

SEXUALLY TRANSMITTED INFECTIONS IN
NORTHERN SASKATCHEWAN FROM 1990 TO 1998

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Abstract

Purpose: The purpose of this study was to provide a detailed picture of the descriptive epidemiology of STIs in northern Saskatchewan from 1990 to 1998.

Methods: Between 1990 and 1998, the Northern Health Services Branch compiled a database of all laboratory confirmed cases of gonorrhea, chlamydia, syphilis and herpes in northern Saskatchewan. This data was used to calculate incidence rates of STIs in the north as a whole and by health district, and 1998 incidence rates by community. All identifying factors for individuals and communities received in this data were encrypted with codes, ensuring confidentiality of all cases, contacts and communities.

Results: Incidence rates of gonorrhea, chlamydia and infectious syphilis in northern Saskatchewan between 1990 and 1998 were considerably higher than in Saskatchewan as a whole. Overall rates of STI in northern Saskatchewan have fallen 30% over the period of study, to 2216 cases per 100,000 population, likely related to improved testing, treatment and screening practices. From 1996 to 1998, the age standardized incidence rate of all STIs combined in northern Saskatchewan was 4.6 times higher than in Saskatchewan. 82% of cases reported in the north were chlamydia, with rates 7 times those of gonorrhea by 1996 to 1998. On average, females had STI rates 2.4 times those of males. Females aged 15 to 24 and males aged 15 to 29 typically had the highest rates of infection. Rates of infectious syphilis appear low when compared to other infections in the north, but they are considerably higher than Saskatchewan rates. Herpes rates appear to be increasing, but this is likely unreliable due to incomplete data. High STI rates in northern Saskatchewan are thought to be related to high risk sexual behaviors, the high efficiency of screening and reporting practices in the north, and social inequities in this region of the province.

Significance: Results of this study may be used to assist in program planning, targeting and development for future northern initiatives, as a baseline STI assessment for the three northern health districts and may also assist in the future evaluation and monitoring of interventions.

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List of Abbreviations

Aboriginal: descriptive of people, rights, customs, institutions which derive from the Indigenous inhabitants of North America and their way of life. Defined by the Canadian Constitution Act of 1982 Section 35¹ as comprising of 3 groups: Indian, Metis and Inuit. See Appendix A.

AHA: Athabasca Health Area

First Nation: Usually used to refer to a politically autonomous band under the Indian Act, a nation of First Peoples²

KYHD: Keewatin Yatthe Health District

MCRHD: Mamawetan Churchill River Health District

NEHD: North-East Health District

north: In the context of this thesis, the “north” is defined as the specific boundary area which includes the area of the Mamawetan Churchill River Health District, Keewatin Yatthe Health District and the Athabasca Health Area. This area is roughly equivalent to census division #18, the previous Northern Health Services Branch area, the Northern Administration District, and the northern half of the province. See appendix B.

northern communities: Due to the small numbers of infection in individual communities, confidentiality is a difficult but important issue. In order to respect the confidentiality of their residents, communities are not identifiable except by code available through the Medical Health Officers of the Population Health Unit of Keewatin Yatthe and Mamawetan Churchill River Health District and the Northern Intertribal Health Authority. The main purpose of the thesis analysis is to provide a detailed description of the

epidemiology of STIs in Northern Saskatchewan, which includes a report on the extent of community variation in reporting of STIs while not singling out certain communities.

PID: Pelvic Inflammatory Disease

STI: sexually transmitted infection. For the purpose of this thesis includes herpes, infectious syphilis, gonorrhea and chlamydia, unless otherwise specified. STIs are also commonly referred to as sexually transmitted diseases (STDs), but this term has been replaced with STI.

1. Introduction and Problem Statement

The Northern Health Services Branch (NHSB) initiated the collection and surveillance of STI data specifically for the northern half of Saskatchewan in mid-1986. A report published in 1989, which was based on this data, indicated that reported rates of gonorrhea, chlamydia, syphilis and herpes were significantly higher in northern Saskatchewan than in the rest of the province, especially among persons less than 30 years of age. Now ten years later, there is a lack of specific, detailed information available for this area.

STIs, specifically gonorrhea, syphilis, chlamydia and herpes, are potentially preventable infections, most of which can be easily treated with medications if detected and treated early. They typically affect people under the age of thirty, women more often than men, and people who engage in high-risk sexual behaviors. Left undetected and untreated, STIs can lead to very serious sequelae including PID, epididymitis, Reiter's syndrome, infertility, and ectopic pregnancies, as well as the possibility of spreading of an infection from an infected mother to her child either in utero or at birth. Repeated antibiotic treatment of STIs also raises concerns regarding the development of increased antibiotic resistance.

2. Purpose of Study

The purpose of this study was to provide a detailed picture of the descriptive epidemiology of STIs in northern Saskatchewan from 1990 to 1998. It begins by answering the following questions with regards to STIs in the north as a whole: What are the numbers and rates of STIs by diagnosis? Which age and gender groups appear to be most at risk? Is there a trend in disease rates shown over the period of study? Do all STIs follow the same trend pattern? Is there any variability in trends by age or diagnosis? and how do STI rates in northern Saskatchewan compare to Saskatchewan provincial rates and to Canadian national rates?

This is followed by a look at the variability of rates within northern Saskatchewan. Is there any variability in the numbers and rates of STIs among the three northern health districts or among all northern communities? Is there any variability in trends among these areas? What is the range of rates reported in these areas?

Finally, what types of treatments were being used most in northern Saskatchewan and were they consistent with Saskatchewan Health recommendations? How many contacts are identified per case? as this the first step in contact tracing, and the number of contacts identified is a crude indicator of the potential success of contact tracing programs.

3. Relevance of Study

The results of this descriptive study will be used to assist in program planning and development for future northern initiatives, including the developing Sexual Wellness programs in La Ronge and La Loche, which are projects aimed at the reproductive health of youth in the north. Results will also be useful as a baseline STI assessment for the two new northern health districts, MCRHD and KYHD, which were officially created April 1, 1998, to the AHA which will be involved with community programs in the future, and to the Northern Intertribal Health Area (NITHA), as they develop initiatives for health promotion and disease prevention and treatment in the north. Specific disease rates are necessary for the identification of high-risk groups, thereby allowing prevention programs to be targeted towards those most in need of services. They also provide baseline quantitative data, which can be used to identify trends and as a basis for the evaluation and monitoring of a specific intervention's success.

4. Background and Literature Review

The following is a short overview of the cause, symptoms, complications, and treatment of gonorrhea, chlamydia, syphilis and herpes, as well as a look at the current epidemiology of these infections in Canada. The intent of this background information is to give the reader a clear understanding of the impact of these infections on the persons and populations affected.

4.1 Gonorrhea

4.1.1 Epidemiology

Gonorrhea is a bacterial infection caused by the Gram negative bacterium *Neisseria gonorrhea*.³ It is transmitted through contact with the mucous membranes of an infected individual through sexual activity, and has an incubation period of two to seven days.⁴ Gonorrhea often co-exists with other STIs, most notably chlamydia, and is a marker for the transmission of HIV.⁵ Asymptomatic in more than 50% of all cases,^{6,7} women infected with the bacterium may or may not begin to experience symptoms resulting from cervicitis (inflammation of the cervix), urethritis (inflammation of the urethra), salpingitis (inflammation of the fallopian tubes),⁸ pain on urination,⁷ or a copious greenish yellow mucopurulent vaginal discharge, a few days after exposure. Men exposed to *Neisseria gonorrhea* may experience penile redness or itching, dysuria (painful or difficult urination) and/or purulent discharge from the urethra.⁴ Gonorrhea may also be spread to newborns from an infected mother at birth, possibly leading to gonococcal conjunctivitis (ophthalmia neonatorum), which can cause blindness if not treated immediately.⁹

Since gonorrhea is asymptomatic in more than 50% of cases, many cases go undetected and therefore untreated, as asymptomatic persons are not likely to seek medical care. This can allow for uterine invasion by the bacterium and the possible development of serious complications such as infertility, ectopic pregnancy, chronic pelvic pain,⁶ premature deliveries, septic abortion, ophthalmia in newborns and postpartum endometritis.⁸ Untreated gonococcal infection is the underlying cause of 20-40% of cases of PID and 14% of tubal infertility.

Gonorrhea was the most common STI in the world,¹⁰ and in Canada until 1991, when it was surpassed by chlamydia.³ It has been nationally notifiable in Canada since 1924, while gonococcal ophthalmia neonatorum has been nationally reportable since 1979.¹¹ In developed countries there were intermittent peaks in the numbers of reported cases after World War I, World War II, and also following the sexual revolution in the late 60's, but the rate has been steadily declining since. Gonorrhea rates in the United States (US) are declining, but at a slower rate than in other developed countries (in 1995, the national rate was approximately 150 cases/100,000 population). This has been partially attributed to the higher incidence rates in African-Americans and the differences in care received according to socio-economic status in the states. The change in sexual behavior due to the fear of AIDS, along with improved case management and contact tracing, are thought to be the main reasons for the recent decline in US rates.^{3,10}

In Canada, the incidence rate of gonorrhea decreased 14 -fold since 1980, when the national rate was 219.8 cases per 100,000 population. By 1997 this rate had fallen to 14.9 cases per 100,000 population⁵ (Figure 4.1). This decline is also thought to be due to improved diagnostic services, contact tracing and the availability of effective, efficient treatment.

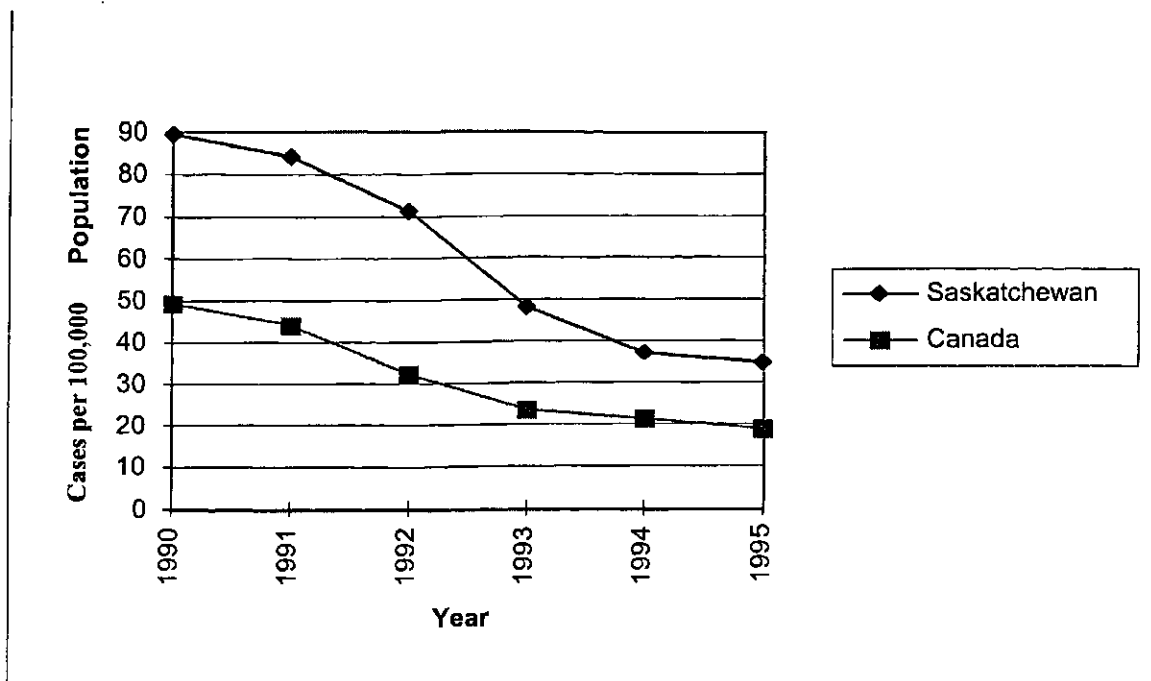


Figure 4.1. Incidence Rate of Gonorrhea, Saskatchewan and Canada, 1990 to 1995³

In 1997, the highest rate of gonorrhea in Canada was among women aged 15-19, with 73.3 cases per 100,000 population,⁵ and the highest rate among Canadian men was among 20-24 year olds, with 69.7 cases per 100,000 population. In 1995, 70% of cases of gonorrhea reported were among females aged 15 -24³ (Figure 4.2). Gonorrhea is diagnosed more often in women than men, but this discrepancy has been decreasing since 1980, as the male:female ratio has also decreased from 1:59 in 1980 to 1:36 in 1995.³

It is estimated that 4% of female cases are in girls under the age of 15, and 0.4% of male cases are in boys less than 15 years of age,³ where diagnosis often implies sexual abuse or exploitation. In Canada, there were 6 cases of gonococcal ophthalmia neonatorum and 64 cases of gonococcal infection¹² reported in children less than 10 years of age in 1984. Infection rates reported for children under the age of 10 may be underestimates of the true rates, as one author felt that some physicians may be unaware of the possibility of this infection among children so young, or may not be reporting cases they do find in

order to avoid legal implications.¹² This is likely not true in Saskatchewan, as all laboratory diagnoses of STIs are reported directly to the Medical Health Officer and to Public Health.

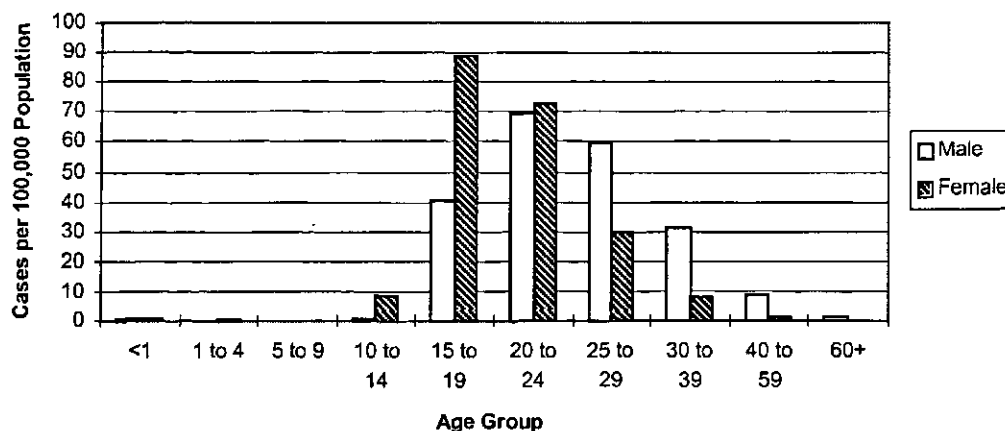


Figure 4.2. Incidence Rate of Gonorrhea by Age and Sex, Canada, 1995³

Provincial statistics from 1980 to 1995, show that the highest rates of gonorrhea in Canada were consistently in the North West Territories (NWT) and Yukon, until 1992, when the incidence rate of gonorrhea in Manitoba surpassed that of the Yukon. In 1995, the four provinces with the highest rates of gonorrhea in Canada were NWT (164.1 cases/ 100,000), Yukon (53.1 cases/ 100,000), Manitoba (55.0 cases/ 100,000) and Saskatchewan (35.5 cases/ 100,000). All of these rates were considerably higher than the 1995 national rate of 18.6 cases per 100,000 population (Figure 4.3). The lowest rates were found in the maritime regions³, Alberta, British Columbia and Quebec⁵. When comparing provincial rates, it must be taken into consideration that provincial variations in reporting, screening, treatment and contact tracing programs, educational programs, as well as migration of high risk and core groups³, are all factors which will affect the numbers of cases reported and influence the reported rates of infection. Such variations can lead to higher rates in one province relative to another, where, for example, there are less efficient screening or reporting practices in place and therefore fewer numbers of cases reported.

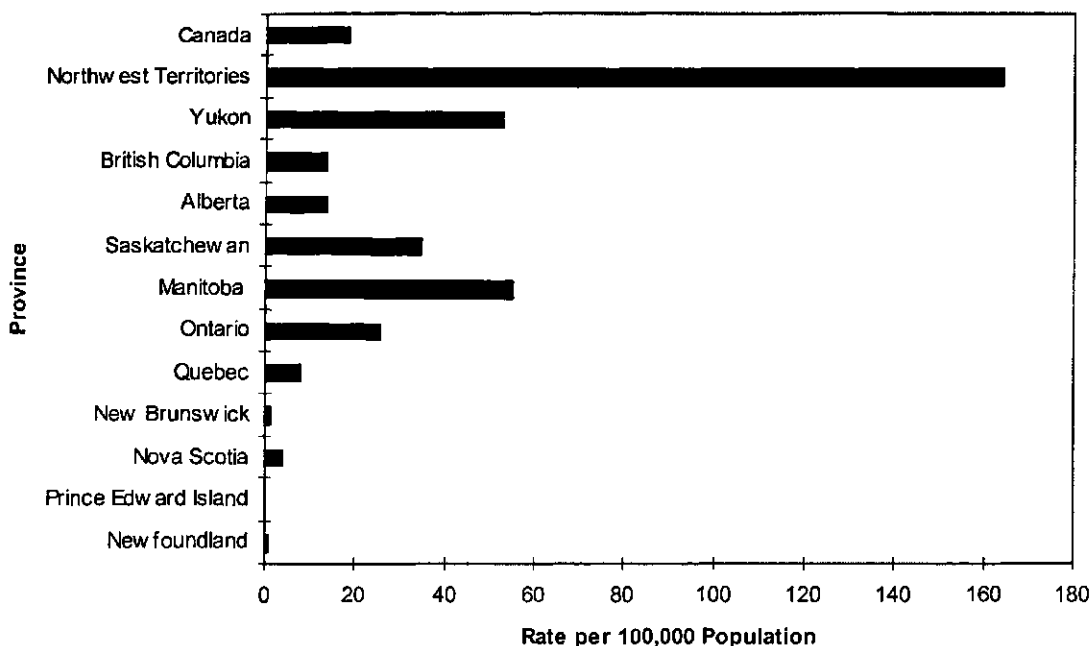


Figure 4.3. Incidence Rate of Gonorrhea in Canadian Provinces, 1995³

It appears that the highest gonorrhea rates are among regions with high concentrations of First Nations people. For example, in Quebec 14% of cases reported are among the Nunavik area, but the population accounts for only 0.1% of the province. In 1997, the rate of gonorrhea in Nunavik was 263.3 cases per 100,000 population, a rate which was 31 times the rate in Quebec the same year (7.5 cases/100,000)⁵. Due to the small population numbers in northern Quebec Cree Territories, the rate there has fluctuated from 120 cases/100,000 in 1994, to 0 cases in 1993, and back up to 96 cases/100,000 in 1995 (8 cases).¹⁰ STIs have also had a disproportionate impact on Native Americans, where gonorrhea and syphilis rates have been found to be more than double than those among non-native Americans.¹³ Some authors have suggested that this is likely due to reasons such as large social inequalities, more efficient reporting practices, and the difficulty in accessing health care in remote regions⁵

4.1.2 Diagnosis and Treatment

Recommended methods for laboratory diagnosis of gonorrhea in Canada have changed between 1990 and 1998^{14 15 16 17} (Figure 4.4). For the majority of this period, diagnosis of gonorrhea was typically made from a culture of specimens collected from urethral swabs in males, and from cervical

1989 & 1992

- First choice is culture from urethral specimens in males and cervical specimens in females
 - Allows screening for susceptibility to penicillin and tetracycline
 - Highly sensitive and specific (few false positives)
 - Problems with transportation
- EIA
 - No need for viable organism, therefore no transport problems
 - Cannot test for susceptibility to antimicrobials
 - Increased false positives and false negatives

1995

- First choice is culture from urethral specimens in males and cervical specimens in females
 - Non culture methods, such as EIA to be used only if culture not practical
 - first void urine not recommended

1998

- First choice remains culture form urethral specimens in males and cervical specimens in females as it allows to test for antimicrobial susceptibility
 - Non-culture tests such as amplified nucleic acid test (PCR) from first void urine, or EIA only recommended if culture not practical

Figure 4.4. Recommended Methods of Laboratory Diagnosis of Gonorrhea, 1989 to 1998^{1,4,15,16,17}

swabs in women. For the latter part, diagnosis using polymerase chain reaction (PCR) testing, has been done from urine specimens that are a less invasive form of collection. This option has officially been offered to all men of Saskatchewan since 1999 (unofficially since 1995), and is currently offered only to selected women in the province, due to the high cost associated with laboratory procedures (E.

Chan, January 27, 2000) (Figure 4.5), but will soon be offered to all women of the province too. Because chlamydia and gonorrhea often co-exist, it is recommended that anyone being tested for gonorrhea be simultaneously tested for chlamydia, as well as HIV and syphilis.

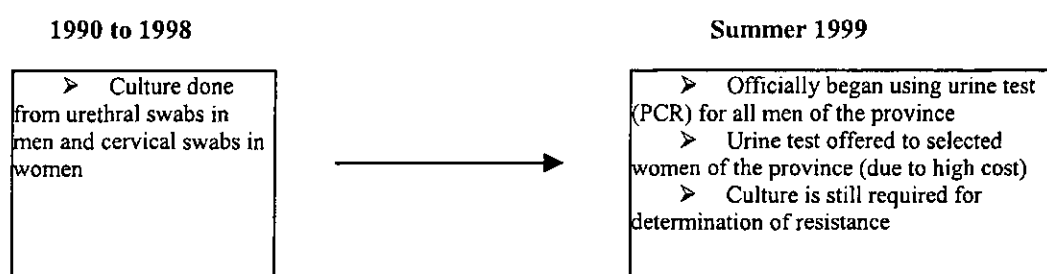


Figure 4.5. Laboratory Methods Used for the Diagnosis of Gonorrhea in Saskatchewan, 1990 to 1999 (E. Chan, Jan. 27, 2000)

In most cases, gonorrhea is an easily treatable infection. Recommended treatments have changed since 1990, and the current treatment of choice for adolescents and adults is a directly observed single 400 mg oral dose of cefixime,^{14,16,17,18} (Figure 4.6) with concurrent chlamydia treatment. Treatments recommended specifically in Saskatchewan are similar, but timing of changes may differ. Options which are safe for pregnancy are not listed in Table 4.6, but are considered appropriate. Due to the severity of consequences associated with untreated ophthalmia neonatorum, national guidelines suggest that all newborns receive prophylactic erythromycin 0.5%, tetracycline 1%, or silver nitrate 1% ophthalmic ointment to their eyelids within one hour of birth.⁹ Prior screening is not required, and these treatments are effective against ophthalmia caused by gonorrhea and chlamydia.

The frequency of antimicrobial resistant strains of *N. gonorrhea* in Canada has been increasing in the recent past¹⁰. In 1990, 11% of cases of gonorrhea reported were antimicrobial resistant strains of penicillinase producing neisseria gonorrhea (PPNG) and tetracycline resistant *N. gonorrhoeae*. In 1995 this had increased to 23%, and in 1996 nearly 50% of cases were identified as tetracycline resistant *N. gonorrhea*, while 9.4 % of cases were penicillin resistant and 8% resistant to both penicillin and

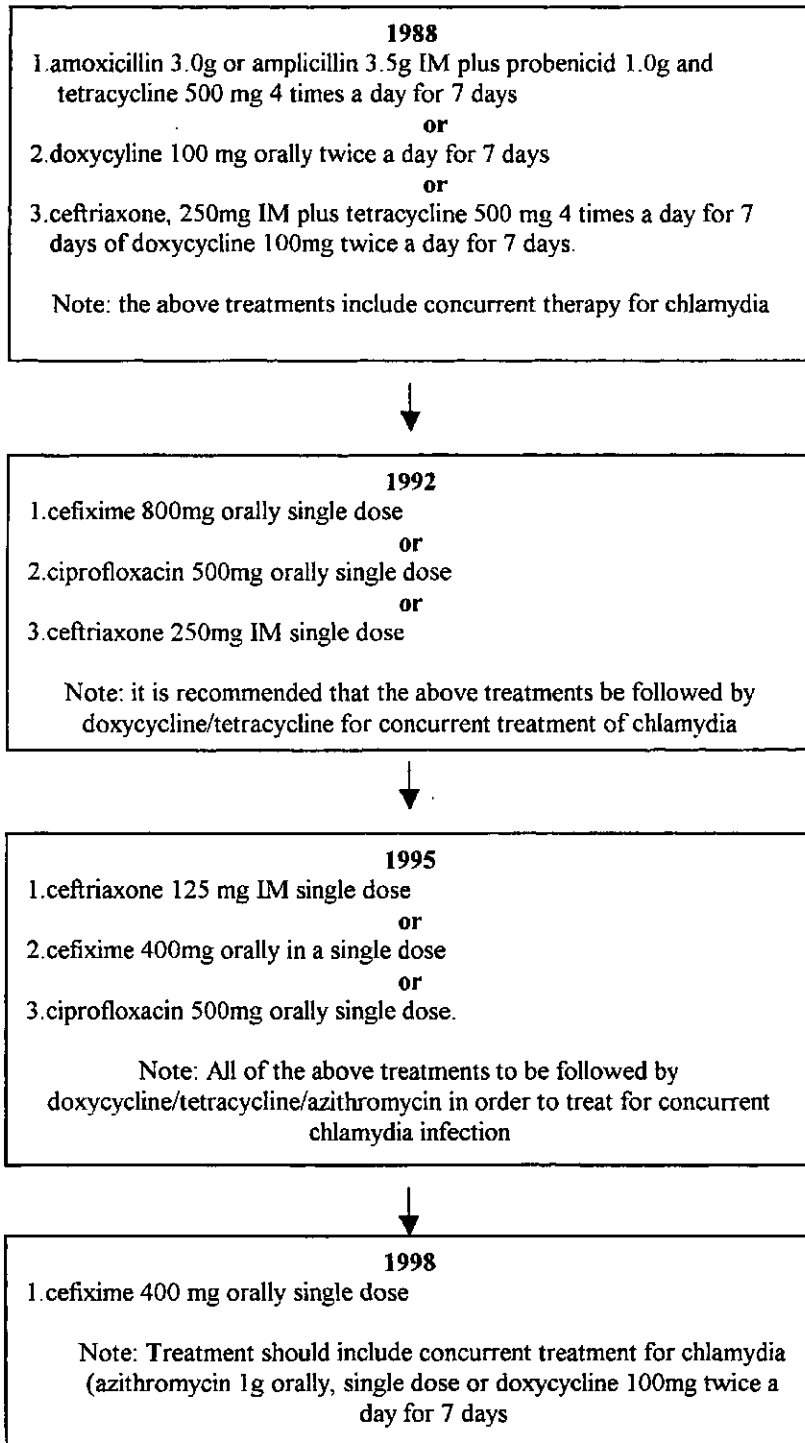


Figure 4.6 Standard Treatment Recommendations for Gonorrhea in Adolescents and Adults, 1988 to 1998^{14,16,17,18}

tetracycline⁵. There have also been reports of decreased susceptibility or resistance to fluoroquinolones (ciprofloxacin and norfloxacin), and chromosomal mediated resistance to penicillin, tetracycline and doxycycline.^{9,10} Due to this increase in resistant strains of the bacterium, treatment guidelines for gonococcal infection have been revised to reflect increased microbial resistance, and all gonococcal infections are now to be treated as if they are resistant. For example, penicillin, ampicillin, amoxicillin and tetracyclines are no longer recommended treatments, and have been replaced by third generation cephalosporins that are effective against these PPNG and tetracycline resistant strains.^{3,10} When a resistant strain is detected in Saskatchewan, the MHO of the district and the diagnosing physician are informed by the provincial laboratory.

4.1.3 Reporting

In Saskatchewan, the Communicable Disease Control Regulations of the Public Health Act govern the reporting of STIs. For category II communicable diseases the Act states that subjects diagnosed with a disease within this category, which includes gonorrhea, chlamydia and syphilis, must inform contacts within 72 hours of diagnosis and encourage them to seek medical care. If a doctor or nurse is asked to communicate with the contact, they are required to do so within 14 days of the request. The health care practitioner is responsible for reporting the diagnosis, identification and treatment information of each case to the medical health officer of their district. For gonorrhea specifically, all contacts within 60 days of onset of symptoms must be contacted,¹⁴ or if there was no partner within that time, the last partner.

4.1.4 Goals

The rates of gonorrhea in Canada have been declining for many years now, and this is expected to continue into the next millennium. Health Canada has therefore set a goal to fully eliminate gonorrhea by 2010⁵.

4.2 Chlamydia

4.2.1 Epidemiology

Chlamydia is a bacterial infection caused by *Chlamydia trachomatis*. Like gonorrhea, chlamydia is transmitted through sexual contact and often co-exists with other STIs.⁴ It's incubation period and period of communicability are unknown,⁴ however when symptoms do occur, they often appear 6 to 14 days after contact with an infected individual.¹⁹ Women may experience symptoms similar to those of gonorrhea including mucopurulent cervical discharge,⁴ resulting from cervicitis, endometritis, and salpingitis,⁸ while males infected by the bacterium may experience symptoms such as opaque discharge and/or urethral itching and burning.⁴ The majority of persons infected with *C. trachomatis* do not exhibit these symptoms, and between 70-90% of women and 50-90% of men are asymptomatic.^{6,19,20} This leads to the potential for chlamydia to go undiagnosed and untreated, as asymptomatic persons are not likely to seek medical care. The complications of untreated chlamydia affect women of childbearing age most, and are responsible for the majority of personal and public expenses associated with chlamydia. Between 10-40% of women infected with chlamydia will develop PID²¹ and chlamydia is responsible for 65% of all PID cases. Prior chlamydia infection is also responsible for up to 70% of all incidents of tubal infertility and 30% of all ectopic pregnancies.¹⁹ The risk of ectopic pregnancy is 7-10 times greater in women who have had PID as compared to those who have not.²² For men, complications of untreated chlamydia can include infertility, epididymitis and Reiter's syndrome.

Chlamydia is the most common STI in developed countries and in North America.²¹ The US reported a rate of 182 cases per 100,000 population in 1995.²³ First identified in 1907, reliable diagnostic techniques that were simple to transport to the lab, did not become available until the 1980's,⁷ and chlamydia became nationally reportable in Canada in 1990,¹¹ with thorough Canadian data available by 1992. Today, 84% of all reported STIs in Canada are genital chlamydia. It is estimated that the prevalence of chlamydia in the Canadian general population is 5-6%.

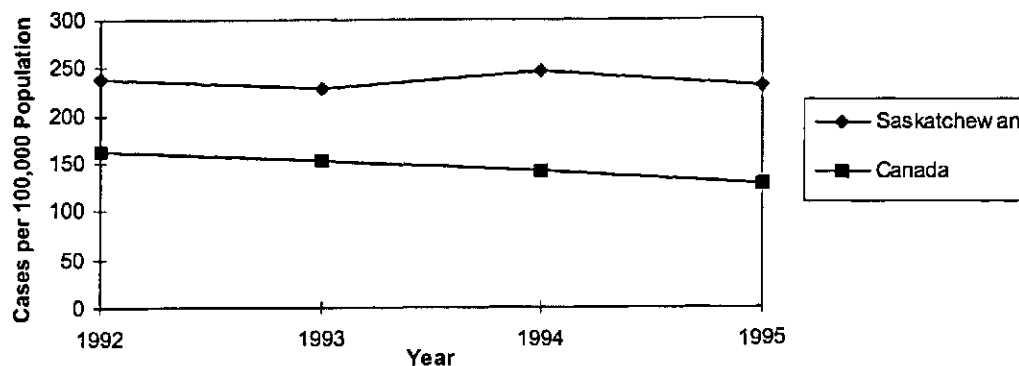


Figure 4.7. Incidence Rate of Chlamydia, Saskatchewan and Canada, 1995¹⁹

In 1995, there were 37,557 cases of genital chlamydia reported in Canada, a decrease of 19% from the 46,365 cases reported in 1992. The national rate of chlamydial infection decreased, on average, 7.7 % per year between 1991 and 1996, and 1.8% from 1996 to 1997, to a rate of 112.7 cases per 100,000 population, a rate 7 times higher than that of gonorrhea in the same year.^{19,21,24} Adolescents are particularly at risk for chlamydial infection because of high-risk behaviors, numerous partners, and unprotected sex including the use of non-barrier contraception such as the birth control pill.¹⁹ As in gonorrhea, male and female 15-24 year olds have the highest incidence rates of chlamydia,²¹ and rates are disproportionately high among young females. In 1995, persons between 15 and 29 had more than 85% of reported cases.¹⁹ In 1997 those between 15 and 24 years old represented 69% of cases²⁴ and the prevalence rate of chlamydia in sexually active females under the age of 25 was 5-10%. In 1997 females 15 to 24 had a rate of 943 cases per 100,000 population, and females 15 to 19 had a rate of 971.6 cases per 100,000 population²⁴ (Figure 4.8). Women are more likely to be diagnosed with chlamydia, while men are more likely to be diagnosed with gonorrhea.⁸

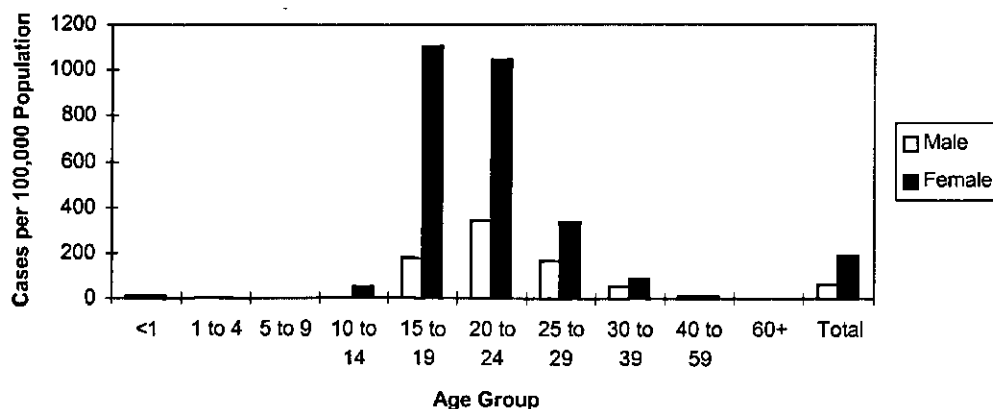


Figure 4.8. Incidence Rate of Chlamydia, by Age and Sex, Canada, 1995¹⁹

In 1996, Saskatchewan had the fourth highest provincial rate of chlamydia infection in Canada (219.3 cases/100,000), behind NWT (1345.8 cases/100,000), Yukon (460 cases/100,000) and Manitoba (224.4 cases/100,000). In Manitoba, from 1988 to 1990, 73% of all cases involved women, and 72% were aged 15-24. Only 4% of cases were in those aged less than 14 or over 40. 13% of all cases in Manitoba were among North American Indians.²² As previously mentioned, provincial rates of infection are influenced by a variety of factors such as type of screening programs, educational programs, health promotion campaigns, choice of treatment and the effectiveness of contact tracing.

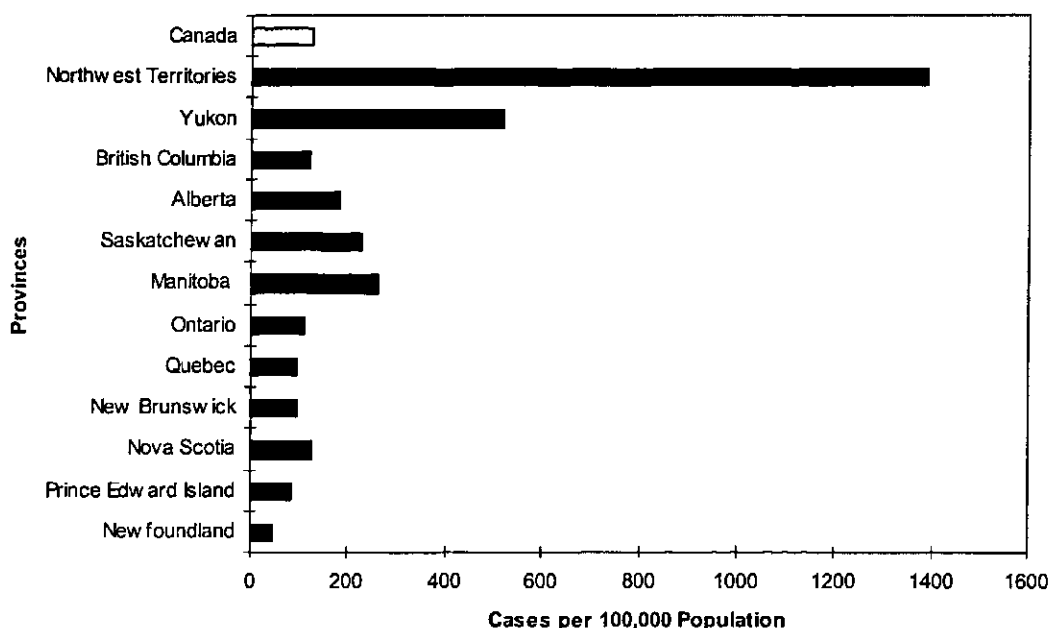


Figure 4.9. Incidence Rate of Chlamydia by Province, Canada. 1995¹⁹

4.2.2 Diagnosis and Treatment

Methods of diagnosis and sample collection recommended by Health Canada have changed since 1990 when urethral swabs were always used for specimen collection in males, and cervical swabs used for women.⁶ There are now new urine testing techniques available which decrease the discomfort associated with sample collection (Figure 4.10). PCR urine testing for chlamydia has been available to men in Saskatchewan since 1995, and to selected groups of women since 1997 (Figure 4.11) (E. Chan, Jan. 27, 2000). Urine testing is not routinely used for all women in the province due to the high cost associated with the required laboratory procedure. The increased use of urine testing is expected to increase the number of tests done because it eliminates the need for men to endure painful urethral swabs. This could then increase the proportion of cases that are reported, leading to increased male rates, subsequently narrowing the gap between male and female rates.²⁴ British Columbia (BC) has reported an increase of 25% in the number of tests done since the implementation of urine tests.

1989 & 1992

- Culture is the best option, with swabs taken from urethra in males or cervix in females
 - Specimen needs to be in laboratory within 24 hours
 - 75-80% sensitivity
 - 100% specificity
- If transport delays inevitable, enzyme immunoassay (EIA) or direct fluorescent antibody (DFA) can be used, but more false positives are likely

1995

- Culture from swabs taken from urethra in males or cervix in females or
 - Molecular amplification techniques (PCR) from first void urine in males and females
 - More sensitive than culture and highly specific

1998

- Amplified Nucleic Acid test (PCR) from urethra in males and cervix in females, or first void urine samples
 - 98% sensitive
 - 100% specific

Figure 4.10. Recommended Methods of Laboratory Diagnosis of Chlamydia, 1989 to 1998^{1,5,16,17,18}

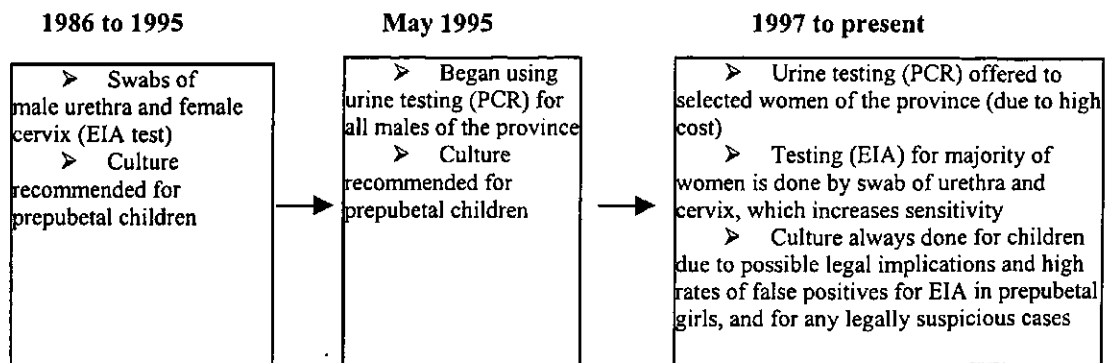


Figure 4.11. Laboratory Methods Used for the Diagnosis of Chlamydia in Saskatchewan, 1986 to 1998
(E. Chan, Jan. 27, 2000)

Chlamydia can be treated with tetracycline or erythromycin,⁹ but the preferred treatment with the highest rate of compliance is a directly observed single oral 1mg dose of azithromycin^{6, 14 21} which has been shown to be as effective as doxycycline 100mg twice a day for 7 days,^{6,19} the previously recommended treatment. Before doxycycline, tetracycline four times a day for seven days was the recommended treatment (Figure 4.12). These treatments render discharge non-infectious.⁴ Chlamydia is found concurrently with gonorrhea in 40% of male cases and 60% of female cases,¹⁹ and gonorrhea is more likely to be symptomatic than chlamydia.²¹ Because of the frequency of dual infection and the difficulty in clinically distinguishing between the two infections, treatment regimens often recommend a dual therapy which is effective against both.¹⁹

4.2.3 Reporting

Reporting regulations for chlamydia are the same as those for gonorrhea, described in section 4.1.3. All contacts within 60 days prior to diagnosis should be contacted, assessed, tested and treated for the same infection as the index case.¹⁴

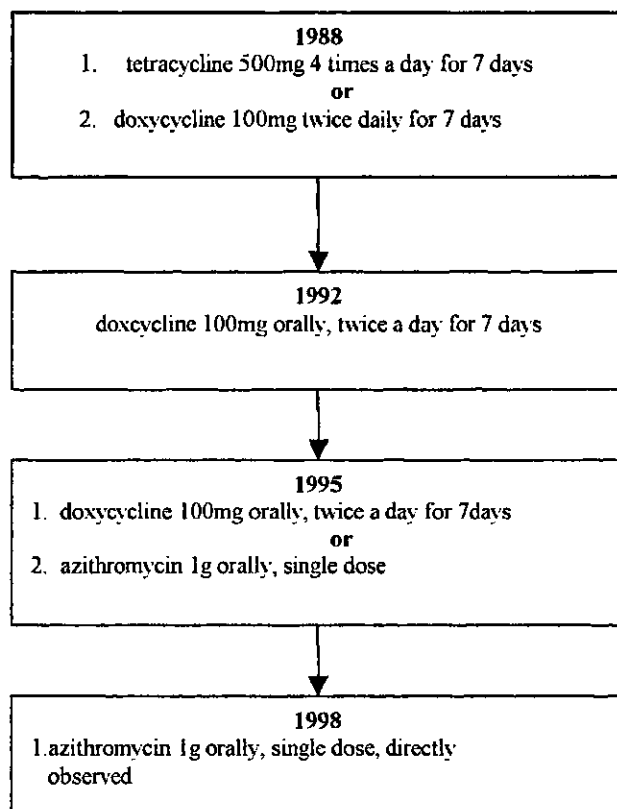


Figure 4.12 Standard Treatment Recommendations for Chlamydia in Adolescents and Adults, 1988 to 1998^{14,16,17,18}

4.2.4 Goal

A reasonable goal is thought to be to reduce the Canadian rate of chlamydia to less than 80 cases/100,000 population and to decrease the rate among women aged 15 to 24 to 500 cases/100,000 population by the year 2000.²⁵

4.3 Herpes

4.3.1 Epidemiology

Herpes is a viral infection, of which there are two types. Herpes simplex virus, Type I (HSV I) commonly causes the "cold sore". It is very common, and it is estimated that 70-90% of people have antibodies to it⁴. Herpes simplex virus, Type II (HSV II) is the cause of sexually transmitted, typically genital, herpes,⁴ and causes greater than 70% of cases of genital herpes.⁶ After initial infection, the virus remains in the nervous system for life,⁴ but is generally asymptomatic.⁶

Genital herpes is the most common type of genital ulceration in developed countries. It typically begins with the appearance of a primary lesion consisting of tiny vesicles after a 2-21 day incubation period,⁶ accompanied by dysuria and urinary retention, or the primary infection may be asymptomatic.⁶ Primary lesions are followed by a dormant, asymptomatic period, with localized recurrence of symptoms and silent infectivity²⁰ at unpredictable intervals.²⁶ 75% of people infected with HSV II are asymptomatic, and most people are infected through sexual intercourse, when the partner shedding the virus has no obvious lesions. Both HSV I and HSV II can be transmitted from lips to genitals and vice versa. In pregnancy, HSV infection can lead to neonatal herpes and prematurity.⁸

Herpes has high psychosexual and physical consequences. Physical complications associated with herpes can include intrauterine infection of the fetus after primary infection of the mother, leading to severe damage and destructive lesions to the fetus.⁶ Neonatal herpes is typically transmitted during the birth process from an infected mother to the neonate and can lead to a generalized systemic infection, isolated central nervous system disease (CNS) disease, conjunctival or oral disease.⁶

Herpes is not a notifiable disease throughout Canada, therefore national rates are difficult to find.²⁶ It is currently reportable in some provinces only,⁶ including Saskatchewan, although there is a move to remove it from the list of reportable infections there by the year 2000. Since the virus remains in the body

for life, it may be diagnosed at any point in its natural history. Some reports indicate that 2% of young Canadians will acquire the infection annually.²⁵

4.3.2 Diagnosis and Treatment

Due to its viral nature, herpes has no known cure. Diagnosis can best be confirmed by a culture, which is 99% sensitive and 100% specific, along with the clinical appearance of lesions¹⁴. For primary episodes of genital herpes, treatment will be useful to reduce symptoms, complications, and viral shedding, but is only effective if given in the early stages of a symptomatic episode. The treatment of choice has changed little since 1990, and currently acyclovir 400mg, five times a day for 7-10 days is recommended (Figure 4.13), although treatment initiated 6 or more days after onset of symptoms is unlikely to be effective¹⁴. For recurrent herpes, acyclovir 200mg orally for 5 days is thought to have limited clinical benefit if initiated by the patient in early recurrence, but treatment for recurrences may not be necessary unless they are severe and frequent.^{6,14} Topical acyclovir has no role for use in genital herpes. Clients diagnosed with herpes are encouraged to notify any sexual partners.

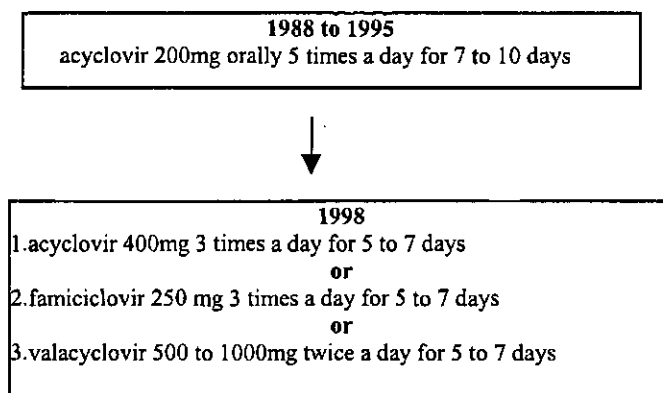


Figure 4.13. Standard Treatment Recommendation for Herpes, Primary Episode, 1988 to 1998^{14 17 18}

4.4 Syphilis

4.4.1 Epidemiology

Syphilis is a bacterial infection caused by the spirochete *Treponema pallidum*, a natural pathogen found only in humans. *T. pallidum* is typically transmitted through sexual contact with an infected person, but can also be transmitted through a blood transfusion, or from an infected mother to her fetus in utero.

Syphilis has three phases, which are indicative of infectivity and of the stage of the disease. The first phase of infection, primary syphilis, is characterized by the appearance of a painless genital chancre 10 to 90 days after sexual contact with an infected partner, which will disappear within a few weeks. Before the appearance of the chancre, infection cannot usually be detected. If primary syphilis is left undetected and untreated, the infection may progress to secondary syphilis.⁹ This phase is characterized by a generalized, transient, variable skin rash on the trunk, palms and soles, as well as fever and malaise, which appear 4 to 10 weeks after signs of primary infection. These signs will typically last a few weeks and then disappear, possibly recurring within three years.⁴ Together, primary and secondary syphilis are called early symptomatic syphilis. Primary, secondary and the next phase, called early latent syphilis, are all considered to be infectious, therefore together are referred to as infectious syphilis. 15% of those with untreated late latent syphilis (which is no longer infectious) will progress to tertiary syphilis, signs of which will appear 10 to 30 years after initial infection. This phase is not infectious, and is characterized by gummatous lesions of skin, bone and subcutaneous tissue, cardiovascular symptoms and neurosyphilis.⁷ *T. Pallidum* can lead to spontaneous abortion, stillbirth and congenital syphilis⁸ if left untreated during pregnancy.

Syphilis has been a nationally notifiable disease in Canada since 1924, but in 1992, reporting was expanded to include a more extensive breakdown of stages of disease, including congenital, early latent, early symptomatic and other syphilis.¹¹ Rates of syphilis in Canada are low, with 0.3 cases per 100,000 population in 1997. In the early 1980's, 87% of cases were diagnosed in males. In 1995, diagnoses had become more evenly distributed between genders, and 62% of cases were men. Young women in Canada have a relatively high rate of syphilis (3.1 cases per 100,000 population among women 15-19). This rate is

more than 4 times the rate of syphilis in males of the same age. Syphilis rates overall decreased from 9.9 cases per 100,000 population in 1981, to 3.9 cases per 100,000 population in 1993.⁸ From the early 1980's, the majority of cases of early symptomatic syphilis have been among 20-59 year olds, and the highest rates were among women aged 15 to 29 (Figure 4.14). There have been only 5 cases of congenital syphilis reported in Canada since 1990.²⁶

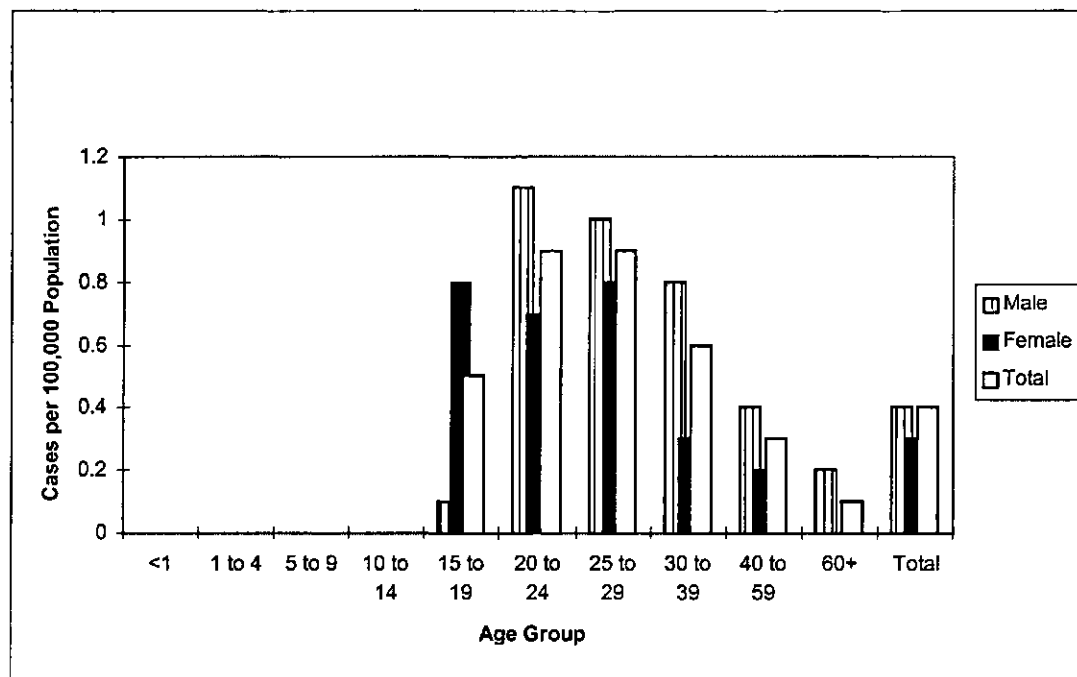


Figure 4.14. Reported Rates of Early Symptomatic Syphilis in Canada, by Age and Sex, 1995²⁷

Of all Canadian provinces in 1995, Saskatchewan has the highest rate of early symptomatic syphilis for men and women, 1.8 and 1.6 cases per 100,000 respectively (Figure 4.15), with 18 of 19 cases reported in Saskatchewan from northern Saskatchewan. This is considerably higher than all other provinces, where rates range from 0 to 0.7 cases per 100,000.²⁷ All provinces except BC have already reached the national goal of less than 0.5 cases per 100,000 population by the year 2000.

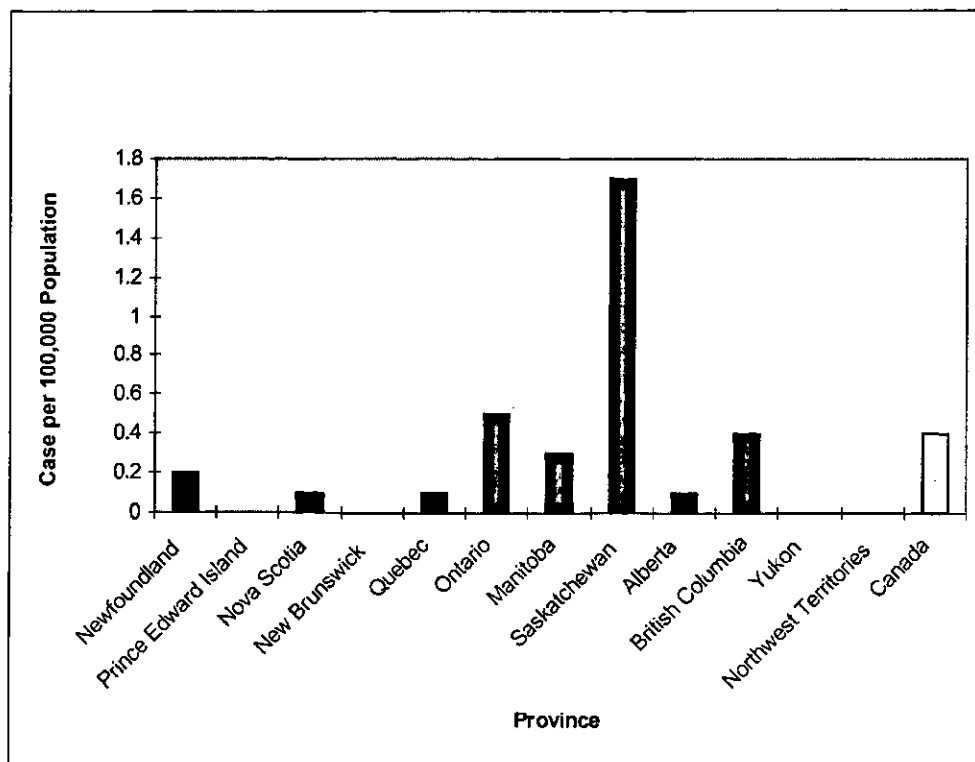


Figure 4.15. Reported Rates of Early Symptomatic Syphilis in Canada, by Province, 1995²⁷

4.4.2 Diagnosis and Treatment

Syphilis is a treatable infection, and the tertiary stage can be avoided if infection is recognized early. It is recommended that HIV testing be done at the same time as syphilis testing, as the presence of syphilis increases the transmission of HIV by six or seven fold. It is difficult to diagnose syphilis, as no single test exists. Classification of infection must rely on clinical history, physical examination and laboratory investigation,²⁸ while the type of laboratory test and treatment prescribed varying according to the stage of disease. In the early stages, meaning primary, secondary or early latent syphilis (infectious syphilis), preferred treatment has not changed since 1990, and a single 2.4 million U IM dose, of benzathine benzylpenicillin is recommended^{14,16,17,18}. Partner notification of syphilis is dependent on the stage of syphilis, but ranges from 3 to 12 months prior to diagnosis.

1988 to 1998
 Benzathine penicillin (Bicillin) 2.4 million U IM in a single session

Figure 4.16. Standard Treatment Recommendations for Infectious Syphilis, 1988 to 1998^{14 17 18}

4.5 Pelvic Inflammatory Disease

4.5.1 Epidemiology

Pelvic Inflammatory Disease (PID) can be a serious consequence of STIs that are left undiagnosed and untreated. Approximately 75-85%²⁹ of cases of PID are caused by *C. trachomatis* and *N. gonorrhea* spreading from the vagina and endocervix to the uterus, fallopian tubes and ovaries, causing STI rates in a community to effect the rates of PID.

Symptomatic or asymptomatic, PID can cause serious damage and symptoms such as lower abdominal pain, intermenstrual bleeding, urinary frequency, purulent endocervical discharge, tenderness to tissues around uterus and fever.^{29 30} It can lead to infertility, ectopic pregnancy and chronic pelvic pain.⁶ There is also a high rate of asymptomatic infection, particularly among adolescents.²⁹ It has been found that 30-40% of women with untreated gonorrhea or chlamydia developed clinical symptoms of PID²⁹ and is estimated that approximately 15% of women become sterile after one episode of PID, 30% after a second infection. Women who have had one episode of PID have a 10 fold increased risk of a future episode, a 10 fold increased risk of infertility and an 8 fold increased risk of ectopic pregnancy⁶, as 33% of ectopic pregnancies are attributed to prior PID. The risk factors associated with PID are being sexually active, young, using non-barrier contraceptives such as the pill, and a history of PID. Approximately 50% of ectopic pregnancies are due to prior STI infection often 5 to 10 years prior to the event. The likelihood of tubal infertility increases the longer the delay between the onset of PID and the onset and treatment.

PID is not a notifiable disease in Canada, therefore the following rates are for hospitalized cases only,²⁹ and likely underestimates of the true incidence. PID in Canada had decreased fairly steadily among all age groups between the years 1983/84 and 1993/94, with an overall drop of 51.1% in hospitalized cases²⁹ to the current rate of 86.3 cases per 100,000 population. PID rates for 1993/94 indicate that the rate of hospital treated PID is highest among women 25-34 years of age (147.9 cases/100,000) closely followed by women 20-24 (141.7 cases/100,000). Of all provincial PID rates the same year, Saskatchewan had the highest rate (137.7 cases/100,000 women). A study done in northern Saskatchewan found that hospital separation rates for PID in 1992-1993 were two to three times higher in northern and registered Indian women than in women who live in the southern regions of the province.³¹

4.6 STI Prevention and Control

The most cost effective and efficient method of controlling STIs is to prevent them. The majority of prevention programs in place today focus on modification of risk behavior, promotion of condom use, screening and detection of asymptomatic infections, case treatment and contact tracing.⁸ When a multifactorial approach is taken, strategies which are effective against STIs often overlap with other public health issues such as the prevention of unwanted pregnancies, cervical cancer and infertility³²

4.6.1 A Model for STI Control

Methods used for prevention and control of STIs vary depending on the characteristics of the STI in question, as well as the characteristics of the target population. This concept is clarified in a model for STI control developed by Brunham and Plummer,⁸ that emphasizes the need for a multifactorial approach to STI prevention.

Two major principles affect STI control:

1) STIs are transmissible only through direct contact, their only reservoir is the human genital tract, and they survive poorly if at all outside the human body. STIs can therefore only be transmitted through sexual intercourse, gestation or birth, restricting transmission to sexually active people.

2) STIs can be classified as bacterial or viral. For viral STIs such as herpes, where treatment is of limited benefit, primary prevention through reduced sexual exposure is the strategy of choice. Control of bacterial STIs, for which effective antibiotic treatment is available, is focused on the detection and treatment of cases, as well as on behavior change.

STI transmission is sustained by the behavioral and biologic characteristics of humans, and the biologic characteristics of the pathogen. The interaction of these factors is represented by the following formula:

$$R=BcD \quad (4.1)$$

where R is equal to the reproductive rate of the pathogen. If R is equal to 1, then the level of infection in a defined area is maintained. If R is greater than 1, prevalence of infection increases, and if R remains less

than 1, the prevalence of infection decreases, and will eventually disappear. The value of R is determined by the interaction of B , c and D .

B represents the measure of infectivity or transmissibility of the pathogen, which can range from 50% in gonorrhea to 20% in chlamydia. Generally, bacterial STIs are more transmissible than viral STIs. Condoms and spermicides reduce the transmissibility of STIs, but oral contraceptives and intact foreskin enhance it.

c is a measure of interaction or contact rates between susceptible and infected persons. If it is known it can help to identify subgroups to target for control. c is the critical determinant of R when no control measures are in effect. A subset of the population with high rates of change of sexual partners is necessary to maintain STIs in human populations, two groups in particular are core groups and STD repeaters. Core groups typically have a high incidence and prevalence of STD's and act as a reservoir for infection and a source of infection to others, although they represent less than 2% of those at risk overall. They retain the reproductive rate of disease greater than 1 ($R > 1$). Members of these groups are often young, live in inner city, have a low socioeconomic status (SES), poor access to medical care and are non-white. These groups are a small proportion of the population at risk, but have the majority of STIs. It is believed that if core group members are kept free of disease, then STIs will gradually disappear, making the focus of control measures on core groups very important to the control and elimination of STIs.

STD repeaters are a population who may have an association with the core group. A symptomatic repeater who seeks attention after each new episode is less likely to transmit disease than a core group member who will not seek medical help.

D is a measure of the duration of infectiousness, which also differs for each pathogen, and can be decreased with detection and treatment.

According to this model, the hypothetical goal of an STI control program is to decrease the R in core groups to less than 1. Since it is difficult to focus efforts on core groups, as they are difficult to access, districts typically have broader programs in place,⁸ which tend to emphasize strategies to decrease D , the duration of infectivity of the case, by providing access to medical diagnosis, education and effective treatment.

4.6.2 Condoms

Condom use is recommended for the prevention of STIs, including HIV, for those with multiple or serial partners.³³ Latex is impermeable to HIV, hepatitis B, HSV, chlamydia and gonorrhea³⁴, therefore effective in prevention of transmission of infection, although lesions not physically covered by the condom present a risk.

Condoms can only be effective if they are used. It has been shown that condom use declined with the introduction of the birth control pill, but has increased steadily since the late 1980's, as it is increasingly being seen as normal behavior³⁴. One study done in Ontario looked at condom use among young adults and found that males 16-34, single students, those in unskilled occupations and persons at higher risk of HIV infection were more likely to use condoms. Females were found to be 52% less likely to use condoms than males. Persons 25-44 were 50% less likely to use condoms than those 16-24, and those living in rural areas were 33% less likely to use condoms than people in urban areas. Binge drinkers were 27% less likely to use a condom³⁴. A 1997 Canadian survey reported that 27.7 % of men and 28.1% of women did not use a condom the last time they had sex with a non-regular partner³⁵ and a local Saskatchewan survey found that condom use among sexually active males differed little depending on the region of the province in which they lived. Approximately 34 to 38 % of male youth in Saskatchewan reported "always" using a condom, while the percentage of females in the north reporting "always" using a condom was less than 20% compared to between 30 and 40% of females in the rest of the province who "always" use a condom³⁶.

Condom use can be affected by many different factors. In some cases, religious beliefs influence the choice to use a condom. Studies among youth have shown that the use of birth control pills increases with increased commitment in the relationship,³⁷ which often leads to a decrease in condom use and therefore an increased risk of STI, indicating that serial monogamy and the increase of trust and feelings of safety in a relationship are risk factors for STIs.³⁸ Ulman and Lanthrop found that when free condoms were distributed with birth control pills, 39% of youth who received free condoms used both birth control pills and condoms at last intercourse, as compared to 29% of people who did not receive free condoms, who used both birth control pills and condoms at last intercourse³⁷.

4.6.3 Screening

One effective method of STI control is to detect and treat cases as soon as possible, in order to prevent spread to contacts and serious sequelae. Effective screening for an infection depends largely on the availability of suitable screening tests that will produce valid results, meaning that tests will be positive when infection is present (sensitivity) and negative when it is not (specificity).³⁹ Since 1989, Health Canada has recommended screening of adolescent and adult women, especially those in high-risk groups (including those under 30, having more than two partners in the past year, age of first intercourse less than 16, prostitutes and those who have had known contact with an infected person), people who are demonstrating STI symptoms, and if there is an increased risk of serious consequences, such as in pregnancy. No time interval for regular screening has been set.^{14 16 17 18} A recent study published in the *Journal of the American Medical Association* found that if screening of adolescent females was limited to only those who showed signs of STI and reported inconsistent condom use, a large proportion of cases would be missed (79%) as many cases are asymptomatic. This study failed to identify a high risk subgroup of adolescent females and therefore concluded that since adolescent females are the highest risk group for STIs, that all adolescent females, whether symptomatic or not, or whether or not they are considered to be members of a high risk group, should be screened for infection every six months. Such screening practices could detect a large number of infections, thereby preventing further spread of infection and other serious sequelae.⁴⁰ A study which looked at the cost effectiveness of screening asymptomatic women for chlamydia found that if the prevalence of chlamydia was greater than 6%, screening with DNA amplification and treatment with single dose azithromycin under supervision was the most cost effective intervention strategy. And with greater prevalence, screening with enzyme immunoassay (EIA) generated savings and improved cure rate compared with no screening. They also compared tissue cell culture with no intervention and found that this is only cost effective if prevalence of infection is greater than 14%.⁴¹

4.6.4 Testing

One of the reasons for reluctance of men and women to go for STI testing is the fear of painful and invasive tests that require urethral swabs for men and cervical swabs for women. As described in detail in sections 4.1.2 and 4.2.2, methods of diagnosis for gonorrhea and chlamydia in Saskatchewan have changed between 1990 and 1998. Urine tests are now available and have been used for men in Saskatchewan since 1995 for chlamydia and gonorrhea. It is expected that test numbers will go up with increased use of the urine test, therefore diagnoses and rates will subsequently increase, but be more accurate.

4.6.5 Behavioral Change.

Behavioral change involves encouraging safer sexual practices such as delaying age of first intercourse, decreasing number of lifetime partners and increasing condom use. The majority of Canadian men and women have their first sexual experience between the ages of 16 and 19. 31% of males and 21% of females are sexually active by the time they are 14, and 45% of youth 16 years old are sexually active. Age at first intercourse is potentially relevant to the reduction of STIs as it is associated with the total number of lifetime partners.³⁸

Youth are likely to have a higher number of sexual partners than people over the age of 30, of whom only 6% report having had more than one sexual partner in the past year. A 1997 Canadian survey found that only 8.4% of men and 6% of women between the ages of 20 and 45 have had more than one sexual partner in the past year.³⁵ Influencing the number of sexual partners is thought to have little effect on STI rates if you do not target the high-risk groups. For instance, decreasing number of sexual partners among a group with low STI rates would have little effect on the overall rate. However, if groups with high STI rates and high numbers of partners are identified and targeted, decreasing rates among this population would have an impact on overall rates. Maticka-Tyndale³⁸ outlines two goals for behavioral change that could be effective in reducing the incidence of STIs. The first is to increase rates of condom use, even when oral contraceptives are used. The second is to increase public access to STI screening, diagnosis and treatment facilities, in order to provide early treatment, avoiding complications as well as decreasing the period of time a person is infectious.

4.6.6 Education

The effect of education on behavioral change is not clear. Although young men and women aged 15-19 have been found to be the most knowledgeable of all age groups about methods of preventing STD's, women 15-19 still have the highest rates of chlamydia and gonorrhea in Canada, indicating that STD knowledge is not typically translated into safer sex practices.

An excellent resource for sexual health education programs is The Canadian Guidelines for Sexual Health Education ⁴², which is meant to serve as a reference to assess and evaluate existing sexual health programs. The goals of sexual health education outlined involve helping people to achieve positive outcomes such as self-esteem and healthy relationships, and to avoid negative outcomes such as STIs and sexual dysfunction. Effective sexual health education should be provided in an age appropriate, culturally sensitive manner which is respectful of individual choices, and based on five principles:

1. Accessibility. Financial and administrative support must be provided for a range of sexual health activities. Culturally appropriate programs which reflect different social situations are necessary, as is improved access to sexual health education.
2. Comprehensiveness. Sexual health education is the shared responsibility of parents peers, schools, churches, health care, government, media and many others.
3. Effectiveness and sensitivity of educational approaches and methods.
4. Training and Administrative support. This includes preparation and support of those who provide education, in-service training, continuing education, opportunities for parents and caregivers to learn about sexuality, as well as educational opportunities for peer education
5. Program planning, evaluation updating and social development. Programs should be based on broad assessment and understanding of individual and community needs, determined in collaboration with those for whom the program is intended. They should also be evaluated regularly to ensure needs are being met.

4.6.7 Partner Notification

Partner notification is necessary to decrease the spread of STIs from unknowingly infected persons. It involves contacting any sexual partners within a given time frame prior to diagnosis, so that they can be

located, tested and treated. In Saskatchewan today partner notification is mandatory for gonorrhea, chlamydia and syphilis. For symptomatic cases of gonorrhea and chlamydia, contacts need to be traced back 60 days.¹⁴ Partner notification for syphilis depends on the stage of the infection, but ranges from 3 to 12 months prior to diagnosis. Clients are encouraged to contact partners within three days, however public health staff should be available to do so within 14 days of diagnosis, ensuring confidentiality of the index case.

4.7 Barriers to Prevention Strategies in Northern Communities

Prevention of STIs has many barriers, which are often magnified in northern Canada, where family life has been affected by loss of traditional lifestyles and economic dependency.³² It has been said that because people living in remote northern communities often have many more serious problems to deal with such as unemployment, violence and alcohol abuse, poor housing, sanitation and running water, the prevention of STIs far from the top of the priority list.^{43,44} There can also be a language barrier, a preference for traditional healing or simply the stigma that is associated with STIs. Assured confidentiality is always a primary concern, and difficult to maintain in small communities, possibly leading to a reluctance to seek testing. The frequent turnover of staff may lead to issues of trust, as there is often only one clinic where a client invariably knows all of the staff and patients there. People in remote communities can also have a false sense of being safe from infection, but must be reminded that infections can easily be brought into their communities by someone returning home infected⁴⁴.

Alcohol has been considered one of the major health problems of Aboriginal people in Canada for many years. The federation of Saskatchewan Indian Nations and Health and Welfare Canada found that the level of alcohol consumption of First Nations people does not differ greatly from the total Canadian population, but the level of abuse is higher for aboriginal peoples, finding that 35-40% of Aboriginal adults and 10-15% of Aboriginal youth abuse alcohol. Myers et al looked at the association between alcohol abuse and sexual risk taking, and found that a large number of people participated in unprotected intercourse and that this behavior changed little when "drunk or high". If it did change, behavior was more likely to be safe when high or drunk. This negates the stereotype of the need to focus prevention messages on the relationship between drug and alcohol abuse and unsafe sex.³⁴

4.8 Attitudes and Behaviors Toward Sexuality

Two studies published in the past ten years provide specific information regarding attitudes and behaviors toward sexuality in northern Saskatchewan. The first study, done in 1989 in Ile a la Cross, was focused specifically around AIDS attitudes and awareness. It found that the majority of adults (75%) reported having 1 to 2 sexual partners within the past year and that 89% of male and 63% of female adolescents aged 16 and over have engaged in sexual intercourse at least once, most having had 1 to 2 partners. 54% of the sexually active adolescents in the study reported using condoms, while only 6.8% of the adults reported always using condoms and 62% never did⁴⁵. Another study, done 10 years later, looked specifically at the issues of sexual behaviors, attitudes and knowledge among youth in Saskatchewan. It was found that approximately 50% of all youth in northern Saskatchewan (which includes Prince Albert in this case) reported having had sexual intercourse, and 70% of those over 17 years of age reported having had sexual intercourse. Of the three regions of the province, (north, central and south) northern Saskatchewan had the highest percentage of youth who reported having had more than 4 partners (17.7%), and the lowest percentage of youth reporting having had no sexual partners (46.2%). The number of sexual partners increases with age, with 45 to 50 % of youth over 17 years of age in the province reporting having had three or more sexual partners. This study also found that 38 to 55% of youth in the province reported having had their first intercourse between the ages of 14 and 15. Males in all regions reported having been in a relationship for more than one year before having sex, as did females in the central and southern regions, while females in the north most frequently reported having been in relationship for 1 to 6 months before engaging in sexual intercourse. Males overall have the highest reported rates of 'always' using a condom, with little difference in rates among regions. Females in the north have the lowest reported rate of 'always' using a condom (19.5%) and the highest percentage among females of all regions who 'never' use a condom.³⁶

5. Specific Research Questions (summarized in Table 5.1)

5.1 Trends in Northern Saskatchewan

Question 1: Have the numbers and rates of STIs reported in Northern Saskatchewan changed between 1990 and 1998?

- a) What was the number of cases of gonorrhea, chlamydia, syphilis and herpes, and the total number of all STIs combined reported in Northern Saskatchewan each year from 1990 to 1998 ?
- b) What was the crude annual incidence rate per 100,000 population of new cases of gonorrhea, chlamydia, syphilis and herpes and of all STIs combined in northern Saskatchewan for the three-year periods of 1990-1992, 1993-1995, 1996-1998?
- c) What are the age and sex specific incidence rates for gonorrhea, chlamydia, syphilis and herpes and for all STIs in northern Saskatchewan for the three-year periods 1990-1992, 1993-1995, 1996-1998, breaking the population down into the age groups 10-14, 15-19, 20-24, 25-29, 30-39 and 40+ ?
- d) What are the age standardized rates for all STIs, by diagnosis, in northern Saskatchewan for the three-year periods 1990-1992, 1993-1995, 1996-1998?
- e) How do these rates compare to those of the Saskatchewan general population and to Canada?
- f) Which age group and gender is most at risk for developing STIs?
- g) If trends in disease frequency are changing, what are the possible influences?

5.2 Variability Between Health Districts

Question 2: Is there any variability in the numbers and rates of STIs reported or in the age groups affected in MCRHD, KYHD and AHA?

- a) What was the total number of all STIs reported in MCRHD, KYHD and AHA district for the years 1990 to 1998?
- What is the variability in total numbers of STIs reported among these three health districts?
- b) What are the incidence rates of all STIs reported in MCRHD, KYHD and AHA for the three year periods 1990-1992, 1993-1995, and 1996-1998?
- How do the incidence rates of STIs in these health districts differ from each other?
- c) What are the age and sex specific STI rates in the MCRHD, KYHD, and AHA for the three-year periods 1990-1992, 1993-1995 and 1996-1998, using the age groups defined above.
- Are there variations between health districts for these age and sex specific disease rates?

5.3 Variability between Northern Communities

Question 3: What is the range in the rates of STI reported in each of the northern communities?

- a) What was the number of cases in each of the northern communities for the year 1998?
- b) What was the combined incidence rate of gonorrhea and chlamydia in each of the northern communities for 1998?
- c) What are the age and sex specific rates for gonorrhea and chlamydia combined in each of the northern communities, using the age groups 10-19, 20-29 and 30+ ?
- d) What was the number of cases of herpes in each northern community for the year 1998?
- e) What was the number of cases of syphilis in each northern community for the year 1998?

Question 4: How do all of the above disease rates compare to the rest of the province? to Canada?

5.4 Analysis of Treatment and Contact Information.

Question 5: Do the treatments used to treat STIs follow Health Canada or Saskatchewan Health recommended guidelines?

- a) What type of treatments are typically being used for gonorrhea, syphilis, chlamydia, and herpes?
- b) How have these treatments changed over the past nine years?

Question 6: How many contacts does the average case have?

- a) How many contacts are identified by each case (mean number of contacts per case and range of numbers)?

Table 5.1 Summary of Specific Research Questions

Location	STI	Year(s)	Statistical Analysis	Graph
Northern Saskatchewan	<ul style="list-style-type: none"> All STI's combined Gonorrhea Chlamydia Syphilis Herpes 	1990-1992 1993-1995 1996-1998	<ol style="list-style-type: none"> Absolute number of infections Crude incidence rate per 100,000 Age and sex specific infection rates for 10-14 15-19 20-24 25-29 30-39 40+ age groups Age standardized rates Treatment appropriateness Trends in each age group 	Trends
Health Districts 1. MCRHD 2. KYHD 3. AHA	<ul style="list-style-type: none"> All STI's combined 	1990-1992 1993-1995 1996-1998	<ol style="list-style-type: none"> Absolute numbers of infections Crude Incidence rate per 100,000 population Age and sex specific rates for age groups as above 	Variability of district rates Trends
Communities 1. MCRHD : communities 20 through 39 2. KYHD: communities 1 through 7 3. AHA: communities 10 through 12	<ul style="list-style-type: none"> gonorrhea and chlamydia combined 	1998	<ol style="list-style-type: none"> Absolute numbers of infection Crude incidence rates per 100,000 Age and Sex specific rates for 10-19 20-29 30+ age groups 	Variations in community rates
	<ul style="list-style-type: none"> Syphilis Herpes 	1998	<ol style="list-style-type: none"> Absolute numbers of infection 	Variability in community rates

6. Methodology

6.1 Design

This is a simple descriptive epidemiological study. Its main purpose was to describe the general characteristics of the distribution of sexually transmitted infections in northern Saskatchewan. This includes determining what age and gender groups are affected by these infections, the geographic distribution of the infections (where they are occurring), and changes in age and gender group distribution that occur over time.

6.2 Study Population

Northern Saskatchewan, in the context of this thesis, includes the specific boundary areas known officially since April 1, 1998, as MCRHD, KYHD and AHA. This area is roughly equivalent to census division #18, the previous Northern Health Services Branch area, the Northern Administration District, and the northern half of the province (see maps in Appendix B). In 1998, the total population was 33,209, or roughly 3.3% of the total population of Saskatchewan, spread over roughly half of the geographic area of the province.

The 1998 non-apportioned covered population by health district shows that MCRHD, also known as health district 31, is the most populous district of the north, with a total population of 20,717. The major centre of the area is La Ronge. Males make up 51.4% of the population, while 36.6% of the total population are under the age of 15, and 69.5% are under the age of 35. There are very few elderly people, with only 4.3% of the population over 65.

KYHD, health district 32, has a total population of 10,110 and the largest centre in this district is La Loche. 37.2% of the population is under the age of 15, 71% under the age of 35, and only 4.4% of the population is over 65. AHA, health district 33, has a very small and very young non-apportioned covered population of 2382. 38.7% of the population are under the age of 15, 75.1% under the age of 35 and only 4.0% over the age of 65 (Appendix C).

The total covered population of Saskatchewan for 1998 was 1,031,933, consisting of 49.7% males. 22% of the population was under the age of 15, 50.3% under the age of 35 and 14.4% over 65 (Appendix D).

The age structure of the population of the northern half of the province differs greatly from the age distribution of the entire province. From Tables 6.1 and 6.2, it can be clearly seen that the population of the north as a whole is very youthful when compared to the Saskatchewan general population, with 50% of the total population of Saskatchewan under the age of 35, compared to 70% of the northern population. Non-apportioned population numbers are available for the north as a whole and for the northern health districts for 1991, 1994 and 1997 by age and sex (Appendix C). Non-apportioned means that the population count of the area includes all persons who are members of local bands, even if they do not physically reside in the area. It is estimated that 57% of Treaty Indians live on reserve, but the proportion who live off reserve and in the southern half of the province is unknown (S. Whitehead, March 1, 2000). The population numbers are therefore likely overestimations of the true population in specific communities and health districts, which will subsequently lead to underestimation of the true rates of infection in these health districts and communities. Apportioned population numbers for 1998 are available for northern communities, by age and sex. These numbers are likely more accurate reflections of the true population as they are based on postal codes and registration with an Indian band. In order to calculate infection rates and view trends of infection within health districts, the north was divided into 21 communities for the calculation of community specific rates. The communities are grouped as follows, as each STI case was assigned to one of these communities, or groups of communities, which are based on commonalities of service area.

Table 6.1 Total Covered Population, by Age and Sex, Saskatchewan, 1998

	Total	% of Population	Cumulative %
<1	12212	1.2	1.2
1 to 4	56113	5.4	6.6
5 to 9	78781	7.6	14.2
10 to 14	80980	7.8	22
15 to 19	80726	7.8	29.8
20 to 24	73088	7.1	36.9
25 to 29	65998	6.4	43.3
30 to 34	71062	6.9	50.2
35 to 39	82551	8.0	58.2
40 to 44	79703	7.7	65.9
45 to 49	65779	6.4	72.3
50 to 54	53362	5.2	77.5
55 to 59	43287	4.2	81.7
60 to 64	39460	3.8	85.5
65 to 69	39080	3.8	89.3
70 to 74	36350	3.5	92.8
75+	73401	7.1	100
Total	1031933	100	100

Table 6.2 Total Covered Population, by Age and Sex, Northern Saskatchewan, 1998

	Total	% of Population	Cumulative %
<1	738	2.2	2.2
1 to 4	3320	10.0	12.2
5 to 9	4353	13.1	25.3
10 to 14	3842	11.6	36.9
15 to 19	3046	9.2	46.1
20 to 24	2677	8.1	54.2
25 to 29	2767	8.3	62.5
30 to 34	2611	7.9	70.4
35 to 39	2362	7.1	77.5
40 to 44	1895	5.7	83.2
45 to 49	1478	4.5	87.7
50 to 54	1160	3.5	91.2
55 to 59	865	2.6	93.8
60 to 64	643	1.9	95.7
65 to 69	551	1.7	97.4
70 to 74	370	1.1	98.5
75+	521	1.6	100
Total	33209	100	100

List of Communities Included in Study:

AHA

- Black Lake (including Black Lake First Nation)
- Fond du Lac (including Fond du Lac Denesulin First Nation)
- Stony Rapids
- Uranium City (including Camsell Portage)

KYHD

- Beauval (including Canoe Lake First Nation), Canoe Narrows, Jans Bay, Cole Bay
- Buffalo Narrows
- Ile a la Crosse, St. Georges Hill, Michel Village
- La Loche (including Clearwater River Dene Nation)
- Dillon (including Buffalo River Dene Nation)
- Patunak (including English River First Nation)
- Turnor Lake (including Birch Narrows First Nation)

NEHD

- Cumberland House (including Cumberland House Cree Nation)

MCRHD

- Creighton (including Denare Beach and Flin Flon, SK)
- Air Ronge, La Ronge, La Ronge Indian Band at La Ronge, Grandmother's Bay, Hall Lake, Nemebien River, Missinipe, Weyakwin
- Pinehouse
- Sandy Bay (including part of Peter Ballantyne Cree Nation)
- Deschambault Lake (including part of Peter Ballantyne Cree Nation)
- Pelican Narrows (including Sturgeon Landing and part of Peter Ballantyne Cree Nation)
- Southend (including part of Peter Ballantyne Cree Nation)

- Stanley Mission (including part of La Ronge Indian Band)
- Wollaston Lake (including Hatchet Lake Nation)

All data received for this study is for the population over the age of ten due to the small number of STIs reported in children less than ten years of age. This age group is likely not sexually active, and any infections reported are often due to sexual abuse or transmission from an infected mother to her infant at birth. The exclusion of infections in those under 10 allows for a more accurate estimate of the true rates of infection among the population at risk. It also led to slightly higher rates than would have been calculated for the entire population. In order to provide consistency in comparisons in this study, all Saskatchewan rates were calculated only for the 10 and over population, and Canadian rates were corrected to represent infection rates in the population over ten only.

Northern Saskatchewan has a small population spread over a large area. All major centers have physicians and public health nurses, and the majority of smaller communities have primary care nurses who reside in the community and can diagnose and treat STIs. The care in these communities also includes weekly (sometimes more) visits by a physician. There are a few very small communities whose only access to health care is in nearby communities, or periodic visits by public health nurses who can refer them to a physician for diagnosis and treatment.

6.3 Database

In 1986, Northern Health Services Branch, a branch of Saskatchewan Health, began collecting data on reportable STIs in northern Saskatchewan. Throughout the period of study, all cases of reportable STIs such as gonorrhea, chlamydia and syphilis identified in northern Saskatchewan, were reported to the MHO of the health district by both the diagnosing health care professional and the confirming laboratory. The reporting health care worker was responsible for completing and submitting a Confidential Notification of Sexually Transmitted Disease report, which details the diagnosis, treatment given and contacts of the case to the MHO (see Appendix E).

A database of all reported and laboratory confirmed cases of STIs diagnosed in the north was then formed by matching STD reports and lab confirmations of diagnosis. Anytime a lab confirmation report

was received with no matching STD report, then the STD report was requested from the source of diagnosis. Reported cases that were not laboratory confirmed were excluded from the final database. There are very few missing values in the database, and when they do occur the source is often due to the inability to obtain a completed STD report, likely related to situations such as the case having moved, or refused to return for treatment. Human Immunodeficiency Virus (HIV) was excluded from the analysis due to the lack of reliable data specifically for northern Saskatchewan. The completed database used in this study consists of the following variables for the years 1990 through 1998, for all cases aged 10 and over:

- EPISODE: The number assigned to the case in order of data entry.
- HSN code: The code in place of the Health Services Number, so that duplicate HSN codes indicate that a person was seen more than once in the year.
- DREPORT, MREPORT, YREPORT: These give the day, month, and year that the STD report was received by the MHO office.
- SEX
- AGE: Age of case at time of diagnosis.
- RESNUM: Code number for community in which the case resides.
- HD: Indicates the Health District in which the case resides.
- DIAGNOSIS: Gonorrhea, chlamydia, syphilis or herpes.
- TREATMENT: Type of treatment given.
- MSeen, DSeen, YSeen: Month, date and year that the patient was seen for testing.
- SOURCE: Who notified the MHO (usually the clinic that did the testing)
- CONTACTS: Number of sexual contacts reported by the case.

6.4 Ethics

Due to the small numbers of infection in individual communities, confidentiality is an important issue. Any identifying factors for individuals or communities in the data received for this study, were encrypted with codes available only to the Medical Health Officers of the Population Health Unit of Keewatin Yathé and Mamawetan Churchill River Health Districts and the Northern Intertribal Health Authority, ensuring confidentiality for all cases, contacts and communities. No individual person's identity can be determined from the database. The main purpose of the thesis analysis was to provide a detailed description of the epidemiology of STIs in Northern Saskatchewan, which includes a report on the extent of community variation in reporting of STIs while not singling out or identifying certain communities.

The final database was only accessible to the author on a disk, which was returned to the MHO upon completion of the study and not saved to a personal computer.

6.5 Analysis

As previously mentioned, the main goal of this thesis was to produce the descriptive epidemiology of STIs in Northern Saskatchewan by answering the specific research questions outlined in Table 5.1. The data analysis process used for this study can be broken down into three distinct sections: determination of absolute numbers, calculation of rates, and calculation of comparison rates.

The original database (see section 6.3) was received in SPSS format, therefore SPSS software was used to breakdown the original dataset, which consists of 5536 STI cases, diagnosed between 1990 and 1998. This allowed the determination of the absolute numbers of cases of each diagnosis found in the north overall and in each health district by year, age and sex. This step also determined the absolute number of cases of each diagnosis, in each community in the north, for the year 1998, by age and sex. The number of contacts reported per case was determined here, as was the various types of treatment that were given for each of infection over the years of study. These absolute numbers of cases were then used as numerators in the calculation of incidence rates.

Using the absolute numbers of cases as numerators, and the population numbers for the northern Saskatchewan population aged 10 and over (see section 6.2 and Appendix C) as denominators, incidence rates were calculated by residence, diagnosis, age and sex.

The following formula is typically used to calculate the cumulative incidence, or the proportion of people who develop a new case of disease during a specified time period.

$$\text{Incidence rate} = \frac{\text{Number of new cases of disease}}{\text{total population at risk}} \times 100,000 \quad (6.1)$$

In this case, we had the numbers of cases of disease for each year 1990 through 1998 and the mid year population numbers for the years 1991, 1994 and 1997. The average annual incidence rates for the three year periods of 1990-1992, 1993 to 1995 and 1996 to 1998 were calculated using the following formula:

$$\text{Annual Three Year Average Incidence Rate: } \frac{C1 + C2 + C3}{\text{midyear population} \times 3} \times 100,000 \quad (6.2)$$

where C1, C2 etc. = the number of cases of infection for a particular year.

With regards to the specific disease rates (syphilis, herpes, chlamydia and gonorrhea) there were insufficient numbers to produce meaningful rates for individual communities and health districts, therefore a less detailed analysis was done for specific diseases, and rates were calculated for all STIs combined. In order to do more detailed analysis on larger numbers, gonorrhea and chlamydia numbers were grouped together when calculating rates in communities. In order to compare these numbers to provincial and national rates, the separate provincial and national rates of gonorrhea and chlamydia can be added together in order to be comparable to the combined rate calculated for the north.

Finally, rates of infection in northern Saskatchewan were compared to those of the general Saskatchewan population and of the Canadian population. Saskatchewan rates were calculated using yearly numbers of cases obtained from Saskatchewan Health for the numerator, and the yearly provincial covered population aged 10 and over as a denominator. In order for these annual rates to be comparable to the three year average annual rates for northern Saskatchewan, the average annual rates for the three year

periods of 1990 to 1992, 1993 to 1995 and 1996 to 1998 were done, resulting in one annual three year average rate for each time period.

Since published Canadian rates include the entire population, including those under the age of ten, Canadian rates were corrected to represent rates in the over 10 proportion of the population, making them comparable to the northern and provincial rates calculated above. This was done by dividing the published Canadian rate by the proportion of the Canadian population which was 10 and over for each year of study:

$$\frac{\text{Population \# over 10 years}}{\text{Total Canadian Population}} = n \quad \left(\frac{\text{proportion of population over 10}}{10} \right) \quad (6.3)$$

Next the published rate was divided by n :

Rate / n =corrected Canadian rate

These corrected rates make the assumption that there were no cases in the population under ten, and that including the population under 10 simply dilutes the true rate of infection in the population at risk. Corrected rates were therefore higher than published rates.

Because the age distribution of northern Saskatchewan differs so substantially from that of the rest of the province (section 6.2), age standardization was used when comparing northern Saskatchewan infection rates to the rates of Saskatchewan in general, to ensure an accurate comparison. Direct age standardization provides summary rates of disease that account for the difference between populations with respect to age structure, and the process used the Saskatchewan covered population for the appropriate year.^{46 47}

In order to look at whether treatments given in the north followed national guidelines, the percentage of treatments which met national guidelines outlined in Tables 4.6 and 4.12, was determined. Treatments were categorized to as to whether they met the guidelines, meaning appropriate dual treatment for both gonorrhea and chlamydia was given, or suitable options for pregnant women. Treatments categorized as likely meeting guidelines were single treatments, only for the diagnosed infection.

Treatments included in the 'do not meet guidelines' category were not included in the national guidelines, nor were they suitable options. The number of contacts named by each index case was summarized to determine the range of number of contacts per case, as this is a proxy measure for the effectiveness of the contact tracing system.

7. Results

The following are the answers to the specific research questions summarized in Table 5.1.

Question 1: Have the numbers and rates of STIs reported in northern Saskatchewan changed between 1990 and 1998, and how do these rates compare with Saskatchewan and Canada?

Table 7.1. Total Number of Cases of STIs by Year, Northern Saskatchewan, 1990 to 1998.

1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
682	681	655	653	582	596	599	542	546	5536

NB: cases reported as gonorrhea and chlamydia combined counted as one case of infection

The number of STIs diagnosed in northern Saskatchewan has gradually decreased between 1990 and 1998, with a slight increase seen in 1995 and 1996. The largest number of cases in a year was 682 in 1990, and the smallest number was 542 in 1997. The average number of cases diagnosed per year of the study period was 615.

Table 7.2. Total Yearly Number of Cases of STIs Reported in Northern Saskatchewan, by Diagnosis, 1990 to 1998.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Gonorrhea	246	129	161	102	52	67	83	62	77
Chlamydia	513	585	532	573	527	535	527	486	490
Infectious Syphilis	0	6	9	3	14	18	10	2	1
Late Syphilis	1	0	0	0	0	0	0	2	0
Herpes (I, II and unspecified)	5	3	0	1	4	7	4	9	2
Number of cases of gonorrhea and chlamydia combined	83	42	47	26	15	31	25	19	24

NB: cases reported as gonorrhea and chlamydia combined were added to individual gonorrhea and chlamydia numbers

Overall, the number of cases of each STI reported yearly decreased between 1990 and 1998.

Chlamydia was the most frequently reported STI in northern Saskatchewan during the study period, with between 486 and 585 cases per year. The next most frequently diagnosed infection was gonorrhea with

between 246 cases (1990) and 52 cases (1994) reported per year. There were very few reported cases of either stage of syphilis, with the maximum number of cases of infectious syphilis reported being 18 in 1995. There were also very few cases of herpes, with between 0 and 9 cases being reported in each study year. Between 4 and 12% of cases of gonorrhea and chlamydia, were gonorrhea and chlamydia combined.

Table 7.3. Crude Three Year Average Annual Incidence Rates of All STIs by Diagnosis, per 100,000 population, Northern Saskatchewan, 1990 to 1998

	1990 to 1992	1993 to 1995	1996 to 1998
All STIs	3124.2	2628.9	2216.2
Gonorrhea	829.8	317.3	291.6
Chlamydia	2523.5	2347.5	1974.5
Infectious Syphilis	23.2	50.3	17.1
Late Syphilis	1.5	0	2.6
Herpes	12.4	17.2	19.7
Gonorrhea and chlamydia combined	266.3	103.4	89.3

NB: cases reported as gonorrhea and chlamydia combined are also included in separate gonorrhea and chlamydia categories.

Crude three year average annual incidence rates are the sum of number of annual cases for a three year period divided by the mid year population which was multiplied by three. The crude three year average annual incidence rate of all STIs diagnosed in northern Saskatchewan has decreased from 3124 cases per 100,000 population to 2216 cases per 100,000 population in 1996 to 1998. Chlamydia has had the highest overall yearly rates of infection, and rates have decreased from 2523 cases per 100,000 population in 1990 to 1992, to 1974 cases per 100,000 population in 1996 to 1998. Crude annual incidence rates of gonorrhea have also decreased over the study period, from 830 cases per 100,000 population in 1990 to 1992, to 292 cases per 100,000 population in 1996 to 1998. Infectious syphilis rates have fluctuated, with a peak rate of 50 cases per 100,000 population in 1993 to 1995, while herpes rates increased from 12 cases per 100,000 population in 1990 to 1992, to 20 cases per 100,000 population in 1996 to 1998 (Figure 7.1).

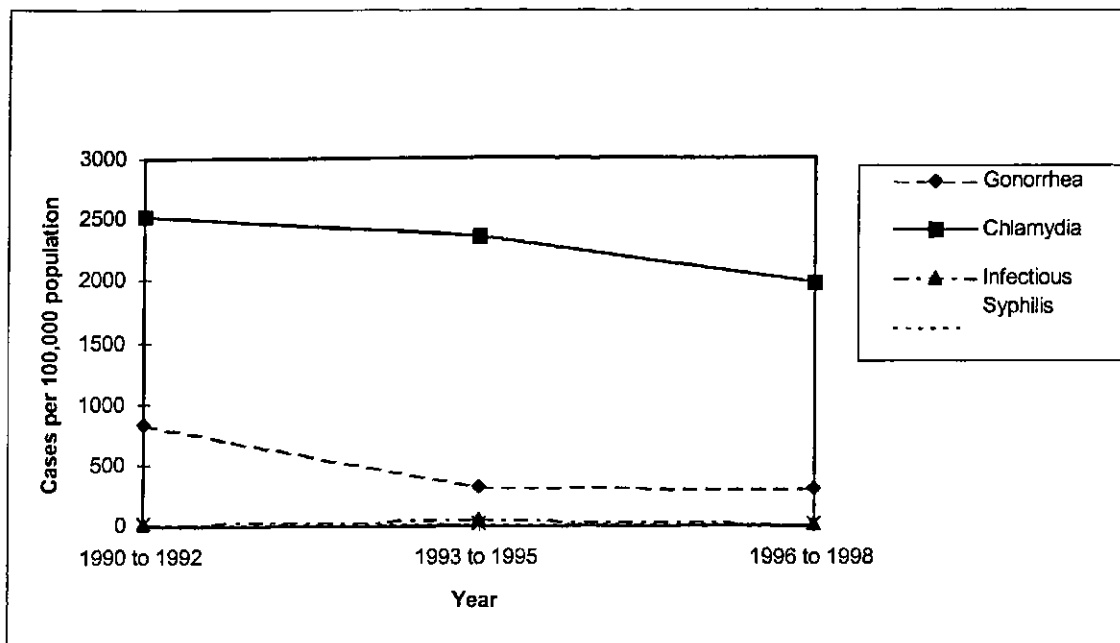


Figure 7.1. Crude Annual Incidence Rates of STIs by Diagnosis (per 100,000 population), Northern Saskatchewan, 1990 to 1998.

Incidence rates of STIs in northern Saskatchewan have decreased in all age groups between 1990 and 1998. Rates are considerably higher in females than in males, but the gender difference narrows in the 40+ population (Table 7.4). The highest overall incidence rates appeared among 15 to 19 year old women, where there were 10311 cases per 100,000 population in 1996 to 1998. This was closely followed by 20 to 24 year old women who had an annual rate of 8858 cases per 100,000 population. A similar distribution of cases was seen in the years 1990 to 1992 and 1993 to 1995, therefore only the period of 1996 to 1998 is graphically represented in Figure 7.2 .

Table 7.4. Cases and Three Year Annual Average Incidence Rates of All STI's (per 100,000 population) by Age and Sex, Northern Saskatchewan, 1990 to 1998

1990-1992						
Age Group	Male		Female		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	6	123.8	57	1285.5	63	678.7
15 to 19	149	3274	564	12832.8	713	7970
20 to 24	259	5679.8	457	11030.7	716	8227
25 to 29	99	2437.2	181	4475.8	280	3454.2
30 to 39	68	1062.7	110	1827	178	1433.2
40 +	37	405.8	31	386.6	68	396.8
Total	618	1842.7	1400	4508	2018	3124.2

1993-1995						
	Male		Female		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	5	99.4	37	752	42	422.2
15 to 19	133	2852.9	557	12604.7	690	7598.3
20 to 24	202	4586.7	398	9181.1	600	6865.8
25 to 29	107	2390.5	191	4606.9	298	3456.3
30 to 39	65	919.2	80	1147.9	145	1032.8
40 +	26	255.7	30	331.6	56	291.4
Total	538	1502.3	1293	3821.3	1831	2629

1996-1998						
	Male		Female		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	1	17	36	623.1	37	317.1
15 to 19	120	2436.1	460	10311.6	580	6178.8
20 to 24	185	4306.3	388	8858.4	573	6604.4
25 to 29	122	2605.2	177	3949.1	299	3262.4
30 to 39	80	1031.2	79	1033.9	159	1032.5
40 +	20	175	19	182.8	39	178.7
Total	528	1354.4	1159	3120.9	1687	2216.2

NB: cases reported as gonorrhea and chlamydia combined counted as one case

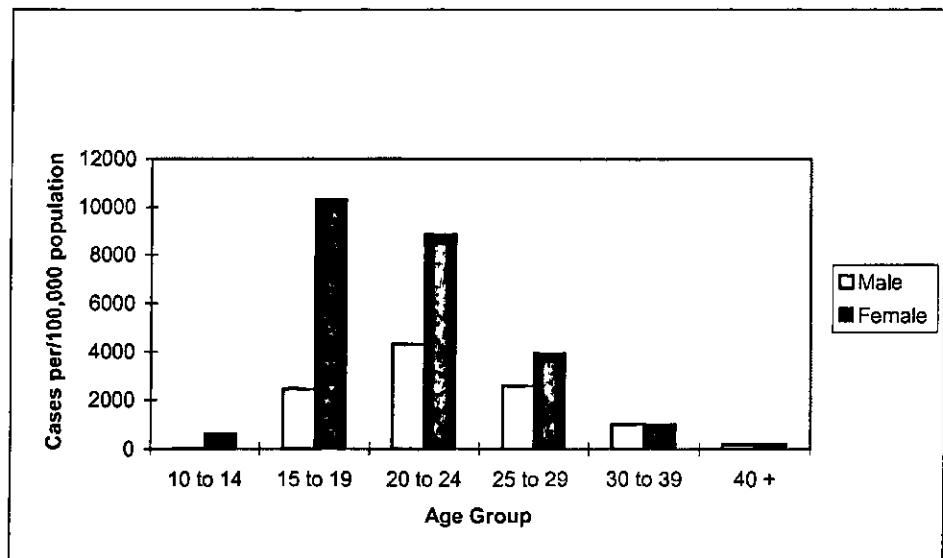


Figure 7. 2. Three Year Average Annual Incidence Rate of All STIs (per 100,000 population) by Age and Sex, Northern Saskatchewan, 1996 to 1998.

Gonorrhea

In 1990 to 1992 there was a total of 536 cases of gonorrhea reported for a three year average annual incidence rate of 830 cases/100,000 population. 134 cases were in 15 to 19 year old females, (3049 cases/100,000 population). In 1993 to 1995, there were a total of 221 cases reported (317 cases/100,000 population), 127 female and 94 male. Females aged 20 to 24 had 51 cases (1177 cases/100,000 population) while males 20 to 24 had a rate of 749 cases per 100,000 population. From 1996 to 1998, 222 cases of gonorrhea were reported for an annual incidence rate of 292 cases per 100,000 population. 113 were females and 109 males. 20 to 24 year old females had 936 cases per 100,000 population, and 15 to 19 year olds had a rate of 874 cases/100,000 population (Table 7.5).

Table 7.5. Cases and Three Year Annual Average Incidence Rates of Gonorrhea, (per 100,000 population) by Age and Sex, Northern Saskatchewan, 1990 to 1998.

1990 to 1992						
Age Group	Males		Females		Total	
	cases	rates	cases	rates	cases	rate
10 to 14	2	41.3	12	270.6	14	150.8
15 to 19	48	1054.7	134	3048.9	182	2034.4
20 to 24	91	1995.6	80	1931.0	171	1964.8
25 to 29	42	1034.0	32	791.3	74	912.9
30 to 39	31	484.5	33	548.1	64	515.3
40 +	21	230.3	10	124.7	31	180.9
Total	235	700.7	301	969.2	536	829.8

1993 to 1995						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rate
10 to 14	0	0.0	5	101.6	5	50.3
15 to 19	22	471.9	43	973.1	65	715.8
20 to 24	33	749.3	51	1176.5	84	961.2
25 to 29	24	536.2	22	530.6	46	533.5
30 to 39	12	169.7	6	86.1	18	128.2
40 +	3	29.5	0	0.0	3	15.6
Total	94	262.5	127	375.3	221	317.3

1996 to 1998						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rate
10 to 14	0	0.0	3	51.9	3	25.7
15 to 19	17	345.1	39	874.2	56	596.6
20 to 24	27	628.5	41	936.1	68	783.8
25 to 29	33	704.7	14	312.4	47	512.8
30 to 39	27	348.0	13	170.1	40	259.8
40 +	5	43.7	3	28.9	8	36.7
Total	109	279.6	113	304.3	222	291.6

NB: cases reported as gonorrhea and chlamydia combined are included in case numbers above

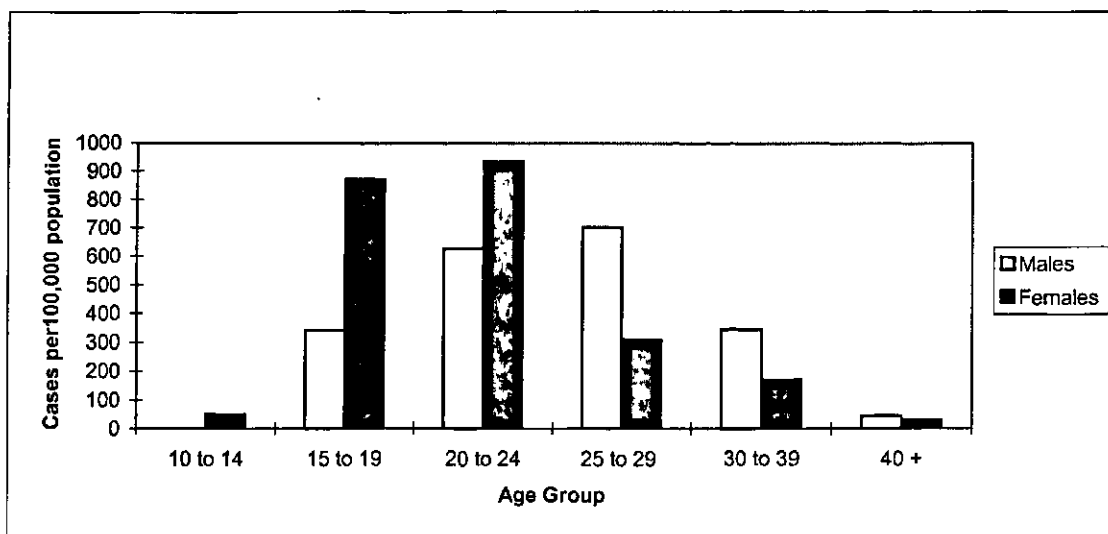


Figure 7.3. Three Year Average Annual Incidence Rate of Gonorrhea by Age and Sex, Northern Saskatchewan, 1996 to 1998.

Chlamydia

In 1990 to 1992, there were a total of 1630 cases of chlamydia. Females 15 to 19 had an incidence rate of 11263 cases per 100,000 population, 20 to 24 year old females had a rate of 9776 cases per 100,000 population and males 20 to 24, 4233 cases per 100,000 population. From 1993 to 1995, 1635 cases of chlamydia were reported for an annual incidence rate of 2348 cases per 100,000 population. 1190 of the cases were among females and 445 were males. Females 15 to 19 had a three year average annual incidence rate of 12107 cases per 100,000 population, while females 20 to 24 had a rate of 8281 cases per 100,000 population. Males 20 to 24 had a rate of 3996 cases per 100,000 population.

From 1996 to 1998, there were 1503 cases of chlamydia reported in the north for an annual average incidence rate of 1975 cases/100,000 population, 1080 of these cases were diagnosed in women, 423 in men. Women 15 to 19 had an annual rate of 9841 cases/100,000 population, and women 20 to 24 8265 cases/100,000 population (Table 7.6).

Table 7.6 Cases and Three Year Annual Average Incidence Rates of Chlamydia (per 100,000 population) by Age and Sex, Northern Saskatchewan, 1990 to 1998.

1990 to 1992						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
10 to 14	4	82.5	49	1105.1	53	571.0
15 to 19	112	2461.0	495	11262.8	607	6785.2
20 to 24	193	4232.5	405	9775.5	598	6871.2
25 to 29	65	1600.2	156	3857.6	221	2726.4
30 to 39	35	547.0	78	1295.5	113	909.8
40 +	18	197.4	20	249.4	38	221.8
Total	427	1273.2	1203	3873.7	1630	2523.5

1993 to 1995						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
10 to 14	5	99.4	35	711.4	40	402.1
15 to 19	116	2488.2	535	12106.8	651	7168.8
20 to 24	176	3996.4	359	8281.4	535	6122.0
25 to 29	87	1943.7	173	4172.7	260	3015.5
30 to 39	45	636.4	66	947.1	111	790.6
40 +	16	157.3	22	243.1	38	197.7
Total	445	1242.6	1190	3516.9	1635	2347.5

1996 to 1998						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
10 to 14	1	17.0	33	571.1	34	291.3
15 to 19	106	2151.8	439	9840.8	545	5805.9
20 to 24	162	3771.0	362	8264.8	524	6039.6
25 to 29	85	1815.1	162	3614.5	247	2695.0
30 to 39	54	696.1	67	876.8	121	785.8
40 +	15	131.2	17	163.5	32	146.6
Total	423	1085.0	1080	2908.2	1503	1974.5

NB: cases reported as gonorrhea and chlamydia combined are included in case numbers above

Due to the similar age distribution of cases throughout the study, only 1996 to 1998 is represented graphically in Figure 7.4.

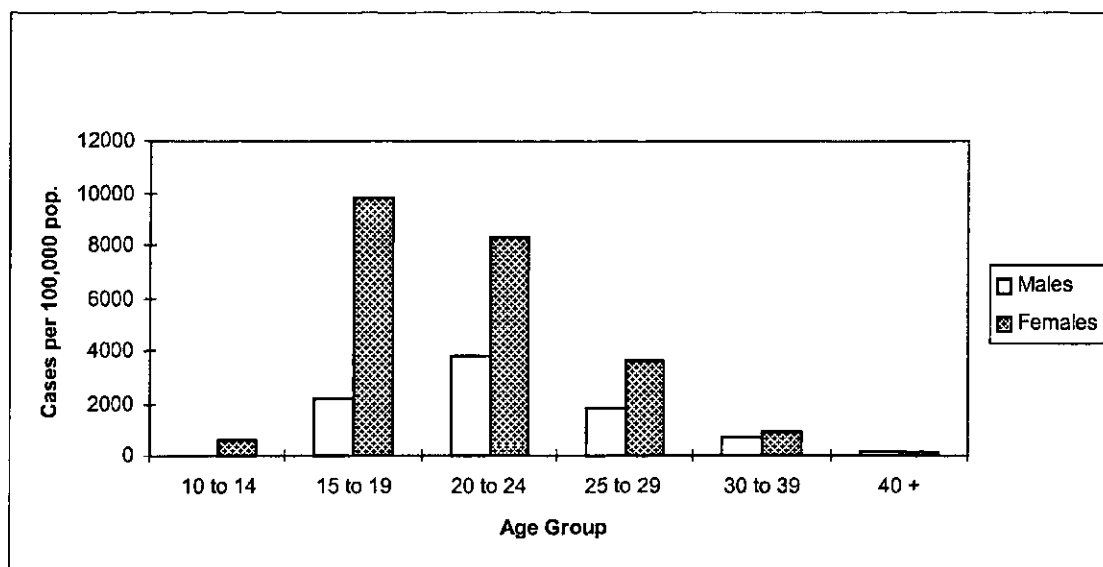


Figure 7. 4. Three Year Average Annual Incidence Rate of Chlamydia by Age and Sex, Northern Saskatchewan, 1996 to 1998.

Infectious Syphilis

From 1990 to 1992 there was a total of 15 cases of infectious syphilis reported in northern Saskatchewan, 10 male and 5 female, and a three year average annual incidence rate of 23.2 cases/100,000 population. Males aged 30 to 39 had the highest total number of cases in a single age group (5), and incidence rate of 78.1 cases per 100,000 population. In 1993 to 1995, there was a cluster of 35 cases of infectious syphilis reported (18 male and 17 female), all within a small northern area, which doubled the rate to 50 cases per 100,000 population. 8 cases were reported among 30 to 39 year old males, with a rate of 113 cases per 100,000 population.

From 1996 to 1998, 13 cases of infectious syphilis were reported (17.1 cases/100,000 population). 7 of these cases were males and 6 females. The most cases reported in a single age group was 2 (Table 7.7). Age and sex distributions are graphed in Figures 7.5 to 7.7.

Table 7.7. Cases and Three Year Annual Average Incidence Rates of Infectious Syphilis (per 100,000 population) , by Age and Sex, Northern Saskatchewan, 1990 to 1998

1990 to 1992						
Age Group	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
10 to 14	0	0	0	0	0	0.0
15 to 19	1	22	1	22.8	2	22.4
20 to 24	0	0	0	0	0	0.0
25 to 29	2	49.2	1	24.7	3	37.0
30 to 39	5	78.1	2	33.2	7	56.4
40 +	2	21.9	1	12.5	3	17.5
Total	10	29.8	5	16.1	15	23.2

1993 to 1995						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
10 to 14	0	0	0	0	0	0.0
15 to 19	0	0	1	22.6	1	11.0
20 to 24	2	45.4	1	23.1	3	34.3
25 to 29	1	22.3	2	48.2	3	34.8
30 to 39	8	113.1	6	86.1	14	99.7
40 +	7	68.8	7	77.4	14	72.8
Total	18	50.3	17	50.2	35	50.3

1996 to 1998						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
10 to 14	0	0	0	0	0	0.0
15 to 19	2	40.6	2	44.8	4	42.6
20 to 24	2	46.6	0	0	2	23.1
25 to 29	2	42.7	2	44.6	4	43.6
30 to 39	1	12.9	1	13.1	2	13.0
40 +	0	0	1	9.6	1	4.6
Total	7	18	6	16.1	13	17.1

NB: Infectious syphilis includes primary syphilis, secondary syphilis and early latent syphilis

Rates were not done for late latent and neurosyphilis in northern Saskatchewan from 1990 to 1998, as there was only one male case reported in 1997 and one female case in 1997.

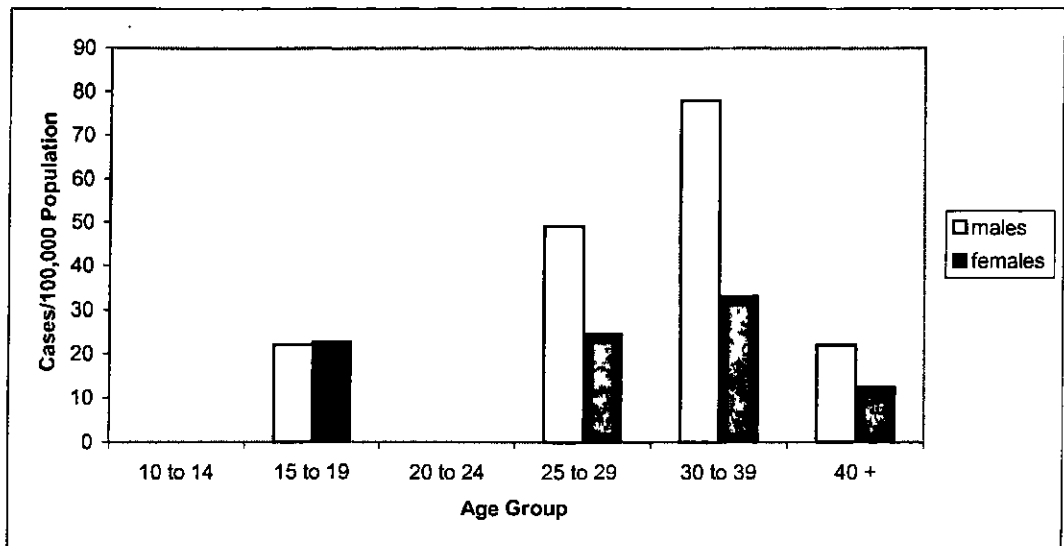


Figure 7.5. Three Year Average Annual Incidence Rate of Infectious Syphilis (per 100,000), Northern Saskatchewan, 1990 to 1992.

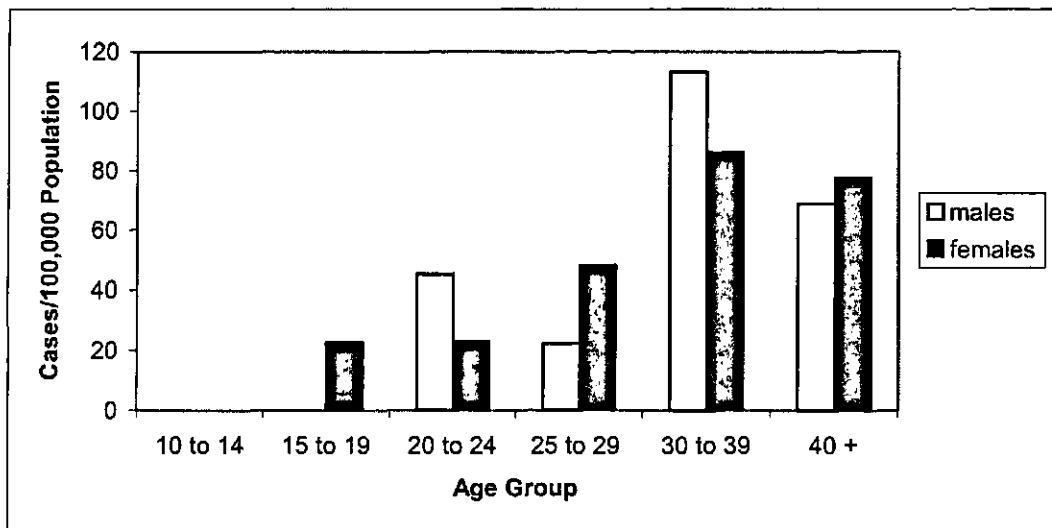


Figure 7.6. Three Year Average Annual Incidence Rates (per 100,000 population) of Infectious Syphilis, Northern Saskatchewan, 1993 to 1995.

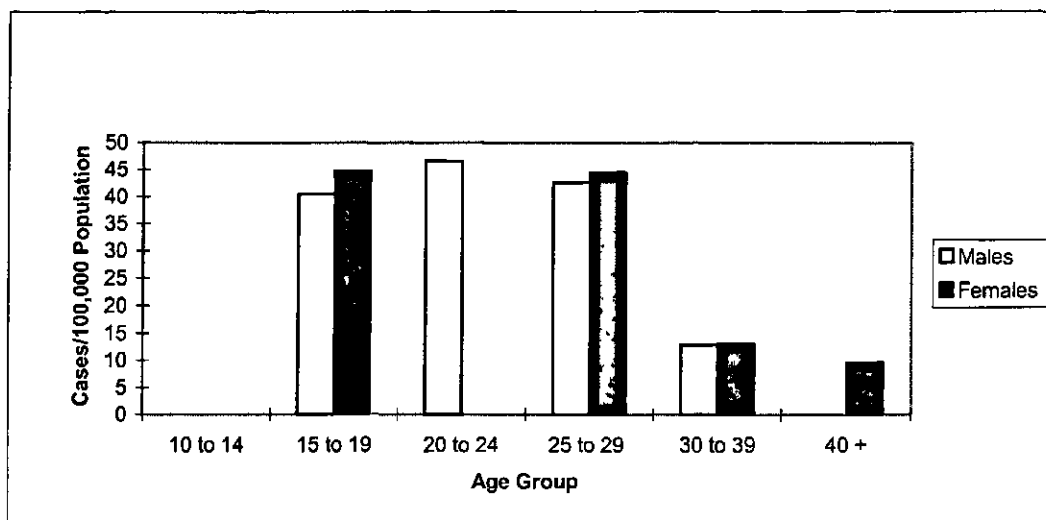


Figure 7.7. Three Year Average Annual Incidence Rate of Infectious Syphilis, Northern Saskatchewan, 1996 to 1998.

Herpes

From 1990 to 1992 there were 8 cases of herpes reported, 2 male and 6 female, for a three year average annual incidence rate of 12.4 cases per 100,000 population. Between 1993 and 1995 there were 12 cases of herpes reported for an annual rate of 17.2 cases per 100,000, and in 1996 to 1998, there were 15 cases of herpes reported, 8 male and 7 female, for a total annual rate of 19.7 cases per 100,000 population. Due to the small number of cases, further age and sex-specific rates would not be reliable and were therefore not done here.

Crude Rates

Table 7. 8. Crude Three Year Average Annual Incidence Rates (per 100,000) of All STIs Combined and by Diagnosis, in Northern Saskatchewan, Saskatchewan and Canada, 1990 to 1998.

	All STIs			Gonorrhea		
	90-92	93-95	96-98	90-92	93-95	96-98
North	3124	2629	2216	830	317	292
Saskatchewan	503	387	358	91	46	42
Canada (published)	n/a	n/a	n/a	42	21	16
Canada (corrected)	n/a	n/a	n/a	49	24	18

	Chlamydia			Infectious Syphilis		
	90-92	93-95	96-98	90-92	93-95	96-98
North	2524	2348	1975	23.2	50.3	17.1
Saskatchewan	338	273	258	1.2	1.6	0.6
Canada (published)	172	140	114	1.1	0.5	0.3
Canada (corrected)	199	163	131	1.2	0.6	0.3

	Herpes		
	90-92	93-95	96-98
North	12.4	17.2	19.7
Saskatchewan	46	45.5	47
Canada (published)	n/a	n/a	n/a
Canada (corrected)	n/a	n/a	n/a

Table 7.8 displays the crude three year average annual incidence rates for 1990 to 1992, 1993 to 1995 and 1996 to 1998, as calculated for northern Saskatchewan, Saskatchewan and Canada. Published Canadian rates were corrected to represent rates in only those aged 10 and over (with the assumption that there were no cases under 10 years of age) in order to be comparable to northern Saskatchewan and Saskatchewan rates. The comparison of crude rates must be interpreted with caution due to the differences in underlying population distributions for each region which will affect the regions rates. The rate of all STIs combined (gonorrhea, chlamydia, infectious syphilis and herpes) for Canada as a whole is not available. In 1990 to 1992, while the north had an overall rate of 3124 cases per 100,000 population, the Saskatchewan general population had a rate of 503 cases per 100,000 population. In 1993 to 1995, the north had a rate of 2629 cases per 100,000, while Saskatchewan had a rate of 387 cases per 100,000 population. The difference between rates continued in 1996 to 1998, when there was a rate of 2216 per 100,000 population in the north and 358 cases per 100,000 population in Saskatchewan.

Between 1996 and 1998 the crude gonorrhea rate in the north was 292 cases per 100,000 population, 42 cases per 100,000 population in Saskatchewan and 18 cases per 100,000 population in Canada. The crude annual chlamydia rate was 1975 cases per 100,000 in the north, 258 cases per 100,000 in Saskatchewan and 131 cases per 100,000 in Canada. From 1996 to 1998 infectious syphilis rates in the north were quite high compared to the rest of the province (17.1 cases/100,000 population and 0.6 cases/100,000 respectively) and Canada (0.3 cases/100,000). Herpes rates are unavailable for Canada as a whole, but in 1996 to 1998, the north reported a rate of 19.7 cases/100,000, while Saskatchewan had a rate of 47 cases per 100,000 population, but these rates must be interpreted carefully due to incomplete data in both cases.

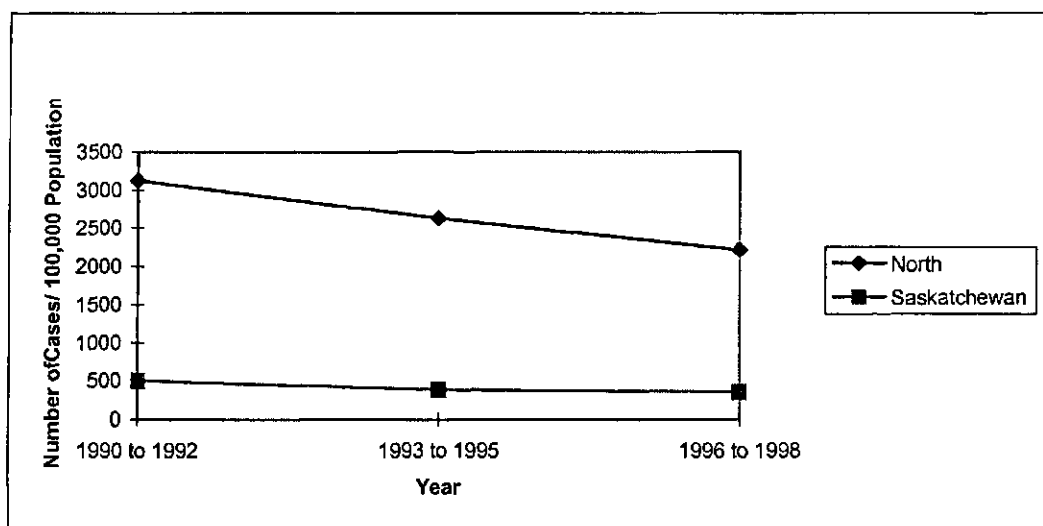


Figure 7.8. Three Year Average Crude Annual Incidence Rate of All STIs (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

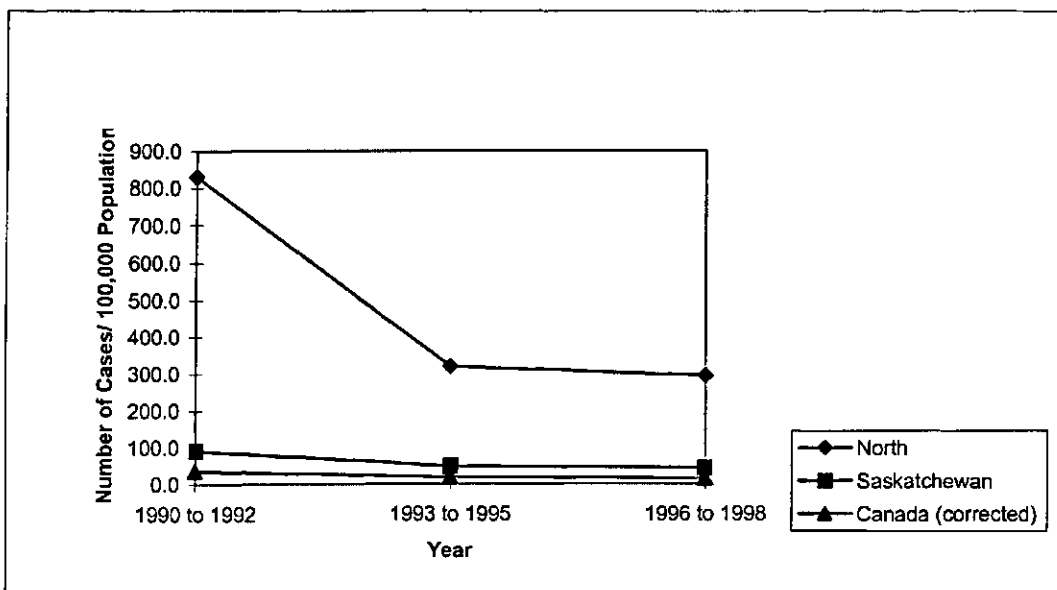


Figure 7.9. Three Year Average Crude Annual Incidence Rate of Gonorrhea (per 100,000 population), Northern Saskatchewan, Saskatchewan and Canada, 1990 to 1998.

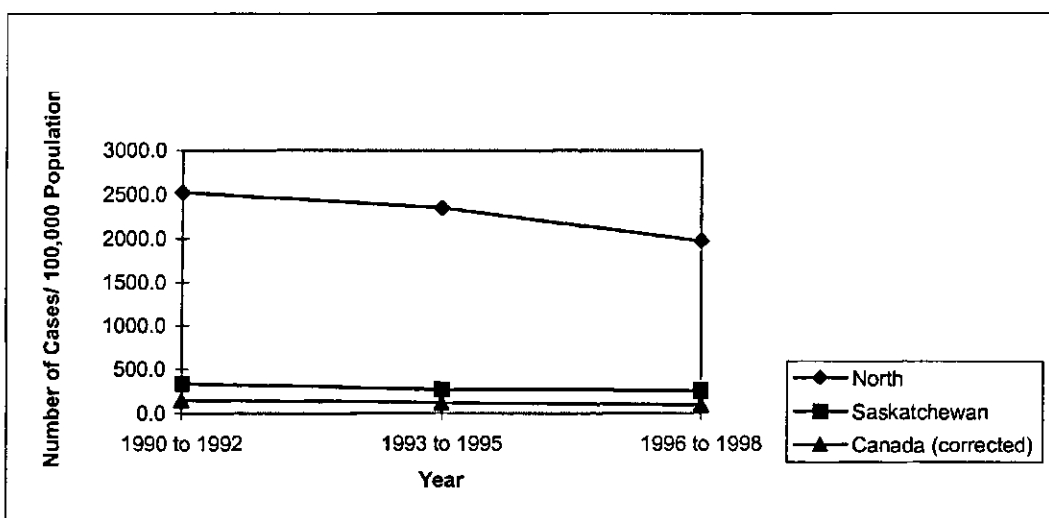


Figure 7.10. Three Year Average Crude Annual Incidence Rate of Chlamydia (per 100,000 population), Northern Saskatchewan, Saskatchewan and Canada, 1990 to 1998.

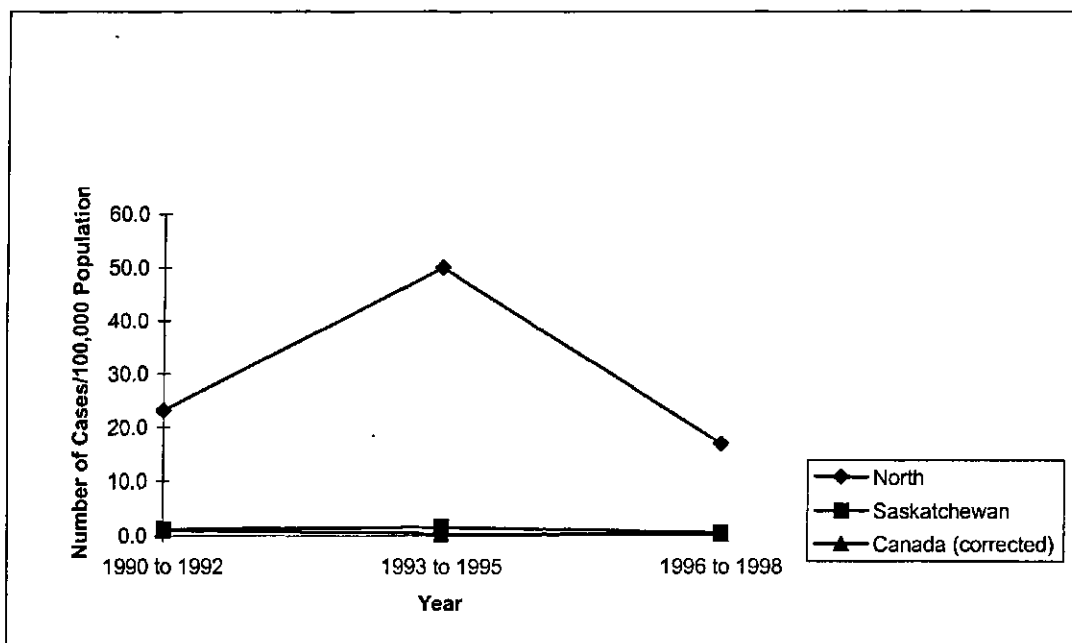


Figure 7.11. Three Year Average Crude Annual Incidence Rate of Infectious Syphilis (per 100,000 population), Northern Saskatchewan, Saskatchewan and Canada, 1990 to 1998.

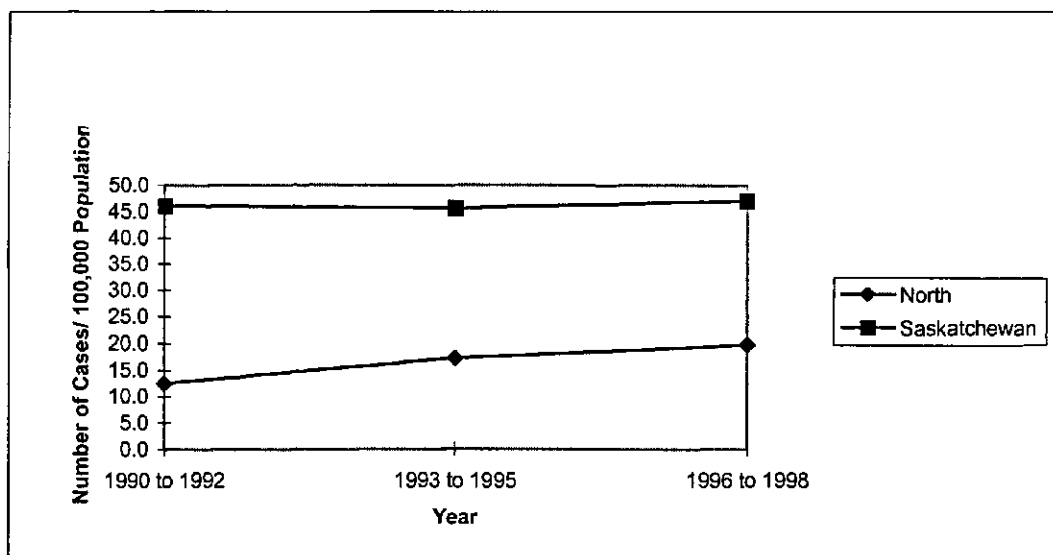


Figure 7.12. Three Year Average Crude Annual Incidence Rate of Herpes (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

Age Standardized Rates

Table 7.9. Age Standardized Three Year Average Annual Incidence Rates for All STIs by Diagnosis (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

1990 to 1992		
	North	Saskatchewan
Gonorrhea	610	91
Chlamydia	2193	338
Infectious Syphilis	24	1.2
Herpes	9	46
All STI	2175	502
1993 to 1995		
	North	Saskatchewan
Gonorrhea	221	46
Chlamydia	1657	273
Infectious Syphilis	60	1.6
Herpes	15	46
All STI	1882	387
1996 to 1998		
	North	Saskatchewan
Gonorrhea	227	42
Chlamydia	1924	259
Infectious Syphilis	14	0.6
Herpes	17	47
All STIs	1656	358

Rates displayed in Table 7.9 are age standardized to the Saskatchewan population to eliminate the effect of age structure on infection rates to be compared, and are likely to be a more accurate representation of the true rate difference between Saskatchewan and northern Saskatchewan. These results show that even with the effect of age removed, STI rates in northern Saskatchewan remain higher than those in the Saskatchewan general population. In 1996 to 1998, the rate of gonorrhea in the north was 227 cases per 100,000 population, and 42 cases/100,000 population in Saskatchewan. Chlamydia had a rate of 1924 cases per 100,000 population in the north and 259 cases per 100,000 population in Saskatchewan. Infectious syphilis in the north was 14 cases per 100,000 population, while in Saskatchewan 0.6 cases per 100,000 population were reported. Similar regional rate discrepancies were seen in 1990 to 1992 and 1993 to 1995. Throughout the entire study period, rates of herpes reported in the north were lower than those in Saskatchewan. In 1996 to 1998, the annual incidence rate in the north was 16.6 cases per 100,000 population, and 47 cases per 100,000 population in Saskatchewan.

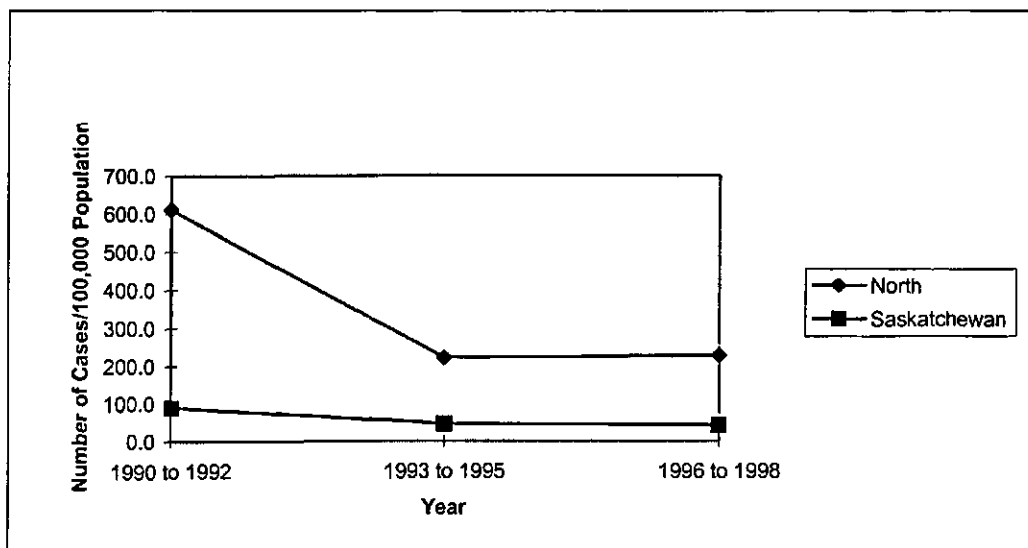


Figure 7.13. Three Year Average Age Standardized Annual Incidence Rate of Gonorrhea (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

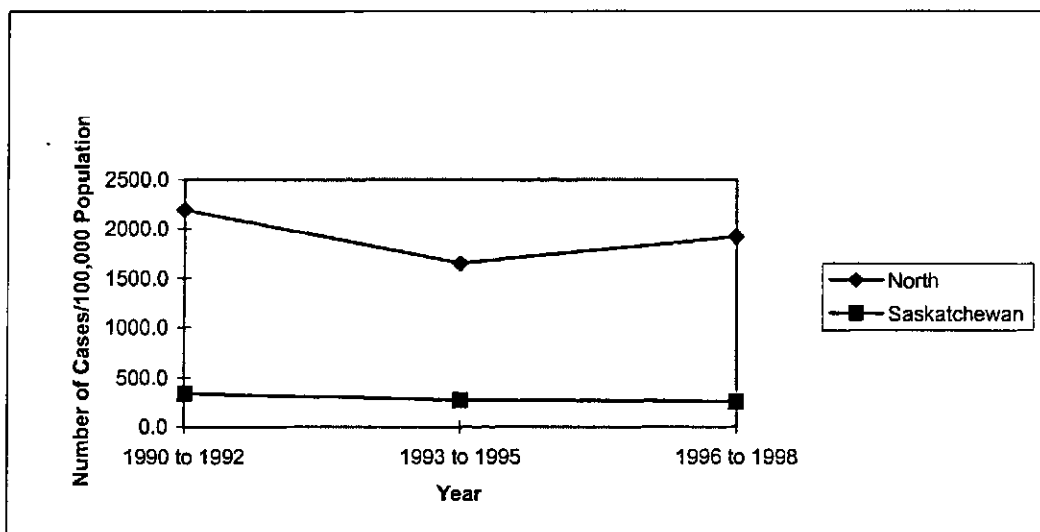


Figure 7.14. Three Year Average Age Standardized Annual Incidence Rate of Chlamydia (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

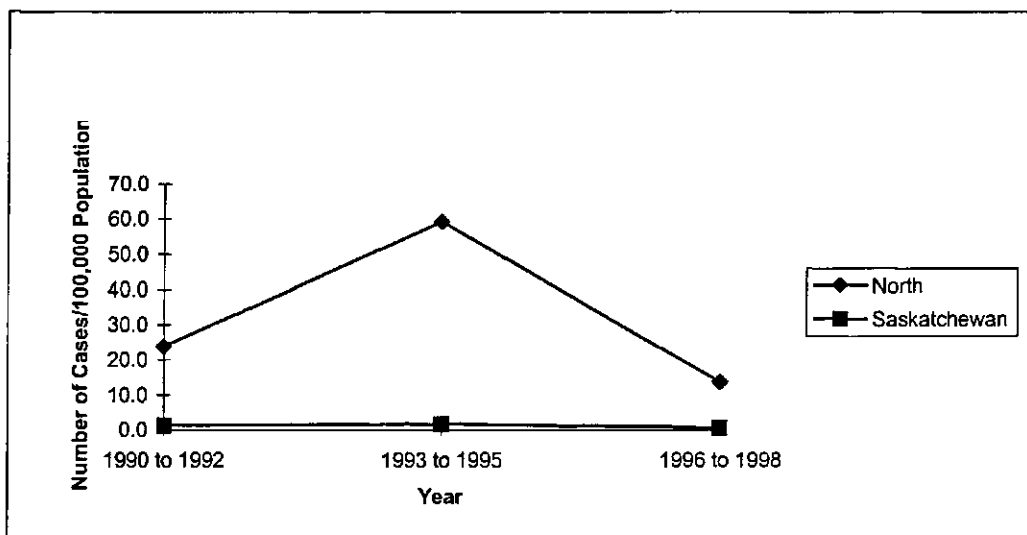


Figure 7.15. Three Year Average Age Standardized Annual Incidence Rate of Infectious Syphilis (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

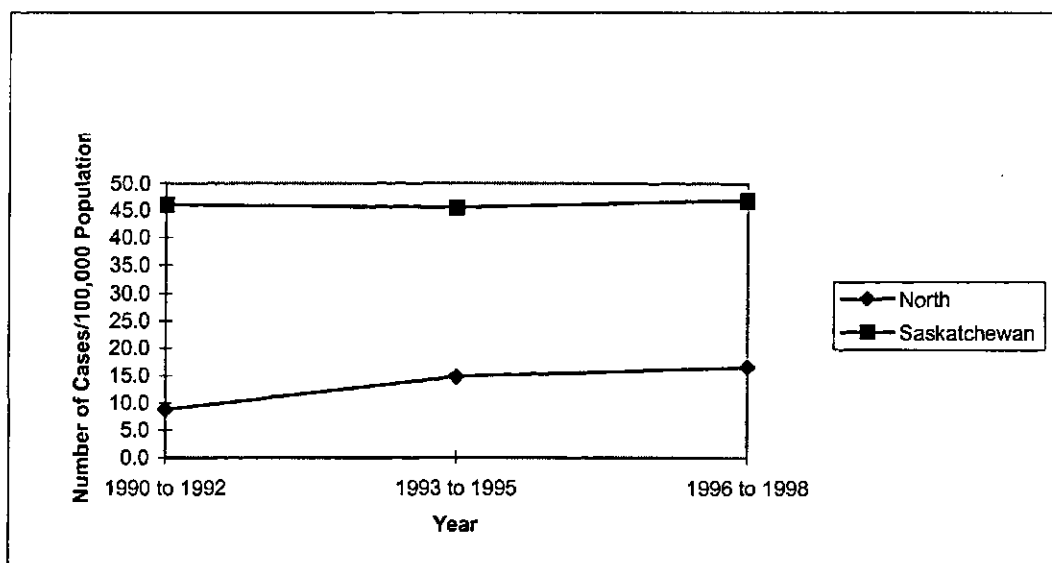


Figure 7.16. Three Year Average Age Standardized Annual Incidence Rate of Herpes (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

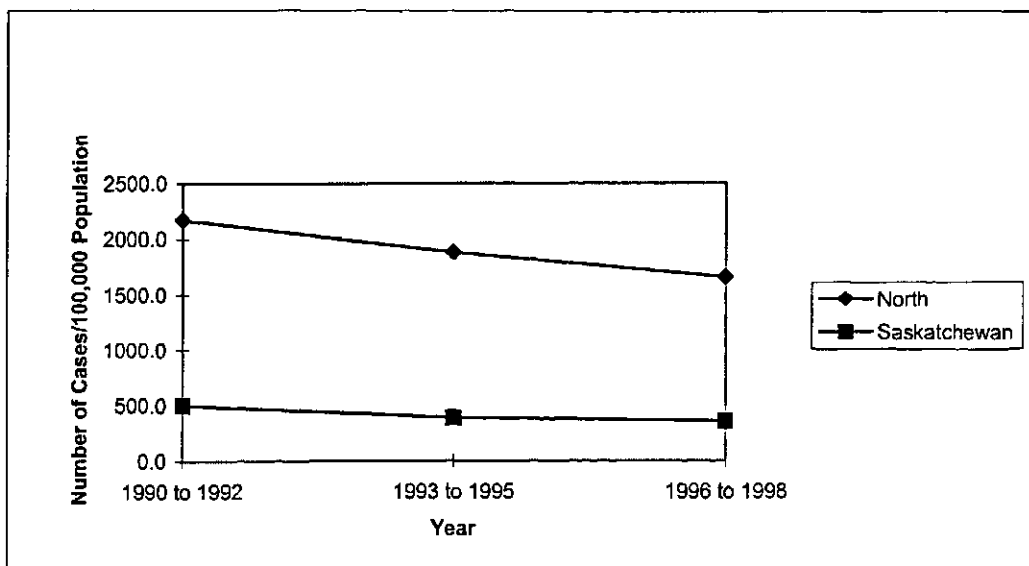


Figure 7.17. Three Year Average Age Standardized Annual Incidence Rate of All STIs Combined (per 100,000 population), Northern Saskatchewan and Saskatchewan, 1990 to 1998.

Question 2: Is there any variability in numbers and rates of reported STIs between the northern health districts?

Table 7.10. Absolute Numbers of Cases of STIs by Health District, Northern Saskatchewan, 1990 to 1998.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
MCRHD	350	363	328	310	294	329	322	327	292
KYHD	294	291	254	261	251	220	240	171	198
AHA	38	27	73	82	37	47	37	44	56
Total	682	681	655	653	582	596	599	542	546

The absolute numbers of cases of STIs reported yearly from 1990 to 1998 in MCRHD has ranged from 350 to 292. The range in KYHD was 294 to 171. AHA reported between 82 and 27 cases in a year.

Table 7.11. Three Year Average Crude Annual Incidence of All STIs (per 100,000 population) by Health District, 1990 to 1998

	1990 to 1992	1993 to 1995	1996 to 1998
MCRHD	2607.7	2163.3	1992.4
KYHD	4217.6	3459.5	2644.3
AHA	2887.6	3096.4	2337.1

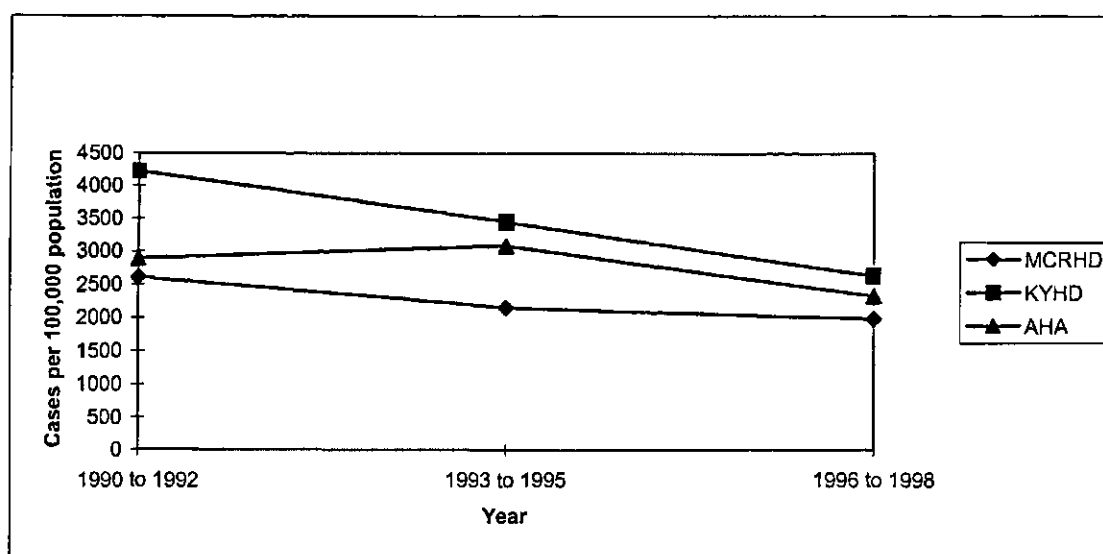


Figure 7.18. Three Year Average Crude Annual Incidence Rate of all STIs (per 100,000 population), by Health District, 1990 to 1998.

Mamawetan Churchill River Health District

Between 1990 and 1992, 1041 STIs were reported in MCRHD, 726 cases were females, 315 males, for a total annual incidence rate of 2608 cases per 100,000 population. Females 15 to 19 had the highest rate of infection with 10651 cases/100,000 population. In 1993 to 1995, 933 STIs were reported in MCRHD for a rate of 2163 cases per 100,000 population. Again the highest rate was among 15 to 19 year old females who experienced a rate of 10468 cases per 100,000 population. Between 1996 and 1998, 941 cases were reported for an annual rate of 1992 cases/100,000 population, and 276 of all cases were among females aged 15 to 19 (9798 cases/100,000 population) (Table 7.12). Because the age distribution for each year grouping of the study is very similar, with the highest rates being seen in 15 to 24 year old women, only 1996 to 1998 is graphed in figure 7.19.

Table 7.12. Cases and Three Year Average Annual Incidence Rates of all STI's (per 100,000 population), by Age and Sex, MCRHD, 1990 to 1998

1990 to 1992						
Age Group	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	2	63.4	29	1053	31	524.8
15 to 19	70	2511.7	293	10650.7	363	6554.7
20 to 24	142	5378.8	238	10132	380	7616.8
25 to 29	52	2194.1	93	3884.7	145	3043.7
30 to 39	32	787.2	60	1531.4	92	1152.4
40 +	17	301.1	13	255.2	30	279.3
Total	315	1525.6	726	3769.5	1041	2607.7

1993 to 1995						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	1	31.8	15	492.1	16	258.3
15 to 19	71	2364.3	293	10468	364	6273.7
20 to 24	109	4138.2	185	7047.6	294	5590.4
25 to 29	52	2006.2	95	3988.2	147	2955.4
30 to 39	29	668.5	49	1114.1	78	892.9
40 +	13	203.1	21	364.6	34	279.6
Total	275	1243.4	658	3131.5	933	2163.3

1996 to 1998						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	0	0	25	700.9	25	352.4
15 to 19	77	2398.8	276	9797.7	353	5857
20 to 24	101	3782.8	204	7359.3	305	5604.6
25 to 29	66	2383.5	95	3623.2	161	2986.5
30 to 39	34	727.9	43	925.9	77	826.6
40 +	10	137.8	10	149.2	20	143.3
Total	288	1194.8	653	2823.9	941	1992.4

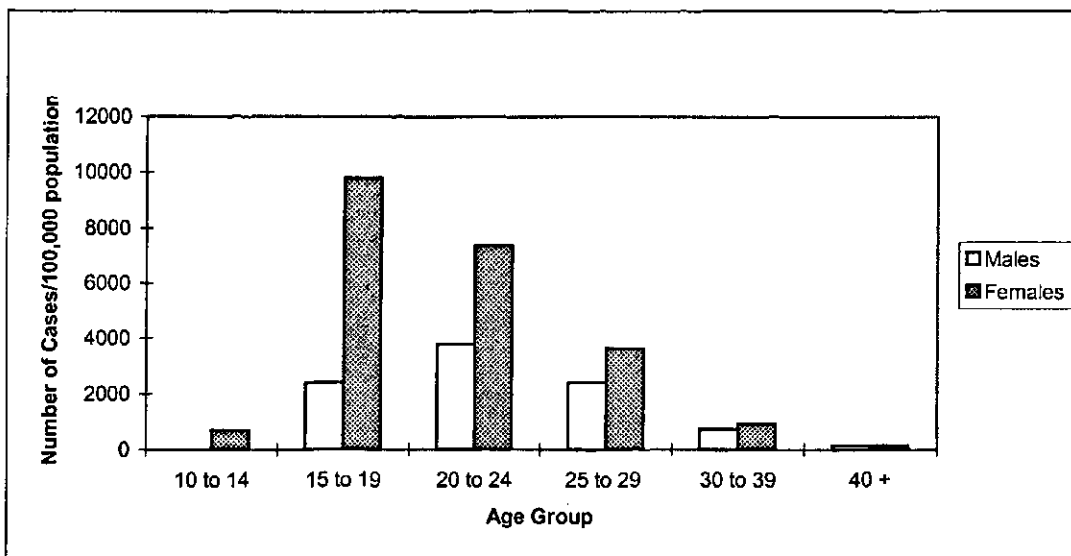


Figure 7.19. Three Year Average Annual Incidence Rate of All STIs (per 100,000 population) by Age and Sex, MCRHD 1996 to 1998.

Keewatin Yathé Health District

In 1990 to 1992, 839 STIs were reported in KYHD (4217 cases/100,000 population), the majority of which were among females aged 15 to 19, with a rate of 17267 cases/100,000 population. Between 1993 and 1995, 732 cases were reported in the district, 213 of which were females 15 to 19 where there was a rate of 16550 cases per 100,000 population. A total 609 cases were reported between 1996 and 1998 (2644 cases/100,000 population), the majority of cases reported in 20 to 24 year old women with 12009 cases per 100,000 population (Table 7.13).

Table 7.13. Cases and Incidence Rates of All STI's (per 100,000 population) by Age and Sex, KYHD, 1990 to 1998

1990 to 1992						
Age Group	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	2	154	26	1974.2	28	1070.3
15 to 19	63	4468.1	230	17267.3	293	10685.6
20 to 24	104	6919.5	187	13040.5	291	9908.1
25 to 29	39	2850.9	75	5707.8	114	4250.6
30 to 39	30	1531.4	47	2705.8	77	2083.3
40 +	19	675.2	17	706.6	36	689.7
Total	257	2482.4	582	6100.6	839	4217.6

1993 to 1995						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	1	68.7	13	929.9	14	490.7
15 to 19	44	3333.3	213	16550.1	257	9858.1
20 to 24	73	5289.9	178	13214.6	251	9204.3
25 to 29	47	3217	88	6376.8	135	4751.8
30 to 39	32	1431.8	26	1261.5	58	1350.1
40 +	10	320.5	7	257.8	17	291.3
Total	207	1886.8	525	5153.1	732	3459.5

1996 to 1998						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	0	0	6	364.3	6	172.6
15 to 19	33	2460.9	143	11349.2	176	6766.6
20 to 24	70	5388.8	156	12009.2	226	8699
25 to 29	47	3177.8	65	4458.2	112	3813.4
30 to 39	40	1598.7	32	1348.5	72	1476.9
40 +	10	287.6	7	228.3	17	259.8
Total	200	1676.7	409	3683.7	609	2644.3

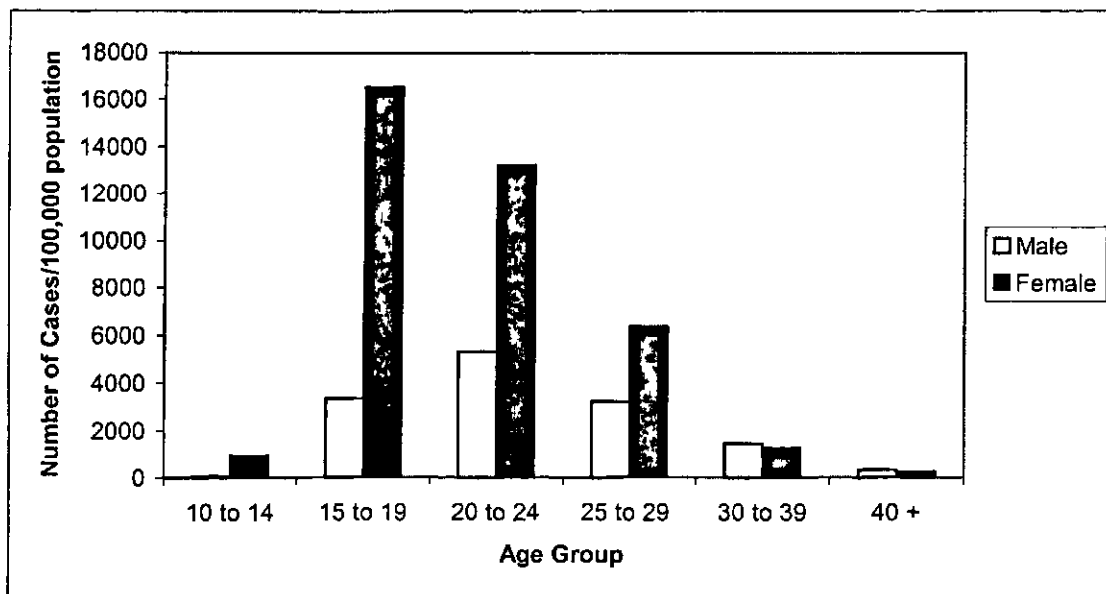


Figure 7.20. Three Year Average Annual Incidence Rate of All STIs (per 100,000 population) by Age and Sex, KYHD, 1993 to 1995

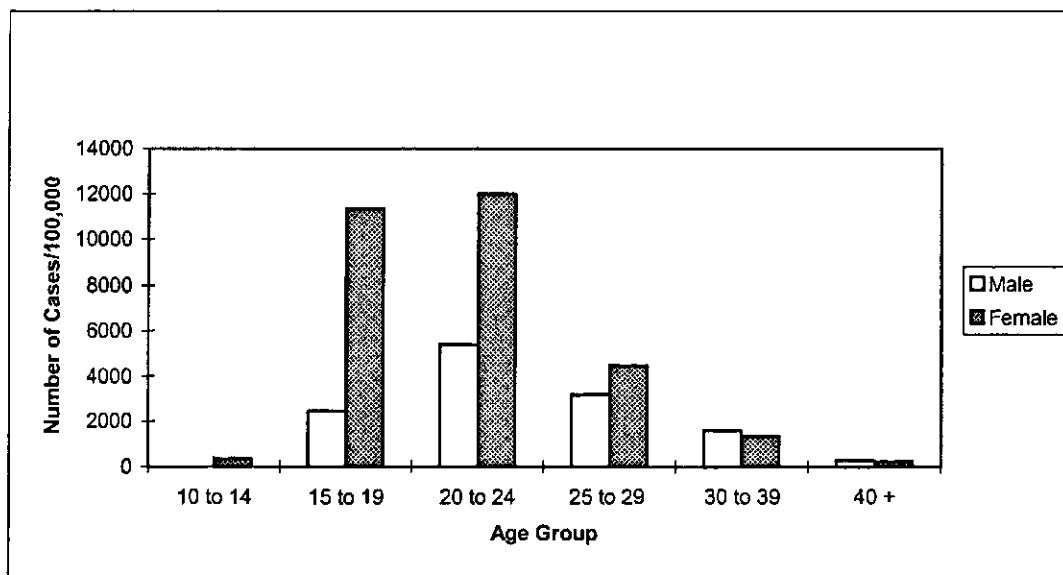


Figure 7.21. Three Year Average Annual Incidence Rate of All STIs (per 100,000 population) by Age and Sex, KYHD, 1996 to 1998.

Athabasca Health Area

There were a total of 138 STIs reported in AHA between 1990 and 1992 for a rate of 2888 cases per 100,000 population. 41 cases were seen in women aged 15 to 19 (13141 cases/100,000 population). A total of 166 cases, or 3096 cases per 100,000 population were reported in 1993 to 1995, and 137 cases were reported in 1996 to 1998 for a three year annual average rate of 2337 cases/100,000 population. Again, most of these cases were among females aged 15 to 19 (10677 cases/100,000 population) (Table 7.14).

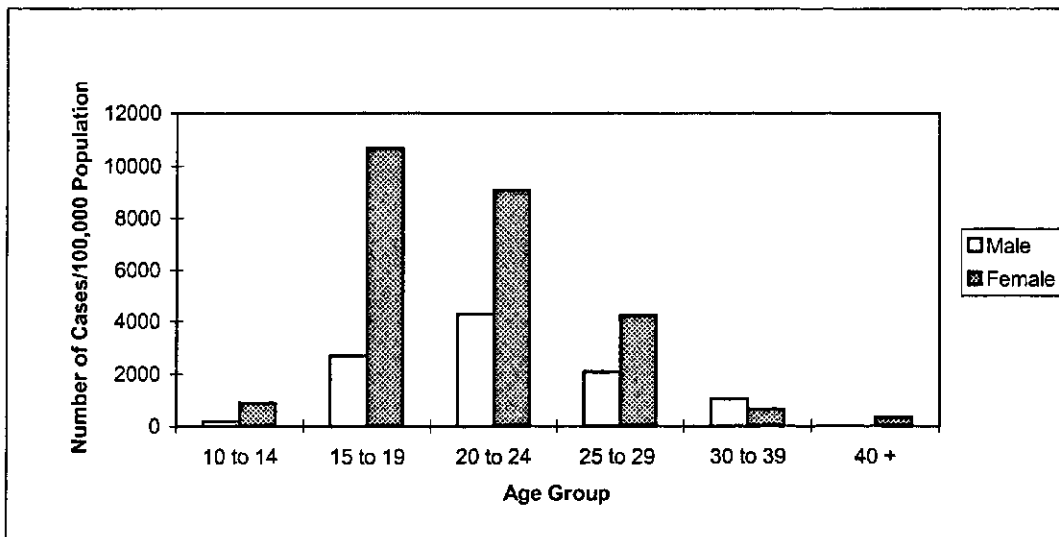


Figure 7.22. Three Year Average Annual Incidence Rate of All STIs (per 100,000 population, by Age and Sex, AHA, 1996 to 1998.

Table 7.14. Cases and Incidence Rates of All STT's (per 100,000 population) by Age and Sex, AHA, 1990 to 1998

1990 to 1992						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	2	505.1	2	551	4	527
15 to 19	16	4519.8	41	13141	57	8558.6
20 to 24	13	3117.5	32	8888.9	45	5791.5
25 to 29	8	2469.1	13	3869	21	3181.8
30 to 39	6	1600	3	819.7	9	1214.6
40 +	1	152.2	1	192.7	2	170.1
Total	46	1823.2	92	4078	138	2887.6

1993 to 1995						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	3	704.2	9	1898.7	12	1333.3
15 to 19	18	5309.7	51	15315.3	69	10267.9
20 to 24	20	5128.2	35	9641.9	55	7304.2
25 to 29	8	1891.3	8	2083.3	16	1982.7
30 to 39	4	803.2	5	980.4	9	892.9
40 +	3	463	2	349	5	409.5
Total	56	2055.8	110	4171.4	166	3096.4

1996 to 1998						
	Males		Females		Total	
	cases	rate	cases	rate	cases	rate
10 to 14	1	187.3	5	886.5	6	546.4
15 to 19	10	2666.7	41	10677.1	51	6719.4
20 to 24	14	4281.3	28	9061.5	42	6603.8
25 to 29	9	2069	17	4228.9	26	3106.3
30 to 39	6	1025.6	4	641	10	827.1
40 +	0	0	2	319	2	151.2
Total	40	1355	97	3333.3	137	2337.1

Age Standardized Incidence Rates by Health District

Table 7.15. Three Year Average Age Standardized Annual Incidence Rates of All STIs Combined, by Health District, 1990 to 1998

	1990-1992	1993-1995	1996-1998
MCRHD	1843.3	1572.9	1472
KYHD	2913.7	2443.1	2030.8
AHA	1847	2152.6	1661.5
North	2174.6	1881.9	1656.1
Saskatchewan	502.2	387.3	365.3

When health district rates for all STIs combined are age standardized to the Saskatchewan population, they remain higher than the rates for the Saskatchewan general population. In 1996 to 1998, KYHD had a rate of 2031 cases per 100,000 population, MCRHD had a rate of 1472 cases per 100,000 population and AHA 1662 cases per 100,000 population, while the same year Saskatchewan had an overall rate of 365.3 cases per 100,000.

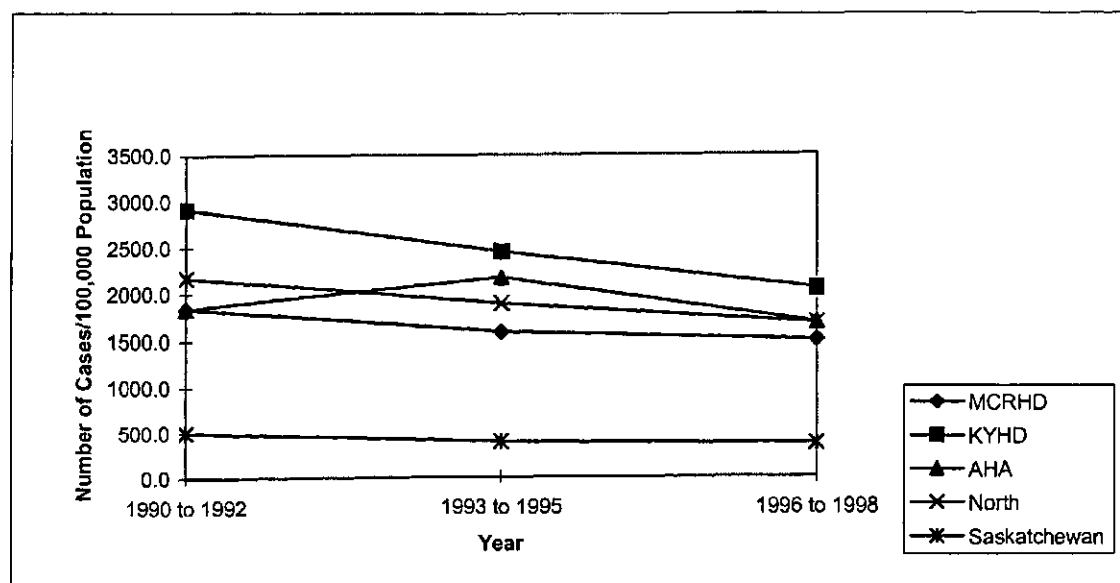


Figure 7.23. Three Year Average Age Standardized Annual Incidence Rate of All STIs (per 100,000 population) by Health District, Northern Saskatchewan, 1990 to 1998.

Question 3: Is there any variability in the numbers and rates of STIs reported in the northern communities?

Table 7.16. Absolute Number of Cases of STIs reported in Northern Communities, by Diagnosis, 1998

Community Code	<i>Gonorrhea & Chlamydia</i>	<i>Syphilis</i>	<i>Herpes</i>	<i>Total</i>
1	36	0	0	36
2	20	0	1	21
3	26	0	1	27
4	61	0	0	61
5	31	0	0	31
6	8	0	0	8
7	14	0	0	14
8	28	0	0	28
9	17	0	0	17
10	11	0	0	11
11	0	0	0	0
12	25	0	0	25
13	3	0	0	3
14	108	1	0	109
15	18	0	0	18
16	19	0	0	19
17	17	0	0	17
18	16	0	0	16
19	11	0	0	11
20	27	0	0	27
21	47	0	0	47
Total	543	1	2	546

The bulk of STIs reported by community in 1998 were gonorrhea or chlamydia combined, and only 3 of 546 total cases were either syphilis or herpes. The most cases reported in one community was 108, and 0 was the lowest.

Table 7.17. Cases and Crude Incidence Rate (per 100,000) of Gonorrhea and Chlamydia, by Community 1998.

Community Code	Cases	Incidence Rate
1	36	2200.5
2	20	1901.1
3	26	2398.5
4	61	2700.3
5	31	5730.1
6	8	1311.5
7	14	3943.7
8	28	4886.6
9	17	2702.7
10	11	2777.8
11	0	0
12	25	2262.4
13	3	120.4
14	108	1921.7
15	18	2912.6
16	19	2745.7
17	17	2251.7
18	16	1091.4
19	11	1517.2
20	27	2161.7
21	47	6233.4
Total- All North	543	2206.4

Due to the large proportion of cases diagnosed being gonorrhea or chlamydia, the combined rates of these infections will be very close to the overall infection rate for each individual community. In most communities, where there were no other types of infection diagnosed in 1998, the combined rate of gonorrhea and chlamydia will be exactly the same as overall infection rate for that community. There is a very large range of rates, from 0 cases per 100,000 population up to 6233 cases per 100,000 population (Figure 7.24).

Table 7.18 shows there is a large variation in rates from community to community. The highest rates tend to be in the 20 to 29 age group, and especially among females, where rates range from 595 cases per 100,000 population all the way up to 29412 cases/100,000 (15 cases) population in community 5. 10 to 19 year old female rates are higher than their male counterparts, with a maximum of 26 cases in a community, and a rate range from 0 to 11194 cases/100,000 population. Rates in the 30+ females age group are considerably lower, ranging from 0 to 1531 cases per 100,000 population.

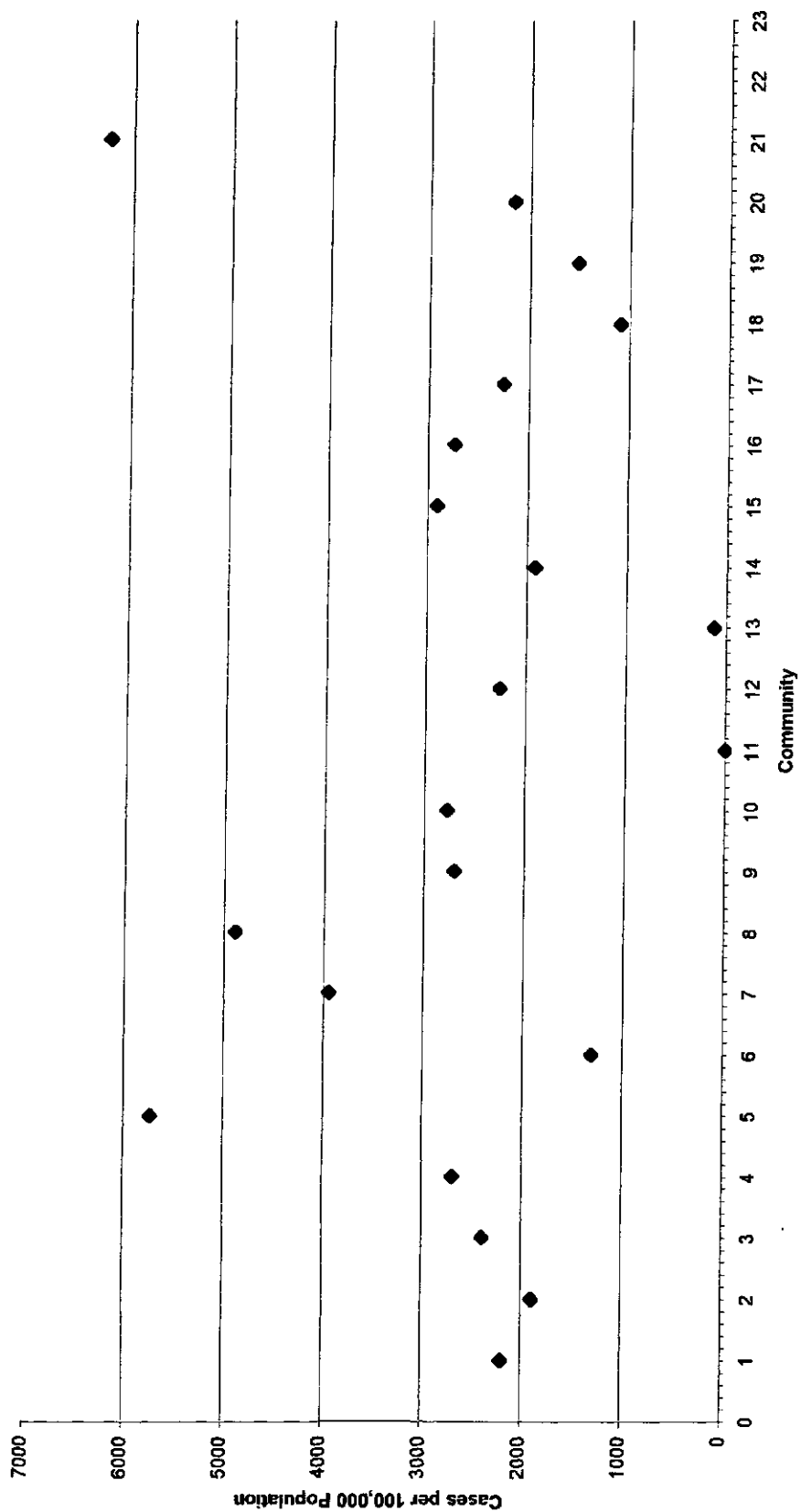


Figure 7.24 Incidence Rate of Gonorrhea and Chlamydia, Northern Saskatchewan Communities, 1998

Table 7.18. Cases and Incidence Rates of Gonorrhea and Chlamydia Combined (per 100,000 population), by Age and Sex, in Northern Saskatchewan Communities, 1998

10 to 19						
Community Code	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
1	5	2118.6	12	5504.6	17	3744.5
2	0	0.0	4	3030.3	4	1465.2
3	2	1204.8	6	4316.5	8	2623.0
4	6	1834.9	13	4113.9	19	2954.9
5	1	1351.4	7	9859.2	8	5517.2
6	0	0.0	0	0	0	0.0
7	0	0.0	2	3703.7	2	2040.8
8	2	1834.9	7	6603.8	9	4186.0
9	1	1075.3	6	6315.8	7	3723.4
10	2	3125.0	6	9090.9	8	6153.8
11	0	0.0	0	0	0	0.0
12	7	4294.5	6	3821.7	13	4062.5
13	0	0.0	2	881.1	2	412.4
14	8	1063.8	26	3975.5	34	2418.2
15	2	2061.9	4	3636.4	6	2898.6
16	1	892.9	8	6611.6	9	3862.7
17	0	0.0	5	4132.2	5	1976.3
18	1	404.9	5	2109.7	6	1239.7
19	1	800.0	6	5504.6	7	2991.5
20	1	588.2	7	4023.0	8	2318.8
21	5	3289.5	15	11194.0	20	6993.0
Total	45	1266.5	147	4445.1	192	2798.8

20 to 29						
	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
1	7	4375.0	11	6918.2	18	5642.6
2	5	5000.0	8	7142.9	13	6132.1
3	6	6122.4	11	10000.0	17	8173.1
4	12	3858.5	19	6270.6	31	5048.9
5	4	6250.0	15	29411.8	19	16521.7
6	4	5882.4	4	7272.7	8	6504.1
7	7	17073.2	1	2564.1	8	10000.0
8	8	13333.3	10	16949.2	18	15126.1
9	3	3488.4	6	8108.1	9	5625.0
10	1	1818.2	2	3448.3	3	2654.9
11	0	0.0	0	0.0	0	0.0
12	2	1680.7	7	6422.0	9	3947.4
13	0	0.0	1	595.2	1	284.1
14	16	2662.2	45	7413.5	62	5136.7
15	5	6329.1	5	6756.8	10	6535.9
16	2	2325.6	6	6741.6	8	4545.5
17	2	2061.9	7	8974.4	9	5142.9
18	0	0.0	8	4395.6	8	2122.0
19	3	3061.2	1	1204.8	4	2209.9
20	9	5232.6	8	5333.3	17	5279.5
21	9	11688.3	17	16831.7	26	14606.7
Total	105	3816.8	192	7215.3	298	5506.3

30+						
Community Code	Males		Females		Total	
	cases	rates	cases	rates	cases	rates
1	0	0.0	1	237.0	1	115.9
2	3	990.1	0	0.0	3	529.1
3	0	0.0	1	393.7	1	175.1
4	4	733.9	7	1531.7	11	1097.8
5	3	1973.7	1	775.2	4	1423.5
6	0	0.0	0	0.0	0	0.0
7	3	3125.0	1	1234.6	4	2259.9
8	1	847.5	0	0.0	1	418.4
9	1	740.7	0	0.0	1	355.9
10	0	0.0	0	0.0	0	0.0
11	0	0.0	0	0.0	0	0.0
12	1	340.1	2	760.5	3	538.6
13	0	0.0	0	0.0	0	0.0
14	5	316.3	8	560.6	13	432.2
15	2	1418.4	0	0.0	2	775.2
16	1	675.7	1	740.7	2	706.7
17	1	628.9	2	1190.5	3	917.4
18	1	326.8	1	334.4	2	330.6
19	0	0.0	0	0.0	0	0.0
20	1	355.9	1	332.2	2	343.6
21	0	0.0	1	724.6	1	344.8
Total	27	418.7	27	458.3	54	437.6

Question 5: Do the treatments used for STIs follow the Health Canada or Saskatchewan Health treatment recommendations?

Tables 7.19 and 7.20 show the percentage of treatments for gonorrhea and chlamydia that met national guidelines. A table was not created for syphilis, as 60 of 63 cases syphilis were treated with Bicillin (benzathine penicillin), which has been the recommended treatment throughout the study period. Treatments given for herpes are not reported here due to the large number of unknown or unspecified treatments.

For the treatment of gonorrhea from 1990 to 1993, amoxicillin and probenidicid in combination with tetracycline was most frequently reported, and was the treatment recommended by Health Canada in 1988 (Figure 4.6). This was followed by amoxicillin and probenidicid alone or in combination with erythromycin. A combination of cefixime and doxycycline was recommended by the 1992 Health Canada guidelines, but did not become common treatment until 1994, when amoxicillin and probenidicid in combination with tetracycline was rarely seen, and the majority of cases between 1994 and 1996 were treated with a combination of cefixime and doxycycline. A cefixime combination has continued to be the most common treatment from 1994 to 1998, used in 51.4% of cases in 1994 and 81.4 % of cases in 1997. In 1996, azithromycin was used with cefixime in 20 % of cases and by 1997 azithromycin with cefixime became the most common treatment combination (58.1% of cases). In 1998 cefixime and azithromycin accounted for 68% of treatments. The frequency of dual therapy has increased from 40 to 70% of cases between 1990 and 1998 . For each year of the study, more than two-thirds of prescribed treatments met or likely met national guidelines (Table 7.19), and if unknown treatments are excluded from the calculations, more than 90% of treatments meet guidelines in most years.

From 1990 to 1993, the treatments of choice for chlamydia were either erythromycin or tetracycline alone, or a combination of tetracycline with ampicillin and probenidicid. In 1988, either tetracycline or doxycycline were recommended treatments, and erythromycin was the alternative used for pregnant women, or women who could be pregnant. By 1992, doxycycline was the treatment of choice recommended for chlamydia (Table 4.12). In 1994, the use of these combinations decreased, and between 1994 and 1996, the combination of cefixime and doxycycline was the most commonly prescribed treatment, which is consistent with national guidelines for 1995. The second most common choice

Table 7.19 Percentage of Gonorrhea Treatments which Follow National Guidelines, 1990 to 1998.

Year	Meet National Guidelines (including Dual Treatment)	Likely Meet National Guidelines (Single Treatment)	Do Not Meet National Guidelines	Unknown or Not Given
1990	40.5	31.9	8.6	19.0
1991	35.6	32.2	6.9	25.3
1992	47.4	36.0	12.3	4.4
1993	42.1	30.3	6.6	21.0
1994	32.4	19.4	18.9	29.7
1995	55.6	19.4	8.3	16.7
1996	65.5	12.1	1.7	20.7
1997	60.5	25.6	4.7	9.3
1998	69.8	3.8	9.4	17.0

Percentages based on recommended treatments outlined in Table 4.6

NB: Percentage of treatments which meet and likely meet national guidelines in 1992 and 1993 were based on 1988 national recommendations, because provincially, these treatments were standard and available until 1994.

Table 7.20 Percentage of Chlamydia Treatments which Follow National Guidelines, 1990 to 1998.

Year	Meet National Guidelines (including Dual Treatment)	Likely Meet National Guidelines (Single Treatment)	Do Not Meet National Guidelines	Unknown or Not Given
1990	22.8	49.3	0.0	27.7
1991	32.0	50.6	0.0	18.8
1992	32.0	53.8	0.0	13.8
1993	19.4	36.7	24.5	19.4
1994	23.0	50.8	2.5	23.6
1995	36.9	42.9	1.0	19.6
1996	50.6	35.3	0.0	13.7
1997	62.7	29.1	0.0	8.0
1998	57.3	26.2	0.0	16.5

Percentages based on recommended treatments outlined in Table 4.12

NB: Percentage of treatments which meet national guidelines in 1992 are based on 1988 Health Canada recommendations.

1993 percentages are based on 1992 Health Canada treatment recommendations because provincially these recommendations were still in effect.

between 1994 and 1996 was either erythromycin or doxycycline alone. In 1996, azithromycin began to be combined with cefixime, and by 1997 and 1998, this combination was the most commonly reported treatment, used in 55% and 52% of cases in respective years. Doxycycline and erythromycin have continued to be used between 1994 and 1998, but the frequency is decreasing. Dual treatment has increased throughout the study period, and the use of single treatments has decreased. The choice of treatment is based on the judgment of the health care provider, and often includes dual treatment if based on epidemiology, or only treatment for the infection present if based on lab results. For most years of the study, more than three-quarters of the prescribed treatments met or likely met national recommendations (Table 7.20), and if unknown treatments are excluded from the calculations, 100% of treatments met national guidelines in most years.

Question 6: How many contacts does the average case have?

Nearly 82% of cases have unidentifiable contacts or only one contact (Figure 7.25). This is a proxy measure that is indicative of the efficiency of the first stage of the contact tracing system. If contacts are not named by index cases, there is no way they can be identified and contacted, thereby decreasing the effectiveness of the entire system.

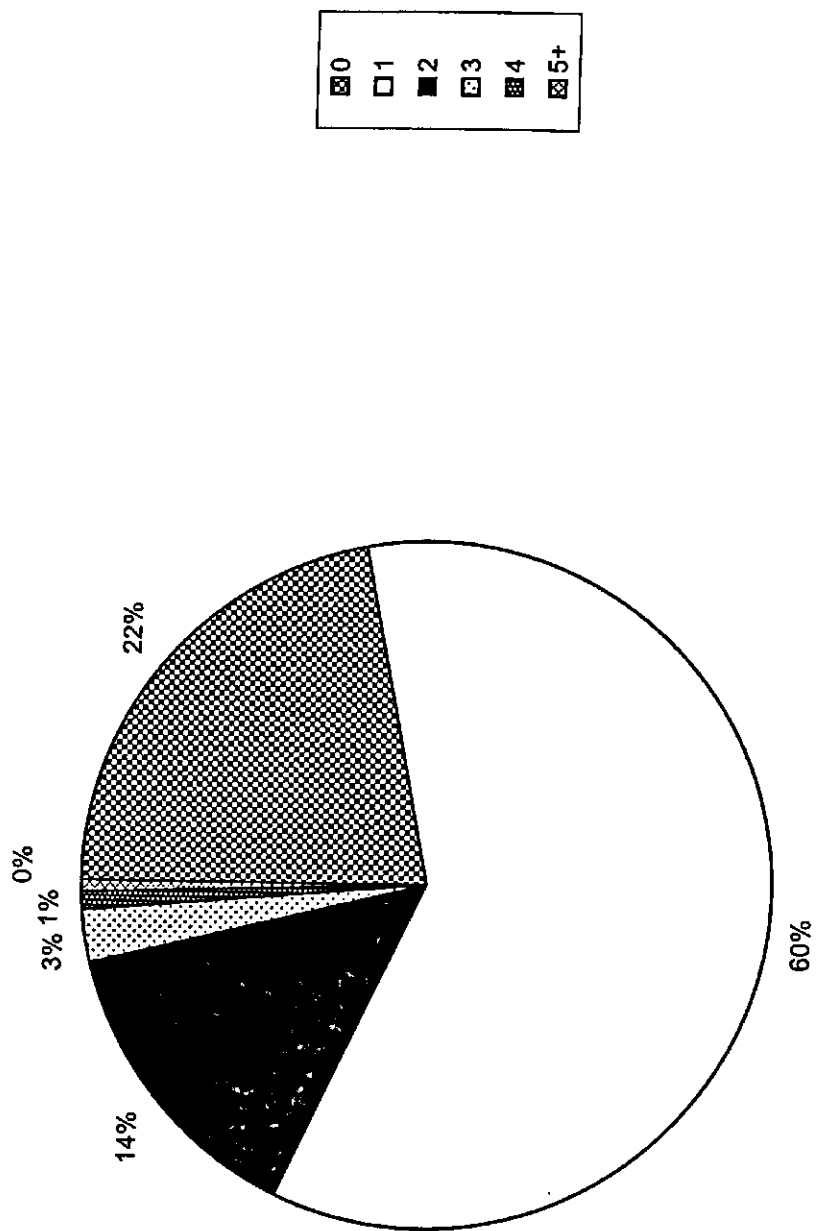


Figure 7.25 Number of Identifiable Contacts per Case, Northern Saskatchewan, 1998

8. Discussion

The purpose of this thesis was to provide a detailed picture of the descriptive epidemiology of STIs in Northern Saskatchewan from 1990 to 1998. This information will be useful as baseline data upon which program focus, planning and evaluation for future northern initiatives may be based. It is a means to identify high-risk groups and communities in the north so that resources may be allocated to those most in need. A descriptive analysis such as this often reveals many more questions than it answers, and is therefore also useful in the formulation of further hypotheses regarding why infection is distributed the way it is. The following is a closer look at the data presented in section 7.

8.1 Treatment

Northern Saskatchewan typically follows the same treatment protocols as the province, whose guidelines over the past few years have been based on the 1997 Saskatchewan Health STD Treatment Guidelines⁴⁸ and more recently on the 1998 Canadian STD Treatment Guidelines¹⁴. Prior to that, treatments were guided by the recommendations of Health Canada, published in 1995, 1992 and 1989.^{16,17, 18} Treatment of STIs in Saskatchewan has changed over the period of study (see Figures 4.6, 4.12, 4.13 & 4.16) and the timing of these changes has correlated, in some instances, with substantial decreases in infection rates. Treatments given in the north have, for the most part, followed national guidelines as they change (see Tables 7.19 and 7.20). Results of this study indicate that whether or not gonorrhea and chlamydia are both present, treatment for both infections has been the standard practice in the north, especially in recent years. Any deviations from recommended treatment could be due to pregnancy or patient allergies, and if treatment is done in response to a lab test, treatment will likely be given only for the positive infection. If treatment is based only on epidemiology, suspicion with signs of infection, two medications are recommended but actual treatment is based on physician preference. Dual treatment is, and has been, more common for gonorrhea than chlamydia throughout the study period. This is likely related to the higher probability of chlamydia being asymptomatic (50 to 90% of cases) than gonorrhea, and that it is known that chlamydia is found concurrently with gonorrhea in 40% of male and 60% of female cases.¹⁹

Due to trends of increasing resistance to amoxicillin, the recommended treatment for gonorrhea went from a single dose of amoxicillin and probenecid to a single observed dose of cefixime in 1992 (Table 4.6). Between 1990 and 1993, the most common treatment used for gonorrhea in northern Saskatchewan was amoxicillin and probenecid. In 1994, cefixime became the treatment of choice. The timing of this treatment change occurred two years later than recommended, and is concurrent with a 50% drop in gonorrhea numbers in 1994. Saskatchewan tends to follow national guidelines, but not always immediately, as seen by this lag in change to cefixime. National guidelines are simply guidelines, and individual provinces will look at their resistance patterns, drug availability and budget restraints, before recommending local changes. Few provinces, if any would meet national guidelines immediately.

Changes in treatment for chlamydia occurred in 1995, when a single dose treatment of azithromycin was first recommended as an alternative to lengthy 7 day treatment regimens of doxycycline, which besides being difficult for compliance, was also associated with lower cure rates and gastrointestinal side effects. Azithromycin became a commonly used treatment in the north in 1997, and was the most prescribed treatment in 1998. Although not as dramatic as the decline in gonorrhea rates, crude rates of chlamydia in 1996 to 1998 were the lowest seen since the beginning of the study. It is possible that the full benefit of this change in treatment has not yet been seen.

8.2 STIs in Northern Saskatchewan

Number of Cases

The numbers of cases of all STIs combined, gonorrhea, chlamydia and infectious syphilis reported in Northern Saskatchewan have decreased over the period of study, while herpes numbers have increased slightly (see Tables 7.1 & 7.2). Numbers of herpes cases should be regarded with caution as numbers are low due to incomplete data.

- The absolute number of cases of STIs in northern Saskatchewan in 1997 and 1998 (542 and 546 cases respectively) were the lowest they had been since 1990 (682 cases).
- The number of STI cases decreased fairly steadily from 1990 to 1998, although there was a slight increase reported in 1995 and 1996.

- Of a total of 5848 cases of infection reported during the study period (cases of gonorrhea and chlamydia combined, which make up 4 to 12% of cases, were counted as two separate infections), 81.5% of infections reported were chlamydia, 16.7% were gonorrhea, 1.1% infectious syphilis and less than 1% were herpes. This distribution is similar to Canada, where 84% of STIs diagnosed were chlamydia.
- The number of cases of gonorrhea reported has decreased the most of all infection types, from 246 to 77 cases yearly. Between 1990 and 1991 cases dropped nearly 50% from 246 to 129 cases. In 1994 there was another nearly 50% decrease in reported cases from the previous year. The overall drop in gonorrhea cases corresponds with, and is likely related to the secular trend. The substantial drop in gonorrhea numbers could also be related to increased availability of free condoms beginning in 1992, the implementation of HIV education programs in the province, as well as the change in recommended and preferred treatments offered in the north in 1994 from amoxicillin and probenidic to cefixime.
- The number of cases of chlamydia reported increased substantially between 1990 and 1991, and did not drop past 1990 numbers until 1997 when single dose treatments of azithromycin were first commonly used in the north. The jump in numbers of chlamydia reported in 1991 from the previous year, correlates with the new national reporting requirements of chlamydia in 1990, although chlamydia had been officially reportable in Saskatchewan since the mid 1980's when a test first became available.
- There were very few cases of infectious syphilis reported yearly from 1990 to 1998, but a notable increase in numbers of annual cases was noted in 1993 to 1995, when a total of 35 cases were reported in the north (85% of all cases in the province).
- The number of reported cases of herpes is very low, with a maximum of 9 cases reported in any year.

Incidence Rates

Between 1990 and 1998, the crude annual incidence rates of gonorrhea, chlamydia and infectious syphilis in northern Saskatchewan have decreased, while incidence rates of reported herpes have increased (Table 7.3).

- The overall annual crude incidence rate of STIs in northern Saskatchewan decreased 30% between 1990 and 1998, from 3124 cases/100,000 population to 2216 cases/100,000 population.
- The overall annual crude incidence rate of gonorrhea in northern Saskatchewan decreased 64% between 1990 and 1998, from 829 cases/100,000 to 291 cases/100,000 population.
- The overall annual crude incidence rate of chlamydia in northern Saskatchewan decreased 22% between 1990 and 1998, from 2524 cases/100,000 to 1975 cases/100,000 population.
- The overall annual crude incidence rate of infectious syphilis in northern Saskatchewan decreased 26% between 1990 and 1998, from 23.2 cases/100,000 to 17.1 cases/100,000, but between 1990 and 1993, the rate had doubled.
- The overall annual crude incidence rate of herpes in northern Saskatchewan increased from 12.4 cases/100,000 in 1990, to 19.7 cases/100,000 population in 1998.
- The most significant decrease was seen in rates of gonorrhea.
- Of all STIs, chlamydia has the highest incidence rates. In 1990 to 1992, chlamydia rates were three times gonorrhea, and from 1993 to 1998 they were 7 times the rates of gonorrhea.
- From 1990 to 1998, chlamydia has accounted for 75% to 91% of all STIs reported in Northern Saskatchewan.

Interpretation

There are several factors that may have interacted, leading to the substantial decrease in reported rates of gonorrhea, chlamydia and infectious syphilis rates in northern Saskatchewan. Methods of diagnosis have improved from invasive swabs to the more acceptable PCR urine test for gonorrhea and chlamydia, which likely had an impact on the number of men being tested and treated, and the subsequent decrease in rates. Recommended treatments for both gonorrhea and chlamydia are now one-dose schedules which ensure compliance and cure. Changes in behaviors and attitudes related to increased availability of free condoms and HIV prevention programs, may also have impacted on rates. Recent studies have reported that due to increased awareness of HIV and the associated prevention programs that have been implemented throughout the country since the 1980's, condom use has been increasing ³⁴ and has become more widely accepted as normal behavior.

Rapidly decreasing gonorrhea rates are responsible for the increasing gap between rates of gonorrhea and chlamydia. This widening gap is likely related to the more recent emergence of one dose treatments for chlamydia, as we may have not yet seen their full benefit.

Late Syphilis is rarely detected in northern Saskatchewan, where only 3 cases were reported over the entire study period. Infectious syphilis rates are also very low when compared to other infection rates in the north, but they are very high when compared to rates of other provinces. The doubling of rates in 1993 to 1995 represented a yearly maximum of 18 cases, showing that a small number of cases in the north can have a huge impact on rates, and that small numbers of cases can cause rates to have large fluctuations. Of 41 cases of infectious syphilis reported in Saskatchewan between 1993 and 1995, 35 were in the north. Regular screening for syphilis is currently not a recommended practice in Saskatchewan, but perhaps northern Saskatchewan should continue to screen for syphilis when other STIs are diagnosed, to avoid the spread of infection that leads to such clusters and other consequences associated with undetected and untreated cases.

Besides decreasing the possibility of spread of infection, the decreasing rates of STI in northern Saskatchewan have likely led to, and will continue to contribute to, a decreased incidence of associated complications such as PID, ectopic pregnancy and sterility.

From reported rates, it appears that the rate of herpes in northern Saskatchewan is increasing. Rates reported for herpes are not likely to be accurate due to the nature of the disease which can be diagnosed at any time in it's life cycle. Although it has been a reportable infection throughout the study period, herpes is likely to be removed from the reportable disease list in Saskatchewan next year with the review of the Communicable Disease Control Regulations. It is possible that the increase seen in herpes rates is related to an increase in reporting, rather than an actual increase in incidence of the disease. If herpes is diagnosed clinically and no laboratory test is done, it would typically not be reported.

Incidence Rates by Age and Sex

The highest STI rates in northern Saskatchewan tend to be among youth aged 15 to 24, especially women (see Tables 7.4 through 7.7).

Between 1990 and 1998:

- The crude annual incidence rate of all STIs combined in northern Saskatchewan for females of all ages was consistently approximately 2.4 times greater than for males of all ages.
- The highest crude annual incidence rates in northern Saskatchewan were among females aged 15 to 19. Males 20 to 24 years old had the highest male rates.
- The crude annual incidence rate of all STIs in northern Saskatchewan decreased among females in every age group, but the change was less significant among those aged 15 to 29:
 - 10 to 14: 52% decrease
 - 15 to 19: 20% decrease
 - 20 to 24: 20% decrease
 - 24 to 29: 12% decrease
 - 30 to 39: 43% decrease
 - 40+: 53% decrease
- The crude annual incidence rate of all STIs in northern Saskatchewan generally decreased among males in every age group, except 25 to 29 year olds:
 - 10 to 14: 86% decrease
 - 15 to 19: 26% decrease
 - 20 to 24: 24% decrease
 - 24 to 29: 7% increase
 - 30 to 39: 3% decrease
 - 40+: 57% decrease
- The highest rate of gonorrhea among males was in those aged 20 to 24 or 25 to 29
- Females aged 15 to 19 in 1990 to 1992, and females aged 20 to 24 in 1993 to 1998, had the highest overall rates of gonorrhea in the north.
- Males 25+ had higher incidence rates of gonorrhea than women aged 25+
- Rates of gonorrhea in males have increased in all age groups 25+ between 1993 to 1995 and 1996 to 1998
- Gonorrhea rates have decreased in all age groups, and in both sexes.
- The highest rate of chlamydia was in females aged 15 to 19.

- The highest rate of chlamydia among males was in the 20 to 24 age group.
- There was an increase in chlamydia rates among males aged 25 to 39.
- From 1990 to 1995, the highest rates of infectious syphilis for males and females were in the 30 to 39 age group
- From 1996 to 1998 the highest rate of infectious syphilis was for males aged 20 to 24, and females 15 to 19 (only two cases)
- In 1990 to 1995, the highest rates of herpes were for females and males aged 20 to 24
- From 1996 to 1998, the highest rates of herpes were for females and males aged 25 to 29

Interpretation

Age and sex specific incidence rates among females have typically been, and remain higher than, male rates. The most obvious explanation for this gender discrepancy is that women are more likely to access the health care system than men, for annual check-ups, prenatal care or birth control, for example, and are therefore more likely to be screened and diagnosed. This is especially relevant to the diagnosis of asymptomatic cases, which are very common and would otherwise go undiagnosed. It is also known that women are biologically more susceptible to infections than men. The gender discrepancy in rates decreases as the population ages. For example, female rates of all STIs combined among 15 to 19 year olds were approximately 4 times those of males in the same age group. In 20 to 24 year olds, female rates were approximately 2 times those of males in the same age group, and 25 to 29 year old women had a rate 1.7 times that of males. In people over 30, the male:female rates of all STIs combined are nearly equal, although females remained slightly higher. This could be related to the fact that older persons are more likely to be in monogamous or married relationships, as only 6% of people over 30 surveyed in one study reported having more than one sexual partner in a year.³⁵

Rates of infection among youth in the north are substantially higher than rates in other age groups. For all STIs combined, the highest incidence rates overall were among women aged 15 to 24 and men aged 20 to 29. The consistently high rates among these groups suggest of the patterns of sexual behavior among older men and younger women. Besides being the highest, rates of all STIs combined among these

groups are decreasing at a slower pace, relative to younger and older age groups. Rates of gonorrhea in males over 25 have increased. This could be related to improved methods of testing for gonorrhea and chlamydia, encouraging more sexually active people, especially men, to seek testing. If an increase in testing did occur, it is also likely partially responsible for the increase in chlamydia rates among males 25 to 39. A review of the frequency of tests done at the provincial laboratory would reveal if this were truly the case. This initial increase would eventually lead to a decrease in male rates as more men are diagnosed and treated¹⁹. Although it is encouraging to see rates decreasing among most groups, the fact that the rate is decreasing slowly in the younger population is concerning because of the continued risk of development of serious complications such as PID, ectopic pregnancy and sterility. In 1993/94, Saskatchewan had the highest rate of PID in the country.

As in overall STI rates, female chlamydia rates are typically higher than those of males, with the age discrepancy also decreasing as the population ages. For example, in the 15 to 19 age group, female rates are nearly 5 times those of males, 20 to 29 year old female rates are double those of males of the same age, and in those over 30, the rates are nearly equal, although women still have a slightly higher rate. Due to the higher likelihood of being symptomatic, gonorrhea rates are likely a more accurate reflection of the true male:female ratio of STIs in the north. Female gonorrhea rates are approximately double male rates in 15 to 24 year olds, but males aged 25 and over have gonorrhea rates very similar to, or higher than, females of the same age. Gender distribution of infectious syphilis between males and females tends to be about equal in all age groups. Most cases are in those aged 30 and over, while there are no reported cases among 10 to 14 year olds, although due to small numbers, no specific age group appears to be at increased risk.

High rates of infection reflect patterns of sexual behavior, such as the rate of condom use and the rate of partner change, among a group. It is known that approximately 50% of youth in the north report having had sexual intercourse, many having had their first sexual experience at 14 or 15. A substantial percentage of northern youth report having had more than 4 lifetime partners, and northern females have the lowest rate in the province of 'always' using a condom (34% of male, and 20% of female youth).³⁶

8.3 Northern Saskatchewan Compared to Saskatchewan and Canada

The risk of gonorrhea, chlamydia and infectious syphilis is substantially higher in northern Saskatchewan than in the rest of the province when crude rates are compared (Table 7.8).

- People living in northern Saskatchewan in 1996 to 1998 had a 6.2 times greater risk of being diagnosed with an STI than the average person living in Saskatchewan.
- People living in northern Saskatchewan in 1996 to 1998 had a 7 times greater risk of being diagnosed with gonorrhea than the average person living in Saskatchewan.
- People living in northern Saskatchewan in 1996 to 1998 had a 7.7 times greater risk of being diagnosed with chlamydia than the average person living in Saskatchewan.
- People living in northern Saskatchewan in 1996 to 1998 had a 29 times greater risk of being diagnosed with infectious syphilis than the average person living in Saskatchewan (note that numbers of cases for syphilis are small).
- People living in northern Saskatchewan had a 0.4 times the risk of being diagnosed with herpes in 1997 than the average person living in Saskatchewan.
- Chlamydia has the highest rates of all STIs in northern Saskatchewan and Saskatchewan. In 1996 to 1998, in both the north and in the Saskatchewan general population, the rate of chlamydia was 6.8 times higher than gonorrhea.
- The overall annual crude incidence rate of STIs in northern Saskatchewan decreased from 3124 cases per 100,000 in 1990 to 1992, to 2216 cases per 100,000 in 1996 to 1998 (30%). Over the same time period the Saskatchewan rates decreased 29%, from 503 to 358 cases per 100,000 population.
- The overall annual crude incidence rate of gonorrhea in northern Saskatchewan decreased from 830 cases per 100,000 in 1990 to 1992, to 292 cases per 100,000 in 1996 to 1998 (67%). Over the same time period the Saskatchewan rates decreased 53%, from 91 to 42 cases per 100,000 population.
- The crude incidence rate of gonorrhea in 1997 in the north (291.6 cases/100,000) was higher than all provincial statistics, the highest of which was the NWT (221.1 cases/100,000).

Interpretation

Although crude annual incidence rates in northern Saskatchewan are substantially higher than in the rest of the province, rates in both regions have dropped at relatively the same rate during the study period. Crude rate comparisons must be interpreted with caution, as the underlying differences in population age distribution of the areas being considered here effects incidence rates, as do differences in reporting practices which vary from region to region. If reporting is physician based, less cases will be reported than in a lab based reporting system like in northern Saskatchewan. Northern regions such as northern Quebec, NWT, Yukon and Manitoba, have typically reported the highest rates of infection in the country. A large proportion these and of the population of northern Saskatchewan is of Aboriginal descent, and Aboriginal peoples are thought to be at higher risk for STIs due to social inequalities, low socio-economic status and problems with appropriate access to health care.⁴³ Although many social inequities do exist in the north, access to health care in northern Saskatchewan communities is quite thorough. The major centers have physicians and public health nurses, and the majority of smaller communities have primary care nurses who reside in the community and can diagnose and treat STIs. The care in these communities also includes weekly (sometimes more) visits by a physician. There are a few very small communities whose only access to health care is in nearby communities, or periodic visits by public health nurses who can refer them to a physician for diagnosis and treatment. Although there may still be problems with concern for anonymity and confidentiality which limits access, insufficient access to health care is not likely contributing to higher northern rates and perhaps just the opposite is true. Screening and diagnosis programs in the north may be more comprehensive than they are in the south. This would indicate that the rates reported for northern Saskatchewan are actually a more accurate reflection of the true rates of infection, while southern rates are underestimates. If this is the case, and prevention and control programs continue to function and to improve, the rates in northern Saskatchewan will continue to fall.

Crude STI rates in northern Saskatchewan and Saskatchewan are typically higher than Canadian rates.

- The crude rate of gonorrhea in Saskatchewan has increased from 2.5 to 3 times that of the Canadian general population between 1990 and 1998

- The 1996 to 1998 rate of gonorrhea in northern Saskatchewan was 6.9 times that of Saskatchewan, and 21 times the Canadian rate.
- The 1996 to 1998 rate of chlamydia in northern Saskatchewan was 7.6 times Saskatchewan and 20 times the Canadian rate.
- Chlamydia rates in Saskatchewan have remained approximately 2 times those of Canada between 1990 and 1997.
- In 1995, 70% of cases of chlamydia in Canada were among women 15 to 24 years old⁴⁹, while 55% of cases in northern Saskatchewan were aged 15 to 24.

Interpretation

Although similar trends such as high female rates, high rates among youth and high chlamydia rates, are seen in northern Saskatchewan, Saskatchewan and Canada, northern Saskatchewan rates are significantly higher than Canadian rates. Besides truly higher rates in the north, and the age structure of the northern population, the discrepancy in gonorrhea and chlamydia rates between northern Saskatchewan and Canada could be due to the fact that Saskatchewan may have a more vigilant screening, reporting and contact tracing program, particularly in the north, so more cases are actually diagnosed and reported. Increased emphasis on routine screening in the north would lead to more screening being done and therefore a higher ascertainment of cases. It is possible that the difference can also be attributed to the fact northern Saskatchewan has a younger population. This issue is explored through age standardization of rates in section 8.4, where it was found that age-standardized rates in the north were also higher than Saskatchewan rates.

Chlamydia rates are approximately 7 times higher than gonorrhea rates in northern Saskatchewan. This trend is also seen in Saskatchewan and in Canada, and is perhaps representative of a secular trend of declining gonorrhea rates and the subsequent widening of the gap between the two infection rates. As rates fall, the chances of a new case being acquired falls, and rates continue to decrease.

The declining rates of gonorrhea in Canada since 1981 are thought to be due to changes in sexual behavior brought on by primary prevention programs that were initiated with the advent of HIV/AIDS, such as improved case management, contact tracing and notification, and the development of one dose

treatments which have an increased cure rate and also improve compliance with treatment.³ These factors are likely responsible for the decrease in Saskatchewan and northern Saskatchewan rates as well.

Chlamydia rates in the north are higher than in Saskatchewan and Canada. Due to the large number of cases of chlamydia that can be asymptomatic (up to 90%) it is thought the true rate of chlamydia in Canada is actually two to three times higher than reported.⁴⁸ If this is true, the same underestimation will be occurring in northern Saskatchewan as well, leading to under detection, underreporting and therefore unnecessary spread of infection.

The overall decline in syphilis rates has been parallel to the decline in gonorrhea rates in Canada²⁵ and is likely also due to the improved screening, education, diagnosis, treatment and contact tracing programs available. It is believed that the existing rates are being sustained by imported cases. Rates of infectious syphilis fluctuate greatly due to small numbers of cases. 35 of a total of 41 cases of infectious syphilis that were reported in Saskatchewan between 1993 to 1995, were reported in northern Saskatchewan, and this cluster of cases is responsible for Saskatchewan having the highest rates of infectious syphilis in the country in 1995.

8.4 Age Standardized Comparisons

When northern Saskatchewan rates are standardized to the Saskatchewan population, rates of gonorrhea, chlamydia and infectious syphilis are higher than in the rest of the province (Table 7.9).

- The 1996 to 1998 age standardized rates of all STIs combined in northern Saskatchewan was 4.6 times the overall rate of STIs in Saskatchewan
- In 1996 to 1998 age standardized rate of gonorrhea in northern Saskatchewan was 5.3 times greater than the rate of gonorrhea in Saskatchewan
- The 1996 to 1998 age standardized rate of chlamydia in northern Saskatchewan was 7.4 times greater than the rate of chlamydia in Saskatchewan
- The age standardized rate of infectious syphilis in northern Saskatchewan was 22.9 times greater than the rate of syphilis in Saskatchewan
- The age standardized rates of herpes in northern Saskatchewan was 0.4 times the rate of herpes in Saskatchewan

- From 1990 to 1998, the highest age standardized rates by diagnosis were consistently chlamydia

Direct age standardization is a process that allows for the calculation of a summary value that removes the effect of age structure in a population. The actual value of the standardized rate calculated is meaningless on its own, but can be directly compared to the rates of the population to which the rates are standardized, or to other rates that have been standardized to the same standard population. This process is necessary when comparing the STI rates of northern Saskatchewan to those of the Saskatchewan general population, due to the difference in the age structures of the two populations discussed in section 6.2.

The age standardized rates show a slightly lower difference in rates between northern Saskatchewan and Saskatchewan compared to the difference in crude rates, indicating that age structure accounts for some of the discrepancy in rates. The 1996 to 1998 age standardized overall STI rate in northern Saskatchewan is 4.6 times that of Saskatchewan compared to the crude rate which is 6.2 times higher than Saskatchewan. Besides the influence of age structure, other explanations such as better screening and treatment programs, differences in attitudes toward STIs, or concerns of higher priority, may be behind the higher northern rates. Issues related to confidentiality, education, imported cases, and isolated populations are also possible contributors.

8.5 Variability Between Health Districts

Rates of all STIs combined in each of the northern health districts are comparable to each other, but are slightly higher in KYHD, likely related to differences in regional screening practices. Trends seen in each northern health district are the same as those seen throughout the north. High rates of infection among youth are seen consistently throughout each health district (tables 7.12 through 7.15).

- Of the three health districts, KYHD had the highest incidence rate from 1990 to 1998. In 1996 to 1998, it was 1.3 times the rate of MCRHD and 1.1 times the rate in AHA.
- Overall, the crude annual incidence rate of all STIs has decreased in each health district between 1990 and 1998:

MCRHD: 24% decrease

KYHD: 37% decrease

AHA: 19 % decrease

KYHD

- The highest rates from 1990 to 1995 were among females aged 15 to 19
- The highest rates from 1996 to 1998 were among females aged 20 to 24
- The highest rates for males were those aged 20 to 24
- The rates in the above age groups were substantially higher (often more than double) than the rate in other age groups
- The incidence rate in all age groups has decreased since 1990.

MCRHD

- The highest rate overall from 1990 to 1992 was among females aged 20 to 24 and 1993 to 1998 was among females aged 15 to 19
- The highest male rate from 1990 to 1998 were among males aged 20 to 24

AHA

- The highest rate overall from 1990 to 1998 was among females aged 15 to 19
- The highest rate among males from 1990 to 1995 was among 15 to 19 year olds and the highest male rate from 1996 to 1998 was among 20 to 24 year olds
- The rates increase among all age groups between 1993 and 1995
- There are a small number of cases in this district
- The age standardized incidence rate of all STIs in KYHD in 1997 was 1.2 times the rate for the north as a whole and 5.7 times the rate in Saskatchewan.
- The age standardized incidence rate of all STIs in MCRHD was 4 times greater than the rate for Saskatchewan in 1997
- The age standardized incidence rate of all STIs in AHA was 4.6 times greater than the rate in Saskatchewan in 1997

8.6 Community Comparisons

The community rates were calculated using the 1998 covered populations that were available for most small communities. Further adjustments were made by the northern health districts' Population Health Unit to estimate the proportion of the population assigned by Saskatchewan Health to the residence codes for Lac La Ronge Indian Band and the Peter Ballantyne Cree Nation that were actually living in several smaller communities. The final community populations were calculated to approximate estimates from other sources including community health centers, Census Canada, the Department of Indian and Northern Affairs, and the Tribal Councils. Because of the small numbers of cases in each community, age groups used in this section are larger (10 to 19, 20 to 29 and 30+), and rates were calculated for gonorrhea and chlamydia combined, in order to have sufficient numbers to calculate rates (Table 7.18).

- There were only 3 of 546 STI cases in northern Saskatchewan in 1998 which were not gonorrhea or chlamydia, therefore the rates for gonorrhea and chlamydia combined will be very close to the rates for all STIs combined for the year 1998.
- The northern community incidence rates in 1998 ranged from 0 cases to 6233.4 cases per 100,000 covered population.
- The highest rates by age group in each community was typically in among 20 to 29 year olds, except in three communities where it was among 10 to 19 year olds.

Interpretation

There is a large variation in community rates which is likely due to the very small population and case numbers involved, as an increase of 2 or 3 cases can cause a 50% increase in rates in some cases. The majority of communities have a rate between 1000 and 3000 cases per 100,000 population. There are a few notable outliers such as 0 and 120 cases per 100,000 in communities 11 and 13, where there are also very low rates in each age group. This particular community had very few reported cases in a large population, and a high proportion of the population over 30, who had no cases. This could represent lack of health care available in this community to diagnose and report cases. Alternatively, there could be a greater awareness in this community therefore more cases have been diagnosed and cured.

There are also 3 communities where the rate of gonorrhea and chlamydia is over 4000 cases per 100,000, and also exceptionally high among 20 to 29 year olds. These communities have a relatively high number of cases and small populations. This could be indicative of the extent of screening and reporting practices in these communities, as education and screening procedures vary from community to community and according to the local health care practitioner. Aggressive screening in one community can cause rates to appear higher than in other communities.

8.7 Contacts

- The majority of cases (81.8%) identified have unidentifiable contacts or only one contact.
- The large number of unknown contacts, 22%, (0= unknown) indicates that health care workers need to ensure accurate contact lists are received from each client.
- The number of unknowns is an indicator of the reliability of the system, as it is a proxy for the follow up capacity of public health. It is affected by a number of factors, including the client's willingness to name or inform contacts, their ability to name contacts, and the health care worker's interview skills.

8.9 Limitations

Population numbers used for northern and health district rates are non-apportioned, indicating that a person counted may or may not physically reside in the area, and that incidence rates in these regions are likely underestimates. We are assuming that a person who was diagnosed in the north truly lives in the north, and therefore this problem will not be reflected in the rates for the north as a whole. The proportion of the population who live off reserve and in the south cannot be determined (S. Whitehead, March 1, 2000). 1998 denominators for community rates have been adjusted to control for this problem. Due to the small number of cases in some communities, overall rates will be very high.

It is difficult to compare northern Saskatchewan and to overall Saskatchewan rates due to regional variations in data collection methods. Reporting may be based on lab notification of infection like in the north, or rely on physician reports, which is less accurate, and would show lower rates in comparison.

Limitations of data collection include a possible lack of recall by the case regarding contacts and the inability to obtain a completed STD report. Data is likely a very accurate representation of diagnosed cases, as 100% of cases are laboratory confirmed and must be reported to the MHO. Northern Saskatchewan data before 1995 may be more accurate than data for the rest of the province, where reporting of positive cases by the lab to the MHO was not officially required until 1995. This would cause northern rates to appear even higher than provincial rates, but they would actually be a more accurate reflection of true rates than the provincial ones.

9. Summary

The previous chapters of this paper have outlined in extensive detail the numbers of cases and rates of STI in northern Saskatchewan as a whole, by health district and by community. It has been found that although infection rates of gonorrhea, chlamydia and infectious syphilis throughout northern Saskatchewan have been decreasing since 1990, they remain substantially higher than in Saskatchewan and Canada.

Age standardized annual rates of all STIs combined in 1996 to 1998 were 4.6 times higher in northern Saskatchewan than in the Saskatchewan general population. The overall crude rate of STIs reported in Northern Saskatchewan decreased 30% during the period of study, to 2216 cases per 100,000 population and also dropped 29% in Saskatchewan, to 358 cases per 100,000 population. This decrease in overall crude rates is apparent in every age group, but tends to be less dramatic among 15 to 29 year old females and 15 to 39 year old males, and is mostly accounted for by falls in gonorrhea rates. The highest overall rates in 1996 to 1998 were among females aged 15 to 19, at 10312 cases per 100,000 population and the highest male rates were among 20 to 24 year olds (4306.3 cases per 100,000 population). Female rates of all STIs combined are approximately 2.4 times those of males in all age groups.

In 1996 to 1998, the age standardized rate of gonorrhea in northern Saskatchewan was 5.3 times the rate in Saskatchewan. The crude rate of gonorrhea in northern Saskatchewan has decreased 64% since 1990, to a rate of 291 cases/100,000 population in 1996 to 1998, a trend which was also seen in, and likely related to, Saskatchewan (61% decrease) and Canada (62% decrease) between 1990 and 1997. Gonorrhea rates are decreasing in both sexes and all age groups, although rates among women aged 15 to 24 remain extremely high in comparison to other age groups. In 1996 to 1998, 15 to 19 year old women had a rate of 874 cases per 100,000 population while 20 to 24 year old women had a rate of 936 cases per 100,000 population. The highest male rate was in the 20 to 24 year age group (704 cases/100,000 population), and males over 25 had gonorrhea rates greater than females in the same age group. It is felt that gonorrhea rates are more indicative of the male:female ratio of STI in the north due to the higher

likelihood of gonorrhea being symptomatic than chlamydia. The high rate among northern youth is consistent with Saskatchewan and Canadian statistics, where the highest STI rates are also among 15 to 19 year old women and 20 to 24 year old men.

From 1990 to 1998, chlamydia was the most frequently reported infection in Saskatchewan and northern Saskatchewan, accounting for between 75 and 91 % of all cases of STIs reported in northern Saskatchewan. In 1998, rates of chlamydia were 7 times those of gonorrhea, related to the rapidly decreasing rates of gonorrhea relative to chlamydia and to the possibility that we have yet to see the benefits of one dose treatments for chlamydia. The 1996 to 1998 age standardized rate of chlamydia in northern Saskatchewan was 7.3 times the rate of chlamydia in Saskatchewan. The crude incidence of chlamydia in northern Saskatchewan has decreased 22% since 1990 to 1992, to 1975 cases per 100,000 population in 1996 to 1998. This drop, although substantial, is slightly less than the 27% decrease in Saskatchewan rates and the 38% decrease in Canadian rates over the same time period. A reduction in rates was seen between 1990 and 1998 in all female age groups, but not all male age groups, likely related to increased male testing. The highest rates of chlamydia in northern Saskatchewan in 1996 to 1998 were among 15 to 19 year old females, with a rate of 9840 cases per 100,000 population, which is 5 times the overall rate of chlamydia for the same year and nearly 5 times the rate in males of the same age (2151 cases/100,000), a gender difference which seems to lessen with age. The highest male rate of chlamydia was among 15 to 19 year olds, at 2151 cases per 100,000 population. The large percentage of chlamydia cases among youth in northern Saskatchewan is consistent with 1995 Canadian statistics, where 70% of all cases of chlamydia reported were among 15 to 24 year olds.

Infectious syphilis rates were the only specific syphilis rates done for this project, as there were very few cases of any other stage of disease. Rates of infectious syphilis in northern Saskatchewan appear low compared to other STI rates, but are very high when compared to the entire province and to Canada. The high northern rate in 1993 to 1995 (50.3 cases/100,000) was due to a cluster of 35 cases reported in one small specific area of the north, when there was a total of 41 cases in the entire province, and was responsible for Saskatchewan having the highest syphilis rates in the country that year. In 1996 to 1998, the rate was 17.1 cases per 100,000 population, representing a decrease of 26% from 1990. When rates were age standardized, the rate of infectious syphilis was 23 times higher in northern Saskatchewan than

Saskatchewan. Between 1990 and 1995, the highest rates of infectious syphilis were among 30 to 39 year olds, and in 1996 to 1998 the highest rates were among 20 to 24 year old males. There is no particular age group in northern Saskatchewan that stands out as being at greater risk for the development of syphilis than any other.

Herpes rates in northern Saskatchewan have increased between 1990 and 1998 and are lower than rates in Saskatchewan, making it the exception, although these numbers must be interpreted with caution due to incomplete herpes data. 1996 to 1998 age standardized rates show that the rate of herpes in northern Saskatchewan is 0.4 times that of Saskatchewan. Canadian information on herpes is limited, as this information is not collected nationally.

Possible reasons suggested for the variation in rates between regions include that northern Saskatchewan screening and reporting practices are more efficient than those elsewhere in the province, a young northern population, social inequalities in the north, high risk sexual behaviors including increased rates of sexual contact, lower age of first sexual intercourse, inconsistent condom use and the contact rate between young women and older men.

Of the three northern Saskatchewan health districts, KYHD has the highest reported rate of all STIs combined. In 1998, there were only two cases of herpes and one case of syphilis reported in all of the northern communities combined. There was, however, a substantial variation in community rates of gonorrhea and chlamydia, ranging from 0 to 6233 cases per 100,000 population. Because the communities cannot be identified here, it is difficult to infer reasons for individual community rates, other than variations in screening practices and age distribution of the community. Communities with very low rates had high proportions of the population over 30. The highest rates in every community were typically among the 20 to 29 year old age group for both males and females, and community rates may be dependent on the proportion of the population between the ages of 20 to 29.

The majority of treatments provided in the north from 1990 to 1998 were appropriate and followed national guidelines as they changed to one dose methods which were easy to comply with and had better cure rates. Most cases named only one sexual contact, or the number of contacts was unknown, indicating that the contact tracing system may not be as efficient as it could be, as naming contacts is the first step to locating and treating them.

9.1 Implications for Prevention

High incidence rates place residents of northern Saskatchewan, especially youth, at increased risk for the development of gonorrhea, chlamydia and infectious syphilis, and also for the development of serious complications such as PID, ectopic pregnancy and sterility. Since chlamydia accounts for more than three quarters of all reported infections in the north, and it is often found concurrently with gonorrhea, the prevention and control of gonorrhea and chlamydia is the highest priority. In order to have a noticeable impact on overall rates, prevention programs should be targeted to groups with the highest infection rates. For chlamydia, females in all age groups have higher rates than males of the same age, with the highest rates in females 15 to 24. The highest chlamydia rates among males are in the 15 to 24 age group as well, although these rates are half to one-quarter of the female rates. For gonorrhea, female rates of those aged 10 to 24 are typically higher than males of the same age, but males over 25 have higher gonorrhea rates than females over 25. It is likely that the gender distribution of gonorrhea is a more accurate reflection of the true male:female ratio of infections due to the high percentage of male chlamydia cases which are asymptomatic. This implies that programs need to be targeted at both males and females, especially youth, with efforts to also include the older male population aged 25 to 29. All sexually active people are at risk for the development of an STI and the level of this risk varies according to factors such as lifestyle, age group, socio-economic status, sex, and number of sexual partners, indicating that strategies for prevention and control must take the characteristics and needs of the population into consideration.

As described in section 4.6, Brunham and Plummer⁸ have developed a multifactorial model for STD epidemiology and implications for control. The following is an attempt to link this control model to health promotion and primary prevention practices that would help to decrease rates of infection specifically in northern Saskatchewan. The model is based on two major points, that STIs are transmissible only through direct contact, which restricts transmission to sexually active people and that primary prevention is the strategy of choice for viral STIs, as treatment is of little benefit, and control of bacterial STIs is based on detection and treatment of cases as well as behavior change. This model is mathematically represented by the formula $R=BcD$. In Canada, most existing programs focus on **B**,

decreasing of the probability of transmission from an infected person (increasing condom use), or *c*, decreasing the rate of contact (limiting sexual partners or monogamy). Shortening the duration of infectivity, *D*, through screening and effective treatment has also been shown to be an effective preventive measure.²¹

Reducing *B*, the measure of infectivity of the pathogen, involves biological characteristics and differences between pathogens that we have no control over. Infectivity of a pathogen can be greatly reduced by the use of a condom, however, as it decreases the probability of transmission of the pathogen. But condoms are only effective if they are used. It has been shown that condoms use among youth in the north is inconsistent, especially among females who have the lowest rate in the province of 'always' using a condom, as evidenced by the high infection rates in this group. Educating the population regarding the importance of using a condom, even when in a long-term relationship or using the birth control pill, must continue. Accessibility to condoms can be difficult in small communities due to lack of anonymity. It has been found that even in major centers, young people still feel embarrassed about the purchase of condoms, which affects their purchasing behavior in that they purchase fewer condoms, less frequently.⁴⁹ Distribution of free condoms is an important way to increase accessibility, although condoms must be located where people will be able to readily access them. Condoms are becoming available in public washrooms in some northern communities, which is an excellent strategy for increasing availability.

C, the contact rate between susceptible and infected persons, is difficult to influence. 50% of northern youth report having had sex, and the highest percentage of youth who report having more than 4 lifetime partners the in the province, live in northern Saskatchewan. Contact rate is determined by broad factors such as knowledge, attitudes, skills, self-esteem, addictions, and socio-economic status, as well as social and historical factors, all of which play a role in a person's sexual behavior pattern. Changes in high risk behavior patterns are the focus of interventions to decrease contact rate, but education regarding changes in sexual risk behaviors cannot simply involve telling people they must reduce risk behaviors. This approach is rarely effective, since behavior is influenced by much more than knowledge of the facts. The philosophy of the Canadian Guidelines for Sexual Health education is that effective sexual health education should be provided in an age appropriate, culturally sensitive manner, which is respectful of

individual choices, emphasizing the development of knowledge, motivation, skills, and taking into consideration the implications of environmental factors⁴² such as the possibility of language barriers and the difficulties with confidentiality in small northern communities. Education to reduce contact rate is a lifelong process, which should start early, before behavior becomes a problem, by building self-esteem, confidence, and the knowledge to make ones own healthy decisions. Schools are the best and preferred way to reach youth³⁶, especially very young children, but education is the shared responsibility of teachers, parents, peers, health professionals and the media. Programs that are developed need to be based on community and individual needs, which means identifying high risk and target groups through studies such as this, but also means consulting the people for whom the services are being developed about what they feel are priorities. The population of northern Saskatchewan is largely of Aboriginal descent, and many regions are affected by social inequalities related to loss of traditional lifestyles such as unemployment and economic dependency. In light of this, the prevention of STIs may not be a priority among the population, and work towards improving the standard of living of the population could indirectly, but positively, affect the rate of STIs.

Sex is a marker for the transition from adolescence to adulthood, and its initiation is influenced by many factors including individual, peer and family characteristics. Many youth in the north have their first sexual experience at 14 to 15 years of age. Increasing age of first sexual intercourse is thought to be a method of decreasing overall number of lifetime partners, thereby directly decreasing the contact rate between susceptible and infected individuals.³⁸ One study found that adolescents with single parents, stepfamily or separated parents had sex earlier than those whose parents were together, which they suggest could be explained by lack of parental control in these situations.⁵¹

Core groups have a high incidence and prevalence of STIs. They act as a reservoir for infection and a source of infection to others, but likely make up less than 2% of those at risk.⁸ STI repeaters are people who have an association with the core group, but may seek medical attention after each episode, and therefore have less of a chance to spread infection. It is believed that the members of the core group have the majority of STIs, and that if they are kept free of disease, STIs will gradually disappear.⁸ Although it would be difficult to specifically identify and access members of these groups, encouraging behavioral changes such as fewer partners, regular use of condoms and increasing the age of first

intercourse within them, would result in the greatest overall reduction in northern rates. Identification and communication with this group would allow for effective targeting of initiatives to where they are most needed. Specific core groups have not been identified by this study, but focusing control and prevention strategies on high incidence groups identified is next best approach. It is likely that not all youth within these high incidence groups are sexually active, or even members of high-risk populations. If the sexual behavior pattern of a person within a group with low STI rates is changed, this would have much less impact on the overall rates of STIs in a community than would changing the sexual behavior patterns of an individual within a group with high rates of STIs and high rates of change of sexual partners. Development of tools to locate core group members would be valuable, as change in their behavior will result in the greatest reduction in rates. In Winnipeg, Manitoba, geographic core groups were identified as areas with high incidence rates of chlamydia and gonorrhea, a process which avoids identifying and stigmatizing individuals. These geographic areas were characterized by low socioeconomic status, higher population density, higher proportion of people who didn't speak English or French, higher unemployment and lower mean household incomes.⁵² Perhaps results of community and health district rates will allow extra efforts to be placed on prevention in 'geographic cores' of the north.

Decreasing D , the duration of infectivity, involves several factors including screening, testing, diagnosis, treatment and partner notification, and is only effective for bacterial and spirochaetal infections such as chlamydia, gonorrhea and syphilis. Due to issues of confidentiality, strategies to reduce the period of infectivity would be best as part of a broad reproductive health program, where there are fewer stigmas associated with accessing services.

Access to screening in the north is very important. Emphasis on screening programs ensures early accurate diagnosis and timely treatment of infections, thereby decreasing the period of infectivity, and the possibility of developing complications. Screening also helps to detect asymptomatic cases, which otherwise would have been missed. It is believed that more screening is done in northern Saskatchewan as compared to the south, a fact which contributes to the higher northern rates. Screening practices can also vary between communities, leading to varying rates among northern communities. PCR tests will soon be available to all women of the province, which is expected to increase the number of women tested.

Knowing the epidemiology of syphilis allows for better targeting of health promotion and disease prevention efforts for this infection. Outbreak focused control, partner notification and case treatment are the current control methods of choice in Canada, including northern Saskatchewan. Based on the impact that the cluster of 35 cases of infectious syphilis seen in 1993 to 1995 had on rates in northern Saskatchewan and Saskatchewan, perhaps increased syphilis screening of high risk populations and pregnant women is warranted in northern Saskatchewan. Routine syphilis screening could detect and eliminate cases, avoiding the spread of infection and development of complications, as well as contain clusters. It would also be valuable in the detection of imported cases, which are thought to be an important factor in the maintenance of current rates.⁵³ Access to screening is not likely to be a problem in most northern communities, as the majority have a health care professional living in the community, or someone who visits regularly, although outreach strategies would be beneficial for clients who cannot or choose not to attend regular clinics.

It would be beneficial to implement a strategy that would help to bring in more young males for testing and treatment, as men are less likely to seek medical care and to consult family physicians than are women, leading to less chance of early detection, treatment and prevention of diseases, including STIs.⁵⁴ Increasing the number of males tested may lead to a more accurate representation of the true rate of infection among males, and decrease the difference in male and female rates.

Azithromycin and cefixime are the most commonly prescribed treatments for gonorrhea and chlamydia in northern Saskatchewan today. The combination of the two straightforward, one-dose treatments, effectively treats gonorrhea and chlamydia, thereby decreasing the infectivity of the pathogens. It is recommended that an infected person abstain from sexual intercourse for 5 days after treatment of chlamydia with azithromycin to ensure the infection is eliminated. It was found that for most years of the study, more than 75% of treatments prescribed met or likely met national guidelines. Perhaps the treatments identified on STD reports could be monitored, and health care professionals who are providing old or inappropriate treatments could be informed of the current recommendations.

Partner notification is mandatory for cases of gonorrhea, chlamydia and syphilis in Saskatchewan, and guidelines for which partners need to be contacted is discussed in section 4.6.7. Strict mandatory partner notification practices are a necessity, as they can greatly limit the spread of infection if

a potentially infected partner is notified and aware they must obtain testing and treatment. The only indicator of the effectiveness of the current contact tracing system in the north is the number of contacts named by each index case. The fact that the majority of cases named only one contact, or the number of contacts was unknown, indicates that more emphasis needs to be placed on getting clients to name all of their contacts. Clients are encouraged to contact partners, but health care professionals must be available to do so if necessary. Partner notification carried out by health care workers rather than the client, has been shown to be more effective in leading to diagnosis and treatment. Contact tracing is not required for herpes, but clients should be encouraged to inform their contacts of the diagnosis.

Education regarding the importance of seeking medical attention can also help to decrease the period of infectivity of gonorrhea, chlamydia and infectious syphilis. Education programs provided by local health care professionals may help to build trusting relationships between themselves and clients, creating an increased level of comfort for the client when they do need to approach the health care system. It is important for health care professionals to be approachable, letting clients know that they are knowledgeable in this area, and where and when they can be reached. Many communities in northern Saskatchewan are quite isolated, which can often lead to a sense of security regarding the risk of being infected, but as long as a person is sexually active, they are placing themselves at risk for STI, wherever they live. Infection can easily be introduced to and spread throughout the community by visitors or returning residents. Education must also involve keeping health care professionals up to date with changes in recommendations for treatments, screening and diagnosis procedures. Due to its viral nature, education and prevention are the key strategies in herpes control, as it remains with you for life.

Conclusion

Rates of STI in northern Saskatchewan from 1990 to 1998 were considerably higher than those in the Saskatchewan general population and in Canada. Chlamydia was the most commonly diagnosed infection throughout the study period, followed by gonorrhea and infectious syphilis. Females had the highest rates chlamydia in nearly all age groups, especially in 15 to 24 year olds, where the rate was up to 5 times that of males the same age. Females 10 to 24 had the highest rates of gonorrhea, often double male rates, but in the over 25 age groups, males had the higher rates. Infectious syphilis rates fluctuated

greatly during the study period due to a cluster of 35 infections in northern Saskatchewan between 1993 and 1995. Due to the relatively small number of cases, no particular age group appeared to be affected more than any other.

It is clear that the prevention of STIs is multifactorial. If all of the strategies mentioned in section 9.1 work together, it is hoped that R , the reproductive rate of infection, will be held at less than 1, thereby causing a decrease in the rates of infection throughout the north. Although the rates of infection in northern Saskatchewan have been consistently higher than in the rest of the province, they are decreasing at a pace equivalent to Saskatchewan and Canada. This is an indication of the success of national and local STI prevention programs that are currently being implemented, as well as an indication of the efficient diagnosis, treatment and subsequent reporting of infections in the north. The trend of high rates among youth is consistent with findings of other regions, including Saskatchewan and Canada. As stated in the opening of this study, specific infection rates are useful in that they provide detailed quantitative data upon which to base and target interventions. They also enable evaluation and monitoring of an intervention's success in a particular community by providing concrete evidence that rates are decreasing or increasing.

Many questions were raised by this study. Targeted research needs to address the difference in sexual behaviors between high and low incidence areas, and to attempt to learn the social/sexual network of core groups. Research into identifying and accessing this subset of the population would greatly aid in accurate targeting of prevention initiatives, and make them as efficient as possible with the greatest impact on local rates. Results of this study allow for geographical targeting of high-risk regions, but does not allow identification of particular high risk groups within those regions. Further studies of the rate of condom use among the northern population would be useful indicators of risk behavior, as would the rate of partner change among all age groups and the typical age of first intercourse, and studies which look at the motivations for risk behavior. Studies into the contact rate between older men and younger women would also be warranted, based on the high rates of gonorrhea in women under 25 and men over 25 in the same years. Reviews and monitoring of the contact tracing system, including monitoring of the number of contacts traced and treated, as well as the number of contacts identified, would give further indication of the effectiveness of the system.

It would be interesting to determine, through a survey of the provincial laboratory records, whether or not the implementation of urine testing among men of the province has lead to an increase in the number of diagnostic tests done, and whether this has influenced the rate of infection. A comparison of the rates of screening in the northern vs. southern regions of the province would determine whether a discrepancy in regional screening rates truly influences infection rates, as would a comparison of screening rates between communities and health districts. An investigation into the efficiency of increasing screening for syphilis in the north would be beneficial in the determination of the feasibility of such a practice.

Although the percentage of treatments given that did not follow guidelines was low, consideration of the development of a system of monitoring the appropriateness of treatments given, as specified on the STD form, could ensure feedback to health care professionals who have prescribed an inappropriate treatment, so that changes could be made. Focus groups that address the needs and ideas of the community and of youth at risk, would ensure local input into program development, and that specific community needs are met. And finally, studies of rates of sequelae such as PID, ectopic pregnancy and sterility in the north, and follow up studies similar to this one, which continue to monitor rates and trends in the north, will assist in the determination of the effectiveness of implemented programs and highlight any changing needs.

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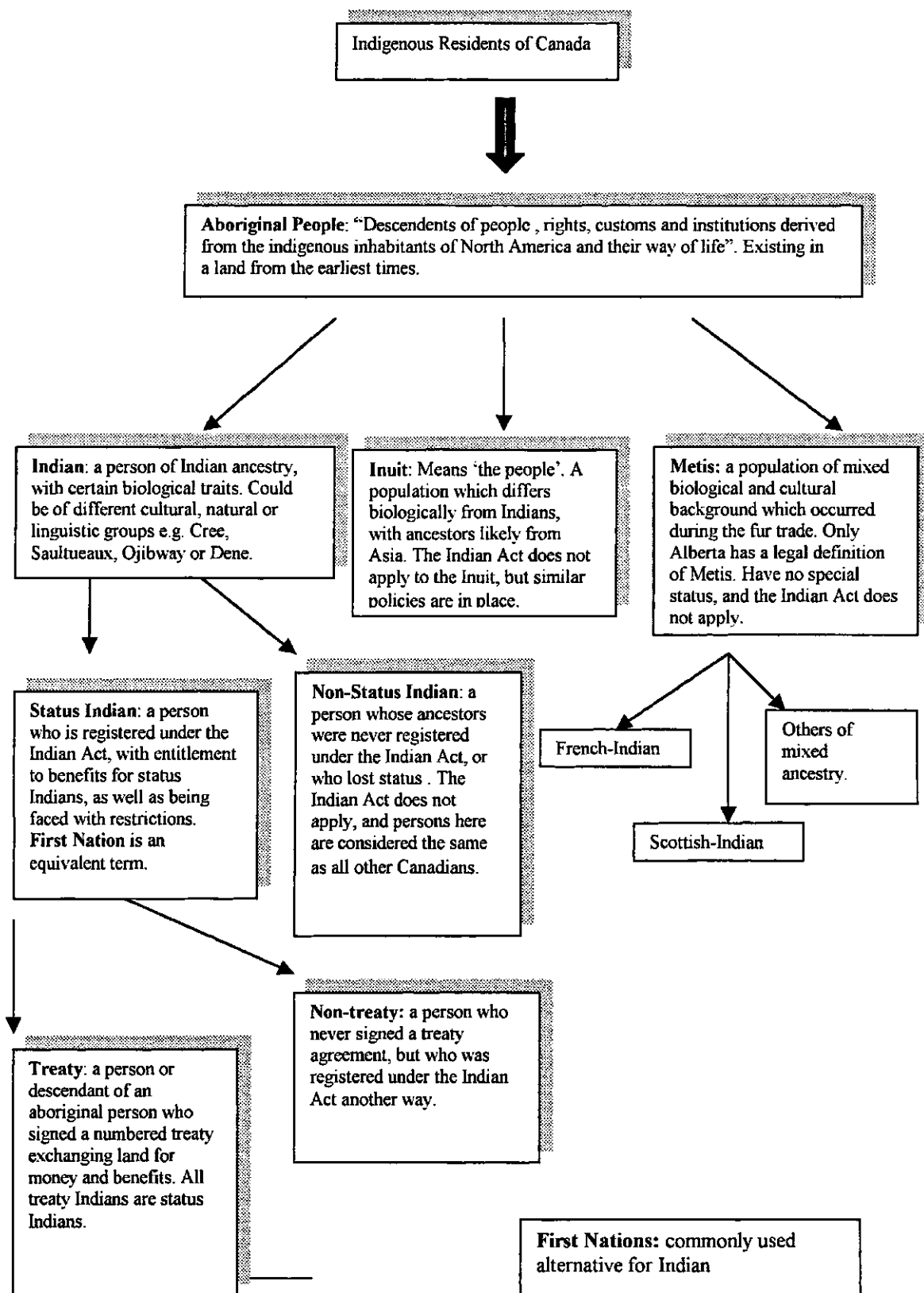
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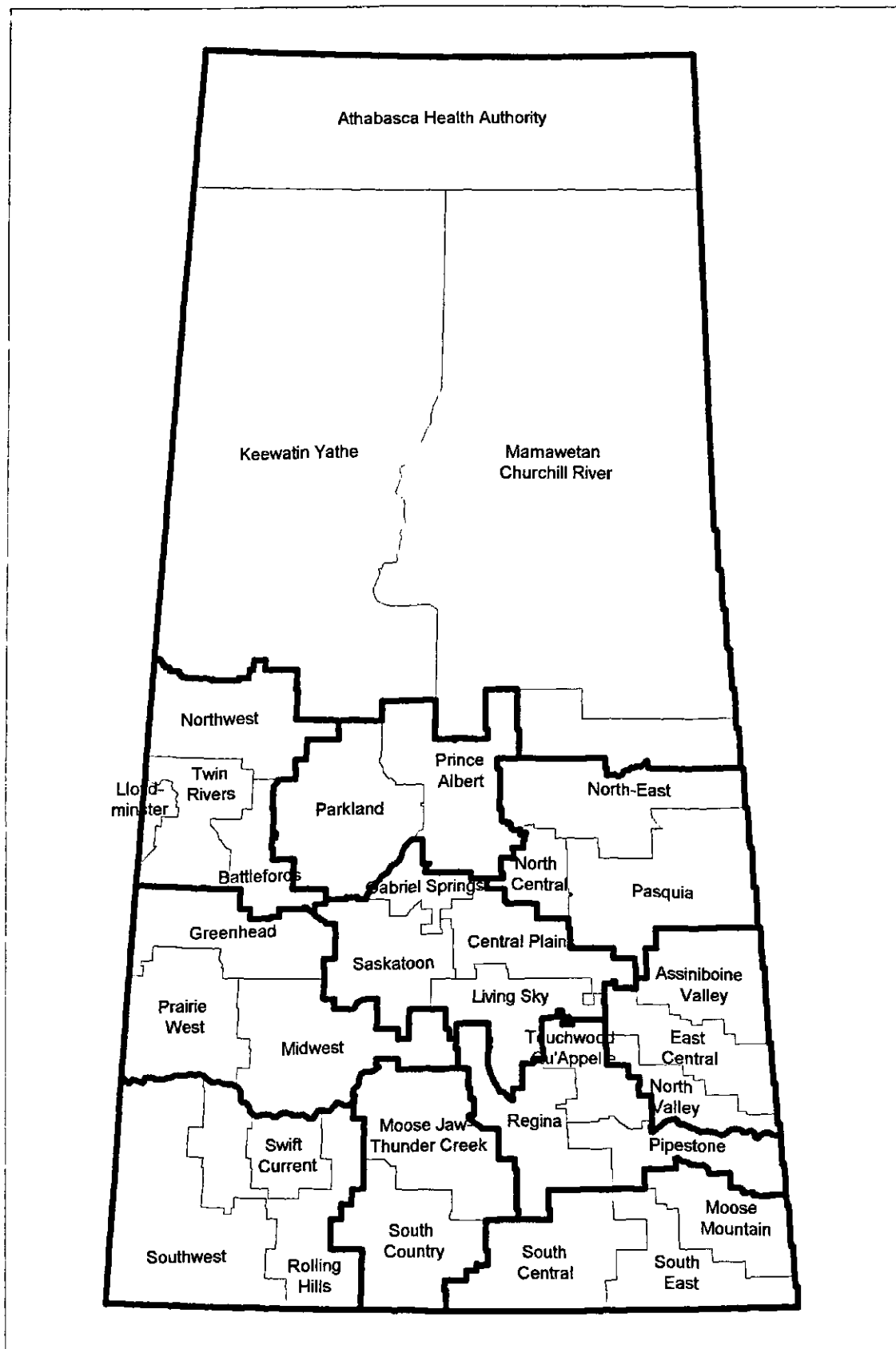
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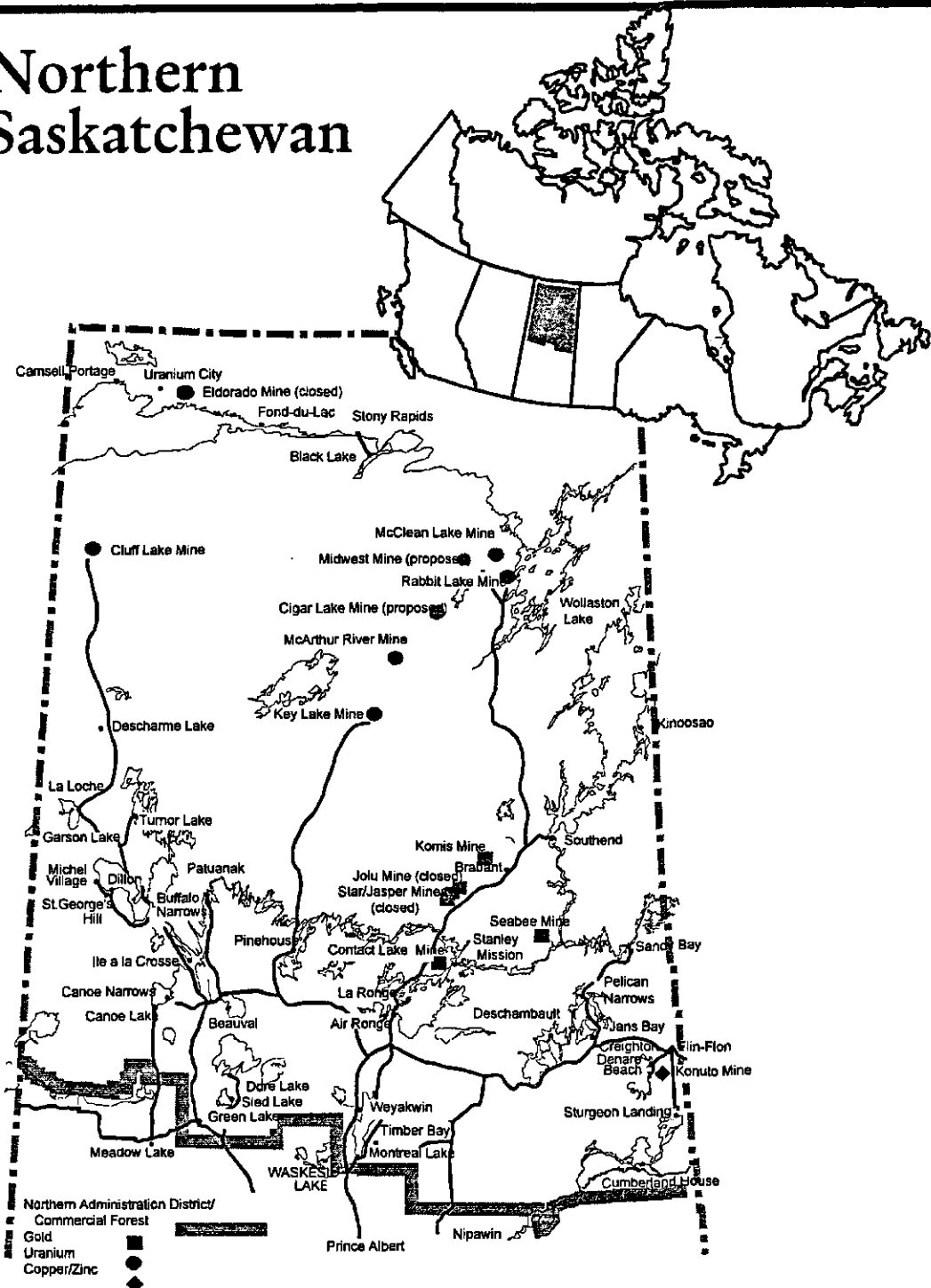
Appendix A: Definitions of Aboriginal Subgroups²



Appendix B: Map of Saskatchewan



Northern Saskatchewan



Northern Education Services Branch, January 22, 1996

Appendix C Northern Saskatchewan Covered Population, by Health District, by Age and Sex, 1991, 1994 and 1997

		1991 COVERED POPULATION																		
		TOTAL	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
HD	TOTAL MALES	1182	37	136	168	132	118	139	108	82	43	42	49	28	34	29	13	9	7	3
		1110	34	136	168	121	104	120	112	34	45	43	34	27	23	17	9	8	4	1
AIA	TOTAL FEMALE	2292	71	272	356	253	222	259	220	159	88	85	83	55	58	46	22	17	11	6
		2292	71	272	356	253	222	259	220	159	88	85	83	55	58	46	22	17	11	6
AIA	TOTAL POPULATION	4758	143	592	572	433	470	561	456	373	280	219	161	163	114	102	61	49	35	22
		4758	143	592	572	433	470	561	456	373	280	219	161	163	114	102	61	49	35	22
KY	TOTAL MALES	4385	142	553	510	439	444	478	438	349	230	182	149	122	94	78	65	48	29	21
		4385	142	553	510	439	444	478	438	349	230	182	149	122	94	78	65	48	29	21
KY	TOTAL FEMALE	9143	285	1145	1082	872	914	979	894	772	510	401	310	285	208	180	126	97	64	43
		9143	285	1145	1082	872	914	979	894	772	510	401	310	285	208	180	126	97	64	43
MCR	TOTAL MALES	9329	284	1352	1106	1031	929	880	790	730	675	500	320	270	244	181	130	96	79	37
		9329	284	1352	1106	1031	929	880	790	730	675	500	320	270	244	181	130	96	79	37
MCR	TOTAL FEMALE	8636	265	1038	1113	918	917	783	798	753	553	433	291	262	206	148	138	94	65	31
		8636	265	1038	1113	918	917	783	798	753	553	433	291	262	206	148	138	94	65	31
MCR	TOTAL POPULATION	18165	549	2390	2219	1949	1846	1663	1588	1483	1228	933	611	532	450	329	268	190	144	68
		18165	549	2390	2219	1949	1846	1663	1588	1483	1228	933	611	532	450	329	268	190	144	68
NORTH	TOTAL MALES	15569	464	1780	1846	1616	1517	1320	1354	1185	948	761	510	461	392	312	204	154	121	62
		15569	464	1780	1846	1616	1517	1320	1354	1185	948	761	510	461	392	312	204	154	121	62
NORTH	TOTAL FEMALE	14311	441	1727	1811	1478	1465	1381	1348	1179	828	658	474	411	324	243	212	150	98	55
		14311	441	1727	1811	1478	1465	1381	1348	1179	828	658	474	411	324	243	212	150	98	55
NORTH	TOTAL POPULATION	29880	905	3507	3657	3094	2982	2701	2702	2364	1776	1419	1084	872	716	555	416	304	219	117
		29880	905	3507	3657	3094	2982	2701	2702	2364	1776	1419	1084	872	716	555	416	304	219	117

		1994 COVERED POPULATION																		
		TOTAL	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
HD	TOTAL MALES	10132	281	1204	1272	1049	1001	878	864	755	691	568	424	296	244	207	136	118	73	48
		9610	250	1140	1216	1016	933	875	794	785	681	486	374	287	219	167	141	120	57	44
MCR	TOTAL FEMALE	19742	534	2344	2488	2083	1934	1753	1638	1540	1372	1054	798	583	463	374	277	238	130	93
		19742	534	2344	2488	2083	1934	1753	1638	1540	1372	1054	798	583	463	374	277	238	130	93
MCR	TOTAL POPULATION	30577	159	585	656	485	440	460	487	432	333	232	198	169	130	105	76	59	29	30
		30577	159	585	656	485	440	460	487	432	333	232	198	169	130	105	76	59	29	30
KY	TOTAL MALES	4757	130	583	628	466	429	449	460	399	288	230	151	141	94	95	62	62	31	21
		4757	130	583	628	466	429	449	460	399	288	230	151	141	94	95	62	62	31	21
KY	TOTAL FEMALE	9814	309	1168	1284	951	869	909	937	831	601	467	349	310	224	200	138	121	60	51
		9814	309	1168	1284	951	869	909	937	831	601	467	349	310	224	200	138	121	60	51
AIA	TOTAL MALES	1300	35	154	203	142	113	130	141	100	66	41	29	48	22	35	17	9	6	4
		1300	35	154	203	142	113	130	141	100	66	41	29	48	22	35	17	9	6	4
AIA	TOTAL FEMALE	2532	70	297	378	300	274	251	269	207	129	89	68	76	39	57	26	26	10	6
		2532	70	297	378	300	274	251	269	207	129	89	68	76	39	57	26	26	10	6
NORTH	TOTAL MALES	16089	478	1943	2131	1676	1554	1468	1492	1287	1070	841	651	513	396	347	229	186	108	83
		16089	478	1943	2131	1676	1554	1468	1492	1287	1070	841	651	513	396	347	229	186	108	83
NORTH	TOTAL FEMALE	15599	435	1866	2019	1640	1473	1445	1382	1291	1032	764	564	456	330	284	212	199	92	67
		15599	435	1866	2019	1640	1473	1445	1382	1291	1032	764	564	456	330	284	212	199	92	67
NORTH	TOTAL POPULATION	31688	913	3809	4150	3316	3027	2913	2874	2578	2102	1605	1215	969	726	631	441	385	200	150
		31688	913	3809	4150	3316	3027	2913	2874	2578	2102	1605	1215	969	726	631	441	385	200	150

		1997 NON-APR COVERED POPULATION																		
		TOTAL	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
HD	TOTAL MALES	10995	271	1247	1442	1176	1070	899	923	823	734	639	518	356	267	227	154	119	65	47
		10995	271	1247	1442	1176	1070	899	923	823	734	639	518	356	267	227	154	119	65	47
AIA	TOTAL FEMALE	10514	257	1164	1385	1189	939	924	874	874	721	597	467	310	255	189	143	119	81	45
		10514	257	1164	1385	1189	939	924	874	874	721	597	467	310	255	189	143	119	81	45
AIA	TOTAL POPULATION	21509	528	2411	2827	2365	2009	1814	1797	1697	1455	1236	985	666	522	416	297	238	146	92
		21509	528	2411	2827	2365	2009	1814	1797	1697	1455	1236	985	666	522	416	297	238	146	92
MCR	TOTAL MALES	16965	431	1977	2270	1984	1642	1432	1561	1385	1201	976	772	564	453	356	277	184	106	73
		16965	431	1977	2270	1984	1642	1432	1561	1385	1201	976	772	564	453	356	277	184	106	73
MCR	TOTAL FEMALE	16908	393	1864	2272	1926	1487	1460	1494	1365	1201	976	772	564	453	356	277	184	106	73
		16908	393	1864	2272	1926	1487	1460	1494	1365	1201	976	772	564	453	356	277	184	106	73
NORTH	TOTAL POPULATION	33873	824	3841	4642	3890	3129	2897	3055	2750	2383	1851	1482	1061	855	649	517	364	235	142
		33873	824	3841	4642	3890	3129	2897	3055	2750	2383	1851	1482	1061	855	649	517	364	235	142

Appendix D Saskatchewan Covered Population, by Age and Sex, 1991, 1994 1997, and 1998


		1991 COVERED POPULATION																					
TOTAL		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95+	
1991	MALES	503568	7601	33099	42296	40713	38223	36305	40462	42282	39422	32496	24830	21564	21384	21177	19664	16340	12744	7662	3661	1298	345
1991	FEMALES	506958	7171	31521	40465	38445	36757	34649	40093	41623	37856	31481	24267	21678	21142	21729	21482	19727	16487	10972	6099	2456	858
1991	SASK	1010526	14772	64620	82761	79158	74980	70954	80555	83905	77278	63977	49097	43242	42526	42906	41146	36067	29231	18634	9760	3754	1203

		1994 COVERED POPULATION																					
TOTAL		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95+	
1994	MALES	504517	6967	31947	41182	41174	39282	35504	34681	41100	41066	35396	28926	22837	20592	20507	19446	17061	12735	8248	4019	1510	337
1994	FEMALES	509067	6597	30033	39169	39318	37402	33871	33605	41190	40036	33978	28177	22663	20637	20982	21000	20061	16908	12577	6989	2961	913
1994	SASK	1013584	13564	61980	80351	80492	76684	69375	68286	82290	81102	69374	57103	45500	41229	41489	40446	37122	29643	20825	11008	4471	1250

		1997 COVERED POPULATION																					
TOTAL		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95+	
1997	MALES	506528	6395	29153	40471	41583	40795	36214	32529	36617	40643	39179	32191	25798	20874	19701	19166	16816	13151	8914	4453	1501	384
1997	FEMALES	513823	5991	27893	38468	39854	38282	34941	31956	37007	40762	38070	30980	25200	21188	19994	20223	19555	17578	13530	8033	3292	1026
1997	SASK	1020351	12386	57046	78939	81437	79077	71155	64485	73624	81405	77249	63171	50998	42062	39695	39389	36371	30729	22444	12486	4793	1410

		1998 COVERED POPULATION																					
TOTAL		<1	1 to 4	5 to 9	10 to 14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95 +	
1998	MALE	513183	6151	28643	40423	41511	41474	37484	33527	35501	41301	40423	33629	27148	21580	19466	19103	16829	13328	8980	4624	1658	400
1998	FEMALE	518750	6061	27470	38358	39469	39252	35604	32471	35561	41250	39280	32150	26214	21707	19994	19977	19521	17621	13715	8461	3523	1091
1998	SASK	1031933	12212	56113	78781	80980	80726	73088	65998	71062	82551	79703	65779	53362	43287	39460	39080	36350	30949	22695	13085	5181	1491

Appendix E

 Saskatchewan Health Communicable Disease Control		CONFIDENTIAL Notification of Sexually Transmitted Disease		MR. USE HEAD OFFICE USE
PATIENT SURNAME FIRST NAME		LAB CONFIRMATION <input type="checkbox"/> YES <input type="checkbox"/> NO SITE _____ CULTURE _____ SMEAR _____ ELISA _____ <input type="checkbox"/> CHLAMYDIA <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> GONORRHOEA <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER _____		
ADDRESS DATE OF BIRTH Y M D		<input type="checkbox"/> HERPES RECURRENCE <input type="checkbox"/> TYPE <input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> SYPHILIS VORL <input type="checkbox"/> TITRE _____ CONFIRMATION <input type="checkbox"/> YES <input type="checkbox"/> NO CSF <input type="checkbox"/> POS. <input type="checkbox"/> NEG.		
HEALTH CARD NO. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE R <input type="checkbox"/> YES <input type="checkbox"/> NO		TREATMENT GIVEN (SPECIFY)		
DATE OF ONSET PHONE # Y M D		MARITAL STATUS <input type="checkbox"/> S <input type="checkbox"/> M <input type="checkbox"/> WID <input type="checkbox"/> DIV <input type="checkbox"/> SEP <input type="checkbox"/> COMM. LAW		
CONTACT INFORMATION				
SURNAME FIRST NAME		MARITAL STATUS <input type="checkbox"/> S <input type="checkbox"/> M <input type="checkbox"/> WID <input type="checkbox"/> DIV <input type="checkbox"/> SEP <input type="checkbox"/> COMM. LAW		
ADDRESS AGE		REMARKS (eg. meeting place, description, etc.)		
HEALTH CARD NO. DATE OF BIRTH Y M D				
PHONE # Home Office				
DATE OF EXPOSURE / / SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE Y M D		WILL YOU BE RESPONSIBLE FOR FOLLOW-UP OF THIS CONTACT? <input type="checkbox"/> YES <input type="checkbox"/> NO		
CONTACT INFORMATION				
SURNAME FIRST NAME		MARITAL STATUS <input type="checkbox"/> S <input type="checkbox"/> M <input type="checkbox"/> WID <input type="checkbox"/> DIV <input type="checkbox"/> SEP <input type="checkbox"/> COMM. LAW		
ADDRESS AGE		REMARKS (eg. meeting place, description, etc.)		
HEALTH CARD NO. DATE OF BIRTH Y M D				
PHONE # Home Office				
DATE OF EXPOSURE / / SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE Y M D		WILL YOU BE RESPONSIBLE FOR FOLLOW-UP OF THIS CONTACT? <input type="checkbox"/> YES <input type="checkbox"/> NO		
DO YOU REQUIRE: NOTIFICATION FORMS <input type="checkbox"/>		ANTIBIOTIC KITS (SPECIFY);		
NAME OF ATTENDING PHYSICIAN DR. NO.		ADDRESS		DATE
OFFICE USE ONLY CONTACT TRACING INITIATED BY				