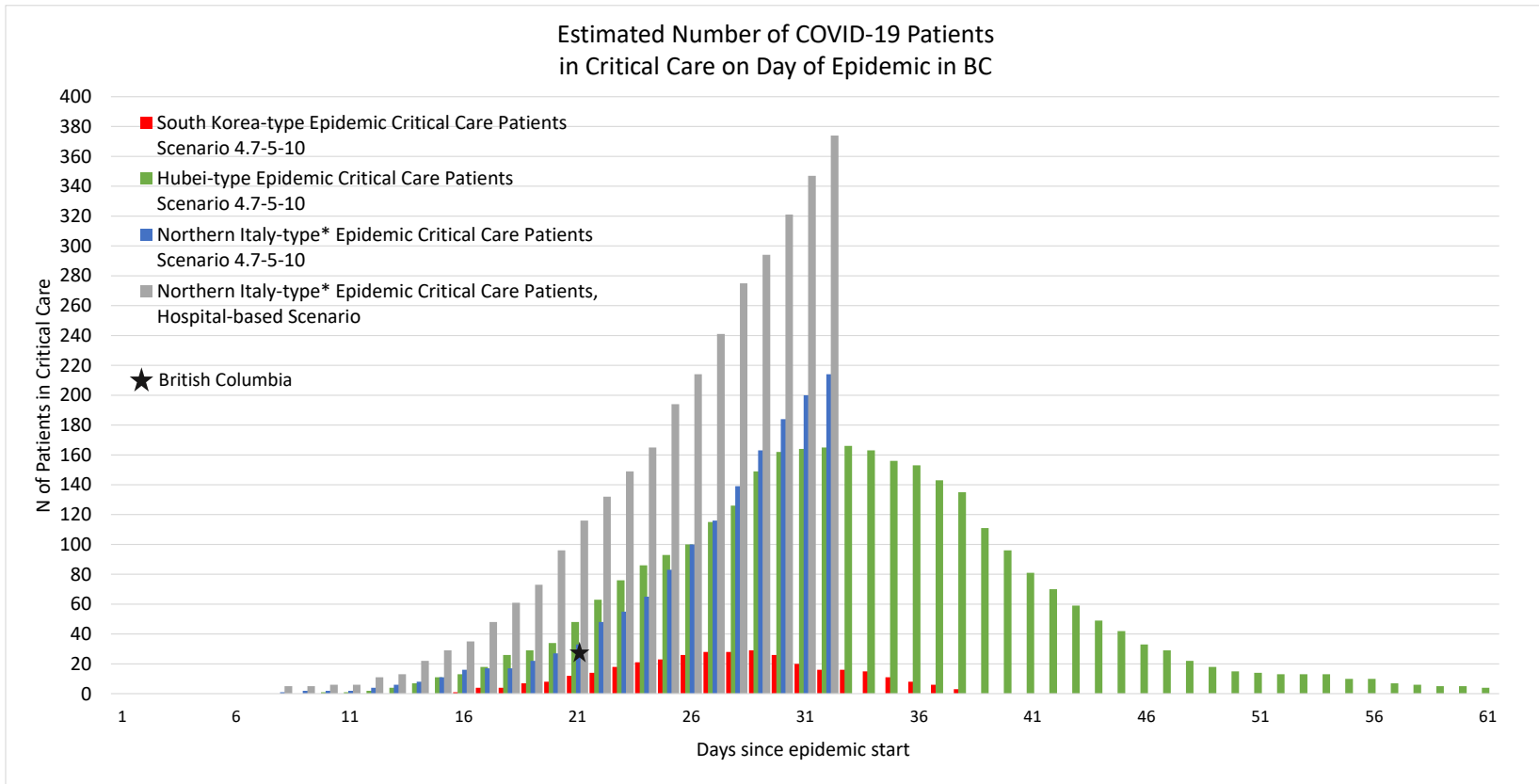
Made this assessment available today through technical briefing to the media and on line

The assessment has had two areas of focus:

First, focus on current capacity with respect to critical care spaces/capacity and current capacity with respect to ventilators for critically ill patients.

Second, focus on current hospital bed capacity for less acute patients requiring hospital care.

# Critical Care Estimates by Day of Epidemic + Underlying Epidemic Type



Scenario 4.7-5-10 assumes that 4.7% of all COVID-19 cases will be admitted to critical care.

Critical care admissions will commence 5 days (range 4-7 days) after symptom onset; ALOS in Critical Care will be 10 days (range 7-14 days).

Note: Italian epidemic in progress and did not reach the peak.



# B.C.'s Ventilator Capacity

## Inventory of Adult Mechanical Critical Care Ventilators by Health Authority

Data Source: HEMBC (March 5, 2020); Provincial Ventilator and ECMO Inventory For the COVID-19 Surge Capacity Working Group

HA	Current Inventory of Critical Care Vents		
	Adult critical care vents	Less Small Hospital Vents (assume they stay in place for Non-COVID 19 use)	Remaining Vent Inventory at Large Hospitals
IH	77	25	52
VIHA	84	27	57
NH	16	7	9
VCH/PHC	150	25	125
FH	130	25	105
<b>Total for adults:</b>	<b>457</b>	<b>109</b>	<b>348</b>

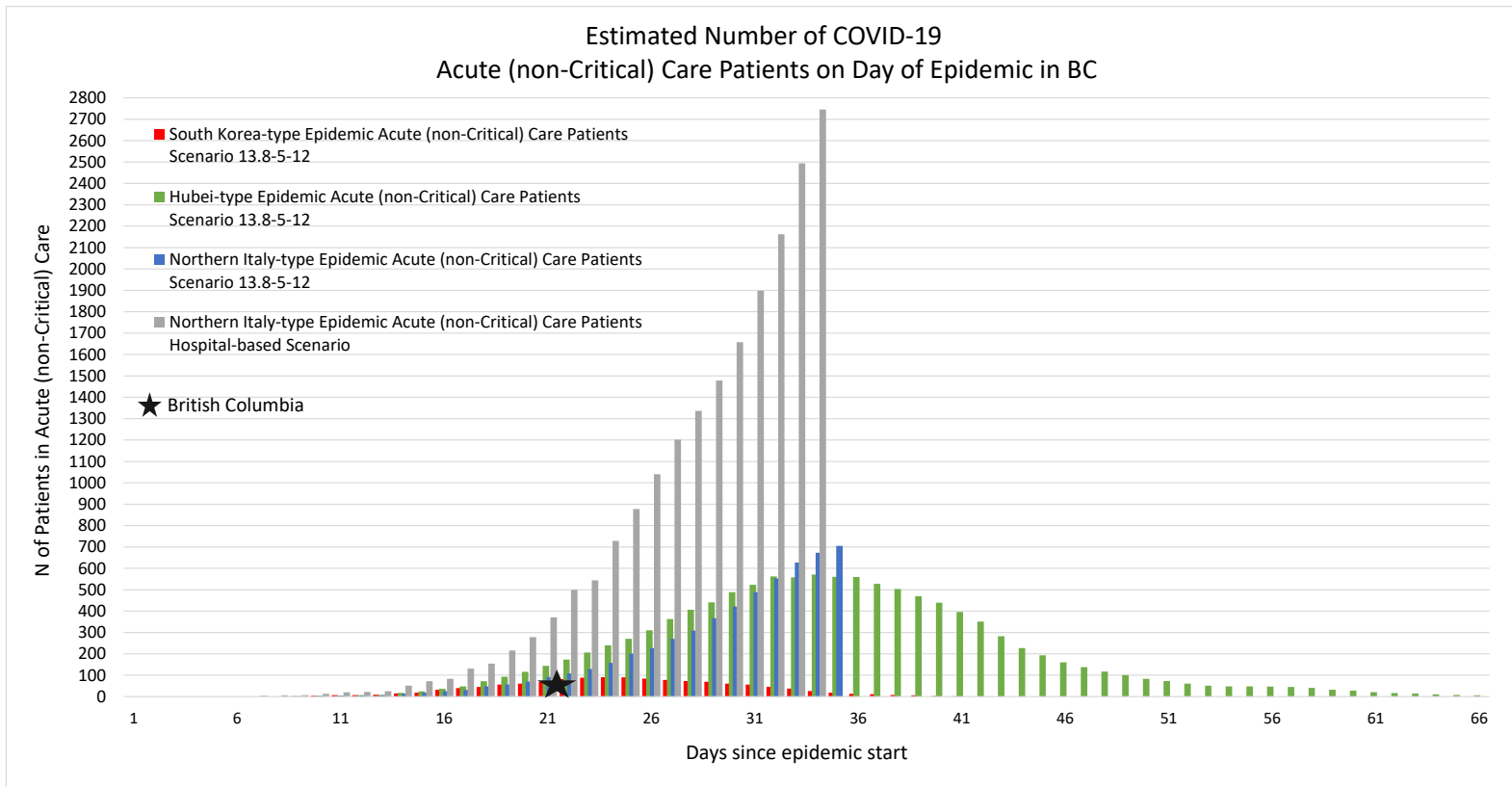
### Important to note:

- This is using adult critical care ventilator units and not spaces capable of providing ventilator care and this does not include transport, neonatal or other non-critical care ventilators. When all available ventilators are included, B.C. has more than 1200.
- An additional 120 ventilators have been ordered since this inventory was completed on March 5, 2020. As of March 24, 15 additional adult critical vents have arrived, with an additional 29 expected early next week. Also, additional critical care ventilators have been identified for loan and for refurbishment – 38 are now ready to be deployed with 19 in progress as of March 26.
- Ventilators at BC Children's include models that could be used for adults but for planning purposes are being held for children/youth.

# Conclusions on ICU and Ventilator Capacity

- Using the likely scenario of below or at a Hubei epidemic level using ICU and high acuity unit bed capacity along with vent capacity, looks reasonable focused on using the 17 primary Covid-19 care sites.
- If B.C. was to move to a Northern Italy trajectory, B.C. would have to use all sites to meet bed demand and implement increased transportation of patients between sites.

# Acute Care Estimates by Day of Epidemic + Underlying Epidemic Type



Scenario 13.8-5-12 assumes that 13.8% of all COVID-19 cases will be admitted to hospital (non-critical care); hospital admissions will commence 5 days (range 2-7 days) after case identification; ALOS in hospital (non-critical care) will be 12 days (range 9-15 days).

Note: Italian epidemic in progress and did not reach the peak.

# Conclusions on Inpatient Acute Care Capacity

- Using the likely scenario of below or at a Hubei epidemic level using inpatient medical and surgical beds, capacity looks good focused on using all sites.
  - ▶ This has been enabled in large part by the decision to defer scheduled surgeries, which opened up significant surge capacity across hospitals in B.C. over the past week.
- If B.C. was to move to an Northern Italy “hospitalized” trajectory, B.C. would use all sites and bed capacity off-site from hospitals for less acute medical and surgical inpatients to open up additional capacity for Covid-19 patients in hospitals with ready access to critical care.

# 1. Critical Care Demand Against Capacity

## Summary of Additional Bed Capacity and Surplus/Deficit for Critical Care Patients, Four Scenarios

		Additional Bed Capacity Required for Modelled COVID-19 Critical Care Patients at Peak*			
		South Korea-type Epidemic, Scenario 13.8-5-12	Hubei-type Epidemic, Scenario 4.7-5-10	Northern Italy-type Epidemic (Case-based), Scenario 4.7-5-10	Northern Italy-type Epidemic (Hospital-based)
Modelled COVID-19 Critical Care Patients at Peak*		29	166	215	374
Non-COVID ICU Patients Current Average Daily Census of Primary COVID Sites <sup>1</sup>		173	173	173	173
Total ICU Patients at Peak*		202	339	388	547
Potential Capacity	Number of Beds	Demand vs. Potential Capacity			
ICU Primary COVID Sites <sup>2</sup>	206	4 ▲	-133 ◆	-182 ◆	-341 ◆
AND 50% HAU <sup>2</sup>	263	61 ●	-76 ◆	-125 ◆	-284 ◆
AND 85% CCU/CSICU/PARR Primary COVID Sites <sup>3</sup>	418	216 ●	79 ●	30 ▲	-129 ◆
AND 50% OR Primary COVID Sites AND 50% All Sites ICUs <sup>3</sup>	666	464 ●	327 ●	278 ●	119 ●

\*Northern Italian epidemic is in progress, peak unknown.

1. Data extracted: Feb 1st to Mar 10th, 2020 ICU data only, primary COVID sites.

2. New Critical Care capacity bed numbers provided by provincial Critical Care Working Group (March 23, 2020).

3. For purposes of modelling available capacity has been estimated as 50% of HAU, 85% of CSICU, CCU, PARR (through cancellations of elective surgeries), and 50% of remaining capacity (ORs and ICU of non-Primary-COVID sites)

## 2. Acute Inpatient Care Demand Against Capacity

### Summary of Additional Bed Capacity and Surplus/Deficit for Acute Care Patients, Four Scenarios

		Additional Bed Capacity Required for Modelled COVID-19 Acute (non-Critical) Care Patients at Peak*			
		South Korea-type Epidemic, Scenario 13.8-5-12	Hubei-type Epidemic, Scenario 13.8-5-12	Northern Italy-type Epidemic (Case-based), Scenario 13.8-5-12	Northern Italy-type Epidemic (Hospital-based)
Modelled COVID-19 Acute Care Patients at Peak*		90	571	704	2,746
Non-COVID Acute Care Patients Current Average Daily Census of Med/Surg, All Sites <sup>1</sup>		4,642	4,642	4,642	4,642
Total Acute Care Patients at Peak*		4,732	5,213	5,346	7,388
Potential Capacity (All Sites)	Number of Beds	Demand vs. Potential Capacity			
Med/Surg Funded <sup>2</sup>	5,610	878 ●	397 ▲	264 ▲	-1,778 ◆
AND 100% Unfunded Med/Surg AND 40% Funded Med/Surg Other <sup>3</sup>	6,944	2,212 ●	1,731 ●	1,598 ●	-444 ◆
AND Off Site/Community-based (Additional 500 Beds)	7,444	2,712 ●	2,231 ●	2,098 ●	56 ▲

\*Northern Italian epidemic is in progress, peak unknown.

1. Census data was extracted on or after midnight of March 23, 2020 and may reflect a small percentage of COVID patients occupying inpatient non-critical care beds. As well, noted that reductions in elective admissions already underway. Other med/surg (e.g., paediatrics, palliative, maternity), Critical care and Other beds (mental health, rehab) excluded from daily census calculation. Included in the daily census is med/surg beds only.

2. Acute (non-critical care) capacity includes funded Med/Surg beds only as reported by the health authorities on March 23, 2020.

3. Acute (non-critical care) capacity includes funded and unfunded beds as reported by the health authorities on March 23, 2020. Unfunded beds represent an estimate of available beds as of March 23, 2020. The number of unfunded beds available may change over time and does not reflect staffing available to care for patients in these beds. Included in the capacity calculation is med/surg and other med/surg (e.g. pediatric, maternity, palliative) beds. Assumes some decanting from HAU to med/surg as well as non-covid management of paediatrics, maternity and palliative.

4. Additional capacity off-site or through community based services (estimated at 500 beds) will be required to provide sufficient capacity in case of a severe and rapid epidemic.

# Conclusions on Inpatient Acute Care Capacity

- Using the likely scenario of below or at a Hubei epidemic level using inpatient medical and surgical beds, capacity looks good focused on using all sites.
  - ▶ This has been enabled in large part by the decision to defer scheduled surgeries, which opened up significant surge capacity across hospitals in B.C. over the past week.
- If B.C. was to move to an Northern Italy “hospitalized” trajectory, B.C. would use all sites and bed capacity off-site from hospitals for less acute medical and surgical inpatients to open up additional capacity for Covid-19 patients in hospitals with ready access to critical care.

# Considerations and Next Steps

- We have presented a range of scenarios based on evidence from other jurisdictions and a set of grounded clinically oriented assumptions.
- As the days of the epidemic pass here in B.C., curve for our acute care and ICU needs will become more clear. The impact of our public health measures should help bend that curve – and we are preparing for a higher curve if the trajectory changes.
- Our health authorities for planning a cascading response are working to find a balance between meeting the needs of potential COVID-19 patients AND reducing the risk of unintended consequences on other non-Covid-19 patients needing access to acute and critical care.



- Health authorities now focused on putting in place, with their clinical and support staff, a four to six week staffing schedule based on their planning:
  - ▶ Redeployment of key clinical staff to support critical care;
  - ▶ Redeployment of staff to support non-acute inpatient Covid-19 care;
  - ▶ Accessing additional staff to support both non-acute surgical and medical care (including re-registrants, trainee health-care professionals);
  - ▶ Enhancing primary and community care capacity to support and monitor Covid-19 patients in self-isolation;
  - ▶ Maintaining primary and community care to meet health needs of non-Covid-19 patients; and
  - ▶ Providing support to clinical care professionals throughout the surge.
- Health authorities are also focused on implementing measures to best use personal protective equipment based on existing at hand and warehouse supplies.
- The province and federal government are also focused on securing additional needed PPE in the coming week and throughout the months of April and May.

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