Infectious Disease Surveillance Framework: Better data for better action
2014-2019
Public Health Ontario

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Recognition and thanks

We would like to thank the many individuals who have contributed to the development of the Infectious Disease Surveillance Framework (the framework) and continue to support infectious disease surveillance across Ontario. In particular, we recognize the efforts of the internal and external members of the working group who were instrumental in shaping the framework’s development process. We would also like to thank the participants in the focus groups and other consultations, including our employees, public health unit representatives, Provincial Infectious Diseases Advisory Committees members, our government partners, and health care sector representatives. Their input was critical to identifying the key themes outlined in the framework, and provided us with ideas for future projects and initiatives to improve provincial infectious disease surveillance in Ontario.

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Purpose

Public Health Ontario’s (PHO) Infectious Disease Surveillance Framework: Better data for better action (the framework) outlines PHO’s strategic approach to infectious disease surveillance. The focus of the framework is on improving data to better inform public health action, while strengthening infectious disease surveillance capacity and collaboration across Ontario. The framework establishes PHO’s key priorities, strategies, and actions that will guide infectious disease surveillance over the timeframe 2014 to 2019. For each priority, the report outlines how PHO will add value, what the impact will be for our clients, and what targets we intend to achieve in the short-term (by the end of fiscal year 2016/17) and long-term (by the end of fiscal year 2018/19). This report also acknowledges factors that PHO may encounter during this timeframe that may require flexibility in its implementation.


Introduction

Surveillance is the systematic and ongoing collection, collation, and analysis of health-related information that is communicated in a timely manner to decision makers so they can direct action. Surveillance data are used to describe the pattern of disease occurrence, allowing the detection of unusual disease patterns and triggering disease control and prevention efforts. These data can also be used to inform resource allocation, evaluate control and prevention measures, and stimulate disease-related research.

The overall goal of infectious disease surveillance is to help reduce the incidence and prevalence of infectious diseases by providing relevant public health information and knowledge to public health professionals, health care professionals, and decision makers to promote actions that result in the timely prevention and control of infectious disease.

PHO is responsible for provincial infectious disease surveillance. In the context of this framework, infectious disease surveillance has a broad scope, including the following elements: reportable and emerging infectious diseases, laboratory data, health care associated infections (HAIs), HAI-related Patient Safety Indicators (PSIs), antibiotic resistance and use, and vaccine safety and immunization coverage (Figure 1 - Elements of provincial infectious disease surveillance in Ontario).
Like many aspects of public health, infectious disease surveillance is a joint undertaking dependent on the dynamic interplay of public health and health sector organizations at various levels of government (i.e., local, provincial, national, and international organizations). PHO both supports and relies on its primary clients and partners in health in conducting provincial infectious disease surveillance. As per PHO’s 2014-2019 Strategic Plan, our primary clients include: Ontario’s Chief Medical Officer of Health, the Ministry of Health and Long-Term Care (MOHLTC) and other ministries, local public health units (PHUs), and health system providers and organizations across the continuum of care. Our partners in health can include academic, research, not-for-profit, community-based and private sector organizations, and government agencies working across sectors that contribute to Ontarians achieving the best health possible.

**Background**

PHO was established as an agency of the provincial government by legislation, the *Ontario Agency for Health Protection and Promotion Act, 2007*. Under the Act, PHO’s purpose is: “to provide scientific and technical advice and support to those working across sectors to protect and improve the health of Ontarians and to carry out and support activities such as population health assessment, public health research, surveillance, epidemiology, planning and evaluation.” PHO’s responsibilities are further articulated in its legislated objects, including the mandate to develop, collect, use, analyze, and disclose data, including population health, surveillance, and epidemiological data. Refer to Figure 2 - PHO’s legislated objects for a summary of PHO’s legislated objects.
Since its inception, PHO has grown through new funding to establish the agency, as well as a series of program transfers from the Government of Ontario. Several transfers are relevant to infectious disease surveillance, notably:

- Public Health Laboratories (in December 2008)
- Regional Infection Control Networks (in July 2010)
- Provincial Infectious Diseases Advisory Committees (PIDAC) (in April 2011)
- Selected functions from the MOHLTC, including surveillance (in July 2011) and immunization and vaccine-preventable diseases (in January 2012)

The transfer of selected functions strengthened MOHLTC’s focus on the responsibilities of policy and program development, setting standards and overseeing performance, and establishing long-term strategic directions for public health. In turn, these transfers helped PHO strengthen its capacity to deliver on its mandate by becoming responsible for surveillance.

PHO’s current role in infectious disease surveillance in Ontario is to support the public health system and health care partners with information, tools, and resources for the prevention and control of infectious diseases with respect to surveillance. We also provide scientific and technical expertise for infectious diseases, including different aspects of surveillance (e.g., data entry requirements, statistical algorithms, provincial surveillance reports).

The first step towards a strategic and coordinated approach to infectious disease surveillance is through development of this framework.
Factors that may influence PHO’s surveillance priorities over the next five years

As PHO takes steps to operationalize the framework, there are several factors on the horizon that we must consider because they have the potential to impact our work over the next five years. We acknowledge that there are also future circumstances that we cannot foresee but may also impact infectious disease surveillance priorities. As such, it is important that the framework be flexible enough to adapt as the infectious disease surveillance landscape changes.

The key factors that we anticipate include:

**New generation surveillance tools**
With technology evolving rapidly, there are many new tools and methods that PHO can leverage to enhance our current ID surveillance practices. This may include: the automation of analyses and advanced use of statistical methods for earlier outbreak detection; integration of public health, health care, administrative, and/or big data sets; adoption of laboratory methods that allow more in-depth characterization of organisms of public health concern; identification of opportunities for systems interoperability; and presentation of data in more engaging and dynamic ways using new data visualization tools.

There are clear benefits to using new generation infectious disease surveillance tools, such as producing a more complete and accurate characterization of infectious diseases in Ontario; however, there are also significant challenges. With the use of these tools, there is greater need for more enhanced technical skills, often beyond what epidemiologists and other public health and health care professionals are exposed to as part of traditional public health and health education. As a result, it may be necessary to build PHO’s internal capacity, and/or look for opportunities to establish partnerships with leaders in other fields, such as computer sciences and health informatics. We also must take steps to ensure that any new software meets our security and privacy standards, and is compatible with our existing information technology (IT) infrastructure.

As PHO explores these tools in the future, it is important that we continuously assess and prioritize what suite of next generation surveillance tools offer the best return on investment for infectious disease surveillance in Ontario.

**Public health 2.0**
Another future consideration for infectious disease surveillance is the role of data generated by participatory technologies (known as public health 2.0 data), such as Twitter and Google. These publicly available data sources have the potential to act as an early indicator of situations of interest, particularly during periods of enhanced surveillance.

Using these data sources as part of routine or enhanced surveillance can pose an analytic challenge. This is because some data sources may be useful in detecting true surveillance 'signals'
corresponding to an outbreak or clusters of emerging infections, while others may just add to the 'noise', resulting in wasted resources and time investigating false alarms. Similar to previous evaluations of more traditional syndromic surveillance data, it is important for PHO to assess if public health 2.0 data will add value to infectious disease surveillance in Ontario.

**Systems change**

Over the next five years, PHO anticipates changes to systems routinely used in infectious disease surveillance. Systems changes have a significant impact on surveillance practices at both the local and provincial levels. Often these system transitions are initiated because current systems are out of date and no longer meet clients’ needs. New systems should be well-designed, user friendly, and better align with current business requirements to enhance data completeness and accuracy. Yet, a significant investment of time and resources across multiple departments and organizations is needed to successfully develop and deploy new systems, which has the potential to dramatically impact PHO’s ability to deliver on other initiatives.

In Ontario, we have already started to experience this change with the deployment of the Immunization module of Panorama, which replaced the Immunization Records Information System (IRIS) as the provincial system for reporting student immunizations and vaccine exemptions in Ontario. Each PHU previously had access to their own local instance of IRIS from which they extracted individual data sets for provincial integration and analysis. Panorama, a single provincial system accessible by all PHUs, has the potential to enhance local ability to assess immunization status of cases during outbreaks, but also to improve provincial surveillance data quality by reducing the occurrence of duplicate and incomplete immunization records. Yet, to develop and implement the Immunization module required dedicated local and provincial resources, in addition to significant investment of time in training and other change management activities.

With regards to laboratories, the province is continuing to make progress on the implementation of the Ontario Laboratory Information System (OLIS). For the first time, a centralized repository will store data from public health, hospital, and community laboratories, becoming a new potential source of data for infectious disease surveillance. We will however need to develop mechanisms for data standardization, change management, and data governance in collaboration with our partners.

In the health care sector, hospitals are moving to electronic surveillance systems to capture data on HAIs. These systems rely on the increasing availability of electronic patient records which can be used to automate case identification and reporting. Provincial surveillance systems that upload data from already existing electronic sources will enable integration with other data sources, centralized analysis, and dissemination of reports.
Emerging infections

Infectious disease surveillance, pathogens of importance can emerge with little warning, requiring public health and the health care sector to quickly change their focus. These situations may be related to a novel pathogen, a re-emerging infectious disease, a potential pandemic, or a disease targeted for eradication. Part of PHO’s role in the area of infectious disease surveillance is the detection of and response to emerging infections. PHO must have the ability to detect these situations early on in order to facilitate public health action, including strategies for prevention and control. However, these types of situations have the potential to dramatically divert resources away from other initiatives, including the commitments outlined in this framework. For this reason, we have designed the framework to be flexible, so that we can accommodate these situations as they arise while still being able to achieve our planned commitments.

The Framework

PHO took a comprehensive approach to developing the framework, which included project oversight and strategic guidance from a multi-disciplinary working group made up of representatives from PHO and several of our primary client groups: MOHLTC, PHUs, and the health care sector. Early in the process, the working group agreed that consultations with internal and external stakeholders were critical to the successful development and implementation of the framework. During the summer and fall of 2013, we consulted with PHO staff, management, and senior executives; our primary clients and partners in health; and the three Provincial Infectious Diseases Advisory Committees (PIDAC). Across the groups consulted, a common vision and priorities for infectious disease surveillance at PHO emerged, which are summarized in Figure 3 – The vision and priorities of the framework. We have further illustrated these priorities in the following sections by describing how PHO will add value, the strategies and actions PHO will use to support the priorities, and the impacts to our clients.

Figure 3 – The vision and priorities of the framework

Vision

By 2019, PHO will have established itself as a responsive and supportive leader in infectious disease surveillance by taking a collaborative and comprehensive approach to enhancing Ontario’s surveillance capacity and the ability of public health officials to make evidence informed decisions and evaluate their impact.

Priority 1: Improve data quality
Priority 2: Accelerate integrated population health monitoring
Priority 3: Transform data into accessible information and knowledge to enable policy, program, and practice action
Priority 4: Strengthen collaboration and capacity building with clients
Priority 1: Improve Data Quality

High quality surveillance data are critical for informed public health action. Public health surveillance data are used to describe and report on the epidemiology of infectious diseases; to understand underlying trends and to detect outbreaks or other aberrations; for scientific studies; and to guide public health decision making, policies, and programs. In Ontario, there is a complex public health and health care system comprised of:

- 36 autonomous PHUs subject to provincial legislation and requirements. While each PHU receives provincial guidance and support, it is independently responsible for local infectious disease surveillance, including case management and data entry.

- Health care organizations that deliver services across the continuum of care which include acute care, complex continuing care and rehabilitation, mental health, community care, long-term care homes, and emergency medical services. Fourteen Local Health Integration Networks are mandated with coordinating the local delivery of health services within regional boundaries; however, governance and accountability structures vary by organization.

- A network of public and private laboratories, each with different funding and accountability structures, yet all sharing a duty to report laboratory confirmed cases of reportable diseases to public health (Health Protection and Promotion Act) and adhering to other relevant legislation and regulations. This network includes Public Health Ontario Laboratories (PHOL), a set of provincial laboratories across Ontario that provide reference clinical microbiology testing and primary testing for infectious diseases of public health concern; public hospital laboratories responsible for all hospital-based testing (inpatient and outpatient); and community laboratories, owned by private companies, responsible for all community-based testing (outpatient).

This arrangement of local public health and health care responsibilities makes it challenging to ensure high quality data across Ontario. Data are collected and recorded by each organization using different systems and databases, with the exception of some systems shared across the province. Even when common systems exist, there are often differences in organizational policies and procedures. Data collection and entry are also not always the priority of the individual interacting with the client or specimen, which can impact the completeness and timeliness of reporting.

In Ontario, MOHLTC mandates the information that PHUs, health care providers, and laboratory operators must report. In some instances, PHO’s role is to provide more granular guidance to the public health and health care sectors on what specific data elements must be reported in provincial systems and databases, including through the development of the integrated Public Health Information System (iPHIS) user guides; while in others, PHO’s role is as an expert advisor to MOHLTC, providing strategic input on revising provincial policy and guidance documents, such as patient safety indicator definitions and the Ontario Public Health Standards. PHO also works to enhance data quality by creating forums for provincial and local representatives to collaboratively develop guidelines and tools to improve data.
quality, such as through establishment of the iPHIS Data Quality Working Group, and by leading routine data cleaning initiatives in collaboration with local partners. Through these activities, our goal is to have the highest quality surveillance data possible.

While PHO has already taken significant strides to improve data quality through various initiatives, there are still areas in which we can further advance the completeness, reliability, and validity of infectious disease surveillance data in Ontario.

**STRATEGY 1.1: IMPROVE REPORTING PRACTICES AND REQUIREMENTS**

**HOW PHO WILL ADD VALUE**

PHO will work closely with public health and health care professionals with expertise in surveillance across Ontario to streamline reporting requirements. Taking this collaborative approach will help increase the consistent application of standards across the province, while ensuring our clients are not overburdened by unnecessary data collection and reporting. We will also lead the effort to address reporting gaps in infectious disease surveillance, particularly in the area of HAI surveillance.

**ACTIONS**

- Assess and prioritize reporting requirements for reportable infectious diseases and HAI-related PSIs
- Provide transparent, evidence-informed input into the Ontario Reportable Disease List and HAI-related PSIs reviews
- Work with health care sector clients to develop standardized provincial HAI surveillance case definitions
- Work with health care sector clients to understand barriers and facilitate infectious disease reporting
- Continue development of a provincial HAI surveillance system for Ontario

**IMPACT ON OUR CLIENTS**

- Access to complete, clearly stated, and streamlined reporting requirements for reportable diseases and HAI-related PSIs
- Opportunities to provide input on provincial reporting practices and requirements
- Enhanced reporting relationships between health care providers and PHUs
- Comprehensive and standardized HAI surveillance across Ontario
STRATEGY 1.2: PRODUCE AND SUPPORT THE USE OF STANDARDIZED DATA COLLECTION TOOLS

HOW PHO WILL ADD VALUE

PHO will continue to invest in data quality by dedicating resources to lead the development of standardized data collection tools, such as disease specific case reporting forms, in collaboration with experts from the field. While these tools will aid in standardized data collection, they will also support the completeness and consistency of data reported locally and provincially, and align with provincial reporting requirements and current best practices. By generating these tools and promoting their use, PHO will be a champion for enhanced infectious disease data quality across Ontario, resulting in better evidence to support decision making and public health action.

ACTIONS

- Develop standardized provincial data collection approaches for reportable diseases and HAIs
- Support improved collection and reporting of infectious disease risk factors, social determinants of health, and exposure data
- Recommend that data validation be incorporated into the collection of HAI-related PSIs

IMPACT ON OUR CLIENTS

- Higher quality and more complete data for provincial and local epidemiologic reporting
- Enhanced ability to characterize the distribution of infectious diseases in the population
- Enhanced ability to identify common exposures and detect outbreaks sooner
- Better evidence to inform decision making and public health action
- Improved availability of tools and resources to ensure PHUs and health care organizations are meeting provincial reporting requirements and implementing best practices in the field
### 2016/2017 TARGETS

<table>
<thead>
<tr>
<th>Description of targets to be completed</th>
<th>Applicable area of provincial infectious disease surveillance in Ontario</th>
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<tbody>
<tr>
<td>Work in collaboration with PHUs and MOHLTC to update iPHIS user guides to fill current gaps in data entry requirements for reportable diseases, including <em>Clostridium difficile</em> infection outbreaks in public hospitals</td>
<td>Antibiotic resistance and use</td>
</tr>
<tr>
<td>Develop with the MOHLTC a long-term plan for revising provincial policies and guidance documents (e.g., Ontario Reportable Disease List, Infectious Diseases Protocol, PSIs), and disclose the proposed schedule to PHUs and health care providers as appropriate</td>
<td>Emerging infectious diseases</td>
</tr>
<tr>
<td>Consult and engage with stakeholders to solicit buy-in for an HAI surveillance system</td>
<td>HAIs and PSIs</td>
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<tr>
<td>Collaborate with Health Quality Ontario and Health Analytics Branch on developing a strategy to enhance and streamline HAI reporting</td>
<td>Laboratory</td>
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| Produce standardized questionnaires and case reporting forms through a collaborative development process with PHUs that aid with both data collection and reporting in iPHIS for at least 10 reportable diseases | Reportable diseases | ✔ | | | | | | | ✔
| Establish data quality benchmarks, with a focus on risk factors and exposure data | Vaccine safety and immunization coverage | ✔ | | | | | | | ✔
| Produce data quality and cleaning resources for iPHIS risk factors and exposures in collaboration with the Data Quality Working Group | | | | | | | | ✔
| Prepare a report on the validity of PSI data based on reporting of vancomycin-resistant enterococci bacteremias to provide evidence of the need for validation | | | | | | | ✔ |
### 2018/2019 TARGETS

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<tbody>
<tr>
<td></td>
<td>Antibiotic resistance and use</td>
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<tr>
<td>Complete a comprehensive review of outdated user guides in collaboration with PHUs and the MOHLTC</td>
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<tr>
<td>Develop a process to establish standardized provincial HAI surveillance case definitions that align with reporting in other jurisdictions</td>
<td>✓</td>
</tr>
<tr>
<td>Produce standardized questionnaires and case reporting forms for an additional 10 reportable diseases</td>
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<tr>
<td>Establish a standardized process to monitor data quality (e.g., timeliness, completeness) on an ongoing basis</td>
<td>✓</td>
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<tr>
<td>Assess the availability and quality of existing social determinants of health data sources, and obtain access to new data sources as required</td>
<td>✓</td>
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Priority 2: Accelerate integrated population health monitoring

Through the consultation process for the development of the framework, PHO’s primary clients identified several gaps in current provincial infectious disease surveillance: understanding the impact of the social determinants of health on infectious disease-related outcomes; lack of information on behavioural risk factors and population-level immunization coverage; and the need for more comprehensive laboratory metrics to assist with the interpretation of surveillance data, such as test volumes and percent positivity. They also identified a lack of availability of surveillance data for priority populations. Better understanding disease acquisition and transmission within these populations is important to help create targeted prevention and control activities.

To address these gaps, PHO must seek opportunities to better integrate existing sources of surveillance data into our routine and enhanced surveillance operations, as well as acquire and consider linking with new and emerging data sources. Combining multiple data streams will allow PHO to enhance our ability to characterize the distribution of infectious diseases in the population, as well as support early identification of outbreaks and situations of interest.

PHO has already started to take an integrated approach to surveillance by combining some PHOL data with case information reported by PHUs. For example, the Ontario Universal Typing of Tuberculosis Web (OUT-TB Web) application developed by PHO provides PHUs’ TB control programs with simple, easy, and user-friendly access to comprehensive TB case and molecular genotyping data. In order to provide the appropriate context for the interpretation of the data, the laboratory results are combined with clinical and epidemiological information. The application also has an interactive geographic information system (GIS) platform, making it possible for users to assess spatial relationships between cases and identify potential disease clusters that previously went undetected. A recent update to OUT-TB Web has added another layer of data to this tool: the Ontario Marginalization Index. This index allows users to examine the geographic relationship between cases and factors like residential instability and material deprivation. OUT-TB Web is an innovative demonstration of the effectiveness of combining complex data sources to explore epidemiologic relationships between cases.

Moving forward, PHO will continue to explore new and existing data sources for integration to address current surveillance gaps, such as electronic medical records, health care administrative data, and OLIS. PHO will also be evaluating the potential use of emerging data sources in public health, such as grocery store loyalty cards to obtain timely and accurate purchase histories for cases during enteric outbreaks. While we forge ahead with data integration, we must consider that high quality integration and analysis of data requires an investment of time and resources. It is also important that we take care to put together the most efficient combination of data sources, while upholding strong privacy and confidentiality principles and ensuring the necessary infrastructure and data sharing agreements are in place.
STRATEGY 2.1: ESTABLISH SECURE AND RELIABLE DATA LINKAGES TO PROMOTE INTEGRATION

HOW PHO WILL ADD VALUE

PHO will seek out new and existing data sources to fill current gaps in infectious disease surveillance in Ontario. We will use our expert resources and advanced technical capabilities to use these data sources to develop a more comprehensive understanding of infectious disease trends in Ontario. By leveraging detailed epidemiological data in combination with advances in laboratory technology such as next generation sequencing, PHO will accelerate our understanding of disease transmission and the underlying pathogenic mechanisms of infectious organisms. Concurrently, PHO will emphasize the importance of data governance best practices to ensure that users take accountability for data management in their day-to-day work.

ACTIONS

- Identify and facilitate access to different data sources for linkage
- Implement data governance best practices for integrating data sources
- Establish mechanisms for linking data to enhance routine surveillance products

IMPACT ON OUR CLIENTS

- Improved understanding of the epidemiology of infectious diseases and immunization coverage in Ontario
- Immunization status is a core data element in surveillance summaries of vaccine-preventable diseases and will enable Ontario to comply with enhanced surveillance requirements when documenting disease elimination
- The ability to assess vaccine coverage of defined geographical areas during outbreaks may be used to alter susceptibility criteria used in outbreak response as well as assessment of vaccine effectiveness
- Earlier notification of outbreaks and other situations of interest, including emerging infections.
- Continued confidence that PHO obtains, handles, and stores data in a secure and confidential manner

STRATEGY 2.2: APPLY AN EQUITY LENS TO DATA ANALYSIS

HOW PHO WILL ADD VALUE

PHO will focus on gaining better access to often underreported or historically unavailable data, specifically behavioural risk factors and social determinants of health. This approach will help us understand what puts some Ontarians at greater risk for infectious disease. We will also ensure that we look at the unique issues and surveillance data gaps related to priority populations. Ultimately, this
information integrated with other data sources will aid public health and health care professionals in taking actions to improve health and reduce inequities.

**ACTIONS**

- Assess existing data gaps in priority populations and initiate strategies to address them
- Advance the routine use of social determinants of health and behavioural risk factors in data analyses

**IMPACT ON OUR CLIENTS**

- More complete understanding of the underlying issues putting Ontarians at risk of acquiring an infectious disease and reasons for lack of adherence to treatment protocols
- Enhanced ability to develop evidence-informed interventions that target groups at risk
## 2016/2017 TARGETS

<table>
<thead>
<tr>
<th>Description of targets to be completed</th>
<th>Applicable area of provincial infectious disease surveillance in Ontario</th>
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</thead>
<tbody>
<tr>
<td>Develop a catalogue of data sources available for infectious disease surveillance activities</td>
<td>✓</td>
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<tr>
<td>Link immunization coverage data with reportable disease and vaccine safety data</td>
<td></td>
</tr>
<tr>
<td>Conduct analyses applying an equity lens to an infectious disease issue, such as the provincial report on TB</td>
<td>✓</td>
</tr>
<tr>
<td>System enhancements to support improved reporting of behavioural risk factors in iPHIS for cases of reportable diseases</td>
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<tr>
<td>Achieve 100% reporting of indigenous persons status in iPHIS where relevant, such as for cases of TB</td>
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<tr>
<td>Annual assessment of coverage of Ontario’s school-aged population using the methodology recommended by the Canadian Immunization Registry Network</td>
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<tr>
<td>Assess exemptions to inform targeted programs to address groups or populations with high exemptions</td>
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<tr>
<td>Access to registry data to provide a more precise denominator estimate and permit validation of receipt of immunization and individual-level data essential to calculate Adverse Event Following Immunization rates</td>
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### 2018/2019 TARGETS

<table>
<thead>
<tr>
<th>Description of targets to be completed</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Routine integration of administrative data and other new and useful data sources into epidemiologic analyses</td>
<td>Antibiotic resistance and use  Emerging infectious diseases  HAIs and PSIs  Laboratory  Reportable diseases  Vaccine safety and immunization coverage</td>
</tr>
<tr>
<td>Develop technological solutions to produce high quality laboratory data sets suited for a variety of clients</td>
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<tr>
<td>An annual report on infectious diseases that includes more comprehensive integration between iPHIS and laboratory data to enhance interpretation of trends</td>
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<tr>
<td>Develop standard processes and quality checks for preparing laboratory datasets for linkage</td>
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<tr>
<td>Use laboratory data as an infectious disease early warning system</td>
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<tr>
<td>Analysis of geographical clustering of un-immunized and under-immunized populations</td>
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**Priority 3: Transform data into accessible information and knowledge to enable policy, program, and practice action**

PHO has already developed a suite of infectious disease surveillance information products and interactive tools. Our products include ad hoc epidemiologic analyses of outbreaks and disease clusters under investigation, as well as routine reports, including: the Monthly Infectious Diseases Surveillance Report; the Ontario Respiratory Virus Bulletin; the Quarterly Carbapenemase Producing Enterobacteriaceae Surveillance Report; and the Annual Report on Vaccine Safety in Ontario. PHO is continuing to enhance existing surveillance products that describe population health status by applying innovative and visually engaging techniques. An example of this is the Ontario Health Profile, a series of ten infographics that describe the health status of Ontarians by focusing on key public health issues, including infographics on infectious disease topics: measles, respiratory viruses, and foodborne illness.

PHO has also produced several interactive, online tools that allow users to manipulate aggregated data sets to describe infectious disease trends locally and provincially. For example, the sexually transmitted infections (STI) Lab Data Decision Support Tool is a dynamic tool that allows PHUs and clinicians to interact with laboratory test results data for gonorrhea and chlamydia cases mapped by PHU and for Ontario overall. Another example is Snapshots, a collection of interactive map-based dashboards showing geographic and temporal trends for key public health indicators, including several infectious diseases.

During the consultation process for the development of the framework, we heard from our primary clients that many of these tools and products are already being used in the field to enable action. Our clients reported the use of PHO resources to generate provincial comparators to local data, but also to provide situational awareness of disease clusters or events occurring across the province. While epidemiologists are often the target audience, other public health professionals indicated that they have used PHO’s tools and products to better understand surveillance trends, and assist with program planning and evaluation. Our clients indicated that they also appreciate the new approaches PHO has taken to presenting information online and using data visualization techniques. For example, Query is an interactive data exploration tool that allows public health professionals to manipulate aggregated reportable disease data extracted from iPHIS using pre-defined reports and filters. Using this tool, users can dynamically compare provincial and local aggregate counts of reportable diseases, which was not possible using a single tool in the past.

To further enable action by our clients and partners, PHO needs to continue to develop new tools and products, while refining what is already available. One key step to ensure our tools and products are useful and acceptable to our clients is evaluation. PHO has already initiated its first evaluation of two routine surveillance products: the Monthly Infectious Diseases Surveillance Report and Reportable Disease Trends in Ontario. The evaluation will focus on the reports’ accessibility, utility, and relevance for our clients. This is the first of many evaluations planned, which will give us the information necessary...
to improve our tools and products, as well as more effectively disseminate and/or communicate how users can access them.

**STRATEGY 3.1: DEVELOP MORE ACCESSIBLE AND TIMELY TOOLS AND PRODUCTS**

**HOW PHO WILL ADD VALUE**

PHO will advance the availability of tools and products that are accessible, timely, and responsive to the needs of our clients. We will continue to expand the presence of infectious disease information on the PHO website. We will also produce more user-friendly and accessible surveillance products by seeking out innovative ways to present static surveillance information in interactive and compelling formats. These steps, in addition to enhancing the interpretation of epidemiologic information, will help improve the availability of information needed by decision-makers and practitioners to take action to improve the health of Ontarians.

**ACTIONS**

- Improve and develop innovative approaches for timely and effective dissemination of surveillance tools and products
- Enhance interpretation of data
- Expand access to data through web-enabled tools
- Identify and adopt effective approaches to data visualization

**IMPACT ON OUR CLIENTS**

- Easy and timely access to provincial and local surveillance information
- Availability of clearly communicated epidemiologic trends
- Ability to interact with data and information in a user-friendly format that provides our clients with an opportunity to seek answers to their own questions
- Equip decision-makers and practitioners with information they need to take action
STRATEGY 3.2: EVALUATE TOOLS AND PRODUCTS

HOW PHO WILL ADD VALUE

PHO will continue to evaluate existing tools and products on a routine basis, which will include input from our clients and partners. We will streamline and tailor our reports based on the results of the evaluations. We will also determine preferred methods for dissemination of our products, and ways to more effectively communicate the presence of tools on our website.

ACTIONS

- Develop evaluation plans for tools and products
- Determine usefulness of products and tools to clients and partners
- Assess methods of dissemination of tools and products

IMPACT ON OUR CLIENTS

- Availability of accessible tools and products that are built to meet the needs of PHO’s clients
- Routine engagement on how to improve PHO’s tools and products, including the interpretation of epidemiologic information
## 2016/2017 TARGETS

<table>
<thead>
<tr>
<th>Description of targets to be completed</th>
<th>Antibiotic resistance and use</th>
<th>Emerging infectious diseases</th>
<th>HAIs and PSIs</th>
<th>Laboratory</th>
<th>Reportable diseases</th>
<th>Vaccine safety and immunization coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create landing pages on the PHO website for priority diseases, conditions, and other relevant topics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Create a secure access repository for documents and tools for public health and healthcare professionals on the PHO website</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Evaluate the reports available in Infectious Diseases Query</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Create online versions of routine surveillance reports</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Evaluate the annual Reportable Disease Trends in Ontario report and the Monthly Infectious Diseases Surveillance Report</td>
<td></td>
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<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
### 2018/2019 TARGETS

<table>
<thead>
<tr>
<th>Description of targets to be completed</th>
<th>Applicable area of provincial infectious disease surveillance in Ontario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build evaluation into the lifecycle of routine surveillance reports</td>
<td>Antibiotic resistance and use</td>
</tr>
<tr>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Expand the infectious disease content available through Query, including development of additional reportable disease and HAI-related PSI reports</td>
<td>✓</td>
</tr>
<tr>
<td>Evaluate the impact of disease specific case report forms, including their impact on data quality</td>
<td>✓</td>
</tr>
</tbody>
</table>
**Priority 4: Strengthen collaboration and capacity building with clients**

PHO works with a broad range of organizations across Ontario and beyond. Our primary clients include: Ontario’s Chief Medical Officer of Health, MOHLTC and other ministries, local PHUs, and health system providers and organizations across the continuum of care. Public health and health care sectors in Ontario have the potential to benefit from this diverse set of experts working towards the common goal of Ontarians achieving the best possible health. PHO is well positioned as a hub for provincial collaboration with respect to infectious disease surveillance, but also as a leader in education and training for our clients.

In less than a decade, PHO has established itself as a champion of provincial collaboration with respect to infectious disease surveillance through the creation of many working groups, committees, and forums comprised of both internal and external experts. Some examples include: the Surveillance Working Group for Pan Am/Parapan Am Games that developed a provincial infectious disease surveillance strategy specific to the 2015 Games; routine teleconferences for PHUs that cover topics related to iPHIS, Cognos, and epidemiology and surveillance; and the Ontario Public Health Convention, an annual public health focused conference which PHO hosts jointly with the Ontario Public Health Association and the Association of Local Public Health Agencies. We have also solicited our clients’ input in planning initiatives to improve our service delivery, including through the Communicable Diseases (CD) unit stakeholder engagement sessions, which allowed the CD unit to identify programming priorities and gaps across Ontario in an effort to ensure adequate and effective PHO support. To accomplish this, the CD unit hosted four stakeholder engagement sessions for PHUs across the province based on geographic location. These sessions provided an opportunity for the CD unit to gain insight into local public health programming priorities and allowed for a focused discussion on how the CD unit could support local PHUs in addressing these areas.

In alignment with PHO’s legislated objects, it is also our role to lead and support relevant training and educational initiatives in the area of infectious disease surveillance. There are numerous examples of PHO already providing this type of support, such as annual workshops that focus on outbreak management. In 2014, the workshop was expanded to address the results of a comprehensive needs assessment completed by PHU stakeholders working in communicable disease prevention and control and infection prevention and control. The workshop focused on the key themes of surveillance, case and contact management, infection prevent and control, and communication around infectious diseases. The presentations, panels, and interactive educational sessions were led by representatives across several departments at PHO and in partnership with PHU colleagues. PHO also routinely organizes other educational initiatives that include topics relevant to infectious disease surveillance, including: PHO Grand Rounds; PHO Rounds: Epidemiology; webinars to accompany the release of new case reporting forms and questionnaires, surveillance best practice documents; annual infection prevention and control Exchanges for sharing best practices and experiences relating to infection prevention and control; and specific educational sessions to address emerging infectious diseases. We
also support the MOHLTC in delivering iPHIS and Cognos training by providing operational context and business scenarios to enhance the relevance of these sessions for PHU staff.

Although PHO has established itself as a leader in collaboration and capacity building, we can build upon the work that we already do to enhance the way we work with our clients and partners in infectious disease surveillance. Strengthening collaboration and capacity building with our partners is also important because it is fundamental to the success of the other priorities outlined in this framework. For example, developing capacity for PHUs and health care sector partners through provision of training and resources helps PHO improve data quality, which supports Priority #1. Furthermore, collaboration with our clients supports Priority #2 and Priority #3 because it is necessary to work together to identify data sources for linkage, as well as to create effective tools and products and evaluate their usefulness. PHO’s success in implementing this framework, and enhancing infectious disease surveillance in Ontario, is only possible with strong and effective partnerships with our clients.

**STRATEGY 4.1: EXPAND OPPORTUNITIES FOR COLLABORATION**

**HOW PHO WILL ADD VALUE**

PHO will foster the development of networks for collaboration across the province and beyond. We will work with our clients to bring coherence and efficiency to surveillance activities by creating opportunities for experts to share their knowledge and experience. We will also work towards enhancing internal collaboration, which will be in part facilitated by the relocation of the Toronto PHOL to 661 University Avenue near the downtown PHO office. PHO will make more resources available to assist with local surveillance activities, by providing access to expertise in various disciplines, including epidemiology, evaluation, and laboratory medicine. PHO will also seek out opportunities for collaborative surveillance initiatives across jurisdictional boundaries in an effort to detect trends that might otherwise not be observable, such as vaccine safety signals.

**ACTIONS**

- Support forums for sharing local innovation and best practices
- Facilitate opportunities for collaborative initiatives
- Engage with clients to identify areas where PHO can add value to surveillance in Ontario via local analyses done on behalf of clients when requested

**IMPACT ON OUR CLIENTS**

- Opportunity to learn from the expertise of public health and health care colleagues
- Reduce duplication of work on similar projects across Ontario, such as syndromic surveillance systems
- Develop skills through collaborative initiatives
- Easily access support through collaborative networks and PHO resources
STRATEGY 4.2: DEVELOP PHO’S CONTINUING EDUCATION AND PROFESSIONAL DEVELOPMENT ROLE

HOW PHO WILL ADD VALUE

PHO will continue to lead and support provincial infectious disease surveillance training and education to enhance consistency across the province. We will work closely with our clients to identify gaps in current training and education with respect to infectious disease surveillance, but also to understand our clients’ preferred methods of learning. PHO will seek out experts within and outside of PHO to share standards, best practices, and other guidance with our clients. We will also provide educational sessions to accompany the release of new tools and products, when appropriate.

ACTIONS

- Assess the training and educational needs of clients across the province to inform training activities
- Create a plan to address the training and educational needs of our clients

IMPACT ON OUR CLIENTS

- Tailored training and educational programs based on local, regional, and/or provincial needs
- Accessible training events, both web-based and in-person
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<tbody>
<tr>
<td>Establish virtual collaboration centres using external collaboration sites on the PHO website</td>
<td>✅</td>
</tr>
<tr>
<td>Utilize infection prevention and control community of practice forums to share local innovations and discuss surveillance issues within healthcare organizations</td>
<td>✅</td>
</tr>
<tr>
<td>Consult with our clients to determine their specific educational and training needs</td>
<td>✅</td>
</tr>
</tbody>
</table>

### 2018/2019 TARGETS

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<tr>
<td>Create training packages related to reportable disease surveillance concepts broken down by level of expertise (e.g., new user vs refresher training)</td>
<td>✅</td>
</tr>
</tbody>
</table>
Implementation

PHO will implement the framework over a five-year (2014-2019) period through annual operational planning activities within the organization. Departments and teams will use the framework as a guide to help prioritize surveillance initiatives, as well as enhance existing projects. PHO senior management will provide oversight to the development of departmental operational plans, including the routine inclusion of framework related initiatives.

In an effort to ensure the successful implementation of the framework, PHO has developed two sets of targets under each priority that align with and support the framework; one set of targets refers to specific projects that will be completed by the end of 2016-17 fiscal year, and the other set is to be completed by the end of 2018-19 fiscal year. These targets will be used to further define key initiatives on individual team work plans that support the framework. Target initiatives will be tracked through routine mechanisms on an annual basis. PHO will review any reasons for delays or changes in project direction with the purpose of identifying any barriers to the successful and timely implementation of these initiatives. These findings will be reported annually to PHO senior management and executive team members.

Progress of target initiatives and other projects supporting the framework will also be formally assessed in 2017. This is an opportunity for PHO to evaluate the framework over the first three years of its implementation, and will allow PHO to make any needed adjustments to the framework for its final two years as a result of emerging priorities and the evaluation findings. This assessment will ensure the framework is still relevant as the landscape of infectious disease surveillance changes over time by accommodating new technologies, data sources, approaches to surveillance, and emerging and priority diseases. PHO will also evaluate the framework in 2019, from which PHO will use the findings and recommendations to guide the development of subsequent frameworks.
Conclusion

PHO’s *Infectious Disease Surveillance Framework: Better data for better action* has been developed through extensive consultation with internal stakeholders and PHO’s primary clients. As the title suggests, the framework outlines PHO’s commitment to taking a strategic and coordinated approach to infectious disease surveillance, to better inform public health action. The four priorities outlined in this document represent the key areas in which PHO will focus its surveillance efforts from 2014 to 2019. Each priority is further supported by a series of strategies and actions that will lead to enhancements in all components of the surveillance cycle, from data collection, analysis, and interpretation to dissemination of surveillance information, across a broad scope of content areas (Figure 1 - Elements of provincial infectious disease surveillance in Ontario). The framework will help improve infectious disease surveillance capacity and collaboration across Ontario, with the ultimate goal of strengthening the public health and health care systems as a whole. We will monitor our success in achieving the targets set out in the framework and make adjustments as future opportunities and challenges arise.

To stay informed on the status of the framework, please visit the [framework’s webpage](#).
References


Glossary of terms

**Antibiotic resistant organisms (AROs)** – A microorganism that has developed resistance to the action of several antimicrobial agents and that is of special clinical or epidemiological significance.

**Health care associated infections (HAIs)** – A term relating to an infection that is acquired during the delivery of health care (also known as *nosocomial infection*).

**Infectious diseases** – Infectious diseases are caused by pathogenic microorganisms, such as bacteria, viruses, parasites or fungi. The diseases can be spread from one person to another, directly or indirectly, through fluid exchange or exposure to vectors, or from the environment.

**Integrated Public Health Information System (iPHIS)** – iPHIS is an information system for the reporting and surveillance of infectious diseases in Ontario, and provides a common database for use by all PHUs. The application enables PHUs to complete client, case, and contact management as well as outbreak management activities.

**Ministry of Health and Long-Term Care (MOHLTC)** – MOHLTC is the ministry under the Government of Ontario responsible for administering Ontario’s publicly funded health care system. For more information about MOHLTC, refer to the [About the ministry section on the MOHLTC website](#).

**Ontario Agency for Health Protection and Promotion (OAHPP)** – OAHPP is the legal name for Public Health Ontario

**Ontario Laboratory Information System (OLIS)** – OLIS is a cornerstone information system that connects hospitals, community laboratories, public health laboratories, and practitioners to facilitate the secure electronic exchange of laboratory test orders and results. For more information on OLIS, refer to the [OLIS section of the eHealth Ontario website](#).

**Panorama** - Panorama is a new public health reporting system under development that assists public health professionals in monitoring, managing, and reporting on public health.

**Partners in health** – As per [PHO’s Strategic Plan 2014-2019](#), our partners in health include academic, research, not-for-profit, community-based and private sector organizations, and government agencies working across sectors that contribute to Ontarians achieving the best health possible.

**Patient safety indicators (PSIs)** – According to the Agency for Healthcare Research and Quality, PSIs are a set of measures that can be used to provide a perspective on patient safety. Specifically, PSIs screen for problems that patients experience as a result of exposure to the health care system and that are likely amenable to prevention by changes at the system or provider level. These are referred to as complications or adverse events. Under Ontario Regulation 965 of the *Public Hospitals Act* (1990), Ontario hospitals are mandated to report on nine indicators related to patient safety, including five HAI-related outcome indicators.
Primary clients – As per PHO’s Strategic Plan 2014-2019, our primary clients include: Ontario’s Chief Medical Officer of Health, MOHLTC and other ministries, local PHUs, and health system providers and organizations across the continuum of care.

Provincial Infectious Diseases Advisory Committees (PIDAC) – PIDAC provides a standing source of expert advice on infectious diseases in Ontario, and has produced a library of best practice documents, reports, and recommendations on matters related to communicable diseases, immunization, infection prevention and control, and surveillance. As part of PHO, PIDAC continues to focus their efforts on developing evidence-informed products that meet the needs of public health agencies, government decision-making bodies, and those working to protect and promote the health of Ontarians. For more information about PIDAC, please refer to the PIDAC section of the PHO website.

Public Health Ontario (PHO) – PHO is the operating name for the Ontario Agency for Health Protection and Promotion. For more information about PHO, please refer to the Our Organization section of the PHO website.

Public health units (PHUs) - There are 36 PHUs in Ontario, which administer health promotion and disease prevention programs to inform the public. They are also responsible for local population health monitoring and surveillance activities, in addition to reporting on specific diseases, conditions, and events as required to MOHLTC, PHO, and/or other provincial organizations or agencies as outlined in legislation and guidance documentation.

Reportable diseases – Reportable diseases are those diseases or events that groups of individuals (e.g., physicians, prescribed health practitioners, laboratory operators) as specified under the Health Protection and Promotion Act have a duty to report to the Ontario MOHLTC, and are outlined in Ontario Regulation 559/91 Specification of Reportable Diseases. Reportable diseases are a subset of infectious diseases.