Public Health Innovations in Analytics

To:	Chair and Members of the Board of Health
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Recommendations

It is recommended that the Board of Health receive this report for information.

Key Points

• WDGPH's data-driven initiatives seek to enhance decision making and community collaboration.

• Innovative vaccination communication strategies have informed future campaigns.

• Upcoming public respiratory illness dashboard will streamline access to relevant data.

• WDGPH is committed to embracing innovative solutions to better serve its community, advance public health goals, and promote health equity.

Background

This report highlights analytics-related innovations at Wellington-Dufferin-Guelph Public Health (WDGPH) undertaken since BH.01.MAY1122.R12 *Health Analytics Innovation During the COVID-19 Pandemic*.[1] As in the previous update, an approach is considered innovative if it advances agency goals, while being new to the organization and possibly unique amongst similar organizations.

In the past year, the Information Systems division has been leading changes within the Agency that better equip WDGPH for data-driven decision making and for community collaboration on data projects. At the same time, WDGPH has continued to adopt innovative COVID-19 management strategies and integrate COVID-19 reporting into its regular population health surveillance.

Five areas of innovation will be discussed in this report:

1. Data Governance renewal at WDGPH
2. Use of Artificial Intelligence
3. Open source initiative
4. COVID-19 Vaccination notification email study
5. Plans for a new public respiratory illness dashboard for Fall 2023

Discussion

Data Governance

In Spring 2023, WDGPH launched a new data governance initiative. The initial stages of this initiative have included the creation of a new data governance committee and a catalogue of agency population health-related data holdings. This catalogue will deliver a search tool for WDGPH staff to identify data sources, characteristics of those data sources (e.g., description of content, update frequency) and contact information for internal experts who can assist with accessing the data and performing analyses.

This initiative data and data-driven decision making in WDGPH programs, help identify gaps in data, and ensure data quality and consistency are maximized wherever data is used.

Artificial Intelligence

WDGPH has been monitoring developments in Artificial Intelligence and the opportunities these advancements provide the Agency. Notably, in Fall 2022 OpenAI released its ChatGPT product, built on their generation 3.5 and, later, their generation 4, Generative Pre-trained Transformer (GPT) models.[2] This product has greatly reduced the barrier to user interaction with sophisticated natural language processing models. While it is understood that this product can sometimes produce inaccurate information, there are many applications in which its use can increase productivity. WDGPH has been exploring its potential in a limited way for increasing productivity in policy, report and presentation creation, as well as programming tasks. As of early 2023, Microsoft is incorporating GPT-4 into its business products.[3] Exploration of this technology now helps WDGPH in determining value of AI features for its employees when they become even more widely available and will inform guidelines and training that might be required to leverage them effectively.

Open-Source

Open-sourcing is the process in which software or code is made publicly and freely available. For WDGPH, open-source projects are an opportunity to share and collaborate with other local public health units and partnering organizations. Open-source projects are also a way the Agency can increase its transparency to the public. Many public sector organizations in Ontario and Canada have embraced an open-source philosophy to their work but, to date, this has been limited among local public health units.

In January 2023, WDGPH developed a process to determine the suitability of a project to be made open-source. Paramount to this process is an assessment of the privacy and security risks posed by the sharing of source code. This assessment involves use of a developer guide, internal code peer review and consultation with WDGPH's Privacy Analyst and IT Infrastructure Architect whenever applicable.

Following the creation of this process, WDGPH released its first open-source project in February 2023 – a tool for analyses involving postal codes. Several Ontario local public health units have expressed interest in the tool already. WDGPH plans on having additional open-source projects by the end of the year and intends to share resources for its open sourcing process with other local public health units. These will be made available through the Agency's organizational account on the GitHub platform.[4]

Vaccine Eligibility Emails

Since vaccinations against COVID-19 were first made available in Ontario in December 2020, there have been several updates to vaccination recommendations based on an improved understanding of disease risks, immunity conferred by vaccination and/or infection and threats posed by new SARS-CoV-2 variants. These updates have resulted in WDGPH moving away from terminology such as “fully vaccinated” and number of doses, to recency of vaccination. Within the last year, updated bivalent vaccines against COVID-19 became available which more closely target circulating Omicron variants, adding another element of complexity.

In attempt to clarify vaccine recommendations and availability for local residents, WDGPH utilized email during the Fall 2022 vaccination campaign. These emails served as a key part of the Agency’s Fall 2022 COVID-19 vaccine information campaign. The email campaign was made possible with the use of a new mass email service for the Agency, and utilized email addresses that were provided by clients during their previous vaccinations against COVID-19. As a result of this email campaign, clients were delivered the most up-to-date vaccine access information for the region and many subsequently opted to receive a vaccine. Through October and November, WDGPH was consistently a top-5 PHU for each adult 10-year age grouping for the Fall vaccination campaign. The WDG region’s lead in this regard is owed to an effective multi-platform informational campaign, careful clinic planning and a receptive population. Bivalent vaccine coverage within Wellington-Dufferin-Guelph as of Mid-October is shown in Figure 1.

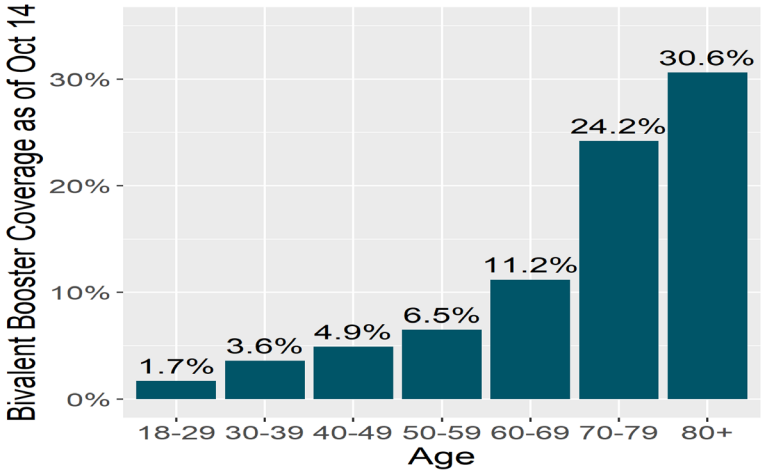

Figure 1: Bivalent vaccine uptake in Wellington-Dufferin-Guelph was jump-started Fall 2022 with an effective informational campaign, which included email notifications. Higher uptake was seen in older age groups as in previous campaigns.

Later in Fall 2022, WDGPH followed up with clients who had not yet received a recommended dose, with a personalized email from the Medical Officer of Health, Dr. Nicola Mercer. These emails were sent in a sequence that accounted for key risk indicators – such as age and time since last dose. The notification sequence was accelerated in areas with clinics with excess availability. In order to make the emails more actionable, they contained information on local public health-operated clinics and vaccinating pharmacies.

In October 2022, WDGPH began exploring slightly altering email content and monitoring if it impacted the response of recipients. This was an application of an approach known as A/B testing. Various characteristics of the emails were altered – including subject line, sender address and email message. No significant differences were found between email versions during this process in terms of email open rate, or how they related to vaccinations.

The A/B testing results motivated a short study through November and December. This study evaluated whether a second email to clients about Fall boosters *moved the needle* at all. All eligible residents that had not received a second email, had not yet had a fall booster and were over the age of 25 were contacted during this study by email. This amounted to over sixty thousand individuals – two thirds of which were between the ages of 25 and 39. Higher-risk individuals had already been contacted twice by WDGPH by email earlier in the Fall, and as a result were not included in this communications study. The Agency was interested in further tailoring an email message for the 17- to 24-year-old population, so they were also excluded.

The study group was split into two, with group one receiving an email immediately, and group two receiving a similar email approximately three weeks later. If the first group lead the second in vaccine uptake, that may indicate an impact from the email. At this point in the Fall vaccination campaign, there was excess clinic capacity throughout the region, so appointment availability was no longer used to limit the rate emails were sent.

In the end, a slight, but insignificant, overall difference developed between the two groups during the monitoring period – just 0.3% higher vaccination after three weeks (see Figure 2). Overwhelmingly, the decision to receive a Fall COVID-19 booster was best predicted by whether an individual had received a previous booster (see Figure 3). Since this email campaign was only one element of the Fall informational campaign – which also included traditional and social media - it is possible that clients that were in the second group were exposed to promoted vaccine information from WDGPH, or the Province of Ontario, during the monitoring period. If clients did receive similar messaging elsewhere, it is expected that the incremental effect of the email would be reduced.

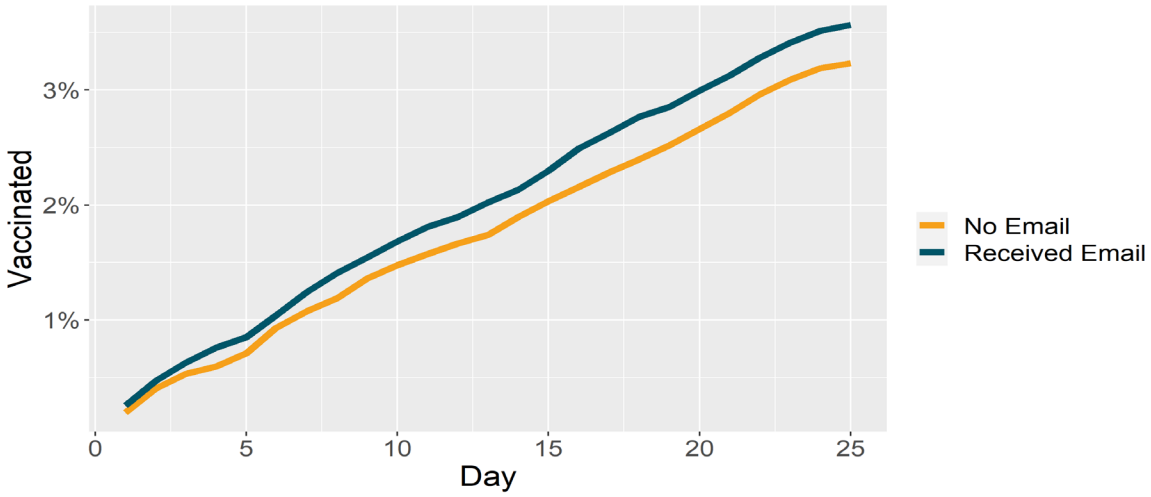

Figure 2: A difference of approximately 0.3% developed between the two groups during the study period. In light of other predictors of vaccine uptake, the receipt of the second email was not found to have a significant impact on vaccine uptake.

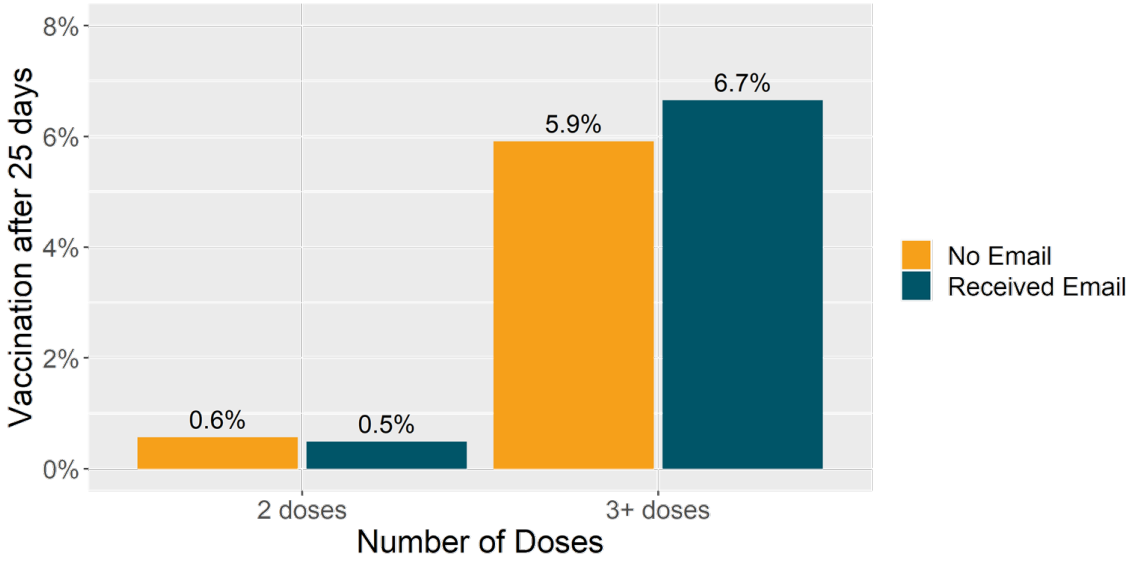

Figure 3: Having previously received a booster dose, was the single best predictor in receiving another dose during the study period. There was not a consistent increase in vaccination between the 2 dose and 3+ dose groups. Inconsistent impact of email was seen in other break downs considered such as age, gender, location, and location of previous dose.

With IT infrastructure and cloud initiatives described in BH.01.NOV0619.R22 *The Modern Enterprise*,[5] WDGPH was able to efficiently utilize mass email services and perform A/B testing on email conte5nt to optimize vaccine outreach efforts.This process informed how WDGPH will utilize emails for future vaccination campaigns.

Integrated Respiratory Illness Dashboard

During the first three years of the COVID-19 pandemic, WDGPH's COVID-19 dashboards have provided relevant, detailed, and accurate information to the community, supporting data-driven decision making and resource allocation. Continuous consideration and implementation of updates to these dashboards, such as those presented in BH.01.JUN0122.R15 *Public Dashboard Updates*, has enabled the Agency to share the latest and most pertinent COVID-19 data with the public.[6] The COVID-19 Cases dashboard was the top accessed page on wdgpublichealth.ca in 2022, with more than three times as many page views as the next most popular page.[7] The COVID-19 Vaccination dashboard was also one of the Agency's top-5 pages in 2022.

WDGPH is in the process of updating the designs and data presented in its most popular dashboards. This will include an updated presentation of COVID-19 information.

In Fall 2022, Ontario saw the full return of respiratory illness activity to levels not seen since prior to the COVID-19 pandemic – notably Influenza A and Respiratory Syncytial Virus (RSV).[8] It was the combined risks of these pathogens to the health of residents, and to the capacity of hospitals, that underscored local and provincial decision making. This more integrated approach to monitoring respiratory illness activity is expected to continue. Because of this, the new dashboard hosting local COVID-19 data will also incorporate information on the activity of other respiratory viruses. This new respiratory illness dashboard is planned to launch ahead of the Fall 2023 respiratory illness season.

The development of the new respiratory illness dashboard is made possible by the Agency's investments in IT infrastructure and digital transformation initiatives, as highlighted in BH.01.NOV0619.R22 *The Modern Enterprise*. WDGPH stays up-to-date with emerging technologies to provide better access to relevant information for the community.

Health Equity Implications

When WDGPH takes a new innovative approach, it must consider equity implications to population health.

The Agency's data governance initiative will support the accuracy, reliability, and accessibility of data within the Agency, which are essential for an evidence-based approach to public health. The data gaps that may be identified through this process may not pertain equally to different population groups within WDG. Illumination of data gaps will motivate seeking alternative data sources, help advocate for additional data collection and access, help prioritize WDGPH-led projects involving data collection and increase awareness of data issues in decision making.

AI can help increase productivity, but there are potential biases within the AI tools, and they may not always provide factual information. WDGPH must ensure that AI is applied with an equity lens, and that guidelines and training are provided for AI for effective use.

The Agency's approach to COVID-19 vaccination emails might improve overall vaccination uptake. At the same time, WDGPH recognizes the population it serves is diverse with unique communication needs and preferences. Mass email is not a substitute for more targeted messaging, outreach activities and engagement with community organizations. Continued use of a variety of communication channels, including traditional and social media, will help to maximize the reach of WDGPH messaging to diverse groups.

Finally, the upcoming public respiratory illness dashboard should be designed to provide accessible and relevant information to as much of the community as possible. Dashboards are one of several methods in which WDGPH provides information to the public. The Agency will continue to use other communication approaches and channels to ensure that individuals with technology access or technology literacy challenges are still able to receive the information they need to make decisions about their health.

By addressing potential unintended consequences and barriers for different populations, WDGPH can ensure that its innovative initiatives promote health equity and do not worsen disparities in local communities.

Conclusion

This report highlights several innovative initiatives undertaken by WDGPH in the past year. The Agency will continue to explore and implement innovative approaches and adjust its strategies to ensure effective and equitable outcomes. In the context of the topics discussed in this report, this may involve further improvement of data governance processes, additional open-source projects, refining the application of AI, further evaluation of communication strategies, and enhancing public dashboards.

The Agency is committed to embracing innovative solutions to better serve its community, advance public health goals, and promote health equity. By fostering a culture of continuous improvement and staying at the forefront of emerging technologies and best practices, WDGPH aims to make a lasting impact on the health and well-being of its residents.

Ontario Public Health Standards

Foundational Standards
- ☒ Population Health Assessment
- ☒ Health Equity
- ☒ Effective Public Health Practice
- ☐ Emergency Management

Program Standards
- ☐ Chronic Disease Prevention and Well-Being
- ☐ Food Safety
- ☐ Healthy Environments
- ☐ Healthy Growth and Development
- ☒ Immunization
- ☒ Infectious and Communicable Diseases Prevention and Control
- ☐ Safe Water
- ☐ School Health
- ☐ Substance Use and Injury Prevention

2023 WDGPH Strategic Directions

☒ **People & Culture:** WDGPH has an organizational culture of engagement, inclusion and agility.

☒ **Partner Relations:** WDGPH collaborates with partners to address priority health issues in the community.

☒ **Health System Change:** WDGPH is positioned to be an agent of change within the broader health sector.

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