

# Chapter 8: Infectious Disease

Historically, infectious diseases have brought terrible suffering to rural Alaskan communities. As late as 1950, infections caused almost one-half of the deaths among Alaska Natives and were still the leading cause of death overall in Alaska.<sup>1</sup> Epidemics of smallpox in the 19th century and influenza and measles at the turn of the 20th century devastated entire Alaskan communities and threatened the survival of Alaska Native cultures, and tuberculosis remained a major cause of disability and death in rural Alaska well into the 1950s. Infectious hepatitis A and B, invasive *Streptococcus pneumoniae*, and *Haemophilus influenzae* infections also have very significant histories in rural Alaska.

Improved sanitation and living conditions, the advent of routine vaccinations, screening and treatment protocols, and other public health efforts have virtually eradicated some of these infections and dramatically lessened the effect of others. Some infections, such as *Chlamydia trachomatis*, a sexually-transmitted infection, and hepatitis C, have emerged in recent years as growing public health concerns, however. In addition, antibiotic-resistant strains of some bacteria have become major threats to health.

Infectious disease remains an area of racial health disparity in Alaska, with higher rates of many communicable diseases and higher rates of hospitalization for infectious diseases among Alaska Natives, compared with non-Natives.

## 8.1. Infectious Disease Statistics

### 8.1.1. Reportable Infectious Diseases (Excluding Sexually-Transmitted Infections)

Some serious infections must be reported to the Alaska Department of Public Health. Although reporting is invariably incomplete for some infections, the reporting of these diseases allows an examination of disease trends over a number of years for specific regions and populations. With the exception of sexually transmitted diseases, the number of cases of reportable infectious diseases in the NSB is very low, and thus diseases have been aggregated into categories and case numbers into multiple-year time periods. Because of the small number of cases of reportable infectious diseases each year, reliable rates for the NSB cannot be calculated for most individual reportable diseases. In general, however, trends in reportable infectious diseases in the NSB parallel those occurring statewide.<sup>2</sup>

#### 8.1.1.1. Vaccine-Preventable Reportable Infections

The graph below shows a decline in vaccine-preventable diseases in the NSB between the early 1990s and the latter half of the decade. This pattern is primarily caused by a statewide hepatitis A outbreak in 1993 and the subsequent virtual disappearance of this disease following the institution of routine vaccination of all Alaskan children against hepatitis A in 1996. Statewide, new cases of hepatitis B are now rare, and rates of *Haemophilus influenzae* group B (HiB) meningitis and pneumococcal disease have decreased dramatically since the development and inclusion of these vaccines in the routine childhood immunization schedule. Cases of serious vaccine-preventable infections such as invasive pneumococcal disease, HiB, and pertussis, do still occur statewide and in the NSB, however. Between 2006 and 2009, there were at least six cases of these vaccine-preventable infections reported in the NSB.<sup>2</sup>

#### 8.1.1.2. Tuberculosis

Tuberculosis remains an important public health issue in Alaska and in the NSB, requiring constant vigilance and preventive efforts. Over the last 25 years, the NSB has averaged fewer than one new case of tuberculosis per year,<sup>2</sup> for an average case rate of roughly 10/100,000 population per year over this time period. The Healthy Alaskans 2010 goal is to reduce new tuberculosis cases to less than 6.8 per 100,000,<sup>3</sup> and the ultimate goal of the State of Alaska's Tuberculosis Control Program is the elimination of this infection from the state.

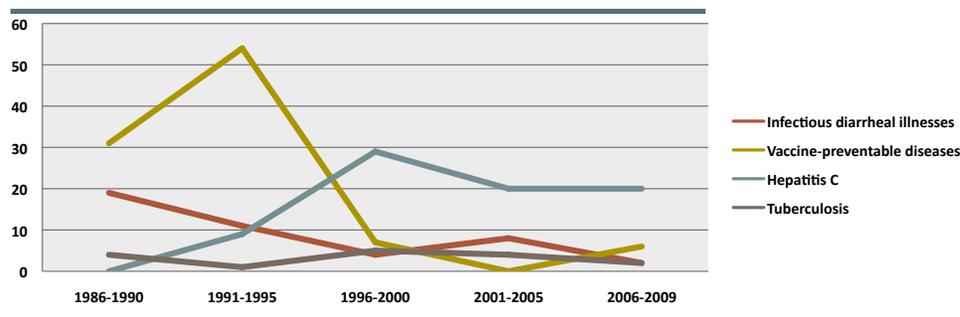
#### 8.1.1.3. Reportable Infectious Diarrheal Illness

Diarrheal, or enteric, infections are typically spread through contaminated food and water or contact with an infected individual. Diarrheal infections remain a leading cause of preventable death in developing countries. According to the Centers for Disease Control and Prevention, an estimated 76 million cases of food-borne illness and 5,000 associated deaths occur every year in the U.S. The number of cases of reportable infectious diarrheal illnesses has declined over the past 25 years in the NSB.<sup>2</sup> In the decade 1998–2007, the number of reported cases of diarrheal illness in the NSB did not exceed the expected number of cases based on a comparison with peer counties.<sup>4</sup>

#### 8.1.1.4. Hepatitis C

Hepatitis C is a chronic, asymptomatic infection that increases the risk for liver cirrhosis and cancer. Unlike for infectious hepatitis A and B, there is no vaccine against hepatitis C. It can be contracted by having had a blood transfusion prior to the initiation of blood supply screening in 1992, injection drug use, and less commonly through sexual, household, or mother-to-newborn transmission. Since testing became widely available in the early 1990s, reported cases of chronic hepatitis C have risen steadily in the NSB,<sup>2</sup> paralleling statewide and national trends.

**Figure 8.1: Reportable Infectious Diseases in the NSB (Excluding Sexually Transmitted Infections): Number of reported cases, 1986–2009**



Infectious diarrheal illnesses include *Campylobacter*, *Salmonella*, *Shigella*, *Escherichia coli* O157:H7, and *Giardia*.  
 Vaccine preventable diseases include *H. influenzae*, invasive pneumococcus, measles, mumps, rubella, pertussis, diphtheria, tetanus, polio, hepatitis A, and acute hepatitis B.  
 Tuberculosis includes cases of active tuberculosis of the lungs, other site, or unspecified site.  
 There were no cases of *E. coli* O157:H7, rubella, mumps, diphtheria, tetanus, or polio reported during these time periods in the NSB.  
 Hepatitis C cases represent prevalent cases of chronic hepatitis C. All other cases represent incident new cases.  
 Data source: Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology.

### 8.1.1.5. Reportable Parasitic Infections

Parasitic infections are a major burden of disease in many tropical and developing countries and in areas with poor sanitation facilities. Parasitic infections do not currently appear to represent a major threat to health in the NSB. Trichinosis is a potentially serious infection that can be contracted by eating the uncooked or undercooked meat of certain animals, including a number of arctic mammals, infected with the *Trichinella spiralis* parasite. In the NSB, there were 14 cases of trichinosis infection reported between 1986 and 1995 but none since 1995.<sup>2</sup> Giardiasis is a diarrheal illness caused by a microscopic parasite called *Giardia lamblia*. This parasite is found in soil, food, or water that has been contaminated with feces from infected humans or animals. Giardiasis statistics are included in the previous section under Infectious Diarrheal Illness, but specifically, there were 13 cases of giardiasis reported in the NSB between 1986 and 1995, five cases between 1996 and 2005, and no cases between 2006 and 2009.<sup>2</sup>

## 8.1.2. Reportable Sexually Transmitted Infections

Sexually transmitted infections (STIs) are infections that are passed from one person to another primarily or exclusively through sexual activity. STIs are not new; they have been known for hundreds of years. These infections are caused by a variety of bacteria, viruses, and parasites. Individuals are often unaware that they are infected as many STI's have mild or delayed symptoms, but left untreated they can lead to infertility, chronic pain, and even death. Infection during pregnancy can result in premature birth, abnormal fetal growth, and potentially life-threatening illness in the newborn. Education and prevention efforts, screening, treatment, sexual contract tracing, and, in some cases, vaccination, have reduced the health burden of STIs; however, STIs remain a major public health concern in Alaska and worldwide. STIs are an area of regional and racial health disparity nationwide. African Americans and American Indian/Alaska Natives experience the highest rates of both chlamydia and gonorrhea, and rural Alaska and the southeastern region of the United States are the regions with the highest rates of these infections.<sup>5</sup>

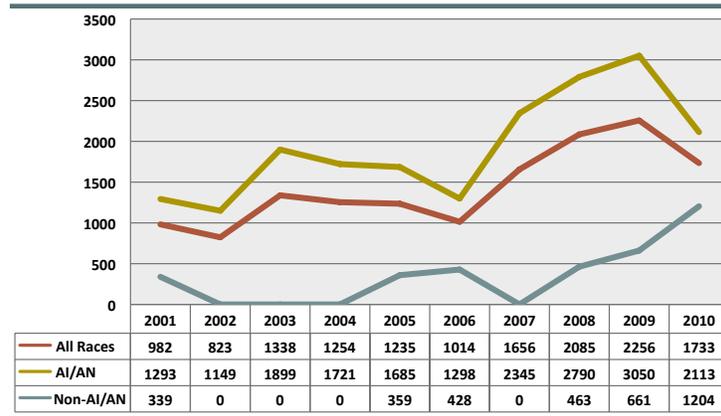
### 8.1.2.1. Chlamydia

*Chlamydia trachomatis*, commonly known as chlamydia, is the most common reportable sexually transmitted infection and one with potentially serious complications, including pelvic inflammatory disease, infertility, ectopic pregnancy, preterm labor, and neonatal infections. Alaska's chlamydia infection rates are consistently among the highest in the nation.<sup>6</sup> Alaska Natives, women, adolescents and young adults,<sup>6</sup> and those living in northern and southwest rural regions<sup>7</sup> are disproportionately affected. In 2007, the

Alaska Indian Health Service (IHS) region had the highest chlamydia rates of all IHS areas, and rates among Alaska Natives were more than five times U.S. rates.<sup>8</sup>

Mandatory reporting of chlamydia began in Alaska in 1996. Rates of infection in the state have been increasing steadily, more than tripling between 1996 and 2009.<sup>6</sup> Chlamydia rates have increased in the NSB as well, although 2010 saw a slight decrease in the chlamydia rate. Increases in chlamydia rates and regional differences in rates may also, in part, reflect screening practices, availability of different diagnostic tests, consistency of reporting by providers and laboratories, and partner identification and testing practices.

**Figure 8.2: Trends in Chlamydia Rates in the NSB, by Race: Number of cases reported per 100,000 population, 2001–2010**

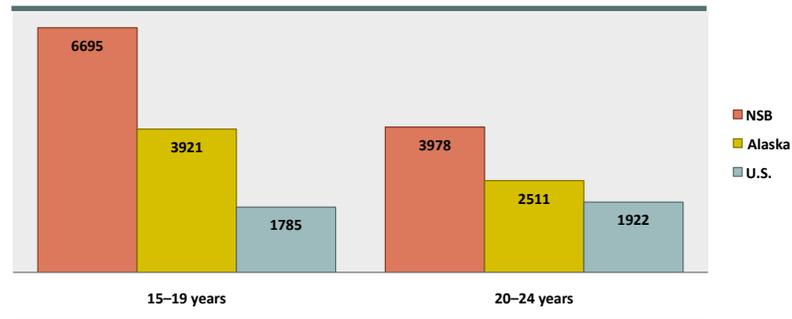


All rates are age-adjusted to the 2000 U.S. census standard population. AI/AN=American Indian/Alaska Native. Rates based on fewer than five cases appear as "0" in graph and table.

Data source: Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology, STD Program: Chlamydia and Gonorrhea Rates, by Alaska Native Health Corporation Service Region—Alaska, 2001–2010 website

NSB chlamydia incidence rates are higher than statewide rates for comparable age groups.<sup>9</sup> Again, differences and trends in testing, diagnosis, reporting, and case-finding must be considered in interpreting the available data.

**Figure 8.3: Chlamydia Rates in High-Risk Age Groups: Number of cases per 100,000 persons, 2006–2008**

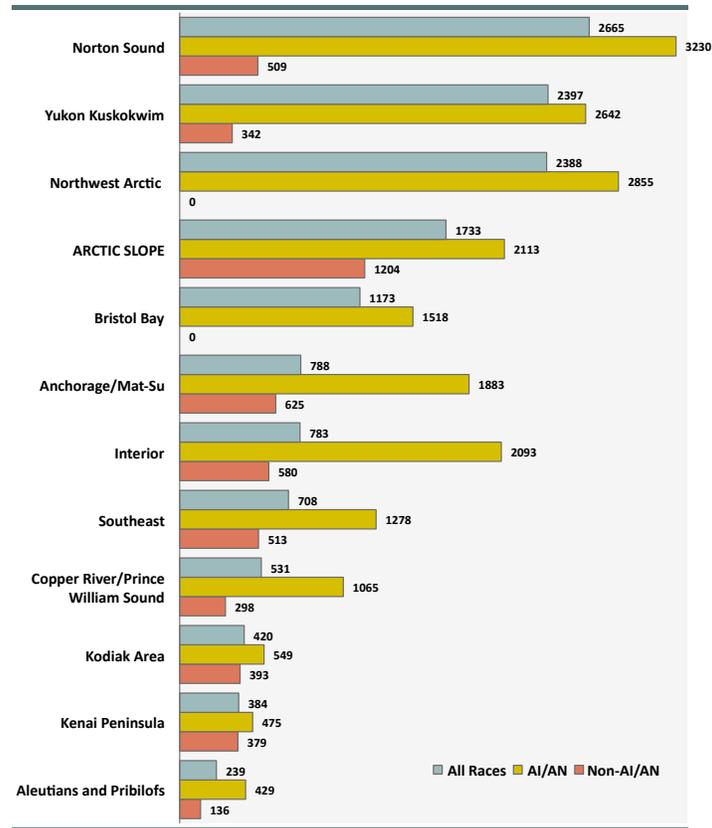


NSB and Alaska data source: Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology, STD Program.

U.S. data source: Centers for Disease Control and Prevention, STD Data and Statistics, Interactive STD Data 1996–2008.

The State of Alaska Department of Health and Social Services HIV/STD program recently made data publicly available on chlamydia rates by age, race, and gender for all Alaska Native Health Corporation Regions. The Arctic Slope service region experienced the fourth highest rate in the state. Of note, the age-adjusted chlamydia rate for non-Native Arctic Slope residents (1204/100,000) was the highest rate among non-Natives of all the regions in 2010.

**Figure 8.4: 2010 Chlamydia Rates, by Race and Region: Number of cases reported per 100,000 population**



All rates are age-adjusted to the 2000 U.S. standard population.

Rates based on fewer than five cases appear as "0" in graph and table.

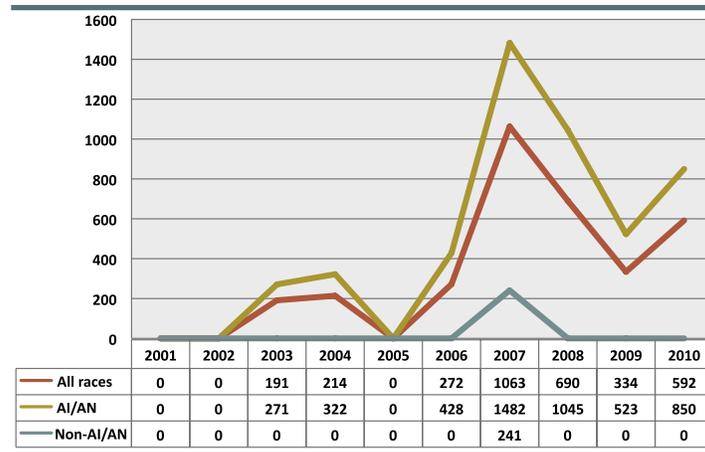
Data source: Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology, STD Program: Chlamydia and Gonorrhea Rates, by Alaska Native Health Corporation Service Region—Alaska, 2001–2010 website

### 8.1.2.2. Gonorrhea

Gonorrhea, another sexually transmitted infection, is less common than chlamydia. It also is associated with a number of potentially serious complications in both men and women, including genitourinary infections, pelvic inflammatory disease, infertility, ectopic pregnancy, joint infection, and preterm birth and neonatal infections.

After a period of decline in the 1980s and early 1990s following the implementation of the national gonorrhea control program in the mid-1970s, gonorrhea rates have been relatively stable in the U.S.<sup>5</sup> During 2008–2009, 84% of states reported a decrease in gonorrhea rates.<sup>5</sup> In 2009, however, Alaska experienced a 69% increase in the number of gonorrhea cases statewide, and this increase has continued in 2010.<sup>10</sup> Alaska Natives and people living in southwest Alaska experienced the highest rates, whereas the northern region experienced the second highest rates.<sup>10</sup> In the NSB, the increase in gonorrhea cases began in 2007, with 59 new cases, the highest number reported of any year for which data were available for the NSB.<sup>9</sup> In 2009 and 2010, the annual gonorrhea rate declined somewhat but did not return to previous levels.

**Figure 8.5: Gonorrhea Rates in the NSB: Number of cases reported per 100,000 population, 2001–2010**



All rates are age-adjusted to the 2000 U.S. standard population.

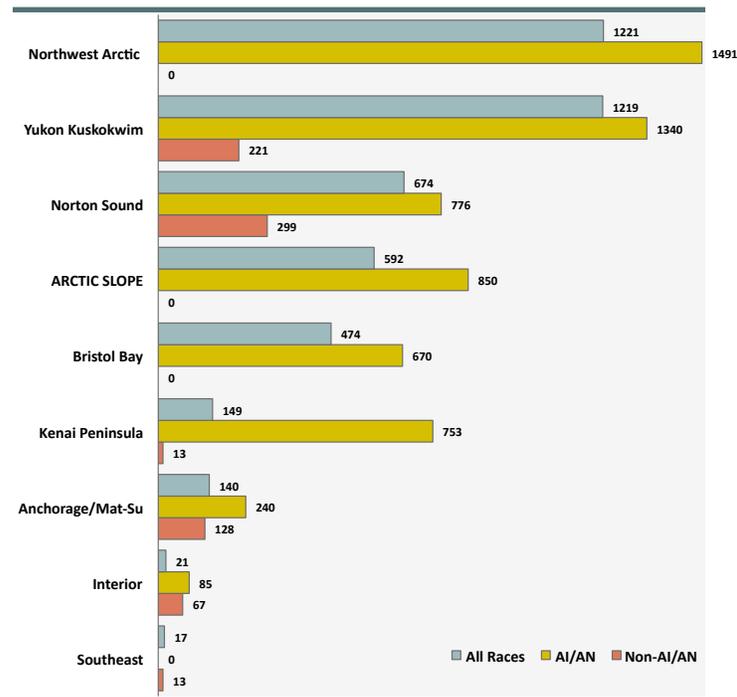
Rates based on fewer than five cases appear as "0" in graph and table.

Data source: Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology, STD Program: Chlamydia and Gonorrhea Rates, by Alaska Native Health Corporation Service Region—Alaska, 2001–2010 website

AI/AN=American Indian/Alaska Native.

As is the case with chlamydia, the northern and southwest regions of the state, and particularly Alaska Native residents of these regions, continue to experience the highest gonorrhea rates in the state.

**Figure 8.6: 2010 Gonorrhea Rates, by Race and Region: Number of cases reported per 100,000 population**



Rates are age-adjusted to the 2000 U.S. standard population.

Rates based on fewer than five cases appear as "0" in graph and table. Kodiak area, Copper River/Prince William Sound, and Aleutians and Probilofs had zero cases reported in 2010.

AI/AN=American Indian/Alaska Native.

Data source: Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology, STD Program: Chlamydia and Gonorrhea Rates, by Alaska Native Health Corporation Service Region—Alaska, 2001–2010 website

### 8.1.2.3. Human Immunodeficiency Virus (HIV)

HIV is the virus that can lead to acquired immunodeficiency syndrome, or AIDS. The CDC estimates that about 56,000 people in the U.S. contract HIV each year and that more than one million people are living with HIV in the United States. It is estimated that one in five (21%) of those people living with HIV is unaware of their infection.<sup>11</sup>

In the NSB, there were fewer than six reported cases of HIV between 1982 and 2008 and no new cases reported since 1995.<sup>9</sup> In Alaska, a cumulative total of 1,317 cases of HIV infection were reported during between 1982 and 2009, with 56 cases reported in 2009.<sup>12</sup>

HIV is spread primarily through unprotected sex and through sharing needles and other equipment used for injecting illegal drugs. Nationwide, approximately one-half of new HIV cases occur in men who have sex with men, although almost one in three new HIV infections are contracted through heterosexual contact and 12% through injection drug use.<sup>11</sup> Among women, 80% of new infections occur through heterosexual contact. HIV is an area of racial health disparity nationwide. African Americans continue to bear the greatest burden of HIV. In 2006, however, American Indian/Alaska Native females had an HIV diagnosis rate that was nearly twice that of white females, and rates among American Indian/Alaska Native males were slightly higher than among whites.<sup>13</sup>

### 8.1.2.4. Syphilis

No cases of infectious syphilis were reported among NSB residents from 1990 to 2008.<sup>9</sup> Syphilis is rare in Alaska, with the exception of an outbreak in 2004 affecting Anchorage, Fairbanks, and Southeast Alaska.<sup>14</sup>

## 8.1.3. Non-Reportable Infectious Disease

Most common infectious diseases are not reportable to the state health department and are thus more difficult to survey and track. These non-reportable illnesses include most common viral and bacterial upper and lower respiratory infections such as colds and flu, pneumonia, and ear, nose, and throat infections. Many other non-reportable infections impact the health of communities and families, including such things as gastrointestinal infections, or “stomach flus,” skin infections, and some sexually transmitted infections.

Respiratory infections, including upper and lower respiratory infections, respiratory syncytial virus (RSV), and influenza, are discussed separately in Chapter 5: Respiratory Disease.

Limited data are available at the community level for several other non-reportable infections.

### 8.1.3.1. Human Papilloma Virus (HPV)

HPV is the most common sexually transmitted infection in the United States. Some strains of this virus cause genital warts, and persistent infection with certain strains of HPV can put a woman at risk for cervical cancer. HPV infection is usually discovered during routine pap smears. HPV can be present without causing abnormalities on a pap smear, however, and abnormal pap smears can have causes other than HPV. The Screening for Life program in the NSB conducted 14,017 pap smears on 3012 women between January 1, 1991 and June 30, 2009. Of these, 2,832 were abnormal, and ultimately 238 were conclusively diagnosed with HPV-associated cervical disease.<sup>16</sup>

The estimated overall prevalence of HPV (the types associated with cervical cancer) in the U.S. is 23%, with the highest prevalence in teens and young women.<sup>15</sup> Comparable HPV surveillance data are not available for the NSB.

### 8.1.3.2. *Helicobacter pylori*

*Helicobacter pylori* is a bacterium associated with inflammation and ulcers of the stomach and intestinal lining. *H. pylori* infection is common in developing countries with poor sanitation, and has been found to be highly prevalent in rural Alaska.<sup>17</sup> Based on stored blood samples from 1980 to 1986, the percentage of Alaska Natives statewide who had antibodies against *H. pylori* (indicating a current or past infection) was estimated to be 75%. The percentage of Alaska Natives in the NSB found to have these antibodies was similar, at 73%.<sup>18</sup> The North Slope does not participate in ongoing *H. pylori* surveillance, and more recent data on the prevalence of *H. pylori* following major improvements in water and sanitation infrastructure in the NSB were not available at the time of writing.

### 8.1.3.3. Invasive and Drug-Resistant Organisms

The CDC Arctic Investigations Program conducts surveillance and research in Alaska on a number of invasive and antibiotic-resistant organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA). Unfortunately, multiple attempts to obtain surveillance information for this report on invasive and antibiotic-resistant organisms in the NSB were unsuccessful.

## 8.2. Determinants of Infectious Disease

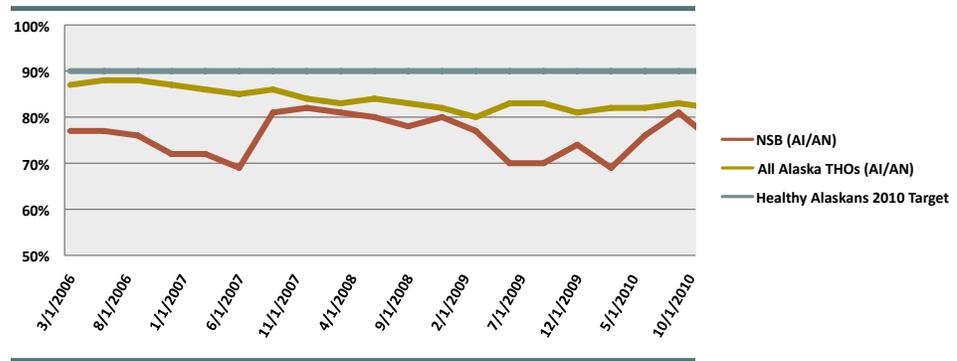
Infectious diseases occur because of a complex interplay between an individual, the infectious organism, and the environment. Nutrition, underlying health, genetic factors, and behaviors such as smoking and alcohol use, breastfeeding, handwashing, and sexual practices influence the risk of contracting and becoming ill with an infectious disease. Socioeconomic, demographic, and environmental factors also play important roles in the transmission of infections—poverty, crowding, migration patterns, water and sewage facilities, and climate change all have the potential to influence patterns of infectious diseases in communities. Antibiotic use and hospital infection control programs affect both infection transmission and antibiotic resistance patterns. Coordinated public health programs have been vital in reducing the burden of infectious diseases such as tuberculosis and gonorrhea through education, screening, treatment, contact investigation, and surveillance.

### 8.2.1. Determinants of Vaccine-Preventable Infections: Childhood Immunization Rates

Immunization has been a cornerstone of public health for many decades. Both the vaccination status of an individual and vaccination rates in the community determine the risk of contracting vaccine-preventable diseases. In general, coverage rates of 90% in a community will prevent spread of vaccine-preventable diseases.<sup>3</sup> In rural Alaska, immunizing children is typically a joint effort between tribal health organizations (THOs) and public health nurses. In the NSB, the Public Health Nursing program, in coordination with the Community Health Aide Program, is responsible for immunizations.

In recent years, childhood vaccine schedules have become increasingly complex. Meanwhile, public health nursing programs across the state, including the NSB's, have suffered from significant staffing shortages, hampering efforts to meet immunization goals. Immunization rates for two-year-olds in the NSB have remained slightly below the average for THO service areas statewide, although both remain below the Healthy Alaskans 2010 goal of 90% coverage.<sup>19</sup>

**Figure 8.7: Two-Year-Old Childhood Immunization Rates: Percent of children ages 19–35 months who have received the recommended series of immunizations\***



\*Coverage rates for 43133 series (4DTaP, 3Polio, 1MMR, 3 HepB). Two-year coverage rates for the currently recommended 431331 series, which includes one varicella dose, are slightly lower for both the NSB and all THOs combined.

Data source: ANTHC Immunization Program.  
AI/AN=American Indian/Alaska Native

### 8.2.2. Determinants of Other Reportable Infectious Diseases (Other than STIs)

Improvements in rural sanitation have been identified as the most important determinant of diarrheal diseases worldwide.<sup>20</sup> Food production, distribution, and home and restaurant food-handling practices are other important factors in determining the burden of food-borne diarrheal illnesses. National food safety policies, farming and food processing practices, state and local health department food and water safety regulations and oversight, general household living conditions, and household food handling practices all influence the risk of infectious diarrheal and food-borne illness.

Tuberculosis is an old disease and has long been known to be associated with such factors as poverty, poor housing, malnutrition, and poor underlying health. High tuberculosis and hepatitis C rates are also seen in incarcerated populations and areas with a high prevalence of HIV/AIDS. Screening of high-risk populations, surveillance and case-finding, the use of preventive medication, and directly-observed therapy and intensive follow-up for active cases are successful public health strategies for reducing tuberculosis rates in communities.

Prevention of hepatitis C transmission is an area of active research, because a significant minority of infected individuals are unable to identify a source for their infection.

### 8.2.3. Determinants of Sexually Transmitted Infections

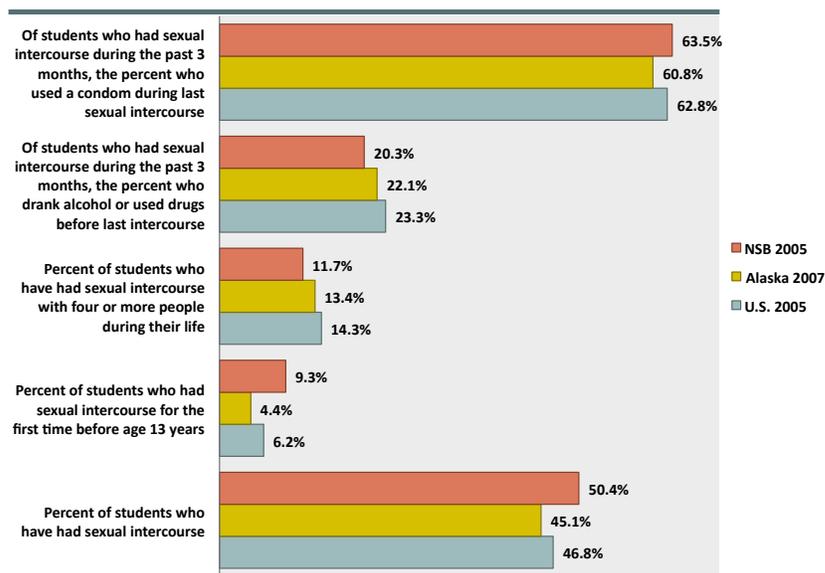
Sexual behavior is the primary determinant of STI risk, with number of sexual partners and condom use being the main factors. The prevalence of STIs in the community also determines the likelihood that an individual will contract an infection through sexual contact. Having one STI can also increase the risk of becoming infected with other STIs, including HIV. Alcohol and drug use, gender, age, social and cultural norms, and socioeconomic factors can all influence sexual behaviors and affect the risk of sexually transmitted infection. Active screening, treatment, and partner notification programs are important means of controlling STI rates in a population, and several STIs (HPV and hepatitis B) can be prevented through vaccination.

Studies have demonstrated that sexual behavior can be influenced by comprehensive sex education in schools<sup>21</sup> and community-based interventions,<sup>22</sup> although little information is available about the effectiveness of STD prevention programs in rural Alaska or in indigenous communities in general.

### 8.2.3.1. Sexual Behavior Among Youth

The Alaska YRBS survey collects information on sexual behavior among high school students. In general, reported sexual practices differed little between the NSB and state and national samples.<sup>23</sup> In 2005, roughly half of NSB high school students reported having had sexual intercourse. The Healthy Alaskans target to help reduce teen pregnancy and STI transmission is for less than 35% of high school students to report having had sexual intercourse. Almost two-thirds of sexually active NSB high school students reported using a condom during the last sexual intercourse. The Healthy Alaskans 2010 target was that at least 75% of students report using a condom during the last sexual intercourse.

**Figure 8.8: Sexual Behavior Among High School Students**



Data source: 2005 and 2007 YRBS.  
There were no statistically significant differences between NSB estimates and state or national estimates.

### 8.2.3.2. Other Determinants of STIs

The causes and social epidemiology behind the high rates of certain STIs in rural Alaska and among Alaska Natives in particular are areas of ongoing research.<sup>24</sup> Evidence is also very limited on factors associated with condom use in indigenous communities, although there is some evidence that white male/Alaska Native female partner pairs are less likely to use condoms than other sexual partners.<sup>25</sup> Sudden demographic and socioeconomic changes can effect sexual behavior, particularly among youth. A study in an oil “boomtown” in northeastern Canada identified ways in which sudden demographic and socioeconomic changes can impact sexual behavior among youth, fueling the spread of STIs: mobility of oil/gas workers, binge partying, high levels of disposable income, and gendered power dynamics.<sup>26</sup> One study of adolescents in a Lower 48 American Indian tribe found that “youth faced intense pressures for early sex, often associated with substance abuse. Condoms were not associated with stigma, yet few seemed to value their importance for disease prevention.”<sup>27</sup>

# Chapter 8 Endnotes

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