

## Canada COVID-19 epidemic models situation report No 30 - 2022-01-21

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Combine and visualize international periodically updated estimates of  
COVID-19 pandemic  
at the country level, countries with subnational level estimates  
Canada

Based on uptake 20220121 in <https://github.com/pourmalek/CovidVisualizedCountry>

Study update dates in uptake 20220121:

**DELP 20220121, IHME 20220121, IMPE 20220102, SRIV 20220119, PHAC 20220114**

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

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

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

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

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## **Summary of predictions**

**Summary of uptake 20220119 with IHME update 20220119, IMPE update 20220102, and PHAC update 20220114**

### **Daily Deaths**

The officially reported daily deaths are rising in Quebec (surpassed 70), British Columbia (surpassed 10), Manitoba (surpassed 8), New Brunswick (surpassed 3), and Nova Scotia (surpassed 2). Daily deaths peaked above 30 in Ontario before mid-January 2022.

The IHME model estimates show decline of the daily deaths started in about mid-January 2022 at the national level, Quebec, Ontario, Alberta, British Columbia, and Manitoba.

The officially reported daily deaths have surpassed IHME estimates at the national level, British Columbia, Manitoba, Nova Scotia, Quebec, and Saskatchewan.

### **Daily Cases or Infections**

The officially reported daily cases are declining in Ontario, Quebec, and Alberta. Daily cases are rising in British Columbia and stagnating in other provinces and territories.

The IHME model estimates show decline of the daily infections started in late December 2021 at the national level, in Quebec, Ontario, British Columbia, and Manitoba, and to begin in early January 2022 in Alberta and Saskatchewan.

The PHAC model estimates show decline of the daily infections at the national level and in Quebec, Ontario, Alberta, Manitoba, British Columbia, and Saskatchewan in January 2022.

The PHAC model estimates – both their better and the worse scenario – were way higher than the officially reported daily cases in Alberta, British Columbia, Manitoba, Ontario, and Saskatchewan. However, the reported daily cases surpassed (above 70) both scenarios of the PHAC model in Quebec.

### **Peak Times**

Comparison of previous IHME model estimates of peak times with official reports shows that the model estimates might have about two weeks error, i.e., their estimates of peak times might be within two weeks sooner to two weeks later than the peak times in the official reports.

## What is this report, and where does it come from?

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

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

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

Pre-print Data Note manuscript on Research Square, titled “CovidVisualized: Visualized compilation of international updating models’ estimates of COVID-19 pandemic at global and country levels”, 02 August 2021, PRE-PRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-768714/v1>] describes the methods and results of CovidVisualized tools: [\*CovidVisualizedCountry\* \(for Canada\)](#), [\*CovidVisualizedGlobal\* \(for global level\)](#), and [\*covir2\* \(for Iran\)](#).

Farshad Pourmalek MD MPH PhD, who has created the [\*CovidVisualizedCountry\*](#) tool (and [\*covir2\*](#) tool for Iran and [\*CovidVisualizedGlobal\*](#) tool for global level) and this report is a physician and epidemiologist who worked in the [School of Population and Public Health of University of British Columbia](#) and Vancouver General Hospital, [University of Washington](#), WHO, UNDEP, and UNICEF. ORCID ID <https://orcid.org/0000-0002-2134-0771>, PubMed.

**This report** is the **30th** situation report of predictions of five international and periodically updating COVID-19 epidemic models about the future trajectory of the epidemic in Canada and its provinces. The report is based on the “[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. Situation Reports are available online at

<https://github.com/pourmalek/CovidVisualizedCountry/tree/main/situation%20reports>

**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 regularly 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 models show an increase in daily cases or infections, hospitalizations, or deaths in the near future of ***one to three months***, ***technical advisors to the national and subnational decision-makers*** may consider suggesting augmentation of non-pharmacologic preventive interventions and vaccination. In doing so, the strengths and weaknesses of individual models need to be considered and 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.

The “CovidVisualized” project includes <https://github.com/pourmalek/CovidVisualizedCountry> for Canada and its provinces, <https://github.com/pourmalek/covir2> for Iran, and <https://github.com/pourmalek/CovidVisualizedGlobal> for the global level.

**Methods and technical details** of this work are available in a pre-print Data Note manuscript on Research Square, titled “CovidVisualized: Visualized compilation of international updating models’ estimates of COVID-19 pandemic at global and country levels”, 02 August 2021, PRE-PRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-768714/v1>] describes the methods and results of CovidVisualized tools: [CovidVisualizedCountry](#) (for Canada), [CovidVisualizedGlobal](#) (for global level), and [covir2](#) (for Iran).

Strengths and weaknesses of international and periodically updating COVID-19 epidemic models are discussed in [Pourmalek F, Rezaei Hemami M, Janani L, Moradi-Lakeh M. Rapid review of COVID-19 epidemic estimation studies for Iran. BMC Public Health. 2021 Feb 1;21\(1\):257. doi: 10.1186/s12889-021-10183-3. PMID: 33522928.](#)

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>

### **The 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>

**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](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>

\*

## Graphs

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 level, 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 ratio, Daily cases or infections estimated to reported cases ratio. Followed by additional outcomes estimated by IHME and added starting from uptake 20210916, i.e., R effective, Daily Infection-outcome ratios, Daily mobility, Daily mask use, and (Percent) cumulative vaccinated.

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

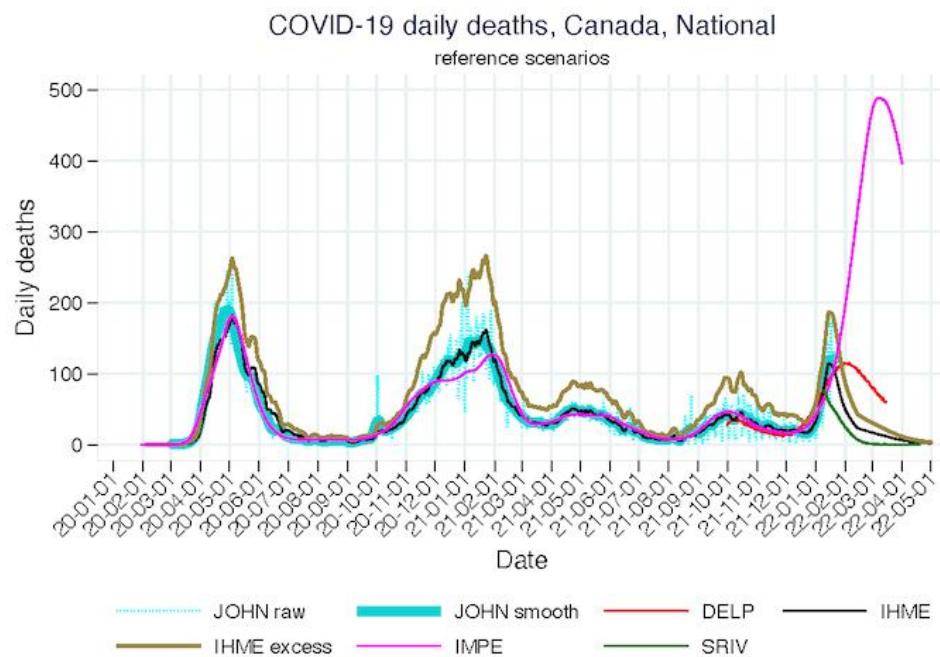
(4) *Scenarios*: Reference scenarios, followed by alternative scenarios. To examine the main or reference (aka. status quo) scenario and alternative (better and worse) scenarios.

(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 the 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)

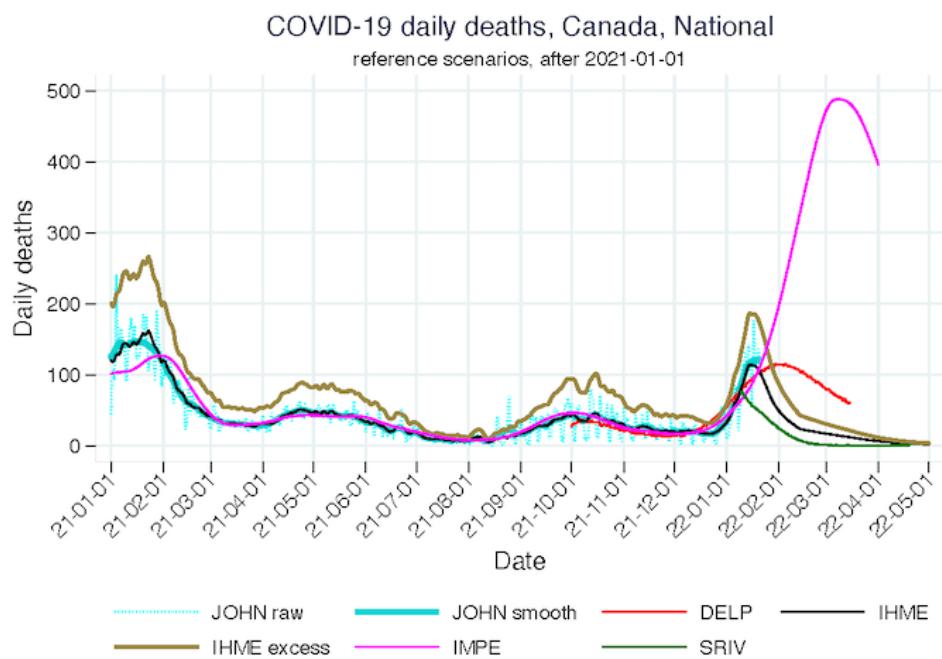
Among the five available international periodically updating studies or models of COVID-19 pandemic, only **TWO** studies, DELP and IHME, provide subnational level estimates for some countries. For Canada, they provide estimates for **SEVEN** provinces (AB, BC, MB, NS, ON, QC, SK).

## Selected graphs - Canada, national

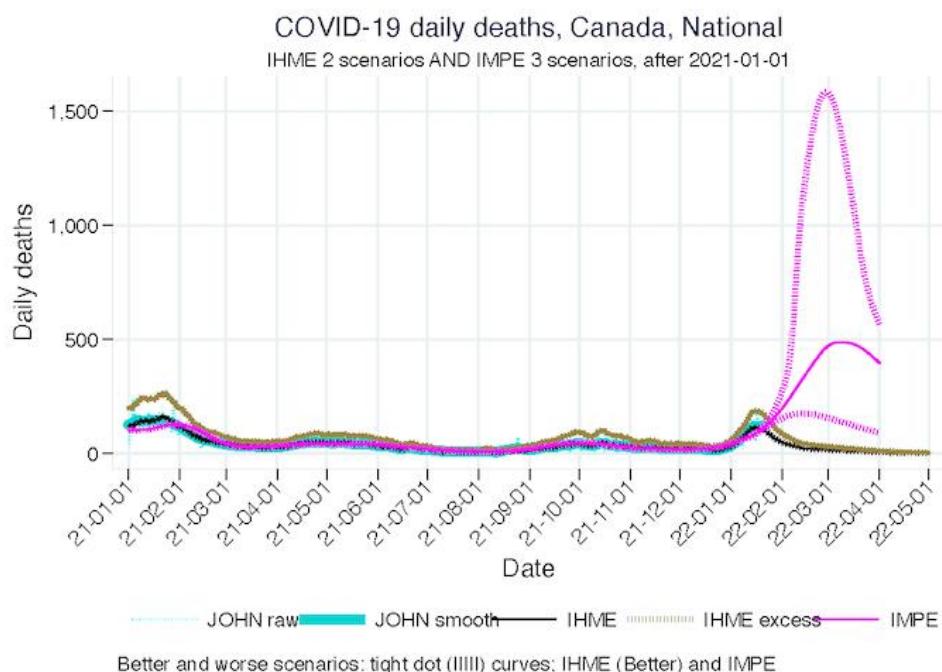
### (1) Canada [Daily deaths, reference scenarios, all time](#)



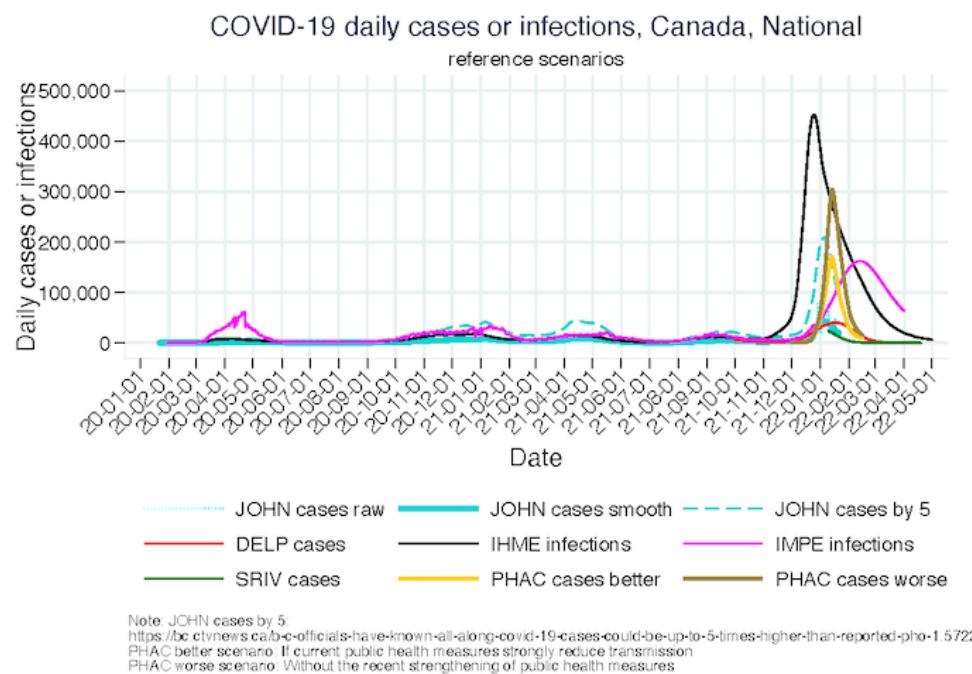
(2) Canada [Daily deaths, reference scenarios, 2021 on](#)



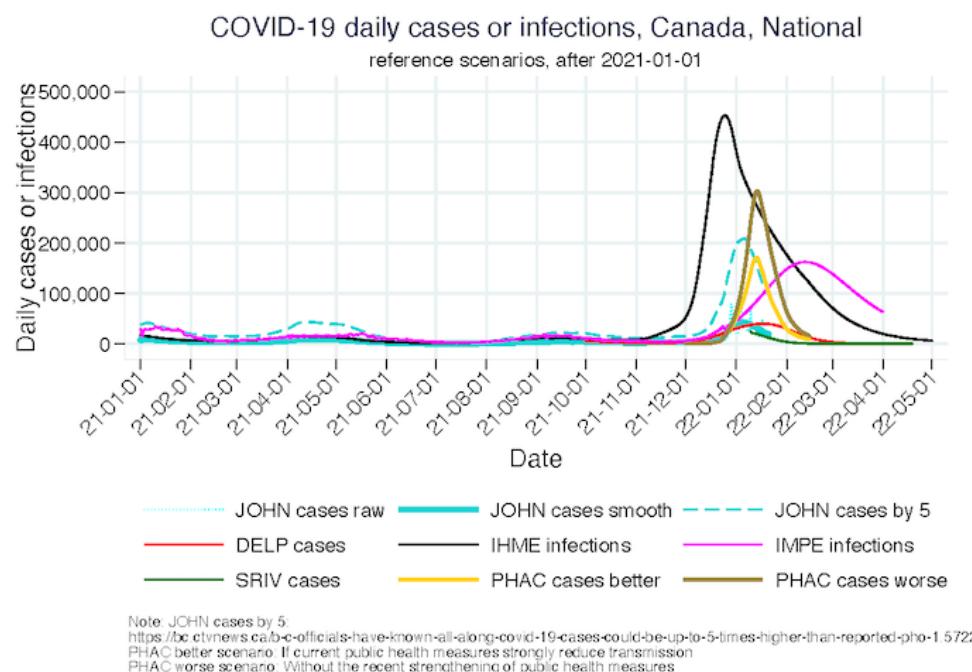
(3) Canada [Daily deaths, 3 scenarios, 2021 on](#)



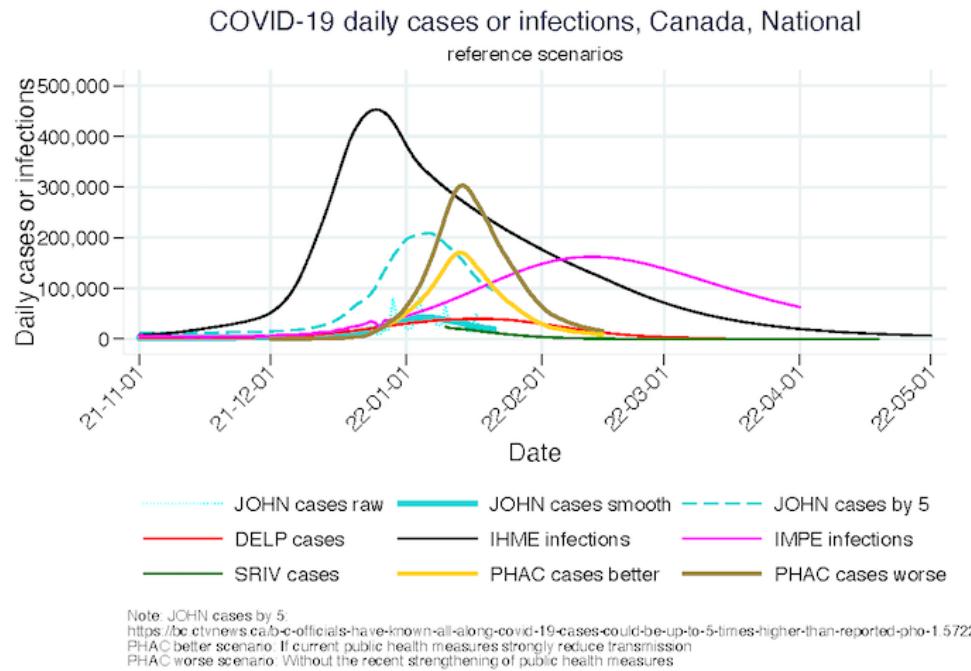
#### (4) Canada Daily cases or infections, reference scenarios, all time



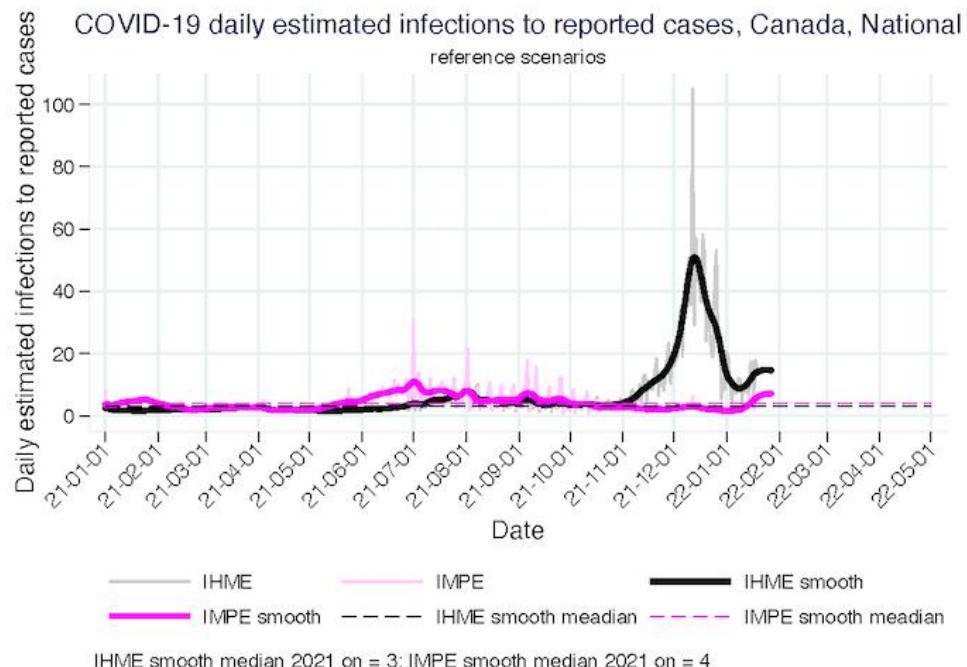
#### (5) Canada Daily cases or infections, reference scenarios, 2021 on



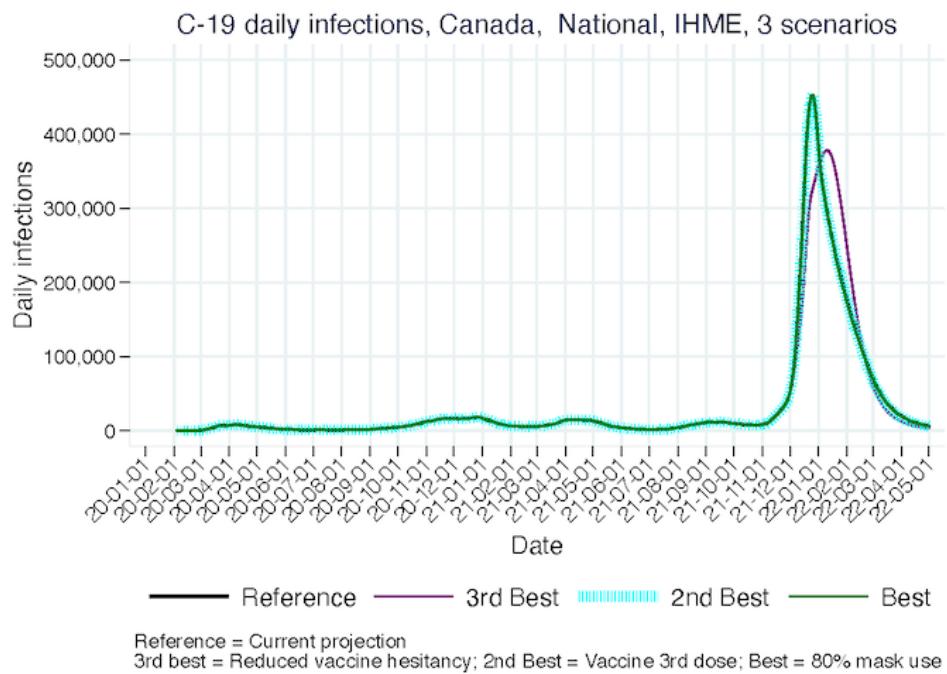
(6) Canada [Daily cases or infections, all scenarios, late 2021 on](#)



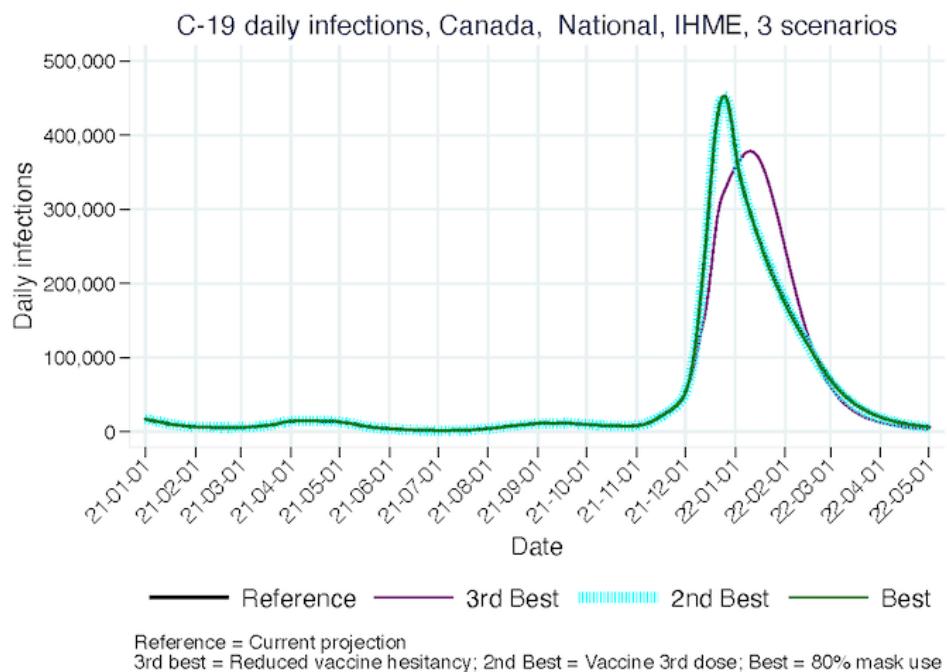
(6b) Canada [Daily estimated infections IHME IMPE to reported cases JOHN, main scenarios, 2021 on](#)



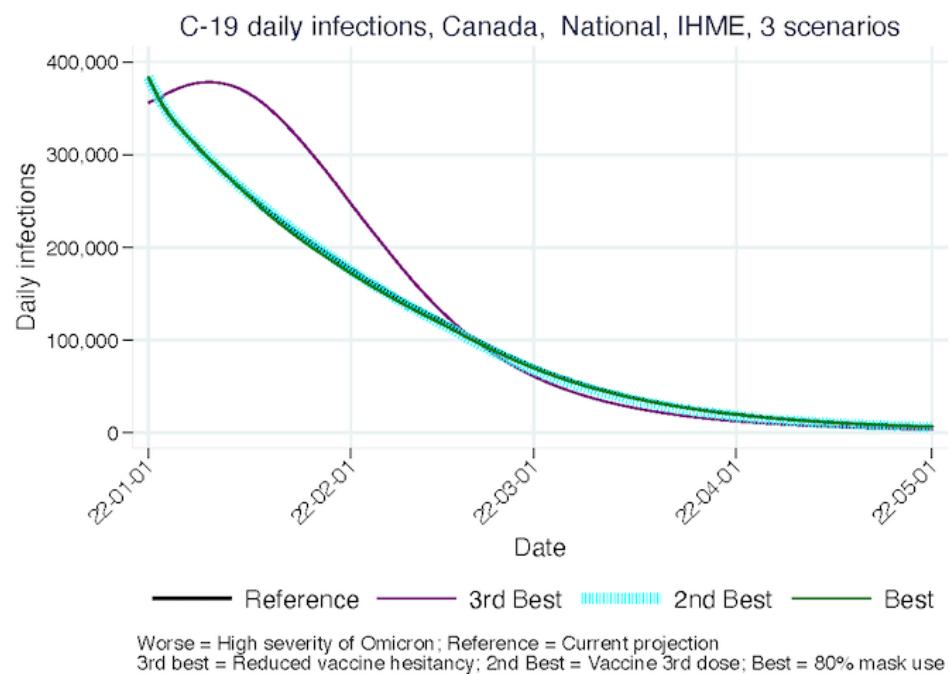
(6c) Canada [Daily estimated infections IHME, all scenarios, all time](#)



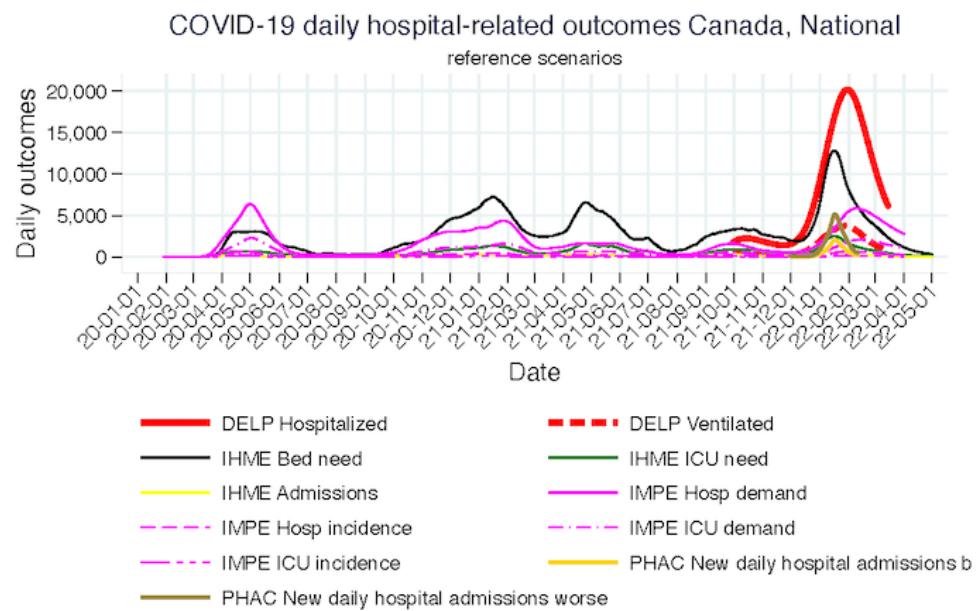
(6d) Canada [Daily estimated infections IHME, all scenarios, 2021 on](#)



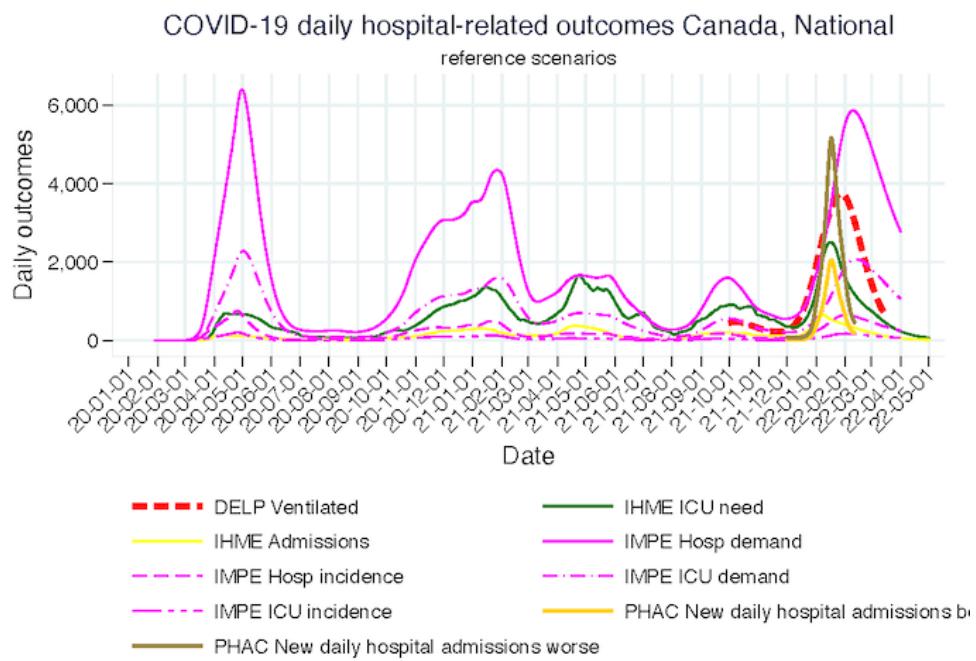
(6e) Canada [Daily estimated infections IHME, all scenarios, 2022](#)



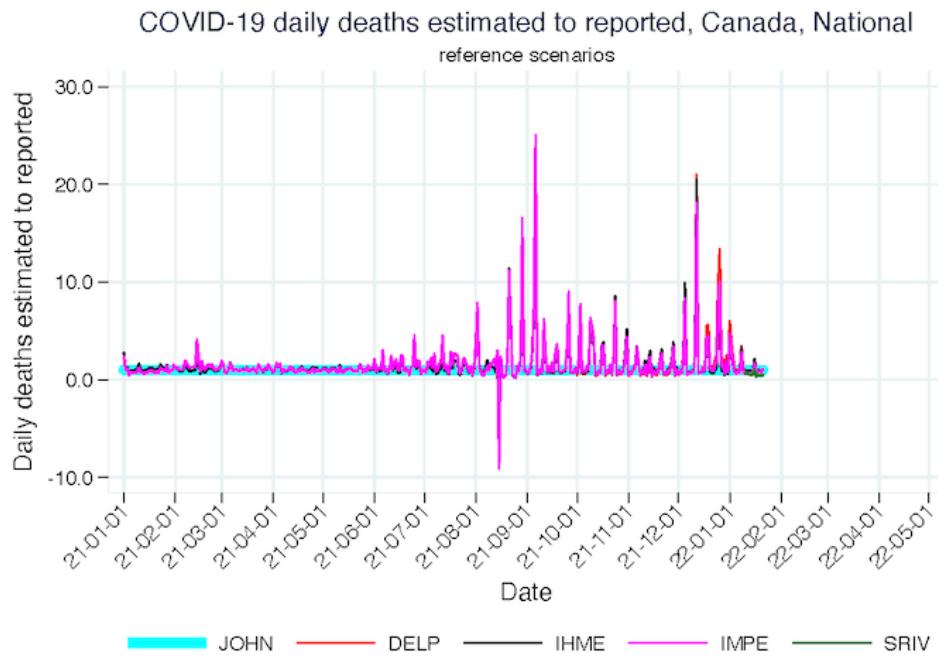
(7) Canada [Hospital-related outcomes, all time](#)



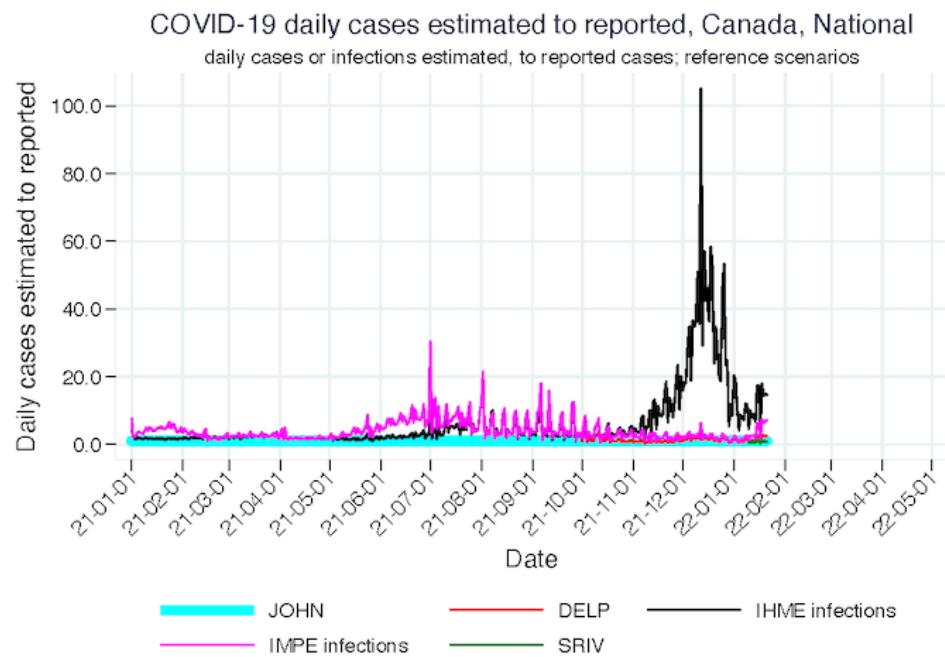
(8) Canada [Hospital-related outcomes, all time, without DELP](#) [Hospitalized DELP, DELP Ventilated, and IHME Bed need](#)



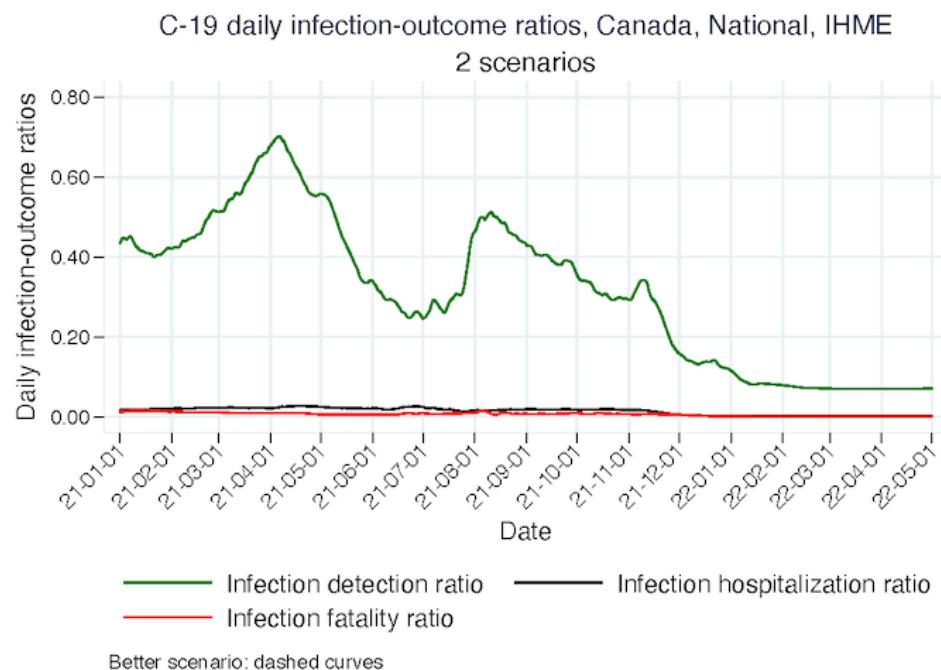
(9) Canada [Daily deaths estimated to reported, reference scenarios, 2021 on](#)



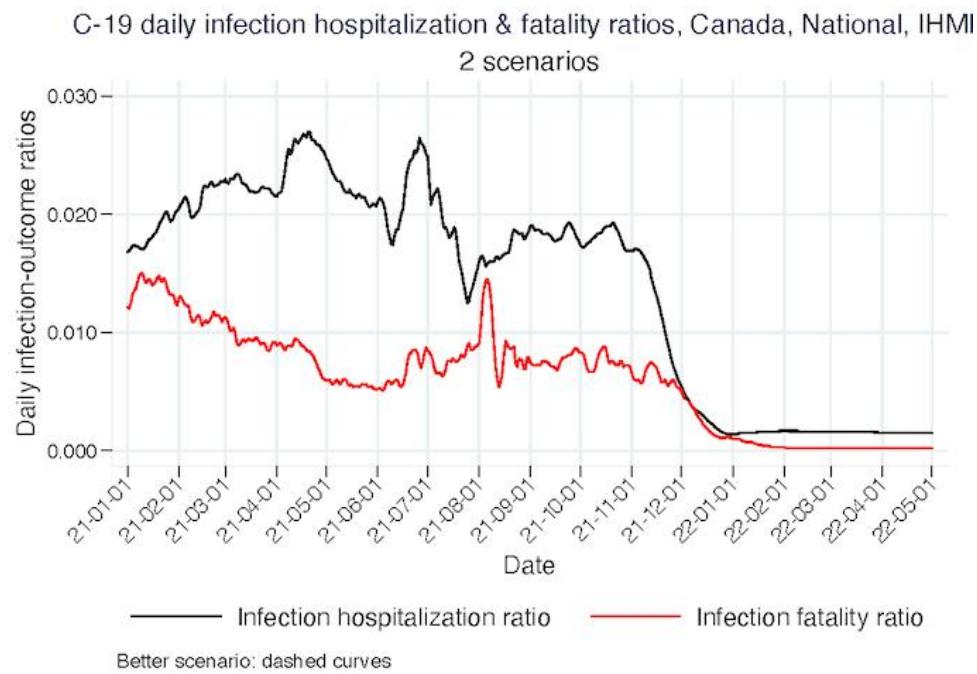
(10) Canada [Daily cases or infections estimated to reported, reference scenarios, 2021 on](#)



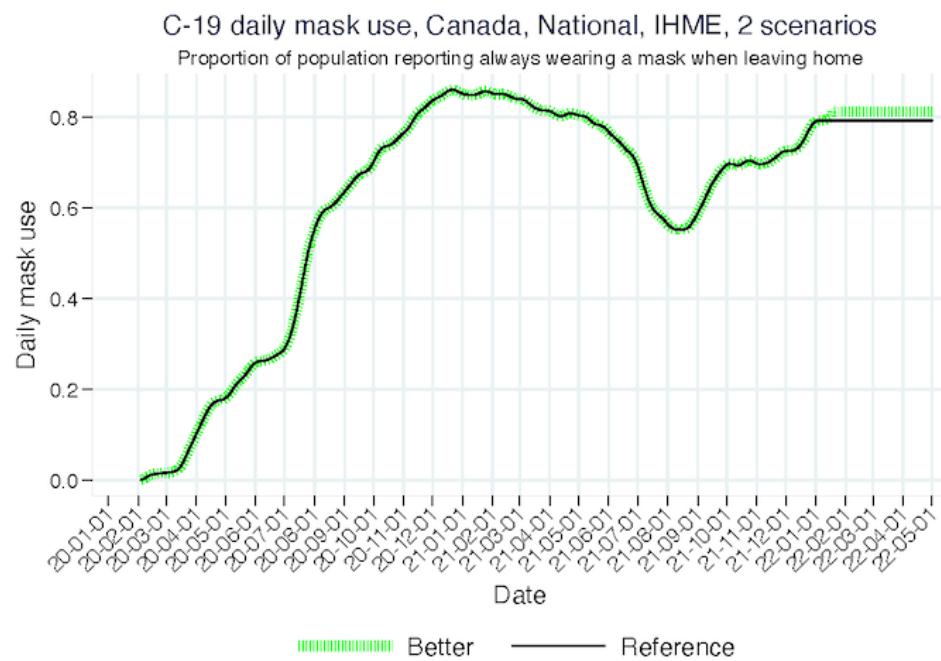
(11) Canada [Daily Infection-outcomes ratios, 2 scenarios, IHME, 2021 on](#)



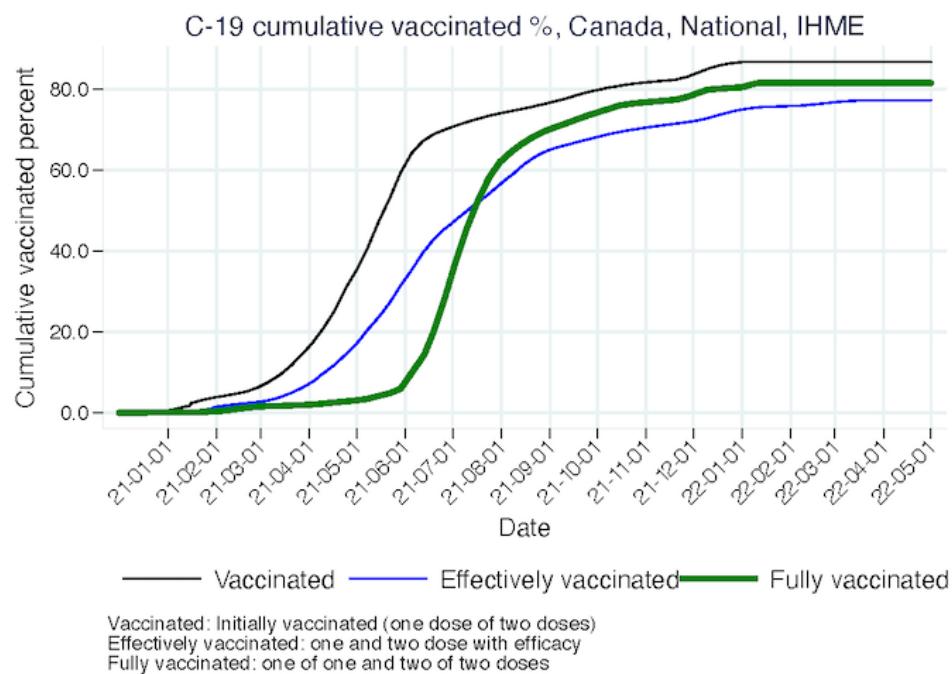
(11b) Canada [Daily infection hospitalization & fatality ratios, 2 scenarios, IHME, 2021 on](#)



(12) Canada [Daily mask use, 2 scenarios, all time, IHME](#)

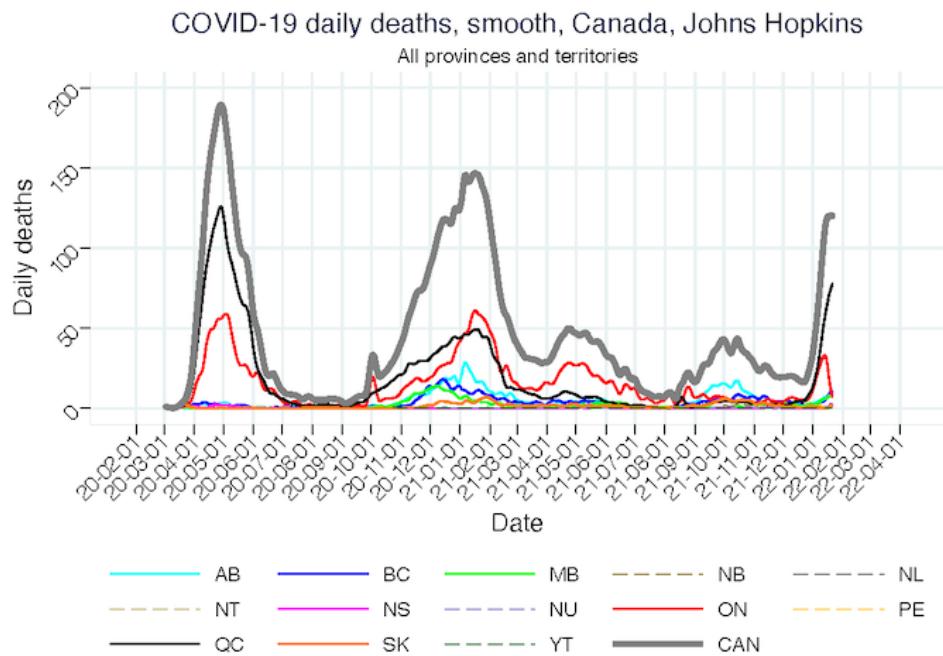


(13) Canada [Percent cumulative vaccinated, 2021 on, IHME](#)

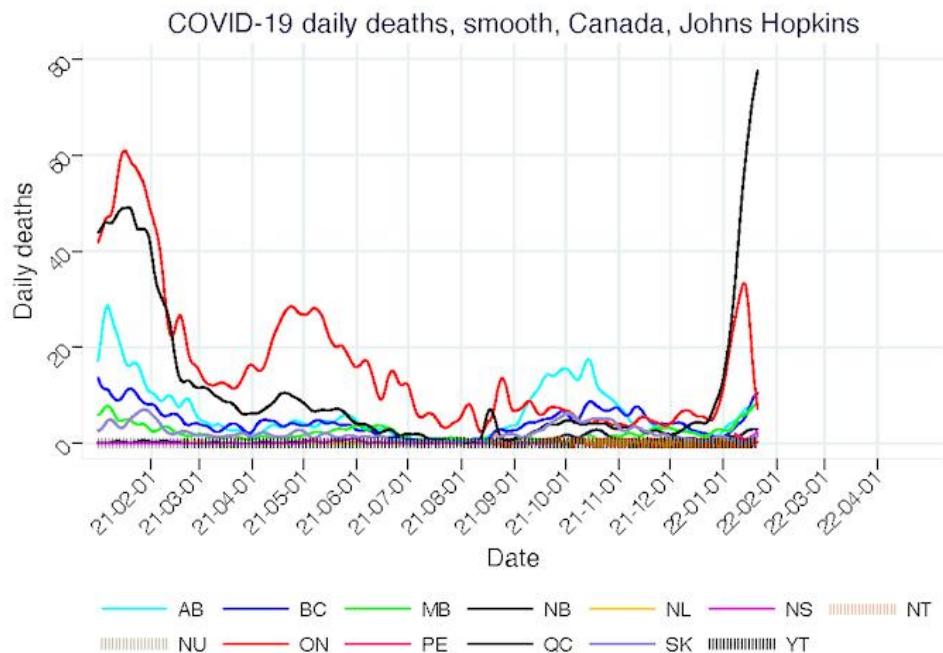


## Selected graphs - Canada, provinces

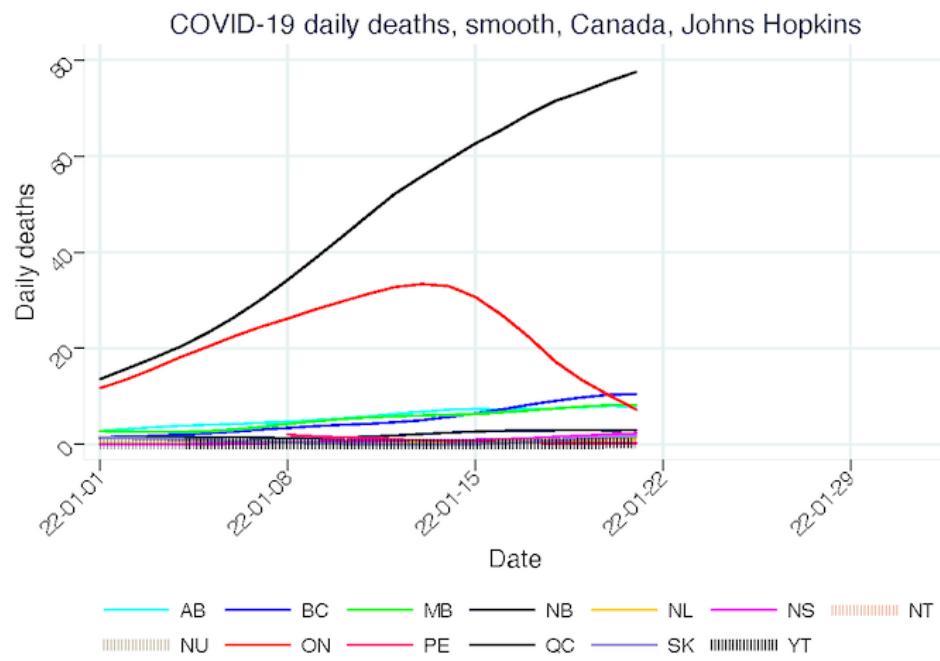
(0a) Canada provinces [Daily reported deaths, all time, JOHN](#)



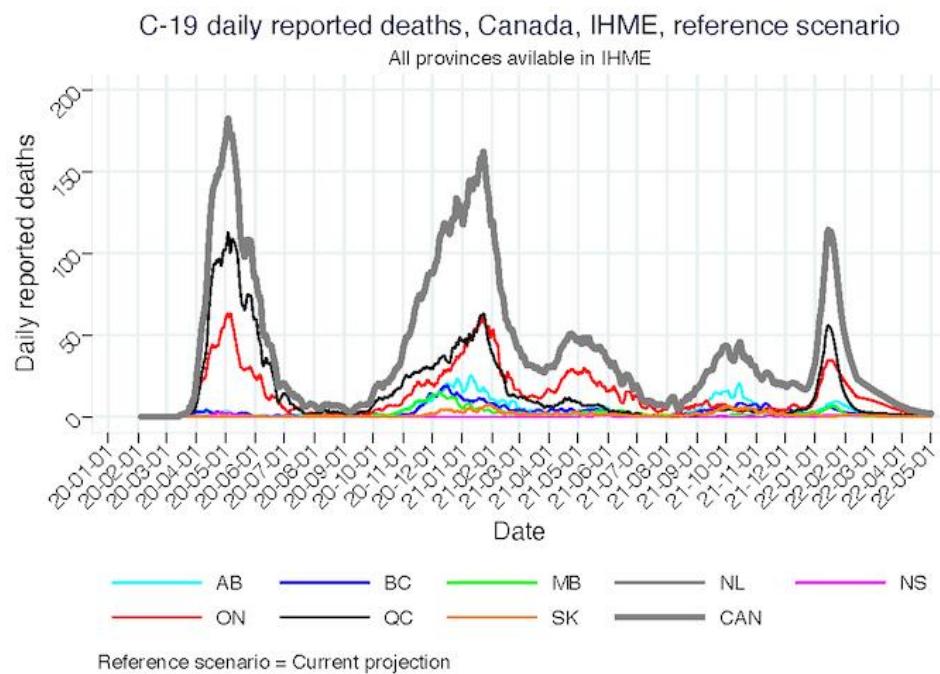
(0b) Canada provinces [Daily reported deaths, 2021 on, JOHN](#)



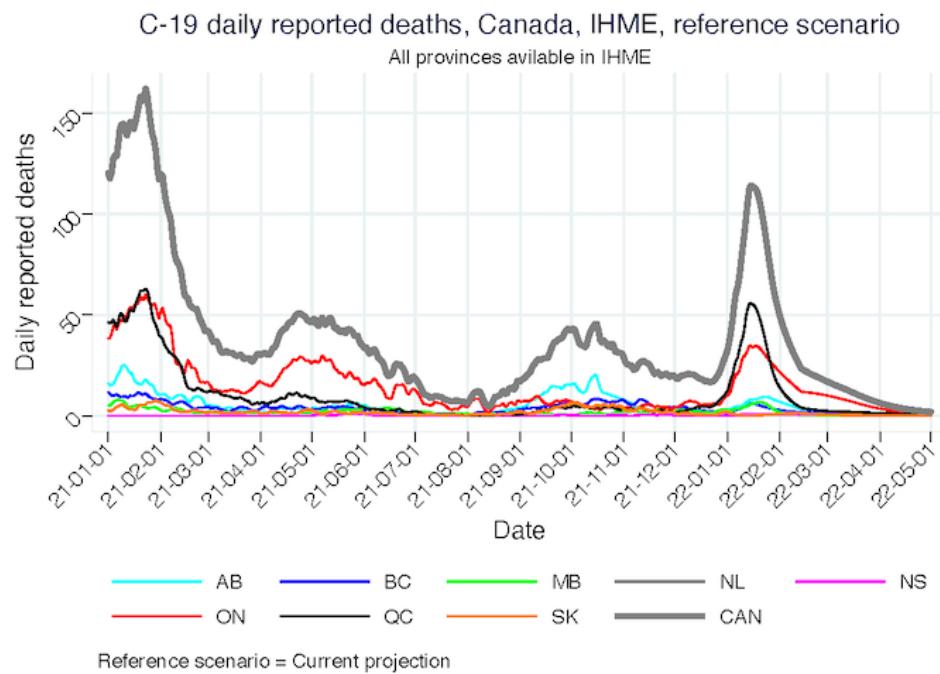
(0c) Canada provinces [Daily reported deaths, 2022, JOHN](#)



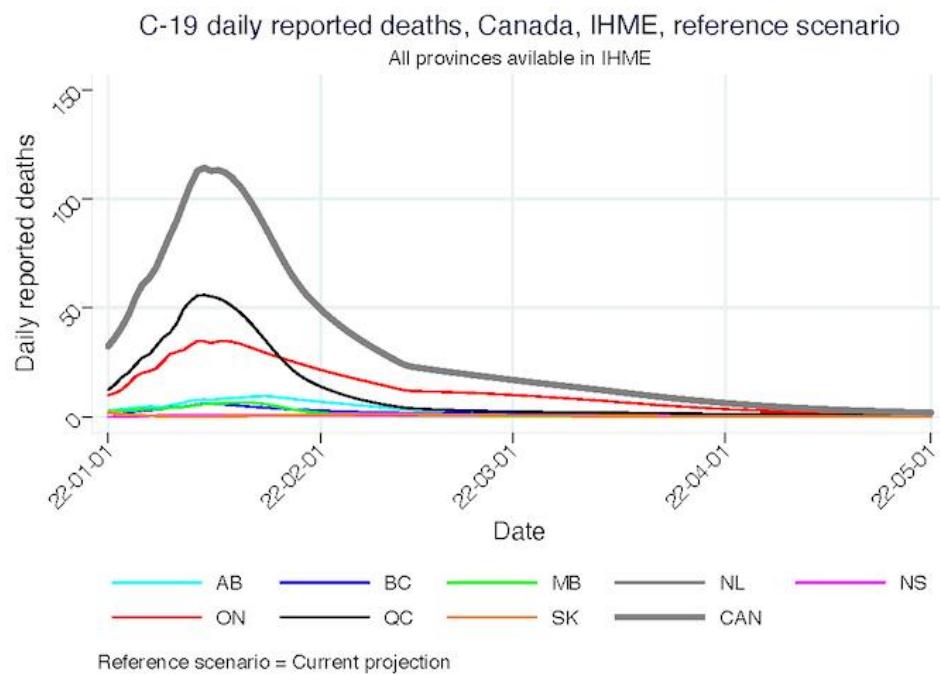
(1a) Canada provinces [Daily reported deaths, reference scenarios, all time, IHME](#)



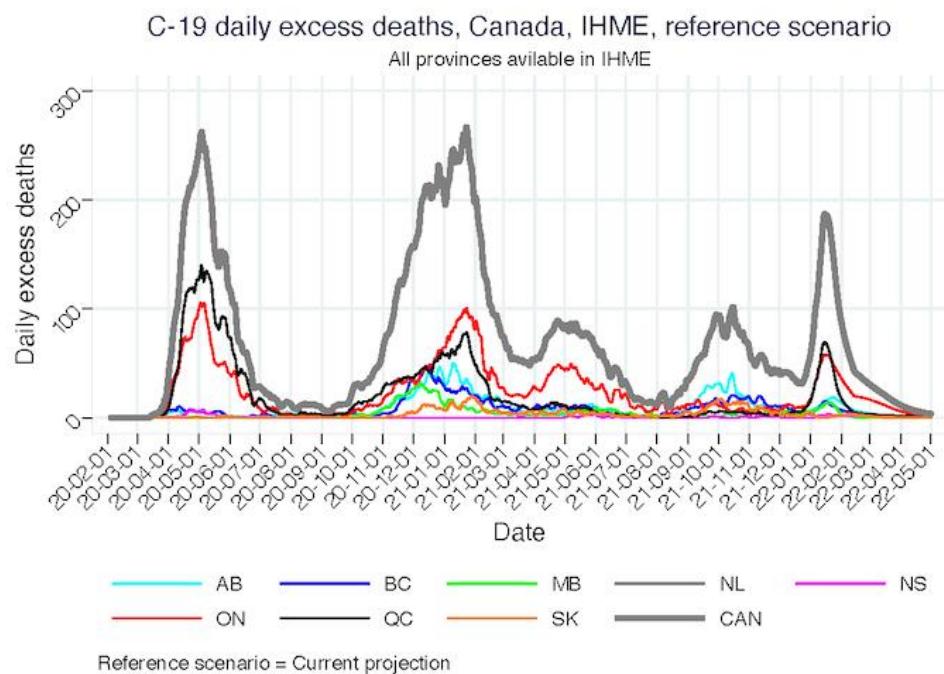
(1b) Canada provinces [Daily reported deaths, reference scenarios, 2021 on, IHME](#)



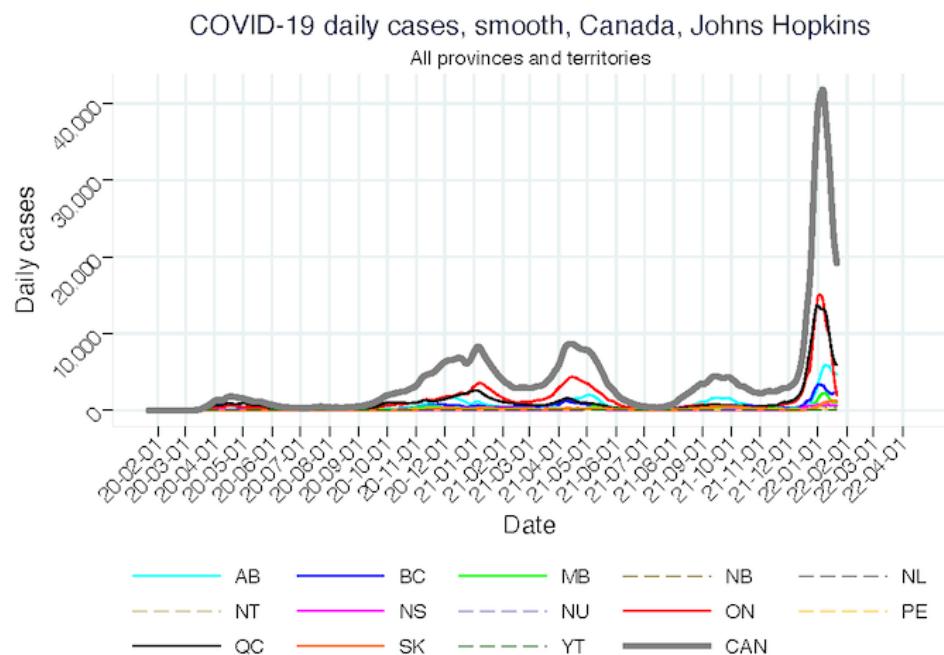
(1c) Canada provinces [Daily reported deaths, reference scenarios, 2022, IHME](#)



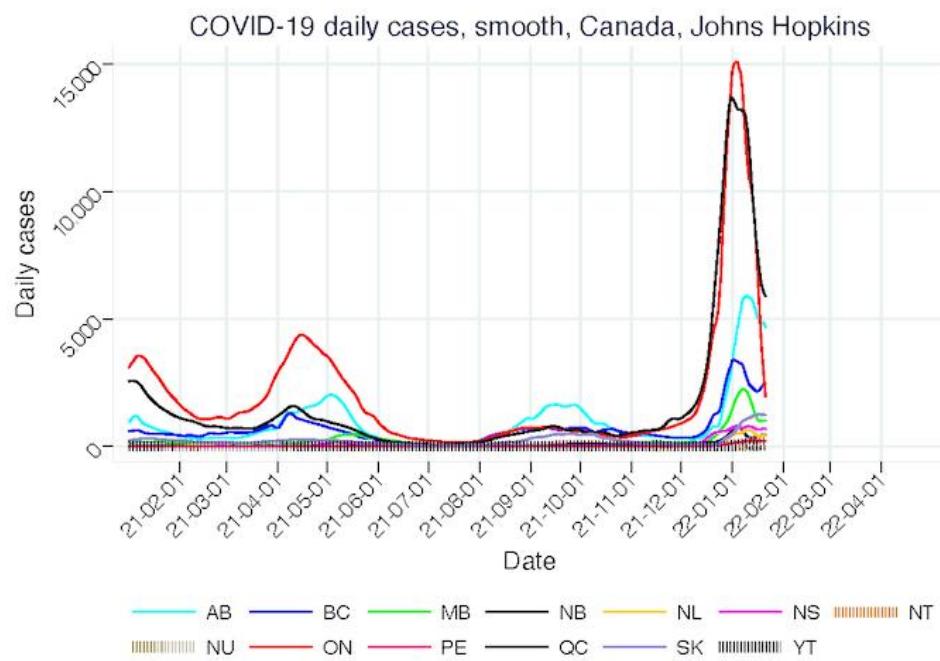
(2) Canada provinces [Daily excess deaths, reference scenarios, all time, IHME](#)



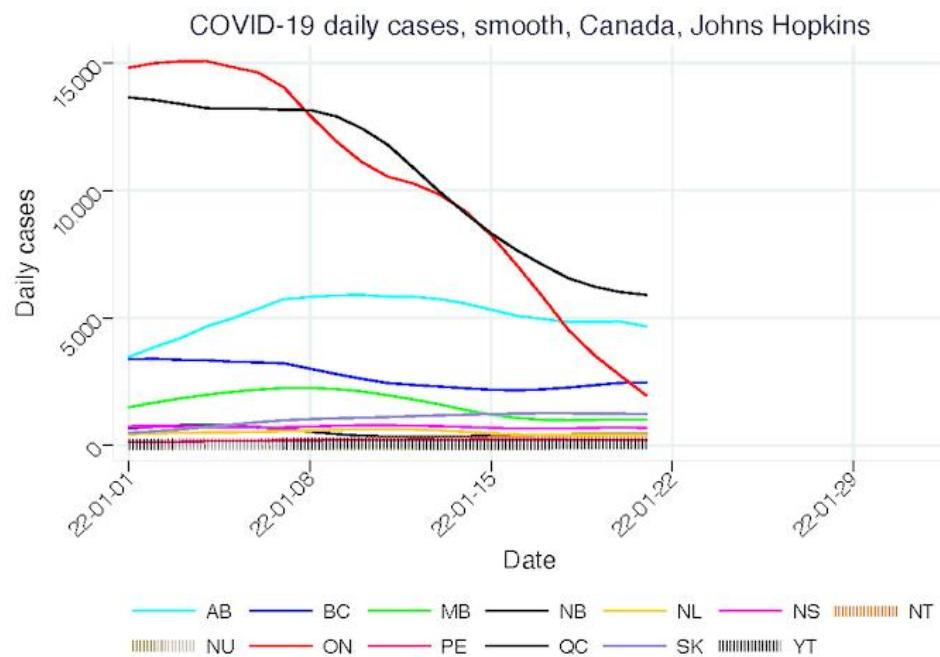
(00a) Canada provinces [Daily reported deaths, all time, JOHN](#)



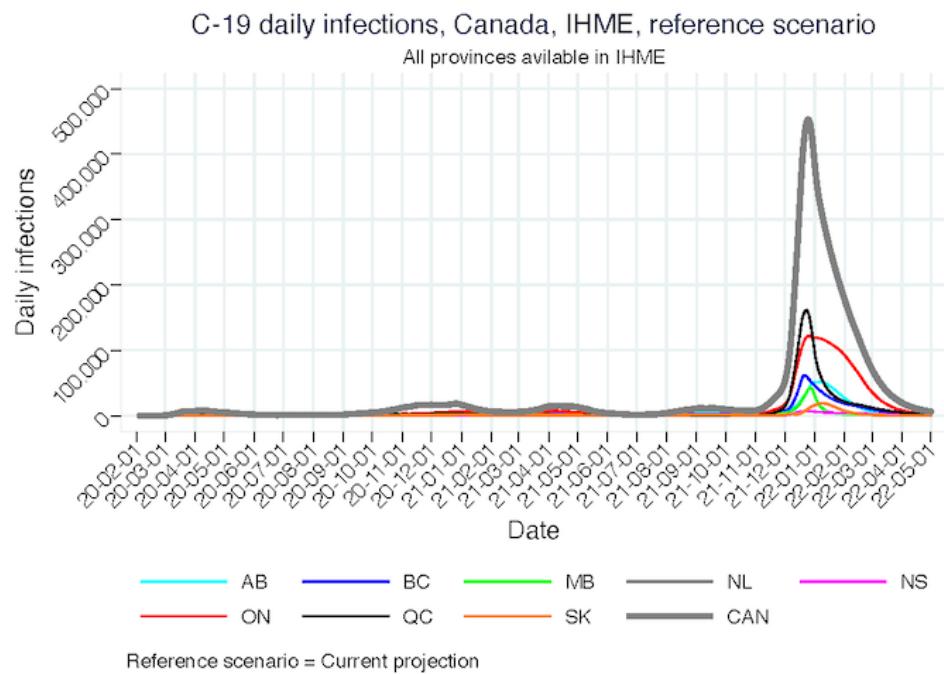
(00b) Canada provinces [Daily reported deaths, 2021 on, JOHN](#)



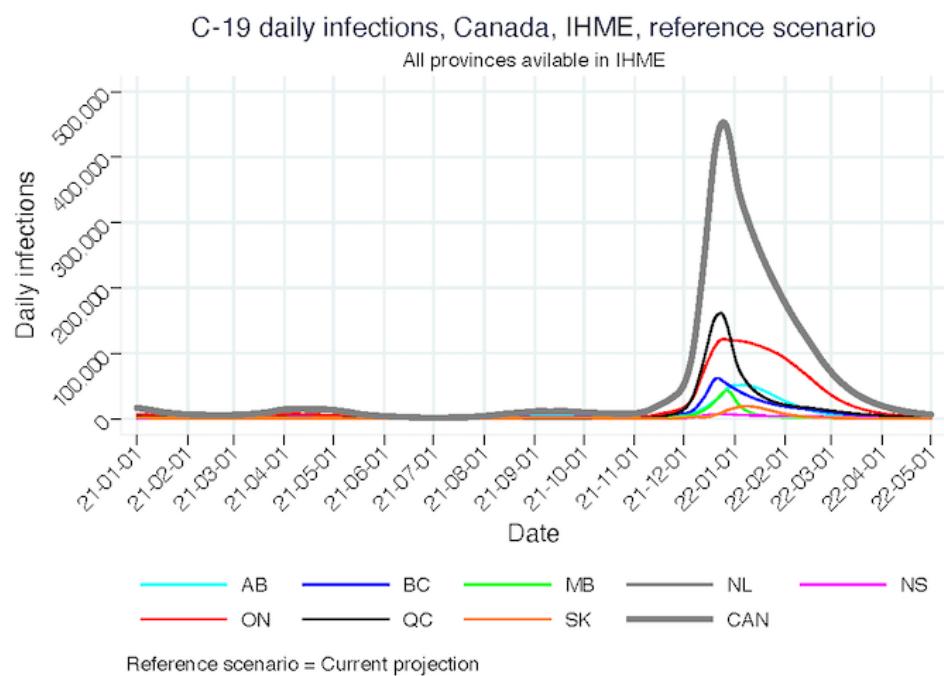
(00c) Canada provinces [Daily reported deaths, 2022, JOHN](#)



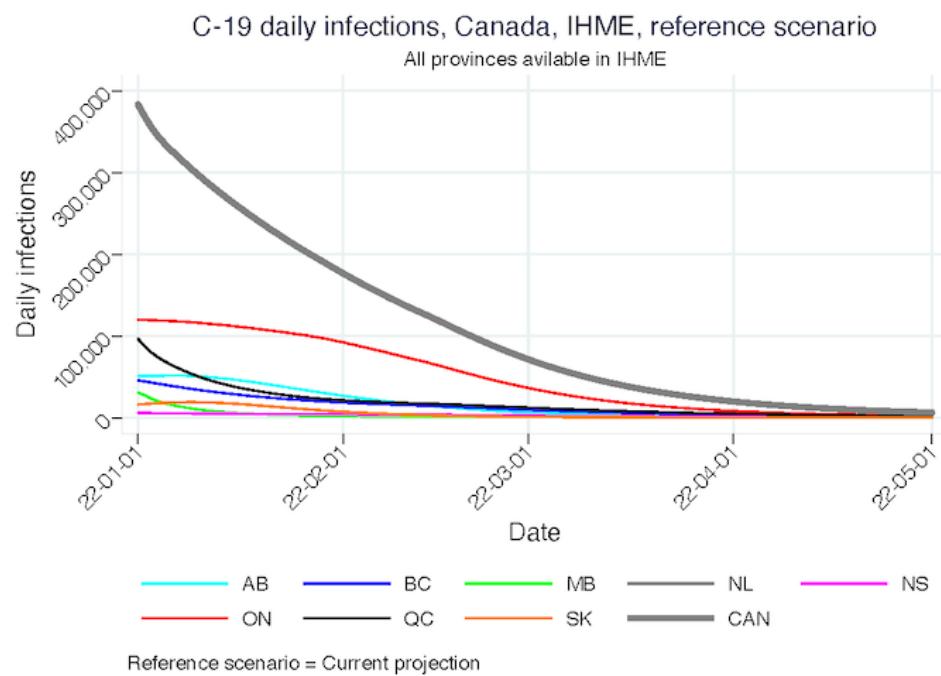
(3a) Canada provinces [Daily infections, reference scenarios, all time, IHME](#)



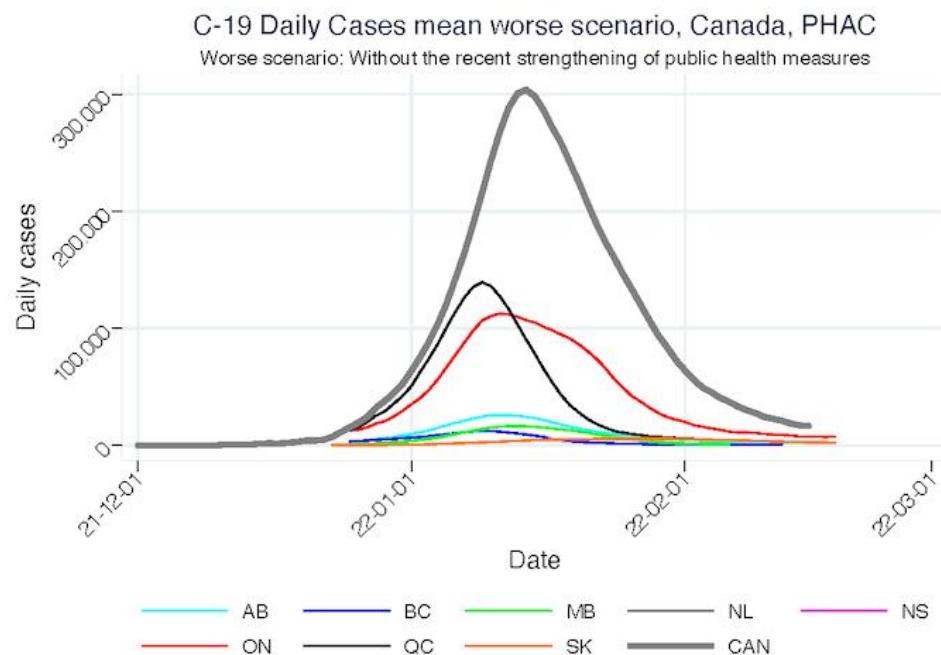
(3b) Canada provinces [Daily infections, reference scenarios, 2021 on, IHME](#)



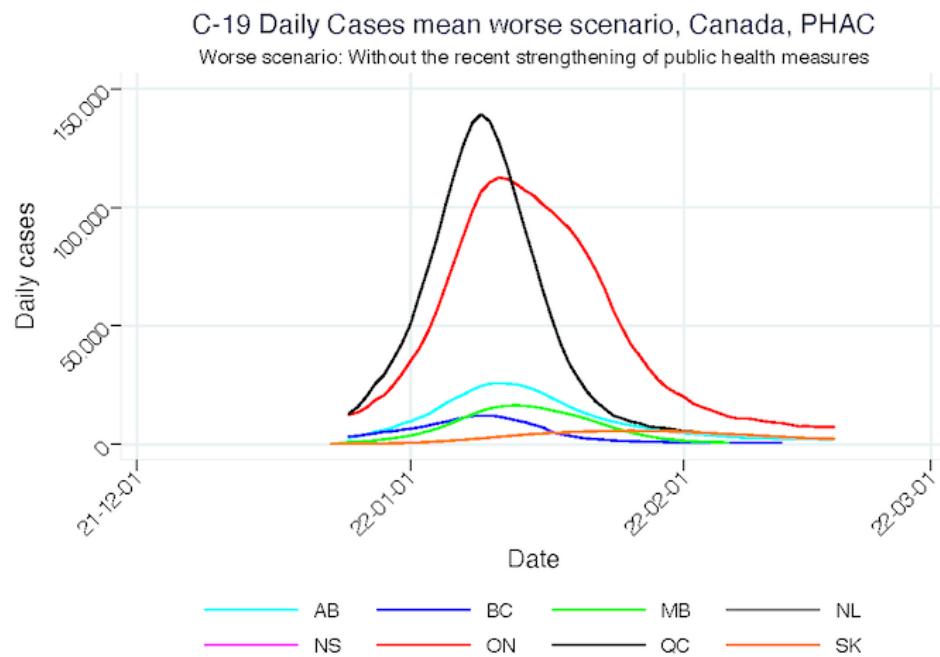
(3c) Canada provinces [Daily infections, reference scenarios, 2022, IHME](#)



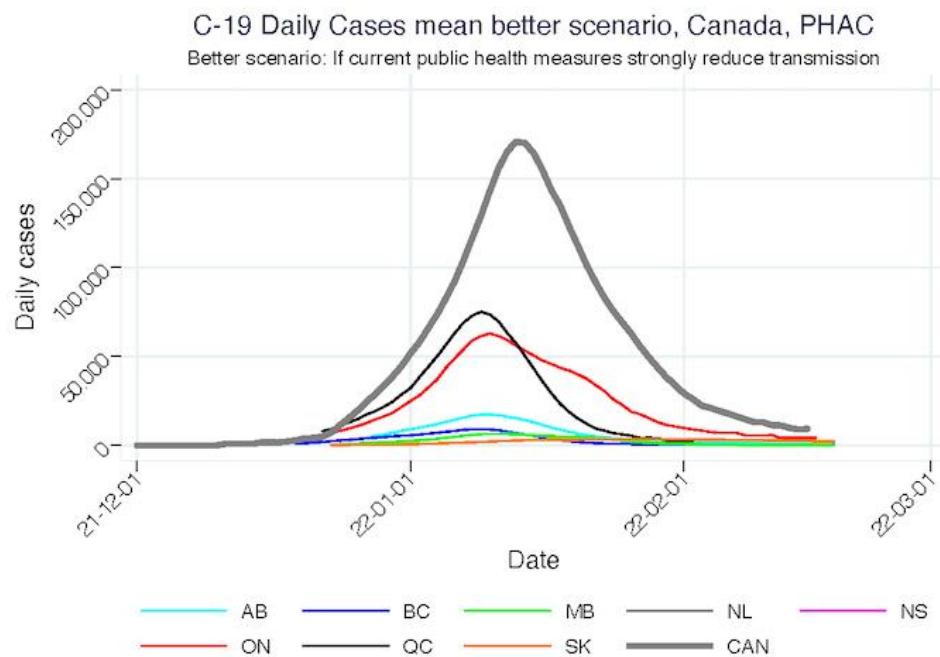
(4a) Canada provinces [Daily Cases mean worse scenario, with national, PHAC](#)



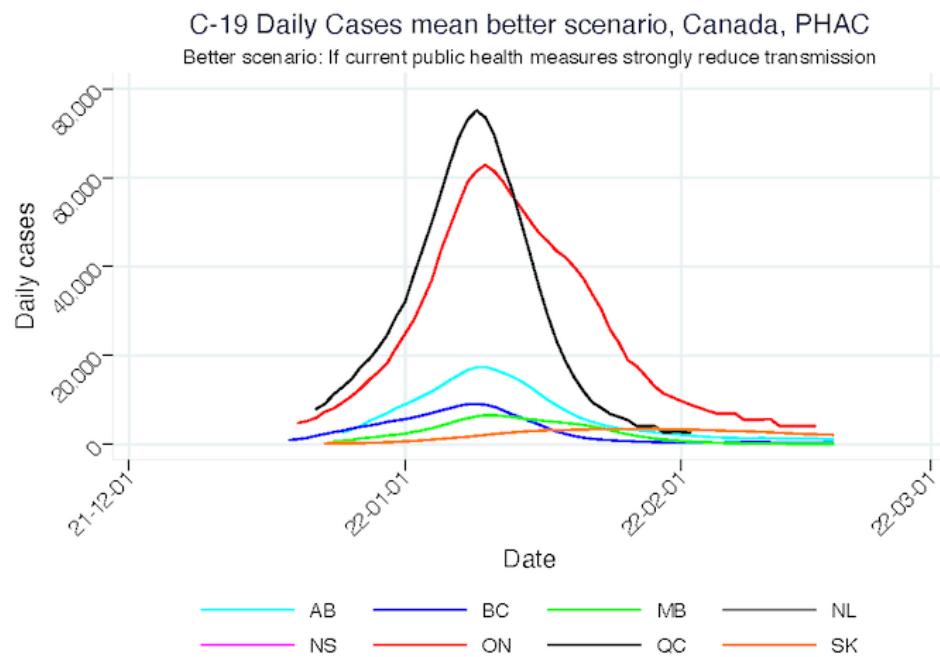
(4b) Canada provinces [Daily Cases mean worse scenario, without national, PHAC](#)



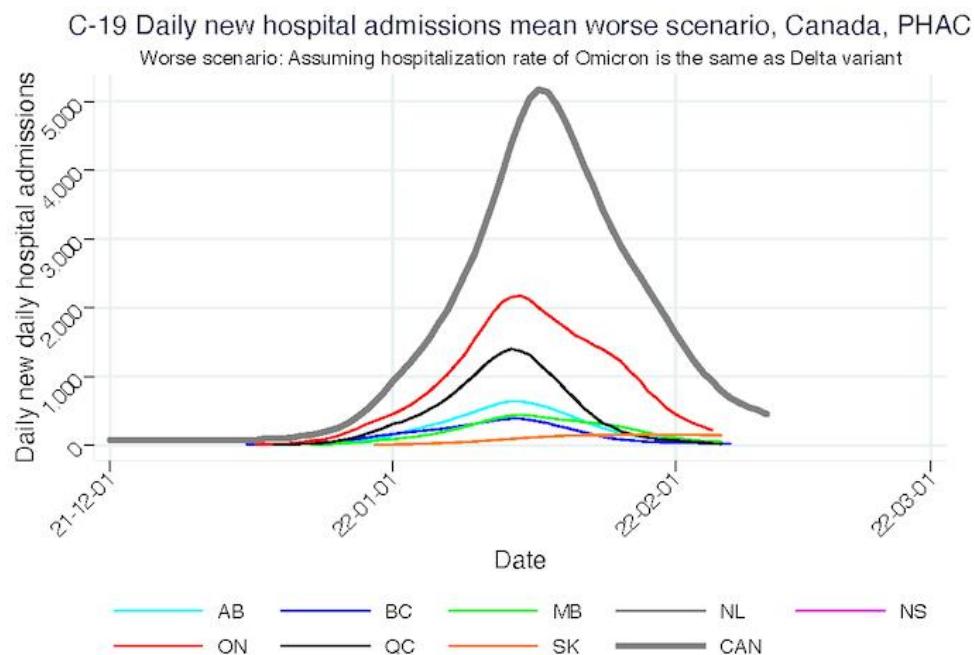
(5a) Canada provinces [Daily Cases mean better scenario, with national, PHAC](#)



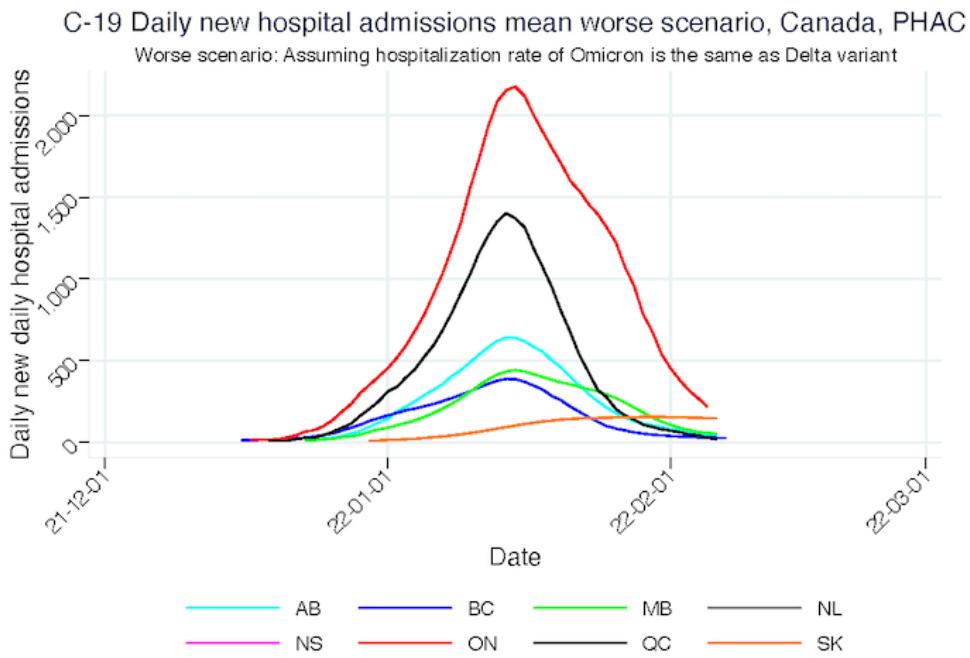
(5b) Canada provinces [Daily Cases mean better scenario, without national, PHAC](#)



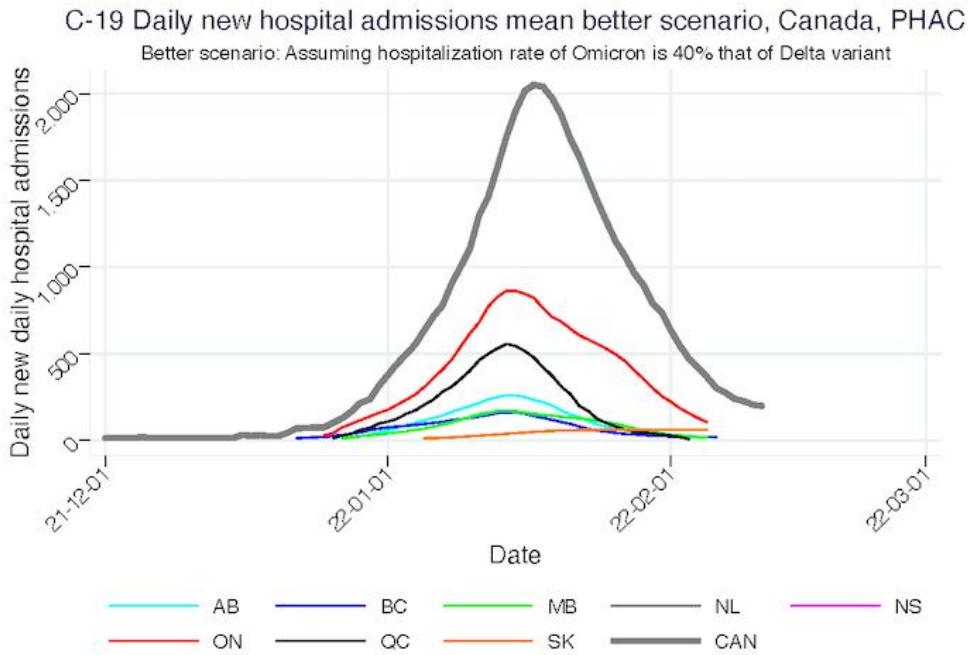
(6a) Canada provinces [Daily New hospital admissions mean worse scenario, with national, PHAC](#)



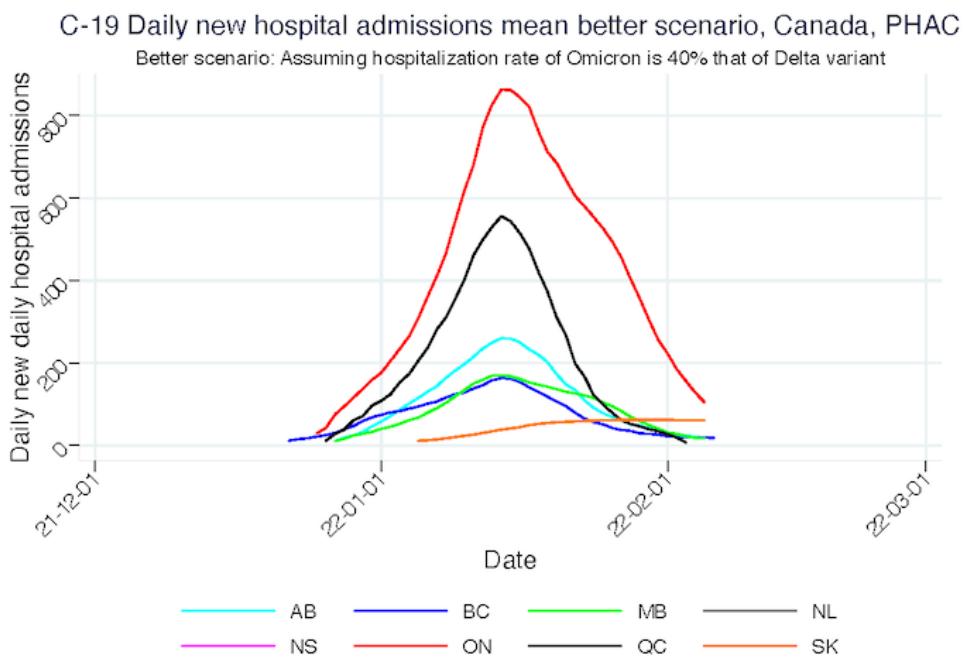
(6b) Canada provinces [Daily New hospital admissions mean worse scenario, without national, PHAC](#)



(7a) Canada provinces [Daily New hospital admissions mean better scenario, with national, PHAC](#)

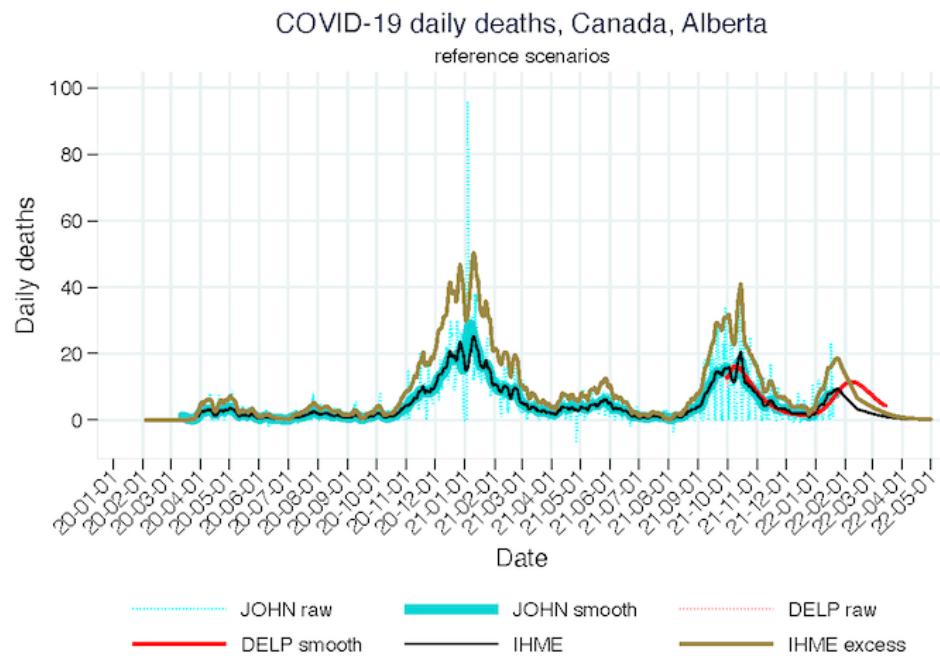


(7b) Canada provinces [Daily New hospital admissions mean better scenario, without national, PHAC](#)

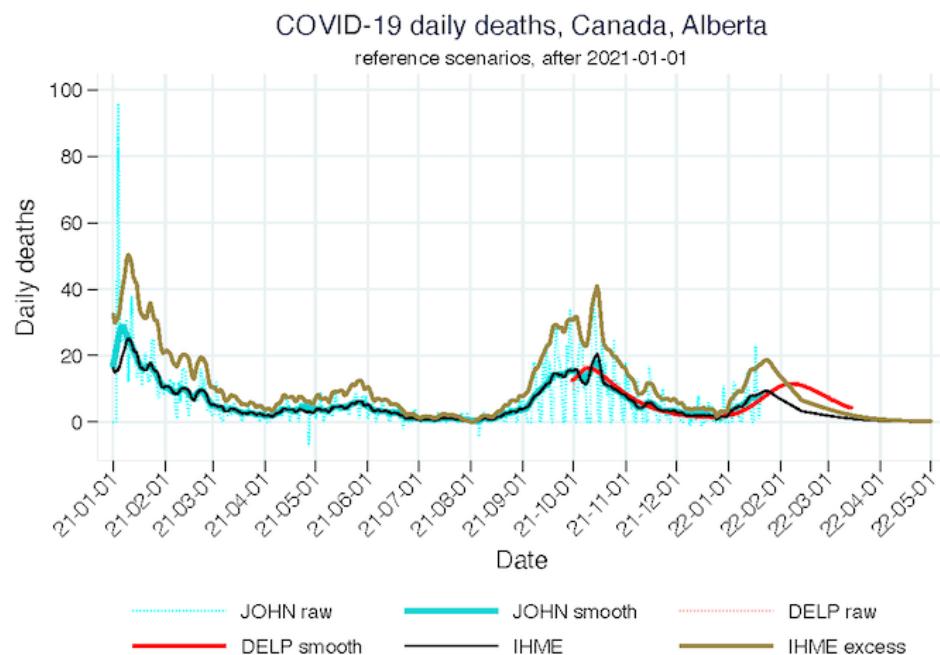


## Selected graphs - Alberta

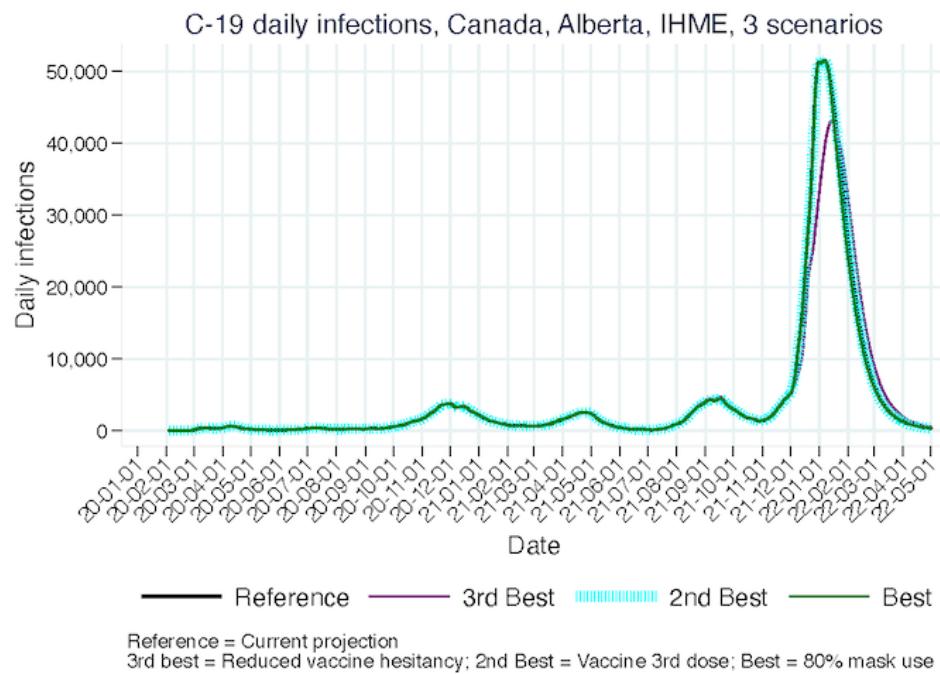
### (1) Alberta Daily deaths, reference scenarios, all time



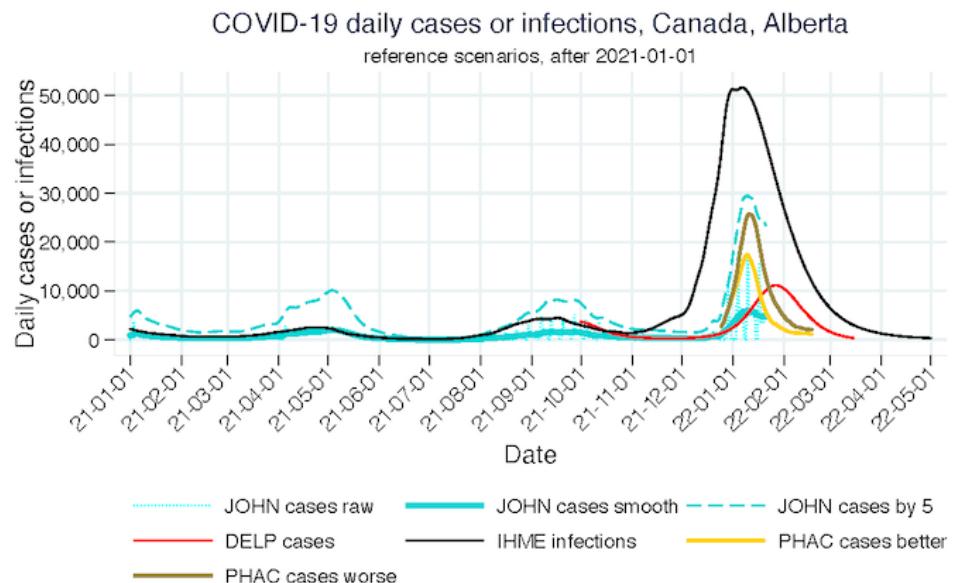
### (3) Alberta Daily deaths, 3 scenarios, 2021 on



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



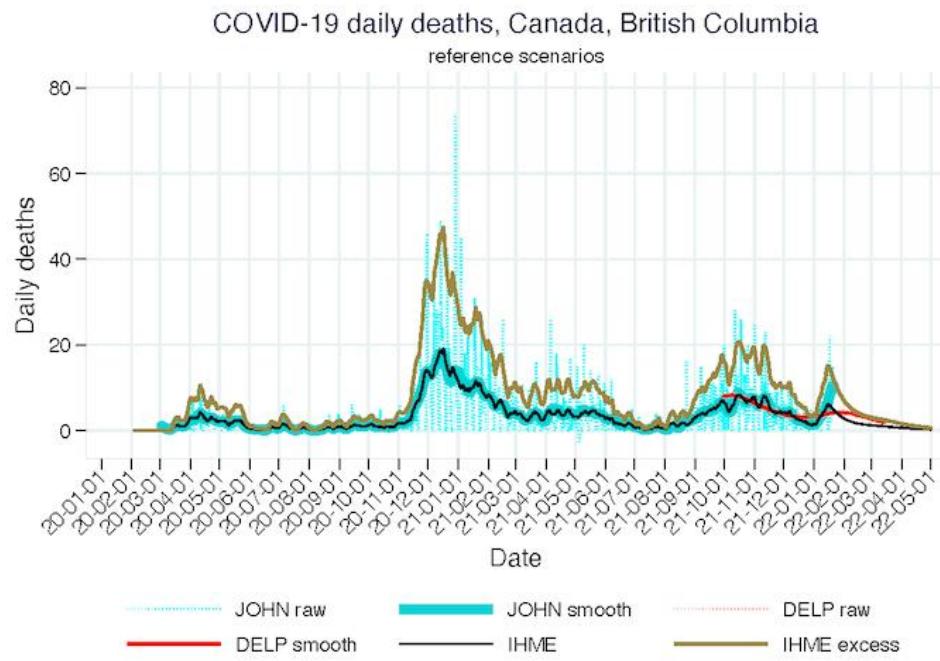
(6) Alberta Daily cases or infections, 3 scenarios, 2021 on



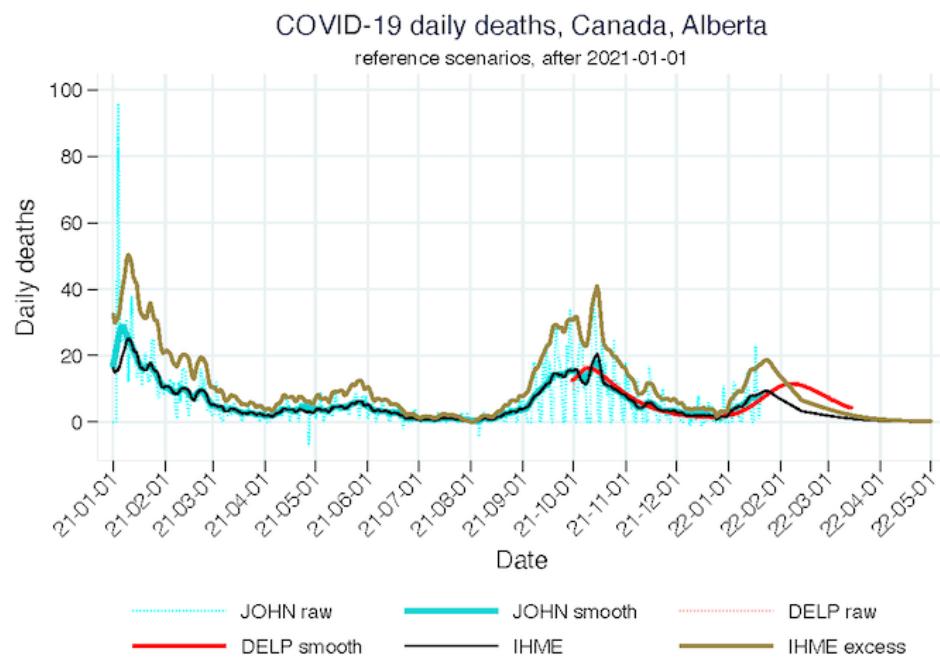
Note: JOHN cases by 5.  
<https://cbc.ctvnews.ca/b-c-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1.57228>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures

## Selected graphs - British Columbia

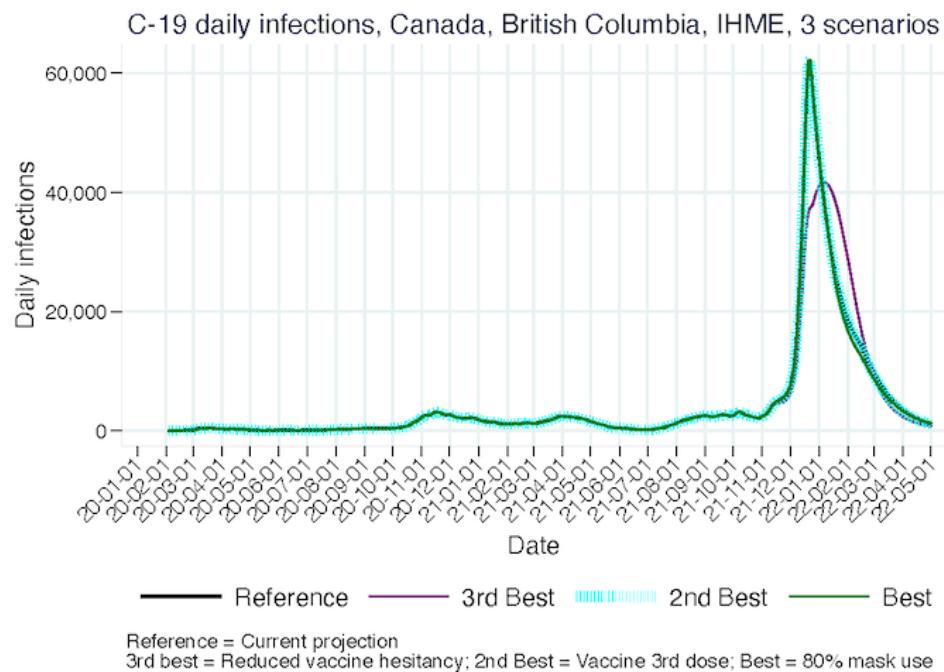
### (1) British Columbia [Daily deaths, reference scenarios, all time](#)



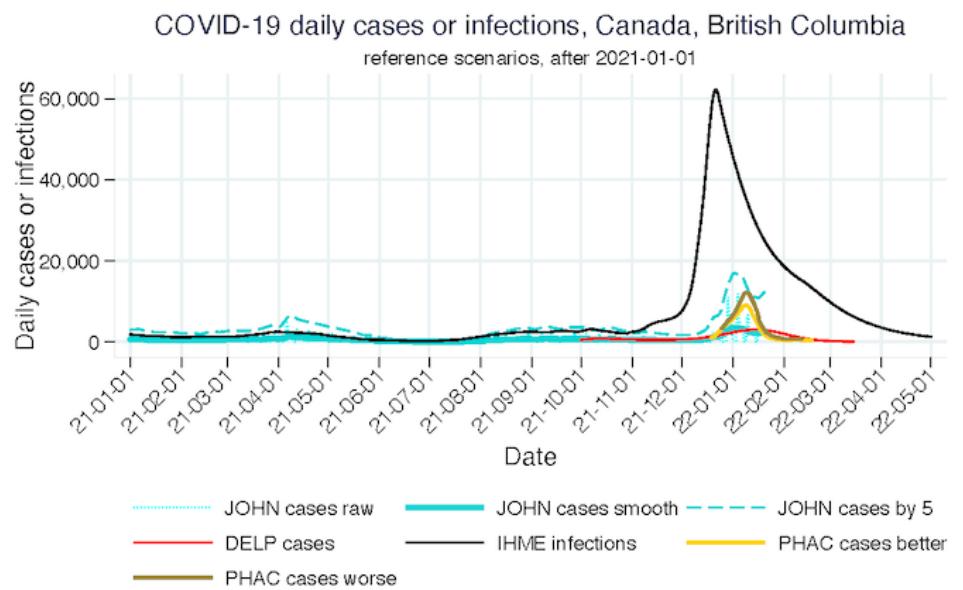
### (3) British Columbia [Daily deaths, 3 scenarios, 2021 on](#)



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



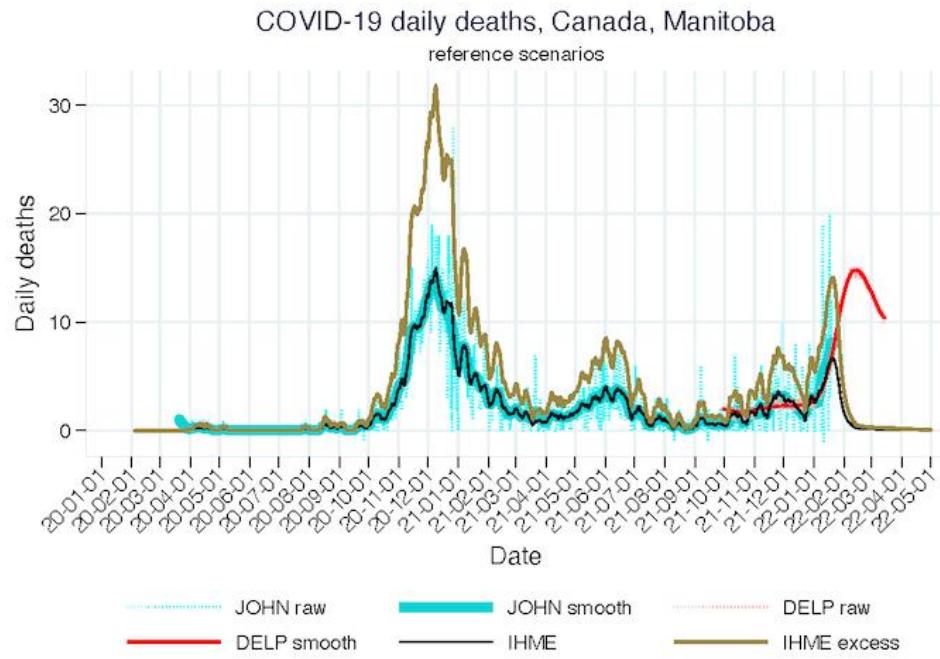
(6) British Columbia [Daily cases or infections, 3 scenarios, 2021 on](#)



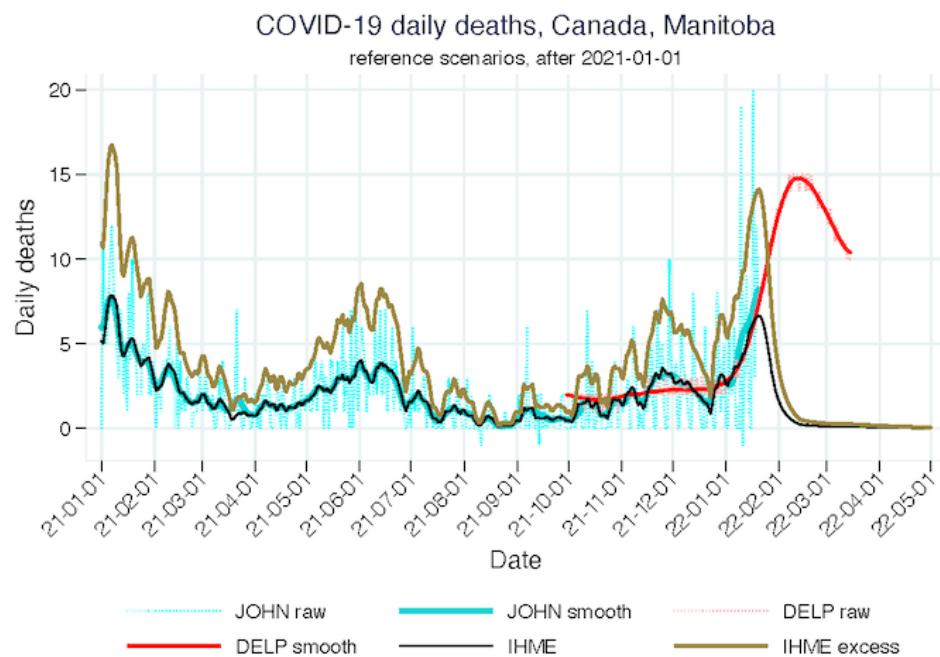
Note: JOHN cases by 5.  
<https://bc.ctvnews.ca/bc-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1-57228>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures

## Selected graphs - Manitoba

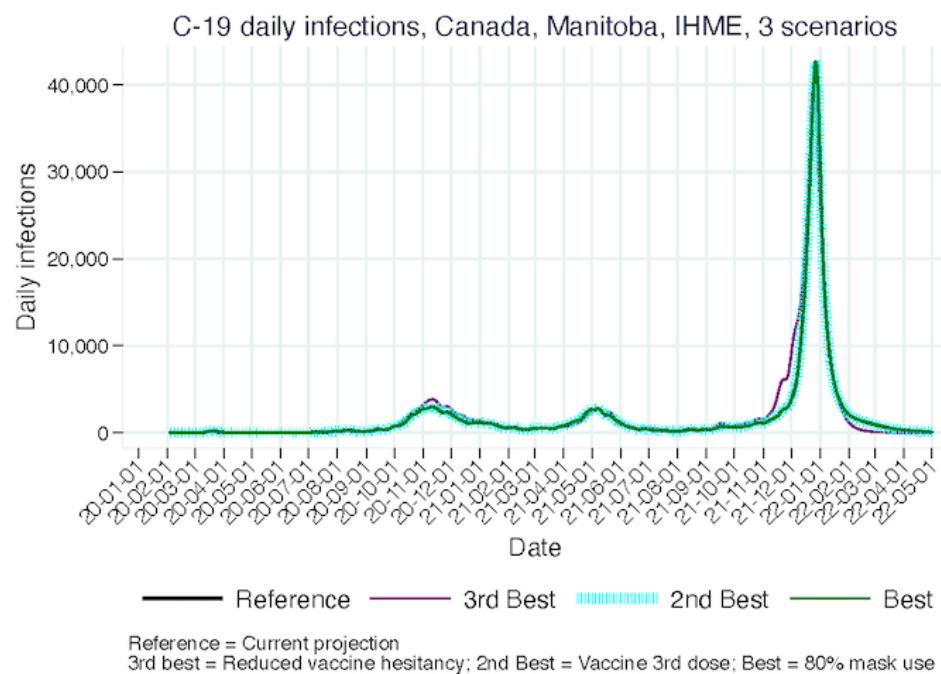
### (1) Manitoba [Daily deaths, reference scenarios, all time](#)



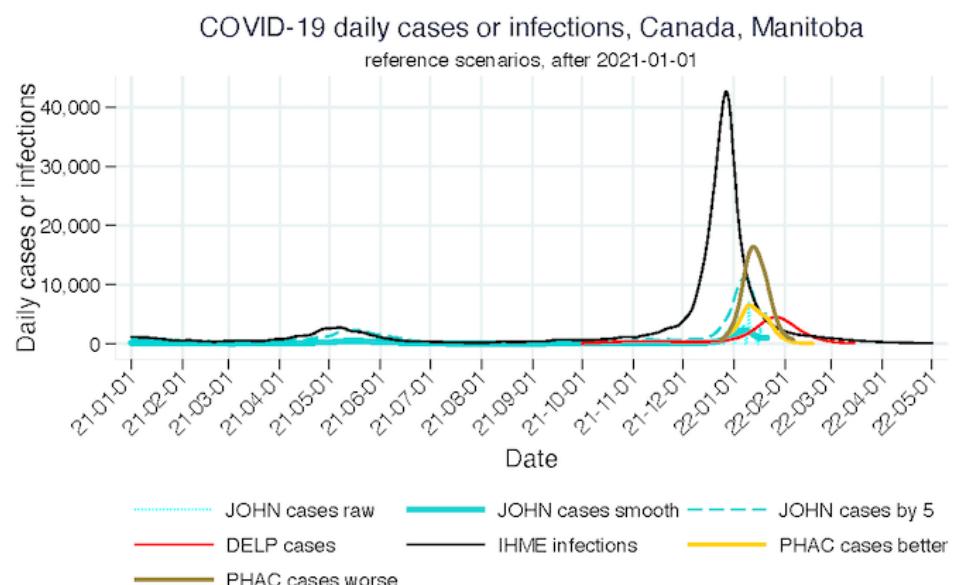
### (3) Manitoba [Daily deaths, 3 scenarios, 2021 on](#)



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



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

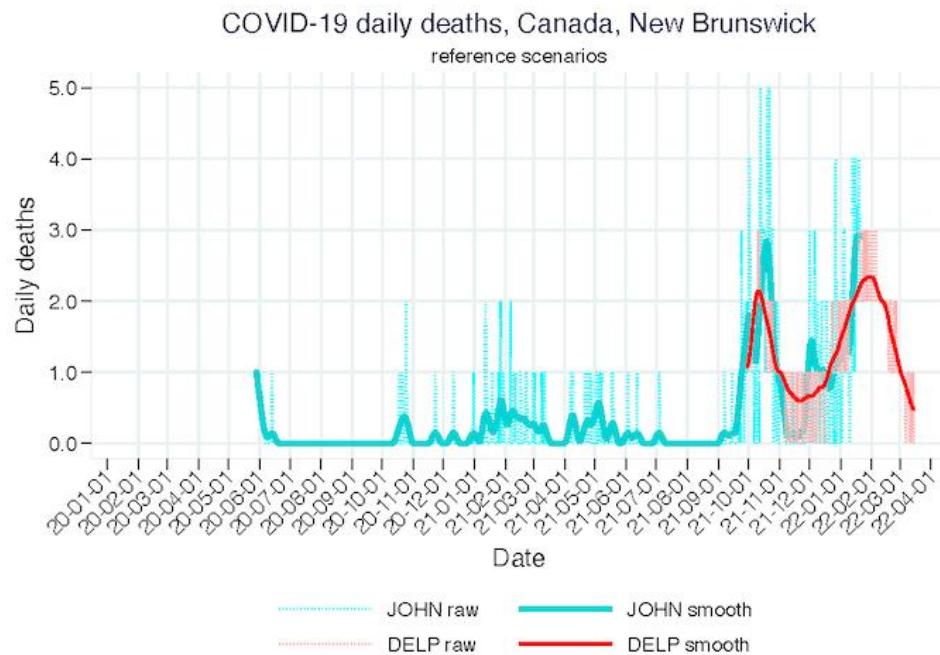


Note: JOHN cases by 5.  
<https://bc.ctvnews.ca/b-c-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1-57228>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures

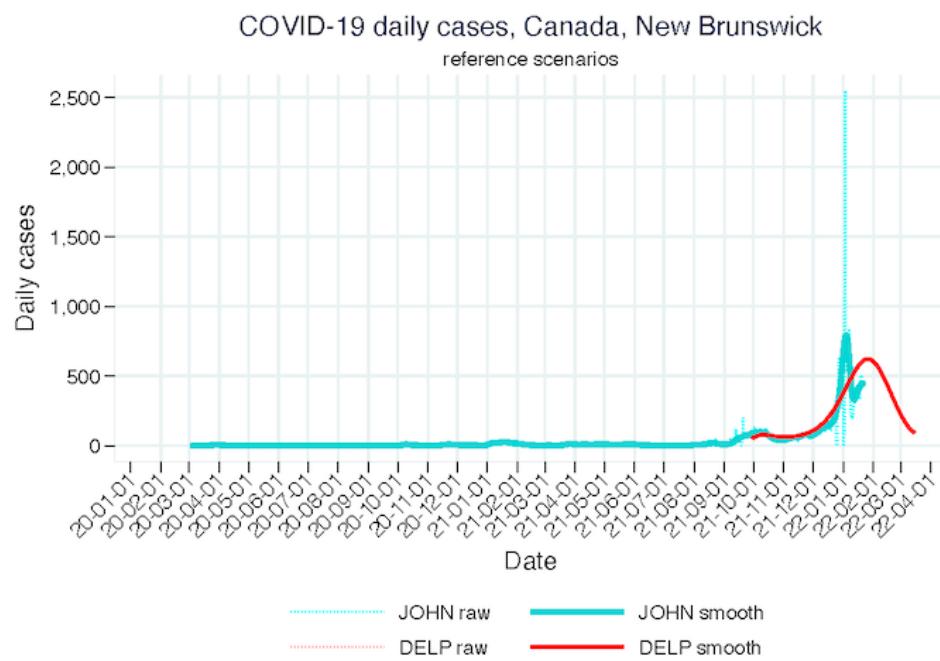
## Selected graphs - New Brunswick

New Brunswick only predicted in DELP model.

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



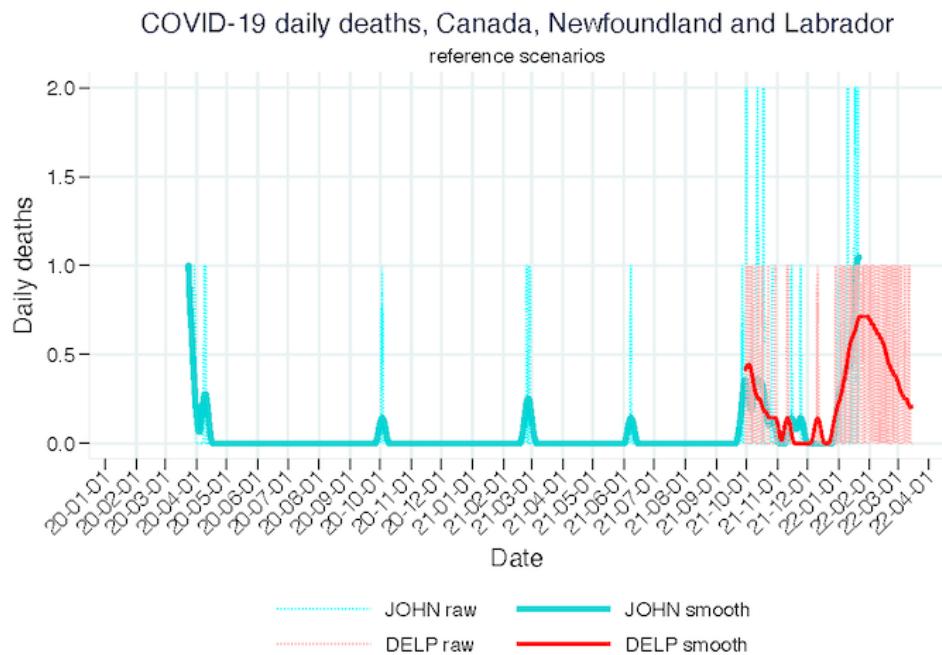
(2) New Brunswick [Daily cases, reference scenarios, all time](#)



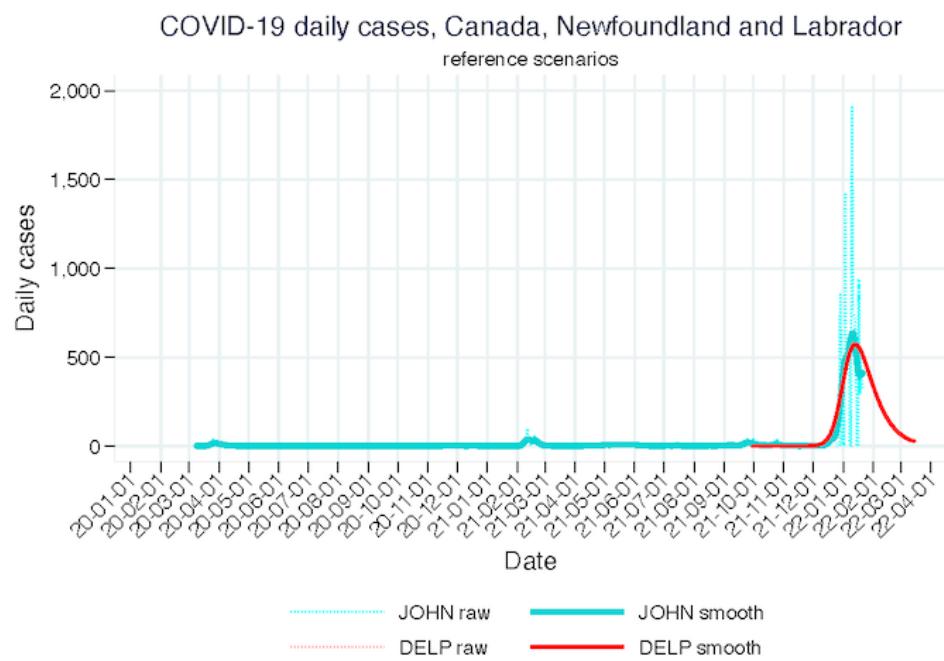
## Selected graphs - Newfoundland and Labrador

Newfoundland and Labrador only predicted in DELP model.

### (1) Newfoundland and Labrador [Daily deaths, reference scenarios, all time](#)

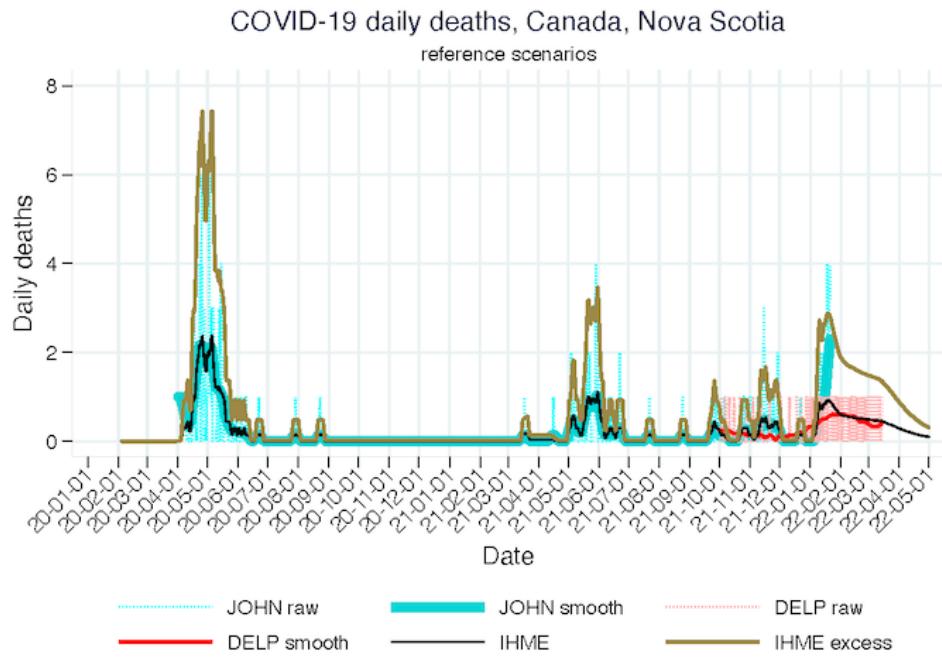


(2) Newfoundland and Labrador [Daily cases, reference scenarios, all time](#)

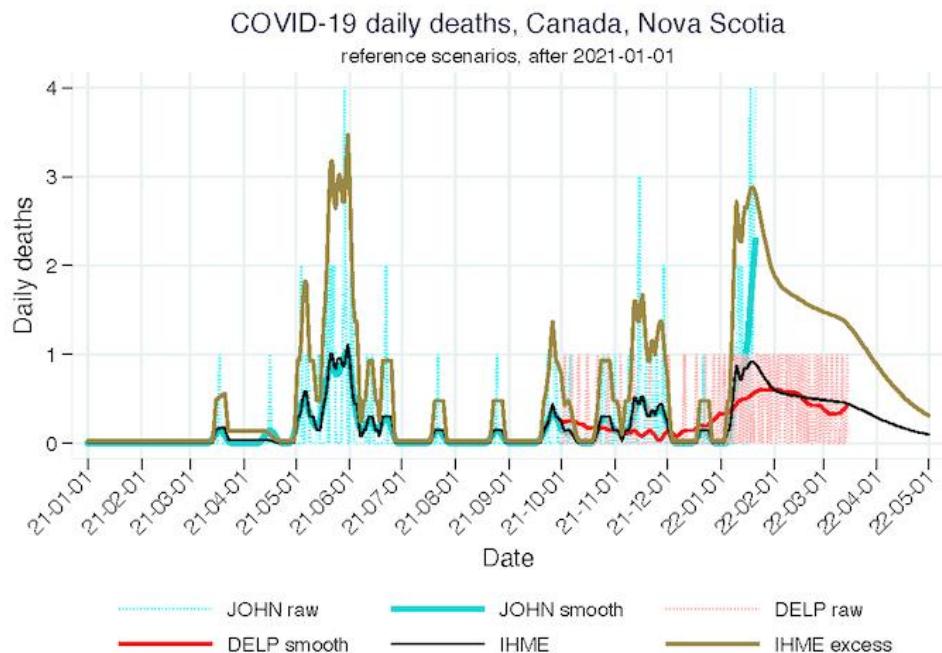


## Selected graphs - Nova Scotia

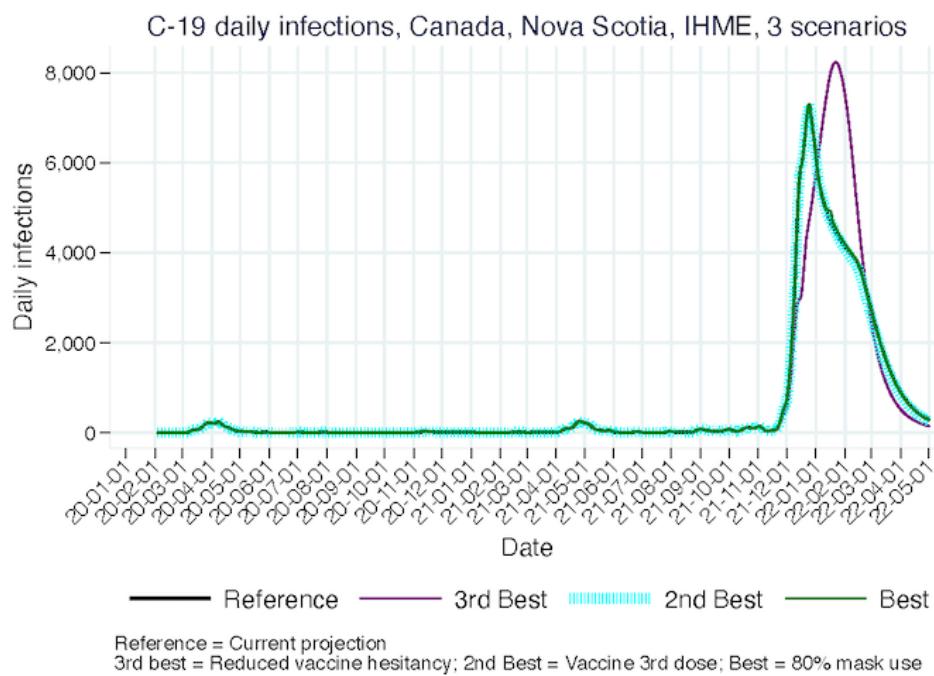
### (1) Nova Scotia [Daily deaths, reference scenarios, all time](#)



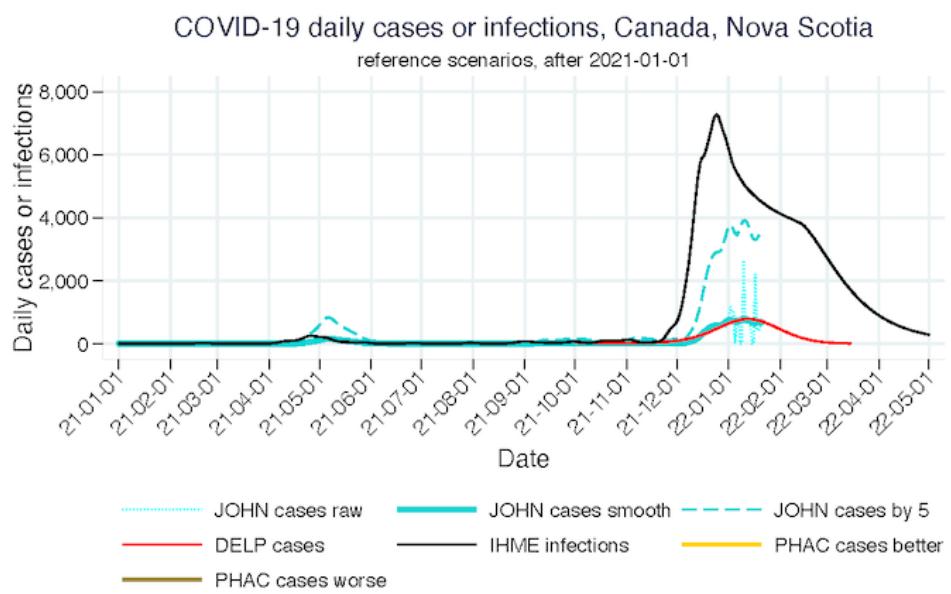
### (3) Nova Scotia [Daily deaths, 3 scenarios, 2021 on](#)



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



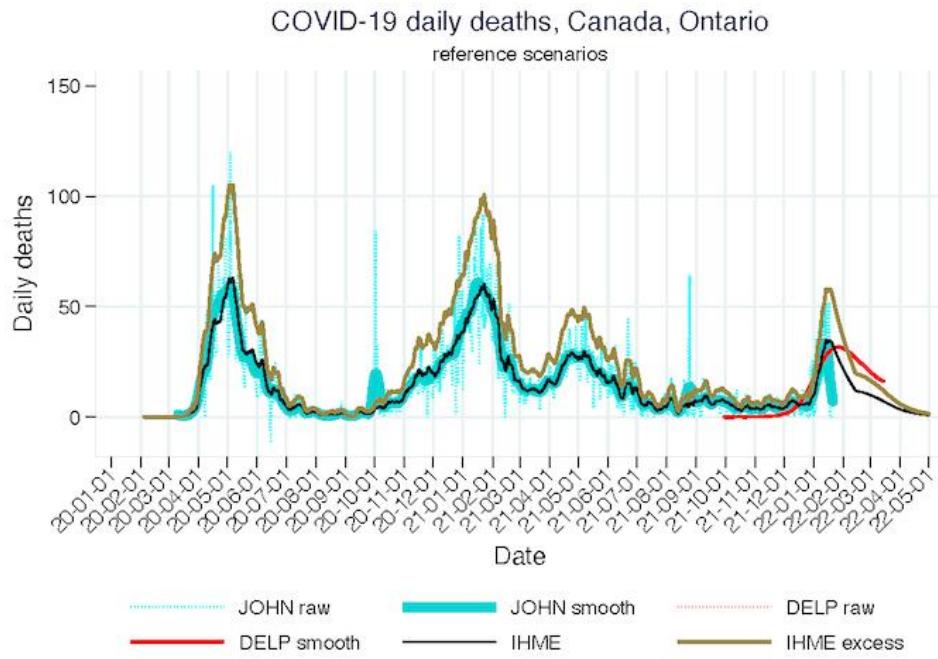
(6) Nova Scotia [Daily cases or infections, 3 scenarios, 2021 on](#)



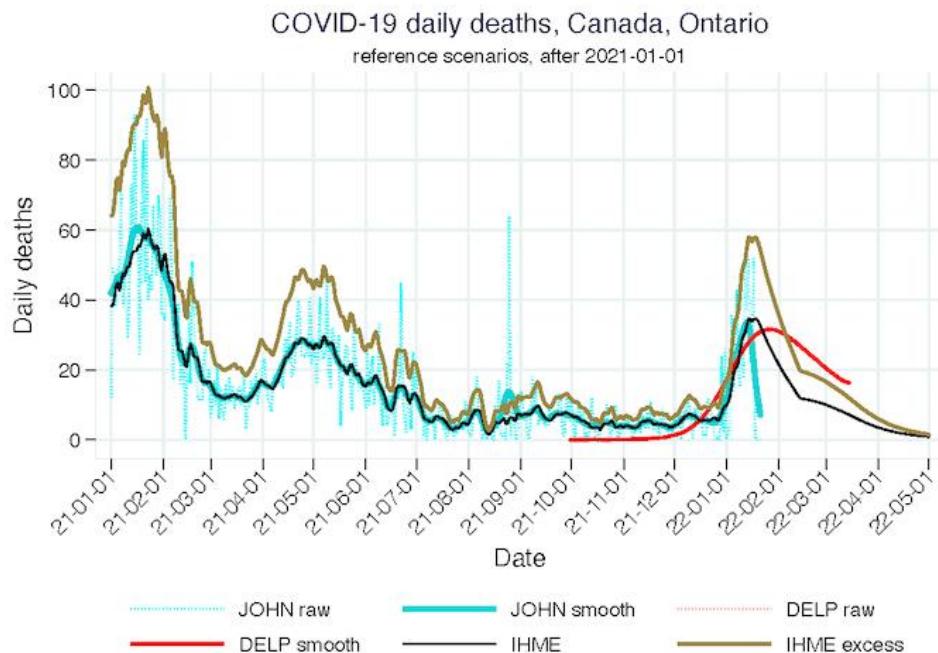
Note: JOHN cases by 5  
<https://bc.ctvnews.ca/b-c-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1.572280>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures

## Selected graphs - Ontario

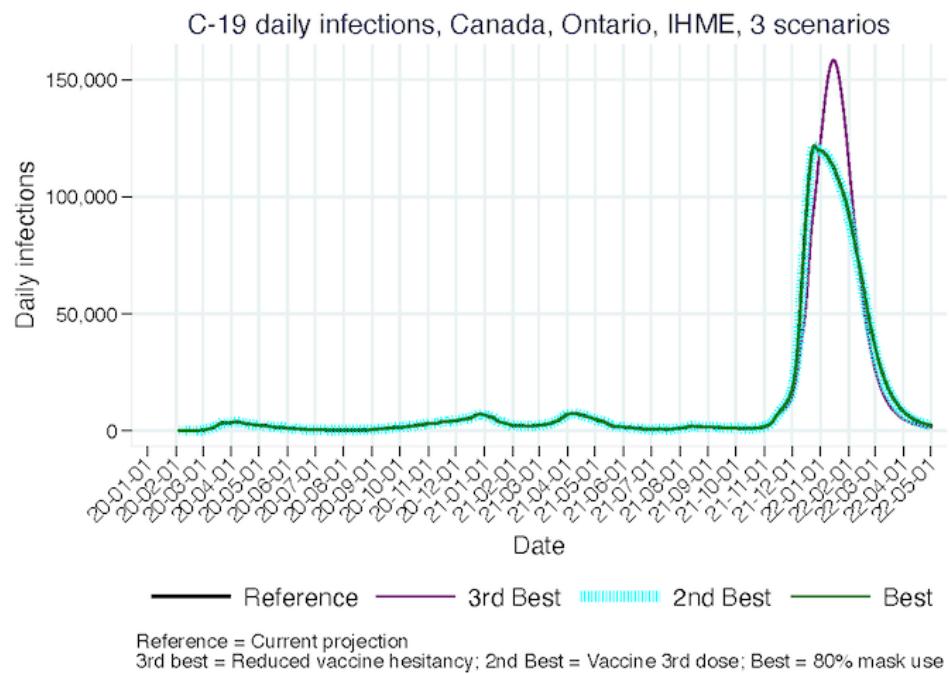
### (1) Ontario [Daily deaths, reference scenarios, all time](#)



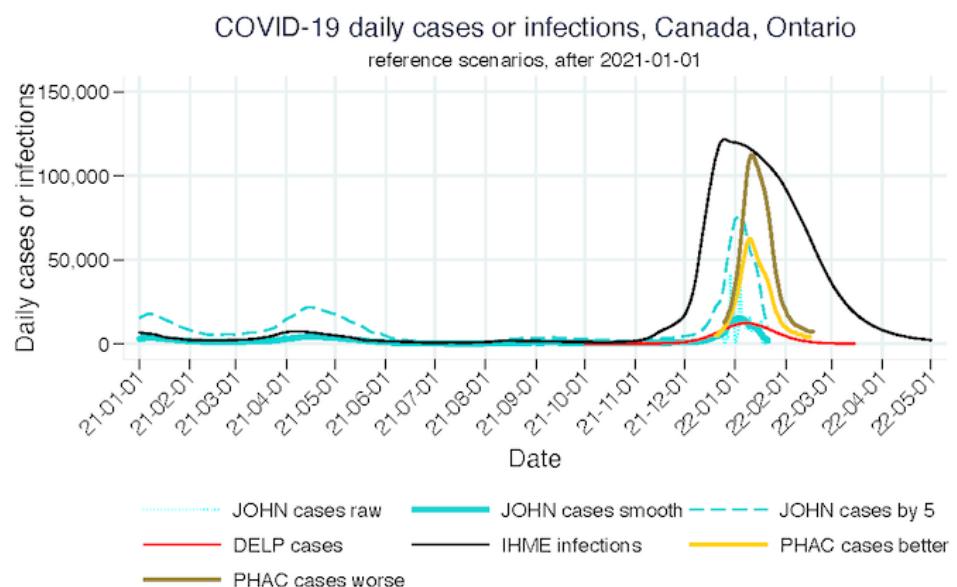
### (3) Ontario [Daily deaths, 3 scenarios, 2021 on](#)



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



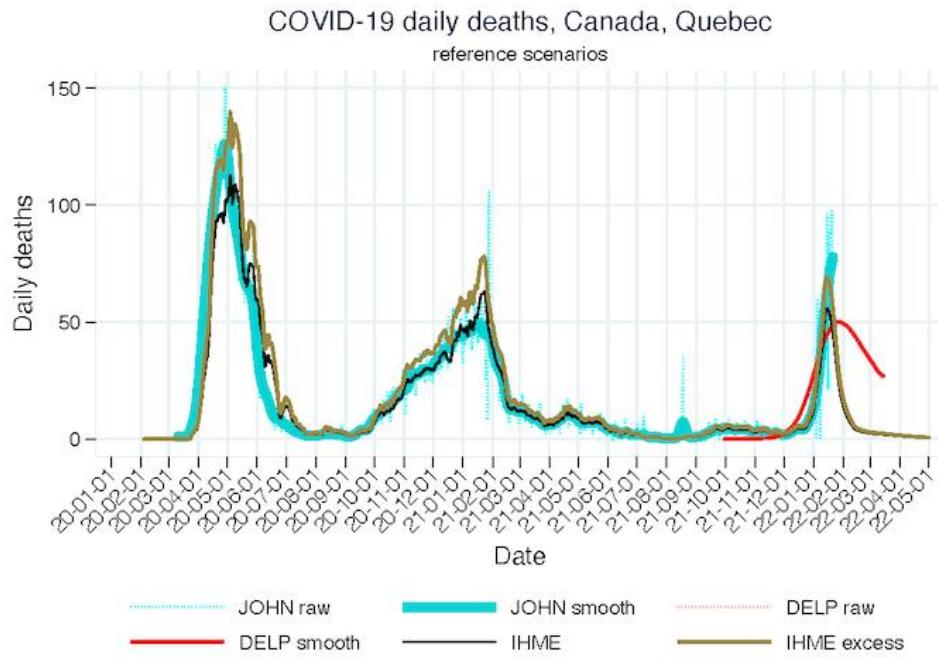
(6) Ontario [Daily cases or infections, 3 scenarios, 2021 on](#)



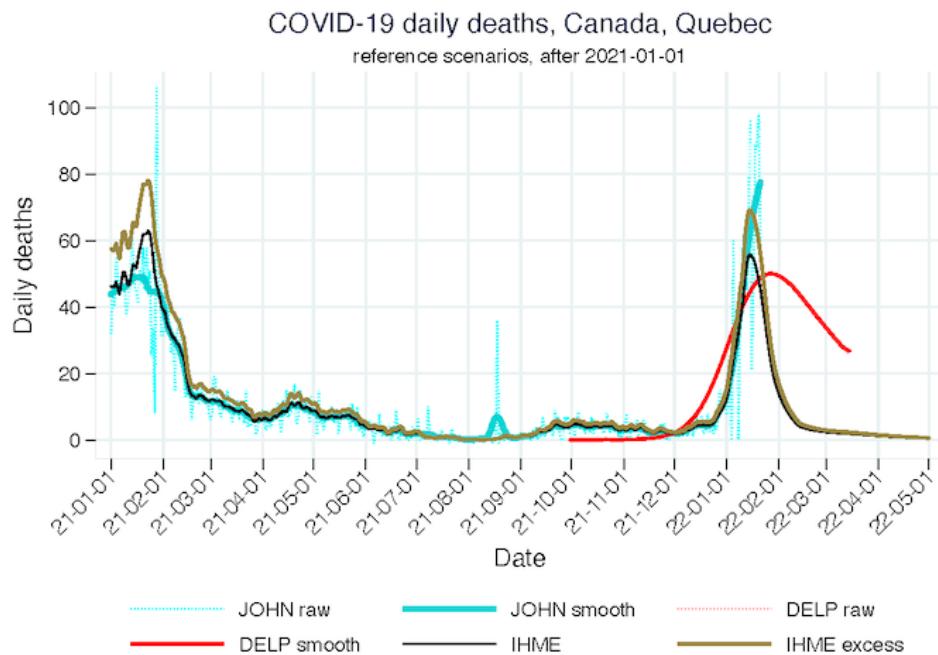
Note: JOHN cases by 5:  
<https://bc.ctvnews.ca/b-c-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1-5722>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures

## Selected graphs - Quebec

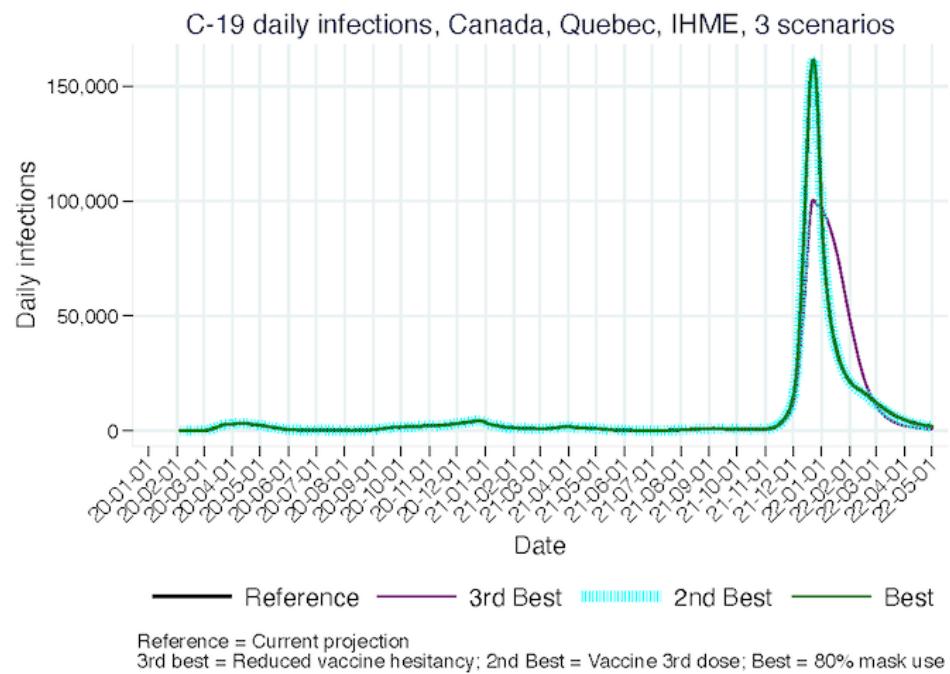
### (1) Quebec [Daily deaths, reference scenarios, all time](#)



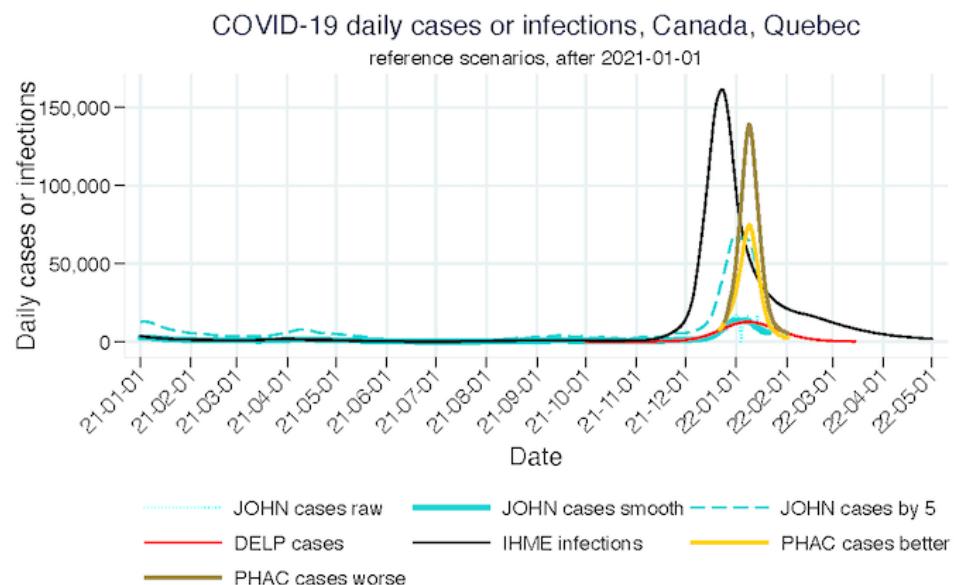
### (3) Quebec [Daily deaths, 3 scenarios, 2021 on](#)



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



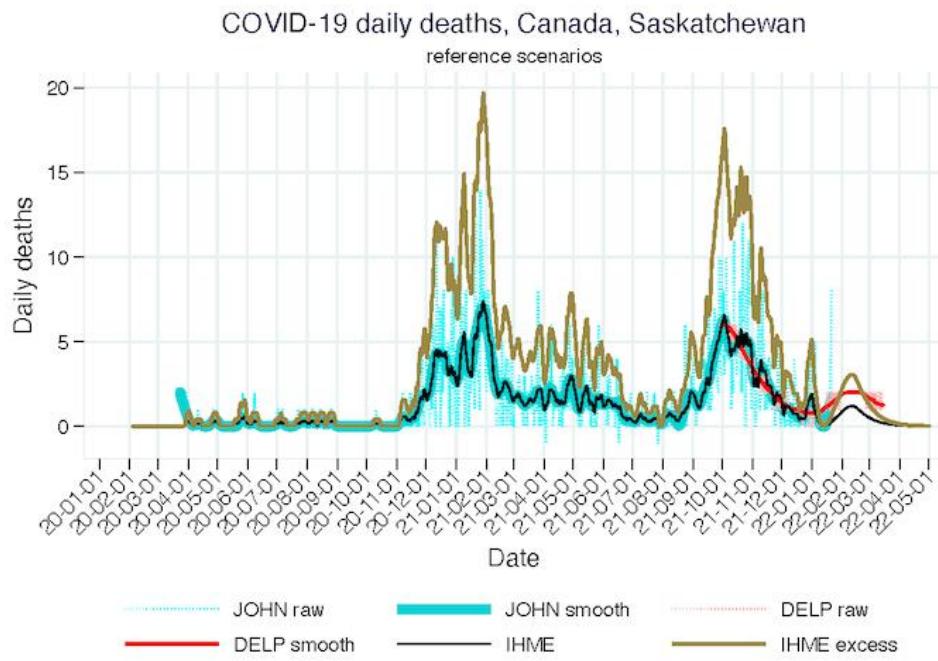
(6) Quebec [Daily cases or infections, 3 scenarios, 2021 on](#)



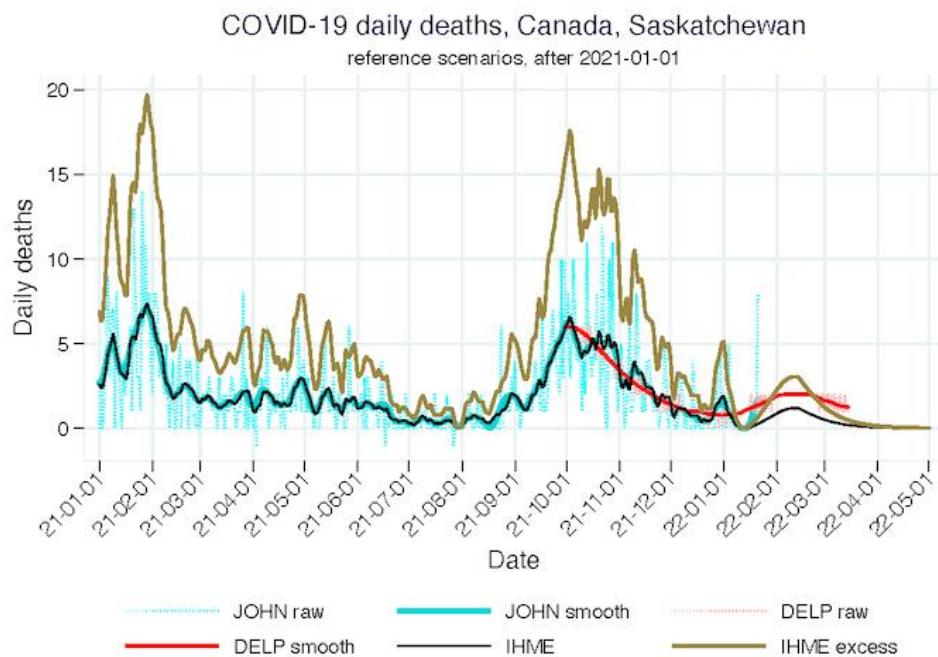
Note: JOHN cases by 5  
<https://bc.ctvnews.ca/b-c-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1-5722>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures

## Selected graphs - Saskatchewan

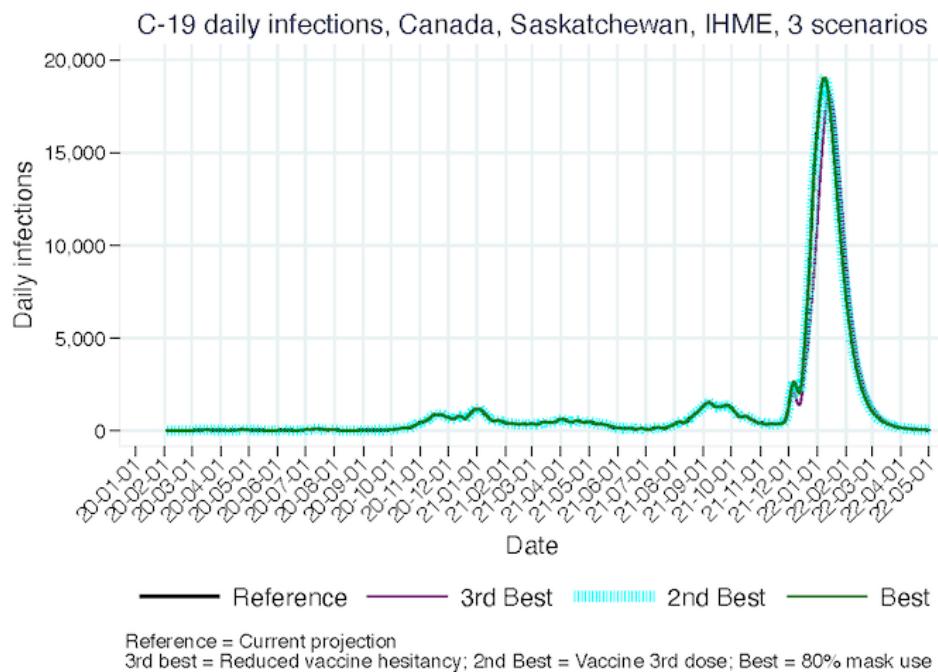
### (1) Saskatchewan [Daily deaths, reference scenarios, all time](#)



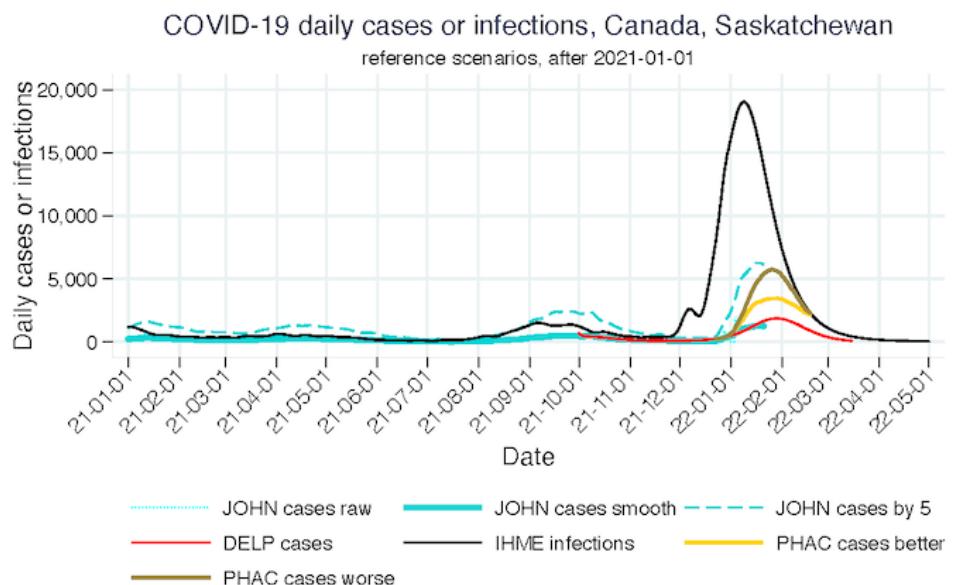
### (3) Saskatchewan [Daily deaths, 3 scenarios, 2021 on](#)



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



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



Note: JOHN cases by 5.  
<https://bc.ctvnews.ca/bc-officials-have-known-all-along-covid-19-cases-could-be-up-to-5-times-higher-than-reported-pho-1-57228>  
 PHAC better scenario: If current public health measures strongly reduce transmission  
 PHAC worse scenario: Without the recent strengthening of public health measures