### WASTEWATER-BASED SURVEILLANCE FOR PUBLIC HEALTH:

KNOWLEDGE TO ACTION S E R I E S

## CASE EXAMPLE OTTAWA PUBLIC HEALTH

# Open Data is a game changer



# **KEY TAKEAWAYS**

**Partnerships and sustainability** – The partnership between public health, academia and the City of Ottawa has been essential for the establishment and success of wastewater-based surveillance (WBS) in Ottawa. Uncertainty remains about how WBS for public health can become a sustainable program at all levels, from local to global.

**Data dashboards and open data** – Information for local decision making, by both community leaders and the general public, needs to be timely, accessible and meaningful. The Ottawa Public Health dashboard, with the combination of this open data set and clear messaging on risk and how to protect yourself, has been a game changer.

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**Communicating risk and changing behaviours** – Communication is a critical part of WBS. It needs to include risk reporting based on evidence, such as the Ottawa Public Health dashboard information that weights WBS data as part of the overall assessment of weekly change. It is also essential to have social media that is accurate, communicates the data clearly at the local level, and feels authentic to the audience.

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# OTTAWA PUBLIC HEALTH

O ttawa Public Health (OPH) provides programs and services to about one million people in the City of Ottawa, Ontario. Almost 92 percent of this population is covered by a single system (Robert O. Pickard Environmental Centre – ROPEC) that collects and treats wastewater. This allows for centralized measuring of the level of key viruses in the sewage, including SARS-CoV-2, influenza, RSV, Mpox and others. Public Health integrates SARS-CoV-2, influenza and RSV WBS data, weighted at 40 percent of the overall assessment of weekly change. This data sits alongside traditional surveillance metrics of percent positivity, outbreaks and hospitalizations, each weighted at 20 percent. These indicators are reported on the public dashboard with information on respiratory and enteric diseases. The dashboard includes guidance for the public and decision-makers on how to protect themselves and their community.

# Respiratory and Enteric Surveillance Dashboard:

https://www.ottawapublichealth.ca/en/reportsresearch-and-statistics/flu-report.aspx

The main dashboard includes information on whether the number of infected people in Ottawa is increasing, decreasing, or staying the same compared to the week before. Trend data are published on Wednesdays. The update includes wastewater trends for Influenza (A&B combined and separate), RSV and COVID-19, as well as an overall measure of risk for respiratory illness transmission in healthcare settings (low or high).



#### WASTEWATER-BASED SURVEILLANCE FOR PUBLIC HEALTH

## **Research partners**

The public health WBS program in Ottawa started in March 2020 in response to the COVID-19 pandemic. The University of Ottawa, in collaboration with the Children's Hospital of Eastern Ontario (CHEO) Research Institute and the Ottawa Hospital Research Institute (OHRI), developed early methods to measure SARS-CoV-2, its variants and infectious diseases, and shared these methods with academic institutions and agencies across Canada and globally. The WBS program was expanded to influenza in February 2022 and RSV in July 2022 as the evidence evolved.

The 613covid.ca dashboard hosts the longest data set of daily SARS-CoV-2 WBS data in the world. It remains publicly available and continues to be updated five days a week (Monday-Friday, although data is collected every day of the year) with SARS-CoV-2, influenza, and RSV data. This webpage was populated by the WBS data generated by the University of Ottawa and was hosted for the first three years by OHRI. The dashboard went live in September 2020 with data being uploaded seven days a week at that time. The public has followed the dashboard, which has more than 10,000 site visits a day during peak periods, from the beginning.

### Research website/dashboard:

https://613covid.ca/wastewater/





# A PARTNERSHIP APPROACH

The partnership in Ottawa is unique and is fortunate to include people from academia, public health, public works and research institutes who were actively engaged in starting up WBS early in the pandemic, and who remain committed to supporting WBS locally, in Canada and internationally. The diversity of partners enabled the partnership to quickly produce normalized methods for WBS and create quality assessment and control pipelines for the data. This ensured the information would be readily understood by the public as well as easily interpreted and integrated by health decision-makers. The result was more reliable and accurate WBS data compared to some other communities early in the pandemic. In the longer term, this has added value to WBS data in the Canadian landscape.

The "hidden ace" in the development of the successful and broadly focused WBS program has been the strong relationship and engagement between the Epidemiology, Evidence and Surveillance Department (EESD) at Ottawa Public Health and Dr. Robert Delatolla and his research team from the Department of Civil Engineering at the University of Ottawa. The EESD's team gathered early on and quickly defined requirements and thresholds for WBS data generation, which was critical for creating a publicly available WBS data set and for developing a strong WBS response in the region. The technical and engineering expertise of Dr. Delatolla's team was leveraged for translating their pre-existing understanding of wastewater infrastructure and the fate of microbial entities within wastewater matrices into strategies for creating data that is understandable by both public health practitioners and the general public.

Catherine (Cat) Millar, health information analyst at Ontario Public Health, and Jacqueline Willmore, epidemiologist at Ottawa Public Health, recognize how important the relationship with the research team has been to public health being able to get its work done. "The technicalities of collecting and cleaning data and getting it ready to go … have not been barriers for us, the way they have been for some regions," says Cat.

## Importance of local public health surveillance

The importance of local public health surveillance should not be underestimated. Kevin Parent, social media lead at Ottawa Public Health, remembers hearing Toronto's Medical Officer of Health comment that when public health is working, it's completely invisible. "You don't notice us when things are going well, when we're doing our job. It's only when things aren't going well that you notice, so that's when we launched a campaign to highlight the work ... [including] some posts and video products talking about epidemiology, what it is, just to shine a light on it."

When the COVID-19 pandemic arrived in early 2020, the value of WBS surveillance and the application of an evidence-based approach at the community level in Ottawa was demonstrated. With support from their research partners, the senior leadership team at Ottawa Public Health actively supported reporting WBS publicly in September 2020. This made a difference in understanding the local context and in effective communication to support health behaviours.

Jacqueline attributes the use of WBS data to the leadership team's evidence-driven approach. "They asked, 'What data can we get in the absence of clinical case data?' Wastewater data is fantastic ... particularly with the shift in testing eligibility after the arrival of Omicron." WBS was able to measure the quantity of the SARS-CoV-2 virus at the population level in the absence of representative clinical data as the dramatic increase in testing demand due to the Omicron variant overwhelmed the clinical testing system.

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The benefit of having data at the local level can be seen in the potential for WBS data to impact the use of RSV prophylaxis in highrisk infants. Jacqueline describes how, in 2023, the increase in RSV happened earlier than usual in Ottawa by a couple of months. "If public health and clinicians had been able to look at WBS data they could have started prophylaxis sooner. The researchers were able to publish on that [so we can be more prepared for next year]." The RSV WBS monitoring in Ottawa has now been expanded to testing at 12 locations across Ontario by the Ottawa team and is being reported to the Ontario Ministry of Health RSV advisory group. A completed cost consequence model has demonstrated that RSV WBS and prophylaxis administration based on this data will result in approximately \$3M of savings per year in Ontario and a reduction of approximately 250 emergency visits and 950 medically attended visits (Thampi et al., 2024).

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### WBS for neighbourhood and facility monitoring

A congregate care task force was set up in Ottawa during the COVID-19 pandemic with representatives from public health and a variety of organizations (i.e., retirement homes, longterm care facilities, hospitals, the shelter system, detention centres). Public health supported these sites with guidance when they had outbreaks, and there was high quality clinical testing data to guide decision making. However, the use of WBS focused on specific facilities was never identified as a priority as it was not clear what information it would have added, given the ongoing availability of clinical case data. In addition, there was concern the cost would have been prohibitive due to the number of facilities.

At the same time, there was interest in neighbourhood monitoring from a research perspective. Dr. Delatolla went to Ottawa Public Health with his team to ask about which neighbourhoods would be a higher priority for a WBS project based on social equity priorities. Three neighbourhoods in Ottawa were chosen based on elevated incidence of COVID-19, in part due to a higher number of people in the population working in longterm care facilities, and from marginalized groups. Community advisory committees (CACs) were developed in two of the three neighbourhoods to listen to people with lived experiences from these communities and to identify potential unintended consequences of WBS for the community and potential pathways for stigmatization. The CACs supported testing in the communities and sharing of WBS data with public health and

publicly. The COVID-19 WBS data from these neighbourhoods was shared with OPH and demonstrated unique characteristics relative to city-wide WBS data in Ottawa. Similar work has been done with influenza A and B (Mercier et al., 2022).

Cat explains how public health identifies and reaches out to communities they are concerned about. "We do outreach to neighbourhoods in ways that are meaningful to that neighbourhood, based on our connections in those neighbourhoods. It's more about empowering your community as opposed to [saying] there's a problem here."



# COMMUNICATING DATA FOR DECISION-MAKING

## Supporting leadership and decision making

Municipal leaders were watching the data closely during the COVID-19 pandemic. The Ottawa Public Health dashboard was set up fairly quickly and included WBS data early on. People started following the WBS data closely right away. "If the [WBS] data is not posted on time we get requests and follow up ... people want to know where it is," says Jacqueline.

One of the challenges in giving WBS data meaning is how to translate specific measures into a risk assessment that helps with both community and individual decision making. The Ottawa Public Health team worked with their research partners to develop 'cut off measures' based on a sound statistical and evidence-based approach. The COVID-19 dashboard is where the methodology for weighting data, creating cut-offs and identifying trends was documented, and messages were developed to clearly communicate risk. However, there is more to the process than reliance on scientific principles – it also requires judgement.

"I think it boils down to the leadership style within the health unit ... specifically, our epidemiology and evidence team is given a lot of autonomy. [We are] well trusted within the health unit as experts in surveillance ... there is [always] conversation and tweaking based on feedback from leaders, but by and large ... even if [there was still uncertainty, the data was] approved, endorsed and went public," says Jacqueline, recalling the process. "There is comfort with it being an iterative process ... we've had several versions of the dashboard and we've updated the way we weight the overall change as new indicators become available."

Key messages around risk were added to the dashboard to benefit both those who are data savvy and those looking for a basic recommendation about how to protect themselves and their community. Early in the dashboard implementation process the epidemiology team would meet with the communications team on a weekly basis to determine how to communicate the right "level of risk." This led to the development of a protocol for communicating cut-offs and trends.

See Part 3 – Dashboards for Communication and Decision-Making or an example of the Ottawa respiratory transmission risk assessment and risk cut-offs.

Cat notes that developing the dashboard in partnership with their communication colleagues was worth the investment of time. "[Early in the process] it took longer to make a decision about what [level of risk] we were at from a big picture perspective ... which led us to develop the cut offs based on statistical analysis of historical data. We wanted to simplify as much as possible ... but it has to also make sense [to the end user] ... and in the context of messages from Public Health Ontario and the Ministry of Health."

## Social media and messages that make sense

The social media and communications team at Ottawa Public Health has been key to getting the messages about WBS out and summarizing recommendations for action in an accessible way. During the pandemic, Ottawa city councillors would often put the messages directly into emails to their constituents on a weekly basis, or they would retweet social media posts from OPH.

The OPH communications team is very engaging, uses a lot of humour and pays close attention to what conversations are happening on social media (i.e., social listening). The team is very proactive. It supported the epidemiology team to use colour coding and simple language on the dashboards in a similar way to how they use it in social media.

See **Part 1 - Overview** for more information on health literacty and risk communication.



Early in the COVID-19 pandemic it was important to strengthen health literacy around infectious disease transmission from an epidemiological perspective. The communications team developed a series of info graphics (see an example in Figure 1), the first one being a real life flow chart that illustrates how one person with COVID-19 attending a family barbecue turned into hundreds of people with COVID-19. Kevin



Figure 1: Infographic Example (Source: https://twitter.com/d

describes how they ran these through 2020, but ended up stopping them. "They were ridiculously effective comms pieces, but they were very resource heavy, and things kept getting busier and busier in the pandemic ... we just didn't have the resources to keep doing them."

Standalone communication about wastewater started in March 2021 when a communications challenge communicating came up, particularly



OttawaHealth/status/1308413748776968192)

around communicating messages that could be perceived to be conflicting with one another. Messages from the province of Ontario indicating that the regional risk was low in the Ottawa area were being promoted at the same time as Ottawa Public Health was communicating an increase in risk. Both were correct, but it needed some context added for clear public communication. Kevin explains, "people were noticing there were only five people in ICU and wondered 'what are you talking about?' ... so [we realized] we needed to explain leading and lagging indicators to the general population."

This led to their infamous 'poop happens' <u>social</u> <u>media thread</u> using eight tweets to explain how even though not everyone gets tested, everyone contributes feces to the wastewater system that can be sampled to measure levels of SARS-CoV-2 virus. As Kevins notes, "we were kind of playful with it and just educated people on what wastewater surveillance is ... so when we did our weekly snapshot [of the dashboard] ... wastewater was one of the things we pointed to as an early indicator ... [followed by advice like] putting on a mask and staying home when you're sick."

Communication is a critical part of public health surveillance, including WBS. It is important to be accurate and communicate the data clearly, but it is also important to be authentic. This is where social media can be a valuable part of a surveillance strategy.

"We listen to what people are saying and try to meet them where they are ... we are humorous when we can be ... and a calming voice of reason," says Kevin about Ottawa's communications strategy. "People just found it refreshing ... people responded 'I really needed this,' or 'OPH sounds like a trusted family member talking to me online."

# LOOKING TO THE FUTURE

# Provincial funding, program evaluation and sustainable systems

Jacqueline notes that the work being done by the University of Ottawa is funded by research grants and does not have a stable public health stream of funding. "It's public health surveillance, so we'd like to see that change before all the COVID funding dries up."

Core surveillance funding supports public health to establish the necessary programs and services that cut across different types of surveillance. This enables the system to be adaptive and flexible depending on what is needed. Cat notes that it's not much of an effort to add another stream of data to the system. "All the wastewater data we receive is through open data ... all we need to do is plug our dashboards and our different reporting tools into that open data and we are good to go!" She adds, "our researchers are directly sending us the data ... everybody gets the latest data at the same time ... so it's all very seamless on our end." This system is made possible by the University of Ottawa and Ottawa Public Health commitments to open data.

See Part 3 – Dashboards for Communication and Decision-Making for more on the value of open data. Jacqueline and Cat are worried that there may not be a long-term commitment to supporting the work collecting, analyzing and reporting high quality WBS data at the provincial level. Jacqueline says that Public Health Ontario (PHO) has been interested in hearing what Ottawa has been doing, and has been generally supportive of developing WBS, however their plans are not clear. "PHO has shown interest in this work, and has advised that we work to build a case, for example in peer reviewed literature, to show the important value it has in public health surveillance."

The Association of Public Health Epidemiologists of Ontario WBS working group, to which Ottawa belongs, is talking about setting up some standardized indicators to facilitate evaluation. However, the main evaluation role in Ottawa continues to be filled by Dr. Delatolla and his team through the publication of their peer-reviewed articles. Jacqueline reflects on the role of the epidemiology unit in evaluation. "Often evaluation has been done at the program level, but [WBS] doesn't have a program ... it's outside the health unit at the university, so it's sort of been left to them ... [but there is a need to understand] how it impacts decisions." Ottawa Public Health continues to keep providing information to the researchers, aligning the WBS data with clinical case-based data for their publications. Cat notes, "it's so manageable for us that it just makes sense to keep reporting [back to the researchers] ... and it informs our work in so many different ways that it would be a huge loss not to have it."

## Vision for the future

Dashboards have been a gamechanger, replacing PDF reports and static tables on the website, which have a large data lag. The Ottawa Public Health team is looking at adding another public dashboard focused on all reportable infectious diseases.

See Part 3 – Dashboards for Communication and Decision-Making for more on principles of dashboard development.

Both Jacqueline and Cat are proud of how Ottawa Public Health has been able to create the dashboard as a 'one stop shop' for the essential risk information that people need to make personal health decisions during the COVID-19 pandemic. Cat is particularly thankful for the strong collaborative spirit in Ottawa. "This pandemic has been awful, but the people we've worked with throughout have been amazing." Jacqueline adds, "I'm proud of the continued commitment to public reporting and transparency in our methodology ... providing open data that anybody can access ... and they do, from all over the world!"

Both Cat and Jacqueline have a vision for the future that has an integrated data system within public health, and across public health and clinical care. But for WBS, they envision a future with provincially driven funding and standardized procedures, reporting and evaluation. This could look like funding based on population and geography, with 'memorandums of understanding' in place between municipal wastewater programs and local public health.

And the last word of advice to their public health colleagues? "Embrace open data. So many folks are afraid of it ... [but] it's such a game changer for getting data out to the people you are working with and also getting data back from them ... it goes both ways," says Cat.

In the end it's about valuing a true partnership approach.

## For more information

On WBS and Ottawa Public Health as a Canadian success story see the "case study" in: *Royal Society of Canada Policy Briefing* (Hrudey et al., 2022, pg. 89-90 and pg. 143-145).

On the early days of WBS development in Ottawa during the COVID-19 pandemic see: "Reading the Entrails: Using Wastewater Epidemiology to Track Covid-19" from the *Royal Society of Canada COVID-19 series* (Mackenzie, Delatolla & Manuel, 2020).

## References

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## **OTHER TOPICS IN THIS SERIES**

### **PART 1: OVERVIEW**

### **PART 2: CASE EXAMPLES**

The case examples in this Knowledge-to-Action Series are stories told from the perspective of the Public Health practitioners most closely involved in the development and implementation of the WBS program in their region. They are intended to provide a deeper understanding of the organizational and community context, and key learnings related to interpretation and communication of information related to wastewater-based surveillance.

BC Centre for Disease Control.

📕 Ottawa Public Health.

Nunavik Board of Health and Social Services.

### PART 3: WBS RESOURCES AND TOOLS

The resources and tools in this Knowledge-to-Action Series are intended to provide a summary of key information and communication topics for public health practitioners related to WBS. Each document includes core concepts with references and links to additional materials. There is also a set of reflection questions at the end for individuals and teams to consider when applying the concepts to the development and implementation of WBS programs.

Data Governance and Ethics.

Dashboards for Communication and Decision Making.

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