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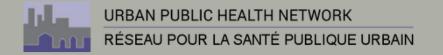RÉSEAU POUR LA SANTÉ PUBLIQUE URBAIN

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COVID-19 Indicators for Examining Sub-Provincial Pandemic Trends in Canada

A Flash Review

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The UPHN is a national organization established in 2004 which today includes the Medical Officers of Health in 24 of Canada's large urban centres. Working collaboratively and with a collective voice, the network addresses public health issues that are common to urban populations. Research operations of the UPHN are conducted in partnership with the University of Saskatchewan.

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COVID-19 Indicators for Examining Sub-Provincial Pandemic Trends in Canada: Flash Review[1][2][3]

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COVID-19 Indicators for Examining Sub-Provincial Pandemic Trends in Canada: Flash Review

Question
There are a handful of dashboards and associated data repositories that have been created in Canada to report real-time data analyses and visualization of the COVID-19 pandemic, improve public understanding of the pandemic, and support evidence-based decision making. Each dashboard contains slightly different variables and indicators, although all have compiled their datasets by aggregating the same or similar data from different publicly available sources across Canada. These dashboards have been used by many organizations (Canadian Institute for Health Information, and Government of Canada), and media (CBC News, 2020, and Global News 2020), and report the pandemic trends and impacts in Canada and its different provinces. At present, there remains a gap in our understanding of sub-provincial and regional pandemic trends and their impacts throughout the country. Henceforth, the Urban Public Health Network (UPHN) research team aims to investigate the local level (i.e., sub-provincial) COVID-19 pandemic trends and impacts in Canada. For this purpose, this flash review answers the following question: Which COVID-19 dashboard should the UPHN Research team use, or combination thereof, to examine sub-provincial pandemic trends and impacts in Canada?

Review
We searched for real-time data repositories and dashboards that give a comprehensive update on the COVID-19 outbreak across Canada using different indicators. We identified two: The COVID-19 Tracker Canada (CTC) (Little, 2020), founded by Noah Little and his team, and data repository by the COVID-19 Canada Open Data Working Group (CCOD) (Berry et al. 2020):

- **COVID-19 Tracker Canada (CTC):** CTC is an independent volunteer-run initiative dedicated to aggregating, visualizing, and sharing Canadian COVID-19 data. The team makes up-to-date, granular Canadian COVID-19 data accessible to all via their dashboard and data API. On March 7, 2020, the project was launched with the goal of combining fragmented data released by provinces and territories into a current database of cases across Canada. In April 2020, they began expanding their tracked data to include fatalities, recoveries, testing, and patients in hospitals and ICU. They were the first tracking project in Canada. In December 2020, they expanded their efforts to include all of their metrics at the health region level in Canada. In mid-December 2020, they launched their vaccine tracking initiative. Their dataset has been widely used by media both in Canada and internationally. Their website was linked in the Government of Canada's national daily epidemiological report for a number of days in Spring 2020. Their data has been used or referenced by all major news outlets in Canada and by many internationally, including Reuters, CNN, the BBC, FT, and the NYT. Their vaccination and hospitalization data are used by Oxford's Our World In Data initiative and used by Google for their native visualizations of Canadian vaccinations and hospitalizations. In late 2021, they began working directly with the Public Health Agency of Canada to provide vaccination, hospitalization, and other COVID-19 related data at the health-region level through the University of Saskatchewan to support Canada's COVID-19 response. The website and associated dataset are maintained by Noah Little, along with his team, who manually collect and verify data every day.

- **Canada Open Data Working Group (CCOD):** CCOD was founded in March 2020 to develop a real-time open-access individual-level epidemiological dataset of the COVID-19 epidemic in Canada for robust pan-Canadian analyses and to identify health outcome trends. The CCOD is composed of a dedicated team of volunteers with expertise in epidemiology, public health, and data science. Data are manually identified and entered, and gathered by their team throughout the day. They collect daily time series data on COVID-19 cases, deaths, recoveries, testing, and vaccinations at the health region and province levels. Data are collected exclusively from publicly available sources, including government reports and news media. Their dataset also has been widely used by media both in Canada and internationally. Their data have appeared in reports and tools from government sources, including the Public Health Agency of Canada and the Canadian Institute for Health Information (CIHI). Their data has been used or referenced by all major news outlets in Canada, including CBC News, The Globe & Mail, and Global News.

<u>Findings</u>

Both the CTC and CCOD share their data in CSV format that is open-access and directly downloadable. Their data can also be obtained in JSON format from API. Although the dataset for the health regions is not publicly available in CSV format in the CTC, this dataset can be obtained through communication with them. Both databases use similar kinds of indicators in their reporting. The indicators used by the CCOD in their reporting at the national and provincial level are the number of cases, active cases, fatalities, tests, recoveries, vaccinations, vaccinated, vaccine distributed. Along with the mentioned indicators used by the CCOD, the CTC includes data on hospitalizations, the number of critical patients, and vaccine boosters received. Similarly, at the health region level, the CCOD uses the number of cases, fatalities, while the CTC uses the number of tests, hospitalizations, critical patients, recoveries, vaccinations along with the number of cases and fatalities in their reporting.

Data from the CTC are distributed in only two CSV files. All national and provincial level data are found in CSV format in one file. In the other file, all health region unit data are included. In contrast, the CCOD uses multiple files for their dataset. The national, provincial, sub-provincial data are distributed in three different files. There are individual CSV files (i.e. Excel spreadsheets) within these three files for each indicator (e.g., individual CSV files for the number of cases, active cases, fatalities, tests, etc.). However, for the JSON format from API, data are available separately based on different indicators from both the CTC and CCOD.

See appended supplemented Table 1 for the comparison between databases. In both of the databases, for the most part, data is manually compiled from a huge variety of government and news media sources in near real-time, as information is announced. They use different publicly available sources, and their datasets are based on almost the same underlying data. However, there are slight discrepancies between the two databases in terms of reporting each indicator. The cumulative or accumulative data are not equal in two databases in some instances. This may be due to the fact that there were some unavoidable assumptions that have been required in order to present a complete dataset. Because some provinces did not report every day, hence, data released by some provinces had been later retracted or modified, and throughout the course of the pandemic, there had been changes in definitions used to capture testing, recoveries, and case/mortality reporting or even region boundaries.

They use a variety of sources to ensure that an accurate and complete dataset is available. For every case, a source URL is provided. Ontario is a unique province in that the provincial reporting is nearly a day out-of-date by the time it is released. In order to provide the most up-to-date data available, they source data from each of the individual 34 Public Health Units in

Ontario. The Saskatchewan Government now reports data for 13 regions instead of the prior 6 regions. This change took effect in August of 2020, but historical data for the new regions were never provided. As such, they combine the 13 regions and continue to report by the original 6 regions to ensure a full, accurate historical dataset.   Prior to December 1, 2020, the CTC group used the data from the CCOD in reporting health region data. Noteworthy, the CCOD uses hospitalization data from the CTC in their reporting. In reporting health region data, both databases use similar health region units. However, the CCOD reports on seven administrative regions only for Northwest Territories as these territories represent only a health region. In contrast, the CTC provides sub-health regions data for vaccination only for selected provinces and territories. The vaccination data provided by the CTC are distributed by various age groups.

The earlier cases from the CCOD had more detailed information, i.e. the demographic information, than their more current cases. There were numerous provinces and health regions that provided extensive information about each case, including demographics, when the pandemic initially began. However, as the number of reported cases has risen, this data became less available.

Both dashboards are limited by the amount of COVID-19 information that is publicly reported in government reports, on government websites, and in the news media. Undoubtedly, the count of cases presented in these datasets underestimates the total COVID-19 burden in Canada because these only include individuals with COVID-19 who interacted with the health system. There are individuals with COVID-19 who do not seek treatment, and therefore, are not included in the count of cases compiled by the public health system.

Conclusions and Recommendations
Both databases provide useful and roughly similar information, and comprehensive as they examine the sub-provincial trends of the pandemic and impacts in Canada. The important thing is that these data are publicly accessible and easily obtainable. The UPHN research team will mostly use the CTC dataset in their sub-provincial analyses because the CTC dataset has more indicators than the dataset of the CCOD. In addition, the data on the number of tests, hospitalization, and recoveries from the CTC dataset will enable the team to determine the effectiveness of the sub-provincial response to the pandemic. However, if the CTC dataset contains any missing values that the CCOD dataset does not, or any additional data from the CCOD contribute to the robust and rigorous analyses, the UPHN research team will wrangle the data from the CCOD dataset.

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Little, N. (2020). COVID-19 Tracker Canada. Retrieved February 22, 2022, from https://covid19tracker.ca/index.html

<u>Supplement Table:</u>

Table 1. A comparison between the datasets of the COVID-19 Tracker Canada (CTC) and the COVID-19 Canada Open Data Working Group (CCOD)

<u>Appendices</u>

Appendix A. Government data sources for provincial and territorial COVID-19 indicators used by the COVID-19 Tracker Canada (CTC) and the COVID-19 Canada Open Data Working Group (CCOD)

Appendix B. Government data sources for Ontario Public Health Unit COVID-19 indicators used by the COVID-19 Tracker Canada (CTC) and the COVID-19 Canada Open Data Working Group (CCOD)

Appendix C. List of the 92 subdivisions (health region units) used and reported in the dataset

Table 1. A comparison between the datasets of the COVID-19 Tracker Canada (CTC) and the COVID-19 Canada Open Data Working Group (CCOD).

Characteristics	COVID-19 Tracker Canada (CTC)	COVID-19 Canada Open Data Working Group (CCOD)	Key differences
How is data shared?	CSV format, and JSON format from API.	CSV format, and JSON format from API.	Data from the CCOD are also shared in Google Drive in CSV format.
Indicators: National level	Number of cases, fatalities, tests, hospitalizations, critical patients, recoveries, vaccinations, vaccinated, boosters received, vaccine distributed.	Number of cases, active cases, fatalities, tests, recoveries, vaccinations, vaccinated, vaccine distributed.	CTC database contains a few more indicators, i.e. number of hospitalizations, critical patients, booster received, while the CCOD database contains only an extra indicator, i.e. number of active cases.
Indicators: Provincial level	Number of cases, fatalities, tests, hospitalizations, critical patients, recoveries, vaccinations, vaccinated, boosters received, vaccine distributed.	Number of cases, active cases, fatalities, tests, recoveries, vaccinations, vaccinated, vaccine distributed.	CTC database contains a few more indicators, i.e. number of hospitalizations, critical patients, booster received, while the CCOD database contains only an extra indicator, i.e. number of active cases.
Indicators: Health region level	Number of cases, fatalities, tests, hospitalizations, critical patients, recoveries, vaccinations.	Number of cases, fatalities, active cases (active cases for Northwest Territories and its sub-regions only).	CTC database contains a few more indicators, i.e. number of hospitalizations, critical patients, recoveries, vaccinations, while the CCOD database contains only an extra indicator, i.e. number of active cases for Northwest Territories and its sub-regions only.
Data sources	For the most part, data are entirely manually compiled from a huge variety of government and news media sources in near real-time as information is announced. Different publicly available sources, and almost based on the same underlying data. Regional data (prior to December 1st 2020): CCOD.	For the most part, data are entirely manually compiled from a huge variety of government and news media sources in near real-time as information is announced. Different publicly available sources, and almost based on the same underlying data. Hospitalization data: CTC.	CTC obtained the regional data (prior to December 1st, 2020) from the CCOD. In contrast, the CCOD obtains the hospitalization data from the CTC.
Similarities and differences between two data repositories	There are not any major differences. Some differences in the data presentation and indicators.	There are not any major differences. Some differences in the data presentation and indicators.	Differences in the data presentation and indicators.
Is health region data over and above another sub-provincial unit of analysis?	Available data: National > Provincial > Sub-provincial (health region unit). Similar health region unit for both data repositories. The CTC provides sub-health regions data for vaccination only for selected provinces and territories.	Available data: National > Provincial > Sub-provincial (health region unit). Similar health region unit for both data repositories. This database reports on seven administrative regions only for Northwest Territories as these territories represent only a health region.	The CCOD database reports on seven administrative regions only for Northwest Territories as these territories represent only a health region. In contrast, for selected provinces and territories, the CTC provides sub-health regions data for vaccination only.
Do they have sub-provincial units for all provinces?	There have sub-provincial units for all provinces.	There have sub-provincial units for all provinces.	No differences.
Are there different sub-provincial geographies being used between data aggregators?	No.	No.	No differences.
How is the data organized/structured?	For CSV format, data are organized into two CSV files. All national and provincial level data are in CSV format in one file. In another file, all health region unit data. However, for JSON format from API, data are available separately based on different indicators.	For CSV format, data are organized into multiple files. National, provincial, sub-provincial data in three different files. Then, there are individual CSV files within these three files for each indicator (e.g., individual CSV files for the number of cases, active cases, fatalities, tests, etc.). Similarly, for JSON format from API, data are available separately based on different indicators.	For CSV format, the CCOD data are organized into multiple files based on the different indicators, while CTC data are organized into two files (one for national and provincial level data and another for health region level data).
Does it come with any supporting documentation?	Everything regarding data and sources is described on their websites. In addition, discrepancies, ambiguities, and any other special data notes are described and can be found on their websites.	Everything regarding data and sources is described on their websites. Furthermore, discrepancies, ambiguities, and any other special data notes are described and can be found on their websites. Besides, their Technical Reports states their project in detail.	The CCOD has detailed their project in their Technical Reports that can be found in their website.

Appendix A. Government data sources for provincial and territorial COVID-19 indicators used by the COVID-19 Tracker Canada (CTC) and the COVID-19 Canada Open Data Working Group (CCOD).

Province/Territory	Sources
Alberta	https://www.alberta.ca/covid-19-alberta-data.aspx
British Columbia	http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data
Manitoba	https://www.gov.mb.ca/covid19/updates/index.html
New Brunswick	https://www2.gnb.ca/content/gnb/en/departments/ocmoh/cdc/content/respiratory_diseases/coronavirus.html
Newfoundland and Labrador	https://covid-19-newfoundland-and-labrador-gnl.hub.arcgis.com/
Nova Scotia	https://experience.arcgis.com/experience/204d6ed723244dfbb763ca3f913c5cad
Nunavut	https://www.gov.nu.ca/health/information/covid-19-novel-coronavirus
Northwest Territories	https://www.gov.nt.ca/covid-19/
Ontario	https://covid-19.ontario.ca/#section-0
Prince Edward Island	https://www.princeedwardisland.ca/en/information/health-and-wellness/covid-19-testing-and-case-data
Quebec	https://www.quebec.ca/sante/problemes-de-sante/a-z/coronavirus-2019/situation-coronavirus-quebec/
Saskatchewan	https://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/emerging-public-health-issues/2019-novel-coronavirus/cases-and-risk-of-covid-19-in-saskatchewan
Yukon	https://yukon.ca/en/case-counts-covid-19

Appendix B. Government data sources for Ontario Public Unit COVID-19 indicators used by the COVID-19 Tracker Canada (CTC) and the COVID-19 Canada Open Data Working Group (CCOD).

Public Health Unit	Sources
Algoma	https://www.algomapublichealth.com/disease-and-illness/infectious-diseases/novel-coronavirus/current-status-covid-19/
Brant	https://www.bchu.org/ServicesWeProvide/InfectiousDiseases/Pages/coronavirus.aspx
Chatham-Kent	https://ckphu.com/current-situation-in-chatham-kent/
Durham	https://app.powerbi.com/view?r=eyJrIjoiMjU2MmEzM2QtNDliNS00ZmIxLWI5MzYtOTU0NTI1YmU5MjQ2IiwidCI6IjUyZDdjOWMyLWQ1NDktNDFiNi05YjFmLTlkYTE5OGRjM2YxNiJ9
Eastern Ontario	https://eohu.ca/en/covid/covid-19-status-update-for-eohu-region
Grey Bruce	https://www.publichealthgreybruce.on.ca/
Haldimand and Norfolk	https://hnhu.org/health-topic/coronavirus-covid-19/
Haliburton, Kawartha, Pine Ridge	https://www.hkpr.on.ca/
Halton	https://www.halton.ca/For-Residents/Immunizations-Preventable-Disease/Diseases-Infections/New-Coronavirus
Hamilton	https://www.hamilton.ca/coronavirus/status-cases-in-hamilton
Hastings Prince Edward	https://hpepublichealth.ca/the-novel-coronavirus-2019ncov/
Huron Perth	https://www.hpph.ca/en/health-matters/covid-19-in-huron-and-perth.aspx
Kingston, Frontenac, Lennox & Addington	https://www.kflaph.ca/en/healthy-living/status-of-cases-in-kfla.aspx
Lambton	https://lambtonpublichealth.ca/2019-novel-coronavirus/
Leeds, Grenville and Lanark	https://healthunit.org/coronavirus/
Middlesex-London	https://www.healthunit.com/novel-coronavirus#local-case-count
Niagra	https://www.niagararegion.ca/health/covid-19/statistics/statistics.aspx
North Bay Perry Sound	https://www.myhealthunit.ca/en/health-topics/coronavirus.asp
Northwestern	https://www2.nwhu.on.ca/
Ottawa	https://www.ottawapublichealth.ca/en/reports-research-and-statistics/daily-covid19-dashboard.aspx
Peel	https://www.peelregion.ca/coronavirus/testing/#cases
Peterborough	https://www.peterboroughpublichealth.ca/your-health/diseases-infections-immunization/diseases-and-infections/novel-coronavirus-2019-ncov/local-covid-19-status/
Porcupine	https://www.porcupinehu.on.ca/en/your-health/infectious-diseases/novel-coronavirus/
Renfrew	https://www.rcdhu.com/novel-coronavirus-covid-19-2/
Simcoe Muskoka	https://www.simcoemuskokahealthstats.org/topics/infectious-diseases/a-h/covid-19
Southwestern	https://www.swpublichealth.ca/en/my-health/covid-19-novel-coronavirus.aspx
Sudbury	https://www.phsd.ca/health-topics-programs/diseases-infections/coronavirus/current-status-covid-19/
Thunder Bay	https://www.tbdhu.com/coviddata
Timiskaming	https://www.timiskaminghu.com/90484/covid-19
Toronto	https://www.toronto.ca/home/covid-19/covid-19-pandemic-data/
Waterloo	https://www.regionofwaterloo.ca/en/health-and-wellness/positive-cases-in-waterloo-region.aspx
Wellington-Dufferin-Guelph	https://wdgpublichealth.ca/your-health/covid-19-information-public/status-cases-wdg
Windsor-Essex	https://www.wechu.org/cv/local-updates
York	https://www.york.ca/wps/portal/yorkhome/health/yr/covid-19/!ut/p/z1/jY_fCoIwFMafxQeQna2l83JYuc1kgWS2mxiFNiiVEC96-iS86SLr3H3w-_4cZFCJTGMHV9vetY29jfpogpPkiRQiBaUpi4GD5oqEDNYRRoc3AF-OAzL_-GcAMx-vfhWMH5BHFmc1Mp3tr75rqhaV53ZwFx9HY7_5TEhyRkEWKuQF1kDlYgIIoYHAMSgQmoHchLvligkMKZmAmZHdfV8-t1Uua897ARbl9OA!/dz/d5/L2dBISEvZ0FBIS9nQSEh/#.YhV8PuhKi3C

Appendix C. List of the 92 subdivisions (health region units) used and reported in the dataset.

Province/Territory	Subdivision Name	Sub-Division Number	Names of Subdivisions
Alberta	Zone	5	Calgary, Central, Edmonton, North, South
British Columbia	Health Authority	5	Fraser, Interior, Island, Northern, Vancouver Coastal
Manitoba	Health Authority	5	Interlake Eastern, Northern, Prairie Mountain, Southern, Winnipeg
New Brunswick	Zone	7	Zone 1 (Moncton area), Zone 2 (Saint John area), Zone 3 (Fredericton area), Zone 4 (Edmundston area), Zone 5 (Campbellton area), Zone 6 (Bathurst area), Zone 7 (Miramichi area)
Newfoundland and Labrador	Health Authority	4	Central, Eastern, Labrador-Grenfell, Western
Nova Scotia	Zone	4	Zone 1 – Western, Zone 2 – Northern, Zone 3 – Eastern, Zone 4 - Central
Nunavut	N/A	1	Nunavut
Northwest Territories	N/A	1	Northwest Territories
Ontario	Public Health Unit	34	Algoma, Brant, Chatham-Kent, Durham, Eastern, Grey Bruce, Haldimand-Norfolk, Haliburton Kawartha Pineridge, Halton, Hamilton, Hastings Prince Edward, Huron Perth, Kingston Frontenac Lennox & Addington, Lambton, Leeds Grenville and Lanark, Middlesex-London, Niagara, North Bay Parry Sound, Northwestern, Ottawa, Peel, Peterborough, Porcupine, Renfrew, Simcoe Muskoka, Southwestern, Sudbury, Thunder Bay, Timiskaming, Toronto, Waterloo, Wellington Dufferin Guelph, Windsor-Essex, York
Prince Edward Island	N/A	1	Prince Edward Island
Québec	Health Region	18	Abitibi-Témiscamingue, Bas-Saint-Laurent, Capitale-Nationale, Chaudière-Appalaches, Côte-Nord, Estrie, Gaspésie-Îles-de-la- Madeleine, Lanaudière, Laurentides, Laval, Mauricie, Montérégie, Montréal, Nord-du- Québec, Nunavik, Outaouais, Saguenay, Terres-Cries-de-la-Baie-James
Saskatchewan	Zone	6	Central, Far North, North, Regina, Saskatoon, South
Yukon	N/A	1	Yukon