City of Winnipeg COVID-19 Pandemic/Economic Modelling and Winter 2021 Outlook – MABE/CABE 2021 Presentation

April 23, 2021

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Presentation Outline

- Our approach to developing COVID-19 scenarios

- Connecting the pandemic and the economy

- Update from our September 2020 Outlook

- City of Winnipeg Winter 2021 COVID-19 Outlook for 2021/2022

  - Our link between lockdowns and the vaccine rollout

  - Three COVID-19 Pandemic/Economic Scenarios

Developing COVID-19 Scenarios

High Uncertainty Necessitates Multiple Scenarios

- The COVID-19 pandemic has created such a high degree of uncertainty that a single economic forecast is not useful for short-term planning during this crisis
- To manage this uncertainty we prepare three scenarios for each round of our modelling that are in part designed to capture the plausible extremes of the best and the worst cases for how COVID-19 may evolve in Manitoba
- The scenarios should be sufficiently robust that they continue to provide high value under a rapidly changing environment (e.g. emergence of new variants, changing vaccine roll out)

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Developing COVID-19 Scenarios

The Fundamental Process

- The scenarios are developed in three stages:
    1. Primary research: track daily global media reports on new developments of pandemic, review new COVID-19 research from public health agencies and academic institutions, and watch media briefings by public health officials
    2. Develop initial pandemic scenarios that consider potential possibility/timing of future waves, vaccine rollout projections, border/travel restrictions and other future public health restrictions in response to these dynamics
    3. Present our initial scenarios to our head of emergency management for review/feedback and adjust accordingly
- The scenarios have a monthly time frequency to capture the fast moving dynamics of COVID-19 and the subsequent responses

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The Pandemic-Macroeconomic Model
The Guts of the Model

- The macroeconomic model uses an Input/Output (I/O) model framework for Manitoba, to translate final demands into GDP by industry estimates. The final demand inputs are:
  - Household consumption: 104 variables
  - Government and Non-profit Institutions Serving Households consumption: 2 variables
  - Business Investment in Residential Structures: 3 variables
  - Business Investment in Non-residential Structures: 16 variables
  - Business Investment in Machinery & Equipment: 16 variables
  - Business Investment in Intellectual Property Products: 1 variable
  - Government and Non-profit Institutions Serving Households Investment: 6 variables
  - Exports: 59 variables
  - Imports: Implicitly estimated using the I/O model

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The Pandemic-Macroeconomic Model

Linking Expenditures to the Pandemic

- The output of the I/O model are GDP by industry estimates for 284 industries in Manitoba
- Winnipeg's (CMA) share of Manitoba's employment by industry are used to translate the provincial GDP by industry estimates into Winnipeg (CMA) GDP estimates
- The expenditure variables are broadly modelled in one of three ways:
  1. A direct function of the state of public health restrictions (e.g. varying capacity limits on restaurants or shutdown for indoor dining)
  2. A binary state of the whether pandemic still exists or not, causing a general decline in economic activity (GFC growth rates used as a proxy) or likely around trend growth (3-year CAGR)
  3. Invariant to COVID-19 (e.g. exports of canola), which again assumes 3-year CAGR (some intervention may be required for special circumstances)

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The Pandemic-Macroeconomic Model

Linking Expenditures to the Pandemic

- The final outputs of the model are conditional on our monthly pandemic assumptions
  - For example, last September our worst case scenario assumed a second wave began in December 2020. This translated into household consumption for restaurants to decline that month after growing the previous month prior to the second wave
- The growth/contractions rates for the variables are updated with each round of modelling:
  - Monthly survey statistics are used as indicators for determining the degree of the economic impact based upon the state of the pandemic (replacing our assumptions needed to fill data gaps when possible)
  - Emerging trends that were not expected by economists are updated to reflect realized outcomes (e.g. the housing market has performed significantly better than most economists expected a year ago)

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Connecting The Pandemic To The Economy

Some Challenges in Doing Economic Modelling of the Pandemic

- Varying impacts of COVID-19 waves (higher fear in spring 2020 versus winter 2021, people and businesses learning to live with COVID-19 plus COVID fatigue)
- Forced to make numerous assumptions, econometric models estimated using pre-pandemic data will likely be useless to estimate final demands
- Limited Statistics Canada economic accounts data provided at the provincial level and effectively no useful data that is timely for municipalities
  - Some high-frequency Statistics Canada survey data for municipalities does help, but these are limited
  - As a result of COVID-19 Statistics Canada is starting to address data gaps faced by municipalities

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Update Since the September 2020 Scenarios

- Manitoba entered a second wave of COVID-19 in October, with strong lockdown measures put in place in November and have begun to be gradually relaxed starting in late January 2021

- Since September 2020 Health Canada has approved four vaccines:
  - Pfizer-BioNTech and Moderna in late 2020
  - AstraZeneca on February 26, 2021
  - Johnson & Johnson on March 5, 2021

- Health Canada is currently reviewing the Novavax vaccine

- Multiple variants of concern have been identified across the globe, notably the B117 (U.K.), B1351 (South Africa) and P1 (Brazil) variants, which have higher degrees of transmission, possibly causing more severe outcomes and some raising concerns of efficacy for current vaccines

- The first case of the B117 variant in Manitoba was announced on February 9, 2021

- The first case of the B1351 variant in Manitoba was announced on March 2, 2021

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Winnipeg Pandemic Scenarios

Provincial Vaccine Rollout Projections and Modelling Future Restrictions

"The doctor [Dr. Jazz Atwal, Deputy Chief Provincial Public Health Officer] said patients of all ages have been admitted to hospital for treatment, <u>with those 50 or older making up most of the hospitalizations so far</u>. Many people who require hospital treatment also have underlying conditions, such as cardiovascular disease, diabetes and high blood pressure, Atwal said." - Care home vaccinations won't dent hospitalization rate in Manitoba – Winnipeg Free Press, February 2, 2021

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Winnipeg Pandemic Scenarios

Provincial Vaccine Rollout Projections and Modelling Future Restrictions

- One purpose of increasing public health restrictions is to counteract rising transmission of COVID-19 to ensure our health care system has the capacity to treat all patients who become severely ill

- The purpose of the vaccines are to prevent people from contracting COVID-19 and reducing severe outcomes. This results in reducing the burden on our health care system and reducing public health restrictions.

- In Canada the 50+ population makes up ~83% of the total population that has been hospitalized due to COVID-19
  - In Manitoba it is slightly lower, approximately 75%, exact numbers are not publically available

- In Manitoba, First Nations populations have seen a higher hospitalization rate due to COVID-19 than the general population

- Therefore, vaccinating the 50+ general population and the First Nations population is a major benchmark in our modelling for when public health restrictions can started to be eased

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Assumptions and Risks

Scenario Assumptions

- Vaccine rollout projections are based upon the Government of Manitoba low and high dose vaccination projections released February 24, 2021

- Vaccinating the 50+ general population and the 30+ First Nations general population are the benchmarks that begin to allow restrictions to be more broadly relaxed

- The province assumes vaccine uptake will reach 70% of the adult population. Given emerging variants of concern have a higher transmission rate we are assuming vaccine uptake will need to reach 85% of the adult population for most restrictions to be relaxed

Epidemiological Risks in our Assumptions

- Vaccine supplies deviating from the Government of Manitoba's low and high dose projections used for this analysis may alter the assumed timing of changes in restrictions and potential future waves

- The change in timing of the second dose of the vaccines may alter the assumed timing of changes in restrictions and potential future waves

- New information regarding current known variants and future unknown variants could impact our scenarios

- A vaccine uptake of less than 85% to reduce most restrictions would have a modest positive impact on our scenarios, resulting in the timing of restrictions being reduced by 1-2 months

Source: Government of Manitoba Vaccine Task Force Update, February 24, 2021

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Winnipeg Pandemic Scenarios
Government of Manitoba High Dose Vaccine Projection

- 70% of 50+ General Population and 30+ First Nations vaccinated by June 30, 2021

- 70% of all 18+ population vaccinated by August 31, 2021

Cohort	Population Cohort	Start	Finish	Duration
1	Healthcare Workers	16-Dec-2020	28-May-2021	23.6w
2	Personal Care Home Residents	11-Jan-2021	12-Mar-2021	9w
3	Other congregate living settings	19-Feb-2021	28-Apr-2021	9.8w
4	FN general population 60+	15-Mar-2021	14-May-2021	9w
5	General population 80+	15-Mar-2021	14-May-2021	9w
6	FN general population 50-59	2021-04-01	2021-05-31	8.6w
7	General population 70-79	01-Apr-2021	31-May-2021	8.6w
8	FN general population 40-49	15-Apr-2021	31-May-2021	6.6w
9	General population 60-69	2021-04-15	2021-05-31	6.6w
10	FN general population 30-39	03-May-2021	30-Jun-2021	8.6w
11	General population 50-59	2021-05-03	2021-06-30	8.6w
12	FN general population 18-29	01-Jun-2021	30-Jul-2021	8.8w
13	General population 40-49	2021-06-01	2021-07-30	8.8w
14	General population 30-39	01-Jul-2021	31-Aug-2021	8.8w
15	General population 18-29	15-Jul-2021	31-Aug-2021	6.8w

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Winnipeg Pandemic Scenarios
Government of Manitoba Low Dose Vaccine Projection

- 70% of 50+ General Population and 30+ First Nations vaccinated by July 29, 2021

- 70% of all 18+ population vaccinated by November 30, 2021

Cohort	Population Cohort	Start	Finish	Duration
1	Healthcare Workers	16-Dec-2020	30-Jul-2021	32.6w
2	Personal Care Home Residents	11-Jan-2021	12-Mar-2021	9w
3	Other congregate living settings	19-Feb-2021	30-Apr-2021	10.2w
4	FN general population 60+	15-Mar-2021	14-May-2021	9w
5	General population 80+	15-Mar-2021	2021-05-14	9w
6	FN general population 50-59	01-Apr-2021	28-May-2021	8.4w
7	General population 70-79	01-Apr-2021	2021-05-28	8.4w
8	FN general population 40-49	03-May-2021	29-Jun-2021	8.4w
9	General population 60-69	2021-05-03	2021-06-29	8.4w
10	FN general population 30-39	01-Jun-2021	2021-07-29	8.6w
11	General population 50-59	01-Jun-2021	29-Jul-2021	8.6w
12	FN general population 18-29	02-Aug-2021	30-Sep-2021	8.8w
13	General population 40-49	2021-08-02	2021-09-30	8.8w
14	General population 30-39	03-Sep-2021	29-Oct-2021	8.2w
15	General population 18-29	01-Oct-2021	30-Nov-2021	8.6w

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Winnipeg Macroeconomic Projections by Scenario
Scenario Considerations

""We are going into a second year of this, it could even be tougher given the transmission dynamics and some of the issues that we are seeing," Mike Ryan, the WHO's top emergencies official" – Second year of pandemic 'could even be tougher' as coronavirus surges, WHO says, Reuters, January 13, 2021

""Ugur Sahin, BioNTech's chief executive, said he thought the company's existing Covid-19 vaccine, developed with Pfizer, would still be effective against the new variant. If not, "<u>the beauty of the messenger mRNA technology is we can directly start to engineer a vaccine that completely mimics this new mutation and we could manufacture a new vaccine within six weeks</u>," he said." – BioNTech says it can produce new vaccine for Covid variant in 6 weeks, Financial Times, December 22, 2020

""Dr. Zaks [Chief Medical Officer for Moderna] said that the <u>new version of the Moderna vaccine, aimed at the South African variant, could be used if needed as a booster one year after people received the original vaccine</u>." – As Virus Grows Stealthier, Vaccine Makers Reconsider Battle Plans, New York Times, January 28, 2021

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Winnipeg Macroeconomic Projections by Scenario

Best-Case Scenario Narrative

Scenario Assumptions

- Narrative: The B117 variant emerges in Manitoba, but does not become a dominant threat in winter/spring 2021. Vaccines are sufficiently effective against current known variants and future unknown variants. Restrictions are slowly relaxed on a broad basis with strict capacity limits until May 2021 (warmer weather) and July 2021 (50+ general population and 30+ First Nations general population has been vaccinated). No additional waves of COVID-19.

- Vaccine rollout projection: High dose scenario

- The goal of this scenario is to capture the event of COVID-19 being kept under control with broad reopening for businesses

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Winnipeg Macroeconomic Projections by Scenario

Best-Case Scenario Timeline Assumptions
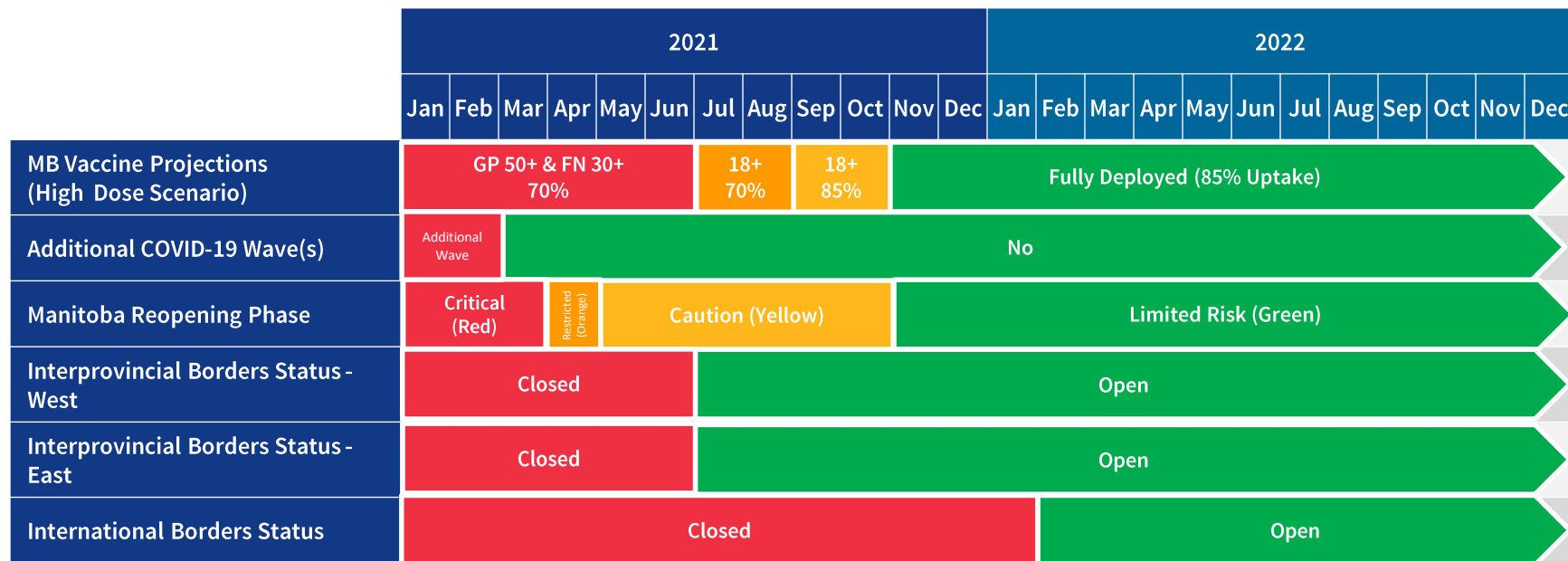
	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MB Vaccine Projections (High Dose Scenario)	GP 50+ & FN 30+ 70%						18+ 70%		18+ 85%		Fully Deployed (85% Uptake)													
Additional COVID-19 Wave(s)	Additional Wave	No																						
Manitoba Reopening Phase	Critical (Red)		Restricted (Orange)	Caution (Yellow)						Limited Risk (Green)														
Interprovincial Borders Status - West	Closed				Open																			
Interprovincial Borders Status - East	Closed				Open																			
International Borders Status	Closed											Open												

Notes: GP: General Population, FN: First Nations

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Winnipeg Macroeconomic Projections by Scenario

Best-Case Scenario Results

Indicator - Winnipeg CMA	2019	2020F	2021F	2022F
GDP Growth Rate	+1.9%	-5.8%	+5.1%	+3.6%
Unemployment Rate	5.3%	8.8%	6.8%	5.7%

Sources: The 2019 GDP growth rate is from the Conference Board of Canada Fall 2020 Metropolitan Outlook. The 2020 GDP growth rate is from the September 2020 Worst Case Scenario prepared by City of Winnipeg Economic Research. The 2019/2020 unemployment rates are from Statistics Canada Table 14-10-0385-01 Labour Force Characteristics, Annual. All other estimates have been prepared by City of Winnipeg Economic Research.

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Winnipeg Macroeconomic Projections by Scenario

Medium-Case Scenario Narrative

Scenario Assumptions

- Narrative: The B117 variant emerges in Manitoba and results in an additional wave beginning in May 2021. Vaccines are sufficiently effective against current known variants and future unknown variants. Restrictions are relaxed at the same rate as in the best case scenario for February – April and re-imposed for May – July. By August 2021 the third wave has subsided and 70% of the 50+ general population and 30+ First Nations general population are vaccinated allowing restrictions to start to be relaxed. Seventy percent of the 18+ population will be vaccinated by the end of November 2021 and 85% of the population by the end of January 2022.

- Vaccine rollout projection: Low dose scenario

- The goals of this scenario is to capture the event of a third wave in Spring 2021, requiring restrictions to be re-imposed and a slower vaccine rollout.

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Winnipeg Macroeconomic Projections by Scenario

Medium-Case Scenario Timeline Assumptions

	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MB Vaccine Projections (Low Dose Scenario)	GP 50+ & FN 30+ 70%							18+ 70%			18+ 85%		Fully Deployed (85% Uptake)											
Additional COVID-19 Wave(s)	Additional Wave	No		Additional Wave			No																	
Manitoba Reopening Phase	Critical (Red)		Restricted (Orange)	Critical (Red)				Restricted (Orange)		Caution (Yellow)			Limited Risk (Green)											
Interprovincial Borders Status - West	Closed									Open														
Interprovincial Borders Status - East	Closed									Open														
International Borders Status	Closed															Open								

Notes: GP: General Population, FN: First Nations

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Winnipeg Macroeconomic Projections by Scenario

Medium-Case Scenario Results

Indicator - Winnipeg CMA	2019	2020F	2021F	2022F
GDP Growth Rate	+1.9%	-5.8%	+3.7%	+5.1%
Unemployment Rate	5.3%	8.8%	7.1%	5.7%

Sources: The 2019 GDP growth rate is from the Conference Board of Canada Fall 2020 Metropolitan Outlook. The 2020 GDP growth rate is from the September 2020 Worst Case Scenario prepared by City of Winnipeg Economic Research. The 2019/2020 unemployment rates are from Statistics Canada Table 14-10-0385-01 Labour Force Characteristics, Annual. All other estimates have been prepared by City of Winnipeg Economic Research.

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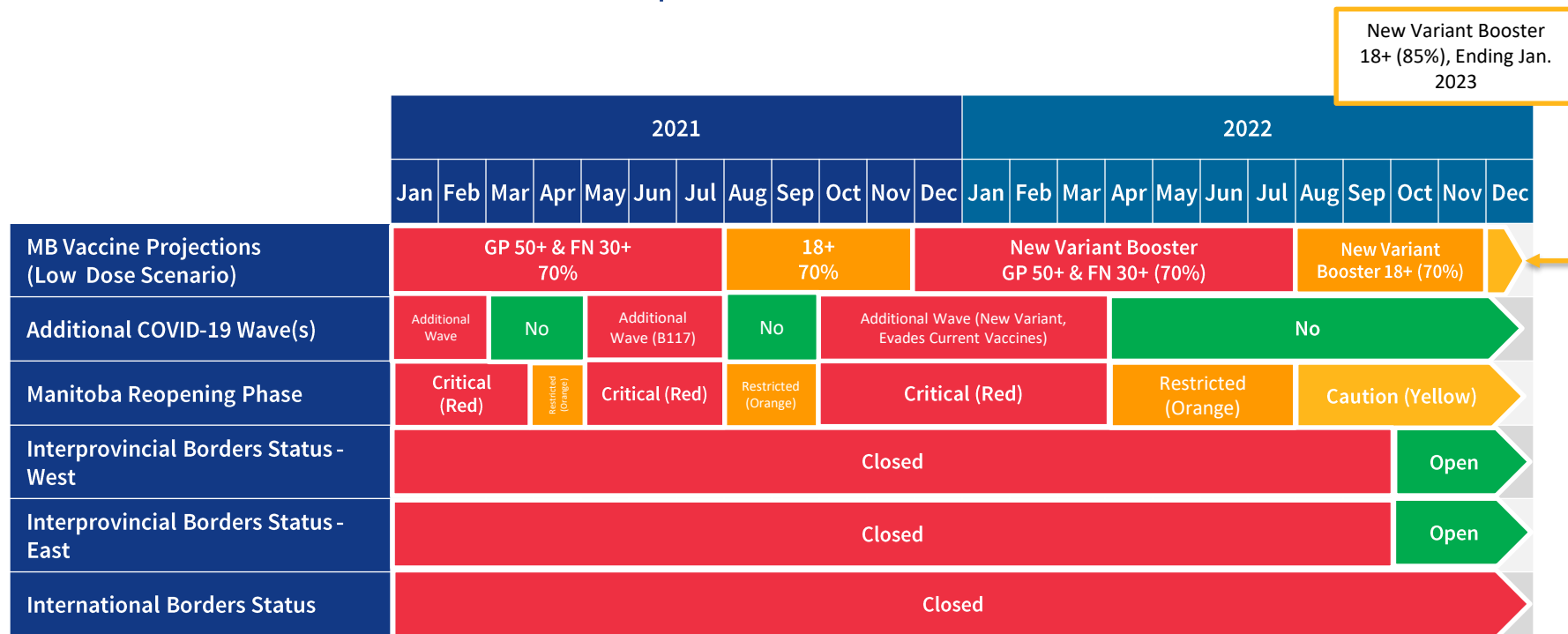# Winnipeg Macroeconomic Projections by Scenario

Worst-Case Scenario Narrative

Scenario Assumptions

- Narrative: This scenario builds on the medium case with the third wave in spring 2021. We assume that during the summer of 2021 a new variant that evades current vaccines is detected and drug manufacturers being to produce a booster shot. The new variant begins to rise as a share of Manitoba COVID-19 cases in fall 2021 and becomes the dominant strain. All non-pharmaceutical interventions are required to limit transmission. Booster shots are deployed at the beginning of December 2021 and follows the low vaccine projection for 2021 with a one year lag.

- Vaccine rollout projection: Low dose scenario for 2021 and used as a one year lag for the booster deployment

- The goals of this scenario is to capture the event of a third wave in Spring 2021 and a new variant emerging requiring new booster shots to be developed and administered in 2022. The development and deployment of the booster shot are based upon comments made by the CEO of BioNTech and the Chief Medical Officer of Moderna.

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Winnipeg Macroeconomic Projections by Scenario

Worst-Case Scenario Timeline Assumptions

New Variant Booster 18+ (85%), Ending Jan. 2023

	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MB Vaccine Projections (Low Dose Scenario)	GP 50+ & FN 30+ 70%							18+ 70%			New Variant Booster GP 50+ & FN 30+ (70%)									New Variant Booster 18+ (70%)				
Additional COVID-19 Wave(s)	Additional Wave	No		Additional Wave (B117)				No		Additional Wave (New Variant, Evades Current Vaccines)					No									
Manitoba Reopening Phase	Critical (Red)		Restricted (Orange)	Critical (Red)				Restricted (Orange)		Critical (Red)						Restricted (Orange)				Caution (Yellow)				
Interprovincial Borders Status - West	Closed																				Open			
Interprovincial Borders Status - East	Closed																				Open			
International Borders Status	Closed																							

Notes: GP: General Population, FN: First Nations

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Winnipeg Macroeconomic Projections by Scenario
Worst-Case Scenario Results

Indicator - Winnipeg CMA	2019	2020F	2021F	2022F
GDP Growth Rate	+1.9%	-5.8%	+3.0%	+1.9%
Unemployment Rate	5.3%	8.8%	7.5%	6.7%

Sources: The 2019 GDP growth rate is from the Conference Board of Canada Fall 2020 Metropolitan Outlook. The 2020 GDP growth rate is from the September 2020 Worst Case Scenario prepared by City of Winnipeg Economic Research. The 2019/2020 unemployment rates are from Statistics Canada Table 14-10-0385-01 Labour Force Characteristics, Annual. All other estimates have been prepared by City of Winnipeg Economic Research.

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Summary

- Overall the economy saw a historic shock in 2020, with an uneven recovery across industries due to changed human behaviours and public health measures in response to COVID-19.

- Because the short-term future remains highly uncertain, Economic Research has produced three scenarios of varying impacts of COVID-19 on the economy.

- Our first round of scenarios were used as part of navigating the crisis early on and our second round results were used for planning the 2021 budget.

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