

Canada COVID-19 epidemic models situation report No 01 on 20210731

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Based on uptake 20210726 in <https://github.com/pourmalek/CovidVisualizedCountry>

Study update dates in uptake 20210726:

DELP 20210726, **IHME 20210723**, IMPE 20210709, LANL 20210718, SRIV 20210726

DELP: [model by Massachusetts Institute of Technology, Cambridge](#)

IHME: [model by Institute for Health Metrics and Evaluation, Seattle](#)

IMPE: [model by Imperial College, London](#)

LANL: [model by Los Alamos National Laboratories, Los Alamos](#)

SRIV: [model by Srivastava, Ajitesh, University of Southern California, Los Angeles](#)

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Executive Summary

This report shows the trajectory of daily deaths, infections, bed needs, and ICU bed needs, for Canada at national and province levels, estimated by five international and periodically updating COVID-19 epidemic models.

The graphs show the predictions for *when, where, and how much* increase / decrease in infections, deaths, and bed needs.

Model estimations predict start of the fourth wave of the epidemic at the national level in August, reaching about 90,000 daily infections, 15,000 daily bed needs, 4,000 daily ICU bed needs, and 150 daily deaths on November 1st, with a still-would-be-increasing slope.

This report summarizes results of a project named *CovidVisualizedCountry*, that is online tool developed to function as an early warning tool for technical advisers to health decision makers.

Creator of the *CovidVisualizedCountry* tool and this report is a physician and epidemiologist who worked before in School of Population and Public Health of University of British Columbia and Vancouver General Hospital.

Numbers are rounded.

*

Daily infections at end date of available estimates (Nov 1st), descending order of daily infections

Province:	IHME Reference scenario (Worse scenario)
CANADA	60,000 (90,000)
Ontario:	50,000 (60,000)
Alberta:	8,000 (10,000)
Quebec:	7,000 (12,000)
Saskatchewan:	2,000 (2,000)
British Columbia:	1,000 (2,000)
Manitoba:	1,200 (2,000)
Nova Scotia:	100 (200)

Daily deaths at end date of available estimates (Nov 1st), by descending order of daily infections

Province: IHME Reference scenario (Worse scenario)

CANADA	75 (150)
Ontario:	50 (120)
Alberta:	10 (10)
Quebec:	10 (20)
Saskatchewan:	3 (3)
British Columbia:	10 (10)
Manitoba:	5 (5)
Nova Scotia:	0 (0)

Daily regular bed needs (or ICU bed needs) at end date of available estimates (Nov 1st), by descending order of daily infections

All predictions by IHME model reference scenario. Alternate scenarios do not include bed needs.

Province: Daily regular bed needs (ICU bed needs)

CANADA	15,000 (4,000)
Ontario:	10,000 (3,000)
Alberta:	1,000 (300)
Quebec:	1,400 (400)
Saskatchewan:	600 (180)
British Columbia:	250 (100)
Manitoba:	150 (50)
Nova Scotia:	10 (5)

What is this report and where does it come from?

This report is first situation report of predictions of five international and periodically updating COVID-19 epidemic models about future trajectory of epidemic in Canada and its provinces. The report is based on “**CovidVisualizedCountry**” online tool, that is a GitHub repository for sharing data and codes, available at <https://github.com/pourmalek/CovidVisualizedCountry>. This report is meant to serve as an offline and stand-alone version of the online tool.

Objectives of the “CovidVisualizedCountry” tool are to identify international and periodically updated models of the COVID-19 epidemic, compile and visualize their estimation results, and periodically update the compilations.

The ultimate objective is to provide an ***early warning system*** for technical advisors to the decision makers. When the predictions of one or more model show an increase in daily cases or infections, hospitalizations, or deaths in near future, ***technical advisors to the national and subnational decision-makers*** may consider suggesting augmentation of non-pharmacologic preventive interventions and vaccination. In doing so, strengths and weaknesses of individual models need to be considered, as well as those of this work. Models’ estimates demonstrate the trajectory of COVID-19 deaths, cases or infections, and hospital-related outcomes in one to three months into the future.

Similar work: Situation Reports from “covir2” (<https://github.com/pourmalek/covir2>), a sister repository, have been presented for and shared with three deputy ministers of health in Iran.

Methods and technical details of this work are available online at <https://github.com/pourmalek/CovidVisualizedCountry#ii-methods-and-results-of-this-work-1> as well as in “[Pourmalek - CovidVisualized- Visualized compilation of international updating models' estimates of COVID-19 pandemic at global and country levels - pre-print in progress - 2021](#)”.

Stata codes written and used for this whole work can be examined online and / or downloaded and re-run to check, securitize, verify, or flag any mistakes.

<https://github.com/pourmalek/CovidVisualizedCountry#iii-inner-works-of-this-repository-1>

Five international and periodically updating COVID-19 epidemic models:

DELP, IHME, IMPE, LANL, SRIV; JOHN (these abbreviations are used in the graphs)

DELP: DELPHI. Differential Equations Lead to Predictions of Hospitalizations and Infections. COVID-19 pandemic model named DELPHI by Massachusetts Institute of Technology, Cambridge. *Reference:* COVID Analytics. DELPHI epidemiological case predictions. Cambridge: Operations Research Center, Massachusetts Institute of Technology.

<https://www.covidanalytics.io/projections> and
<https://github.com/COVIDAnalytics/website/tree/master/data/predicted>

IHME: Institute for Health Metrics and Evaluation. COVID-19 pandemic model by Institute for Health Metrics and Evaluation, Seattle. *Reference:* Institute for Health Metrics and Evaluation (IHME). COVID-19 mortality, infection, testing, hospital resource use, and social distancing projections. Seattle: Institute for Health Metrics and Evaluation (IHME), University of Washington. <http://www.healthdata.org/covid/> and <http://www.healthdata.org/covid/data-downloads>

IMPE: Imperial. COVID-19 pandemic model by Imperial College, London. *Reference:* MRC Centre for Global Infectious Disease Analysis (MRC GIDA). Future scenarios of the healthcare burden of COVID-19 in low- or middle-income countries. London: MRC Centre for Global Infectious Disease Analysis, Imperial College London. <https://mrc-ide.github.io/global-lmic-reports/> and <https://github.com/mrc-ide/global-lmic-reports/tree/master/data>

LANL: Los Alamos National Laboratories. COVID-19 pandemic model by Los Alamos National Laboratories, Los Alamos. *Reference:* Los Alamos National Laboratory (LANL). COVID-19 cases and deaths forecasts. Los Alamos: Los Alamos National Laboratory (LANL). <https://covid-19.bsvgateway.org>

SRIV: Srivastava, Ajitesh. COVID-19 pandemic model by University of Southern California, Los Angeles. *Reference:* Srivastava, Ajitesh. University of Southern California (USC). COVID-19 forecast. Los Angeles: University of Southern California. <https://scc-usc.github.io/ReCOVER-COVID-19> and https://github.com/scc-usc/ReCOVER-COVID-19/tree/master/results/historical_forecasts

*

JOHN: Johns Hopkins. Coronavirus resource center, Johns Hopkins University, Baltimore. Curation of official reports of countries to World Health Organization. **Ground truth for comparison.** *Reference:* Johns Hopkins University. Coronavirus resource center. <https://coronavirus.jhu.edu/map.html> and <https://github.com/CSSEGISandData/COVID-19>

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Models' updates and their acquisition in this work:

The two models with least frequency of periodic updates of estimates are IHME and IMPE, which get updated on approximately a weekly and bi-weekly basis, respectively. With the release of each update of the either of these two models, the whole set of the five included models are updated in **CovidVisualizedCountry** GitHub repository, in which the most recent update of each model is used.

Models' updates dates in this report:

DELP 20210726, IHME 20210723, IMPE 20210719, LANL 20210725, SRIV 20210727

Full names of model name abbreviations on previous page.

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Graphs

Graphs of epidemic trajectory in Canada and provinces till November 1st

Graphs of the most recent models' updates are shown here. These graphs, as well as graphs of previous updates are available online at <https://github.com/pourmalek/CovidVisualizedCountry>

Logical order of graphs:

(1) *Location levels*: National, followed by provinces for which estimations are available: Alberta, British Columbia, Manitoba, Nova Scotia, Ontario, Quebec, and Saskatchewan.

(2) *Outcomes*: Daily deaths, Daily cases or infections, Hospital-related outcomes, Daily deaths estimated to reported, Daily cases or infections estimated to reported cases.

(3) *Calendar time of estimates coverage*: All-time, followed by 2021. To view the whole epidemic trajectory, and further focus on near future.

(4) *Scenarios*: Reference scenarios, followed by alternative scenarios. To examine the main (aka. status quo) scenario, and alternative (better and worse) scenarios.

(5) *Five models*: Different models *within* each graph (for which model estimates update release dates are maximally synchronized), plus official reports of the country to WHO (curated by Johns Hopkins university) as under-reported benchmark for trends. To examine how heterogeneity in methods used by different models results in heterogeneous results for the same outcome (same time-place-person aggregated units)

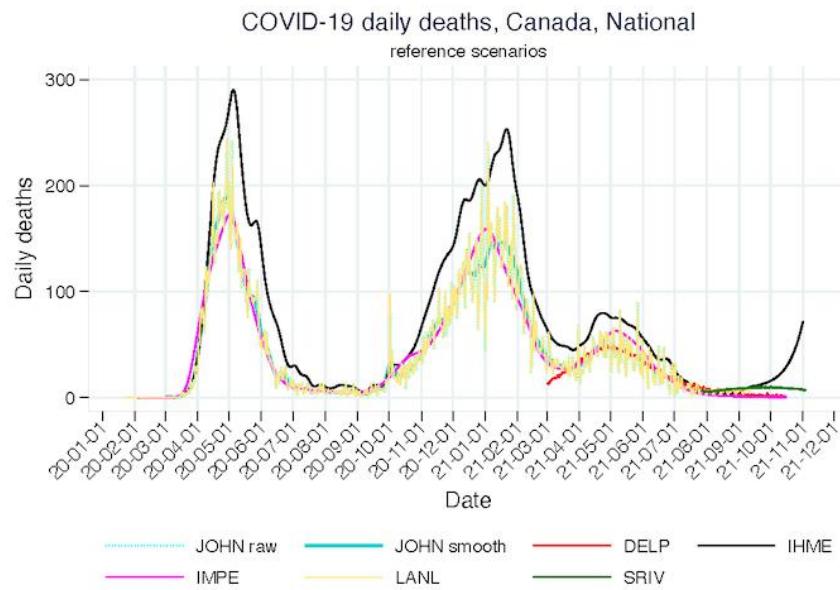
Among the 5 available international periodically updating studies or models of COVID-19 pandemic, only TWO studies, DELP and IHME, provide subnational level estimates for some countries.

List of graphs

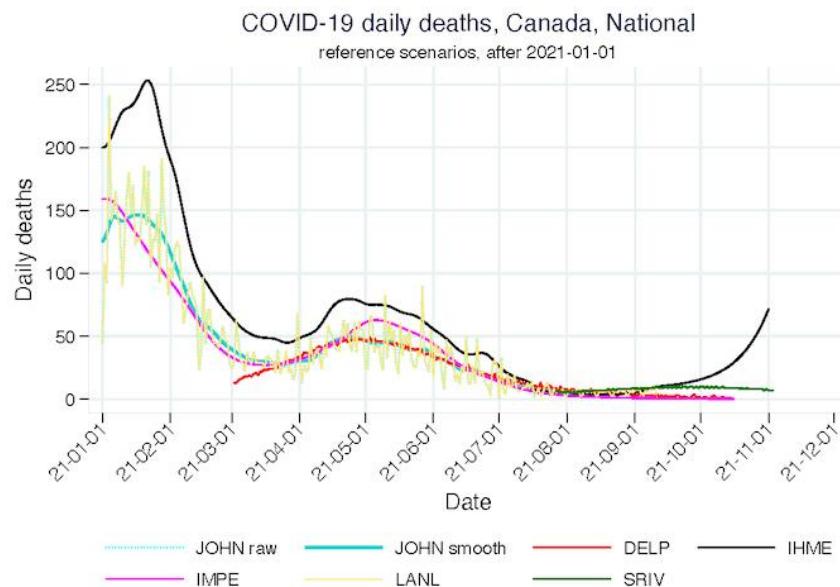
- (1) Daily deaths, reference scenarios, all time
- (2) Daily deaths, reference scenarios, 2021
- (3) Daily deaths, 3 scenarios, 2021
- (4) Daily cases or infections, reference scenarios, all time
- (5) Daily cases or infections, reference scenarios, 2021
- (6) Daily cases or infections, 3 scenarios, 2021
- (7) Hospital-related outcomes, all time
- (8) Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand
- (9) Daily deaths estimated to reported, reference scenarios, 2021
- (10) Daily cases or infections estimated to reported cases, reference scenarios, 2021

Selected graphs – Canada

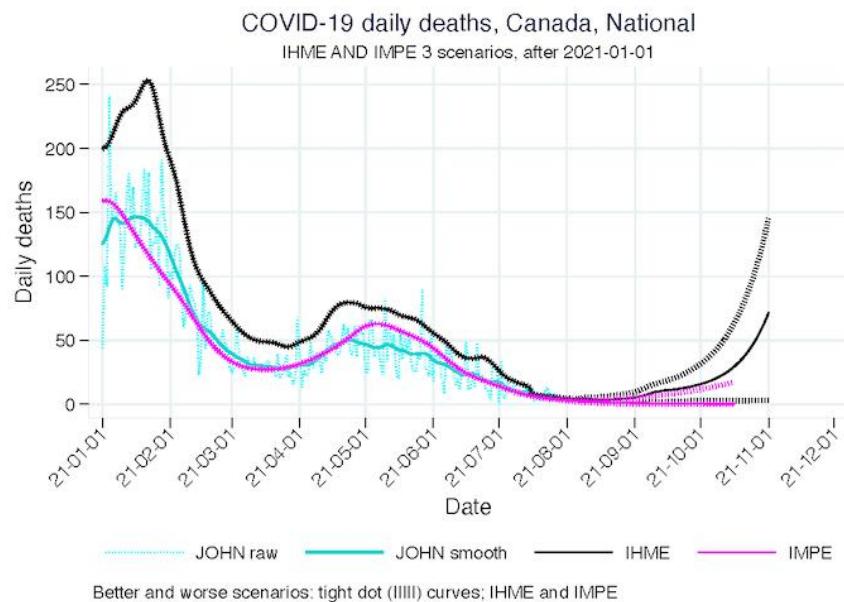
(1) Canada [Daily deaths, reference scenarios, all time](#)



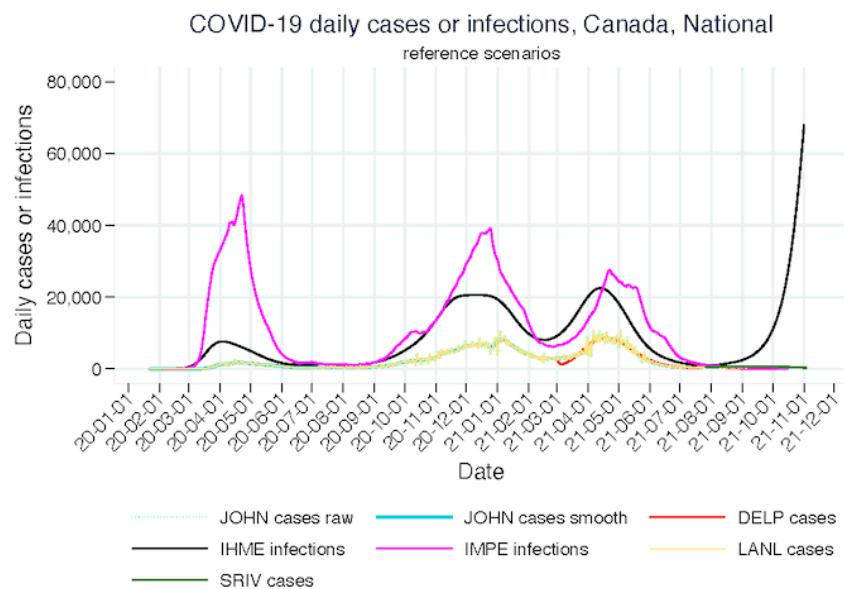
(2) Canada [Daily deaths, reference scenarios, 2021](#)



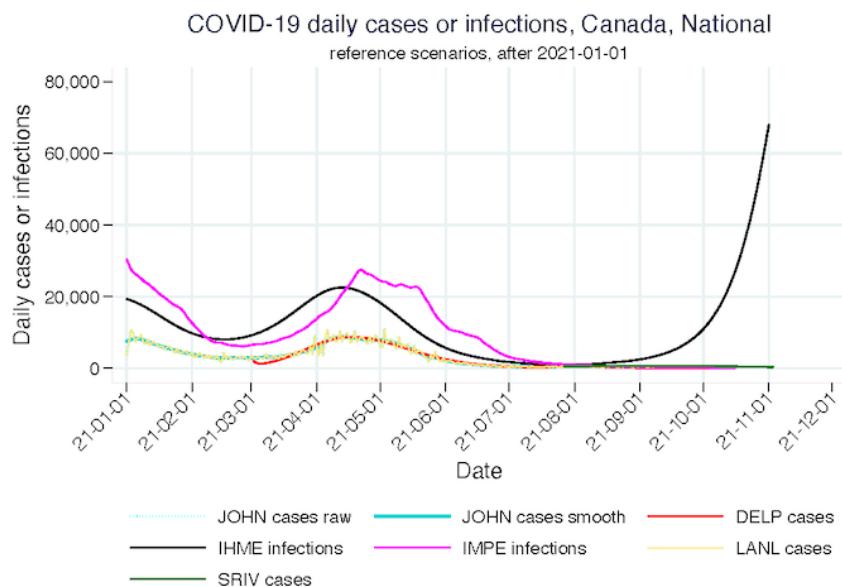
(3) Canada [Daily deaths, 3 scenarios, 2021](#)



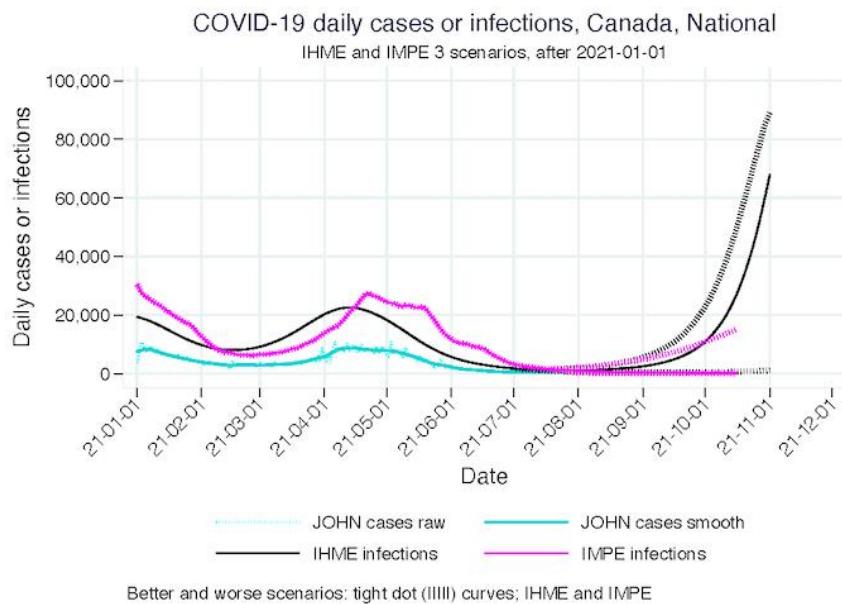
(4) Canada [Daily cases or infections, reference scenarios, all time](#)



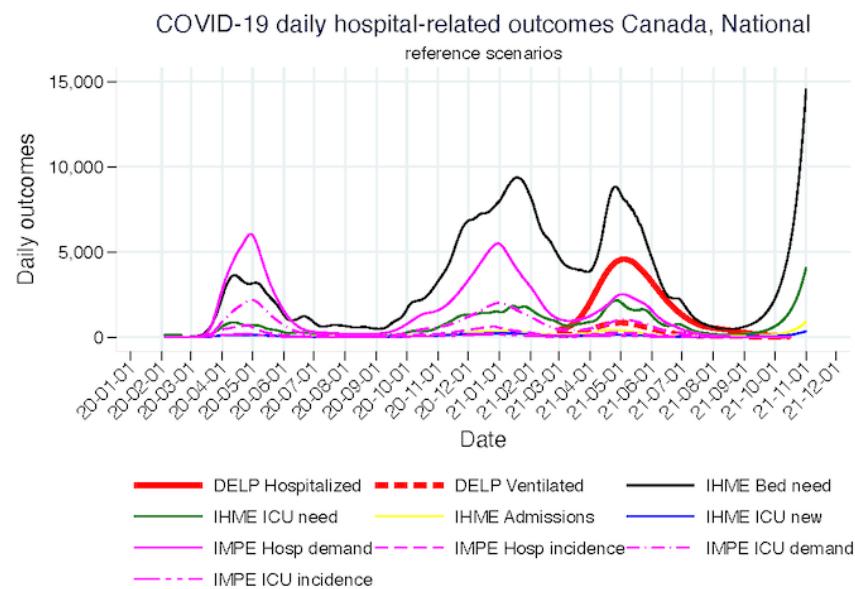
(5) Canada [Daily cases or infections, reference scenarios, 2021](#)



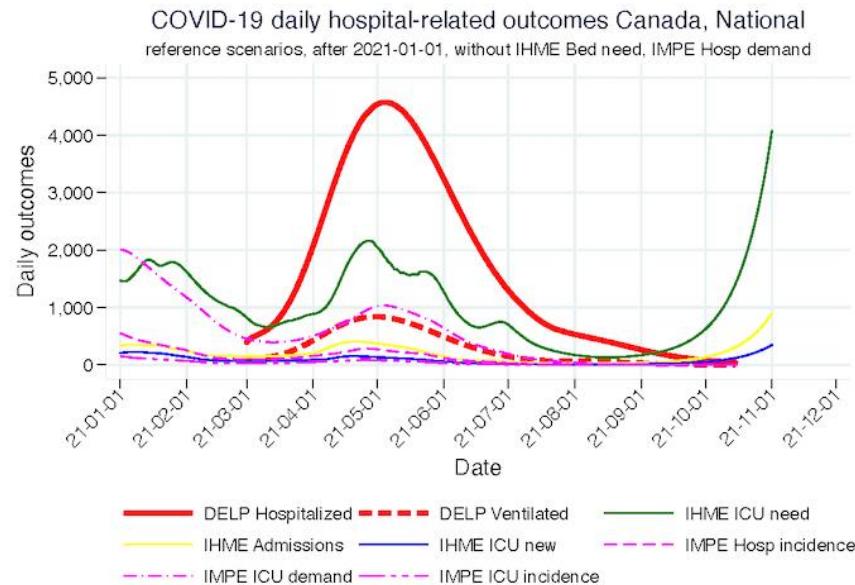
(6) Canada [Daily cases or infections, 3 scenarios, 2021](#)



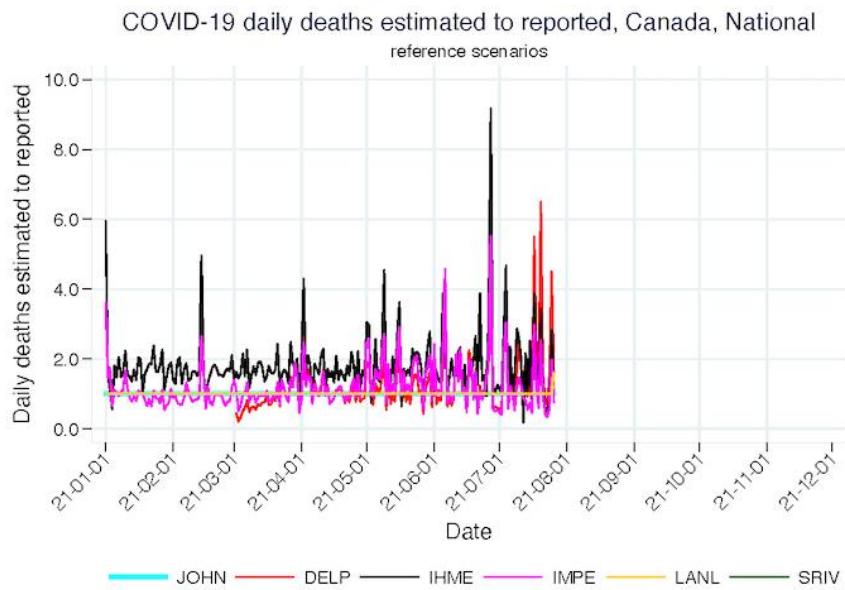
(7) Canada [Hospital-related outcomes, all time](#)



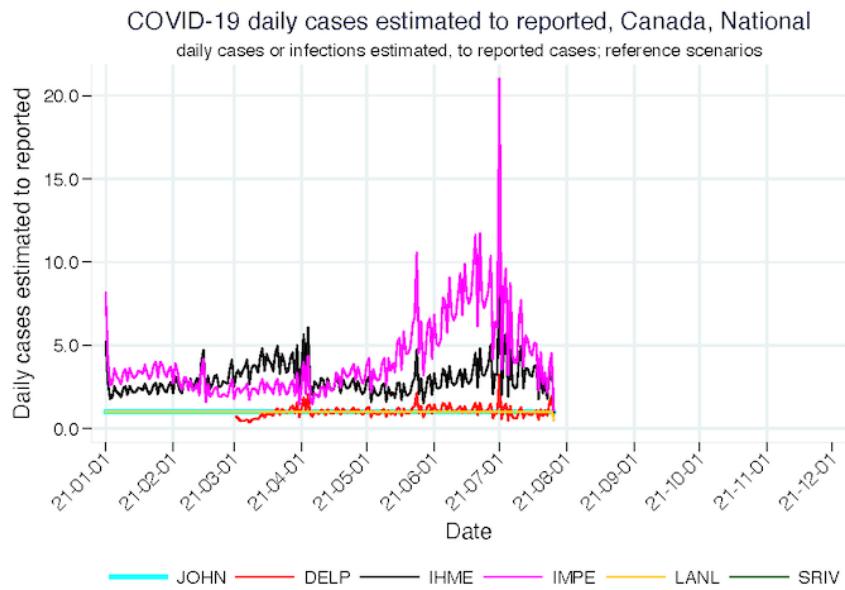
(8) Canada [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



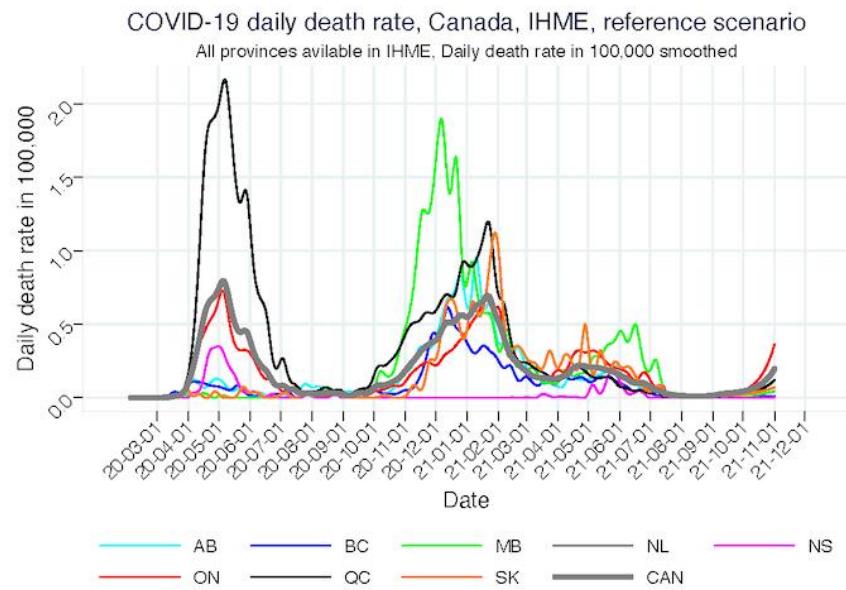
(9) Canada [Daily deaths estimated to reported, reference scenarios, 2021](#)



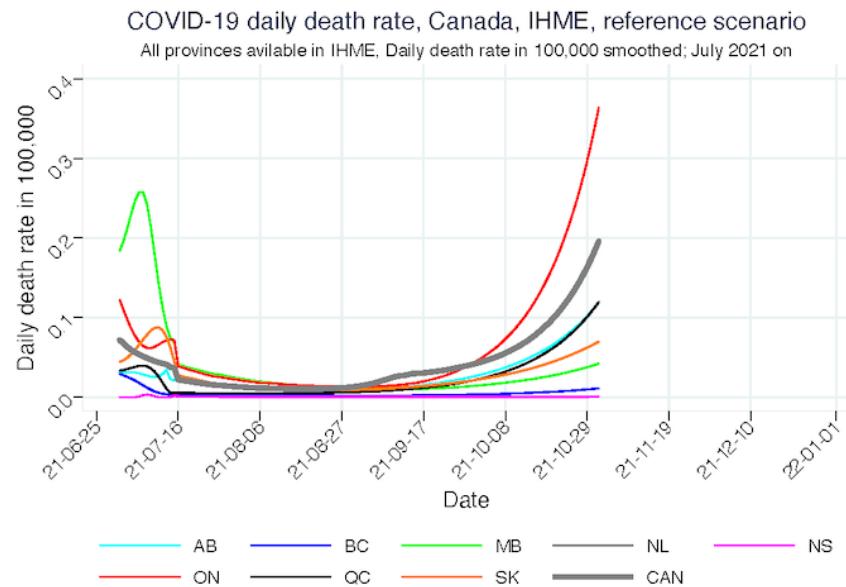
(10) Canada [Daily cases or infections estimated to reported, reference scenarios, 2021](#)



(11) Canada and provinces [Daily death rates, reference scenario, all time, IHME](#)

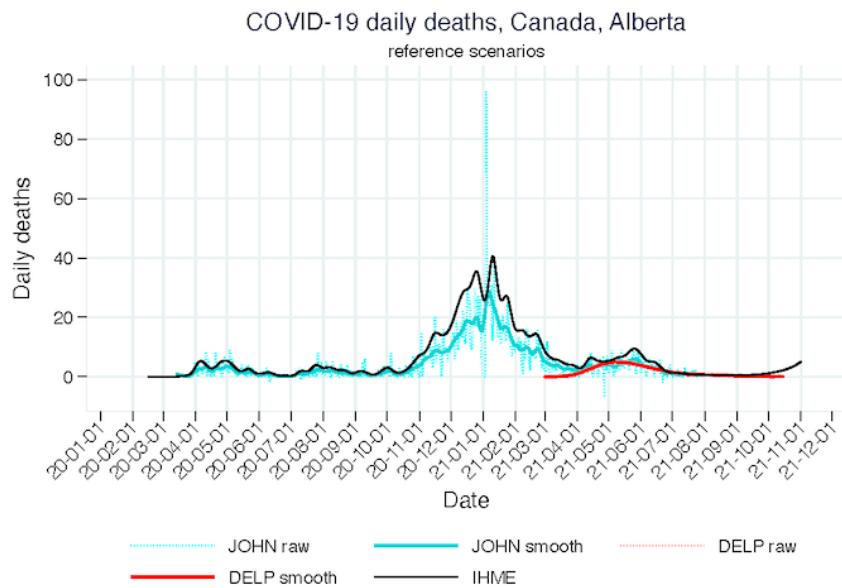


(12) Canada and provinces [Daily death rates, reference scenario, 2021 IHME](#)

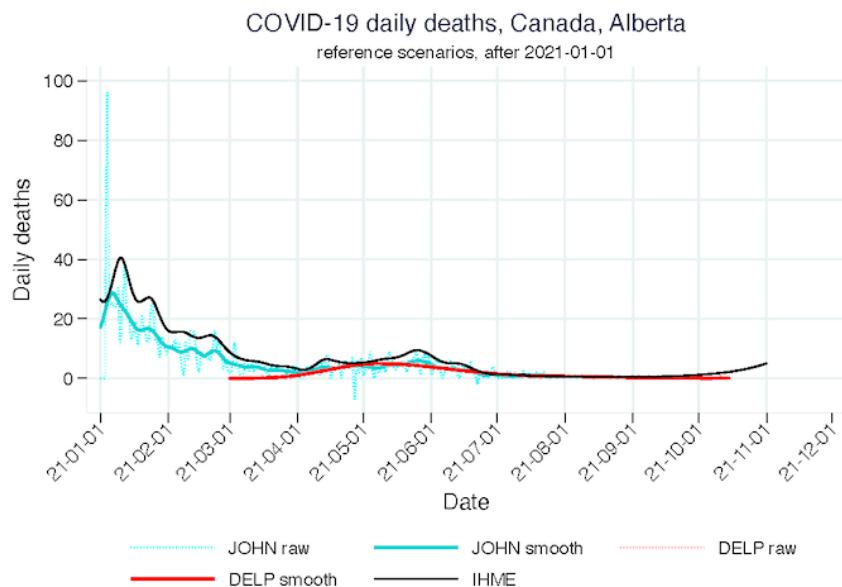


Selected graphs – Alberta

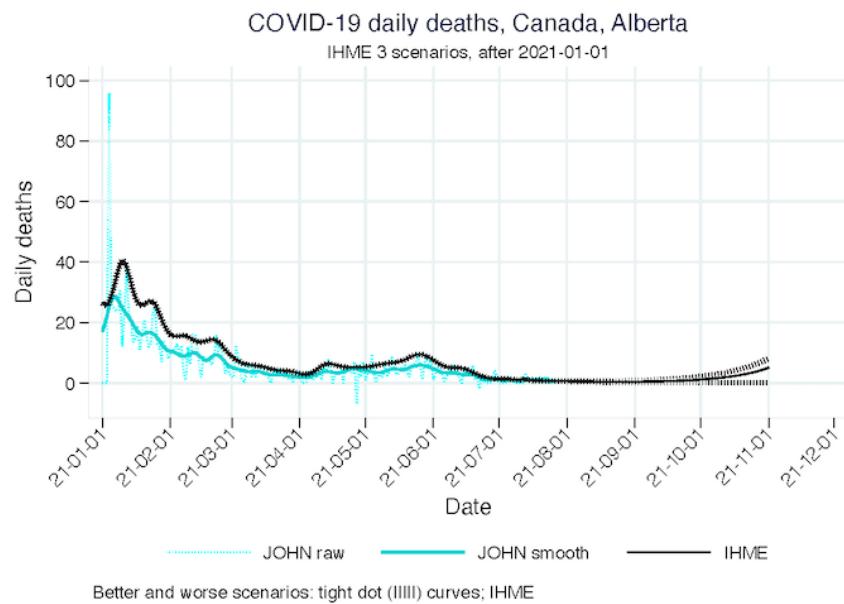
(1) Alberta [Daily deaths, reference scenarios, all time](#)



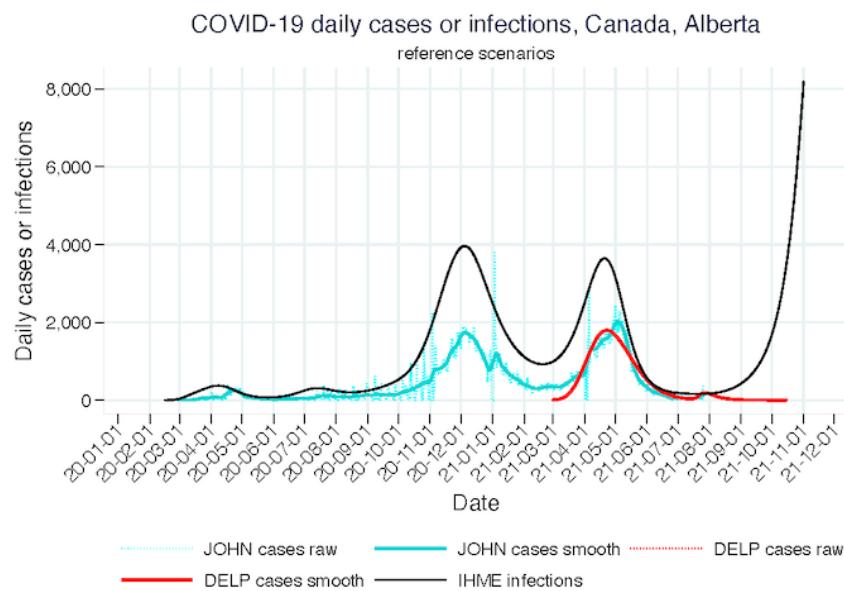
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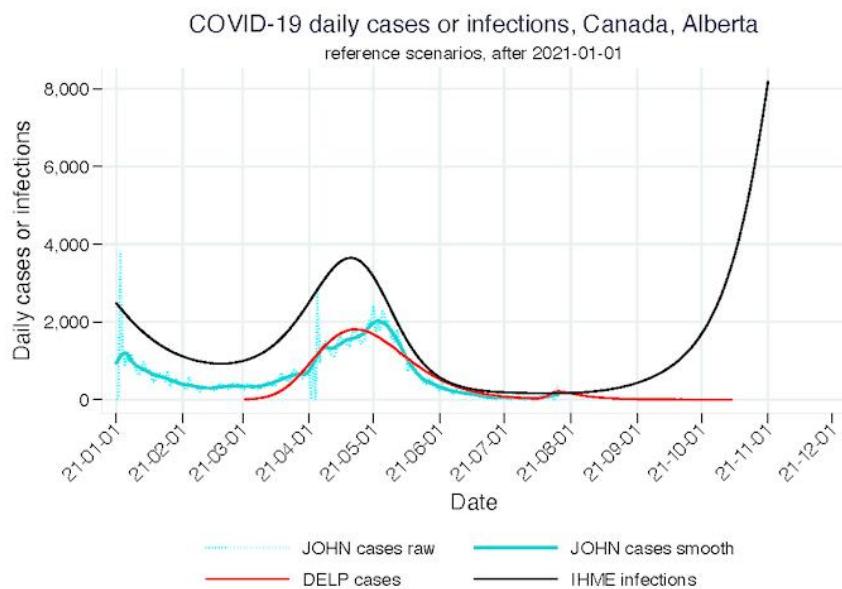
(3) Alberta [Daily deaths, 3 scenarios, 2021](#)



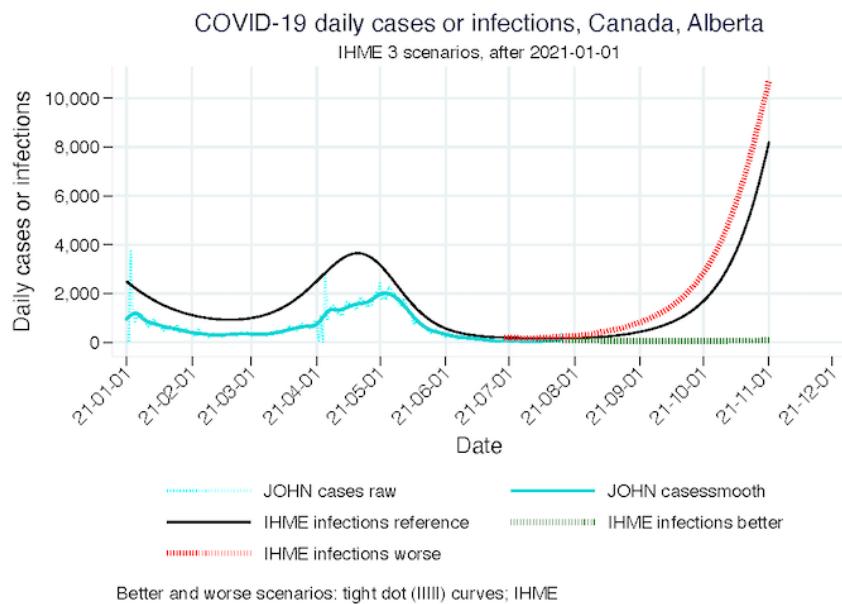
(4) Alberta [Daily cases or infections, reference scenarios, all time](#)



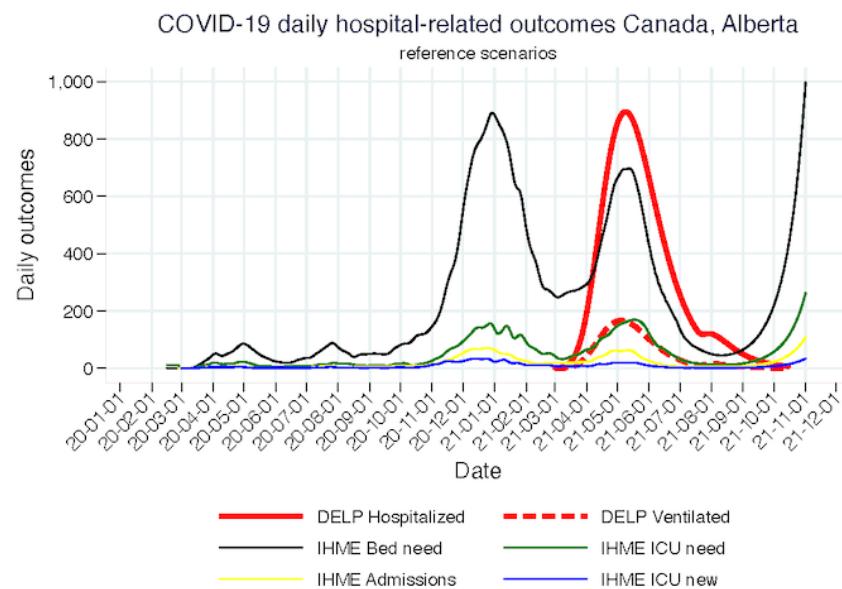
(5) Alberta [Daily cases or infections, reference scenarios, 2021](#)



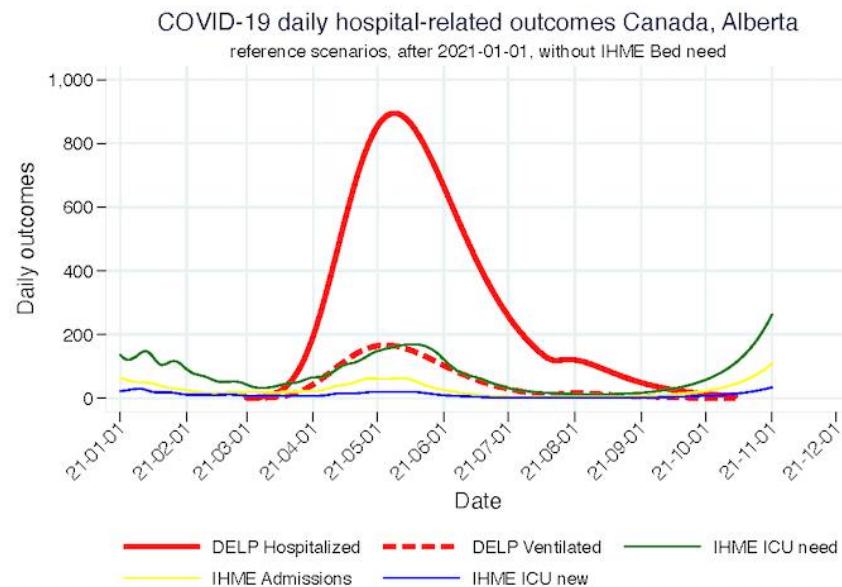
(6) Alberta [Daily cases or infections, 3 scenarios, 2021](#)



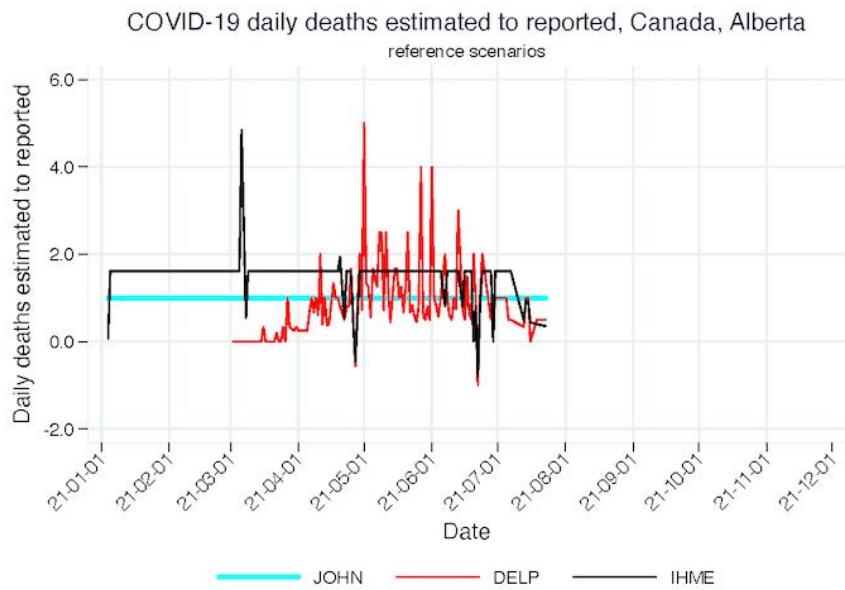
(7) Alberta [Hospital-related outcomes, all time](#)



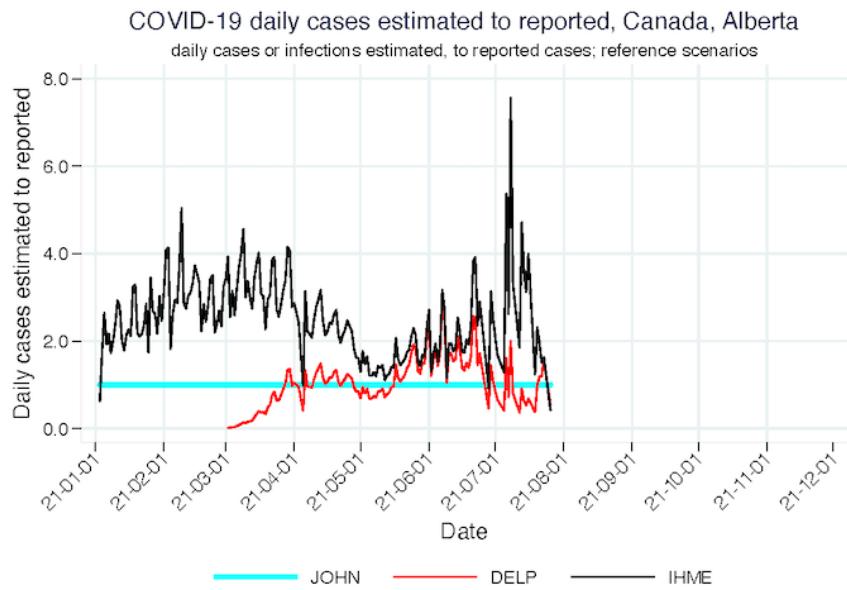
(8) Alberta [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



(9) Alberta [Daily deaths estimated to reported, reference scenarios, 2021](#)

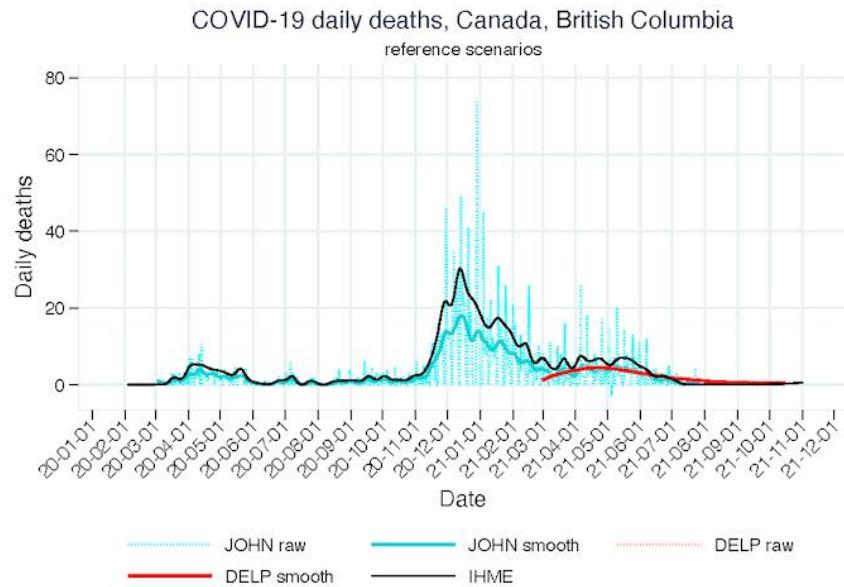


(10) Alberta [Daily cases or infections estimated to reported, reference scenarios, 2021](#)

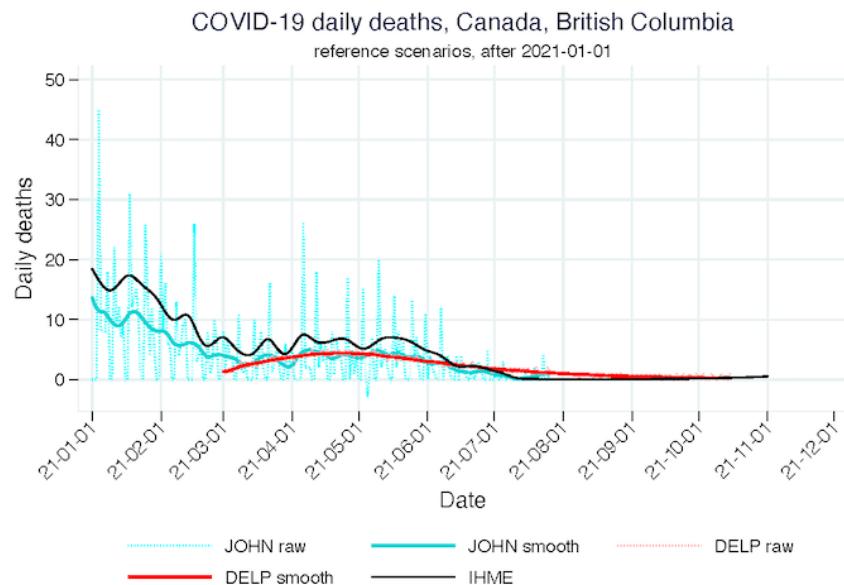


Selected graphs - British Columbia

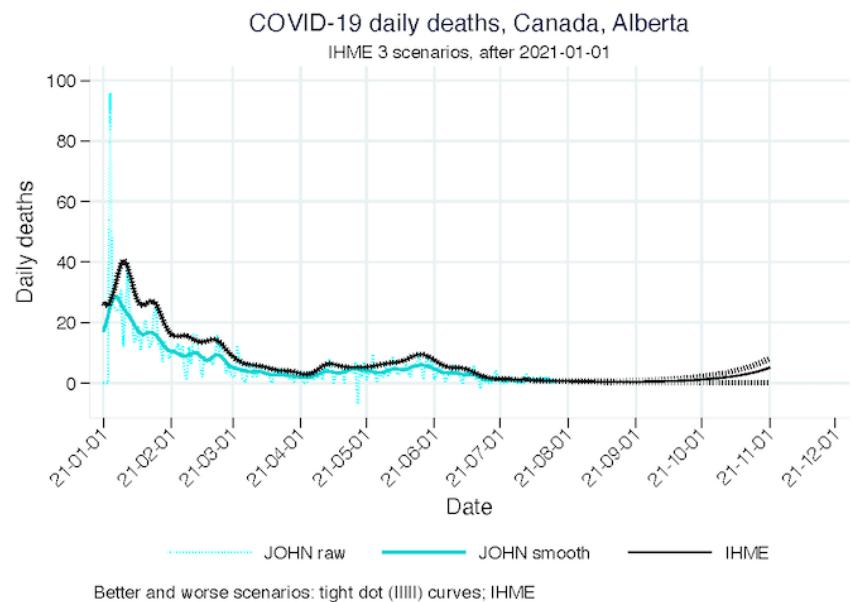
(1) British Columbia [Daily deaths, reference scenarios, all time](#)



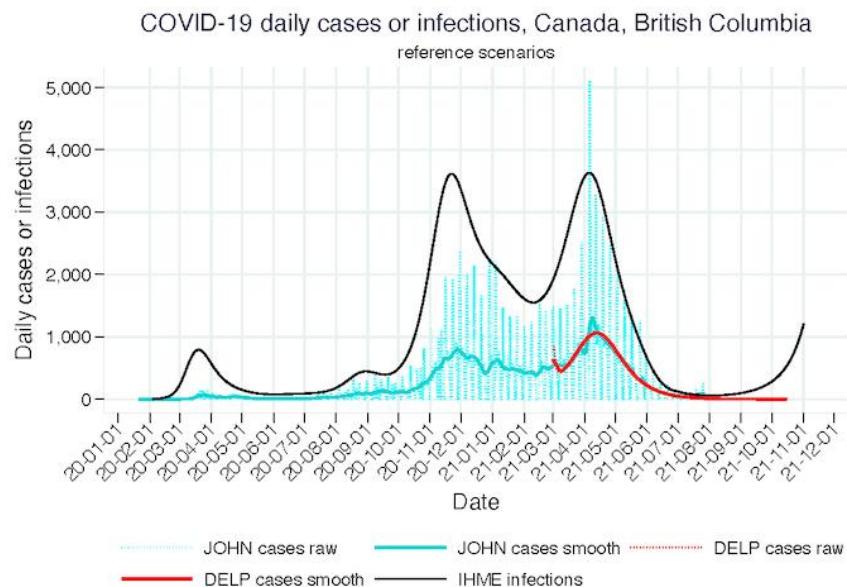
(2) British Columbia [Daily deaths, reference scenarios, 2021](#)



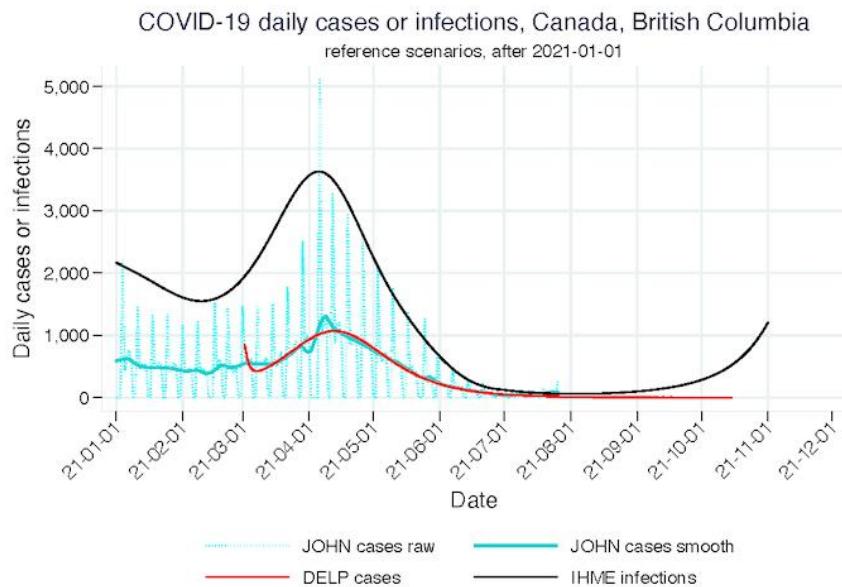
(3) British Columbia [Daily deaths, 3 scenarios, 2021](#)



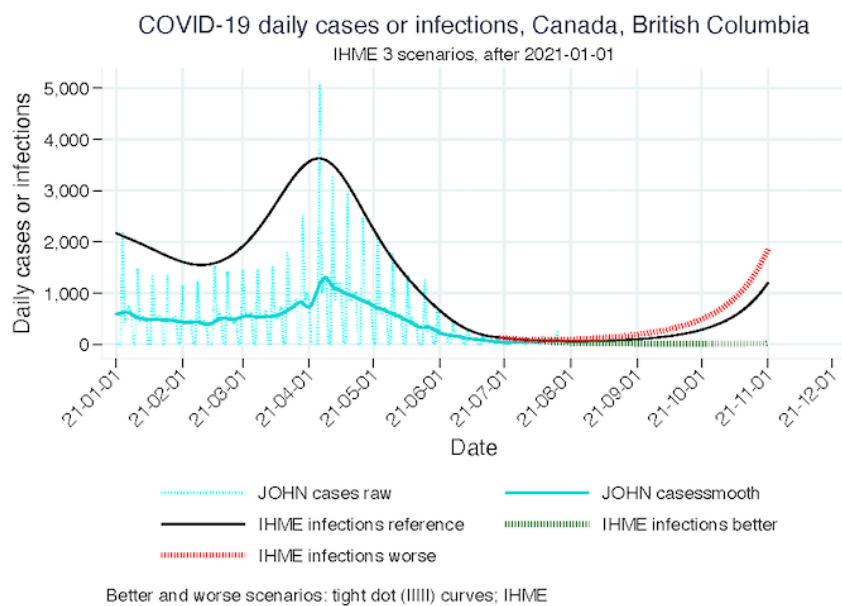
(4) British Columbia [Daily cases or infections, reference scenarios, all time](#)



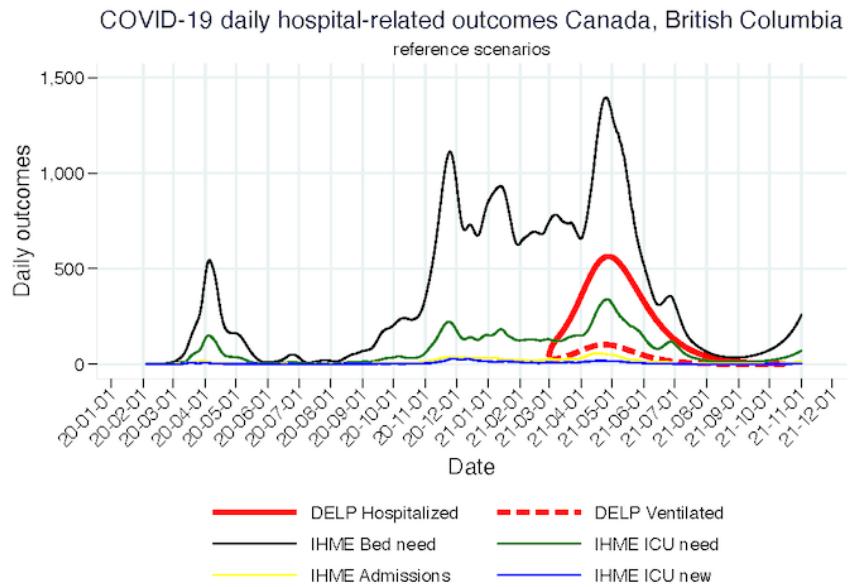
(5) British Columbia [Daily cases or infections, reference scenarios, 2021](#)



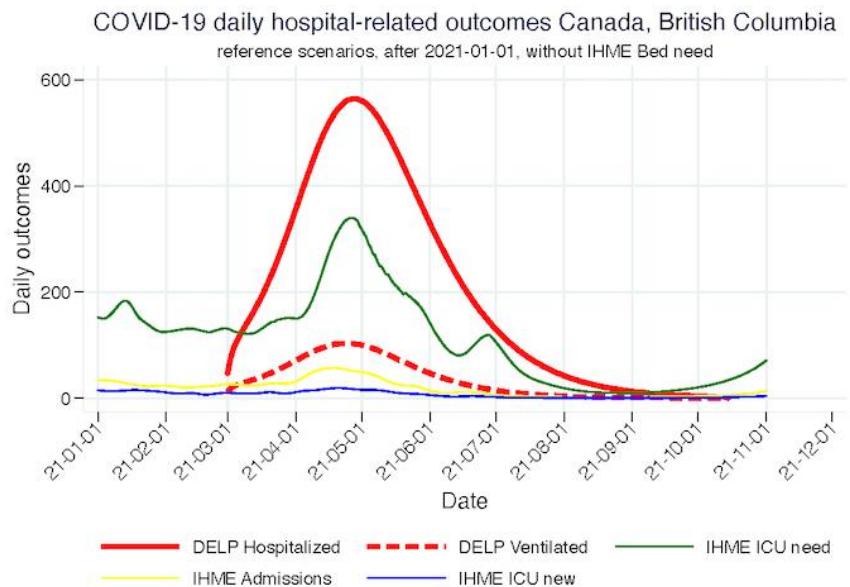
(6) British Columbia [Daily cases or infections, 3 scenarios, 2021](#)



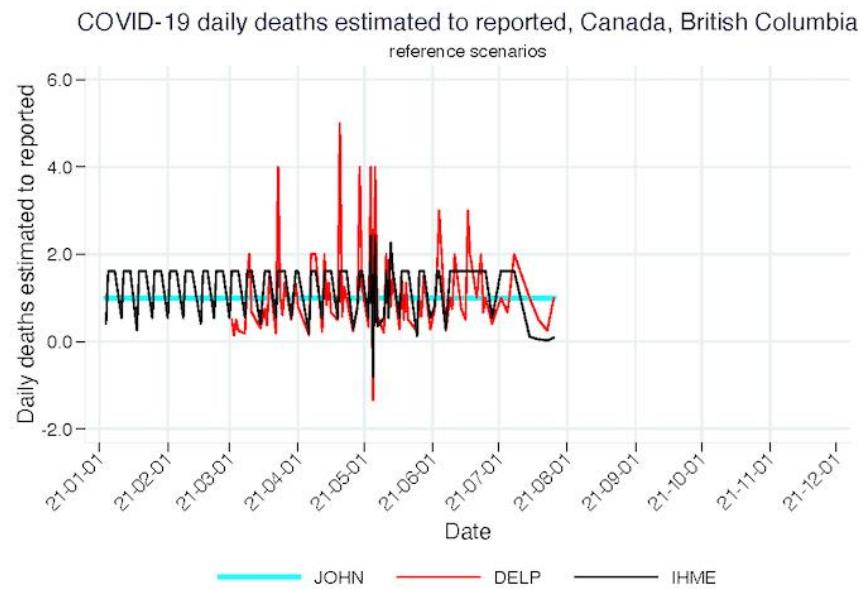
(7) British Columbia [Hospital-related outcomes, all time](#)



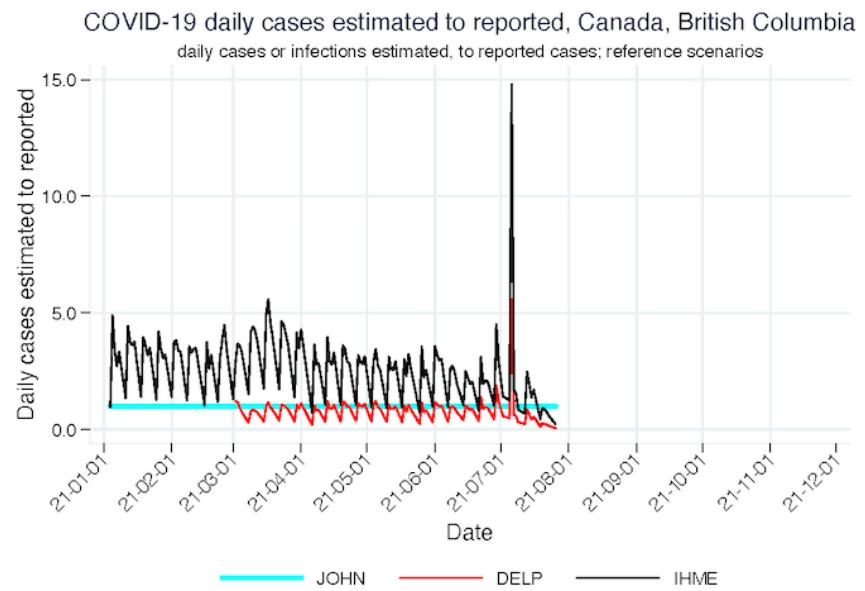
(8) British Columbia [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



(9) British Columbia [Daily deaths estimated to reported, reference scenarios, 2021](#)

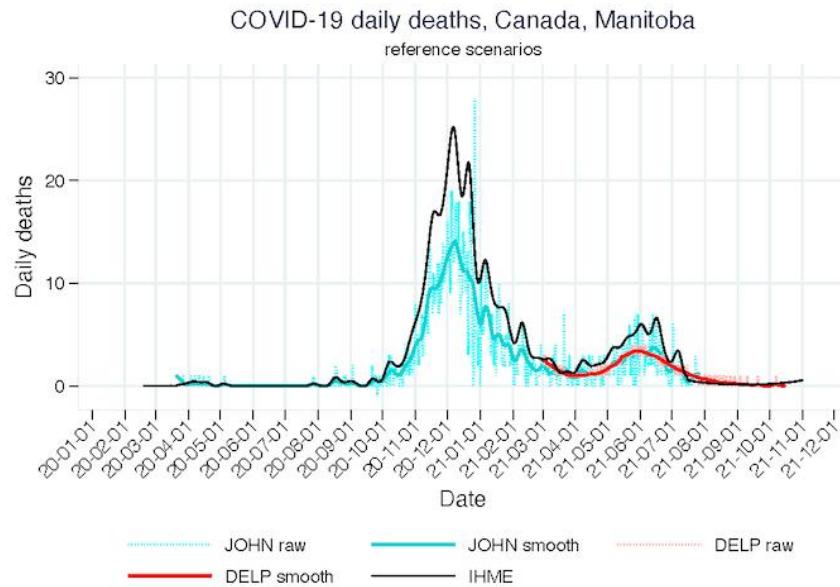


(10) British Columbia [Daily cases or infections estimated to reported, reference scenarios, 2021](#)

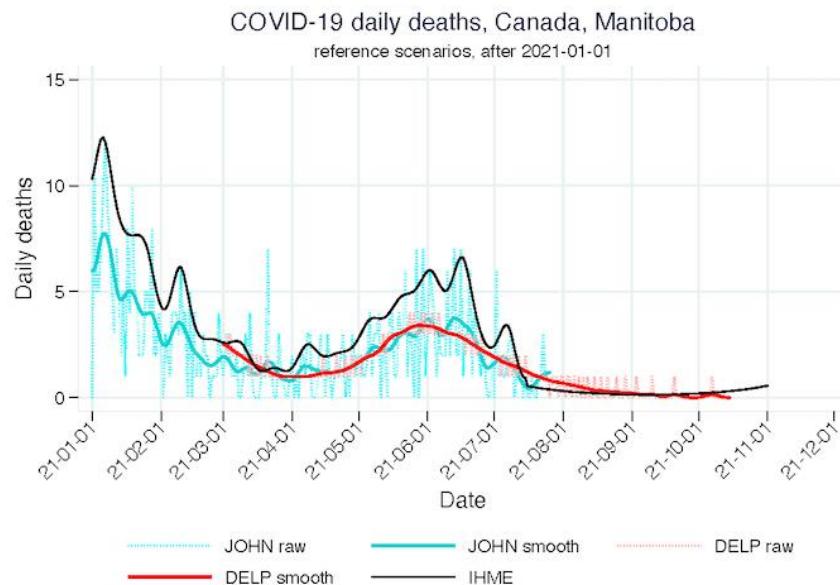


Selected graphs – Manitoba

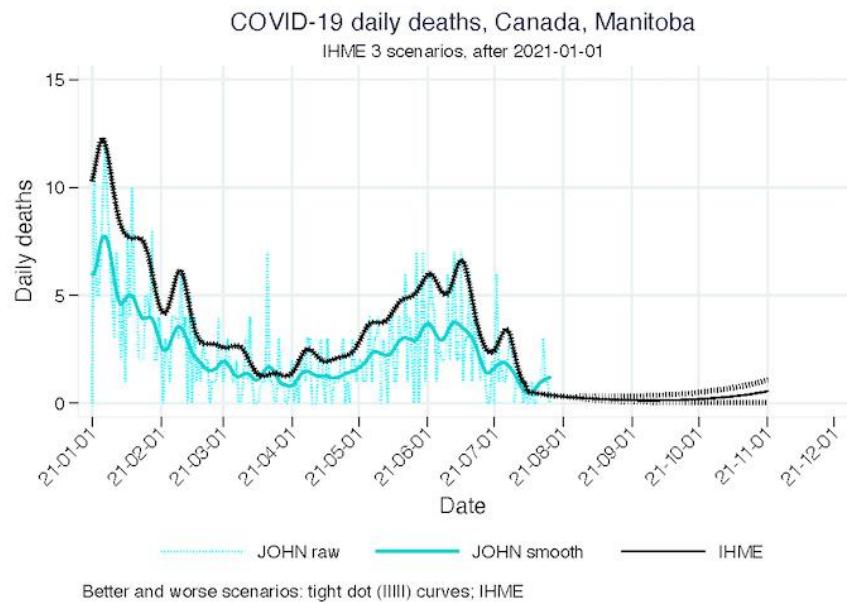
(1) Manitoba [Daily deaths, reference scenarios, all time](#)



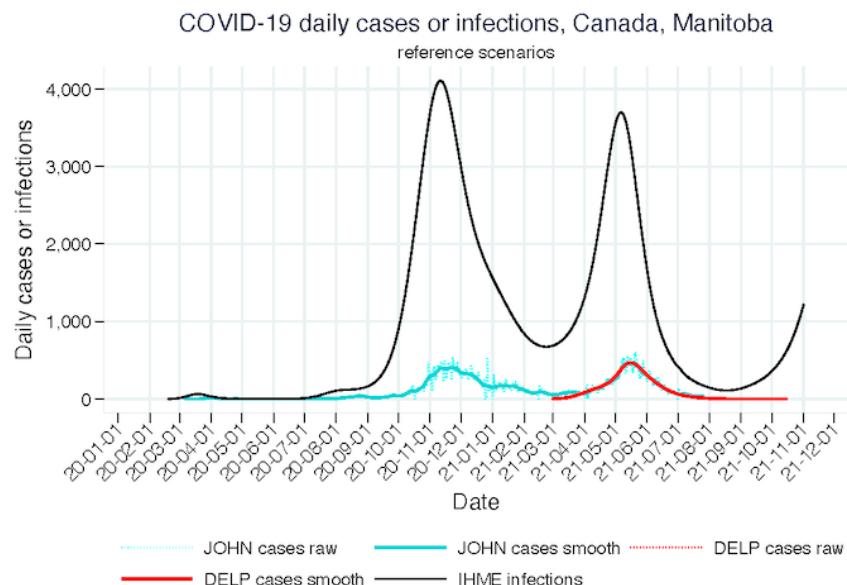
(2) Manitoba [Daily deaths, reference scenarios, 2021](#)



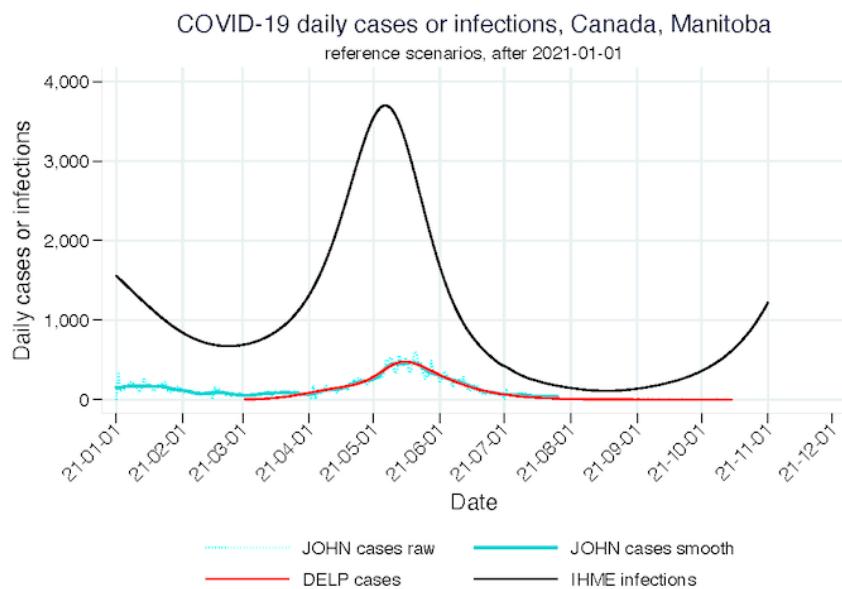
(3) Manitoba [Daily deaths, 3 scenarios, 2021](#)



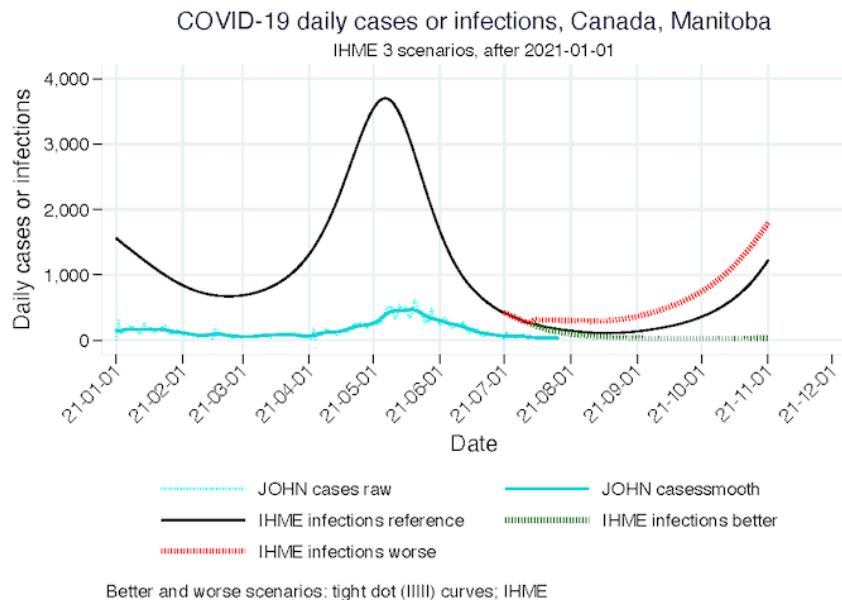
(4) Manitoba [Daily cases or infections, reference scenarios, all time](#)



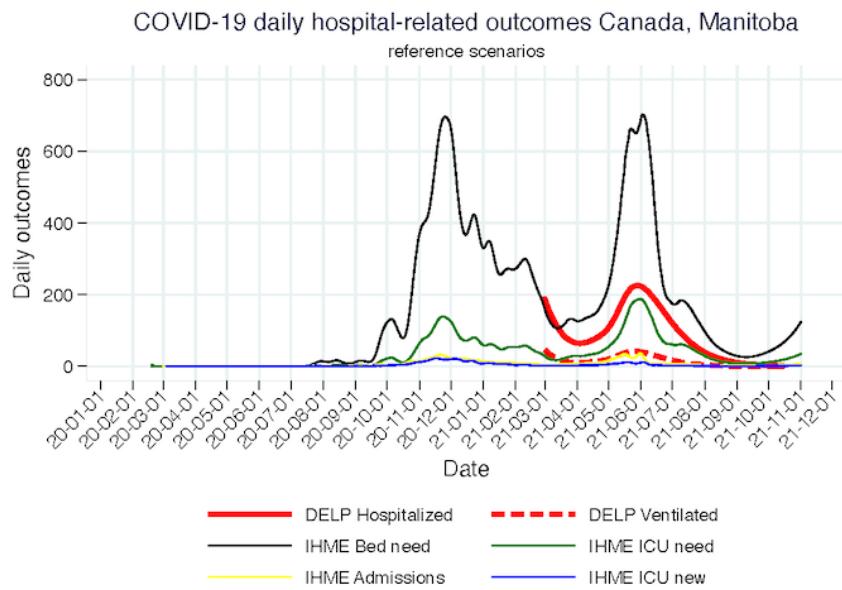
(5) Manitoba [Daily cases or infections, reference scenarios, 2021](#)



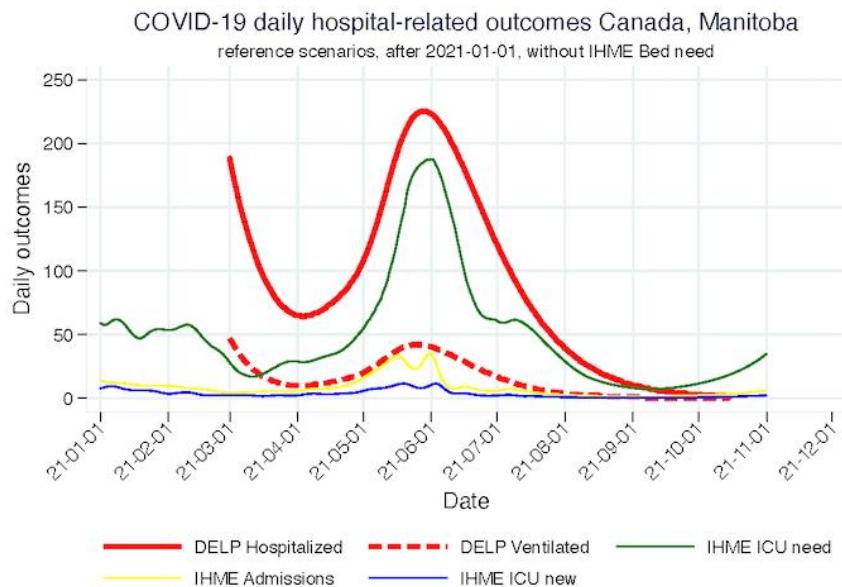
(6) Manitoba [Daily cases or infections, 3 scenarios, 2021](#)



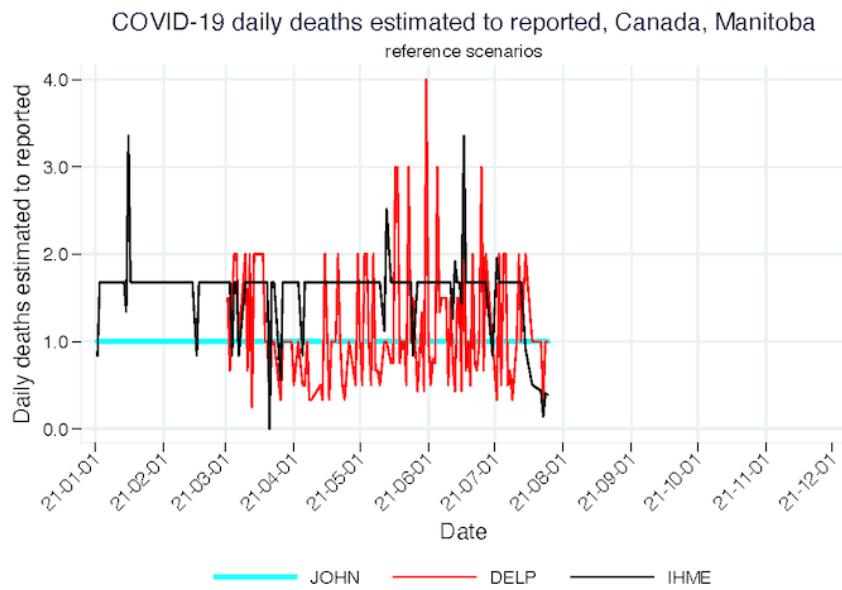
(7) Manitoba [Hospital-related outcomes, all time](#)



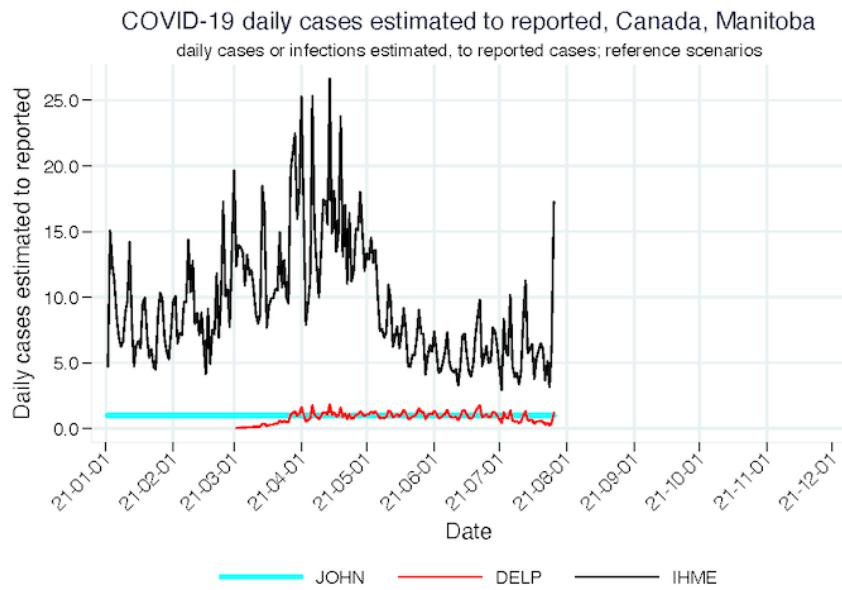
(8) Manitoba [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



(9) Manitoba [Daily deaths estimated to reported, reference scenarios, 2021](#)

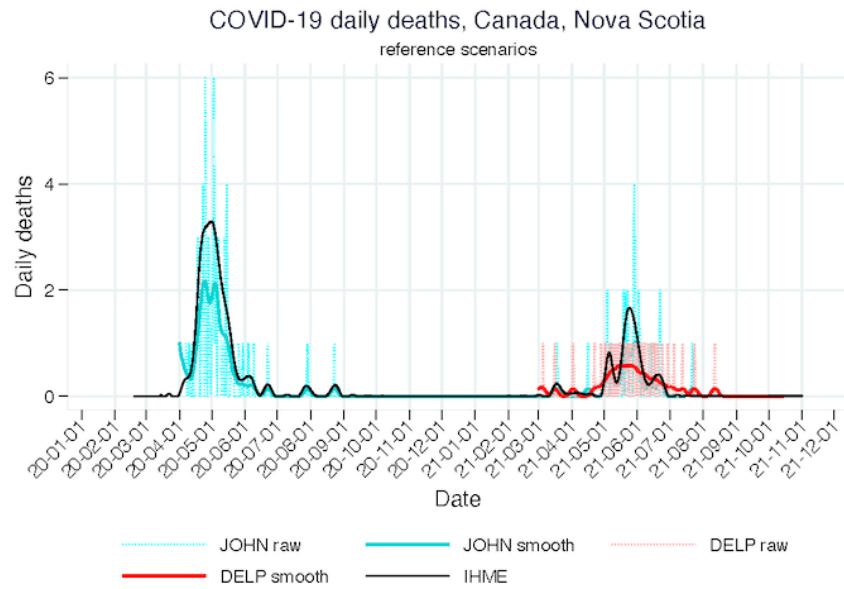


(10) Manitoba [Daily cases or infections estimated to reported, reference scenarios, 2021](#)

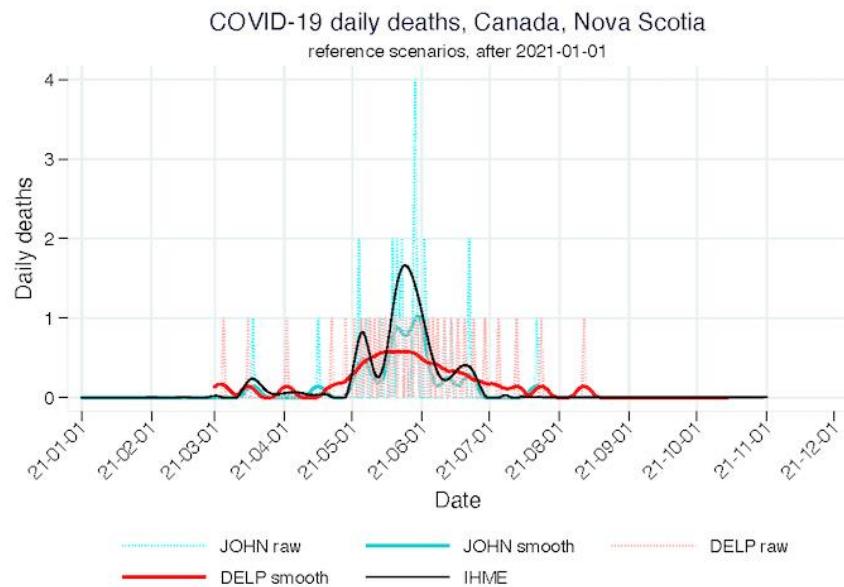


Selected graphs - Nova Scotia

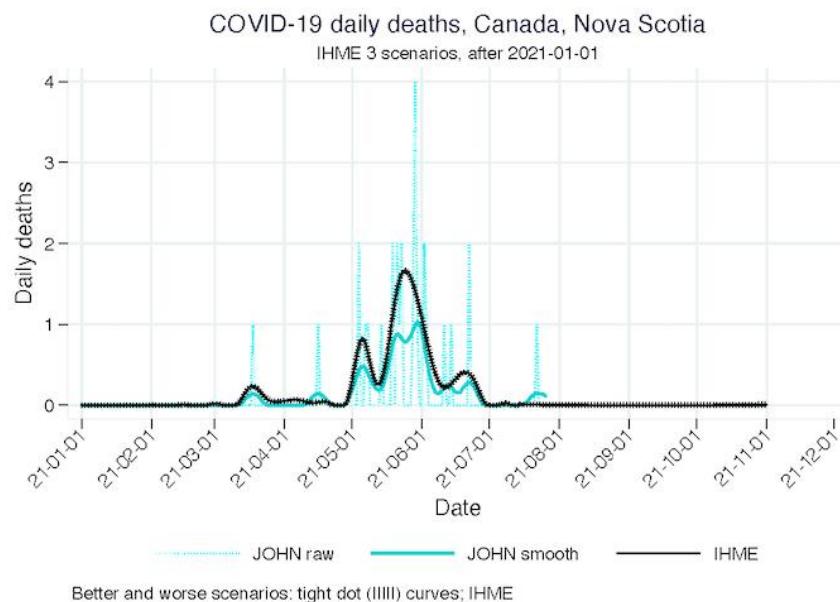
(1) Nova Scotia [Daily deaths, reference scenarios, all time](#)



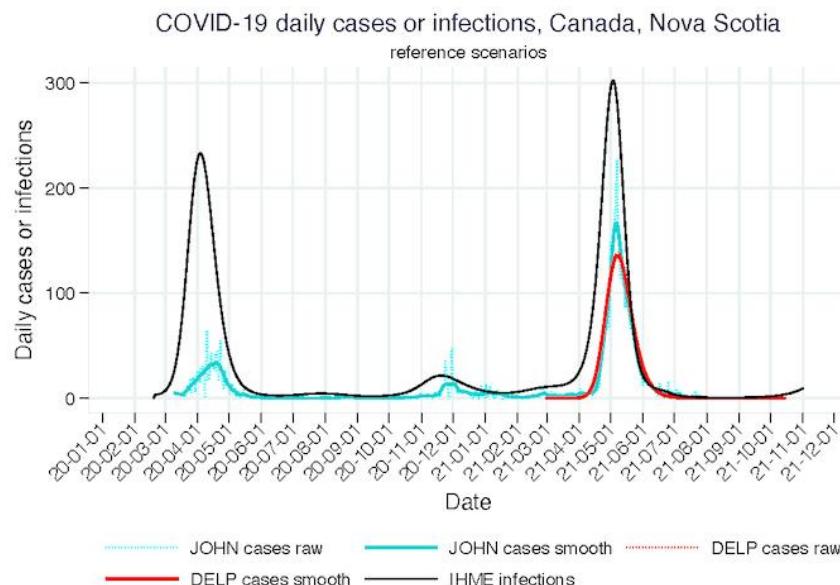
(2) Nova Scotia [Daily deaths, reference scenarios, 2021](#)



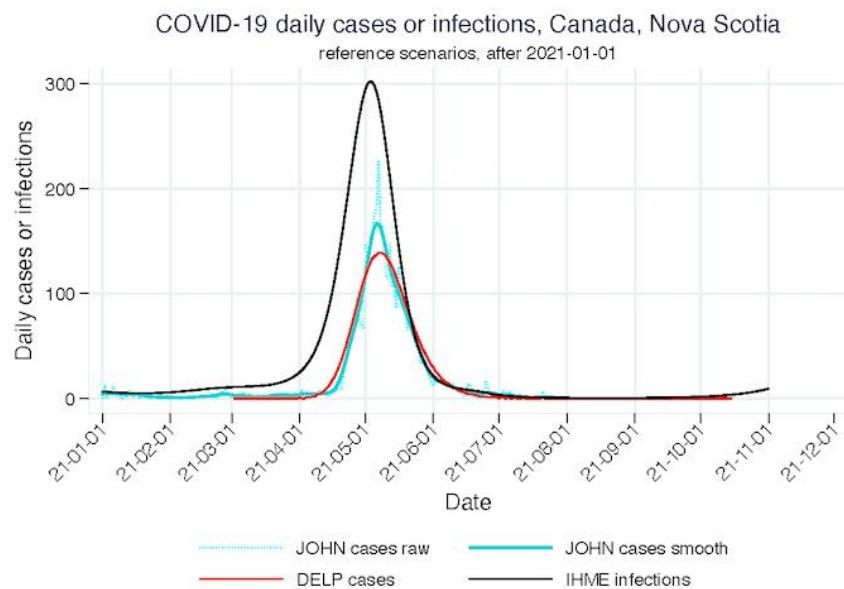
(3) Nova Scotia [Daily deaths, 3 scenarios, 2021](#)



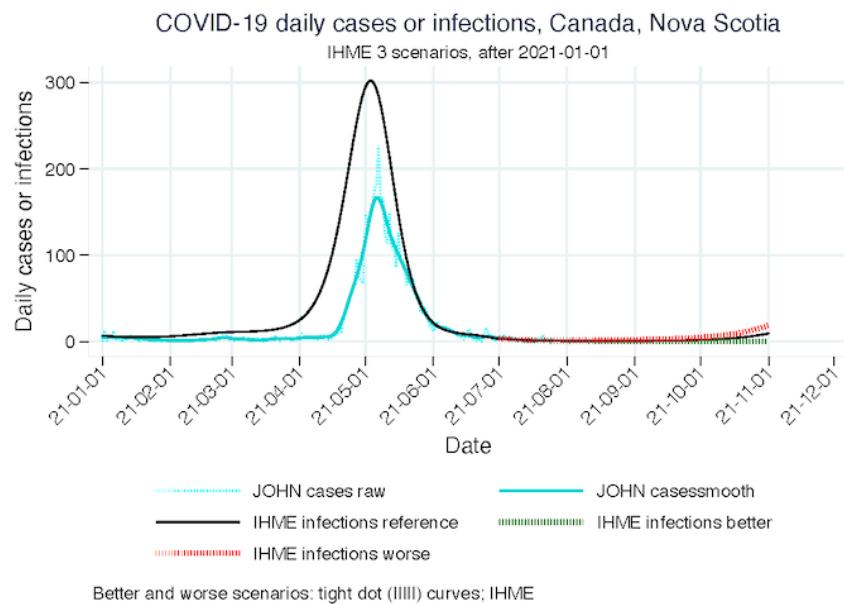
(4) Nova Scotia [Daily cases or infections, reference scenarios, all time](#)



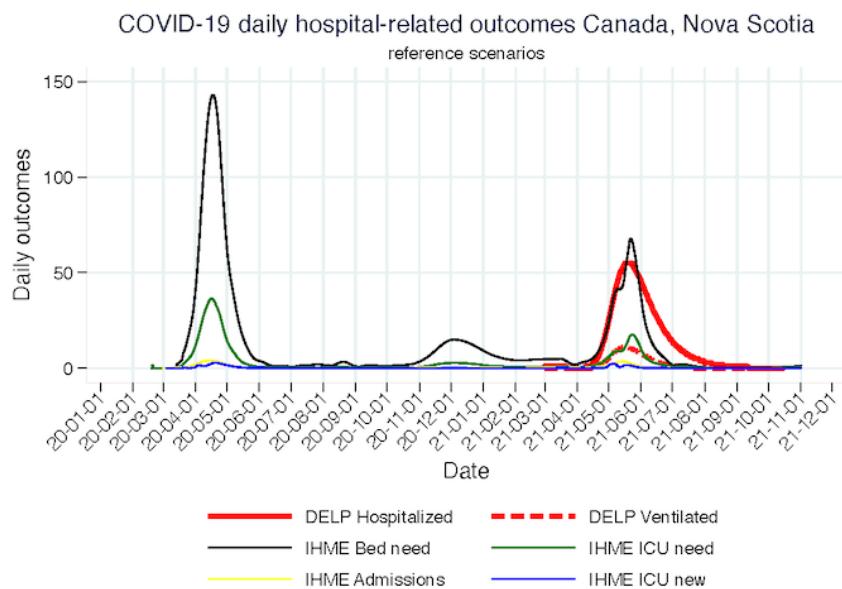
(5) Nova Scotia [Daily cases or infections, reference scenarios, 2021](#)



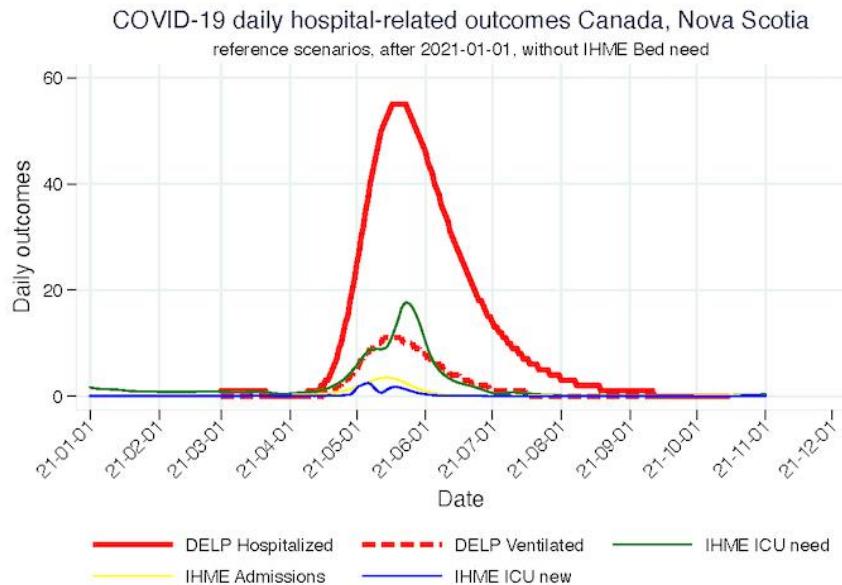
(6) Nova Scotia [Daily cases or infections, 3 scenarios, 2021](#)



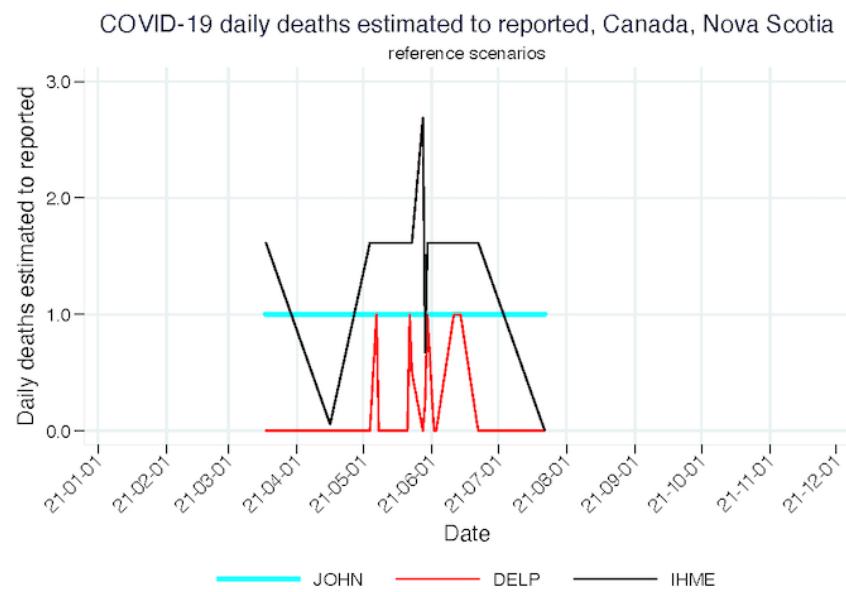
(7) Nova Scotia Hospital-related outcomes, all time



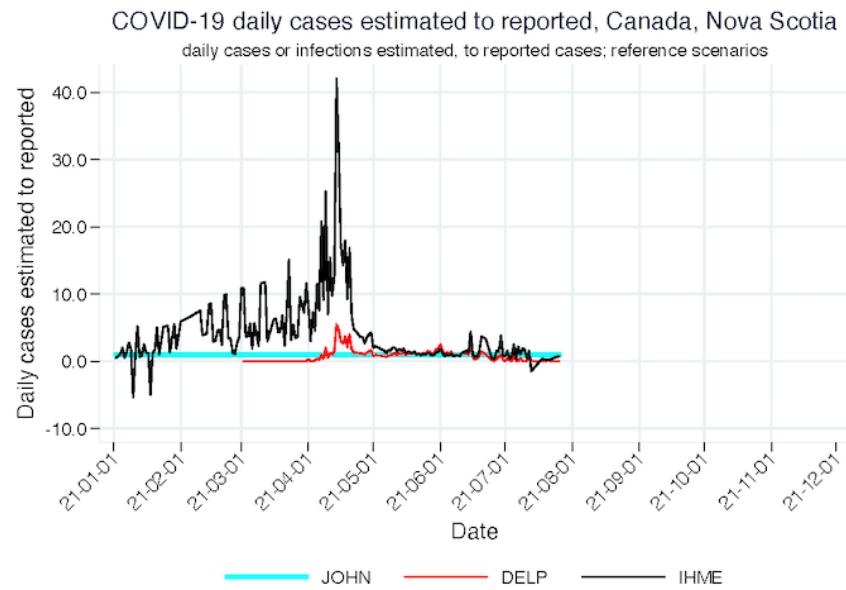
(8) Nova Scotia Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand



(9) Nova Scotia [Daily deaths estimated to reported, reference scenarios, 2021](#)

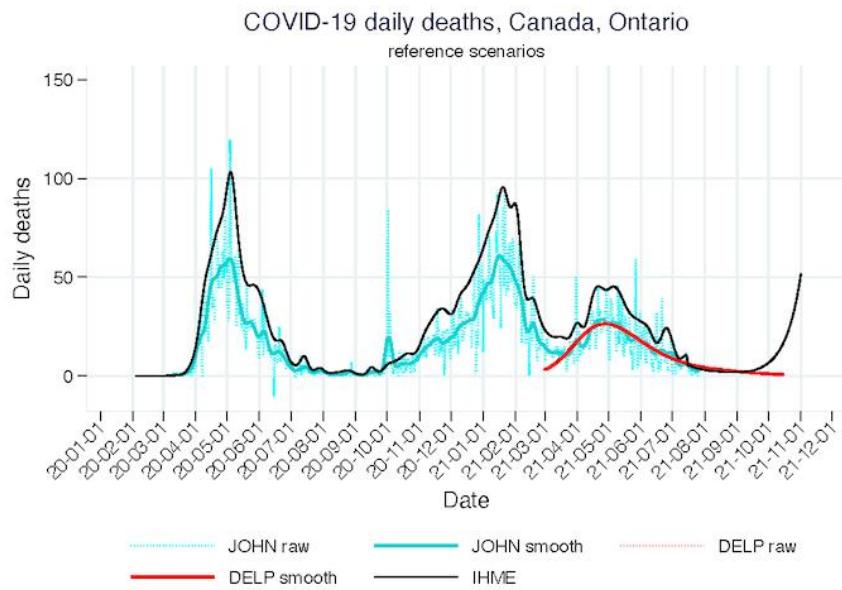


(10) Nova Scotia [Daily cases or infections estimated to reported, reference scenarios, 2021](#)

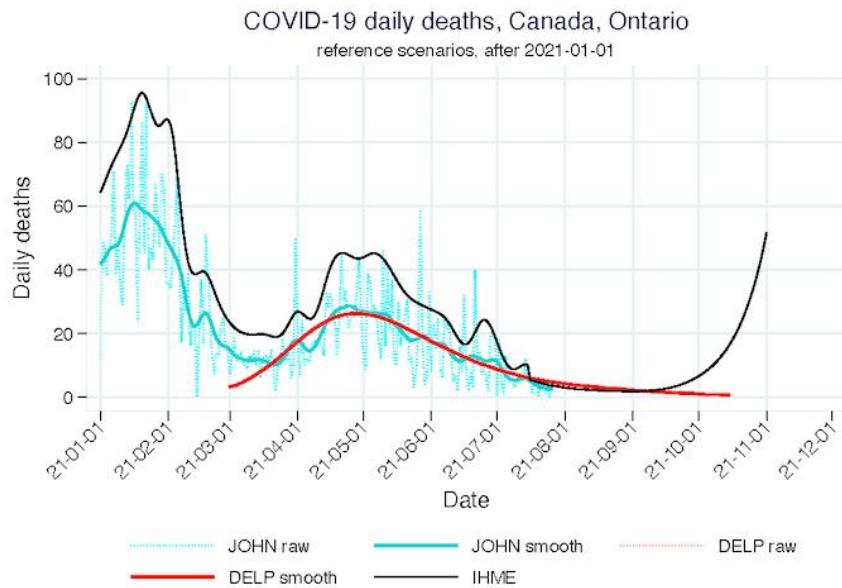


Selected graphs – Ontario

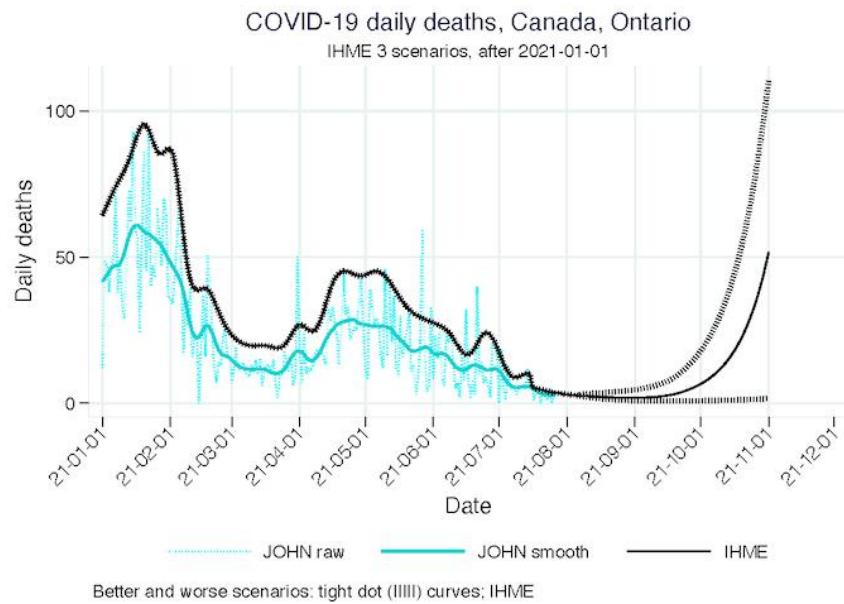
(1) Ontario [Daily deaths, reference scenarios, all time](#)



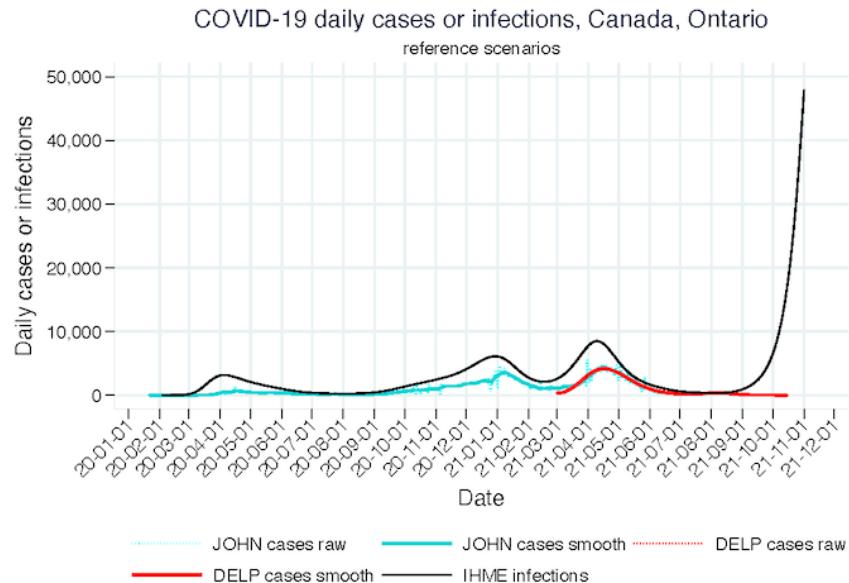
(2) Ontario [Daily deaths, reference scenarios, 2021](#)



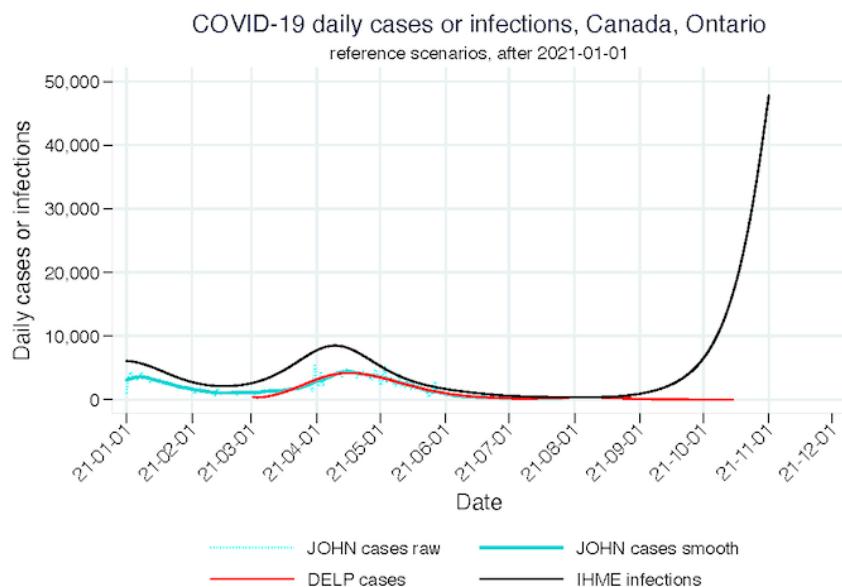
(3) Ontario [Daily deaths, 3 scenarios, 2021](#)



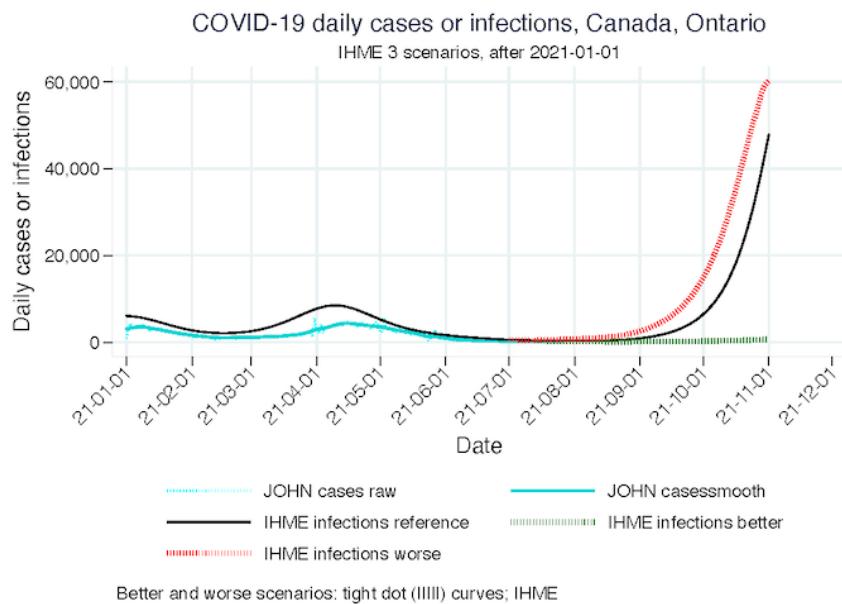
(4) Ontario [Daily cases or infections, reference scenarios, all time](#)



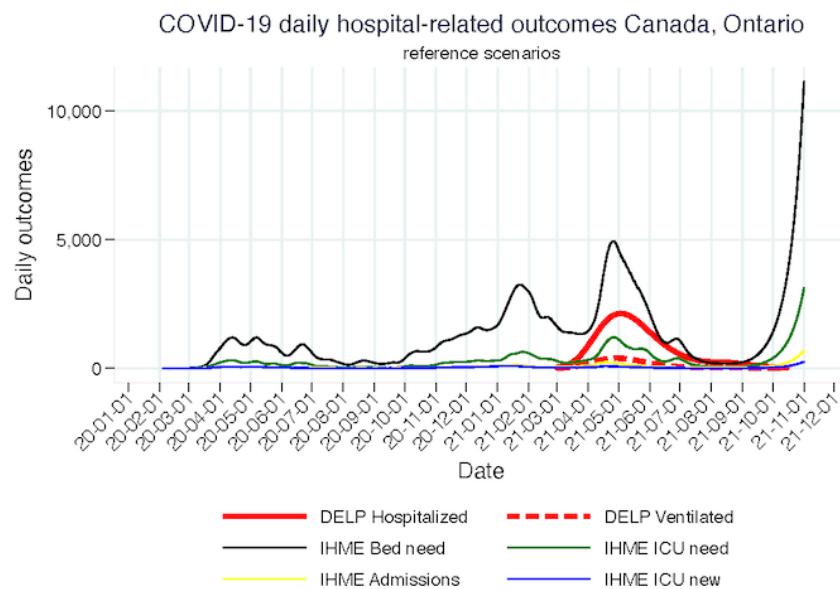
(5) Ontario [Daily cases or infections, reference scenarios, 2021](#)



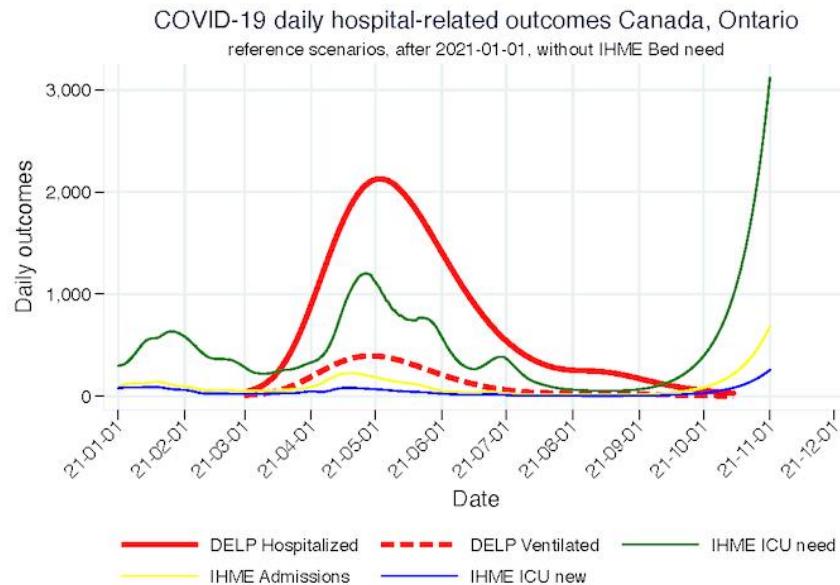
(6) Ontario [Daily cases or infections, 3 scenarios, 2021](#)



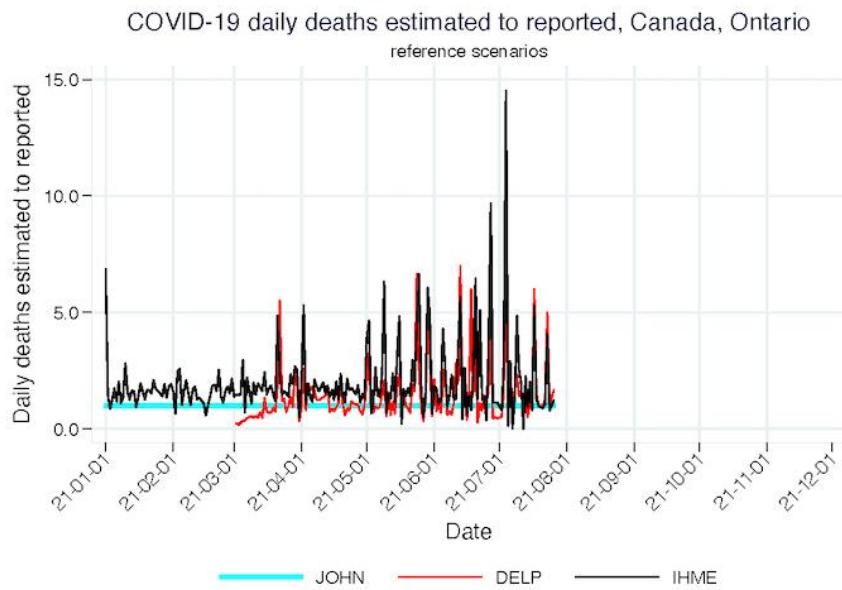
(7) Ontario [Hospital-related outcomes, all time](#)



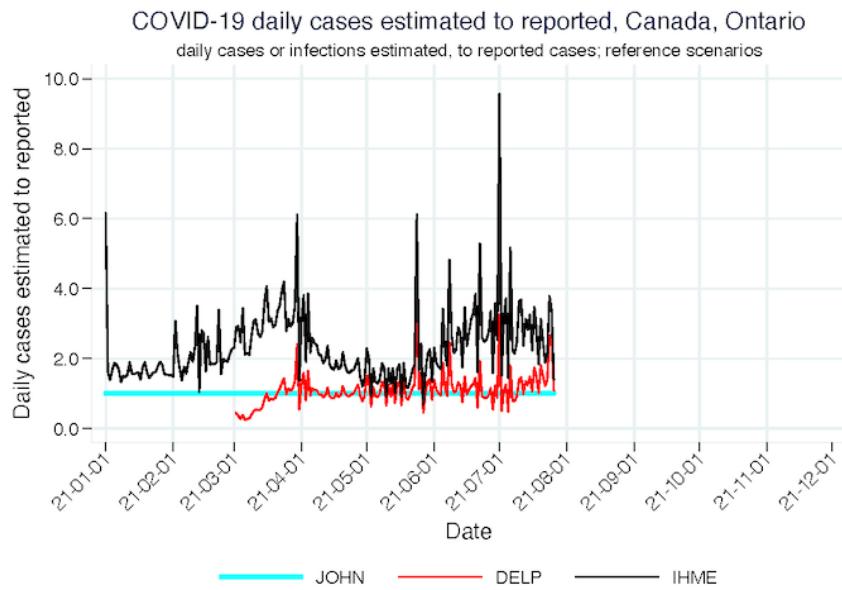
(8) Ontario [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



(9) Ontario [Daily deaths estimated to reported, reference scenarios, 2021](#)

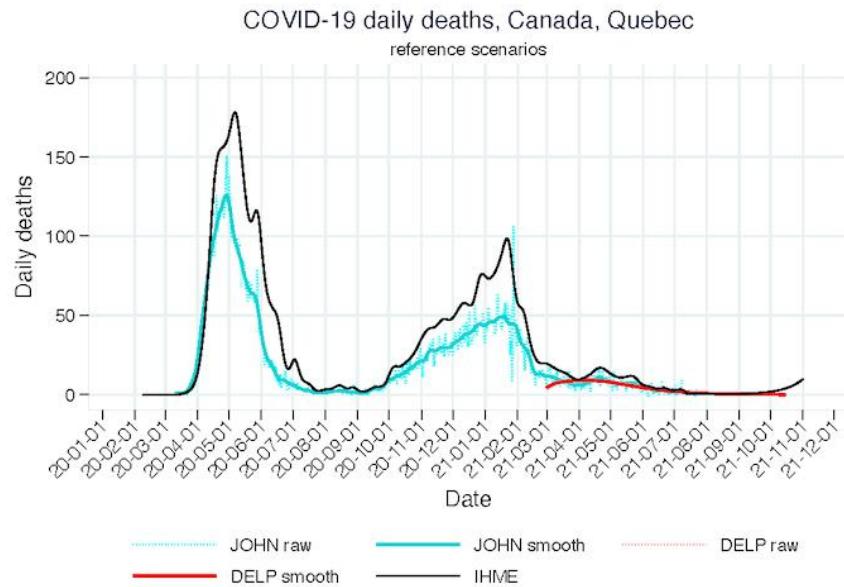


(10) Ontario [Daily cases or infections estimated to reported, reference scenarios, 2021](#)

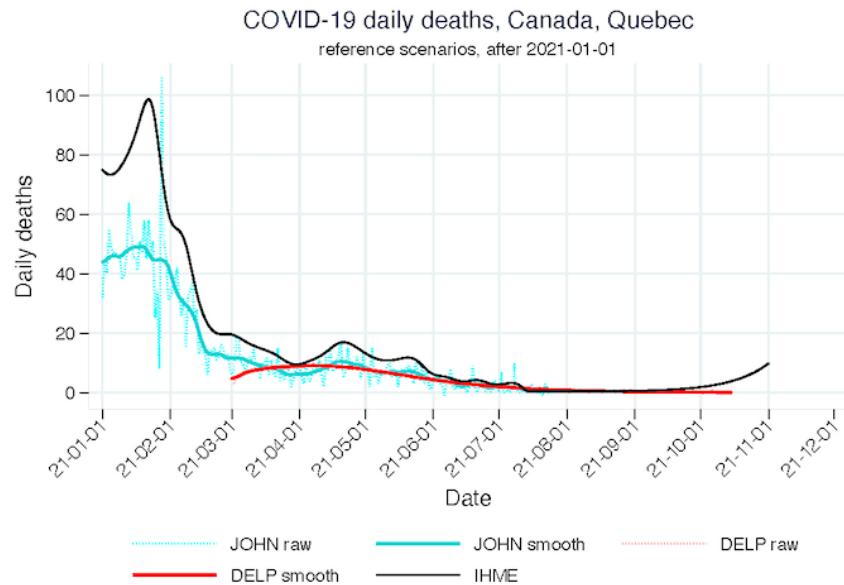


Selected graphs – Quebec

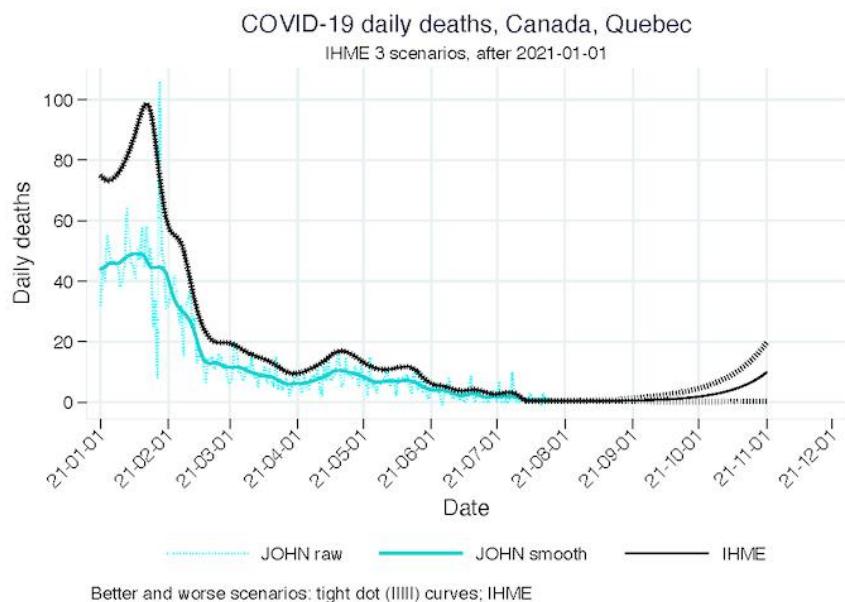
(1) Quebec [Daily deaths, reference scenarios, all time](#)



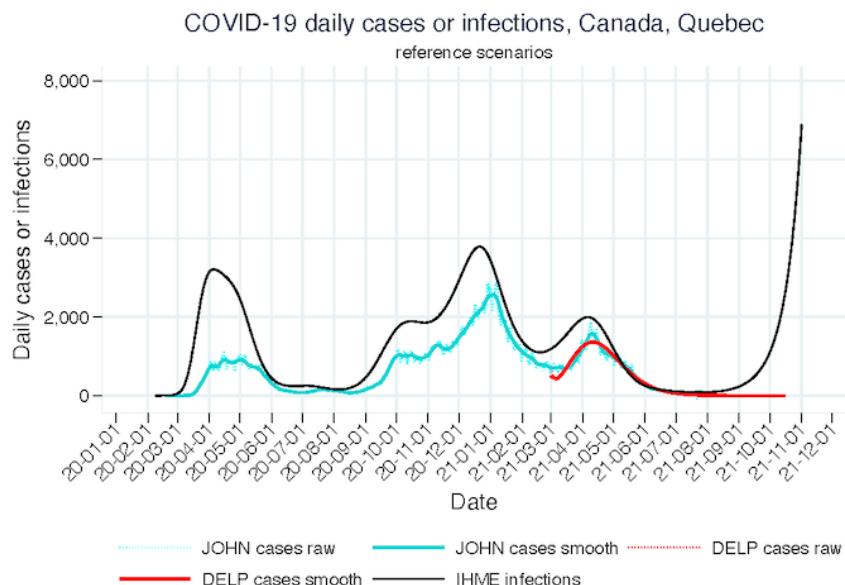
(2) Quebec [Daily deaths, reference scenarios, 2021](#)



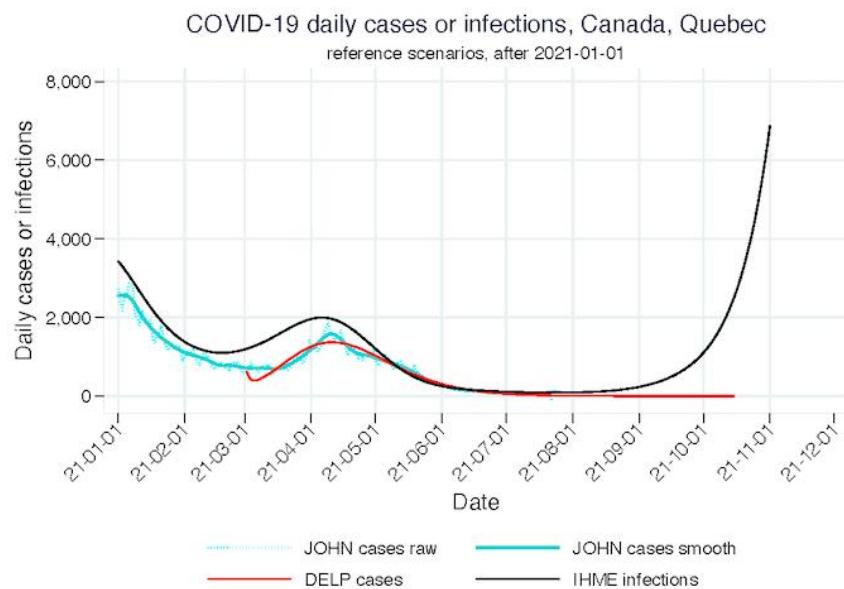
(3) Quebec [Daily deaths, 3 scenarios, 2021](#)



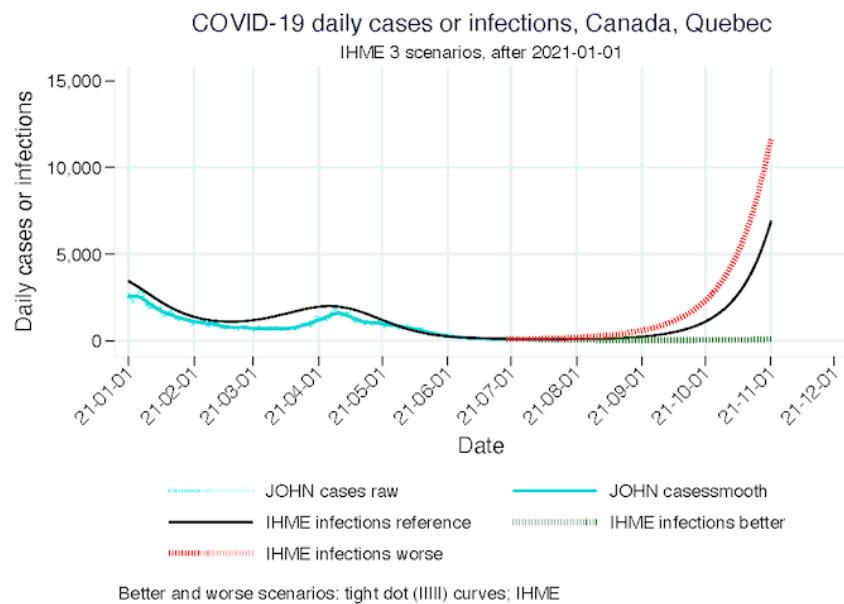
(4) Quebec [Daily cases or infections, reference scenarios, all time](#)



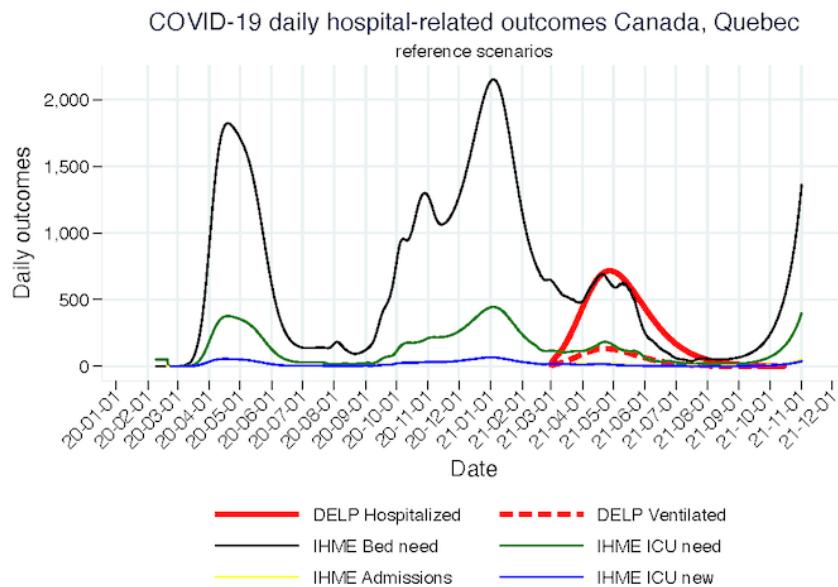
(5) Quebec [Daily cases or infections, reference scenarios, 2021](#)



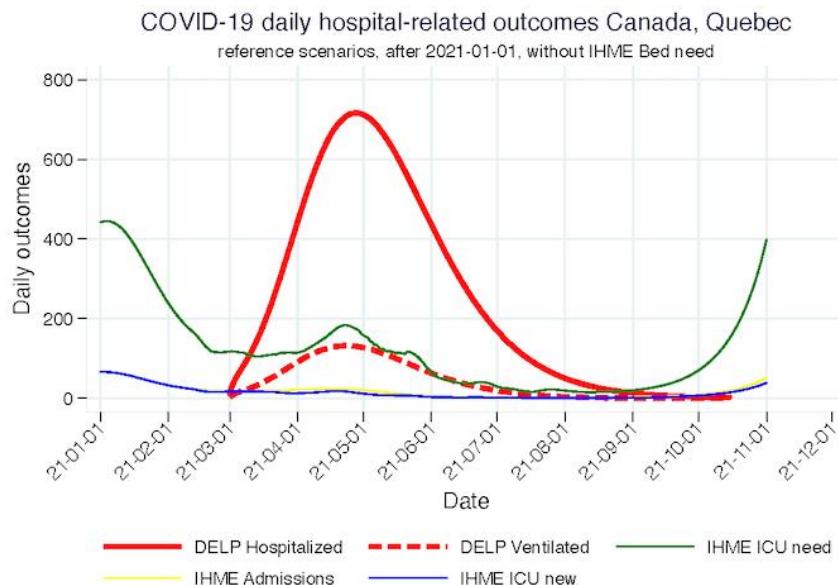
(6) Quebec [Daily cases or infections, 3 scenarios, 2021](#)



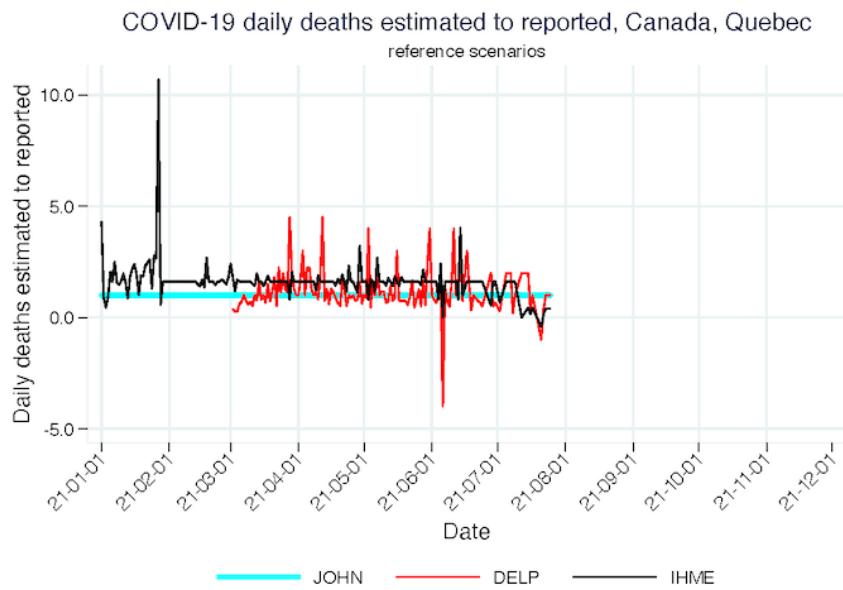
(7) Quebec [Hospital-related outcomes, all time](#)



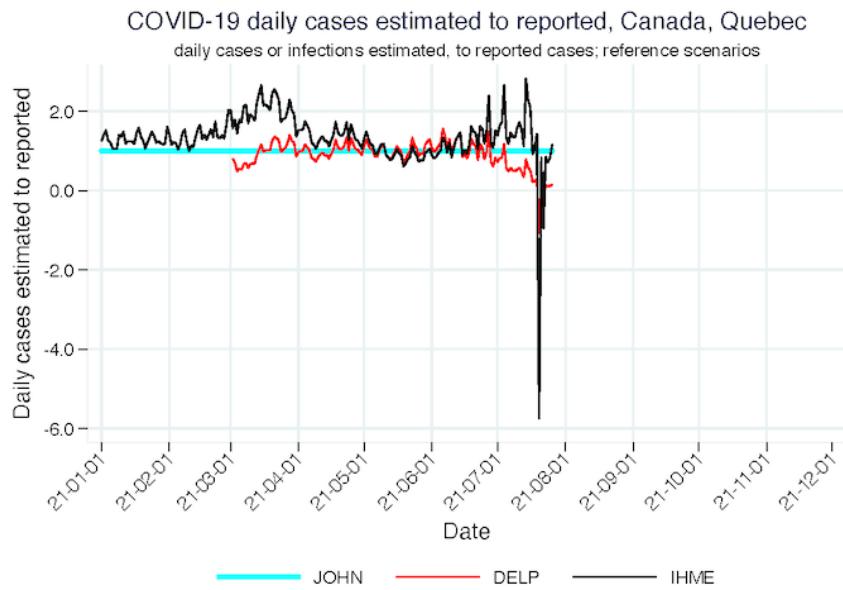
(8) Quebec [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



(9) Quebec [Daily deaths estimated to reported, reference scenarios, 2021](#)

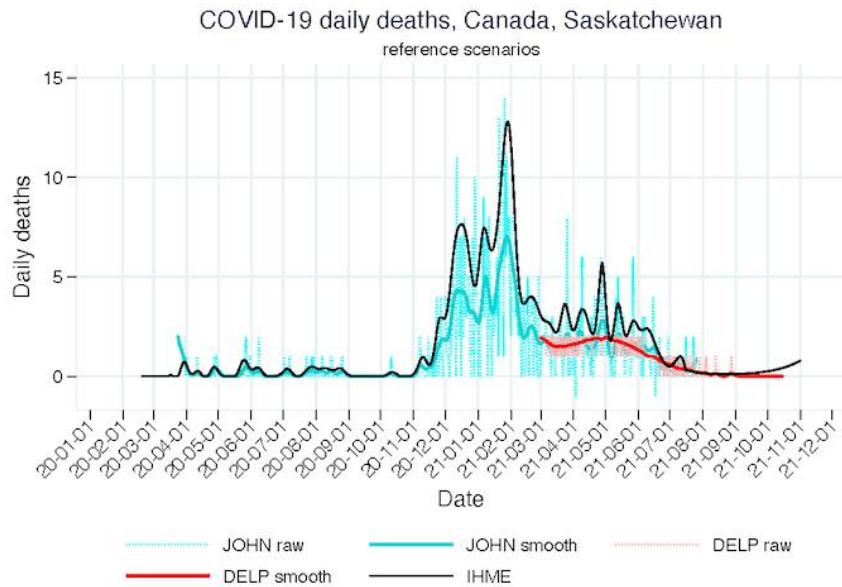


(10) Quebec [Daily cases or infections estimated to reported, reference scenarios, 2021](#)

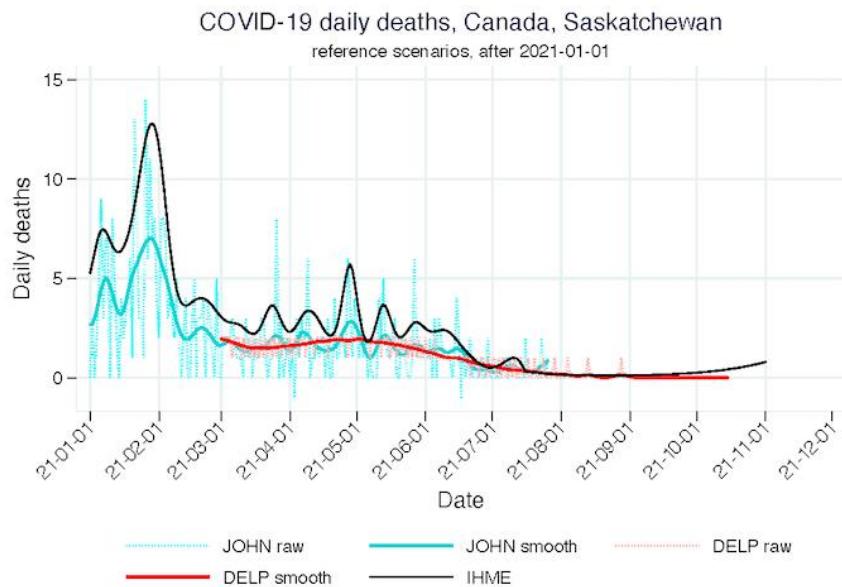


Selected graphs – Saskatchewan

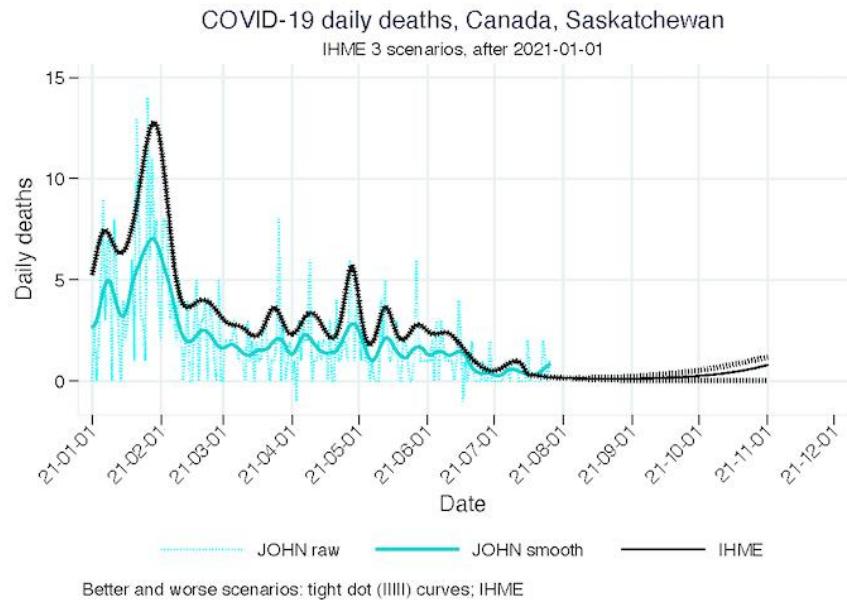
(1) Saskatchewan [Daily deaths, reference scenarios, all time](#)



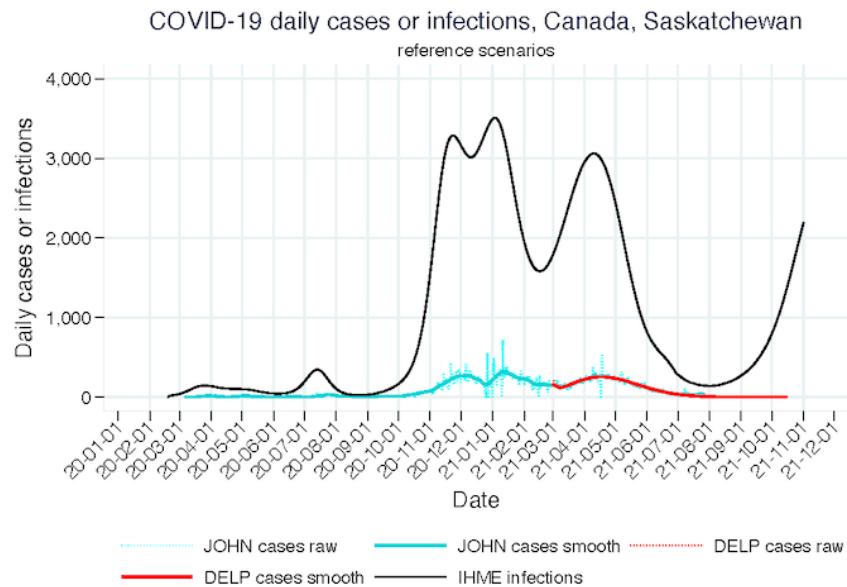
(2) Saskatchewan [Daily deaths, reference scenarios, 2021](#)



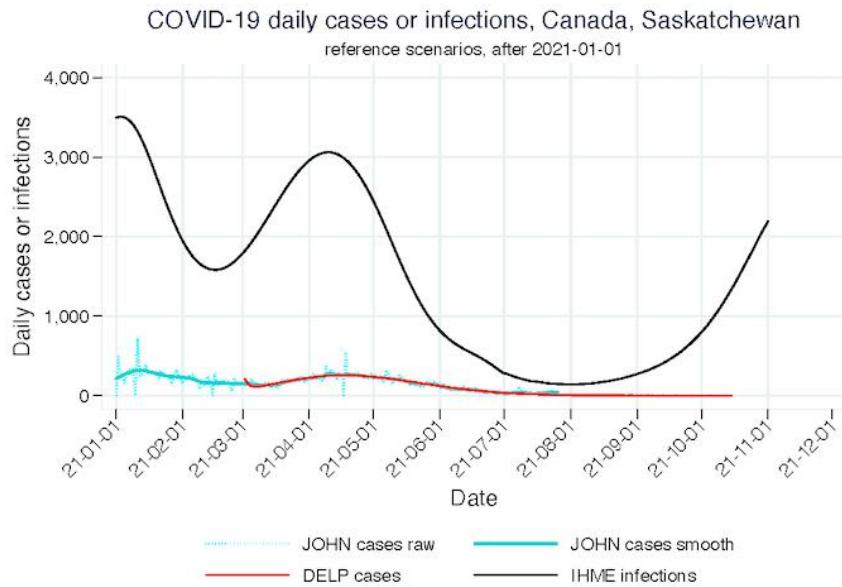
(3) Saskatchewan [Daily deaths, 3 scenarios, 2021](#)



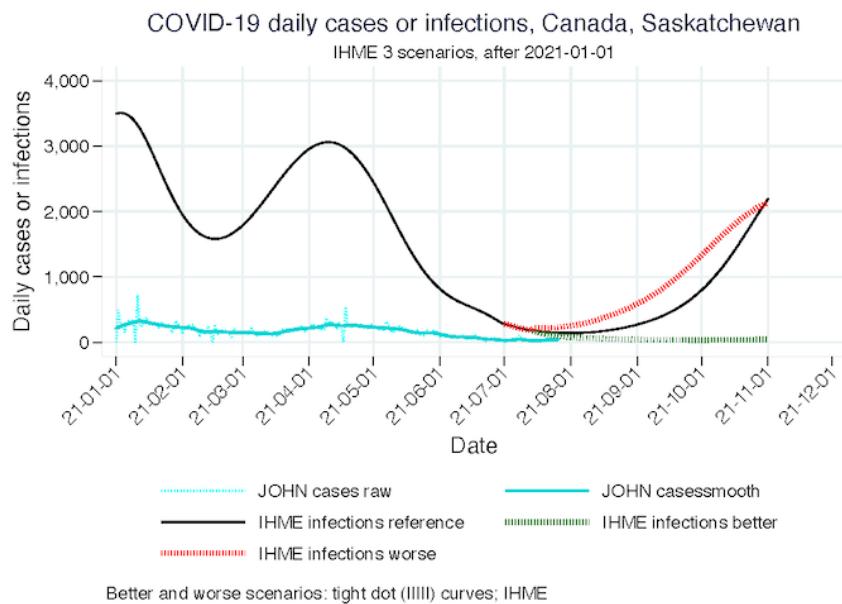
(4) Saskatchewan [Daily cases or infections, reference scenarios, all time](#)



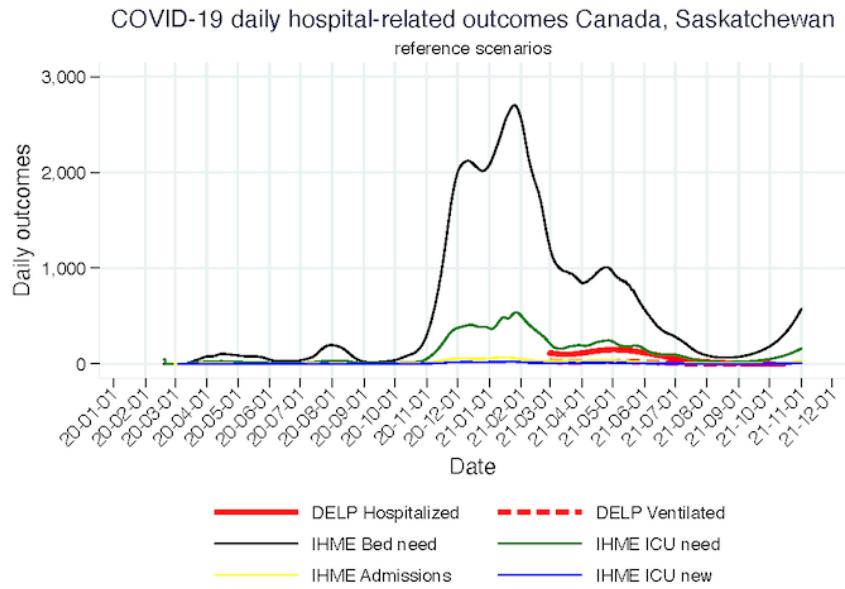
(5) Saskatchewan [Daily cases or infections, reference scenarios, 2021](#)



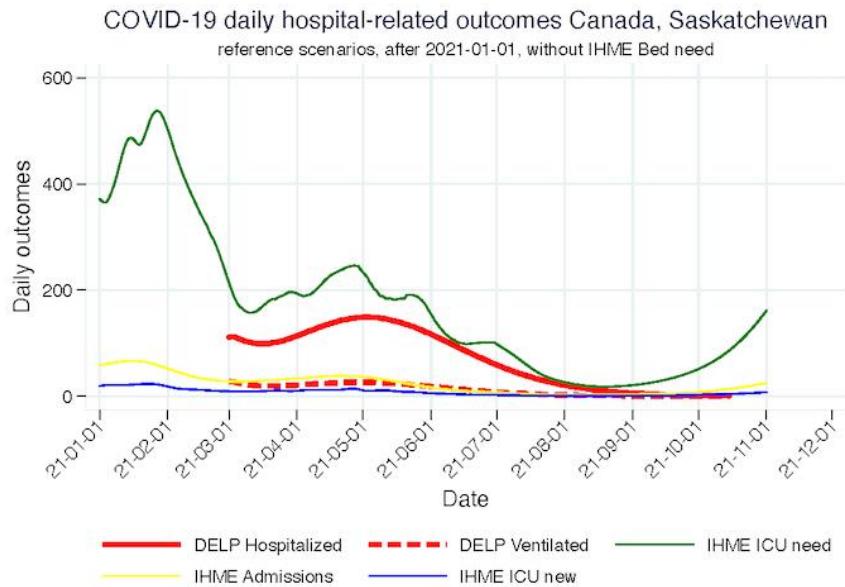
(6) Saskatchewan [Daily cases or infections, 3 scenarios, 2021](#)



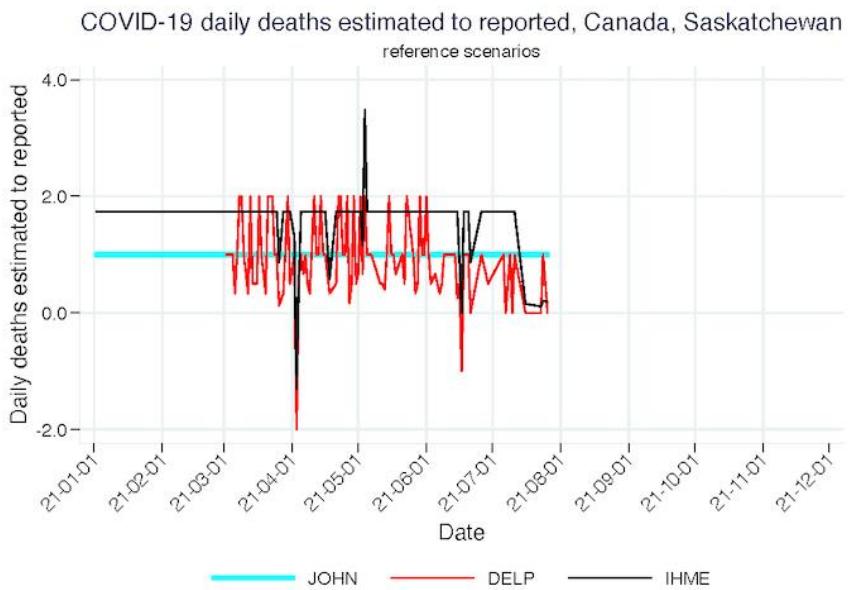
(7) Saskatchewan [Hospital-related outcomes, all time](#)



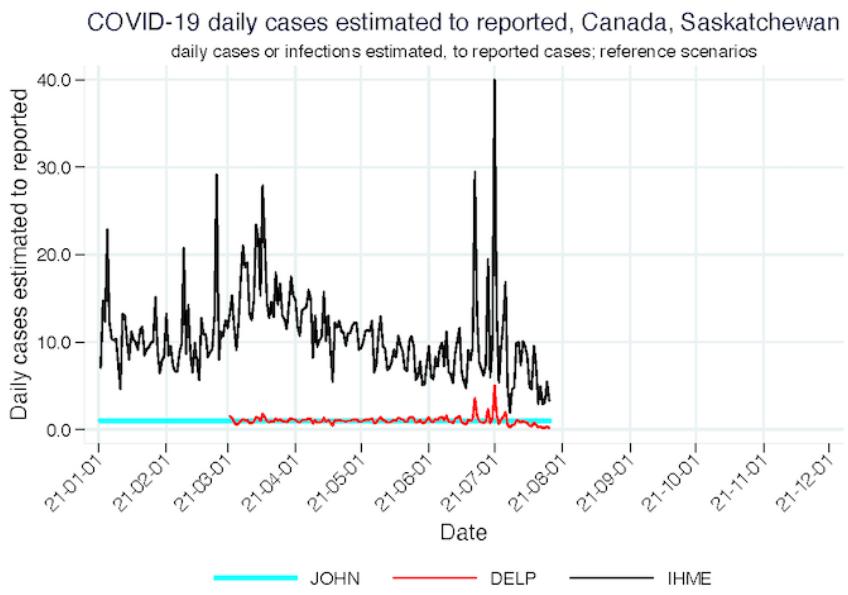
(8) Saskatchewan [Hospital-related outcomes, 2021, without IHME Bed need and IMPE Hospital demand](#)



(9) Saskatchewan [Daily deaths estimated to reported, reference scenarios, 2021](#)



(10) Saskatchewan [Daily cases or infections estimated to reported, reference scenarios, 2021](#)



Graphs' Description and Interpretation

FOURTH WAVE of the epidemic in Canada is predicted *to start from early August 2021 at the national level.*

NATIONAL LEVEL

Summary:

IHME model:

Daily deaths, reference scenario: (page 9) rise start early Aug, max value on Nov 1st < 75

Daily deaths, worse scenario: (page 10) rise start early Aug, max value on Nov 1st < 150

Daily infections, reference scenario: (page 11) rise start early Aug, max value on Nov 1st > 60 K

Daily infections, worse scenario: (page 11) rise start late Jul, max value on Nov 1st < 90 K

Daily bed need, reference scenario: (page 12) rise start mid Aug, max value on Nov 1st: < 15 K

Daily ICU need, reference scenario: (page 12) rise start early Sep, max value on Nov 1st: > 4 K

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

Details:

Graphs of the estimated trajectory of infections and deaths by IHME show still-would-be-increasing trends on latest date of estimations available (November 1st). Based on retrospective longitudinal assessment of predictive performance of models in Canada and provinces, Iran¹, and the global level², **IHME** and **IMPE** are the more reliable ones among the five models. The latest released update of IMPE model, dated 20210719, lags for about a week behind the latest released update of IHME, dated 20210727.

¹ <https://github.com/pourmalek/covir2>

² <https://github.com/pourmalek/CovidVisualizedGlobal>

(A) Rise in Infections

(Page 11) Daily infections (sum of all asymptomatic and symptomatic infections) are predicted to rise in mid-August and reach > 60,000 by November 1st by IHME's reference scenario, where IHME estimates for daily cases in second and third waves peaked about 20,000 (three times less than 60 K). IHME and IMPE do not estimate "cases" (symptomatic infections). Cases should follow comparable trajectory with that of infections, but with much less values.

The latest released update of IMPE model, dated 20210719, did not predict increase in infections in their reference scenario, but predicted so in their worse scenario, starting late July, and reaching below 20,000 in mid-October. IHME's worse scenario daily cases reaches about < 90,000 daily infections on November 1st.

(B) Rise in deaths

(Pages 9-10) Daily deaths are predicted by IHME to start rising slowly from early August, with steeper slope in September, and more steeply in October, reaching < 75 about November 1st. The latest released update of IMPE model, dated 20210719, did not predict increase in deaths in their reference scenario, but predicted so in their worse scenario, to < 25 in mid-October. IHME's worse scenario daily deaths reaches about < 150 daily deaths on November 1st.

Interpretation of deaths to cases ratios

A huge rise in daily deaths is not predicted to be accompanied by the huge rise in infections (and cases), like what would be expected in populations with low vaccination converge rates. This lower values of ratios of deaths to infections (and cases), i.e., IFR (and CFR) – compared with previous waves – is most is reflection of the now higher vaccination converge rates compared with previous waves. However, larger rises in deaths would be expected in pockets and subgroups of population in locations with low vaccination converge rates.

(C) Rise in hospital-related outcomes

(Page 12) IHME's prediction of daily *Bed Need* (non-ICU) increases starting from mid-August, reaching < 15,000 by November 1st, where IHME's estimates in second and third waves were about 8,000 to 9,000. More than 50% increase in daily bed needs is predicted by IHME, by about November 1st, with a still-would-be-increasing slope. IHME's daily *ICU Bed Need* prediction reach > 4,000 November 1st, with a still-would-be-increasing slope, where such estimates in the last two waves peaked about 2,000 to 3,000.

* Interpretation of rise in hospital-related outcomes

It seems given the lower values of ratios of deaths to infections (and cases), compared with previous waves, the levels of estimated daily regular and ICU bed need is higher than expectation. Seems that there might be an internal inconsistency between IHME model estimates of deaths and their estimates of regular and ICU bed need. This interpretation is made based on observation a few instances of prior similar observation of inconsistency elsewhere. For instance, IHME update 20210514 for Iran³ predicted a huge increase in bed needs about July 2021, whereas there was not proportionate increase in cases or deaths predicted for July 2021 in update 20210514. In later updates, IHME removed such huge increase in bed needs about July 2021. Strangely, now in July 2021, that prediction of huge increase in bed needs has become true. The bottom-line is that the bed needs in Canada predicted by IHME might need a closer look considering the contemporaneous levels of estimated infections and deaths. I am not sure if this interpretation is correct.

This observation about relation of predicated bed needs and predicated infections and deaths at the national level might hold true, to some extent, for the predictions at the province level.

Daily Death Rates, national level and by province (page 14)

Fourth wave: IHME predicted that from August to October 2021, Ontario would have daily death rates (in 100,000 population) higher than national value, reaching more than 0.35 about November 1st, when national value would be about 0.2. Rates in other provinces (for which estimates are available by IHME) would be less than national value – among which Alberta and Quebec would have the highest rates, followed by Saskatchewan, Manitoba, British Columbia, and Nova Scotia.

First to third waves: IHME estimates indicate that during the first wave, Quebec had the highest daily death rate; more than 2.0, versus national value of 0.75. Early in the second wave Manitoba had the highest rate, and later in January 2021 Quebec had the highest rate. Early in the third wave, Saskatchewan and Ontario had the highest rates, and later in May and June 2021 Manitoba had the highest daily death rate. At the national level, the highest rates decreased from the first to second and the third wave, 0.75, 0.70, and less than 0.25 reactively.

³ <https://github.com/pourmalek/covir2/tree/main/20210514>

PROVINCE LEVEL

Two models, IHME and DELP, provide estimates for the subnational levels. As mentioned above, IHME's estimates are more reliable than the other. *Therefore, the predictions below for the provinces summarized below are all by IHME model.*

Limitation: Predictions for territories, and some provinces, are not produced in these models.

The end date of available estimates is November 1st, 2021.

Daily bed need = Daily regular bed need

Summary:

Numbers are rounded.

Daily infections at end date of available estimates (Nov 1st), descending order of daily infections

Province:	IHME Reference scenario (Worse scenario)
CANADA	60,000 (90,000)
Ontario:	50,000 (60,000)
Alberta:	8,000 (10,000)
Quebec:	7,000 (12,000)
Saskatchewan:	2,000 (2,000)
British Columbia:	1,000 (2,000)
Manitoba:	1,200 (2,000)
Nova Scotia:	100 (200)

Daily deaths at end date of available estimates (Nov 1st), by descending order of daily infections

Province:	IHME Reference scenario (Worse scenario)
CANADA	75 (150)
Ontario:	50 (120)
Alberta:	10 (10)
Quebec:	10 (20)
Saskatchewan:	3 (3)
British Columbia:	10 (10)
Manitoba:	5 (5)
Nova Scotia:	0 (0)

Daily regular bed needs (or **ICU bed needs**) at end date of available estimates (Nov 1st), by descending order of daily infections

All predictions by IHME model reference scenario. Alternate scenarios do not include bed needs.

Province: Daily regular bed needs (ICU bed needs)

CANADA	15,000 (4,000)
Ontario:	10,000 (3,000)
Alberta:	1,000 (300)
Quebec:	1,400 (400)
Saskatchewan:	600 (180)
British Columbia:	250 (100)
Manitoba:	150 (50)
Nova Scotia:	10 (5)

Details:

Alberta

Daily deaths, reference scenario: (page 15) rise start late Sep, max value on Nov 1st < 10

Daily deaths, worse scenario: (page 16) rise start late Sep, max value on Nov 1st < 10

Daily infections, reference scenario: (p 16-17) rise start early Aug, max value on Nov 1st: 8,000

Daily infections, worse scenario: (page 17) rise start early Aug, max value on Nov 1st: > 10,000

Daily bed need, reference scenario: (page 18) rise start early Aug, max value on Nov 1st: 1,000

Daily ICU need, reference scenario: (page 18) rise start early Sep, max value on Nov 1st: < 300

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

British Columbia

Daily deaths, reference scenario: (page 20) rise start early Sep, max value on Nov 1st < 10

Daily deaths, worse scenario: (page 21) rise start early Sep, max value on Nov 1st < 10

Daily infections, reference scenario: (p 21-22) rise start early Aug, max value on Nov 1st > 1,000

Daily infections, worse scenario: (page 22) rise start early Aug, max value on Nov 1st < 2,000

Daily bed need, reference scenario: (page 23) rise start early Aug, max value on Nov 1st: 250

Daily ICU need, reference scenario: (page 23) rise start early Sep, max value on Nov 1st: < 100

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

Manitoba

Daily deaths, reference scenario: (page 25) rise start early Sep, max value on Nov 1st < 5

Daily deaths, worse scenario: (page 26) rise start early Sep, max value on Nov 1st < 5

Daily infections, reference scenario: (p 26-27) rise start late Aug, max value on Nov 1st < 1,200

Daily infections, worse scenario: (page 27) rise start late Aug, max value on Nov 1st < 2,000

Daily bed need, reference scenario: (page 28) rise start early Aug, max value on Nov 1st < 150

Daily ICU need, reference scenario: (page 28) rise start early Sep, max value on Nov 1st: < 50

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

Nova Scotia

Daily deaths, reference scenario: (page 30) rise start *none*, max value on Nov 1st: zero

Daily deaths, worse scenario: (page 31) rise start *none*, max value on Nov 1st: zero

Daily infections, reference scenario: (p 31-32) rise start early Oct, max value on Nov 1st < 100

Daily infections, worse scenario: (page 32) rise start early Oct, max value on Nov 1st < 200

Daily bed need, reference scenario: (page 33) rise start late Nov, max value on Nov 1st < 10

Daily ICU need, reference scenario: (page 33) rise start late Nov, max value on Nov 1st: < 5

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope, very low slope, for deaths and infections; almost horizontal for regular bed and ICU beds.

Ontario

Daily deaths, reference scenario: (page 35) rise start mid Sep, max value on Nov 1st: 50

Daily deaths, worse scenario: (page 36) rise start early Aug, max value on Nov 1st: 120

Daily infections, reference scenario: (p 36-37) rise start late Aug, max value on Nov 1st < 50 K

Daily infections, worse scenario: (page 37) rise start early Aug, max value on Nov 1st < 60 K

Daily bed need, reference scenario: (page 38) rise start early Sep, max value on Nov 1st > 10 K

Daily ICU need, reference scenario: (page 38) rise start early Sep, max value on Nov 1st: > 3 K

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

Quebec

Daily deaths, reference scenario: (page 40) rise start mid Sep, max value on Nov 1st: 10

Daily deaths, worse scenario: (page 41) rise start early Sep, max value on Nov 1st: 20

Daily infections, reference scenario: (p 41-42) rise start late Aug, max value on Nov 1st < 7 K

Daily infections, worse scenario: (page 42) rise start late Jul, max value on Nov 1st < 12 K

Daily bed need, reference scenario: (page 43) rise start late Jul, max value on Nov 1st: 1,400

Daily ICU need, reference scenario: (page 43) rise start early Sep, max value on Nov 1st: 400

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

Saskatchewan

Daily deaths, reference scenario: (page 45) rise start early Oct, max value on Nov 1st < 3

Daily deaths, worse scenario: (page 46) rise start early Sep, max value on Nov 1st < 3

Daily infections, reference scenario: (p 46-47) rise start early Aug, max value on Nov 1st > 2 K

Daily infections, worse scenario: (page 47) rise start mid Jul, max value on Nov 1st > 2 K

Daily bed need, reference scenario: (page 48) rise start late Aug, max value on Nov 1st: 600

Daily ICU need, reference scenario: (page 48) rise start mid Aug, max value on Nov 1st: 180

See the “Interpretation of rise in hospital-related outcomes” on page 52.

Trends on latest date of estimations available (November 1st), still-would-be-increasing slope.

END