Effectiveness_of_Community_Contact_Reduction

October 14, 2020

[1]:
```
from IPython.display import Image
Image("../Images/Logo.jpg")
```

[1]:

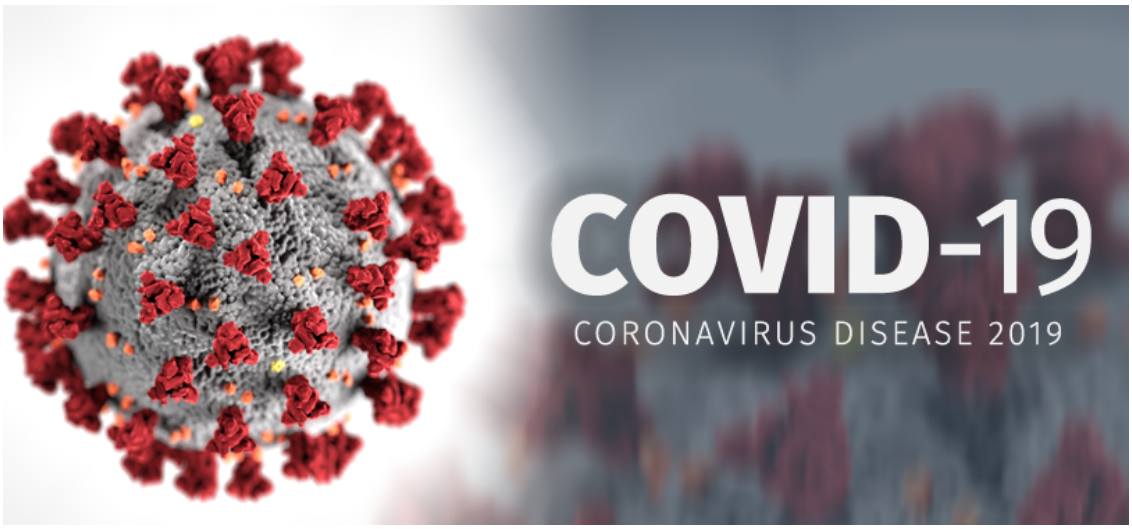
#

Graduate Project ENEL 698

Github Link

[2]:
```
Image("../Images/Covid-19.png")
```

[2]:



0.1 This Notebook constitues of analysis of Effectiveness of Community Contact Reduction for reducing Coronavirus Disease 2019 (COVID-19) transmission.

0.2 Objective and Scope

0.2.1 Measures have been included in pandemic response plans to reduce contact between people during an influenza pandemic. Early in a pandemic, restricting the activities of infected individuals could reduce the negative health impact. This analysis aims to assist decision-makers with evidence to support decision-making during pandemic.

- This analysis will address the following question:

1. This anlaysis will tell us what is the effectiveness of community contact reduction for reducing transmission of COVID-19?
2. This analysis provides information on select interventions (policies and other measures) to stop the spread and improve health outcomes from COVID-19 by jurisdiction (Canada, province and territory).

Lets load the intervention scan data (Canada Specific)

- Data Source - For more info please click here.

[3]:
```
#importing the necessary files required for visualization and statistical␣
↪analysis

import requests

import pandas as pd
import numpy as np

import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline

import plotly.express as px
import chart_studio.plotly as py
import plotly.graph_objects as go
from plotly.offline import download_plotlyjs, init_notebook_mode, plot, iplot
```

[4]:
```
intervention_scan = pd.ExcelFile('../covid_data/Data/InterventionScanCanada/
↪covid-19-intervention-scan-data-tables-en.xlsx')
```

[5]:
```
# Its a big datasheet lets see how many sheets it constitutes

print("This dataset contains {} sheets {}.".format(len(intervention_scan.
↪sheet_names), intervention_scan.sheet_names))
```

```
This dataset contains 6 sheets ['COVID-19 Intervention Scan', 'Notes to
readers', 'Intervention scan', 'Data dictionary', 'Version history', 'Filters'].
```

Loading Individual Sheets

[6]:
```
# Parsing Individual sheets to gather data specific information

intervention_scan_data_info = intervention_scan.parse('COVID-19 Intervention␣
↪Scan')
intervention_scan_data_info.head()
```

[6]:
```
  Screen reader users: This workbook has 5 worksheets, including this title
page, notes to readers on tab 2, an intervention scan on tab 3, a data
dictionary on tab 4 and version history on tab 5.
0           COVID-19 Intervention Scan - Data Tables
1  This data table provides information on select…
2  Unless otherwise indicated, this product uses …
3                              Additional resources
4  To learn more about data and information on CO…
```

[7]:
```
pd.set_option('display.max_colwidth', -1)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\ipykernel_launcher.py:1:
FutureWarning:

Passing a negative integer is deprecated in version 1.0 and will not be
supported in future version. Instead, use None to not limit the column width.
```

[8]:
```
intervention_scan_data_info[:3]
```

[8]:
```
                Screen reader users: This workbook has 5 worksheets, including
this title page, notes to readers on tab 2, an intervention scan on tab 3, a
data dictionary on tab 4 and version history on tab 5.
0  COVID-19 Intervention Scan - Data Tables
1  This data table provides information on select interventions (policies and
other measures) implemented across Canada to stop the spread and improve health
outcomes from COVID-19.\n
2  Unless otherwise indicated, this product uses data provided by Canada's
federal, provincial and territorial governments as well as provincial and
territorial regulatory bodies for select health professions.
```

[9]:
```
intervention_scan_notes_to_reader = intervention_scan.parse('Notes to readers')
intervention_scan_notes_to_reader
```

[10]:
```

```

[10]:

Notes to readers

0 This data table provides information on select interventions (policies and other measures) to stop the spread and improve health outcomes from COVID-19 by jurisdiction (Canada, province and territory).

1 Data sources

2 Primary sources of data include announcements of interventions on the following websites: ministry press releases, ministry websites, federal/provincial/territorial public health agency websites, Indigenous organizations as well as provincial and territorial regulatory bodies for health professions. Secondary sources of data include additional links (e.g., media articles, updated releases, and supporting documentation) that provide more information not covered in the primary source.

3 Scope and search strategy

4 • The scan provides comprehensive information on key health interventions for case finding and management, physical distancing, health workforce capacity, health services and travel restrictions. Contextual information, such as the timing of spring breaks, is also included.\n• The search strategy for this scan is limited to interventions announced or implemented by the federal, provincial and territorial governments, along with regulatory bodies of select health professions. Interventions announced by national Indigenous organizations (e.g., Assembly of First Nations, National Association of Friendship Centres) are also included. \n• Interventions related to Indigenous groups are noted in the Indigenous population group column. \n• Interventions announced below the provincial and territorial level were considered out of scope for the data collection search strategy. In some instances, however, health region or municipal level interventions are included in provincial and territorial announcements and may be tracked in this document. Regional and municipal entries can be identified by filtering by the "Level" column.\n• See Data dictionary tab for more information on the scope and categorization of interventions for this project.

5 Accuracy and maintenance:

6 • This project started on March 19, 2020. Accuracy is limited by the availability of information and timing of data collection. Previous versions of documents are generally not accessible on ministry websites. Where possible, Internet Archive was used to access old versions of ministry web pages. Some interventions may have been missed because of the timing of this project's initiation, the use of official government press releases as primary sources or the scope of the intervention categories and types. \n• The COVID-19 situation is dynamic. Interventions and links are changing daily, so there may be differences between the current version of official websites and this resource. \n• This scan will be updated to include new or edited content on a regular basis.\n• See Version history tab for date last updated.

7 Keywords

8 To find other information on this subject, use the following search terms: COVID-19, coronavirus, infectious disease, outbreak, pandemic, case management, closures, openings, health services, health workforce, state of emergency, travel, distancing, public information, financial and economic.

```
9   Terms of Use
10  The Canadian Institute for Health Information ("CIHI") is making this
COVID-19 Intervention Scan (the "Scan") available for non-commercial use to
create output scenarios related to COVID-19 response, modelling and planning
purposes (the "Purpose"). You cannot repurpose, distribute, sell or create
derivative works of the Scan. You can only view and use the Scan for the
Purpose. \n\nYou will not alter, cover or remove any acknowledgement, copyright
or other proprietary rights notice placed by CIHI or a third party on the Scan.
You obtain no title in or other rights to the Scan beside those use rights
expressly granted to you by these Terms of Use. If you become aware of any
infringement of CIHI's intellectual property rights in the Scan, you will
promptly notify CIHI and use commercially reasonable efforts to help CIHI
protect those rights.
11  Disclaimer
12  This Scan is provided "as is" and without warranties of any kind, including
but not limited to warranties of fitness for a particular purpose. This Excel
document is the version of the Scan created on May 5, 2020. The Scan and the
outputs generated from the Scan are based on information available to CIHI, as
well as certain assumptions and trends considered reasonable and assessed by
CIHI, as of the date of the Scan, and use of the output is not designed to
provide detailed guidance. As new information becomes available from time to
time, new versions of the Scan may be created to respond to those changes.\n\nIf
you do not or cannot agree to the above Terms of Use, you may not access, view
or use the Scan. If you access, view or use the Scan, you are indicating that
you have understood and agreed to the above Terms of Use.
13  If you do not or cannot agree to the above Terms of Use, you may not access,
view or use the Scan. If you access, view or use the Scan, you are indicating
that you have understood and agreed to the above Terms of Use.
```

[11]:
```
intervention_scan_DataDictionary = intervention_scan.parse('Data dictionary')
intervention_scan_DataDictionary
```

[12]:
```
```

[12]:
```
   Screen reader users: This tab contains 2 tables. The first table is called
Table 2: Column attributes. It begins at cell A8 and ends at cell B20. The
second table is called Table 3: Intervention attributes. It begins at cell A22
and ends at cell D61.   \
0   Data dictionary
1   This tab provides a list of variables, intervention types and their
descriptions for CIHI's COVID-19 Intervention Scan.
2   Data set description:
3   Data current to:
4   Update frequency:
5   Publication date:
6   Table 2  Column attributes
7   Variable name
```

```
8   Entry ID
9   Jurisdiction
10  Date announced
11  Date implemented
12  Intervention category
13  Intervention type
14  Intervention summary
15  Primary source
16  Secondary source
17  Level
18  Indigenous population group
19  Table 3  Intervention attributes
20  Intervention category
21  Case management
22  Case management
23  Case management
24  Case management
25  Case management
26  Case management
27  Closures
28  Closures
29  Closures
30  Closures
31  Closures
32  Contextual Information
33  Distancing
34  Distancing
35  Distancing
36  Financial and economic
37  Financial and economic
38  Health services
39  Health services
40  Health services
41  Health services
42  Health services
43  Health services
44  Health workforce
45  Health workforce
46  Health workforce
47  Health workforce
48  Openings
49  Openings
50  Openings
51  Openings
52  Openings
53  Public information
54  Public information
```

```
55  Public information
56  Public information
57  State of emergency
58  Travel
59  Travel

                                  Unnamed: 1  \
0   NaN
1   NaN
2   COVID-19 Intervention Scan
3   2020-06-22 00:00:00
4   Ad hoc
5   2020-08-18 00:00:00
6   NaN
7   Variable description
8   A unique alpha-numeric identifier that allows users of the scan to identify
an entry if they have questions about it.
9   Jurisdiction covered by the intervention or announcement (i.e., Canada, the
province or the territory).
10  The date an intervention was publicly announced (e.g., website publication
date, date of press release).
11  The date an intervention came into effect.
12  A classification of similar types of interventions or announcements. See
Table 3 for list and description of scope.
13  A sub-classification of interventions within a category. See Table 3 for
list and description of scope.
14  A brief description of the intervention, name of the organization that made
the announcement and the date the intervention is effective until (where
applicable).
15  Link to the source of information on the intervention. These may include
ministry press releases, federal/provincial/territorial government websites,
Indigenous organizations and regulatory bodies for health professionals.
16  Link to additional sources of information on the interventions that may
include media publications.
17  Indicates whether the intervention was implemented at the federal,
provincial/territorial (PT), regional or municipal level. Sub-PT interventions
are captured in this scan only when announced by a federal, provincial or
territorial government or national Indigenous organization.
18  Indicates whether the interventions are related to Indigenous groups in
Canada (i.e., First Nations, Inuit, Métis).
19  NaN
20  Intervention type
21  Case management - assessment centres
22  Case management - case definition
23  Case management - online assessment
24  Case management - other
25  Case management - self-isolation
```

```
26  Case management - test criteria
27  Closures - daycares
28  Closures - education
29  Closures - health services
30  Closures - non-essential services
31  Closures - recreation
32  Contextual information - holiday
33  Distancing - gatherings
34  Distancing - other
35  Distancing - work from home
36  Financial and economic - assistance
37  Financial and economic - research and development
38  Health services - delayed medical procedures
39  Health services - equipment
40  Health services - other
41  Health services - resumed medical procedures
42  Health services - telemedicine/virtual care
43  Health services - visitors
44  Health workforce - change in practice
45  Health workforce - licence reinstatement/reclassification
46  Health workforce - safety guidelines
47  Health workforce - supply management
48  Openings - daycares
49  Openings - education
50  Openings - health services
51  Openings - non-essential services
52  Openings - recreation
53  Public information
54  Public information - masks
55  Public information - projections
56  Public information - reopening plan
57  State of emergency
58  Travel - restrictions
59  Travel - self-isolation

Unnamed: 2  \
0   NaN
1   NaN
2   NaN
3   NaN
4   NaN
5   NaN
6   NaN
7   NaN
8   NaN
9   NaN
10  NaN
```

11 NaN
12 NaN
13 NaN
14 NaN
15 NaN
16 NaN
17 NaN
18 NaN
19 NaN
20 In scope
21 First openings of COVID-19 assessment centres, and drive-through and mobile community testing sites.
22 Initial case definition for confirmed and probable cases, persons under investigation, deaths and outbreaks. Where possible, alignment with the national case definition is noted. Updates to case definitions are also noted.
23 First launch of self-assessment tool.
24 Case-management measures not captured by other intervention types (e.g., online portals for COVID-19 test results, infection control measures in long-term care facilities, testing capacity).
25 Self-isolation guidance for COVID-19 cases, contacts of known cases and other suspected COVID-19 cases. Includes information on interventions that facilitate and encourage self-isolation (e.g., securing new spaces for vulnerable people to self-isolate).
26 Testing criteria at the provincial/territorial level along with updates (e.g., expanding testing from only international travellers to symptomatic individuals).
27 Closures of licensed and unlicensed child care centres (with noted extensions and exceptions for essential workers). Seasonal day camp closures are also included.
28 Closures of elementary, middle, secondary and post-secondary schools (with noted extensions).
29 Closures of non-essential and non-emergency health services offered in-person by regulated and unregulated health professionals. \n\nRegulatory body directives announcing closures of non-essential and non-emergency health services preceding a provincial/territorial government directive.
30 Closures of and/or restrictions to personal service establishments (e.g., hair, nails, tattoo), retail, food and drink services, and religious services determined non-essential (with noted extensions). In some cases, links to lists of essential services are included.
31 Closures of and/or restrictions to entertainment businesses (e.g., theatres, bingo halls) and recreational services (e.g., libraries, museums, parks) and activities (e.g., fishing, hunting).
32 Spring break dates for provinces/territories. A note is included to indicate if there are sub-provincial/-territorial differences.
33 Restrictions and easing of restrictions related to the number of people permitted in a gathering, the recommended distance for people to maintain and information on household bubbles.

```
34  Distancing measures not captured by other intervention types (e.g.,
enforcement measures).
35  Recommendations and directives to facilitate working from home.
36  Federal programs providing individual-level assistance (e.g., CERB) or wage
subsidies for businesses (e.g., CEWS).
37  Federal investments to advance testing, treatment and vaccine research and
development.
38  Delay of elective and non-emergency medical procedures provided in acute or
continuing care settings. Procedures are listed where available (e.g.,
surgeries, diagnostic imaging, laboratory tests, endoscopies).
39  Government management of critical goods such as personal protective
equipment (PPE), hand sanitizer and ventilators (e.g., distribution of supplies,
funding announcements related to procurement).
40  Health services measures not captured by other intervention types (e.g.,
expansions of the Non-Insured Health Benefits [NIHB] Program, interventions to
support outbreak planning).
41  Resumption of elective and non-emergency medical procedures provided in
acute or continuing care settings. Procedures are listed where available (e.g.,
surgeries, diagnostic imaging, endoscopies).
42  Measures to support telemedicine/virtual care service delivery (e.g.,
billing codes, published guidelines and resources to providing virtual
care).\n\nRegulatory body directives announcing shifts to telemedicine/virtual
care preceding a provincial/territorial government directive.
43  Implementing and easing restrictions on and screening of visitors to
hospitals and congregate living facilities for seniors (e.g., long-term care
facilities).
44  Changes to or expansion in practice for health care professionals to improve
the diagnosis and treatment of COVID-19, or to maintain distancing (e.g.,
changes to prescribing, allowing physiotherapists to perform nasopharyngeal
swabs).
45  Temporary changes in licensing requirements or licence reclassification for
regulated health care professionals (e.g., waiving registration requirements for
retired, inactive and graduating health professionals; calls by regulatory
bodies to former members to re-licence) to expedite temporary entry into the
workforce.
46  Safety guidelines for health professionals (e.g., provincial/territorial
directives restricting movement of workers in different facilities,
provincial/territorial directives regarding the use of PPE in health care
settings, directives from regulatory bodies for safe openings).
47  Directives focused on managing health workforce capacity (e.g.,
announcements about mandated redeployment of health care workers and the
deployment of the Canadian Armed Forces to health care facilities, salary
bonuses for health care workers).
48  Openings of licensed and unlicensed child care centres (with noted
restrictions on capacity and availability). Seasonal camp openings are also
included.
49  Openings of elementary, middle, secondary and post-secondary schools.
```

50 Resumption of non-essential and non-emergency health services offered in-person by regulated and unregulated health professionals. \n\nRegulatory body directives announcing resumption of non-essential and non-emergency health services preceding a provincial/territorial government directive.
51 Opening of and/or easing of restrictions on personal service establishments (e.g., hair, nails, tattoo), retail, food and drink services, and religious services determined non-essential (with noted extensions).
52 Opening of and/or easing of restrictions on entertainment businesses (e.g., theatres, bingo halls) and recreational services (e.g., libraries, museums, parks) and activities (e.g., fishing, hunting).
53 First launch of a dedicated web page, hotline or data hub for the public with information on COVID-19.
54 Recommendations or directives to wear and guidance on appropriate non-medical masks.
55 Initial and updated projections for cases, mortality and critical care capacity.
56 Releases of reopening plans and phase transitions with information on how services and businesses will resume operations. Where there are regional differences, announcements of phase transitions at a regional level are included.
57 Declarations and extensions of provincial/territorial states of emergency and public health emergencies.
58 Restrictions related to international and interprovincial/-territorial travel (e.g., initial federal travel advisories to certain countries; restrictions against non-essential travel, including border checkpoints; lifting of restrictions).
59 Self-isolation measures and directives for travelers (e.g., mandatory 14-day self-isolation for travelers, enforcement measures).

	Unnamed: 3
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN
5	NaN
6	NaN
7	NaN
8	NaN
9	NaN
10	NaN
11	NaN
12	NaN
13	NaN
14	NaN
15	NaN
16	NaN

17 NaN
18 NaN
19 NaN
20 Out of scope
21 Expansion of the availability of assessment centres following the first opening.
22 Not applicable
23 Updates to self-assessment tools.
24 Not applicable
25 Not applicable
26 Not applicable
27 Not applicable
28 Not applicable
29 Delay of elective and non-emergency medical procedures provided in acute or continuing care settings (see Health services - delayed medical procedures).\n\nRegulatory body directives announcing closures of non-essential and non-emergency health services already captured in a provincial/territorial government directive.\n
30 Safety guidelines for essential businesses.
31 Not applicable
32 Not applicable
33 Not applicable
34 Not applicable
35 Organizations that have implemented work from home policies independent of the federal and provincial/territorial recommendations or directives.
36 Provincial/territorial programs.\n\nFederal programs not related to individual-level assistance or wage subsidies for businesses.\n
37 Provincial/territorial investments to advance testing, treatment and vaccine research and development.
38 Non-essential and non-emergency services offered in-person by regulated and unregulated health professionals (see Closures - health services).
39 Announcements related to receiving ventilators or other critical equipment.\n\nGuidance for the public to not use medical masks, as well as guidance for the public on wearing homemade masks (see Public information - masks).\n
40 Not applicable
41 Non-essential and non-emergency services offered in-person by regulated and unregulated health professionals (see Openings - health services).
42 Funding announcements related to telemedicine/virtual care.\n\nAnnouncements about virtual mental health services/supports to address mental health concerns arising from the pandemic.\n\nRegulatory body directives announcing shifts to telemedicine/virtual care captured in a provincial/territorial government directive.
43 Not applicable
44 Regulatory body directives announcing change in practice for health care professionals already captured in a federal/provincial/territorial government directive.

```
45  Not applicable
46  Not applicable
47  Not applicable
48  Not applicable
49  Not applicable
50  Resumption of elective and non-emergency medical procedures provided in
acute or continuing care settings (see Health services - resumed medical
procedures).\n\nRegulatory body directives announcing resumption of non-
essential and non-emergency health services already captured in a
provincial/territorial government directive.
51  Not applicable
52  Not applicable
53  Updates to web pages, hotlines or data hubs.
54  Not applicable
55  Not applicable
56  Updates to reopening plans\n\nOpening dates (see Openings category).
57  Closures and restrictions to services (see Closures category).
58  Regulations implemented by travel and tourism industries.
59  Not applicable
```

[13]:
```
intervention_scan_versionhistory = intervention_scan.parse('Version history')
intervention_scan_versionhistory
```

[14]:
```
```

[14]:
```
  Screen reader users: There is 1 table on this tab called Table 4: Version
history. It begins at cell A3 and ends at cell B6.   \
0  Table 4  Version history
1  Publication date
2  2020-06-18 00:00:00
3  2020-07-14 00:00:00
4  2020-08-18 00:00:00

                                          Unnamed: 1
0  NaN
1  Changes made
2  Initial release. Includes announcements up to May 5.
3  Updated to include announcements up to May 27.
4  Updated to include announcements up to June 22.
```

[15]:
```
#### Now Lets see the Dataframe

intervention_scan_data = intervention_scan.parse('Intervention scan',header=2)
intervention_scan_data.head(5)
```

[16]:
```
```

[16]:

	Entry ID	Jurisdiction	Date announced	Date implemented	\
0	BC007	B.C.	2020-03-15 00:00:00	2020-03-16 00:00:00	
1	ON021	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	
2	ON022	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	
3	ON023	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	
4	ON111	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	

	Intervention category	Intervention type	\
0	Case management	Case management - test criteria	
1	Closures	Closures - recreation	
2	Closures	Closures - recreation	
3	Closures	Closures - non-essential services	
4	Closures	Closures - daycares	

	Intervention summary \
0	Who: BC Centre for Disease Control, Provincial Health Services Authority\nWhat: Testing criteria first published. Testing is prioritized for patients with respiratory symptoms who are hospitalized or likely to be hospitalized; health care workers; residents of long term care facilities; part of an investigation of a cluster or outbreak.\nEffective until:
1	Who: Office of the Premier\nWhat: Closed all facilities providing indoor recreational programs and public libraries, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12
2	Who: Office of the Premier\nWhat: Closed all theatres including those offering live performances of music, dance and other art forms, as well as cinemas that show movies and concert venues, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12
3	Who: Office of the Premier\nWhat: Closures of all bars and restaurants, except to the extent that such facilities provide takeout food and delivery, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12
4	Who: Office of the Premier\nWhat: Closures of all licensed child care facilities and EarlyON programs, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12

	Primary source\n(news release or specific resource) \
0	http://www.bccdc.ca/health-info/diseases-conditions/covid-19/testing/phases-of-covid-19-testing-in-bc
1	https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-emergency-to-protect-the-public.html
2	https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-emergency-to-protect-the-public.html
3	https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-emergency-to-protect-the-public.html
4	https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-emergency-to-protect-the-public.html

```
           Secondary source  \
0  http://www.bccdc.ca/Health-Professionals-Site/Documents/PHSA-labtesting-
archived-summary.pdf
1  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
2  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
3  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
4  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249

                   Level  … Column16364 Column16365 Column16366  \
0  Provincial/territorial  … NaN         NaN         NaN
1  Provincial/territorial  … NaN         NaN         NaN
2  Provincial/territorial  … NaN         NaN         NaN
3  Provincial/territorial  … NaN         NaN         NaN
4  Provincial/territorial  … NaN         NaN         NaN

  Column16367 Column16368  Column16369  Column16370  Column16371  Column16372  \
0 NaN         NaN         NaN          NaN          NaN          NaN
1 NaN         NaN         NaN          NaN          NaN          NaN
2 NaN         NaN         NaN          NaN          NaN          NaN
3 NaN         NaN         NaN          NaN          NaN          NaN
4 NaN         NaN         NaN          NaN          NaN          NaN

   Column16373
0 NaN
1 NaN
2 NaN
3 NaN
4 NaN

[5 rows x 16384 columns]
```

[18]:
```
intervention_scan_data.columns
```

[18]:
```
Index(['Entry ID', 'Jurisdiction ', 'Date announced', 'Date implemented',
       'Intervention category', 'Intervention type', 'Intervention summary',
       'Primary source\n(news release or specific resource)',
       'Secondary source', 'Level',
       …
       'Column16364', 'Column16365', 'Column16366', 'Column16367',
       'Column16368', 'Column16369', 'Column16370', 'Column16371',
       'Column16372', 'Column16373'],
      dtype='object', length=16384)
```

[19]:
```
intervention_scan_data = intervention_scan_data.loc[:,:'Indigenous \npopulation␣
↪group']
print(intervention_scan_data.columns)
intervention_scan_data.head()
```

```
Index(['Entry ID', 'Jurisdiction ', 'Date announced', 'Date implemented',
       'Intervention category', 'Intervention type', 'Intervention summary',
       'Primary source\n(news release or specific resource)',
       'Secondary source', 'Level', 'Indigenous \npopulation group'],
      dtype='object')
```

[19]:

	Entry ID	Jurisdiction	Date announced	Date implemented	\
0	BC007	B.C.	2020-03-15 00:00:00	2020-03-16 00:00:00	
1	ON021	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	
2	ON022	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	
3	ON023	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	
4	ON111	Ont.	2020-03-17 00:00:00	2020-03-17 00:00:00	

	Intervention category	Intervention type	\
0	Case management	Case management - test criteria	
1	Closures	Closures - recreation	
2	Closures	Closures - recreation	
3	Closures	Closures - non-essential services	
4	Closures	Closures - daycares	

	Intervention summary	\
0	Who: BC Centre for Disease Control, Provincial Health Services Authority\nWhat: Testing criteria first published. Testing is prioritized for patients with respiratory symptoms who are hospitalized or likely to be hospitalized; health care workers; residents of long term care facilities; part of an investigation of a cluster or outbreak.\nEffective until:	
1	Who: Office of the Premier\nWhat: Closed all facilities providing indoor recreational programs and public libraries, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12	
2	Who: Office of the Premier\nWhat: Closed all theatres including those offering live performances of music, dance and other art forms, as well as cinemas that show movies and concert venues, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12	
3	Who: Office of the Premier\nWhat: Closures of all bars and restaurants, except to the extent that such facilities provide takeout food and delivery, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12	
4	Who: Office of the Premier\nWhat: Closures of all licensed child care facilities and EarlyON programs, with subsequent extensions (see secondary source column)\nEffective until: 2020-06-12	

	Primary source\n(news

```
release or specific resource)  \
0  http://www.bccdc.ca/health-info/diseases-conditions/covid-19/testing/phases-
of-covid-19-testing-in-bc
1  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
2  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
3  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
4  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html

           Secondary source  \
0  http://www.bccdc.ca/Health-Professionals-Site/Documents/PHSA-labtesting-
archived-summary.pdf
1  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
2  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
3  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
4  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249

                    Level Indigenous \npopulation group
0  Provincial/territorial  No
1  Provincial/territorial  No
2  Provincial/territorial  No
3  Provincial/territorial  No
4  Provincial/territorial  No
```

[20]:
```
# Intervention scan jurisdiction

intervention_scan_data['Jurisdiction '].unique()
```

[20]:
```
array(['B.C.', 'Ont.', 'N.S.', 'Que.', 'Sask.', 'Nun.', 'P.E.I.',
       'N.W.T.', 'Man.', 'N.B.', 'N.L.', 'Alta.', 'Y.T.', 'Can.'],
      dtype=object)
```

[21]:
```
# Overall Canada Specific Intervention scan

intervention_scan_data[intervention_scan_data['Jurisdiction ']=='Can.']
```

[21]:
```
     Entry ID Jurisdiction        Date announced     Date implemented  \
88    CAN127   Can.          2020-05-29 00:00:00  2020-05-29 00:00:00
89    CAN128   Can.          2020-05-29 00:00:00  2020-05-29 00:00:00
90    CAN129   Can.          2020-05-29 00:00:00  2020-07-01 00:00:00
```

```
91    CAN130   Can.          2020-05-29 00:00:00  2020-07-01 00:00:00
134   CAN131   Can.          2020-06-03 00:00:00  2020-06-04 00:00:00
…       …    …                          …                 …
1429  CAN072   Can.          No data              No data
1430  CAN078   Can.          No data              No data
1431  CAN079   Can.          No data              No data
1432  CAN081   Can.          No data              No data
1498  CAN080   Can.          No data              No data

     Intervention category                          Intervention type  \
88    Health workforce      Health workforce - supply management
89    Travel                Travel - restrictions
90    Travel                Travel - restrictions
91    Travel                Travel - restrictions
134   Public information    Public information - masks
…                  …                           …
1429  Public information    Public information
1430  Case management       Case management - self-isolation
1431  Case management       Case management - self-isolation
1432  Health services       Health services - telemedicine/virtual care
1498  State of emergency    State of emergency

                                                                  Intervention
summary  \
88    Who: Prime Minister\nWhat: Announced $285.1 million to support the ongoing
public health response to COVID-19 in Indigenous communities (i.e., fund
community-led responses to the pandemic and provide targeted increases in
primary health care resources for First Nations communities. In case of
outbreaks, this funding can be drawn upon to provide surge capacity and
additional support for community-based services in First Nations, Inuit and
Métis communities. \nEffective until:
89    Who: Transport Canada\nWhat: Prohibited cruise ships with overnight
accommodations carrying more than 100 persons from operating in Canadian waters
and passenger vessels with the capacity to carry more than 12 persons from
entering Arctic coastal waters (including Nunatsiavut, Nunavik and the Labrador
coast)\nEffective until: 2020-10-31
90    Who: Transport Canada\nWhat: Announced that all passenger vessels (with
the exception of cruise ships with overnight accomodations) must follow
provincial, territorial, local and regional health authority requirements for
timelines and processes to resume operations\nEffective until:
91    Who: Transport Canada\nWhat: Lifted restriction allowing all passenger
vessels (with the exception of cruise ships with overnight accomodations) to
operate in inland rivers and lakes in the N.W.T., Nun. and Y.T.\nEffective
until:
134   Who: Transport Canada\nWhat: Expanded the requirements for the use of face
coverings by workers and others involved in the transportation system (e.g.,
flight crew and airport workers) \nEffective until:
```

…
…
1429 Who: Public Health Agency of Canada\nWhat: Launched a dedicated government web page for COVID-19\nEffective until:\n
1430 Who: Public Health Agency of Canada\nWhat: Published fact sheet on how to self-isolate for those diagnosed with COVID-19 \nEffective until:
1431 Who: Public Health Agency of Canada\nWhat: Published fact sheet on how to self-isolate for those who may have been exposed and have no symptoms\nEffective until:
1432 Who: Canadian Psychological Association\nWhat: Published guidelines for psychologists for virtual care options that ensure continuity of care for clients\nEffective until:
1498 Who: Government of Canada\nWhat: Activated the federal/provincial/territorial health response plan for biologic events \nEffective until:\n

                                                                Primary source\n(news release or specific resource) \
88   https://pm.gc.ca/en/news/news-releases/2020/05/29/prime-minister-announces-additional-funding-health-economic-and
89   https://www.canada.ca/en/transport-canada/news/2020/05/minister-garneau-announces-updated-measures-for-cruise-ships-and-passenger-vessels-in-canadian-waters-up-to-october-31-2020.html
90   https://www.canada.ca/en/transport-canada/news/2020/05/minister-garneau-announces-updated-measures-for-cruise-ships-and-passenger-vessels-in-canadian-waters-up-to-october-31-2020.html
91   https://www.canada.ca/en/transport-canada/news/2020/05/minister-garneau-announces-updated-measures-for-cruise-ships-and-passenger-vessels-in-canadian-waters-up-to-october-31-2020.html
134   https://www.canada.ca/en/transport-canada/news/2020/06/minister-garneau-announces-new-measures-for-the-use-of-face-coverings-in-the-canadian-transportation-sector.html
…
…
1429
https://web.archive.org/web/20200125011050/https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection.html
1430 https://www.canada.ca/en/public-health/services/publications/diseases-conditions/covid-19-how-to-isolate-at-home.html
1431 https://www.canada.ca/en/public-health/services/publications/diseases-conditions/coronavirus-disease-covid-19-how-to-self-isolate-home-exposed-no-symptoms.html
1432 https://cpa.ca/docs/File/Insurance/COVID-19_Telehealth%20Resource_2020%20(PSY).pdf\n
1498 https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/canadas-reponse.html?topic=tilelink

```
                  Secondary source    Level Indigenous \npopulation group
88    Not applicable                Federal  Yes
89    Not applicable                Federal  No
90    Not applicable                Federal  No
91    Not applicable                Federal  No
134   Not applicable                Federal  No
…                …                  …  ..
1429  Not applicable                Federal  No
1430  Not applicable                Federal  NO
1431  Not applicable                Federal  No
1432  https://cpa.ca/corona-virus/  Federal  No
1498  Not applicable                Federal  No

[101 rows x 11 columns]
```

[22]:
```
# Slicing Intervention Summary to get Who implemented the policy what was the␣
↪policy and how long it will be effective.

Intervention_summary = intervention_scan_data['Intervention summary'].str.
↪split("Who: |\nWhat: |\nEffective until:",

                                                                          ␣
↪expand=True)
```

[23]:
```
# Sliced Columns are expanded into individual columns.

Intervention_summary.rename(columns={1: "Who Implemented", 2: "What␣
↪Implemented", 3: "Effective Until"},
                            inplace = True)
Intervention_summary.head()
```

[23]:
```
   0                                                  Who Implemented  \
0    BC Centre for Disease Control, Provincial Health Services Authority
1    Office of the Premier
2    Office of the Premier
3    Office of the Premier
4    Office of the Premier

     What Implemented  \
0  Testing criteria first published. Testing is prioritized for patients with
respiratory symptoms who are hospitalized or likely to be hospitalized; health
care workers; residents of long term care facilities; part of an investigation
of a cluster or outbreak.
1  Closed all facilities providing indoor recreational programs and public
libraries, with subsequent extensions (see secondary source column)
2  Closed all theatres including those offering live performances of music,
dance and other art forms, as well as cinemas that show movies and concert
venues, with subsequent extensions (see secondary source column)
```

```
3  Closures of all bars and restaurants, except to the extent that such
facilities provide takeout food and delivery, with subsequent extensions (see
secondary source column)
4  Closures of all licensed child care facilities and EarlyON programs, with
subsequent extensions (see secondary source column)

  Effective Until
0
1   2020-06-12
2   2020-06-12
3   2020-06-12
4   2020-06-12
```

[24]:
```
# concatinating intervention_scan data and intervention summary data.

intervention_scan_data = pd.
 ↪concat([intervention_scan_data,Intervention_summary],axis=1)
intervention_scan_data.head()
```

[24]:
```
  Entry ID Jurisdiction        Date announced     Date implemented  \
0  BC007    B.C.          2020-03-15 00:00:00  2020-03-16 00:00:00
1  ON021    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00
2  ON022    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00
3  ON023    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00
4  ON111    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00

  Intervention category                 Intervention type  \
0  Case management       Case management - test criteria
1  Closures              Closures - recreation
2  Closures              Closures - recreation
3  Closures              Closures - non-essential services
4  Closures              Closures - daycares

                   Intervention summary  \
0  Who: BC Centre for Disease Control, Provincial Health Services
Authority\nWhat: Testing criteria first published. Testing is prioritized for
patients with respiratory symptoms who are hospitalized or likely to be
hospitalized; health care workers; residents of long term care facilities; part
of an investigation of a cluster or outbreak.\nEffective until:
1  Who: Office of the Premier\nWhat: Closed all facilities providing indoor
recreational programs and public libraries, with subsequent extensions (see
secondary source column)\nEffective until: 2020-06-12
2  Who: Office of the Premier\nWhat: Closed all theatres including those
offering live performances of music, dance and other art forms, as well as
cinemas that show movies and concert venues, with subsequent extensions (see
secondary source column)\nEffective until: 2020-06-12
3  Who: Office of the Premier\nWhat: Closures of all bars and restaurants,
```

```
except to the extent that such facilities provide takeout food and delivery,
with subsequent extensions (see secondary source column)\nEffective until:
2020-06-12
4  Who: Office of the Premier\nWhat: Closures of all licensed child care
facilities and EarlyON programs, with subsequent extensions (see secondary
source column)\nEffective until: 2020-06-12

                                                          Primary source\n(news
release or specific resource)  \
0  http://www.bccdc.ca/health-info/diseases-conditions/covid-19/testing/phases-
of-covid-19-testing-in-bc
1  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
2  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
3  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
4  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html

           Secondary source  \
0  http://www.bccdc.ca/Health-Professionals-Site/Documents/PHSA-labtesting-
archived-summary.pdf
1  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
2  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
3  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249
4  https://www.ontario.ca/laws/regulation/200051?_ga=2.184837289.1860153609.1592
920176-470745044.1584640249

                   Level Indigenous \npopulation group 0  \
0  Provincial/territorial  No
1  Provincial/territorial  No
2  Provincial/territorial  No
3  Provincial/territorial  No
4  Provincial/territorial  No

                                                        Who Implemented  \
0  BC Centre for Disease Control, Provincial Health Services Authority
1  Office of the Premier
2  Office of the Premier
3  Office of the Premier
4  Office of the Premier

     What Implemented  \
```

```
0  Testing criteria first published. Testing is prioritized for patients with
respiratory symptoms who are hospitalized or likely to be hospitalized; health
care workers; residents of long term care facilities; part of an investigation
of a cluster or outbreak.
1  Closed all facilities providing indoor recreational programs and public
libraries, with subsequent extensions (see secondary source column)
2  Closed all theatres including those offering live performances of music,
dance and other art forms, as well as cinemas that show movies and concert
venues, with subsequent extensions (see secondary source column)
3  Closures of all bars and restaurants, except to the extent that such
facilities provide takeout food and delivery, with subsequent extensions (see
secondary source column)
4  Closures of all licensed child care facilities and EarlyON programs, with
subsequent extensions (see secondary source column)

  Effective Until
0
1   2020-06-12
2   2020-06-12
3   2020-06-12
4   2020-06-12
```

[25]:
```
# Dropping Secondary source

intervention_scan_data.drop(['Secondary source',0],axis=1,inplace=True)
```

[26]:
```
# Renaming the columns

intervention_scan_data.rename(columns = {"Indigenous \npopulation group":␣
↪"Indigenous population group",'Primary source\n(news release or specific␣
↪resource)': 'Primary source'},inplace=True)
intervention_scan_data.head()
```

[26]:
```
  Entry ID Jurisdiction        Date announced     Date implemented  \
0  BC007    B.C.          2020-03-15 00:00:00  2020-03-16 00:00:00
1  ON021    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00
2  ON022    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00
3  ON023    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00
4  ON111    Ont.          2020-03-17 00:00:00  2020-03-17 00:00:00

  Intervention category                 Intervention type  \
0  Case management       Case management - test criteria
1  Closures              Closures - recreation
2  Closures              Closures - recreation
3  Closures              Closures - non-essential services
4  Closures              Closures - daycares
```

```
                    Intervention summary  \
0  Who: BC Centre for Disease Control, Provincial Health Services
Authority\nWhat: Testing criteria first published. Testing is prioritized for
patients with respiratory symptoms who are hospitalized or likely to be
hospitalized; health care workers; residents of long term care facilities; part
of an investigation of a cluster or outbreak.\nEffective until:
1  Who: Office of the Premier\nWhat: Closed all facilities providing indoor
recreational programs and public libraries, with subsequent extensions (see
secondary source column)\nEffective until: 2020-06-12
2  Who: Office of the Premier\nWhat: Closed all theatres including those
offering live performances of music, dance and other art forms, as well as
cinemas that show movies and concert venues, with subsequent extensions (see
secondary source column)\nEffective until: 2020-06-12
3  Who: Office of the Premier\nWhat: Closures of all bars and restaurants,
except to the extent that such facilities provide takeout food and delivery,
with subsequent extensions (see secondary source column)\nEffective until:
2020-06-12
4  Who: Office of the Premier\nWhat: Closures of all licensed child care
facilities and EarlyON programs, with subsequent extensions (see secondary
source column)\nEffective until: 2020-06-12

              Primary source  \
0  http://www.bccdc.ca/health-info/diseases-conditions/covid-19/testing/phases-
of-covid-19-testing-in-bc
1  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
2  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
3  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
4  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html

                   Level Indigenous population group  \
0  Provincial/territorial  No
1  Provincial/territorial  No
2  Provincial/territorial  No
3  Provincial/territorial  No
4  Provincial/territorial  No

                                                    Who Implemented  \
0  BC Centre for Disease Control, Provincial Health Services Authority
1  Office of the Premier
2  Office of the Premier
3  Office of the Premier
4  Office of the Premier
```

```
     What Implemented  \
0  Testing criteria first published. Testing is prioritized for patients with
respiratory symptoms who are hospitalized or likely to be hospitalized; health
care workers; residents of long term care facilities; part of an investigation
of a cluster or outbreak.
1  Closed all facilities providing indoor recreational programs and public
libraries, with subsequent extensions (see secondary source column)
2  Closed all theatres including those offering live performances of music,
dance and other art forms, as well as cinemas that show movies and concert
venues, with subsequent extensions (see secondary source column)
3  Closures of all bars and restaurants, except to the extent that such
facilities provide takeout food and delivery, with subsequent extensions (see
secondary source column)
4  Closures of all licensed child care facilities and EarlyON programs, with
subsequent extensions (see secondary source column)

  Effective Until
0
1   2020-06-12
2   2020-06-12
3   2020-06-12
4   2020-06-12
```

[27]:
```
#converting the date column to datetime format and extracting month from it.

intervention_scan_data[intervention_scan_data['Date announced']=='No data']

DateColumns = ['Date announced','Date implemented', 'Effective Until']

for column in DateColumns:

    intervention_scan_data[column] = pd.
 ↪to_datetime(intervention_scan_data[column],␣
 ↪infer_datetime_format=True,errors='coerce')
#intervention_scan_data['Date implemented'] = pd.
 ↪to_datetime(intervention_scan_data['Date implemented'],␣
 ↪infer_datetime_format=True,errors='coerce')
#intervention_scan_data['Effective Until'] = pd.
 ↪to_datetime(intervention_scan_data['Effective Until'],␣
 ↪infer_datetime_format=True,errors='coerce')
```

[28]:
```
# Rearranging the columns

intervention_scan_data = intervention_scan_data[['Entry ID', 'Jurisdiction␣
 ↪','Level','Date announced','Date implemented',
                                                  'Intervention␣
 ↪category','Intervention type','Who Implemented',
```

```
                                                    'What Implemented','Effective␣
↪Until','Indigenous population group',
                                                    'Primary source']]

intervention_scan_data.head()
```

[28]:

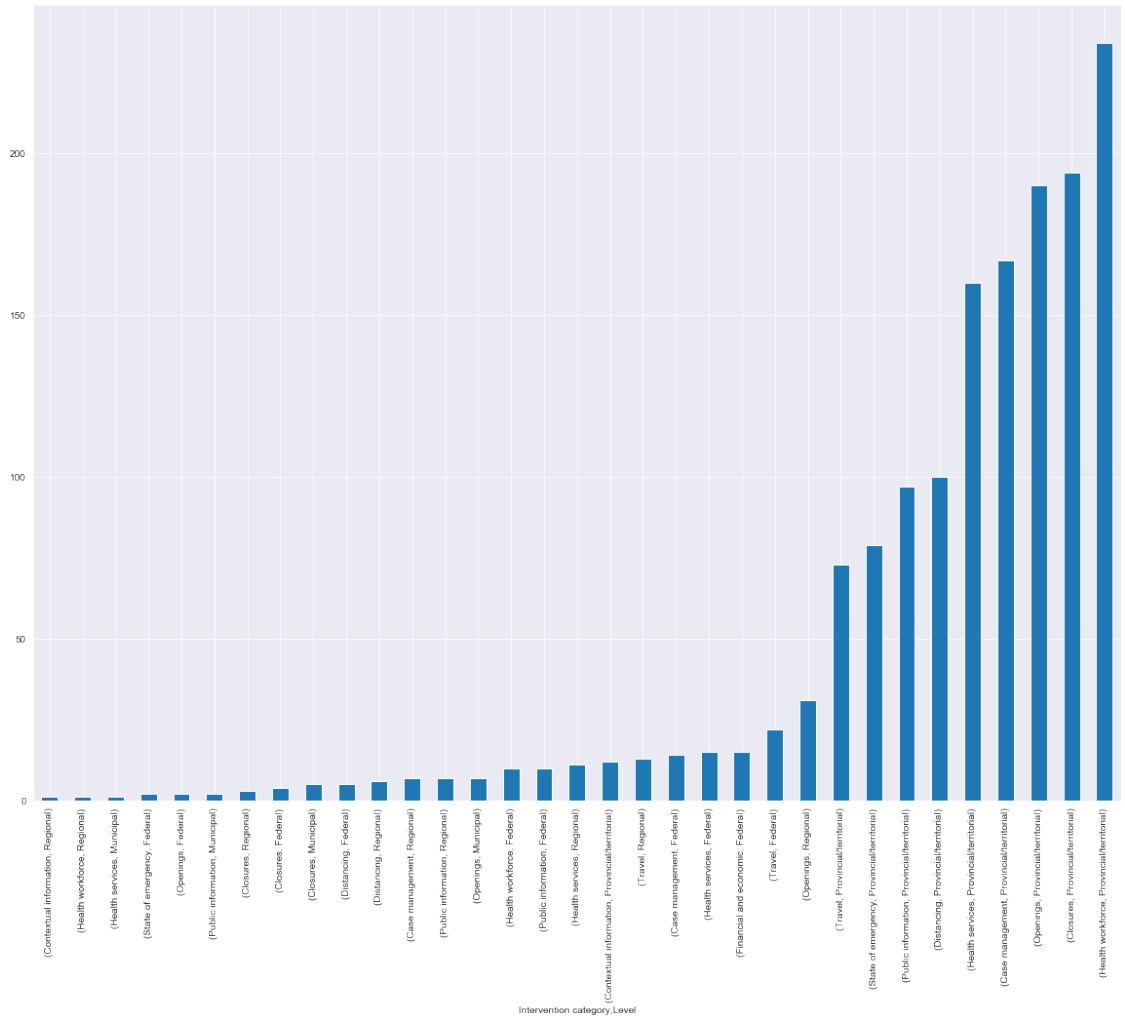
	Entry ID	Jurisdiction	Level	Date announced	Date implemented	Intervention category	Intervention type	Who Implemented	What Implemented	Effective Until	Indigenous population group	Primary source
0	BC007	B.C.	Provincial/territorial	2020-03-15	2020-03-16	Case management	Case management - test criteria	BC Centre for Disease Control, Provincial Health Services Authority	Testing criteria first published. Testing is prioritized for patients with respiratory symptoms who are hospitalized or likely to be hospitalized; health care workers; residents of long term care facilities; part of an investigation of a cluster or outbreak.	NaT	No	
1	ON021	Ont.	Provincial/territorial	2020-03-17	2020-03-17	Closures	Closures - recreation	Office of the Premier	Closed all facilities providing indoor recreational programs and public libraries, with subsequent extensions (see secondary source column)	2020-06-12	No	
2	ON022	Ont.	Provincial/territorial	2020-03-17	2020-03-17	Closures	Closures - recreation	Office of the Premier	Closed all theatres including those offering live performances of music, dance and other art forms, as well as cinemas that show movies and concert venues, with subsequent extensions (see secondary source column)	2020-06-12	No	
3	ON023	Ont.	Provincial/territorial	2020-03-17	2020-03-17	Closures	Closures - non-essential services	Office of the Premier	Closures of all bars and restaurants, except to the extent that such facilities provide takeout food and delivery, with subsequent extensions (see secondary source column)			
4	ON111	Ont.	Provincial/territorial	2020-03-17	2020-03-17	Closures	Closures - daycares	Office of the Premier	Closures of all licensed child care facilities and EarlyON programs, with subsequent extensions (see secondary source column)			

```
3 2020-06-12       No
4 2020-06-12       No

              Primary source
0  http://www.bccdc.ca/health-info/diseases-conditions/covid-19/testing/phases-
of-covid-19-testing-in-bc
1  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
2  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
3  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
4  https://news.ontario.ca/opo/en/2020/03/ontario-enacts-declaration-of-
emergency-to-protect-the-public.html
```

Intervention category by level

[29]:
```
# Lets see which intervention category has been implemented the most.

plt.figure(figsize=(20,15))
sns.set_style("darkgrid")
intervention_scan_data.groupby(['Intervention category','Level']).size().
 ↪sort_values().plot.bar()
```

[29]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x2f78ceee948>
```



- Here we can see that health workforce, closures, case management, health services, distancing, travel were mostly implemented. They were implemented by either provincial/territorial, federal, municipal, regional.

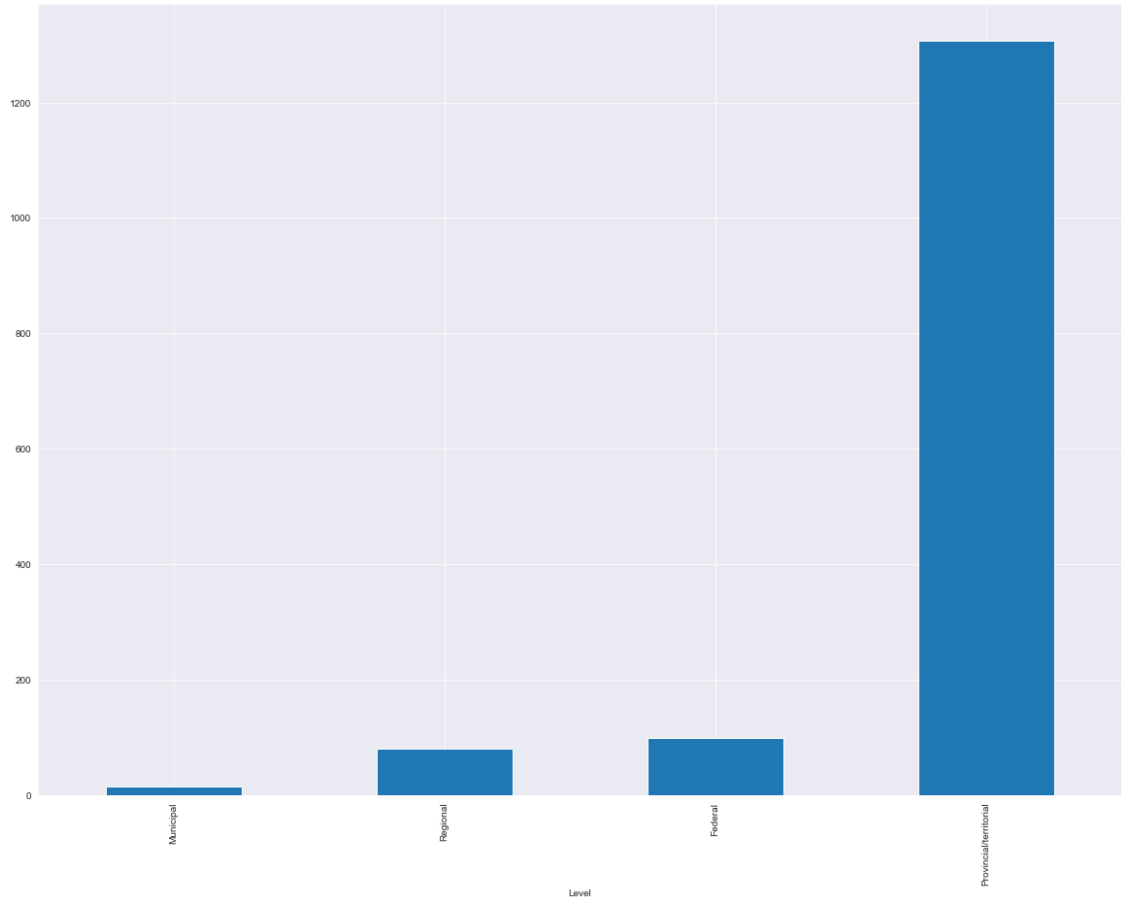
Intervention Level

[30]:
```
# Lets see at which level the interventions got implemented
intervention_level = intervention_scan_data.groupby('Level').size().
 ↪sort_values()
print(intervention_level)

plt.figure(figsize=(20,15))
intervention_scan_data.groupby('Level').size().sort_values().plot(kind='bar')
```

```
Level
Municipal                15
Regional                 80
```

```
Federal                     99
Provincial/territorial    1306
dtype: int64
```

[30]: <matplotlib.axes._subplots.AxesSubplot at 0x2f790aa1a88>



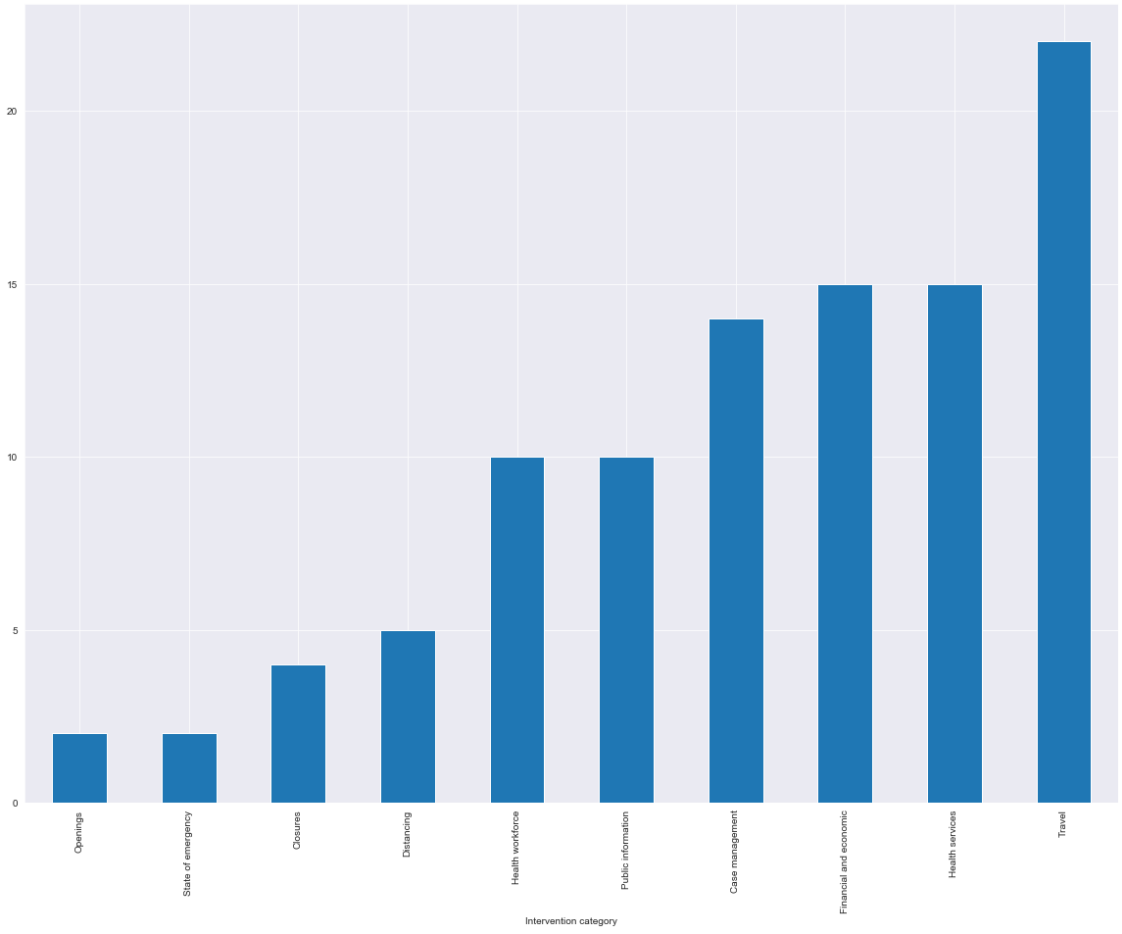
- Here we can see that mostly policies were implemented by provincial/territorial. Municipal department is least likely to implement the policies.

Federal categories

[31]:
```
federal_category =␣
 ↪intervention_scan_data[intervention_scan_data['Level']=='Federal']
federal_category_size = federal_category.groupby('Intervention category').
 ↪size().sort_values()
print(federal_category_size)

plt.figure(figsize=(20,15))
federal_category_size.plot.bar()
```

```
Intervention category
Openings                  2
State of emergency        2
Closures                  4
Distancing                5
Health workforce          10
Public information        10
Case management           14
Financial and economic    15
Health services           15
Travel                    22
dtype: int64
```

[31]: <matplotlib.axes._subplots.AxesSubplot at 0x2f790c7e5c8>

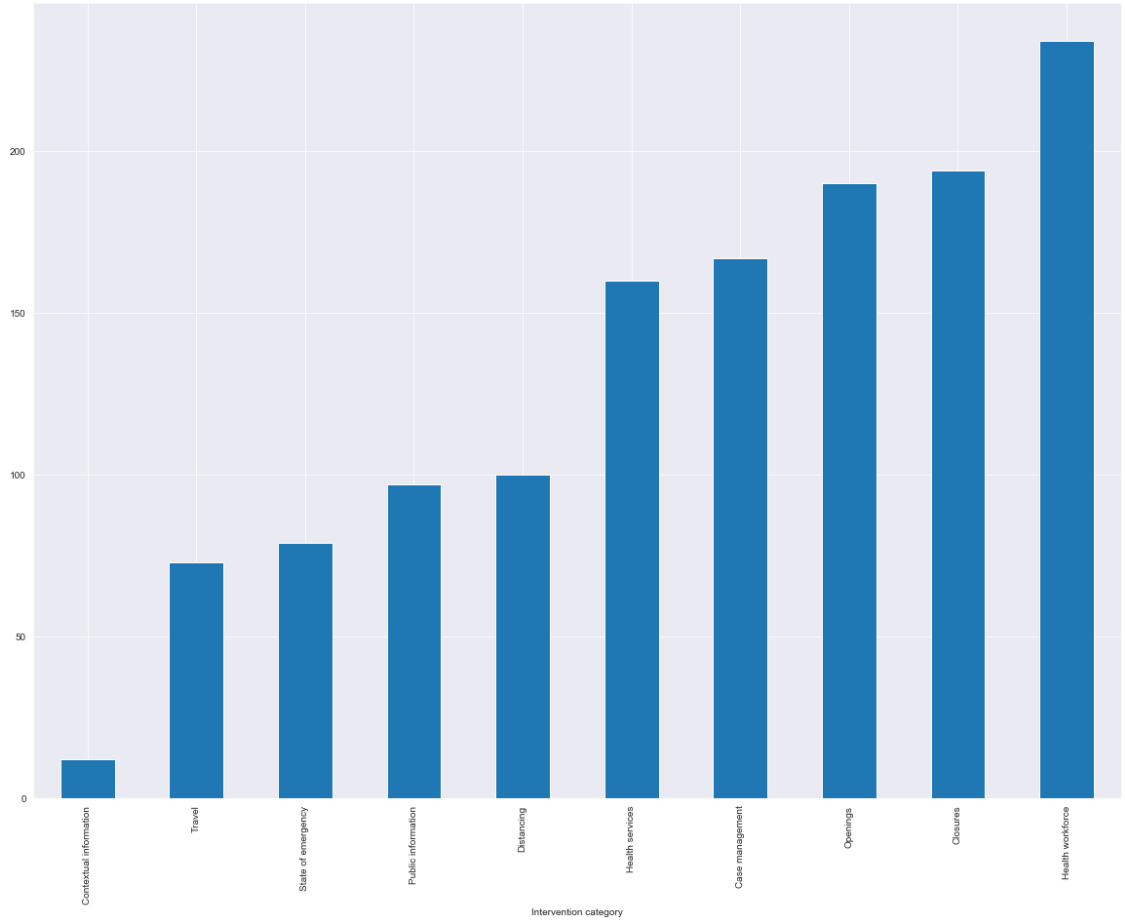


Provincial Categories

[32]:
```
# Intervention categories by level

provincial_category =␣
 ↪intervention_scan_data[intervention_scan_data['Level']=='Provincial/
 ↪territorial']
provincial_category_size = provincial_category.groupby('Intervention category').
 ↪size().sort_values()
print(provincial_category_size)

plt.figure(figsize=(20,15))
provincial_category_size.plot.bar()
```

```
Intervention category
Contextual information    12
Travel                    73
State of emergency        79
Public information        97
Distancing               100
Health services          160
Case management          167
Openings                 190
Closures                 194
Health workforce         234
dtype: int64
```

[32]: <matplotlib.axes._subplots.AxesSubplot at 0x2f78cf48408>



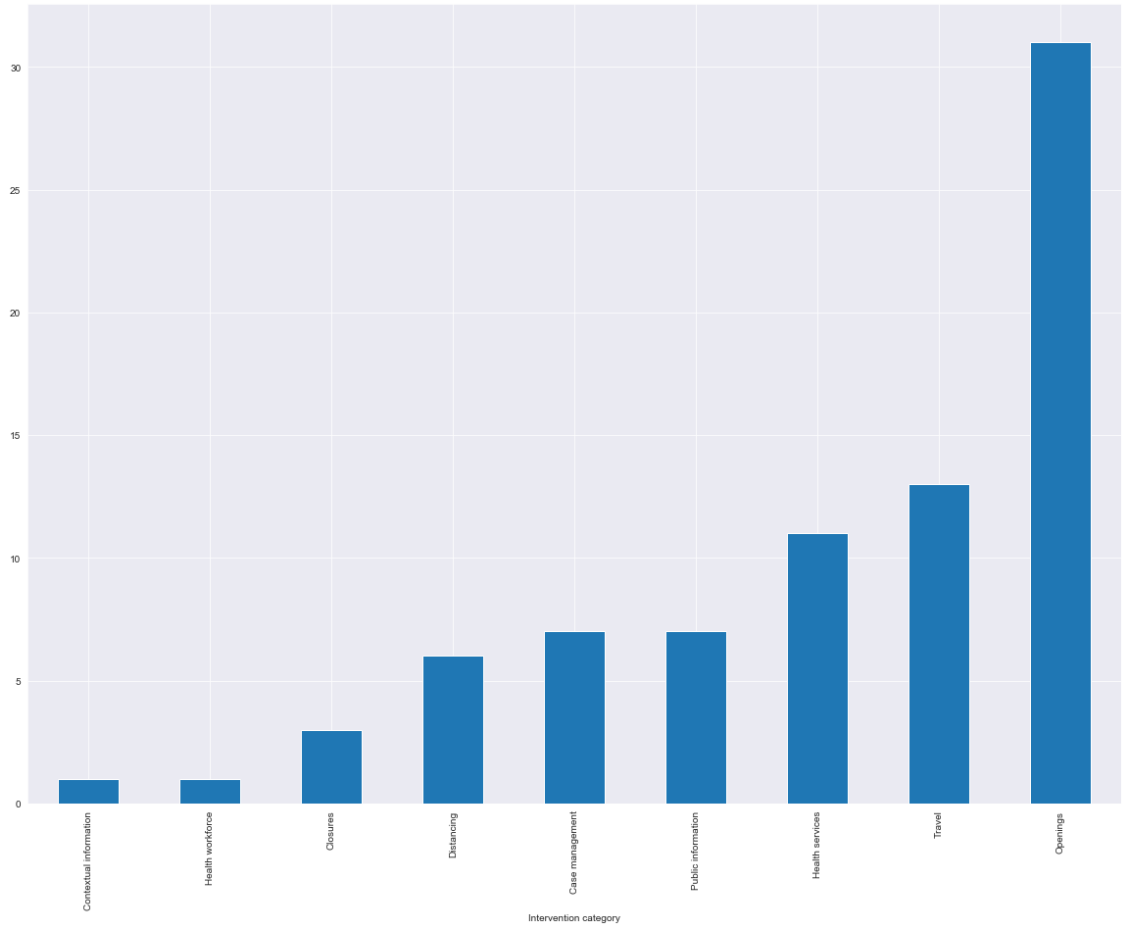
Regional Categories

[33]:
```
# Regional Categories

regional_category =␣
 ↪intervention_scan_data[intervention_scan_data['Level']=='Regional']
regional_category_size = regional_category.groupby('Intervention category').
 ↪size().sort_values()
print(regional_category_size)

plt.figure(figsize=(20,15))
regional_category_size.plot.bar()
```

```
Intervention category
Contextual information    1
Health workforce          1
Closures                  3
Distancing                6
Case management           7
```

```
Public information        7
Health services           11
Travel                    13
Openings                  31
dtype: int64
```

[33]: <matplotlib.axes._subplots.AxesSubplot at 0x2f791643488>



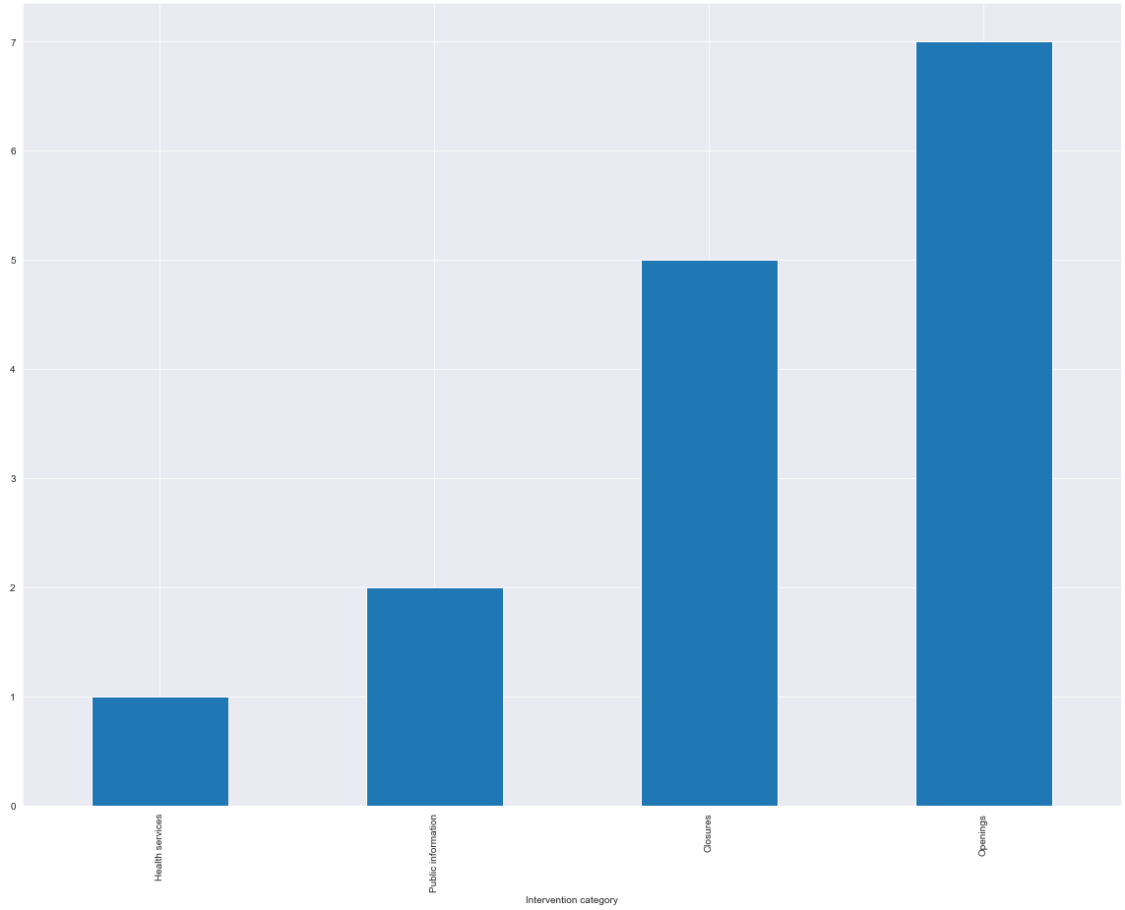
Municipal Categories

[34]:
```
# Municipal Categories

municipal_category =␣
 ↪intervention_scan_data[intervention_scan_data['Level']=='Municipal']
municipal_category_size = municipal_category.groupby('Intervention category').
 ↪size().sort_values()
print(municipal_category_size)

plt.figure(figsize=(20,15))
```

```
municipal_category_size.plot.bar()
```

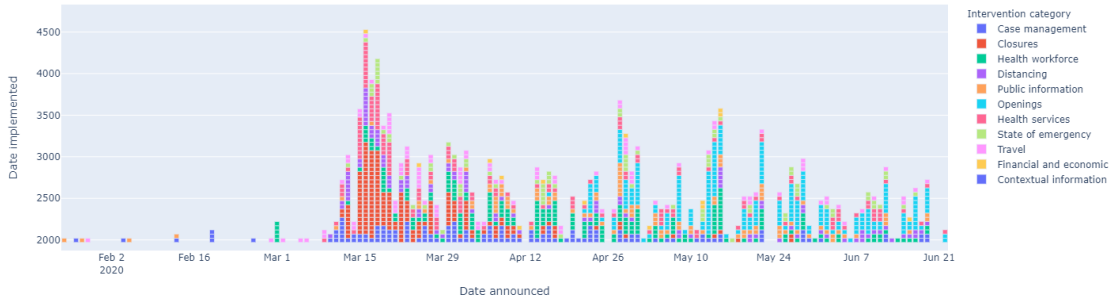
```
Intervention category
Health services       1
Public information    2
Closures              5
Openings              7
dtype: int64
```

[34]: <matplotlib.axes._subplots.AxesSubplot at 0x2f791350188>



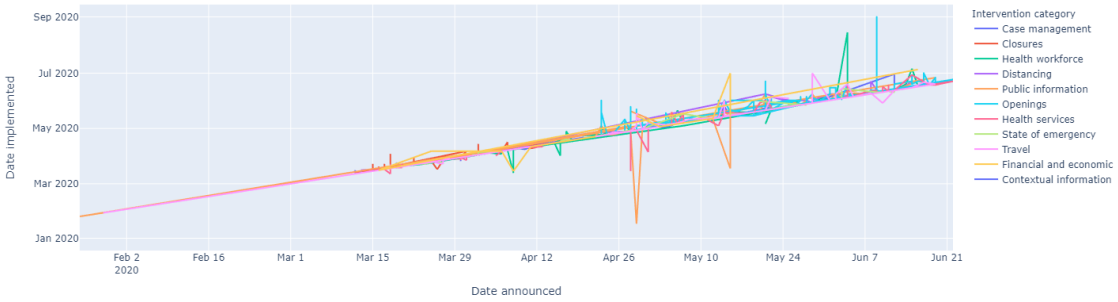
Intervention category by date

[111]:
```
# Intervention Category by date

fig = px.bar(intervention_scan_data, y='Date implemented', x = 'Date␣
 ↪announced', color='Intervention category')
intervention_category_by_date = fig.to_image(format = 'png', width = 1200,␣
 ↪height = 700, scale =1)
```



- Here we can see in the early months **Case management, Travel, Public information** were implemented. The reason were massive failures of judgement and inaction in January, February, and even March of this year.
- After month of march when respective governments saw significant rise in number of cases of COVID-19, then majority of intervention categories were implemented. Most commonly used is closures nationwide along with other measures.

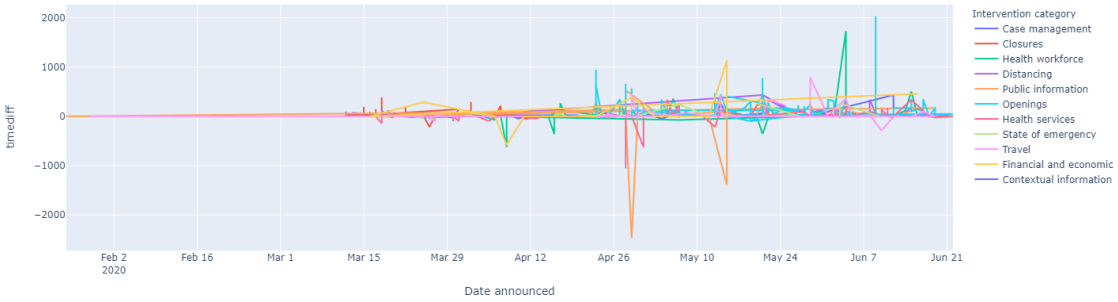
[110]:
```
fig = px.line(intervention_scan_data, x = 'Date announced', y = 'Date␣
↪implemented', color='Intervention category')
fig.show()
```



Time difference between the date announced and date implemented

[109]:
```
# Time difference between date announced and date implemented.

intervention_scan_data['timediff'] = ((intervention_scan_data['Date␣
↪implemented'] - intervention_scan_data['Date announced']).dt.total_seconds().
↪fillna(0))//3600

# Timediff between date announced and date implemented
```

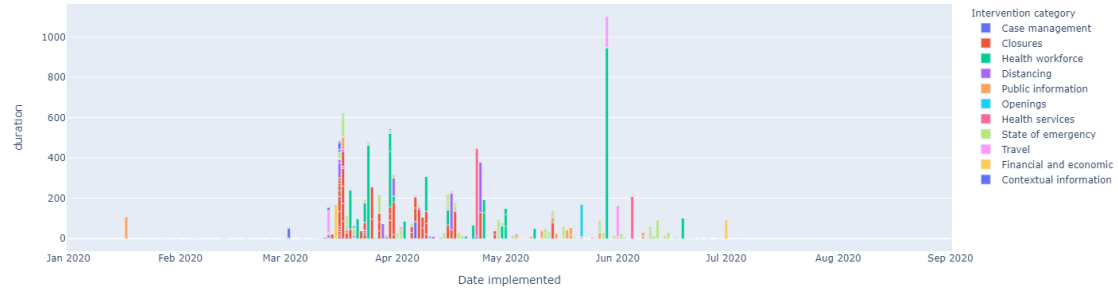
```
fig = px.line(intervention_scan_data, x = 'Date announced', y = 'timediff',␣
 ↪color = 'Intervention category')
fig.show()
```



- This graph shows a horizontal line from which we can state the most of the intervention categories were implemented straight away.
- The interesting fact here is some of the policies were implemented first and then announced (ex: **Public Information, Health services, and Travel**)
- Another interesting takeway from here is some of the policies have lag time more than **25 days** (ex: **Travel, Openings, Health workforce**). There is no real reason for that, but government might want to keep a check on the situation of COVID-19 before opening the closures or removing travel restrictions.

Duration of various policies to be in effect

[108]:
```
# How long a intervention category is effective.

intervention_scan_data['duration'] = ((intervention_scan_data['Effective␣
 ↪Until'] - intervention_scan_data['Date implemented']).dt.total_seconds().
 ↪fillna(0))//(3600*24)
fig = px.bar(intervention_scan_data, x = 'Date implemented', y = 'duration',␣
 ↪color= 'Intervention category')
fig.show()
```



Mean of the duration of various policies

[39]:
```
x = intervention_scan_data['duration'].mean()
print("Mean of duration is: {}".format(x))
```

```
Mean of duration is: 6.9046666666666665
```

- Mean of the intervention types is around **7 months**.
- Here we can see health workforce policies are there for maximum amount of time, after that comes closures across nation.
- **Travel restrictions** are upto **5 months**.
- **Social Distancing** also upto **8 months** in some provinces

Who Implemented

Number of Authorities involved

[40]:
```
# Preprocessing of data for generating word cloud.

intervention_scan_data['Who Implemented'] = intervention_scan_data['Who␣
↪Implemented'].astype('str')

text = " ".join(who for who in intervention_scan_data['Who Implemented'])
print("There are {} number of authorities across canada who implemented various␣
↪policies.". format(intervention_scan_data['Who Implemented'].nunique()))
```

```
There are 422 number of authorities across canada who implemented various
policies.
```

[41]:
```
# Here we are downloading Wordcloud to create wordcloud based on the column␣
↪values using textmining

from PIL import Image
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
```

[42]:
```
# generating Wordcloud based on the frequency of word.

# Create stopword list:
stopwords = set(STOPWORDS)
stopwords.update(["of",","])

wc = WordCloud(background_color="white", max_words=2000, stopwords=stopwords,␣
↪max_font_size=50,
            contour_width=3, contour_color='firebrick')
wc.generate(text)
plt.figure(figsize=(20,15))
```

```
plt.imshow(wc, interpolation='bilinear')
plt.axis("off")
plt.show()
```

- The boldness of the word describes its weight(Frequency in the text.)
- We can see here most of the policies were implemented by respected Government.
- **Province health agency, Health officer, Premier Office, College officials, Chief Medical Officer** were among the major policy makers, or we can say who implemented the policies.
- This pandemic is complex along with its, multiple consequences, governments have had to adapt quickly and ensure that appropriate capacity for co-ordination was in place. Some Emergency institutional arrangements to deal with the coronavirus (COVID-19) pandemic that are implemented by the government officials:

1. Ad hoc arrangements.
2. Existing structures adapted to the crisis.
3. Temporary structures provided for by crisis-management plans, policies or laws on national security.
4. a hybrid approach, combining two or more above mentioned arrangements.

What Implemented ?

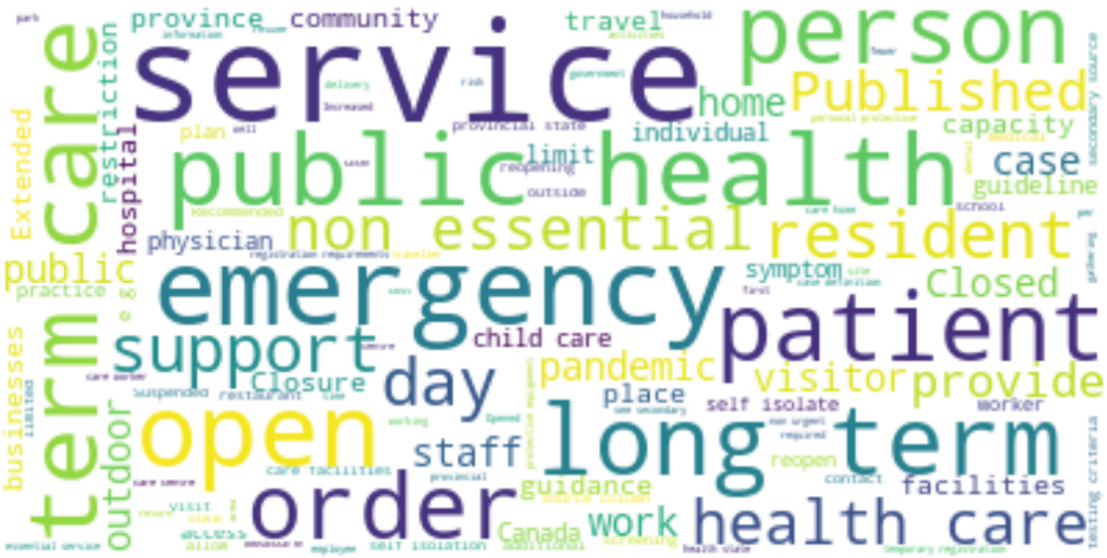
Number of the policies Implemented

[43]:
```
intervention_scan_data['What Implemented'] = intervention_scan_data['What␣
↪Implemented'].astype('str')
text = " ".join(who for who in intervention_scan_data['What Implemented'])
```

```
print("There are {} number of policies, which were implemented by above␣
 ↪mentioned officials.". format(intervention_scan_data['What Implemented'].
 ↪nunique()))
```

```
There are 1368 number of policies, which were implemented by above mentioned
officials.
```

[44]:
```
# generating Wordcloud based on the frequency of word.

# Create stopword list:
stopwords = set(STOPWORDS)
stopwords.update(["of",",",";
 ↪","a","an","or","is","for","are","with","to","be","all","(see secondary␣
 ↪source column)",
                  ␣
 ↪"apply","including","COVID","people","include","Launched","region","will","Updated","may",
                   "new","Permitted","must","Issued","source␣
 ↪column","Announced","provided","released"])

wc = WordCloud(background_color="white", max_words=2000, stopwords=stopwords,␣
 ↪max_font_size=50,
            contour_width=3, contour_color='firebrick')
wc.generate(text)
plt.figure(figsize=(20,15))
plt.imshow(wc, interpolation='bilinear')
plt.axis("off")
plt.show()
```



- Most common implmented policiy words can be seen in the above wordcloud, and based on the previous knowledge we can derive some of the following policies:

1. Long term closure.
2. Support for health workforce.
3. Community support.
4. Workplace restrictions.
5. Travel restrictions.
6. Community restrictions.
7. Outdoor restrictions.
8. Facilities guidelines.
9. Public health care facilities.
10. Self isolation.
11. Patient care.
12. Reopening of the closures.

Policies Effect on Number of Covid cases

[122]:
```
canada_covid_df = pd.read_csv("../covid_data/Data/Covid-19/covid19.csv")
```

[122]:
```
      pruid                  prname                    prnameFR        date  \
0     35     Ontario                 Ontario                    31-01-2020
1     59     British Columbia        Colombie-Britannique       31-01-2020
3     35     Ontario                 Ontario                    08-02-2020
4     59     British Columbia        Colombie-Britannique       08-02-2020
6     35     Ontario                 Ontario                    16-02-2020
…    ..        …                     …                          …
2946  11     Prince Edward Island    Île-du-Prince-Édouard      19-09-2020
2947  60     Yukon                   Yukon                      19-09-2020
2948  61     Northwest Territories   Territoires du Nord-Ouest  19-09-2020
2949  62     Nunavut                 Nunavut                    19-09-2020
2950  99     Repatriated travellers  Voyageurs rapatriés        19-09-2020

      numconf  numprob  numdeaths  numtotal  numtested  numrecover  …  \
0     3        0        0.0        3         NaN        NaN         …
1     1        0        0.0        1         NaN        NaN         …
3     3        0        0.0        3         NaN        NaN         …
4     4        0        0.0        4         NaN        NaN         …
6     3        0        0.0        3         NaN        NaN         …
…  ..       ..       …       ..        ..         ..          …
2946  57       0        0.0        57        33379.0    56.0        …
2947  15       0        0.0        15        3049.0     15.0        …
2948  5        0        0.0        5         3944.0     5.0         …
2949  0        0        0.0        0         2198.0     0.0         …
2950  13       8        0.0        13        76.0       13.0        …

      percentdeath  numtestedtoday  numrecoveredtoday  percentactive  \
0     0.0           NaN             NaN                100.00
```

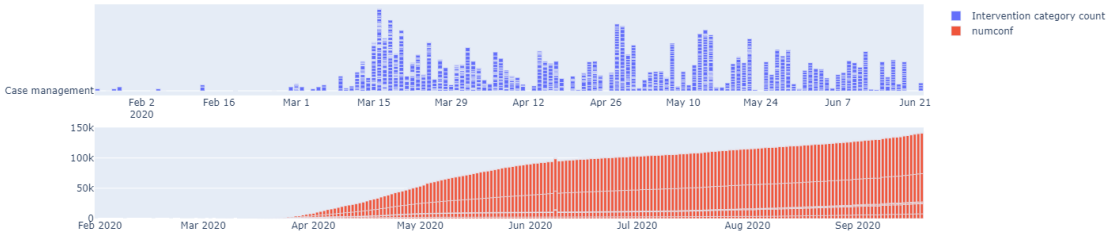
```
1     0.0          NaN             NaN                 100.00
3     0.0          NaN             NaN                 100.00
4     0.0          NaN             NaN                 100.00
6     0.0          NaN             NaN                 100.00
…   …           ..              ..                   …
2946  0.0           326.0           0.0                 1.75
2947  0.0           0.0             0.0                 0.00
2948  0.0           0.0             0.0                 0.00
2949 NaN            20.0            0.0                NaN
2950  0.0           0.0             0.0                 0.00

      numactive  rateactive  numtotal_last14  ratetotal_last14  \
0     3.0        0.02       NaN              NaN
1     1.0        0.02       NaN              NaN
3     3.0        0.02       NaN              NaN
4     4.0        0.08       NaN              NaN
6     3.0        0.02       NaN              NaN
…   …          …         ..               ..
2946  1.0        0.64        10.0             6.37
2947  0.0        0.00        0.0              0.00
2948  0.0        0.00        0.0              0.00
2949 NaN         0.00        0.0              0.00
2950  0.0       NaN          0.0              NaN

      numdeaths_last14  ratedeaths_last14
0    NaN               NaN
1    NaN               NaN
3    NaN               NaN
4    NaN               NaN
6    NaN               NaN
…   ..                ..
2946  0.0               0.0
2947  0.0               0.0
2948  0.0               0.0
2949  0.0               0.0
2950  0.0              NaN

[2743 rows x 27 columns]
```

[123]:
```
#converting the date column to datetime format and extracting month from it.

from datetime import datetime

canada_covid_df['date'] = pd.to_datetime(canada_covid_df['date'],␣
 ↪infer_datetime_format=True)
canada_covid_df = canada_covid_df[canada_covid_df['prname']!='Canada']
```

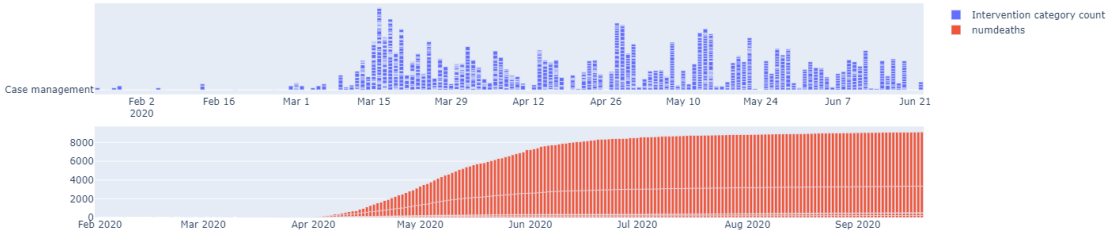
[124]:
```
import plotly.graph_objects as go
from plotly.subplots import make_subplots
```

[142]:
```
# Effect of policies on covid cases

number =␣
↪['numconf','numdeaths','numactive','numrecover','numtested','percentrecover','percentdeath'

for i in range(len(number)):
    print(number[i])

    fig = make_subplots(rows=2, cols=1,

                    specs=[[{"type": "bar"}],
                           [{"type": "bar"}]])
    fig.add_trace(
              go.Bar(
              x= intervention_scan_data['Date announced'],
              y= intervention_scan_data['Intervention category'],
              hovertext=intervention_scan_data['Intervention category'],
              name = 'Intervention category count',
              ),
                row=1,col=1)


    fig.add_trace(
            go.Bar(
            x = canada_covid_df['date'],
            y = canada_covid_df[number[i]],
            name = number[i],
            ),

            row=2,col=1)

    fig.show()
```

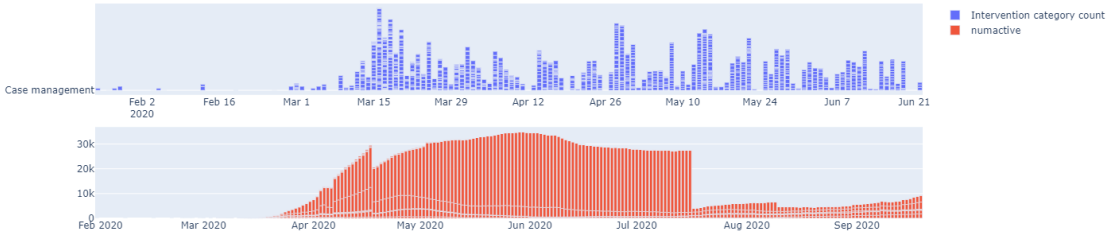
```
numconf
```



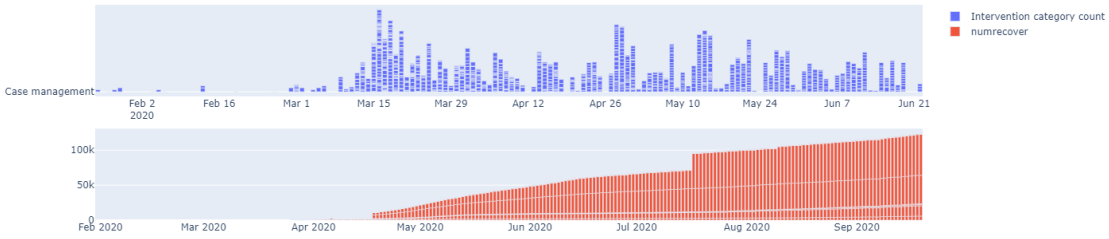
numdeaths



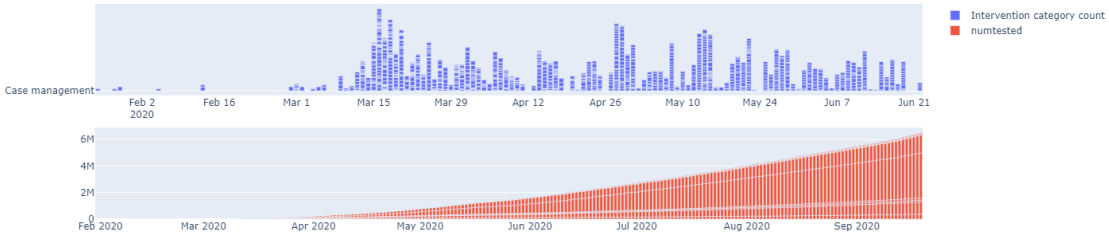
numactive



numrecover

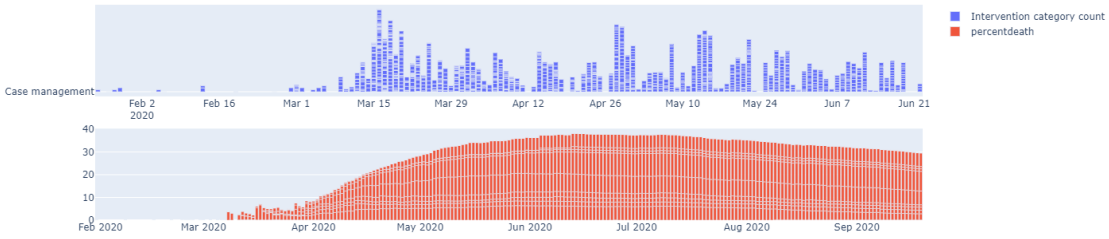


`numtested`

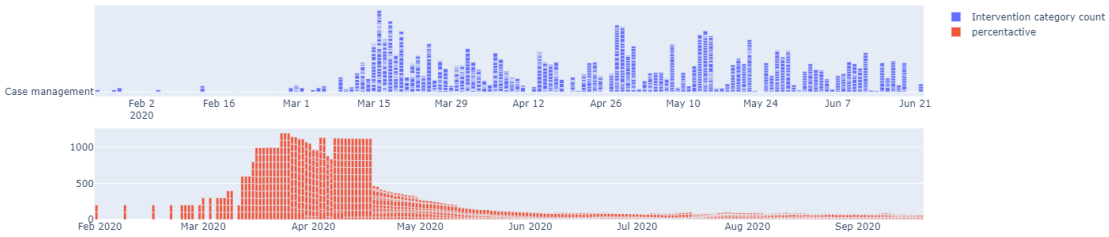


`percentrecover`

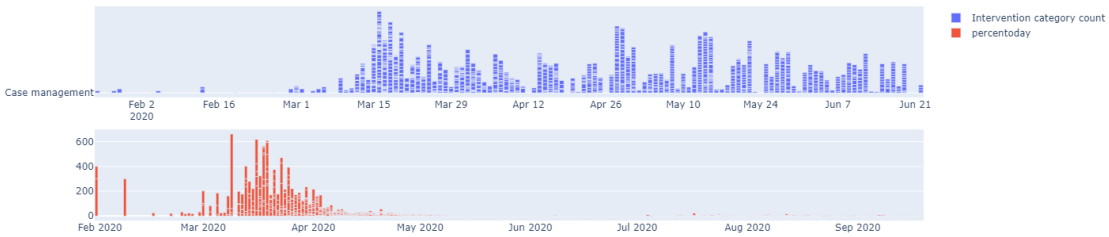
`percentdeath`



percentactive



percentoday



- Government started to implement the policies from the month of **Jan**. Most of the policies were implemented from the mid of **march**, after that subsequent new policies were implemented.
- Because of the various policies to reduce community contact we can see **Canada** has flattened the curve. There is significant change in number of

confirmed cases.

- Cumulative death number has also been controlled, thanks to Health force policies.
- Number of the active cases saw a significant ~80% drop, which can be attributed to closures, self isolation, and proper health care.
- Number of tested and recovered both saw a enormous spike, which can be attributed to robustness of the healthcare.
- Percent active, percentage of death, percent today all graphs shows a negative slope which depicts that implementation of various policies were significantly effective.