

**Planning the Design and
Implementation of an Application for
Surveillance of Notifiable Disease**

By

Susan Langille
B00046039
susan@cs.dal.ca

Performed at the Office of the Chief Medical Officer of Health
Nova Scotia department of Health,
1690 Hollis Street, PO Box 488
Halifax, NS B3J 2R9

In partial fulfillment of the requirements of the Master of Health Informatics Program,
Dalhousie University

Report of Internship for the period January 4 – April 4, 2006

Date Submitted: May 1, 2006

Acknowledgement and Endorsement

This internship report was written by me in partial fulfillment of the requirements for the Master of Health Informatics Program at Dalhousie University. This report has not received any previous academic credit at Dalhousie University or any other institution.

I would like to thank Dr. Maureen Baikie, Deputy Chief Medical Officer of Health for her support and supervision during this internship. The Office of the Chief Medical Officer of Health (OCMOH) is a busy place but she took the time to make this internship an enjoyable and valuable learning experience. Thank you as well to Frans Sanders, Ann Coombs, Elaine Holmes and the rest of the staff of OCMOH for their support, advice and assistance. I would also like to thank the many people in various roles in the health department and in the health districts throughout the province who responded to my emails and telephone calls in a friendly and helpful way.

Susan Langille

Executive Summary

This internship was completed at the Office of the Chief Medical Officer of Health, Nova Scotia Department of Health during the months of January – April 2006. The intern reported to Dr Maureen Baikie, Deputy Chief Medical Officer of Health for Nova Scotia. The objectives were to assist in the design and use of IT tools for use by Public Health and to explore the role of informatics in public health.

The author's role was to catalogue applications used by Public Health in notifiable disease surveillance and work with a team to design an application to promote an efficient and effective means of providing notifiable disease surveillance. The Application for Notifiable Disease Surveillance was the result. The program has been produced and is ready for user testing. Implementation issues were researched and presented. The role of informatics in public health was researched and the role of the Public Health Informatician was outlined. A job description was produced and the job will be posted this summer.

The internship proved to be a valuable learning experience as it provided the opportunity to put into practice the skills and knowledge obtained in the MHI program. Public Health has always been a special interest to the author and the lack of appropriate use of information technology has been frustrating.

The Application for Notifiable Disease Surveillance (ANDS) program can provide a blueprint for the implementation of the Atlantic Public Health Surveillance System over the next several years. The better job that is done with implementation of ANDS, the easier it will be to get an enthusiastic staff commitment for the Infoway project.

Table of Contents

1.	Introduction.....	5
2.	Description of the Organization	6
3.	Description of Work Performed by the Intern at the Organization.....	7
4.	How the internship work relates to Health Informatics.....	8
5.	Discussion of a Problem and the Solution	9
6.	Conclusions.....	12
7.	Recommendations	12
8.	Reference Material.....	13
8.1	References.....	13
8.2	Appendices	14
	Appendix 1.....	14
	Appendix 2.....	15
	Appendix 3.....	17
	Appendix 4.....	21
	Appendix 5.....	23

1. Introduction

The 13 week internship was performed at the Office of the Chief Medical Officer of Health for Nova Scotia (OCMOH). The intern reported to and worked with the deputy chief medical officer of health Dr. Maureen Baikie. The intent of the internship was to explore the role of informatics in public health. The intern also explored IT tools in development for use by public health and worked on the planning and procurement process for a large IT project.

The Health Protection Act in Nova Scotia requires that the Chief Medical Officer of Health develop a plan for surveillance. It also provides for mandatory reporting of certain diseases and conditions, which are listed in the regulations. (See Appendix 1) The purpose of these legislative requirements is to ensure that appropriate information is available to find and manage cases, prevent more cases, identify trends in incidence and risk factors and manage outbreaks. Currently several databases are used in the Office of the Chief Medical Officer of Health to conduct surveillance. These databases are of varying age and dependability. The main application in use (Paradox) has not been supported by the Department of Health for some time. An attempt has been made to replace it with a system provided by the Public Health Agency of Canada. However, after considerable effort it was not found to be fully functional.

Historically, public health has made poor use of information technology. Much of the information is collected, manipulated and stored on paper and IT applications that are used are not integrated to work together. The focus of the internship was to work with the Public Health information technology team within the OCMOH. The role of the public health Informatician was explored, a job description was produced and jobs have been approved for both a Public Health Informatician and an Application Specialist to work in public health. The intern worked with the team to design an application for the collection of the required information on notifiable disease surveillance and immunization. The application (ANDS) will be used as a short term solution while the Pan Canadian public health surveillance solution is being developed and implemented. The intern also worked on the plan for implementation of both the short term solution (ANDS) and the Atlantic Planning Project for the Infoway Public Health Surveillance solution.

2. Description of the Organization

At the beginning of the internship the Office of the Chief Medical Officer of Health (OCMOH) was part of the Nova Scotia Department of Health. On February 28 a change in the government led to the development of the Department of Health Promotion and Protection. The Department of Health Promotion and Protection (NSHPP) is made up of the OCMOH, Public Health and Health Promotion. The OCMOH is responsible for protecting and promoting the health of the public in the areas of communicable disease control, environmental health and emergency preparedness and response. The OCMOH is responsible for maintaining or enhancing public health standards, ensuring that major health issues and threats to the health of Nova Scotians are addressed, and communicating health information in an appropriate and timely manner.

The role of the OCMOH is legislated by the Health Protection Act. The Health Protection Act is legislation designed to protect the health of the public. It came into effect on November 1, 2005. It

- provides the legal framework enabling public health officials to protect the public and to prevent, detect, manage, and contain health threats without unduly interfering with civil rights and liberties
- deals with notifiable diseases or conditions, communicable diseases, health hazards, public health emergencies and food safety
- defines the duties and responsibilities of public health officials and of the Ministers responsible.

The OCMOH is divided into 10 work groups. Dr Baikie heads the Public Health Information Technology work group which also includes Ann Coombs, a field surveillance officer and Frans Saunders, an IT/IM project manager with the information management of the Dept of health who works with OCMOH part time. The intern was part of this team for the course of the internship.

3. Description of Work Performed by the Intern at the Organization

The role of the intern was described at the beginning of the internship:

1. Assist the NS Office of the Chief Medical Officer of Health (OCMOH) with the Atlantic Planning Project for the Infoway Public Health Surveillance solution which will be available in 2006. This includes seeking input from end users i.e. current field staff.
2. Review and advise OCMOH on interim IT related strategies for communicable disease surveillance.
3. Review current electronic laboratory reporting system, current databases and alerting mechanisms and advise on optimizing in the short term.

The intern was part of the Public Health IT work group and was involved in a number of projects both individually and as part of the team.

- The first project was to research the role of the Public Health Informatician and write job descriptions for several IT positions. (See Appendix 4)
- A catalogue of applications used in the OCMOH for communicable disease control (CDC) was assembled. (See Appendix 5)
- The legislation relating to privacy issues, confidentiality and information security was researched and a policy was written for public health staff. (See Appendix 2)

The main project was an application for notifiable disease surveillance (ANDS). The application will be used to conduct surveillance of notifiable diseases and conditions as required by legislation. This work had been started the year before but progress was slow. Following a mumps outbreak when complete immunization records were difficult to access it was decided to incorporate immunization records in the program. The business/system requirements document was revised and completed to include the issues raised by the variety of users. The team designed the forms for the collection of data and the screens to record and manipulate the information. The Public Health Agency of Canada

(PHAC) acted as programmers for the project. The ANDS program will be used for surveillance until the Infoway solution (the Atlantic Public Health Surveillance system) is available.

The final responsibility of the intern was preparing for the implementation of the Atlantic Public Health Surveillance system. Research was done on the barriers to implementing a public health information system and a report was prepared. (See Appendix 3) This information will be used by the project team to help pave the way for a smooth implementation of the surveillance system.

4. Relevance of the internship to Health Informatics

This internship concentrated almost exclusively on tasks and issues relevant to health informatics. The OCMOH wanted to focus more effort on IT/IM projects but lacked staff with time and expertise to devote to the projects. The internship projects required the author to gain an understanding of the business practices and processes within both the OCMOH and the health districts throughout the province. It required the gathering of information about CDC application in use and the issues and concerns about their effectiveness. This relationship of information technology with health information and processes defines the nature of health informatics.

The projects required that the intern gain an understanding of the needs of the various departments and levels of government. The information flow and the processes related to the collection and manipulation of data also needed to be analyzed. This research was conducted through interviews and discussion with user representatives, through the analysis of applications already in use and through a review of legislative requirements of the various departments.

The OCMOH and the department of Public Health were anxious to add new staff with expertise in health informatics. To that effect job descriptions were written for a public health Informatician and a public health application specialist. Both of these positions designate training in health informatics as an asset.

5. Discussion of a Problem and the Solution

The chief medical officer of health is required by the Health Act to develop a plan for surveillance of communicable disease. Several databases have been used and found to function poorly.

The team at OCMOH recognized the need for an effective CDC surveillance program. Multiple applications were in place to record and report on various diseases to both provincial and federal agencies and for gathering statistics. Some data such as immunization records in the districts is incomplete depending on who gives the vaccine. When doctors give a vaccine it is recorded in the doctor's office and sometimes reported to MSI, however, Public Health is seldom notified. When vaccines are given at schools or clinics by public health nurses, the information is recorded on cards and filed in cardboard boxes. Accessing and compiling this data for program planning, statistical analysis or even to plan appropriate client care and follow up is inefficient, often inaccurate and time consuming.

An application is needed to allow nurses in the community to record the surveillance data as they follow up cases of the notifiable diseases that they are required to investigate. This computer application must allow easy input of the required data and output of the required reports.

In 2005, the OCMOH team began the process of designing an application for the surveillance of notifiable diseases. This was delayed as staff lacked time and expertise to focus specifically on public health informatics.

In the summer of 2005 and again in December there were outbreaks of mumps in the Halifax area. This occurred in a population aged 14 – 23. A vaccine for mumps (MMR) has been publicly funded since 1975 and a second dose of MMR has been offered to all children at age 5 since 1997. So this age group should have been immunized at least once. It was a time consuming process to track down immunization records and complete records were never found on all the cases and contacts. It is vital to have access to accurate immunization records when investigating an outbreak. This led to the decision that immunization records should be included in the surveillance program.

The opportunity for an immunization registry may be possible in the future but at present the program will record information on vaccines given by public health staff only. This can be expanded to

include immunizations done by family doctors when electronic patient records are available and records can be electronically transferred.

Business system requirements were discussed with the OCMOH team and public health field staff who would be the users of the system, to ensure that the program would meet everyone's needs. The forms to be used by field staff were designed to record needed data as accurately and simply as possible. The team designed an overview of what the site should look like on the screen arranged to look as much like the paper forms as possible. Issues of privacy were addressed by restricting access to areas of the program based on the needs of the users to do their job. Users will have access based on their role and the location where they work. A privacy impact assessment will be completed and approved prior to implementation of the program. The program was written by programmers at the Public Health Agency of Canada (PHAC). Communication between the team and the programmers had some misunderstandings, but with persistence and compromise the program has been completed. It will be called Application for Notifiable Disease Surveillance (ANDS) and user testing will be starting in May 2006.

The next and maybe bigger issue will be the implementation. The ANDS program is one of several IT initiatives being introduced to public health staff this year. Research into possible barriers to the implementation of a public health information system yielded a number of areas where this process can be enhanced (See Appendix 3). Several of these points will be of particular concern in this case.

- Standardization and connectivity of information may be difficult for systems and staff that have worked independently in the past. In Nova Scotia each region has a degree of independence in their expectations and use of IT systems. The users in all areas must perceive a benefit in the new system and must have hardware and system speed to support the program. The new must be integrated with the old as much as possible.
- Users should be involved early in the process and a part of the planning. They need to be involved in identifying needs and concerns and providing input and feedback throughout the process. Planning major changes without involving the users wastes a valuable resource and demonstrates lack of respect and a poor communication strategy.

- Staff must feel that there is sufficient reward in the long term to motivate them to cope with an increased data entry work load and changes in the way they work. In order for the system to be accepted and embraced, there needs to be a balance in effort and benefit for each party involved.
- Communication begins with listening and understanding the concerns before shaping informational messages. Staff needs to have up-to-date information throughout the process. There must be a willingness to share problems and concerns without negative consequences and also share strategies for solving problems in a non-judgmental, non-threatening atmosphere.

As the team prepares for testing of ANDS, user testers in each region have been identified. Comfort with the use of the program will begin with this group. Information sessions in each region are taking place to provide information and to consult regarding issues and concerns.

Health Canada has provided funding to Infoway to develop a Pan Canadian Public Health Surveillance and Case Management System. Infoway established the **Public Health Communicable Disease Surveillance and Management Program** in 2004. The program's purpose is to reduce morbidity from communicable diseases by investing in a new generation of surveillance systems in Canadian jurisdictions that can support better and more consistent case management, immunization management, and outbreak detection and response. The approach taken by the program is to invest in a Pan-Canadian Solution System and then assist the jurisdictions in implementing it and adapting it to their local requirements and related systems. This system is currently being designed and built for Pan Canadian use. A prototype is expected to be ready by the end of 2006. Working through Health Infostructure Atlantic (HIA), Nova Scotia, Newfoundland and New Brunswick have decided to undertake a planning project to determine the issues, costs, schedule, scope and approaches to implementing the modules of Pan-Canadian Public Health Surveillance System in Atlantic Canada. The project will produce a detailed set of implementation plans and budgets that will allow implementation to proceed in Atlantic Canada, once the necessary commitments and resources are in place. Since the Infoway project is only in the design stages and will not be available for at least 2 years. The application for notifiable disease surveillance (ANDS) will provide an interim solution in NS until the Infoway Solution is deployed.

5. Conclusions

During the internship several initiatives have been identified, researched and work is in progress to continue the projects.

- The job descriptions for the Public Health Informatician and Public Health Application specialist have been classified by the HR department and will be posted for hire this summer.
- The ANDS program is written and ready for testing. The testing begins early May and user testers have been identified.
- Implementation procedures are beginning with members of the team conducting sessions in each region in order to inform and get feedback from field staff.

6. Recommendations

This is an exciting time for Public Health in Nova Scotia with the changes that the Pan-Canadian Public Health Surveillance System will bring. The steps that are in process now will help to prepare staff and pave the way for the Atlantic Public Health Surveillance System. The hiring of new staff with a focus in health informatics and a commitment to change within the OCMOH bodes well for the future.

The implementation strategy used for the ANDS project can be seen as a blueprint for the implementation of the Infoway project. This implementation is very important because if it is done poorly without staff support and commitment, it will be difficult to get staff to buy into the next project in two years time. The better the job that is done with implementation of ANDS, the easier it will be to get an enthusiastic staff commitment for the Atlantic Public Health Surveillance System.

8. Reference Material

8.1 References

1. Jane Hendy, Barnaby C Reeves, Naomi Fulop, Andrew Hutchings and Cristina Masseria Challenges to Implementing the National Programme for Information Technology (NPfIT): a qualitative study. *BMJ* August 6, 2005; 331; 331-336.
2. Eric G Poon, Ashish K Jha¹, Melissa Christino¹, Melissa M Honour, Rushika Fernandopulle, Blackford Middleton, Joseph Newhouse, Lucian Leape, David W Bates, David Blumenthal and Rainu Kaushal¹ Assessing the level of healthcare information technology adoption In the United States: a snapshot. *BMC Medical Informatics and Decision Making* 05 January 2006, 6:1
3. Jac Davies, Greg Smith, Deb Gustafson Public Health Informatics Transforms The Notifiable Condition System *Northwest Public Health Spring/Summer* 2001; 14-17.
4. David Niles Organizations finding ways to overcome barriers to electronic health records implementation 06/14/05 <http://wistechology.com/article.php?id=1906>
5. Thacker SB, Stroup DF. Future directions for comprehensive public health surveillance and health information systems in the United States
6. Ellen L. Wild, Terry M. Hastings, Ruth Gubernick, David A. Ross, and S. Nicole Fehrenbach Key Elements for Successful Integrated Health Information Systems: Lessons from the States *J Public Health Management Practice*, 2004, November (Suppl), S36–S47
7. Kristin N. Saarlal, Alan R. Hinman, David A. Ross, William C. Watson, Jr, Ellen L. Wild, Terry M. Hastings, and Patricia A. Richmond All Kids Count 1991–2004: Developing Information Systems to Improve Child Health and the Delivery of Immunizations and Preventive Services *J Public Health Management Practice*, 2004, November (Suppl), S3–S15
8. Patrick W O’Carroll, William A. Yasnoff, M. Elizabeth, Laura H. Ripp Ernest L. Martin, (Editors) Public Health Informatics and Information Systems 2003, Springer Science+Business Media Inc., New York
9. Nova Scotia Department of Health, “Information Management: Access & Privacy” December 1, 2003.
10. Health Protection Act <http://www.gov.ns.ca/legislature/legc/>
11. Freedom of Information and Protection of Privacy Act <http://www.gov.ns.ca/legislature/legc/statutes/freedom.htm>

8.2 Appendices

Appendix 1 It's the Law Reporting Notifiable Diseases and Conditions

Amebiasis	Malaria
Anthrax	Measles
Botulism	Meningococcal Disease Invasive
Brucellosis	Methicillin Resistant Staphylococcus Aureus (MRSA)
Campylobacteriosis	Mumps
Chancroid	Paratyphoid
Chlamydia	Pertussis
Clostridium	Plague
Creutzfeldt-Jakob Disease Classic (CJD)	Pneumococcal Disease Invasive
Creutzfeldt-Jakob Disease New Variant (nCJD)	Poliomyelitis
Cryptosporidiosis	Q Fever
Cyclosporiasis	Rabies
Diphtheria	Relapsing Fever
Giardiasis	Rocky Mountain Spotted Fever
Gonorrhoea	Rubella
Group A Streptococcal Disease Invasive	Salmonellosis
Group B Streptococcal Disease of Newborn	Severe Acute Respiratory Syndrome
Haemophilus Influenzae Type b Invasive Disease (HIB)	Shigellosis
Hantavirus Pulmonary Syndrome	Smallpox
Hantavirus Pulmonary Syndrome (HPS)	Syphilis
Hepatitis A	Tetanus
Hepatitis B	Toxoplasmosis
Hepatitis C	Trichinellosis
Hepatitis E	Tuberculosis
HTLV 1 and HTLV II	Tularemia
Human Granulocytic Ehrlichiosis	Typhoid
Influenza – Laboratory Confirmed	Vancomycin Resistant Enterococcus (VRE)
Human Immunodeficiency Virus (HIV)	Verotoxigenic E. coli
Influenza Virus of Pandemic Potential	Viral Hemorrhagic Fevers (Crimean-Congo, Ebola, Lassa, and others)
Legionellosis	West Nile Virus (WNV)
Leprosy (Hansen's Disease)	Yellow Fever
Listeriosis	Yersiniosis
Lyme Disease	
Lymphogranuloma Venerum	

Published August 2005

Appendix 2 Privacy, Confidentiality and Security

Canadians expect and have confidence that the privacy and confidentiality of their personal information will be protected when governments use it in the course of providing programs and services. In Nova Scotia **the Department of Health/Department of Health Protection and Protection Information Management: Access and Privacy policy (2003)** outlines provisions for the collection, use, management and disclosure of health information. The ten principles for the protection of personal information in the policy (Appendix A) were tailored to be consistent with the **Freedom of Information and Protection of Privacy Act (1993)**.

FOIPOP provides access to records under the control of the provincial government while protecting the privacy of individuals. The Act strives for balance between the public's right to know and an individual's right to privacy. Under section 24(1) it states that a government body can collect personal information only if it is legislated to do so. Personal information can be collected if it is expressly authorized, for the purpose of law enforcement or if it relates directly to, and is necessary for, a government program. Information may be released if there are compelling circumstances affecting anyone's health or safety. A government body can release personal information without the prior approval of the individual if it is in the public interest. For example, the information must be about a risk of significant harm to the environment, health or safety of the public.

The **Health Protection Act (2005)** is legislation designed to protect the health of the public. The purpose of this legislation is to ensure that appropriate information is available to find and manage cases of communicable disease, prevent more cases, identify trends in incidence and risk factors and to manage outbreaks. It requires that the Chief Medical Officer of Health (CMOH) develop a plan for surveillance. It also provides for mandatory reporting by physicians, medical laboratory technologists and others of certain diseases and conditions, which are listed in the regulations. Under the direction of the CMOH, the Medical Officers of Health (MOH) are responsible to receive and investigate reports of communicable diseases and health hazards in the District Health Authority to which they have been assigned, although their authority extends province wide. They are supported in this role by Public Health Nurses who work for Public Health Services (reporting to the District Health Authority) and by Public Health Inspectors who work for Nova Scotia

Environment and Labor or Nova Scotia Agriculture and Fisheries. MOHs require a broad range of information in order to investigate/assess and prevent risks to public health. Under the act, a MOH may access data or records from all possible sources including other government departments, other levels of government, NGOs, hospitals, and Canadian Blood Services.

The Health Protection states that a MOH may publicly release the identity of a person with a communicable disease as a last resort to protect public health (Section 15.3). Information may be provided in court, etc., if the Minister directs and where ordered by a Supreme Court Judge in a public inquiry (Section 17.4).

The Confidentiality Regulations made under the Health Protection Act provide detail related to how the confidentiality of information is to be maintained. These regulations do four things: define “business information”; define “personal information”; set out security requirement for business and personal information; and set out requirements for inter-jurisdictional information sharing agreements. The collection, use and disclosure of health information is to be carried out in the most limited manner, on a need-to-know basis and with the highest degree of anonymity possible in the circumstances. Medical Officers of Health may in the course of their work acquire a considerable amount of information about an identifiable individual or business. The CMOH may share information with other jurisdictions or parties when it is necessary to fulfill his or her duties. When the information is shared, the Chief Medical Officer of Health must enter into an agreement with the other party to ensure that the information is not further disclosed without the consent of the CMOH.

The regulations also outline security requirements for the information. The regulations make it clear that the MOH must keep personal and business information that they receive by authority of the act in a secure location with access only by the MOH or staff authorized by the MOH. The information received by a MOH or a public health nurse or a public health inspector in the course of their work must be carefully safeguarded. The FOIPOP Act also specifies that measures must be taken to protect personal information by making reasonable security arrangements against such risks as unauthorized access, collection, use, disclosure or disposal. (Section 24.3)

Appendix 3

Barriers to the Implementation of a Public Health Information System

The major barriers to a successful comprehensive, nationwide integrated public health system are a lack of appreciation for the value of high quality surveillance data and a weak societal commitment to Public Health (5). Several areas are identified in literature as possible areas of concern when implementing a public health information system.

System flexibility and integration

Lack of system integration and flexibility can be a barrier to implementation. The system must work with a variety of hardware and software (databases and browsers) options and different operating systems. The system must permit easy communication (interoperability) among staff so that information can be shared in real time. Cross-institutional communication is hindered by the use of different software packages and a lack of standards. Systems that often functioned independently will now require standardization and connectivity of information. The requirements of the system should be defined to support users' needs. It should also be adaptable to jurisdiction specific process concerns. That is, a jurisdiction may find a change in process more efficient. It should be able to collect data that is needed for normal processes in that area. Whatever the legacy system, the new system should be integrated with existing practices. The infrastructure to support the program is needed at deployment so as to get the best user buy-in. Appropriate network speed to allow the most efficient usage must be available. Equipment that is not available when needed because of either shared computers or shared access point leads to frustration. These barriers to use can be overcome if the users perceive a benefit and the information system supports the delivery of services. Projects that adopted the motto "if we build it, they will come" were more likely to fail. (7)

Communication is critical.

Computer science, information science, public health expertise—all of these are essential, but without the interpersonal, organizational, and management skills needed to communicate with stakeholders, an information system project's chances of success are considerably diminished. (6)

Communication with all participants should begin early and continue throughout the planning and implementation process. Individuals and groups who will not immediately be affected but are likely to be involved in the future should also be included in the communication loop. This can help reduce

anxiety over potential changes and ensure that specific program needs are met. A good communication strategy begins with listening to the various stakeholders and understanding their concerns and needs before shaping informational messages. It requires a commitment of resources to ensure that key groups have continuous, up-to-date information about the purpose and progress of information systems. Public health managers must work hard to find and educate spokespersons that can successfully communicate messages both externally and internally.

Involve stakeholders from the beginning.

Optimal delivery of an information system depends not only on technical capability but also on managing implementation so that staff embraces the changes with enthusiasm. Users need to be involved in setting priorities and planning for actual implementation. They need to understand the need for and help with any redesign of workflow. It is helpful to identify people who will be barriers, bring them onboard and deal with their challenges. The need to get those "early wins" that help build a culture open to technology adoption is crucial to implementation success. Stakeholders, both users and beneficiaries of information systems, need to be actively involved throughout the planning and implementation of information systems. It is up to leadership to recognize the magnitude of change that will result from integration of health information systems and to introduce strategies to increase acceptance. Strategies include ensuring all stakeholders are "on board" with the project from the beginning; seeking input and feedback throughout the project lifecycle; ensuring staff have the training and resources to do their jobs; and, perhaps most importantly, demonstrating the commitment of leadership to the integration of information systems.

Acceptability

Unrealistic and shifting timetables, lack of consultation and communication, and lack of perceived short-term benefits have affected staff morale. Often there is insufficient reward to motivate staff for data entry and changes in working style. Staff feels that they will not experience tangible benefits in the near future, but will have to cope with disruption, uncertainty, and change, and possibly a loss of IT functionality in the short term. In these circumstances, success will depend on gaining the cooperation of front line staff. There needs to be some benefit for the user to make system change/added work worthwhile. Effort and benefit have to balance for each party involved.

Representative users must become partners in the enterprise through genuine consultation; this is

what is likely to give them a sense of ownership and reward as systems are introduced, even when the going gets difficult.

Timing is essential. Plan boldly but build incrementally.

Each success increases the likelihood of a subsequent success. It also permits adaptation to the inevitable changes and the up-front loss of productivity during the transition from paper-based to computer-based systems. The usefulness of an information system often is not seen until a large quantity of patient information has been entered. This can be a time-consuming task and staff time needs to be respected.

Plan for Change

Implementation of an integrated health information system is much more than implementation of hardware and software. Cultural change is as important as technological change. Successful implementation is largely dependent on the commitment of staff to implementing an information system that will change the way they do their jobs. This can be threatening to some. Although organizations have come to accept the idea that change is inevitable, it's easy to forget how hard it can be and how slow. A good communication plan is needed to describe how everyone is affected by the changes and to identify supports available to stakeholders who experience the greatest impact. Change agents need to be sensitive to these issues and be prepared to address them.

Organization or system-wide planning requires people to adopt new behaviors—collaborating with others outside their immediate program area, changing internal business processes to align with external practices, and giving up short-term internal gains for long term system-wide benefit.

Address common problems collaboratively.

Establishing a systematic cycle of quality improvement and feedback of data in the information system is essential to improving its usefulness. A key factor in successful collaborative efforts is camaraderie and trust among a group's members. Members must feel that problems (and failures) can be shared without negative consequences. There must be a willingness to talk honestly and openly with each other about problems and share strategies for solving them in a non-judgmental, non-competitive, non-threatening atmosphere.

Ease of Use

Staff is looking for ease of use. It is important to avoid duplicate data entry. This may happen when new systems are not universally implemented. Not only is there a substantial learning curve to use information technology, but also the usefulness of an information system often is not seen until a large quantity of patient information has been entered. This can be a time-consuming task. Data entry and flow should be intuitive; terminology needs to be consistent and easily understood or well explained, and mandatory fields limited. Ease of navigation is important and screen resolution should be consistent with user systems/work habits.

Training is essential.

Ongoing reliability and availability support and resources to deal with technological difficulties are essential. Continuing education programs are necessary to equip staff with the necessary skills to enable them to use the system effectively in their work. However not only do staff in public health agencies need training in how to use new technology, background training in informatics may be helpful. This provides staff with a basic understanding of why integration is necessary and how it works. That understanding helps promote the necessary cultural change.

Privacy and Confidentiality issues

Concerns about data security and integrity are common. Electronic exchange of information and integrated information systems raise the concerns of the public and health officials over loss of privacy and confidentiality. To build and maintain trust in the integration efforts, planners must actively pursue strong security measures and must test those measures to ensure they are effective.

Ongoing Evaluation

Identifying the costs and benefits of the information systems from the perspectives of all stakeholders will help each sector understand how its contributions affect the overall outcome. As integrated information systems mature, the ability to document and measure benefits improves. Evaluation efforts should include measuring the cost benefit and cost-effectiveness of information systems.

Appendix 4 Job Description for Public Health Informatician

We are looking for a skilled professional who understand both the healthcare and information technology environments. The candidate should have IT knowledge and skills that support usage, understand the meaning and use of public health information and be able to deploy information technologies in support of public health business processes and objectives.

Duties and Responsibilities:

Leadership - 10%

Provides leadership and direction to a (team of) professional(s) who will provide consultation, advice and education to Public Health staff on issues related to Public Health information systems and Public Health's Information Technology Strategy (PHITS)

Project Management/Capacity building - 40%

Participates in the development and management of Public Health information systems
Coordinates and manages teams working on various initiatives. Provides written reports as required. Ensure adherence to timelines, scope and budget expenditures.

Business Process Re-Engineering - 20%

Leads business process re-engineering planning, development, implementation, and on-going evaluation to support all aspects of Public Health information systems. Leads requirements definition in support of Public Health information needs and in support of day-to-day use of Public Health information systems and other manual and automated tools.

Monitoring and Evaluation - 30%

Leads the development and implementation of a comprehensive information management plan for the development and measurement of progress towards Public Health goals and indicators Provides on-going monitoring and evaluation of the use of Public Health information systems Supports the collection, analysis and dissemination of data to support Public Health/OCMOH evaluation and monitoring Ensures compliance with standards and policies on quality, security and privacy

Knowledge and Skills:

- Knowledge of the Nova Scotia Health care system, with main focus on public health. An understanding of the meaning of and use of information generated in public health settings.
- Broad background and training in information technology with technical skills in the use, implementation and maintenance of information systems.
- Ability to effectively use a wide range of software, including office applications, project management software, internet/intranet software and email software is essential. Knowledge and experience with web-enabled systems and statistical analysis software is an asset.

- Ability to listen attentively and communicate effectively both orally and in writing with individuals and groups in clear, concise language appropriate for the purpose and parties addressed. Must be able to facilitate communication between technical and non-technical groups.
- Requires excellent interpersonal skills: the ability to work well with others, maintain long-term relationships and work with diverse stakeholders. The ability to establish rapport with IT and public health staff.
- Skills in group dynamics, facilitation and consensus building. The ability to coordinate committee work and participate in groups as needed.
- Organizational skills to manage day-to-day activities as well as the ability to manage multiple priorities simultaneously and coordinate multi-institutional projects.
- Planning skills (long and short term) and time management skills are required to meet multiple deadlines.
- The ability to work independently and cooperatively with groups in a multi-task environment, taking appropriate initiative and effectively delegating responsibility and authority.
- Ability to use problem solving techniques to make reasoned, timely and consistent decisions and to facilitate the effective resolution of problems.
- Knowledge and experience with project management and the ability to coordinate several projects at once.

Education/Experience:

- A degree and/or certification in a health related discipline with preference given to public health, e.g. public health nursing, epidemiology, public health inspection or public health nutrition.
- A degree and/or experience in health informatics/information systems/computer science.
- Five years related experience and a demonstrated knowledge base that encompasses the public health system, computer science and health information systems related topics.

Appendix 5 CDC Application used by OCMOH

Program	Purpose	Based on	Where Used	Descriptions of Contents
Adverse Events Following Immunization Reports (AEFI)	Provide information on adverse events reported following immunizations	Access	OCMOH	Patient identification information, Vaccine given and date of immunization. Name and address of reporter. MOH involved
ANDS (Application for Notifiable Disease Surveillance)	Surveillance of notifiable diseases in NS and a record of immunizations given by public health staff in NS	Oracle	New program to replace Paradox program. Plan to go live by April 14. Will be used by both DHAs and OCMOH	Ability to search the system for a client, add a client not in the system and record information regarding a case of a notifiable disease or an immunization that is given. Also has the ability to generate both standard and ad hoc reports. The system administrator controls user access.
Anonymous HIV Test Site	Records questionnaire data on Nova Scotians requesting anonymous testing for HIV/AIDS		Data from Planned Parenthood Metro Clinic. OCMOH staff	Demographic data (such as country of residence, birth year and gender), risk factors, reasons for testing, test history, results and suggested community services contacts.
BIMS (Biological Inventory Management System)	Access information at any time about planning, ordering distribution and utilization of publicly funded biologicals from manufacturer to service provider.	SAP based	OCMOH staff that manage biologicals budget and biologicals coordinators in the DHAs.	Each DHA tracks biologicals in and out of the office in real time. Each sub office sends in fridge counts and distribution figures to the main office in the DHA for entering into the program. Tracks Vaccine Lot# and amount.
Blood and Blood Product Look back	Summarizes information for individuals involved in look back investigations.	Access97	OCMOH staff	Blood or blood product, Recipient information.

CIOSC (Canadian Integrated Outbreak Surveillance Center)	Canada wide respiratory and enteric alert system for outbreaks or unusual occurrences		Both OCMOH and DHAs. Staff has reader and/or writer capability.	Event information, date of investigation, location, organism source, priority, Poster of alert and contact information. Updates can be added as required
ELR (Electronic Laboratory Reporting)	A reporting application that enables the retrieval of positive results of lab tests for notifiable diseases from the QE2 lab system.		Records can be accessed by the OCMOH and the applicable DHA	Lab data for positive notifiable disease reports from the QE2 Health Science Center is compiled into a centralized server each night and presented to public health districts for follow up.
Enteric Outbreaks	Summarizes reported enteric outbreaks	Access 2000	OCMOH staff	ID#, Location, Organism, Date of events, Number of cases, Lab confirmations, Mode of transmission.
Flu Watch	Activity level of influenza in a DHA or provincially based on information from schools/day cares, workplaces, long term care facilities and hospitals.		Part of the CIOSC system (Atlantic Pilot) DHAs in Atlantic Canada input data from the field. OCMOH staff can access regional or provincial reports	The number of cases at sentinel sites leads to a calculation of activity level. No activity, sporadic, localized wide spread
HACRSS (HIV/AIDS Case Reporting Surveillance System)	Captures enhanced surveillance information for reported cases of HIV and AIDS	Access 97	OCMOH staff	Demographics, Risk factor information
Hepatitis C Lab Data	Summarizes Hepatitis C lab test data on an aggregate level.	Access 97	OCMOH staff	Number and kind of lab tests performed, Number of positive results. Summarized by SSA.

Hepatitis C Surveillance	Provides enhanced surveillance information on all reported positive cases of Hepatitis C	Access 97	OCMOH staff	Demographics, Risk factor information Form for within NS and for out of province
HIV/AIDS Lab Data	Summarizes HIV lab test data on an aggregate level	Access 97	OCMOH staff	Number of lab tests performed, Number of positive results
Invasive Meningococcal Disease Enhanced Surveillance	Line list of Cases	Excel	OCMOH staff	Province, DOB, Sex, Diagnosis, Confirmation, Date of onset, Immunization status, Specimen, Lab method, Outcome, Travel
Notifiable Disease Surveillance	Provides summary surveillance information on all notifiable diseases except Hepatitis C and HIV/AIDS	Paradox	Used by OCMOH staff	Age group, sex, shared service area, month.
Respiratory Outbreaks	Summarizes reported respiratory outbreaks	Access 97	OCMOH staff	Outbreak #, Region, Facility and Contact. Organism, Date of onset, Status and Final Assessment.