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EPI NORTH
The Northwest Territories' Epidemiology Newsletter

IN THIS ISSUE

Immunization Coverage in the Northwest Territories

Maria Santos, Territorial Epidemiologist, Department of Health and Social Services

Immunization is one of public health's greatest and most cost-effective achievements, being primarily responsible for the sharp decline in illness, disability and death from vaccine-preventable diseases experienced over the past several decades. While clean water, proper sewage, and improved living conditions account for better health and less mortality, immunizations, by far, carry the largest impact.[1]

Immunization coverage rates are important for monitoring the uptake level of vaccines in the population. As an important health indicator, it measures the vulnerability of a population to vaccine-preventable diseases. Immunization coverage rates assist with targeting public health interventions to regions and population groups (e.g. low-income households, transient and urban populations)[2] with low immunization coverage. Measuring trends in coverage contributes to the evaluation of newly implemented programs/interventions and the progress towards achieving immunization targets. It can also act as a proxy for evaluating the delivery of health services or systems.[3,4] Because five or more encounters with a health care provider are needed to fully immunize a child, immunization coverage can act as a proxy for how well the health care system performs.

Why does it even matter if a region's immunization coverage rates are high? Even if a child is immunized, the risk of a vaccine preventable infectious disease increases when there are lower vaccine coverage rates in the general population. Increased rates of disease could lead to exposure to vaccine preventable diseases in children. Since no vaccine is 100% effective, some children will be susceptible. Another reason for sustaining high immunization rates is to maintain herd immunity. The resistance of a group to the spread of an infectious agent is dependent on a high proportion of individual members of the group that are resistant to the infection.[5] Herd immunity refers to the decreased probability that a group will experience an epidemic after the introduction of an infectious agent, even though some individuals in the group may be susceptible to the agent.[6]

In 2005, the Department of Health and Social Services reviewed the immunization coverage of two and seven year old children in the Northwest Territories (NWT). This article provides highlights from our findings.

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Northwest Territories Health and Social Services

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Letters to the editor and articles are welcome but may be edited for space, style and clarity. Please contact the Managing Editor for article guidelines. All submissions must be sent electronically.

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Editor's Notes:

Janet Hopkins, Managing Editor, EpiNorth, Department of Health and Social Services

As of April 2006, *EpiNorth* has replaced its paper publication with a new electronic format. All previous subscribers and new readers are now welcome to our online edition.

The *EpiNorth* newsletter will continue to be published on a quarterly basis by the Population Health Division of the Department of Health and Social Services. EpiNorth's mandate is to provide quality information on disease patterns and trends and health determinants relevant to the people of the NWT. It is intended to provide an opportunity for all those involved in health promotion, disease prevention and disease control activities to share their experience and exchange information with regard to new initiatives, best practices and program evaluations.

The main focus of this issue of *EpiNorth* is Health Surveillance. The Public Health Agency of Canada defines Surveillance as:

"the 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"[1]

A brief summary of articles in this issue:

Immunization in the NWT by Maria Santos, NWT Territorial Epidemiologist, discusses the importance of monitoring immunization coverage rates as an important health indicator to measure the vulnerability of a population to vaccine-preventable diseases. It also highlights findings from a review done by the Department of Health and Social Services of the immunization coverage rates of two and seven year old children in the NWT.

The Report on Abnormal Pap Smears during Cervical Cancer Screening, by Sarah-Jane Taleski, Epidemiology Practicum Student, Maria Santos, Territorial Epidemiologist and Dr. Bing Guthrie, discusses the rates of abnormal pap smears in females in the NWT and provides data on the age and ethnic-specific frequencies of abnormal results. This report will assist in guiding future decisions toward a HPV immunization program or cervical cancer-screening program for the NWT.

The article *Prevention of Cervical Cancer: The HPV Vaccine*, by Dr. Bing Guthrie, OBS/GYN, Stanton Territorial Health Authority, provides us with information on the development of an effective vaccine as a primary prevention strategy against Human Papilloma Virus (HPV) infection. HPV is one of the most common sexually transmitted diseases in the world that is also associated with the development of cervical dysplasia and cancer.

Prenatal Screening for Maternal Alcohol Consumption, by Dr. Kami Kandola, advocates for routine screening for alcohol consumption during pregnancy, based on the dramatic impacts FASD has on the individuals affected, their families and on the health care system as a whole. It reviews all major screening instruments and compares them to the current NWT standard in prenatal care to assess maternal alcohol consumption, T-ACE.

Finally, Helen MacPherson, Senior Disease Registries Officer, provides the usual update on Notifiable Diseases in the NWT.

As always we invite your comments or suggestions regarding articles that appear in *EpiNorth*. The Editor also welcomes articles with NWT relevance from any authors.

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Immunization schedule

The NWT immunization schedule is based on recommendations from the National Advisory Committee on Immunization (NACI). The most current immunization schedule for the NWT is accessible through the Department of Health and Social Services' website: http://www.hlthss.gov.nt.ca/Features/Programs_and_Services/immunizations/pdf/nwtimmunizationschedule.pdf

By two years of age, a fully vaccinated child born in 2002 should have received the following series of doses and agents: 4 doses each of diphtheria, tetanus, pertussis, poliovirus and haemophilus influenzae type b vaccine; 3 doses of hepatitis B vaccine; 2 doses of measles, mumps and rubella; and 1 dose of varicella vaccine.

Recent additions to the immunization schedule include two doses of meningococcal C vaccine and four doses of pneumococcal conjugate vaccine. The meningococcal vaccine is typically provided at 2 and 12 months of age. However, the analysis of the 2002 cohort did not examine the administration of this vaccine since the meningococcal vaccine was implemented into the schedule in June 2004. By this time, the children in the 2002 cohort were either two years old or almost turning two. Instead, children between the ages of 1 to 19 years were provided with only one dose of the vaccine, which is appropriate for this age group. Since children in the 2002 cohort were not targeted for the catch-up program, any analysis in relation to the meningococcal vaccine was performed only among the 1997 cohort that underwent the catch-up program. Pneumococcal Vaccine coverage is not reported at all in this analysis due to the relatively recent introduction of this program in 2006.

In addition to the infant series of immunizations, a fully vaccinated seven-year-old born in 1997 should have received an added dose of diphtheria, pertussis, tetanus and polio vaccine between the ages of 4 to 6. Varicella coverage was not examined in this cohort since the catch up program only applied to children less than 5 years of age after May 2002. By this time, almost half of the 1997 cohort would have already turned 5 years old and would have not been targeted for varicella vaccination.

Methodology

Initiated in the summer of 2005, this audit involved the collection of immunization cards from community health centres across the territories for children born in 1997 and in 2002. Without a national or territorial immunization registry, there is no centralized list to determine who has been immunized, against what infectious agent and when. Thus, there is no capacity to track one's immunization status from one jurisdiction to another, without permanently retaining an official up-to-date immunization card. The information captured for the analysis included, the child's name, health care number, community of residence, date of birth, sex, date of immunization, and immunizing agent. This information was manually entered into a Microsoft Access database and integrated with data gathered from Health Suite (the community health management information system). Once entered, preliminary data cleaning included reviewing the cards of all children who did not receive a full immunization series. As the gold standard, the immunization cards were used to assess whether information was missed or incorrectly entered into the database. Once cleaned, the file was prepared for analysis.

Each cohort was determined using the Health Care Registration Database. For the 2002 cohort (i.e. the two year old cohort), only children born in 2002 who were residents of the Northwest Territories since birth were included in the analysis. The 1997 cohort (i.e. the seven year old cohort) consisted of

children born in 1997 who resided in the Northwest Territories since they were at least four years of age until after their 7th birthday. Typically, a child's immunization status is screened prior to the entry of pre-school. The opportunity to screen a child's immunization status after four years of age does not recur until the child enters grade nine. Therefore, seven-year-old children who moved into the territories after four years of age were not included in the analysis as it was highly unlikely the health centres would have the child's immunization information on file unless the child had unexpectedly visited the health centre. This is a major limitation in the assessment of this population's immunization status.

Data analysis included counting the number of children from the cohort that received the full dose for each individual antigen as well as the number of children who received the full vaccination series. With these counts each representing a different numerator and the number of children in the cohort serving as the denominator, the immunization coverage rate was thus calculated. The analysis further looked at up-to-date vaccination as of June 2005 (i.e. the date in which data collection started) whereas a second approach examined only those provided at or before the second or seventh birthday, depending on which cohort was being studied. The first method determines whether the child is adequately immunized while the second approach examines whether the child is immunized on time. Although the results are not presented in this article, this complete analysis was also conducted for each regional health authority.

Table 1: Immunization coverage rates for the 2002 birth cohort

	Up-to-date coverage N = 568[1]		By 2nd birthday[2] N = 523[1]	
Agent (number of doses)	n	%	n	%
Diptheria (4)	519	91.4%	415	79.3%
Pertussis (4)	518	91.2%	414	79.2%
Tetanus (4)	519	91.4%	415	79.3%
Polio (4)	519	91.4%	415	79.3%
HIB (4)	519	91.4%	415	79.3%
MMR (2) [3]	542	95.4%	436	83.4%
BCG (1) [4]	279	90.6%	269	91.8%
Hep B (3)	550	96.8%	503	96.2%
Varicella (1)	504	88.7%	439	83.9%
Fully vaccinated [5]	477	84.0%	369	70.6%

1 Cohort is based on the Health Care Plan Registration Database. Child must have resided in the NWT from birth to at least two years of age. Children who moved to the NWT after birth or moved out of the NWT before two are excluded.

2 Note: Services dates were not available from Hay River to determine coverage rates by 2nd birthday. As a consequence, Hay River's population was excluded from the denominator.

3 Only 1 dose of MMR is considered for full coverage in Inuvik by age 2; the remaining RHAs require 2 doses of MMR for full coverage.

4 The BCG coverage rate only represents the aboriginal population defined as Dene or Inuit.

5 Full vaccination refers to the number of children vaccinated with 4 doses of diptheria, pertussis, tetanus, polio and haemophilus influenzae type b; 3 doses of hepatitis b; 2 doses of measles, mumps and rubella; and 1 dose of varicella. BCG is not included in the analysis. Furthermore, one dose of MMR in the Inuvik Region was considered sufficient to be fully vaccinated for MMR by age 2.

Source: Department of Health and Social Services

Results

Individually for children born in 2002 the coverage rate for each antigen as of June 2005 was found to be more than 85%. Meanwhile, 84% of the cohort had received their full vaccination series by of June 2005. Although this is commendable, the second column in Table 1 indicates the cohort did not receive their full complement in a timely manner (i.e. by their 2nd birthday). By their 2nd birthday, only 80% of the cohort had received the full four doses of Pentacel (a combined vaccine against diphtheria, pertussis, tetanus, polio and haemophilus influenzae type b). Furthermore upon examining the complete series, only 70% of the cohort was fully vaccinated by their 2nd birthday. There has been much discussion on the best way to present immunization rates.[7] The estimate up-to-date coverage rates for a population are used primarily to determine vulnerability to disease whereas immunization by age examines the effectiveness of the health delivery system.

When looking at children born in 1997, their immunization rates were satisfactory when examined both ways (i.e. up-to-date immunization vs. immunization status at 7th birthday). This was expected since full coverage only included one dose of Quadracel (combined vaccine against diphtheria, pertussis, tetanus, and polio) in addition to the infant series of immunizations. Furthermore, children are screened prior to the entry of school. Without taking into account meningococcal vaccine, about 85% of the 1997 cohort was fully immunized as of June 2005 and their 7th birthday. (Table 2) When meningococcal vaccine was included in the series of immunizations required for full vaccination, the rate decreased to 77%.

As previously mentioned in the methodology, any immigrants or emigrants into or out of the NWT (i.e children born in 2002 who arrived after their birth or left before their 2nd birthday, or children born in 1997 who entered the NWT after 4 years of age or left before their 7th birthday) were not included in the analysis. The reason for their exclusion was twofold. Unless the child had encountered the health care system after his/her arrival into the territories, the child's immunizations (regardless of whether he/she was fully or partially immunized) would not be documented. This would result in underestimating the coverage rate for the NWT. In addition, the immunizations of those who left the territories prior to their 2nd or 7th birthday will appear incomplete if they had not received the full series prior to their departure. Even if the child's new jurisdiction completes the full series of immunization, the records in the NWT would still indicate inadequate vaccination since the additional vaccinations would not necessarily be recorded on their NWT immunization card. Including this population of emigrants would lead to an underestimation of the coverage rates.

Table 2: Immunization coverage rates for the 1997 birth cohort

	Up-to-date coverage N = 559 [1]		By 7th birthday [2] N = 503 [1]	
Agent (number of doses)	n	%	n	%
Diptheria (5)	508	90.9%	452	89.9%
Pertussis (5)	508	90.9%	452	89.9%
Tetanus (5)	508	90.9%	452	89.9%
Polio (5)	508	90.9%	452	89.9%
HIB (4)	530	94.8%	475	94.4%
MMR (2)	541	96.8%	484	96.2%
Meningococcal (1) [3]	494	88.4%	-	-
BCG (1) [4]	292	91.3%	271	90.6%
Hep B (3)	523	93.6%	468	93.0%
Fully vaccinated w/o meningococcal [5]	480	85.9%	425	84.49%
Fully vaccinated with meningococcal [5]	432	77.3%	-	-

1 Cohort is based on the Health Care Plan Registration Database. Child must have resided in the NWT from at least 4 years of age up to the 7th birthday. Children who moved to the NWT after 4 years of age or moved out of the NWT before the 7th birthday are excluded.
2 Note: Services dates were not available from Hay River to determine coverage rates by 7th birthday. As a consequence, Hay River's population was excluded from the denominator.
3 Mass Men-C vaccination for 1-19 years olds was completed in June 2004 and only included one dose.
4 The BCG coverage rate only represents the aboriginal population defined as Dene or Inuit.
5 Full vaccination refers to the number of children vaccinated with 5 doses of diphtheria, pertussis, tetanus, polio; 4 doses of haemophilus influenzae type b; 3 doses of hepatitis b; 2 doses of measles, mumps and rubella; and 1 dose of varicella. BCG is not included in the analysis.
Source: Department of Health and Social Services

Since transient populations are considered at high-risk for low immunization rates, it is important to assess the coverage of this group. Should this transient population actually possess low coverage rates, it is still possible that the rest of the NWT population is at risk for infectious disease even if they are adequately immunized because of the previous described concept of herd immunity.

A second limitation of the study is in relation to the Health Care Registration database. If a resident does not cancel his/her health care plan after leaving the territories or notify a change in address

when moving into a different community, this can also lead to a decrease in the coverage rates especially if the child departed or moved prior to receiving the full series of immunizations. Without fully understanding the registration database's accuracy, it is currently difficult to determine the impact on the coverage rates.

Lastly, any comparisons made to previous reports on immunization coverage in the NWT should be made with extreme caution. Several different methodologies have been used throughout time, with each new analysis attempting to develop a more accurate picture of immunization coverage in the NWT. Previous studies surveyed the community health centres; however the health centres do not calculate coverage rates for their region in a consistent manner with other health centres. Depending on how the cohort (i.e. the denominator) is defined can create wide variation in the rates. Furthermore, the health centres may not necessarily have the full picture of a child's immunization status if the child moves out of the community. The analysis performed two years ago only looked at coverage rates by 2nd birthday.[8] The rate for full coverage by 2nd birthday in the 2000 cohort for the old analysis is similar to this year's 2002 cohort (2000-87%, 2003-70%, 2005-84%). However, this year's analysis additionally examined up-to-date coverage and the coverage of 7 year olds. As per the results, the coverage rates of the 2002 and 1997 cohorts are adequately immunized. There is, however, room to improve the timeliness in which immunizations are delivered. This will most likely improve with the existence of a centralized immunization registry. In addition, evaluating immunization rates, which is performed once every two years due to the lengthy process, will become more efficient and timely as well. Many other jurisdictions are facing these similar challenges without a registry. As Canada works towards developing a national public health surveillance system, there lies great hope in one day possessing an immunization registry in the territories.

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Prevention of Cervical Cancer: The HPV Vaccine

Dr. Bing Guthrie, Obstetrics/Gynecology, Stanton Territorial Health Authority

In the recent past, the Human Papilloma Virus (HPV) was considered a troublesome organism associated with many types of warts including genital warts. Now HPV infection has been found to be associated with several precancerous conditions as well as cancer. The most common conditions are cervical dysplasia and cervical cancer. Cervical cancer is a common cancer in young women. The incidence of cervical cancer in the NWT for the 1992-2001 period was 11.76 per 100,000 women. This is above the Canadian incidence for the same time period. Every year in Canada, about 1500 women will develop cervical cancer. Therefore, this organism has a great impact on human health.

HPV is one of the most common sexually transmitted diseases in the world. In the US, studies have estimated the lifetime prevalence of HPV infection. About 1% of the population will have visible genital warts, 4% will have an HPV lesion seen on colposcopy, 10% will have HPV DNA detected, and 60% will have antibodies to HPV. This suggests that there would only be about 25% who will not have had an HPV infection in their lives. Transmission is almost always by sexual contact. From the time of the first sexual relationship, 60% of women will be positive for HPV after four years. The prevalence is greatest in women under 30.

The natural history of HPV is significant. Most people with HPV infection will clear it through their immune system. Some will have persisting infection that can be detected by colposcopy. Further persistence may lead to cervical dysplasia and eventually development of cancer. The Pap smear was developed as a secondary prevention tool for the early detection of cervical cancer. It can detect precancerous dysplastic lesions that are easily treatable. A comprehensive Pap smear screening program can theoretically reduce the incidence of cervical cancer by 90%. Although Pap smear screening is an effective tool, there are disadvantages that make implementation and compliance difficult.

Primary prevention is the prevention of disease before it occurs. Because HPV infection is a prerequisite to cervical dysplasia and cancer, prevention strategies aimed to reduce transmission would be helpful. This includes promoting education, especially to young people, in the role of HPV and cervical cancer, as well as the role of sexual practices and HPV infection. The development of an effective vaccine against HPV is another primary prevention strategy that is being investigated. Currently, there is work on two products and it is hoped that they will be approved for use in the near future. There are many serotypes of HPV that cause various conditions. Type six and eleven are the most common genital types and are responsible for genital warts. Cervical cancer and most cervical dysplasia are caused by type 16 and 18. One product manufactured by Merck targets all four of the above types, while the other, manufactured by GlaxoSmithKline, targets type 16 and 18. Because the vaccines are only targeting specific serotypes, they will not prevent all HPV infections or their sequelae. However, they will target the most common or the most clinically significant types. Both are efficacious at preventing precancerous lesions and early cancer in the short term. With the quadrivalent HPV vaccine made by Merck, there was 94% efficacy after four years. Unfortunately, it is not known how long the immunity will last. Antibody titres are higher in younger women compared to older women immunized at the same time suggesting that immunity may be longer lasting. At present, there is little information about the long-term safety of these vaccines, but generally, they are well- tolerated and have shown few side

About 1500 women will develop cervical cancer every year in Canada.

effects. Currently, both products are in phase III trials. It is expected that approval to use these vaccines may occur later this year.

There will be a few issues that will need to be addressed when approval occurs and implementation is started. At what age will immunization occur? This will depend on the immunogenicity of the vaccines. Immunizing before women are sexually active has been proposed as the optimal time. Though considered unlikely, moral issues will also need to be considered. Questions whether immunizing to prevent a sexually transmitted disease to adolescents might send messages condoning sexual activity, need to be addressed. Also, should men be immunized as well? They are vectors for HPV and can also have genital warts and anal cancer associated with HPV. Finally, cost issues need to be addressed. Despite having an immunization program, a pap smear screening program will still be needed. The cost burden of disease caused by HPV is quite high when one looks at the cost of treatment of warts by laser and interferon, colposcopy and surgery for cervical dysplasia and the cost of treatment for cervical cancer. A vaccine that may be quite expensive may be worth it.

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NWT Health Status Report 2005

Report on Abnormal Pap Smears during Cervical Cancer Screening

Sarah Jane Taleski, Epidemiologist Practicum, Department of Health and Social Services
Maria Santos, Territorial Epidemiologist Department of Health and Social Services,
Dr. Bing Guthrie, Gyne/OBS, Stanton Territorial Health Authority

The age-standardized incidence rates of cervical cancer in Canada and the NWT were 8.9 and 11.8 per 100,000 women respectively during the period of 1992-2001. Human Papillomavirus (HPV) is associated with invasive cervical cancer. However, relatively few types of HPV cause cervical dysplasia or cancer[1-4].

The rate of sexually transmitted infections (STIs) in 2002 was significantly higher in the NWT (17.5 per 1,000 population) than in Canada (2.0 per 1,000 population) and showed an increasing trend from 1996 to 2002. Over the last five years there has been a 30% increase in the number of STIs reported among 15-24 year-olds in the NWT[5]. A study conducted in Nunavut, which is similar in geographic and demographic conditions to NWT, found that women aged 13-20 years had an increased risk of HPV infection[6]. The high rates may be associated in part to the high proportion of adolescents who are sexually active in Northern Canada. Sixty per cent of 15-19 year olds are sexually active in the NWT, which is significantly higher than the proportion of Canadians the same age who are sexually active (45%)[7].

A vaccine has been developed, which will protect women from the cancer causing strains of the HPV virus[1,3,8]. Longitudinal studies indicate that protective vaccination against HPV16 infection could prevent up to 44% of cervical carcinoma[9]. Immunization programs may be of particular importance in populations with low or insufficient cervical screening coverage rates.

Policy makers are re-evaluating the guidelines for current care practices as new technologies such as HPV vaccines, HPV tests and enhanced Pap screening methods are continually developed to detect and manage cervical- HPV related disease[10]. To make these decisions and evaluate current policy, policy makers require descriptive data on the age and ethnic-specific frequencies of cervical HPV-related events and current coverage rates[10]. The objective of this study was to examine abnormal pap smears for guiding decisions toward a HPV immunization program or cervical cancer screening program.

Methods:

Since 1997, most, if not all, cytological testing of pap smears collected in the NWT are conducted in Alberta. The information collated by the Department of Health and Social Services after testing includes patient healthcare number, date of birth, collection date, date of processing completion, specimen number, ordering location, physician code, diagnosis code and a description of the diagnosis. All test results from NWT women receiving a pap smear in the NWT between 2001 and 2004 inclusive were used for the analysis. During this period, a total of 26,012 Pap smears were performed on 11,785 NWT women who had valid NWT health cards.

The guidelines for pap smear screening in the Northwest Territories state that screening should occur every 2 years after receiving three consecutive years of normal annual pap smears. Based on these guidelines, every woman should have at least one pap smear every two years. Recommendations suggest that women begin screening once they reach

18 years of age or once sexual activity is initiated.

Upon consultation with an obstetrician-gynecologist from the NWT, the diagnostic codes used by the laboratory were grouped into seven categories based on management strategies (Refer to Table 1). Because of the small number of cases in the more severe diagnostic groups, the categories were further subdivided into two major categories: abnormal and normal.

Results:

During the period between 2001-2004, there were 26,012 pap smears performed on 11,785 NWT women in the NWT. Figure 1 illustrates the results of the pap smears, with the majority of tests benign or with a slight alteration in the cellular material. Only 1% of the tests were inadequate for diagnosis. This changed slightly from year to year, ranging from 0.7% to 1.2% of all tests. The rates of inadequate specimens for diagnosis were significantly higher in 2001 than 2002.

Sixty-seven percent of the pap smears were performed by physicians, 24% by a community health nurse, 5% by a nurse practitioner, 3% by a public health nurse and 1% by registered nurses.

Figure 2 shows the proportion of abnormal tests relative to the total number of pap smears performed each year. On average, the proportion of pap smears with abnormal results ranged from 2% to 4%. The proportion of abnormal tests in 2003 and 2004 were significantly higher than in 2001 and 2002.

Table 1: Diagnosis codes assigned to Pap Smears conducted in the NWT between 2001-2004, the description of those codes, corresponding management strategies and categorization of the coding.

Diagnosis Description	Diagnosis Group Based on Management Strategy	Diagnosis Group Based on Normal and Abnormal
Specimen inadequate for diagnosis	1	Specimen Inadequate for Diagnosis
Benign	2	Normal
Benign cellular changes	2	Normal
Alteration of cellular material	2	Normal
ASCUS, Atypical squamous cells of undetermined significance, favour reactive	2	Normal
ASCUS, Atypical squamous cells of undetermined significance, favour dyplasia/ HPV	3	Abnormal
Atypia, Koilocytotic, NOS, LSIL (Low grade intraepithelial lesion/ HPV)	3	Abnormal
LSIL, low grade squamous intraepithelial lesion/ dysplasia, MILD (CIN I)	3	Abnormal
ASCUS, Atypical squamous cells of undetermined significance, possible high grade lesion	4	Abnormal
Dysplasia, Moderate (CIN II), HSIL (high grade squamous intraepithelial lesion)	4	Abnormal
Dysplasia, Severe (CIN III), HSIL (high grade squamous intraepithelial lesion)	4	Abnormal
AGCUS, Atypical glandular cells of undetermined significance, NOS	5	Abnormal
Carcinoma, SQ CELL, NOS	6	Abnormal
Adenocarcinoma, NOS	7	Abnormal

Statistical analyses included frequencies, proportions, rates and chi-square tests using SPSS version 11.0, Microsoft Excel and EpiInfo 2002.

Because women with a previous abnormal result may be tested more than once a year, a similar analysis was performed looking at the trends in the proportion of women tested with abnormal results rather than the proportion of tests with an abnormal result. Likewise, there was a significant increasing trend in the proportion of women tested with abnormal pap smears from 2.1% to 3.5% (Figure 3). Even with the examination of incident cases (i.e. the first abnormal test for any individual since December 31, 2000), this increasing trend was maintained (results not shown).

In terms of severity, about 22% of the abnormal tests from 2001-2004 had moderate to high-grade lesions (i.e. diagnosis group 4 or higher in Table 1). In 2004, there were 7,147 pap smears performed. This was the highest number of pap smears performed during the period of 2001 to 2004. With an increase in the number of tests performed, a relatively higher proportion of abnormal tests were detected yet a smaller percentage of these had moderate to high-grade lesions. The proportion of abnormal tests with moderate to high-grade lesions was significantly higher in 2002 yet significantly lower in 2004 (Figure 4). As a hypothesis, this may reflect early treatment of low-grade lesions due to screening and thus tertiary prevention of moderate to high-grade lesions.

An analysis according to age illustrates that tests among those aged 15-29 years had a significantly higher proportion of abnormal results. Figure 5 illustrates the counts of abnormal pap smears by age category. Interesting enough, although the frequency and proportion of abnormal results are higher between 15 and 29 years, the proportion of moderate to high-grade lesions relative to the number of abnormal results were significantly higher among those aged 25-44 years.

Figure 1: Distribution of Pap Smears by Diagnosis Group (2001-2004), n=26,012 tests

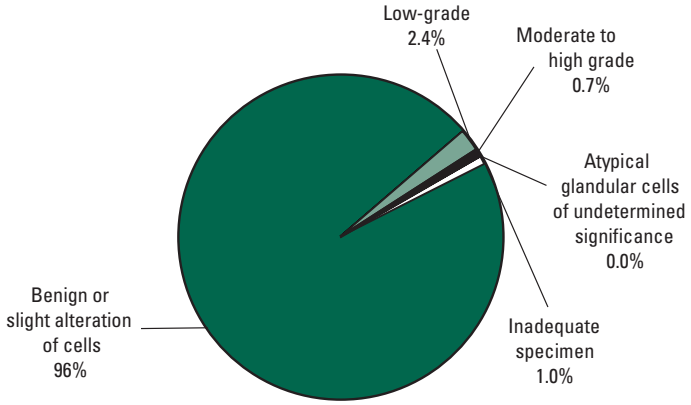


Figure 2: Percentage of Abnormal Tests among Pap Smears Performed in the NWT (2001-2004)

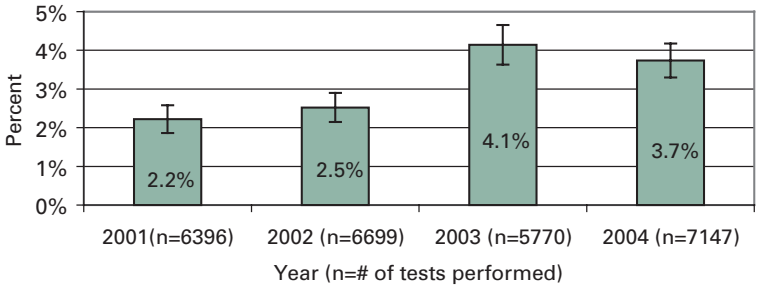


Figure 3: Proportion of Individual Women Tested with an Abnormal Result (2001-2004)

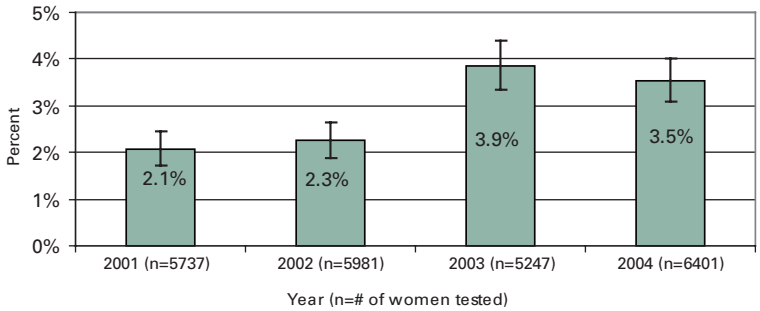


Figure 4: Proportion of Abnormal Pap Smears with Moderate to High Grade Lesions

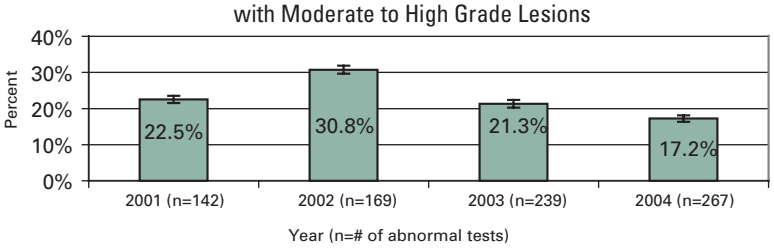


Figure 5: Pap Smear Result by Age Category (2001-2004)

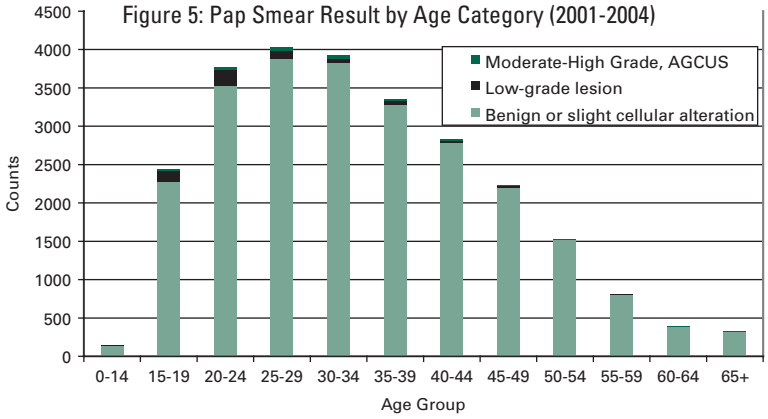


Figure 6: Proportion of Women Tested with Abnormal Pap Smears Based on Ethnicty, NWT (2001-2004

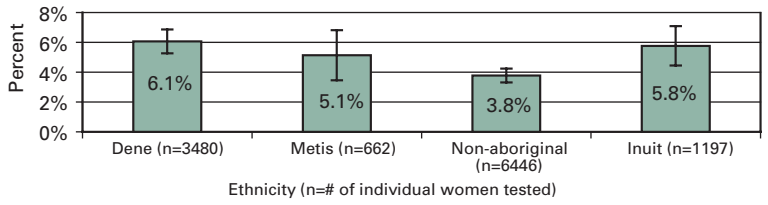
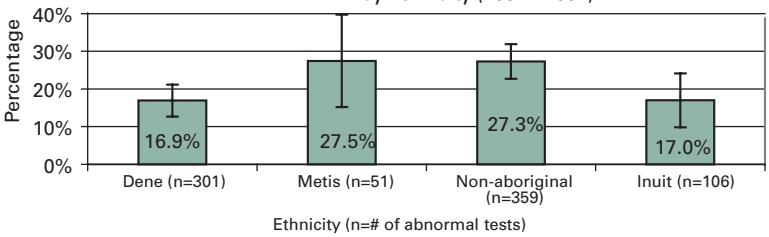


Figure 7: Proportion of Moderate to High-Grade Abnormal Tests by Ethnicity (2001 - 2004)



Between 2001 and 2004, 11,785 women received pap smears. Among these women, 30% were Dene, 6% were Metis, 55% were non-aboriginal and 10% were Inuit. In the NWT, the make up of the female population aged 15-69 years is 28% Dene, 9% Metis, 52% non-aboriginal, and 11% Inuit (12). With slight variation, the ethnic distribution of women tested somewhat approximate the ethnic distribution of the population.

Figure 5 illustrates the proportion of women tested that received an abnormal result based on ethnicity. Looking at Figure 6, the Dene and Inuit women had higher proportions of abnormal pap smears. However the proportion of abnormal results with moderate to high-grade lesions were significantly lower than those of non-aboriginal women (Figure 7).

An analysis which examined the various community types from which pap smears were collected illustrated that the proportion of abnormal pap smears were similar across Yellowknife (3.1%), regional centres (which include Hay River, Inuvik and Fort Smith) (3.3%), and the smaller communities (3.3%). However- the proportion of inadequate specimens for diagnosis was significantly higher in the smaller communities in comparison to Yellowknife. As for the proportion of moderate to high-grade lesions among abnormal tests, tests from Yellowknife had a significantly higher percentage (26.6%) than smaller communities (16.1%).

Discussion:

This review set out to present abnormal test results in the hopes of recognizing populations at risk for cervical cancer and evaluating the need to develop an immunization program to decrease the likelihood of HPV infection in the NWT. The Canadian Task Force on the Periodic Health Examination

recommends annual screening following initiation of sexual activity or age 18; after 2 normal smears, screen every 3 years to age 69. Consider increasing frequency for women with risk factors: age of first sexual intercourse < 18 yrs, many sexual partners or consort with many partners, smoking or low socioeconomic status.(12). The NWT guidelines are more conservative and recommend that tests be done every 2 years after three years of consecutive normal results.

There was a significant trend observed in the increasing proportion of abnormal test results. In fact, there was almost a doubling in the proportion between the first two years and the last two years that cannot be accounted for by a change in pap smear or laboratory methodology. When the abnormal tests were examined on the basis of individual women rather than tests the doubling in abnormal cases was maintained, ruling out repeat smears among individuals with abnormal results as the cause of the increase. When examining incident cases, a woman diagnosed with an abnormal finding was removed from the denominator and numerator if she continued to present with abnormal results in subsequent years.

Although there was an increase in the proportion of abnormal pap smears, the proportion of moderate to high-grade lesions in relation to the abnormal results decreased from 2001 to 2004. This is a good indication that perhaps early intervention and prevention of moderate to high-grade lesions is taking place.

When developing a cervical cancer screening program or HPV immunization program, one needs to consider factors such as age, ethnicity, and residence. Youth from 15-29 years tend to present with abnormal results yet those between 25-44 years have a higher proportion of moderate to high-grade lesions. Similarly, the Dene and Inuit women have higher proportions of abnormal results yet the proportion of moderate to high-grade lesions are lower than in their non-aboriginal peers. Lastly, each of the community types share similar results for abnormal tests; however Yellownife's proportion of moderate to high-grade lesions was higher than the smaller communities.

Increasing pap smear coverage may result in an increased ability to detect dysplastic changes in women living in the NWT who are not presenting with symptoms. As a consequence, this can create an artifactual increase in abnormal cases. Although there was an increase in the number of pap smears and in the number of women tested between 2001 and 2004, there was not a significant change in the overall coverage rates of the population (unpublished data). In 2003 only 59.6% of women obtained a Pap smear according to the guidelines in the NWT.

Some studies use registration data to conduct case-control studies to evaluate the risk of cervical cancer among those women who do not receive Pap smears relative to those who do. Unfortunately, this methodology is difficult to carry out in the NWT due to the small population and the small number of cases, which occur during a given period. These factors combine to create a situation in which there is insufficient numbers to detect any differences. The small population also limited the ability to run analyses on multiple factors simultaneously.

In terms of limitations to this review, it is possible that some women from NWT obtain their Pap smear test outside of the NWT. In Fort Liard, women may go to British Columbia to receive their Pap test and university and college students may receive their tests at their educational setting. This in turn may account in part for the difference in coverage rates between the Canadian Community Health Survey and pap smear data (at least for the younger population). It should be

noted, however, that in Fort Liard, there are approximately 200 women in the eligible population and the effect on coverage rates would thus be small.

Introduction of an HPV vaccine is particularly relevant in populations with low Pap smear coverage rates as well as populations that have high rates of sexually transmitted infections. High rates of sexually transmitted infections increase the rates of HPV and the associated cervical cancer, while low Pap smear coverage rates fail to detect dysplastic changes to the cervix and allow more cases of full-fledged cervical cancer to develop. Such a vaccine should be accompanied with sexual education discussing risk of pregnancy and other sexually transmitted infections (STIs) as well as the importance of regular cervical screening.

In their strategic directions made public in January 2005, the GNWT set out a number of goals including: ensuring appropriate and effective clinical practices and treatment of STIs; development, implementation and monitoring of policies for improved screening; and improved access to and efficiency of STI diagnosis and treatment in all NWT communities (5). Implementation of an HPV immunization program may be able to counter the effect of HPV infection in an increasingly young sexually active population and decrease the number of cases of cervical cancer that develop.

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Prenatal Screening for Maternal Alcohol Consumption

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There is no amount of alcohol that is safe to drink during pregnancy

The purpose of this article is to provide a rationale for the importance of screening for alcohol consumption during pregnancy. It will also review all major alcohol-screening instruments to date and compare this to the T-ACE questionnaire, which is the current NWT standard in prenatal care to assess maternal alcohol consumption :

This article is therefore relevant to health professionals who provide prenatal care in the NWT or those involved in women's health in general. These include but are not limited to community health nurses and nurse practitioners, midwives, family physicians, obstetricians and prenatal care workers.

Background:

Fetal Alcohol Spectrum Disorder (FASD) describes a range of disabilities that may affect an individual who was exposed to alcohol before birth. FASD includes terms such as fetal alcohol syndrome (FAS), partial FAS, alcohol related neurodevelopmental disorder (ARND) and alcohol-related birth defects (ARBD) . FAS is the more commonly known disorder due to its readily identifiable features. Characteristics of FAS include growth deficiency; select facial abnormalities; and neurodevelopmental defects. Nonetheless, the effects of alcohol can still critically impact children during their prenatal development even if they are on the lower spectrum of FASD and do not demonstrate visible congenital abnormalities.

There is no cure for FASD.

There is no amount of alcohol that is safe to drink during pregnancy.

To date, there are no national data on the incidence of FASD in Canada. However, FASD is believed to be one of the leading causes of preventable birth defects and developmental delay among Canadian children. The national rate of FAS alone has been estimated to be 1-2 per 1000 live births. A recent study showed that the incidence of a combination of FAS and ARND is estimated to be at least 9.1/1000 live births.

Fetal Alcohol Syndrome Disorder is a serious concern in Northwest Territories but the extent of the problem has yet to documented. Clients with FASD pose a significant financial burden in the NWT, impacting across multiple sectors (educational, judicial, health). What we do know is that alcohol consumption rates for females in the NWT are estimated at 75.4% and up to 30% of NWT women report drinking during pregnancy. These high rates demonstrate the importance of prevention of FASD by targeting this high-risk group through:

(1) **Primary prevention**, which involves eliminating FASD through educational outreach programs to encourage women to avoid consuming alcohol before conception and throughout pregnancy.

(2) **Secondary prevention**, which involves identifying women who are drinking while pregnant and reducing their consumption.

The prevention of one FAS case can save society over a million dollars in a lifetime.

Recommended Screening Guidelines:

Maternal alcohol screening is important because even low levels of prenatal alcohol exposure can adversely impact

Sensitivity =

True Positives

All those with

the disease.

Specificity=

True Negatives

All those without

the disease

the developing brain. Traditionally, alcohol-screening questionnaires were geared towards male alcoholics and had low yield in identifying the high-risk pregnant client. An obstetrician first developed the T-ACE in 1989 after an observation that the Tolerance question did not socially stigmatize the patient but rather reflected a pattern of drinking. Patients were less likely to deny their alcohol tolerance.

- **T**olerance: how many drinks can you hold? (2 points; any answer indicating more than two (2) drinks is considered positive.)
- **A**nnoyed: have people annoyed you by criticizing your drinking (1 point)
- **C**ut down: have you felt you ought to cut down on your drinking? (1 point)
- **E**ye-opener: have you ever had a drink first thing in the morning to cure a hangover or steady your nerves? (1 point)

Table 1: Comparison of the T-ACE, CAGE, and MAST in Identifying Pregnancy Risk Drinking
Screening for Pregnancy Risk Drinking*

Instrument	Positive Test Score (points accrued)	Sensitivity (%)	Specificity (%)
T-ACE	(>=2)	69	89
CAGE	(>2)	38	92
MAST	(>5)	36	96

* Pregnancy risk drinking is defined as the consumption of 1 ounce or more of alcohol per day during pregnancy. SOURCE: Sokol et al. 1989.

The T-ACE is considered positive for identifying heavy drinkers with a score of two (2) or more points. If the total score is zero (0), the likelihood that the respondent drinks heavily is 1.5%. Heavy drinking is defined as an average of two (2) or more drinks per day, 5-6 drinks per occasion, or determined by clinical evaluation. A response to the tolerance question of more than five (5) drinks indicates a 8.5-fold increased probability of heavy drinking.

Review of Alcohol Screening Tools

Other pre-existing alcoholism screening questionnaires included the Michigan Alcoholism Screening Test (MAST) developed by Selzer in 1971 and the CAGE Questionnaire by Ewing in 1984 . The MAST is a short survey of 25 "yes" or "no" questions designed to detect alcoholism. The widely adopted CAGE questionnaire consists of four questions:

(1) Have you ever felt you should Cut down on your drinking?

(2) Have people Annoyed you by criticizing your drinking?

(3) Have you ever felt bad or Guilty about your drinking?

(4) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (Eye opener)?

As stated, both these instruments were developed to detect alcohol dependence mainly in men. They were less sensitive in screening for pregnancy risk drinking as seen in Table 1.

- The sensitivity of a screening test is the probability that a person who should test positive does so.
  - o the sensitivity of a screen for pregnancy risk drinking is, the probability that a woman who is a problem drinker tests positive.
- The specificity of a screening test is, the probability that a person who should test negative does so,.
  - o the probability that a woman who is not a problem drinker tests negative.

The T-ACE Questionnaire was also compared to additional screening alcohol instruments such as the AUDIT and SMAST in Table 2. The AUDIT (the Alcohol Use Disorders Identification Test) was developed by WHO in the 1980s. It consists of 10 questions about recent alcohol use, alcohol dependence

symptoms, and alcohol-related problems. The SMAST refers to the Short Michigan Alcoholism Screening Test., an abbreviated version of MAST that is self-administered to screen for alcoholism.

Finally, the most recent screening tool is the TWEAK, which is a five-item screening tool that includes questions from the MAST, CAGE and T-ACE. The sensitivity and specificity is calculated to be 79% and 83% respectively, compared to the T-ACE which is 70% and 85% respectively. It is another option to T-ACE but has no significant advantage.

TWEAK

T Tolerance: How many drinks can you hold?

W Have close friends or relatives Worried or complained about your drinking in the past year?

E Eye Opener: Do you sometimes take a drink in the morning when you get up?

A Amnesia: Has a friend or family member ever told you about things you said or did while you were drinking that you could not remember?

K Do you sometimes feel the need to Cut down on your drinking?

The TWEAK is used to screen for pregnancy risk drinking, defined here as the consumption of one ounce or more of alcohol per day while pregnant. Scores are calculated as follows:

- A positive response to question T on Tolerance (i. e., consumption of more than five drinks); yields two points
- Question W on Worry yields two points;
- An affirmative reply to question E, A, or K scores one point each.
- A total score of two or more points on the **TWEAK** indicates a positive outcome for pregnancy risk drinking.

SOURCE: Chan et al. 1993.

Table 2 Sensitivity and Specificity of the T-ACE, AUDIT, SMAST, and Medical Record

Criterion Standard	Instrument	Sensitivity* (%)	Specificity* * (%)
DSM-III-R lifetime alcohol diagnosis	T-ACE (tolerance >= 2)	87.8	36.6
	T-ACE (tolerance > 2)	60.0	66.4
	AUDIT (>= 11)	7.0	99.6
	AUDIT (>= 10)	11.0	99.0
	AUDIT (>= 8)	22.6	97.4
	SMAST	14.8	97.9
	Medical record	15.6	93.6
Risk drinking (two drinks per day before pregnancy)	T-ACE (tolerance >= 2)	92.4	37.6
	T-ACE (tolerance > 2)	74.3	71.4
	SMAST	11.4	95.9
	Medical record	6.7	89.4
Current alcohol consumption while pregnant)	T-ACE (tolerance >= 2)	89.2	37.8
	T-ACE (tolerance > 2)	60.0	66.9
	AUDIT (>= 11)	3.3	97.8
	AUDIT (>= 10)	6.7	96.9
	AUDIT (>= 8)	15.0	93.9
	SMAST	7.5	94.3
	Medical record	20.0	96.1

NOTE: The sensitivity and specificity for varying cutoff scores for the T-ACE and AUDIT are listed (e.g., in response to the tolerance question in the T-ACE, more than two drinks would be a positive response in one scoring method and two or more drinks would be a positive response under a different scoring method). **With tolerance defined as two or more drinks to feel intoxicated, the T-ACE was the most sensitive instrument to detect current alcohol consumption, risk drinking, and lifetime DSM-III-R alcohol diagnoses. However, it was also the least specific.** SOURCE: Chang et al. 1998.

Conclusion

Although most women do limit alcohol intake spontaneously when they are pregnant, some will still require additional support to curtail their drinking habits. Screening pregnant women for alcohol consumption is a powerful preventative tool. T-ACE screening is now expected to be part of routine prenatal care for Northwest Territories. It is a validated and highly sensitive screening tool to detect problem drinkers. In NWT, it is recommended that ALL pregnant

women receive the T-ACE questionnaire even if they deny alcohol intake at the time of the prenatal visit. It would also be important to ask when they had their last drink and whether they had a drinking problem in the past. Counseling does make an impact. Any positive score should receive supportive ongoing counseling with referral to specialized treatment services for scores greater than 2.

Key Points

1. Alcohol consumption is a concern for the pregnancy
2. FASD is preventable
3. Completion of the T-ACE questionnaire is required at antenatal visits
4. Appropriate supportive counseling and/or referral should occur for at risk drinkers.

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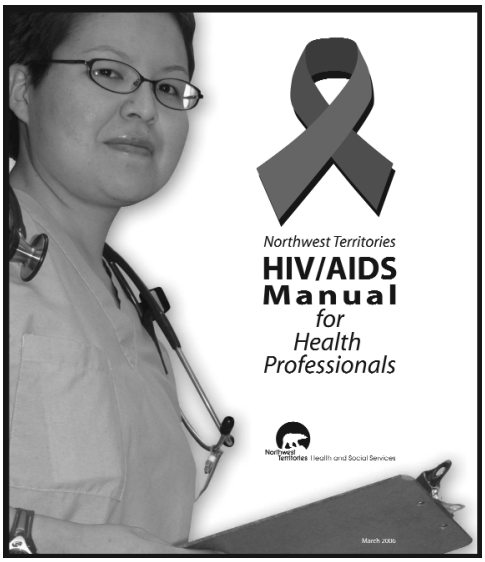
WHAT'S new



The new 2006 edition of the *NWT HIV Infection and AIDS: Information for Health Professionals Manual* is now available from the Office of the Chief Medical Health Officer, Department of Health and Social Services. It can also be found on the Department's web site @ http://www.hlthss.gov.nt.ca/.

The new HIV/AIDS Manual for Health Care Professionals will replace the August, 1999, HIV Infection and AIDS: Information for Health Professionals Manual.

The new HIV/AIDS Manual for Health Care Professionals, March 2006 includes the approved clinical practice standards for the NWT, and supersedes all previous clinical practice standards and guidelines.

In addition to the subject areas covered in the previous manual, this edition contains new sections on self-disclosure, treatment for HIV infection and AIDS diseases, information fact sheets for clients & information resources for health care providers.

Please contact us at 867-920-8646, fax 867-0442 should you require additional information.

NOTIFIABLE diseases

CUMULATIVE TOTALS for the Northwest Territories (NWT) January - December 2005[a]

		January - December 2004 NWT	January - December 2005 NWT
Vaccine Preventable Diseases	Hepatitis B	0	0
	Haemophilus Influenza	0	0
	Influenza A	0	12
	Influenza B	0	3
	Pertussis	0	5
	Chicken Pox	41	17
Sexually Transmited/ Bloodborne Diseases	Chlamydia	649	722
	Gonorrhea	181	140
	Hepatitis C	34	22
	Hepatitis, Other	0	0
	Syphilis	0	0
Diseases by Direct Contact/ Respiratory Route	Invasive Group A Strep	3	1
	Invasive Group B Strep in neonates	0	0
	Invasive Group B Streptococcus	1	0
	Invasive Pneumococcal Disease	15	13
	Legionellosis	0	0
	Listeriosis	0	0
	Meningitis/Other Bacterial	0	0
	Meningitis/Unspecified	0	0
	Meningitis/Viral	1	0
	Meningococcal Infections	1	1
	Respiratory Syncytial Virus	41	53
	Tuberculosis	10	8
Enteric, Food and Waterborne Diseases	Botulism	0	0
	Campylobacteriosis	5	6
	Cryptosporidiosis	0	0
	E.Coli 0157:H7	3	3
	Giardiasis	12	6
	Hepatitis A	0	0
	Salmonellosis	3	3
	Shigellosis	0	0
	Tapeworm	0	0
	Trichinosis	0	0
	Yersinia	0	0
Vectorborne/ Other Zoonotic Diseases	Brucellosis	0	0
	Malaria	2	0
	Rabies Exposure	10	7
Antibiotic resistant microorganisms	Methicillin-resistant Staph. Aureus	10	23
	Vancomycin-resistant Enterococci	0	0

NWT HIV Infections Reported from 1987 to 2005

	Age at Diagnosis								Gender		Risk Category					
Total	0-9	10-14	15-19	20-29	30-39	40-49	50-59	60+	Female	Male	MSM[b]	MSM/ IDU[c]	IDU	Hetero-sexual	Perinatal	Blood Products
29	1	0	0	4	17	5	1	1	5	24	12	1	7	7	1	1

a Statistics are based on currently available data and previous data may be subject to change
b Men who have sex with men (MSM)
c Injection Drug User (IDU)