

New Variants of COVID-19: What are the Economic Costs?

Christopher S. Cotton

Brett Crowley

Bahman Kashi

Huw Lloyd-Ellis

Frederic Tremblay

Abstract:

We apply the methodology developed in Cotton et al (2021) to compare the economic outcomes under alternative COVID-19 mitigation and recovery strategies under consideration by policymakers and public health officials in Canada. This includes updating previous economic cost projections to consider the possibility that new variants of the disease will necessitate stricter lockdown measures in Spring 2021.

Author Affiliations: Christopher Cotton is a Professor of Economics and the Jarislowsky-Deutsch Chair in Economic & Financial Policy at Queen's University, and the Director of Research at Limestone Analytics. Brett Crowley is a Project Coordinator at Limestone Analytics. Bahman Kashi is President of Limestone Analytics and Adjunct Professor at Queen's University. Huw Lloyd-Ellis is a Professor of Economics at Queen's University and Academic Research Advisor at Limestone, Frederic Tremblay is a Researcher at Limestone and a Ph.D. Candidate at Queen's University.

Project Background and Funding: Limestone Analytics provided financial support for this modeling exercise and the development of the STUDIO economic model on which it builds. The methodology is presented in Cotton et al. (2021). The epidemiological and public policy scenarios considered in this brief were provided to the research team by Global Canada's COVID Strategic Choices Group.



About the JDI Policy Paper Series: The John Deutsch Institute for the Study of Economic Policy (JDI) works to build connections between academic researchers and policymakers. The JDI Policy Paper Series includes reports conducted by faculty on behalf of governments and institutions, research summaries and policy briefs written by Queen's researchers in an effort to inform decisions, and academic working papers that may be of relevance to policymakers and practitioners.

**SAVING THE
ECONOMY**
THE NEW VARIANT

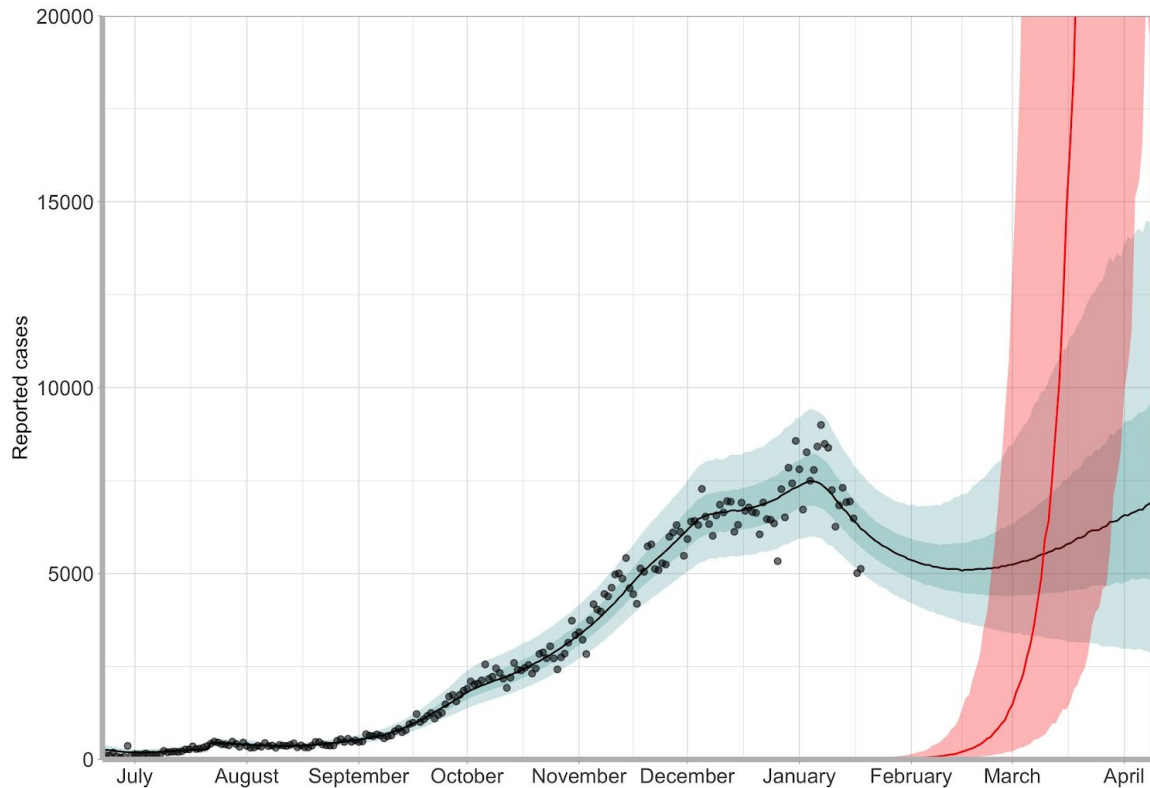
**SUSTAINING
HEALTHCARE**
THE VACCINE ROLLOUT

New Variants of COVID-19: What Are The Economic Costs?

New variants of COVID-19 are becoming increasingly common in North America, with several of these strains having higher transmission rates than the initial strain that made up the majority of cases over the past year. Epidemiologists are now predicting that North America risks seeing the rapid growth of the new, more-easily transmissible strains over the coming weeks, greatly increasing the risks that the healthcare systems exceed capacity even as vaccinations become more widespread.

Michael Osterholm, Director of the Center for Infectious Disease Research and Policy at the University of Minnesota and advisor to US President Joe Biden predicts a surge in new cases over the next six to 14 weeks: “We are going to see something like we have not seen yet in this country,” he said on *Meet the Press*, “That hurricane is coming.” Canada faces similar challenges. A team of leading epidemiologists headed by Caroline Colijn at Simon Fraser University predict that the new strains, if allowed to gain a foothold in Canada over the coming month, are likely to grow exponentially, greatly surpassing the original strain of the virus by mid-March. Such concerns have led Global Canada’s COVID Strategic Choices group and others to call for more-aggressive preventative measures to significantly reduce virus spread and move Canada towards becoming a zero-COVID environment.

In this policy brief, Limestone Analytics applies its well-regarded STUDIO model to compare economic outcomes under two alternative scenarios proposed by the COVID Strategic Choices Group. In one scenario, Canada takes aggressive preventative action over the next few months, which is assumed to result in a low and manageable rate of COVID for the rest of the year until vaccines are widely distributed. In the second scenario, Canada delays the implementation of more-aggressive preventative measures until after a new variant with a higher transmission rate gains a foothold in Canada, only then responding with aggressive measures which will be necessary to prevent catastrophe within the healthcare system. Under this second scenario, we will be unlikely to fully-lift restrictions until vaccines are widely distributed.



Elisha Are and Caroline Colijn, SFU, <https://www.sfu.ca/magpie/blog/high-transmission-variant-modelling.html>

Figure 1: Projected COVID-19 Cases, Original Strain (black) vs. New Variants (red), SFU Model

The purpose of our analysis is to quantify the potential economic impact of two scenarios currently being considered by epidemiologists and policymakers in Canada. We do not assess the likelihood of these scenarios occurring, or whether the proposed preventative measures under these scenarios will be successful in bringing the disease under control and preventing a surge of new variants. For such judgements, we refer to the work of the epidemiologists. Rather, our analysis provides credible economic projections from Limestone's STUDIO Model to ensure that the economic costs of alternative scenarios are also well understood.

We show that delaying the implementation of more-aggressive lockdown measures until after the new strains gain a foothold in Canada comes with significant economic costs in terms of lost jobs and GDP. It is less costly to implement more-aggressive policy now, assuming that the more aggressive early actions enable Canada to get the disease under control and begin full reopening earlier in the year than it otherwise could. We show how an aggressive-yet-effective Canadian Shield strategy implemented over the coming months is associated with approximately \$63 billion higher GDP and 413,000 more full-time equivalent jobs over the course of 2021 compared to a delayed response that does not implement aggressive measures until after the new variants see rapid increases in transmission.

Background

Limestone Analytics, together with economists from Queen's University, developed the Short-Term Under-capacity Dynamic Input-Output (STUDIO) model to measure the economic impact of COVID-19.¹ The model is designed to provide GDP and workforce projections under various pandemic mitigation and recovery policies. It is capable of providing national, provincial, or local-level projections of job and GDP loss for alternative lockdown and reopening strategies in order to guide policymaker strategy.

STUDIO captures *dynamic* input-output interactions between industrial sectors resulting from the lock-down and recovery policies. The highly-flexible model can consider policies implemented at either the province-wide or location-specific levels to provide projections down to the level of census division and industry level using readily-available public data sources. It can accommodate various scenarios regarding how the disease is likely to spread and consumer behaviour likely to change over the recovery period. The model has been implemented for all of Canada and provides the economic projections for the federally funded Looking Glass project supported through Canada's Digital Technology Supercluster, and was the economic model behind the initial and ongoing Canadian Shield analysis. The model has also been adapted to provide projections for several other countries around the world.

In a series of COVID-19 policy briefs, Limestone Analytics has highlighted the ability of its STUDIO model to provide rapid-response policy analysis to guide the short-to-medium term policy response within Canada. These briefs are available at: <https://limestone-analytics.com/publications/>

Limestone Analytics is able to provide more detailed and customized analyses, including the breakdown at the local level of the economic costs of alternative mitigation and reopening strategies being considered by the government.

Policy Options and Scenarios

We provide economic projections through the end of the year for two scenarios regarding the mitigation and recovery from COVID-19 in Canada.

Scenario 1: Aggressive Canadian Shield

The first scenario involves a version of the Canadian Shield strategy that has been proposed by the COVID Strategic Choices Group led by Global Canada, which involves more-aggressive lockdown measures starting immediately under the assumption that such measures will enable economic reopening later in the spring and summer.

The scenario includes the following assumptions around the evolution of the lockdown and recovery strategies:

¹ The academic paper summarizing the methodology is: Cotton, Christopher, Brett Crowley, Bahman Kashi, Huw Lloyd-Ellis, and Frederic Tremblay (2020). Quantifying the Economic Impacts of COVID-19 Policy Responses on Canada's Provinces in (Almost) Real Time. Queen's Economic Department Working Paper 1441. <https://limestone-analytics.com/publications/>

Aggressive Canadian Shield Scenario Summary:

Month 2021	Policy Narrative	The model assumption about costs of lockdown
January	Consistent with the original Canadian Shield and general observations	Restrictions are 2/3rds as economically costly as those from April 2020
February	Aggressive preventative measures are implemented to reduce cases before new variants gain a foothold	Restrictions are 3/4th as economically costly as those from April 2020
March	Moderate relaxation of aggressive measures	Restrictions are 3/4ths as economically costly as those from May 2020
April	Holding steady	Restrictions are 3/4ths as economically costly as those from May 2020
May onward	No more lockdowns	Relaxation of all restrictions and the economy can recover towards 'normal'

We model the economic restrictions during each month as restrictions on economic activity based on the economic declines observed during lockdown measures that were implemented in early 2020 and the relaxation of these restrictions. However, there is evidence that many businesses and organizations are better able to deal with the lockdown restrictions now than they were able to at the early stages of the pandemic. Therefore, we assume that the lockdown restrictions will be generally less costly than they were during the initial wave. We assume, for example, that the most aggressive restrictions will be only 3/4th as costly as the most-aggressive restrictions we observed in the spring of 2020.

The Canadian Shield scenario considered here is more-restrictive than the Canadian Shield scenario considered in Limestone's previous two policy briefs, assuming that more-restrictive measures may be needed to get the virus under control than were previously assumed in the face of the new variants. The scenario implicitly assumes that such an aggressive Canadian Shield policy is successful in reducing COVID-19 transmission rates to the extent that from May 2021 onward, economic restrictions are lifted, and the economy begins its recovery towards 'normal' activity.

Scenario 2: Delayed Aggressive Response

In the second scenario, Canada delays the implementation of more-aggressive preventative measures until after a new variant with a higher transmission rate gains a foothold in Canada, assumed to occur in March, after which aggressive measures will be implemented to prevent catastrophe within the healthcare system, and these restrictions will only be able to be gradually lifted between now and wide-spread vaccination.

The scenario includes the following assumptions around the evolution of the lockdown and recovery strategies:

Aggressive Response to Expanding COVID Cases Scenario Summary:

Month 2021	Policy Narrative	The model assumption about costs of lockdown
January	Consistent with the original Canadian Shield and general observations	Restrictions are 2/3rds as economically costly as those from April 2020
February	Moderate relaxation of January lockdown measures	Restrictions are 2/3rds as economically costly as those from May 2020
March	Spike in cases due to growth in new strains prompt an aggressive response	Restrictions are 3/4ths as economically costly as those from April 2020
April	The aggressive response continues to gain control over the virus	Restrictions are 3/4ths as economically costly as those from April 2020
May	Cautious relaxation of restrictions	Restrictions are 3/4ths as economically costly as those from May 2020
June	Cautious relaxation of restrictions	Restrictions are 2/3rds as economically costly as those from May 2020
July	Holding steady	Restrictions are 2/3rds as economically costly as those from May 2020
August	Continued relaxation of restrictions	Restrictions are 1/3rds as economically costly as those from May 2020
September	Continued relaxation of restrictions	Restrictions are 1/3rds as economically costly as those from June 2020
October onward	No more lockdowns	Relaxation of all restrictions and the economy can recover towards 'normal'

Specifically, this scenario assumes that February sees a moderate relaxation of the restrictions put in place in December and January. However, the measures are not sufficient to prevent the exponential growth in COVID cases due to the new variants of the disease and a high rate of transmission requires an aggressive response starting in March and continuing for several months before cautious relaxation of restrictions can begin as vaccinations become more widely distributed later in the year.

For details regarding the epidemiological model and policy projections behind the scenarios, see the Canadian Shield policy proposal related briefs released by the COVID Strategic Choices Group led by Global Canada.²

² <https://covidstrategicchoices.ca/>

Economic Projections

The STUDIO model can provide economic projections by industry at the local level. For the purposes of this report, we break out results by province but not at the local level of the industry. More detailed projections and customized scenario projections are available through Limestone Analytics.

We can consider how the economic costs of COVID-19 for Canada evolve over the course of the year under the two different scenarios. The analysis allows us to compare the employment and GDP deficits that result from COVID-19 under the two different scenarios. These are deficits compared to what we project would have occurred in 2021 in the absence of COVID-19. Tables 1 and 2 break out the projected Canada-wide economic impact by quarter. The chart in Figures 1 and 2 illustrate the GDP and job deficit by month from January through December 2021.

Table 1: Canada-wide average deficit in FTE employment due to COVID-19, 2021

Scenario	Q1	Q2	Q3	Q4	Average
Delayed Aggressive Response	-2,175,597	-2,281,332	-1,475,089	-385,445	-1,579,366
Canadian Shield	-2,229,103	-1,545,637	-673,388	-219,047	-1,166,794

Projections from Limestone Analytics STUDIO model

Table 2: Quarterly deficit in Canada annual GDP due to COVID-19 (millions CAD), 2021

Scenario	Q1	Q2	Q3	Q4	Total
Delayed Aggressive Response	-\$92,986	-\$91,896	-\$55,852	-\$14,188	-\$254,922
Canadian Shield	-\$95,099	-\$59,487	-\$27,717	-\$9,708	-\$192,011

Projections from Limestone Analytics STUDIO model

Under both scenarios, the STUDIO model projects that there will be substantially lower jobs and GDP compared to an environment in which COVID-19 did not occur. By comparing the declines under the two scenarios, we can estimate the economic benefits of implementing a more-aggressive lockdown policy over the coming month, if such a policy allows us to avoid a scenario in which new variants of the disease gain a foothold and require a more-persistent lockdown starting in March.

We observe that the Canadian Shield scenario, relative to the Delayed Aggressive Response scenario, is associated with approximately \$63 billion higher GDP, and 413,000 more full-time equivalent jobs over the course of 2021.

The general patterns are consistent across regions within Canada. In Ontario, for example, the decline in GDP is expected to be 28 percent higher under the delayed aggressive response scenario compared to the aggressive Canadian Shield policy. In Quebec, the decline is 37% worse, and in Alberta 44% worse. Other provinces and regions fall in between these values. The provincial values are illustrated in Figures 3 and 4.

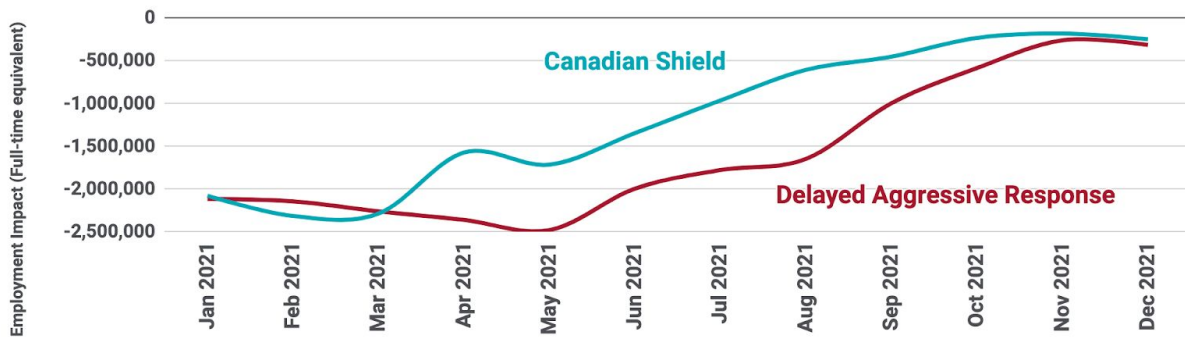
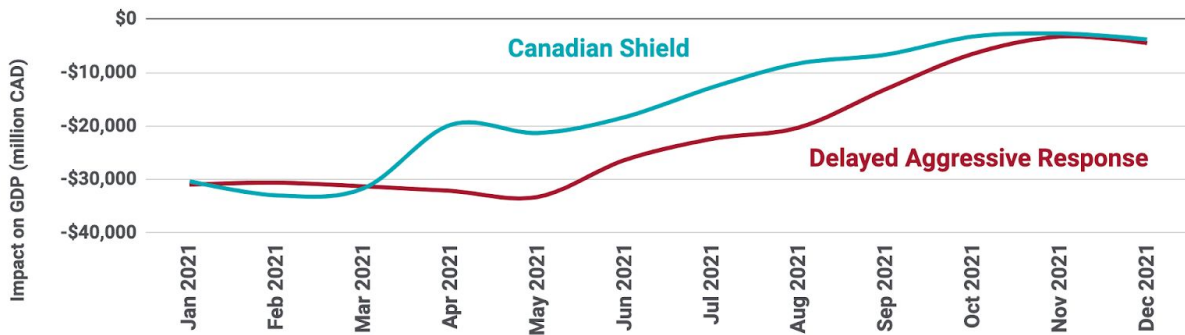


Figure 1: Projected trends in full-time equivalent job loss due to COVID-19 under each scenario



Projections from Limestone Analytics STUDIO model

Figure 2: Projected trends in national GDP deficit due to COVID-19 under each scenario

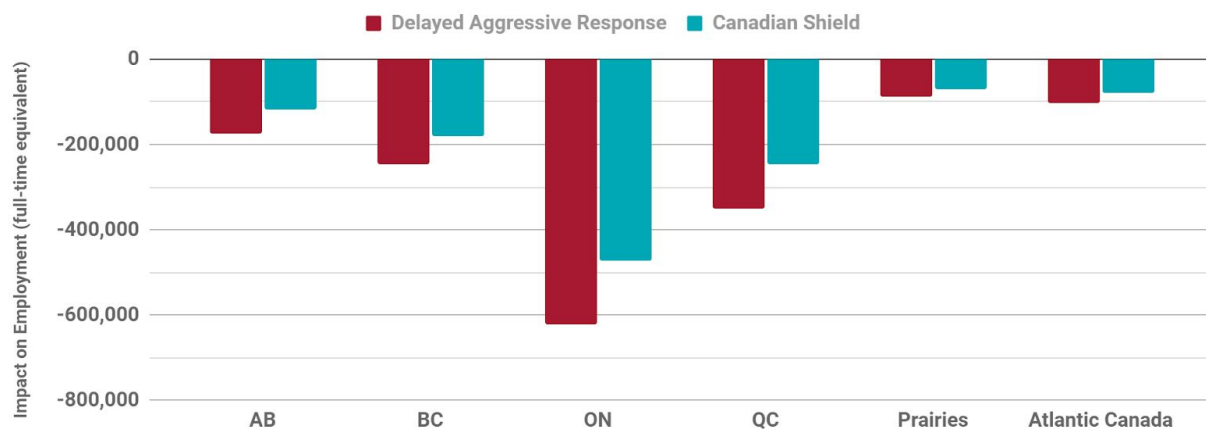


Figure 3: Projected full-time equivalent job loss due to COVID-19 under each scenario by province

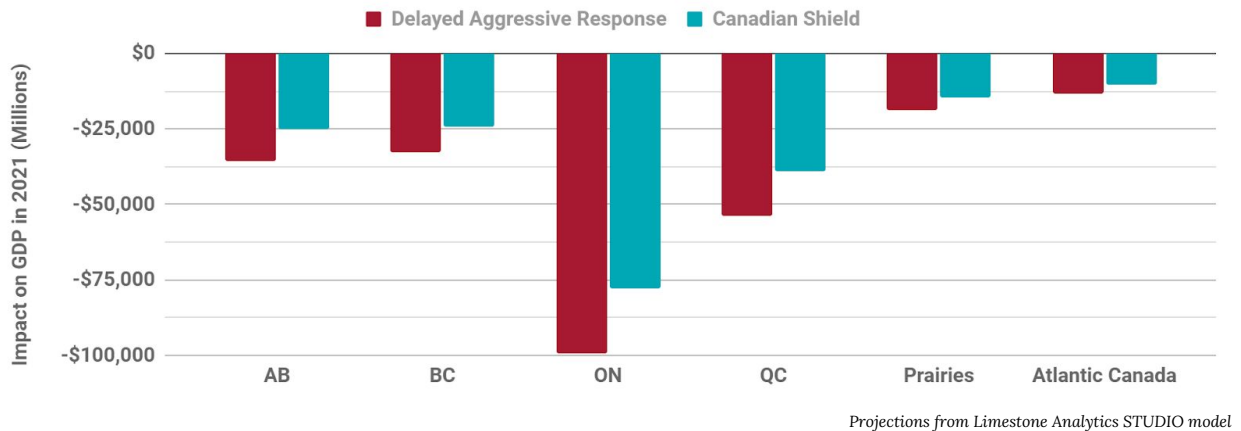


Figure 4: Projected GDP deficit due to COVID-19 under each scenario by province

About Limestone

Limestone Analytics (Limestone) is a Canada- and U.S.-based consulting firm that specializes in the evaluation of projects and policies around the globe. The firm is recognized for combining academic rigour, state-of-the-art methods, and policy experience to provide the highest-quality, customized analysis and evaluation services and to help clients incorporate evidence into the design, financing and implementation of their projects. The firm and its principal staff have successfully completed assignments for large organizations and NGOs such as the US Department of State, Nutrition International, Copenhagen Consensus Center, World Bank, World Vision and the Millenium Challenge Corporation, among many other clients.

Limestone Analytics, together with economists from Queen’s University, developed the Short-Term Under-capacity Dynamic Input-Output (STUDIO) model to measure the economic impact of COVID-19. That model serves as a foundation for the analysis in this policy brief.

This policy brief is based on research conducted by Christopher Cotton, Brett Crowley, Bahman Kashi, Huw Lloyd-Ellis, and Frederic Tremblay.³

³ Cotton is the Director of Research at Limestone Analytics and the Jarislowsky-Deutsch Chair in Economic & Financial Policy at Queen’s University; Crowley is an Associate at Limestone; Kashi is the President of Limestone and an Adjunct Professor at Queen’s; Lloyd-Ellis is a Professor of Economics at Queen’s and an Academic Research Advisor at Limestone; Tremblay is a Research Associate at Limestone and Ph.D. Candidate at Queen’s.

The bibliography includes sources directly referred to in the analysis and related policy briefs that informed the research team's analysis, including reference to updated, publicly available versions of the health projections that were shared with the research team..

References

Are, Elisha and Caroline Colijn (2021), "High-transmission variants in Canada," SFU Mathematics, Genomics and Prediction in Infection and Evolution Blog, February 9, 2021.

Agnew, Mark, Tasha Ayinde, Andre Beaulieu, Caroline Colijn, Christopher Cotton, Marion Crowe, Irfan Dhalla, Justin Ferbey, Robert Greenhill, Blayne Haggart, Brett House, Ryan Imgrund, Jack Jebwab, Jaspreet Khangura, Jeff Kwong, Chris McCabe, Andrew Morris, Jean-Paul R. Soucy, and Ashleigh Tuite. "Building the Canadian Shield: A New Strategy to Protect Canadians from COVID and from the Fight Against COVID." A Policy Proposal by the COVID Strategy Choices Group, December 2020.

Cotton, Christopher, Brett Crowley, Bahman Kashi, Huw Lloyd-Ellis, and Frederic Tremblay (2021), "Quantifying the Economic Impacts of COVID-19 Policy Responses on Canada's Provinces in (Almost) Real Time," Canadian Journal of Economics, forthcoming.

Cotton, Christopher, Brett Crowley, Bahman Kashi, Huw Lloyd-Ellis, and Frederic Tremblay (2020), "COVID-19 PLanning for 2021: Comparing the Economic Impact of Alternative Recovery Scenarios," Limestone Analytics and JDI Public Policy Paper 20-1202.

Cotton, Christopher, Brett Crowley, Bahman Kashi, Huw Lloyd-Ellis, and Frederic Tremblay (2021b), "Will a Candian Shield Lockdown Save Jobs in Ontario?" Limestone Analytics and JDI Public Policy Paper 21-0101.

Cotton, Christopher, Brett Crowley and Huw Lloyd-Ellis (2021), "The Economic Costs of Delayed Policy and Delayed Vaccines in the Fight Against COVID-19," Limestone Analytics and JDI Public Policy Paper 21-0302.

Crowley, Brett and Frederic Tremblay (2021), "Optimizing COVID-19 Stimulus Spending in Malawi," Limestone Analytics and JDI Public Policy Paper 21-0301.

Global Canada, "Should Canada Go For Zero? Global Best Practices, TANZANC Democracies & Lessons For Canada," working paper, December 2020.

McCabe, Christopher, Vic Adamowicz, Robin Boadway, Dan Breznitz, Christopher Cotton, Nathalie de Marcellis-Warin, Stewart Elgie, Evelyn Forget, Richard Gold, Esyllt Jones, Fabian Lange, Stuart Peacock, and Lindsay Tedds, "Renewing the social contract: Economic recovery in Canada from COVID-19," An RSC Policy Briefing, Royal Society of Canada COVID-19 Task Force, December 2020.

Otto, Sarah "Sally", Dean Karlen, Caroline Colijn, Jens von Bergmann, Rob James, James Collander, Eric Cytrynbaum, Daniel J. McDonald, Paul Tupper, Dan Coombs, Elisha Are (2021), "COVID Model Projections," BC COVID-19 Modelling Group.
