Chapter 30
Public Health Informatics in Canada

Lawrence E. Frisch, Elizabeth M. Borycki, Alyse Capron, Abla Mawudeku, and Ronald St. John

Abstract Canadian healthcare and public health services are provided to all citizens and to most non-citizen residents of a country with an increasingly multicultural and multi-linguistic population experiencing significant social, economic, and population health disparities. Early successes in Canadian public health informatics included the Global Public Health Intelligence Network (GPHIN), a surveillance system employing automated analysis of international news sources to achieve early identification of public health threats. Two important organizations, "the Canadian Institute for Health Information" Institute and Canada Health Infoway have respectively contributed to national capabilities for data analysis and informatics. The

L.E. Frisch, MD, MPH (✉)
School of Population and Public Health,
University of British Columbia; Vancouver Coastal Health Research Institute,
Vancouver, BC, Canada
e-mail: larry.frisch@vch.ca

E.M. Borycki, RN, PhD
School of Health Information Science, University of Victoria,
3050 STN CSC, victoria, BC V8N 2G7, Canada
e-mail: emb@uvic.ca

A. Capron, Masters of Nursing
Clinical Strategy Unit, HealthLink BC,
290 Perimeter Pl, Victoria, BC V9C 4J6, Canada
e-mail: jacapron@shaw.ca

A. Mawudeku, MPH
Health Security and Infrastructure Branch, Public Health Agency of Canada,
100 Colonnade Road, A.L. 6201A, Ottawa, ON K1A 0K9, Canada
e-mail: abla.mawudeku@phac-aspc.gc.ca

R. St. John, MD, MPH
St. John Public Health Consulting International,
1320 Potter Drive, Manotick, ON K4M 1C6, Canada
e-mail: ronaldstjohn@gmail.com

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nation's public health infrastructure was greatly strengthened following the 2003 severe acute respiratory syndrome (SARS) outbreak, during which a variety of surveillance, communication, and management challenges complicated effective public health response. Many of these challenges called for solutions based on informatics concepts and tools.

Three programs, telehealth/telemedicine, the Ontario Community Health Survey, and British Columbia's "HealthLink BC" exemplify Canadian public health informatics. Telehealth provides consultation and health information to rural residents; the Ontario Health Survey is an internet-based population cohort to facilitate epidemiology studies of cancer and other non-communicable disorders, and HealthLink BC uses a variety of tools to provide preventive and self-care information to patients in the province of British Columbia.

Keywords Canada Health Infoway • Canadian Institute for Health Information • Climate change • Geography • Global Public Health Intelligence Network • Métis • Natural language processing ontology • Panorama • Telehealth • Telemedicine

Learning Objectives

1. Compare the Canadian model for distributing healthcare financing responsibilities between federal and provincial governments to that which exists in the US between federal and state governments.
2. Indicate how reports criticizing the Canadian response to Severe Acute Respiratory Syndrome (SARS) led to informatics enhancements in public health services.
3. Explain how modern public health informatics tools will change outbreak management of SARS or a similar dangerous and highly contagious pathogen compared to the 2003 Canadian experience.
4. Analyze how the GPHIN program combines complex informatics tools with human expert knowledge to assess national news coverage for clues to the possible occurrence of disease outbreaks.
5. List three recently developed informatics systems which have been developed in Canada to meet public health needs.

Introduction: What Makes Canada Unique

In comparison to the United States, Canadians are more supportive of a strong government role in health and somewhat less willing to accept social inequity. Some Canadians, especially those influenced by an increasingly conservative economic climate in the US and Europe, have expressed concern that many aspects of the health care system, including the very small role for a private sector in healthcare delivery, have adversely affected both the quality of health care and health care

innovation [1]. Nonetheless, despite a variety of economic, access, and quality challenges the majority of Canadians likely favor at most limited change in the structure and financing of healthcare [2]. And given the predominance of public care, many of the health and public health informatics projects emerging across Canada do involve the private sector.

In Canada, health information systems often are procured or purchased from private sector corporations by physicians, federal, provincial, and territorial governments as well as regional health authorities. For example, there are many differing types of electronic medical record systems being used by physicians across the country. These systems are sold by private companies that compete for physician customers. Larger scale procurements and purchases have also been made by federal, provincial, and territorial governments as well as by regional health authorities.

There are arguably fewer differences between Canada and the US in public health and public health informatics, though in policy and focus Canada has tended to occupy a middle ground between Europe and the US. The Canadian "public intellectual" and novelist John Ralston Saul has advanced the thesis that, in contrast to the US and Europe, Canada's traditional culture and social contract has been formed out of its heritage as a "Méti" nation [3]. Métis are a major Canadian ethnic group who trace their origins to marriages between Europeans and First Nations or Aboriginals. Saul contends that the Métis heritage has bequeathed to Canadians a sense of fairness and a penchant for negotiation, as an alternative to violence, in this way distinguishing them from their southern neighbor, whose historical relationship with her Native American co-continental inhabitants might most generously be described as a form of ethnic cleansing.

It is within this cultural context (i.e., Canada's fairness and penchant for negotiation) that we consider the factors that have influenced and continue to influence public health and public health informatics in Canada. These factors include geography, climate change, demography, and politics. When considered together they have had a significant impact on Canada's public health system and the subsequent evolution of public health informatics in Canada (Fig. 30.1).

Factors Affecting Public Health and Public Health Informatics in Canada

Geography exerts a major influence on health and healthcare in Canada. Canada is a very large landmass, as a country it is exceeded in size only by Russia. Of the ten largest countries in the world, only Australia has a (slightly) lower population density. Most of Canada's large population centers are close to its southern border with the US, and the northern regions of the country are for the most part sparsely settled. While much of the Canadian north lies below the Arctic Circle, winters are harsh and Northern soil is often inhospitable to agriculture. Transportation infrastructure is limited in the north, though winter ice roads facilitate travel and movement of commercial products between more southern centers and some communities north

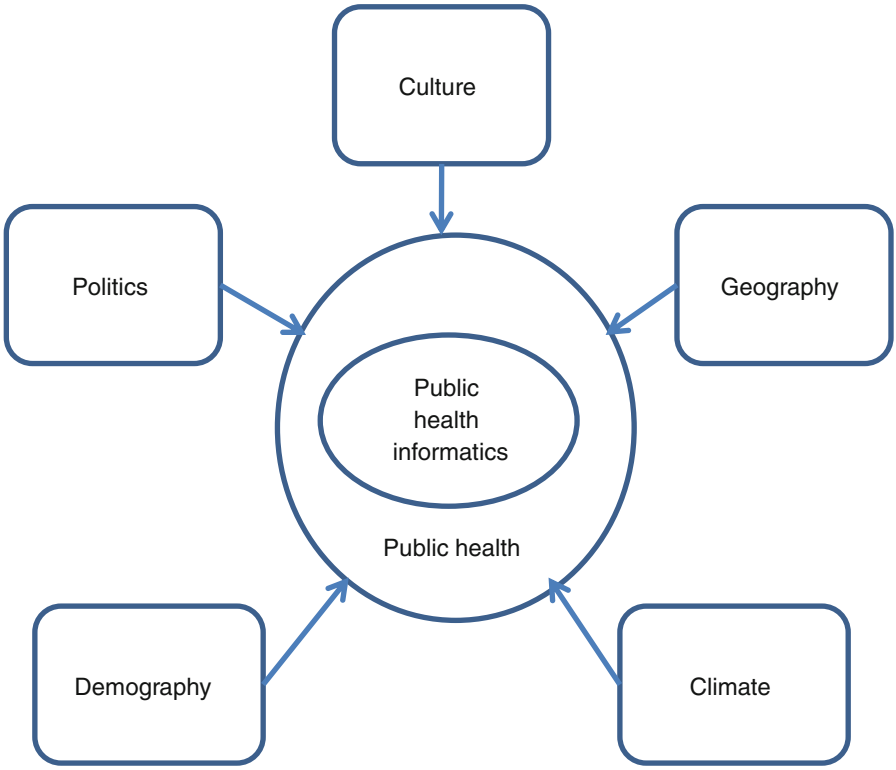

Fig. 30.1 Factors that have influenced the Public Health System and Public Health Informatics in Canada

of Yellowknife in the Northwest Territories. While manufacturing is well-developed, especially in eastern areas bordering the US, much of the rest of the economy relies on resource extraction. Resource extraction industries such as forestry, mining, and fishing have important public health challenges because of high injury rates and the distance of worksites from major healthcare facilities. Providing healthcare and public health services to dispersed populations living in remote areas remains a challenge that has been partly met by the widespread development of telehealth services [4]. While clinical care for rural populations remains the major telehealth focus, this technology has significant potential to address a variety of public health and public policy issues affecting rural and remote communities [5–7]. We will discuss Canadian telehealth applications in more detail later in this chapter.

Climate change, already clearly evident in the north of Canada, will bring major changes to the country; some of these changes will affect public health. As one of the world's largest contributors to atmospheric CO_2, Canada is exerting an effect on global climate far out of proportion to its population. Much of this effect is due to recent Canadian exploitation of very large deposits of oil-yielding sands in northern Alberta. Removing petroleum from these formations requires large amounts of

energy and water and has resulted in the clear-cutting of very large tracts of land. While potential reserves of oil in Alberta's northern oil sands are estimated to be the second largest in the world, exceeded only by those in Saudi Arabia, extracting this resource comes at a huge environmental cost that has important public health (and informatics) implications [8–10].

Demography also has important implications for public health and public health informatics in Canada. Canada is currently one of the world's most multi-cultural societies. Over much of the past several decades Canada has had a policy of relatively open immigration that has brought in very large numbers of new residents and citizens primarily to urban areas. At present nearly a fifth of Canadian residents were born outside of Canada, and nearly a quarter speak a language other than English or French (the two official Canadian languages). With a low birthrate, "traditional" Canadians are aging and not increasing in numbers – a pattern familiar in contemporary Europe, Japan, and China. Nearly all of Canada's recent population growth is attributable to immigration. Providing appropriate prevention and other public health services have led to innovative informatics strategies, especially for refugee immigrants [11].

While this pattern of large-scale immigration has significant implications for both public health and for public health informatics, many feel that Canada's major public health challenge is achieving health equity for its First Nations and Aboriginal populations. Throughout the nineteenth and especially the twentieth century, Canada and its provinces engaged in active, often brutal, suppression of traditional cultural values and indigenous languages. The most egregious of these assaults on First Nation traditions was the forcing of children into often-violent and tuberculosis-ridden boarding schools far from their families and homes [12–14]. Many of these children suffered physical and sexual abuse that has social and psychological consequences well into adulthood [13]. Canadian public health authorities contributed further to serious cultural damage by enforcing tuberculosis hospitalization of First Nations and Aboriginal persons during the early to mid-twentieth century. Tuberculosis facilities were usually far from patients' homes; those who recovered from tuberculosis – like boarding school survivors – carried lasting social and psychological scars from their experiences [15, 16].

If Canada's public health history – and the subsequent health and social disparities experienced by First Nations and Aboriginal citizens – was initially formed by boarding school and tuberculosis policies, Canada's most recent formative public health experience was the sudden emergence of Severe Acute Respiratory Syndrome (SARS) in 2003 [17]. Although detected in a timely fashion by the Canadian Global Public Health Intelligence Network (GPHIN) surveillance system, which will be discussed in more detail later in this chapter, awareness of the rapid emergence of SARS was hampered by incomplete development of public health informatics structures in Canada. A report published by Health Canada, the federal department responsible for national oversight of Canadian health, was highly critical of the Canadian response to the SARS outbreak. Health Canada's assessment identified multiple system failures, including the lack of infrastructure to effectively warn doctors and hospitals about the likelihood of impending SARS cases, appropriate

surveillance requirements, and protective measures required for staff and patients in response to a previously unknown contagious pathogen [17].

SARS severely taxed the healthcare delivery system in Toronto, where the majority of cases occurred. Canada's outbreak was the largest outside of China, and had the highest recorded national case-fatality rate: 44 deaths among 251 cases. Reflection by Canadian experts following the SARS outbreak led to the realization that only public health systems could respond effectively to a health emergency such as SARS. Following SARS, Canada saw enhanced investment in public health infrastructure and a national recognition that providing hospital care alone would not meet all of the country's health requirements.

> Long before SARS, evidence of actual and potential harm to the health of Canadians from weaknesses in public health infrastructure had been mounting but had not catalyzed a comprehensive and multi-level governmental response. The National Advisory Committee on SARS and Public Health has found that there was much to learn from the outbreak of SARS in Canada – in large part because too many earlier lessons were ignored [17].

Politics greatly influences the organization of public health information systems in Canada because the Canada Health Act gives government a major role in the provision of healthcare [18]. Canada is divided into ten provinces and three territories, and each province and territory has responsibility for providing healthcare and public health services to its inhabitants. The federal government has a very limited role in healthcare, but does have responsibilities to prevent chronic disease and injury as well as to respond to public health emergencies and communicable disease outbreaks [19].

The Canadian Institute for Health Information

In 1994 the Federal government created the Canadian Institute for Health Information (CIHI) as an independent not-for-profit corporation whose role is "to serve as the national mechanism to coordinate the development and maintenance of a comprehensive and integrated health information system for Canada" [20]. While much of CIHI's work involves health services data compiled from the healthcare delivery system, with only limited relevance to public health informatics, in 1999 Health Canada gave CIHI responsibility for the Canadian Population Health Initiative (CPHI) [21].

As the Public Health arm of CIHI, CPHI has two main goals:

- to foster a better understanding of factors that affect the health of individuals and communities
- to contribute to the development of policies that reduce inequities and improve the health and well-being of Canadians

CPHI analyzes existing evidence and policy, commissions new research where needed, and seeks to inform Canadians about the determinants of individual and community health [21]. Publicly available results of CPHI analysis are almost

exclusively in the form of reports intended for the public and for policy makers. Much health services data is accessible through CIHI's "Quick Stats" interactive data pages [22]. Most health authorities purchase portal access, and provincial/territorial governments have ready access to CIHI data. CIHI's mandate as a public corporation requires that it recover its costs for services provided, potentially creating data access barriers for researchers, or for others who are not registered users of CIHI's data "portal" [23]. While the responsibility for collecting national public health data is shared among CIHI, Statistics Canada, the Public Health Agency of Canada, and Health Canada, for public health informaticians CPHI remains the best source of Canadian public health data aggregated at the national level.

In 2001, the federal government created a second independent not-for-profit corporation called Canada Health Infoway Inc. [24, 25]. Infoway's purpose is to channel federal funding into a variety of health-related informatics activities, including public health surveillance. One of Infoway's major accomplishments is *Panorama*, an information system being constructed for provincial and territorial Public Health. Other health informatics system solutions have been developed or extended in innovative ways to address the public health issues that arise from the unique factors influencing the health of Canada's population (i.e., culture, geography, politics, demography, and climate), one of which (GPHIN) will be discussed in more detail.

The Global Public Health Intelligence Network (GPHIN)

In September 1994, Canadian television showed people fleeing the city of Surat, India due to an outbreak of possible pneumonic plague. While at the time there might have seemed to be minimal significance or threat to Canadians from a public health tragedy halfway around the world, circumstances proved otherwise. Several hours after the airing of news reports, workers at Canada's largest airport threatened a complete work stoppage in response to the arrival of an Air India flight. It became clear to public health officials that distance was no longer a protection, and that with modern transportation a communicable disease in a distant place could impact Canada within hours or days. Surat's plague was a wake-up call: there was a need for early warning of possible threats to the Canadian public generated by movement of potentially-diseased or contaminated people, animals, animal products, and processed foods around the world.

By the early 1990s, the Canadian government was determined to utilize innovative communications and information technologies for health information systems [26]. A set of pilot projects to demonstrate the use of the Internet for accessing and exchanging health surveillance information was undertaken, and included the development of the GPHIN prototype system in 1998. GPHIN was designed to continuously monitor global news media on the Internet and gather current information about possible disease outbreaks worldwide. Because news media may be imprecise and subject to reporters' biases, GPHIN entered into an agreement with

the World Health Organization (WHO) to establish a process to verify disease outbreaks of potential international public health concern [27]. WHO's role was to request verification by Member States to corroborate information originating from unofficial sources on the Internet.

GPHIN Architecture

Once verification was assured, GPHIN proceeded to build an infrastructure, processes, and components for a robust early-warning system, using reports from news media sources around the world. Rather than scanning individual web sites, GPHIN chose to use news aggregators as the primary information source. News aggregators are websites or other electronic data sources that use automated systems to scan and collate news reports from a variety of sources [28]. As the prototype GPHIN system evolved, news media sources and languages were expanded to include Arabic, Chinese (simplified and traditional), Farsi, Portuguese, Russian, and Spanish media sources. New public health issues such as infectious diseases in animals and food, radiation events, product safety concerns, and natural disasters were added. The automated Internet-based monitoring component operates 24/7, gathering, filtering, and categorizing relevant news reports. The reports are presented in chronological order for human analysis by a multilingual, multidisciplinary team of analysts, who ensure public health relevance and identify conditions notifiable under the revised International Health Regulations [29]. During public health emergencies such as SARS, GPHIN analysts work around the clock to provide users with regularly updated status reports on the emerging situation.

GPHIN: Management of Information

GPHIN has added advanced informatics technologies to accommodate an expanding volume of news reports and the continuing addition of new languages. These technologies include a machine translation engine combined with data filtering and manipulation tools to identify duplicate or irrelevant reports [30]:

- **Rating Algorithm**: Reports are rated for quality and relevancy according to an algorithm developed for use by human raters.
- **Categorization**: GPHIN uses a filtering structure to categorize reports into a variety of categories, examples of which include human diseases, animal diseases, plant diseases, natural disasters, and chemical or radiological exposure incidents. This process utilizes a *natural language processing ontology* system that classifies reports by automated content analysis.
- **Relevancy Scoring**: A computerized algorithm uses a combination of subject categories and keywords identified in the articles to produce a numerical score for each article. Those with low automatically-assigned relevancy are not posted

but receive expert human analysis. Those with moderately high scores are also sent to analysts for review, but are simultaneously posted on the GPHIN site accompanied by a statement that human review is pending. Articles with very high scores are posted immediately.

Currently, over 20,000 news media sources are monitored in nine languages. Search syntaxes are used to identify and gather relevant news reports that are then forwarded to the multilingual platform. News reports are further filtered and categorized according to the GPHIN system taxonomy as described above. Occasionally, news reports not captured by the automated process are manually entered into the GPHIN system. Each news report is assigned a relevancy score based on keywords, automated news report analyses, and the GPHIN system taxonomy. Analysts systematically review reports given low relevancy scores to ensure the accuracy of data mining algorithms. Analysts may use query functions applied to an archive of prior reports to confirm the relevance of the filtered news reports and to identify trends or possible relationships between apparently disparate events. These tools greatly facilitate the work of human analysts.

To be effective, the GPHIN system must identify relevant information and separate it from "noise", such as irrelevant and duplicate media reports. As is often the case in public health informatics, establishing criteria to monitor and retrieve relevant news reports involves a delicate balance between being too specific and being too general. While duplicate reports are filtered automatically, other criteria are adjusted regularly to ensure comprehensive capture of relevant public health issues. Because of its informatics complexity, GPHIN requires multidisciplinary human analytic and interpretive skills of a high order. Analysts play a crucial role in identifying situations that may have serious public health consequences and flagging them as alerts. In addition to linguistic skills, GPHIN analysts require broad knowledge in public health, journalism, medicine, biology, chemistry, environmental science, economics, and surveillance technologies.

Users of the GPHIN system are able, without cost, to access the multilingual system from anywhere there is Internet service using a password-protected interface. Users have ready access to GPHIN analysts so they can request assistance regarding specific queries, ask for clarification on translated news reports, or provide feedback on any of the features and functions of the GPHIN system.

GPHIN Value

Based on several studies, GPHIN's system has proven to be valuable both during and in the absence of a public health emergency. GPHIN has been a primary source of event-based information utilized by WHO and the International Health Regulations [30–32]. The proportion of verified events for which news media were the initial reporting source has varied from year to year, but GPHIN remains an important early warning and situational awareness tool.

Some of GPHIN's more important contributions came during the SARS epidemic, the appearance of avian influenza (H5N1), and the H1N1 influenza pandemic. During all the recent major global outbreaks, GPHIN reported not only on the magnitude of the outbreak, but also on related issues such as the type of control and prevention measures being considered and implemented by countries worldwide.

GPHIN Challenges

While the information from news media is useful, there are ongoing challenges to ensure that the information is reliable and accurate. It is often difficult for GPHIN analysts to ascertain which news reports provide the most accurate information. While analysts favor news reports in which the source for the information is an official representing a governmental healthcare organization or an international body, over the years analysts have become aware of news sources that may have political motivations to potentially distort factual material. GPHIN has also noted that social media such as Twitter and Facebook have emerged as potentially important sources that can indicate that an event of significance is beginning.

False positives occur occasionally, especially when information has been incorrectly translated from one language to another. For example, in Arabic the word for chicken pox is very similar to the word for smallpox and thus can easily be misinterpreted. Subsequent news reports in Chinese and French clarified that a reported outbreak of chicken pox in Yemen had been incorrectly translated from Arabic to English as smallpox [33]. To ensure accuracy of the system, GPHIN analysts must understand the style of writing and the use of language in different regions of the world.

Timeliness is important. While delays may occur before a GPHIN analyst can issue an alert published in a distant time zone, GPHIN has exploited advances in technology to shorten the time between the publication and retrieval of news reports. The GPHIN system gathers news reports every 15 min, and automated processing makes these reports available for initial viewing in less than a minute. New technologies are enabling ever-faster dissemination of both news and alert reporting. Speech-to-text and text-to-speech technologies allow a statement made by an official during a press conference to be automatically transformed into text and quickly disseminated worldwide, while alerts generated by the GPHIN system can be sent equally rapidly to users via email, which can be rapidly accessed by the user directly or through smart-phones and other digital devices.

GPHIN Summary

The GPHIN system has been stable and robust for nearly two decades. The team of IT specialists who support the GPHIN system has been instrumental in managing

technical difficulties that have arisen. The team continuously assesses the functionality of the GPHIN system to see where improvements can be made to benefit users and analysts. The continuing trend of globalization and increased human mobility means that global public health security is increasingly under threat [34]. Large scale migration and human incursion into areas shared with wildlife increase the risk of infectious disease transmission. War and other conflict often destroys surveillance and communication pathways that make large-scale emergence of these diseases more probable. With the 2005 revision of the International Health Regulations, all nations have an increased need for rapid information to comply with reporting regulations [29]. As an event-based surveillance system, GPHIN has demonstrated its capability to enrich traditional surveillance and support early-warning functions by monitoring the occurrence and evolution of disease outbreaks and other events of public health importance.

Leveraging Electronic Health Records for Public Health

Public health surveillance tools are an essential component of Canada's health information infrastructure, but many other components also have important public health applications. For example, data extracted from provincial information systems has been used for occupational disease and injury surveillance; to study the risk of falls; to evaluate whether methadone, in conjunction with other harm reduction initiatives, can reduce transmission of Hepatitis C among individuals who inject opiates; and for many other topics. Likewise, electronic medical records have also been used to assist with public health interventions. For instance, a large group practice in Sault Ste. Marie, Ontario, used its electronic records to identify and schedule vaccinations for patients who might most benefit from H1N1 vaccination [35]. Many other similar applications are possible. Public health units in Vancouver have managed to link a legacy public health electronic record system to Panorama so that some vaccination-related information can be shared between the two systems, reducing the need for duplicate data entry [35].

HealthLink BC

Telehealth for Public Health Surveillance and Response

There has been a substantive growth in *telehealth* services and usage across Canada over the past decade. Telehealth services use computer and video technology to allow patient-clinician interaction from a distance. Not only does this technology allow specialist services for clients who live far from major medical centers, but it can serve to provide information, advice, and clinical consultation for those seeking

assistance with health issues. Telehealth practitioners, policy makers, and researchers have also observed that telehealth can be a source of public health information and surveillance intervention as it helps citizens to address their health needs, while at the same time supporting population health. For example, HLBC played a key role in the Provincial H1N1 outbreak management response, including notification, trending, and responses such as immunization.

HealthLink BC (HLBC) is a non-emergency health information service that provides BC and Yukon residents with 24-h access to medically-approved information and advice from anywhere in the province [39]. HLBC was launched in 2008 and operates as a branch within the Health Sector Information Management/Information Technology Division (HSIMIT) of the B.C. Provincial Ministry of Health. HLBC operates, maintains and enhances a 24/7/365 contact center and web-based platform that provides the general public, within British Columbia and the Yukon, with access to health related information and advice, health navigation services, and timely disposition and/or resolution of health related problems. HLBC provides access to an organized system of real-time health advice, information, and navigation that supports and educates the public and health care providers around both episodic and chronic care through multiple delivery channels, including telephone services (8-1-1 and 10 digit dialing) for delivery of HLBC nursing, dietitian, pharmacy, navigation, and print and web services. Because of partnerships with the British Columbia Centre for Disease Control (BCCDC) and the Ministry of Health (MOH), HLBC is able to access and publish real-time information and advice researched and developed by these key governmental agencies [36].

The HLBC contact centre is staffed by registered nurses, dieticians, and pharmacists, and services include:

- *Health information* – provision of credible, reliable information on a wide variety of health topics.
- *Health advice* – the application of clinical skills and knowledge to triage, advise, and assist an individual (or their care giver) with self-care or management, or a colleague with enhanced practice and/or service provision.
- *Clinical consultation* – the provision of specialized clinical advice to health professionals to assist in the management of an individual in their care.
- *Professional engagement* – engagement with relevant professional communities and supporting governance bodies on matters related to the best provision of service. This may include working with the public sector, private sector, research bodies, academic institutions, and professional licensing organizations.
- *Encounter information* – pertinent information about the person(s) in receipt of service and their interaction with HLBC.

HLBC maintains key records and analytics related to its services, appropriately capturing data from both phone- and web-based interactions. This data includes the geographic location of the client and the topic or area of concern. HLBC routinely

processes this data for significance, correlation, and clustering, and has utilized this data to predict and respond to various public health-based occurrences.

Using H1N1 as a case study, HLBC was able to identify its capacity as an organization to assist in public health surveillance. Through routine analysis of data captured in its decision support and integrated client record system, HLBC identified an increased incidence of respiratory and gastrointestinal-based symptoms, and was further able to associate this variation to both geographical area and demographical age and gender information. Upon recognition of this emerging issue, data was circulated to other public health agencies such as the BCCDC and the Ministry of Health (MOH.) This analysis assisted with response readiness, targeting of responses, and timely dissemination of key information to the general public, serving to enhance the content and timeliness of BC's response to this public health concern.

HLBC is working the the MOH to analyze HLBC telephone call classifications and volumes and web data (searches, views and Google trends) to support the identification of emerging public health issues. HLBC continues to enhance its role as a key sentinel public health surveillance program.

Health information and advice can be provided using Internet and telephone services. Telehealth organizations like HealthLink BC are partnering with public health organizations (e.g., BCCDC) as well as ministries of health to share and access information about disease outbreaks. Such work is essential not only in recognizing a disease outbreak when it is occurring, but in developing a response that will help the public during such events.

Summary

Canada has a rich cultural and political history that has been greatly influenced by its complex relationship with Aboriginal peoples and by successive waves of immigration to a large country rich in natural resources. The Canadian healthcare system provides near-universal access to all residents through a public "single payer" structure, which stands in sharp contrast to the more privately focused system in the US. While Canada's public health infrastructure is much smaller than that in its more populous southern neighbor, Canada has made a number of unique contributions to public health informatics; among these are the GPHIN surveillance system, Panorama, HealthLink BC, and the Internet-based Ontario Health Study [37]. GPHIN was arguably the first automated surveillance tool for international public health event surveillance and served as the model for a variety of similar and complementary surveillance systems. While perhaps of less international importance, Panorama, HLBC, and other telehealth programs provide national and regional informatics solutions to the provision of public health to Canada's unique demographic mixture of dense urban populations and highly dispersed rural and remote settings.

Review Questions

1. Compare the role of the Canadian Federal government in health and public health care to that in the US.
2. How did Canada's 2003 experience with SARS lead to changes for the Canadian Public Health system?
3. How was GPHIN able to identify the SARS outbreak in China well before it was reported in the professional media or on "standard" communicable disease surveillance sites?
4. What is the role of the Canadian Institute for Health Information (CIHI)? What unit within CIHI is responsible for the collection and analysis of public health data?
5. What contributions does telehealth make to the improvement of public health in sparsely populated rural and remote areas of Canada?

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