CORE
Public Health Functions for BC

Evidence Review:
Health Assessment & Disease Surveillance

This paper is a review of the scientific evidence for this core program. Core program evidence reviews may draw from a number of sources, including scientific studies circulated in the academic literature, and observational or anecdotal reports recorded in community-based publications. By bringing together multiple forms of evidence, these reviews aim to provide a proven context through which public health workers can focus their local and provincial objectives. This document should be seen as a guide to understanding the scientific and community-based research, rather than as a formula for achieving success. The evidence presented for a core program will inform the health authorities in developing their priorities, but these priorities will be tailored by local context.

This Evidence Review should be read in conjunction with the accompanying Model Core Program Paper.

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EXECUTIVE SUMMARY

This evidence review focuses on the health assessment and disease surveillance core program. It identifies categories of best practices and the processes that enable best practices and speaks to the integration of the practice and the players.

This paper resulted from a mix of key informant interviews, Internet searches and a literature review using PubMed and EBSCO. The public health key informants included: health authority Chief Medical Health Officers, researchers in health authorities and tertiary care organizations and Ministry of Health staff.

The health assessment and disease surveillance core program lacks evidence of effectiveness with respect to its practice, but is informed by expert opinion. This paper describes those practices used by and/or supported by multiple and reputable sources. These sources provided consistent recommendations related to the main categories of best practices: data collection, analysis and interpretation, dissemination and utilization/action.

Data collection practices include identifying data sources and current needs, collecting data from a variety of data sources and collecting data in a standard fashion. Analysis and interpretation practices include utilizing standard approaches and methodologies. Dissemination practices include defining the message and defining the audience. Action/utilization practices include developing a connection between the people who would use the data and those who collect it.

Two enabling factors, organization and capacity, are key to an effective health assessment and disease surveillance program. Organizations must define participant roles to ensure there is a clear definition of "who is doing what." Other important success factors related to organization include leadership, formal and informal relationships, strong infrastructure in critical areas (e.g., laboratories) and data quality.

With regard to building capacity, all informants poke to the need to increase funding in order to maintain current practices and undertake new 'best practice' initiatives, and to train staff required to undertake health assessment and disease surveillance work.

1.0 OVERVIEW/ SETTING THE CONTEXT

In 2005, the British Columbia Ministry of Health released a policy framework to support the delivery of effective public health services. The *Framework for Core Functions in Public Health* identifies health assessment and disease surveillance as one of the 21 core programs that a health authority provides in a renewed and comprehensive public health system.

The process for developing performance improvement plans for each core program involves completion of an evidence review used to inform the development of a model core program paper. These resources are then utilized by the health authority in their performance improvement planning processes.

This evidence review was developed to identify the current state of the evidence based on the research literature and accepted standards that have proven to be effective, especially at the health authority level. In addition, the evidence review identifies best practices and benchmarks where this information is available.

1.1 An Introduction to This Paper

This evidence review focuses on the health assessment and disease surveillance core program. It identifies categories of best practices and the processes that enable best practices and speaks to the integration of the practice and the players.

This paper is organized in three sections. The first section describes categories of best practice in health assessment and disease surveillance, and the second describes a number of "enablers"[1] that cross the categories as illustrated in Figure 1.

Figure 1: Categories and Enablers of Health Assessment and Disease Surveillance
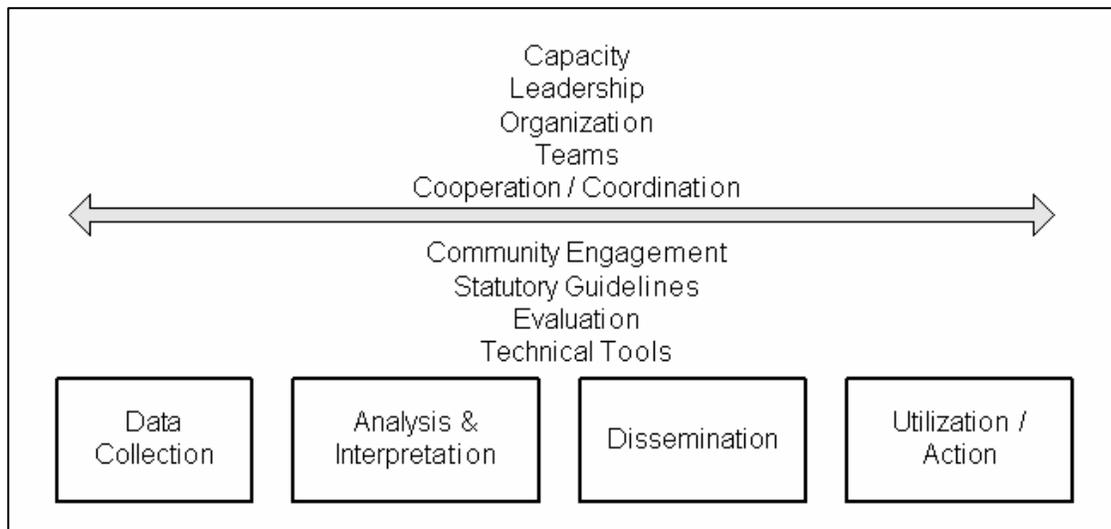
The final section summarizes the key findings.

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[1] Enablers are organizational factors that enable and support best practices.

2.0 METHODOLOGY

This paper resulted from a mix of key informant interviews, Internet searches and a literature review using PubMed and EBSCO. The public health key informants included: health authority Chief Medical Health Officers, researchers in health authorities and tertiary care organizations and Ministry of Health staff. Researchers outside the province who had published research relating to this topic were also contacted. The search parameters for the literature review included health assessment, disease surveillance, best practices and specific practices mentioned by the key informants. The practices chosen focused on jurisdictions of similar size to British Columbia health authorities.

Best practices in health assessment and disease surveillance that were based on randomized control trials or similar standard measures of evidence were difficult to find; therefore, the practices identified in this review are based on guidelines, consensus statements or current practices. A summary of the practices identified in this paper is presented in Section 6.0.

The concepts of health assessment and disease surveillance are closely linked and some distinctions in this paper may seem artificial. The British Columbia Centre for Disease Control is working on an evidence paper related to Infectious Diseases, which is part of disease surveillance; therefore, this paper will place less focus on that area, but will instead address non-infectious disease surveillance relating to injuries, cancer clusters, chronic diseases and risk behaviours.

2.1 Definition of Terms

The literature contains various definitions of the key terms used in this paper (see Appendices A and B for the entire list and their sources). This section documents the definitions chosen for this paper.

2.1.1 Health Assessment

Health assessment is the regular collection, analysis and sharing of information about health conditions, determinants, risks and resources in a community in order to guide public health programs and policies (Public Health Improvement Plan, as cited in University of Washington n.d.).

2.1.2 Disease Surveillance

Disease surveillance is the ongoing, systematic collection, analysis, interpretation and timely dissemination of data to the appropriate audiences for public health action, including disease prevention, health promotion, program planning and evaluation.[2]

2.1.3 Comparing Health Assessment and Disease Surveillance

There are differences and similarities between the two as illustrated in Table 1.

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[2] This definition is a synthesis of several definitions found in the literature. See Appendix A for a complete list.

Table 1: Differences/Similarities between Health Assessment and Disease Surveillance

Characteristic	Health Assessment	Disease Surveillance
Key Dimensions of Person, Place, Time, Factors	Of interest	Of interest
Person	Groups	Individuals and groups
Place	Small geographic area such as local health area	Often very small geographic area (e.g., an individual restaurant), but sometimes larger (e.g., a cancer cluster)
Time	Years to decades	Hours to days
Factors	All diseases, conditions, health determinants, health risks, health status	Mainly communicable diseases, but also risk behaviours, injuries and some chronic diseases
Intent is to anticipate "clusters" in either space or time	Yes	Yes
Focus	Long-term planning	Detection/Reactive
Continuous regular data	Desirable	Imperative
Data collection methods	All methods used to obtain data	Directly from client or physician or indirectly from health service generated data(e.g, laboratories, Medical Services Plan, hospitals) and via disease registries
Analysis and interpretation of data	Small numbers not utilized	Individual cases analyzed and aggregated as appropriate
Dissemination of information	Broad: From health professionals, to researchers, to policy makers, to program planners, to the public	Narrow and broad: Individual case information exchanged between health care providers and public health staff, aggregate data interpreted and disseminated to those with a need to know

Wolfe and Yuan (2001) identified four common principles that can be applied to disease surveillance systems. These include:

- Being selective in the conditions for analysis.

- Ensuring effective communication with collaborators.

- Building data collection systems in stages.

- Making ongoing improvements and upgrades as part of ongoing evaluation.

2.1.4 Evidence-Based Practice

Evidence-based practices are "practices which have consistently demonstrated positive outcomes in multiple research findings" where research findings refer to epidemiological or clinical studies (Guilford Center 2006).

In many fields, evidence—proof based on epidemiological or clinical studies that an action makes a difference—is seen as the only basis to identify a best practice. The field of health assessment and disease surveillance suffers lacks this type of evidence of effectiveness, but is informed by expert opinion. Both evidence and expert opinion attempt to anticipate disease clusters and outbreaks. If successful, either method could be looked upon as a best practice, sometimes defined as "a continual process of reflecting on how to improve and enhance our practice" (Nova Scotia Best Practices Framework n.d.).

2.1.5   Better and Best Practices

Better practices are "actions and processes - plausible, appropriate, evidence-based and well-executed - that will reduce the current and future burden of disease" (Moyer et al. 2001, as cited in Ministry of Health 2005. In the absence of evidence, better practice is one used by and/or supported by multiple and reputable sources, which seems to make a difference without having been proven; there may be several "better practices, but not one that is best."

The definition of best practices used in the the Core Public Health Functions Performance Improvement Process is "a strategy or program for which a comprehensive review of the available literature has been completed to determine its effectiveness in addressing a given public health problem. Three types of reviews exist; in order of increasing scientific strength these are: 1) narrative, 2) qualitative and 3) quantitative. (New Hampshire Institute for Health Policy and Practice n.d., as cited in Ministry of Health 2006).

Best practice is often used in the literature. It is confined by time and context in that tomorrow, a better practice may emerge to supercede today's best practice. Similarly, best practice in one context may not turn out to be best practice in another context. In this paper, the term best practice is used to describe what is commonly seen to be the most effective and efficient method to address an issue, whether based on evidence or on the opinion of experts.

3.0 CATEGORIES OF BEST PRACTICES

The interviews with key informants provided guidance as to how to categorize best practices in health assessment and disease surveillance. The following categories reflect the key functions of this program:

- Data Collection.

- Analysis/Interpretation.

- Dissemination.

- Utilization/Action.

The Advisory Committee on Population Health and Health Security and the Surveillance Systems for Chronic Disease Risk Factors Task Group (2005) also used these categories.

3.1 Data Collection

3.1.1 Planning Data Collection

Planning data collection involves both understanding the purpose of the data collection and defining the condition and/or population clearly. Teutsch and Churchill (2000) describe a range of purposes for surveillance systems. These include:

- To estimate the magnitude of a health problem in the population at risk.

- To understand the natural history of a disease or injury.

- To document the distribution and spread of a health event.

- To assess the quality of health care.

- To facilitate planning.

Case definitions are particularly important in disease surveillance. These definitions delineate the criteria relating to person, place and time which distinguish between 'suspected' or 'confirmed' cases; this, in turn, shapes the data collection requirements.

3.1.2 Data Sources and Methods of Collection

Data for health assessment and disease surveillance can be collected from a number of sources. The principal sources of data include:

- Demographic data.

- Laboratories.

- Environmental data and biomarkers.

- Education system.

- Health care utilization.

- Surveys (often with a component identifying risk factors).

Demographic Data

While specific attributes of individuals are important to disease surveillance, broad demographic data is used more in health assessment. The acquisition of data from multiple sources was of particular interest to the key informants: the collection of a very broad range of data outside of health data is considered best practice. This demographic data includes (but is not limited to) employment statistics, criminal justice data, census data, youth risk assessment data, age-specific data, high school dropout rates and cancer registries. Methods of data collection can vary from negotiating and purchasing data from Statistics Canada, to special surveys done by outreach workers to obtain data on the health status of the homeless, to qualitative data from focus groups.

A survey on child and youth health from Ontario provides guidance on the type of data which is of greatest interest to health assessment. Three-quarters of survey respondents wanted to know about the population attitudes, 63% wanted information on the behaviour of youth, almost 60% of respondents wanted census-type information, 1/3 of respondents wanted statistics about the health of the population and 60% wanted information from the research literature (Gardner et al. 2005).

Laboratories

Medical laboratories are a valuable asset for obtaining disease surveillance data. Medical laboratories collect data in all disease-related disciplines and collect data for over 80 per cent of all patient-based decisions. Laboratory data sources encompass all disease diagnostic disciplines (surgical pathology, hematology, chemistry and microbiology).

Environmental Data and Biomarkers

Surveillance for environmental exposures or risk factors provides information for health assessment and disease surveillance. Health Canada maintains an inventory of the various environmental and occupational health data sources and surveillance activities.[3] These sources range from British Columbia's Air Data and Management System to BC's Watertrax (water quality) system. In the United States, the Agency for Toxic Substances and Disease Registry (1994) produced a guidance manual which categorized the background information and analytical data required to review the health impacts of hazardous substances released into the environment.

There is a growing recognition of the utility of collecting data on biomarkers as a health assessment tool and as an early warning system for emergent health issues. Studies are required to establish appropriate biomarkers for disease development (Health Canada 2000). Biomarkers can assist in the quantification of effect due to exposure and may help identify cancer clusters and other conditions. Biomarkers are also being used to study the association between nutrition and chronic diseases (National Public Health Institute n.d.). Finally, biomarkers such as cotinine,

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[3] See http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/inventory-repertoire/index_e.html .

are used for measuring human exposure to environmental tobacco smoke and for predicting potential health risks for exposed individuals (Benowitz 1999).

Education System

The education system is mentioned in the literature as a source of data for both health assessment and disease surveillance. Data from this source, for example, monitor trends in obesity (Jones et al. 2005). School absenteeism data has been used for monitoring outbreaks of illness like influenza, asthma (air pollution) or substance abuse (Besculides et al. 2004). In British Columbia, the Ministry of Education is implementing a new student information system, the BC Enterprise Student Information System (BCeSIS) which could provide real-time school attendance information to health authorities to integrate into their disease surveillance systems.[4]

Health Care Utilization

Health care utilization data is available for health assessment and disease surveillance. For example, in British Columbia, routinely collected health utilization information is being reviewed to determine if it can identify imminent outbreaks of influenza. In the United States, over-the-counter prescriptions is another area under review (Das et al. 2004).

In Australia, the Bettering the Evaluation And Care of Health (BEACH) project provides health assessment and disease surveillance information from general practitioners (GP) on a continuous basis. The purpose of BEACH is to:

- "Collect reliable and valid data about general practice which is responsive to the ever-changing needs of information users.

- Establish an ongoing database of GP/patient encounter information.

- Assess patient based risk factors and the relationship these factors have with health service activity.

- Provide accurate and timely data to a wide variety of users including government bodies, GP organizations, consumers, researchers, and the pharmaceutical industry" (Australian General Practice Statistics and Classification Centre n.d.).

General practitioners are paid to complete a comprehensive survey regarding the patient seen, the reason the patient sought medical care, the problem managed and treatments provided for each encounter.

In Canada, the National Diabetes Surveillance System(NDSS) is an example of a surveillance system based on standard health care utilization information collected by the provinces.[5] Both hospital admissions and physician visits are used to determine if a patient has met the case definition of two visits with a diagnostic code of diabetes within two years. BC is also utilizing drug prescription data in its case definition.

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[4] For more information about BCeSIS, contact: D. Scott MacDonald, Director, Business Integration, Ministry of Education (e-mail: D.Scott.MacDonald@gov.bc.ca).
[5] For more information on NDSS, see http://www.phac-aspc.gc.ca/ccdpc-cpcmc/diabetes-diabete/english/ndss/.

At times, health utilization information is not collected even though the key informants and other experts suggest the best practice would be to collect it. The most salient example is emergency room data as raised at the Canadian Association of Paediatric Health Centres' (CAPHC) 2002 Annual Conference entitled: "Child and Youth Health in the 21st Century: Where is the Evidence?" The National Ambulatory Care Reporting System (NACRS) is starting to provide this information. All facilities in Ontario and some facilities in Prince Edward Island and Nova Scotia are using this system. However, according to the Canadian Institute for Health Information (2005), who maintains this database, only three BC hospitals use it to report emergency room data.

Evaluations can focus on specific categories of health assessment and disease surveillance. British Columbia might benefit from reviewing areas of interest in other jurisdictions. For example, Australia has recently completed a review of data collection regarding congenital anomalies (Birch, Grayson, and Sullivan 2004), and one of the key informants interviewed for this paper raised concerns about the collection of similar data in British Columbia. If the congenital anomaly is not identified immediately, the information may be collected on the discharge abstract. This data can take 18 months to be organized into a database that can be used by researchers. This delay reduces the likelihood of identifying patterns that might indicate an intervention is required.

Surveys

Surveys can provide focused information for health assessment and disease surveillance. For example, in Ontario, the Rapid Risk Factor Surveillance System (RRFSS) allows ongoing tracking of indicators within a community. Several local public health units are conducting ongoing surveys of their populations, allowing early identification of emerging trends. Such surveillance systems are critical to help identify behavioural trends, thereby enhancing the likelihood of effective intervention and the resulting population health gains.[6] The RRFSS is used to monitor health issues such as smoking, immunization, obesity and mammography, but is also used to collect information on emerging issues such as West Nile Virus and Severe Acute Respiratory Syndrome. The RRFSS results are used to support program planning and evaluation, to advocate for public policy development and to improve community awareness about public health issues (Regional Municipality of Halton n.d.; Health Canada 2004). Similar types of online surveys are done in the United States.[7] Closer to home, another example of a focused survey is the work done by BC Stats. They have initiated a continuous time series survey for Tobacco Control.[8]

The federal government supports surveys related to health assessment and disease surveillance, including the following examples:

- The Canadian Community Health Survey (CCHS) collects information regarding demographics, risk factors and the self-reported health status of individuals. The survey is

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[6] For more information on the Rapid Risk Factor Surveillance System, see http://www.rrfss.on.ca/.

[7] An example is the Community Health Survey, undertaken by the Public Health Division of the St. Charles, Missouri, Department of Community Health and the Environment. For more information, see http://www.scchealth.org/docs/ph/ph_docs/Survey/index.cfm.

[8] The survey can be found on the BC Stats website at: http://www.bcstats.gov.bc.ca/data/lss/social.asp.

repeated every three years, providing snapshots of the health of Canadians over time. The survey is used to track activity levels and obesity, for example, and can relate this information to income and self-reported chronic diseases. The results are widely used by the province and by health authorities in their work. The CCHS does not provide as much local input and access as the RRFSS.

- The Canadian Tobacco Use Monitoring Survey (CTUMS) provides timely, reliable and continual data on tobacco use and related issues. The survey's primary objective is to track changes in smoking status and amount smoked, particularly for 15–24-year-olds, who are most at risk to begin smoking.

- The federal government, as part of its Integrated Strategy on Healthy Living and Chronic Disease, funds the Healthy Living Knowledge Development and Exchange. This project focuses on surveillance and on "…the development, synthesis, translation and exchange of knowledge on physical activity and healthy eating…to guide population and public health promotion activities (Public Health Agency of Canada 2005a).

Surveys done at schools provide insight and inform the discussion regarding the health of youth. Examples include:

- In British Columbia, the McCreary Centre collects information on young people's behaviours and attitudes through its Adolescent Health Survey. The Centre conducts the survey every five to six years, and completed its third cycle in 2003.

- In Ontario, the Region of Peel released a wide-ranging report on the health of children in 2002. The report revealed a lack of information in several areas, such as bullying, obesity, substance abuse, dental health, injury, sexual health and mental health. The School Health Assessment/Survey has been designed to gather more data on these important areas (Peel Public Health 2005).

3.1.3 Data Sharing

Researchers have identified the facilitators to data sharing. A report from the Public Health Foundation found that the governmental agencies were not sharing health information in the USA (Giordano, Bechamps, and Barry 1998). It documented instances in which data sharing was successful and identified major facilitators:

- Agencies require leadership to understand, appreciate and promote data sharing.

- Informal relationships between staff are the most essential and greatest aid to data sharing because they were able to break down agency-wide barriers to data sharing.

- Formal relationships, often Memoranda of Understanding, are important to ongoing data sharing efforts, along with, and sometimes instead of, informal relationships.

- Data sharing is most successful in environments where agencies have high quality data.

These facilitators are also true in British Columbia. For example, the Office of the Child and Youth Officer successfully integrated data from the Ministry of Health and the Ministry of

Education with its own data. It used both informal connections and formal research agreements to break down barriers and organize the sharing of data.

3.1.4   Data Transfer

Related to both data collection and data sharing is the concept of improved data transfer. Best practices in this area relate to quality, automation and integration.

The British Columbia Centre of Disease Control (BCCDC) has established quality standards for laboratories. BCCDC notes that to obtain high quality laboratory data, a strong laboratory Quality Management System (QMS) must be in place and function. BCCDC is a recognized leader in the Pan-Canadian Public Health Lab Network in the area of a quality management system. Routine monitoring of performance indicators is being put in place with regular statistical reporting.

Automated data transfer is integral to the development of laboratory information systems. Examples from the United States include the Laboratory Data Sharing and Interoperability (LDSI) and systems from the STARLIMs corporation. The LDSI initiative facilitates the electronic transfer/sharing of laboratory order entry and results reporting among the United States Department of Defence, the Department of Veteran Affairs and commercial reference laboratories. The Department of Defense uses this application to electronically route laboratory requests to the Composite Health Care System Laboratory at Tripler Army Medical Center. Upon completion of the ordered test, Tripler electronically routes the laboratory test results back to the Department of Defense. Computerized order entry and results reporting support the delivery of high quality patient care and patient safety by eliminating much of the manual entry of test results which may contribute to medical errors (US House of Representatives 2004).

STARLIMS Corporation provides an integrated laboratory information management system that is designed to efficiently manage the functions of a multidisciplinary Public Health Laboratory (PHL). STARLIMS is an enterprise-level information system that brings together all PHL activities into a single platform, offering comprehensive public health reporting, surveillance and networking capabilities compatible with national and international standards. National and local PHLs are at the core of the public health delivery system, linking almost every facet of the public health infrastructure, from disease control and prevention, to maternal and child health, environmental health, food safety, epidemiology and emergency response. Consequently. PHLs interact with a wide range of agencies including local hospitals and clinics, environmental and agricultural institutions, health science centres and law enforcement agencies.

In British Columbia, BCCDC, as part of the Provincial Health Services Authority, is helping to build an automatic information transfer system for laboratory data across the province. This would integrate information from the pre-analytical phase of test requests (i.e., order entry) to the analytical phase (i.e., laboratory testing) to the post-analytical phase (i.e., communication of laboratory results).

In addition to CDC, effective data transfer is important in other areas of health assessment and disease surveillance. The Agency for Toxic Substances and Disease Registry states that hazardous sites are making their environmental databases available in machine-readable formats

and that this electronic transfer greatly speeds the review and analysis process by eliminating the need for duplicate data entry and verification. The Agency also reports that data in an electronic format can be imported to a Geographic Information System (GIS) so that disparate, geographically based information, such as contaminant distribution, census data and land uses, can be integrated and interpreted. A final practice the Agency suggests is the transmittal of the entire analytical data set rather than only selected or summary data (Agency for Toxic Substances and Disease Registry 1994).

3.1.5 Data Standards

The use of data standards is a best practice important for both health assessment and disease surveillance. British Columbia has a history of using data standards in its indicator reports. For example, the Office of the Provincial Health Officer developed a set of population health indicators, which were published in the Provincial Health Officer's annual report (2003). Other examples include *Health Goals for British Columbia* (Provincial Health Officer 1997), and Ministry Objectives and Indicators Reports[9]. BC also had a standards council that approved data standards for public health such as immunizations.[10]

Canada Health Infoway and the Canadian Institute for Health Information are also working on data standards. These agencies standardize the coding of information so it can be analyzed. The Logical Observation Identifiers Names and Codes (LOINC) is an example of a standard used in public health laboratories that facilitates the exchange and pooling of results, such as blood hemoglobin, serum potassium or vital signs, for clinical care, outcome management and research (Regenstrief Institute n.d.).

Ontario recognized the need for a consistent set of definitions for health indicators when it developed population health indicators. The Association of Public Health Epidemiologists in Ontario formed the Public Health Indicators Working Group (PHIWG), bringing together epidemiologists from across the province with staff from Health Intelligence Units, the Public Health Resources Education and Development Program and two branches of the Ministry of Health and Long-Term Care. This has resulted in the development of a core set of population health indicators for Ontario (Ardel 2002). The complete PHIWG Indicator List can be found in Appendix C.

The United States has developed a Nationwide Mandatory Reporting System for adverse events based on three principles:

- Collection of standardized information about adverse events that result in death or serious harm.

- Mandatory reporting systems.

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[9] These reports were produced in the early- and mid-1990s. An example is the *Public Health Protection: BC Objectives and Indicators for 1993/94* (1994), produced by the Ministry of Health and Ministry Responsible for Seniors.

[10] An eHealth Information Standards Council was recently created to replace the old Standards Council.

- Development of unambiguous and clearly defined lists of reportable events to facilitate reporting compliance (Kohn, Corrigan and Donaldson 2000).

In the United States, the National Quality Forum has established and maintains a core set of reporting standards. The list consists of 27 serious, preventable adverse events that should be reported by all licensed health care facilities. The list includes only clearly defined events, and uses standardized terminology to encourage consistent implementation (National Quality Forum 2006).[11]

Finally, as part of data standards, Teutsch and Churchill (2000) recommend that data-collection instruments should use generally recognized and computerized formats for data elements to facilitate analysis and comparison across multiple data collections.

3.2   Analysis and Interpretation

In a report presented to the Federal/Provincial/Territorial Deputy Ministers of Health in June 2005 (and backed up by key informants interviewed for this evidence review), it stated that while the analysis and interpretation component of health assessment is very important, it is not being carried out as effectively as it could be (Advisory Committee on Population Health and Health Security 2005, p. 24). Quality is dependent upon having educated and qualified personnel, appropriate tools and standard approaches and methodologies.

Quality information is one of the critical characteristics of best practices in policy research identified by the Canadian Population Health Initiative. "Quality is based on coherence, accuracy, rigorous methodology and documentation and synthesis of sound evidence" (Canadian Population Health Initiative 2002, p. 8). The report emphasized the importance of peer/expert review as a best practice to ensure quality.

Researchers working with health indicators have identified the need for a standard set of approaches and methodologies. For example, in Ontario, the Public Health Indicators Working Group (PHIWG) recommends a number of specific approaches and methodologies. The following is a list of some key items that are being standardized, as identified in the report *Core Population Health Indicators for Ontario* (Association of Public Health Epidemiologists of Ontario 2000):

- Denominator data.

- Standardization.

- Direct standardization.

- Indirect standardization.

- File sharing.

- Handling of "non-response" data.

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[11] The National Quality Forum is a private, not-for-profit membership organization created to develop and implement a national strategy for healthcare quality measurement and reporting. See http://www.qualityforum.org/ for more information.

Washington State has developed specific guidelines for information usage. They also recommend guidelines for the calculation of rates and the use of measures (Washington State Department of Health n.d.).

Janes et al. (2000) summarize best practices related to analysis and interpretation around similar organizers, namely:

- *Methodologic Considerations*: Methodologic considerations include reviewing the reliability and validity of the surveillance, the statistical testing undertaken and the clustering of health events. Reliability refers to whether a condition is reported consistently by different observers, and validity refers to whether the condition reported is the true condition. The utility of some statistical tests is dictated by the limitations of the data; therefore, researchers must be cognizant of the ability to generalize from the samples available. Researchers require common language to describe the clustering of health events.[12]

- *Time, Place and Person*: Different methodologies may be used to analyze time, place and person. The concept of time might use graphs of current and past experience or time-series analyses to account for period-to-period correlations and seasonality. Place is particularly suited to maps and geographic information systems. Researchers use demographic variables to create sub-populations for analysis.

- *Rates and Rate Standardization*: Best practice requires an understanding of the use of crude, specific and standardized rates. Rates describing the complete population are termed crude. Within a population, sub-groups might be identified; rates calculated for these groups are termed specific. Standardized rates are used to compare different populations or the same population over time; the standardization can adjust for the effects of confounding variables such as age and sex. Direct standardization averages the specific rates for the population, using the distribution of a selected standard population as the averaging weights. Indirect standardization averages the specific rates for a select standard population, using the distribution of the study population as weights.

- *Exploratory Data Analysis*: Exploratory data analysis (EDA) is another best practice described by Janes et al. (2000). EDA involves:

  o Using visual data displays to convey the structure of the data.

  o Transforming the data mathematically to simplify their distribution.

  o Investigating the influence of outliers on the results.

  o Examining the differences between observed data and the expected values.

- *Interpretation of Surveillance Data*: Best practices regarding the interpretation of surveillance data include recognizing the limitations in data. Three limitations in data are important to understand. First, since most surveillance relies on conditions being reported

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[12] A *cluster* is usually used to describe uncommon events while an *epidemic* is often reserved for a specific level of an aberration. The term *outbreak* has less evocative connotations.

by and to someone, under-reporting is inevitable. Second, reported cases may not be representative of the overall picture. Third, the case definition may be inconsistent among practitioners, over time or in different locations.

A best practice in health assessment for interpretation is the integration of complementary data from various sources. Hertzmann (2001) asserts that the integration of data from various sources can inform the discussion of key issues in health.

In BC, local health authorities have a range of health resource data available at the local level, which can be used in various analyses, such as program finances and the number of health professionals. They may want to access provincial/national level data like the National Longitudinal Survey of Children and Youth and collect data from other agencies purposefully by selecting data for the determinants of health. These data are then analyzed along with other health status and health resource data.

Health authorities can also utilize data provided by the Office of the Provincial Health Officer. Each year, the Provincial Health Officer releases a report detailing the health status of the BC population or specific aspects of health. For example, the 2004 Annual Report on the impact of diabetes provided incidence and prevalence rates for both the province and health authorities (Provincial Health Officer 2005).

Another example of integrating data from multiple sources is Annual Report of the Director of Public Health for the Lothian health area in Scotland (2004). The report integrates data such as income, employment, education, access to services, life expectancy, low birth weight, self-reported health and use and impression of health services. Data are obtained from local health information systems, local surveys and national information sources.

The Lothian report also illustrates the use of standard methodologies, specifically the Scottish Index of Multiple Deprivation (SIMD) that assigns levels of deprivation. It is based on 31 indicators in the 6 individual domains of Current Income; Employment; Housing; Health; Education Skills and Training; and Geographic Access to Services and Telecommunications.

3.3   Dissemination

A study in Ontario described the community-level reporting of assessment information from an Early Development Instrument. It found that only half of the sites funded to do assessment of early development produced a report and only one-third produced a publicly available report; with regard to the reports, only half of all the public reports were disseminated via relatively comprehensive dissemination strategies and outreach efforts, and only half of all the public reports received some form of media coverage (Gardner et al. 2005).

The key informants agreed that information products should have a clear purpose (including goals and their status) and be appropriate for the audience. They also recognized that a broader range of audiences is important such as health professionals not normally involved in public health (e.g., cardiac surgeons interested in health promotion and prevention activities).

The literature speaks to these same themes. In its report entitled *Tools for Knowledge Exchange: Scanning Best Practices in Policy Research*, the Canadian Population Health Initiative (2002) interviewed 20 social and health policy research organizations on when and how policy research is released. "Always tailor the message to the target audience."

The same report identified a variety of methods for successful dissemination. These included press conferences to capture media attention, and conducting face-to-face follow-up on findings with key policy-makers once a report is released. It also noted that forming alliances and coalitions with organizations with similar policy agendas is an effective approach to dissemination (see Section 4.5). In BC, the Ministry of Health, health authorities and community organizations could time the release of information to maximize visibility and impact. This might involve a release of a provincial report first and then health authority reports a few weeks later to keep the topic in the public's consciousness.

One key aspect of dissemination is accessibility. The literature identifies key messages as being much more useful than dense, academic literature reviews (Canadian Population Health Initiative 2002). Key informants in the health authorities reported that health assessment reports were better received by the public when the lead author had a journalism background rather than a health research background.

The Internet is becoming the most common form of dissemination. For example, the National Health Service of Scotland has a website that shares current, new and innovative examples of good practice across the National Health Service in Scotland and beyond. The website is constantly monitored and updated with new examples. After three months, these new examples are automatically transferred to the National Common Practice in Action section of the website. [13] Another example is the US Department of Health and Human Services, which has a website that showcases best practices in public health from around the country to foster an environment of peer learning and collaboration. [14]

Ontario has recognized that researchers use the Internet as one of the main sources of information (Gardner et al. 2005). As part of establishing the Local Health Integration Networks, the Ontario government set up a single web portal with provincial information to serve as an introduction to the website for each of the 14 geographically based networks. This website allows for the presentation of common information like best practices on interventions that are of interest to persons outside the specific health authority. As another example, the Public Health Agency of Canada, through the National Best Practices Consortium Coalition of Disease Surveillance, maintains a portal that provides surveillance information. [15]

The key informants spoke to the lessons learned from past dissemination efforts. For example, in BC, the Ministry of Health's Health Planning Data Base (HPDB) was popular with data analysts but was not as well used by others because the technology prevented the easy use of the information. The key informants suggested that users of information often want formatted

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13 For more information, see http://www.show.scot.nhs.uk/sehd/goodpracticeinaction/contents.htm.
14 For more information, see http://www.osophs.dhhs.gov/ophs/BestPractice/default.htm.
[15] For more information , see http://www.phac-aspc.gc.ca/ccdpc-cpcmc/surveil_e.html.

reports rather than data that require manipulation; thus, the reports produced by the database were not specific to the needs of information users. This example speaks to the need to evaluate tools. Evaluating whether information tools and products are reaching the target audience can be achieved through user interviews, surveys and focus groups.

Dissemination differs from knowledge exchange. Dissemination is a one-way flow of information from information providers to those requiring the information. Knowledge exchange involves a sharing and two-way communication of ideas for the purpose of improving policy and interventions. Manske et al. (2003) describes how moving from a situation of transferring information to and from parties to a situation of mutual engagement predicts utilization of information. Knowledge exchange is discussed later in the report in Section 4.5.

Manske et al. (2003) also describes how the dissemination of information can lead to action. By providing schools with its data on the number of smokers in its student population, researchers increased the likelihood of interventions related to tobacco reduction.

3.3.1 Annual Reports

With respect to health assessment, a key information product is an annual health status report. The key informants identified exemplary examples of health profiles available on the Internet, including one from the East Lothian Constituency (Office for Public Health in Scotland 2001) and another from Interior Health (2004a). These reports and others, such as the Provincial Health Officer's annual reports, provide common attributes that might form best practice in terms of this type of reporting. These attributes include:

- A focus on population health and public health services including all program/service areas.

- A statement of purpose.

- Mission, goals and objectives.

- A clearly identified audience.

- Multiple objectives/indicators for each program/service area.

- Key core program indicators (more than just descriptions of the programs).

- A framework or model that establishes the basic categories of information for the report such as inputs, operations, results, outcomes and targets.

- Integration and analysis of data from multiple sources (health status plus health determinants plus health resources).

- Identification of any unique characteristics of the population or sub-populations and the efforts that have been made to address any associated health issues/risks or inequalities/disparities.

- Data presented that is valid, utilizes a standard set of approaches and methodologies in its analysis and is properly interpreted. Data quality issues, assumptions and sources are noted.

- Comparisons with other jurisdictions.

- Trends over time.

- An objective analysis of missed targets including a plan of action to remediate (implies long-term planning and reporting). Ideally it demonstrates progress in reducing disease and increasing health.

- Involvement of all levels of stakeholders (e.g., from the public health nurse to the chief executive officer) in the development of the report, in the setting and meeting of the goals and in the planning to meet missed targets. Even better is an indication that other health professionals (e.g., health-related organizations) and the community at large are active participants in development.

- A feedback mechanism.

- Effective distribution of the report (broad, targeted and advertised).

3.4   Action/Utilization of Information

Of particular interest to the key informants was the need to translate information into action, i.e., program design and evaluation.

Researchers have found that reports 'sit on shelves' and that information does not become public for broader discussion and action (Gardner et al. 2005). A report by the Advisory Committee on Population Health and Health Security, and the Surveillance Systems for Chronic Disease Risk Factors Task Group (2005) suggests that weak connections between the people who would use the data and those who collect it prevent the surveillance system from becoming an integral part of the management cycle.

The literature has identified the importance of creating a data library and of staffing the library with knowledgeable staff who can assist researchers and policy analysts access data (McMaster Health Collaboration 2004; McDonald and Shearer 2005). This function crosses local health agencies and therefore, would require provincial leadership. There is also a growing body of literature regarding the packaging and disseminating of health research and its effect on uptake and utilization of data in policy making.

4.0 BEST PRACTICES PROCESS ENABLERS

Beyond the functional description of the process, best practices of health assessment and disease surveillance can be further classified by enablers of the process:

- Organization

- Teams

- Capacity

- Cooperation / Coordination

- Community Engagement

- Evaluation

- Statutory Guidelines

- Technical Tools

These enablers are important at each stage of the cycle of moving data to public health policy.

4.1 Organization

The literature did not suggest a best practice regarding the organization of health assessment and disease surveillance activities. Successful organization structures identified by key informants and the literature include:

- Knowledge exchange networks.

- Inter-jurisdictional collaborations.

- Academic institutes.

- Content-specific organizations.

- Population-specific organizations.

4.1.1 Knowledge Exchange Networks

In Canada, health assessment and disease surveillance activities are organized by research and knowledge exchange networks. In Ontario, this form of organization has recently been formalized. The Local Health Integration Networks (LHINs) are replacing many of the functions of District Health Councils and the Health Intelligence Units.

Health Intelligence Units were originally intended to "provide the ability to measure the health status of the population, assist in defining appropriate, effective and efficient health care, evaluate new technology, and appropriately allocate health care resources" (Ardal n.d.). Neufeld and Spasoff (1990) suggested that such units be partnerships between planning bodies, public health departments, local governments and other organizations with similar information needs.

Ontario's Health Intelligence Unit program was founded in 1994 following discussion with representatives from academic health science centres, Public Health Units and District Health Councils (Ontario's planning advisory bodies).

In British Columbia, some forms of public health research are coordinated by the Public Health Research Network. This group is handicapped by the lack of dedicated resources. It requires dedicated resources, such as a secretariat, to support its requirements. One of the initial and ongoing functions of this secretariat could be to maintain an inventory of available health information. Networks also need liaison resources to utilize information from critical data sources such as the provincial public health laboratory node.

4.1.2   Inter-jurisdictional Collaborations

There have been some successful inter-jurisdictional collaborations, as evidenced in the literature (Advisory Committee on Population Health and Health Security 2005).

The National Diabetes Surveillance System (NDSS) has a broad stakeholder base, including the federal and all provincial/territorial governments, non-governmental organizations, national Aboriginal groups and researchers. The stakeholders implemented a standardized model for the surveillance of core data. The federal government provided standardized computer programs which utilized provincial data to create aggregate-level information that could be returned to the federal government for integration of national level reporting. The intention is to expand the NDSS into other chronic diseases. [16]

The Integrated Disease Surveillance Project (IDSP), covering all states in India, is moving toward a similar organizational structure where the central government provides assistance and support while the regional governments control the ongoing operation. The IDSP seeks to assist the central and state governments to shift from a centrally driven, vertically organized disease surveillance system, to one which is coordinated by the centre and implemented by the states, districts and communities (Ministry of Health & Family Welfare n.d.).

Edwards and Lippeveld (2004) examined health information systems in developing countries and found "that decentralization of information management toward the district level is an effective strategy to improve routine information systems."

4.1.3   Academic Institutes

Health assessment and disease surveillance activities can be organized as academic institutes. The Kansas Health Institute (KHI)[17], for example, operates on the principle that the information necessary to make sound decisions must be based on a broad understanding of health and the factors that influence health, including public health as well as social, behavioural, and community factors. To better serve the information needs of policymakers, KHI is divided into four units:

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[16] For more information, see http://www.phac-aspc.gc.ca/ccdpc-cpcmc/diabetes-diabete/english/ndss/.

[17] For more information on the Kansas Health Institute, see http://www.khi.org/.

- Public Affairs: This non-research unit develops programs and publications that inform policy-makers about facts relevant to current issues.

- Public Health Studies: This unit focuses on providing the best available information on public health issues, with particular focus on population health and public health infrastructure.

- Health Informatics: This unit strives to improve the quality and utility of health information available to public policy-makers, public program staff and researchers.

- Health Care Finance and Organization: This unit produces timely and policy-relevant analyses on the effectiveness, availability and cost of health care in Kansas.

4.1.4 Content-specific Organizations

Organizations can be focused on specific areas of health assessment and disease surveillance, such as the study of adverse events. Medical errors rank as a significant cause of morbidity and premature mortality in the United States and Canada, and most are preventable (Rosenthal and Booth 2003). Various American states are establishing Patient Safety Centers. In Maryland, for example, the safety center is based on three tenets:

- *Collaboration and Education*. The Center facilitates collaboration across providers so they can learn from each other and prevent errors before they are made. The Center sponsors educational conferences and seminars that provide training in processes—such as Root Cause Analysis (RCA) and Failure Mode and Effects Analysis (FMEA)—and share best practices from Maryland, providers across the nation and worldwide. [18] The Center's collaborative workshops bring together Maryland providers and national experts to focus on safety culture and specific process improvements, with the goal of implementing measurable and sustained improvement.

- *Voluntary Confidential Reporting*. Health care providers will voluntarily report to the Center "near misses" and errors that do not result in permanent harm. The Center will analyze the data to identify trends and patterns across Maryland providers, including best practices. Feedback to providers will include individual hospital reports and periodic patient safety advisories. Findings will also be incorporated into future educational offerings.

- *Research*. The Center will lead applied research to find and implement safer processes and practices. Research findings will be disseminated through educational sessions and other forms of communication.

There are Canadian examples focused on patient safety. In September 2001, the Royal College of Physicians and Surgeons created the National Steering Committee on Patient Safety, which released a report in September 2002. The report *Building a Safer System: A National Integrated Strategy for Improving Patient Safety in Canadian Health Care* outlines 19 recommendations,

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[18] For more information, see http://www.marylandpatientsafety.org/.

including the creation of an independent Patient Safety Institute that would track the prevalence of medical mistakes, help build safeguards into the system, and educate health professionals.

A joint project established in 2002 by the Canadian Institute for Health Information (CIHI) and the Canadian Institutes of Health Research (CIHR) conducted the first prevalence study of medical error and adverse events in Canadian hospitals. Using methodology similar to studies in the United States and Australia, researchers reviewed hospital charts at a selection of hospitals in BC, Alberta, Ontario, Quebec and Nova Scotia, to see whether there was an adverse event, such as an unintended injury or complication, resulting in disability, death or prolonged hospital stay, which occurred as a result of hospital or medical management rather than the patient's disease. The results showed that the overall adverse event rate in Canadian acute care hospitals in 2000 was 7.5 per 100 patient admissions, not including pediatric, obstetric or psychiatric admissions. The researchers suggested that "efforts to improve medication safety and surgery are likely to play an important role in improving patient safety in Canada" and that system changes will be necessary to improve safety in hospitals (Baker et al. 2004).

British Columbia has recently created a Provincial Infection Control Network (PICNet) to work with experts across the continuum of health care. The goal of PICNet is to establish a provincially supported infection control knowledge collaborative among the regional and provincial health organization stakeholders. The role of PICNet is to maximize coordination and integration of activities related to prevention, surveillance and control of health care-associated infection for the entire province, using an evidence-based approach. In its focus on health care-associated infections it has also linked to provincial patient safety groups such as Safer Health Care Now and the BC Reproductive Care Program.

Washington State has a coordinated response to Fetal Alcohol Syndrome. "With the establishment of the Washington State Fetal Alcohol Syndrome Diagnostic and Prevention Network of clinics, the development of the Fetal Alcohol Syndrome Facial Photographic Analysis Software, the creation of the Fetal Alcohol Spectrum Disorders (FASD) 4-Digit Diagnostic Code, the establishment of the Foster Care Fetal Alcohol Syndrome Screening Program, and the collection of Pregnancy Risk Assessment Management System data on maternal use of alcohol during pregnancy, the tools, methods and infrastructure for assessing the effectiveness of fetal alcohol syndrome primary prevention efforts in Washington State are in place" (Astley 2004).

4.1.5   Population-specific Organizations

Various jurisdictions have found that organizations focused on specific populations or content areas are important. British Columbia created a government ministry focused on children to co-ordinate the collection of data and the creation of policy to improve the health outcomes of children. Maryland created an agency solely dedicated to children's environmental health issues. One of its initiatives involves using the Center for Disease Control and Prevention's Pregnancy Risk Assessment Monitoring System, which collects information about maternal behaviours and experiences that may be associated with adverse pregnancy outcomes.[19]

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[19] See http://www.epa.gov/reg3esd1/childhealth/projects.htm#9.

Other foci of health assessment and disease surveillance include women's health, injuries, and senior's health. The *Women's Health Surveillance Report: A Multidimensional Look at the Health of Canadian Women* (Canadian Population Health Initiative and Health Canada 2003) is the most comprehensive study of women's health ever conducted in Canada. It was funded jointly by the Canadian Population Health Initiative and Health Canada, and was authored by a team of more than 60 experts from universities and other organizations across the country.

The British Columbia Injury Research and Prevention Unit (BCIRPU) plans and implements injury prevention programs.[20] The Unit is undertaking research examining regional differences in BC for childhood injuries. The project examines the extent to which population health indicators can account for variations in injury rates by Local Health Area. The Unit also undertakes surveillance activities as a participant in the Canadian Hospitals Injury Reporting & Prevention Program (CHIRPP) data collection project run by Health Canada. The purpose of CHIRPP is to obtain detailed data collection on child/youth presentations in the emergency department of British Columbia Children's Hospital. These data are used to conduct research, respond to community requests and help plan prevention initiatives.

In terms of senior's health, the Council of Senior Citizens' Organizations of BC partners with the Public Health Agency of Canada's Canadian Health Network to provide information to their constituency. Another group specifically involved in health assessment for older persons is the Canadian Coalition for Seniors Mental Health. It addresses specific issues such as suicide assessment and prevention, depression detection and treatment, and mental health issues in long-term care. This organization sponsored the 2005 Best Practices Conference focused on Senior's Health, a best practice in itself (Canadian Coalition for Seniors Mental Health 2005).

Other organizations focus on issues related to ethnic groups/aboriginals. The recent analysis by the Department of Medicine, McMaster University, solidified the rationale for the Study of Health Assessment of Risk in Ethnic Groups (SHARE), an ongoing cohort study of 300 South Asian, 300 Chinese and 300 European Canadians designed to determine risk factors for CVD in ethnic populations in Canada. Preliminary results from the SHARE pilot study show intriguing differences in lifestyle factors, dietary intake and metabolic factors among Canadians of South Asian, Chinese and European origin despite a similar 'acculturation' period in Canada (approximately 17 years) among immigrant populations (Canadian Cardiovascular Society 1998).

4.2   Capacity

"Capacity is the ability of individuals, organizations and societies to perform functions, solve problems, and set and achieve goals. Capacity development entails the sustainable creation, utilization and retention of that capacity…." (United Nations Development Programme, as cited in Right to Water n.d.) Capacity assessment is then a realistic assessment of the organization's capability to perform its functions, solve its problems, and set and achieve its goals.

The document *A Framework for Core Functions In Public Health* (Ministry of Health 2005) discusses the need for capacity to be maintained and strengthened through investments at both

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[20] For more information, see http://www.injuryresearch.bc.ca

the provincial and health authority level. Ontario' Ministry of Health and Long-Term Care published an interim report on public health capacity in November 2005. It provided opinions from local staff on capacity, including:

- There is an overall shortage of qualified personnel to fill some positions.

- Public health salaries are not competitive.

- There is a lack of time/opportunities for ongoing professional training.

- There is a lack of career paths and opportunities for advancement.[21]

A report by the European Network for Diagnostics of "Imported" Viral Diseases (1996) talked to the need to have capacity to respond to outbreaks of disease. It identified four key principles:

- Established detail case definition.

- Expert team for assessment.

- Rapid response plan

- Communicate plan to organization and to public.

BCCDC Laboratory Services, as the provincial public health laboratory, was part of a pan-Canadian and international group defining and publishing the 10 Core Functions and Capabilities for Public Health Laboratories (Canadian Public Health Laboratory Network n.d.). The Core Functions and Capabilities include disease surveillance, outbreak and emergency response, quality leadership and data management.

Developing a capacity to perform health assessment could involve training the internal staff or creating an environment in which the academic community can perform this function. Some training resources are available on the Internet[22]; the hurdle is identifying an organization to structure these into a 'made-in-BC' product. The report prepared for the Advisory Committee on Population Health and Health Security by the Surveillance Systems for Chronic Disease Risk Factors Task Group (2005) identified the Skills Enhancement for Public Health Program, an internet-based continuing education initiative, based in the Public Health Agency of Canada, as an innovative program for Canadian public health workers to enhance their surveillance knowledge.[23] It is designed to increase professionals' skills in epidemiology, surveillance and information management. Another example comes from the United States, where the University of New Hampshire has organized a variety of web-based education modules relating to evidence-based public health practice (NH Institute for Health Policy & Practice n.d.).

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[21] Dr. Ron Dovell, of Interior Health, has recently completed a capacity assessment discussion paper for BC (funded by the Public Health Agency of Canada), which has increased the knowledge base in this area. The paper can be found at http://www.phabc.org/pdf/MajorSurveyThemes_Dec_06.pdf.

[22] Some examples can be found at http://healthlibrary.com/reading/healthmgmt.html or http://www.massleague.org/events/2004DPHOnlineTrainingCourse.pdf.

[23] For more information on the Skills Enhancement for Public Health Progam, see www.phac-aspc.gc.ca/skills.

Another type of training opportunity which also builds relationships is the use of secondments between health authorities, the Ministry of Health and other provincial agencies. For example, a pathologist from Interior Health works at the BC Centre for Disease Control for periods of time.

A recent paper by Chambers et al. (2006) provides detailed information on strengthening the capacity of public health. The most essential aspect is a health human resource strategy, to provide and maintain skilled professionals in local health agencies. The paper describes how there is a wealth of health information and surveillance products available, but a large proportion of the workforce requires training in the use of surveillance concepts and techniques. New information resources need to be accompanied by ready access to sophisticated tools, including geographical information systems and database management software, which require higher quality data and skilled staff to work with the tools. The World Health Organization (2001) came to a similar conclusion: "Monitoring programmes are reliant on good human resources to make them efficient and effective. The strength of any monitoring programme is determined by the weakest element and this can often be identified as inadequate human resources."

Chambers et al. (unpublished) identifies specific ways that management and members of boards of health can support and strengthen surveillance skills and capacity development:

- Strengthen health surveillance systems by:

    o Allocating resources, including human resources, for the effective use of health surveillance data and tools.

    o Recognizing the need for existing staff to acquire new skills, and for dedicated staff at the regional or provincial/territorial level to manage new systems.

    o Making a commitment to high quality data collection and analysis, and to timely reporting to all stakeholders.

    o Simplifying and standardizing the management of public health information.[24]

    o Improving access to local, regional and national surveillance data to ensure high quality information from the local to the global level.

    o Providing all staff who make program decisions with access to surveillance information.

    o Supporting professional networking in surveillance.

- Upgrade and strengthen staff and management skills in surveillance by:

    o Collaborating with universities, colleges, the Skills Enhancement for Public Health Program and others to provide public health practitioners with opportunities to improve their surveillance skills and knowledge through project work and courses.

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[24] The Public Health Agency of Canada has launched a system for sharing information on potential outbreaks at the national or provincial/territorial level (Canadian Integrated Outbreak Surveillance Centre) and has supported the implementation of the Integrated Public Health Information System (iPHIS) in many provinces

o Developing and implementing strategies to recruit and retain specialists and staff with surveillance expertise.

o Including surveillance capacity in accreditation standards and job descriptions.

o Participating in initiatives to ensure that surveillance and surveillance skills are adequately identified as core functions and core competencies in public health.

Capacity crosses all the earlier categories of best practice (Data Collection, Analysis and Interpretation, Dissemination and Utilization/Action). The literature describes organizational capacity with an emphasis on leadership and clarity of roles. Articles reviewing the organizations of the Saskatchewan health care system described confusion about 'who is doing what' and how a Health Quality Council has a potential role in knowledge transfer (Charity Evans BSP 2004). Other roles that must be organized included that of establishing priorities and of serving as a clearinghouse for information (Birdsell 2003).

A best practice related to capacity is the ongoing evaluation of current capacity and future needs. One phase of the Heart Health Nova Scotia initiative involved building and researching organizational capacity for health promotion and chronic disease prevention. During this project many organizations were involved in discussions about how to collectively do more health promotion work. Research was undertaken to develop individual profiles of each organization's capacity for health promotion work. For many organizations, receiving a qualitative piece of research on this aspect of their work was new, and this stimulated the organizations to reflect on their organizational practice (Kahan and Goodstadt 2002).

The BC Heart Health Project (n.d.) created a model against which an agency could assess its own capacity. The model included seven dimensions, namely:

- Infrastructure: staff or dollars assigned specifically to cardio-vascular disease (CVD) prevention.

- Collaboration: existence of inter-agency committees to deal with CVD or its risk factors and participation in community-based coalitions.

- Evidence-base: CVD and its risk factors are monitored and reported on.

- Political will: Heart health and CVD prevention are a high priority within the region.

- Written planning documents that include CVD prevention.

- Technical expertise: the existence of a staff resource dedicated to supporting CVD prevention activities in the region.

- Champions: the existence of champions at the board, management and staff level.

This model provides a framework for health authorities to perform a self-assessment of their health assessment and disease surveillance capacities.

4.3   Evaluation

With respect to health assessment and disease surveillance, evaluation relates to practices and organizations. The evaluation of health assessment and disease surveillance practices can include the following key characteristics:

- Usefulness: the surveillance will be used to help prevent and control disease or injury.

- Simplicity: the design and the size of the system is simple but meets the objectives.

- Flexibility: the system adapts to changing needs or data-collection elements.

- Acceptability: individuals and organizations are willing to participate in the system.

- Sensitivity: the case reporting is complete and the system has the ability to identify epidemics.

- Specificity: the proportion of perons identified as case-patients who actually have the condition being monitored.

- Representativeness: the occurrence of a health event is accurately described over time, place and person.

- Timeliness: the ability of the system to take appropriate action based on the urgency of the problem.

- Resources: the cost of personnel and tools required to undertake the surveillance (Wolfe and Yuan 2001; Teutsch and Churchill 2000).

Washington State's health department evaluates data quality by conducting cross-checks between hospital discharge data and vital statistics to confirm causes of death and contributing factors and to verify information about clusters of deaths. A study in Ontario related to the Early Development Index found "a lack of rigorous and careful evaluation of how those reports and the EDI-related information are being picked up and used in communities to help support the early development of children and to help them make positive transitions to school" (Gardner et al. 2005).

Evaluation relates to organizations and their success in undertaking health authority functions. In the United States, the Local Public Health System Assessment (LPHSA) answers the questions, "What are the components, activities, competencies and capacities of our local public health system?" and "How are the Essential Services being provided to our community?" The LPHSA is a broad assessment completed through a structured series of workshops involving all of the organizations and entities that contribute to public health in the community (Mobilizing for Action through Planning and Partnerships n.d.). The assessment is framed around 10 Essential Public Health Services:

1.   Monitor health status to identify community health problems.
2.   Diagnose and investigate health problems and health hazards in the community.
3.   Inform, educate, and empower people about health issues.
4.   Mobilize community partnerships to identify and solve health problems.

5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable.
8. Assure a competent public health and personal health care workforce.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Research for new insights and innovative solutions to health problems (Public Health Functions Steering Committee 1994).

4.4 Cooperation/Coordination

One of the largest barriers to effective health assessment and disease surveillance is the integration of activities by the multitude of players. The players operate at the international, national, regional (provincial/state) and local (health authority) level. The best practice is understanding what other players are doing and working together with them.

4.4.1 International Level

Agencies like the World Health Organization (WHO) and the World Bank are active in setting standards and developing protocols related to disease surveillance. The WHO coordinates the International Classification of Diseases, which provides the basis for sharing disease-related information by standardizing the way to identify them. They also established and maintain an international database for safety surveillance of drugs and other pharmaceutical product (Olsson 1998).

The WHO is the focal point for the efforts in influenza pandemic surveillance. The coordination role of the WHO is described in the opening speech of Dr. Gro Harlem Brundtland, then Director-General of the WHO, at a 2002 Consultation on Global Priorities in Influenza Surveillance and Control: "To take forward the global influenza control effort there is a need for up to date knowledge on the burden of influenza illness, the availability of affordable vaccine and current prevention and control policies within developing countries. WHO is ready to play a critical part in addressing these issues. We will focus on what we do best, seeking our partners who can take on other functions. We will keep a sharp eye on financial implications. We know that we must step up our efforts in some areas—such as data on the influenza burden in developing countries, better pandemic preparedness plans, and strategies for expanding vaccine usage."

4.4.2 National Level

Other research institutes in the health field can contribute to successful operational practices. The Centre for Healthcare Innovation and Improvement (CHII), for example, is designed to bring together researchers and clinician-researchers with different but complementary skills and enable them to collaborative in clinical, policy and health services research on specific health issues. CHII researchers take a health care issue, create a team that includes researchers, clinicians and decision makers, evaluate a problem, design and test interventions, implement and evaluate

policy and practice changes and then re-evaluate and make recommendations for quality improvement (Centre for Healthcare Innovation and Improvement n.d.).

The unit's research program is organized into three sub-themes, concentrated around key technologies or processes fundamental for knowledge generation, translation and transfer—a continuum that is essential for ensuring research translates into improved health and health care. The sub-themes are:

- Health Informatics: explores innovative new systems to capture, store, process, interpret and use evidence for improving health and health care.

- Knowledge Translation Methods: develop rigorous analytic methods to process, analyze and interpret health data to support clinicians and policy-makers in making appropriate decisions around practice and policy changes

- Knowledge Transfer: supports the development of networks of researchers, clinicians and decision makers to implement and evaluate practice and policy changes broadly in the health system.

The federal government, through Health Canada and Statistics Canada, produce large volumes of information that may be useful to health authorities. Again the ability to integrate requires knowledge of, and the ability to access, the information. The Canadian Community Health Survey (CCHS), for example, provides regular estimates of health determinants, health status and health utilization. The National Advisory Group on Monitoring and Evaluation (NAGME) reviewed Canadian databases, including the CCHS database, using the following criteria:

- National or provincial geography.

- Sample size provides a provincial estimate.

- Collected on a repeated basis.

- Consistent in content and methods.

- Elapsed time between collection and public release.

The NAGME found that the CCHS database best suited its surveillance activities (National Advisory Group on Monitoring and Evaluation n.d.).

Researchers in Alberta have used the CCHS files in an innovative way to estimate the costs of chronic disease (Jacobs et al. 2004). They found that the CCHS provides useful data to study the economics of personal activities related to health risks and the burden of chronic disease.

The key informants described barriers to accessing CCHS data. The 'pumf (Public Use Microdata) file' does not contain detailed information while the 'share file' is not readily available to the health authorities. As part of the 2003 'pumf' data collection, though, three health regions in the province of Quebec provided extra funds for a 'buy-in sample', which can be combined with the main sample to provide one large file of data (Statistics Canada 2005). A similar arrangement could work in BC: in fact, the health authorities, in conjunction with the province, might purchase the sample to provide for more cooperative use of the information.

In terms of environmental health assessment, the Canadian Environmental Protection Act National Advisory Committee under the *Canadian Environmental Protection Act* is the main intergovernmental forum for the purpose of enabling national action. The role of the Committee can be broadly defined as a platform for ensuring a full and open sharing of information between the federal, provincial, territorial and aboriginal governments on all matters related to the protection of the environment and the management of toxic substances (Environment Canada 2005).

In the United States, there has been a focus on cooperation and coordination of data relating to injury prevention specifically for motor vehicle crashes. Researchers in Louisiana, for example, utilize data for motor vehicle-related injury from two national sources: the Fatality Analysis Reporting System (FARS) and the General Estimates System (GES), which are both maintained by the National Highway Traffic Safety Administration. FARS is a census of all fatal traffic crashes (within the 50 states, Puerto Rico and the District of Columbia) that occur on a roadway customarily open to the public and that result in at least one death within 30 days of the crash. Data for estimates of non-fatal motor vehicle-related injury are from GES, a nationally representative sample of police-reported motor vehicle crashes of all severities, including death, non-fatal injury and property damage (Centers for Disease Control and Prevention 1999).

4.4.3   Provincial/State Level

There are a number of research institutes that are collecting, analyzing, interpreting and disseminating information. The McCreary Centre is interested in the health of children and adolescents. Its major work is the Adolescent Health Survey, which is completed about every 5 or 6 years, and covers topics about physical and emotional health and about factors that contribute to health.[25] Useful integration, though, requires the exchange of ideas and the sharing of data. Some of the key informants interviewed described the difficulty of accessing the data collected for the Survey. Similar child health surveys are undertaken in other parts of the world but the organizational structure allows direct access to the data; for example, the New South Wales Child Health Survey in Australia, where the originator is the Department of Health in conjunction with the New South Wales Commission for Children and Young People (New South Wales Department of Health 2001).

In the field of child development, health authorities have the opportunity to partner with the Human Early Learning Partnership, an interdisciplinary, collaborative research network that is directing a world-leading contribution to new understandings and approaches to early child development. Directed by Dr. Clyde Hertzman, this network is unique in Canada. It has assessed and mapped child development, neighbourhood-by-neighbourhood, and school district-by-school district, for the province's kindergarten children.[26] The map shows the state of BC kindergarten children on one of the domains of development of concern to the health system: physical health and well-being.[27] The map shows the proportion of children whose physical development puts

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[25] For more information on the Adolescent Health Survey, see http://www.mcs.bc.ca/rs_ahs_key-findings.htm.
[26] For more information on the Human Early Learning Partnership, see http://www.earlylearning.ubc.ca/pub_map.htm.
[27] The other key domains are social/emotional mental health and language/cognitive, consistent with the World Health Organization's definition of "health [as] a state of complete physical, mental and social well being."

them in the 'vulnerable' category; these are children whose physical health and well-being may limit their ability to benefit fully from the learning and peer group environment of the school. The map shows that there is a 6-fold difference (from 4.5 per cent to 27.1 per cent) in the proportion of vulnerable children from the most, to the least, vulnerable school district (Hertzmann 2004).

Another example of regional cooperation is in South Carolina, where the Department of Health and Environmental Control, and the Department of Public Safety, in conjunction with the National Health Transportation Safety Administration, developed an injury surveillance and prevention database that was used by the South Carolina Health Alliance for legislative activities related to seat belt and helmet use. This database linked motor vehicle accident reports, ambulance run reports, emergency room visits, in-patient hospitalizations and other related datasets (Giordano et al. 1998).

In BC, the British Columbia Injury Research and Prevention Unit (1998) coordinated the Emergency Department Injury Surveillance System (EDISS). EDISS was conceived both to provide general injury surveillance of the population to quantify the burden of injury presenting to emergency departments, and to conduct detailed resource-intensive surveillance of specific trends identified in the first stage. This pilot provided technical guidance to practices in disease surveillance. It found that a minimum dataset of 13 elements was not more efficient than the National Ambulatory Care Reporting System (NACRS) dataset of 25 elements, and it provided guidance on the human factors related to disease surveillance processes. It also found that educating emergency department staff on the importance of injury prevention encourages participation, that a change of this type requires a champion to keep everyone motivated and committed, that teamwork and relationship-building is key and that projects plan are important but flexibility is required in the current health care environment.

Ontario is developing the Public Health Agency of Ontario to provide a level of coordination to public health. The report by the Ministry of Health and Long-term Care (2005) on revitalizing public health capacity articulated the problem "According to survey respondents, one of the main weaknesses in the current approach to research and knowledge transfer and exchange is lack of coordination. Many people are involved in research activities, but there is no mechanism to coordinate research, share best practices or disseminate knowledge in a coordinated/concerted manner."

4.4.4   Local Level

The most common instances of cooperation and coordination are between the health authority and the province. The coordination involves finding the most effective method to provide both jurisdictions with the capacity to respond to health issues under their control.

The Rapid Risk Surveillance surveys in Ontario might be defined as the gold standard of this type of coordination. The survey administration is efficient because all local authorities contract with a common resource and use common software. The local authorities determine the standard, high-level requirements in conjunction with the province, while, at the same time, tailoring the system to address their own requirements. The data is stored in the databases of the local

authorities for direct and immediate access while the standard data is transferred to the province for the production of general information.

In other situations, health authorities utilize the data collected and analyzed by the province to identify disease outbreaks. Province-wide data collection of physician claims, hospital admissions and pharmacy prescriptions feed both communicable and chronic disease surveillance systems, with the results being provided to Medical Health Officers in the health authorities for review and action.

4.5 Community Engagement

Community engagement refers to public processes in which the general public and interested parties (such as community leaders and other health professionals) can contribute to the policy-making activity. It is a link between information provided by health assessment and disease surveillance activities and the public policy that results from them. Community engagement:

- Breaks down barriers between data collection, analysis and action.

- Broadens the perspective of all participants involved.

- Increases communities' feeling of responsibility for their own health and leads to a greater interest in health assessment and disease surveillance activities.

Community engagement requires knowledge exchange with the focus on making decisions from evidence. It requires the surveillance teams examining the 'what to collect' to be linked to the practitioners in the field. This combination increases the likelihood of mobilization into action. Key informants described how community engagement, mobilization and capacity are all connected. A health authority that plans programs or interventions will increase its capacity to perform health assessment and disease surveillance. This increase in capacity will result in an increase in the number of interventions (Naylor, P.J., personal communication).

The Vancouver Costal Health Authority has supported this function by developing a Community Engagement Unit. The Unit which was successful in two major efforts:

- *The Riverview Redesign project*: The working 'tables' included members of the general public, municipalities, users and family members. These groups identified issues, broadened the perspective and built capacity to work through the change. Medical specialists saw how the input of families was useful to the final design. The project went beyond a one-off consultation—it provided a forum for ongoing communication.

- *The Vancouver Agreement*: This tripartite agreement between federal, provincial and municipal representatives provides a framework for a functional organization. Vancouver Coastal Health Authority and the city police department were recognized as key players in the success of the agreement. The structure included a policy committee represented by provincial government ministers and the Mayor of Vancouver, a management committee consisting of nine senior officials (three from each jurisdiction), a coordination team responsible for implementing the strategic vision and a number of working 'tables' organized around the seven major outcome indicators. The coordination unit, a small secretariat dedicated to administration, communications and program administration,

oversees the day-to-day work of the Vancouver Agreement. One of the reasons for success lay in the personal relationships this structure engendered. This community engagement created a connection with police that provided a new perspective for officers regarding harm reduction.[28]

Other literature speaks to the 'spectrum or ladder of engagement' (Elton Consulting n.d.). The 'ladder' describes increasing levels of public impact that different forms of community engagement can provide. The steps on the ladder include informing, consulting, involving, collaborating, and empowering. Through community engagement, communities may take responsibility for the health of their residents in the same way government encourages individuals to take responsibility for their own health.

Another example of successful community engagement is the Child Health Report done by the Interior Health Authority (2004b). The participatory model included families, interest groups and professionals to support child health. The model produced reports with plans and priorities, which then translated into action. The action is evaluated and the iterative process begins again.

4.6   Statutory Guidelines

Disease surveillance requires the identification of cases and tracking of individuals with the disease. At the same time, due diligence is required to protect the privacy of individuals' personal information. It is important for processes to protect privacy to be common across different agencies working with confidential information. Snider and Stroup (2000) describe the ethical obligations of researchers. These include:

- Minimizing risks and protecting the welfare of participants in surveillance.

- Maximizing the potential benefits of surveillance.

- Protecting confidentiality and privacy.

- Using informed consent.

- Disseminating data and publishing promptly to increase the usefulness of the data.

- Maintaining public trust by being fair, reliable and competent.

- Maintaining objectivity and impartiality.

- Confronting unacceptable misconduct.

In the United States, reports have been written with the sole purpose of helping public health agencies understand and interpret their responsibilities to maintain privacy (Centers for Disease Control and Prevention 2003). Standardized practices in relation to protection of privacy (obtaining client consent and informing clients about their rights and responsibilities and the agency's privacy obligations) are also seen as key in British Columbia (Ministry of Children and Family Development 2003).

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[28] See http://www.vancouveragreement.ca/ for more information on this community engagement process.

In BC, the *Freedom of Information and Protection of Privacy Act* guides health authorities. Plans for new data collection or information management initiatives must include provisions to protect privacy. Interior Health Authority, for example, integrated these considerations prominently in its Information Management and Information Technology Strategic Plan (Interior Health 2004c).

The BC Ministry of Health is developing technical tools which will facilitate the matching of data while at the same time protect personal information (see Section 4.7).

4.7   Technical Tools

Capacity also includes the ability to use specific technical tools. New knowledge can emerge from linking disparate data that do not contain a common identifier. A software tool like Automatch can assist in this probabilistic matching, but there are few analysts with experience using this tool.

Another tool that is being recognized in the literature as a key in analyzing spatial relationships and related tabular data for health assessment and disease surveillance is the geographical information system (GIS). As supportive GIS data layers become more available, more robust analyses are possible. Combined with the growth in hardware and software systems, along with availability of skilled resources, many new possibilities for analysis at the city, health authority and private sector level will evolve. Many analyses will be able to solve perplexing questions that were very difficult, if not impossible to determine just a few years ago.

One example of the use of GIS is "EpiGis: Mapping Cancer Registry Data." EpiGis helps epidemiologists and other public health professionals quickly develop accurate data tables, reports and maps of cancer rates for their territories. EpiGis makes quick work of what has traditionally been a very time-consuming, complex and error-prone operation. In addition, EpiGis allows epidemiologists to prepare a base disease rate dataset that can be used to identify statistically significant high- and low-rate areas in preparation for more sophisticated analysis. It lets health professionals focus on analyzing, and not preparing and manipulating, cancer incidence data (Applied Geographics n.d.).

Another example of a GIS tool is the Public Health Map Generator. The Public Health Map Generator was developed by the Geographic Information Systems (GIS) Program of the Public Health Agency of Canada. It is a web-based mapping tool designed specifically for public health professionals to enable them to quickly and easily visualize their local health data on a map. For example, the map could be used to compare asthma rates across regions to help health professionals improve intervention and future prevention strategies. It will be provided to public health professionals at no cost to them (Public Health Agency of Canada n.d.).

Standardized tools allow for direct comparison between those regions using the tool and reduce costs both in software development/maintenance and in the training of staff. The National Diabetes Surveillance System is an example of a standardized system developed by the federal government, provinces and territories and used in all jurisdictions in Canada. Agencies in the United States use a similar method. As part of its Guide to Inpatient Quality Indicators, the

Agency for Healthcare Research and Quality created standard, public computer programs for use by care providers (Agency for Healthcare Research and Quality 2002).

A public health system needs effective information systems to support outbreak management and epidemiological investigations. After reviewing the outbreak of legionnaires' disease in a facility in Ontario, a report was produced—*Report Card: Progress in Protecting the Public's Health*—which urged Ontario to move quickly to fully deploy and improve the functionality of the Integrated Public Health Information System (*i*PHIS) in order to give public health units the capacity to collect and share data and to produce reports (Walker, Henry, and Young 2005).

*i*PHIS is the web-based electronic health record developed by the Public Health Agency of Canada (Public Health Agency of Canada 2006). The application has comprehensive communicable disease, sexually transmitted disease and tuberculosis case management modules, an outbreak module, electronic laboratory resulting and an immunization module. It also includes modules for rabies incident reporting, school health screening (dental, vision, hearing), and nursing health assessments (newborn, postpartum, early childhood). Walker et al. (2005) also advised that the system should be compatible with national public health information systems, and identified the necessity of electronic information systems to support laboratory operations. During the outbreak, Ontario laboratory relied on paper forms, which limited data sharing, was time-consuming and prone to error. A new pan-Canadian communicable disease, immunization and outbreak management system is currently under development, funded by Canada Health Infoway. This will produce a standard product based on infoway's electronic health record technical architecture.

Technology may assist researchers examining health assessment and disease surveillance data by protecting personal confidentiality during data extraction and manipulation. The Aggregated Health Information Project (AHIP) currently underway at the Ministry of Health is developing the technical infrastructure known as a 'trustbox.' The trustbox is a computer that can combine disparate datasets based on personal health numbers or other fields containing confidential personal information and return matched datasets without personal information. The process will require no human intervention.

5.0   PRIORITIZING BEST PRACTICES

The United Kingdom's National Health Service, Health Development Agency (2005) developed a framework for grading of recommendations for public health interventions. This will be useful for the workgroups that will be asked to determine key program components, to identify best practices for each program and to identify key performance areas, performance targets, and suitable performance indicators, relevant to each health authority. This framework was based on the methodology from the National Institute for Clinical Excellence (NICE). NICE is an independent organization responsible for providing national guidance within the United Kingdom on the promotion of good health and the prevention and treatment of ill health.

The initial literature review for the NICE framework found that there was general agreement that randomized clinical trials (RCTs) were the best method of evaluating the effectiveness of an intervention. However, concerns were documented about the feasibility, cost and practicality of utilizing a "gold standard RCT" for public health interventions. The review also determined that the key to an effective intervention is to supplement quantitative data with qualitative research. Still in development is the method for combining the results of different types of corroborative evidence.

As well as applying this framework, it is important to consider that best practices are contextual: what works for one jurisdiction may not work in.

6.0 BEST PRACTICES, BETTER PRACTICES AND PROMISING INITIATIVES

Best practice for health assessment and disease surveillance in a health authority is an organized set of individual better practices that fits the context of the health authority. A reviewing of best practices in health assessment and disease surveillance is important to inform the discussion around Health Service Redesign Plans and activities. This section summarizes key observations into better practices and promising initiatives for each of the categories of best practice and process enablers.[29]

Section	Better Practices	Promising Initiatives
Data Collection	▪ Identify data sources and current needs ▪ Collect data from a variety of data sources ▪ Collect data (including data on core program indicators) in a standard fashion ▪ Engender informal relationships between staff at agencies sharing data ▪ Automate data transfer	▪ *Examine new data sources (e.g., emergency room visits)* ▪ *Develop formal relationships, often Memoranda of Understanding, for data sharing efforts*
Analysis and Interpretation	▪ Utilize standard approaches and methodologies	
Dissemination	▪ Define the message ▪ Define the audience	
Action/Utilization of Information		▪ Develop a connection between the people who would use the data and those who collect it
Organization		▪ Define the roles of the participants identifying "who is doing what" ▪ Develop leadership, formal and informal relationships, and strong infrastructure in critical areas to facilitate Health Assessment and Disease Surveillance
Capacity	▪ Ensure adequate resources to maintain current practices and to undertake new 'best practice' initiatives ▪ Train staff	

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[29] *Better practices* are when both the BC key informants and the literature agree on the importance of this practice; *promising initiatives* are those initiatives identified by key informants or the literature.

Section	Better Practices	Promising Initiatives
Evaluation		- Use an assessment method (see Local Public Health System Assessment on page 25) to identify gaps between the current environment and best practices that might be of use in this process - Use surveys or public forums to identify improvements that will increase the use of the results of health assessment - Standardize an intervention description such that reviewers can decide whether it would fit into Health Authority context (see Appendix D for a possible format)
Cooperation/ Coordination	- Develop a single network with a focus on the review and development of best practices in Health Assessment and Disease Surveillance in BC - Develop information systems that are based on the premise of local control AND efficient administration through economies of scale (The Rapid Risk Surveillance surveys in Ontario might be defined as the gold standard.)	Develop a Public Health secretariat responsible for coordinating, communicating, and implementing projects developed by the Public Health research networks in BC (Possible models include the Co-ordination Unit of the Vancouver Agreement, the PICNET secretariat, or the new Public Health Agency of Ontario.)
Community Engagement		Develop dedicated units or participatory models related to community engagement
Statutory Guidelines		Protect the confidentiality of personal information and still use individual-level data by developing sound organizational or technical infrastructure
Technical Tools	Utilize Geographical Information System (GIS) for Health Assessment and Disease Surveillance	Examine application of provincial- or national-level tools for local application

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APPENDIX A: DEFINITIONS RELATING TO HEALTH AND SURVEILLANCE

An internet search for definitions of health assessment and disease surveillance turned up numerous variations of these terms such as:

- assessment

- health assessment

- health impact assessment

- surveillance

- health surveillance

- disease surveillance

- public health surveillance

This appendix is a compilation of the various terms and their sources.

Term	Definition
Health Assessment	The process of collecting, analyzing, and disseminating information on health status, personal health problems, population groups at greatest risk, availability and quality of services, resource availability, and concerns of individuals (MAPP, as cited in New York State Department of Health. n.d.). Note: MAPP is a community wide strategic planning tool for improving community health developed by National Association of County and City Health Officials (NACCHO) in partnership with CDC. It builds on information learned from Assessment Protocol for Excellence in Public Health (APEXPH), an internal organizational assessment tool for local health departments.
Health Impact Assessment	Provides decision makers with information about how any policy, programme or project may affect the health of people. HIA seeks to influence decision makers to improve the proposal. This provides a foundation for improved health and well-being of people likely to be affected by such proposals (World Health Organization n.d.).
Assessment	The regular collection, analysis and sharing of information about health conditions, risks, and resources in a community (University of Washington n.d.) The assessment function is needed to identify trends in illness, injury, and death, the factors which may cause these events, available health resources and their application, unmet needs, and community perceptions about health issues.

Term	Definition
Surveillance	" the ongoing systematic collection, analysis and interpretation of health data that are essential to the planning, implementation and evaluation of public health practice" (Ministry of Health, 2005).
	…includes the collection of data, and the review, analysis and dissemination of findings on incidence (new cases), prevalence, morbidity, survival and mortality. Surveillance also serves to collect information on the knowledge, attitudes and behaviours of the public with respect to practices that prevent cancer, facilitate screening, extend survival and improve quality of life (Public Health Agency of Canada 2005b).
	The systematic collection of data pertaining to the occurrence of specific diseases, the analysis and interpretation of these data and the dissemination of consolidated and processed information to contributors to the surveillance program and other interested parties (Friis and Sellers 2004).
Health Surveillance	"..tracking and forecasting of any health event or health determinant through the collection of data, and its integration, analysis and interpretation into surveillance products, and the dissemination of those surveillance products to those who need to know." It is NOT investigation, planning, intervention, research, priority-setting, policy development, issue management or risk management. It provides information essential to them. Characteristics: • prospective, purposeful • data collection that is continuous or at regular intervals • population-based; incidence, prevalence • surveillance products add value to the data • results in information and analytical products Source: Health Canada 1999.
Disease Surveillance	The objective is to provide early and precise information on key aspects of disease activity such as time, location, virus type, and disease severity. Analysis of this information provides the necessary data to predict disease transmission and guide the implementation of control measures Source: CDC 2003, as cited in Public Health Data Standards Consortium n.d. Note: The Public Health Data Standards Consortium is a voluntary confederation of federal, state and local health agencies; national and local professional associations; public and private sector organizations; and individuals.
	The ongoing systematic collection and analysis of data and the provision of information which leads to action being taken to prevent and control a disease, usually one of an infectious nature. Source: Medicine Net.com. http://www.medterms.com/script/main/art.asp?articlekey=26702

Term	Definition
Public Health Surveillance	The ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice. A surveillance system includes the functional capacity for data collection and analysis as well as the timely dissemination of these data to persons who can undertake effective prevention and control activities. Sources: University of Washington, n.d.; Thacker 1994.
	The ongoing, systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with timely dissemination of these data to those who need to know. The final link of the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity of data collection, analysis, and dissemination linked to public health programs (Halperin, Baker, and Monson 1992)

APPENDIX B: DEFINITIONS RELATED TO BEST PRACTICE AND EVIDENCE

Various definitions are provided here for "best practices" and "evidence-based".

Best Practices
Programs, initiatives or activities which are considered leading edge, or exceptional models for others to follow Source: http://www.tsa.gov.bc.ca/sport/Glossary.htm
Examples of field-based activities, operational procedures or capacity building approaches that are successful and sustainable in social and environmental terms and can be readily adopted by other individuals or organizations Source: www.compass-malawi.com/cglossary.html
Processes and activities that have been shown in practice to be the most effective. Source: http://it.csumb.edu/departments/data/glossary.html
The procedures and policies that allow a business to outperform all other in a particular business process. Source: http://www.crfonline.org/orc/glossary/b.html
Initiatives that have been assessed as being effective and worthy of replication. Source: http://www.utoronto.ca/chp/download/Sep04BPfinalreport.pdf
Best practices in health promotion/public health are those sets of practices and activities that are consistent with health promotion/public health values, goals and ethics, theories and beliefs, evidence, and understanding of the environment, and that are most likely to achieve health promotion/public health goals in a given situation. Source: http://www.idmbestpractices.ca/idm.php?content=basics-overview#definition
The concept of best practice rests on a continuum of scientific rigor. The quality of best practice can fluctuate based on the evidence used to support and form guidelines, protocols, and pathways. In application, best practice includes rigorous scientific evidence to support the effectiveness of specific clinical interventions for explicit patients, groups, or populations; implementation monitoring to assure accurate application; and outcome measurement to validate effectiveness. Finally the currency, comprehensiveness, validity, and applicability to patients, practice, and community must be considered in the context of the burden of illness, beliefs about the value of interventions, cost and energy, and barriers to implementation (Sackett, Straus, Richardson, Rosenberg, Haynes, 2000, p.179-181). As the quality of evidence increases, the methods of evidence synthesis become mainstream, and implementation guidelines and outcome measures are validated, evidence based practice will equal best practice (EBP = BP). When benchmarking for best practice, first ask, "...what is the source of the evidence, where does it ride on the opinion vs. evidence continuum?" Source: http://www.acestar.uthscsa.edu/Learn_terminology.htm

Better Practices
"actions and processes – plausible, appropriate, evidence-based and well-executed – that will reduce the current and future burden of disease" Source: Ministry of Health 2005.
Evidence-based
Findings based on the use of current best evidence from scientific and medical research. Source: http://www.iffgd.org/GIDisorders/glossary.html
A term applied to health care practices that are based on the review of the current best evidence on the effectiveness of a test, drug, surgery or other medical practice. This evidence is based on collecting and analyzing all of the research studies that have been conducted on a particular intervention. These reviews (see meta-analysis and systematic review) are often published or made available in electronic formats for wide distribution to health care providers and others. Source: http://websites.afar.org/site/PageServer?pagename=HC_glossary
In a health policy context is the application of the best available scientific evidence to policy decisions about specific medical treatments or changes in the delivery system. The goals of evidence-based decision making are to improve the quality of care, increase the efficiency of care delivery, and improve the allocation of health care resources. Source: http://www.va.gov/vatap/glossary.htm
Practice supported by research findings and/or demonstrated as being effective through a critical examination of current and past practices. Source: http://www.cona-nurse.org/STANDARDS/glossary.htm
The conscientious use of current best evidence in making decisions about the care of individual patients or the delivery of health services. Source: http://www.sahealthinfo.org/evidence/e.htm
Programs are considered evidence-based if there exists good evidence that they have a positive impact on the outcomes that they are designed to change. For example, some sex and HIV education programs are considered evidence-based because their impact on sexual or contraceptive behavior have been carefully measured with experimental designs, and these studies produced strong evidence that the programs actually changed behavior in a desirable direction. Source: http://www.etr.org/recapp/research/researchglossary.htm
Evidence-based or best practices are those that have consistently resulted in positive outcomes based on scientific studies. In the mental health field, these are specific services or interventions that have been proven to produce benefits to consumers and their quality of life. Source: http://www.guilfordcenter.com/provider/practices/default.htm
Evidence-based programs and approaches are those that are based on prior research and evaluation findings. Source: http://www.jrsa.org/jjec/resources/definitions.html

APPENDIX C: PUBLIC HEALTH INDICATORS WORKING GROUP – INDICATOR LIST

Indicator	List
Population	Population by age and sex (Census counts) Dependency ratios Population growth Proportion of immigrants and recent immigrants Ethnic Origin Mother tongue Home language Percent who cannot speak English and French
Environment and Health	Social Environment and Health: Unemployments rate Incidence of low income Proportion of single parent families with children Education level of population 15 and over Percent of households paying 30% or more of household income on housing Cost of a nutritious food basket Physical Environment and Health: Air quality index UV index Trihalomethanes in water Posted bathing beaches
Leading Causes of Mortality and Hospitalization	Mortality: All-cause mortality and crude death rate Mortality by ICD-9 chapter Potential Years of Live Lost by ICD-9 chapter Life expectancy Avoidable mortality from specific diseases Hospitalization: All-cause hospital separation rates Hospitalization by ICD-9 chapter
Health-Related Quality of Life	Health expectancy Perceived health Prevalence of long-term disability
Behaviour and Health	Smoking: Current daily cigarette smoking Proportion living in smoke-free homes Alcohol: Proportion consuming 15 or more alcoholic drinks per week Proportion of low-risk drinkers Frequency of heavy drinking episodes Prevalence of drinking and driving
Physical Activity	Frequency of physical activity Energy Expenditure
Chronic Disease and Injuries	Chronic Diseases:

Indicator	List
	Mortality from selected chronic diseases
	PYLL from selected chronic diseases
	Hospitalization for selected chronic diseases
	Prevalence of selected chronic health problems
	<u>Cancer Incidence and Early Detection of Cancer:</u>
	Incidence of selected cancers
	Mortality from selected cancers
	PYLL from selected cancers
	Hospitalization for selected cancers
	OBSP mammography rates
	Mammography rates for women 50-69
	Clinical breast exam rates
	Cervical cancer screening rates
	Injury Prevention and Substance Abuse Prevention:
	Death from selected causes of injury
	Hospitalization for selected causes of injury
	Alcohol-related injuries and deaths from motor vehicle traffic collisions
Nutrition	Population distribution of body mass index
	Average fat intake as percent of energy
	Percent of population consuming five or more servings of vegetables and fruit daily
	Proportion of adolescents aged 12-17 years consuming three or more servings of milk products daily
	Proportion aged 18 and over consuming two or more servings of milk products daily
	Proportion aged 12 and over consuming five or more servings of grain products daily
Mental Health	Prevalence of depression
	Suicide mortality rate
	Hospitalization for attempted suicides
Infectious Diseases	Mortality from selected infectious diseases
	Incidence of selected vaccine-preventable diseases
	Vaccination coverage for selected diseases
	Influenza and pneumococcal vaccination rates among long-term care facility residents
	Influenza vaccination rates among long-term care facility workers
	Influenza vaccination
	Adverse vaccine reactions
	Incidence of selected sexually transmitted diseases
	Hospitalization for pelvic inflammatory disease Incidence of tuberculosis and drug-resistance tuberculosis
	Incidence of animal rabies
	Incidence of selected enteric diseases
	Hospitalization for selected enteric diseases
Family Health	<u>Sexual Health:</u>

Indicator	List
	Youth sexual activity
	Age of sexual debut
	Number of sexual partners
	Condom frequency among those at risk for STDs
	Condom use the last time among those at risk for STDs
	Reproductive Health:
	Crude birth rate
	Age-specific fertility rates and general fertility rate
	Total fertility rate
	Age-specific therapeutic abortion rates
	Age-specific therapeutic abortion ratios
	Age-specific pregnancy rates, including teenage pregnancy rate
	Rate of multiple births
	Low birth weight rate
	Rate of neural tube defects
	Stillbirth rate
	Perinatal mortality rate
	Infant mortality rate
	Child and Adolescent Health:
	Selected causes of death in children and adolescents
	Selected causes of hospital morbidity in children
	Breast-feeding initiation
	DMF/dmf Index
	Percent of caries-immune children
	Seniors Health:
	Long-term care bed ratio
	Population projections for seniors
	Living arrangements for seniors
	Selected causes of hospitalization among seniors
	Fall-related deaths among seniors
	Fall-related hospitalizations among seniors
	Activity limitations among seniors
Use of Health Services and Medications	Prevalence of General Practitioner Visits
	Prevalence of Dentist Visits
	Use of emergency services
	Rate of days of hospitalization
	Prevalence of medication use
	Prevalence of taking three or more medications in the past two days

APPENDIX D: BEST PRACTICE DESCRIPTIVE SUMMARY

Contact Information
Name: **Phone:**
Organization: **E-mail:**

Core Program:
Name of Best Practice:
Description:

   a. Describe best practice:

   b. Describe former process:

   c. Describe changes instituted (technical, process, cultural):

   d. Describe new process:

   e. Describe effect of new process (improvement in effectiveness, efficiency, cost savings, processes eliminated):

   f. Describe resources required to implement best practice:

   g. Describe measurements used to measure performance/effectiveness:

   h. Describe potential for province-wide deployment (if any):

   i. Additional Information/Explanation here: